User & Installation Manual

LT-300 GNSS Receiver
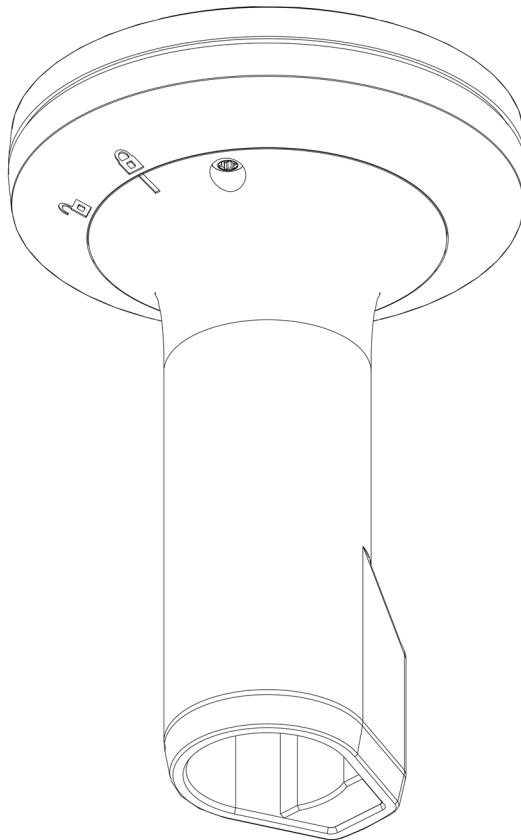
Disclaimer

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Disposal

Old electrical and electronic equipment marked with this symbol can contain substances hazardous to human beings and the environment. Never dispose these items together with unsorted municipal waste (household waste). In order to protect the environment and ensure the correct recycling of old equipment as well as the re-utilization of individual components, use either public collection or private collection by the local distributor of old electrical and electronic equipment marked with this symbol. Contact the local distributor or dealer for information about what type of return system to use.

IMO and SOLAS

The equipment described in this manual is intended for use on leisure and commercial marine boats not covered by the International Maritime Organization (IMO) and Safety of Life at Sea (SOLAS) regulations.

⚠ Safety Instructions for Installer & Operator

The following safety instructions must be observed during all phases of operation, installation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment.

Lars Thrane A/S assumes no liability for the customer's failure to comply with these requirements.

Instructions for the Installer

⚠ WARNING - Product installation

To ensure correct performance of this equipment, it is strongly recommended that professionals, with expertise, properly trained, and likewise authorized within the industry is completing the installation.

⚠ WARNING – Turn off power switch

Turn off the main power switch before installing the equipment described in this manual. Do not connect or disconnect equipment when the main power switch is on.

⚠ WARNING – Use only the supplied cable

Use only the supplied power and communication cable for connecting the equipment.

⚠ WARNING – Input Power

The input voltage range is: 9-40 VDC.

⚠ WARNING – Power supply protection

Make sure that the power supply is adequately protected by a fuse or an automatic circuit breaker when installing the equipment.

⚠ WARNING - Explosive atmosphere

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite hazard.

⚠ WARNING - Compass safe distance

The compass safe distance for standard and steering compasses is 0.3 m (1 ft). Observe this distance to prevent interference to a magnetic compass.

Instructions for the Operator

⚠ WARNING – Do not disassemble

Do not disassemble or modify this equipment. Fire, electrical shock, or serious injury can result.

⚠ WARNING – Keep away from live circuits

Operational personnel must not remove product enclosure. Do not service the equipment, with the communication cable connected. Always disconnect and discharge unit, cable and circuits before touching them.

⚠ WARNING - Permanent watch

In case of smoke or water leaks into the equipment, immediately turn off the power. Continued use of the equipment can cause fire or electrical shock. Keep access and permanent watch of the equipment in order to prevent any unwanted escalation.

⚠ WARNING - Safe navigation

This product is intended only as an aid to navigation and must never be used in instead of sound navigation judgement.

No one navigation device should ever be solely replied upon for the navigation of a vessel. Always confirm position against all available aids to navigation, for safety of vessel and crew.

If the safety precautions and warnings above are not followed, warranty will be void.

Required information for the reader

Throughout this document, essential information will be presented to the reader. The following text (emphasized) has the following meaning and/or implication:

WARNING: A 'Warning' is an Operation or Service procedure that, if not avoided, may cause a hazard situation, which could result in personnel death or serious injury.

NOTE: A 'Note' provides essential information to the reader.

IMPORTANT: Text marked 'Important' provides essential information to the reader, and is key information to the user in order for the equipment to work properly. Personnel injury or damage to the equipment can occur if instructions are not followed.

About this manual

Intended readers

This is a User & Installation Manual for the LT-300 Global Navigation Satellite System Receiver, LT-300 GNSS Receiver. The manual is primarily intended for installers and service personnel.

Personnel installing or servicing the system should be professionals, with technical expertise, properly trained, and likewise authorized.

All safety instructions and guidelines in this manual must be observed. The safety instructions are listed in the beginning of the manual. The guidelines are to be found in the separate chapters, where it is needed.

Manual overview

This manual has the following chapters:

- **Introduction** – *provides a high-level description of the product, technology, performance, installation options, and installation steps to be completed.*
- **Quick installation guide** – *a short guide providing a minimum of information to complete an installation.*
- **Installation** – *a complete description of mounting and installation details, with a step-by-step instruction for both pole and roof mount installations.*
- **Connecting** – *a description of the unit connector, 8-pin multi cable, connecting to NMEA 0183, connecting to NMEA 2000, and connecting the LT-Service Tool.*
- **Configuration using LT-Service Tool** – *a short description of the LT-Service Tool. A PC-program, communicating over NMEA 0183, which is supporting configuration and maintenance functions.*
- **Service and repair** – *a short description of what to do in case of a defective unit.*
- **Troubleshooting** – *if the unit is not working as expected, please check this guide to help resolve the problem*

This manual has the following appendixes:

- Outline Drawings
- Performance
- Specifications
- NMEA 0183 Sentences
- NMEA 2000 PGNs
- LT-Service Tool (commands)
- Declaration of Conformity

Software versions

This manual corresponds to the following software:

Software Versions	
Description	**Version**
LT-300 GNSS Receiver	1.01
LT-Service Tool	1.02

TABLE 1: SOFTWARE VERSIONS

Record of Revisions

Rev.	Description	Release Date	Initials
1.00	Original document	March 23, 2016	PT

Table of Contents

Introduction

Congratulations on your purchase of the LT-300 Global Navigation Satellite System (GNSS) Receiver!

The LT-300 GNSS Receiver is a maritime navigation product from Lars Thrane A/S. The LT-300 GNSS Receiver is designed for the leisure as well as the professional maritime markets. The LT-300 GNSS Receiver meets all standards and certification requirements needed for worldwide maritime navigation equipment.

Performance
The LT-300 GNSS Receiver is capable of providing positions with an accuracy better than 2 meters. The LT-300 GNSS Receiver outputs navigation data (up to 10 Hz): UTC time and date, position, course over ground, speed over ground, GNSS satellite information and magnetic variation, in order to give your vessel smooth navigation capabilities. The 72-channel GNSS receiver benefits from advanced technologies such as:

- Receive and track multiple satellite systems (GPS, QZSS, GLONASS, and BeiDou)
- Support for Satellite-Based Augmentation System (SBAS): EGNOS, WAAS, and MSAS

The LT-300 GNSS Receiver is designed and built for the extremely demanding and rough environment at sea and with an operational temperature range from -40°C to +55°C (-40°F to +131°F).

Installation & Navigation
The LT-300 GNSS Receiver is easy to mount on a 1" pole or roof-mount, with a single cable supporting NMEA 0183, NMEA 2000, and power. The LT-300 GNSS Receiver can be configured to either 4800 or 38400 baud (NMEA 0183), and open or terminated (NMEA 2000). An external PC LT-Service Tool is available for optional configuration and maintenance of the LT-300 GNSS Receiver.

More than 40 years of experience have been put into the design and construction of the advanced LT-300 GNSS Receiver, with an exceptional performance and specification level.

Installation Guide

The following steps, with reference to relevant chapters, will provide you with information, considerations, and guidance on how to complete a successful installation:

Step 1:   Mounting the Unit   see *Installation* on page 5.

Step 2:   Connecting the Unit   see *Connecting* on page 19.

Step 3:   Configuring the Unit   see *Configuration using LT-Service Tool* on page 26 (optional).

NOTE: A quick installation overview is presented in the *Quick Installation Guide* on page 3. Here most of the necessary information is provided to perform a fast installation and take the product in use. It is recommended to use the entire LT-300 User & Installation Manual as guidance for the best possible and complete installation.

Quick Installation Guide

LT-300 Global Navigation Satellite System Receiver

Congratulations on your purchase of the LT-300 Global Navigation Satellite System (GNSS) Receiver!

The LT-300 GNSS Receiver is capable of providing accurate positions down to 2 meters. The LT-300 GNSS Receiver outputs navigation data (up to 10 Hz): UTC time and date, position (latitude and longitude), course over ground, speed over ground, GNSS satellite information, and magnetic variation.

NOTE: Refer to the 95-100229 LT-300 User & Installation Manual for detailed information on installation requirements and guidance.

Unpacking

Unpack the LT-300 GNSS Receiver and check that the following items are present:

- LT-300 GNSS Receiver
- LT-300 GNSS Pole & Roof Mount (incl. screws for installation)
- 10m Cable Multi 8-pin Simple-Cut (M)
- Screw-in Conn. NMEA 2000 Micro-C (M)
- Quick Installation Guide
- Unit Test Sheet

> ⚠️ **WARNING**
>
> Refer to the 95-100229 LT-300 User & Installation Manual for Safety Instructions.

Installation

Mounting

Mounting considerations:

- Mount the unit horizontally
- Mount the unit with free line of sight to GNSS satellites. If the Roof Mount is used for below deck installation, make sure that the unit is capable of receiving signals from the GNSS satellites
- Mount the unit on a rigid structure with a minimum of exposure to vibration and shock
- Mount the unit in an area with an ambient temperature between -40°C and +55°C (-40°F and +131°F)
- The minimum compass safe distance is 0.3 m. (1 ft.)

IMPORTANT: The pinol screw used for fastening the pole mount shall not exceed 0.8 NM (0.6 lbs/ft).
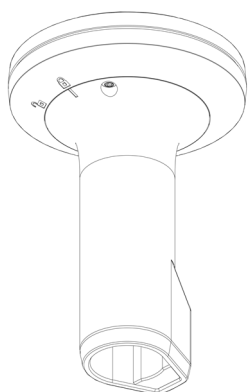

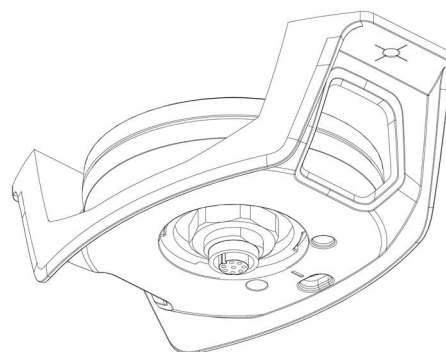FIGURE 1: LT-300 GNSS RECEIVER WITH POLE MOUNT INSTALLATION

FIGURE 2: LT-300 GNSS RECEIVER WITH ROOF MOUNT INSTALLATION

Connecting

The LT-300 GNSS Receiver connector and cable interconnect details are listed in Table 2 and Figure 3.

LT-300 GNSS Interconnect Details		
Pin No.	Wire Color	Wire Designation
1	Brown	TxD-
2	Yellow	TxD+
3	Black	GND
4	White	CAN_H
5	Blue	CAN_L
6	Orange	RxD+
7	Green	RxD-
8	Red	Vsupply

TABLE 2: LT-300 GNSS RECEIVER MULTI CABLE WIRE color AND DESIGNATION.
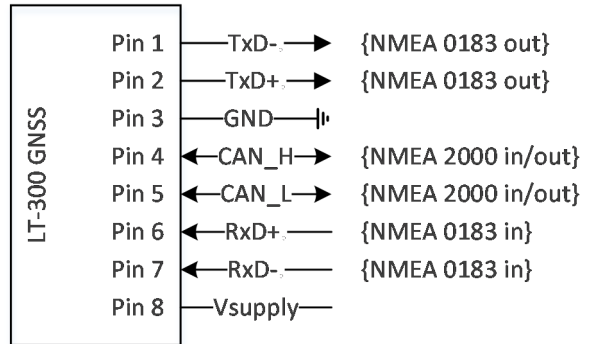

FIGURE 3: TRANSMIT AND RECEIVE DIRECTIONS FOR THE LT-300 GNSS RECEIVER.

NMEA 0183 baud rate

The NMEA 0183 baud rate is configured by selecting the input level of the NMEA 0183 Rx signals (RxD+/RxD-), see Table 3.

LT-300 GNSS Baud Rate Configuration		
Mode	RxD+/RxD-	Baud Rate
Option 1 (default)	Floating (not connected)	4.800
Option 2	Grounded (connected to GND)	38.400

TABLE 3: CONFIGURATION OF LT-300 GNSS RECEIVER NMEA 0183 BAUD RATE.

NMEA 2000 'Open' or 'Terminated'

The LT-300 GNSS Receiver is configured to 'Open' (NMEA 2000) from the factory. The LT-Service Tool can be used for configuration of NMEA 2000 'Terminated'.

Configuration

Use the LT-Service Tool for optional configuration of the LT-300 GNSS Receiver. The LT-Service Tool is a PC program which may run on any Windows PC. The LT-Service Tool is connected to the LT-300 GNSS Receiver via the NMEA 0183 interface, see Figure 4.

LT-Service Tool Key Features:

- Configuration of GNSS receiver (GPS, SBAS, GLONASS and BeiDou)
- Configuration of NMEA 2000 'Open' or 'Terminated'
- Status of unit (POST, CM, general status)
- Monitoring of NMEA 0183 sentences
- Live Navigation data
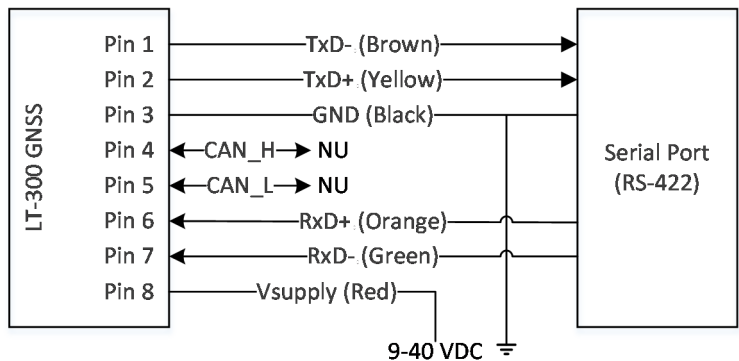- Generation of a Diagnostic Report
- Upload of new Application Software

FIGURE 4: WIRING OF THE LT-300 GNSS RECEIVER TO A SERIAL PORT (RS-422).

Installation

Unpacking (in-the-box)
Unpack your LT-300 GNSS Receiver and check that the following items are present:

- LT-300 GNSS Receiver
- LT-300 GNSS Pole & Roof Mount (incl. screws for installation)
- 10m Cable Multi 8-pin Simple-Cut (M)
- Screw-in Conn. NMEA 2000 Micro-C (M)
- Quick Installation Guide
- Safety Instructions Sheet
- Unit Test Sheet

Inspection
Inspect the shipping cartons and/or wooden box immediately upon receipt for evidence of damage during transport. If the shipping material is severely damaged or water stained, request that the carrier's agent be present when opening the cartons and/or wooden box. Save all box packing material for future use.

After unpacking the system and opening the cartons, inspect it thoroughly for hidden damage and loose components or fittings. If the contents are incomplete, if there is mechanical damage or defect, or if the system does not work properly, notify your dealer.

WARNING: To avoid electric shock, do not apply power to the LT-300 GNSS Receiver if there is any sign of shipping damage to any part of the unit or the outer cover. Read the Safety Instructions at the front of this manual before installing or operating the unit.

Mounting and installation considerations
For optimum system performance, some guidelines on where to install or mount the LT-300 GNSS Receiver must be followed. It is recommended to mount the unit in a location, with as much free line of sight as possible, while making sure that the support structure fulfills the requirements for pole or roof mount installation:

- Mount the unit horizontally
- Mount the unit with unobstructed view to the sky. If the Roof Mount is used for below deck installation, make sure that the unit is capable of receiving signals from the GNSS satellites
- Mount the unit on a rigid structure with a minimum of exposure to vibration and shock
- Mount the unit in an area with an ambient temperature between -40°C and +55°C (-40°F to +131°F)
- Mount the unit at least 1 m. (3 ft.) away from radio transmitting antennas (VHF, UHF, MF-HF, Inmarsat, Iridium, Transmitting VSAT, etc.)
- Mount the unit with a minimum angle of 20 degrees towards a radar antenna (above or below).
- The compass safe distance for standard and steering compasses is 0.3 m (1 ft). Observe this distance to prevent interference to a magnetic compass.

IMPORTANT: The pinol screw used for fastening the pole mount shall not exceed 0.8 NM (0.6 lbf-ft).

Water intrusion

It is recommended not to use pneumatic tools for cleaning the LT-300 GNSS Receiver, especially at a short distance, and directly at the split between the top and bottom part of the enclosure.

Pole or Roof Mount installation

It is possible to use either a pole or roof mount, when installing the LT-300 GNSS Receiver, see Figure 5 (roof mount) and Figure 6 (pole mount).
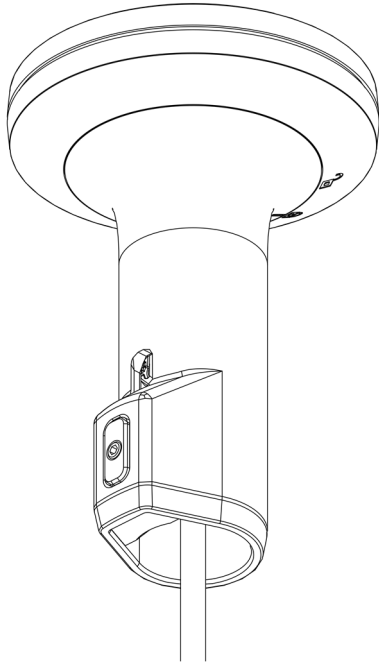

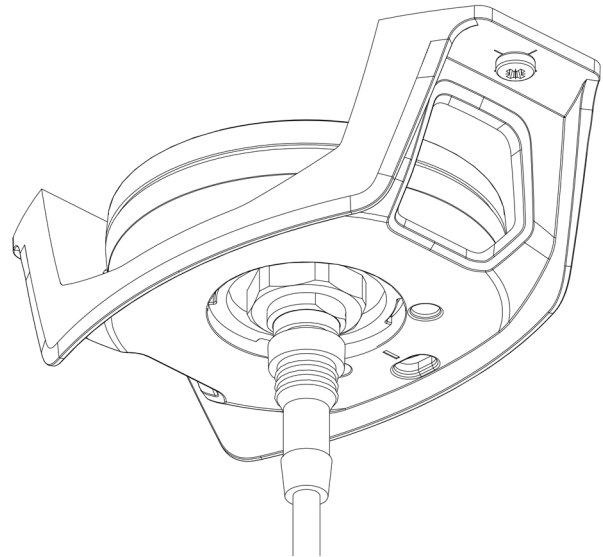FIGURE 5: LT-300 GNSS RECEIVER WITH ROOF MOUNT.

FIGURE 6: LT-300 GNSS RECEIVER WITH POLE MOUNT.

The following two sub-chapters will in details, step-by-step, describe how to complete an installation with either a pole or roof mount

- Pole mount installation, see *Pole Mount installation* on page 7
- Roof mount installation, see *Roof mount installation* on page 14

NOTE: The LT-300 GNSS Receiver is delivered with both a Pole Mount and a Roof Mount. For further details on what is in-the-box, see *Unpacking* on page 5.

Pole Mount installation

Step 1: Unpack the LT-300 GNSS Receiver and make a record of the unit serial number for support or warranty issues that could occur in the future. The unit serial number label is fixed on the pole mount as illustrated on Figure 7.
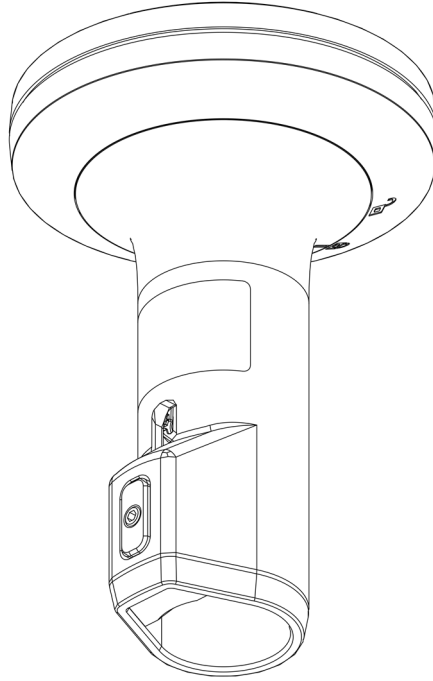
FIGURE 7: POLE MOUNT INSTALLATION STEP 1 (MAKE
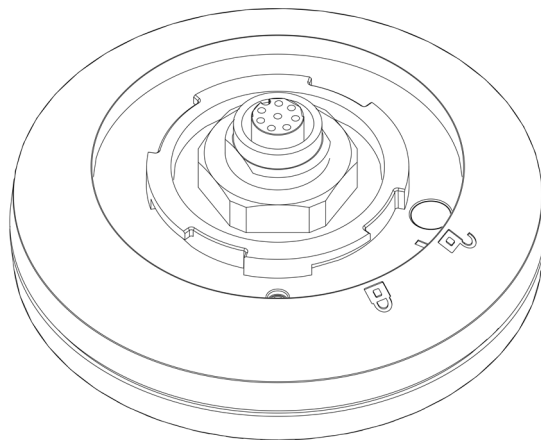A RECORD OF THE UNIT SERIAL NUMBER)

FIGURE 8: POLE MOUNT INSTALLATION STEP 1 (BOTTOM SIDE
OF THE LT-300 GNSS RECEIVER)

Step 2: Please refer to *NMEA 0183 Baud Rate* on page 20 for details on NMEA 0183 baud rate settings and *LED Color Description* on page 20 for LED description. Figure 9 is illustrating the bottom side of the LT-300 GNSS Receiver; highlighting the 2-color LED, the locking symbols, and the safety lock hole.
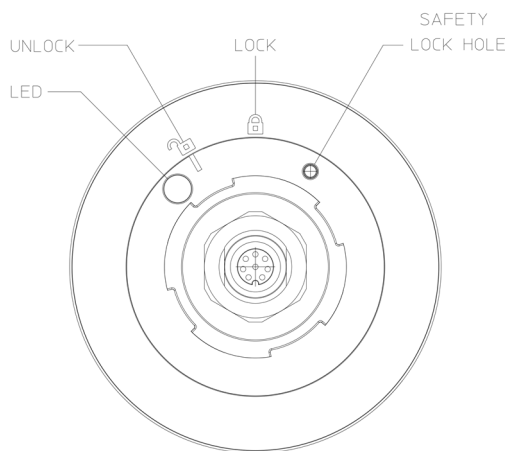

FIGURE 9: POLE MOUNT INSTALLATION STEP 2 (BOTTOM SIDE
OF LT-300 GNSS RECEIVER)

Step 3: Locate an appropriate location for the pole mount installation. See drawings under step 3 with respect to pole mount installation.

IMPORTANT: Make sure that the LT-300 GNSS Receiver is capable of receiving signals from the GNSS satellites (see *Mounting and installation considerations* on page 5 for details) and no compass within 0.3 m. (1 ft.) of the unit. Mount the LT-300 GNSS Receiver at least 1 m. away from VHF, UHF, MF-HF, Inmarsat, Iridium, etc. radio transmitting equipment. Make sure that the LT-300 GNSS Receiver minimum has a 20-degree angle towards a radar antenna (above or below).
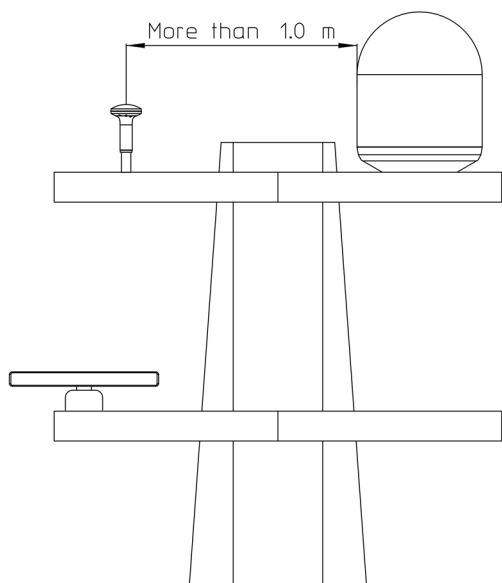

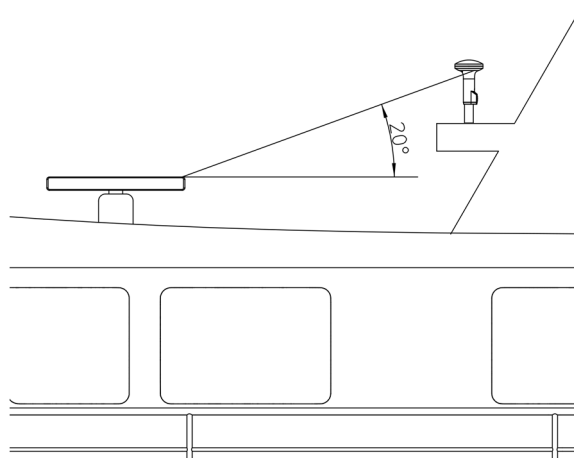FIGURE 11: POLE MOUNT INSTALLATION STEP 3 (LOCATE AN
APPROPRIATE LOCATION)

FIGURE 10: POLE MOUNT INSTALLATION STEP 3 (LOCATE
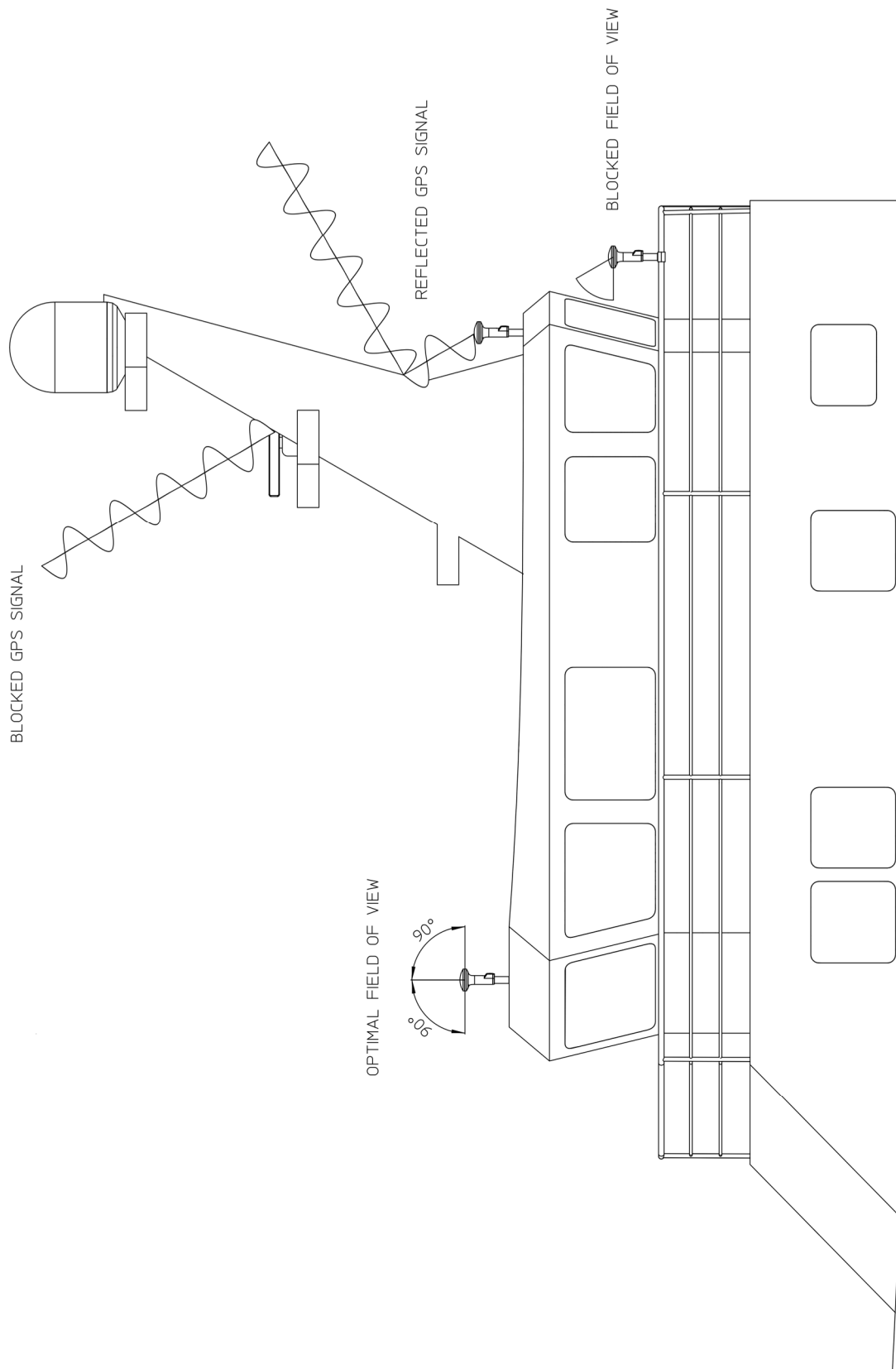AN APPROPRIATE LOCATION)

REFLECTED GPS SIGNAL

BLOCKED FIELD OF VIEW

BLOCKED GPS SIGNAL

OPTIMAL FIELD OF VIEW

90°

90°

FIGURE 12: POLE MOUNT INSTALLATION STEP 3 (LOCATE AN APPROPRIATE LOCATION)

Step 4: Complete the internal or external cable routing. Feed the communication cable through the pole mount.
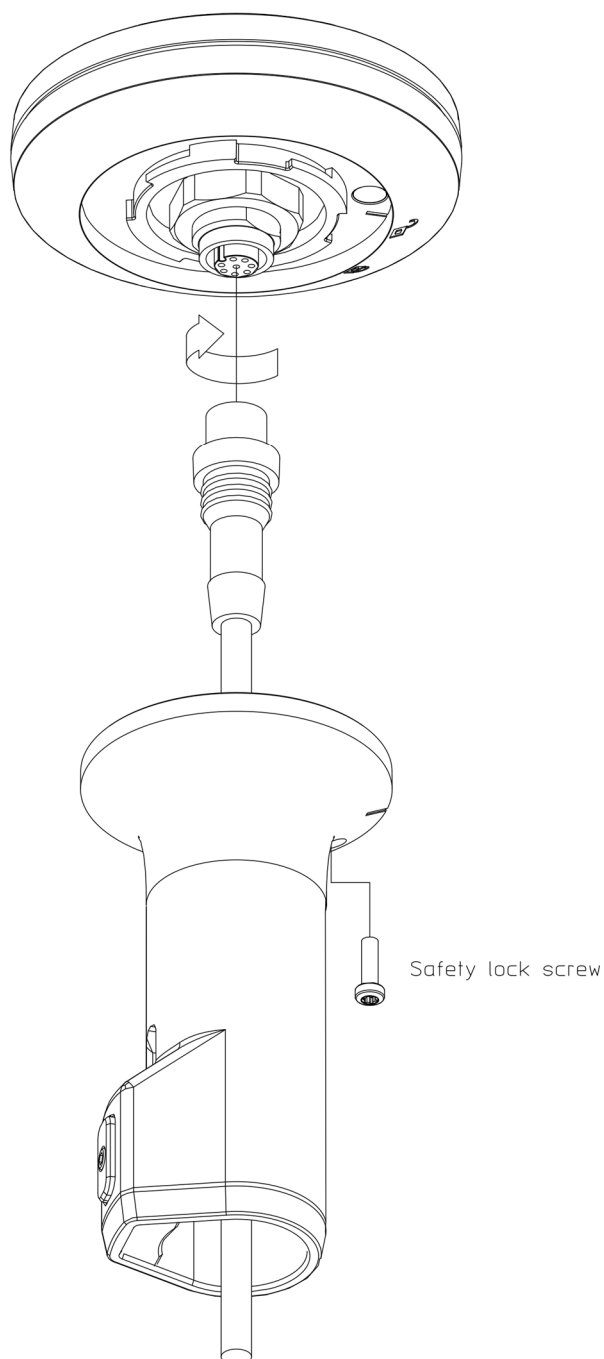
Safety lock screw

FIGURE 13: POLE MOUNT INSTALLATION STEP 4 (INTERNAL ROUTING OF THE COMMUNICATION CABLE)
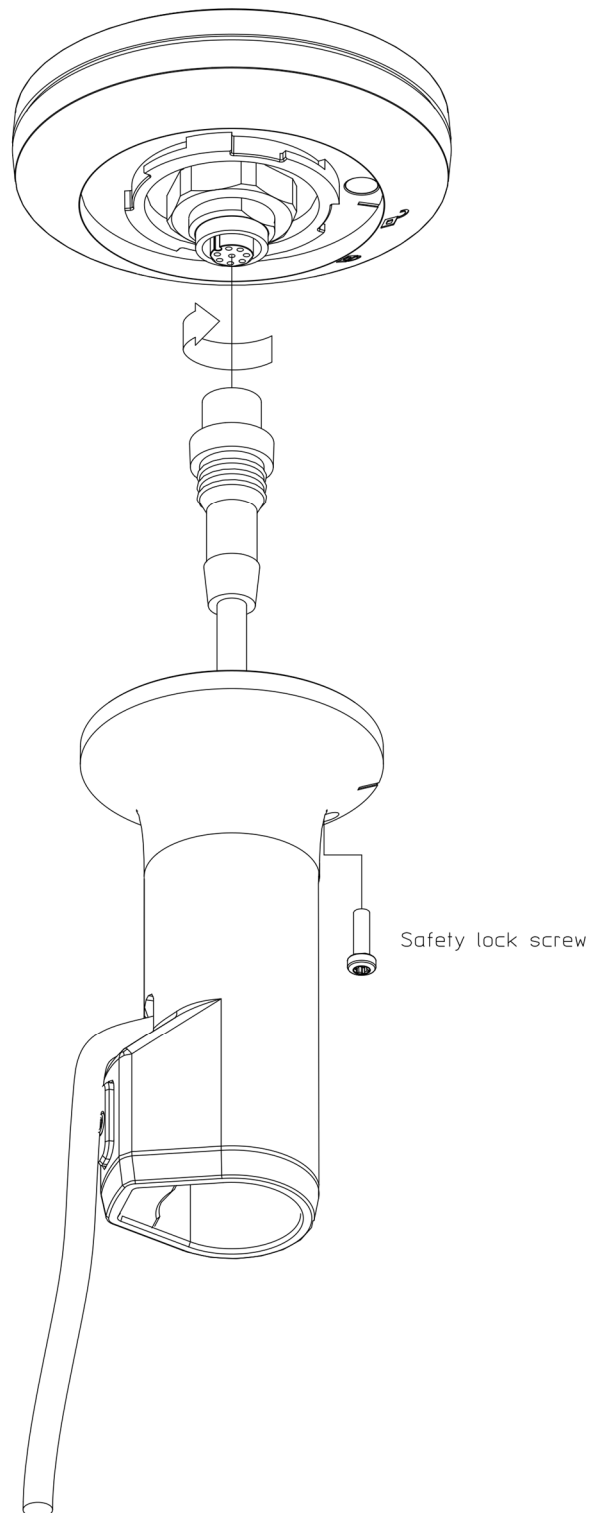
**FIGURE 14: POLE MOUNT INSTALLATION STEP 4 (EXTERNAL ROUTING
OF THE COMMUNICATION CABLE)**

Step 5: Fasten the pole mount by securing the two screws as illustrated in Figure 15 (pinol and safety lock screw).

IMPORTANT: The pinol screw used for fastening the pole mount to the 1" tube shall not exceed 0.8 NM (0.60 lbs/ft). The Safety lock screw used for fastening the pole mount to the LT-300 GNSS Receiver shall not exceed 0.6 NM (0.44 lbs/ft).

Safety lock screw
Torque 0,6 Nm [0,44 lbf-ft]

Recommended torque 0,6 Nm [0,44 lbf-ft]
Never exceed 0,8 Nm [0,60 lbf-ft]
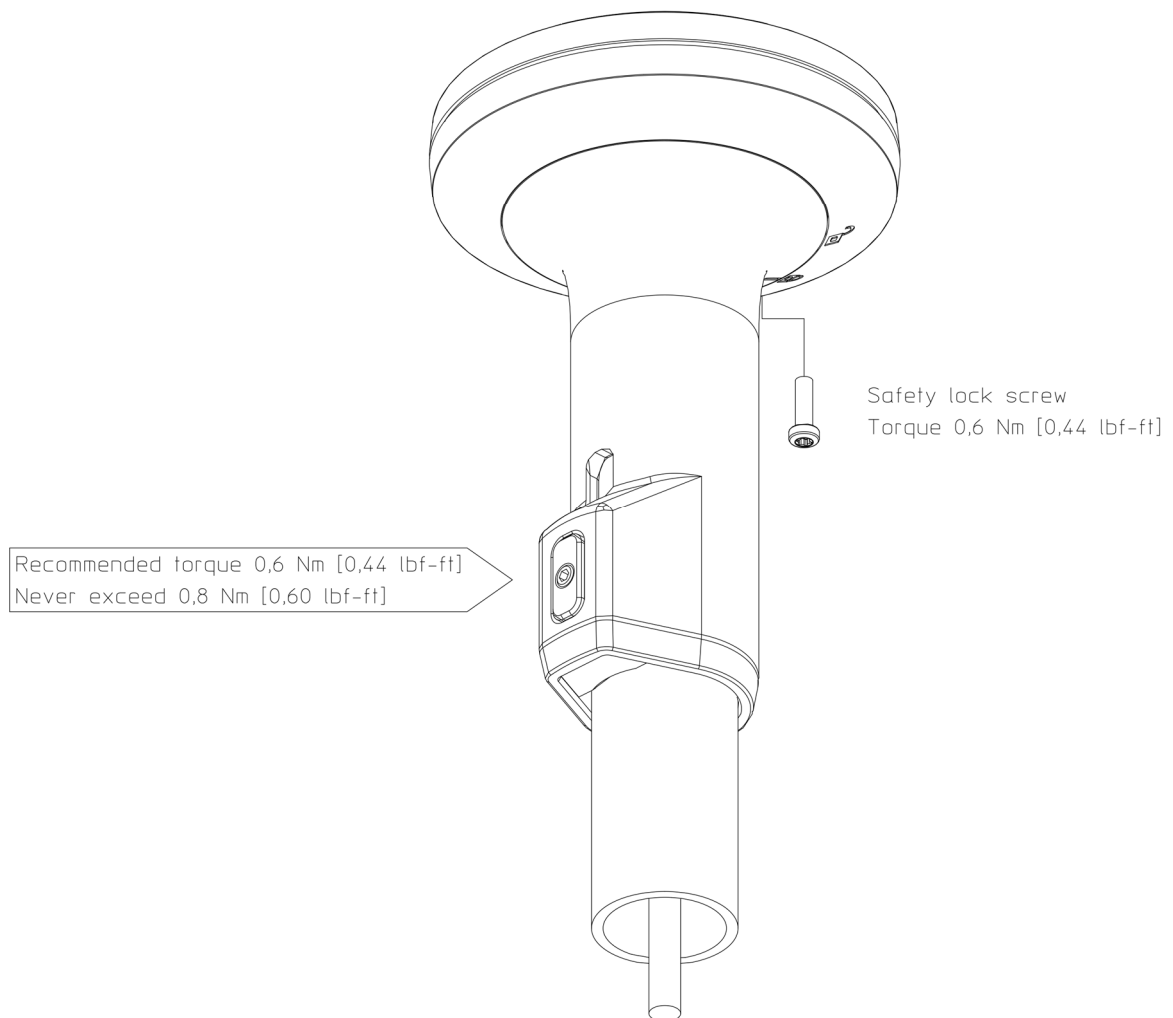
FIGURE 15: POLE MOUNT INSTALLATION STEP 5 (SECURING SCREWS)

Step 6: The mounting is not completed. Install the simple-cut end of the communication cable according to the details provided in *Connecting* on page 19.

NOTE: GNSS satellite configuration can be performed using the LT-service tool, see *Configuration using LT-Service Tool* on page 26.

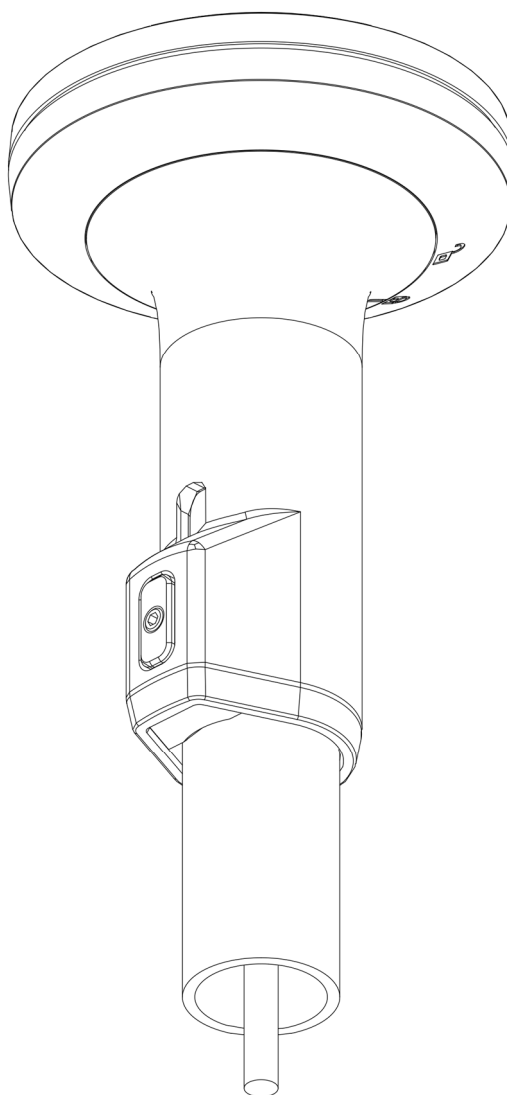FIGURE 16: POLE MOUNT INSTALLATION STEP 6 (INSTALL THE
SIMPLE-CUT END OF THE COMMUNICATION CABLE)

Roof mount installation

Step 1: Locate an appropriate location for the roof mount installation.

IMPORTANT: Make sure that nothing is blocking the GNSS satellite signals (see *Mounting and installation considerations* on page 5 for details) and that no compass is within 0.3 m. / 1 ft. of the LT-300 GNSS Receiver.
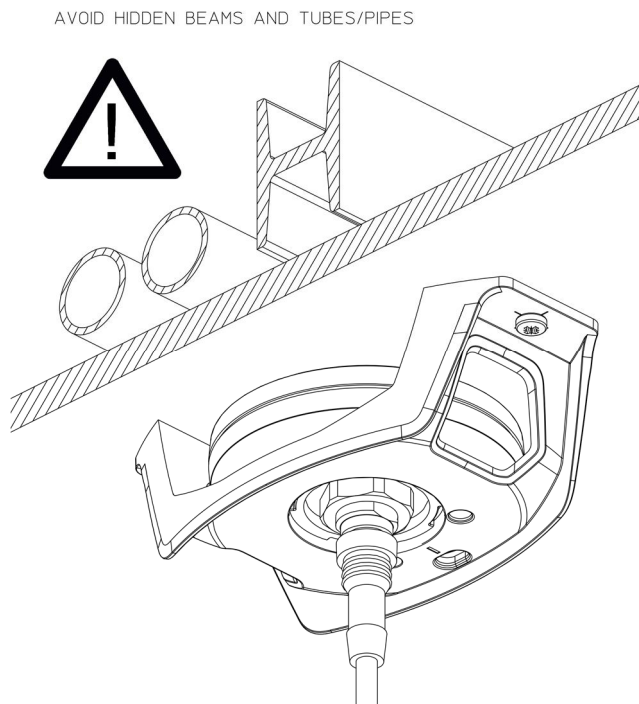
AVOID HIDDEN BEAMS AND TUBES/PIPES

FIGURE 17: ROOF MOUNT INSTALLATION STEP 1 (LOCATE AN APPROPRIATE LOCATION)

Step 2: Measure and mark the installation holes in accordance with the drawing showed in Figure 18. Use the enclosed two stainless A4 screws for mounting.
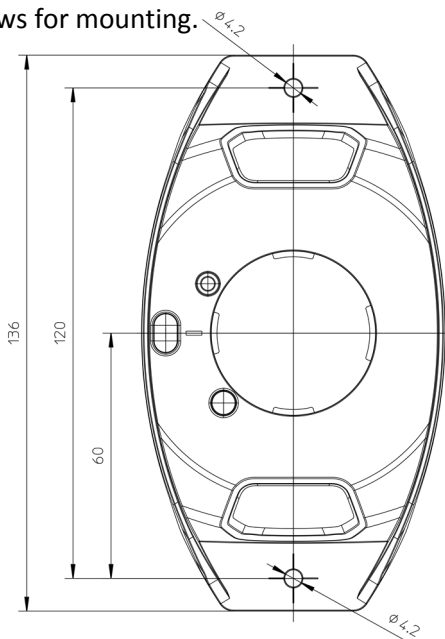
FIGURE 18: ROOF MOUNT INSTALLATION STEP 2 (MEASURE AND MARK THE INSTALLATION HOLES)

Step 3: Unpack the LT-300 GNSS Receiver and make a record of the unit serial number for support or warranty issues that could occur in the future. The unit serial number label is fixed on the pole mount as illustrated in Figure 19.
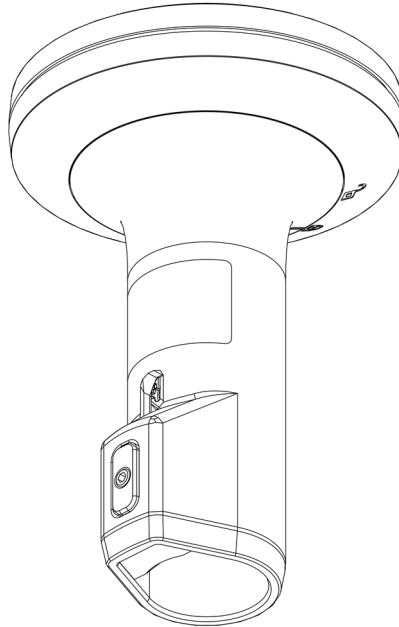
FIGURE 19: POLE MOUNT INSTALLATION STEP 3 (MAKE A RECORD OF THE UNIT SERIAL NUMBER)
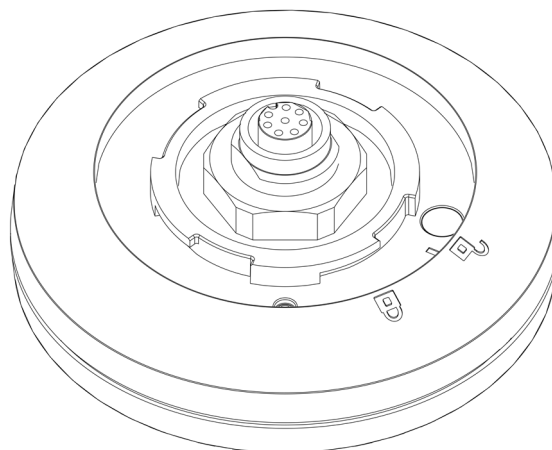
FIGURE 20: ROOF MOUNT INSTALLATION STEP 3 (BOTTOM SIDE OF THE LT-300 GNSS RECEIVER)

Step 4: Please refer to *NMEA 0183 Baud Rate* on page 20 for details on NMEA 0183 baud rate settings and *LED Color Description* on page 20 for LED color description. Figure 21 is illustrating the bottom side of the LT-300 GNSS Receiver; highlighting the 2-color LED, the locking symbols, and the safety lock hole.
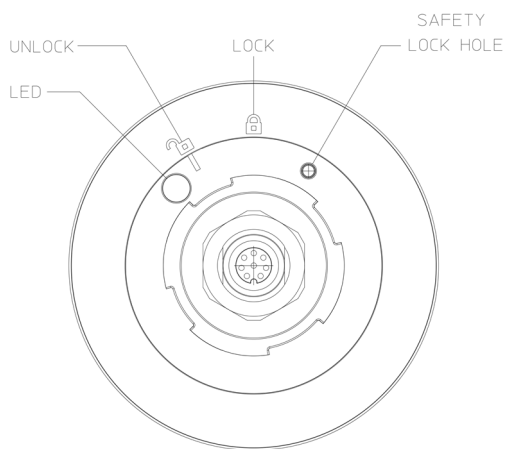
**FIGURE 21: ROOF MOUNT INSTALLATION STEP 4
(BOTTOM SIDE OF THE LT-300 GNSS RECEIVER)**

Step 5: Fasten the LT-300 GNSS Receiver to the Roof Mount as illustrated in Figure 22 to Figure 25.
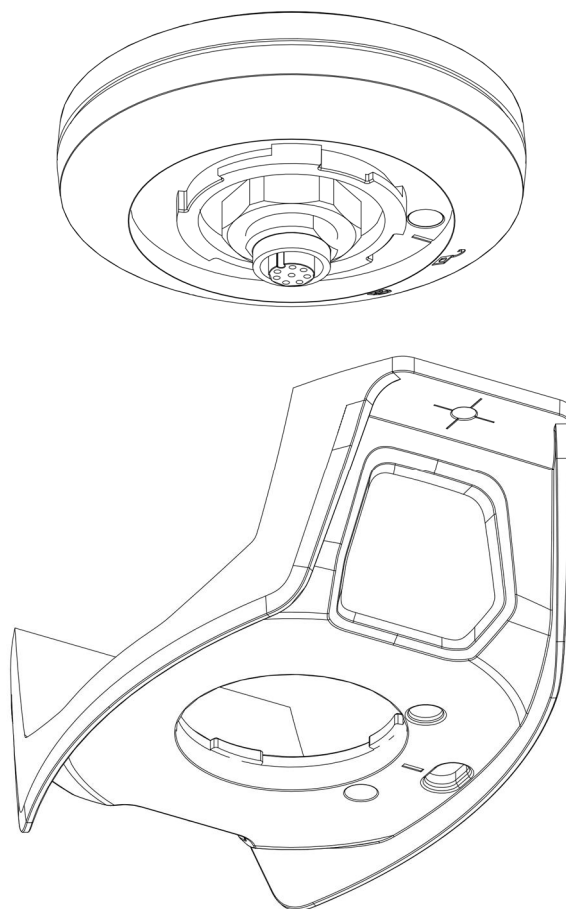
**FIGURE 22: ROOF MOUNT INSTALLATION STEP 5 (FASTEN THE
LT-300 GNSS RECEIVER TO THE ROOF MOUNT)**
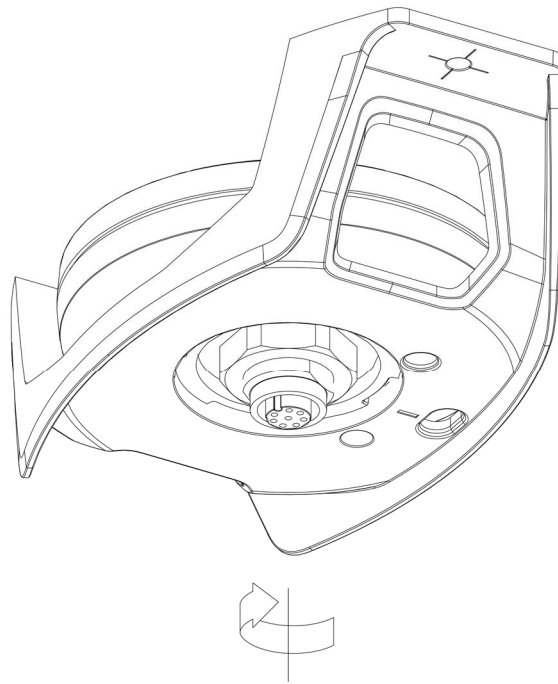
To Lock – turn 30° clockwise

FIGURE 23: ROOF MOUNT INSTALLATION STEP 5 (FASTEN THE LT-300 GNSS RECEIVER TO THE ROOF MOUNT)

To Lock – turn LT-300 GNSS 30° clockwise

Lock position – mount safety screw PT 30x10 WN 5452
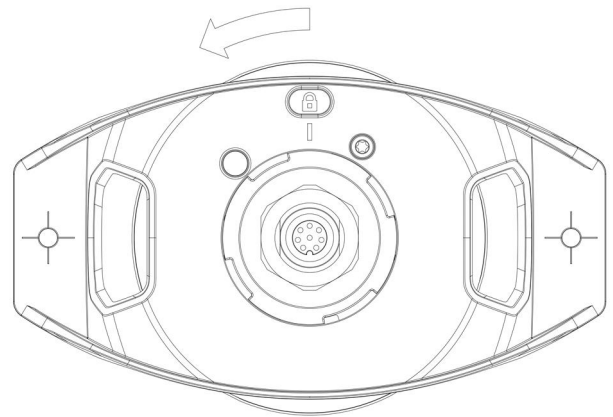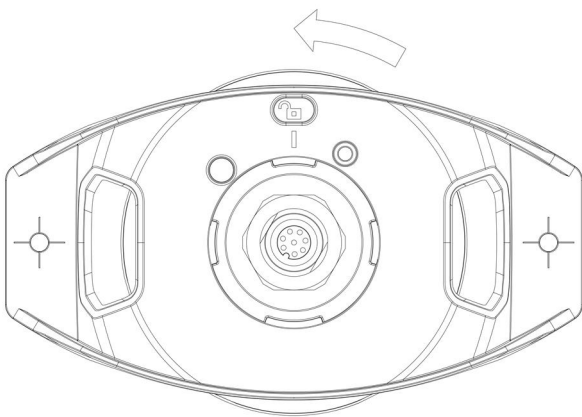
FIGURE 25: ROOF MOUNT INSTALLATION STEP 5 (UNLOCK POSITION OF THE LT-300 GNSS RECEIVER)

FIGURE 24: ROOF MOUNT INSTALLATION STEP 5 (LOCKED POSITION OF THE LT-300 GNSS RECEIVER)

Step 6: Use the two self-cutting stainless screws to mount the Roof Mount against the roof. Secure the LT-300 GNSS Receiver and Roof Mount with the safety lock screw as illustrated in Figure 26. Connect the communication cable.

Safety lock screw
Torque 0,6 Nm [0,44 lbf-ft]
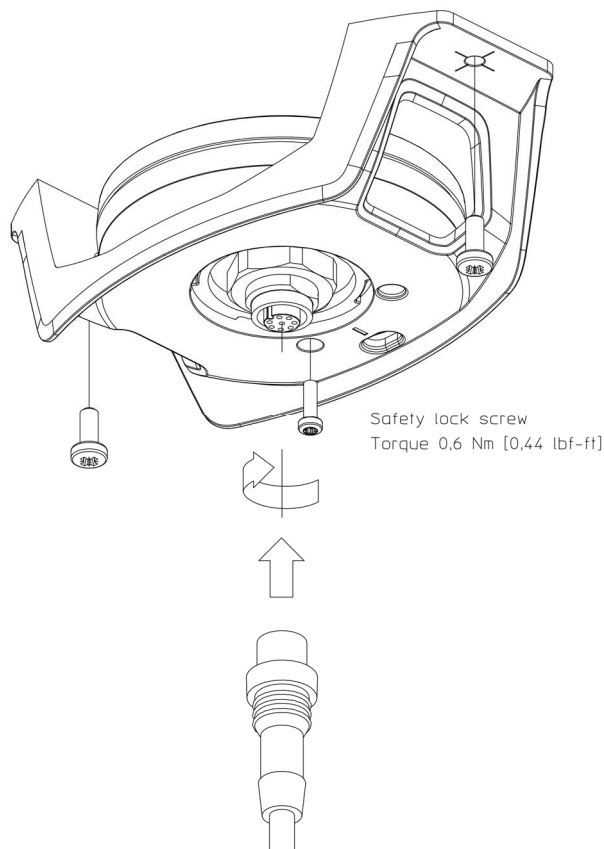
FIGURE 26: ROOF MOUNT INSTALLATION STEP 6 (FASTEN SCREWS AND
CONNECT THE COMMUNICATION CABLE)

Step 7: The mounting is now completed. Install the simple-cut end of the communication cable according to the details provided in *Connecting* on page 19.
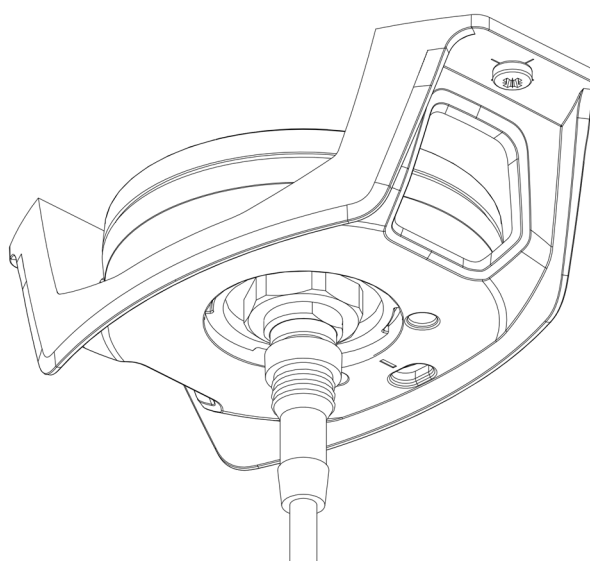
FIGURE 27: ROOF MOUNT INSTALLATION STEP 7 (INSTALL THE
SIMPLE-CUT END OF THE COMMUNICATION CABLE)

Connecting

This section provides relevant information for connecting the LT-300 GNSS Receiver to NMEA 0183, NMEA 2000, power, and the LT-Service Tool.

Connector and cable definition

The LT-300 GNSS Receiver has an 8-pin female connector, which is supporting simultaneously data on NMEA 0183 and NMEA 2000. The placement of the LT-300 GNSS connector is illustrated in Figure 28. A detailed connector pin out with pin numbering is illustrated in Figure 29.
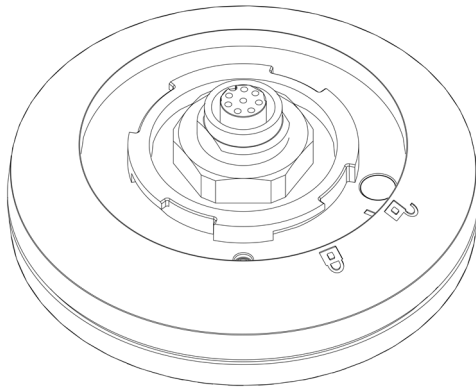
FIGURE 28: LT-300 GNSS RECEIVER (BOTTOM VIEW). 8-PIN FEMALE CONNECTOR USED FOR CONNECTING THE LT-300 GNSS RECEIVER TO NMEA 0183, NMEA 2000, AND POWER.
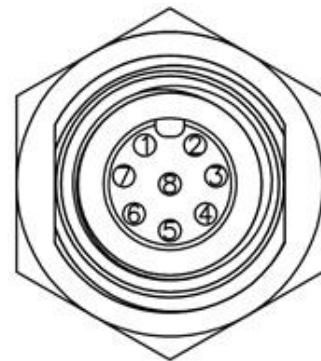
FIGURE 29: LT-300 GNSS CONNECTOR PIN NUMBERING

The LT-300 GNSS connector has a proprietary pin out and therefore a communication cable is always included in-the-box, see *Unpacking (in-the-box)* on page 5. The communication cable is available in two lengths: 10 or 30 meters. The LT-300 GNSS Receiver is delivered including a 10 meter cable (simple-cut). The communication cable, wire color and designation, is illustrated in Table 4.

LT-300 GNSS Interconnect Details		
Pin No.	Wire Color	Wire Designation
1	Brown	TxD-
2	Yellow	TxD+
3	Black	GND
4	White	CAN_H
5	Blue	CAN_L
6	Orange	RxD+
7	Green	RxD-
8	Red	Vsupply

TABLE 4: LT-300 GNSS RECEIVER MULTI CABLE WIRE COLOR AND DESIGNATION.

LT-300 GNSS		
Pin 1	TxD-	{NMEA 0183 out}
Pin 2	TxD+	{NMEA 0183 out}
Pin 3	GND	
Pin 4	CAN_H	{NMEA 2000 in/out}
Pin 5	CAN_L	{NMEA 2000 in/out}
Pin 6	RxD+	{NMEA 0183 in}
Pin 7	RxD-	{NMEA 0183 in}
Pin 8	Vsupply	
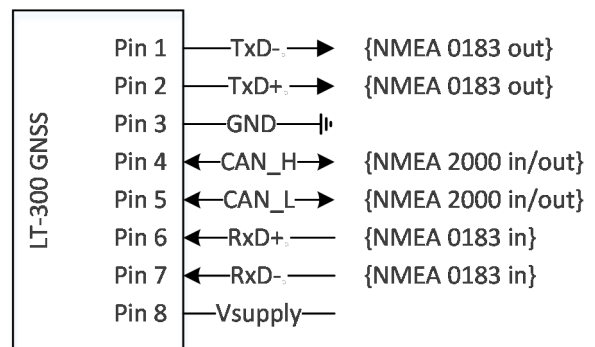
FIGURE 30: TRANSMIT AND RECEIVE DIRECTIONS FOR THE LT-300 GNSS RECEIVER.

NOTE: To avoid any misinterpretation, the transmit (Tx) and receive (Rx) directions are illustrated in Figure 30, relative to the LT-300 GNSS Receiver.

NMEA 0183 Baud Rate

The NMEA 0183 baud rate is configured by selecting the input level of the NMEA 0183 Rx signals (RxD+/RxD-), see Table 5.

LT-300 GNSS Baud Rate Configuration		
Mode	**RxD+/RxD-**	**Baud Rate**
Option 1 (default)	Floating (not connected)	4.800
Option 2	Grounded (connected to GND)	38.400

TABLE 5: CONFIGURATION OF LT-300 GNSS RECEIVER NMEA 0183 BAUD RATE.

IMPORTANT: It is important that both RxD+ and RxD- have the same input level (floating or grounded). For LT-300 interconnect details (wire colors), see Table 4 on page 19.

NMEA 2000 'Open' or 'Terminated'

The LT-300 GNSS Receiver is configured to 'Open' (NMEA 2000) from the factory. The LT-Service Tool can be used for setting NMEA 2000 bus termination for the LT-300 GNSS Receiver.

IMPORTANT: Use the LT-Service Tool to configure the NMEA 2000 bus termination to 'Terminated'. For further information on the LT-Service Tool, see *Configuration using LT-Service Tool* on page 26.

LED Color Description

The color code and description of the LED is illustrated in Table 6.

LT-300 GNSS LED Color Description	
LED	**Description**
Green	Power on unit.
Red	Power on Unit. Error or warnings present. Check installation setup and *Troubleshooting* on page 30 to resolve the problem. Connect the LT-Service Tool to read-out details from the LT-300 GNSS Receiver, see *Connecting LT-Service Tool* on page 24.
Off	No power on unit.

TABLE 6: LT-300 GNSS RECEIVER LED COLOR CODE AND DESCRIPTION

Connecting to NMEA 0183

If connecting the LT-300 GNSS Receiver to a NMEA 0183 device, it is only required to connect the transmit part of the NMEA 0183 wires TxD- (Brown) and TxD+ (Yellow) from the communication cable.

NOTE: Make sure that the LT-300 GNSS Receiver is configured for the desired baud rate (4800 or 38400 baud), see *NMEA 0183 Baud Rate* on page 20. Check that both the NMEA 0183 receive device and the LT-300 GNSS Receiver have the same GND reference, as illustrated in Figure 31 and Figure 32.

IMPORTANT: It is recommended to connect the LT-300 GNSS Receiver with a balanced NMEA 0183 connection (RS-422) as illustrated in Figure 31. An unbalanced connection (RS-232), as illustrated in Figure 32, is less robust and should only be considered when using a short communication cable.
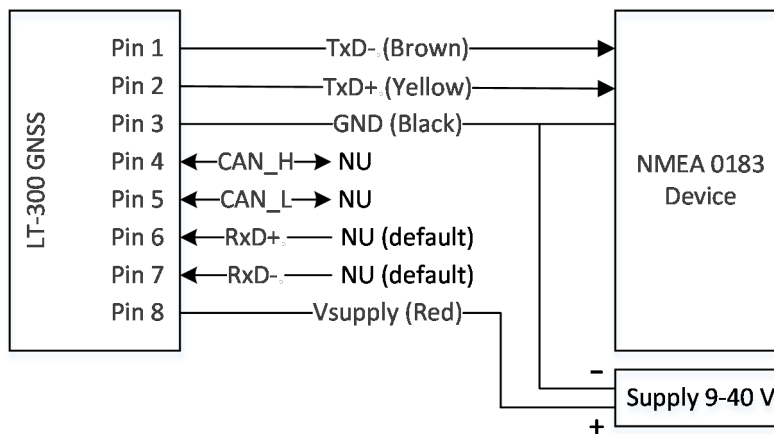

FIGURE 31: CONNECTING THE LT-300 GNSS RECEIVER TO A BALANCED NMEA 0183 DEVICE.
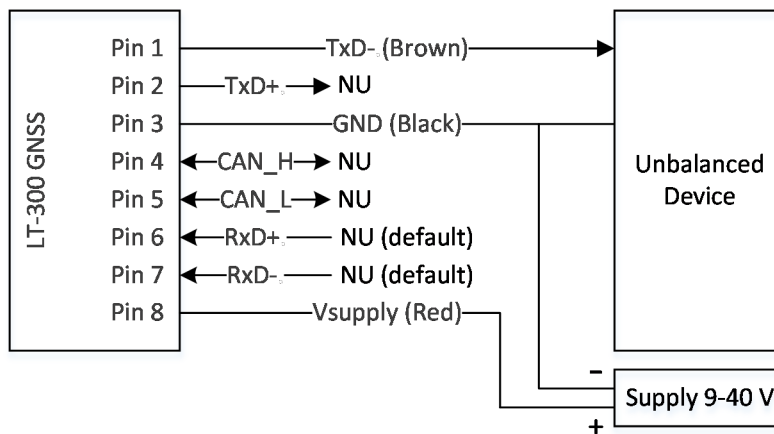
FIGURE 32: CONNECTING THE LT-300 GNSS RECEIVER TO AN UNBALANCED DEVICE.

Connecting to NMEA 2000

If connecting the LT-300 GNSS Receiver to a NMEA 2000 network (drop or backbone) then it is required to use a screw-in connector as illustrated in Figure 33. The screw-in connector is in-the-box together with the LT-300 GNSS Receiver.
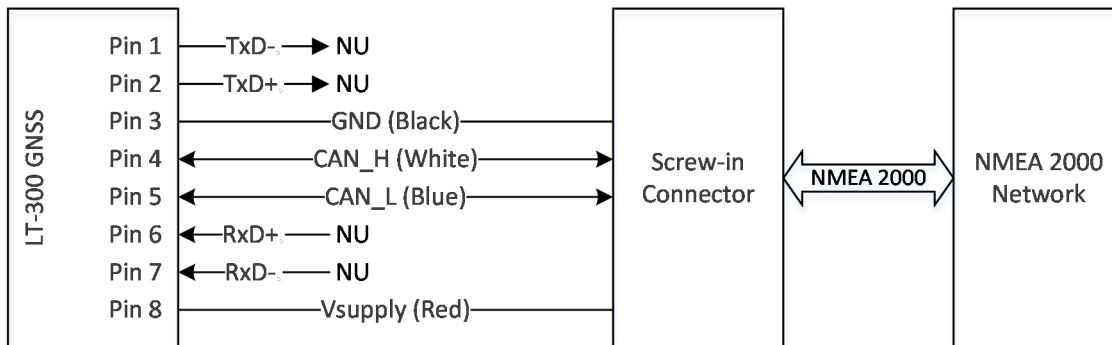
NOTE: The screw-in connector is connected to the communication cable by cutting the cable in the right length, stripping the wires, screwing the specific wires to the connector, and then re-assemble the connector again.

The screw-in connector outline is illustrated in Figure 34. The pin-out and numbering of the screw-in connector is illustrated in Figure 35, while the wiring details for interconnection with the communication cable is shown in Table 7.
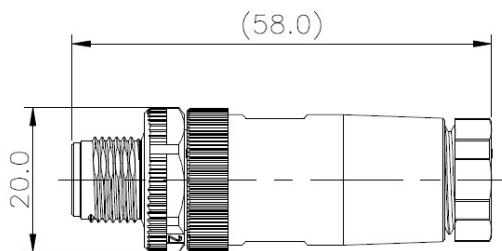
FIGURE 34: NMEA 2000 SCREW-IN CONNECTOR (M) OUTLINE
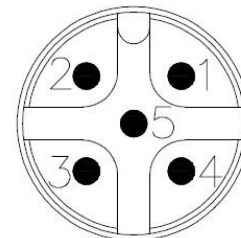
FIGURE 35: NMEA 2000 SCREW-IN CONNECTOR PIN NO.

NOTE: The LT-300 does not require a connection on Pin No. 1: drain/shield. The unit is designed to work with open cable shield.

NMEA 2000 Screw-in Conn. Wiring		
Cable Wire Color	**Cable Wire Designation**	**Screw-in Conn. Pin No.**
-	-	1
Red	Vsupply	2
Black	GND	3
White	CAN_H	4
Blue	CAN_L	5

TABLE 7: ILLUSTRATES HOW THE LT-300 GNSS 8-PIN MULTI CABLE IS CONNECTED TO A NMEA 2000 SCREW-IN CONNECTOR.

NOTE: The LT-300 GNSS Receiver can be configured to NMEA 2000 'Open' or 'Terminated'. The LT-Service Tool must be used to change this configuration (factory default is 'Open'). The LT-Service Tool is described in details in *Configuration using LT-Service Tool* on page 26.

The remaining figures in this sub-chapter does not show the screw-in connector for simplicity.

NMEA 2000 Installation

The LT-300 GNSS Receiver is delivered with a NMEA 2000 screw-in connector, which is used to interconnect the communication cable to a NMEA 2000 backbone. The LT-Service Tool can be used to configure the LT-300 GNSS Receiver to either 'Open' or 'Terminated', see *Configuration using LT-Service Tool* on page 26 (factory default: 'Open'). Figure 36 and Figure 37 are illustrating two options for connecting the LT-300 GNSS Receiver to a NMEA 2000 network (backbone).

NMEA 2000 ('Open')

If the LT-300 GNSS Receiver is installed as illustrated in Figure 36, no internal LT-300 NMEA 2000 bus termination is required (default: 'Open'). The LT-300 GNSS Receiver is connected to the NMEA 2000 backbone using a drop-cable.

IMPORTANT: Make sure that the communication cable, delivered together with the LT-300 GNSS Receiver, is shortened to a maximum length of 6 meters as defined in the NMEA 2000 standard for a drop cable.
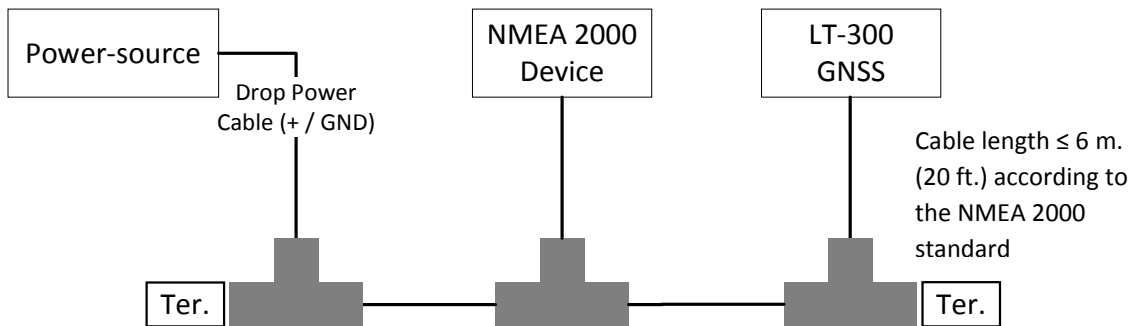
FIGURE 36: LT-300 GNSS RECEIVER CONNECTED TO A NMEA 2000 BACKBONE CONFIGURED TO 'OPEN' (DEFAULT CONFIGURATION). THE NMEA 2000 SCREW-IN CONNECTOR IS NOT ILLUSTRATED IN THIS FIGURE.

NMEA 2000 ('Terminated')

If the LT-300 GNSS Receiver is installed as illustrated in Figure 37, internal LT-300 NMEA 2000 bus termination is required and configuration must be changed from 'Open' to 'Terminated' (default: 'Open'). The LT-Service Tool must be used to make this configuration, see *Configuration using LT-Service Tool* on page 26. The LT-300 GNSS Receiver is connected to the NMEA 2000 backbone using a standard backbone cable.

FIGURE 37: LT-300 GNSS RECEIVER CONNECTED TO A NMEA 2000 BACKBONE WITH NMEA 2000 BUS TERMINATION CONFIGURED TO 'TERMINATED'. THE NMEA 2000 SCREW-IN CONNECTOR IS NOT ILLUSTRATED IN THIS FIGURE.

For details on how to connect the communication cable with the NMEA 2000 screw-in connector, see *Connecting to NMEA 2000* on page 22.
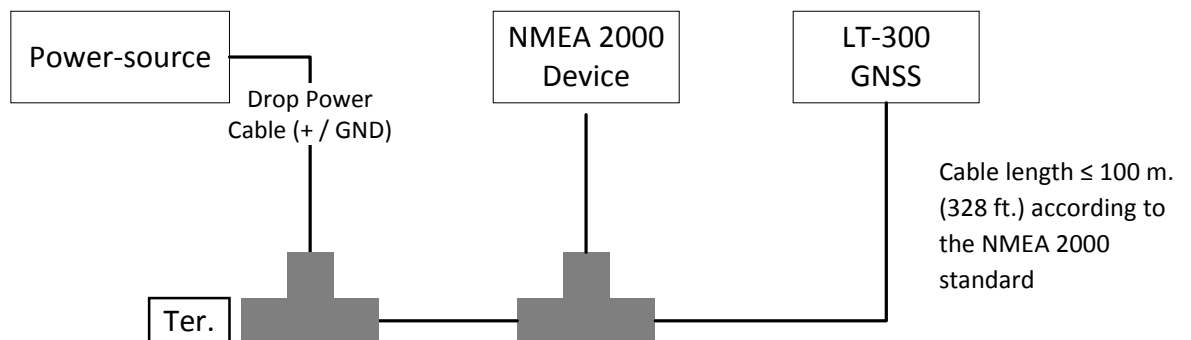
Connecting LT-Service Tool

The LT-Service Tool is a PC program made for configuration, maintenance, and service of the LT-300 GNSS Receiver. Use of the LT-Service Tool is optional. For details and functionality, see *Configuration using LT-Service Tool* on page 26. This sub-chapter is describing how to physically interconnect a PC (with the LT-Service Tool), to a LT-300 GNSS Receiver. The LT-Service Tool is using the NMEA 0183 interface for communicating with the LT-300 GNSS Receiver (both Tx and Rx directions).

Use either a 'USB to RS-422 converter' or connect a serial port directly to the LT-300 GNSS Receiver as described in the following sub-sections. The LT-300 GNSS Receiver requires an input voltage of 9-40 VDC. Most of the USB to RS-422 converter's and serial interfaces are only providing 5 VDC. Make sure that GND on both devices (PC and LT-300 GNSS Receiver) are connected to the same reference.

NOTE: The LT-Service Tool will automatically detect all LT-Navigation devices, which are connected to the PC's peripheral interfaces (USB and serial). Make sure that Tx and Rx wires are connected correctly. The LT-Service Tool will automatically try both 4.800 and 38.400 baud to search for possible LT-Navigation devices. If the LT-Service Tool does not automatically detect a LT-Navigation device, check automatically and manual connection modes, described in *Configuration using LT-Service Tool* on page 26.

USB to RS-422 converter

A standard USB to RS-422 converter, as illustrated in Figure 38, is perfect for providing a communication link in between the LT-Service Tool and the LT-300 GNSS Receiver. The PC is connected to the 'USB to RS-422 converter' through a standard USB cable.
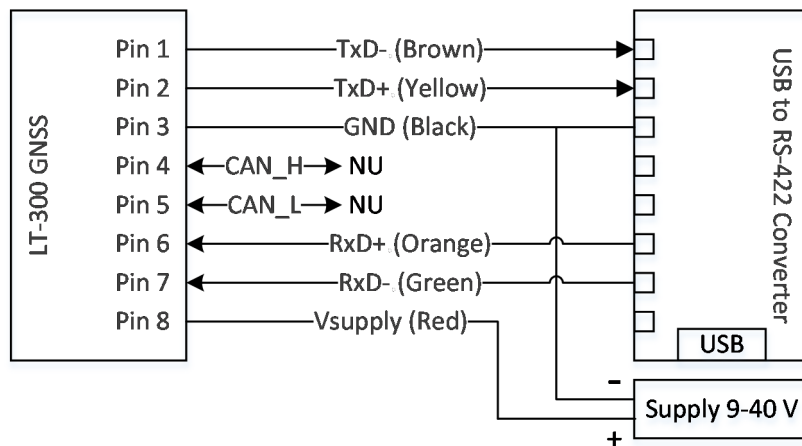
FIGURE 38: USB TO RS-422 CONVERTER PROVIDING THE COMMUNICATION LINK IN BETWEEN THE PC (LT-SERVICE TOOL) AND THE LT-300 GNSS RECEIVER.

NOTE: Windows may wrongfully recognize an USB to Serial device, as a mouse, if the device is transmitting when being plugged into the PC. Avoid this by giving Windows time to recognize the USB to Serial device before powering on the LT-300 GNSS Receiver.

Serial Port (RS-422)

Illustration of a RS-422 interface in between a serial port and the LT-300 GNSS Receiver for providing a communication link for the LT-Service Tool, see Figure 39. The RS-422 interface is balanced and more robust than an unbalanced serial interface, which is illustrated in Figure 40.

NOTE: The RS-422 interface is using both Tx and Rx transmission lines (balanced/differential) and is therefore a more robust communication link than the RS-232 interface. The LT-300 GNSS Receiver is supporting both RS-422 and RS-232 communicating link to the LT-Service Tool.

Serial port (RS-232)

Illustration of a RS-232 interface in between a serial port and the LT-300 GNSS Receiver for providing a communication link for the LT-Service Tool, see Figure 40.

NOTE: When using the RS-232 (unbalanced) serial communication link, it is important that the RxD-signal level from the serial port is > 5 VDC for proper operation.

Configuration using LT-Service Tool

The LT-Service Tool is a PC program interfacing and communicating with LT-Navigation devices. The LT-Service Tool is communicating via the NMEA 0183 serial interface. The newest available LT-Service Tool will be available from the local dealer or distributor, see www.thrane.eu (Dealers & Distributors).

File name: LT-Service_vX.XX.exe

NOTE: The LT-Service Tool is an optional PC program, which can be used together with the LT-300 GNSS Receiver. It is possible to install the LT-300 GNSS Receiver and use it for navigational purposes, without configuration by the LT-Service Tool. The LT-Service Tool is intended for installation and service by trained personnel.
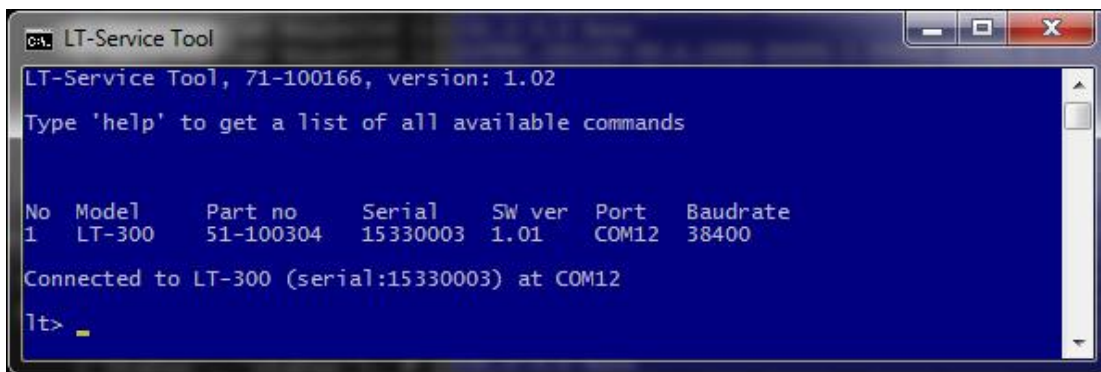
FIGURE 41: THE LT-SERVICE TOOL WILL AUTOMATICALLY SEARCH FOR LT-NAVIGATION DEVICES, WHICH ARE CONNECTED TO THE PC. A MANUAL CONNECTION MODE IS ALSO AVAILABLE.

Identify a LT-Navigation device

The LT-Service Tool requires a bi-directional RS-422 balanced or RS-232 unbalanced serial interface in order to communicate with the LT-Navigation devices. The baud-rate is either: 4.800 or 38.400 baud (see *NMEA 0183 Baud Rate* on page 20).

NOTE: It is recommended to use a 'USB to RS-422 converter' for easy interfacing in-between the PC (LT-Service Tool) and the LT-300 GNSS Receiver. Interconnection diagrams are illustrated in *Connecting LT-Service Tool* on page 24.

Automatic mode:

Step 1:   Double click on the LT-Service_vX.XX.exe file to start the program

Step 2:   The LT-Service Tool will automatically search all COM ports on the PC to identify potential LT-Navigation devices connected to the PC. Devices found, will be shown in a list, as illustrated in Figure 41.

Step 3:   If the LT-Service Tool finds more than one LT-Navigation device, then type the number of the device in the list to be connected with, e.g. "1" and "Return". If only one device is found, then the LT-Navigation device will automatically connect.

Manual mode:

Step 1:   Start cmd.exe (Windows command prompt).

Step 2:   Navigate to the directory where the LT-Service Tool is stored.

Step 3:   In the cmd prompt write: "LT-Service_vX.XX.exe –p COM25 –b 4800" to launch the program
                 (depends on the version of the LT-Service Tool (X.XX = 1.01), PC COM port, and the baud rate
                 for which the LT-300 GNSS Receiver is configured).

LT-Service Tool functions

The key functions of the LT-Service Tool are listed here. For a complete list of functionality and commands, see *App. F – LT-Service Tool* on page 38.

Key features:

- Configuration of the GNSS Receiver (GPS, SBAS, QZSS, BeiDou and GLONASS)
  - Default configuration: GPS, SBAS, QZSS, and GLONASS
- Configuration of NMEA 2000 'Open' or 'Terminated' (factory default: 'Open')
- Status of the LT-300 GNSS Receiver
  - Power On Self-Test (POST)
  - Continuous Monitoring (CM)
  - General status
- Monitoring of NMEA 0183 data
  - Live NMEA 0183 sentences (to inspect valid output from the LT-300 GNSS Receiver)
- Live navigations data
  - Navigation window to display live data (up-date-rate = 1 second)
- Automatic generation of a Diagnostic Report
- Upload of new application software

List of commands

All available commands in the LT-Service Tool are described in details when using the "help" command, see *App. F – LT-Service Tool* on page 38. Some of the most used commands are presented here:

"help"   Lists all commands supported by the LT-Service Tool and the LT-300 GNSS

"set gnss receiver <id> <id>" Select the following type of satellites: GPS, SBAS, QZSS, GLONASS or BeiDou

"set nmea2000 term <id>"   Set NMEA 2000 bus termination: open or close

"diag"   Generate a Diagnostic Report

"upload <filename>"   Upload a new application image (absolute or relative file path)

"reboot"   Reboot device (for configuration to take affect)

"post", "event" & "status" Prints Power On Self-Tests (POST), events (CM) and status

GNSS satellite receiver configuration

The LT-300 GNSS Receiver is by default configured to the following GNSS satellite reception:

GPS, SBAS, QZSS, and GLONASS

For a complete list of possible configurations, see Table 8, which may be configured using the LT-Service Tool. For further information on the LT-Service Tool, see *Configuration using LT-Service Tool* on page 26.

GNSS Satellite Receiver Configuration	
Configuration	**GNSS Satellites**
Default	GPS, SBAS, QZSS, GLONASS
Option 1	GPS, SBAS, QZSS, BeiDou
Option 2	GPS, SBAS, QZSS
Option 3	GPS, QZSS
Option 4	GLONASS
Option 5	BeiDou

TABLE 8: GNSS SATELLITE RECEIVER CONFIGURATION

Service and repair

This section describes what the end-user must do in case of required service or repair.

NOTE: The LT-300 GNSS Receiver does not require any scheduled maintenance or service. Make sure that the product is installed, as described in this manual, before making contact to the distributor or dealer for further assistance.

For troubleshooting the LT-300 GNSS Receiver, see *Troubleshooting* on page 30.

If the LT-300 GNSS Receiver for some reason does not work as described in this manual, make contact to the distributor or dealer, from where the product was originally bought. The distributors or dealers will have experience and know-how to assist with further technical support and troubleshooting.

Contacting the distributor/dealer:

1) Make sure to have the product name (LT-300 GNSS Receiver), Part Number (P/N: 51-100304), and the unit serial number (S/N: XXXXXXXX) identified. The unit serial number is listed on the outside of the device (pole mount).
2) Write a technical report about the observation or error. If possible, attach a picture of the installed product and include a wiring diagram. If possible, make a diagnostic report with the LT-Service Tool (see *Configuration using LT-Service Tool* on page 26).
3) Send all information to the local distributor or dealer.

IMPORTANT: Unless otherwise agreed, the end-user shall always coordinate service and repair issues directly with the distributor or dealer. This practice also applies for returning of products for service and repair.

All information that will get back to Lars Thrane A/S, either directly or indirectly, will be handled with confidentiality. End-user sensitive data will not be shared with any third party without prior written acceptance from the involved parties.

Troubleshooting

Before contacting the distributor or dealer for support, please check the following troubleshooting guide.
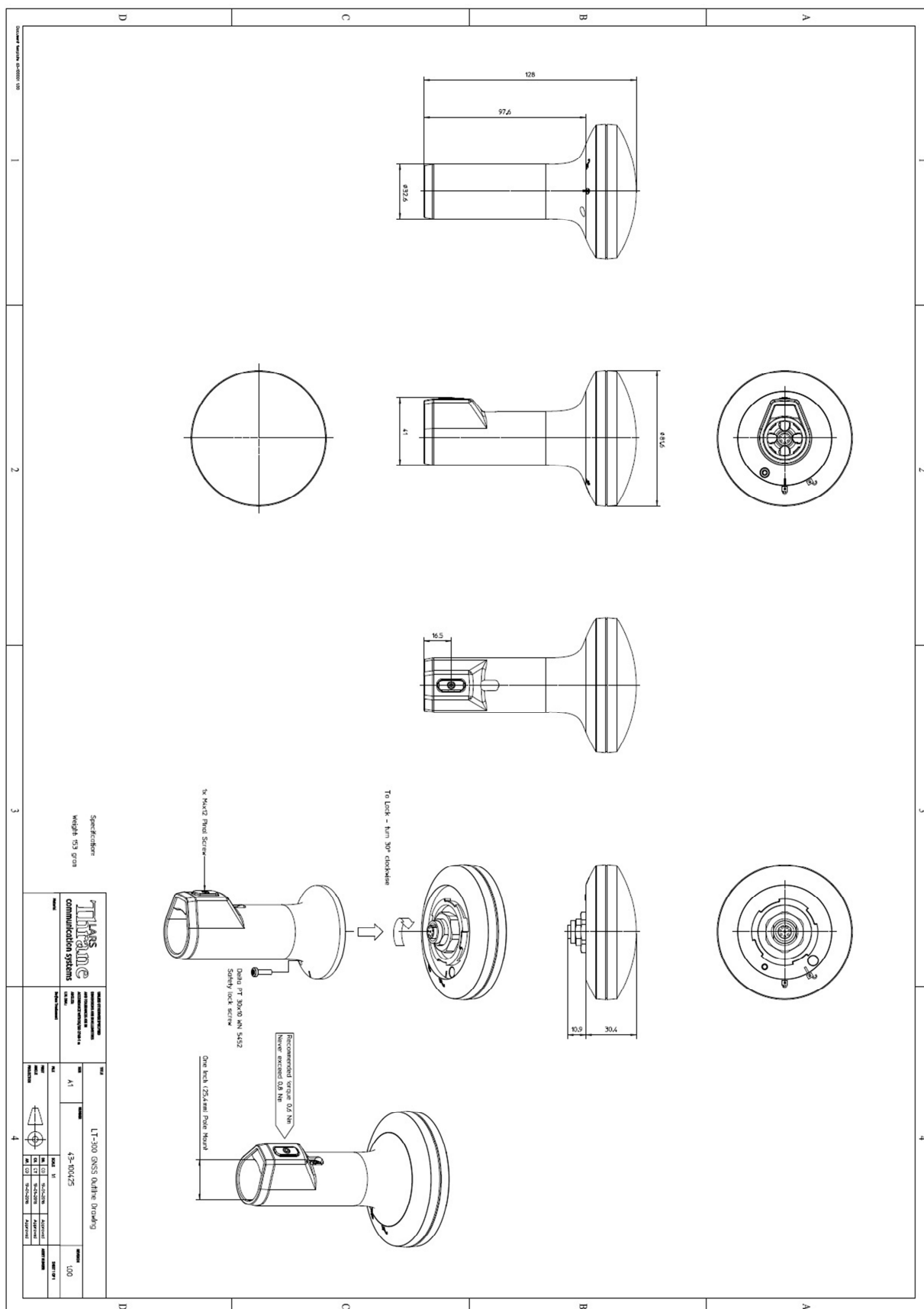
Troubleshooting guide:

1) Power cycle the unit to verify that the problem still exists

2) Is the communication cable properly connected?
    For more information on connecting cables, see *Connecting* on page 19.

3) Check the status of the 2-color LED.
    If everything is correct, then LED shall light with a green color.
    For further details on the LED, see *LED Color Description* on page 20.

4) Check the configuration of the NMEA 0183 baud rate.
    NMEA 0183: 4.800 or 38.400 baud (RxD+/RxD- floating: 4800 baud)
    For further details on baud rate, see *NMEA 0183 Baud Rate* on page 20.

5) Check the configuration of the NMEA 2000 setting.
    NMEA 2000: 'Open' or 'Terminated' (factory default: 'Open')
    For further details on NMEA 2000 setting, see *NMEA 2000 'Open' or 'Terminated'* on page 20.

6) Using NMEA 2000 - check your navigational equipment for correct selection of the LT-300 GNSS Receiver as preferred source (GPS/GNSS). Check that the LT-300 GNSS Receiver is supporting the expected NMEA 2000 PGNs; see *App. E - NMEA 2000* on 37.

7) Using NMEA 0183 - check your navigation equipment for correct baud rate. Check that the LT-300 GNSS Receiver is supporting the expected NMEA 0183 Sentences; see *App. D - NMEA 0183* on page 35.

8) Connect the LT-Service Tool (see *Connecting LT-Service Tool* on page 24 and *Configuration using LT-Service Tool on page* 26). Check and record the following commands in the LT-Service Tool:
    a. Write "status" and check for errors and warnings
    b. Write "nav" and verify navigation data is as expected
    c. Write "mon" to monitor NMEA 0183 output

9) If any configuration has been applied in the LT-Service Tool, make sure that you have used the "reboot" command and check that the new configuration is properly configured after the LT-300 GNSS Receiver has power up again.

If none of these troubleshooting steps have re-solved the problem, please contact your local distributor or dealer for further action and support.

NOTE: It is recommended, that the end-user makes contact to the local distributor or dealer for technical support on the product, as they have information and experience with the product.

App. A - Outline Drawings

LT-300 GNSS Receiver with Pole Mount

LT-300 Roof Mount
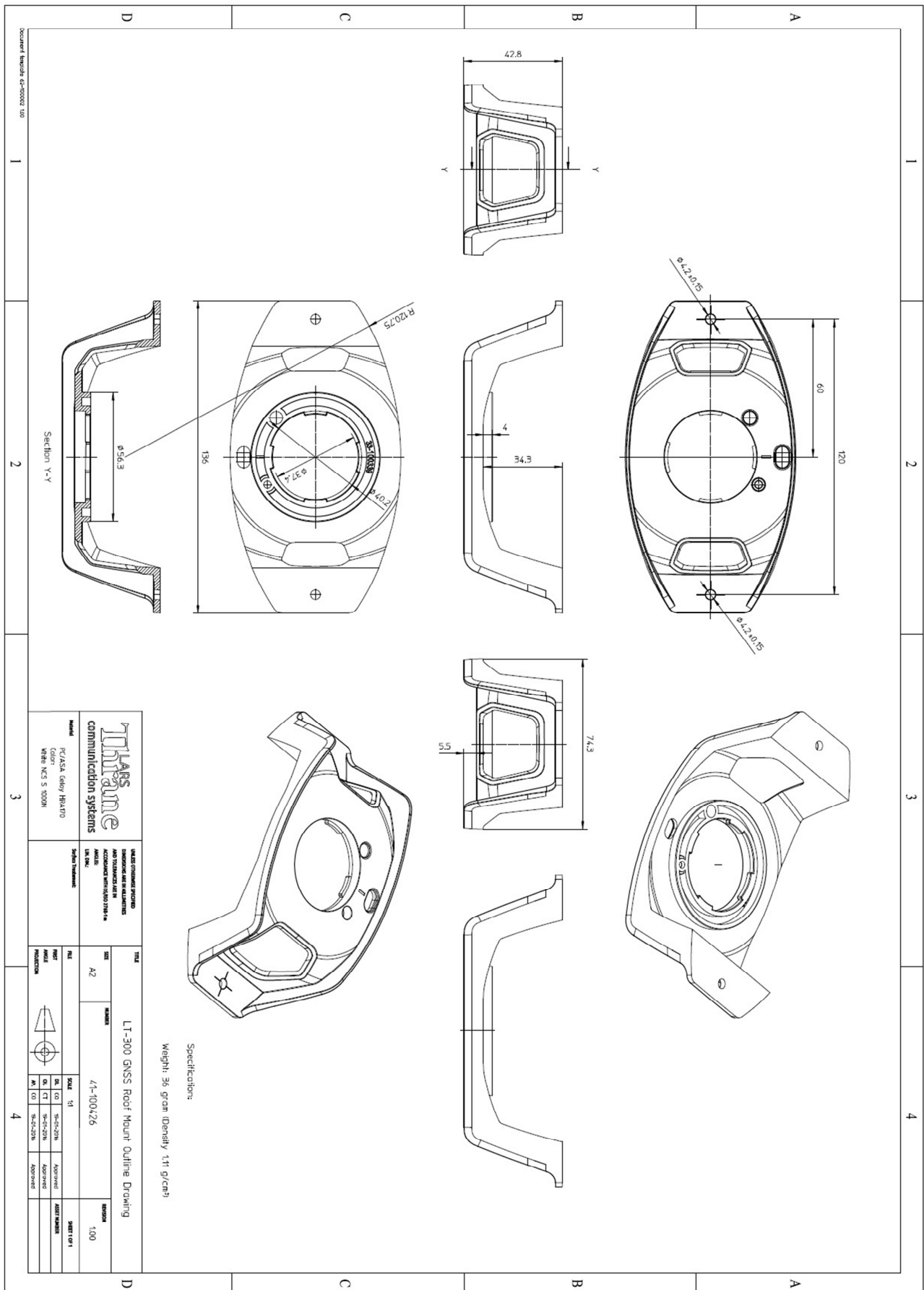
App. B - Performance

LT-300 GNSS Receiver[1]			
Data	**Accuracy**	**Resolution**	**Range/Comments**
Position[2]	GNSS: < 2.5 m SBAS: < 2 m	0.1 m	CEP, 50%, 24 hours static, -130 dBm, > 6 SVs By default the GNSS receiver is configured for GPS/GLONASS & SBAS reception Time-To-First-Fix (cold acquisition): 26 s. Time-To-First-Fix (hot acquisition): 1 s.
Speed	0.1 knot	0.1 knot	0 to 195 knots

1: The LT-300 GNSS Receiver performance may be subject to degradation caused by an improper installation.

2: The LT-300 GNSS Receiver has an immunity filter against Iridium and Inmarsat transceivers.

App. C – Specifications

LT-300 GNSS Receiver Specifications	
Certification and standards[1]	CE, IEC 60945, IEC 60950-1/-22, EN 300 440, EN 301 389, FCC, IC, RoHS NMEA 0183, NMEA 2000
Equipment class	Protected, according to IEC 60945
Weight, with pole mount	153 g (0.34 lbs)
Weight, with roof mount	148 g (0.33 lbs)
Dimensions, with pole mount	Ø 81.6 x 128.0 mm (Ø 3.21 x 5.04 in)
Dimensions, with roof mount	136.0 x 81.6 x 45.2 mm (5.35 x 3.21 x 1.78 in)
Temperature, operational (ambient)	-40°C to +55°C (-40°F to +131°F)
Temperature, storage (ambient)	-40°C to +85°C (-40°F to +185°F)
Vibration, operational	IEC 60945 (sine) & Proprietary Maritime Random profile (240 h)
Vibration, survival	Properitary Maritime Random profile (100 h)
Vibration, shock	Proprietary Maritime profile (100 g pk, 11 ms)
Waterproof rating	IP67
Humidity	95% non-condensing @ 40°C
Wind, operational	80 knots (93 MPH)
Wind, survival	110 knots (127 MPH)
Ice, survival	25 mm (1 in)
Solar radiation	1120 W/m2
Communication interface	8-pin female connector for NMEA 0183, NMEA 2000 and power
Input voltage	9-40 VDC
Power consumption	< 1 W (@ 12 VDC)
Load Equivalent Number (LEN)	2
Compass safe distance standard	0.3 m (1 ft)
Compass safe distance steering	0.3 m (1 ft)
Mounting, pole mount	25.4 mm (1 in)
Warranty	2 year
Maintenence	None

1: RoHS and NMEA 2000 is pending for final registration and certification.

App. D - NMEA 0183 Sentences

The LT-300 GNSS Receiver is compliant with version 4.00 of the NMEA 0183 standard. The following table lists the supported sentences.

NMEA 0183 Sentences		
Sentence	**Description**	**Rate**
4800 baud		
GNDTM	Datum Reference	1 Hz
GNGGA	GPS Fix Data	1 Hz
GNGLL	Position Latitude/Longitude WGS84	1 Hz
GNGSA	GNSS DOP and Active Satellite	1 Hz
GNRMC	Mini Specific GNSS Data	1 Hz
GNVTG	Course Over Ground and Ground Speed	1 Hz
GNZDA	Time and Date	1 Hz
38400 baud		
GNDTM	Datum Reference	1 Hz
GNGGA	GPS Fix Data	1 Hz
GNGLL	Position Latitude/Longitude WGS84	1 Hz
GNGSA	GNSS DOP and Active Satellite	1 Hz
GNRMC	Mini Specific GNSS Data	1 Hz
GNVTG	Course Over Ground and Ground Speed	1 Hz
GNZDA	Time and Date	1 Hz
GPGSV[1]	GNSS Satellites in View	1 Hz

Note: For all GNSS sentences, talker ID "GN" can be configured to be "GP"
1: Talker ID (GP, GL, GB) depends on satellite system (GPS/SBAS, GLONASS, BeiDou)

GNSS Talker Identifier

The first two characters in the address field of an NMEA 0183 sentence is the Talker Identifier (e.g. "GN" in the address field "GNRMC"). The Talker Identifier may be used to determine the source of a sentence, when it can have multiple sources. In case of the GNSS related sentences (DTM, GGA, GLL, GSA, GSV, RMC, VTG, ZDA), the Talker Identifier can be used to determine from which specific GNSS system the data originates:

GNSS Talker Identifier	
Talker Identifier	**GNSS Type**
GB	BeiDou
GL	GLONASS
GN	Multiple GNSS'
GP	GPS, SBAS, or QZSS

TABLE 9: GNSS TALKER IDENTIFIER

GN Talker Identifier is a special case that indicates the sentence data originates from multiple GNSS systems. This is the case when the LT-300 is configured (see *GNSS satellite receiver configuration* on page 28) to use multiple GNSS systems: GPS + GLONASS or GPS + BeiDou.
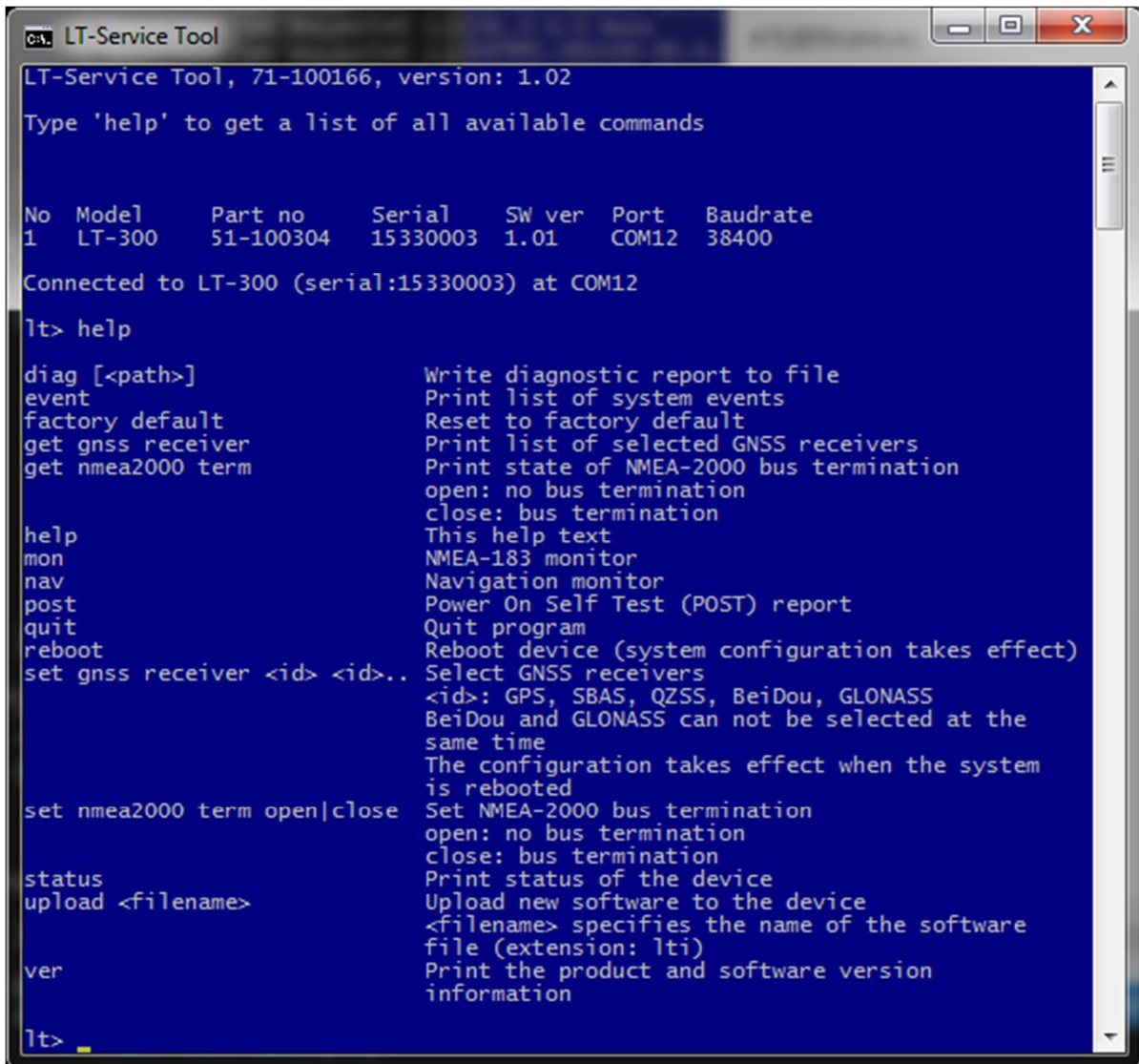
The GSV sentence will never be sent with Talker Identifier GN as it will ever only contain data from one GNSS system. If the LT-300 GNSS Receiver is configured to use multiple GNSS systems, the GSV sentence will be repeated for each GNSS system and the Talker Identifier of each GSV sentence will indicate the specific GNSS system to which it applies.

App. E - NMEA 2000 PGNs

The LT-300 GNSS Receiver is compliant with version 2.000 of the NMEA 2000 standard and version 2.000 of the NMEA Network Database. The following table lists the supported PGNs.

NMEA 2000 PGNs		
PGN	**Description**	**Rate**
Periodic PGNs		
126992	System Time	1 Hz
126993	Heartbeat	< 0.1 Hz
127258	Magnetic Variation	1 Hz
129025	Position, Rapid Update	10 Hz
129026	COG & SOG, Rapid Update	4 Hz
129029	GNSS Position Data	1 Hz
129044	Datum	0.1 Hz
129539	GNSS DOPs	1 Hz
129540	GNSS Sats in View	1 Hz
Requestable PGNs		
126464	PGN List (Transmit and Receive)	-
126996	Product Information	-
126998	Configuration Information	-
129538	GNSS Control Status	-
Oher PGNs		
059392	ISO Acknowledgement	-
059904	ISO Request	-
060928	ISO Address Claim	-
065240	ISO Commanded Address	-
126208	NMEA Request/Command/Acknowledge	-

App. F – LT-Service Tool (commands)

```
LT-Service Tool

LT-Service Tool, 71-100166, version: 1.02

Type 'help' to get a list of all available commands


No  Model     Part no     Serial     SW ver  Port    Baudrate
1   LT-300    51-100304   15330003   1.01    COM12   38400

Connected to LT-300 (serial:15330003) at COM12

lt> help

diag [<path>]               Write diagnostic report to file
event                       Print list of system events
factory default            Reset to factory default
get gnss receiver           Print list of selected GNSS receivers
get nmea2000 term          Print state of NMEA-2000 bus termination
                            open: no bus termination
                            close: bus termination
help                        This help text
mon                         NMEA-183 monitor
nav                         Navigation monitor
post                        Power On Self Test (POST) report
quit                        Quit program
reboot                      Reboot device (system configuration takes effect)
set gnss receiver <id> <id>..  Select GNSS receivers
                            <id>: GPS, SBAS, QZSS, BeiDou, GLONASS
                            BeiDou and GLONASS can not be selected at the
                            same time
                            The configuration takes effect when the system
                            is rebooted
set nmea2000 term open|close  Set NMEA-2000 bus termination
                            open: no bus termination
                            close: bus termination
status                      Print status of the device
upload <filename>           Upload new software to the device
                            <filename> specifies the name of the software
                            file (extension: lti)
ver                         Print the product and software version
                            information

lt>
```

App. G - Declaration of Conformity

68-100429 Rev. 1.00

LARS
Thrane
communication systems

Declaration of Conformity

This declaration of conformity is issued under the sole responsibility of the manufacturer

Manufacturer:	Lars Thrane A/S
Address:	Stubbeled 2, 2950 Vedbæk, Denmark
Product Identification:	LT-300 GNSS Receiver PN = 51-100304

Product Description

The LT-300 GNSS Receiver is capable of providing accurate positions down to 2 meters. The LT-300 GNSS Receiver outputs navigation data (up to 10 Hz): UTC time and date, position, course over ground, speed over ground, GNSS satellite information and magnetic variation.

The 72-channel GNSS receiver supports multiple satellite systems: GPS, GPS & GLONASS or GPS & BeiDou including Satellite-Based Augmentation System SBAS: EGNOS, WAAS and MSAS.

The LT-300 GNSS Receiver is designed and built for the extremely demanding and rough environment at sea and with an operational temperature (ambient) range from -40^{0}C and +55^{0}C (-40^{0}F and +131^{0}F).

Declaration

We as manufacturer declare that the above listed product complies with the specification of the EC directive 1999/5/EC. The conformity has been assessed according to the procedure detailed in Annex IV of the R&TTE Directive. The following harmonized standards were applied:

RF Spectrum: EN 300 440-2, v1.4.1

EMC:	EN 301 489-1, v1.9.2 / EN 301 489-3, v1.6.1
Safety:	EN 60950-1:2006+AC:2011+A11:2009+A1:2010+A12:2011+A2:2013
	EN 60950-22:2005
	EN 60945:2002

Year of affixing the CE mark: 2016

Place and Date

Vedbæk, 18. Marts 2016

Peter Thrane, CEO
Lars Thrane A/S

$C\epsilon$

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