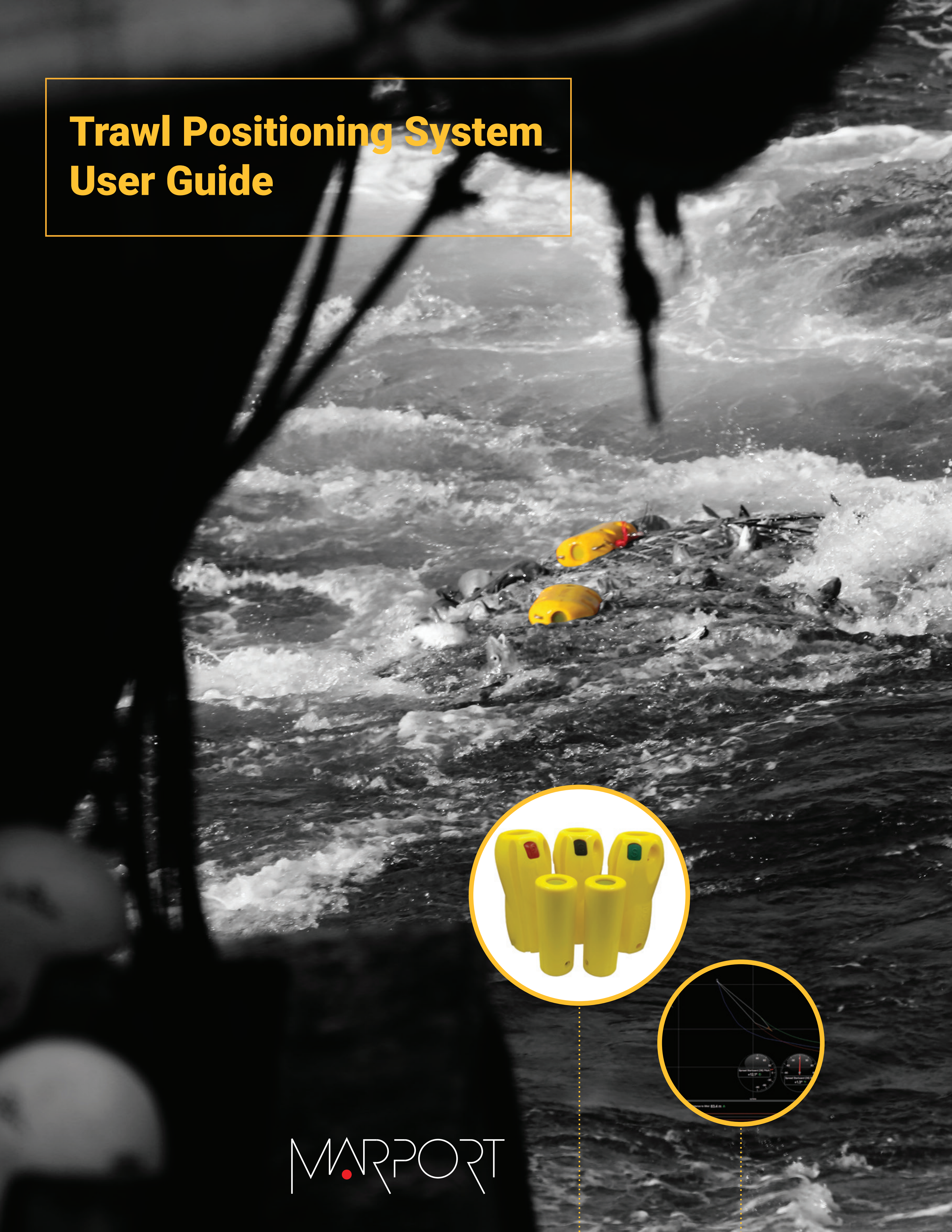
Trawl Positioning System User Guide



MARPORT

Contents

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History

V1	03/09/18	First release
V2	04/12/18	Documentation now also includes Scala version 01.06.19. Improved topics: • Displaying Trawl Positioning from Scala on SeapiX on page 82: new compatible sentence ($PTSAL for SeapiX).
V3	07/06/18	New topic: • Troubleshooting: Sensor cannot connect in wireless connection on page 108 Improved topics: • Interference Check on page 102: more detailed information about **Spectrum** page. • Appendix B: Compatible NMEA Sentences from Winch Control Systems, GPS and Compass Devices on page 121: structure of compatible NMEA sentences is now explained.
V4	11/30/18	Improved topic: • Appendix A: Frequency Plan on page 116: drawings have been changed, frequencies are now allocated between 34 kHz and 36 kHz and frequency ranges of narrowband and wideband hydrophones are indicated.

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Disclaimer

Marport endeavors to ensure that all information in this document is correct and fairly stated, but does not accept liability for any errors or omissions.

The present user guide is applicable for the following versions:

- **Scala: 01.06.06-01.06.25**
- **Mosa: 01.01.01-01.02.13**

Patents apply to products. U.S. Patents 9,772,416; 9,772,417

Introduction and Presentation

Read this section to get a basic knowledge of your door sensor.

Tip: Click Marport logo at the bottom of pages to come back to the table of contents.

Introduction

Marport Trawl Positioning System indicates the position of the trawl gear. You can see the trawl doors on your screen to help you maneuver the gear with more ease and security.

The position of the trawl gear can be calculated with two different types of sensors:

- With Spread sensors, it is calculated using depth and bearing data received from the sensors and using the length of warp behind the towing blocks. Warp lengths can be obtained from winch control systems giving accurate wire measurements or manually entered.
- With Slant Range sensors (also called pingers), it is calculated using the distance from the sensors to the hydrophones, depth and bearing data received from the sensors.

Each option has its advantages: Spread sensors offer a more rapid update, a longer battery life, a longer range and can be used alone. This is the preferred option. Slant Range sensors are usually used in addition to Spread sensors, so you need two pockets on the doors. They are more suited to fishing vessels that do not have winch control systems.

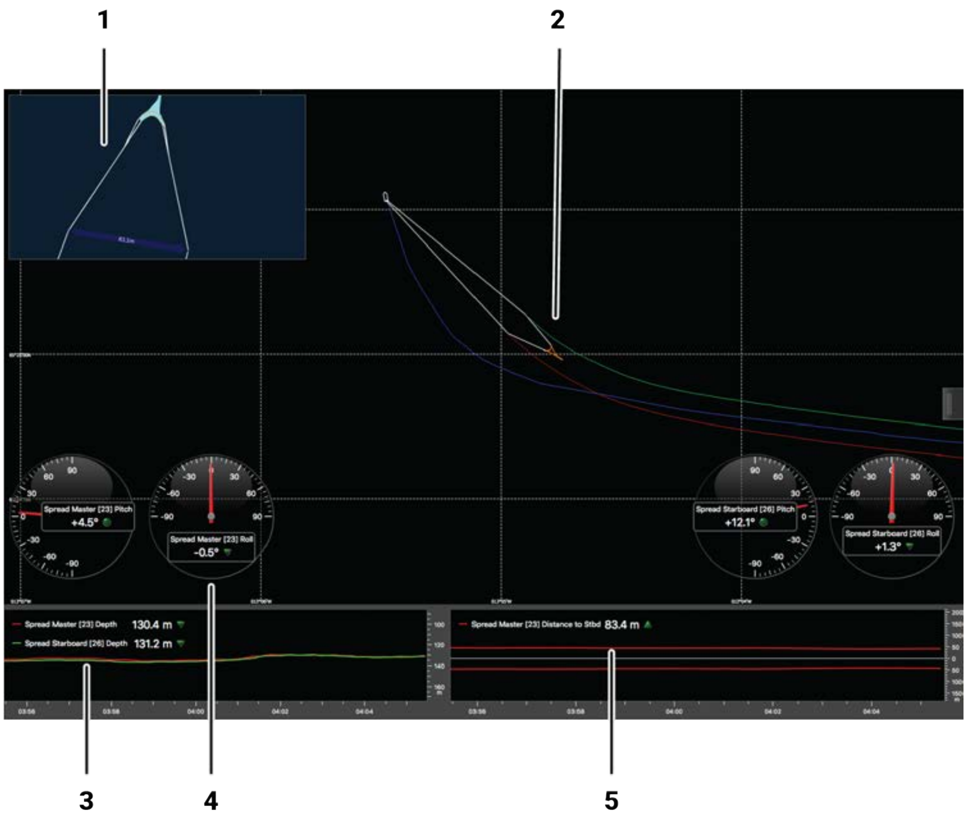
Spread and Slant Range sensors also exist in smaller size to meet the needs of smaller trawlers: a Mini Spread Sensor (stubby bottle) with a standard or slim housing and a mini Slant Range (small bottle).

You can use Marport Trawl Positioning System to display the trawl position on Olex, MaxSea version 12.

Applications

Here are some examples of data received from Spread and Slant Range sensors displayed in Scala.

Spread Sensors



1. 3D overview of vessel and trawl

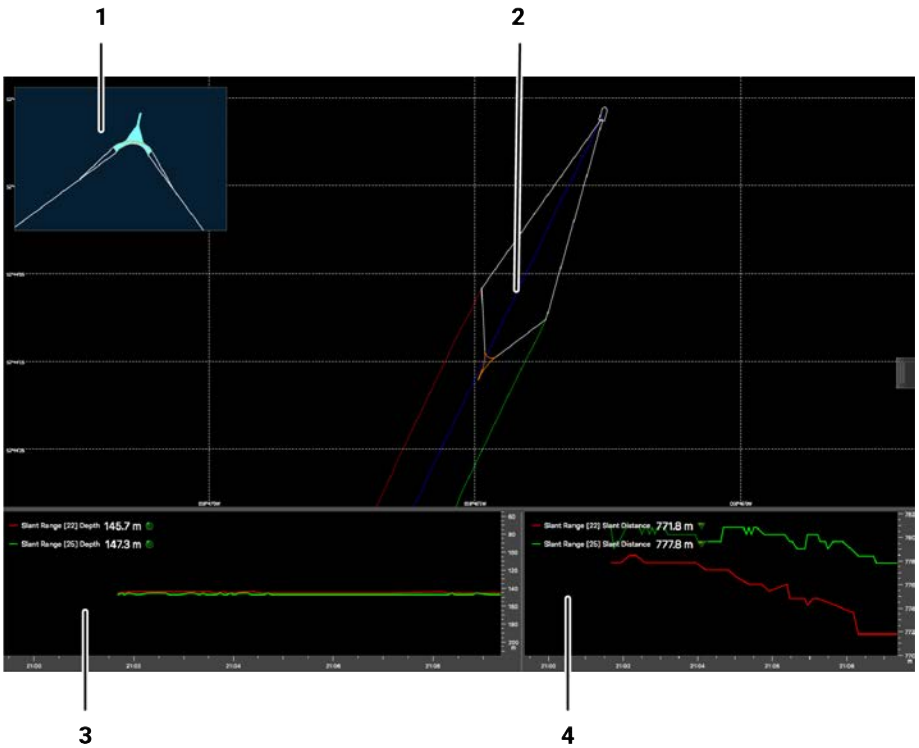
2. Chart view with vessel and door trails

3. Depth of the doors

4. Pitch and roll of the doors

5. Distance between doors

Slant Range



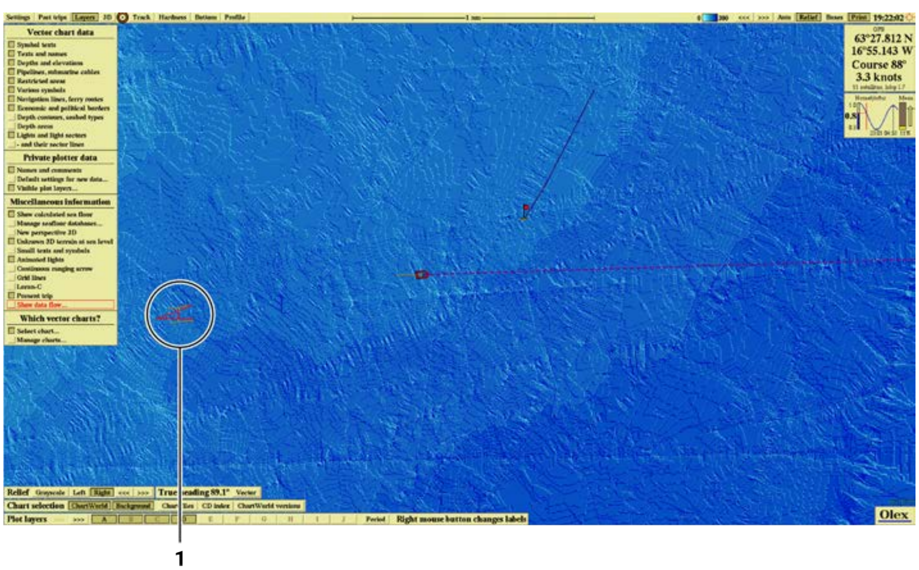
1. 3D overview of vessel and trawl

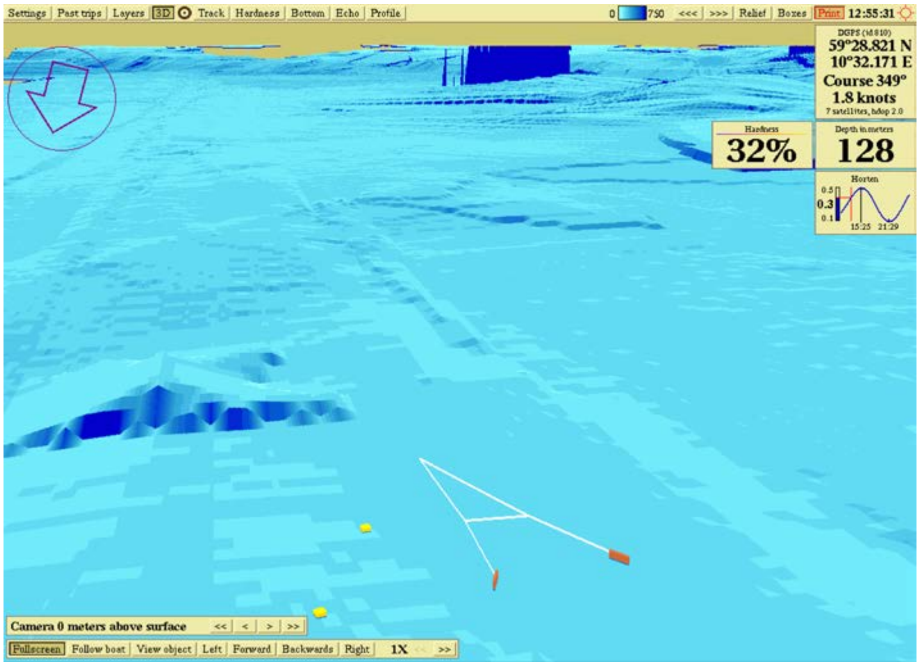
2. Chart view with vessel and door trails

3. Depth of the doors

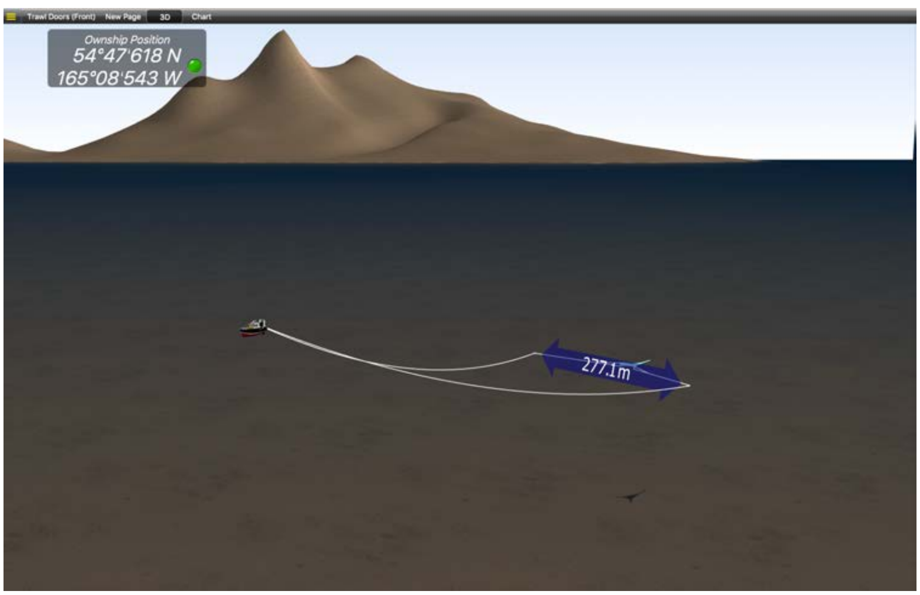
4. Distance from the Slant Range to the hydrophones

Positioning data exported on Olex





Vessel 3D overview with GEBCO bathymetry



Safety Guidelines

Important: To ensure proper and safe use of this equipment, carefully read and follow the instructions in this manual.

Basic good practices

When using the product, be careful: impacts can cause damage to the electronic components inside.

Never place the product in a hazardous and/or flammable atmosphere.

Product installation and use

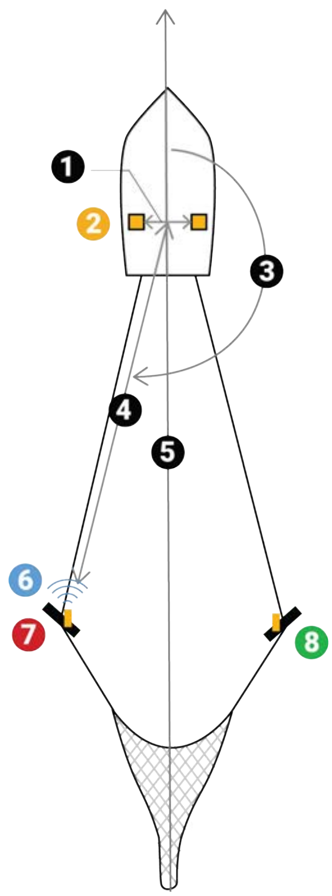
Install and use this product in accordance with this user manual. Incorrect use of the product may cause damage to the components or void the warranty.

Only qualified Marport dealers can do maintenance and repairs on internal components of the sensors.

Precautions

Warning: In case of water ingress in the product, do not charge it: battery may vent or rupture, causing product or physical damage.

About Trawl Positioning



Positioning signal is sent after the depth signal (**6**). The receiver can calculate with this signal the relative bearing angle (**3**) of the sensors placed on port (**7**) and starboard (**8**) doors. Port relative bearing angle is positive and starboard is negative. Scala also displays true (T) bearing angles (based on true North).

For a Slant Range sensor (also called pinger), distance from the hydrophones to the doors (**4**) is calculated from the response time of the sensor to the hydrophone (**2**).

For a Spread sensor, the distance is calculated from the warp lengths (calculated with a winch control system or manually entered).

Scala software can calculate the positioning of the trawl from this distance, the depth and bearing angle.

The distance between the two hydrophones is called the baseline (**1**).

(**5**) represents the heading of the vessel.

For a basic system you need:

2 Slant Range sensors	**2-3 Spread Sensors**
2 receiving hydrophones: • 2 passive hydrophones + wideband preamplifier (ref NC-2-02) OR • OR 2 active wideband hydrophones (ref NC-1-06)	2 receiving hydrophones: • 2 passive hydrophones + wideband preamplifier (ref NC-2-02) • OR 2 active wideband hydrophones (ref NC-1-06)
1 transmitting hydrophone: passive hydrophone (ref NC-1-05)	Knowledge of warp lengths
Baseline calculation, Z angular offset	Baseline calculation
1 M3/M4/M6 receiver	1 M3/M4/M6 receiver
Scala with GPS and heading input	Scala with GPS and heading input

Important: The two receiving hydrophones must have a minimum distance of **1 meter** between each other.

Important: You need to remove the 50kHz notch filter on the wideband preamplifiers.

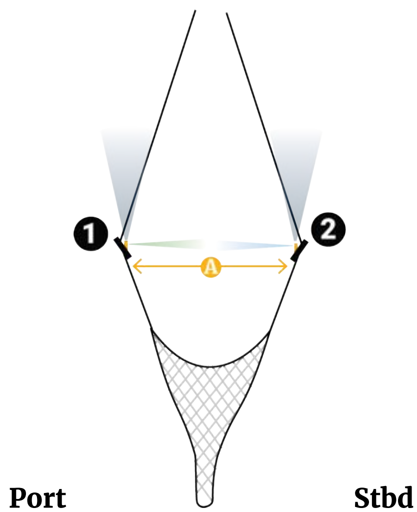
Important: On **M4 systems**, receiving hydrophones must be both connected to a hydrophone input between H1, H2 and H3 or both between H4, H5 and H6. The transmitting hydrophone for a Slant Range must be connected to a different set of hydrophone inputs than the receiving hydrophones (for example, if the receiving hydrophones are connected to H1 and H2, the transmitting hydrophone must be connected to a hydrophone input between H4, H5 and H6).

About Spread Sensors

You can use Spread sensors in three different modes: single trawl, twin trawls with double distance and twin trawls with triple distance. The following schemas illustrate the three modes and how Spread sensors communicate with each others.

Single Trawl

User case 1: Single trawl with single distance



Asks for answer

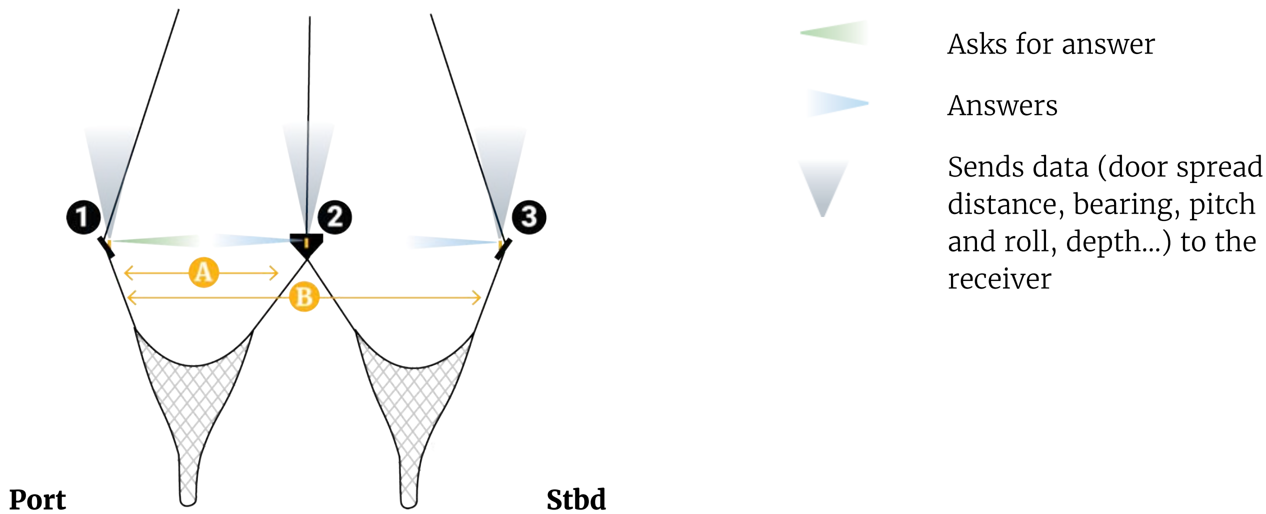
Answers

Sends data (door spread distance, bearing, pitch and roll, depth...) to the receiver

- The master sensor (**1**) interrogates the starboard sensor (**2**) to know the distance between them (**A**). Then, it sends the door spread distance to the receiver.
- Both sensors send data such as bearing, temperature, depth, pitch and roll to the receiver.

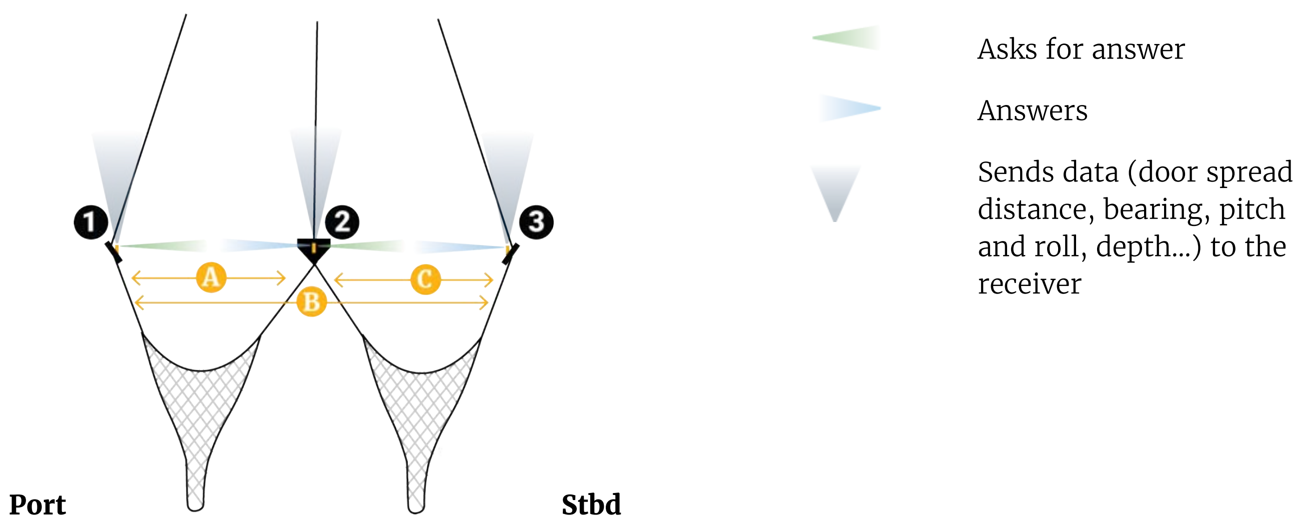
Twin Trawls

User case 2: Twin trawls with double distance



- The master sensor (**1**) interrogates the clump (**2**) and the starboard (**3**) to know the distance with each one. Then, it sends master-clump (**A**) and master-starboard (**B**) distances to the receiver.
- All sensors send data such as bearing, temperature, depth, pitch and roll to the receiver.

User case 3: Twin trawls with triple distance

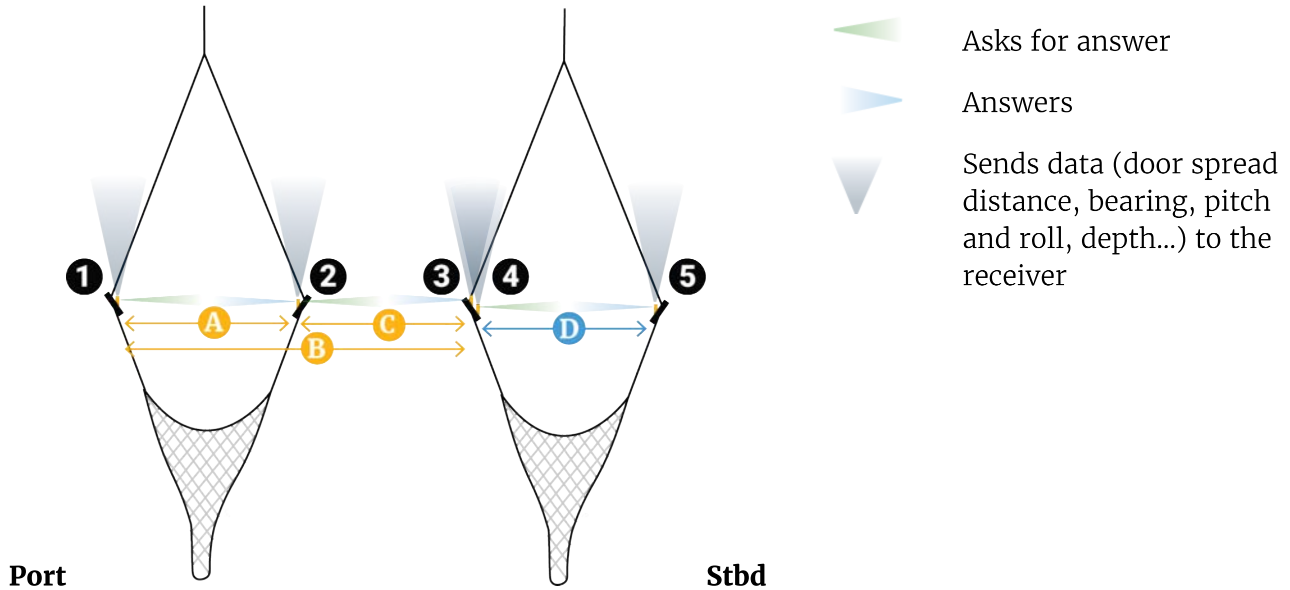


- The master sensor (**1**) interrogates the clump (**2**) and the starboard (**3**) to know the distance with each one. Then, it sends master-clump (**A**) and master-starboard (**B**) distances to the receiver.
- The clump sensor (**2**) interrogates the starboard (**3**) to know the distance between them. Then, it sends clump-starboard (**C**) distance to the receiver.
- All sensors send data such as bearing, temperature, depth, pitch and roll to the receiver.

Dual Trawls

User case 4: Dual trawls with two sets of spread sensors

If you use two separate trawls, you need to install two sets of spread sensors. You can install them in two different ways: in the same way as for a single trawl on each trawl, or if you want to have the spread distance between the two inner doors, you can set up the following installation:



The port trawl uses sensors with triple distance and the starboard trawl sensors with single distance.

- The master sensor (**1**) on the port trawl interrogates the clump (port trawl) (**2**) and the starboard on the starboard trawl (**3**) to know the distance with each one. Then, it sends master-clump (**A**) and master-starboard (**B**) distances to the receiver.
- The clump sensor (port trawl) (**2**) interrogates the starboard sensor (starboard trawl) (**3**) to know the distance between them. Then, it sends clump-starboard (**C**) distance to the receiver.
- The master sensor on the starboard trawl (**5**) interrogates the starboard sensor (starboard trawl) (**4**) to know the distance between them. Then, it sends the spread distance (**D**) to the receiver.
- All sensors send data such as bearing, temperature, depth, pitch and roll to the receiver.

Note: Make sure to put different ranging frequencies between the two sets of Spread sensors.

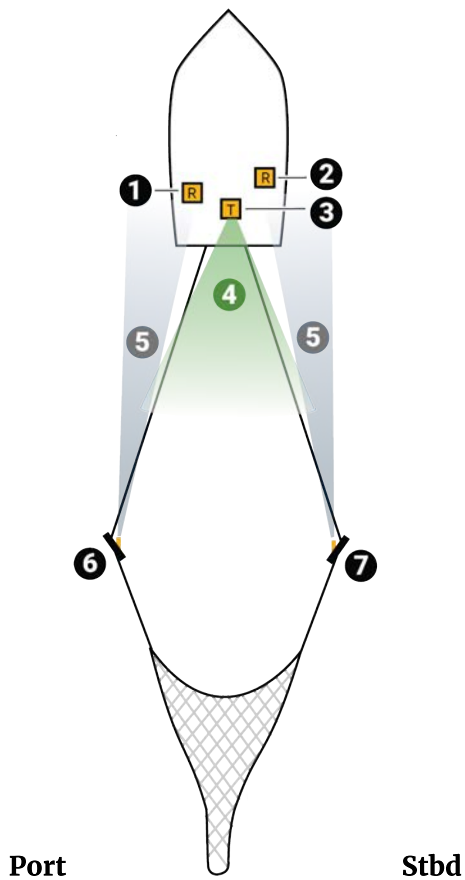
Summary of parameters

The table of geometry parameter defines the possible user cases for the Spread Sensors:

	MASTER		CLUMP		STARBOARD		DISTANCE		
User case	*Firmware*	*Trawl Geometry*	*Firmware*	*Slave Type*	*Firmware*	*Slave Type*	D1	D2	D3
1	FIRM174	Single Trawl	-	-	FIRM173	Starboard for single/double distances doorspread	x		
2	FIRM174	Twin Trawl	FIRM173	Clump for double distances doorspread	FIRM173	Starboard for single/double distances doorspread	x	x	
3	FIRM174	Twin Trawl	FIRM173	Clump for triple distances doorspread	FIRM173	Starboard for triple distances doorspread	x	x	x

	MASTER (port trawl)		CLUMP		STARBOARD (port trawl)		MASTER (stbd trawl)		STARBOARD (stbd trawl)	
User case	*Firmware*	*Trawl Geometry*	*Firmware*	*Slave Type*	*Firmware*	*Slave Type*	*Firmware*	*Trawl Geometry*	*Firmware*	*Slave Type*
4	FIRM174	Twin Trawl	FIRM173	Clump for triple distances doorspread	FIRM173	Starboard for triple distances doorspread	FIRM174	Single Trawl	FIRM173	Starboard for single/double distances doorspread

About Slant Range Sensors



1. Port receiving hydrophone
2. Starboard receiving hydrophone
3. Transmitting hydrophone
4. Transmitting hydrophone asks
5. Slant Range sensors answer
6. Slant Range sensor 1
7. Slant Range sensor 2

Slant Range sensors are also called **pingers**.

You can install one Slant Range sensor on each trawl door.

1. One transmitting hydrophone sends a signal toward the Slant Range sensors.
2. Both Slant Range answer with depth and bearing data.
3. Two receiving hydrophones receive the responses from the 2 sensors.

The distance between the sensors and the hydrophones is calculated using the response time of the sensors to the hydrophone.

Description

Firmware

Spread Sensors

All options are activated by default.

Position on Door	Firmware Name	Firmware Number
Master	Spread Master with pitch, roll, depth, position and temp (Triple distance Dual direction)	FIRM174
Starboard	Spread Slave with pitch, roll, depth, position and temp (Dual direction)	FIRM173
Clump (optional)	Spread Slave with pitch, roll, depth, position and temp (Dual direction)	FIRM173

Slant Range

Pinger_NB with Depth (FIRM125, from version 07.06) on both doors.

Technical Specifications

Spread sensor

Uplink frequency	30 to 60 kHz
Range to vessel	up to 2500 m*
Data update rate (telegrams)	Spread: 3-15 sec. - Depth + bearing : 3-8 sec. - Temp: 3-16 sec. - Pitch & roll: 3-15 sec.
Depth range	up to 1800 m
Depth resolution	0.1 m with 0.1% accuracy
Pitch angle	±90°
Roll angle	±90°
Pitch & roll accuracy	±0.1°
Temp measurement range	-5° C to +25° C
Temp accuracy	±0.1° C
Typical battery life	Up to approx. 11 days (approx. 5.5 days for Mini Spread Sensor) †
Charging time	Standard: 8-12 hours ‡
	Fast Charge: 4 hours
Battery type	Lithium-Ion
Weight in air (with housing)	7.3 kg

Weight in water (with housing)	2.4 kg
Spread Mini weight in air	4 kg, slim 3.3 kg
Spread Mini weight in water	1 kg, slim 0.9 kg
Warranty	2 years (Sensor & Battery) **

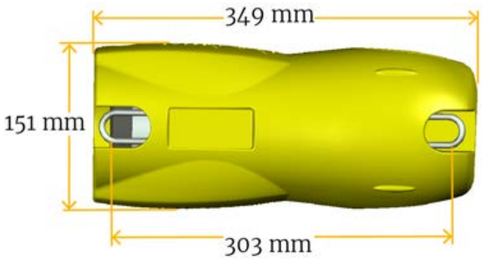
Slant Range sensor

Uplink frequency	30 to 60 kHz
Range to vessel	up to 700 m*
Data update rate	Every 4 sec.
Depth range	up to 1500 m
Depth resolution	0.1 m with 0.1% accuracy
Typical battery life	• XL bottle: up to approx. 76h • Small bottle: up to approx. 38h †
Charging time	Standard: 8-12 hours ‡
	Fast Charge: 4 hours
Battery type	Lithium-Ion
Weight in air	3 kg
Weight in water	2.7 kg
Warranty	2 years (Sensor & Battery)**

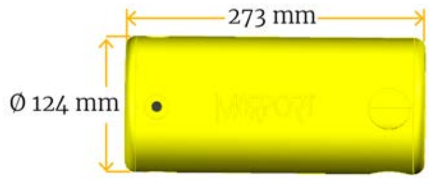
*Reference only. Depends on functions enabled. / † Depends on sensor uplink power and options. / ‡ Based on average charging time. / **Marport Standard Marine Limited Warranty

Dimensions

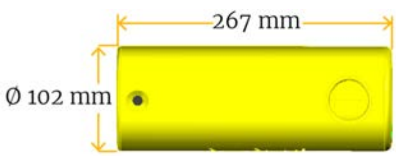
Standard Spread Sensor & Slant Range (XL bottle)



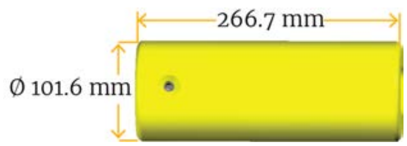
Mini Spread Sensor (stubby bottle)



Mini Spread Sensor with slim housing (stubby bottle)



Mini Slant Range (small bottle)



Main Parts

External View

Tip: Door sensors have colored markers on the housing to indicate their location on trawl doors:

- Starboard sensor (green)
- Port sensor (red)
- Clump sensor (black)

Figure 1: Standard Spread Sensor (XL bottle)

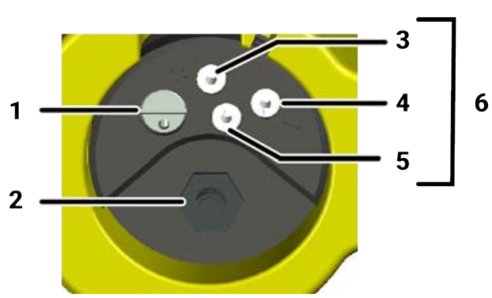
Figure 2: Mini Spread Sensor (stubby bottle)

Figure 3: Mini Spread Sensor with slim housing (stubby bottle)

Figure 4: Standard Slant Range (XL bottle)

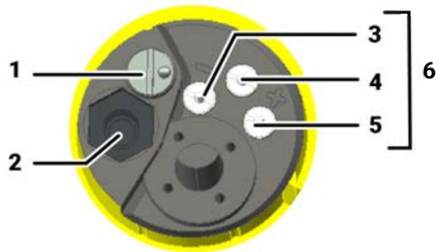
Figure 5: Mini Slant Range (small bottle)

End cap of standard Spread Sensor, standard Slant Range (XL bottle) and mini Spread Sensor (stubby bottle)



1. Pressure sensor
2. Temperature sensor
3. Positive charge
4. Negative charge
5. Water switch
6. Shoulder bolts

End cap of mini Slant Range (small bottle)



1. Pressure sensor
2. Temperature sensor
3. Negative charge
4. Water switch
5. Positive charge
6. Shoulder bolts

CAUTION:

- Do not put foreign objects into pressure sensor opening or try to open it.
- Do not remove the shoulder bolts from the outside of the sensor.

It may damage the components.

Operational Mode Indicator

Indicators from the transducer

State	Situation	Operation	LED
Charging	Charger plug is connected.	Batteries are charging.	No light.
Running	Sensor is in water or activated with jumper.	After an initialization phase, echo sounder is operating.	 Flashing red
Configuring	Sensor is out of water.	Configuration via wireless communication. Turns off after 10 minutes without user action.	 Flashing green

Installation Steps

Tip: Click an installation step to jump directly to the corresponding section.

Note: You can customize the display of data on Scala at any time.

Sensor Configuration

Learn how to configure door sensor settings.

Note: This guide refers to the following versions of **Mosa: 01.01.01-01.02.13**. If you use another version, the visual interface and options may vary.

Note: Mosa is now available on tablet computers:

- Download Mosa app on the Play Store.
- Compatible tablet: refer to Marport sales offices to know the recommended model.

Installing Mosa

If Mosa is not already installed on your computer, you need to install it to configure the sensor.

About this task

Note: On desktop and laptop computers, Mosa can only be installed on a macOS operating system.

Note: To install Mosa on a tablet computer, download the app from the Play Store. Compatible tablet: refer to Marport sales offices to know the recommended model.

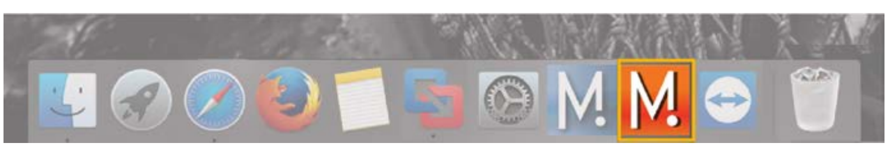
Procedure

1. Double-click the *.dmg file received from Marport.
2. From the installation window that appears, drag the Mosa icon to the **Applications** icon.

   Mosa is added to the **Launchpad**.
3. From the **Launchpad**, click and drag Mosa icon to the Dock at the bottom of the screen.

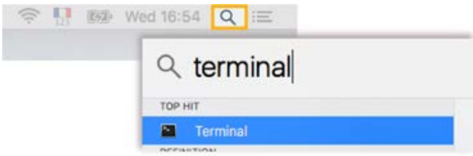
   To open Mosa, click its icon on the Dock.

   
4. If you have an error message when trying to open Mosa, change the **Security & Privacy** settings:

   a) From the upper left corner of the screen, click **Apple menu** > **System Preferences** > **Security & Privacy** .
   b) From the lower left corner of the **Security & Privacy** dialog box, click the lock icon and enter the password, if applicable.
   c) At **Allow apps downloaded from**, select **Anywhere**, then close the dialog box.
   d) If you are under macOS Sierra, **Anywhere** option may not be displayed by default. To display **Anywhere**:

   - Click the magnifying glass from the top right corner of your screen and type `Terminal`.

- Click **Terminal** from the results.



- From the terminal, enter `sudo spctl --master-disable`.
- Press enter.

  Anywhere option is now displayed in **Security & Privacy** preferences.

Connecting the Sensor to Mosa

To configure the sensor, you need to connect it to Mosa using a wireless communication.

Procedure

1. Open Mosa.

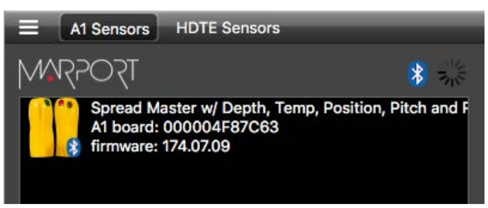
2. Connect the water-switch.

   The LED flashes red.

3. Disconnect the water-switch.

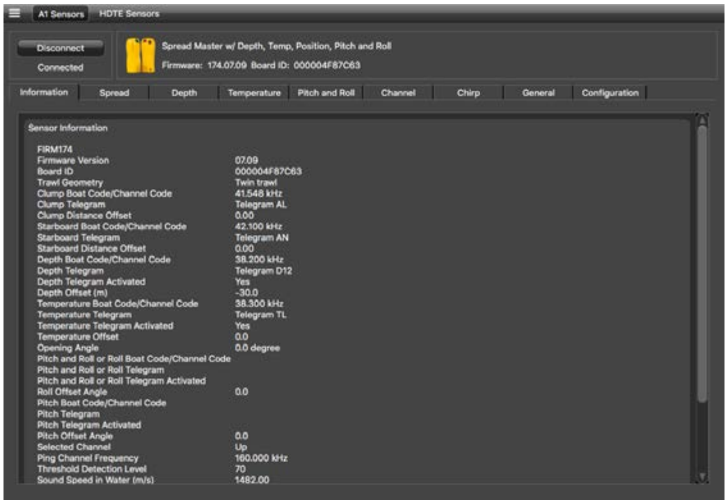
   After a few seconds, the LED flashes green.

4. From Mosa, wait a few seconds for the sensor to be recognized. The sensor appears from **A1 Sensors** on the left side of the window.



5. Click the sensor name.

   Sensor configuration page is displayed.



What to do next

You can now configure the sensor settings.

Spread Sensor Specific Settings

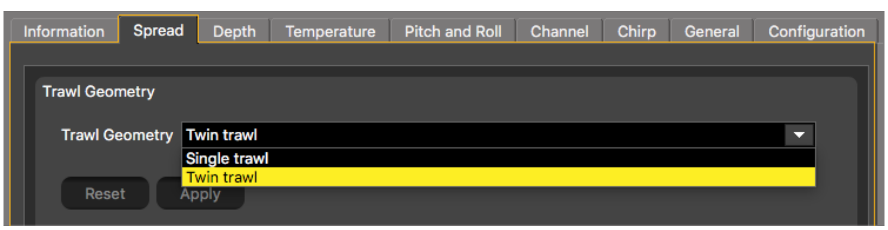
You need to set these settings for Spread sensors.

Defining the Trawl Geometry

You need to define for the Master Spread Sensor the type of trawl that you are using.

Procedure

1. Connect the Master sensor to Mosa.
2. Click the tab **Spread**.
3. From **Trawl Geometry**, select your type of trawl, depending if you are fishing with twin trawls or a single trawl.



4. Click **Apply** and make sure there is a green check mark ✓.

Defining the Starboard and Clump Sensor Type

You need to define the type of Starboard and Clump (if applicable) sensors that are installed.

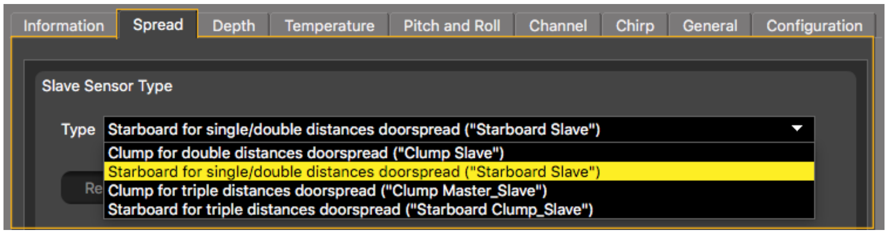
About this task

If you have a Starboard and a Clump sensor, you need to do this task for both of them.

Procedure

1. Connect the Starboard or Clump sensor to Mosa.

2. Click the tab **Spread**.
3. From **Slave Sensor Type**, choose according to your type of installation:



- Single Trawl:

Sensor	Slave Sensor Type
Starboard	Starboard for single/double distances doorspread

- Twin trawls with double distance:

Sensor	Slave Sensor Type
Starboard	Starboard for single/double distances doorspread
Clump	Clump for double distances doorspread

- Twin trawls with triple distance:

Sensor	Slave Sensor Type
Starboard	Starboard for triple distances doorspread
Clump	Clump for triple distances doorspread

4. Click **Apply** and make sure there is a green check mark ✓.

Configuring Spread Sensor Telegrams

You need to configure telegrams sent by the Master, Starboard and Clump (if applicable) sensors.

Before you begin

The sensor is connected to Mosa.

About this task

You need to configure telegrams for each door sensor that you have.

Telegrams are used to define the acoustic communication between the sensor and the receiver. Data (e.g. temperature, pitch) are recognized by the receiver according to the type of telegram defined (e.g. TL, CL). The telegram defines intervals between pulses emitted by the sensor, and one interval represents one value. For example, if the interval between 2 pulses of an AL spread telegram is 15 s., the spread is 250 meters.

Important: Make sure there is a minimum distance of 100 Hz between PRP telegrams and of 400 Hz with the uplink frequency of NBTE sensors. See Appendix A: Frequency Plan on page 116 for a full list of boat/channel codes.

Remember: Always click **Apply** after you change a setting and make sure there is a green check mark ✓.

Note: To use Spread sensors with a Scanmar system, use AL and AL6 spread telegrams. Temperature, depth, pitch and roll telegrams are all compatible.

Spread

You need to configure spread telegrams sent by the Master sensor to the vessel and, if applicable, by the Clump sensor. You do not need to configure spread telegrams for a Starboard sensor.

About this task

Choose spread telegrams according to the distance between trawl doors, or between the Clump and doors:

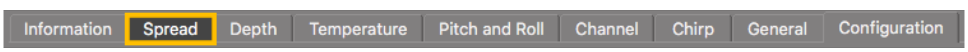
- AL: less than 250 m. Sends data every 11 to 15 sec. (compatible with Scanmar)
- AN: less than 250 m. Sends data every 3 to 8 sec.
- AL6: less than 610 m. Sends data every 11 to 14 sec. (compatible with Scanmar)
- A6: less than 610 m. Sends data every 3 to 8 sec. (starboard telegram only)

Procedure

1. If you have a single trawl, you need to configure the telegram giving the spread distance from Master to Starboard:

   a) Connect the Master sensor to Mosa.

   b) Click the tab **Spread**.

   c) From **Starboard Telegram** (Master to Starboard distance), choose AL, AN, A6 or AL6.

   Note: If using the sensors with Scanmar system, choose between AL and AL6.

   a) From **Starboard Boat Code/Channel Code** choose a frequency for the telegram.

2. If you have twin trawls:

   a) Connect the Master or Clump sensor to Mosa.

   b) Click the tab **Spread**.

c) The table below shows which telegram you need to configure, depending on the measured spread distances. You also need to set a frequency for each one.

Measured Distance	Sensor	Telegrams
Dual distance	Master	• Clump telegram (Master to Clump distance) • Starboard telegram (Master to Starboard distance)
	Clump	n/a
Triple distance	Master	• Clump telegram (Master to Clump distance) • Starboard telegram (Master to Starboard distance)
	Clump	Starboard telegram (Clump to Starboard distance)

3. If needed, you can change the frequency used for the sensors to communicate with each other.

   a) From Mosa, click **Menu** > **Expert Mode** and enter the password `copernic`.

   b) From **Spread** > **Ping Frequency**, enter the same frequency for all door sensors (default is 144.000 kHz, range is 120 to 220 kHz).

   Important: If using dual trawls with two sets of Spread sensors (see About Spread Sensors on page 14), you must apply different frequencies between the two sets (e.g. 110 kHz for port trawl sensors and 144 kHz for starboard trawl sensors).

   Note: V2 firmware: When operating, a difference of frequency is automatically applied.

   - Master emitting frequency (Tx): configured ping frequency
   - Clump Tx: configured ping frequency - 10 kHz
   - Starboard Tx: configured frequency + 10 kHz

   For example, if spread frequency is set at 144 kHz for all door sensors, it means that Master emits at 144. Clump listens 144 then emits at 134. Starboard listens at 144 then emit at 154.

Depth

Procedure

1. Click the tab **Depth**.

2. From **Depth Boat Code/Channel Code**, choose a frequency.
3. From **Depth Telegram**, choose among the telegrams according to the depth at which you are fishing. They all send data every 3 to 8 sec, but at different depth ranges.

   Note: The lower the depth range is, the more precise the measures are.

- D3 = 300 m
- D6 = 600 m
- D12 = 1200 m

- D18 = 1800 m

4. You can deactivate depth data to save battery life:

   a) From Mosa, click **Menu** > **Expert Mode** and enter the password `copernic`.
   b) From **Depth Activation**, select **No**.

Temperature

Procedure

1. Click the tab **Temperature**.

2. From **Temperature Boat Code/Channel Code**, choose a frequency.
3. From **Temperature Telegram**, choose between:
   - TL: sends data between every 11 to 16 sec.
   - TN: sends data between every 3 to 11 sec.

   Note: TN sends data more often, but it reduces the battery life.
4. You can deactivate temperature data to save battery life:

   a) From Mosa, click **Menu** > **Expert Mode** and enter the password `copernic`.
   b) From **Temperature Activation**, select **No**.

Pitch & Roll

Procedure

1. Click the tab **Pitch and Roll**.

2. If you send pitch and roll data on the same channel:

   a) From **Pitch and Roll or Roll Boat Code/Channel Code**, select a frequency.
   b) From **Pitch and Roll or Roll Telegram**, choose between:

   - **Telegram CL**: sends data every 11 to 14 sec.
   - **Telegram VQ**: sends data every 5 to 9 sec.

   Note: VQ sends data more often, but it reduces the battery life.
3. If you send pitch and roll data on two different channels:

   a) From **Pitch and Roll or Roll Boat Code/Channel Code**, select a channel for roll data.
   b) From **Pitch and Roll or Roll Telegram**, choose roll telegrams between:

      - **Telegram D3**: sends data every 3 to 8 sec.
      - **Telegram AL**: sends data every 11 to 15 sec.

      Note: D3 sends data more often, but it reduces the battery life.
   c) From **Pitch Boat Code/Channel Code**, select a channel for pitch data.
   d) From **Pitch Telegram**, choose between:

- **Telegram D6**: sends data every 3 to 4 sec.
- **Telegram AN**: sends data every 3 to 6 sec.

4. You can deactivate pitch and roll data to save battery life:

   a) From Mosa, click **Menu** > **Expert Mode** and enter the password `copernic`.
   b) To deactivate the roll: from **Pitch and Roll or Roll Activation**, select **No**.
   c) To deactivate the pitch: from **Pitch Activation**, select **No**.

Configuring Spread Sensor Positioning Settings

You need to configure the settings of the signal sending positioning data.

About this task

The signal sending positioning data is called a chirp signal. It allows to calculate the bearing.

Default chirp settings are already set, change them only if necessary.

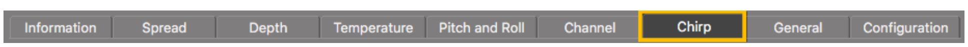
Note: Only Master and Starboard sensors can send positioning data.

Important: Master and Starboard Spread sensors must have the same chirp settings.

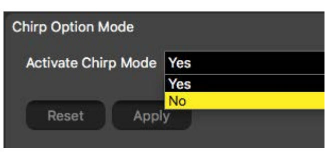
Important: If you have other NBTE sensors (Trawl Explorer, Catch Explorer, Bottom Explorer...) we recommend to allow enough distance (min. 200 Hz) between their frequencies and the chirp bandwidth.

Procedure

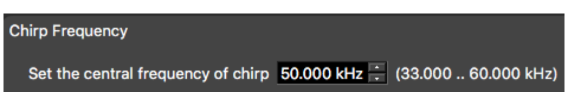
1. Click the tab **Chirp**.



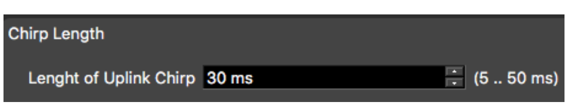
2. If you use a Clump sensor with FIRM173, you need to deactivate the chirp signal from this sensor: from **Activate Chirp Mode**, select **No**.



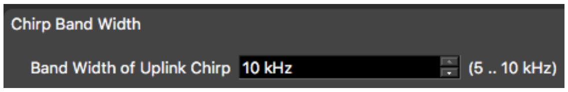
3. For Master and Starboard sensors, from **Chirp Frequency**, enter the center frequency of the signal sent by the sensor.



4. From **Chirp Length**, enter the length (milliseconds) of the signal sent by the sensor.



5. From **Chirp Bandwidth**, enter a frequency bandwidth of the signal sent by the sensor. We do not recommend to enter a frequency bandwidth lower than 10.



For example, if the center frequency is 50 kHz and the bandwidth is 10 kHz, the signal will cover the frequency 45 kHz to 55 kHz.

6. Click **Apply** and make sure there is a green check mark ✓.

Configuring the Spread Sounding Channel

For XL bottles produced before S/N 3636606 (see sticker on the end cap), you need to configure correctly the up and down channels.

Before you begin

The sensor is connected to Mosa.

About this task

Important: Only do this task if:

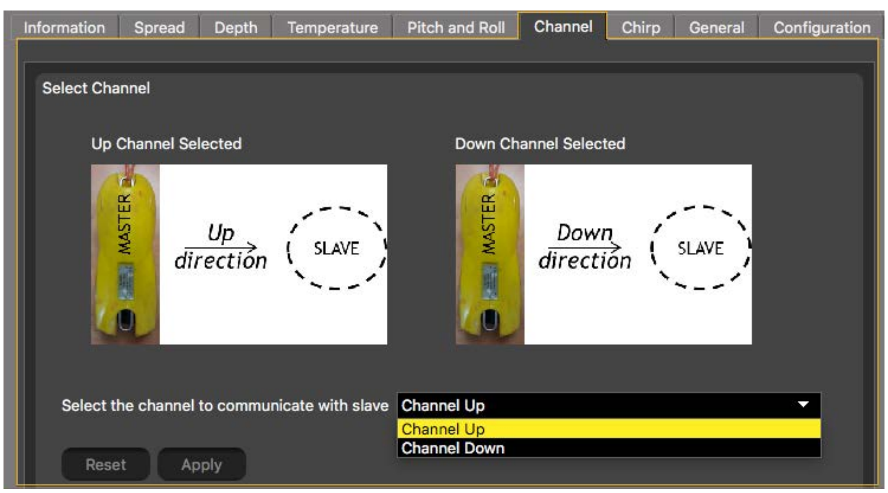
- You have XL bottles produced before S/N 3636606 with V2 firmware

For other bottles, leave default settings.

Sensors communicate with each other with the down sounder on the transducer. On XL bottles produced before S/N 3636606, the down sounder is connected to the up A1 connector. To correctly receive spread data, you need to configure the channels on Mosa when these bottles have V2 firmware.

Procedure

1. Click the tab **Channel**.
2. For a Master, Starboard and Clump sensor, from **Select Channel**, select **Channel Up**.



3. Click **Apply** and make sure there is a green check mark ✓.

Calibrating the Pitch and Roll

You need to calibrate the pitch and roll of the sensors when they are placed in the sensor pockets.

Before you begin

Some trawl door manufacturers measure the pitch and roll offsets themselves and write it on the doors. Check on trawl doors.

About this task

The sensor pocket is usually welded to the door at a 15 to 20 degree vertical angle. This means that when trawl doors are vertical, the sensors will already have a pitch angle and maybe a roll angle. You need to calculate these angles and offset them in order to have 0° of pitch and roll when doors are vertical.

If you do not know the pitch and roll offsets, doors need to be taken out and placed on the ground in order to calibrate the pitch and roll.

Procedure

1. If you already know the pitch and roll offsets, go straight to step 4.
2. Prepare the doors:
   a) Remove all rigging, shackles and attachment points from the doors.
   b) Remove the net gear attached to the door.
   c) Using a crane or forklift, place the door on a flat surface, such as a dock or similar location.
   d) Using the necessary rigging, hang doors with angles as close to 0 degree as possible on the vertical and horizontal plane. Use a carpenter level to help you.


3. Insert the sensor in the pockets on the doors.
4. Open Mosa software.
5. Activate and deactivate the water-switch to connect the sensor to Mosa via a wireless signal.

   ⚠ **Troubleshooting:** If you have difficulty to connect the sensor to Mosa via Bluetooth, use Mosa from a tablet computer to get as close as possible to the sensor. Otherwise, remove the sensor from the door, establish the connection, then put the sensor back in the door. To extend the range of the wireless signal, you can use a key (ref. TRENDnet TBW-106UB) with a USB range extender connected to the computer. Place the key as close as possible to the sensor.
6. Click the tab **Pitch and Roll**.

7. Click **Pitch and Roll Calibration**, then:

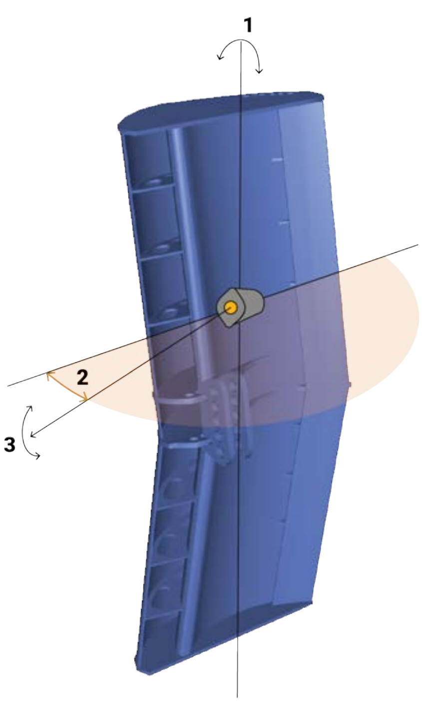
   a) If you already know the pitch and roll offsets, select **Manual**, then manually enter the pitch and roll offsets.

   b) If you do not know the pitch and roll offsets, click **Auto Calibrate**. Pitch and roll offset values change according to the position of the sensor on the door.

8. Click **Save**.
9. From **Opening Angle**, enter the angle between the door and the sensor (horizontal plane) in degrees. If you do not know the angle, ask the manufacturer for the angle of attack. If you cannot know the angle, you can put 35° but be aware that a wrong angle impacts pitch and roll measurements.



1. Roll
2. Opening angle: 25-40°
3. Pitch

10. Click **Apply** and make sure there is a green check mark ✓.

Slant Range Specific Settings

You need to set these settings for Slant Range sensors.

Configuring Sounding Frequencies

You need to configure sounding settings for both Slant Range sensors.

Before you begin

The sensor is connected to Mosa.

Procedure

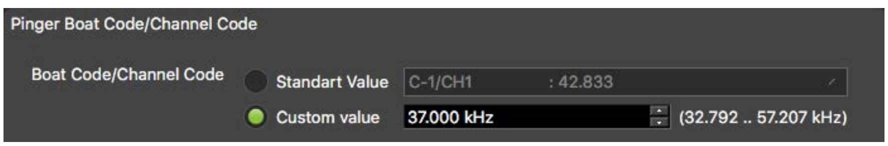
1. Click the tab **Pinger**.

2. From **Ping Down Frequency Pinger**, enter a frequency for the transmitting hydrophone signal.

We recommend:

- Bottom trawling: 34,000 kHz
- Mid-water trawling: 56,000 kHz

3. From **Pinger Boat/Channel Code**, enter a frequency for the signal answering to the hydrophone.



4. From **Pinger Delay for Response**, enter a different delay for each sensor: we recommend 500 ms for port Slant Range and 600 ms for starboard Slant Range.

Note: This delay is the delay of response to the hydrophone. It corresponds to the time between when the sensor receives the signal and when the sensor sends the response signal to the hydrophone.

The second sensor must have a delay of minimum 100 ms more than the first sensor. This is to make sure positioning data from each sensor is differentiated when received by the hydrophone. Without a different delay, they are not recognized.

5. Click **Apply** and make sure there is a green check mark ✓.

Configuring Slant Range Positioning Settings

You need to configure the settings of the signal sending positioning data.

About this task

The signal sending positioning data is called a chirp signal. It allows to calculate the bearing. Default chirp settings are already set, change them only if necessary.

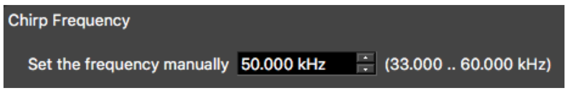
Important: Chirp settings need to be the same for both sensors.

Important: If you have other NBTE sensors (Trawl Explorer, Catch Explorer, Bottom Explorer...) make sure to allow enough distance (min. 200 Hz) between their frequencies and the chirp bandwidth.

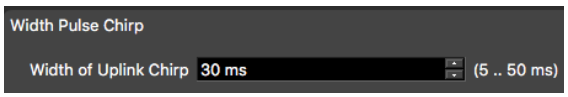
Procedure

1. Click the tab **Chirp**.

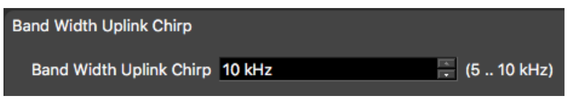
2. From **Chirp Frequency**, enter the center frequency of the signal sent by the sensor.



3. From **Width Pulse Chirp**, enter the length (milliseconds) of the signal sent by the sensor.



4. From **Band Width Uplink Chirp**, enter a frequency bandwidth of the signal sent by the sensor. We do not recommend to enter a frequency bandwidth lower than 10.



   For example, if the center frequency is 50 kHz and the bandwidth is 10 kHz, the signal will cover the frequency 45 kHz to 55 kHz.

5. Click **Apply** and make sure there is a green check mark ✓.

Configuring the Uplink Power

You can increase the uplink power of the sensor to increase the power of the signal transmitted. It is useful if you have interferences or if the sensor is far from the vessel.

Before you begin

The sensor is connected to Mosa.

Procedure

1. From Mosa, click the tab **General**.

2. From **Uplink Power Adjustment Level**, choose the uplink power (percentage is for Mosa 01.02.00 version and later):

Sensor	Recommended Uplink Powers	Conditions	Battery Life
Spread Sensor	1800 / 43%	Works for most conditions.	approx. 11 days (5.5 days for a Mini Spread Sensor)*
	4095 / 100%	• Sensor is far from vessel (e.g. more than 800 m depending on conditions, high depth) • High level of interferences • Issues receiving data • Low SNR	approx. 4 days (2 days for a Mini Spread Sensor)
Slant Range	2000 / 48%	Works for most conditions.	• XL bottle: approx. 76h • Small bottle: approx. 38h
	4095 / 100%	• Sensor is far from vessel (e.g. more than 800 m depending on conditions, high depth) • High level of interferences • Issues receiving data • Low SNR	The more you increase the uplink power, the shorter the battery life becomes.

*Spread Starboard sensor usually has a longer battery life than a Master sensor (1-2 additional days).

Note: The average battery life also depends on the uplink frequency, sounding range and options activated.

Testing Measures

You can test the measures taken by the sensor (e.g. battery level, temperature, depth) to check that there are no faults.

Before you begin

The sensor is connected to Mosa.

Procedure

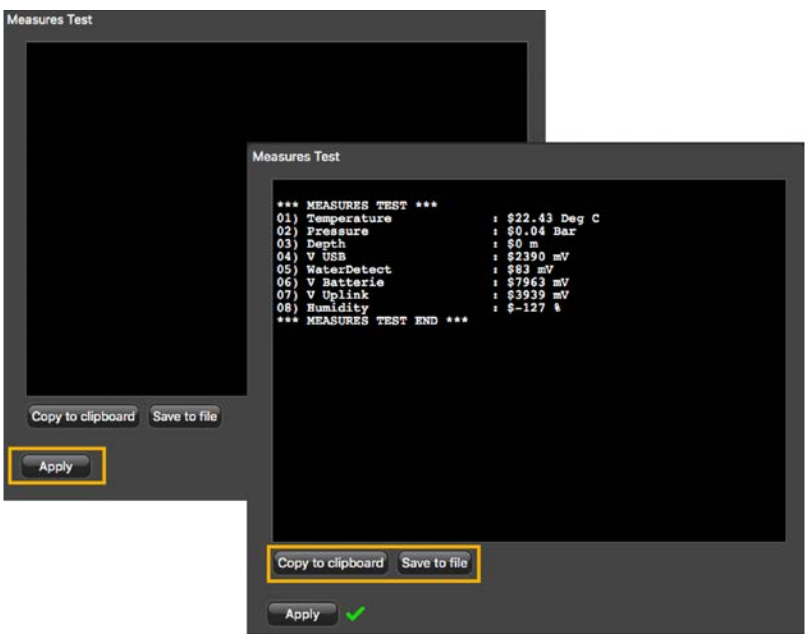
1. From Mosa, click **Menu** > **Expert Mode** and enter the password `copernic`.
2. Click the tab **General**.

3. From **Measures Test**, click **Apply**.

   The measures taken by the sensor are displayed.
4. Check the following measures:
   - The temperature is consistent with the sensor environment.
   - The depth is between 0 and 2m.
   - The battery is between 6.9V and 8.1V.

   Troubleshooting: If depth is incorrect, you can put an offset from **Depth** > **Depth Offset**.

   The other measures are only useful for the support service.
5. To save the test on your computer:



   - Click **Save to file** to download the file.
   - Or, click **Copy to clipboard** then press **Cmd + V** on a word processor like Pages to paste the contents.

Exporting Configuration Settings for Record Keeping

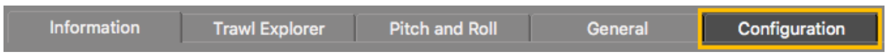
You can export in a *.txt file all the settings configured for the sensor (such as ping length, frequency, range, TVG...).

Before you begin

- You have finished configuring the sensor.
- The sensor is connected to Mosa.

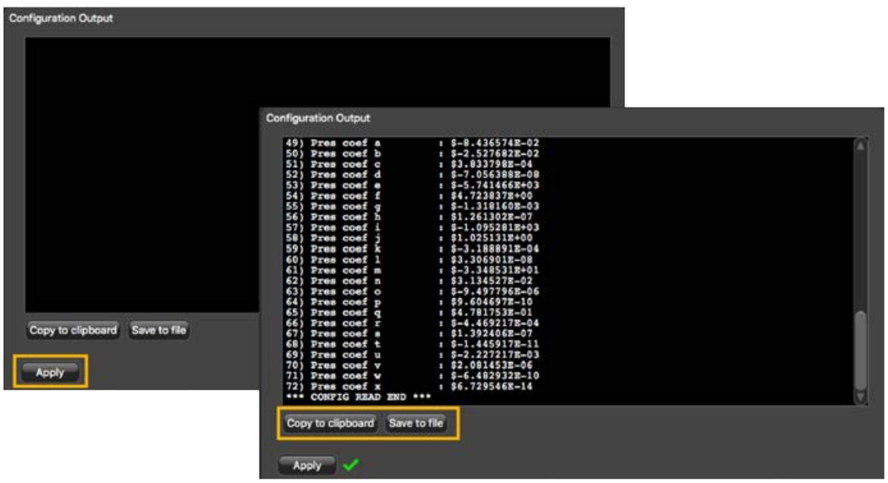
Procedure

1. Click the tab **Configuration**.



2. Click **Configuration Output**.
3. Click **Apply** under the black area.

   The settings are displayed.
4. To save the settings:



   - Click **Save to file** to download the file on the computer.
   - Or, click **Copy to clipboard**, then press **Cmd + V** on a word processor like Pages to paste the contents.

Exporting Sensor Configuration for Receiver

You can export the sensor settings you configured on Mosa on an XML file. You can afterward use this file when adding the sensor to a receiver.

Before you begin

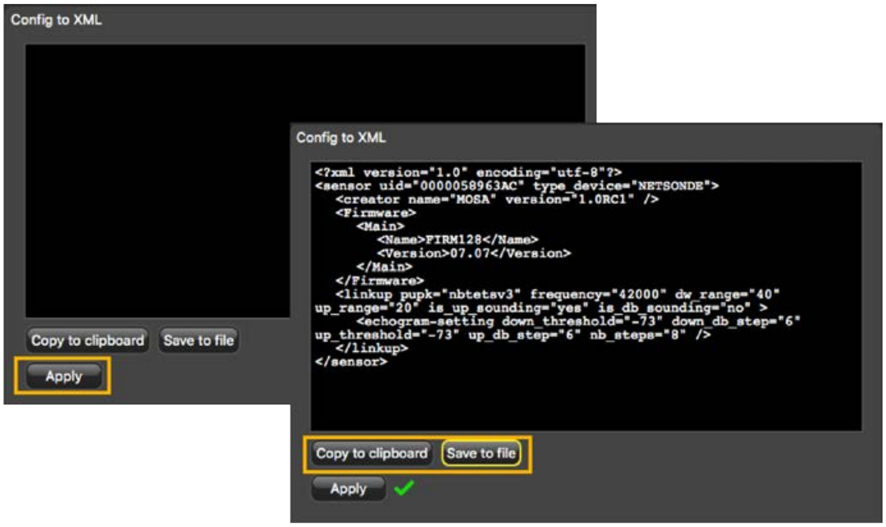
- You have finished configuring the sensor.
- The sensor is connected to Mosa.

Procedure

1. Click the tab **Configuration**.

2. Click **Config to XML**.
3. Click **Apply** under the black area.

   The settings are displayed.
4. To save the settings:



   - Click **Save to file** to download an XML file on the computer.
   - Or, click **Copy to clipboard**, then press **Cmd + V** on a word processor like Pages to paste the contents.
5. Change the name of the XML file saved on your computer.

   Note: When you export the sensor settings, the XML file always has the same name. Changing its name will prevent you from overwriting it the next time you download sensor settings.

What to do next

See Adding the Sensor with a Configuration File on page 44 to know how to add the sensor to a receiver with this file.

System Configuration and Display

Learn how to configure the receiver to be able to receive and display door sensor data.

Note: This guide refers to the following versions of **Scala: 01.06.06-01.06.25**. If you use another version, the visual interface and options may vary.

Configuring the Hydrophones

You need to configure the hydrophones to correctly receive signals from the sensors.

Before you begin

Important: The two receiving hydrophones must have a minimum distance of **1 meter** between each other.

Important: You need to remove the 50kHz notch filter on the wideband preamplifiers.

Important: On **M4 systems**, receiving hydrophones must be both connected to a hydrophone input between H1, H2 and H3 or both between H4, H5 and H6. The transmitting hydrophone for a Slant Range must be connected to a different set of hydrophone inputs than the receiving hydrophones (for example, if the receiving hydrophones are connected to H1 and H2, the transmitting hydrophone must be connected to a hydrophone input between H4, H5 and H6).

Tip: To help you remembering the configuration, always begin to configure the port hydrophone, then the starboard hydrophone. This way, you could note that values associated with port side are usually smaller than those of the starboard side (hydrophone number, node numbers...).

Procedure

1. From Scala, click **Menu** > **Expert Mode** and enter the password `copernic`.
2. Click **Menu** > **Receivers**.
3. From the left side of the page, click **Hydrophones**.
4. Add the two receiving hydrophones.
5. For the receiving hydrophones:
   a) From **Rx/Tx** select **Receive**.
   b) From **Location**, select the port and starboard hydrophone. It is important to know which one is port and which one is starboard.

      Note: If you do not select the location, you will not be able to configure positioning settings.
6. If you have Slant Range sensors:
   a) Add a third hydrophone. This hydrophone is passive. It receives a digital signal from the receiver, then transmits an acoustic signal to the sensors.
   b) From **Rx/Tx**, select **Transmit**.

      Note: The voltage emitted by the receiver on the hydrophone is approx. 140 Volt RMS (depending on ping frequency).

Figure 6: Hydrophone configuration for Spread sensors

Figure 7: Hydrophone configuration for Slant Range sensors

Adding Sensors to the Receiver

You need to add the sensors to the receiver in order to display their data on Scala.

<table>
<tr><th>Firmware</th><th>Mx Receiver version</th><th>Scala version</th></tr>
<tr><td>Spread Sensor</td><td>• M3 05.01.00 or later
• M4 04.02.26 or later
• M6 05.01.00 or later</td><td rowspan="2">01.02.06 or later</td></tr>
<tr><td>Slant Range</td><td>• M3 05.01.00 or later
• M4 04.02.23 or later
• M6 05.01.00 or later</td></tr>
</table>

Adding the Sensor with a Configuration File

You can add the sensor to the receiver with a configuration file that contains the sensor settings you configured on Mosa.

Before you begin

- You have exported an XML file containing the sensor settings (See Exporting Sensor Configuration for Receiver on page 41).

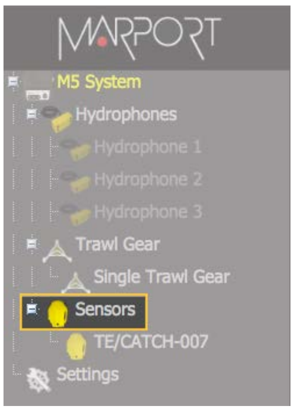
Important: You need to have **Firefox version 22 to 51**.

Procedure

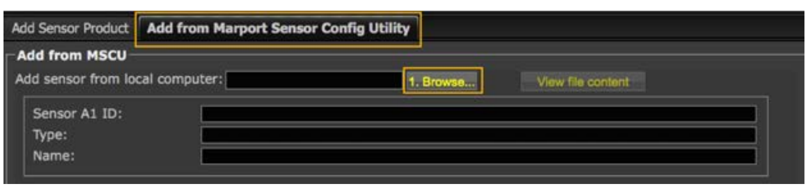
1. Enter your receiver IP address in Firefox web browser to access the system control panel web page.

   Note: Default IP addresses are: 192.168.10.177 for M3 and M6 receivers, 192.168.1.170 for M4 receiver. Add the address as a bookmark in Firefox to easily connect to it.

2. From the left side of the page, click **Sensors**.



3. Click the tab **Add from Marport Sensor Config Utility**.
4. Click **Browse** and select the XML file.



   Information about the sensor is displayed.

5. Select a node from the list on the left. Nodes in green are already used.

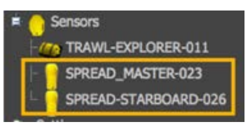
   Note: For Slant Range sensors, choose 22 for port and 25 for starboard sensor.

   Note: For Spread sensors, choose:

   - Master: 23
   - Starboard: 26 (single trawl), 123 (twin trawls)
   - Clump: 26

6. Click **Add Sensor**.

   The sensor is added to the system, with all its settings.



Results

You can see incoming data from the control panels, in **Sensors Data**.

What to do next

- If you want to apply filters on data received by the sensor, see Configuring Sensor Settings on page 48.
- You can now configure the display of incoming data in Scala.

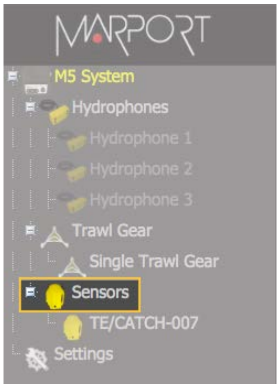
Adding the Sensor Manually

You can add the sensor to the receiver from Scala, by entering the same settings as the ones in Mosa.

Adding Sensors to the Receiver

1. From Scala, click **Menu** > **Expert Mode** and enter the password `copernic`.

2. Click menu again, then **Receivers**.
3. From the left side of the receiver page, click **Sensors**.



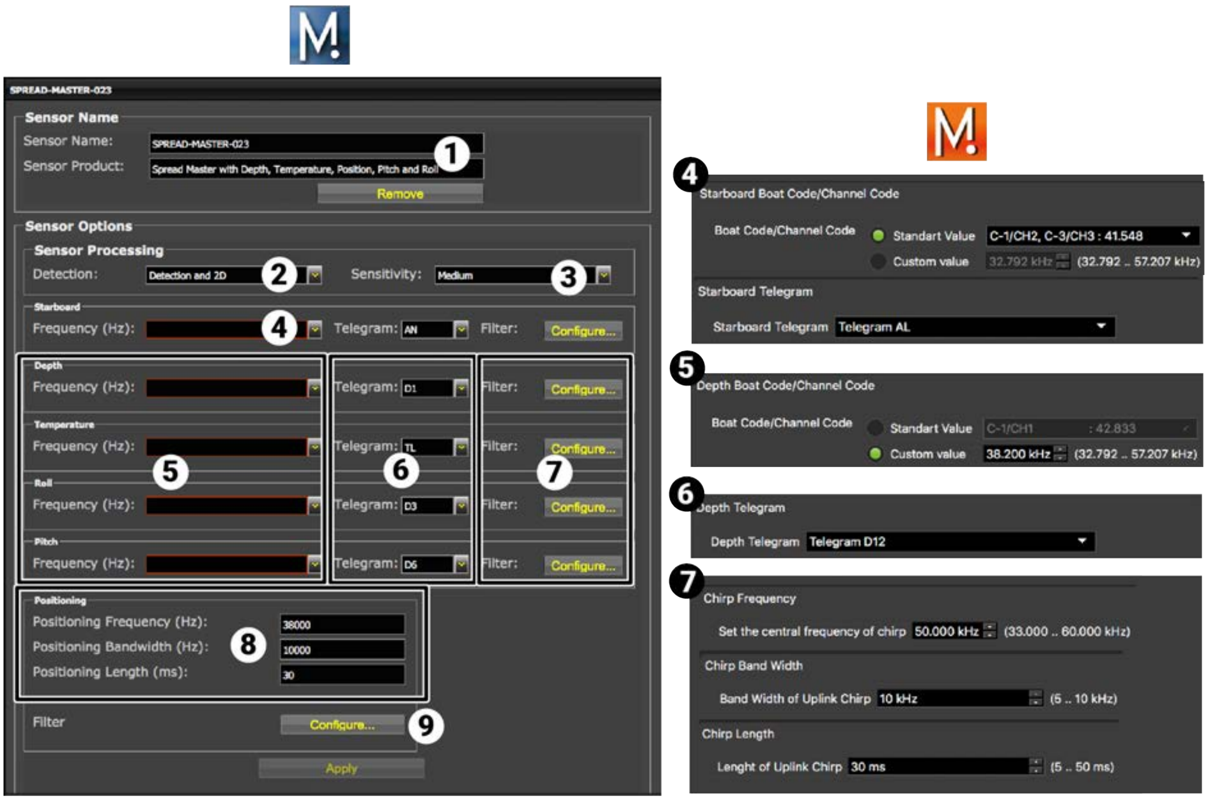
4. From the page **Add Sensor Product** select the options according to your type of sensor:

Type of sensor	**Product Category**	**Product Name**	**Trawl Gear Location**
Spread Sensor	Spread Master	Spread Master with Depth, Temperature, Position, Pitch and Roll	23
	Spread Starboard	Spread Starboard with Depth, Temperature, Position, Pitch and Roll	• Single trawl : 26 • Twin trawl: 123
	Spread Clump	Spread Starboard with Depth, Temperature, Position, Pitch and Roll	26
Slant Range	Slant Range	Slant Range	• Single trawl: 22 and 25 • Twin trawl: 22 and 122

Configuring Sensor Settings

Important: Make sure the settings you enter here are the same as in Mosa.

Spread Sensors

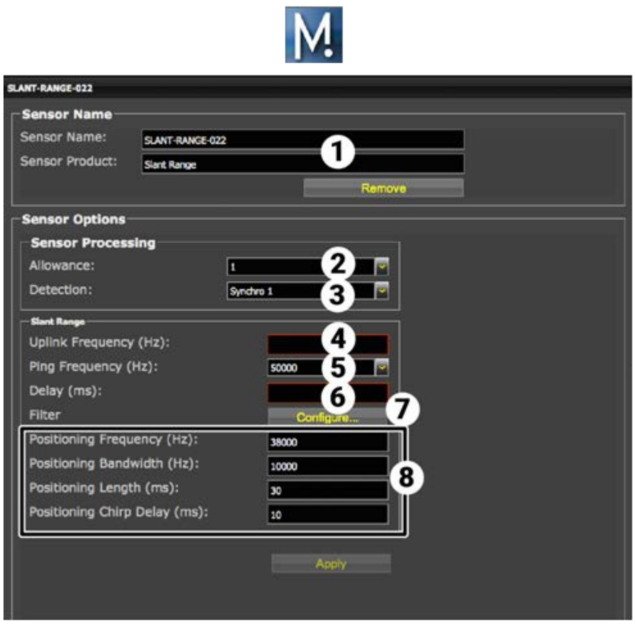


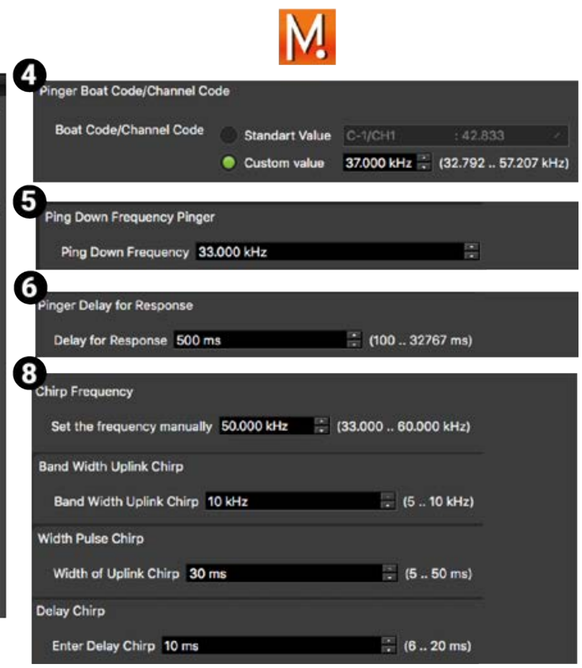
1	Sensor name displayed in Scala and its features.
2	This setting helps detecting the signal of the sensor among other sensor or echosounder signals. Change only if you have issues receiving data. • **Detection and 2D**: default value. This setting helps distinguishing the sensor signals when there are a lot of interferences (e.g. echosounders). It selects the correct signals according to very selective criteria. • **Detection**: If you do not receive data, it may be because the Detection and 2D setting is too selective with the signal. Detection is less selective and allows more signals to be received. • **Detection for Seiner**: no need for this sensor
3	• **Low**: if the signal of the sensor is high = the trawl is close to the vessel (SNR min. 18dB). • **Medium**: Default setting. Compromise between the two other settings (SNR min. 12dB). • **High**: if the signal of the sensor is low = the trawl is far from the vessel (SNR min. 6dB).
4	Master and clump sensors only: enter the same frequencies and telegrams as those entered in Mosa.
5	Enter the same frequencies as those entered in Mosa for each option.

6	Enter the same telegrams as those entered in Mosa for each option.
7	Click **Configure** to change filters applied on incoming data.
8	Enter the positioning parameters you entered in Mosa for **Chirp**.
9	Click **Configure** to change filters applied on positioning data.

Click **Apply** when you have finished.

Slant Range Sensors





1	Sensor name displayed in Scala and its features.
2	This setting helps detecting the signal of the sensor among other sensor or echosounder signals. Change default setting only if you have issues receiving data. • 0-2: select only if no interferences on the vessel (not recommended). • 3-4: default setting. • 5-6: select if you have issues receiving data. It allows you to receive more data, but be aware they might be wrong data.
3	This setting also helps detecting the sensor signal. Leave default setting at Synchro 1.
4	Enter the frequency you entered in Mosa in **Pinger Boat Code/Channel Code**.
5	Enter the frequency you entered in Mosa in **Ping Down Frequency**.
6	Enter the pinger delay you entered in Mosa in **Pinger Delay for Response**.
7	Click **Configure** to change filters applied on incoming data.
8	Enter the positioning parameters you entered in Mosa for **Chirp**.

Click **Apply** when you have finished.

Results

The sensor is added to the system. You should see incoming data from the control panels, in **Sensors Data**. You can now configure the display of incoming data in Scala.

Configuring the Positioning Settings

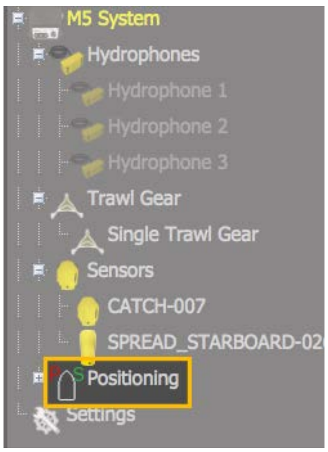
You need to configure the positioning settings on the receiver page.

Before you begin

You have added the sensors to the receiver.

Procedure

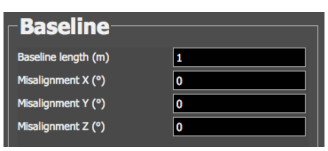
1. From the left side of the screen where the system is displayed, click **Positioning**.



The positioning configuration page appears.

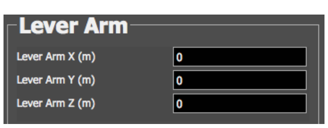
2. In the **Baseline** part, enter the baseline and misalignment measurements:

a) For the baseline, indicate the distance between the two receiving hydrophones.
b) You can complete the misalignment X and Z, for more accurate positioning. See Calculations for Positioning System on page 51. Otherwise, you can enter 0.
c) Enter 0 for the misalignment Y.



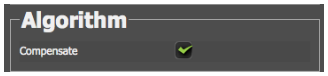
Note: Baseline is very important to have accurate positions of the doors.

3. In **Lever Arm** group, leave 0 in the fields.



4. In **Inputs** group, enter the port and starboard hydrophones, according to the hydrophone configuration.

5. In **Algorithm** group, select **Compensate** to take into account the misalignment.



6. Click **Apply**.

Calculations for Positioning System

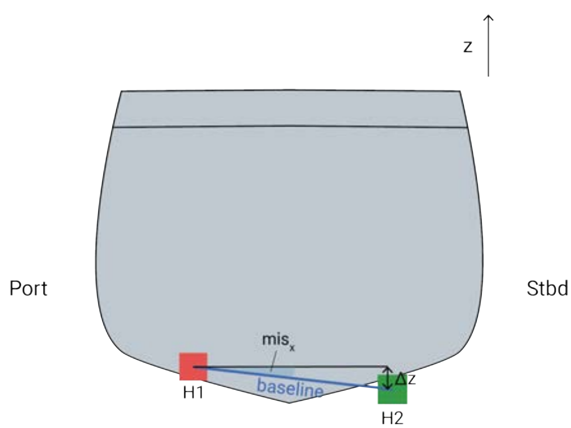
When configuring the positioning system on Scala receiver page, you should consider the position of the hydrophones. When they are misaligned, you can calculate their misalignment angles with the following calculations.

Note: Baseline length is the distance between two hydrophones. It must be in meters.

There are two misalignment angles that you should calculate. Misalignment Z is the more critical for correct positioning data. Make sure these calculations are correct if you enter them in Scala.

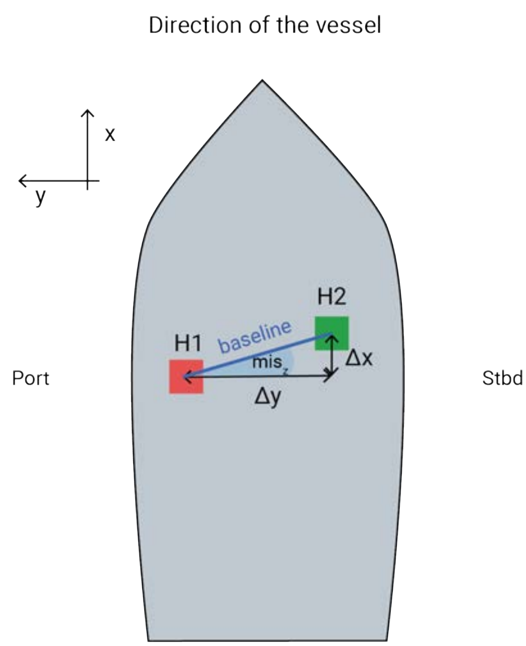
The drawings below show the misalignment angles and how to calculate them:

Misalignment X (angular offset around X axis)



$$mis_x = \arcsin\left(\frac{\Delta z}{BL}\right)$$

Misalignment Z (angular offset around Z axis)

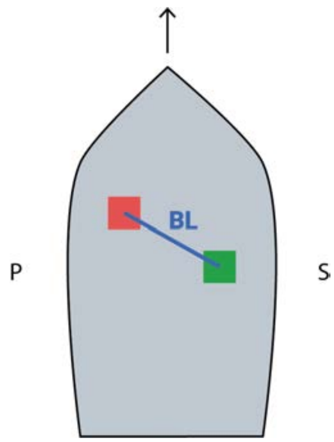


$$mis_z = \arctan\left(\frac{\Delta x}{\Delta y}\right)$$

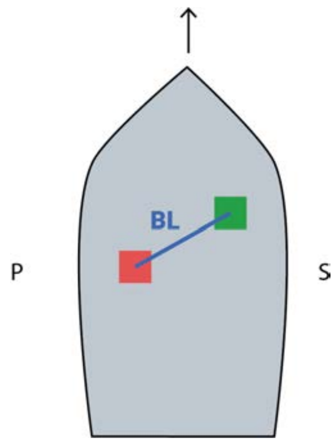
Sign of Angles

Once you have calculated X and Z misalignment angles from the above formulas, you need to add a positive or negative sign to the result. The sign depends on the offset of the hydrophones. Refer to the drawings below to know if you need to add a negative or positive sign to misalignment Z and X. The sign of the angles is important to receive correct positioning data.

Misalignment Z (view from above)

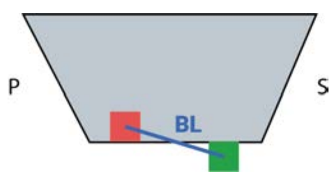


Negative sign (-)

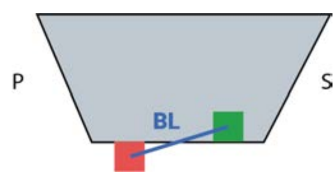


Positive sign (+)

Misalignment X (view from behind)



Negative sign (-)



Positive sign (+)

Adding Data from External Devices

You need to add to Scala: warp lengths (Spread sensors only), GPS coordinates and heading data received from devices such as winch control systems or GPS compass.

About this task

See Appendix B: Compatible NMEA Sentences from Winch Control Systems, GPS and Compass Devices on page 121 to know which NMEA sentences are compatible.

Note: Heading data is very important to have precise positioning of the trawl.

Note: Make sure you receive data from only one GPS device or the trawl will not be displayed correctly.

Note: Warp lengths can be received from a winch control system. If you do not have a winch control system, do not manually enter warp lengths. They will be calculated from the bearing, spread distance and depth data sent by the Spread sensors.

Procedure

1. Click **Menu** > **Settings**.
2. Under the **NMEA Inputs** tab, click **Add**.

3. Choose the type of connection between serial port, UDP server or TCP server.
   - For a serial port:

   a) In **Port**, select the incoming data you want to add.
   b) In **Baud**, choose the transmission speed (bit per second).
   c) Leave the other default parameters if you have no specific requirements.
   d) Select a different input format if you have Marelec or Rapp Marine/Rapp Hydema equipment. Otherwise, select **Standard NMEA format**.
   e) To broadcast the input data to other equipment than Scala, select **Output to UDP** and choose the target port and address.

   Tip: The address written by default enable to broadcast to all equipments.

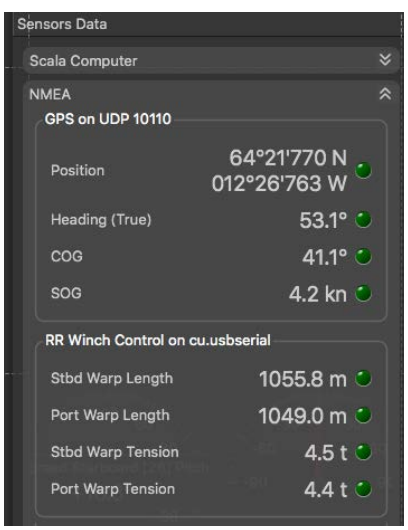
   - For a UDP server: enter the port.
   - For a TCP server:

   a) Enter the server and port.
   b) Select a different input format if you have Marelec or Rapp Marine/Rapp Hydema equipment. Otherwise, select **Standard NMEA format**.

4. Click **OK**.

Results

In the control panels, new data appears under **Sensors Data** > **NMEA**



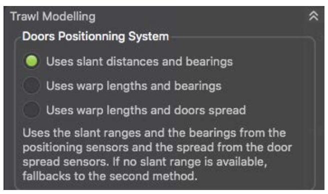
LEDs blink green when data is received (it may be steady green if data are received continuously). When communication with the NMEA devices is lost, LEDs do not blink anymore.

Configuring Trawl Settings

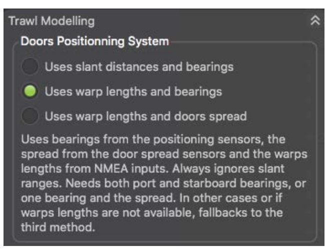
You need to configure trawl settings to display the trawl on the chart and vessel 3D overview.

Procedure

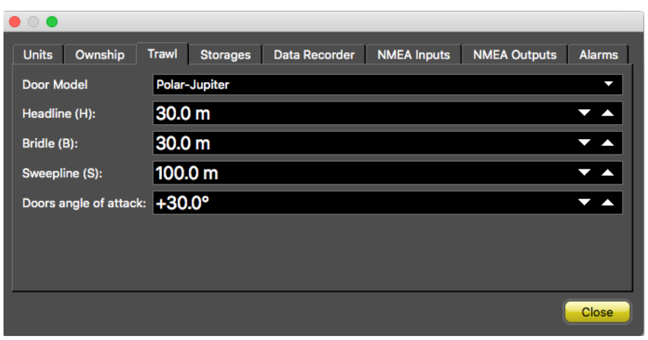
1. From the control panels, click **Data Processing** > **Trawl Modeling** and from **Doors Positioning System**, select:
   - For a Slant Range: **Uses slant distances and bearings**.



   - For a Spread Sensor: **Uses warp lengths and bearings**. Select even if you do not receive warp length data.



2. Click **Menu** > **Settings**.
3. From the tab **Trawl**, complete **Headline (H)**, **Bridle (B)** and **Sweepline (S)** with accurate measurements of your trawl gear.



Configuring Data Display on Scala

You can display on pages in Scala measurements taken by the sensors, such as the spread distance or the pitch and roll of the doors. You can also use the chart or 3D view to display the position of the trawl.

About this task

Sensor measurements are displayed in the control panels, under **Sensors Data**. Data title should be:

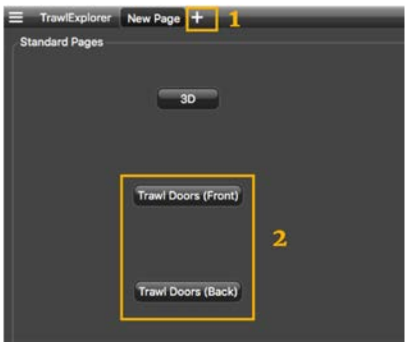
- **Spread Master** / **Spread Slave** / **Spread Clump** for Spread sensors.
- **Slant Range** for Slant Range sensors.

The title is followed by the node where the sensor was placed when added to the system.

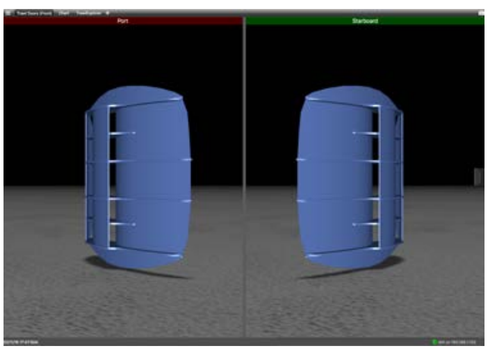
Spread Sensor: Displaying Door 3D View

Procedure

1. From the top left corner of the screen, click **Menu** > **Customize** and enter the password `eureka`.
2. From the top toolbar, click the add icon.
3. From Standard Pages, click **Trawl Doors (Front)** to see doors from vessel or **Trawl Doors (Back)** to see doors from trawl.

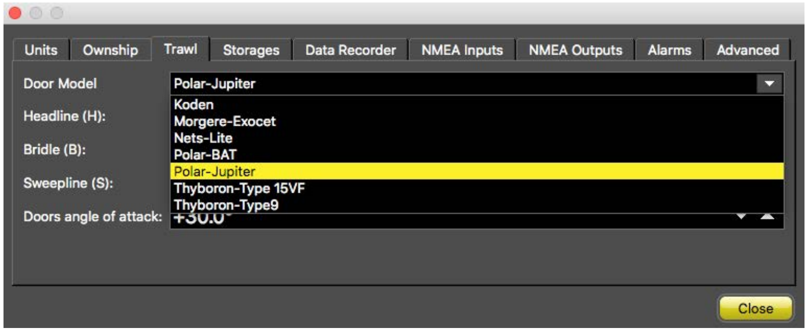


Port and starboard trawl doors are displayed.



4. To change the door model:

   a) From the top left corner, click **Menu** > **Settings**.
   b) Click the **Trawl** tab and select the door you want in **Door model**.

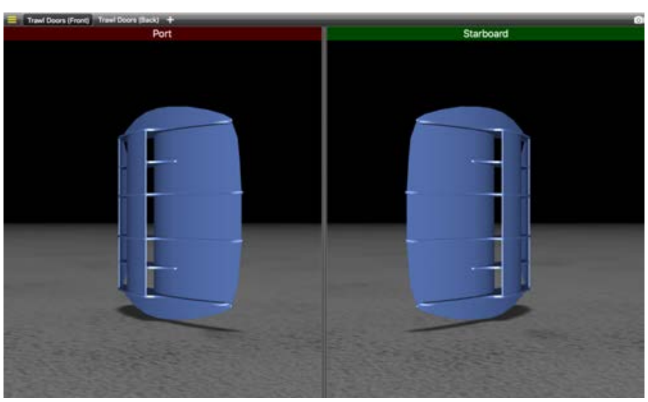


5. To change the door location and orientation, connect in **Customize** mode, then right-click the 3D view and select **Configure**.

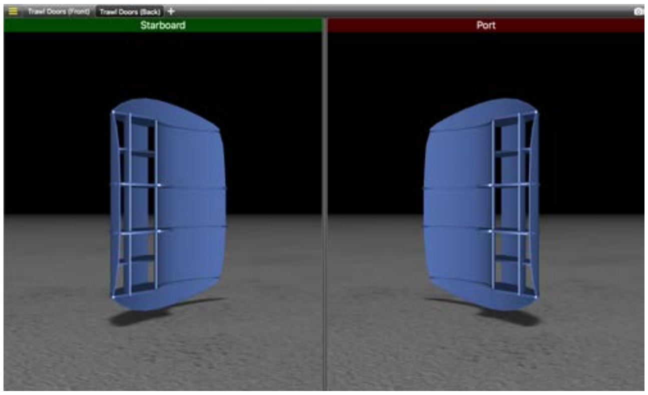
   a) Select which door (port or starboard) and from which trawl (port or starboard if you have two trawls) to display.

   b) Select a front or back view of the doors.

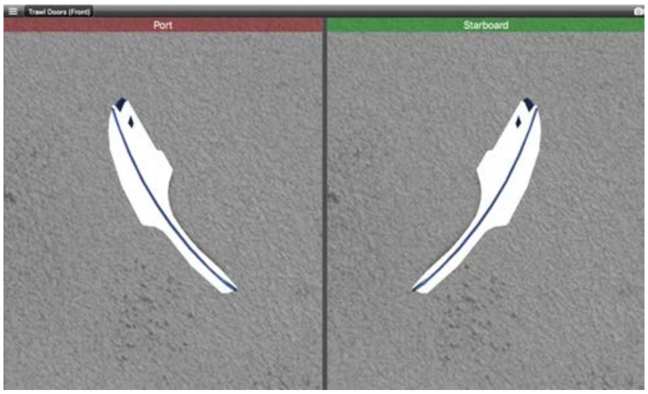
6. To change the view angle of the door, right-click the 3D view and choose:
   - Horizontal Camera to see the doors from the front:



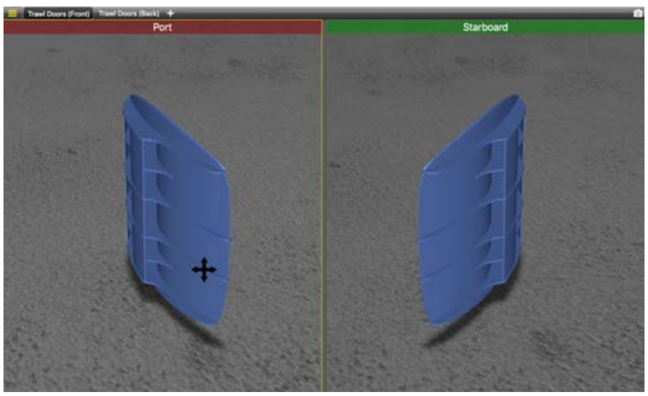
Or back:



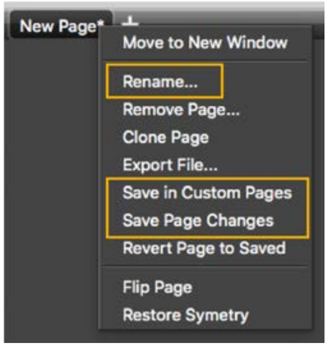
- Vertical Camera to see the doors from above.



- Free Camera to adjust the viewing angle yourself, by clicking and dragging the 3D doors.



7. To display or hide the ground, right-click the 3D view and select or not **Display Ground**. You should leave the ground displayed, in order to see if doors are touching it.
8. To save the changes you made:



1. To rename the page, right-click the name of the page and click **Rename**.
2. To save the page, right-click the name of the page and click **Save Page Changes**.
3. To have a backup of the page, right-click the name of the page and click **Save in Custom Pages**.

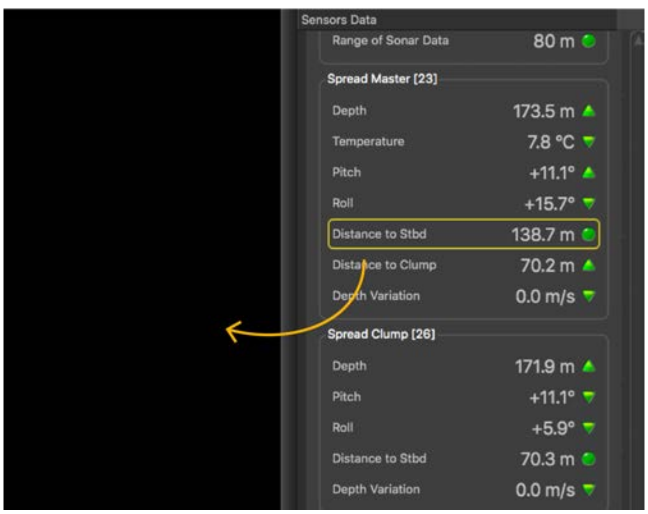
   Your page is saved in Scala's page backups.

9. When you have finished customizing pages, you need to deactivate the Customize mode: click **Menu** > **Customize** again.

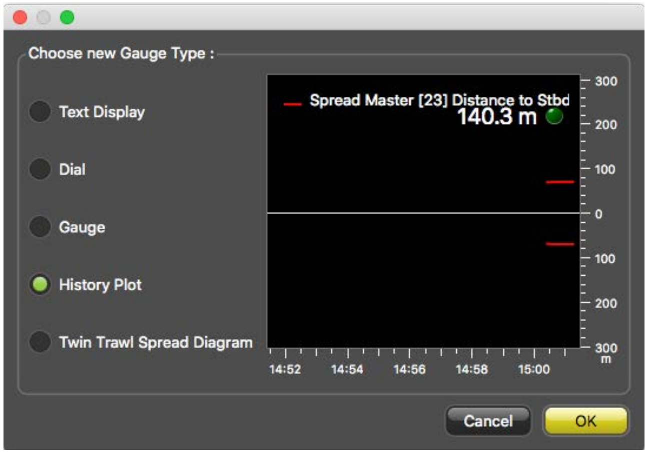
Spread Sensor: Displaying Single Trawl Spread

Procedure

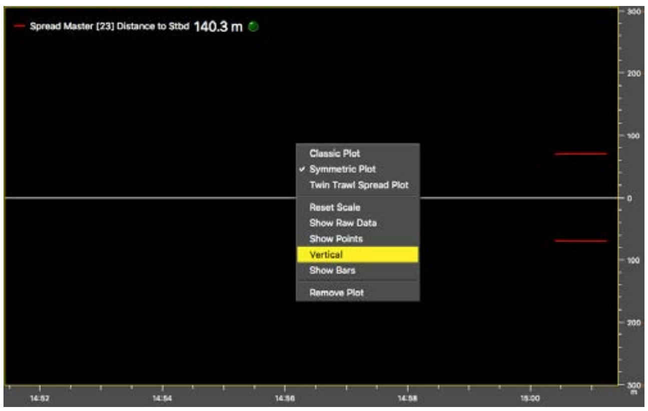
1. From the top left corner of the screen, click **Menu** > **Customize** and enter the password `eureka`.
2. In **Control Panels** > **Sensors Data**, click + hold distance data from spread sensors such as **Distance to Stb** from a **Spread Master** and drag it to the page display.



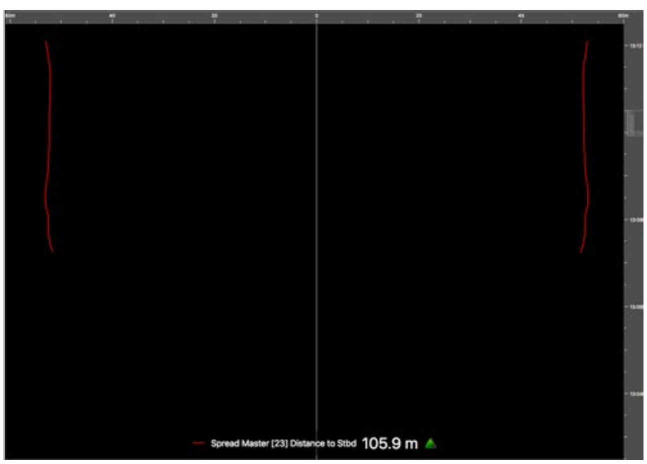
3. Under **Choose new Gauge Type**, select **History Plot**.



4. Right-click the history plot and select **Vertical**.



The history plot becomes vertical. You can see the distance between the port and starboard door.



What to do next

When you have finished customizing pages, you need to deactivate the Customize mode: click **Menu** > **Customize** again.

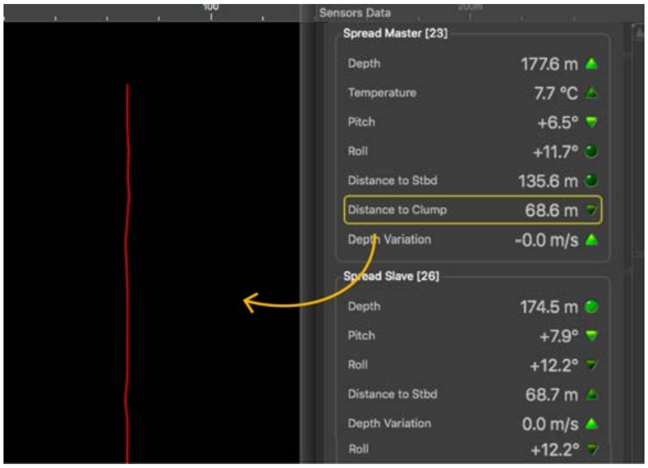
Spread Sensor: Displaying Twin Trawl Spread

Before you begin

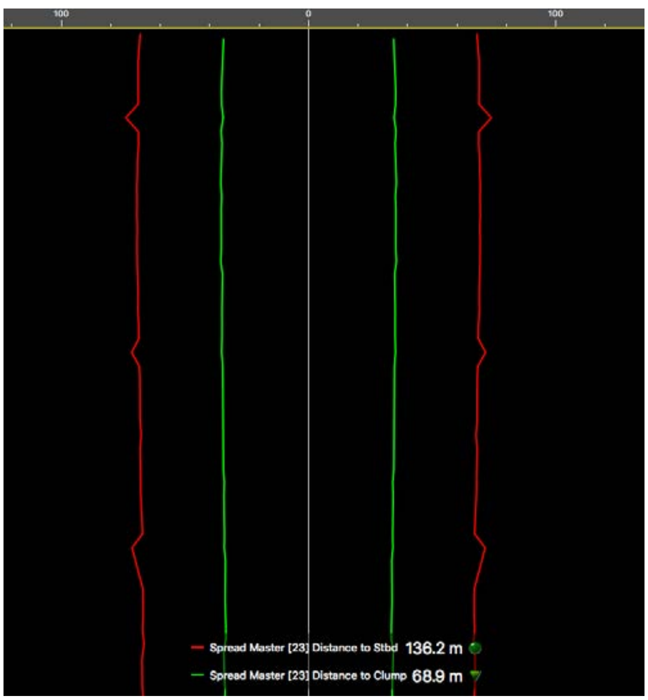
You need to have twin trawls and Spread sensors with dual or triple distance option.

Procedure

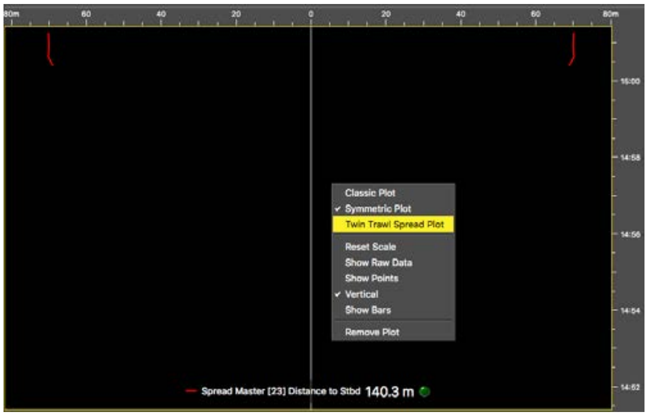
1. From the top left corner of the screen, click **Menu** > **Customize** and enter the password `eureka`.
2. If you have twin trawls with **2 measured distances**, drag Spread Master **Distance to Clump** on top of the **Distance to Stbd** plot.



Distances between the port door and starboard door and between the port door and clump are displayed.



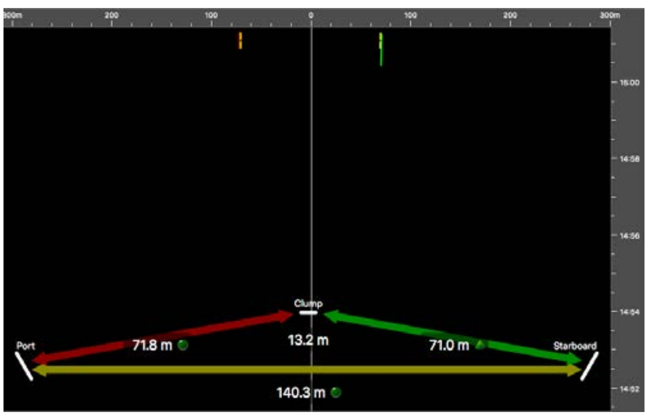
3. If you have twin trawls with **3 measured distances**, right-click the history plot and select **Twin Trawl Spread Plot**.



You now have an history plot and a diagram displaying the distance between:

- port door and starboard door,
- port door and clump,
- clump and starboard door.

You can know if the clump is centered when the yellow dashed line is above the red and green lines.



4. If you only want to display the diagram (3 measured distances only):
   a) In the lower part of the control panels, click **Customize**.
   b) Click + drag **Twin Trawl Spread Diagram** to the page.

c) Drop it in a yellow area.

The diagram appears.

What to do next

When you have finished customizing pages, you need to deactivate the Customize mode: click **Menu** ▤ > **Customize** again.

Displaying the Chart View

Before you begin

- You must be in **Customize** mode to do this task.

You must have:

- Incoming GPS data and heading data.
- Spread or Slant Range sensors with bearing measurement
- Warp lengths or Slant Range sensors giving distance to vessel

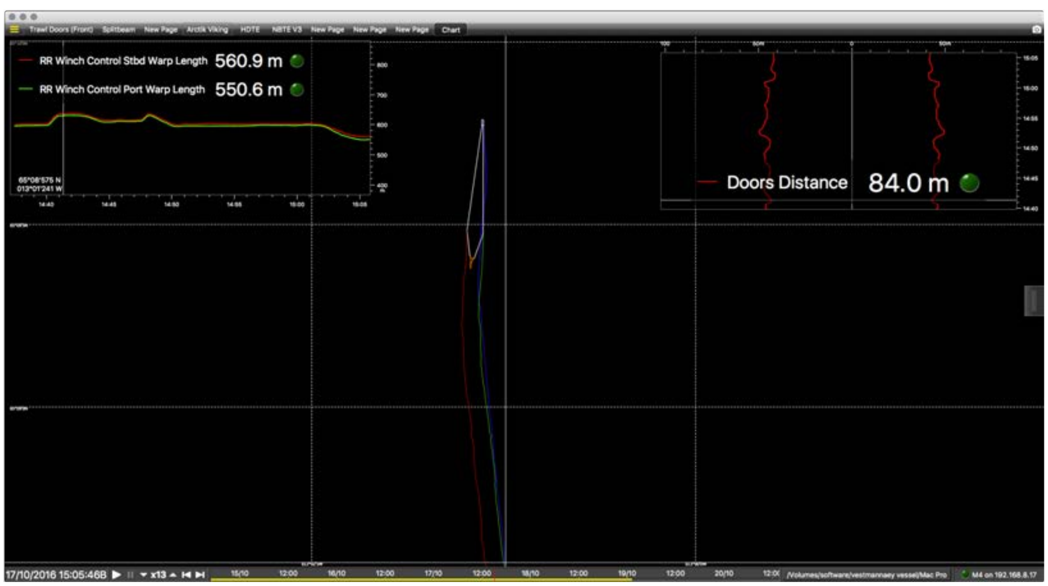
Procedure

1. From the lower part of the control panels, click **Customize**.

   The **Customize** panel appears.
2. Click + drag **Chart** to the page.

3. Drop it in a yellow area.

   The chart view is displayed. The blue trail is the heading of the vessel, red trail is the port door and green trail is the starboard door.



4. If the view looks empty it might be because the view is not centered on the vessel. Right-click the view and select **Center On**: **Ownship**, **Trawl** or **Doors**.

Displaying the Vessel 3D Overview

You can display a 3D overview of the vessel system if you have the Scala Full version. To know if you have the 3D enabled, check in **Menu** > **About Scala**.

Before you begin

You must be in **Customize** mode to do this task.

You need to have incoming data from:

- GPS (position, heading)
- Sensors with positioning
- Warp lengths or Slant Range sensors giving distance to vessel

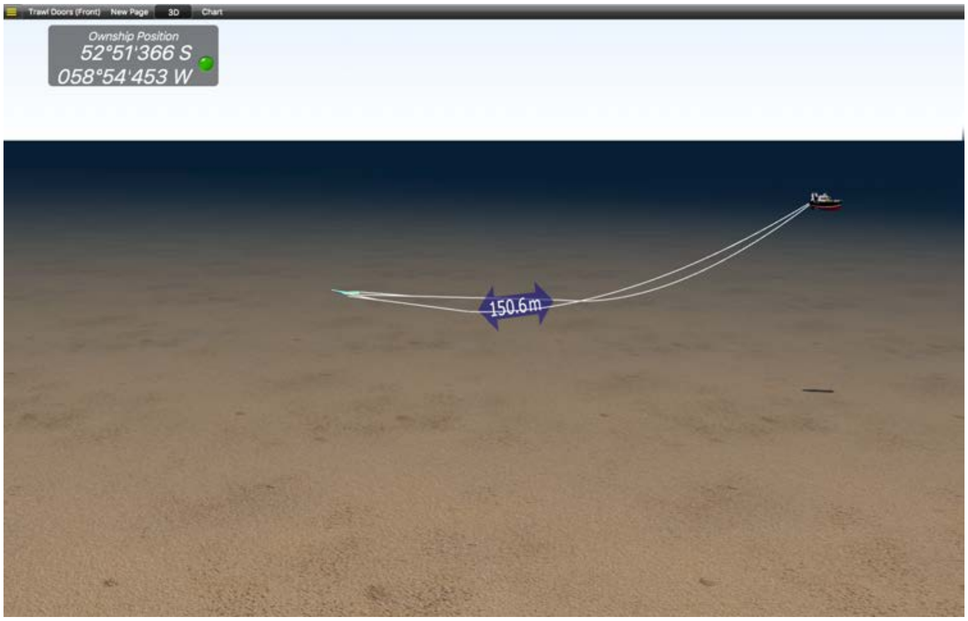
Procedure

1. From the lower part of the control panels, click **Customize**.

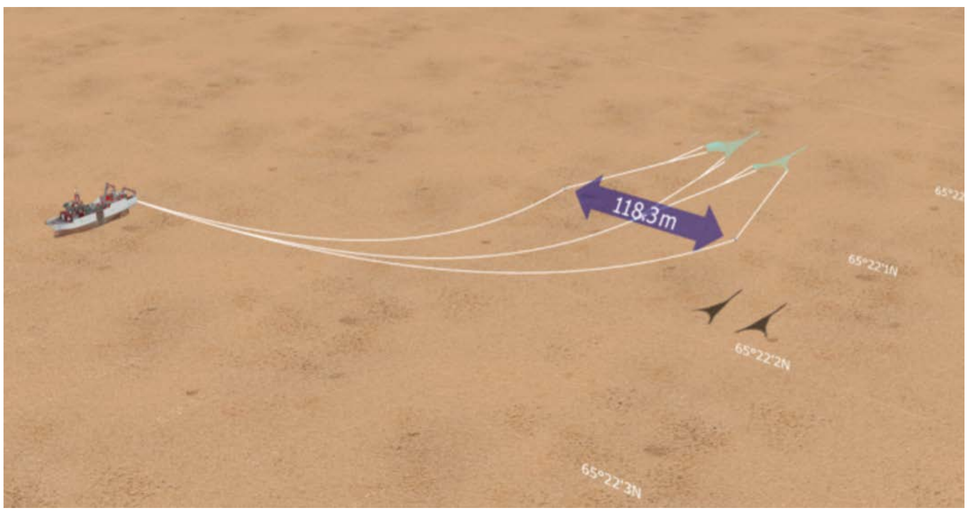
   The **Customize** panel appears.
2. Open the customization panel and go to the **Geographic** tab.
3. Click + drag the **3D Overview** to the page.

   A 3D view of the vessel and trawl is displayed.



If you have twin trawls, you can see it on the 3D view as well. Make sure you have configured twin trawls in the receiver settings.



4. To change the vessel 3D model, from the upper left corner of the screen click **Menu** > **Settings** and click the **Ownship** tab.
5. To change the view, you can use the numeric keypad: press 5 to see the vessel from above, press the digits around to make the vessel turn accordingly (2 being front view and 8 back view).
6. Or, right-click the 3D view and choose:
   - **Moves Camera with** to select which part of the system the camera follows.
   - **Reset Camera Position** to come back to the default view.
   - **Fix Camera on Ownship** so that the camera moves with the vessel.

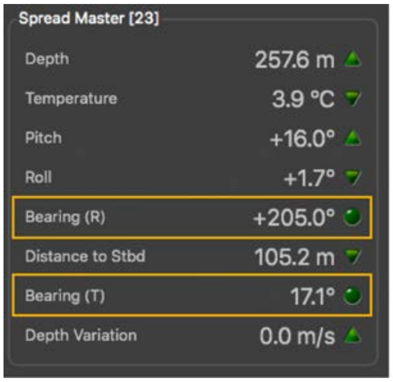
What to do next

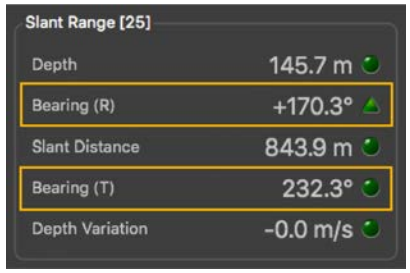
When you have finished customizing pages, you need to deactivate the Customize mode: click **Menu** > **Customize** again.

Bearing Angles

Procedure

Scala displays the relative (R) and true (T) bearing angles of the doors. Relative bearing angle is the angle of the doors relative to the heading of the vessel and true bearing angle is the angle of the doors relative to the true North. Use drag and drop to display them on a page.





Displaying Trawl Positioning from Scala on Olex

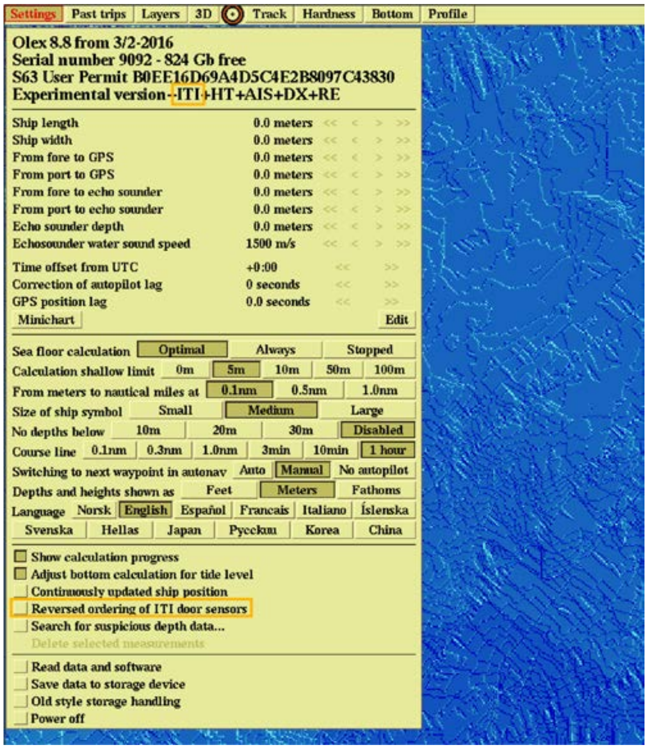
You can export trawl positioning data coming from Scala to Olex software.

Before you begin

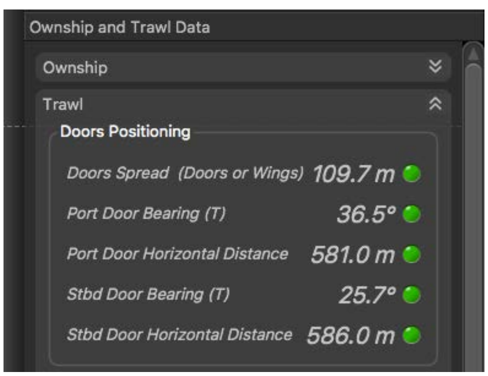
- Olex software version must be able to read **PSIMS** NMEA data.
- Olex software must have the ITI option (displays net position).
- You must have a GPS and door positioning sensors.

Procedure

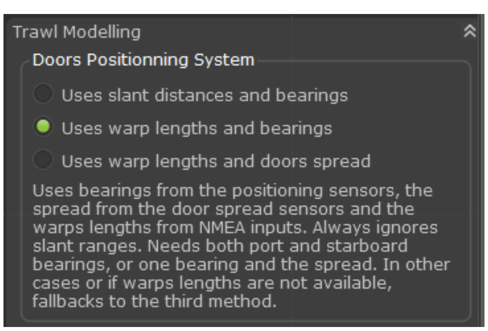
1. From Olex, click **Settings** and check:
   a) There is the **ITI** option. It allows the display of the trawl when positioning data from Scala is received.
   b) The option **Reversed ordering of ITI door sensors** is not selected.



2. On Scala, in **Control Panels** > **Ownship and Trawl Data** > **Trawl** check that you receive **Door Positioning** data.

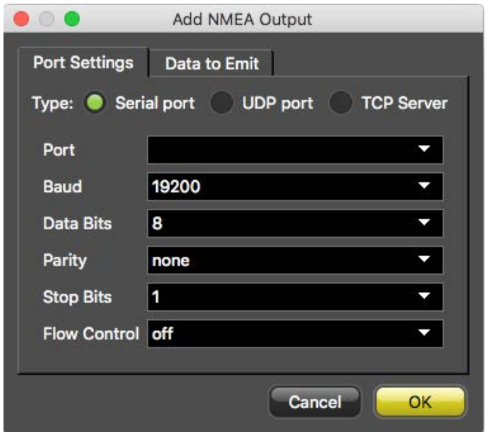


3. From **Control Panels** > **Data Processing** > **Trawl Modelling** > **Door Positioning System**, select **Uses slant distances and bearings** if using a Slant Range sensor or **Uses warp lengths and bearings** if using a Spread sensor.

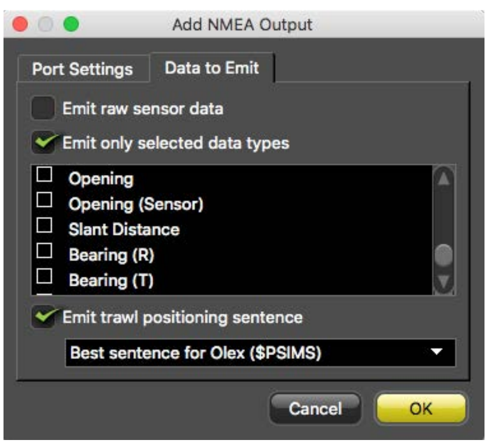


4. Connect a GPS to Scala and Olex.

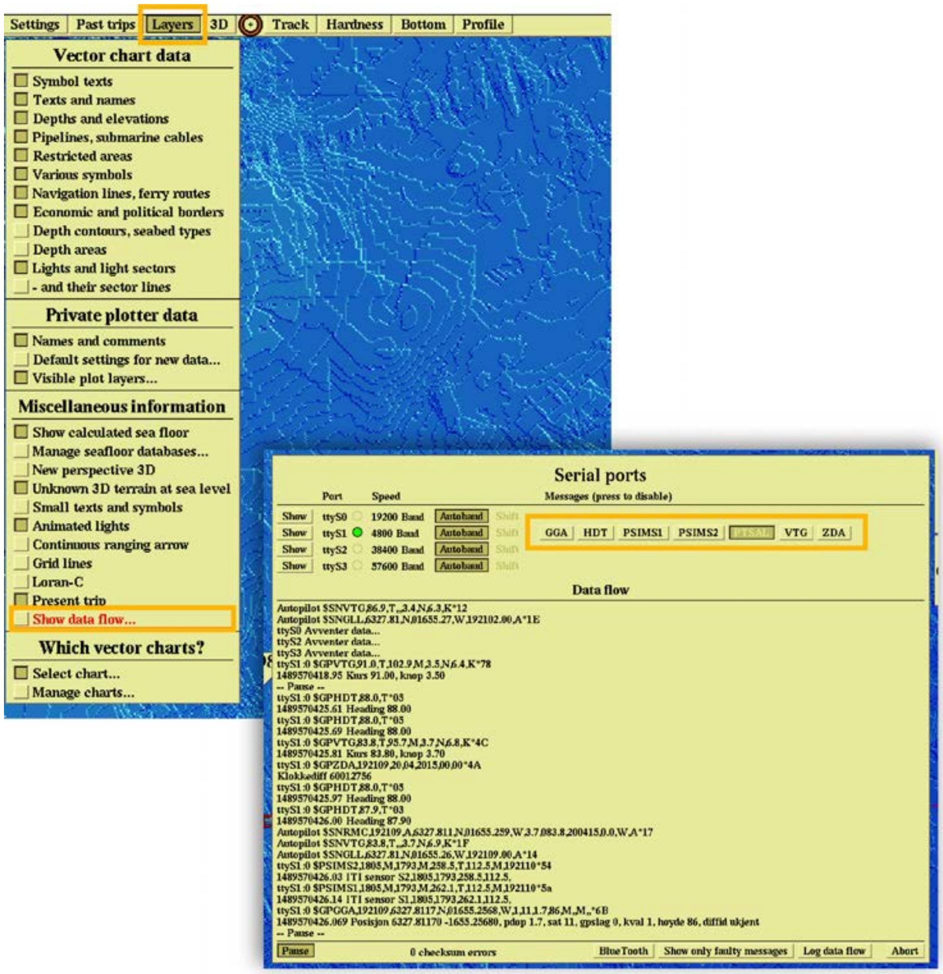
5. Using a serial to USB cable, connect the USB end to the Mac computer and the serial end to a serial port on the Olex machine (ttyS0/1/2/3).
6. To configure the export of trawl positioning data from Scala:
   a) Click **Menu** ▤ > **Settings**.
   b) Under the **NMEA Outputs** tab, click **Add**.
   c) In **Port Settings**, select **Serial port** and enter a port name depending on your serial to USB cable, such as cu.usbserial. Enter a baud rate of **19200** or **38400**.



   d) In **Data to Emit**, select **Emit only selected data types** and deselect all the items. This is to make sure Scala do not output these data. If you do not do this, Scala outputs all data and this slows down Olex.
   e) Select **Emit trawl positioning sentence** and click **Best sentence for Olex ($PSIMS)**.



7. If you use a version of Scala older than v. 01.06.06, you cannot choose the sentence that is sent. PSIMS and PTSAL sentences are sent at the same time. This causes display issues on Olex, so you need to disable PTSAL sentences from Olex:
   a) From Olex, click **Layers** > **Show data flow**.
   b) In the list of sentences, click **PTSAL** to disable it.



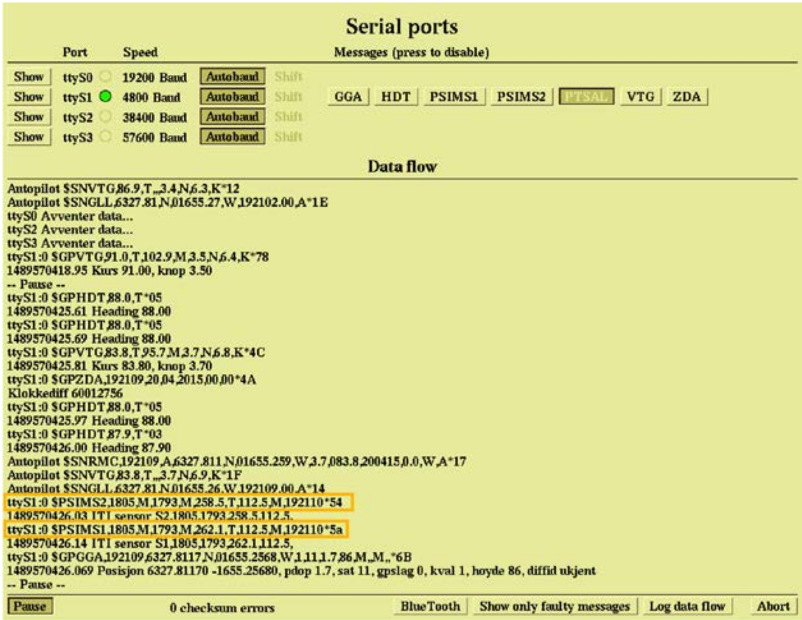
8. In **NMEA Outputs** in Scala, check that there is a green LED next to the created output.

   ⚠ **Troubleshooting:** If the LED is grey it means the port is not accessible. Check that you chose the correct port from the list of ports in **Port Settings**.

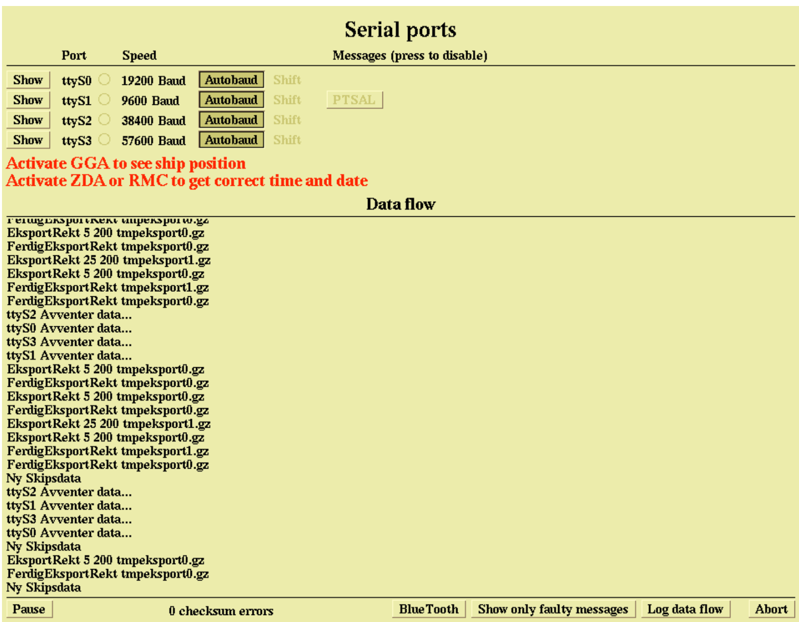
9. From Olex, check that you correctly receive data:

   a) Click **Layers** > **Show data flow**.

   b) In **Data Flow**, you can see the NMEA sentences that are received. Check if there are PSIMS1 and PSIMS2 sentences with correct data.

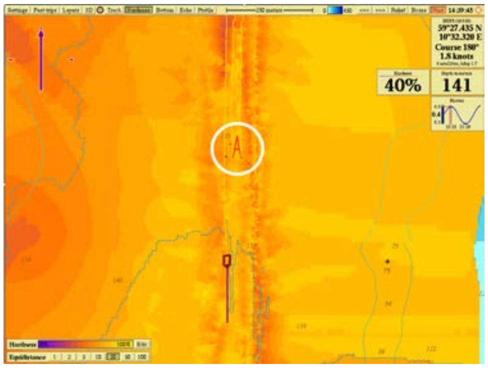


If Olex is not connected to Scala, no NMEA sentences are displayed.



Results

You can see the trawl position on Olex.



Displaying Trawl Positioning from Scala on MaxSea Version 12

You can export trawl positioning data coming from Scala to MaxSea v12 software.

Before you begin

- You must have a GPS and door positioning sensors.
- Compatible MaxSea version: **MaxSea version 12**.
- Compatible Scala version: Scala 01.06.06 (only PTSAL sentence) / Scala 01.06.14.

About this task

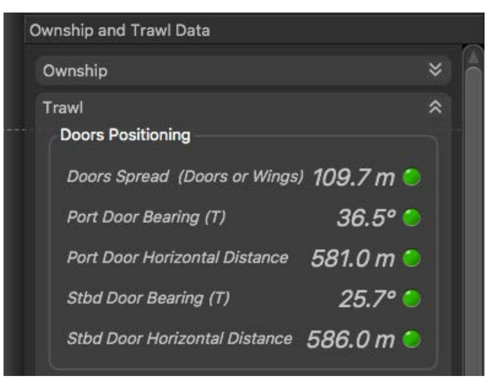
You can export trawl positioning data from Scala to MaxSea with PTSAL or IIGLL sentences. With PTSAL sentence you can display the trawl on MaxSea from the positions of trawl wings and center between both doors. With IIGLL you can display the trawl only from the position of the center between both doors. You cannot display a 3D view of the trawl when using IIGLL sentence.

To use PTSAL sentence, you need a good stability of heading values. If heading values are unstable, the trawl displayed in MaxSea will have erratic movements. If this is your case, use IIGLL instead, as it is more stable for trawl positioning.

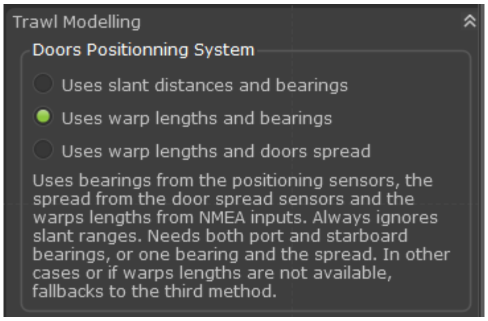
Note: Scala 01.06.06 Scala v.01.06.06 can only emit PTSAL sentence.

Procedure

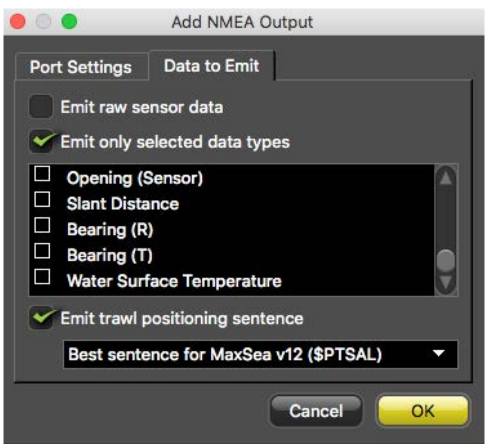
1. On Scala, in **Control Panels** > **Ownship and Trawl Data** > **Trawl** check that you receive **Door Positioning** data.



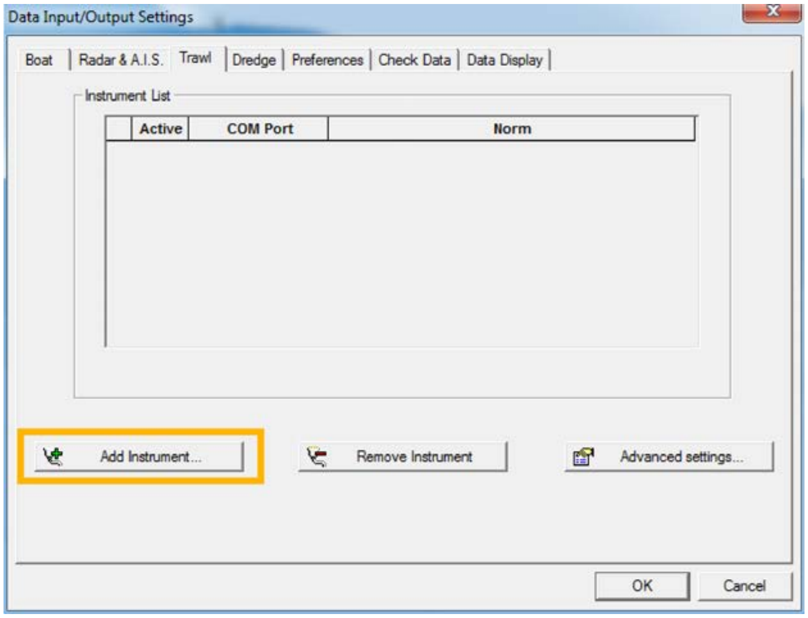
2. From **Control Panels** > **Data Processing** > **Trawl Modelling** > **Door Positioning System**, select **Uses slant distances and bearings** if using a Slant Range sensor or **Uses warp lengths and bearings** if using a Spread sensor.



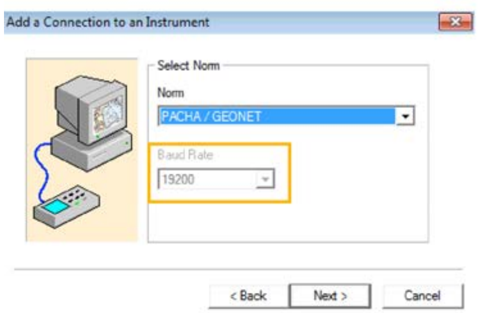
3. To configure the export of trawl positioning data:
   a) Click **Menu** > **Settings**.
   b) Under the **NMEA Outputs** tab, click **Add**.
   c) In **Port Settings**, depending on your installation select **Serial port** or **UDP port** and enter a port. If using a serial port, enter a baud rate of 19200 for PTSAL and 4800 for IIGLL to correspond with baud rates in MaxSea.
   d) In **Data to Emit**, select **Emit only selected data types** and deselect all the items.
   e) Select **Emit trawl positioning sentence** and choose between **$PTSAL** or **$IIGLL**.

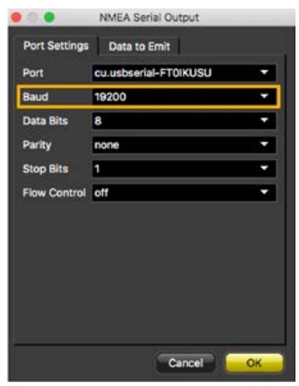


4. To display the trawl when using PTSAL sentence, make sure that MaxSea receives heading data from **Boat** instruments. You can check from **Data Display**.
5. To configure **Trawl** parameters:
   a) In **Data Input/Output Settings**, click the **Trawl** tab.
   b) Click **Add instrument**.



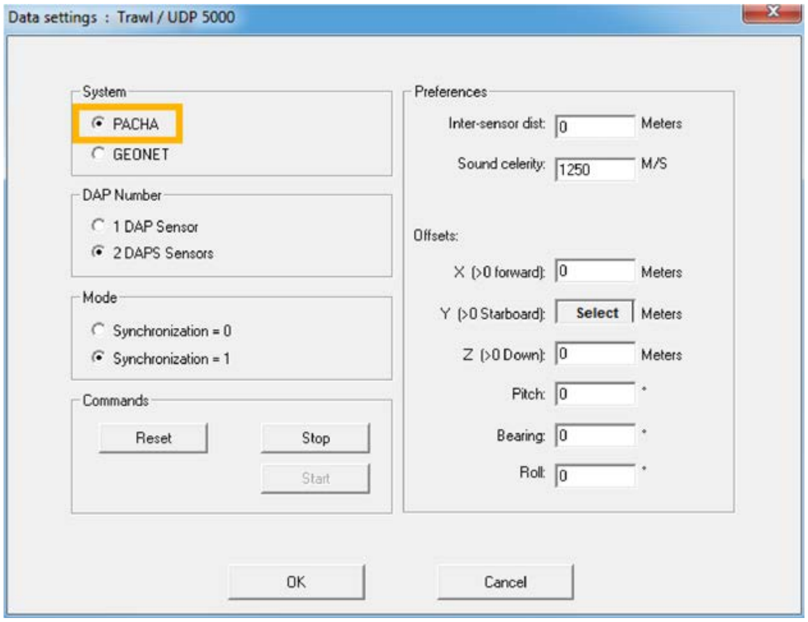
c) Put the same port as configured on Scala.
d) Click **Next**.
e) If using PTSAL sentence select **PACHA/GEONET** and if using IIGLL select **Simrad ITI**.
f) You cannot change the baud rate from MaxSea. If using a serial port, make sure you put the same baud rate in Scala.



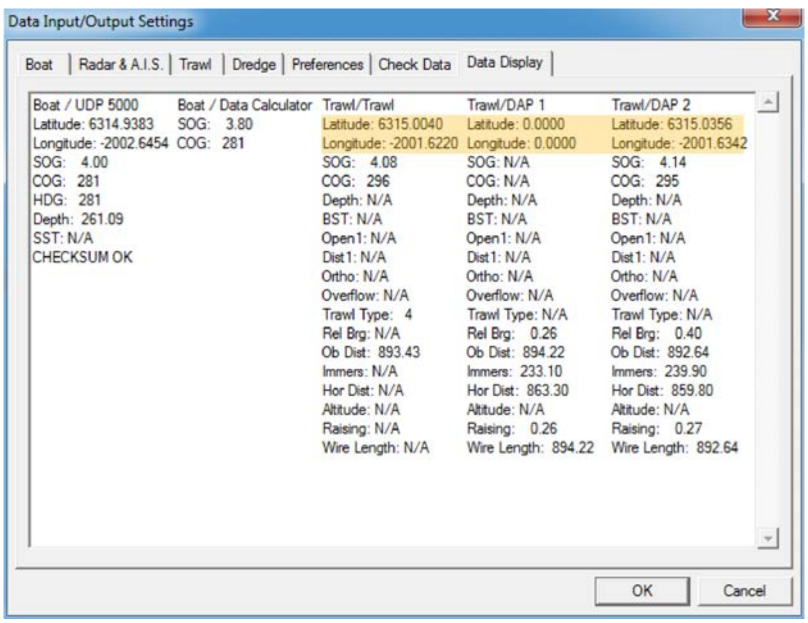


g) Click **Finish**.

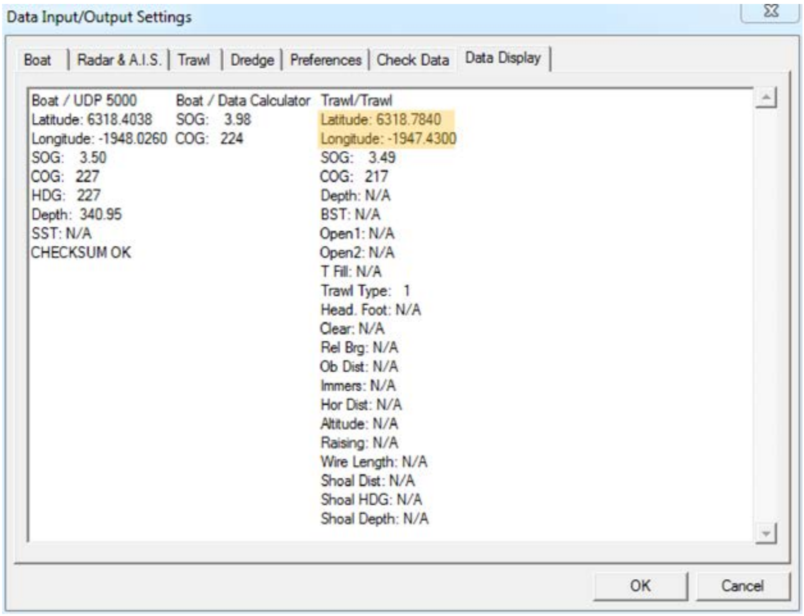
6. **If using PTSAL sentence**, click **Boat** > **Advanced Settings** and in **System**, select **PACHA**.



7. Click the **Data Display** tab and check that you see:
   - For PTSAL sentence, 3 trawl positions with latitude and longitude data.



   - For IIGLL sentence, 1 trawl position with latitude and longitude data.



8. To check incoming data:

a) Click the **Check Data** tab.

b) Select the port.

c) Click **Display**.

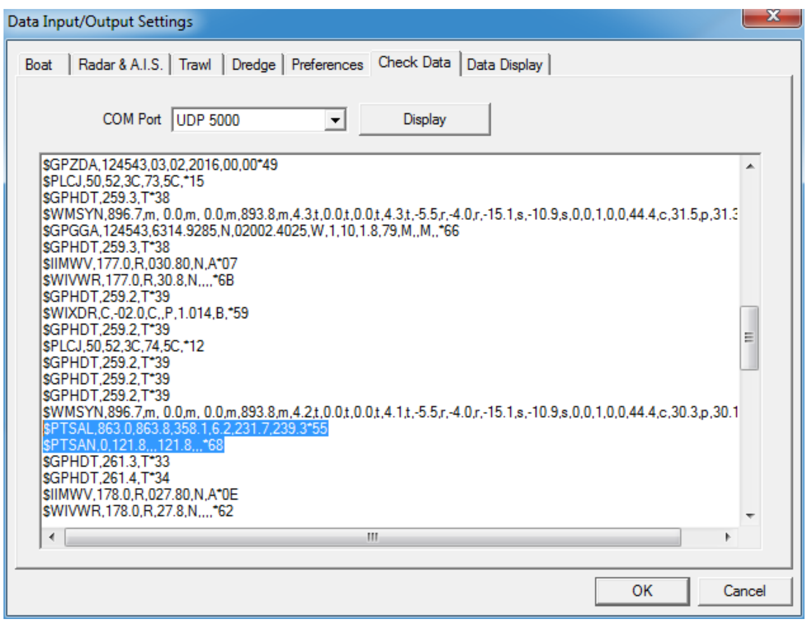
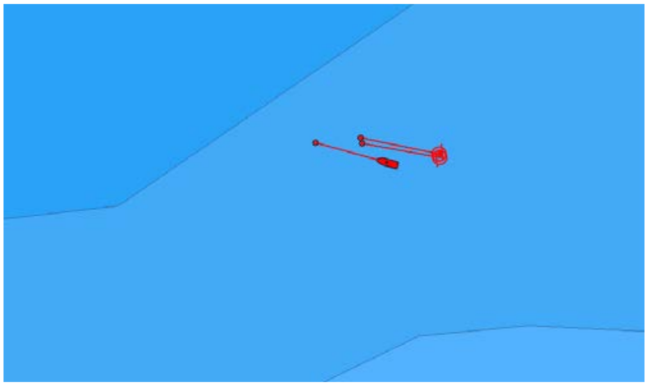


Figure 8: Example of incoming PTSAL sentence

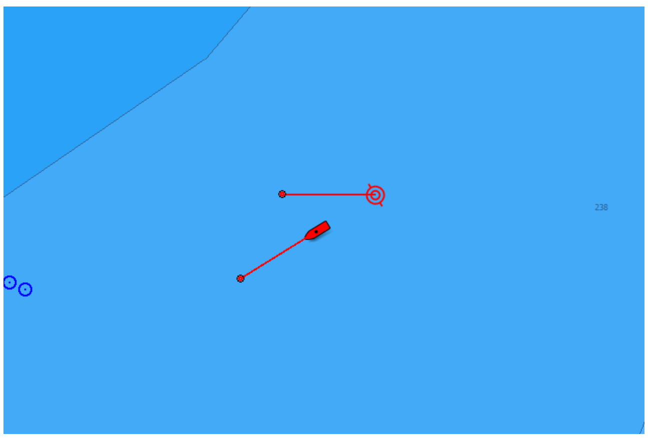
Results

From MaxSea, you should see the trawl behind the boat.

With a PTSAL sentence, there are 3 points corresponding to the location of the 2 trawl wings and of the center between the doors. The 3 lines are the headings of the wings and doors.



With a IIGLL sentence, there is 1 point, corresponding to the center between the doors. The line corresponds to its heading.



Displaying Trawl Positioning from Scala on MaxSea TimeZero

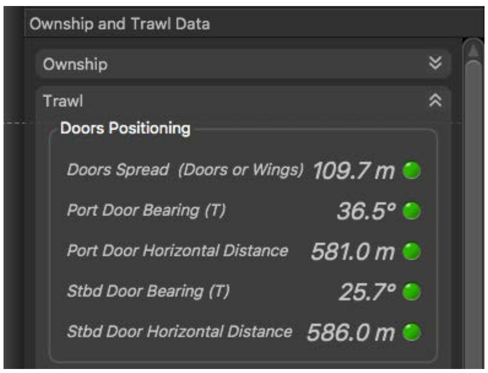
You can export trawl positioning data coming from Scala to MaxSea TimeZero software.

Before you begin

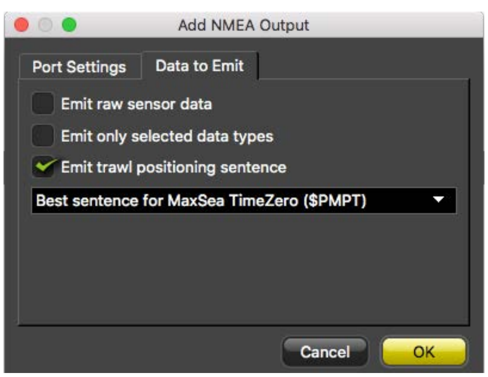
- You must have a GPS and door positioning sensors.
- Compatible MaxSea TimeZero version: TimeZero Professional v3.
- Compatible Scala version: Scala 01.06.06 and later

Procedure

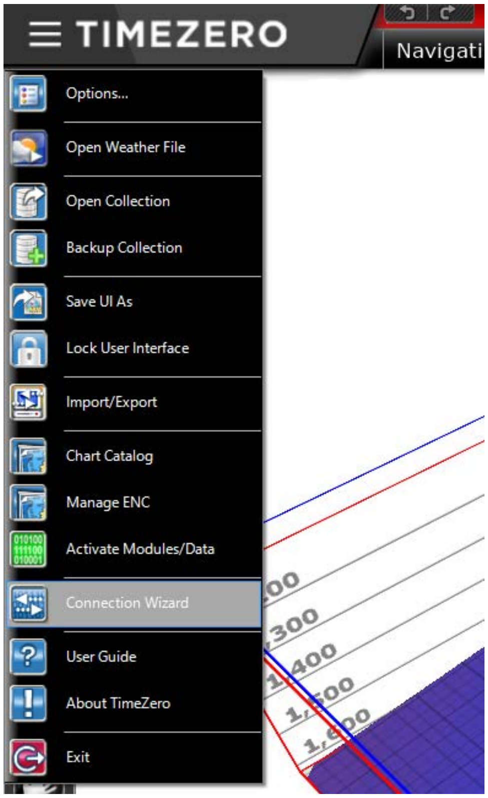
1. On Scala, in **Control Panels** > **Ownship and Trawl Data** > **Trawl** check that you receive **Door Positioning** data.



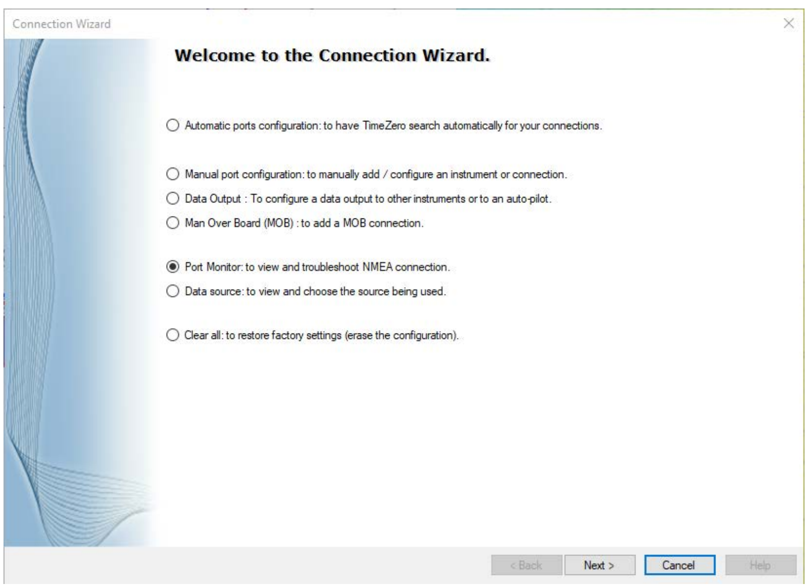
2. To configure the export of trawl positioning data:
   a) Click **Menu** > **Settings**.
   b) Under the **NMEA Outputs** tab, click **Add**.
   c) Under **Port Settings**, depending on your installation select **Serial port** or **UDP port** and enter a port.
   d) Under **Data to Emit**, select **Emit trawl positioning sentence** and choose **Best sentence for MaxSea TimeZero ($PMPT)**.



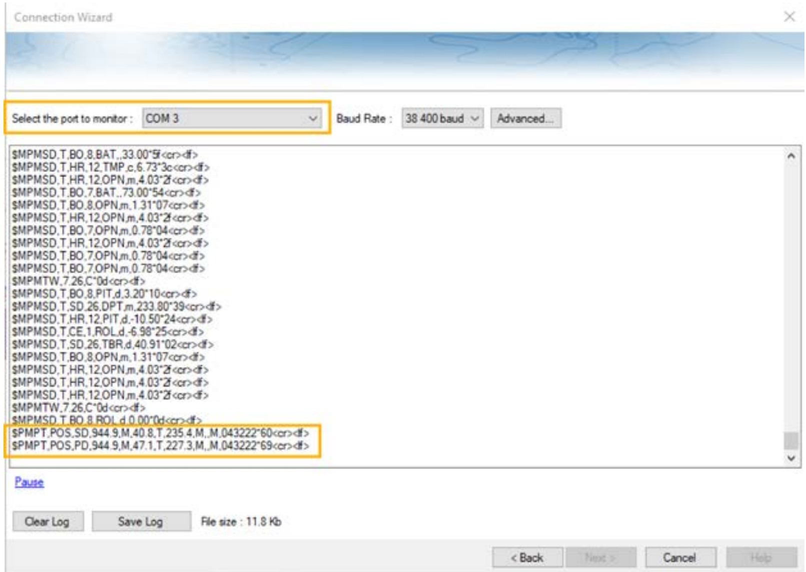
3. From TimeZero, check that you receive NMEA data from Scala and data from a GPS:
   a) From TimeZero, click **TIMEZERO menu** > **Connection Wizard**.



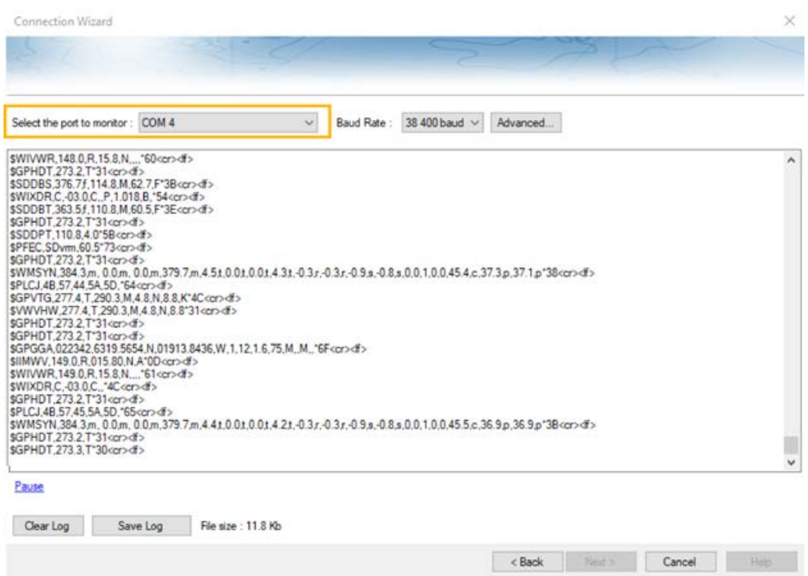
b) In the connection wizard, select **Port Monitor**.



c) Select the port of the NMEA data. You should see Marport NMEA positioning data ($PMPT).

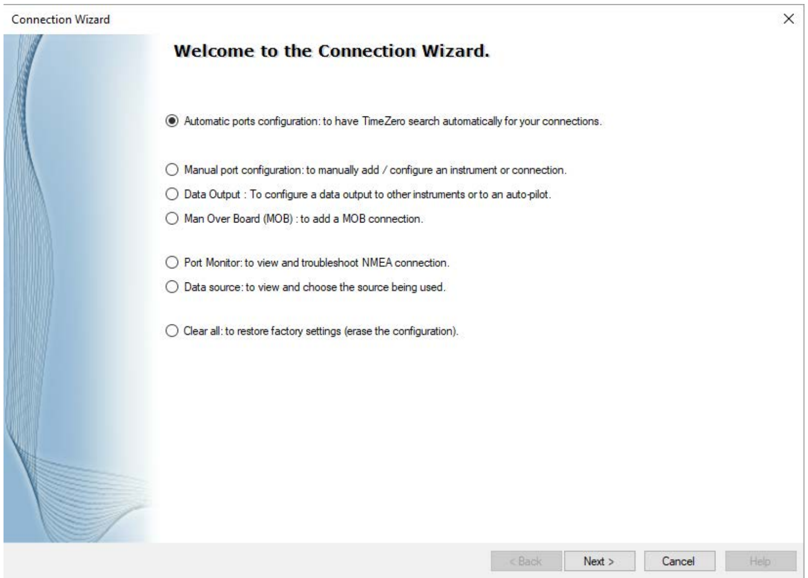


d) Select the port of the GPS. You should see incoming data.



4. To add these data to TimeZero chart:

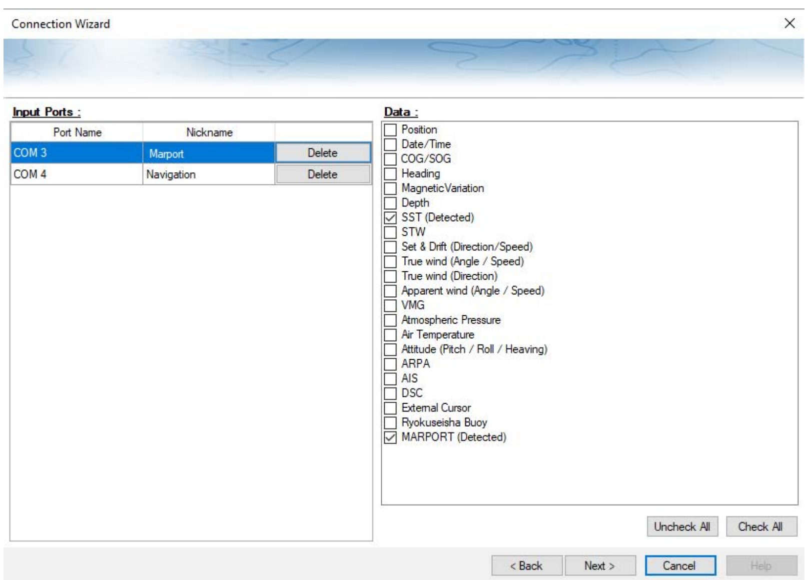
   a) From TimeZero, click **TIMEZERO menu** > **Connection Wizard**.
   b) Select **Automatic ports configuration**.



The wizard analyzes the system and search for incoming data. When the search is complete, it shows a list of ports where devices are connected and data they transmit.

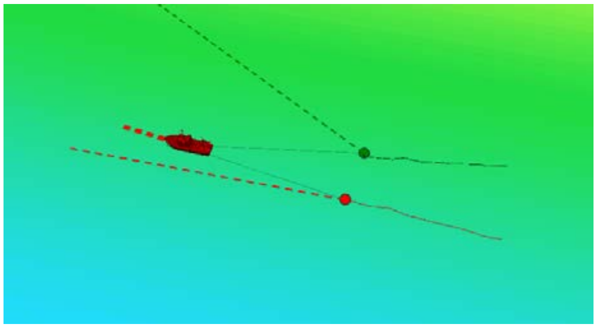
c) Check if the ports and data are correct. You should at least have a GPS device and Marport NMEA data.

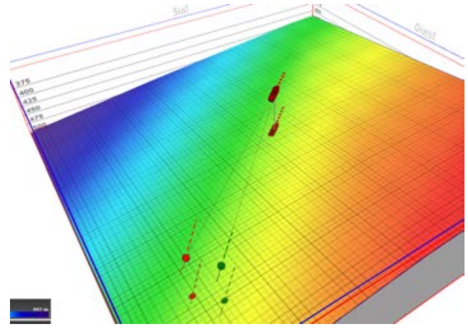
d) From **Nickname** enter a name for the ports to easily recognize them.



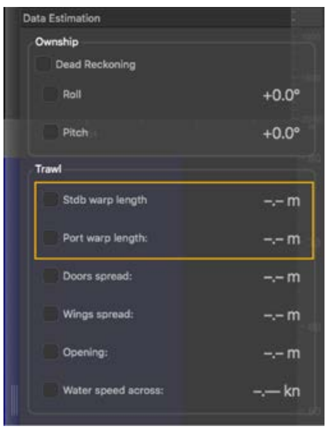
e) Follow the instructions from the wizard.

5. From TimeZero chart, check that you see the trawl behind the vessel.





Trouble: If you see the trawl on Scala chart view whereas it is not in water and you do not see it on TimeZero: from Scala, click **Control Panels** > **Data Estimation** and check that **Stdbd warp length** and **Port warp length** are **not** selected.



Displaying Trawl Positioning from Scala on SeapiX

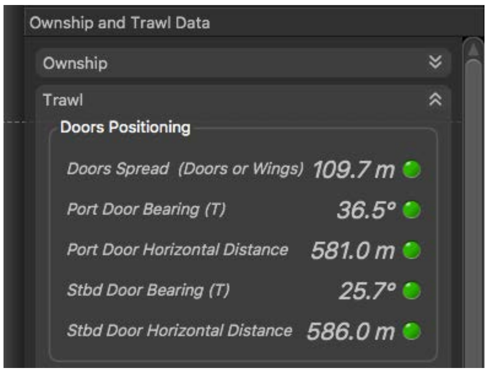
You can export trawl positioning data coming from Scala to SeapiX software.

Before you begin

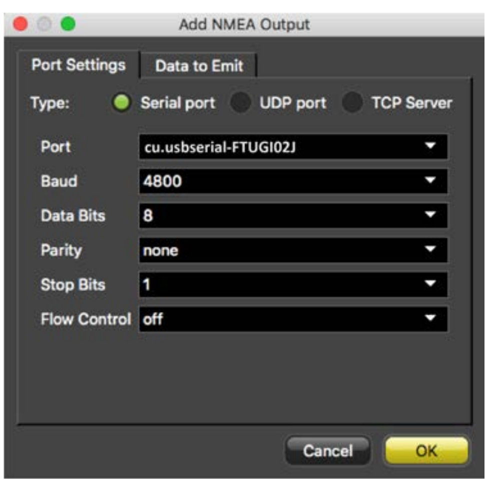
- You must have a GPS and door positioning sensors.
- Documented SeapiX version: version 8.6.0
- Compatible Scala version: Scala **01.06.23** and later

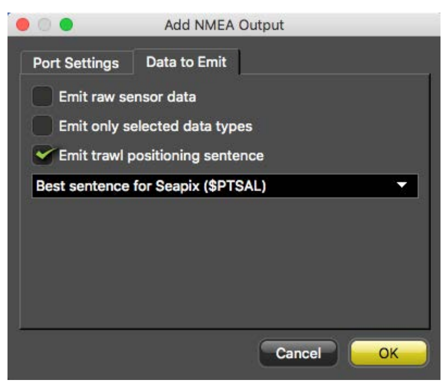
Procedure

1. On Scala, in **Control Panels** > **Ownship and Trawl Data** > **Trawl** check that you receive **Door Positioning** data.



2. To configure the export of trawl positioning data:
   a) Click **Menu** > **Settings**.
   b) Under the **NMEA Outputs** tab, click **Add**.
   c) In **Port Settings**, depending on your installation select **Serial port**, **UDP port** or **TCP Server** and configure the port.
   d) In **Data to Emit**, select **Emit trawl positioning sentence** and select **Best sentence for Seapix ($PTSAL)**.

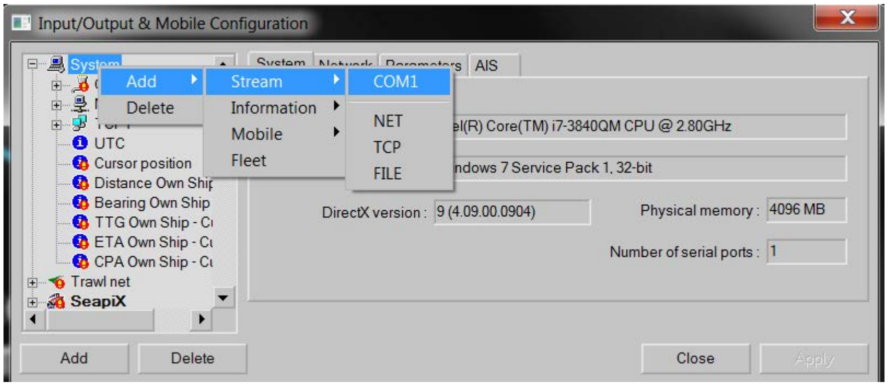




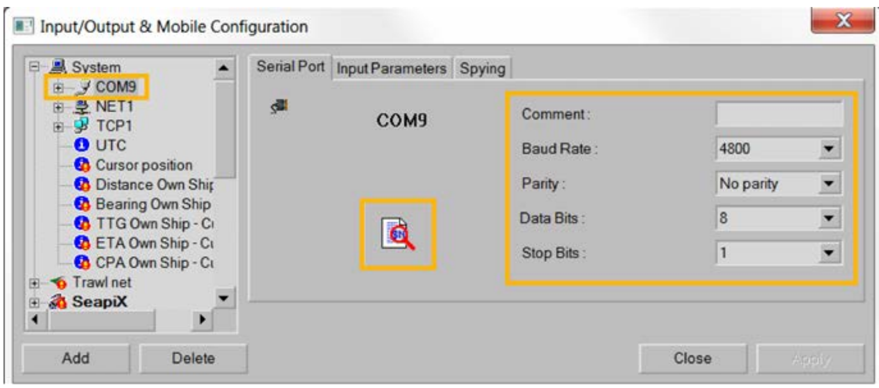
3. From SeapiX, add the communication port used to receive NMEA from Scala:

a) In the menu bar, click **System** > **Settings** > **I/O and Mobiles** > **Input/Output & Mobile Configuration**.

b) In the left panel, right-click **System** and select **Add** > **Stream**, then choose a port between serial (COM), UDP (NET) or TCP.



c) To configure the port, click its name in the left panel. Make sure the baud rate is the same as in Scala.

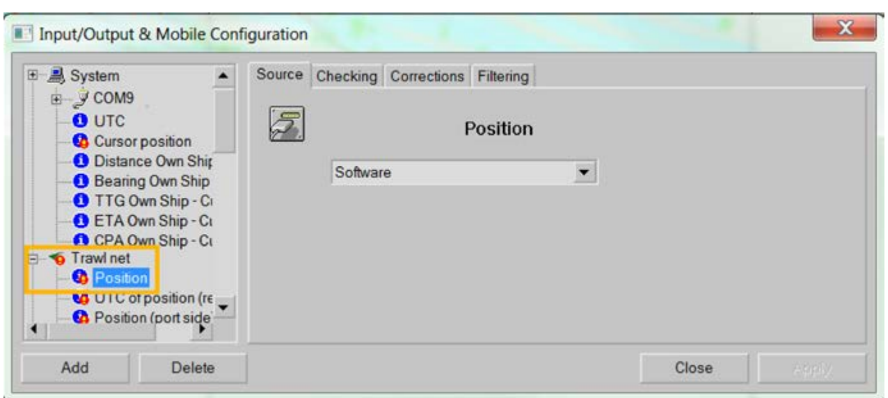


Once you have configured the input from Scala (next step), you can click the magnifying glass to see incoming data.

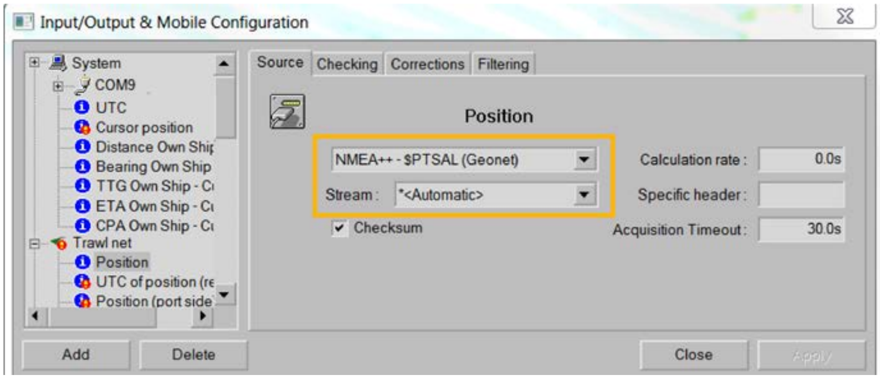
4. Configure the input of positioning NMEA sentences received from Scala:

a) In the menu bar, click **System** > **Settings** > **I/O and Mobiles** > **Input/Output & Mobile Configuration**.

b) In the left panel, click **Trawl net** > **Position**.

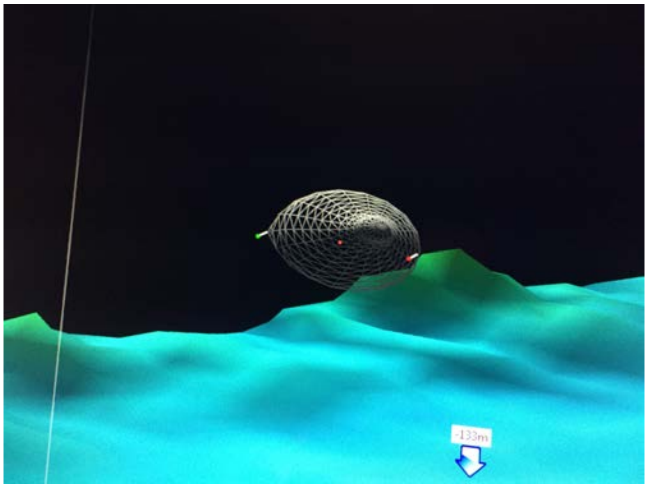


c) Under the **Source** tab, select **NMEA++-$PTSAL (Geonet)**.



d) From **Stream**, select the port connected to Scala or select **Automatic** to automatically find the port.
e) You do not need to change the other settings.
f) Under the **Checking** tab, you can check if the system understands the sentences it receives.

5. When the trawl is in water, check on SeapiX chart view that you see the trawl with markers. Port door is in red and starboard in green.



Displaying Bathymetric Data from GEBCO Database

You can display bathymetric data coming from GEBCO database on the 3D overview of the vessel.

Before you begin

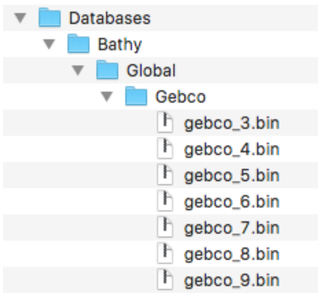
- You must have Scala Full dongle.
- You need to have incoming data from a GPS (position, heading)
- You need to have specific GEBCO files. Ask your local Marport office to get them.
- GEBCO files use approximately 5.7 GB of space, make sure you have enough space on your computer.

Procedure

1. You need to save GEBCO files according to a specific folder structure:

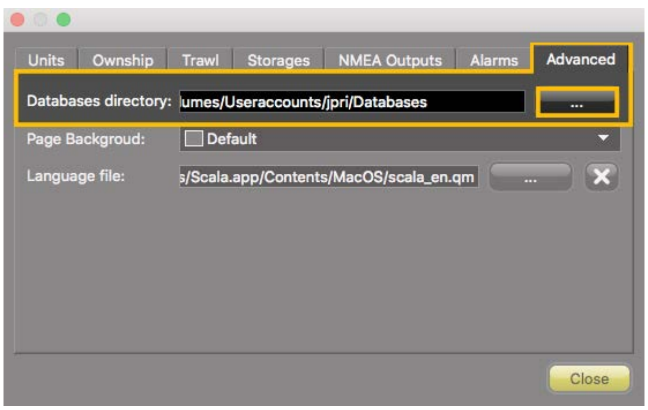
a) Create a folder named **Databases** anywhere on the computer.

b) Create the following folder structure inside **Databases** and save the GEBCO files in the **Gebco** folder.



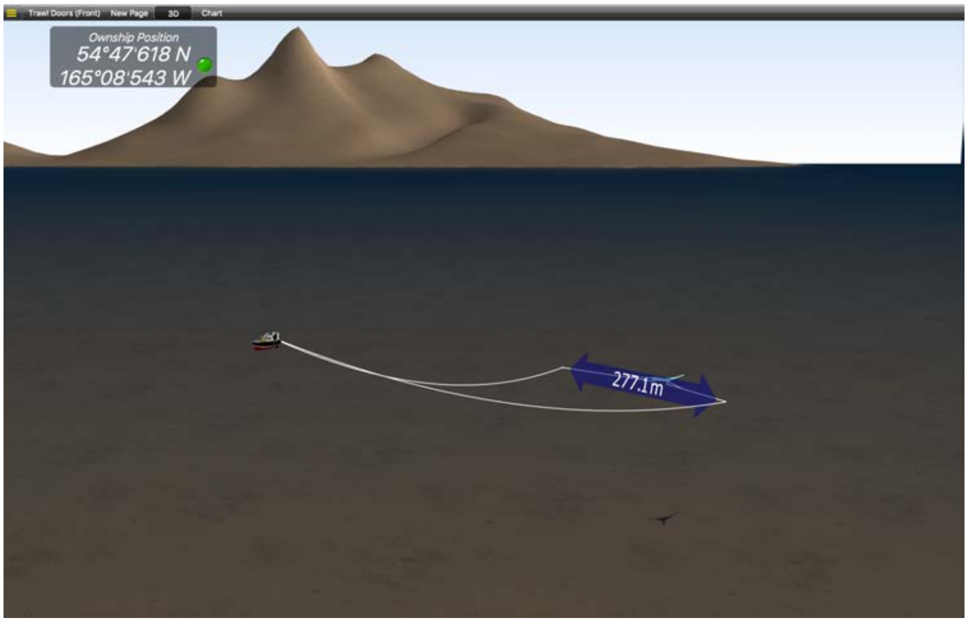
Important: Make sure you write exactly the same names of folders (letter case, spaces).

2. From Scala, click **Menu** > **Expert Mode** and enter the password `copernic`.
3. Click **Menu** > **Settings**.
4. Under the **Advanced** tab, click ... in front of **Databases directory** and select the folder **Databases** you created.



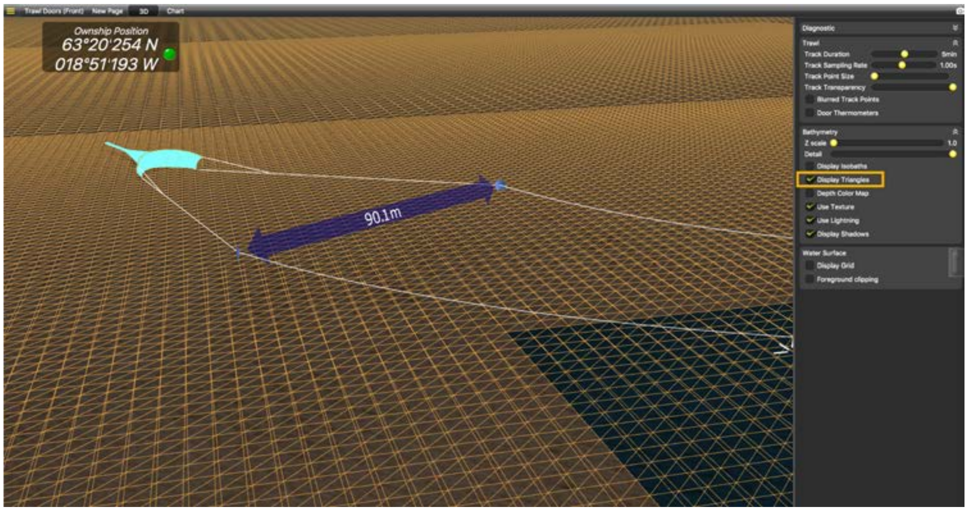
5. Open a page with a 3D overview of the vessel.
6. Right-click the 3D view and select **Display Global Bathymetry**.

   GEBCO bathymetric data is displayed on Scala.



7. To check if the bathymetry is correctly received:
   a) Right click the 3D and select **Display Settings**.
   b) From the panel on the right side of the screen, from the part **Bathymetry**, select **Display Triangles**.

   Triangles are displayed on the 3D.



Displaying Olex Bathymetric Data on Scala

You can display bathymetric data coming from Olex on Scala 3D overview.

Before you begin

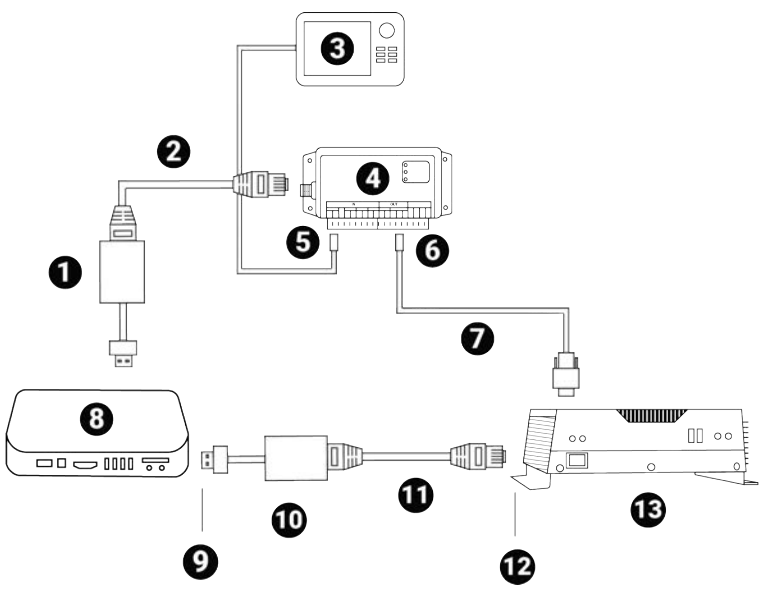
- You need to have a GPS sending data to both Scala and Olex. If the GPS has only one output, use a multiplexer such as ShipModul MiniPlex-3E-N2K (NMEA0183 and NMEA2000) or Miniplex-3E (NMEA0183 only) to be able to share data.
- Olex software must have the **RE** option (it exports bathymetry)

About this task

Note: If you have a M4 system with two Mac minis, connect devices to the **Mac mini i5**. Only this computer will receive the bathymetry.

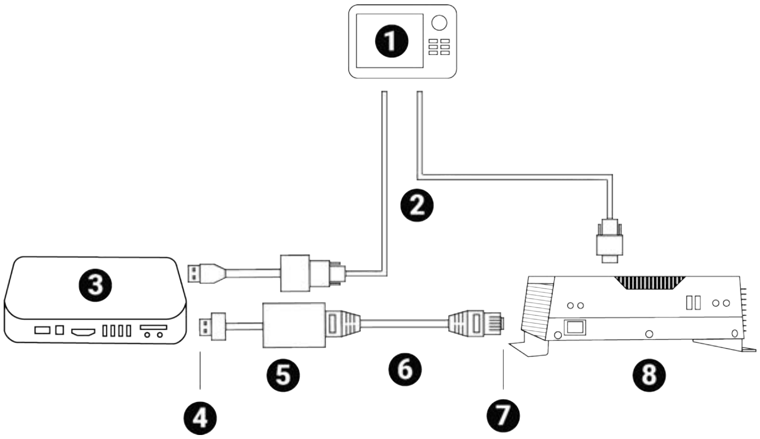
Procedure

1. Connect the equipment as follows:
   - If your GPS has only 1 output, use a multiplexer:



1	USB or Thunderbolt Ethernet adapter
2	Ethernet Cable
3	GPS
4	Multiplexer
5	NMEA In
6	NMEA Out
7	Serial port
8	Computer
9	IP address 192.168.65.16
10	USB or Thunderbolt Ethernet adapter
11	Ethernet Cable
12	IP address 192.168.65.15
13	Olex machine

   - If your GPS has more than one output, connect it to the computer and to Olex machine:

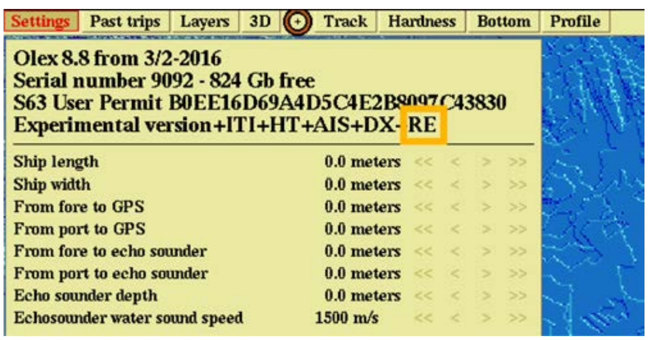


1 GPS
2 Serial ports
3 Computer
4 IP address 192.168.65.16
5 USB or Thunderbolt Ethernet adapter
6 Ethernet cable
7 IP address 192.168.65.15
8 Olex machine

2. From Olex, check that it can export bathymetric data:

   a) Click **Settings**.

   b) Check that there is the **RE** option:



3. Configure the IP address of the USB/Thunderbolt to Ethernet adaptor that links the computer and Olex machine:

   a) Click **Apple menu** > **System Preferences** > **Network**.

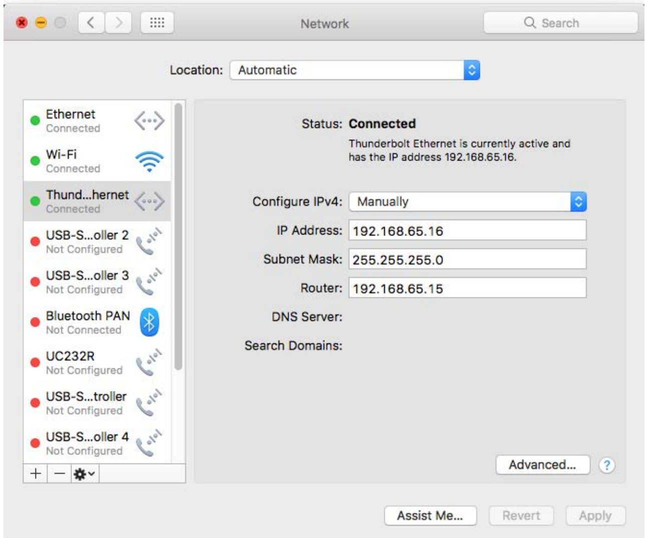
   b) Click the USB/Thunderbolt to Ethernet network.

   c) Click the **Configure IPv4** pop-up menu, then select **Manually**.

   d) In **IP Address**, enter `192.168.65.16`.

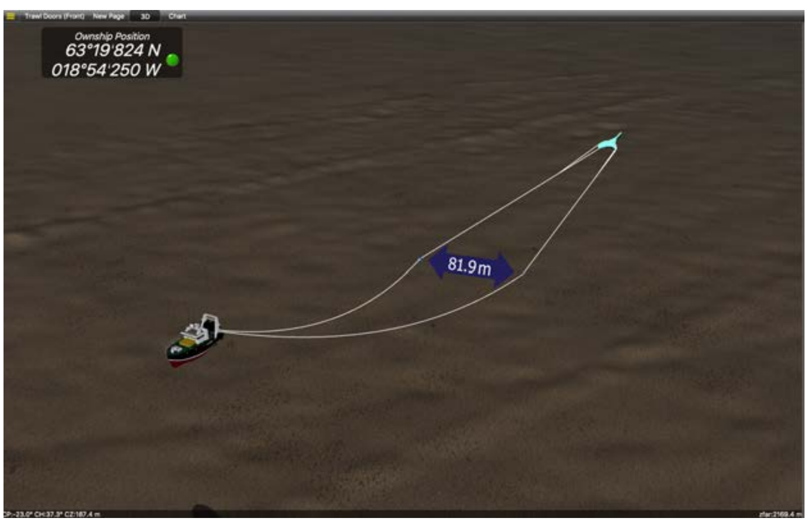
   e) In **Subnet Mask**, enter `255.255.255.0`.

   f) In **Router**, enter `192.168.65.15`.



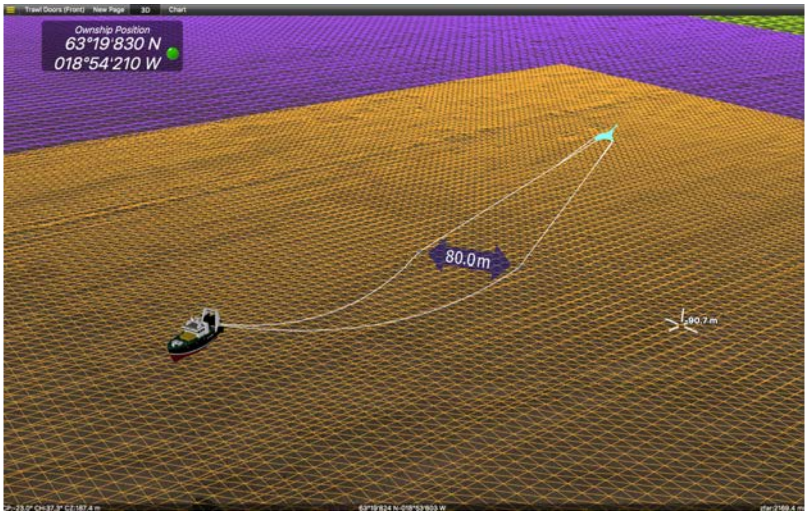
4. Open Scala.
5. Restart Olex machine.
6. From Scala, display a 3D view of the vessel and trawl: click **Control Panels** > **Customize** and drag **3D Overview** to a page.
7. Right-click the 3D view and select **Display Olex Bathymetry**.

   Olex bathymetry is displayed on Scala.



8. To check if the bathymetry is correctly received by Scala:
   a) Right-click the 3D view and select **Display Settings**.
   b) In the panel on the right side of the screen, select **Display Triangles**.

      Triangles are displayed on the 3D.


Ownship Position
63°19'830 N
018°54'210 W
80.0m

Installation

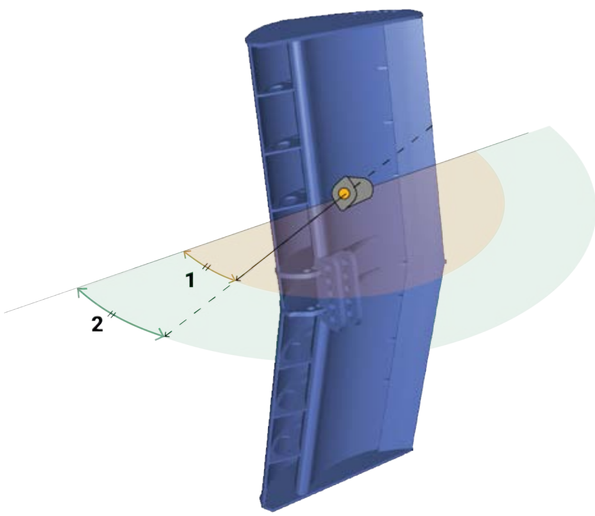
Learn how to install door sensors on the trawl gear.

Installation Principles

Door sensors need to be installed in pockets welded on trawl doors. Carefully read these installation principles before installing sensor pockets.

Angle of Attack

The angle of attack is the angle of the door in relation to the towing direction. This angle is important for the efficiency of the doors. It varies between trawl door models, so refer to manufacturer to know the exact angle. The angle is usually from 25° to 40°.



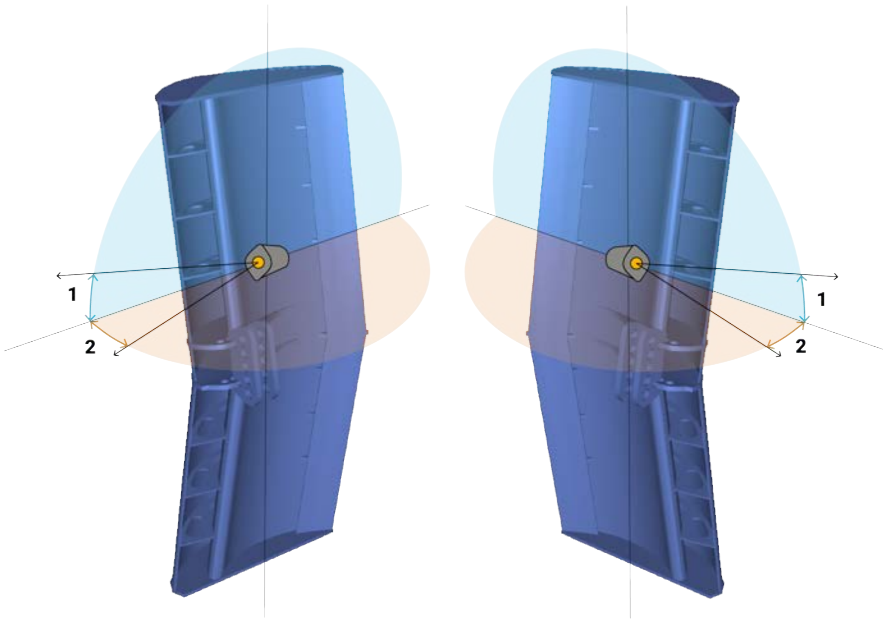
1. Angle of attack: 25-40°
2. Opening angle 25-40°

Opening and Elevation Angles

The opening and elevation angles depend on the pocket installation on the door.

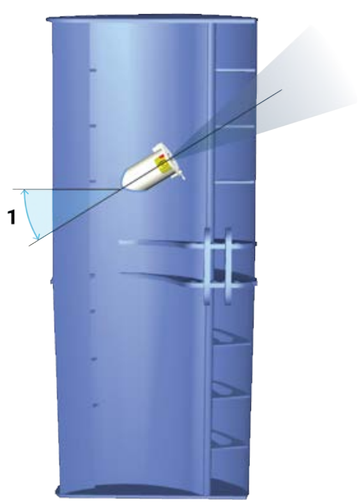
The opening angle is the horizontal angle of the pocket in relation to the door. It should be between 25° and 40°. Opening angles should be in line with the angle of attack. You need to indicate the opening angle on Mosa.

The elevation angle, or tilt angle, is the vertical angle of the pocket in relation to the door. It should be between 15° and 20°. The sensor must point toward the vessel: adjust the elevation angle based on the operational depth of the door during fishing operations.



1. Elevation angle: 15-20°

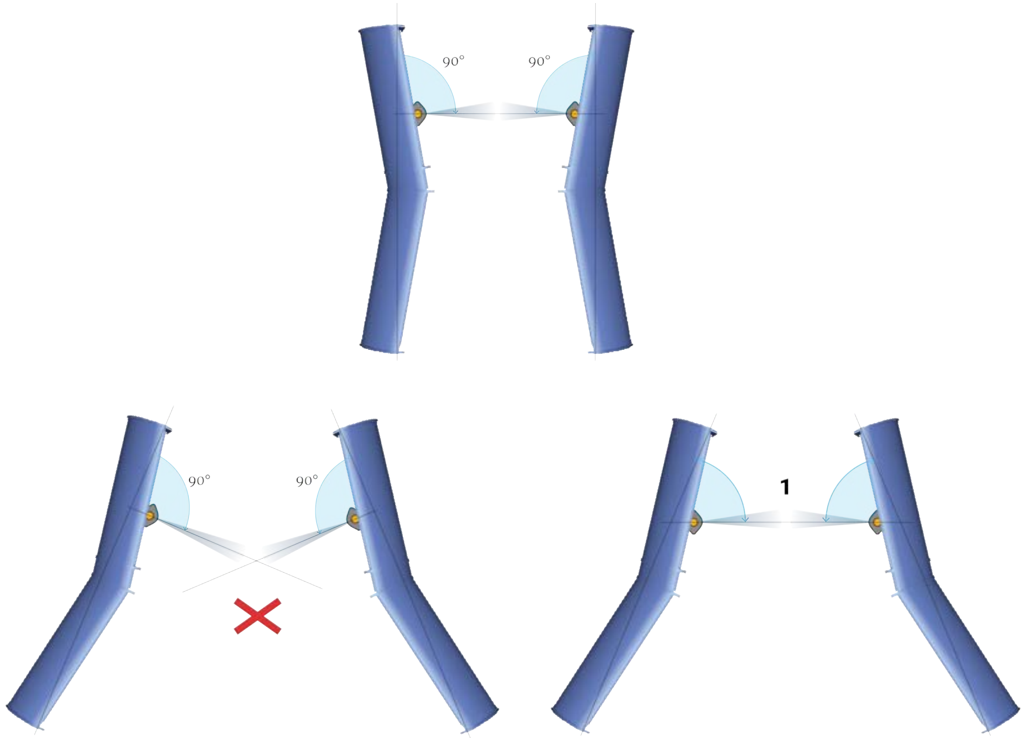
2. Opening angle: 25-40°



1. Elevation angle: 15-20°

Roll Angles

Roll angle of the sensors depends on the tilt of the doors when fishing. If doors are straight during fishing, you can apply a roll angle of 90°. If doors are tilted inward during fishing, slightly roll the pocket so that lines of communication between the sensors stay aligned. If not, you will have sporadic spread readings.

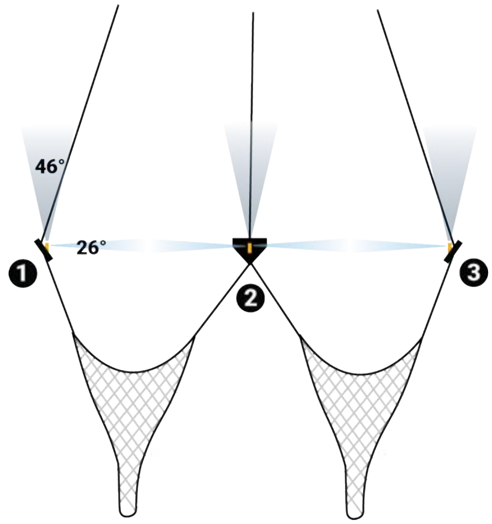


1. Adapt roll angles of pockets according to the tilt of the doors.

Communication

Spread Sensors communicate with each other and with the receiver. Lines of communication between them and toward the receiver must be unobstructed.

The beamwidth toward the receiver (uplink ping) is 46° and beamwidth toward the other sensors (down ping) is 26°. This beamwidth is thinner: this is why it is important to keep sensors aligned.



Communication toward receiver (46°)

Communication between sensors (26°)

Communication toward receiver (46°)

Communication between sensors (26°)

1. Master sensor

2. Clump sensor

3. Starboard

Slant Range sensors do not communicate with each other, so only lines of communication toward the hydrophones must be unobstructed.

Installing Sensor Pockets

You need to install pockets on each trawl door to hold the door sensors.

Before you begin

- Read Installation Principles on page 91 to become familiar with installation requirements.
- You need different pockets depending on your type of door sensor:
  - Spread Sensor / Slant Range (XL bottle)
  - Mini Spread Sensor (stubby bottle)
  - Mini Spread Sensor (stubby bottle) with slim housing
  - Mini Slant Range (small bottle)

See Appendix C: Pocket Drawings on page 128 to know which installation you need.

About this task

Important: Make sure you install the sensor pockets in accordance with the installation principles: pockets are important for the correct functioning of the sensors. If they are misaligned or if the pocket hides the sensor signal, you will have issues receiving data.

Important: Take care to gather as much information as possible from the trawl doors manufacturer before installation. Such as the angle of attack and towing angle.

Note: If your door model have the doors rigged “nose up” or “nose down”, you need to change the angle of the door pockets so that the sensor always point toward the bottom of the ship when being towed.

Figure 9: Nose down (left) and nose up (right)

Note: If you use Spread sensors for bottom trawling, install pockets on the upper part of trawl doors. Make sure the pocket's position does not influence too much the center of gravity of the door. Refer to door manufacturer for details.

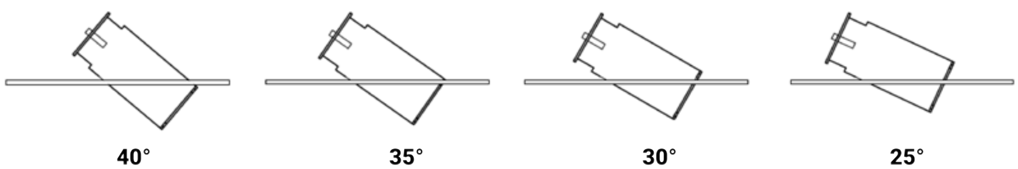
Procedure

1. Use drawings of door pockets to mark the shape to be cut off: Appendix C: Pocket Drawings on page 128.

   Note: Ask your local Marport Office for scaled templates of door pockets.

2. Cut round openings in the doors.

3. Place the sensor pocket with the bottom portion sticking out of back side of the door. Adjust accordingly to the elevation angle and angle of attack you need (see Pocket Angle of Attack on page 129). Picture above shows angles of attack seen from above the door.



4. You can trace a line with a marker around the pocket at the point it enters the door to remember the correct position.
5. For Spread sensors, check if angles are correct:
   a) Weld only a few points on two sides of the pocket to hold it on the door.
   b) Place the sensor inside the pocket. For XL pockets, slide the sensor into the alignment bar inside the door pocket. You can adjust the roll of the sensor using the alignment bar (see Pocket for XL Bottles (Standard Spread Sensor & Standard Slant Range) on page 130).

c) Open Mosa software.

d) Activate and deactivate the water-switch to connect the sensor to Mosa via a wireless signal.

e) From Mosa, click the tab **Pitch and Roll**.

f) Click **Pitch and Roll Calibration** then click **Auto Calibrate**. Pitch and roll offset values change according to the position of the sensor on the door. Pitch should be between 15 and 20°, roll should be ±5°. Roll may need to be higher depending on the door model and operation: adjust accordingly.

g) If you do not have Mosa software, manually check the angles.

6. If values are not correct, move the pocket, then check again.
7. If values are correct, permanently weld the pocket to the door.
8. We recommend to use a protective cage made of metal bars around pockets to protect sensors, like the examples below.

Note: Make sure there is sufficient space between the protective cage and the sensor pocket, so that if the cage becomes bent, you can still remove the sensor.

Installing Spread Sensors

You need to install Spread sensors in pockets welded to the trawl doors.

Before you begin

To install Spread sensors on the doors, you need to have specifically designed sensor pockets welded to the trawl doors. See Installing Sensor Pockets on page 95.

About this task

Usually, sensors pockets welded to the doors have a 15 to 20° degree vertical angle.

Single Trawl

Before you begin

For a single trawl you need:

- A Master Spread sensor
- A Starboard Spread sensor

Procedure

1. Remove the screw holding the pocket cover.
2. Install the Master sensor (red marker) on the port door and the Starboard sensor (green marker) on the starboard door.
3. The top of the transducer (side with marker on housing) must be oriented toward the vessel and the side of the sensor with the circle/A must be oriented toward the opposite door.
4. Attach the safety line from the sensor to the pocket and fasten the pocket's screw.
5. Make sure that both sensor transducers are aligned with each other during towing. This way, they can communicate with each other.
6. Make sure there is nothing in front of the sensors that would block their signal toward the vessel.

Port

Starboard

Twin Trawls

Before you begin

For twin trawls you need:

- A Master Spread sensor

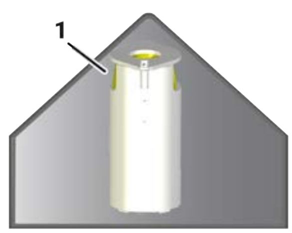
- A Starboard Spread sensor
- A Clump sensor

Procedure

1. Remove the screw holding the pocket cover.
2. Install the Master sensor (red marker) on the port door and the Starboard sensor (green marker) on the starboard door.
3. Install the Clump sensor (black marker) on the clump.
4. The top of the transducer (side with marker on housing) must be oriented toward the vessel. For Master and Starboard sensors, the side of the sensor with the circle/A must be oriented toward the opposite door. For a Clump sensor, it must be oriented toward the Master sensor on the port door.
5. Attach the safety line from the sensor to the pocket and fasten the pocket's screw.
6. Make sure that all three sensors are correctly aligned, to be able to communicate with each other.
7. Make sure there is nothing in front of the sensors that would block their signal toward the vessel.

Port

Starboard



Clump

1. Down sounder (marked with a circle)

Installing Slant Range Sensors

You need to install Slant Range sensors in pockets welded to the trawl doors.

Before you begin

To install Slant Range sensors on the doors, you need to have specifically designed sensor pockets welded to the trawl doors. See Installing Sensor Pockets on page 95.

Procedure

1. Remove the screw holding the pocket cover.
2. Install Slant Range sensors inside each door pocket: the top of the transducer (side with marker on housing) must be oriented toward the vessel.

Port Starboard

3. Attach the safety line from the sensor to the pocket and fasten the pocket's screw.
4. Make sure there is nothing in front of the sensors that would block their signal toward the vessel.

Servicing and Maintenance

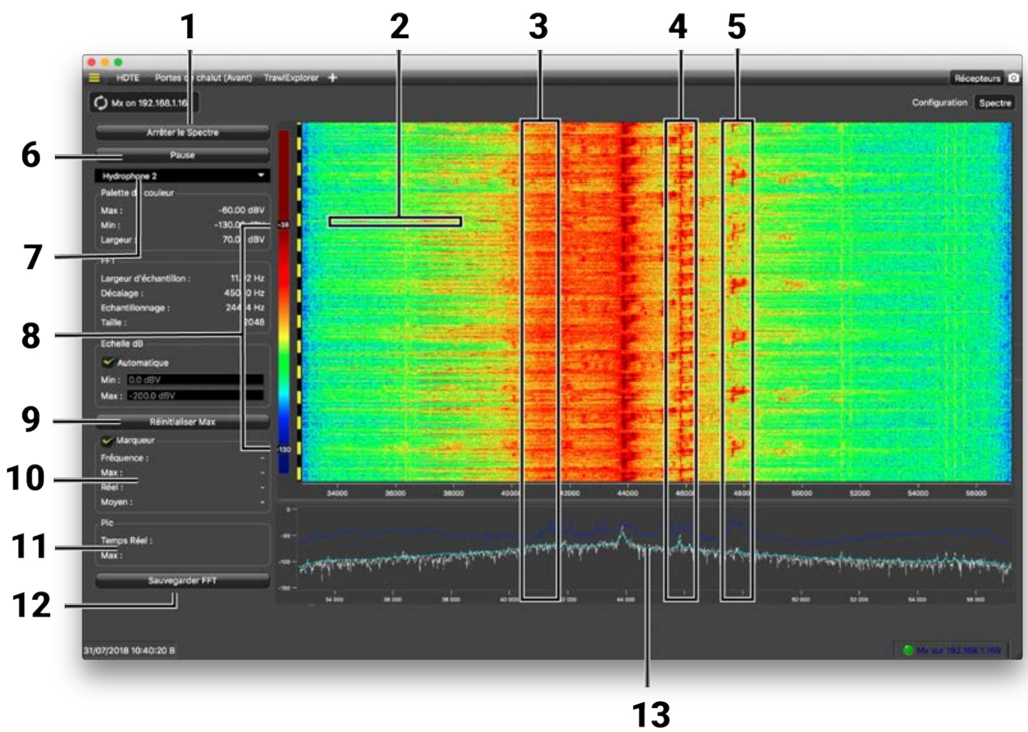
Read this section for troubleshooting and maintenance information.

Interference Check

You can check if there is noise interfering with the reception of signals.

Spectrum Analyzer Display

The following picture explains the main parts of the spectrum analyzer on Scala.



1. Start/Stop spectrum analyzer
2. Noise interference
3. Pulses of the sensors (PRP)
4. Narrow band/HDTE signals
5. Door sounder signals
6. Pause spectrum analyzer
7. Select hydrophone
8. Drag to adjust color scale
9. Reset the Max line.
10. **Marker**: display frequency and levels of noise (dB) at the mouse pointer location on the graph.
11. **Peak**:
    - **RealTime**: latest highest level of noise recorded.
    - **Max**: highest level of noise recorded since the beginning of the spectrum.
12. Export recorded max, mean and real time noise levels in a txt file.
13.
    - Dark blue line: maximum signal level
    - Cyan line: average signal level
    - White line: last received signal level

Checking Noise Interference

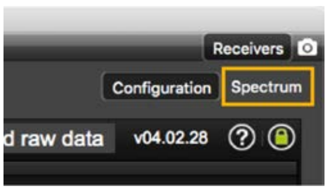
You can use the spectrum analyzer to check the noise level of the hydrophones and check for interference.

About this task

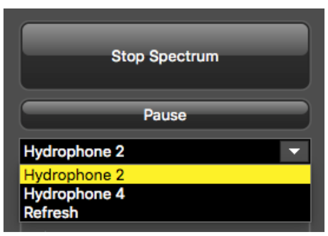
See Spectrum Analyzer Display on page 102 for details about the spectrum analyzer display.

Procedure

1. From the top left corner of Scala window, click **Menu** > **Expert Mode** and enter the password `copernic`.
2. Again in the menu, click **Receivers**.
3. From the top right corner of the screen, click **Spectrum**.



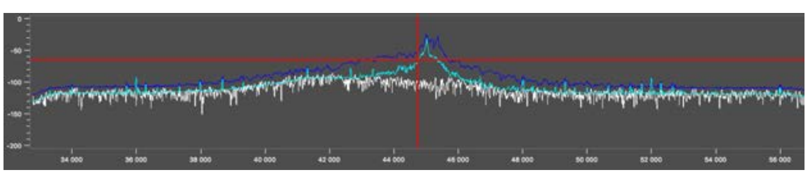
4. Select the hydrophone you want to test. Only the hydrophones that are switched on are displayed. Select refresh to update the list.



5. From the top left corner of the screen, click **Start Spectrum**.

   The graph at the bottom of the page shows three levels of noise in dBV:

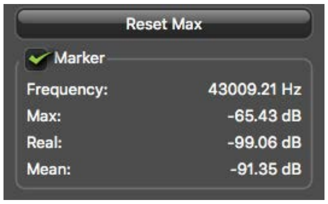
   1. **RealTime** (white): level of noise recorded in real time.
   2. **Mean** (cyan): mean recorded level of noise. It is useful to assess the noise floor.
   3. **Max** (dark blue): shows the latest highest level of noise recorded. It is useful to see on which frequencies are the sensors.



   The acceptable average level of noise depends on the conditions (distance from the sensor to the hydrophone, fishing method, type of hydrophone). You can have better performance with the following levels:

   - Active wideband hydrophone with high/low gain: below -100 dBV
   - Active narrowband: NC-1-04 below -80 dBV / NC-1-07 below -100 dBv
   - Passive hydrophone: below -110 dBV

6. To see the maximum, mean and real time measures of noise level at a specific frequency, select **Marker** on the left side of the screen and move the mouse over the graph.



Frequency and levels of noise (dB) at the mouse pointer location are displayed under **Marker**.

7. Under **Peak**, you can check:
   - **RealTime**: the latest highest level of noise recorded.
   - **Max.**: the highest level of noise recorded since the beginning of the spectrum.
8. Check that there is more than 12dBV between the maximum noise level (dark blue line) and the average noise level (light blue line) on the peak of sensor frequencies.
9. If you changed the configuration of the hydrophone or sensors, click **Reset Max** to reset the dark blue line showing the maximum level of noise.
10. To save data recorded by the spectrum in a *.txt file, click **Save FFT**.

    The FFT file lists for the entire bandwidth used by the hydrophone (frequencies are in Hz) the maximum and mean levels of noise since the FFT export has started and the last real time level of noise before the export (dBV).

FFT level for Hydrophone 1 of Receiver 192.168.1.153			
Freq	Max	RealTime	Mean
32793	-129.07	-136.64	-138.50
32804	-129.31	-138.41	-139.65
32816	-128.72	-142.89	-139.02
32828	-128.09	-147.78	-139.86
32840	-127.95	-143.07	-140.06

11. When you have enough data, click **Stop Spectrum**.

Charging the Sensor

Charge the sensor at any battery level with either **Marport Basic Sensor Charger** or **Marport Medusa II Multi-charger**.

About this task

The sensor uses lithium-ion batteries. Charge them only with Marport's chargers.

Warning: In case of water ingress in the product, do not charge it: battery may vent or rupture, causing product or physical damage.

Important: Make sure to disconnect the charger from the sensor when you switch off the charger or vessel's power supply. If not, the contact of the charger's pins with the shoulder bolts switches on the sensor, that will run until discharged.

Note: Avoid full discharges and charge the battery whenever possible, at any battery level. Lithium-ion batteries do not have a charge memory, so they do not need full discharge cycles.

Procedure

1. Before charging the sensor: wash with fresh water and dry the sensor. This prevent corrosion of the charging pins.
2. Place the sensor and charger in a dry room like the deck or bridge. The optimal temperature while charging is between 10 and 25 °C.
3. Place the sensor away from any installing material (e.g. wet ropes) and fix the sensor with brackets to keep it stable while charging.
4. Allow good air circulation around the charger for cooling.
5. Connect the 3-pin charging connector to the sensor shoulder bolts.

   Tip: You can apply a small film of electrical contact grease lubricant on pins.
   To maintain the electrical pins, polish them with fine sandpaper.

   Important: Check that the shoulder bolts are not damaged. If they are, contact your local Marport dealer for replacement. Below is an example of shoulder bolts damaged because of insufficient maintenance.

6. Plug in the charger to a 110-240 V AC 50-60 Hz socket.
7. If you have the multi-charger, turn the power switch to the **ON** position.

   The power switch lights on. If not, check the AC power cord connection.
8. Wait for the battery to charge: standard charging cycle takes 8 to 12 hours. A fast charge configuration allows a 70 % charge in 1 hour and full charge in 4 hours.
9. Look at the LED(s) on the charger box to know the charge status. For the multi-charger, there is a LED for each sensor charging cable. The charge status are:
   - Green LED: > 90%
   - Orange LED: from 70% to 90%
   - Red LED: < 70%
10. Make sure to disconnect the charger from the sensor when you switch off the charger or vessel's power supply. If not, the contact of the charger's pins with the shoulder bolts switches on the sensor, that will run until discharged.

Results

Once charged, the operational life time can be up to approximately 16 days for a Spread Sensor (8 days for a mini Spread Sensor) and 76 hours for a Slant Range, 38 hours for a mini Slant Range.

The operational life time depends especially on the uplink power of the sensor, but also on the sounding range, uplink frequency and options activated.

Maintenance

Read this section to learn best practices for maintaining the sensor.

Only an approved Marport dealer can access the internal unit. Warranty will become void if anyone other than an approved dealer tries to do internal maintenance duties on the sensor.

CAUTION: Never remove shoulder bolts directly from the end cap (black part). Shoulder bolts are attached to cables and trying to remove them will damage the cables.

CAUTION: Always inspect and correctly install all the o-ring seals inside the sensor when doing internal maintenance duties. If o-ring seals are worn out, missing or incorrectly installed, sensor may be flooded.

Cleaning the Sensor

You need to regularly clean the sensor for proper performance.
Wash the sensor with fresh water before you charge or store it.

Regularly check that the sensor is clean. If not:

- Remove any marine life with a piece of wood or screwdriver.
- Wash away mud or debris with warm water.

  CAUTION: Do not use highly abrasive materials or jet wash.

  CAUTION: Special care should be taken with sensors and components sensitive to mechanical shock or contamination.

Maintenance Checklist

We recommend you to follow this maintenance schedule for better performance and to avoid any trouble with the equipment.

Before use	• Check that all attachment equipment are not worn or torn. Replace when appropriate. • Check that the sensor is clean. See Cleaning the Sensor on page 106 for cleaning procedures.
After use	Wash the sensor with fresh water.
Between uses	• When the sensor is not in use, store in a dry area, without humidity, at a temperature between -10° and 70 °C (14 to 158 °F). • If you put the sensor into storage for a long period of time, charge it once in a while. If you do not, batteries can become inoperable.
Every 2 years	Return the sensor to an approved Marport dealer for inspection and maintenance.

Troubleshooting

Read this section to know how to solve common problems.

Mosa does not start due to error message

Mosa displays an error message saying Mosa cannot be opened.

→ Your Mac security preferences do not allow you to open software not downloaded from the App Store.

1. From the upper left corner of the screen, click **Apple menu** > **System Preferences** > **Security & Privacy**.
2. From the lower left corner of the **Security & Privacy** dialog box, click the lock icon and enter your password (if applicable).
3. At **Allow apps downloaded from**, select **Anywhere**.
4. For some macOS Sierra versions, click **Open Anyway** or see Installing Mosa on page 26 to know how to add the **Anywhere** option.
5. Close the dialog box.

Sensor has difficulty connecting to Mosa

Mosa is very slow or unable to detect the sensor.

→ The wireless connection does not work correctly.

- Connect and disconnect the sensor to a charger to make the sensor reboot.

→ The sensor is out of the range of the wireless signal.

1. Bring the sensor closer to the computer.
2. For door sensors that need to be in door pockets for calibration: remove the sensor from the door, establish the connection, then put the sensor back in the door.
3. To extend the range of the wireless signal, you can use a key (ref. TRENDnet TBW-106UB) with a USB range extender connected to the computer. Place the key as close as possible to the sensor.

Sensor cannot connect in wireless connection

When trying to connect to the sensor by wireless connection, the sensor appears on Mosa discovery area but you cannot click it OR the sensor does not appear on discovery area.

→ In some cases, the computer keeps an history of some wireless devices and this interfere with the correct detection of sensors. You need to launch a script to uninstall Mosa and erase all wireless preferences.

1. Double-click the DMG file of a Mosa version **01.02.05 and after**.
2. Right-click **UninstallMosa.command** and select **Open With** > **Terminal**.

3. From the terminal window, enter your computer password and press **Enter**.

   Note: For security reasons, the terminal window will not display anything when you type the password.

   The terminal window displays **Process completed** when the script is completed. Mosa is uninstalled from your computer and all wireless settings on the computer are erased.
4. From the DMG file, install Mosa again.

Data in Scala is wrong

Data displayed in Scala is wrong.

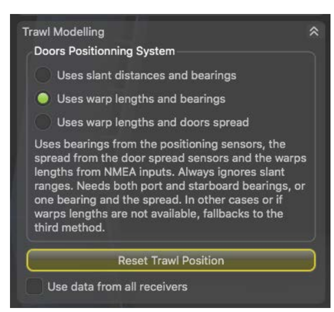
➜ There are signal interferences.

1. First, check that the sensor frequencies and telegrams are the same in the sensor configuration (via Mosa) and the receiver configuration (via Scala).
2. Check the frequencies of your other sensors to make sure there is enough distance between them.
3. Check the noise on the spectrum (see Checking Noise Interference on page 103). If the frequency where the sensor is placed is too noisy, change for a less noisy frequency:
   1. Spread Sensor: see Configuring Spread Sensor Telegrams on page 29
   2. Slant Range: see Configuring Sounding Frequencies on page 37

   Important: Do not forget to also change the frequency on Scala receiver page.
4. You can increase the uplink power of the sensor to increase the power of the signal transmitted to the receiver: see Configuring the Uplink Power on page 39.

Chart and 3D Views Are Wrong

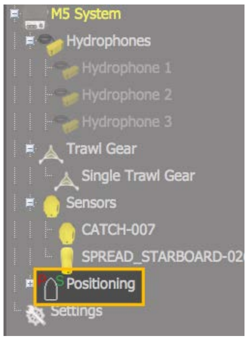
Tip: If the position of the trawl is wrong, click **Control Panels** > **Data Processing** > **Trawl Modelling** and click **Reset Trawl Position**.



The trawl is placed incorrectly

→ The positioning settings on Scala receiver page may be incorrect.

1. From Scala, click **Menu** > **Expert Mode**.
2. Click **Menu** > **Receivers**.
3. From the left side of the screen where the system is displayed, click **Positioning**.

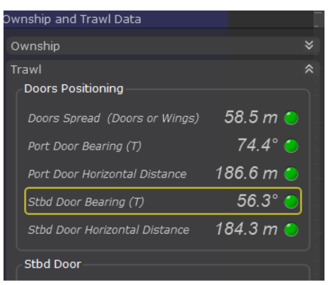


4. Check that the settings are correctly completed. See Configuring the Positioning Settings on page 50

There is no trawl on Scala, MaxSea or Olex

→ Trawl settings may be incorrect.

1. Check from **Control Panels** > **Ownship and Trawl Data** > **Trawl** that you see data in **Doors Positioning**.

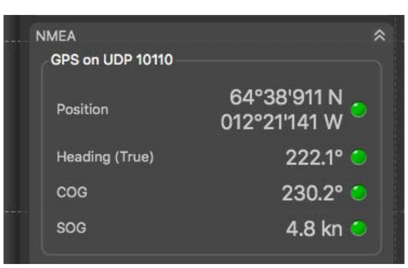


2. Click **Menu** > **Settings** > **Trawl**.
3. Check that **Headline**, **Bridle** and **Sweepline** dimensions are completed according to your trawl model.

There is no trawl or vessel

→ You may have no GPS coordinates or heading data.

1. From the **Control Panels**, click **Sensors Data** > **NMEA** and check that you receive GPS coordinates and heading data.



2. If not, check you have correctly configured you NMEA input(s): Adding Data from External Devices on page 52.

The trawl seems shrunken

→ Bearing angles may be incorrect.

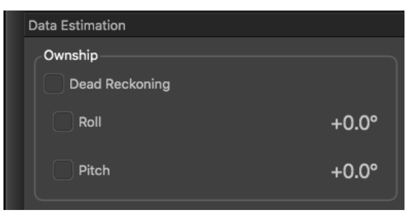
1. Check if the issue comes from the bearing angles:
   1. From the **Control Panels**, click **Data Processing** > **Trawl Modeling**.
   2. Change **Doors Positioning System** settings. For example change **Uses warp lengths and bearings** to **Uses warp lengths and door spread**.
   3. On the chart view, if the size of the trawl decreases or increases it means that the bearing measurements are not correct.
2. If so, check the baseline dimensions you entered in the positioning settings on Scala receiver page.

The vessel moves backwards and there is no trawl

→ **Dead Reckoning** option may be active.

1. Scala 01.06.14 From Scala version 01.06.14 and later, check from the bottom of Scala window if you see a **DR** warning meaning that **Dead Reckoning** option is active. If yes, follow the next steps.

2. Click **Menu** > **Expert Mode**.
3. From the Control Panels, click **Data Estimation** > **Ownship**.
4. Check that none of the options are selected. If so, deselect them.



The vessel and trawl have erratic movements: they jump, zigzag, move forward and backward

→ You have two GPS inputs. Coordinates can be slightly different between the two GPS so the position of the trawl changes according to one or the other.

1. Check from **Control Panels** > **Sensors Data** > **NMEA** if you receive coordinates from two GPS.
2. If so, click **Menu** > **Settings**> **NMEA Inputs** and remove one of the devices.

Positioning on SeapiX: Port/starboard trawl doors are reversed

→ Your version of Scala does not output the correct positioning sentence or you selected a wrong positioning sentence.

1. Upgrade Scala to version 01.06.19 or later.

2. When configuring the output of positioning data in Scala, from **Settings** > **Add NMEA Output** > **Emit trawl positioning sentence**, select **Best sentence for Seapix ($PTSAL)**.

Spread Sensor: In Scala, Lost is displayed instead of spread distance

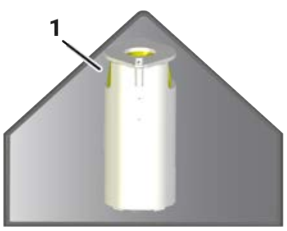
From Sensors Data in the control panels, it is written **Lost** instead of spread distance data.

➜ Trawl doors may not be aligned or may lay on their side.

1. Check the pitch and roll.
2. If needed, pull the warps to align the doors or set them back upright.

➜ The sensors are placed backwards in the doors.

1. Remove the sensors from the pocket.
2. Check that the side of the housing with a marker is on the top and that the side of the sensor with a circle is oriented towards the outside (**1**).



➜ Master and Starboard sensors have been inverted on the doors. In that case, you will also have wrong pitch and roll values.

- Open the pocket and check the top of the housing of the sensor: the one with a green marker must be on the starboard side and the one with a red marker on the port side. If there is no marker on the top, remove the sensor and check on the side if there is a marker. The side of the sensor with a circle must be oriented towards the outside.

➜ If you used to have correct data and suddenly lost them, the up or down component in the transducer may be broken.

1. Remove sensors from the doors and check from the office if **Lost** is still displayed.
2. If yes, see with support service for repair.

➜ Distance between trawl doors is more than 255 m (signal is lost at 256 m, ±1 m) and the sensor telegram does not cover such a distance.

- Change the sensor telegrams to AL6 or A6: see Configuring Spread Sensor Telegrams on page 29.

Spread Sensor: Distances are incorrect or irregular

Spread distances displayed in Scala do not correspond to the reality or distance values are very irregular.

➜ The threshold of the sensor detection level is too low.

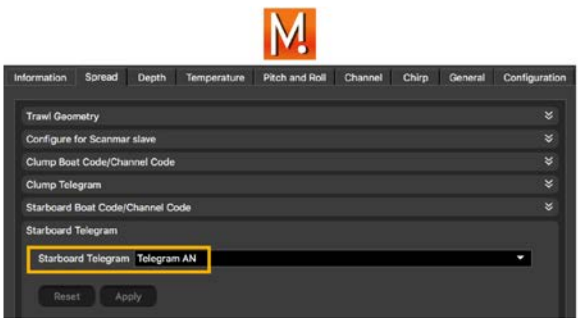
1. Connect the sensor to Mosa.
2. From Mosa, click **Menu** > **Expert Mode** and enter the password `copernic`.
3. Click the tab **Spread** and from **Threshold Detection Level**, add 10 to the current level.
4. Test the sensor when installed on the doors during trawling, and if needed, add 10 again.

➜ There is a conflict between frequencies.

- Make sure there is a minimum distance of 100 Hz between all the telegram frequencies.

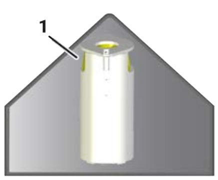
➜ The spread telegrams you entered in Mosa and those you entered in the receiver page on Scala are not the same.

- Compare the telegrams you configured on Mosa and those you entered in the receiver page. Change if necessary.



➜ If the spread distances are very small such as 1 meter or less, the Master and Starboard sensors have been inverted on the doors. In that case, you will also have wrong pitch and roll values.

- Open the pocket and check the top of the housing of the sensor: the one with a green marker must be on the starboard side and the one with a red marker on the port side. If there is no marker on the top, remove the sensor and check on the side if there is a marker. The side of the sensor with a circle (**1**) must be oriented towards the outside.

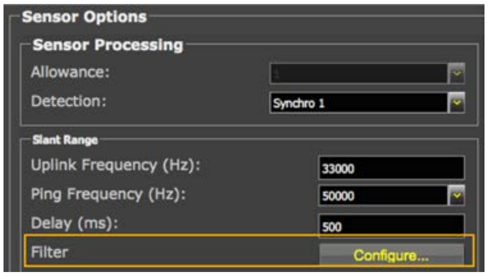


Slant Range: Slant distance is too long

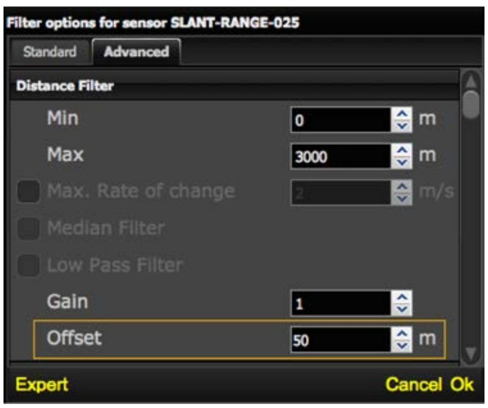
The slant distance displayed in Scala is longer than the distance indicated by the winch control system.

➜ Slant distance is calculated from the sensor to the receiving hydrophone. If the hydrophone is placed further away from the stern than the winch control system, it will display a longer distance. You need to apply an offset to the slant distance.

1. From Scala, click **Menu** > **Expert Mode** and enter the password `copernic`.
2. Click **Menu** > **Receivers**.
3. From the left side of the screen, click the name of your sensor.
4. From **Sensor Options** > **Slant Range** > **Filter**, click **Configure**.



5. From **Distance Filter**, apply an offset corresponding to the difference between what displays the winch control system and the Slant Range sensor.



Support Contact

You can contact your local dealer if you need maintenance on your Marport products. You can also ask us at the following contact details:

FRANCE

Marport France SAS

8, rue Maurice Le Léon

56100 Lorient, France

supportfrance@marport.com

ICELAND

Marport EHF

Fossaleyni 16

112 Reykjavik, Iceland

supporticeland@marport.com

SPAIN

Marport Spain SRL

Camino Chouzo 1

36208 Vigo (Pontevedra), Spain

supportspain@marport.com

USA

Marport Americas Inc.

12123 Harbour Reach Drive, Suite 100

Mukilteo, WA 98275, USA

supportusa@marport.com

Appendix

Appendix A: Frequency Plan

It is important to carefully plan the setup of your sensors before adding them to the system. You can create a table with a list of frequencies and complete it when you add sensors.

Boat & Channel Codes

This list shows the standard frequencies for PRP telegrams. When you configure boat codes, make sure to respect the correct interval between frequencies (see table above).

Codes		
BC/CH	Frequency	FID (Scanmar)
C-1/CH1	42833	45
C-1/CH2	41548	32
C-1/CH3	41852	35
C-1/CH4	40810	25
C-1/CH5	42500	42
C-1/CH6	43200	49
C-2/CH1	42631	43
C-2/CH2	41417	31
C-2/CH3	41690	33
C-2/CH4	40886	26
C-2/CH5	42300	40
C-2/CH6	43100	48
C-3/CH1	42429	41
C-3/CH2	41285	30
C-3/CH3	41548	32
C-3/CH4	40970	27
C-3/CH5	42100	38
C-3/CH6	43000	47
C-4/CH1	42226	39
C-4/CH2	41852	35
C-4/CH3	41417	31
C-4/CH4	41160	29

C-4/CH5	42700	44
C-4/CH6	43300	50
C-5/CH1	42024	37
C-5/CH2	41690	33
C-5/CH3	41285	30
C-5/CH4	41060	28
C-5/CH5	42900	46
C-5/CH6	43400	51
C-6/CH1	39062	3
C-6/CH2	39375	7
C-6/CH3	39688	11
C-6/CH4	40000	15
C-6/CH5	40312	19
C-6/CH6	40625	23
C-7/CH1	38906	1
C-7/CH2	39219	5
C-7/CH3	39531	9
C-7/CH4	39844	13
C-7/CH5	40156	17
C-7/CH6	40469	21

Frequencies and intervals

The diagrams below show the bandwidth of the different types of Marport sensors and intervals you must respect when adding other sensors.

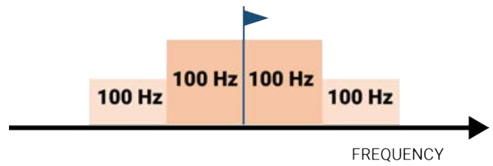


Figure 10: PRP sensors (e.g. Catch sensor, Trawl Speed, Spread sensor...)

Example: If the frequency of the sensor is 40kHz, there should be no sensors between 39.9-40kHz and 40-40.1kHz.

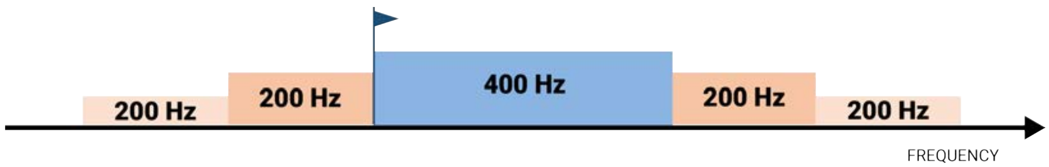


Figure 11: NBTE sensors (e.g. Speed Explorer, Trawl Explorer, Catch Explorer, Door Sounder)

Example: If the frequency of the sensor is 40kHz, there should be no sensors between 39.8-40kHz and 40-40.6kHz.

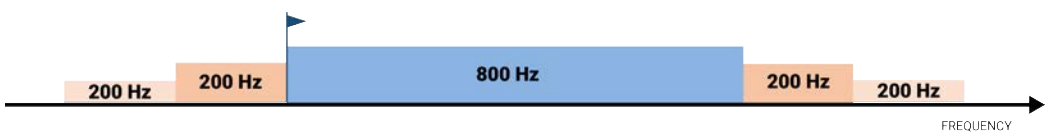


Figure 12: HDTE narrow band mode

Example: If the frequency of the sensor is 40kHz, there should be no sensors between 39.8-40kHz and 40-41kHz.

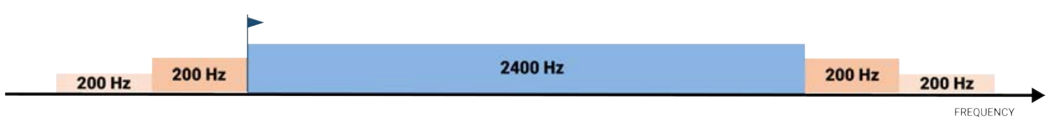


Figure 13: HDTE wide band mode

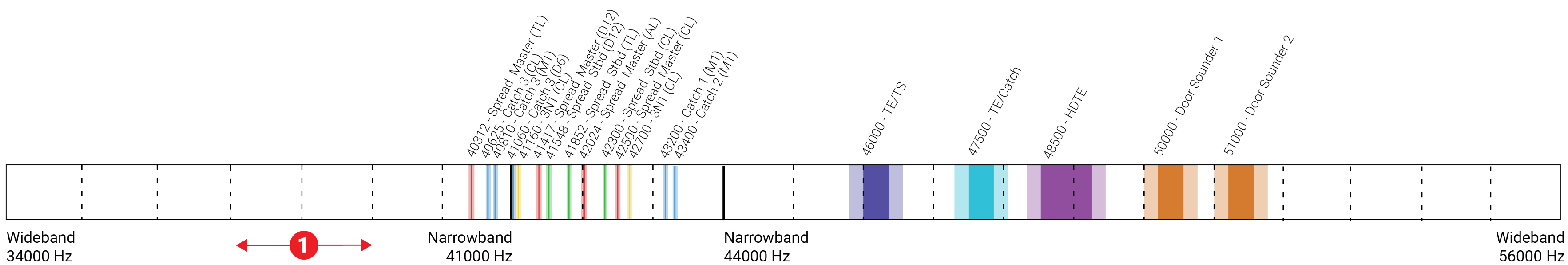
Example: If the frequency of the sensor is 40kHz, there should be no sensors between 39.8-40kHz and 40-42.6kHz.

Frequency of the sensor | Bandwidth | Mandatory distance with other sensors | Recommended distance with other sensors

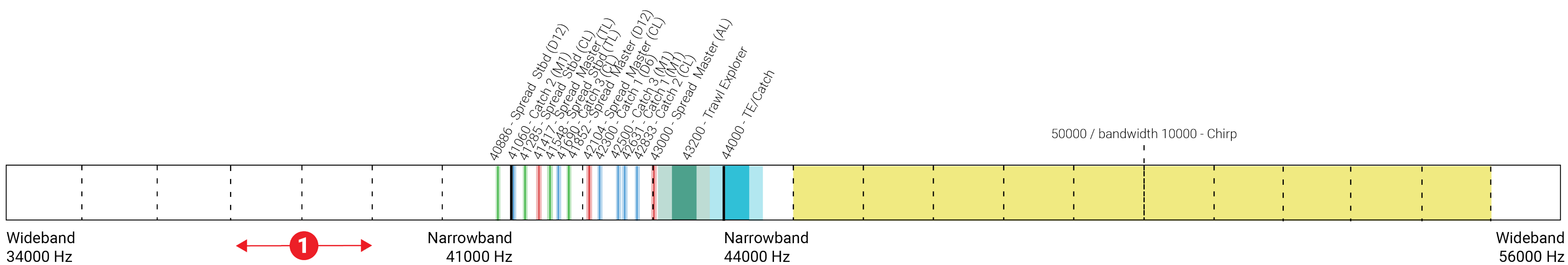
Examples of frequency allocations

- We recommend to allocate frequencies between 34 and 56 kHz for wideband hydrophones and between 41 kHz and 44 kHz for narrowband hydrophones.
- Echosounders are usually placed around 38 kHz, make sure to allow enough distance with them.

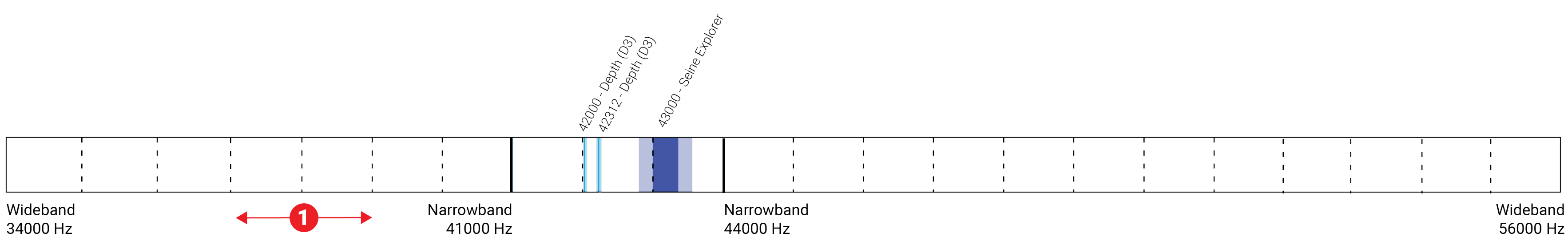
Example of a system with Spread, Catch, Trawl Speed sensors and Speed Explorer, Catch Explorer, HDTE and Door Sounder.



Example of a system with Spread sensors with positioning, Catch sensors, Trawl Explorer and Catch Explorer.



Example of a system for purse seining, with a Seine Explorer and depth Seine sensors.



Bandwidth

Mandatory distance with other sensors

1 Avoid allocating frequencies between 37 and 39 kHz because this range is generally used by echosounders.

Appendix B: Compatible NMEA Sentences from Winch Control Systems, GPS and Compass Devices

You can add to Scala winch control systems (as NMEA inputs) that use the following NMEA sentences.

NMEA 0183 Standard Sentences

Symbol (*) indicates which parts of the sentence Scala uses.

NMEA Sentence	Format	First compliant version of Scala
GGA - Global Positioning System Fix Data	`$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x, xxxx*hh<CR><LF>` **1.** $--: Talker identifier* **2.** GGA: Sentence formatter* **3.** hhmmss.ss: UTC of position* **4.** llll.ll, a: Latitude North/South (N/S)* **5.** yyyyy.yy, a: Longitude East/West (E/W)* **6.** x: GPS quality indicator **7.** xx: Number of satellites in use (00-12) **8.** x.x: Horizontal dilution of precision **9.** x.x, M: Antenna altitude above/below mean sea level (geoid), meters* **10.** x.x, M: Geoidal separation, meters **11.** x.x: Age of differential GPS data **12.** xxxx: Differential reference station ID **13.** *hh: Cheksum*	1.0.0.0
GLL - Geographic Position - Latt/Long	`$--GLL, llll.ll,a,yyyyy.yy,a,hhmmss.ss,A,a*hh<CR><LF>` **1.** $--: Talker identifier* **2.** GLL: Sentence formatter* **3.** llll.ll, a: Latitude North/South (N/S)* **4.** yyyyy.yy, a: Longitude East/West (E/W)* **5.** hhmmss.ss: UTC of position* **6.** A: status (A= data valid / V: data not valid)* **7.** a: Mode indicator **8.** *hh: Checksum*	1.2.6.0

NMEA Sentence	Format	First compliant version of Scala
GNS - GNSS Fix Data	`$--GNS,hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c,xx,x.x,x.x,x.x,x.x,x.x,a*hh<CR><LF>` **1.** $--: Talker identifier* **2.** GNS: Sentence formatter* **3.** hhmmss.ss: UTC of position* **4.** llll.ll,a: Latitude North/South (N/S)* **5.** yyyyy.yy,a: Longitude East/West (E/W)* **6.** c--c: Mode indicator **7.** xx: Total number of satellites in use (00-99) **8.** x.x: Horizontal dilution of precision **9.** x.x: Antenna altitude above/below mean sea level (geoid), in meters* **10.** x.x: Geoidal separation, meters **11.** x.x: Age of differential data **12.** x.x: Differential reference station ID **13.** *hh: Cheksum*	1.0.0.0
HDG - Heading, Deviation & Variation	`$--HDG,x.x,x.x,a,x.x,a*hh` **1.** $--: Talker identifier* **2.** HDG: Sentence formatter* **3.** x.x: Sensor magnetic heading (degrees)* **4.** x.x,a: Magnetic deviation (degrees), Easterly/Westerly (E/W)* **5.** x.x,a: Magnetic variation (degrees), Easterly/Westerly (E/W)* **6.** *hh: Checksum*	1.0.0.0
HDT - Heading, True	`$--HDT,x.x,T*hh` **1.** $--: Talker identifier* **2.** HDT: Sentence formatter* **3.** x.x,T: Heading (degrees) True* **4.** *hh: Checksum*	1.0.0.0

NMEA Sentence	Format	First compliant version of Scala
VHW - Water Speed and Heading	`$--VHW,x.x,T,x.x,M,x.x,N,x.x,K*hh<CR><LF>` **1.** $--: Talker identifier* **2.** VHW: Sentence formatter* **3.** x.x,T: Heading, degrees True* **4.** x.x,M: Heading, degrees Magnetic* **5.** x.x,N: Speed, knots* **6.** x.x,K: Speed, km/hr **7.** *hh: Checksum*	1.4.0.0
VTG - Course Over Ground and Ground Speed	`$--VTG,x.x,T,x.x,M,x.x,N,x.x,K*hh` **1.** $--: Talker identifier* **2.** VTG: Sentence formatter* **3.** x.x,T: Course over ground, degrees, True* **4.** x.x,M: Course over ground, degrees, Magnetic **5.** x.x,N: Speed over ground, knots* **6.** x.x,K: Speed over ground, km/hr* **7.** *hh: Checksum*	1.3.3.0

Proprietary Sentences

Symbol (*) indicates which parts of the sentence Scala uses.

Sentence	Format	First compliant version of Scala

ATW - Naust Marine winch control system	`$NMATW,,xxxxxx,xxxxxx,xxxxxx,xxxxx,xxxxx,xxxxx,`
	`xxxxx,xxxxx,xxxxx,xxxxx,xxxxx,xxxxx,`
	`xx:xx*hh<CR><LF>`
	1. $NMATW: Talker identifier + sentence formatter*
	2. Winch starboard tension (kg)*
	3. Winch port tension (kg)*
	4. Winch middle tension (kg)*
	5. Winch starboard length (meter or feet)*
	6. Winch port length (meter or feet)*
	7. Winch middle length (meter or feet)*
	8. RPM starboard
	9. RPM port
	10. RPM middle
	11. Line speed starboard (meter or feet/min)
	12. Line speed port (meter or feet/min)
	13. Line speed middle (meter or feet/min)
	14. Towing time (meter or feet/min)
		1.2.0.0

FEC - Furuno attitude message	`$PFEC,GPatt,xxx.x,xx.x,xx.x,*hh` **1.** $PFEC: Talker identifier + sentence formatter* **2.** GPatt: Global positioning attitude, sentence formatter **3.** xxx.x: Heading true* **4.** xx.x: Pitch* **5.** xx.x: Roll* **6.** *hh: Checksum*	1.0.5.0
KW - Karmoy Winch	`$PKWIN,x,x.x,T,x.x,M,x.x,rpm` **1.** $PKWIN: Talker identifier + sentence formatter* **2.** x: Winch 0 = Stbd / Trawl 1 = Port Trawl Winch **3.** x.x, T: Tensions (tons) **4.** x.x, M: Length (meters) **5.** x.x, rpm: Speed (rpm)	1.6.25.0

<table>
<tr><th>Sentence</th><th>Format</th><th>First compliant version of Scala</th></tr>
<tr><td>MA DD - Marelec winch length and tension</td><td><code># MA DD dd/mm/yy,hh:mm:ss LB xxxxm LS xxxxm LM xxxxm, TB xxxxK, TS xxxxK, TM xxxxK xx<CR><LF></code>
1. # MA DD: talker identifier*
2. dd/mm/yy: date*
3. hh:mm:ss: time*
4. LB xxxxm: Shooted length portside in meters*
5. LS xxxxm: Shooted length starboard in meters*
6. LM xxxxm: Shooted length center in meters*
7. TB xxxxK: Tension of portside in kg*
8. TS xxxxK: Tension of starboard in kg*
9. TM xxxxK: Tension of center in kg*
10. xx: system in 00 = MANUAL (stop), 10 = auto shooting, 20 = auto fishing, 30 = auto hauling, 40 = slow tension alarm without propeller reduction, 41 = slow tension alarm with propeller reduction, 50 = fast tension alarm without propeller reduction, 51 = fast tension alarm with propeller reduction*</td><td>1.2.0.0</td></tr>
<tr><td>NAV - Ifremer proprietary sentence</td><td><code>$NANAV,04/09/yy,hhmmss.sss,NASYC,N,48,22.92315,W,004,28.90527,D,00.0,WG84,04/09/13, 13:05:37.000,COU,346.08,-00.22,+00.13,+00.00,+00052.172,000,0000</code></td><td>1.0.0.0</td></tr>
<tr><td>IFM - Ifremer versatile sentence</td><td><code>$PIFM,EU,MES,dd/mm/yy,hh:hh:ss.sss,TRFUN,±x,xx,xxxxx,xxxx,x.x,x,xxxxx,xxxx,x.x,x,[CR][LF]</code>
1. $PIFM: Talker identifier + sentence formatter*
2. OCGYR: pitch, roll, heading
3. TRFUN: winch lengths (starboard, port) and winch tensions (starboard, port)</td><td>1.0.0.0</td></tr>
</table>

Sentence	Format	First compliant version of Scala
SYN - Winch Syncro 2020, winch length and tension	`$WMSYN,aaa.a,m,bbb.b,m,ccc.c,m,ddd.d,m,ee.e,t,ff.f,t,gg.g,t,hh.h,t,0.5,r,0.7,r,1.6,s,2.0,s,0,0,1,0,0,45.5,c,33.0,p,32.8,p*31` **1.** $WMSYN: Talker identifier + sentence formatter* **2.** aaa.a: winch starboard length in meters* **3.** bbb.b: winch inner starboard length in meters* **4.** ccc.c: winch inner port length in meters* **5.** ddd.d: winch port length in meters* **6.** ee.e: winch starboard tension in tons* **7.** ff.f: winch inner starboard tension in tons* **8.** gg.g: winch inner port tension in tons* **9.** hh.h: winch port tension in tons* **10.** Other strings are not used.	1.0.0.0
	`$WMSYN,xxx.x,c,xxx.x,c,xxx.x,c,xx.x,t,xx.x,t,xx.x,t*hh<CR><LF>` **1.** $WMSYN: Talker identifier + sentence formatter* **2.** xxx.x,c: Starboard wire length (m=meter, F=fathom, f=feet)* **3.** xxx.x,c: Mid wire length (m=meter, F=fathom, f=feet)* **4.** xxx.x,c: port wire length (m=meter, F=fathom, f=feet)* **5.** xx.x,t: Starboard wire tension, tons* **6.** xx.x,t: Mid wire tension, tons* **7.** xx.x,t: Port wire tension, tons*	1.6.19.0
TAWWL - RappHydema, PTS Pentagon warp length	`@TAWWL,x,M,y,M,z,M<CR><LF>` See below. M = meter	1.4.4.0
	`@TAWWL,x,y,z<CR><LF>` **1.** @TAWWL: Talker identifier + sentence formatter* **2.** x: Starboard winch length* **3.** y: Port winch length* **4.** z: Middle winch length*	1.6.19.0

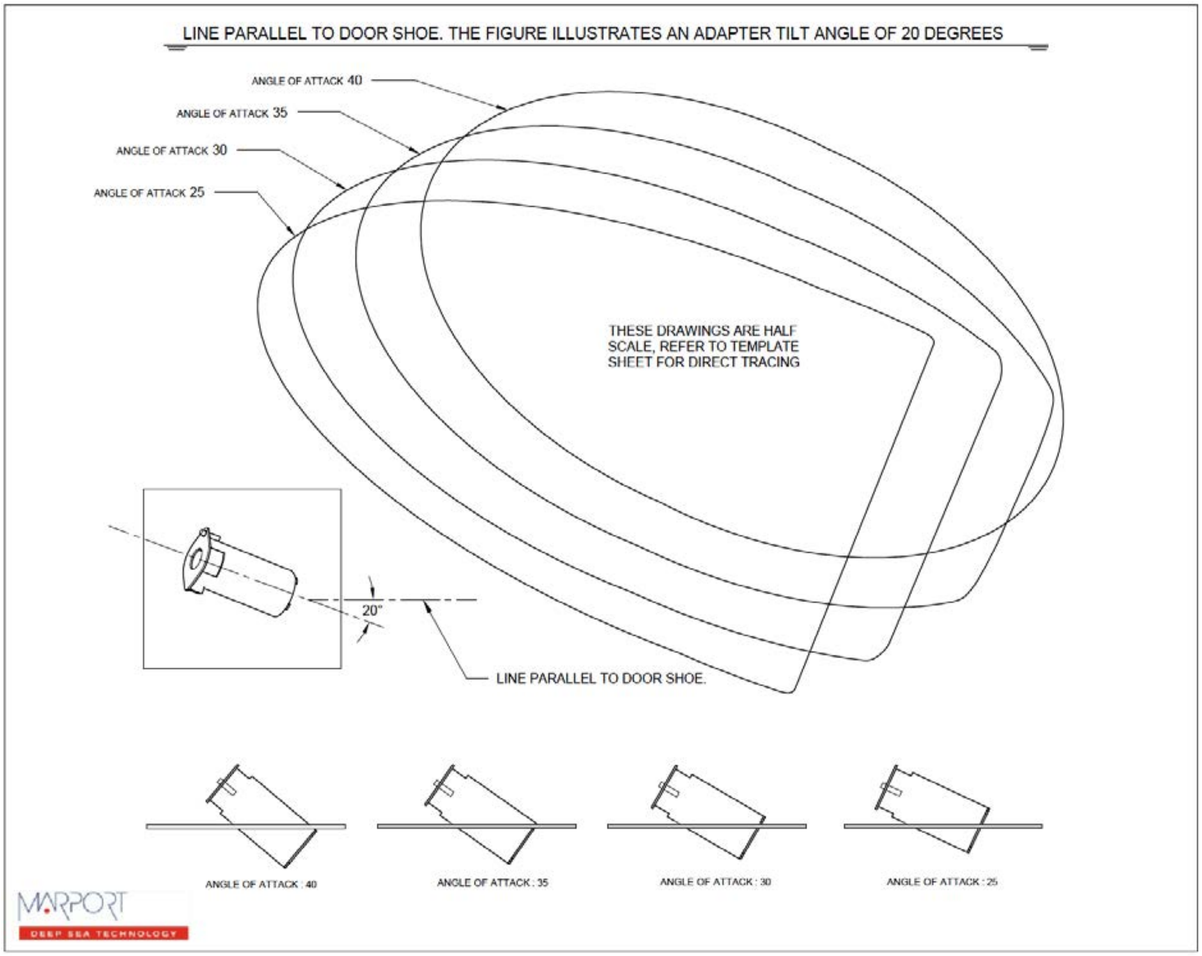
Sentence	Format	First compliant version of Scala
TAWWT - RappHydema, PTS Pentagon warp tension	`@TAWWT,x.x,T,y.y,T,z.z,T<CR><LF>` See below. T = tons	1.4.4.0
	`@TAWWT,x.x,y.y,z.z<CR><LF>` **1.** @TAWWT: Talker identifier + sentence formatter* **2.** x.x: Starboard winch tension* **3.** y.y: Port winch tension* **4.** z.z : Middle winch tension*	1.6.19.0
WCT - Warp length and tension (Silecmar)	`$SIWCT,xxx,xxx,xxx,x.x,x.x,x.x*hh<CR><LF>` **1.** $SIWCT: Talker identifier + sentence formatter* **2.** xxx: Port winch cable, meters* **3.** xxx: Starboard winch cable, meters* **4.** xxx: Clump winch cable, meters* **5.** x.x: Tension in the port winch, tons* **6.** x.x: Tension in the starboard winch, tons* **7.** x.x: Tension in the clump winch, tons* **8.** *hh: Checksum*	1.2.6.0
WLC - Scantrol winch length (clump)	`$SCWLC,x.x,M,y.y,M*hh<CR><LF>` **1.** $SCWLC: Talker identifier + sentence formatter* **2.** x.x,M: paid out wire in meters* **3.** y.y,M: wirespeed in meters/sec., positive when paying out wire **4.** *hh: Checksum*	1.0.6.0
WLP - Scantrol winch length (port)	`$SCWLP,x.x,M,y.y,M*hh<CR><LF>` **1.** $SCWLP: Talker identifier + sentence formatter* **2.** x.x,M: paid out wire in meters* **3.** y.y,M: wirespeed in meters/sec., positive when paying out wire **4.** *hh: Checksum*	1.0.6.0
WLS - Scantrol winch length (starboard)	`$SCWLS,x.x,M,y.y,M*hh<CR><LF>` **1.** $SCWLS: Talker identifier + sentence formatter* **2.** x.x,M: paid out wire in meters* **3.** y.y,M: wirespeed in meters/sec., positive when paying out wire **4.** *hh: Checksum*	1.0.6.0

Sentence	Format	First compliant version of Scala
WTC - Scantrol winch tension (clump)	`$SCWTC,x.x,T*hh<CR><LF>` **1.** $SCWTC: Talker identifier + sentence formatter* **2.** x.x: tension in tons* **3.** *hh: Checksum*	1.0.6.0
WTP - Scantrol winch tension (port)	`$SCWTP,x.x,T*hh<CR><LF>` **1.** $SCWTP: Talker identifier + sentence formatter* **2.** x.x: tension in tons* **3.** *hh: Checksum*	1.0.6.0
WTS - Scantrol winch tension (starboard)	`$SCWTS,x.x,T*hh<CR><LF>` **1.** $SCWTS: Talker identifier + sentence formatter* **2.** x.x: tension in tons* **3.** *hh: Checksum*	1.0.6.0

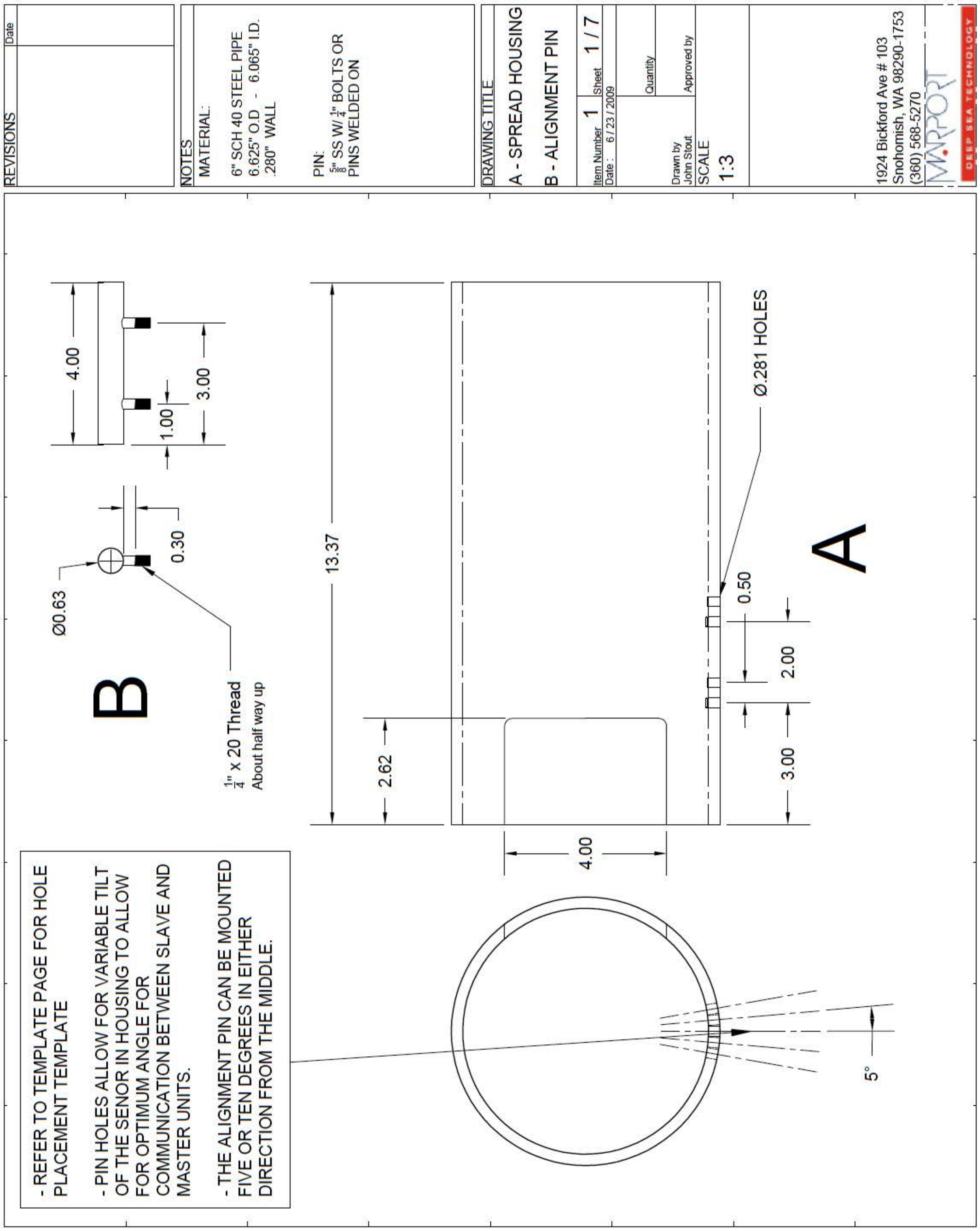
Appendix C: Pocket Drawings

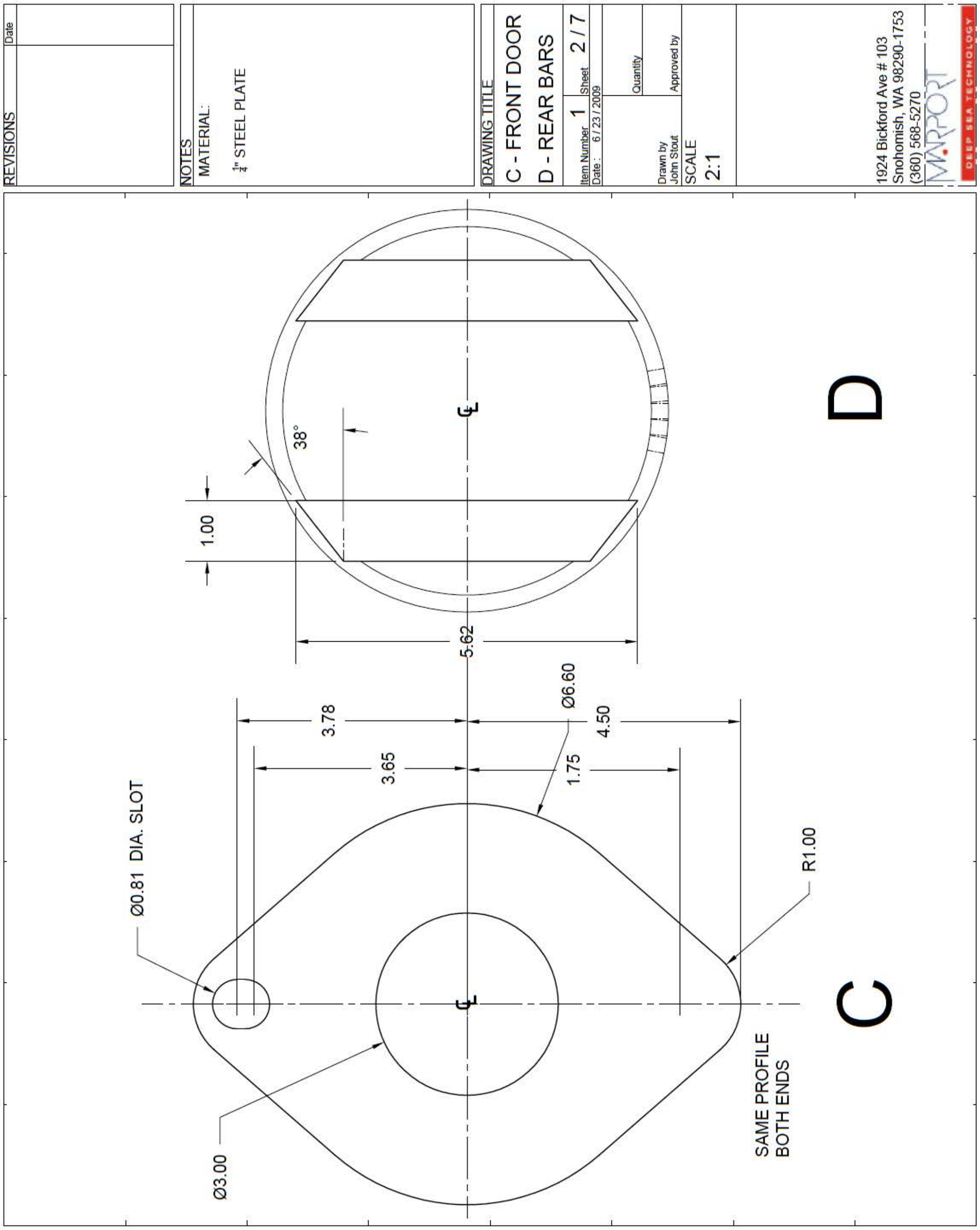
Drawings to manufacture Spread Sensor pockets to be placed on trawl doors. Ask your local Marport Office for scaled templates.

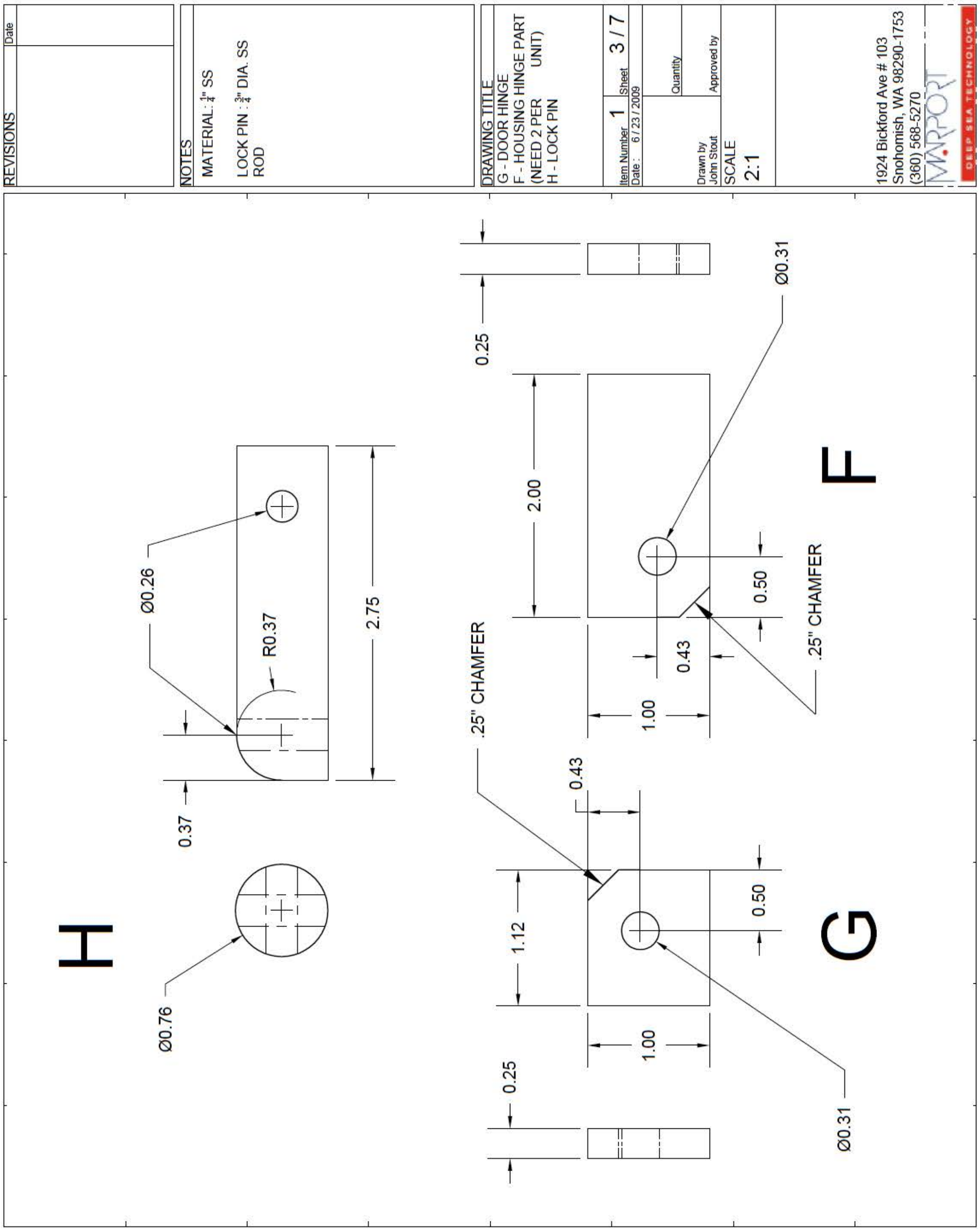
Pocket Angle of Attack

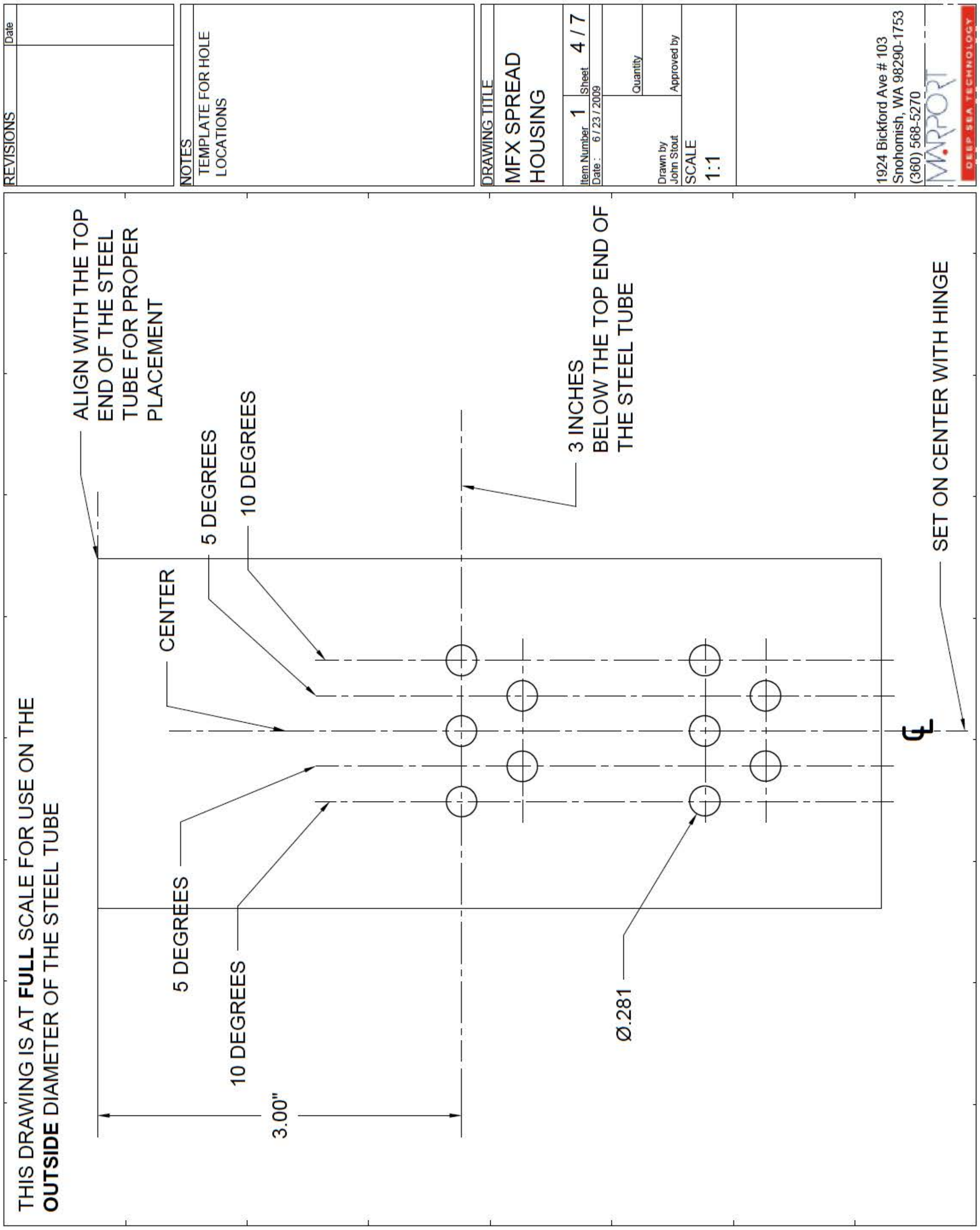


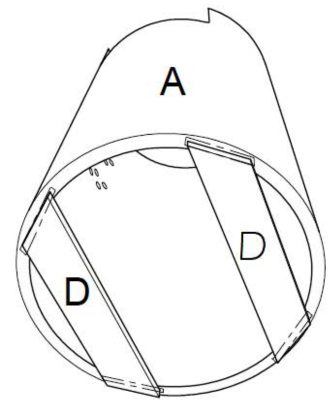
Pocket for XL Bottles (Standard Spread Sensor & Standard Slant Range)



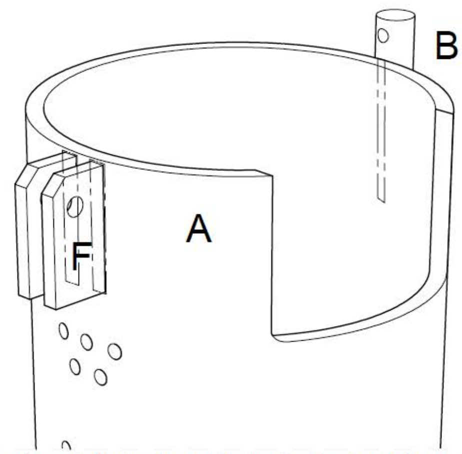

REVISIONS
Date
NOTES
MATERIAL:
1/4" STEEL PLATE
DRAWING TITLE
C - FRONT DOOR
D - REAR BARS
Item Number 1
Sheet 2 / 7
Date : 6 / 23 / 2009
Quantity
Drawn by
John Stout
Approved by
SCALE
2:1
1924 Bickford Ave # 103
Snohomish, WA 98290-1753
(360) 568-5270
MARPORT
DEEP SEA TECHNOLOGY
1.00
38°
5.62
Ø6.60
3.78
4.50
3.65
1.75
Ø0.81 DIA. SLOT
R1.00
Ø3.00
SAME PROFILE
BOTH ENDS
C
D


REVISIONS
Date
NOTES
MATERIAL: 1/4" SS
LOCK PIN: 3/4" DIA. SS ROD
DRAWING TITLE
G - DOOR HINGE
F - HOUSING HINGE PART (NEED 2 PER UNIT)
H - LOCK PIN
Item Number 1
Sheet 3 / 7
Date: 6 / 23 / 2009
Quantity
Drawn by John Stout
Approved by
SCALE 2:1
1924 Bickford Ave # 103
Snohomish, WA 98290-1753
(360) 568-5270
DEEP SEA TECHNOLOGY
H
Ø0.76
0.37
Ø0.26
R0.37
2.75
F
0.25
2.00
Ø0.31
.25" CHAMFER
0.50
0.43
1.00
G
0.43
1.12
.25" CHAMFER
0.50
1.00
0.25
Ø0.31

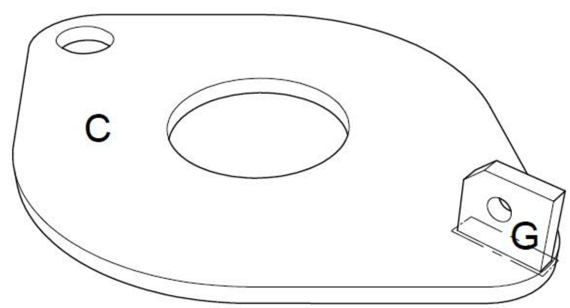

REVISIONS
Date
NOTES
TEMPLATE FOR HOLE LOCATIONS
DRAWING TITLE
MFX SPREAD HOUSING
Item Number 1
Sheet 4 / 7
Date : 6 / 23 / 2009
Quantity
Drawn by John Stout
Approved by
SCALE 1:1
1924 Bickford Ave # 103
Snohomish, WA 98290-1753
(360) 568-5270
MARPORT
DEEP SEA TECHNOLOGY
THIS DRAWING IS AT FULL SCALE FOR USE ON THE OUTSIDE DIAMETER OF THE STEEL TUBE
ALIGN WITH THE TOP END OF THE STEEL TUBE FOR PROPER PLACEMENT
5 DEGREES
10 DEGREES
CENTER
3 INCHES BELOW THE TOP END OF THE STEEL TUBE
SET ON CENTER WITH HINGE
Ø.281
3.00"



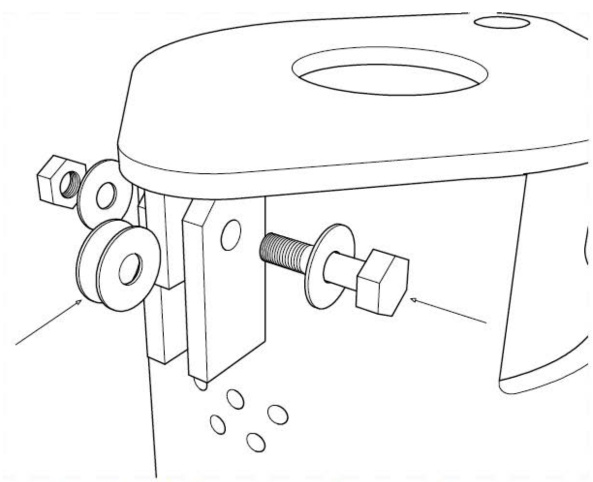
1. Weld both rear bars to main housing tube, ensuring they are parallel to front sensor opening.



2. On the other end of the housing, weld the housing hinge bars to the top end, making sure both bars or the weld does not extend above the top of the tube.



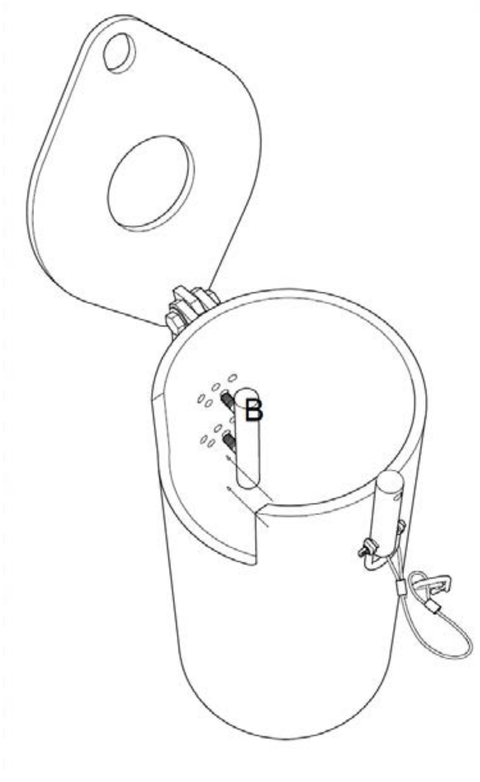
3. Next weld the door hinge onto the top end of the door piece, its distance from the edge is to be determined by the alignment of the opposite hole with the edge of the tube.



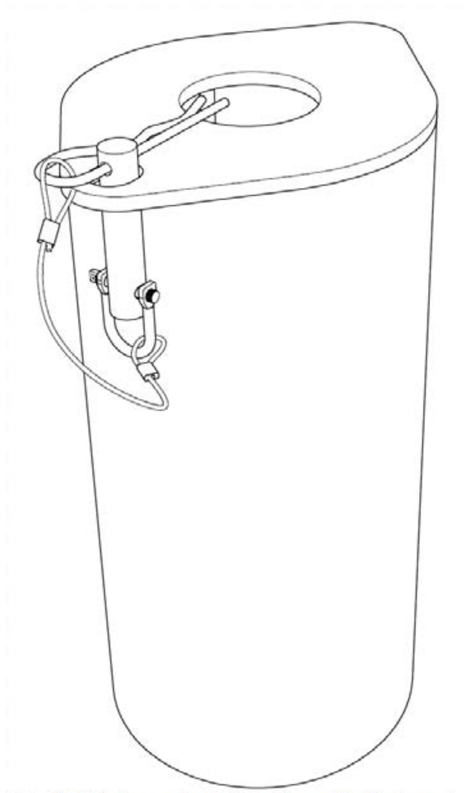
4. Place the $\frac{5}{16}$ x 1.5" bolt through the hinge with washers and $\frac{5}{16}$ nylock nut as shown

MFX SPREAD SENSOR HOUSING

Fabrication Instructions

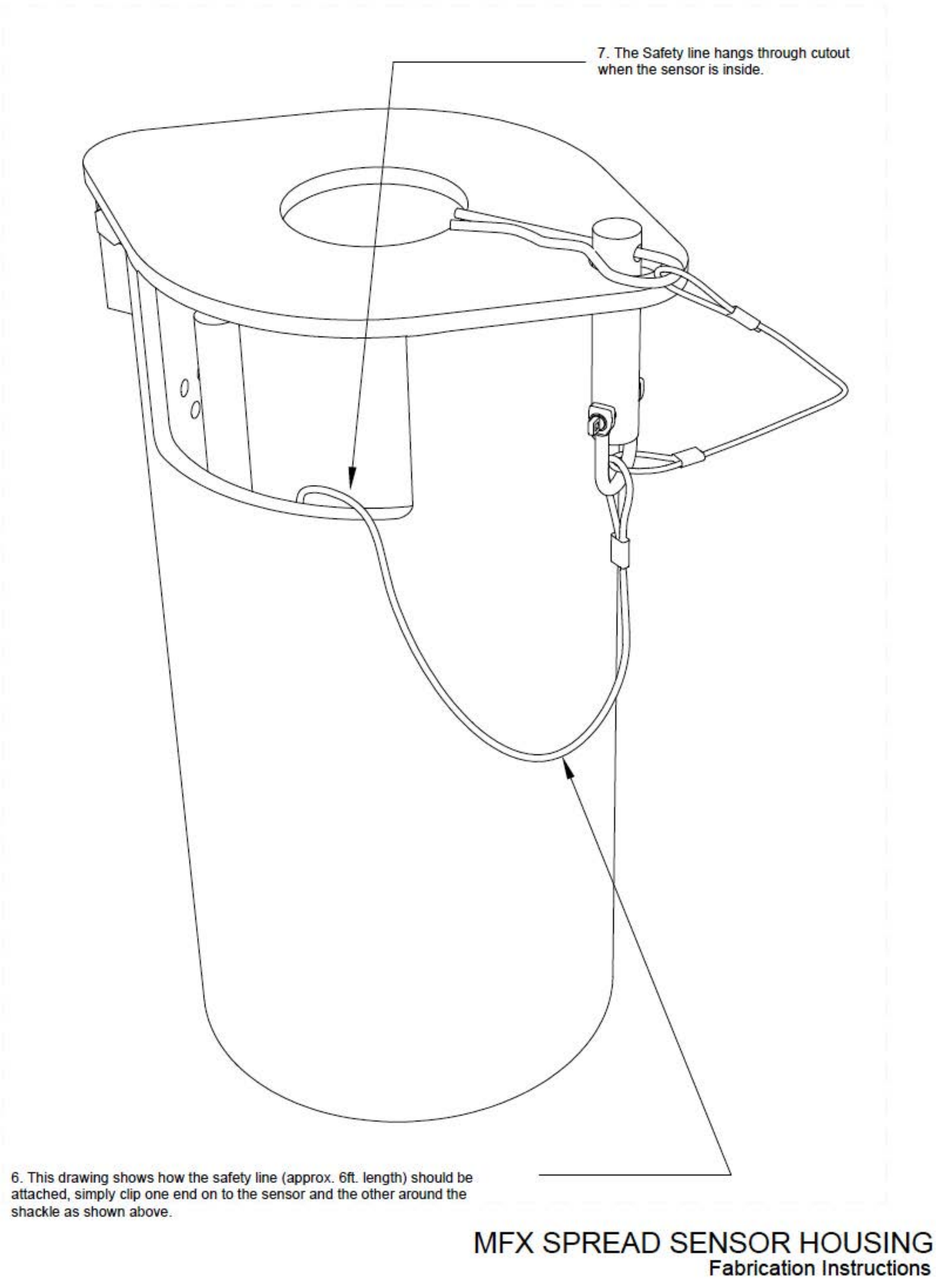


5. Now place the alignment bar at its center location. This can be adjusted for optimum performance of the sensor and once that position is found can be permanently welded into place.

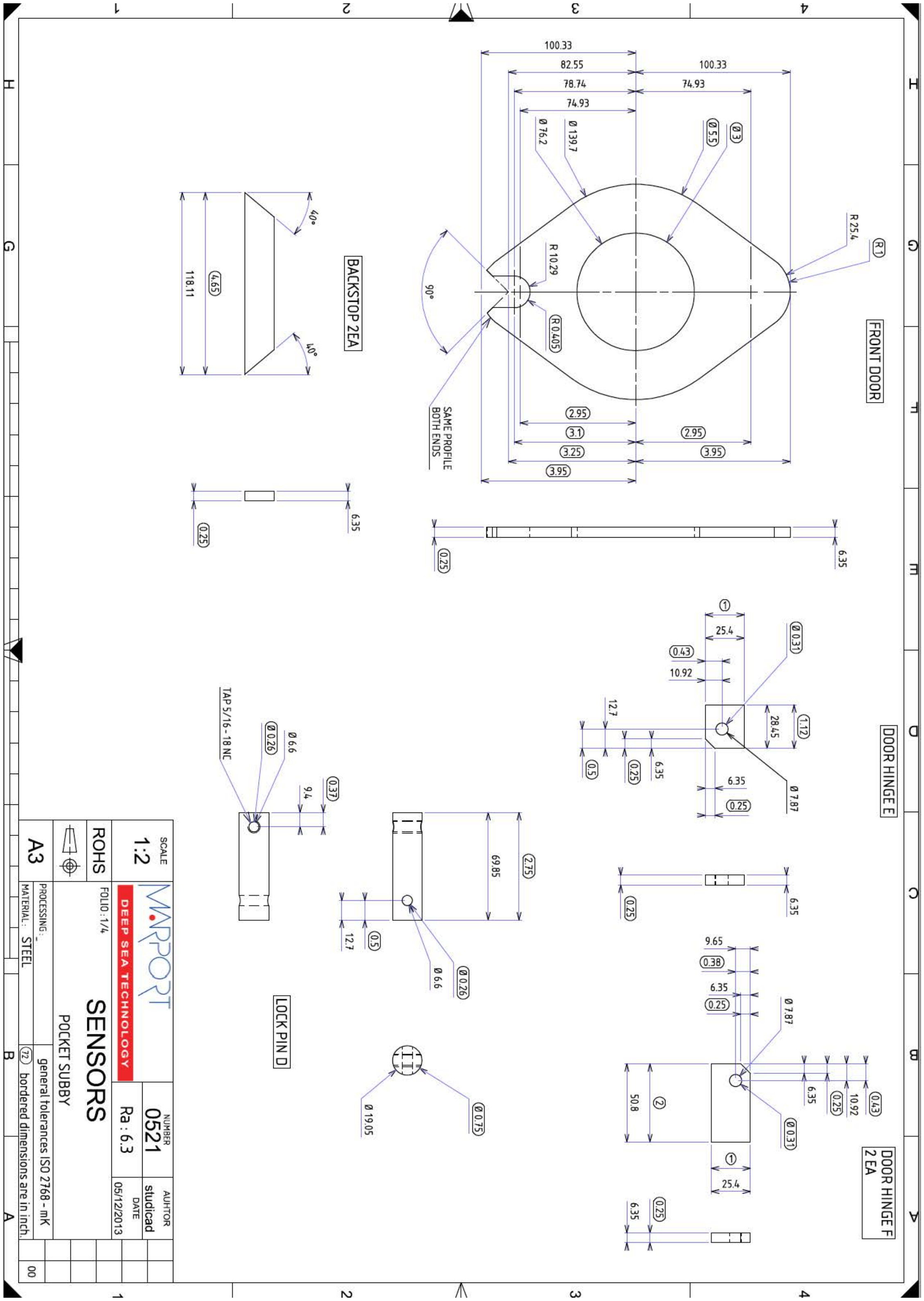


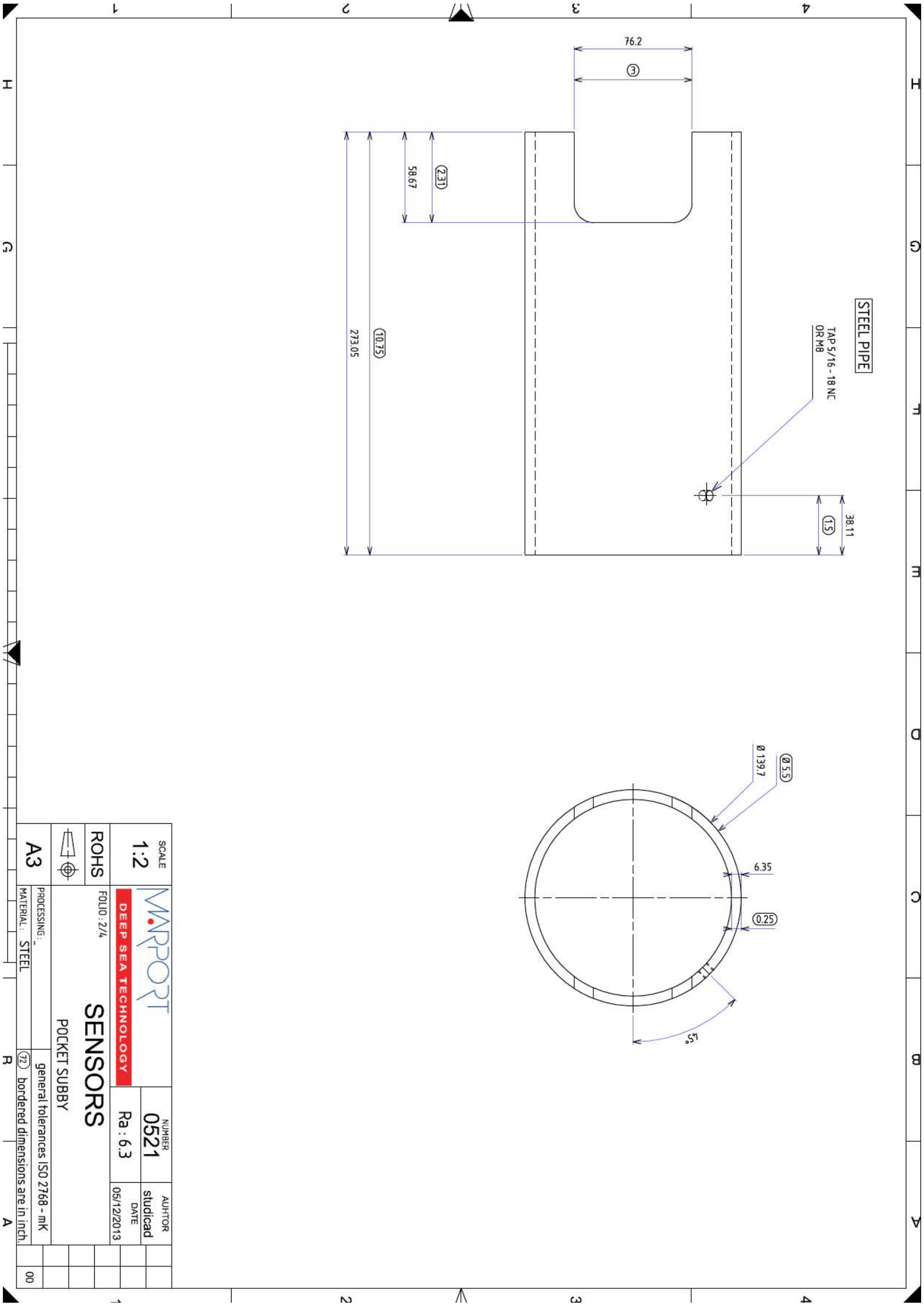
6. Now the final hardware, can be installed, including a safety cable shown on the next page.

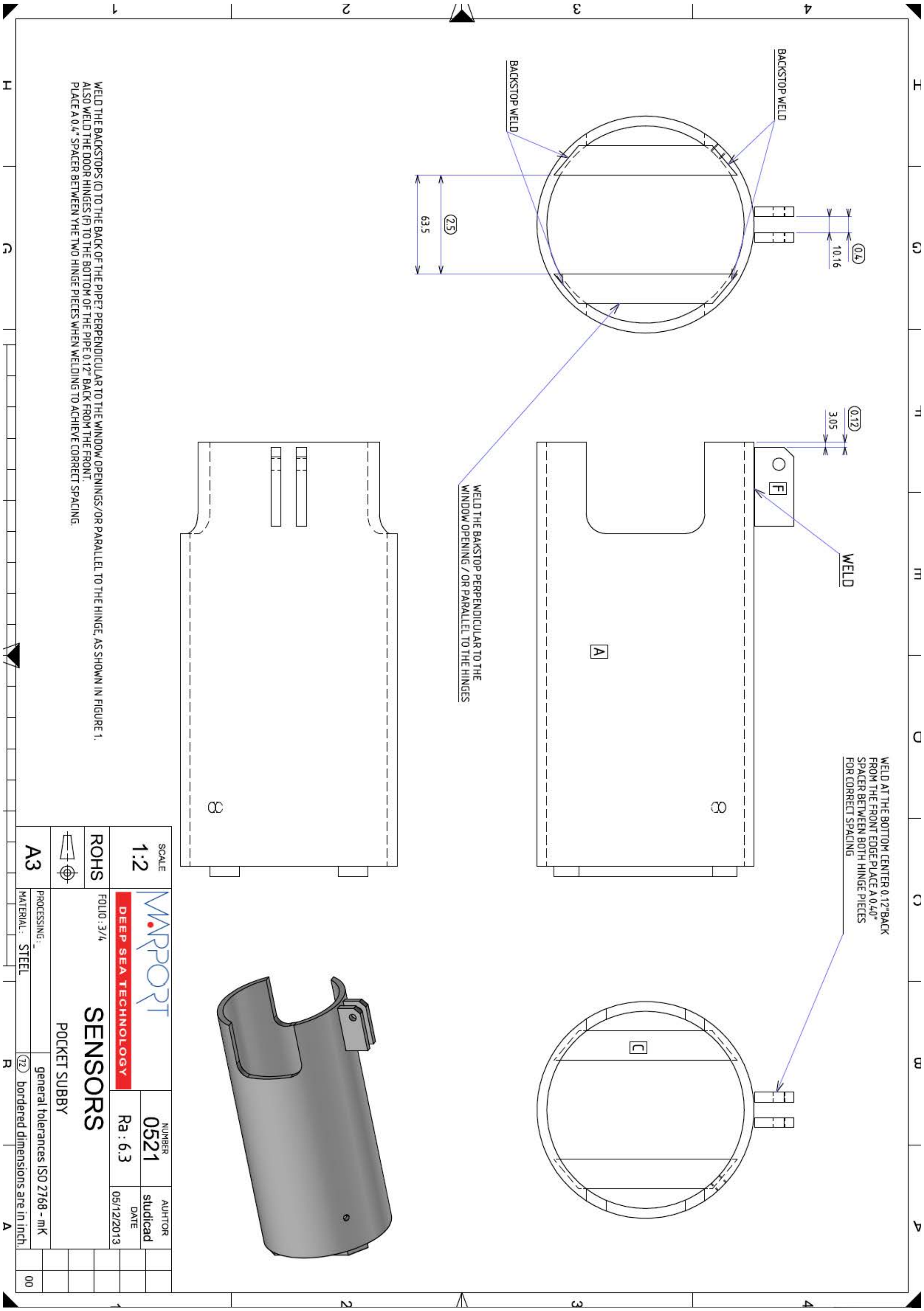
MFX SPREAD SENSOR HOUSING
Fabrication Instructions


7. The Safety line hangs through cutout when the sensor is inside.
6. This drawing shows how the safety line (approx. 6ft. length) should be attached, simply clip one end on to the sensor and the other around the shackle as shown above.
MFX SPREAD SENSOR HOUSING
Fabrication Instructions

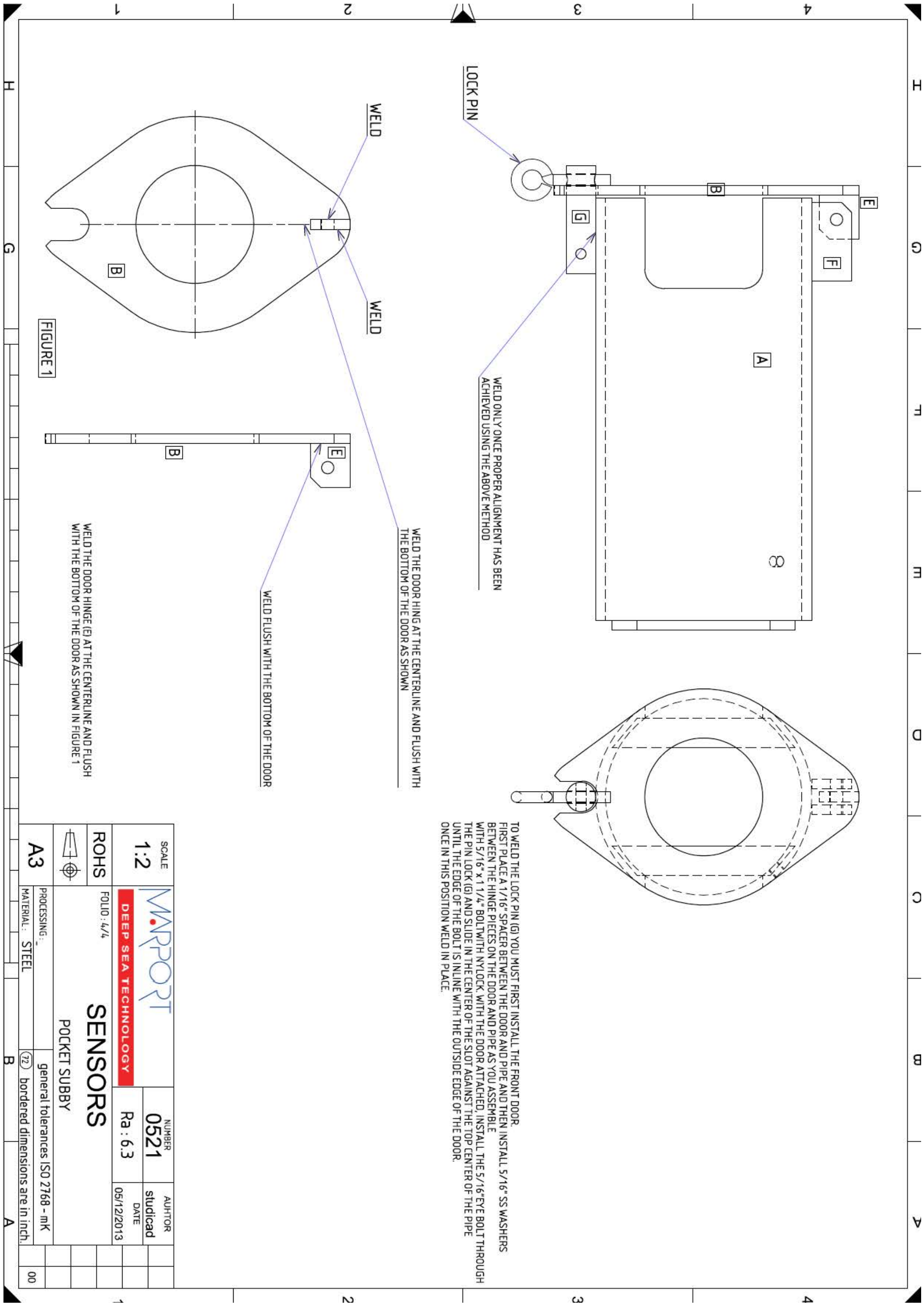
Pocket for Mini Spread Sensor



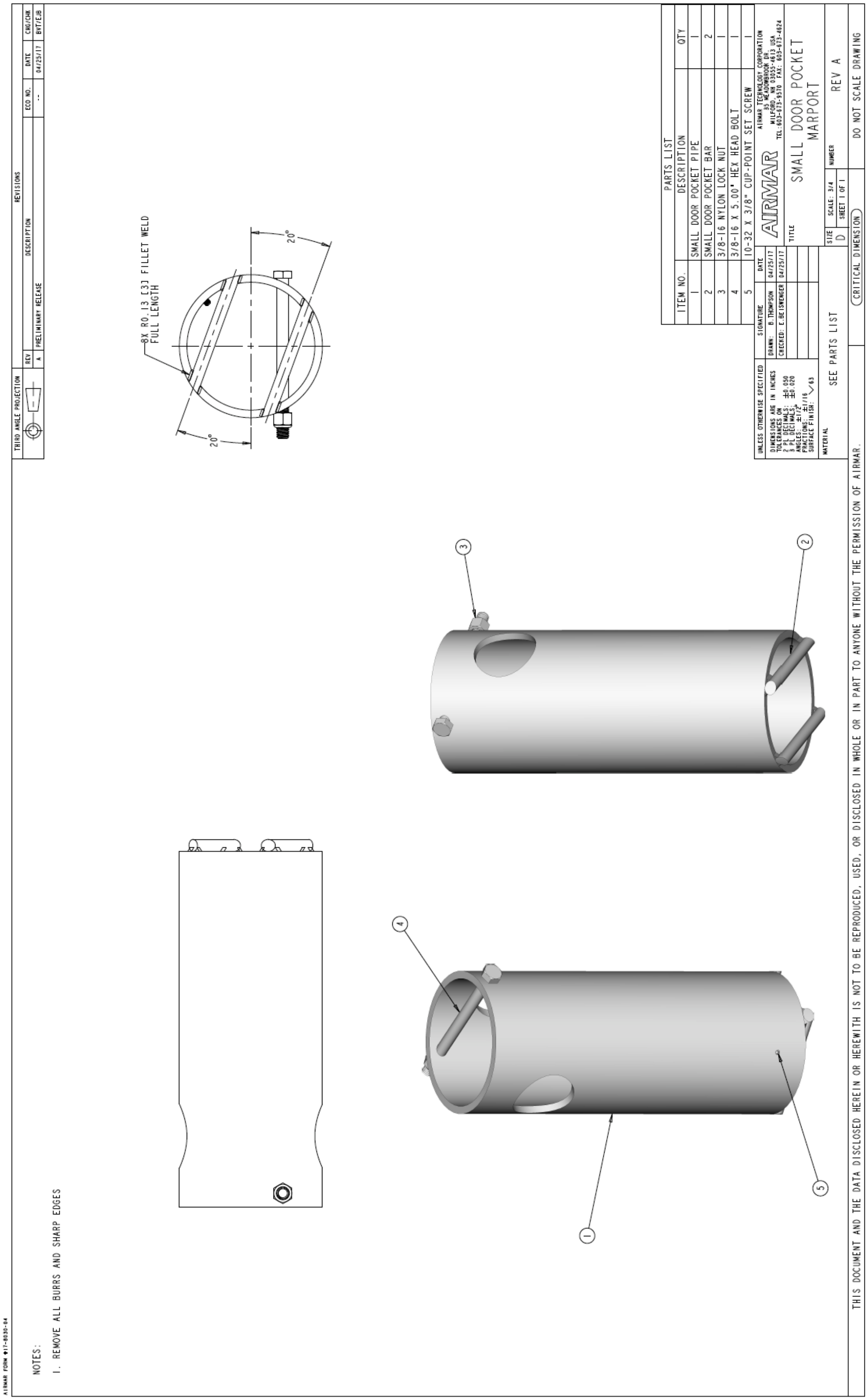

76.2
(3)
58.67
(2.31)
273.05
(10.75)
STEEL PIPE
TAP 5/16 - 18 NC OR M8
38.11
(1.5)
Ø 139.7
(Ø 5.5)
6.35
(0.25)
45°
SCALE 1:2
ROHS
A3
MARPORT DEEP SEA TECHNOLOGY
FOLIO : 2/4
NUMBER 0521
Ra : 6.3
AUHTOR studicad
DATE 05/12/2013
SENSORS
POCKET SUBBY
PROCESSING : _
MATERIAL : STEEL
general tolerances ISO 2768 - mK
(72) bordered dimensions are in inch.
00



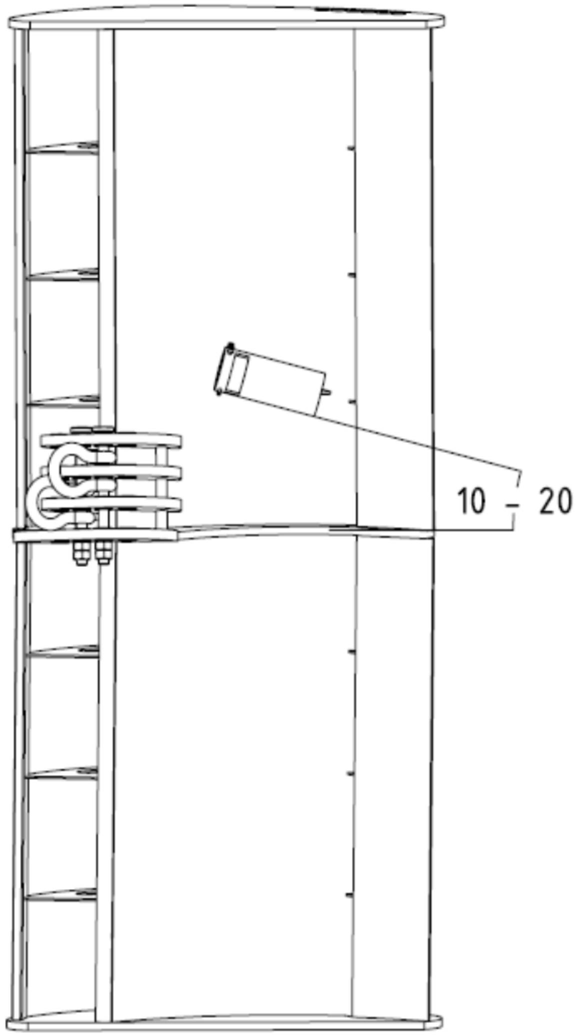
WELD THE BACKSTOPS (C) TO THE BACK OF THE PIPE? PERPENDICULAR TO THE WINDOW OPENINGS/OR PARALLEL TO THE HINGE, AS SHOWN IN FIGURE 1.
ALSO WELD THE DOOR HINGES (F) TO THE BOTTOM OF THE PIPE 0.12" BACK FROM THE FRONT.
PLACE A 0.4" SPACER BETWEEN YHE TWO HINGE PIECES WHEN WELDING TO ACHIEVE CORRECT SPACING.
BACKSTOP WELD
BACKSTOP WELD
2.5
63.5
0.4
10.16
0.12
3.05
F
WELD
WELD THE BAKSTOP PERPENDICULAR TO THE WINDOW OPENING / OR PARALLEL TO THE HINGES
A
C
WELD AT THE BOTTOM CENTER 0.12"BACK FROM THE FRONT EDGE.PLACE A 0.40" SPACER BETWEEN BOTH HINGE PIECES FOR CORRECT SPACING
SCALE
1:2
ROHS
A3
MARPORT
DEEP SEA TECHNOLOGY
FOLIO : 3/4
PROCESSING : _
MATERIAL : STEEL
SENSORS
POCKET SUBBY
NUMBER
0521
Ra : 6.3
AUHTOR
studicad
DATE
05/12/2013
general tolerances ISO 2768 - mK
bordered dimensions are in inch.
00

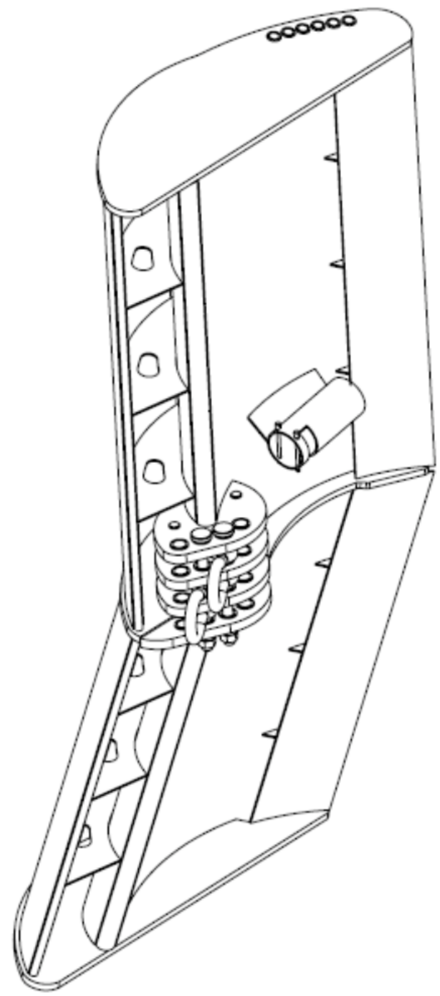

LOCK PIN
WELD
WELD
FIGURE 1
WELD ONLY ONCE PROPER ALIGNMENT HAS BEEN ACHIEVED USING THE ABOVE METHOD
WELD THE DOOR HING AT THE CENTERLINE AND FLUSH WITH THE BOTTOM OF THE DOOR AS SHOWN
WELD FLUSH WITH THE BOTTOM OF THE DOOR
WELD THE DOOR HINGE (E) AT THE CENTERLINE AND FLUSH WITH THE BOTTOM OF THE DOOR AS SHOWN IN FIGURE 1
TO WELD THE LOCK PIN (G) YOU MUST FIRST INSTALL THE FRONT DOOR. FIRST PLACE A 1/16" SPACER BETWEEN THE DOOR AND PIPE AND THEN INSTALL 5/16" SS WASHERS BETWEEN THE HINGE PIECES ON THE DOOR AND PIPE AS YOU ASSEMBLE WITH 5/16" x 1 1/4" BOLT WITH NYLOCK. WITH THE DOOR ATTACHED, INSTALL THE 5/16" EYE BOLT THROUGH THE PIN LOCK (G) AND SLIDE IN THE CENTER OF THE SLOT AGAINST THE TOP CENTER OF THE PIPE UNTIL THE EDGE OF THE BOLT IS INLINE WITH THE OUTSIDE EDGE OF THE DOOR. ONCE IN THIS POSITION WELD IN PLACE.
SCALE 1:2
ROHS
A3
MARPORT DEEP SEA TECHNOLOGY
FOLIO : 4/4
SENSORS
POCKET SUBBY
PROCESSING :
MATERIAL : STEEL
NUMBER 0521
Ra : 6.3
AUHTOR studicad
DATE 05/12/2013
general tolerances ISO 2768 - mK
bordered dimensions are in inch.
00

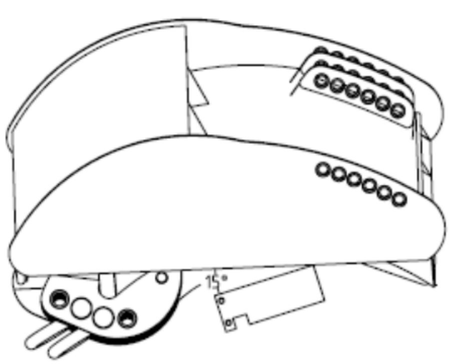
Pocket for Mini Spread Sensor with Slim Housing and Mini Slant Range



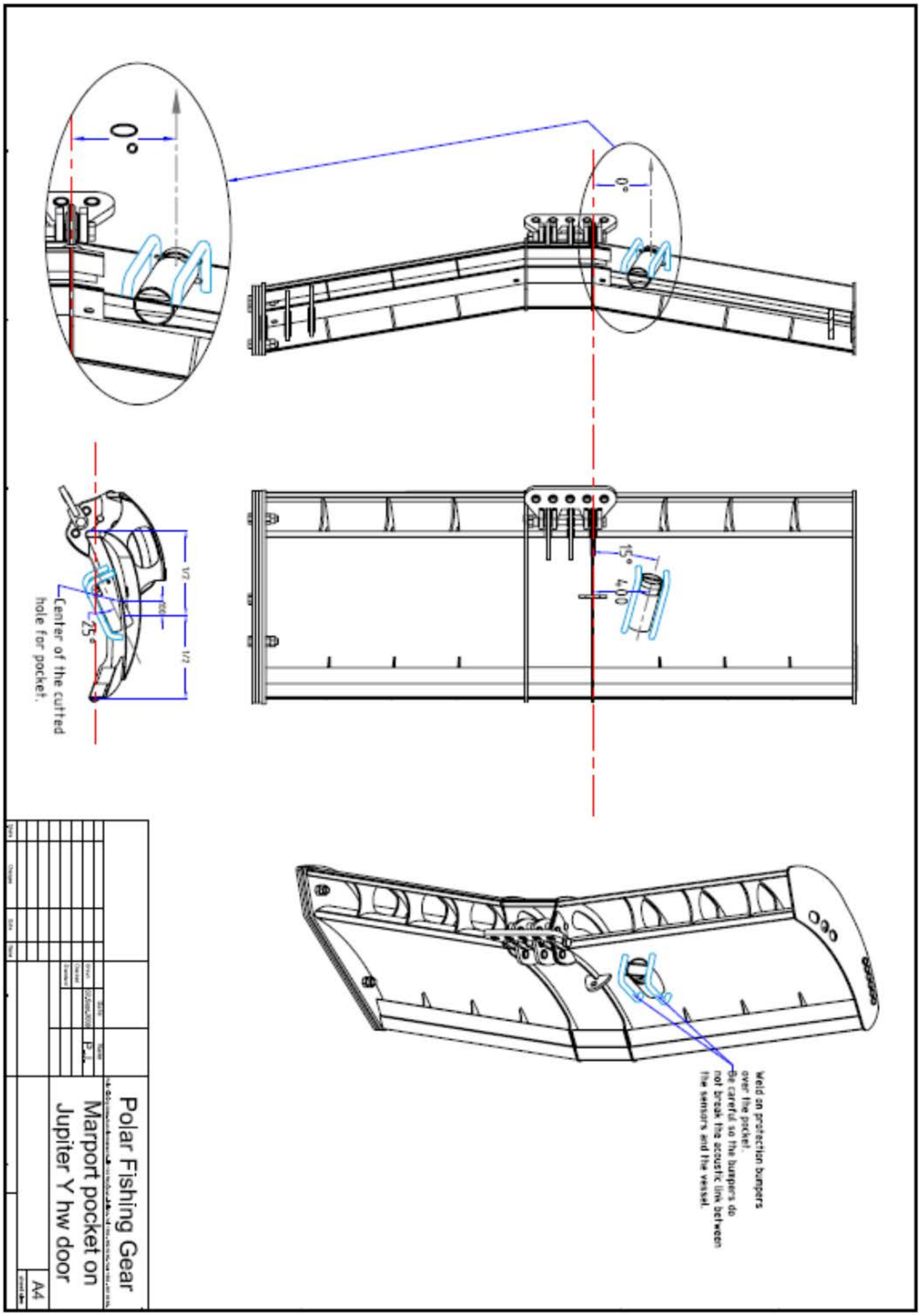
Appendix D: Installation on Poly Jupiter Doors



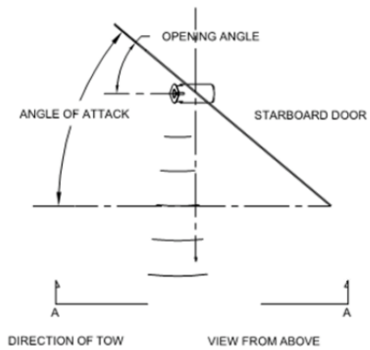


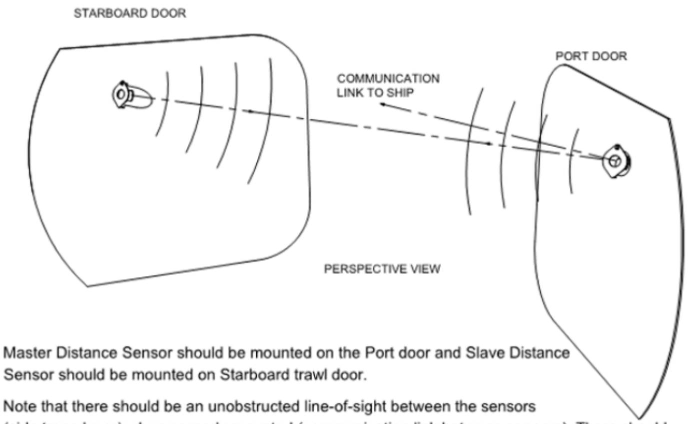


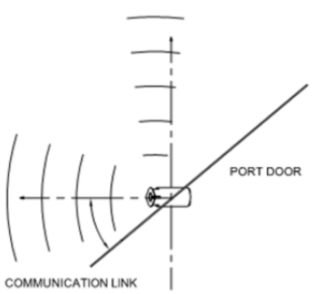
Marport sensor holders on Jupiter hw. doors


0°
0°
15°
400
1/2
1/2
25°
Center of the cutted hole for pocket.
Weld on protection bumpers over the pocket.
Be careful so the bumpers do not break the acoustic link between the sensors and the vessel.
Polar Fishing Gear
Marport pocket on Jupiter Y hw door
A4

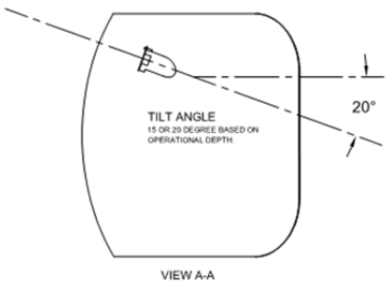
Appendix E: General Installation Instructions and Drawings

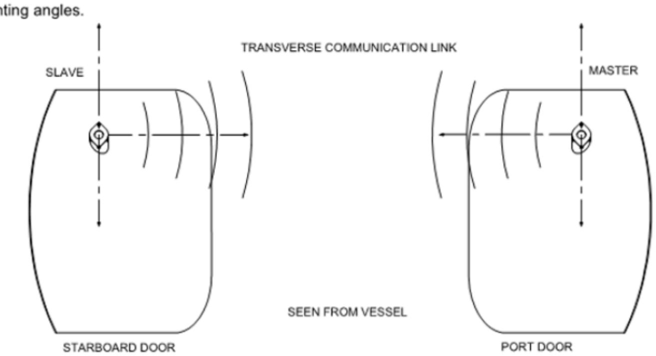






- Master Distance Sensor should be mounted on the Port door and Slave Distance Sensor should be mounted on Starboard trawl door.
- Note that there should be an unobstructed line-of-sight between the sensors (side transducer) when properly mounted (communication link between sensors). There should also be an unobstructed line of sight for communications between the Master Distance Sensor and the vessel's receiving hydrophone.
- For bottom trawling applications, the sensor adapter pocket should be mounted in the upper part of the trawl door but in a place with the least influence in the center of gravity of the door. Consult door manufacturer for details.
- Tilt (elevation angle) should be adjusted in accordance to best performance based on operational depth and length of the trawl gear.
- The door pocket adaptor is designed to compensate for the angle of attack of the trawl door, under normal operational conditions and based on a standard recommendation of 35°.
- Refer to cut-out templates for higher or lower angles. Consult door manufacturer for optional mounting angles.





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