LD5

Operation Manual

(A & B Variants)

VERIPOS

Table of Contents

1   Introduction

1.1   General

This manual is applicable to LD5's which are **A or B variants**. For LD5 **C variants**, please refer to the *LD5 (C Variant) Operations manual*. For installation guidance please see the *LD5 Installation manual, which applies to all LD5 variants*.

An *LD5 Quick Guide* is also available which provides basic information regarding some LD5 menus, data outputs etc.

The latest copies of all LD5 related manuals can be downloaded from VERIPOS Online Support System (VOSS) http://help.veripos.com .

Throughout this manual reference will be made to the VERIPOS Helpdesk. The Helpdesk is provided by VERIPOS as 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 **LD5 (A & B Variant) Operations Manual** comprises information on connecting the unit, beam and access code entry, COM and IP ports and a quick guide.

1.2.1   Contents

Chapter	Contents
1. Introduction	Specifies the purpose and target group for the manual. It also contains a list of used abbreviations and a specification of the document conventions.
2. Operation	Describes the interfaces in detail, the start-up, the status indicators and possible corrective actions and how to shut the system down.
3. Compatible Software	Describes the VERIPOS visualisation software which is compatible with the LD5 (A & B variants).
4. Troubleshooting	Describes basic fault tracing and a detailed description on how to report problems or queries to the VERIPOS Helpdesk.
5. Reference information	Comprises additional information such as additional configuration, station ID listings.
6. Contact information	Contains contact information for the VERIPOS Helpdesk and VERIPOS offices worldwide.

1.3 Terms and abbreviations

ALF	VERIPOS proprietary logging format
APEX	A Veripos PPP DGNSS service using GPS
APEX²	A Veripos PPP DGNSS service using GPS and GLONASS
DGPS	Differential GPS
DGNSS	Differential GNSS
DOP	Dilution of Precision
EIA	Electronics Industry Association (this document uses the previous terminology "RS" that is generally recognized in the industry)
GDOP	Geometric Dilution of Precision
GLONASS	Global Navigation Satellite System – Russian equivalent to GPS
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
HDOP	Horizontal Dilution of Precision
Hz	Hertz
IMU	Integrated Mobile Unit
LAN	Local Area Network
L-Band	Radio frequency band, 1GHz to 2GHz, as used for Veripos correction data transmitted from communication satellites
MF	Medium Frequency radio band, 300kHz to 3MHz, as used to transmit IALA / Beacon correction data from land stations
MHz	Megahertz
MMI	Man Machine Interface
NBF	Novatel Binary Format
NMEA	National Marine Electronics Association
N/A	Not applicable
PDOP	Position Dilution of Precision
PPP	Precise Point Positioning
PPS	Pulse per Second
PRN	Pseudo Random Noise
RoHS	Restrictions of Hazardous Substances
RTCM	Radio Technical Commission for Maritime Services
SAL	Service Access License
SBAS	Satellite Based Augmentation System (for example WAAS/USA. EGNOS/Europe and MSAS/Asia)
SD	Standard Deviation
SNF	Service Notification Form
SNR	Signal to Noise Ratio
Spotbeam	High Power L-Band Signal transmitted from a satellite
Standard / Std	Veripos Single Frequency DGPS System using GPS
Standard² / Std²	Veripos Single Frequency DGPS System using GPS and GLONASS
SV	Space Vehicle
Ultra	A Veripos PPP DGNSS service using GPS
Ultra²	A Veripos PPP DGNSS service using GPS and GLONASS

USB	Universal Serial Bus
UTC	Coordinated Universal Time
VDOP	Vertical Dilution of Precision
VERIPOS	Global DGPS service provider
VOSS	VERIPOS Online Support System
WAAS	Wide Area Augmentation System (SBAS implementation in USA)
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-references 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
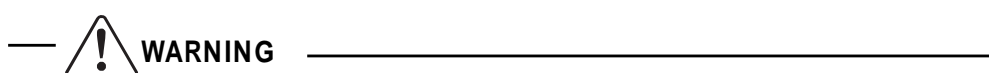
⚠ WARNING

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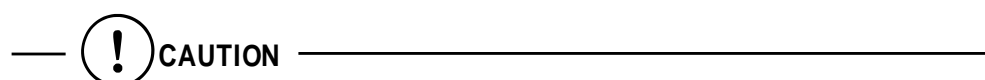
ⓘ CAUTION

A caution indicates the risk of damaging the hardware.
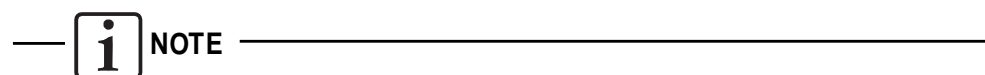
ⓘ NOTE

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

1.5 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 initial assistance with troubleshooting see the *Troubleshooting* section in this manual. If the troubleshooting section does not resolve the issue contact the VERIPOS helpdesk for further assistance.

Users can also create a fault ticket on the help.veripos.com web site. This will ensure contact details and the description of the fault are correctly recorded.

The Helpdesk 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, such as updated manuals.

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

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

VOSS has comprehensive help and assistance that provides:

• Updates on VERIPOS service availability and notifications
• Knowledge base
• Trouble-shooter
• Downloads
• Online fault reporting.

1.7   Enabling the equipment for use

VERIPOS correction signals are provided as a chargeable service.

In order for the equipment to decode corrections and output positions it must be enabled.

The enable/disable procedure is detailed in section 2.6.2 onwards.

When the Veripos services are not required some contracts may allow for disabling the service to avoid charges.

ⓘ NOTE

To use VERIPOS correction signals a contract between the user's company and the VERIPOS Operations department <u>must</u> be in place. VERIPOS call this a service access license (**SAL**).

To avoid delays users should record the SAL number associated with the VERIPOS equipment.

The Helpdesk is not authorised to issue a code unless an active SAL exists and its reference number can be determined.

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 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.

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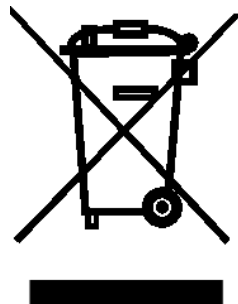
1.9   Disclaimer

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2 LD5 Operation

The controls for working with the LD5 are all available on the front panel. The

LD5 control panel is used to configure the unit using the main screen display.

2.1 LD5 Variants

2.1.1 Available LD5 Variants

There are various LD5 IMU variants available. The variants depict the hardware installed in the unit. In addition to the common variants, there are also Mod variants which allow the use of different antenna configurations.

'A' variants are fitted with Septentrio GNSS receiver cards (A1 variant excluded).

'B' variants are 2nd generation LD5's. The 'B' variants are fitted with Novatel OEM615 GNSS receiver cards.

```
L D 5 - X X

        1 Demodulator Only Installed
        2 Demodulator & GNSS Receivers Installed
        3 Demodulator, GNSS & MF Receivers Installed
      - A Septentrio GNSS Receiver Installed*
      - B Novatel 615 GNSS Receiver Installed**

    Unit Series

  Demodulator

L - Band Receiver Installed
```
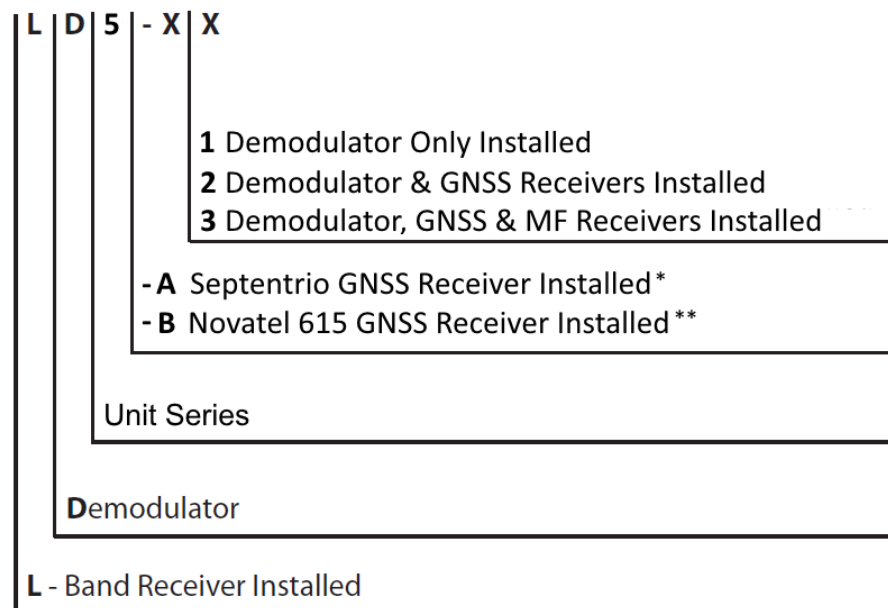
* Will have either GPS or GPS+Glonass tracking capabilities, depending on permissions installed

** Will have GPS+Glonass tracking capabilities

┌─ⁱ┐ NOTE

The GNSS constellations which can be used in the VERIPOS solutions calculated by your LD5 will depend on the LD5 variant and the VERIPOS service which the LD5 is enabled for.

LD5 'C' variants are also available. Please refer to the LD5 (C variant manual for further information.

The table below shows the LD5 A and B variants which are available, depending on the user's requirements;

Hardware Variants	Installed Modules	Antenna Connection
A1	L-Band	**L-Band** Only (N-Type Connector)
A2	L-Band, GNSS	Combined **L-Band** and **GNSS** (N-Type Connector)
A3	L-Band, GNSS, MF	Combined **L-Band**, **GNSS** (N-Type Connector) and **Separate MF** (TNC Connector)
A2 – Mod 1*	L-Band, GNSS	Separate **L-Band** (N-Type Connector) and **GNSS** (TNC Connector)
A3 – Mod 1*	L-Band, GNSS, MF	Combined **L-Band**, **MF** (N-Type Connector) and **Separate GNSS** (TNC Connector)
A3 – Mod 2*	L-Band, GNSS, MF	Combined **GNSS**, **MF** and **Separate L-Band** (N-Type Connector)
B2	L-Band, GNSS	Combined **L-Band** and **GNSS** (N-Type Connector)
B3	L-Band, GNSS, MF	Combined **L-Band**, **GNSS** (N-Type Connector) and **Separate MF** (TNC Connector)

An on screen icon for each optional receiver module (GNSS or MF Beacon) will only be shown when the module is fitted.

*Further details regarding the 'Mod' variants can be found in the LD5 Installation Manual.

2.1.2 Identifying LD5 Variant

There are two methods generally used to identify which LD5 variant you have:

There should be a sticker located on top of the LD5 chassis. Part of the information is the model or variant version:
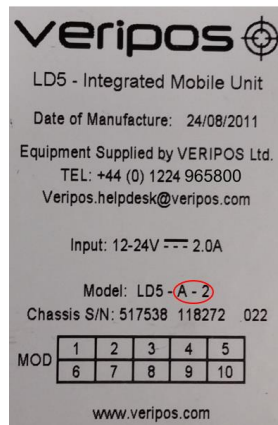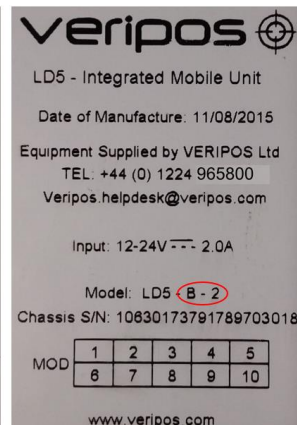
A2 Variant   *B2 Variant*

The variant can also be checked via the **Config/Config** menu:

A3 Variant   *B3 Variant*

2.2   Modes

The LD5 *A Variant* has three operating modes: *LD5*, *QC* and *Maint*. The Mode determines the type of data that is available for output on the serial and Ethernet ports.

QC mode is used when the unit is to be used with Verify QC software running an external computer. In this mode the Raw GNSS data and one NMEA output is available from the LD5 IMU (along with all available RTCM data streams)**.**
In QC mode MF Beacon corrections are available for output only, not for use in the internal calculation.

LD5 mode is used when only internal position computations are required. In this mode two independently configurable NMEA output are available from the LD5 IMU (along with all available RTCM data streams).
In LD5 mode MF Beacon and External RTCM corrections are available both for output and for use in the internal calculation.

Maint mode should only be used under instruction from VERIPOS.

The LD5 *B Variant* has only two operating modes: *LD5* and *QC* (No *Maint* mode)

$\boxed{\mathbf{i}}$ NOTE

The LD5 will log data internally which can be used by VERIPOS during support cases.

Data logging is only enabled while the LD5 is in **LD5** mode. Please refer to **section 2.9.7** for further information regarding LD5 data logging.

2.3   Satellite constellations

When specifying the LD5, users choose which satellite constellations are used by the GNSS receiver card.

The internal GNSS card used in LD5-A's (variants **A2** and above) are preconfigured to the use either **GPS** or **GPS+GLONASS** satellite constellations.

Variants **B2 and B3** are all preconfigured to use **GPS+GLONASS** satellite constellations.

─ ⓘ NOTE ─────────────────────────────────

GLONASS satellites will only be used in the solution if the LD5 is enabled to receive and use VERIPOS GLONASS corrections.

2.4   Views and controls
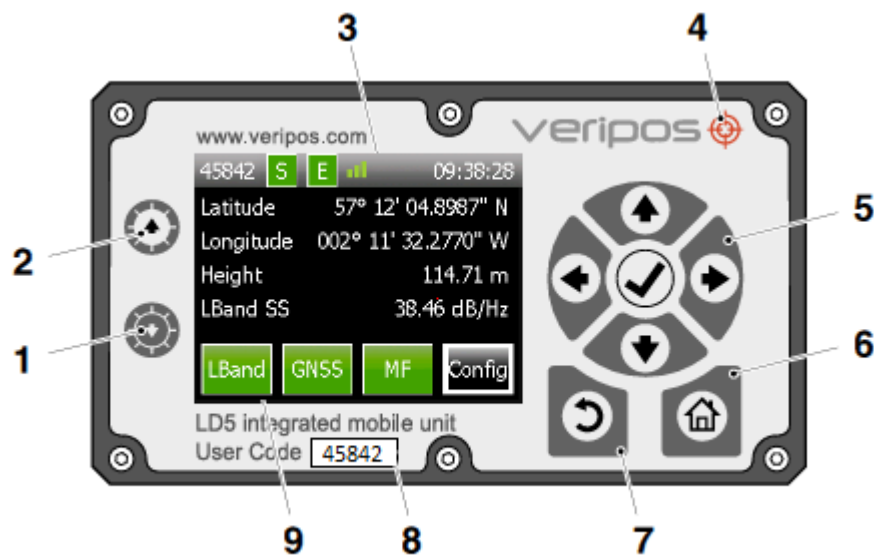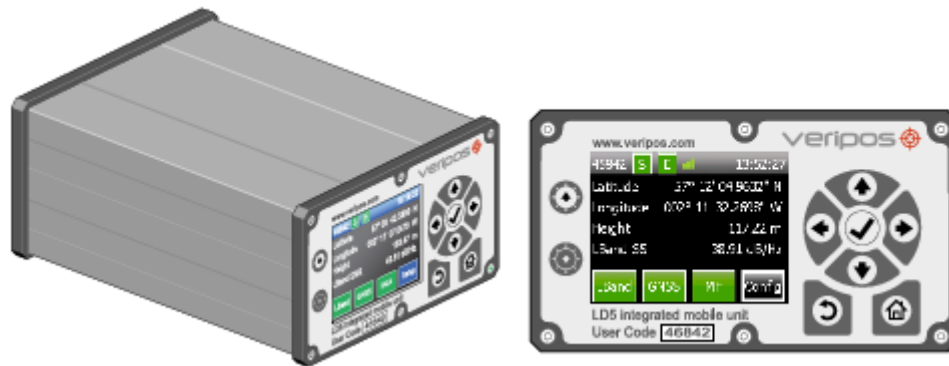
1   Adjust screen darker
2   Adjust screen brighter
3   L-Band Signal Strength Indicator
4   Power indicator
5   Navigation panel. Arrow keys are used to move through menu items and tick key (✓) is used to accept an item.
6   Home
7   Return
8   User code (5 digits)
9   Receiver card icons (3 max.)
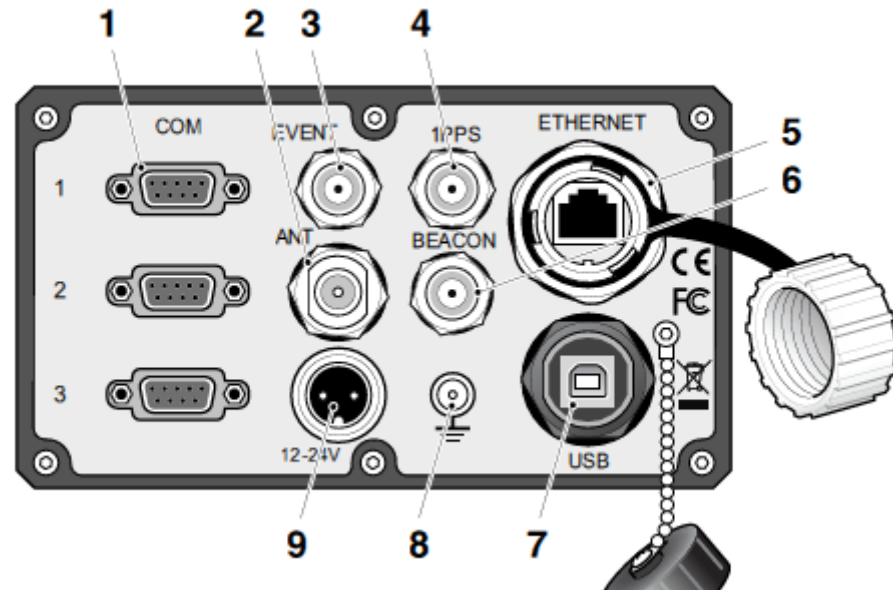
LD5 Rear Panel Connectors

1   COM ports 1 to 3, RS232 or 422, 9-pin D type female connector
2   N-type antenna connector (use depends on variant/mod)
3   'EVENT' input BNC connector (currently not used)
4   '1PPS' output BNC connector
5   Ethernet RJ45 connector *
6   TNC antenna connector (use depends on variant/mod)
7   USB type B connector *
8   Grounding point
9   DC power connector (12–24 VDC)

* Do not connect devices to LD5 without first performing a virus scan!

2.5   LD5 Start up

Confirm the LD5 has been correctly installed.

Where required, refer to the *LD5 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:

http://help.veripos.com

Plug in power to the rear of the unit.

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

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

The LD5 may be disabled when first powered up. If the unit is disabled the L-band, GNSS, and Enabled indicator icons will be red.

A Veripos beam is first needed to be selected to receive correction data in the work area. Once a suitable beam has been selected, and Sync on the signal achieved, the unit can be enabled 'over the air' by the Veripos Helpdesk.

If there is a problem, refer to the *Troubleshooting* chapter in this manual.
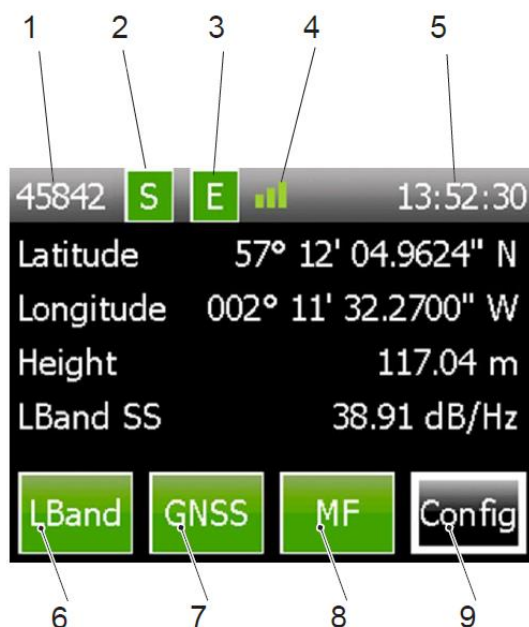
LD5 Main Screen

1   User code (5 digits)
2   L-band Sync indicator
3   Unit Enabled indicator
4   L-Band signal strength indicator
5   LD5 time display (UTC)
6   Indicator and access to L-Band card controls
7   Indicator and access to GNSS card controls
8   Indicator and access to MF card controls **(A3 & B3 variants only)**
9   Access to configuration controls

The home page of the LD5 screen displays the user code number, 'Sync' and 'Enabled' indicators (Green = OK, Red = No sync / Disabled respectively).

The L-Band signal strength indicator (4), has three states:

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

Time shown is in universal time coordinated format (UTC).

The receiver card icons, L-band, GNSS and MF, give access to card status information and configuration controls. The icon colour will change red or green, to indicate the status of the service. See the *Trouble-shooting* chapter for more information.

LD5 units may not have all cards fitted. Only when a receiver card is present does an icon for it appear on screen.

Configuration of each installed receiver card is achieved using the arrows, return, home and accept (tick) control pad on the right hand side of the LD5 front panel to navigate to and select the corresponding on screen button.

2.5.1 LD5 Mode selection

To ensure the correct mode is selected:

Go to *Config/ Config/ Operating mode.*

Three Mode options are selectable:

- **LD5** - Used when internal position computation only is required and there is no requirement for Raw GNSS measurements for Verify QC or other software.
- **QC** - Used when there is a requirement for Raw GNSS measurements for Verify QC or other software.
- ***Maint** – only use this mode under guidance from VERIPOS.

*A Variants only.

2.6 L-Band receiver

This menu provides access to Beam Selection, Access Code, RTCM Station selection, antenna voltage and L-Band Status information.

2.6.1 L-Band / Status / Module Info

This page displays the following information regarding the L-Band card;

- Firmware version
- Decoder version
- Bootloader version

VERIPOS may request these details during support queries.

2.6.2 L-Band / Status / Device Status

This view allows the user to review the Signal Strength, selected Beam, whether or not the unit has Frame Sync or Signal Lock, and whether or not the LD5 is enabled.

To view the L-Band signal status, from the **Home** screen select ***L-Band/ Status/Device Status***

2.6.3 L-Band / Config / RTCM Stations

To enable or disable reference stations, from the Home screen select ***L-Band/ Config/RTCM Stations*** and select from **RTCMa** or **RTCMb**.

Use the right/left navigation arrows to view more stations.
To enable or disable stations, move the cursor to the appropriate box using the arrow keys. Then use the tick (✓) key to toggle stations between enabled (green) and disabled (red).

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 LD5 will automatically use the closest six stations in internal position computations.

2.6.4 L-Band / Config / Beam selection

This step describes how to select a satellite beam to receive VERIPOS correction data.

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

A chart showing the beam names and coverage is available in the *Reference information* chapter – 'Global coverage chart'.

Up to date beam coverage charts are available on VOSS:

http://help.veripos.com

In addition, the free software VeriChart is available for download from VOSS. It allows VERIPOS users to generate their own chart of regional information and helps users get the best service when configuring the LD5.

From the Home page use the navigation panel keys to select **L-Band/ Config/ Beam Selection**
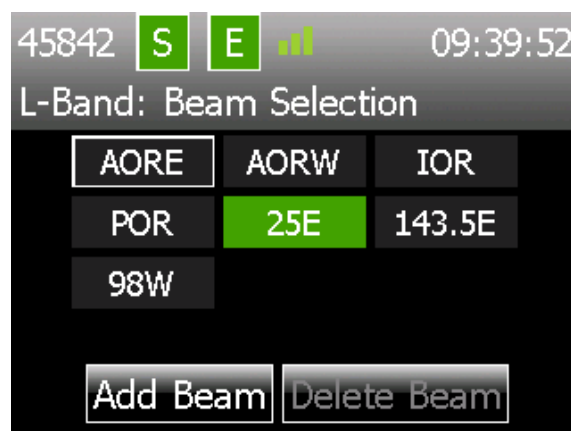
Use the arrow keys to select (highlight) the beam for your region and select (tick on) it. Select (with the tick) a second time to switch to the beam.

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

2.6.5 L-Band / Config / Antenna Bias

The antenna bias menu allows the antenna voltage to be turned *On* or *Off* out from the *ANT* connection at the rear of the LD5. When using a VERIPOS supplied antenna, the antenna voltage should normally be on as the antenna requires power to operate. However, when the LD5 is connected to a vessel tracking dish such as a Fleet system, the voltage may be turned off.

---[i] NOTE--

The function of the *ANT* antenna connection will vary depending on the LD5 variant. For example, on an LD5-A3, the *ANT* connector is used for L-Band and GNSS. On an LD5-A3 Mod 2, the *ANT* connector is only used for L-Band.

Please refer to **Section 2.1** for further information regarding LD5 variants and Mods.

2.6.6 L-Band / Access Info

Download a Service Notification Form from http://help.veripos.com and use this when contacting the Veripos Helpdesk for an enable access code. Provide details requested and the type of Service(s) you require, e.g. Veripos *Standard, Apex.*
Tel. +44 1224 965900   email: helpdesk@veripos.com

To view your LD5 Access code, go to *Home/ L-Band/ Access Info*

45842	S	E	▫▫▫	09:41:10

L-Band: Access Info

Unit ID	45842
Access State	Enabled
Service Code	6
Services STD, STD², Ultra, Ultra²	
	Apex, Apex²
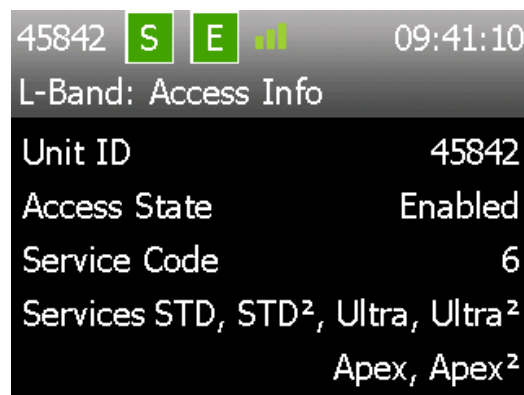
When the LD5 is enabled the Home screen "E" symbol is green.

2.6.7 L-Band / Help

This screen shows VERIPOS Helpdesk contact details.

2.7   GNSS receiver

The LD5 GNSS card status information, and configuration settings are accessed from the *'Home'* page.

2.7.1   GNSS / Status / Module Info

This screen shows the firmware installed on the GNSS receiver. From the Home screen select *GNSS/ Status/ Module Info.*

| i | NOTE

The information displayed on this menu will differ between **'A'** and **'B'** LD5 variants. The information displayed in each variant is detailed below.

'A' Variant

'A' variant LD5's will display the following information:

- **Name**   Model of Septentrio GNSS card fitted
- **Firmware**   GNSS firmware version number
- **Serial#**   Serial number of GNSS card
- **Bootloder**   GNSS card bootloader version

'B' Variant

'B' variant LD5's will display the following information:

- **Name**   Model of Novatel GNSS card fitted
- **Firmware**   GNSS firmware version number
- **Serial**   Serial number of GNSS card
- **Bootloader**   GNSS card bootloader version
- **Model**   Indicates GNSS card permissions.
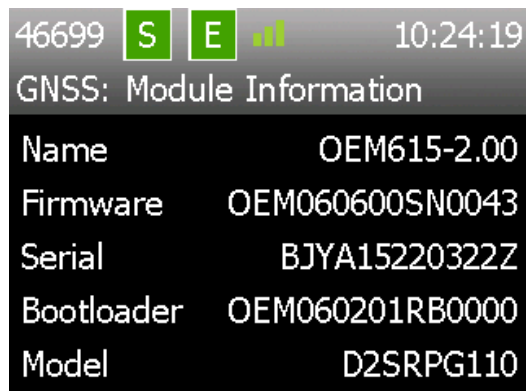
'B' Variant GNSS card Permissions

As stated above, the model number stated on 'B' variant LD5's provides details relating to the GNSS card capabilities and permissions. Presently all 'B' variant LD5 GNSS cards have the below standard default permissions:
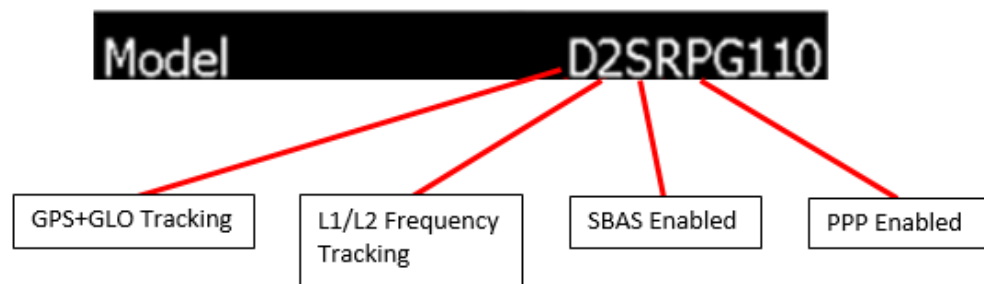
2.7.2 GNSS / Status / SV Info

This screen shows the number of satellites tracked by the LD5. It can also show if the GNSS receiver has GLONASS capability.
From the Home screen select *GNSS/ Status/ SV Info*
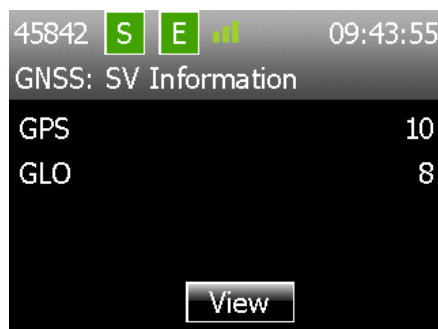
If the GLONASS constellation is not activated on the GNSS receiver card, this screen will show against **GLO** as "Not Available". *Applicable to A variants only*.

To view individual SV information such as SV number, L1 and L2 SNR's, select **View**.

Navigate between available satellite information screens using the left/right

arrows. On **'A'** variants, GPS SV's will no identifier other than their SV number and GLONASS SV's will display an **'R'** next to the SV number.
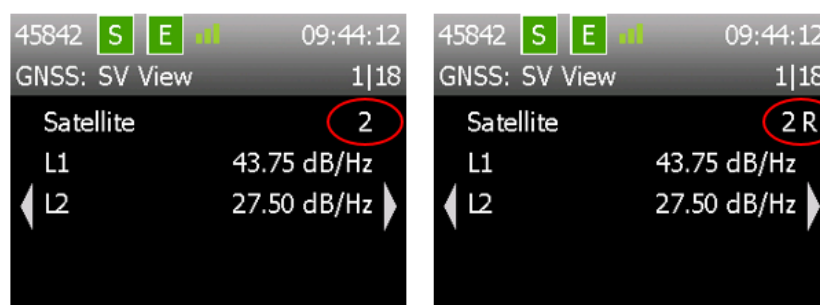
'B' variants will display either **'GPS'** or **'GLO'** to indicate which GNSS constellation a particular satellite is from.
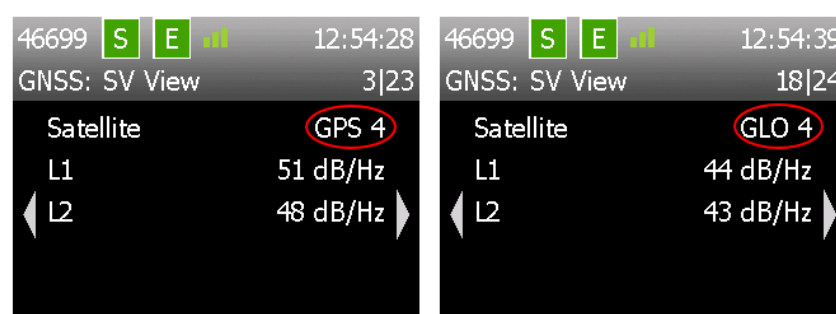
2.7.3   GNSS / Status / Position Info

Using this menu you can view current position and solution type e.g. Apex, Ultra or Standard and number of SVs used.

From the Home screen select **GNSS/ Status/ Position Info**
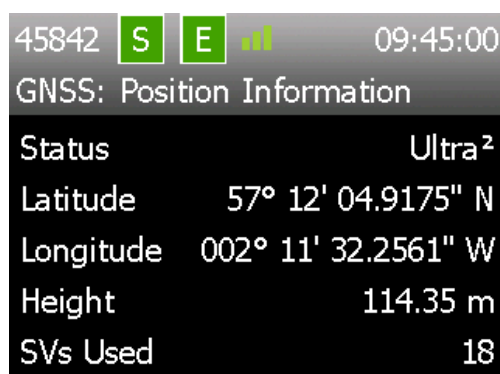
┌─ **ⓘ** NOTE ──────────────────────────

The Height displayed is WGS84 ellipsoidal height, not the antenna height above MSL.

2.7.4 GNSS / Status / DOP Values

This screen shows DOP values of the GNSS solution. HDOP, PDOP, and VDOP are displayed.

From the Home screen select *GNSS/ Status/ DOP Values*

DOP is a measure of the strength of the satellite geometry at the receiver.
- PDOP; Position component; 3D-coordinates
- HDOP; Horizontal component; 2D-coordinates
- VDOP; Vertical component; height

2.7.5 GNSS / Status / Masks

This screen shows the Mask values set on the GNSS receiver. The Mask Values are setup automatically by the LD5 unit and cannot be set by the user. From the Home screen select *GNSS/ Status/ Masks*

┌─ [i] NOTE ──────────────────────────────────

The information displayed on this menu will differ between **'A'** and **'B'** LD5 variants. The information displayed in each variant is detailed below.

LD5 'A' Variants


```
45842  S  E  .il        13:58:19
GNSS: Masks

Tracking Elev Mask              0°
Solution Elev Mask              7°
SNR Mask                   28 dB/Hz
```
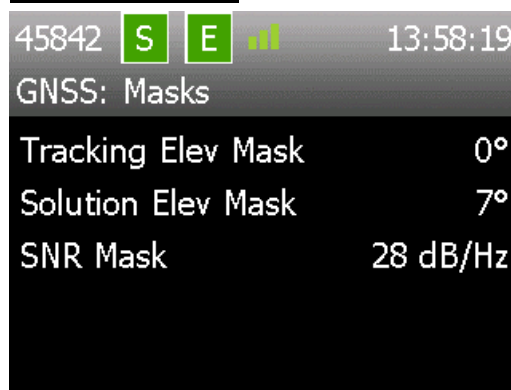
Tracking Elev Mask - SVs below this mask will not be tracked. This value should be 0°.

Solution Elev Mask - SVs below this mask will not be used in the position calculation.

SNR Mask - SVs that have an SNR below this mask will not be used in the position calculation.

LD5 'B' Variants
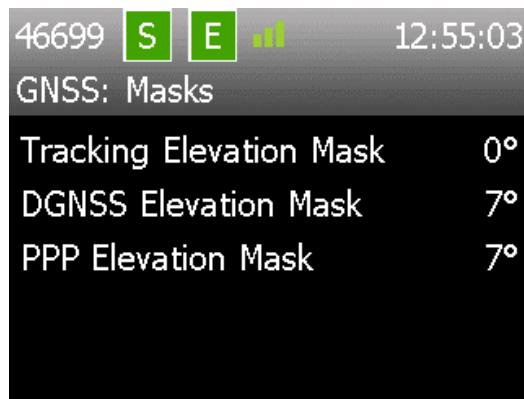
Tracking Elevation Mask - SVs below this mask will not be tracked. This value should be 0°.

DGNSS Elevation Mask – SV's below this mask will not be used in DGNSS position calculations e.g. VERIPOS Standard and Standard[2].

PPP Elevation Mask - SVs below this mask will not be used in the PPP position calculation e.g. Ultra and Apex.

2.7.6   GNSS / Config

This screen allows the user access to the GNSS Config menus

From the Home screen select *GNSS/ Config*

           A Variant   *B Variant*

2.7.7   GNSS / Config / PPS

This menu allows the user to configure the Pulse Per Second (PPS) options. The PPS can be turned on or off and the polarity can be amended (Low2High or High2Low).

From the Home screen select *GNSS/ Config/ PPS*.

Move the cursor to the appropriate box using the arrow keys. Select (✓) to amend then navigate to **Apply** to select the different options.
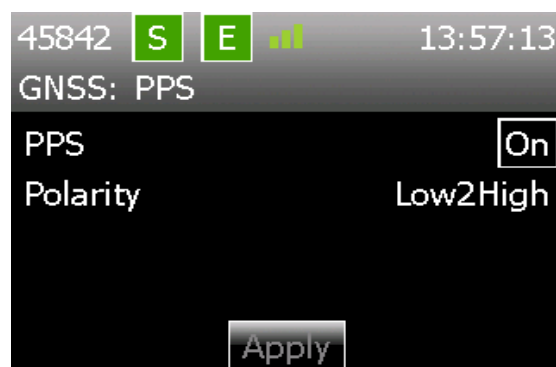
2.7.8 GNSS / Config / PPP Config

NOTE

If the LD5 is enabled for only one PPP service, the *PPP Config* setting must be set to the same service otherwise no PPP solution will be computed.

Changing the PPP Config settings will re-initialise a new PPP calculation, which will take time to settle and a PPP position output to be available.

Ensure that the solution output selected matches with Veripos service(s) you have enabled on the LD5.

Select PPP settings from ***GNSS /Config/ PPP Config***.
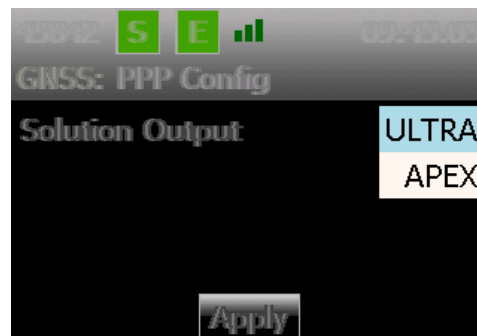
Select (✓) to display the options (Apex or Ultra) and use the Up/ Down arrows to highlight the service required.

Select (✓) to amend then navigate to **Apply** and select (✓) to switch to this PPP service.

Ensure that the solution output selected matches with Veripos service(s) you have enabled on the LD5.

Select PPP settings from **GNSS /Config/ PPP Config**.
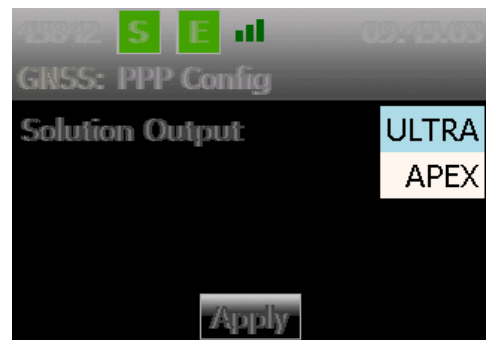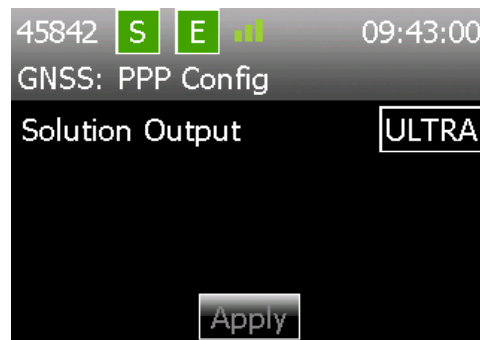
Select (✓) to display the options (Apex or Ultra) and use the Up/ Down arrows to highlight the service required.

Select (✓) to amend then navigate to **Apply** and select (✓) to switch to this PPP service.

2.7.9 GNSS / Config / SBAS/RTK

This menu allows the user to configure the SBAS and RTK options. The SBAS and RTK can be turned on or off as an alternative solution to Veripos calculations.

─── ⓘ **NOTE** ────────────────────────

RTK options will only be displayed if RTK permissions have been enabled on the GNSS card.

Only LD5 'A' variants can be used to receive RTK corrections.

On 'A' variant LD5's, from the Home screen select **GNSS/ Config/ SBAS/ RTK.**

Move the cursor to the appropriate box using the arrow keys. Select (✓) to amend then navigate to **Apply** to select the different options.
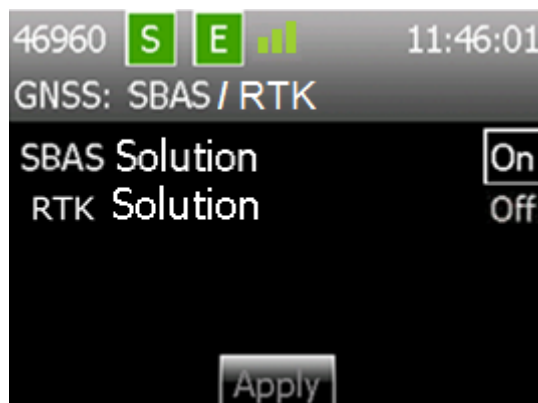
Once selected, click **Apply**.

2.7.10 GNSS / Config / NMEA Config

This menu allows the user to configure the number of decimal places used in the Lat and Lon fields and the Differential Quality Indicator used in the GGA message.

From the Home screen select *GNSS/ Config/ NMEA Config*

GGA output precision

Select and choose the number of digits required (5 to 8) after the decimal point in the latitude and longitude fields that is used in the GGA message.

PPP DQI

This is for APEX/Ultra PPP and allows the selection in the GGA string of whether the Differential Quality Indicator is output with either a 2 or 5, as required by ships systems.

If '2' is selected then all corrected solutions will be designated a DQI of 2.

If '5' is selected then PPP (Ultra and Apex) corrected solutions will be designated a DQI of 5. All Differential Solutions will then be designated a DQI of 2.

2.7.11 GNSS / Config / NMEA

This menu allows the user to select the NMEA strings (turn on/off) required to be output from the rear serial port(s).

On *A Variants,* from the Home screen select *GNSS/ Config/ NMEAa or NMEAb*.

On *B Variants*, select *GNSS/ Config/ NMEA* then in the subsequent menu, select *NMEAa* or *NMEAb*.

Note there are three pages – use the right/left arrows to switch between them.

To enable or disable NMEA messages, move the cursor to the appropriate box

using the arrow keys. Then use the tick (✓) key to toggle stations between **On** and **Off**.

Available NMEA message types:

GGA *	GLL	VTG	ZDA	GRS
GST	GSA	GSV	GNS **	RMC

* Select from 5 to 8 digit Lat/Long precision at ***GNSS/ Config/ NMEA Config***.

Available only on ***A Variant* LD5's.

If more than four NMEA message types are enabled, a warning message will appear. This is to prompt the user to ensure that a suitable baud rate is selected if outputting an excessive number of messages via COM ports:
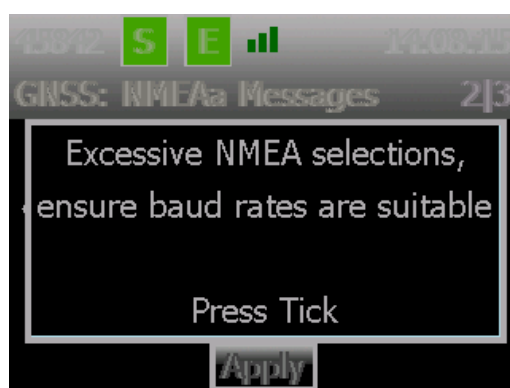
2.7.12 GNSS / Help

This screen shows VERIPOS Helpdesk contact details.

2.8   MF Beacon (IALA) Receiver Config and Status

The LD5 MF card, status information and configuration settings are accessed from the 'Home' page.

2.8.1   MF / Status / Module Info

This menu displays details of the MF receiver card fitted such as model and firmware version.

2.8.2   MF / Status / Device Status

This page displays the current station settings and status.

From the home page select *MF/ Status/ Device Status*
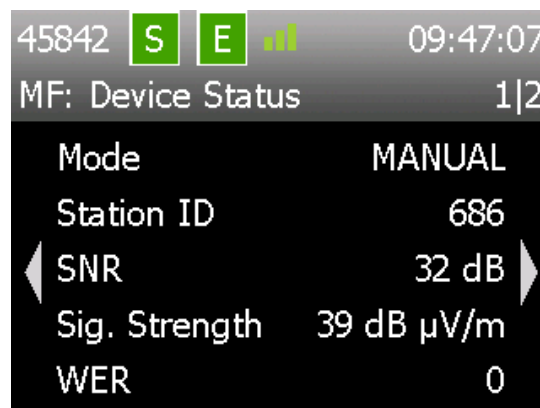
Page 1

Mode	As selected from MF setup
Station ID	The unique numerical identifier for the station used
SNR	The current signal to noise ratio in dB/Hz
Sig. Strength	The signal received in dB µV/m
WER	The word error rate

Page 2

Frequency	Frequency the received station is transmitting on
Baud Rate	Data rate of the received transmission
Station	Station Name (If known)

2.8.3 MF / Config / Mode

This menu allows the user to select the mode that the MF receiver will operate in.

From the Home screen select *MF/ Config/ Mode*.
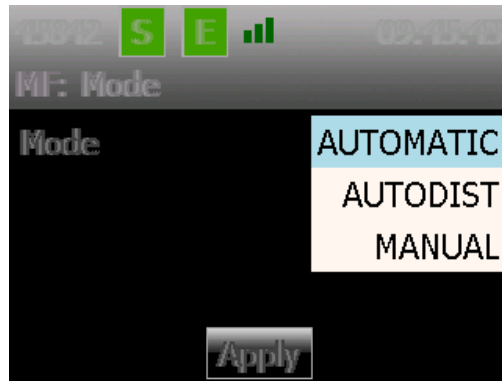
Select (✓) to display the options (Automatic, Autodist or Manual) and use the Up/ Down arrows to highlight the service required.

Select (✓) to amend then navigate to **Apply** and select (✓) to switch to this mode.

Automatic   This setting uses the station with the strongest signal received

Autodist   This setting uses the closest MF beacon station to the receiver's location. This function uses a station database stored in the LD5 unit.

Manual   This setting requires the user to enter a frequency and data rate from Manual Tune Menu or select a station from the Station Tune Menu.

*VERIPOS recommend use of Automatic. Highlight the mode (press tick and then up/down arrows) then navigate to **Apply** and **Select** (✓).*
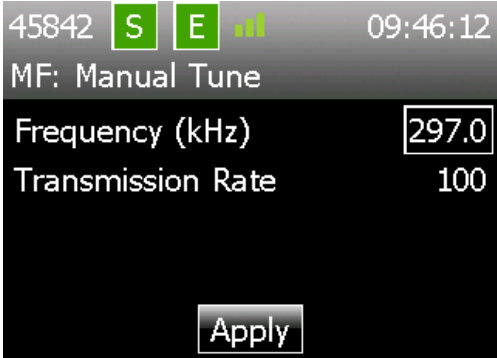
⎯⎯ ⎡ i ⎤ **NOTE** ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

If positioning becomes unstable, it is recommended to manual tune the receiver to the closest MF station or select Autodist mode if the frequency is unknown.

2.8.4 MF / Config / Manual Tune

Where the user has selected Manual tuning mode, the **Manual Tune** button will be available.

From the home page select *MF /Config/ Manual Tune*
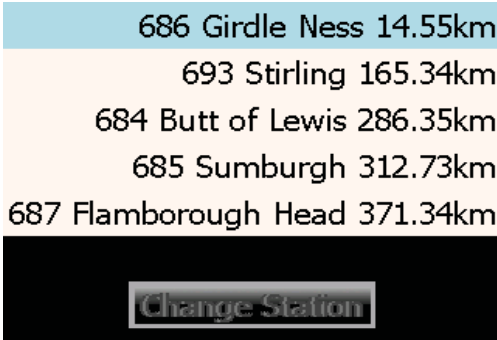
The user enters the Frequency and Data Rate of the MF Beacon Station.

2.8.5 MF / Config / Station Tune

Where the user has selected Manual tuning mode, the **Station Tune** button will be available. In this menu the user selects from the onboard station list. The list is arranged by range in km from the antenna location.

From the home page select *MF/ Config/ Station Tune*

Select Change Station and use Up/ Down arrow keys to highlight the required station. Use Select (✓) to amend the selected station.

2.8.6 MF / Config / Antenna Bias

This menu allows the user to turn on or turn off the Antenna Voltage on the MF antenna connector on the rear of the LD5 unit.
For LD5 A3 (Mod1) this is controlled by the L-Band config settings.
For LD5 A3 (Mod2) the MF / GNSS voltage is ALWAYS ON.

2.8.7 MF / Help

This screen shows VERIPOS Helpdesk contact details.

2.9 LD5 Config

This menu allows access to the configuration of the LD5 unit. Configuration of serial ports, network settings and operating modes are available in this menu.

Access from *Home/ Config.*

2.9.1 Config / I/O

This page allows the user to select the pages required to configure the data outputs and inputs.
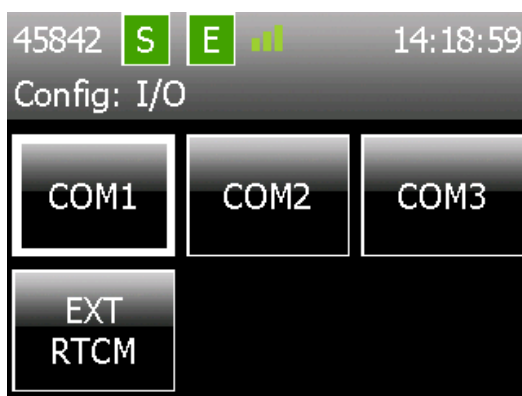
2.9.2 Config / I/O / COM1 COM2 or COM3

These pages allow the user to set the data streams that are output or input on the serial ports of the LD5 unit.

> **ℹ NOTE**
>
> The data that is available for input or output is dependent on the Mode setting of the LD5.

From the home page select *Config/ I/O/ COM1 COM2 or COM3*
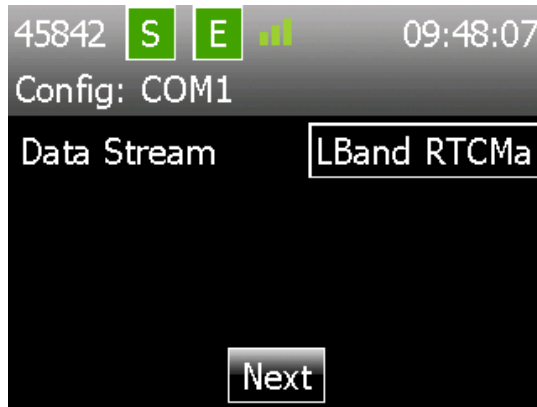
The current configured data stream is shown, or if no data stream is configured **None** will be displayed

Select (✓) to display the Data Streams available and use the Up/ Down arrows to highlight the data required.
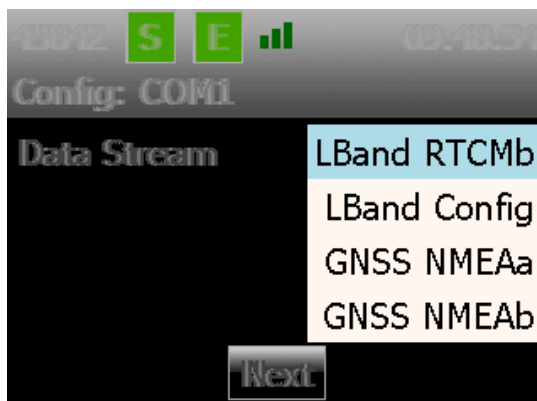
Select (✓) to amend then navigate to **Next** and select (✓) to move onto the next config page.

Configure the Protocol, Baud Rate, Data Bits, Parity and Stop Bits
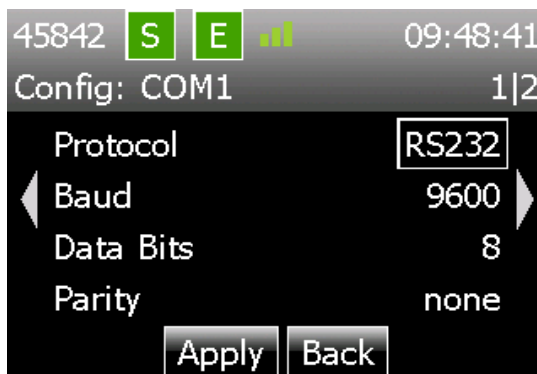
Use Left/ Right arrow buttons to move between the 2 pages
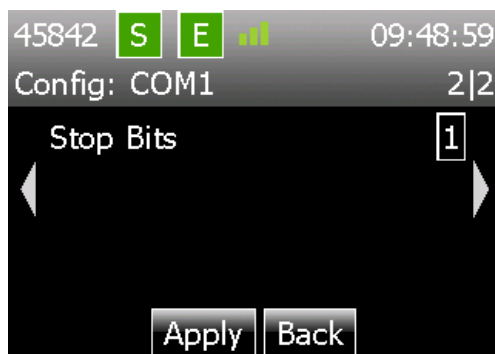
Then navigate to **Apply** and select (✓) to finish the configuration.

2.9.3 Config / I/O / EXT RTCM

This menu is not present on B variant LD5's. B variants only accept VERIPOS RTCM correction data therefore no additional configuration is required.

EXT RTCM is used when MF Beacon (IALA) or External RTCM corrections from another source are used as a backup to the VERIPOS L-Band Corrections in the internal position solution.

From the home page select **Config/ I/O/ EXT RTCM**
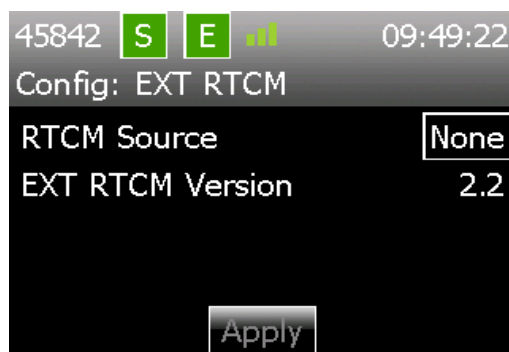
┌─────┐
│ i │ **NOTE**
└─────┘

If the LD5 is set to **QC** Mode this menu item is disabled
If MF corrections are turned off on this page the RTCM corrections are still available to be output on COM 1-3

There are four available external RTCM source options:

RTCM Source	Description
Veripos	Veripos correction data from external source
3ʳᵈ Party	Non-Veripos correction data
MF	MF (IALA) LD5 on board correction data
3ʳᵈ Party + MF	Select to use both LD5's MF & non-Veripos corrections to calculate a non-Veripos Differential solution

If a non-Veripos RTCM source is selected, the EXT RTCM Version can be changed depending on the version of the EXT RTCM being used. The available options are:

- RTCM version 2.2
- RTCM version 2.3

2.9.4 Config / Network

This menu allows the user to view or configure the Ethernet settings of the LD5 unit.

From the home page select *Config/ Network*

45842	S	E	▪▪▪	09:51:15
Config: Network				
Mode				Static
IP Address				192.168.2.5
Subnet Mask				255.255.255.0
Gateway				192.168.2.1
			Edit	
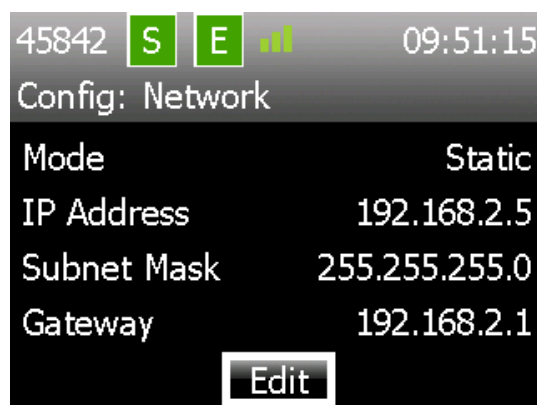
To change the network settings select (✓)

Select from **DHCP** or **Static** mode and if required amend the IP address, subnet mask and gateway using the control panel, then **Apply**.

2.9.5 Config / Reboot

Use this to reboot the LD5 – as an alternative to power cycle.

2.9.6 Config / Admin

Only use admin mode under direction of VERIPOS.

2.9.7 Config / Admin / Logging

The LD5 continuously logs raw data internally. The format in which this raw data is logged depends on the LD5 variant in use.

⌐ⅈ NOTE────────────────────────────

Data logging is only enabled when the LD5 is in 'LD5' Operating Mode. Data logging is disabled when in 'QC' or 'Maint' Modes.

'B' variant LD5's do not have this Logging menu because the logging period is not configurable.

'A' Variant LD5's log data in a VERIPOS proprietary (ALF) format.

'B' Variant LD5's log data in Novatel Binary (NBF) format.

In both cases, the LD5 keeps a rolling log, which means disk space will never run out as once the set duration has been reached, the oldest logged data will start to be overwritten.

This data can be extracted from the LD5 and may be requested by VERIPOS for analysis to assist troubleshooting any positioning issues. Please contact VERIPOS for instructions should archiving of logged data be required.

The default logging period is 3 days. On **'B' variant LD5's**, the default logging period can NOT be changed. On **'A' variants**, it is possible to alter the logging period.

On **'A' variants**, the *Logging* menu is accessed via the *Admin* menu. The *Admin* menu is password protected. Please contact VERIPOS if this password is required.
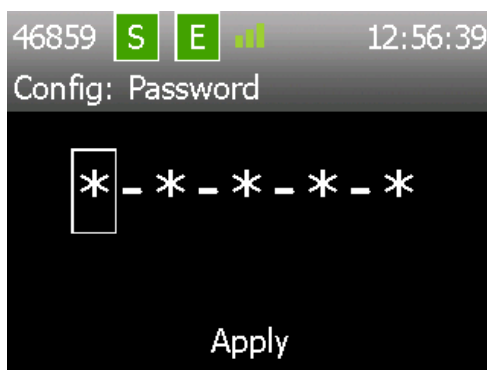
Upon entering the correct password, the following screen will be shown:
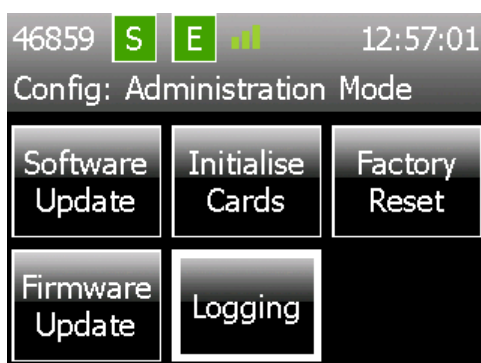
Navigate to the *Logging* section and press (✓) to enter the *Logging* menu:
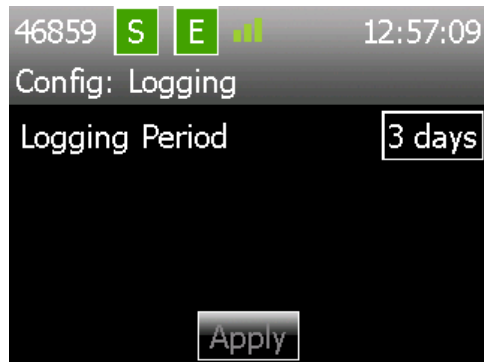
Press (✓) to open the list of available logging periods:
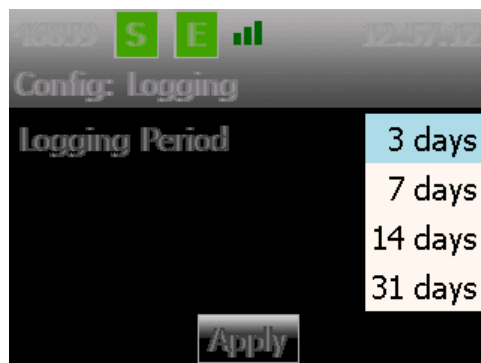
Select the desired logging duration from the list then navigate to the *Apply* icon and press (✓).
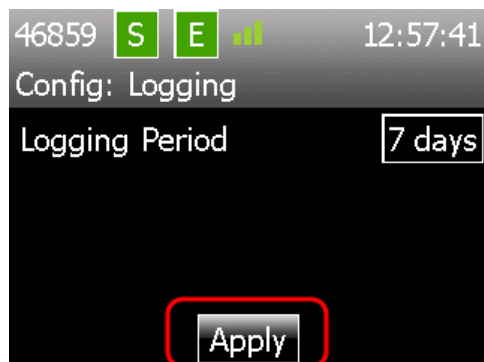
2.9.8 Config / Config

This menu allows the user to configure the mode of use for the LD5 (LD5 or QC), change day/night screen settings and view the LD5 software version number and LD5 unit variant.
The second page allows for adjusting the screen dimmer delay period (mins).

Operating Mode
Switch between operating modes for the LD5:

- **QC** – enables output of RAW GNSS data when interfaced to Verify QC
- **LD5** – normal setting of LD5 for standalone operation
- ***MAINT** – only used under guidance of VERIPOS.

*MAINT mode only available on LD5 'A' variants.

Use 'Operating mode' to switch the LD5 to the correct mode of use.

Software Version
This shows the software version of the MMI running on the LD5 unit.

Hardware Variant
This shows the hardware variant version and if applicable, the Mod of the LD5 unit.

Colour Settings
This toggles the display between Night and Day modes. The screen dims and changes colour palettes.

Dimmer Delay (on Page 2)
This shows the time after there has been no button presses that the display will dim. Any button press takes the display out of dimmed mode.

2.9.9 Config / USB Mode

USB mode is used to perform software updates and to retrieve logged data. Only use USB mode under direction of VERIPOS.

2.10 LD5 Use with RTK corrections

<u>Only the LD5 **'A' variants**</u> can use third party RTK corrections.

Summary of requirements

- The LD5 GNSS card must have permission in place to use the RTK corrections. Where an **'A'** Variant LD5 has RTK permissions, the button (at **GNSS/ Config**) shows "**SBAS/RTK**". For assistance to request GNSS card permissions and upgrade procedure contact the VERIPOS Helpdesk quoting the LD5 User Code.

- RTK corrections are input using one serial port and LD5 set to LD5 Mode.

- The RTK message format needs to be in RTCMv2 format.

To input RTK corrections:

Ensure that the LD5 is in LD5 Mode (**Config/ Config** and Operating Mode is "**LD5**" - see Section 2.9.8).

Configure the LD5 COM port to receive 3rd party RTCM corrections. Go to **Config/ I/O /** **(COM port used)** and set to **"Ext RTCM"** with matching parameters to the serial RTCM source.

Go to **Config/IO/ EXT RTCM**, select **3rd Party** as RTCM Source and **Apply**.
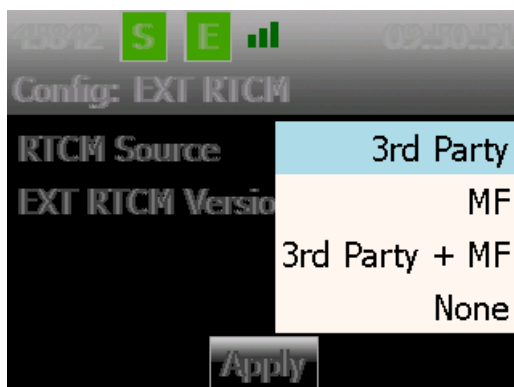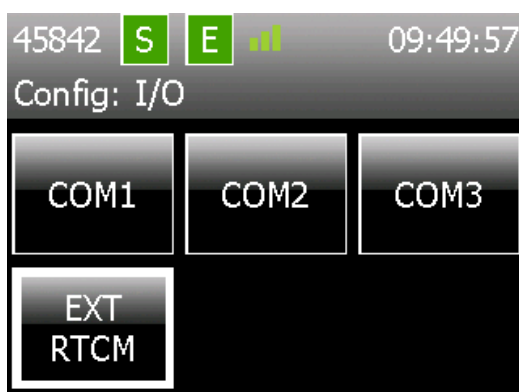
Connect the Serial connection from the RTK source to the LD5 COM port.

From the Home page go to **GNSS/ Config/ SBAS/ RTK**, highlight it, select to on and **Apply**.

The LD5 will now be capable of using third party RTK corrections.

┌─ⓘ NOTE ─────────────────────────

The GGA data stream for RTK will contain the station ID number from the RTK correction source (Base Station)

3 VERIPOS Software Compatibility

The LD5 (A & B variants) can be used with the VERIPOS DP *Orion* visualisation software.

They are also compatible with the VERIPOS *Verify QC* software.

The table below details the compatible Verify QC software version(s) for specific LD5 variants:

Verify QC	
LD5 Variant / Version	**Compatible Verify QC Version**
LD5 A Variant	1.13 & above
LD5 B Variant (v6.0.0.12)	1.13 only
LD5 B Variant (v7.0.0.20)	1.20 only

The latest version of the DP Orion software is **2.0.3.38**. VERIPOS recommend that the latest version of the Orion software is used.

These LD5 variants are **NOT** compatible with *Quantum* – the latest VERIPOS visualisation software.

For further information on the Orion or Verify QC software, please visit VOSS at http://help.veripos.com and refer to the relevant manual.

4 Troubleshooting

4.1 Overview of troubleshooting

The LD5 uses a colour screen and navigation panel to access an embedded Windows CE

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**.

Most problems indicated by the LD5 system relate to signal reception issues and system or configuration errors, relating to the GNSS positioning card.

4.1.1 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 LD5.

4.1.2 Power faults

Fault	Reason	Remedy
Screen blank Power indicator extinguished	External supply fault, dis-connected or switched off	Check power indicator (target symbol, top right on LD5) is lit. Adjust screen brightness using buttons on the left side of the LD5. 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 the power supply unit. The LD5 AC 110/240 VAC supplies DC power 12–24 VDC to the LD5. Reconnect power and allow LD5 to restart.
	LD5 fault.	If the PSU voltage is correct, contact the VERIPOS Helpdesk.

4.1.3 Enable/disable faults

Fault	Reason	Remedy
Enable indicator shows red. `46960 S E`	Unit disabled	Contact VERIPOS helpdesk and request unit to be enabled on desired Access Code.
Unable to receive over the air enable message.	Not receiving L-Band signal. 'Sync' icon is red.	Unit needs to receive a beam (L-Band frequency) for the global work region before it can be enabled / disabled. Ensure L-Band 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.

4.1.4 L-band signal faults

Fault	Reason	Remedy
Sync indicator shows red. `46960 S E`	No sync with satellite beam. No beam being received. Unit requires a restart.	Use the 'Global coverage chart' (in Section 4) to check which beam is correct for current location. Go to *L-Band/ Config/ Beam Selection* to check and, if required, amend to the correct regional beam. Where L-Band signal is derived from vessel's Inmarsat. - Inmarsat system 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 *L-Band/ Status/Device Status*. If necessary consult the **Chart** in the *Reference information* chapter and if required select the regional beam.

Fault	Reason	Remedy
Sync indicator shows red. 46960 S E	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 LD5.

For problems relating to antennas or cables, see the LD5 Installation manual and the Antennas and Coaxial guide before installing replacement equipment and for a general guide to equipment installation.

4.2 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:

http://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 LD5, see the operation chapter for details.
- **Current status** of the LD5
- 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?
- **Description/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 working?
- Did the system cease working after moving to a new region?

Once basic information has been received the Helpdesk raise a fault ticket. Users can access the ticket from the VERIPOS Online Support site.

5   Reference information

5.1   Service access licence and service notification form

5.1.1   Service access license

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.

5.1.2   Service notification form

In order to enable or disable the equipment, codes must be obtained from the VERIPOS Helpdesk. Requests for enable/disable codes should be made using the **Service Notification Form** (SNF). This should be submitted, by email, to the VERIPOS Helpdesk at: **helpdesk@veripos.com**

──── NOTE ────────────────

The current version of the SNF can be downloaded from the VERIPOS Online support web site:

http://help.veripos.com

If necessary, enable requests can also be submitted by telephone to the VERIPOS Helpdesk. See the *Contact information* chapter for current phone numbers. Before calling, please refer to a SNF and ensure that all the required information is available.

5.2   Global coverage chart
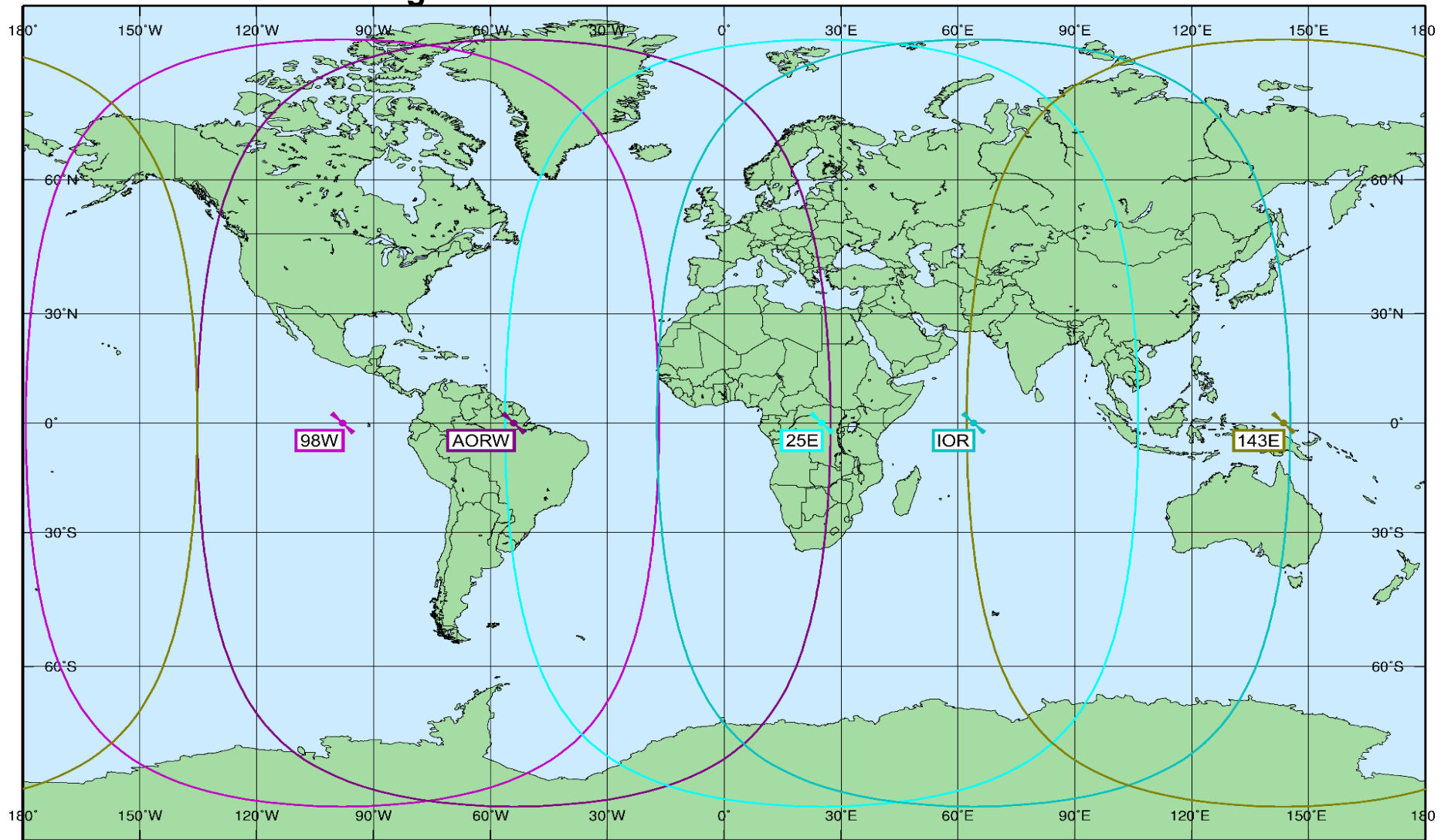
Global Coverage Chart

The updated VERIPOS Global coverage chart can be found on VOSS (http://help.veripos.com)

5.3   COM ports

5.3.1 LD5 COM and IP sockets

A Variant

LD5 Mode – Default Data Stream Settings

Data stream	Default COM port / Assignment	Baud rate	Socket
L-Band RTCMa	COM 1	9600	9001
L-Band RTCMb	Unassigned	9600	9002
L-Band Config	Unassigned	115200	9003
GNSS NMEAa	COM 2	9600	9011
GNSS NMEAb	Unassigned	9600	9012
MF RTCM	COM 3	9600	9031
MF Config	Unassigned	57600	9033
Ext RTCM	Unassigned	9600	19013
None	–	–	–

QC Mode - Default Data Stream Settings

Data stream	Default COM port / Assignment	Baud rate	Socket
L-Band RTCMa	COM 1	9600	9001
L-Band RTCMb	Unassigned	9600	9002
L-Band Config	Unassigned	115200	9003
GNSS NMEAa	COM 2	9600	9011
GNSS Raw	Unassigned	115200	9012
MF RTCM	COM 3	9600	9031
MF Config	Unassigned	57600	9033

None　　　–　　　　　　–　　　–

Maint Mode - Default Data Stream Settings
Use only under direction of a qualified Veripos technician!

Stream	Maint Mode Default COM port / Assignment	Baud rate	Socket
L-Band RTCMa	COM 1	9600	9001
L-Band RTCMb	Unassigned	9600	9002
L-Band Config	Unassigned	115200	9003
GNSS NMEAa	COM 2	9600	9011
GNSS Config	Unassigned	115200	9012
MF RTCM	COM 3	9600	9031
MF Config	Unassigned	57600	9033
None	–	–	–

B Variant

LD5 Mode – Default Data Stream Settings

Data stream	LD5 Mode Default COM port / Assignment	Baud rate	Socket
L-Band RTCMa	COM 1	9600	9001
L-Band RTCMb	Unassigned	9600	9002
L-Band Config	Unassigned	115200	9003
GNSS NMEAa	COM 2	9600	19016
GNSS NMEAb	Unassigned	9600	19017
MF RTCM	COM 3	9600	9031
Ext RTCM	–	–	–
None	-	-	-

QC Mode - Default Data Stream Settings

QC Mode

Data stream	Default COM port / Assignment	Baud rate	Socket
L-Band RTCMa	COM 1	9600	9001
L-Band RTCMb	Unassigned	9600	9002
L-Band Config	Unassigned	115200	9003
GNSS NMEAa	COM 2	9600	19016
GNSS NMEAb	Unassigned	9600	19017
GNSS Raw	Unassigned	115200	9012
MF RTCM	COM 3	9600	9031
Ext RTCM	Unassigned	9600	-
None	–	–	–

LD5 COM ports

Default configuration for each COM port is:

- 8 data bits
- No parity
- 1 stop bit

This information may be required when interfacing to ships systems using RS-232/422 standards. The LD5 is the transmitting device.

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

5.4   LD5 Menu structure

Overall Menu Structure of the LD5
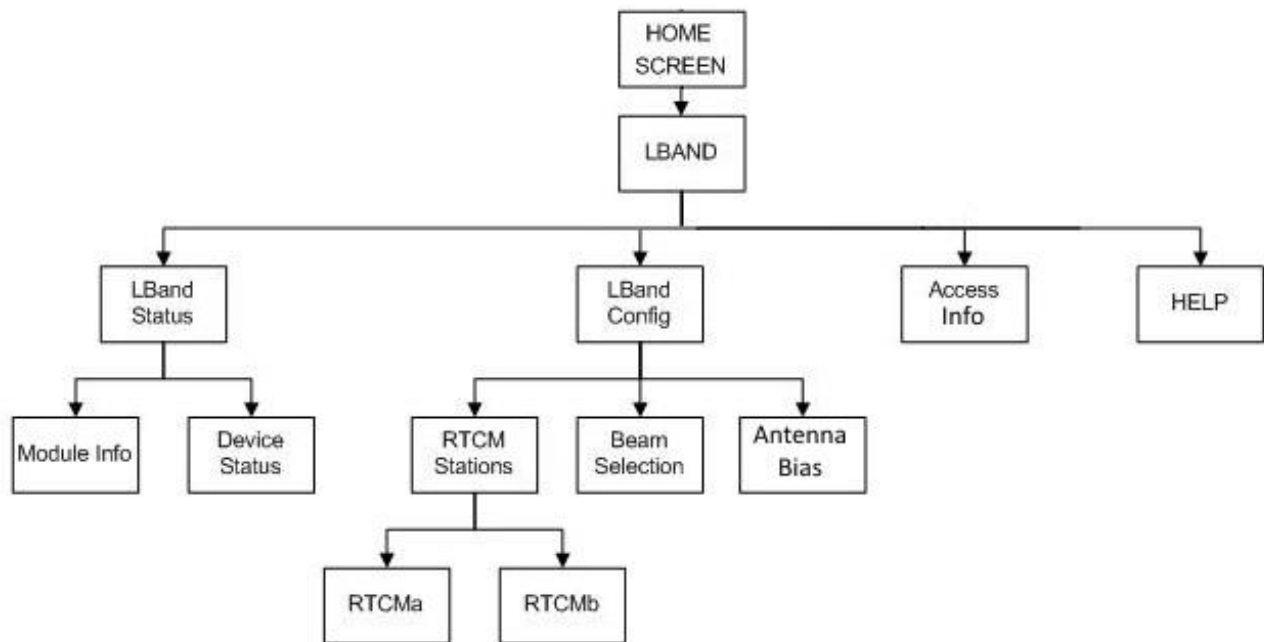
L-Band Menu Structure of the LD5
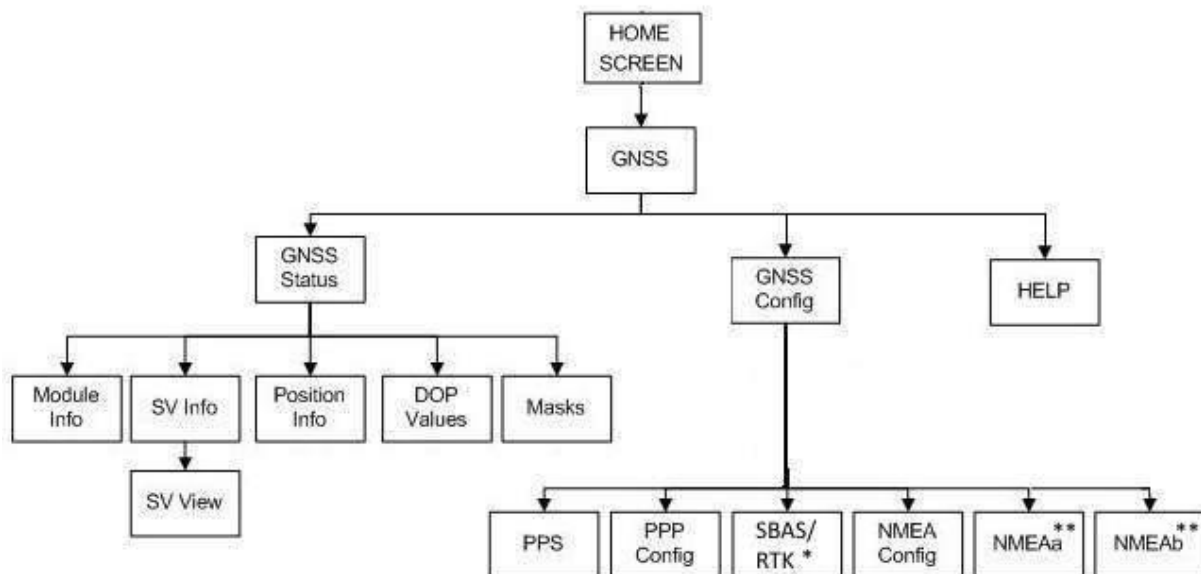
* RTK is only present on A variant LD5's which have been enabled for RTK permissions.

** On B variant LD5's, the NMEAa & NMEAb options will be within a 'NMEA' setting.

GNSS Menu Structure of the LD5
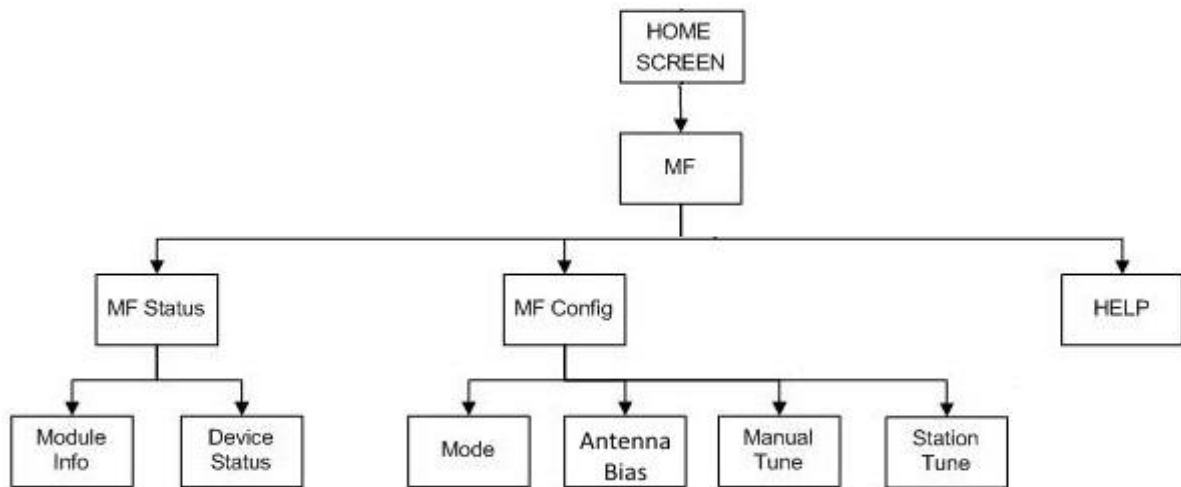
MF Menu Structure of the LD5
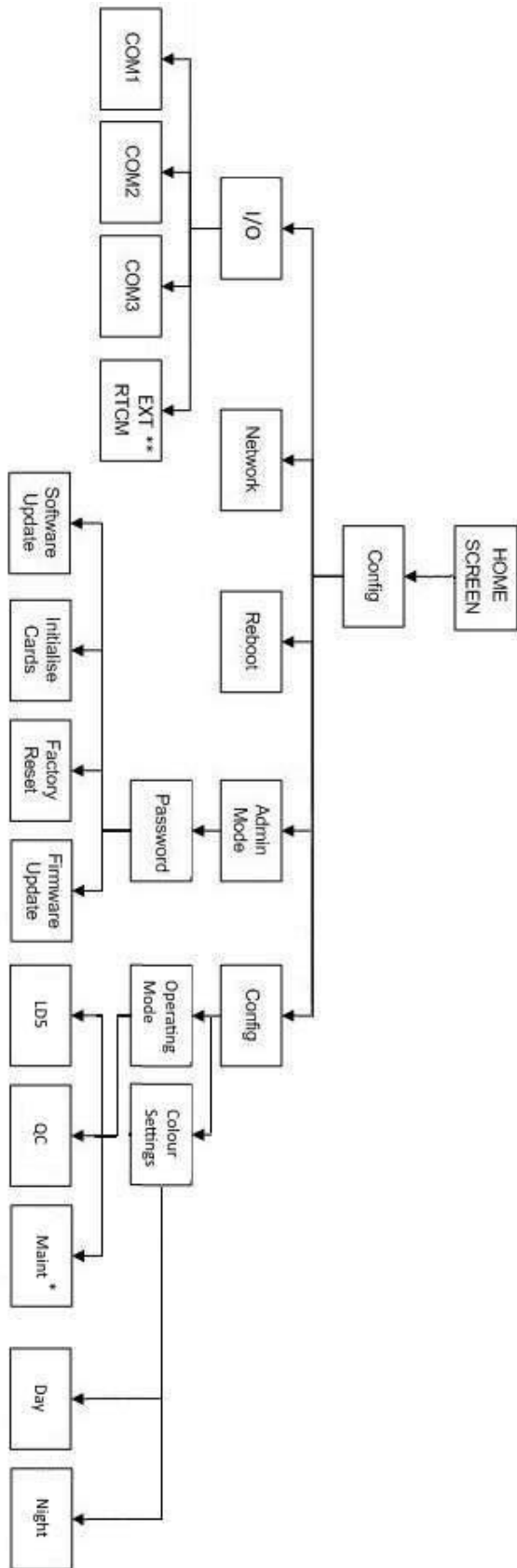
* Maint. Mode is only available on A variant LD5's.

**EXT RTCM menu is only available on A variant LD5's.

5.5　NMEA Sentences

This section describes the message structure of the following advanced positioning and QC output messages: -

GGA	GLL
GST	VTG
ZDA	GNS
GSV	GRS
GSA	RMC

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.mmmmm,a,dddmm.mmmmm,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,,*4
7

GGA sentence defined: -

| GGA	Global Positioning System Fix Data
hhmmss.ss	UTC of position
ddmm.mmmmm	latitude of position
a	N or S, latitude hemisphere
dddmm.mmmmm	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

NOTE: The number of decimal places in the Latitude and Longitude values is configurable via the LD5 in the *GNSS/ Config/ NMEA Config* under *NMEA Precision*. Between 5 and 8 decimal places are selectable.

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 (meters)	Standard deviation of semi-major axis of error ellipse
c.c (meters)	Standard deviation of semi-minor axis of error ellipse
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 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 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.
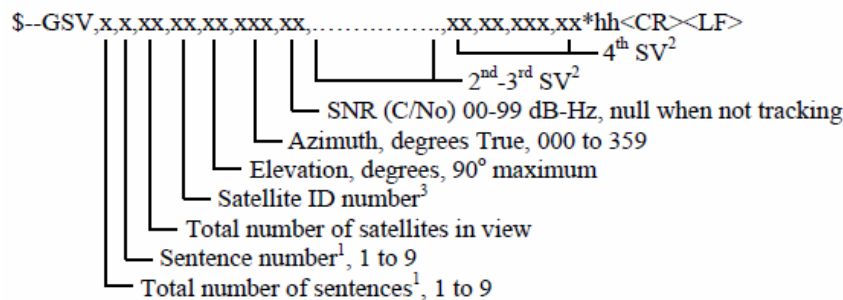
Notes:

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 GLL Sentence

The NMEA GGL 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 GNS Sentence

The NMEA GNS sentence contains time and position fix related data for a single or combined satellite navigation system. Separate $GPGNS and $GLGNS sentences are used to report data calculated from individual systems if a combined GPS+GLONASS position is output. A single string will be output if no GLONASS data is in use.

Structure and Example:

$GPGNS,hhmmss.ss,ddmm.mmmmmmm,a,dddmm.mmmmmmm,b,Q,ss,p.p,h.h,g.g,l.l,nnnn*cc<CR><LF>
$GNGNS,104601.00,5707.7332018,N,00204.7778500,W,DD,12,0.71,24.743,50.284,,*45
$GPGNS,104601.00,,,,,,09,,,,3.0,0001*44
$GLGNS,104601.00,,,,,,03,,,,3.4,0001*56

GNS sentence defined:

GNS = GNSS Fix Data
hhmmss.ss   UTC of position
ddmm.mmmmmmm   latitude of position
a   N or S, latitude hemisphere
dddmm.mmmmmmm   longitude of position
b   E or W, longitude hemisphere
Q Mode Indicator. First character is for the GPS system, the second character for the GLONASS system. (N = No Fix, A = Autonomous, D = Differential, P = Precise, R = Real Time Kinematic, F = Float RTK, E = Estimated, M = Manual Input Mode, S = Simulation Mode)
ss   number of satellites in use
p.p   horizontal dilution of precision
h.h   antenna altitude above mean-sea-level
g.g   Geoidal height
l.l   age of differential GPS data
nnnn   Differential reference station ID, 0000 to 1023
*cc<CR><LF>   checksum, carriage return and line feed

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*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.

6 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.

6.1 VERIPOS Helpdesk

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

ℹ️ **NOTE** ───────────────

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

6.2 VERIPOS Office Locations

6.2.1 VERIPOS UK

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

6.2.2 Additional VERIPOS Offices

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