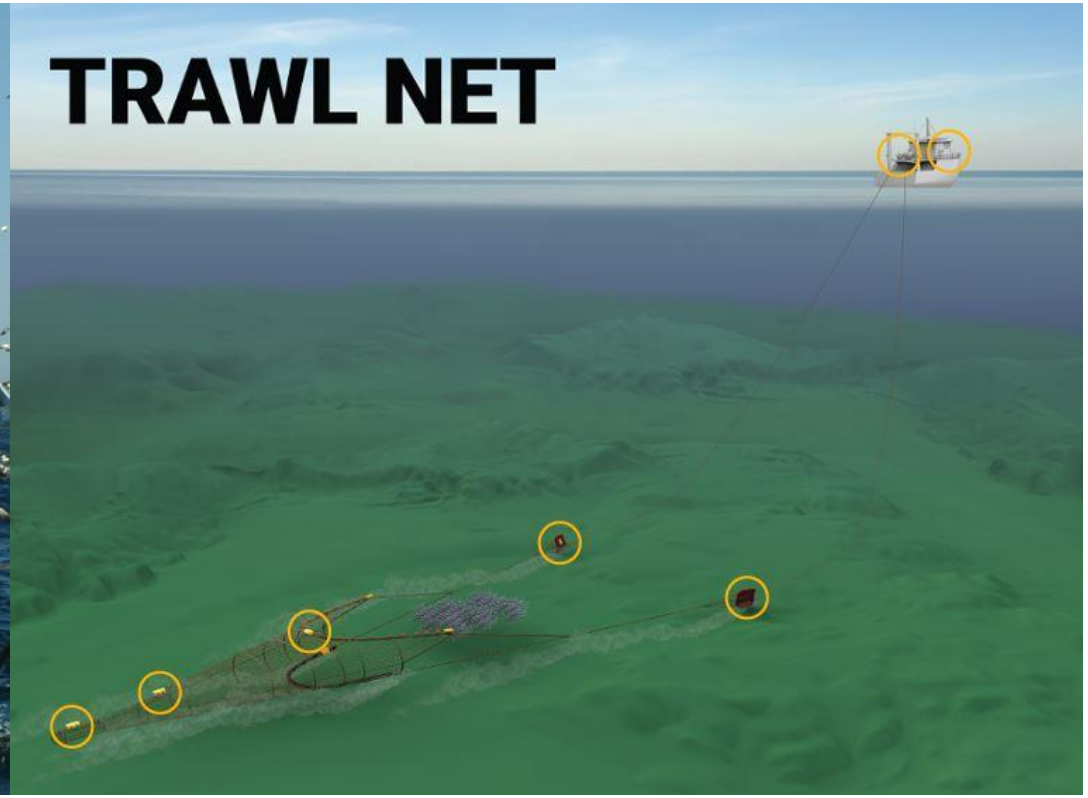

ENL
Hydrophone Installations
MARPORT

PLEASE NOTE:

Information shared here is to supplement Marport's own hydrophone installation instructions – and provide NZ installation examples.

Please always refer to the Marport Hydrophone Installation manual prior to planning hydrophone installation - available for download **on this link** or from ENL.



New Zealand has some unique Deepsea fishing requirements, with vessels fishing less than 100m depths through to over 1500m depths.

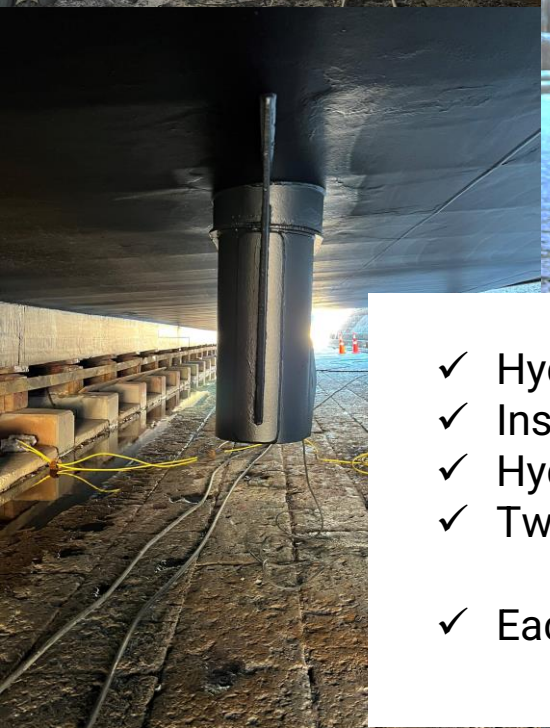
ENL have learnt that hydrophone installation configurations work in other (shallow water) fisheries overseas, may not be suitable here.

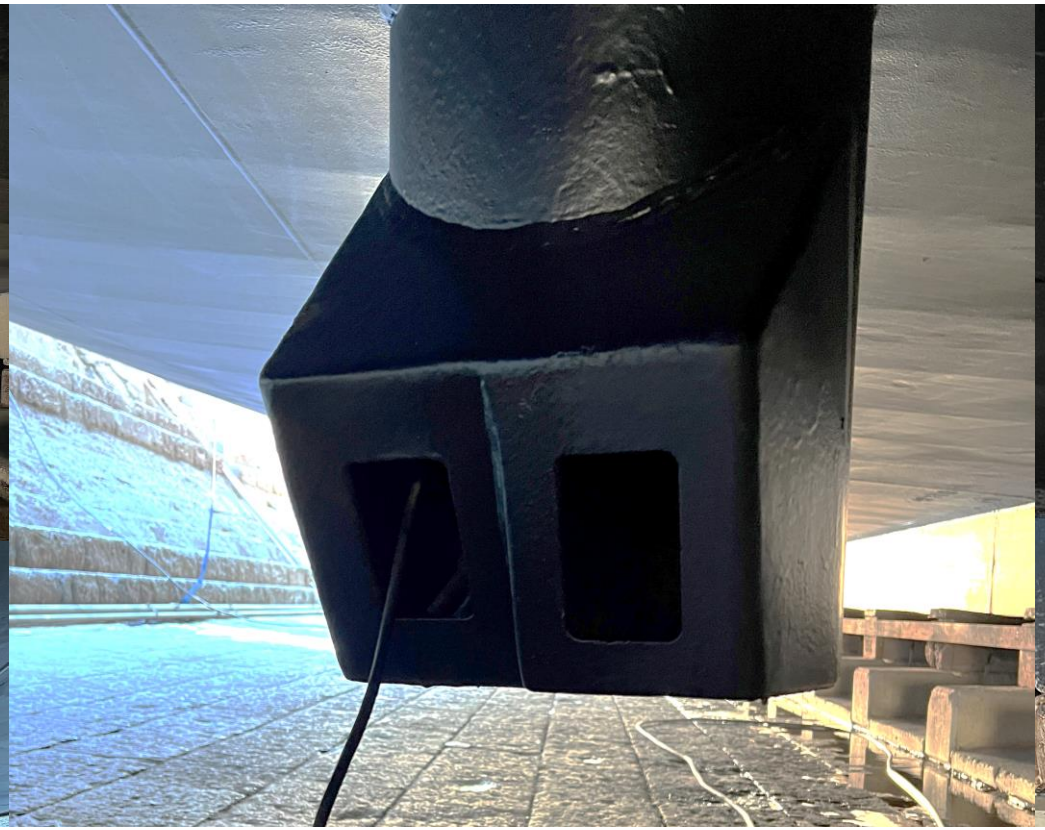
As such, over the next few pages we highlight examples of installations that we have learnt work best for Deepsea vessels in New Zealand Deepsea fisheries….

Good Hydrophone Installation Example 1

- ✓ Hydrophones installed away from keel (clear view to sensors)
- ✓ Installed between 1/3-to-1/2-way distance from bow (avoid bow aeration)
- ✓ Hydrophones tank hangs low to almost keel depth (avoid hull aeration)
- ✓ Two separate pods on port & starboard sides
  (unobstructed sensor/rig visibility)
- ✓ Each Pod has two hydrophones, staggered on different angles
  (allow view of rig on different warp scope, shallow/deep)

Good Hydrophone Installation Example 2





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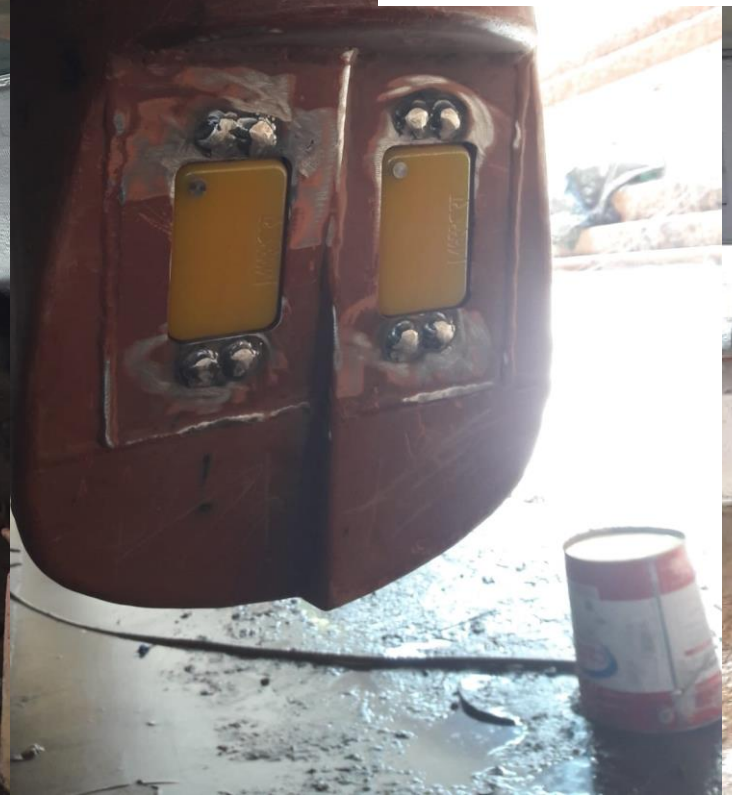
Good Hydrophone Installation Example 3



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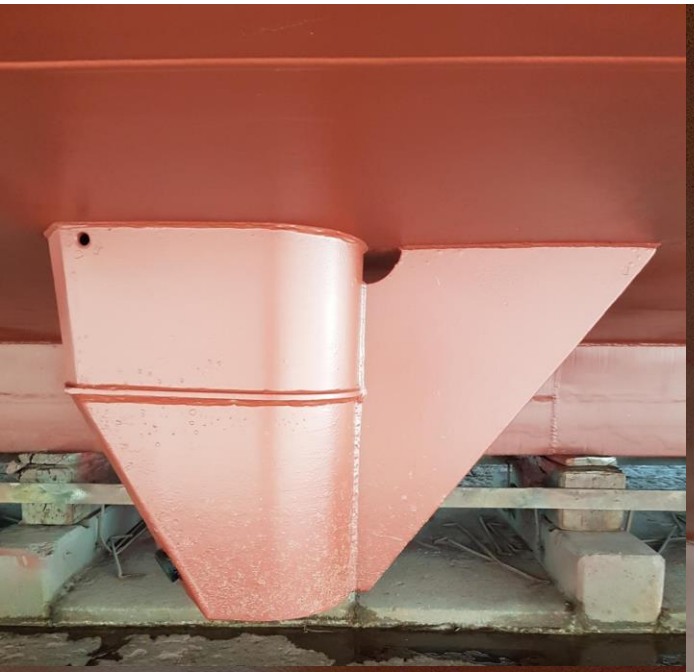
Inadequate Hydrophone Installation Example

- ☒ Hydrophone is too close to bow section (aeration)
- ☒ Hydrophone is too close to bow thruster (aeration)
- ☒ Hydrophone is too close to keel (sensor signal obscured by keel)
- ☒ Hydrophone is installed too high (above keel)

Inadequate Hydrophone Installation Example

- ☒ Hydrophone is too close to keel (signal blockage)
- ☒ Hydrophone is installed too high (above keel)

Inadequate Hydrophone Installation Example



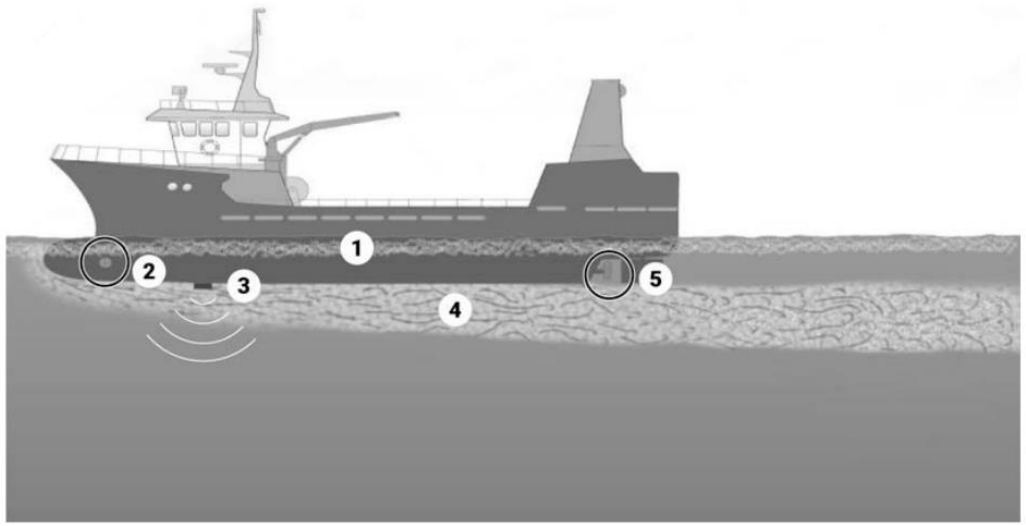
- ☒ Hydrophone is too close to keel (signal blockage)
- ☒ Hydrophones are same angle (does not allow for different wire scope, shallow/deep)
- ☒ Tank design not ideal – allows aeration to ‘wrap around’ tank onto transducer surface

NOTE:
Retrofitting MARPORT Hydrophones in the same tank & locations as original FURUNO under-hulls usually results in poor (MARPORT) performance.

We strongly recommend installing new dedicated MARPORT blister housings that meet the requirements outlined in this document.

Potential Sources of Perturbation

When installing hydrophones, be careful to the following factors that disrupt the hydrophone reception. They can cause interference or completely block the hydrophone reception. Most of them create air bubbles, that are an important source of disruption.



1 **Sea surface**: contains air bubbles along the hull, down to a depth between 3 and 10 meters.

2 **Bow or stern thruster**: creates air bubbles, also when not in operation. Minimum distance from hydrophone: 4 meters.

3 **Active sonar and echo sounder transducers**: transmit underwater signals. Minimum distance from hydrophone: 2 meters (if possible, avoid less than 1 meter). Avoid transducer's direct line-of-sight.

4 **Water flow along the vessel hull**: created when the vessel moves, it creates underwater acoustic noise. This flow becomes stronger near the stern, so it is recommended to install hydrophones on the forward 1/3 of the hull.

5 **Main propeller**: creates air bubbles that cause underwater acoustic noise. When propellers rotate clock-wise (applicable for majority of vessels), there is less noise on the port side of the vessel. Distance from hydrophone: as far as possible. Ideally 15 meters if vessel is long enough. Avoid propeller's direct line-of-sight.

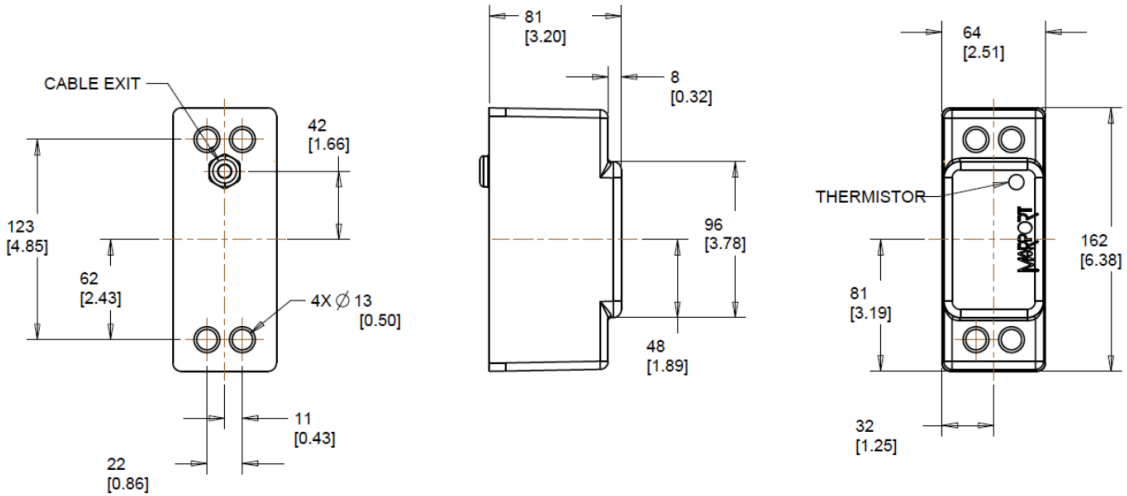
Underwater acoustic noise can also be created by objects such as main keels, zinc anodes, dents in the hull, keel coolers protruding from the hull, sea chests and tubes, water intakes and overboard discharges.

Also bear in mind that when a vessel is pitching in rough seas, it is important that the hydrophones installed on the forward part of the hull are not lifted out of the water. If this happens, acoustic reception is interrupted, and the hydrophone may be damaged because of the repeated impacts with the water.

Hydrophones

For best performance, ENL recommend the MARPORT **NC-1-08** Active wideband hydrophone with integrated preamplifier.

NC 1-08 (Shielded 4 Post)



NC-1-08 Active wideband hydrophone

- 30-60 KHz, 18-22 mA
- Identifier: Yellow Cable
- Vessel with normal level of noise (below -100 dBV).
- Supports large number of sensors
- Use at great depths (>500 m).
- Gain configurable (Low or High)
- Filters configurable (38 and/or 50kHz)
- Cable length: 25m (50 & 75m available upon request)
- Optional steel thru hull glands (single/double/triple)
- Beamwidth:
  - When placed vertically (RECOMMENDED):
    55° (Hoz.) x 35° (Vert)
  - When placed horizontally:
    35° (Hoz.) x 55° Vert.

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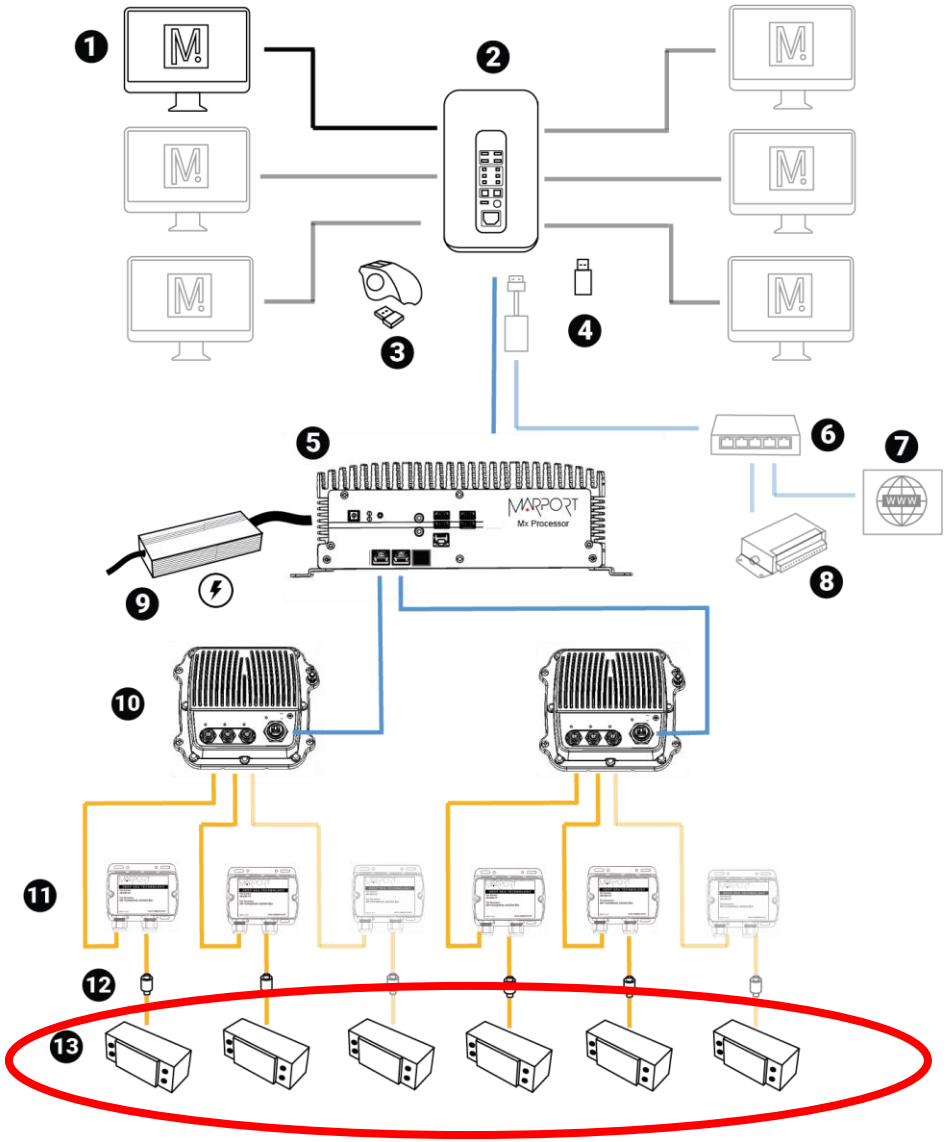
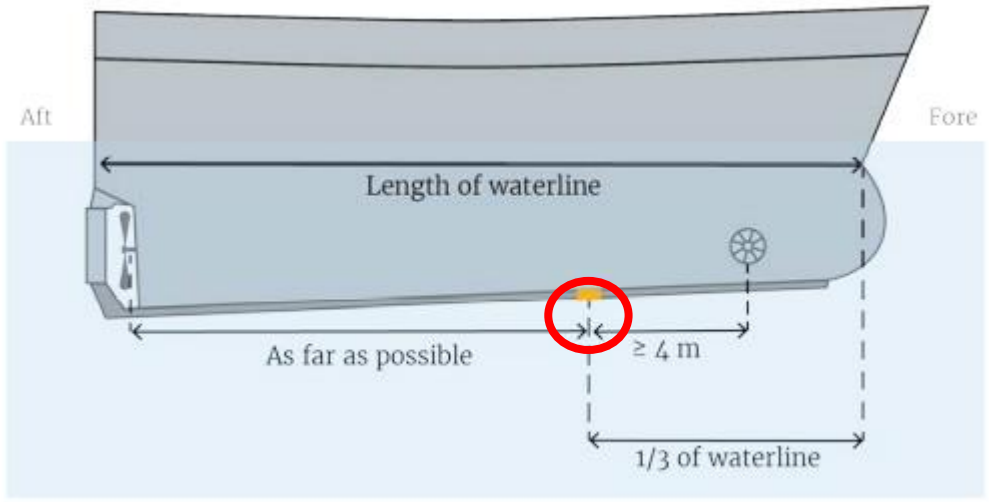


Important:
The advantage of installing multiple NC-1-08 hydrophone's is that the M-Series Receiver will automatically 'hunt' and switch to the strongest acoustic link signal (save the skipper having to manually switch)

1	Screens	8	NMEA multiplexer
2	Mac computer	9	Power supply (recommended power supply: MEAN WELL HEP-150-24 A)
3	Wireless trackball mouse	10	Mx receiver (ref. M6REC)
4	Scala/Scala2 software dongle	11	Junction boxes (x2) (ref. 46-055-01)
5	Mx computer	12	Thru-hull penetration (ref. TH-1-XX)
6	Ethernet switch, connected with USB to Ethernet adapter	13	Hydrophones (ref. NC-1-XX)
7	Internet		

Planning the Installation for Trawling

We recommend two blister pods, with 2 hydrophones in each pod. One Pod installed on Starboard side, the other Port Side.

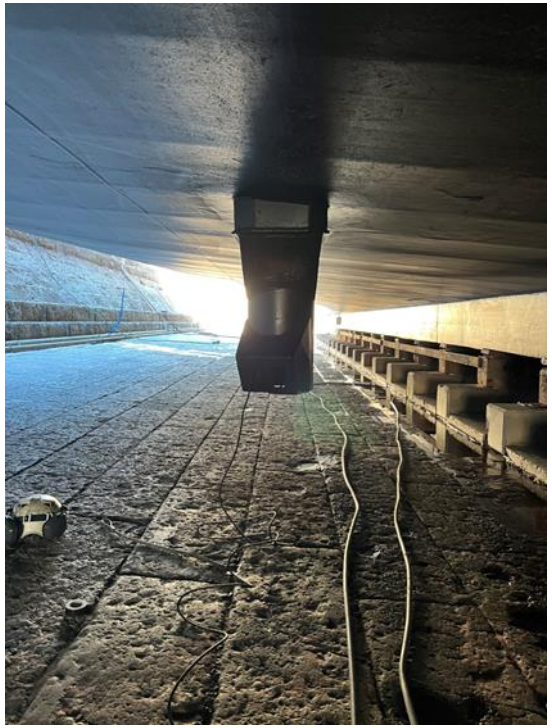


RECOMMENDED

Important:
It is recommended to install the hydrophone at least one-third of the vessel's waterline length from the bow (up to halfway back from bow).

Planning the Installation for Trawling

For Deepsea vessels a minimum of two separate pods, with a minimum of 2 hydrophones in each pod should be installed. (one pod installed on starboard side, the other on the port side)

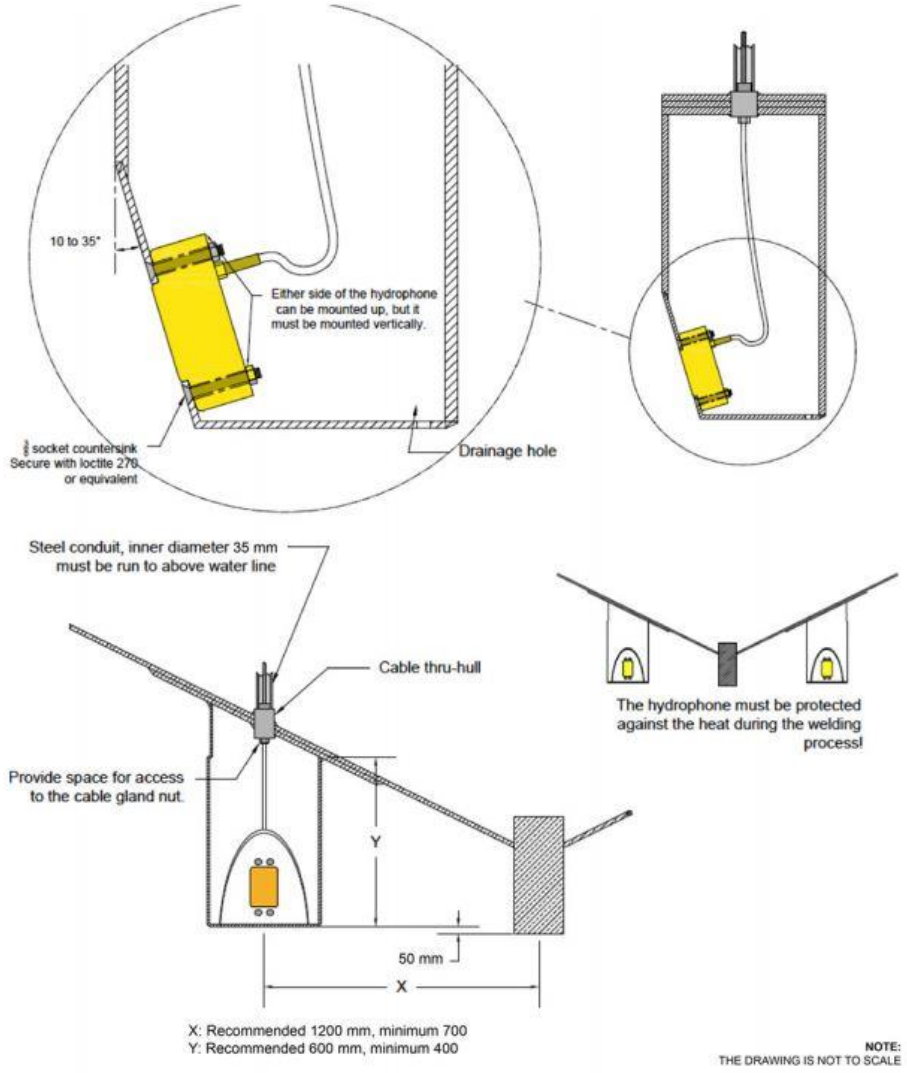


Important:

- Pods should be standalone (freestanding), located away from the keel (which causes signal blockage), and **no more than 50 mm higher than the lowest point on the keel**.
- Install symmetrically the hydrophones on both sides of the vessel's keel. This way, under normal operating conditions, signals transmitted from the sensors attached to the trawl net can be received on both sides of the vessel's keel

Blister Housing

Installing Blister for Trawl Hydrophone

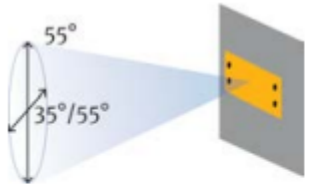


Important:

- If echo sounders are already installed in blisters, you can install the hydrophone blister next to them.
- Make sure to respect a minimum distance of 1 meter with the other equipment (the greater the distance, the less interference).

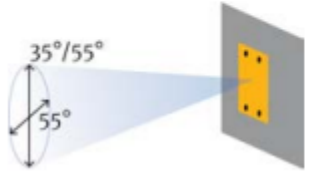
Hydrophone Alignment

It is strongly recommended to install two hydrophones to better receive signals from the sensors, especially when the trawl net is away from the vessel. The hydrophone can be placed horizontally or vertically, but we recommend vertical alignment for NZ Trawlers.



Horizontally: signals are detected within a horizontal beamwidth of 35° (55° for NC-1-05 when 1 cell is connected) and within a vertical beamwidth of 55°.

RECOMMENDED

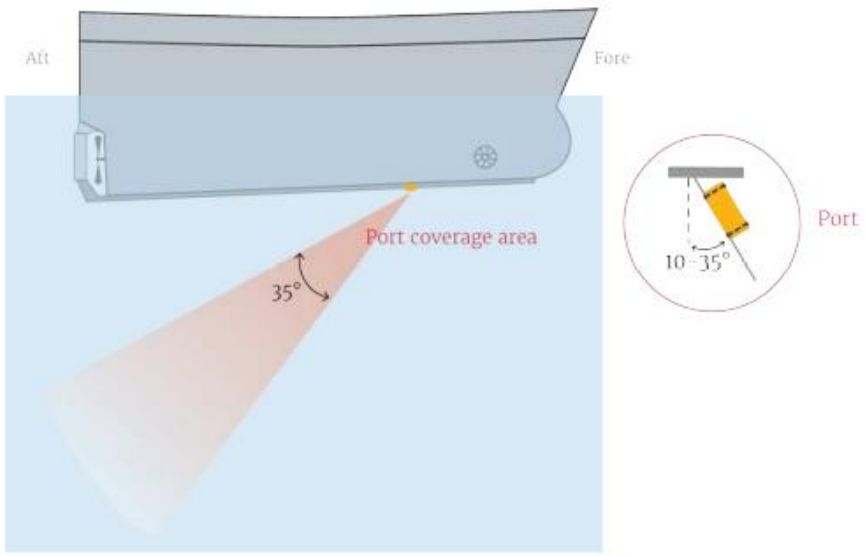


Vertically: signals are detected within a horizontal beamwidth of 55° and within a vertical beamwidth of 35° (55° for NC-1-05 when 1 cell is connected).

Important:
The hydrophone must have an unobstructed line-of-sight to Marport sensors attached to the trawl net (no keel blockage for example)

Vertical Coverage

Install with a vertical tilt angle toward the bottom between 10° and 35°, according to the depth of the trawling gear:



- Shallow water trawling: 10° to 15°
- Middle-water trawling: 15° to 20°
- Deep trawling: 30° to 35°

Important:

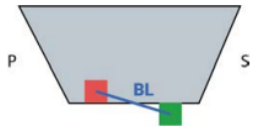
- Pod side walls should be square to the transducer face, to mitigate bubbles flowing onto hydrophone
- Install both hydrophones with an angle of 0° to 15° relative to the centerline and toward the outside. This way, they can both receive signal.

Special Note: Positioning Systems

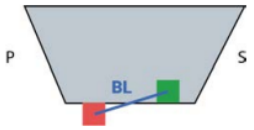
Important: If you have a positioning system, you must follow specific guidelines

- The distance between both hydrophones (baseline) must be at least 1 m. The greater the baseline, the more accurate the position.
- Install both hydrophones with an angle of 0° to 15° relative to the centerline and toward the outside. This way, they can both receive signal.
- When hydrophones work with a positioning system, you need to make measurements regarding the hydrophone location. A spreadsheet is available from ENL to help you make these calculations. You need to measure:
    - The distance between the hydrophones (called baseline)
    - The distances needed to calculate the misalignment angles

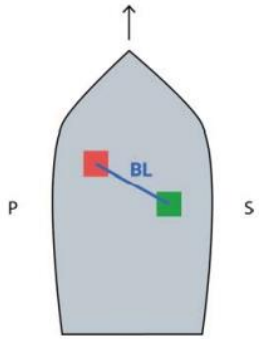
Baseline Calculations:



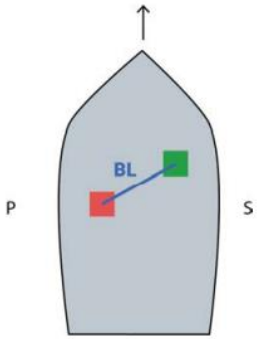
Negative sign (-)



Positive sign (+)



Negative sign (-)



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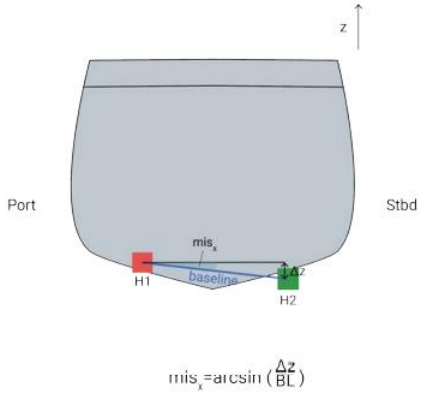
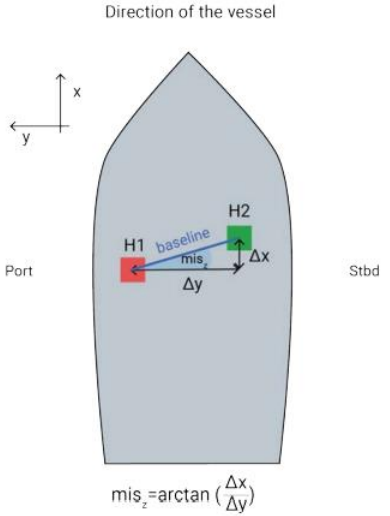




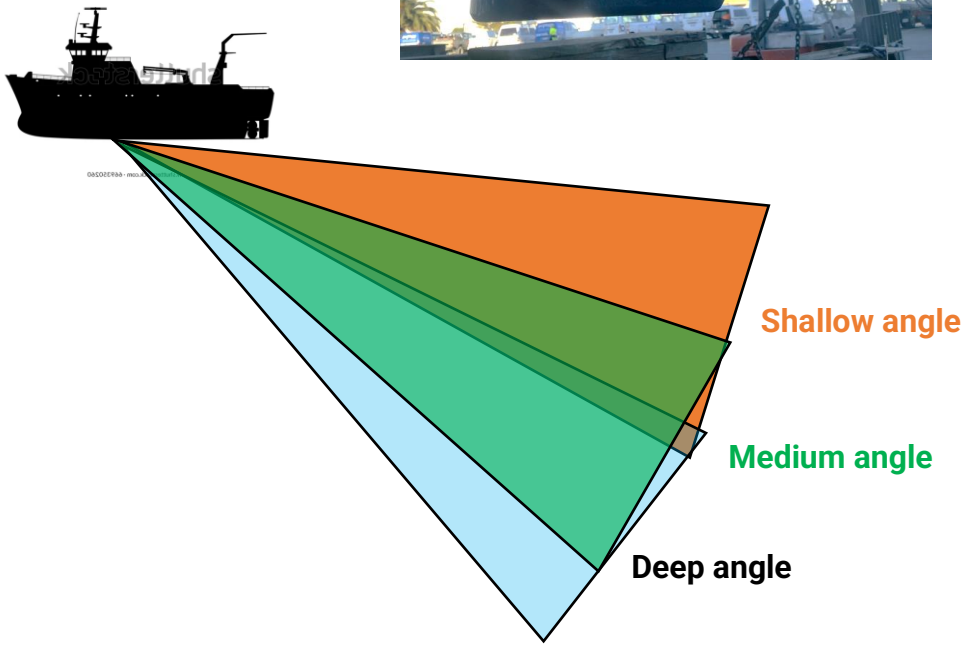
The baseline and the misalignment angles will be entered on the system web page when configuring the positioning system. Refer to Scala or Trawl Positioning System User Guides for complete guidelines for the configuration of a positioning system. Note: The misalignment angles that need to be calculated depends on the receiver firmware version

Vertical Coverage

For Deepsea Trawlers ENL recommend **MARPORT M6 Receiver** with **six hydrophones**
(3 hydrophones each side, staggered on shallow, medium and deep angles)

Bridge Systems Comparision	MARPORT M3 SYSTEM	MARPORT M4 SYSTEM	MARPORT M5 SYSTEM	MARPORT M6 SYSTEM
		Out of production		
Bandwidth	24 KHz (30 to 60 KHz)	24 KHz (30 to 60 KHz)	24 KHz (30 to 60 KHz)	24 KHz (30 to 60 KHz)
Number of Hydrophones	3	6	3	6
Auto Detection	Yes	Yes	Yes	Yes
Parallel Detection	Yes	Yes	Yes	Yes
Distance & Position	Yes (BPO Option-ready)	Yes (BPO Option-ready)	Yes (BPO Option-ready)	Yes (BPO Option-ready)
Number of Sensors	12	100*	24*	100*
Number of Trawl Explorers	1	10*	4*	10*

* Depending on available bandwidth



Important:

- Note: Only M6 Receiver supports six hydrophones (upgrade to M6 may be possible, discuss with ENL)

Vertical Coverage

Use the below chart to calculate your required vertical coverage installation angles.

	Distance (m) from the trawl							
	250	**500**	**750**	**1000**	**1250**	**1500**	**1750**	**2000**
Tilt	Depth of sensors (m)							
10°	50	100	150	175	225	250	300	350
15°	70	150	200	250	350	400	450	535
20°	90	180	275	350	450	550	650	750
25°	120	225	350	450	600	700	800	925
30°	150	300	450	575	700	850	1000	1150
35°	175	350	525	700	875	1050	1200	1400

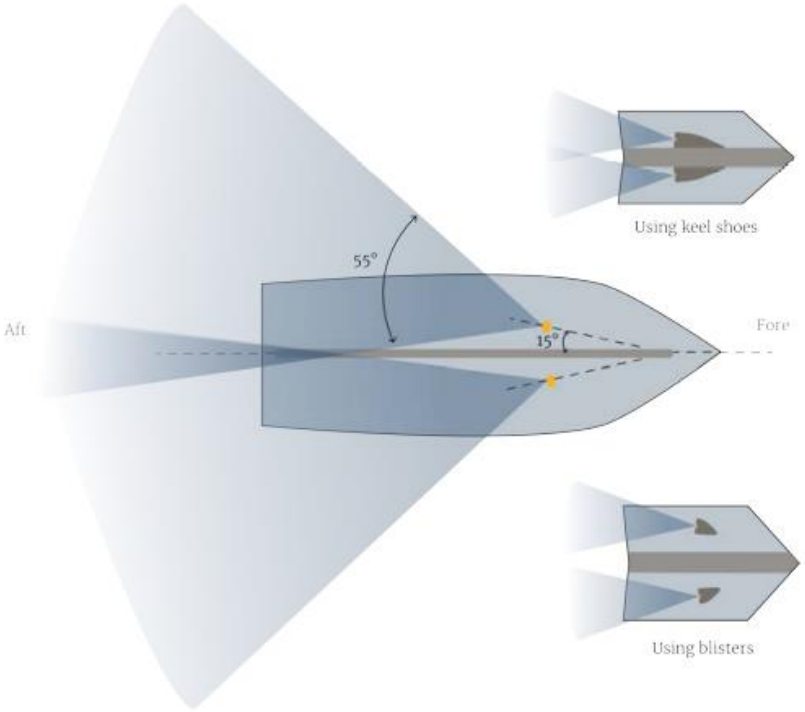
Hydrophone Beamwidth (for Vertically Aligned Installation): 55° (Horizontally) x 35° (Vertically)

Important:

- A minimum of 2 hydrophones should be installed in each of the 2 blister pods for Deepsea vessels
- The hydrophones in the pod are installed at different tilt angles, to provide coverage at various depths
- ENL recommend 3 hydrophones each side, staggered on shallow, medium and deep angles
- Note: Only M6 Receiver supports six hydrophones (upgrade to M6 may be possible, discuss with ENL)

Horizontal Coverage

Install both hydrophones with an angle of 10° to 20° relative to the centerline and toward the outside. This way, their signals overlap each other on the horizontal plane*

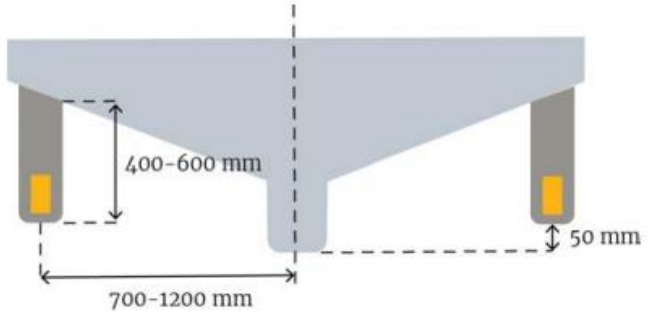


NOT RECOMMENDED

ENL have had poor results with MARPORT Hydrophones installed using keel shoes.
We STRONGLY recommend dedicated **blister housings**.

RECOMMENDED

Blister Pods:



You can install blisters designed specifically for hydrophones. They can be installed on both sides of the keel, at a distance between 700 and 1200 mm from the keel (**1200 mm recommended**).

***However, remember for positioning systems we instead recommend an angle of 0 to 15° to make sure signals from the sensors are received by both hydrophones.**

Anti-foul

We recommend hydrophones (and transducers) be coated with **FOULFREE™** from PROPSPEED. This will minimize marine growth on the transducer face, which can compromise hydrophone/transducer performance.

FOULFREE™
AIRMAR® CERTIFIED TRANSDUCER COATING*

Visit manufacturer website here.

CAUTION:

- Install the hydrophones only when all hot work in the immediate area is complete, specifically welding and sandblasting.
- Do not use high pressure cleaners on the hydrophones.
- Do not hit, force, sandblast or otherwise subject the hydrophone to excessive force.
- Do not scrape the hydrophone with metal or other hard material that may damage the polyurethane housing.
- Do not paint the hydrophone. If necessary, use water-based anti-fouling paints only. Never use metal-based nor ketone-based paints because they will deteriorate the polyurethane housing.
- Do not expose the hydrophone to harsh chemicals.

Summary

Quick summary of a Good Blister/Pod:

- ✓ Install separate port & starboard blister/pods, ~1,200mm outside keel
- ✓ Pods to be between 1/3 and 1/2-way distance back from bow
- ✓ Pods to be no more than 50 mm higher than the lowest point on the keel
- ✓ Install at least 1m from any other acoustic device (sonar, sounder, doppler current meter, multibeam etc.)
- ✓ Highly recommend NC-1-08 Active wideband hydrophone type
- ✓ Fit 2 or 3 hydrophones per pod, aligned vertically (if installing 2, perhaps allow space to install a 3rd hydrophone later, in case needed)
- ✓ Install hydrophones on a fixed angle between 10° to 20° relative to the centerline aimed toward the outside for horizontal coverage (unless being used for positioning in which case they should be aligned 0° - 15°)
- ✓ Install each pair of hydrophones on various vertical slant angles (between 10° to 35°) for vertical coverage. See chart for calculating angles.
- ✓ Ensure opposite pod is a mirror of the other (replicate angles). Ensure the ships MARPORT Receiver is enabled to support the number of hydrophones being fitted
- ✓ Welds on pod housing to be smooth
- ✓ Side walls of housing to be square to transducer face
- ✓ Hydrophone faces to sit flush with housing surface
- ✓ Anti-foul with FOULFREE™ from PROPSPEED

MARPORT

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