NORBIT

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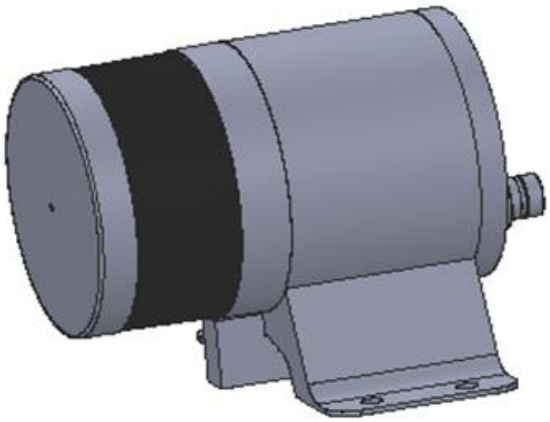
User and Technical Manual



TN-160012-24012-7.0.4_WBMS-iLIDAR-Manual

10.3.6 Release

30 November 2018
Norbit Subsea AS
10.3.6 Release

This manual is valid up to and including the following iLIDAR part number and revision

iLIDAR	24012-3

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Contents

Disclaimer

While every effort is made to ensure the information given is accurate, NORBIT does not accept liability for any errors or omissions. All non-metric weights and measures are approximate. Specifications, equipment and other information in this document are subject to change without notice.

1. Introduction

1.1. Terms & Abbreviations

AMPS	Amperes
Aux	Auxiliary
GPS	US Global Positioning Satellites (often describes all GNSS)
GUI	Graphical User Interface
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
LED	Light Emitting Diode
LIDAR	Light detection and ranging
POS	Positioning & Orientation System
PPS	Pulse Per Second
RPM	Revolutions per Minutes
RTK	Real Time Kinematic
Scan	Equivalent to a multibeam ping
SIU	Sonar Interface Unit
SONAR	Sound Navigation And Ranging
VDC	Volts – Direct Current
WBMS	Wideband Multibeam System

1.2. Technical Overview

The NORBIT iLIDAR laser represents the very latest in dynamic geospatial data collection technology. The system comes fully calibrated and ready to operate, delivering up to 320,000 data points per second the system has been designed to be simple to mobilize and easy to operate without the extra hassles of a standalone LIDAR system. Being able to rapidly acquire accurate geospatial data in real time without the need for post processing, not only offers a number of cost and efficiency benefits to existing operations, it also helps create new business and market opportunities. NORBITs iLIDAR laser is an all-new multi-sensing concept that combines multiple tightly integrated sensors into one hardware platform with a single LAN connection to survey laptop.

1.3. How to Use this Manual

This manual describes the complete installation and operation of the NORBIT iLIDAR with Norbit's family of tightly integrated sonar systems.

The reader is strongly encouraged to thoroughly read this manual. Doing so will encourage safe and efficient operation in the collection of high quality data.

NORBIT makes every effort to ensure that the information contained in this manual is accurate and fully updated to correspond with the latest firmware and software releases.

This Lidar is intended to operate in conjunction with the integrated family of iWBMS systems. As such some topics will be minimally discussed as more detailed information is available in the WBMS manual.

This manual is optimized for digital viewing using PDF software. The table of contents section will link directly to each section listed. At the bottom of each page is a link to return to Table of Contents.

1.4. System Specifications

While continual improvements are being implemented, the below subsections detail the current system specifications. Therefore, specifications may change. To obtain the most current specification sheets please visit http://web.norbit.no/subsea/

Technical Specification – iLIDAR	
Infrared Laser Module	1-20Hz Time of flight measurements with dual returns
Wave Length Peak	905nm (typical)
Frame Rate	5-20Hz (10Hz default)
Output	Up to 300,000 points per second
Angular Accuracy	2° between every one of the 16 laser pairs
Angular Resolution	0.1-0.4°
Field of View	32°/360° (Mounting dependant)
Range	100m
Data i/o	Norbit Proprietary synchronized time stamp
Power	8W (Typical)
Voltage	10-29VDC of 110/220VAC (powered by SIU)
Accuracy	2cm
Dimensions (DIA x H x L)	103mm x 130mm x 150mm
Weight	2.4kg

1.5. Handling

Care must be taken to not to scratch the protective glass surrounding the laser. Always make sure that it is securely mounted utilizing all 4 mounting holes. Not doing to may cause data issues.

1.6. Caring For Your Investment

To protect your investment follow these reasonable minimum guidelines to ensure continuous system operation in harsh environments.

Replace connector caps on iLIDAR, SIU and cables when not in use to keep out debris and moisture. Choose a dry location at room temperature for prolonged storage. Never wet store system in a sealed environment. Dry the system before returning it to the case.

To clean the iLIDAR only use mild, nonabrasive soap, fresh water and a soft brush to gently scrub the unit. Using any other method may damage the LIDAR. Ensure that the cap is securely in place over the connector prior to cleaning.

Do Not Connect iLIDAR cable when the SIU in powered on.
When connecting the LIDAR always ensure that the SIU is powered OFF. Not following this protocol may result in damage to the LIDAR and a voiding of the warranty.

1.7. Delivery Contents – WBMS – What's in the Box?

A WBMS Kid with the iLIDAR option will in addition to the standard parts include the following items:

	Part	Part #	Description
Parts			
	iLIDAR	24012-2	iLIDAR with dust cap
Cables			
	iLIDAR Cable	33029	WBMS/LIDAR Interface Cable with DUST CAPS + O-ring
Documents & Software			
	Booklet Containing:		User manual

1.8. Support

For basic troubleshooting, please see the Troubleshooting section at Troubleshooting in this document. If further support is required then contact support.

Every Norbit system comes with customer-focused support for all time zones.

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2. Hardware Introduction, Installation and Offset Determination

The following section of the manual provides detailed information on the care, mounting and offset determination for the iLIDAR.

2.1. Pre/Post Survey Equipment Inspection and Maintenance

It is always advised that the system be thoroughly inspected following shipment and prior to commencing a survey. The following items should be examined and preventative maintenance performed on a regular basis. Failure to inspect and maintain the system regularly may result in loss of survey efficiency, compromised data quality and increased repair costs.

Component	Inspection	Additional Notes
Lidar Housing	Inspect housing for visible signs of damage. In addition inspect glass surrounding the laser head.	Significant damage to the LIDAR housing may compromise the weather resistance of the LIDAR. Significant scratched on the glass may affect data quality.
Lidar Cable Connector	Check for debris and clean out with compressed air. Cable connector must be dry and clean. Use protective cap when not in-use.	Connection is **not** wet-mateable. Do not disconnect or connect when unit is powered

2.2. Mounting and connecting the iLIDAR

The Lidar is secured to the vessel by 4 bolts. When mounting ensure that the Lidar is mounted in a location that is free from obstructions allowing for a clear view of the survey area. It should be secured such that it is not allowed to move. To get the best results mount the Lidar and the iWBMS on the same pole. This will allow any movement/vibration to be correctly applied to both the sonar data and the Lidar data.

The iLIDAR generates points 360° around the unit. If there are static obstructions within the field of view of the LIDAR points will be continually generated on that structure. This will require additional editing during processing. Therefore to help reduce processing time attempt to mount the laser with minimal obstructions.

The iLIDAR is designed to be used with all v3 SIUs and will be plugged into the AUX port on the front of the SIU. If there is any question about the comparability of the iLIDAR with your SIU contact Norbit Support.

3. Reference Points and Lever-Arm Offsets

For quality repeatable data, the offsets between the sonar, LIDAR and, attitude and positioning sensors on the survey platform must be fixed and well known. The 3-axis should be accurately aligned with the survey platform or any angular misalignment should be measured and input into the acquisition/processing software.

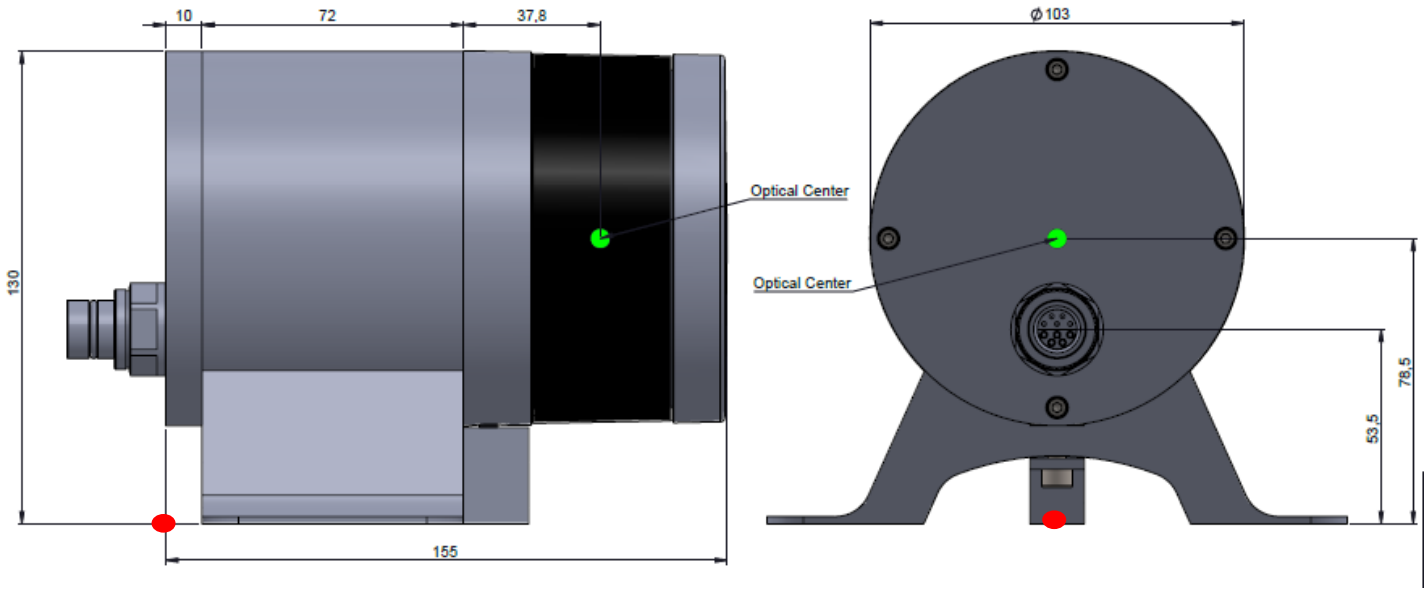
Each sensor will have a well-defined measurement location. This is the point at which the output data is referenced to. For example, a GNSS antenna measurement point is known as the phase centre.

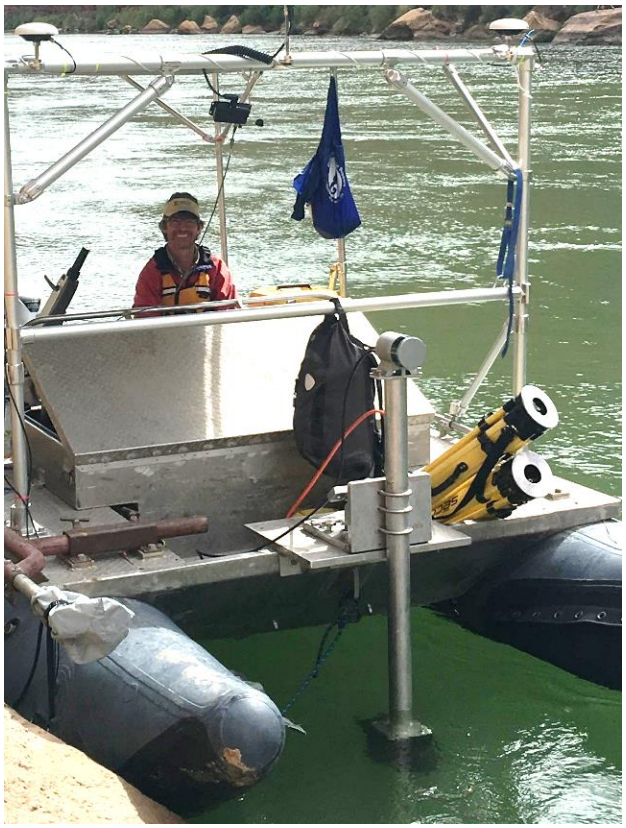
3.1. Lever-Arm Offset Reference Location – iLIDAR

For custom installations, the sensing center of the iLIDAR is the center of the cylindrical housing 0.078m (0.236ft) up from the base and 0.120m (0.393ft) forward from the rear (connecter side) of the unit. The offsets will be entered into the acquisition software and will either be from the sonar reference point or the vessel COR. This will be determined by user preference, for example if using the Sonar reference point as 0,0,0 than offsets to the LIDAR will be from the sonar reference point. If you are utilizing a COR than the LIDAR offsets will be from the COR. **If the LIDAR will be mounted with the connector pointing towards the stern than a 180 rotation will need to be entered in the Z/heading axis in Hypack. For use with QINSy a 90° pitch and a 180° yaw value will need to be entered to use the iLidar in the horizontal position with connector facing aft.**

Measurements from RED dot to GREEN dot.	
Forward	0.120m (0.393)
UP	0.078m (0.236 ft)

Acquisition software rotations (Connector pointed towards the vessel stern)			
	Roll	Pitch	Yaw
Hypack	0	0	180
QINSy	0	90	180





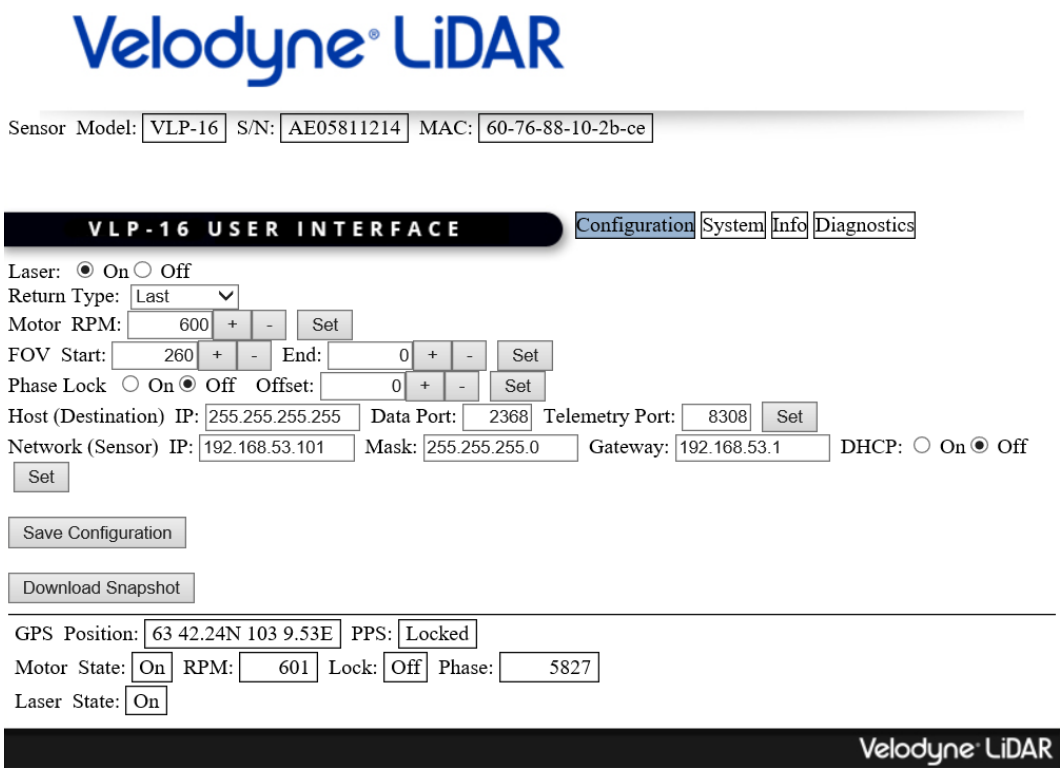
The image to the left shows a solid mounting arrangement for the lidar. Situated directly above the sonar with the connector pointing aft.

4. Software Installation

The iLIDAR requires no additional software for operation. All features of the LIDAR are controlled via a web interface. Assuming that the network setup instructions have been followed using the WBMS manual. Users connect to the LIDAR by typing in an IP address of 192.168.53.101 into a web browser. This will bring up the Velodyne LiDAR interface.

4.1. Velodyne Web Interface.

When the IP address 192.168.53.101 is entered into a web browser the following Velodyne interface will appear. This interface will control operation of the iLIDAR. Users can select return type, scanning speed and scanning angles. The scanning speed of the LIDAR will directly relate to the data rate. At a rotational speed of 600 RPM full 360° scans will be output at a rate of 10Hz. The web interface will also indicate if the LIDAR has timing. PPS status will show “LOCKED” is the PPS is properly received. If the PPS status shows “ABSENT” check cable connections and SIU.



When using the iLidar and the iWBMSc, with NovAtel, the IP settings will have to be changed in the Velodyne web interface so data is only broadcast to the acquisition PC. To do this follow the steps below.

1. Click on the configurations tab
2. Change the Host (Destination) IP to match the IP address of the acquisition PC
3. Save the configuration and power cycle the iLidar

4.2. Return Type

The LIDAR is capable of 3 return types. The following table below described the modes as well as the data rates that can be expected if scanning the full 360°

Mode	Description	Data Rate (MB/s)
Strongest	Returns the distance to the strongest intensity return	~1
Last	Returns the last return regardless of intensity.	~1
Dual	Returns both the strongest AND the last return. This mode is best utilized when attempting to capture ground elevations through vegetation. As the strongest return will be on the vegetation and the last may be the ground.	~2

Timing

PPS & NMEA ZDA hardware input are not required when using the iLIDAR. All timing is handled inside of the iSIU and no additional cables are required. Users must ensure that the integrated system is outputting ZDA and PPS.

Hypack Software Configuration for iLIDAR

General instructions are provided here for integrating NORBIT iLIDAR to Hypack software. The following sections show only one of many possible methods for configuring the system. As with many sensor suite setups, this is certainly not the only method. The examples assume that the LIDAR was installed with the recommended INS reference location moved to the sonar reference location.

Lever-Arm Offsets

Offsets for the iLIDAR are entered into Hypack hardware. The lever are measurements entered will depend on the method chosen for referencing the integrated sonar. If no COR is used than the offsets for the LIDAR will be measured from the sonar reference point (described in the WBMS manual) if a COR is utilized than the offsets will be from that point.

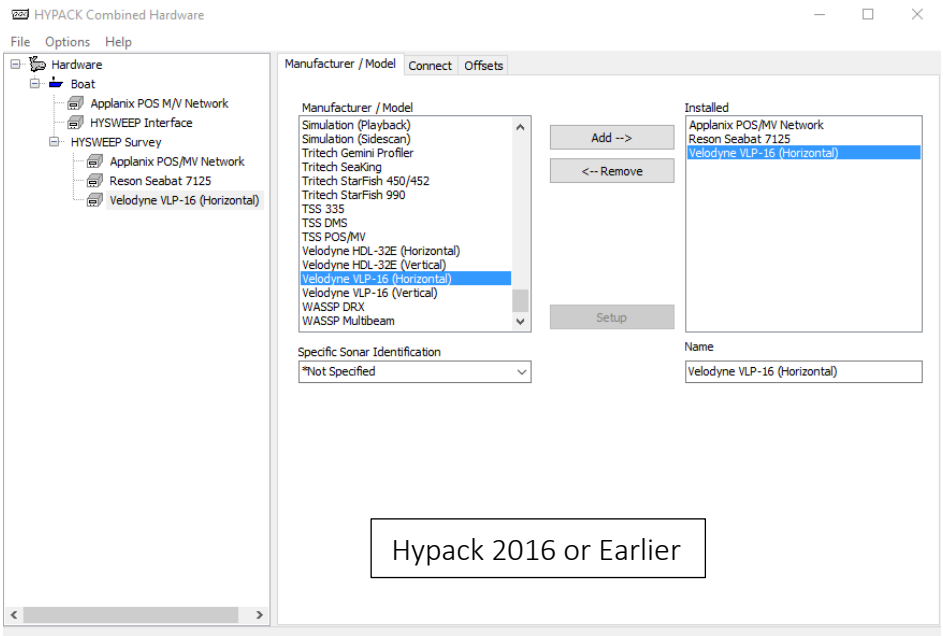
Please note that the offsets shown will be different for every vessel. For this example Hypack2015 is used. **Remember that for Hypack the sign convention is +forward, +starboard, +down** (even when "Elevation Mode" is selected in Geodetic Parameters.)

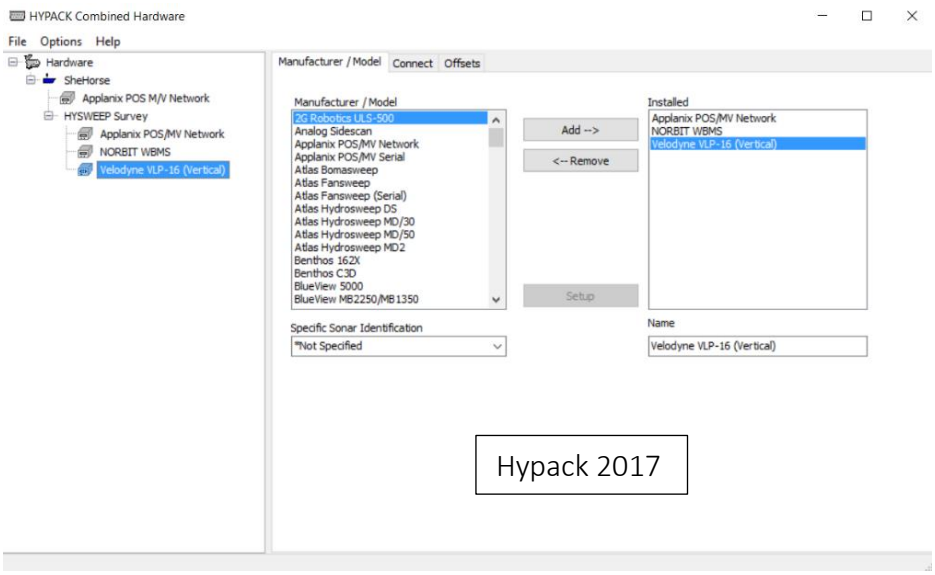
This section will only outline Hypack setup for the iLIDAR only. For setup of the other components of the integrated systems please refer to the WBMS manual.

Hysweep Survey Setup

Hysweep Survey will handle high volume data while communicating with Hypack Survey to send/receive specific data (navigation information). The logged survey lines are HSX files which contain all data required to process data.

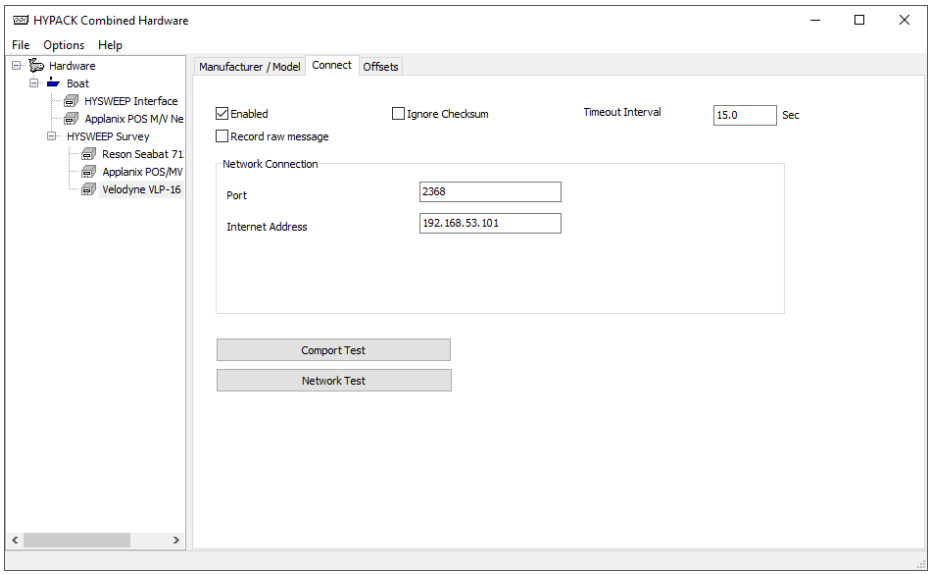
The Norbit iLIDAR utilizes the Velodyne VPL-16 (vertical) driver in Hypack versions 2016 and earlier. For Hypack 2017 the **vertical** driver will be used. In Hysweep select the driver and move it to the installed hardware.



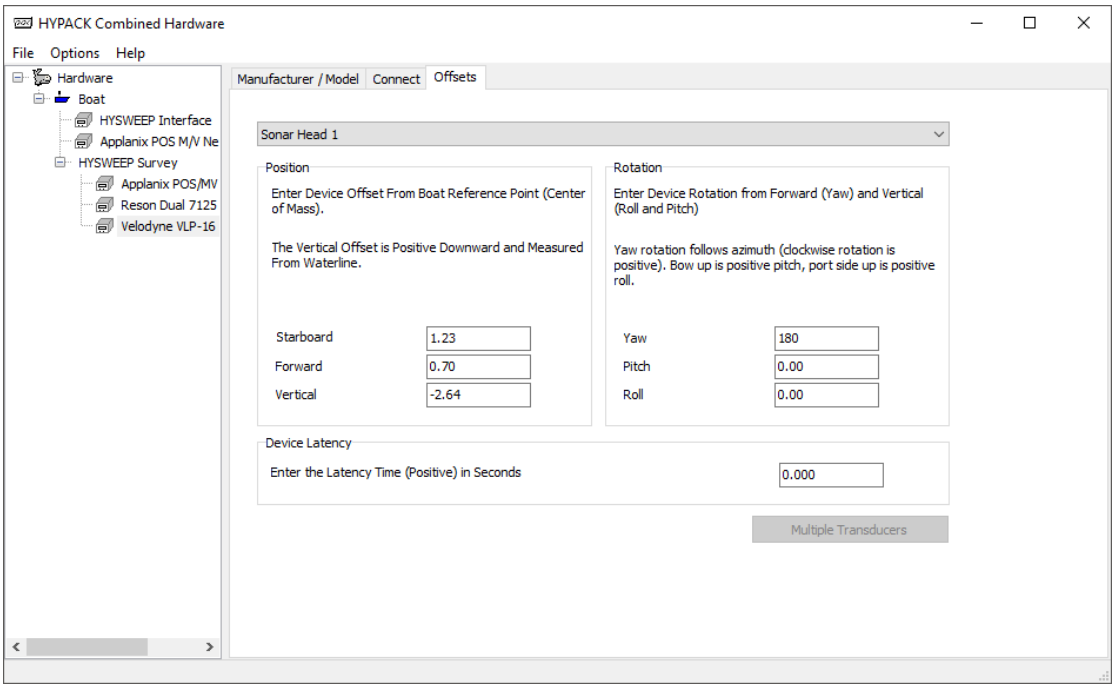


Hypack 2017

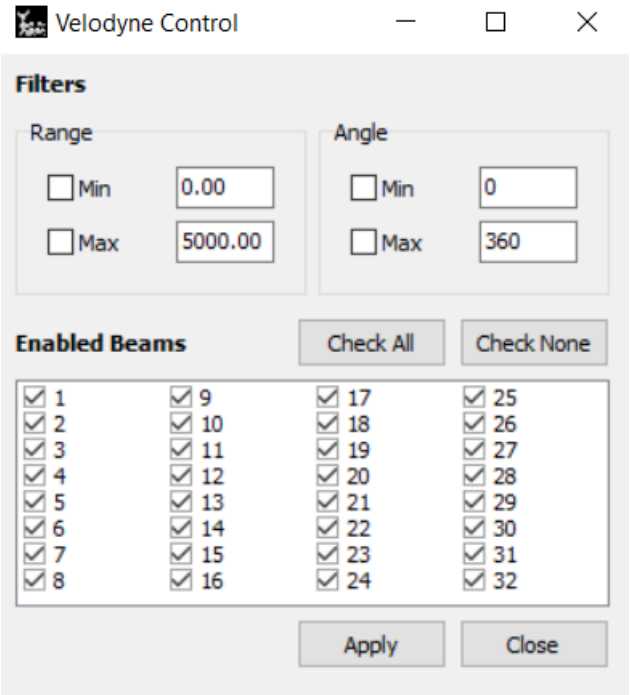
Click on the Connect tab and ensure that the settings are a show below.



Click on the offsets tab and enter in the appropriate offsets. Keep in mind that in nearly all cases the LIDAR will be mounted ABOVE the reference point. Using Hypack sign convention the vertical offset will be negative. Once patch test values have been determined for the LIDAR they will be entered here.



In Hypack 2017 there are additional settings that are available to users to control the Lidar when in Hypack Survey. These settings allow for the settings of a min and max distance, viewing angle as well as beams used. (NOTE: While 32 beams are selected in the control the iLidar only had 16)



QINSy Software Configuration for iLIDAR

General instructions are provided here for integrating NORBIT iLIDAR to QINSy software. The following sections show only one of many possible methods for configuring the system. As with many sensor suite setups, this is certainly not the only method. The examples assume that the LIDAR was installed with the recommended INS reference location moved to the sonar reference location. It should be known that the default rotation (0,0,0) of the lidar in QINSY is as follows. The cable connector pointing down and the lidar base plate to the aft of the vessel.

Lever-Arm Offsets

Offsets for the iLIDAR are entered into QINSy database setup. The lever are measurements entered will depend on the method chosen for referencing the integrated sonar. If no COR is used than the offsets for the LIDAR will be measured from the sonar reference point (described in the WBMS manual) if a COR is utilized than the offsets will be from that point.

Please note that the offsets shown will be different for every vessel. For this example QINSy 8.1 is used. **Remember that for QINSy the sign convention is +forward, +starboard, +up**

This section will only outline QINSy setup for the iLIDAR only. For setup of the other components of the integrated systems please refer to the WBMS manual.

Database Creation

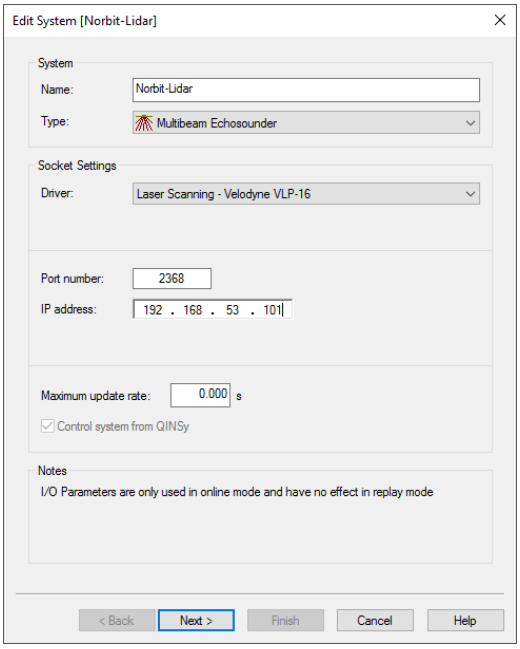
QINSy hardware setup operates in a database format. Equipment and offsets are entered into the database template. The setup is comprised of an object (which is your survey vessel) to which all systems are attached to. The offsets from the object to the system (vessel) COR are entered as a node.

When defining a system the following is required: system name, type, interface parameters, port parameters and update parameters.

ILIDAR Systems setup

When setting up the iLIDAR the system is initially treated as a multibeam system, therefore the driver needed for the iLIDAR will be found under the category multibeam echosounders.

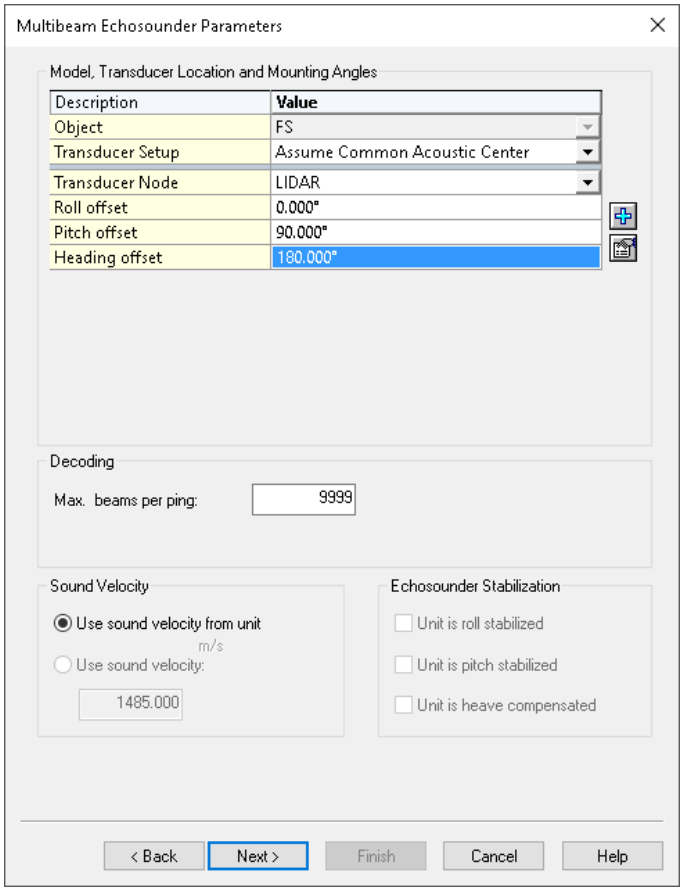
The system will require a name and a type. The name can be user defined and the system type will be **Multibeam Echosounder.** Under socket settings select the **Laser Scanning – Velodyne VLP-16** driver. The port number is **2368 and the IP address is 192.168.53.101**

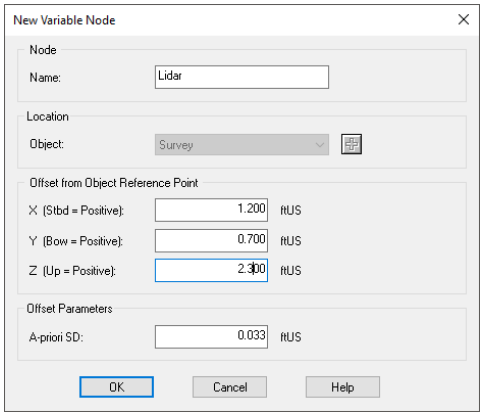


In Multibeam Echosounder Parameters create a new NODE and give the XYZ offsets from the reference point to the LIDAR node. If the LIDAR is not mounted with the connector facing aft than any rotational offsets will be entered here and will be refined with a calibration procedure.

Leave the Max beams per ping at 9999.

The transducer and mounting angles screen is where offsets will be entered. If no COR offsets are used than the LIDAR will be connected to the same node as the sonar and POS. If a COR offset is utilized than connect the LIDAR to the COR node. A +90° pitch and a +180° yaw rotations will need to be entered to use the iLidar in the horizontal position with connector facing aft.

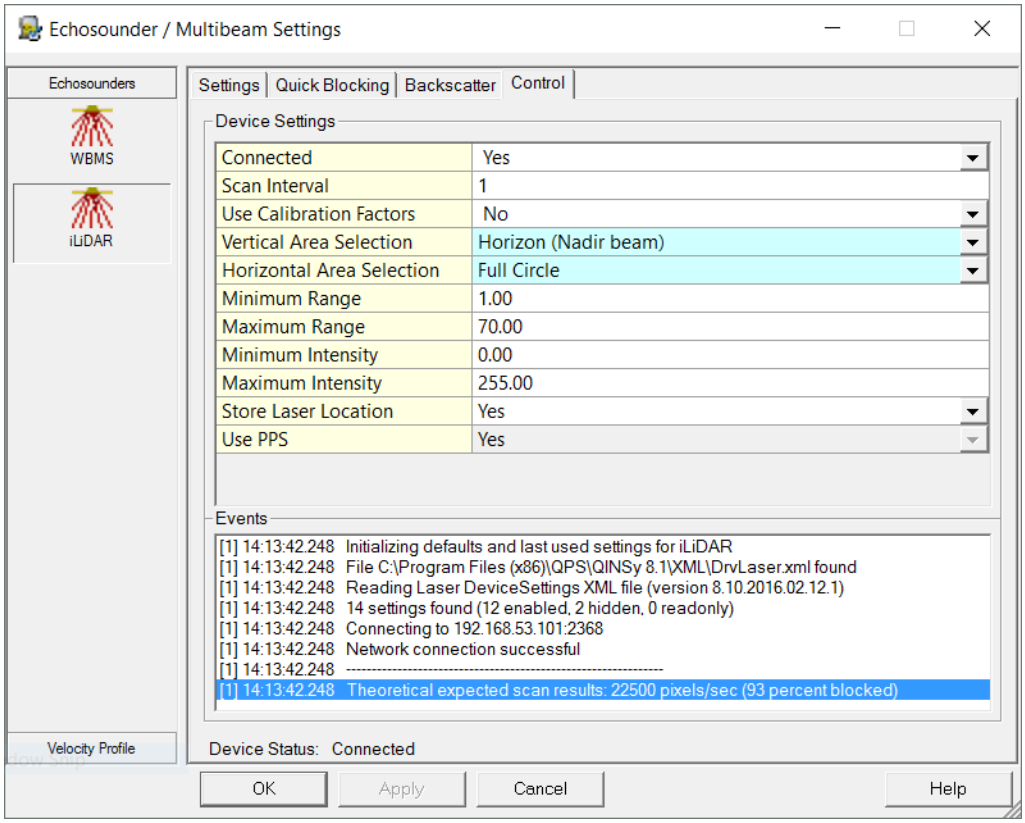




The remaining options can remain set to default. Once everything is entered

QINSy Online

Users of QINSy can utilize some control options that are available directly within QINSy Online. To access these settings click on Echosounder/Multibeam settings and click on the LIDAR icon and select the control tab. Note that when making some settings changes, a restart of Online may be required.



The table below describes the settings available within the controller.

Connected	In order to communicate with the scanner, the driver must make a network connection first. This attempt to connect will always be done automatically when going online. **No** This means that there is no UDP network connection between the driver and the laser unit, and therefore no laser firing data will be received. **Yes** Check this every time you go online with the Controller, in order to communicate with the scanner. If no connection could be made, a notification message will be displayed in the Events list. Under normal circumstances a connection will be established within a second. **[Set to Not Connected at startup]** Select this option (only once, and hit the Apply button) if you want to disable the 'Auto Connect' option. This means that every time you go online with the Controller, you must make a connection yourself by selecting 'Yes' from this list. **[Set to Auto Connect at startup]** Select this option (only once, and hit the Apply button) and the next time that you go online with the Controller, the driver will try to connect to the laser unit immediately. Further notice that the driver will automatically disconnect when going offline, so

	there is no need to do that manually, although you may do so.
Scan Interval	Set to 1 to accept all scans. In this case the horizontal angle between two consecutive scans will be 0.16° To use every n-th scan only, set the interval greater than 1. *Notice that excluded data due to this setting will not be recorded!*
Use Calibration Factors	Per Velodyne, there is no need for a calibration file. Users should ALWAYS select NO. If yes is selected the unit will not work.
Vertical Area Selection	Physical scan area comprises 16 lasers and yields vertical 30 degrees (in case the scanner is mounted normally on a horizontal surface) For example, laser 1 is looking downwards with an angle of -15°, laser 9 (the nadir) is looking forward (0°) and laser 16 is looking upwards with an angle of +15° Selection here will most likely depend on how you are using the scanner, statically or dynamically: Static scanning is when you put the scanner on a non-moving platform. In that case you want to use all or a part of the 16 available lasers, while the unit is rotating a full circle. Dynamic scanning is when you use the scanner on a moving platform (vessel, car). Then it is recommended to use only one beam, e.g. the nadir one. Most likely you have then physically mounted the scanner with a roll or pitch angle of 90°. Notice not to forget to enter the correct C-O offset values in your template setup (see Multibeam Echosounder Parameters). Horizon (Nadir beam) Typical selection for *Dynamic scanning*: Only data from laser 9 (with vertical angle of 1°) will be used. Narrow Horizon (4 beams) Only data from laser 7, 8, 9 and 10 will be used. This covers a vertical area of 6°, looking in the forward direction. Wide Horizon (6 beams) Only data from laser 6, 7, 8, 9, 10 and 11 will be used. This covers a vertical area of 10°, looking in the forward direction. Above Horizon (8 beams) Typical selection for *Static scanning*: Only data from laser 9 - 16 will be used. Below Horizon (8 beams) Typical selection for *Static scanning*: Only data from laser 1 - 8 will be used. Entire Area (All beams) Typical selection for *Static scanning*: Data from all 16 lasers will be used.

	Blocked data due to this setting will not be recorded!
Horizontal Area Selection	A full circle scan goes from 0 to 360 degrees, with an angle step of 0.16°. 0 degrees means forward, 90 degrees means right (starboard side), 180 degrees looking backward, which is the cable direction, 270 means left (port side). NOTE: The below values are based on a 0,0,0 mounting angle. This is with the cable down and the mounting plate facing aft. The descriptions will need to be adjusted for the mounting configuration. Descriptions in BLUE are for the mounting angles (180,-90,0). It is unlikely that the forward and backwards sector options will be used. Full Circle Forward (-90 - +90 deg) will point up Narrow Forward (-45 - +45 deg) will point up Backward (+90 - +270 deg) will point down Narrow Backward (+135 - +225 deg) will point down Starboard (0 - 180 deg) will point port Port (180 - 360 deg) will point starboard *Notice that blocked data due to this setting will not be recorded!*
Minimum Range	Set the minimum required range in meters. Valid values: 1 to 100 meters. *Using this setting is recommended, but be careful: Blocked data due to this setting (i.e. all pixels less than this range) will not be recorded!*
Maximum Range	Set the maximum allowed range in meters. Valid values: 1 to 100 meters. *Using this setting is recommended, but be careful: Blocked data due to this setting (i.e. all pixels more than this range) will not be recorded!*
Minimum Intensity	Set the minimum required intensity (signal strength). Valid values: 0 to 255 . *Notice that blocked data due to this setting will not be recorded!* This option may not be available in your setup. In that case all signal strength values will be accepted.
Maximum Intensity	Set the maximum allowed intensity (signal strength). Valid values: 0 to 255. *Notice that blocked data due to this setting will not be recorded!* This option may not be available in your setup. In that case all signal strength values will be accepted.
Store Laser Location	If enabled, an additional pixel with zero range will be added to each line scan, in order to indicate the exact laser scanner location in the resulting point cloud. This extra pixel will always have beam number 0, and its intensity and quality values will be zero
Use PPS	This setting is highly recommended, in order to use exact time stamping of the laser data. When enabled, the laser unit must receive a valid PPS/Time Synchronization pulse from an external GNSS receiver and UTC time-tag message. See Timing for more information Notice that this option is disabled while connected, so change setting *Connected* first from *Yes* to *No* in order to change it.

Latency	There is no latency with the iLidar a 0 should be entered in this field
Capture Raw Data	Enable this option if you want to store the raw binary data stream coming straight from the unit to a log file on disk. This may be useful for debugging purposes, or to load the data into other software. This binary log file will be located in the current project's LogFile folder and the naming convention will be <System Name> - DD-MM-YYYY - <Sequence>.bin. The sequence number is incremented after every Start/Stop capturing action. Please note that this binary file is of no use for QINSy, and it may affect the online performance because of the extra hard disk activity. This option may not be available in your setup. In that case no raw data will be captured.

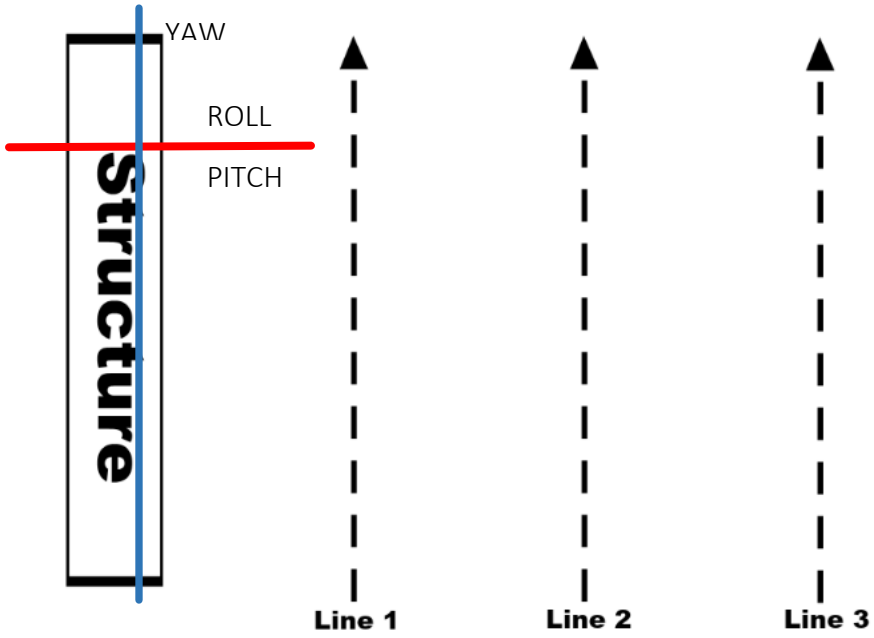
Survey System Calibration & Checks

Prior to starting a survey (or during the course of long duration surveys) it is sound practice to regularly check the performance and alignment of the LIDAR system. The following procedures are vital in maintaining quality control of measurements.

Patch Test/Boresite Calibration

The patch test, also called a boresight calibration, resolves small misalignments between the LIDAR and the navigational system. Failure to NOT resolve these misalignments will result in inaccurate measurements.

A LIDAR patch test from a floating vessel is considerably different from one conducted on land. When conducting a patch test from a floating vessel the easiest method for calibration is to find a structure on land such as a seawall, building wall, bridge pylons etc. It is important that this structure not move during the calibration. A series of lines will be run, parallel to the structure and on the same heading, at larger and larger distances away. It is best to have at least 3 lines, one close, one at medium distance and one at a farther distance. The spacing of these lines should be approximately the distance between the first line and the object. As you run lines farther away it is important to ensure that you are still able to hit the target with the LIDAR. It will also helpful if there is a noticeable feature along the building wall such as an overhang or similar.



The above image shows where to take profiles for processing the calibration. Pitch and roll can be taken from the same profile. It is best to first process the roll making and then process the pitch. To process the yaw take the profile along the structure. This calibration is a bit more involved than a multibeam patch test and may take more time to process, requiring a bit of back and forth processing.

Troubleshooting

Tools to use for troubleshooting

For some troubleshooting, having the right tools in your tool box will greatly speed up the ability to solve the issue. For the Norbit, methods for interrogating serial and network connections are two of the most useful software tools to have in the tool box.

The method for interrogating serial data will vary based on the Windows OS in use on the acquisition computer.

For Windows XP and earlier: the most convenient method is to use HyperTerminal. In HyperTerminal, simply select the Com port you want and the expected connection parameters and attempt to connect. For Windows 7 and beyond: HyperTerminal Is no longer included in the OS. It is recommended to use 3rd party software. Norbit recommends using PuTTY, a free 3rd party telnet and SSH implementation for Windows. See section 10.3 for instructions on using PuTTY

For network troubleshooting: the most common tool needed for the Norbit will be the “ping” command executed using a command prompt. This command will ping the IP address given and test if there is a connection. This is handy to verify that the Norbit is communicating with the PC and that the issue may be somewhere else down the line. Should further investigation be needed, Wireshark is a good networking troubleshooting tool and can be downloaded for free. For Hypack users Wireshark can be found C:\HYPACK 2014\Support\Utilities.

To use the ping command: open a Command Prompt window by typing "cmd" into the Windows search bar. Once the window is open, type in: "ping 192.168.53.101." For this example, you will be verifying the connection of the LIDAR to the computer.

For hardware issues it is always recommended to have a digital multimeter on hand. This device can be picked up at many locations and can be purchased at a low cost. You will want to make sure that it includes a continuity test function. Some units will have an audio indication for this test. Among the many reasons to have a multimeter, the two most often used for troubleshooting sonars are the "continuity test" and "voltage" indicators. The continuity test will help identifying a broken cable or connection and the voltage indicator will help identifying power related issues the unit may be experiencing.

Problems and Possible solutions

Following is a table that should facilitate troubleshooting of common problems:

Problem	Possible Solutions
Cannot connect to the LIDAR.	• Verify the SIU is connected to power and that the box is on. • Check that cables connections are free from corrosion and are properly secured • Check that the network card on the PC is configured to the correct subnet (i.e. 192.168.53.XXX where XXX is not 100, 101 (INS) nor the sonar serial number. • If using a network switch, bypass the switch and connect directly to the computer • Reboot PC, wait 30 seconds, then cycle power on SIU. • Ping the LIDAR to check connection.
IMU is connected but there is no LIDAR connected	• Check cable connections reseat if necessary • Possible IP address conflict. Check network settings • The GUI and BathyProxy should be allowed in windows firewall.
Data packets are being dropped.	• Heavy network traffic, reduce network traffic • Bad switch, hub or cable. Replace. • Loose cable, check cable tightness and try again. If fingers are weak from cold than use a tool but DO NOT OVERTIGHTEN
No data or limited data is observed in acquisition software.	• Check LIDAR scan sector. • Objects of interest may be beyond LIDAR range (typically 100m) Try moving closer.
There is data in Veloview but data is not coming into acquisition software	• Shut down Veloview and try reopening acquisition software
There is no data in Veloview and no data in acquisition software	• Check firewalls. • Ensure proper port number • Check for network conflict.

Cable Covers

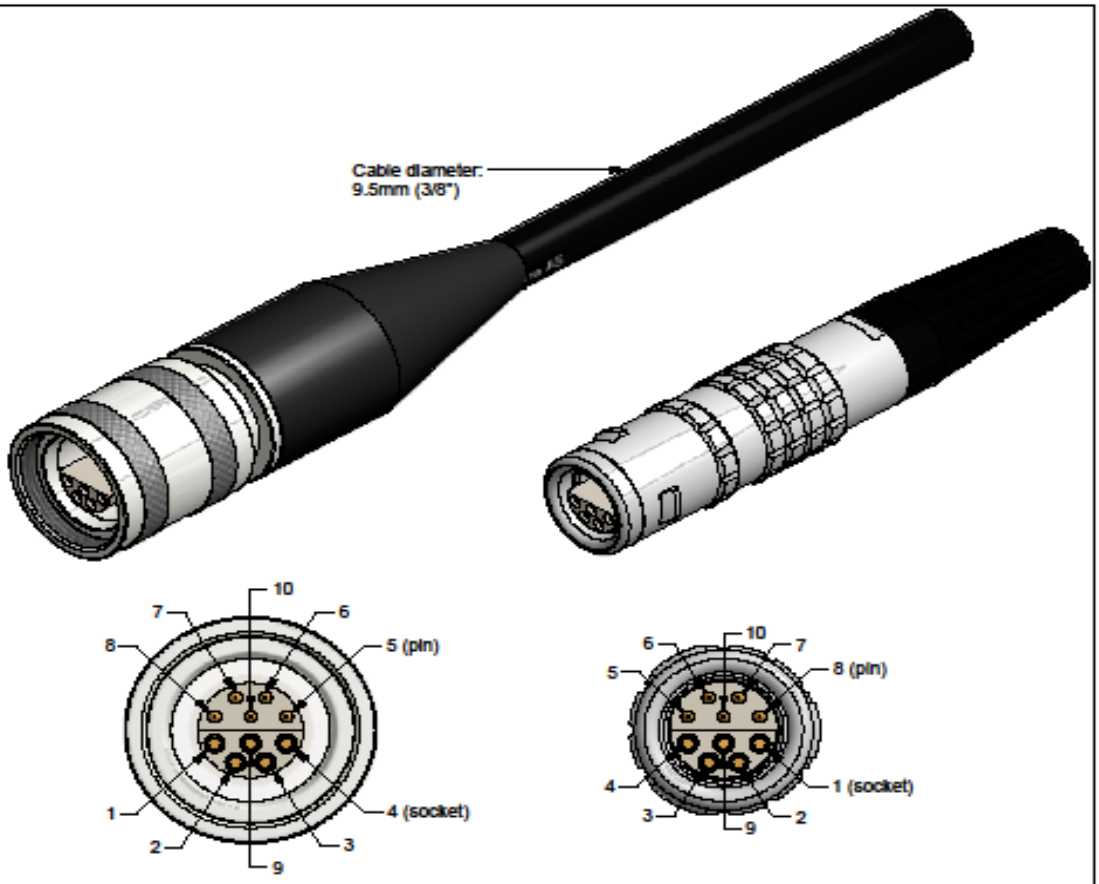
The sonar cables (and IMU cables for the integrated versions) include a protective cap affixed to the cable with an adjustable length cable. The length may be adjusted by grabbing one of the small collars and pulling on the cable.

Data Quality Improvements

Provided that the directions in this manual are followed, it should be possible to obtain high quality data. Often, however, some steps are skipped or not followed closely. This section provides a brief checklist as well as some options available to further increase data quality. Tips below are specific to the iLIDAR. Ensure that data quality tips outlined in the WBMS manual are also followed for optimal data quality.

Checklist to improve data quality:

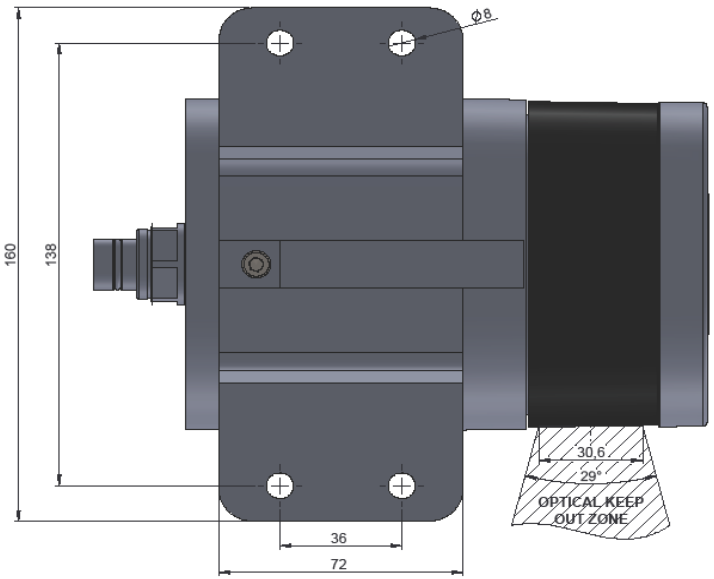
1. Make sure that there LIDAR has an unobstructed view in the desired direction. To keep from collecting data in a sector the LIDAR does not have an unobstructed view change the settings to only allow data collection in the unobstructed sector.
2. Make sure that all cables are tight and will not vibrate loose.
3. Ensure that there are no scratches or thick smudges, such as grease, on the LIDAR glass enclosure. If smudges are present remove with non-abrasive cloth and mild non-abrasive detergent.
4. Check that the LIDAR is securely bolted to the vessel and will not shift or move during the course of the survey. Ensure rotation values are entered correctly.
5. The collection of LIDAR and concurrent multibeam produces large volumes of data very rapidly. Prior to starting survey operations make sure that the storage space on the acquisition PC is sufficient.
6. Due to high data volumes you may need to reduce the number of windows that are open and displaying data in the acquisition software. While most acquisition software prioritises the data collection over data display it is not a guarantee that if the computer is having trouble displaying real-time data that the raw data will be unaffected.



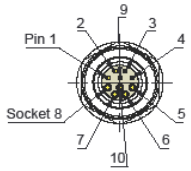
WBMS Interface Cable		
No. Subsea side	Description	No. Top side
1	Tx +	1
2	Tx -	2
3	Rx +	3
4	Rx -	4
5	Reserved 1	5
6	Reserved 2	6
7	Reserved 3	7
8	Reserved 4	8
9	PWR GND	9
10	PWR +24 VDC	10

Order information	
Part number/revision	Lenght in meter
33029-3	L8 (8m standard)

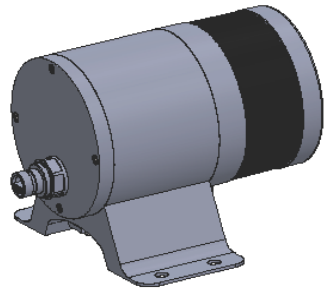
		NORBIT	Norbit Stiklestadveien 1 7041 Trondheim Norway www.norbit.no
	Drawn: hr 2014-05-22		
WBMS_Interface_Cable PUBLIC		This document is confidential and the property of Norbit and may not be reproduced in any form without the written consent of the owner. All copies shall be returned to Norbit on request.	
		Projection	Scale 1.5:1
	Material:	All dimensions in millimeter	Sheet size: A4
Part no: 33029-3-L8	Surfaces:	Tolerances:	Sheet 1 of 1



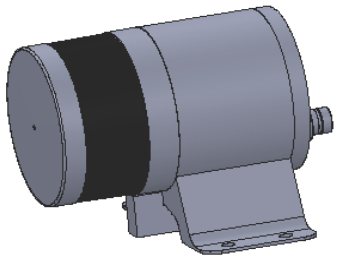
PIN OUT DIAGRAM

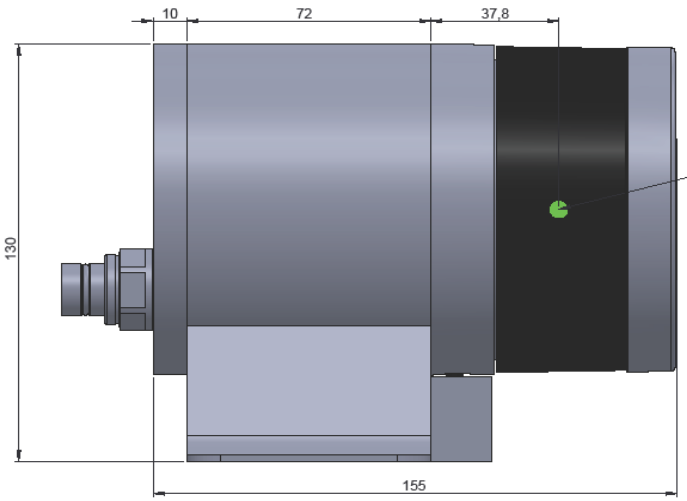


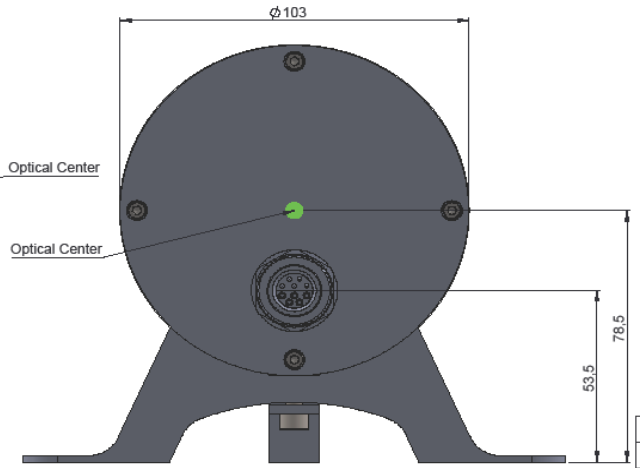
Pin	WBMS Function	Comment
1	LAN, TX+	Twisted pair
2	LAN, TX-	
3	LAN, RX+	Twisted pair
4	LAN, RX-	
5	N.A.	NC
6	N.A.	NC
7	IRIG-B	Timing
8	IRIG-B, GND	Timing GND
9	GND	Side 2 stripped 6mm (tinned)
10	24V DC	Side 2 stripped 6mm (tinned)



3D Views
1 : 2







REVISIONS								
PART REV	DRAW REV	DESCRIPTION	PREP BY	PREP DATE	CHECK BY	CHECK DATE	APPR BY	APPR DATE
1	1	Initial drawing	MS	2016-02-16	TV		ASk	

Material: -
Surface finish: -
General tolerance: -
Weight (g): -

NORBIT

WBMS_Lidar_Compact
Outline/Installation Drawing

Projection: | Scale: 1:1 | Format: A2 | Status.: Production | Drawing no.: 24012 | 1 of1 | Revision RID: 1 | 1