

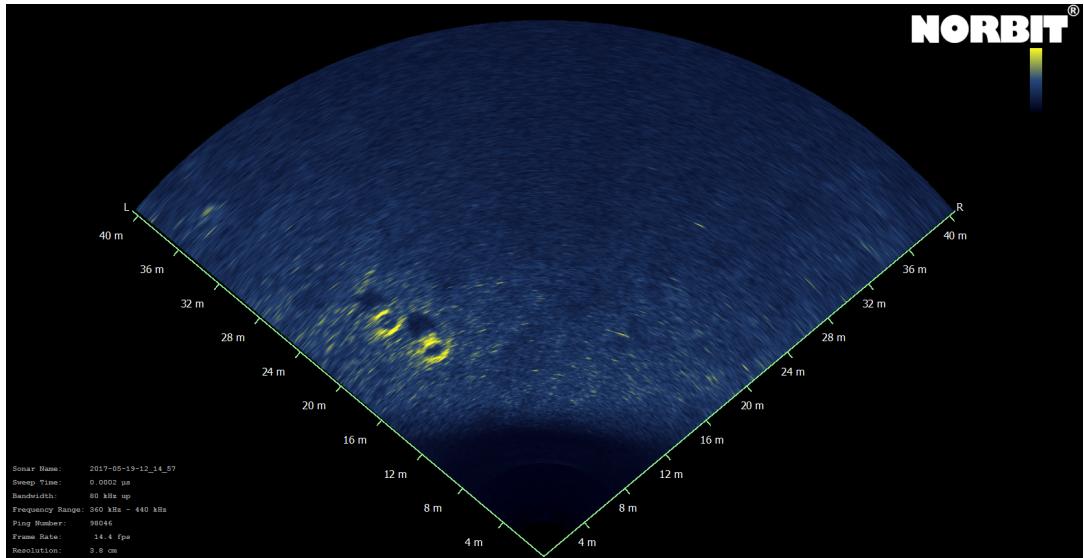
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TN-140083-4

10.3 RELEASE

## FLS Quick Start



NORBIT Subsea AS

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**Attention:**

We make every effort to provide the latest technical documentation. There may be updates. For this, please contact [subsea\\_support@norbit.com](mailto:subsea_support@norbit.com) for the latest information.

**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 measurements are approximate. Specifications, equipment, and other information in this document are subject to change without notice.

All performance metrics mentioned in this document, such as attainable depths, was derived from tests in Trondheim, Norway in May 2017. Acoustic conditions are described when describing performance capabilities.



## | INTRODUCTION

### | Terms & Abbreviations

AMPS	Amperes
Aux	Auxiliary
AUV	Autonomous Underwater Vessel
Bandwidth	Range of frequency sweep
CW	Constant wave (single frequency)
DGPS	Differential GPS enhanced satellite navigation
FLS	Forward looking sonar
FPS	Frames per second
FM	Frequency modulation (swept frequency)
GNSS	Global Navigation Satellite System
GPS	US Global Positioning System
GUI	Graphical User Interface
PPS	Pulse per second
ROV	Remotely operated vehicle
RTK	Real-time Kinematic satellite navigation
Rx	Receive
SIU	Sonar Interface Unit
SONAR	Sound Navigation and Ranging
TVG	Time Varied Gain
Tx	Transmit
VDC	Volts - Direct Current
WBMS	Wide Band Multibeam Sonar

### | Technical Overview

With a compact size and low power draw the stand-alone FLS is easy to mount and may be powered by a small battery (ex. laptop extension battery pack), a wall AC plug or easily integrated into onboard power in select situations (such as ROV or AUV).

The sonar is connected via a single sonar cable that provides power and Ethernet data link between the sonar wet-end and topside. For stand-alone integrations, this cable connects to a small Sonar Interface Unit (SIU). From the SIU, a single Ethernet cable to a laptop or PC is required to transmit control commands to the sonar and receive the sonar data. In certain applications, there may be no need for a SIU. These applications may include ROV AUV mounting or

permanent shipboard mounting. If further information on these applications, contact Norbit.

## | 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 sonar, 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. Rinse with fresh water and dry the system before returning it to the case.

### **CAUTION: Protect Sonar At All Times**

Prolonged durations (months) that the sonar is left submerged (especially in warm salty water) the greater chance it will be heavily fouled (barnacles, etc.) or be subjected to stray currents. NORBIT offers both titanium housing, additional anodes and factory applied bio-fouling paint that is approved and tested against acoustical losses. Contact [subsea\\_support@norbit.com](mailto:subsea_support@norbit.com) for more info.

Do not leave system in the sun for long durations. UV rays will quickly deteriorate the polyurethane coating the transducer. It will eventually dry and develop cracks which will expose sensitive components to the environment consequently damaging the sonar. Never allow wet-end to rest on the polyurethane transducer coating as this may scratch or wear this sensitive area. If working on the ground or deck always use a sturdy padding (foam) under the sonar.

### **CAUTION:**

Do not disconnect any cables while the system is powered on. To prevent damage to system electronics always turn off power before disconnecting or swapping cables.

## | System Specifications

The system has the below listed specifications. Since improvements are implemented regularly, the below subsection details the current system specifications and these may change and not be reflected in the below.

Angle Horizontal	120°, 150° (180° limited navigation performance)
Angle Vertical	> 25°
Angle Resolution	< 0.9°
Range Resolution	< 10mm (Acoustic)
Operating Frequency	400 kHz +/- 40kHz
Range	> 100m
Update range	50 Hz
Depth Rating	350m, 4500m optional
Power Consumption	< 30W
Voltage	10 - 28 VDC (20 - 28VDC when connected w/o SIU)
SIU Fuse (6Amp)	COOPER BUSSMAN BK/GMC-6-R (Farnell: 115-0657)
Data Interface	10/100 MB/s Ethernet, RS-485, Optional VDSL
Standard Cable Length	8m (optional 20m, optional sonar pigtail)
Operating temperature	-20°C to +60°C
FLS Weight - Dry	< 2.9kg
FLS Weight - Wet	< 1.3kg
FLS Dimensions	236 x 154 x 99 mm
SIU Weight	< 1.5kg
SIU Dimensions	200 x 145 x 50 mm

**TABLE 1** Technical specifications.

## | Support

For basic troubleshooting, please see the Troubleshooting section at page 30 in Appendix A in this document. If further support is required then contact support. Every Norbit system comes with customer-focused support for all time zones.

**Norbit Group AS**  
**Stiklestadveien 1**  
**7041 Trondheim**  
**Norway**  
**Phone: +47 73 98 25 69**  
**Email: [subsea\\_support@norbit.com](mailto:subsea_support@norbit.com)**

## | HARDWARE INTRODUCTION AND INSTALLATION

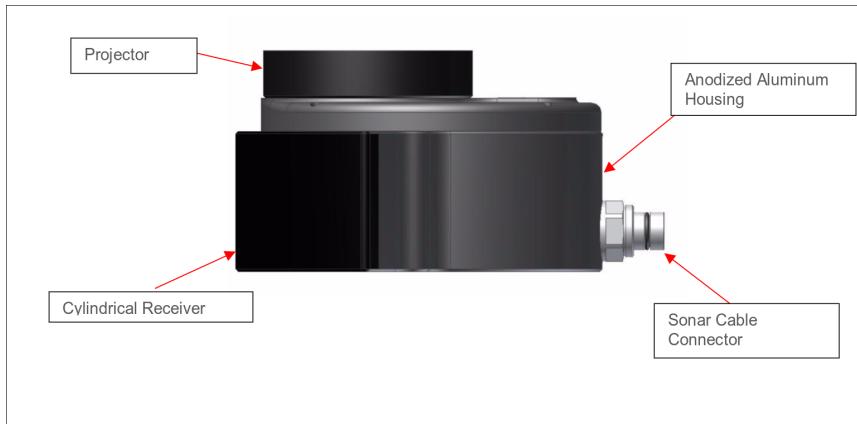
All first-time NORBIT FLS operators are strongly encouraged to fully review this manual prior to commencing a survey project. The orange warning boxes may not cover all critical notices.

### CAUTION: Properly Seal Wet Connection.

Inspect O-Ring each time before connecting wet-cable – replace as needed. Apply a thin coat of synthetic grease (e.g. Molykote 55) to the O-Rings. Strongly hand-tighten wet-connector (push in & tighten repeatedly until firmly connected). If connector sticks when tightening, apply a very thin coat of grease to the threads.

## | FLS Wet-end

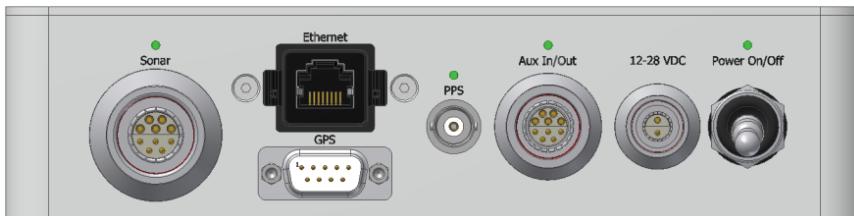
The FLS sonar is comprised of a cylindrical receiver array and a cylindrical transmitter array. The receiver housing contains latest FPGA boards where all sonar processing occurs. Data leaving the WBMS wet-end is ready for survey data acquisition via ETHERNET protocol. FLS wet-end components can be seen in Figure 1.



**FIGURE 1** FLS sonar head description.

## | FLS Dry-end (Topside)

Norbit FLS systems include a compact topside interconnection box which distributes power, and handles data between the sonar wet-end and the computer. The SIU is provided with the FLS. These systems are fan-less, dust-proof and splash resistant to IP67, facilitating worry-free use with little to no protection from the elements. In some applications, such as ROV or AUV, sonar may be mounted without need for a SIU. These integrations have separate documentation, please contact support for this.



**FIGURE 2** Sonar Interface Unit (SIU) connectors.

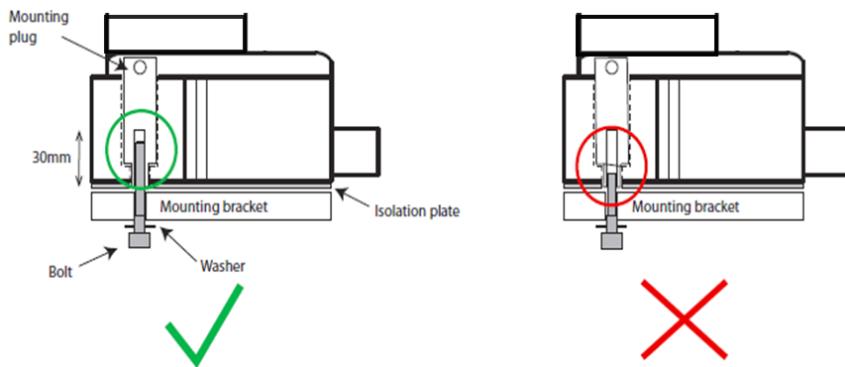
Connector	Description
Sonar LEMO	Interface cable to the sonar
GPS RS232	ZDA timing input
PPS BNC	1 PPS input for external sensor
Ethernet RJ45	For communication between topside PC and sonar. SAMTEC Part# RCE-01-G-05.00-D
AUX LEMO	Factory interface to sonar
Power LEMO	Input DC voltage

**TABLE 2** SIU topside connector explanation.

## | Mounting

The sonar is mounted with two bolts spaced 160 mm apart, typically onto a mounting bracket. An insulating plate is provided with the sonar. This is to be fit between the bracket and the sonar to avoid mechanical wear and galvanic corrosion (rubber feet may need to be removed from the sonar's base plate). Mounting plugs provided with the sonar are designed for M6 fastening bolts used as shown in illustration below or similar.

The bolts that secure the sonar to the mount should be 30-35mm longer than the thickness of the mounting bracket and made of high quality stainless steel to ensure of anti-corrosion especially in salt water environments. Use a lock washer, lock-nut and/or an thread adhesive to prevent loosening of sonar during long deployments. Contact Norbit support for further mounting inquires.



**FIGURE 3** Correct mounting of sonar head.

**CAUTION:** Electrically isolate the FLS from metal!

It is required to use a non-conductive isolation plate between FLS and mounting bracket. Not doing so may cause galvanic corrosion to the system.



## | SOFTWARE INSTALLATION AND NETWORKING

Software for Windows PC may be installed from the USB stick that is contained in the shipping case or from an e-mail received from NORBIT.

The WBMS Graphical User Interface (WBMS GUI) software is used for configuring the sonar for optimum performance, and controls features such as operating frequency, bandwidth, pulse length and gain.

The FLS systems are network based, which allows the user the choice of displaying the Graphical User Interface (GUI or UI) on several computers. In this configuration, only one computer may control the sonar while the other computers passively view.

### | WBMS GUI installation

Contact NORBIT for the latest software release. Prior to contacting, provide the serial numbers of the topside and the wet-end to ensure hardware/firmware compatibility.

Navigate to the provided USB stick or the email sent from Norbit, click on the executable file and follow the prompts. This will install the Graphical User Interface (GUI). Prior to installing, resident anti-viral software may need to be disabled. Temporarily disable this software to ensure that the WBMS GUI is successfully installed.

Installation will also copy latest sonar firmware files to the "Firmware" folder located at: C:\Program Files (x86)\Norbit AS\WBMS\Firmware. When the sonar is started and connected to the WBMS GUI the firmware stored in the sonar will be checked against the version stored in the PC folder. If these are different then the user is given a choice to install the firmware from the PC folder or to keep the sonar as is.

### | Network configuration

The FLS connects to the acquisition computer via a 100MBit Ethernet network cable from the SIU topside. To communicate with the SIU, the computer network adaptor must be configured to the same subnet as the SIU. The settings for changing to the correct subnet can be found in the TCP/IPv4 properties in windows.

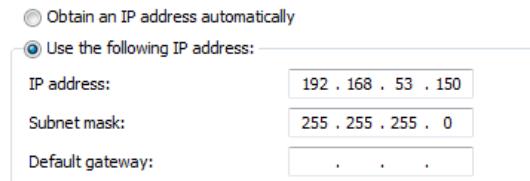
### | FLS Network address

The static IP address<sup>1</sup> of the sonar will be 192.168.53.XX where XX is the last two numbers of the FLS serial number. For example, if the sonar serial number is 35, then IP address of the sonar is 192.168.53.35. For sonar serial number 572, the IP address of the sonar is 192.168.53.72.

The sonar serial number is found on top of the sonar head next to the sonar cable connector

## | Acquisition computer network address

Any system may connect via Ethernet and monitor the FLS sonar. For the sonar, only one may work as a master and control the sonar while many may passively monitor. Typical IP address of a FLS survey computer: 192.168.53.150.



**FIGURE 4** Example of static IP on acquisition computer.

Any PC that connects to the FLS should have the same subnet mask of 255.255.255.0. The IP address for this machine must be 192.168.53.XXX, where the XXX may be any value from 100 to 249 (or from 0 to 249 as long as one makes sure that the PC address does not conflict with existing sonars or other PCs on the network).

## | FLS SETUP AND CONNECTION

The sonar includes a WBMS GUI software that may be used on any Windows PC connected to the FLS. Only one connected GUI is allowed to gain full control of the FLS sonar. This connection may make sonar operation parameter changes. Other GUIs may connect to the sonar in Viewer mode to monitor the sonar passively.

### | FLS power-up

The sonar requires a 20-40 second boot period once the power switch on the SIU is toggled. The boot process can be monitored on the green “Sonar” LED on the SIU. Different states of the sonar can be identified by SIU “Sonar” LED blink patterns in Table 3.

Indicator	Pattern	Description
Sonar LED	Off	Sonar Off
	Led Blinking (ISO) 1Hz	Sonar Booting
	Blinking 1Hz	Sonar Running
	Green steady	Sonar Overcurrent
	Blinking 5Hz	Failure
PPS LED	Orange blinking 1Hz	Sync OK
	Orange blinking 5Hz	No sync, NMEA missing
	Off	No sync, NMEA and PPS missing
	On	No sync, PPS missing
AUX LED	Always off	Not in use at this time
Power LED	Green	Input voltage ok
	Off	No input voltage

**TABLE 3** SIU LED indicator description.

## | Connecting to FLS

When opening WBMS GUI, the connection dialog shown in Figure 5. Wait until the GUI detects the correct sonar (it will detect any sonar connected to the network). Once this happens the LED in column 1 will turn green, and one can connect to the sonar by marking it and click "Connect".



**FIGURE 5** WBMS GUI Connection dialog.

## | DHCP connection

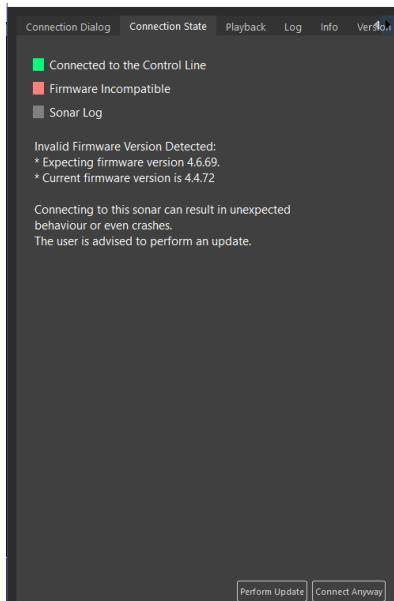
The network configuration procedure in Section 3.2 is valid when no DHCP servers are running on the same network as the sonar.

The sonar can also be used in a network where DHCP addressing is mandatory. During boot up, the sonar will allow itself to be automatically assigned an IP address by the network's DHCP server. When running WBMS GUI on a PC within the same subnet, press "Connect" to detect sonar(s) on the subnet. In the GUI, each sonar is identified by its serial number.

## | Firmware check

Once 'Connect' is selected, the WBMS Viewer software will compare the firmware version currently installed in the FLS sonar against the firmware version hard coded in the release GUI software.

In special circumstances, NORBIT Support may provide a special release that does not require a full installation package. In this case, the firmware may be emailed and the user must copy the files into the firmware folder (C:\Program Files (x86)\Norbit AS\WBMS\Firmware). When the WBMS Viewer is started, the user must then force a firmware update on the sonar. Restarting the GUI following this firmware update may cause a warning dialogue box to appear. Please ignore this window by choosing "Connect Anyway".



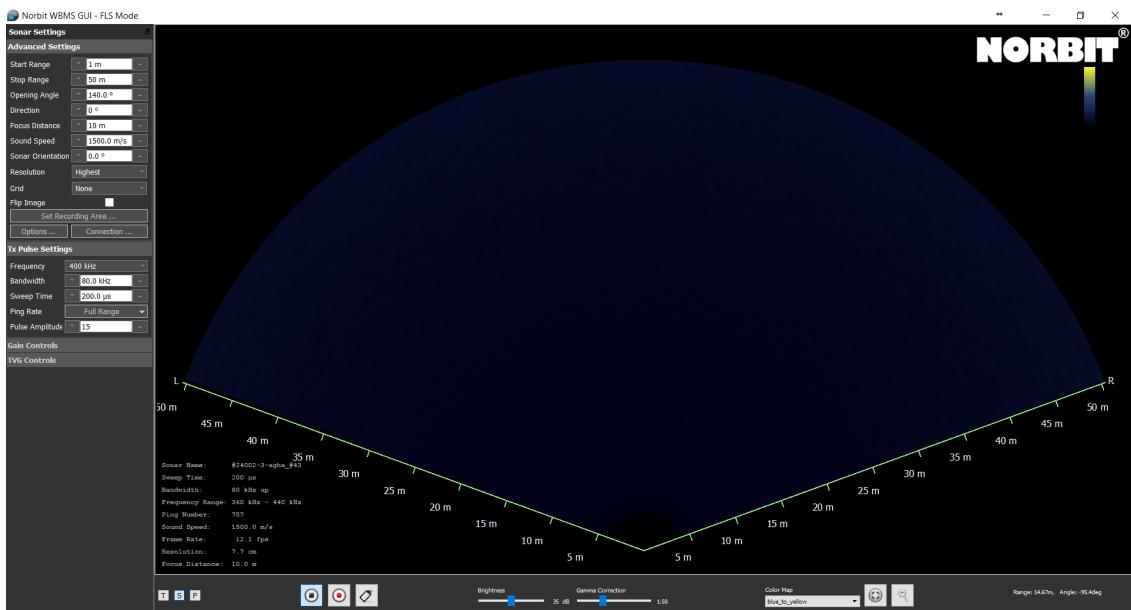
**FIGURE 6** Connection dialog with mismatching FLS firmware.

NOTE: Should you see this warning and have not received special firmware, perform an upgrade to the firmware. If you are unsure of what firmware you should be running, contact NORBIT support.

## | Main WBMS GUI view

Upon connecting to the sonar the first screen that will appear will be the Sonar wedge and the sonar controls. From this screen the FLS will be monitored, configured and controlled. To commence sonar pinging, hit "Play", the square button on the lower bar of the GUI.

Sonar settings and controls can be found on the left hand side of the screen. All sonar functions can be controlled from the tabs in this column. Occupying much of the screen the sonar wedge shows the current viewing angle and any targets within view. The lower bar on the screen is where you will find the "play data" button, record button and sliders to adjust display characteristics.



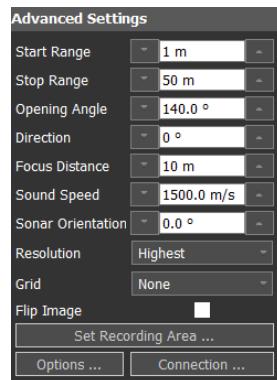
**FIGURE 7** Connection dialog with mismatching FLS firmware.

**CAUTION:** Do not operate dry sonar for long periods!

Prolonged periods of energized dry SONAR will deteriorate channel sensitivity resulting in decreased performance.

## | WBMS GUI CONTROLS

The left column contains various tabs each with user selectable options. The user may click on each tab title (light grey area) to view or hide the contents. For normal operation with default settings, only the first tab, Advanced Settings, need be made visible



### | Advanced Settings Menu

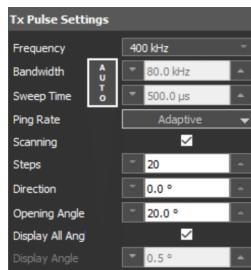
Most FLS control features can be found in the Advanced Settings tab. Here, the operator may adjust the start and stop range, opening angle, sonar orientation and resolution parameters.

Function	Description
Start Range	User selectable value that limits how close the sonar will detect contacts.
Stop Range	User selectable value that determine the maximum range the sonar will detect contacts Minimum Value: 0.0m Maximum Value: 300m
Opening Angle	Total angular swath coverage. Can be user selected. Minimum Value: 7° Maximum Value: 180°
Direction	Direction of swath pointing angle. 0° places the swath symmetrically around nadir. Direction angle is dependent on swath width as no portion of the swath may exceed the 180° allowable view.
Focus Distance	While the sonar has a good performance in all insonified area, contact clarity can be optimized for a specified range of interest by selecting the "focus distance". The focus distance is a range from the sonar with the sharpest image.
Sound Speed	User setting to enter the sound speed at the sonar depth. Important for determining the actual range to a contact.

Sonar Orientation	Rotates the Display. Use to facilitate easier interpretation in different mounting situations.
Resolution	Let the user select resolution on data from sonar. Available images sizes: High: 1024x256 Medium: 521x128 Low: 265x64
Grid	User display options. None: Only range scale with values is visible Arcs: range arcs become visible within the swath. Radial Lines: Lines radiating from source to end of range. Shows three equal angle sectors based on Opening Angle. Arcs and Radial: Displays both range arcs and angle radials.
Flip Image	User selectable option. Switches the display such that the left and right quadrants of the sonar display are reversed.
Set Recording Area...	Let the user select a folder on the acquisition computer where the recorded sonar data will be saved
Options ...	Opens a settings dialog where options regarding timing and display preferences can be modified. <a href="#">See Section 5.5 for more.</a>
Connection ...	Opens the sonar connection dialog

## | Tx Pulse Settings menu

The Tx pulse settings allow for the modification of the acoustic transmission. For most survey types, these values do not need to be changed and the tab should be minimized. Here, it is possible to set the transmission to a Frequency Modulated (FM) signal (what the sonar was designed specifically to do) or to a Constant Wave (CW) signal with constant frequency. How the sonar should be triggered to transmit a pulse can also be configured.



Function	Description
Frequency	The center frequency of the transmission. The system is most efficient at 400kHz and is ideally set to this value.
Bandwidth	Frequency bandwidth of the FM sweep. Range is 0 kHz – 80 kHz. This parameter is responsible for sonar depth resolution. The higher bandwidth the better resolution. Generally, for FM mode, set to maximum (80 kHz). The system is designed from conception as an FM system and operates most efficiently in this mode.
Sweep Time	Pulse duration of the signal transmission. The longer pulse the more energy is being transmitted which improves the range performance. For FM, long transmission duration of 500μs is ideal.
Ping Rate	<b>Full Range:</b> The sonar If enabled, sets the ping rate to maximum possible value over the total effective range as defined by the range settings. Ping rate is a function of the two-way travel-time of the signal from projector to the bottom and back, plus a small duration for ping processing and capacitor charge. The effective range is determined from the angular swath width, swath pointing angle and lower depth or range gate. <b>Fixed:</b> Sets the maximum ping rate of the sonar; even if possible, the sonar will not ping faster than the Fixed Rate.

**External:** Not typically used by most customers.

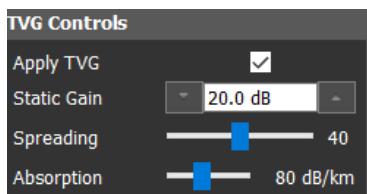
Ping is triggered externally and only happens if the sonar is 'ready' when the signal arrives. E.g. if the sonar cannot ping faster than 10Hz due to range, but the external signal is 12Hz, then every other event will be skipped resulting in a 6Hz ping rate per every other signal. The external signal polarity is configurable. Minimum delay from transmit signal to centre of transmit pulse is 500 $\mu$ s (half the transmit pulse buffer plus additional). An adjustable trigger delay is possible in millisecond resolution.

---

Pulse Amplitude	Changes the amplitude of the Tx signal. Should normally be left at maximum setting. For operation in very short ranges and highly reflective environment the Tx power can be lowered to avoid signal distortions due to saturation.
Scanning (STX only)	If checked, this option directs sonar to sweep an along-track or across-track (based on how the sonar is mounted) sector of angle given by Opening Angle. If unchecked, the sonar is directed to ping in one direction, effectively behaving as a conventional FLS.
Steps (STX only)	This is configurable only if Scanning is enabled and the opening angle is set to a non-zero value. The number of steps corresponds to the number of slices, or pings, in each defined sector.
Direction (STX only)	The value in this field defines the angular direction forming the center of the along-track sector. E.g., for a direction of 5°, and opening angle 20°, the STX will scan across a sector from -5° to 15°.
Display all Ang (STX only)	If checked, this instructs the GUI to display all angles in the sector being scanned by the STX. If unchecked, the GUI will display the angle defined in Display Ang.
Display Angle (STX only)	If Display all Ang is unchecked, this field will be greyed out. However, if the previous field is unchecked, the user may define a single angle within the sector to visualize on the display.

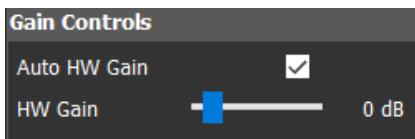
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## | Gain Controls menu



Function	Description
Auto HW Gain	Allows the sonar to select the best gain setting for the current settings.
HW Gain	If auto gain is unchecked, allows the user to manual select a gain value. Under most conditions auto gain will yield the best results. Minimum value: -10dB Maximum value: 80dB

## | TVG Controls menu



Allows the user to change the settings that govern TVG. Adjusting these settings may improve the image clarity within the sonar view. These settings only affect the display and not the sonar data settings.

Sonar hardware has a limited TVG gain which will operate up to around 30m. Then TVG stops at the constant level. That sometimes is a problem for the processing software to create seamless mosaicking. The "Apply TVG" when

checked will remove the native sonar Time Varied Gain applied in sonar hardware and apply the user specified continuous Time Varied Gain described by mathematical formula  $TVG = Spreading * \log_{10}(R) + 2 * Absorption * R / 1000 + Gain$ . When the TVG is applied, all parameters are reported along with the data to the acquisition software and can be used to better utilize the data e.g. for mosaicking.

Shall the data saturated above the limit of data format, the user will be informed about it by red LED indicator on the main GUI screen (see section 5.6) and will be able to rectify that by changing the applied gain. When "Apply TVG" is unchecked the native sonar TVG is not removed and no additional digital gain is applied to the data. In any case the TVG parameters are not applied to the data recorded by GUI with the record button. For most of the cases the gain of 20 spreading 40 and absorption of 80 will sufficiently scale the data. However, if the user wants to adjust the output data it is advised that the setting is set before the data acquisition as changes in TVG parameters will apply to the data output to the acquisition software.

## | Options menu

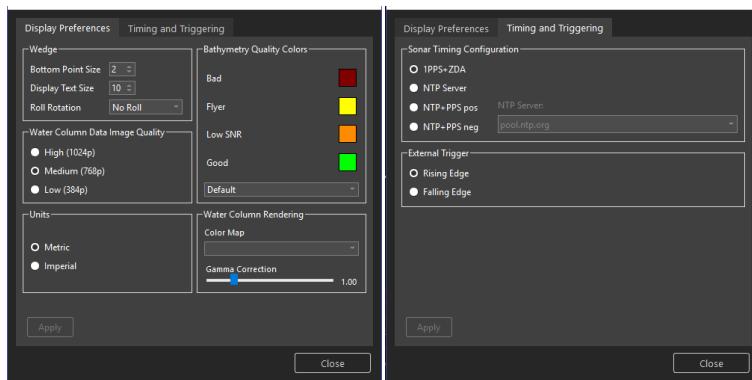
When hitting the Options button under the Advanced Settings tab, a dialog that contain two tabs will open.

## | Display Preferences

Most options in this tab is related to bathymetric systems, and are not relevant when running FLS. But preferences such as units can be selected in the Display Preferences tab.

## | Timing and Triggering

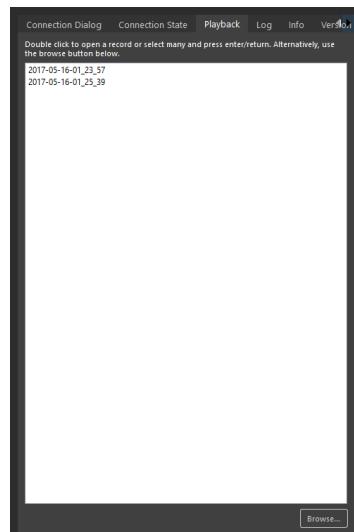
User can specify method for sending timing to the sonar in this window. For most survey applications, it should be left at 1PPS+ZDA; the GNSS signal provides the time stamp and the PPS signal derived from that. If GNSS signal is unavailable an NTP server, such as Meinberg may be used (but not recommended) for timing; to do so, select NTP Server and specify the name of the server in the NTP Server box. If timing error is more than 10milliseconds, sonar will discard timing. Select NTP+PPS pos/neg if using time from an NTP server to provide PPS; "pos" and "neg" refer to a positive and negative signal spike respectively. In NTP+PPS setting, an error of more than 100milliseconds will render the data unusable. More advanced users can use an external signal to trigger the sonar; the External Trigger box provides a way to control whether the rising or falling edge is used to do so.



## | Playback mode

The playback tab displays all detected GUI recordings. If there are GUI recordings in other folders, USB drives, etc. please click on Browse and navigate to the correct folder. To play back a recording double-click on the file name. This will open a second display to the right of the live swath showing the recorded data. The GUI recording files are saved in the folder C:\Users\user\Norbit\WBMS\.

On the left are the Playback Settings and Controls. Users can change the sonar orientation by adjusting the Sonar Orientation control bar. To export current ping or a series of pings, use the Export Current Ping and Export buttons. At the bottom of the main display are the playback controls. Button functionality can be found in Table 7.



Button	Function
	Play recording.
	Stop playing recording.
	Jump to start of recording.
	Step 1 ping backward.
	Step 1 ping forward.
	Insert tag/comment/descriptor to recording.
	Insert duration tag to recording.
	Open graphical zoom.
	Play recording again.

**TABLE 7** Playback control buttons.

## APPENDIX A: PINOUT

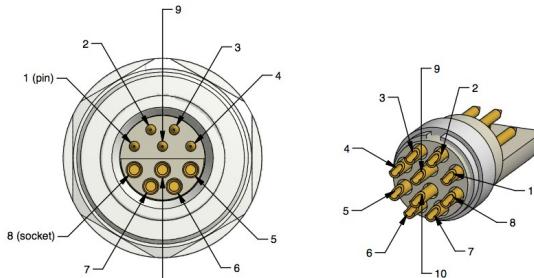


Figure 1: J1, WBMS Bulkhead.

Connector type	:	Norbit 33049
Material	:	Titanium Grade 5
Insert	:	Lemo 10 pin
Endurance	:	> 5000 cycles IEC 60512-5 test 9a (ref: lemo, O-ring needs to be changed)
Pressure rating	:	600 Bar (mated and unmated)

Pin	WBMS function	Electrical spec	Maximum Rating	Comment
1	LAN, TX+	100Base-T	1500 Vrms	Twisted Pair
2	LAN, TX-	100Base-T	1500 Vrms	
3	LAN, RX+	100Base-T	1500 Vrms	Twisted Pair
4	LAN, RX-	100Base-T	1500 Vrms	
5	RS232 Tx/Trig OUT	RS232	-15V to +15V	Debug/trigger. Low = -5.7V High = +6.2V
6	RS232 Rx/ Trig IN	RS232	-25V to +25V	Debug/trigger. Threshold (high) = typ 1.7V, max 2.5V
7	IRIG-B	RS485(A)	-9V to +14V	Timing input. Threshold, high = 0.7V, low = 0.25V
8	Signal GND	GND	-	Shared ground for IRIG-B and RS232
9	GND	GND	-	Power ground
10	24VDC	24VDC	30V	Power input

Pinout Table.

## APPENDIX B: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. 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 192.168.53.053.” For this example, you will be verifying the connection of the sonar to the computer. Keep in mind that the last 2 digits will correspond with the serial number of the unit in question. This will also work for the POS if you ping 192.168.53.100.

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

Problem	Possible solutions
Cannot connect to the sonar	<ul style="list-style-type: none"><li>• Verify the SIU is connected to power and that the box is on.</li><li>• Check that cables connections are free from corrosion and are properly secured.</li><li>• Check that the network card on the PC is configured to the correct subnet (i.e. 192.168.53.XXX where XXX is not the 100 (INS) nor the sonar serial number).</li><li>• If using a network switch, bypass the switch and connect directly to the computer</li><li>• Reboot PC, wait 30 seconds, then cycle power on SIU.</li><li>• Ping sonar to check connection.</li></ul>

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Can Connect to the sonar but an error appears after selecting the sonar.

- There may be a remnant .ini file. Check by typing %programdata%\norbit\and remove any old .ini file.

---

FLS GUI does not match description in this manual or software not performing as described in manual.

- Obtain the latest installation version from NORBIT support: [subsea\\_support@norbit.com](mailto:subsea_support@norbit.com) and install.

---

FLS GUI refuses to start after a new installation.

- For early versions, it may be necessary to remove orphaned files after an uninstallation. To do this, use Windows Explorer and in the address bar type: %appdata%\norbit\then enter - delete everything inside of this location. Next, type %programdata%\norbit\and enter - delete everything inside this folder. Now reinstall.

---

Sonar display is freezing and data packets are being dropped.

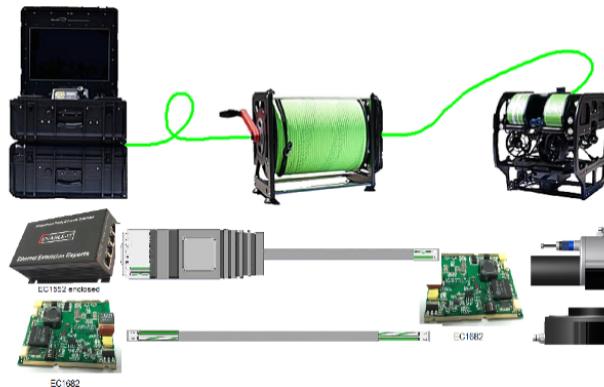
- Heavy network traffic, reduce network traffic.
- Bad switch, hub or cable. Replace.

---

**TABLE 8** Problems and explanation of what can be the possible solution.

## APPENDIX B: VDSL MODEM INTEGRATION

This setup will allow for communications up to 600m or 2,000ft (max 6,000 ft) over 1-pair of twisted pair cabling. Distance and data throughput are subject to interference that can be environmentally introduced such as shipboard DC motors, tether DC voltage, spindle or bulkhead connectors that leak EMF or have significant data loss. There are two types of modem offered by NORBIT: EC1628 and EC1552. The remote EC1682 3 port Micrel LAN chipset uses two ports with micro connector LAN ports for device connectivity. The EC1552 can be also replaced with an EC1682 if the

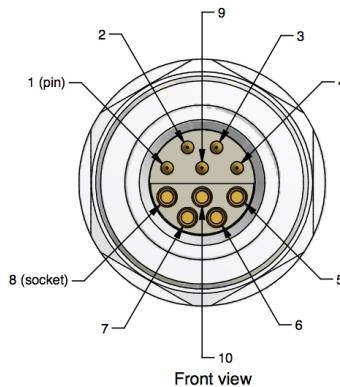


top end does not need the Ethernet switch or is limited in size. Since the sonar data exports more data on the uplink to the surface than receives on the down-link (mostly commands) the modems should be configured such as the EC1682 is a CO and the modem mostly receiving the data (EC1552) should be configured as CPE.

### Sonar Connection and Modem Integration

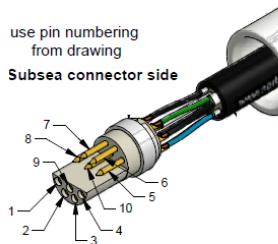
For mechanical integration please see the WBMS user manual. The WBMS sonar has a single 10 pin connector with the pins and functions outlined below. Ethernet pins 1-4 connect directly to pin 1-4 of the EC1682 VDSL modem. The EC1682 modem have two Ethernet ports which is useful for the dual head operation. The power connection on pin 9 & 10 must receive a clean DC power.

Pin Sonar	Function	Comment
1	Tx+ (Ethernet)	Connects to pin 1 of the CN2 or CN3 on EC1682 modem
2	Tx- (Ethernet)	Connects to pin 2 of the CN2 or CN3 on EC1682 modem
3	Rx+ (Ethernet)	Connects to pin 3 of the CN2 or CN3 on EC1682 modem
4	Rx-	Connects to pin 4 of the CN2 or CN3 on EC1682 modem
5	Trig Out, service pin	
6	Trig In, service pin	
7	Timing	
8	Timing GND	
9	PWR GND	
10	PWR +24 VDC	20...28 VDC, max 2A inrush



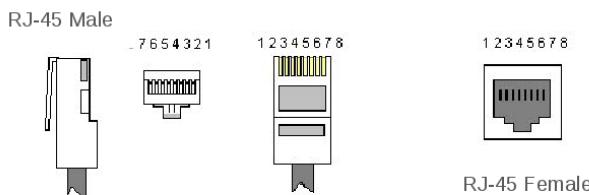
**FIGURE 8** Sonar connector pinout.

The sonar may come with a pigtail connector with the pin configuration shown above in Table 9. In order for the Norbit FLS to work with the VDSL modem the pins need to be configured as follows.



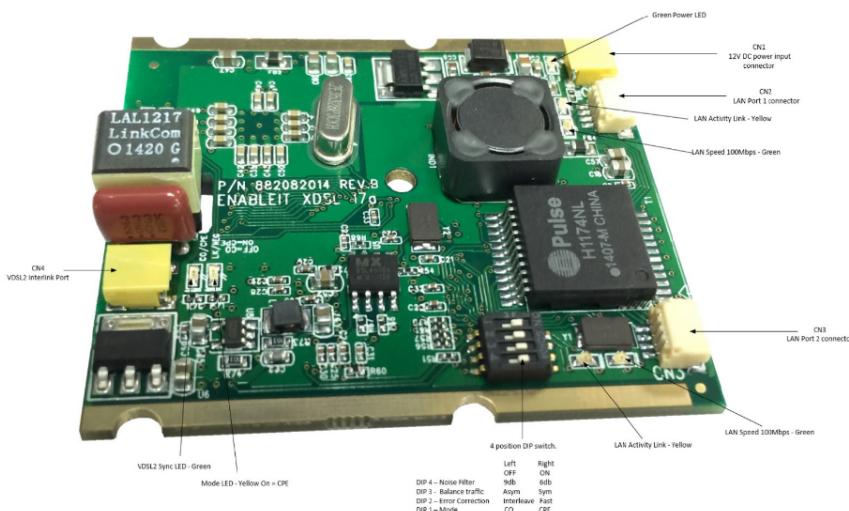
Pin out			
Lemo pin	Description	WBMS function	Cable
1	Tx +	LAN Tx +	black (red pair)
2	Tx -	LAN Tx -	red
3	Rx +	LAN Rx +	black (blue pair)
4	Rx -	LAN Rx -	blue
5	Pair 3 +	RS-232 Tx	black (green pair)
6	Pair 3 -	RS-232 Rx	green
7	Pair 4 +	Trigger/GPIO	black (white pair)
8	Pair 4 -	RS-232/Trig GND	white
9	PWR GND	PWR GND	black 0,5mm2
10	PWR +24V	PWR +24V	white 0,5mm2

**FIGURE 9** Sonar pigtail cable.



Pin No	Color	Function	Connector
1	Pair: Grey-Red, Grey	Tx+ (Ethernet)	RJ45 pin 1
2	Pair: Grey-Red, Red	Tx- (Ethernet)	RJ45 pin 2
3	Pair: Grey-Purple, Grey	Rx+ (Ethernet)	RJ45 pin 3
4	Pair: Grey-Purple, Grey	Rx- (Ethernet)	RJ45 pin 6
5	Pair: Grey-Green, Grey	Trig Out, service pin	(Keep this for future)
6	Pair: Grey-Green, Green	Trig In, service pin	(Keep this for future)
7	Pair: Grey-White, Grey	Timing	
8	Pair: Grey-White, White	Timing GND	
9	Pair: Grey-Black, Grey	PWR GND	
10	Pair: Grey-Black, Black	PWR +24 VDC	

## EC1682 Details



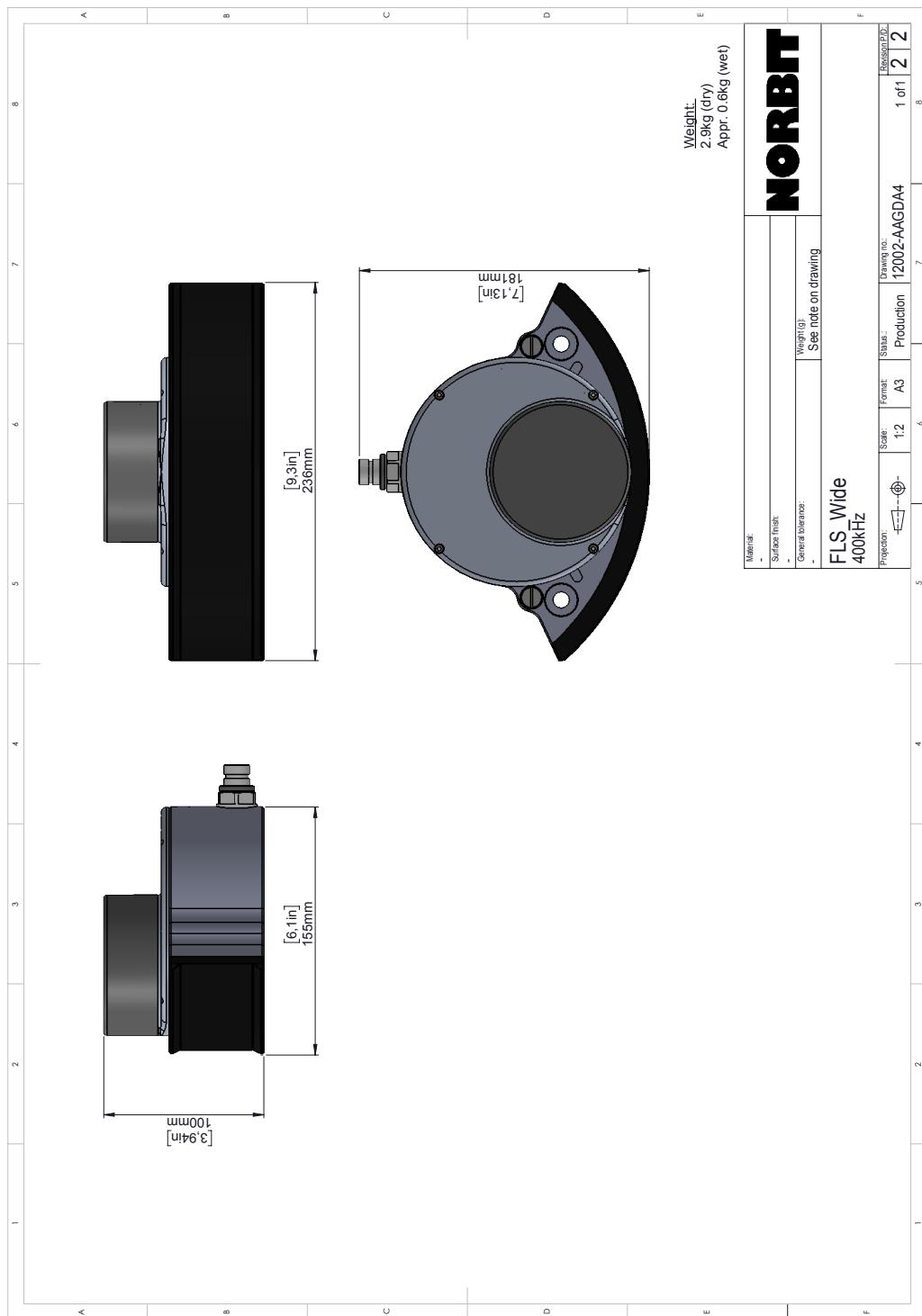
The EC1682 VDSL2 Interlink wiring uses custom micro JST connectors for tether communications and port for connectivity. Using a JST crimping tool and JST connector contacts, crimp two connector contacts onto each end of the contiguous wire run and inset wire (1 & 2) into a blank JST connector and attach to the EC1682 VDSL2 port. The Ethernet port EC1682 connects to the sonar Ethernet port.

| **EC1552 Details**

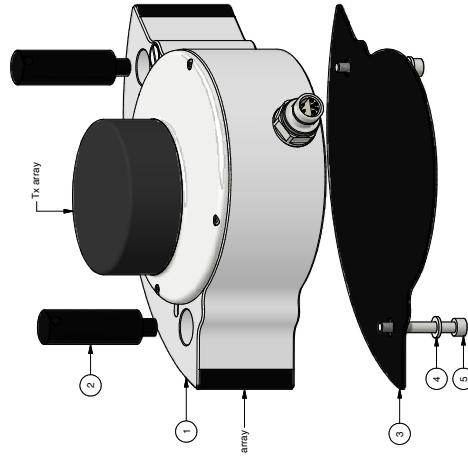
The EC1552 Interlink wiring uses LAN standard RJ-45 port for connectivity point to point on dedicated copper wiring. This is done to standardize LAN installation tools and leverage other pins for optional voice line or PoE passthrough capabilities. Using a LAN cabling tool, crimp a RJ-45 blank male plug onto each end of the contiguous wire run and using the following RJ-45 pins (1 & 2) straight through. If using a spooled tether with a spindle mechanism, please test on CAT rated cable to document a benchmark and help you troubleshoot data loss on your tether setup if required. Our expertise in this area has caught up to 30% data loss in poorly designed spindles and tethers. Installation After performing the out of the box test (OOTBT) all that remains is to attach the LAN device cabling and test your Ethernet communications over the link. The EC1682 has a heatsync on it and it will need a larger cooling surface to touch and a fan generating airflow over/around the PCB in order to keep it cool. This unit is originally designed to be cooled by ocean water surrounding a bottle and frame that is used to extract heat from the heatsync. For practical high throughput (50Mbps 40Mbps) deployment for undersea we recommend 1,000m or 3,280ft using 22 or 24 AWG twisted pair. The remote EC1682 3-port Micrel LAN chipset uses two ports with micro connector LAN ports for device connectivity.

For more information about VDSL integration contact NORBIT.

**APPENDIX D: FLS TECHNICAL DRAWING**



**APPENDIX E: FLS MOUNTING**



WBMS_FLS_PUBLIC				
Pos	Part No.	Part Number	Description	Parts List
5	2	M6x45 Socket Head Cap	M6x45 Socket Head Cap DIN 912	A4
4	2	M6 Washer DIN 125	M6 Washer DIN 125	A4
3	1	45459-1	WBMS Protection Plate	PHEO-1000 Black
2	2	45393-3	WBMS Nut	PDM Black
1	1	24022-2		
				Material
				Notes/Information

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Projection Scale 1:2  
All dimensions in millimeter  
Sheet size: A3  
Tolerances:  
Part no: 24022-2  
Surfaces:  
Firmware version: 4.7.206  
Date: 2014-05-22  
Drawing: Nr. 2014-05-22

Weight in air: 2.6 kg  
Weight in water: 1.4 kg  
(\* Dimensions on Rx and Tx array  
may be changed)

