wassp®
MULTIBEAM

INSTALLATION MANUAL

WMB-3250

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Document Revision History

Revision Date	Reason for Change	Version
7th May 2012	Initial Revision	1.0
8th June 2012	Update of Sea Trial Commissioning Step 13	1.1
29th August 2012	Update of Hydrographic Software Installation	1.2
11th December 2012	Numerous updates, corrections and additions for RTM3	1.3
30th July 2013	WMB-3250 Updates	1.4

Related Documents

Document P/Number	Title
WSP-009-004	WMB-3250 Operator Manual

General Notices

WASSP Ltd. reserves the right to change the contents of this manual and any system specifications without notice.

Contact WASSP Ltd. regarding copying or reproducing this manual.

Warnings, Cautions and Notes

Warnings, cautions, and notes are indicated by the following icons throughout this manual:

A WARNING indicates that if the instruction is not heeded, the action may result in loss of life or serious injury.

A CAUTION indicates that if the instruction is not heeded, the action may result in equipment damage.

A Note indicates a tip or additional information that could be helpful while performing a procedure.

Safety Notices

The installer of the equipment is solely responsible for the correct installation of the equipment. WASSP Ltd. assumes no responsibility for any damage associated with incorrect installation.

Electrical Safety

- Fire, electrical shock, or equipment damage may occur if the BTxR becomes wet.
- The equipment is rated for operation at:
  - BTxR 24 V DC
  - WASSP Processor 9 - 32 V DC (Check the PC power supply to verify this before connecting an incorrect voltage!)

- Make sure that the power is switched OFF at the main supply (e.g. switchboard) before beginning the installation. Fire or electrical shock may occur if the power is left ON.
- Do not open equipment covers unless you are totally familiar with the system's electrical circuits.
- Make sure all safety precautions for electrical equipment are taken when operating or servicing the equipment. These to be carried out in accordance with local or national regulatory body safety regulations.
- Make sure that the transducer will not loosen due to the vessels vibration.

Contents

1. Purpose of this Manual

This installation manual describes the procedures to install the following WASSP equipment:

- Transducer
- BTxR (Transceiver)
- WASSP Processor
- WASSP software and firmware for WASSP Processor and BTxR.

It also provides procedures to commission the WASSP system during dockside and sea trials.

2. Introduction

The WASSP is a multibeam sonar system that uses a wide-angle sonar transducer to profile the water column and seafloor to a high resolution. It is this unique combination of multibeam sonar and computer processing power which provides you with unparalleled information about the underwater environment. It gives you a wide 120° port-starboard swath of the water column and sea-floor, allowing you to find and position reefs and wrecks, seafloor hardness changes, and foreign objects in the water column or on the sea-floor. From the 120° swath, the system processes 224 dynamic beams, with each beam containing detections from the water column and sea-floor.

The WASSP can be applied to a variety of survey methods, as well as search and rescue, customs, and police applications.

The information is presented in a user-friendly, mouse controlled, Windows-based operating system. The system can output data to plotting and hydrographic software packages. For optimal performance, roll, heave, pitch, heading and position inputs are all required.

The effectiveness of motion correction depends on both the quality of sensors and the quality of input data. Accurate ship measurements must be taken and the dockside and sea trial commissioning procedures carried out thoroughly.

2.1 Main Features

- **Simple to use**
- **Improved performance**.
  The use of separate transmit and receive arrays has enabled WASSP Ltd. to optimise both transmit performance and receive sensitivity, giving improved performance over traditional sonar and sounders.
- **High detail picture of the marine environment**.
  The transmit beam spreads over a 120° port-starboard swath and covers 4° fore-aft while the receive beam covers 10° fore-aft, displaying a highly detailed picture of the marine environment.
- **Beam stabilisation**.
  Beam stabilisation compensates for the movement of the vessel, providing accurate seafloor profiles.
- **Variable beam width**.
  Unique to the WASSP, the single beam view can not only be stabilised, but the beam width can be varied from 5° to 40°.
- **Bottom lock**.
  Bottom lock provides a traditional bottom lock mode where the changes in bottom depth are ignored and the bottom is drawn flat. Echoes are shown relative to the flat bottom image, enabling better discrimination on the sea-floor.

- **Computer based profile storage**.
  A computer-based system means the WASSP can generate and store very detailed seafloor profiles.
- **160 kHz operating frequency**.
  Operating at a frequency of 160 kHz provides high seafloor definition with a large range.
- **Depth and seafloor coverage**.
  Seafloor coverage is determined by the swath width in use: For a 90 degree swath width, the seafloor coverage will be approximately twice the water depth. For example, 100 m depth gives 200 m seafloor coverage with 224 beams - every ping. For a 120 degree swath width, the seafloor coverage is 3.4 x depth. For example, 200m depth gives over 600m seafloor coverage.
- **Unique power management system (14 power levels)**.
  14 power levels provide optimal performance over a wide range of seafloor types and water depths.
- **Efficient seafloor mapping**.
  Profiles 90 times faster than conventional single beam echo sounders, leading to reduced costs and improved accuracy.
- **Future proof technology**.
  The computer based operating system and BTxR firmware are both upgradeable as new features and methods in software are developed.
- **Third party integration**
  Through interfacing, real time, to third party software applications and outputting to standard formats, bathymetric and water column data can be collected and processed using specialist tools.

3. System Configuration

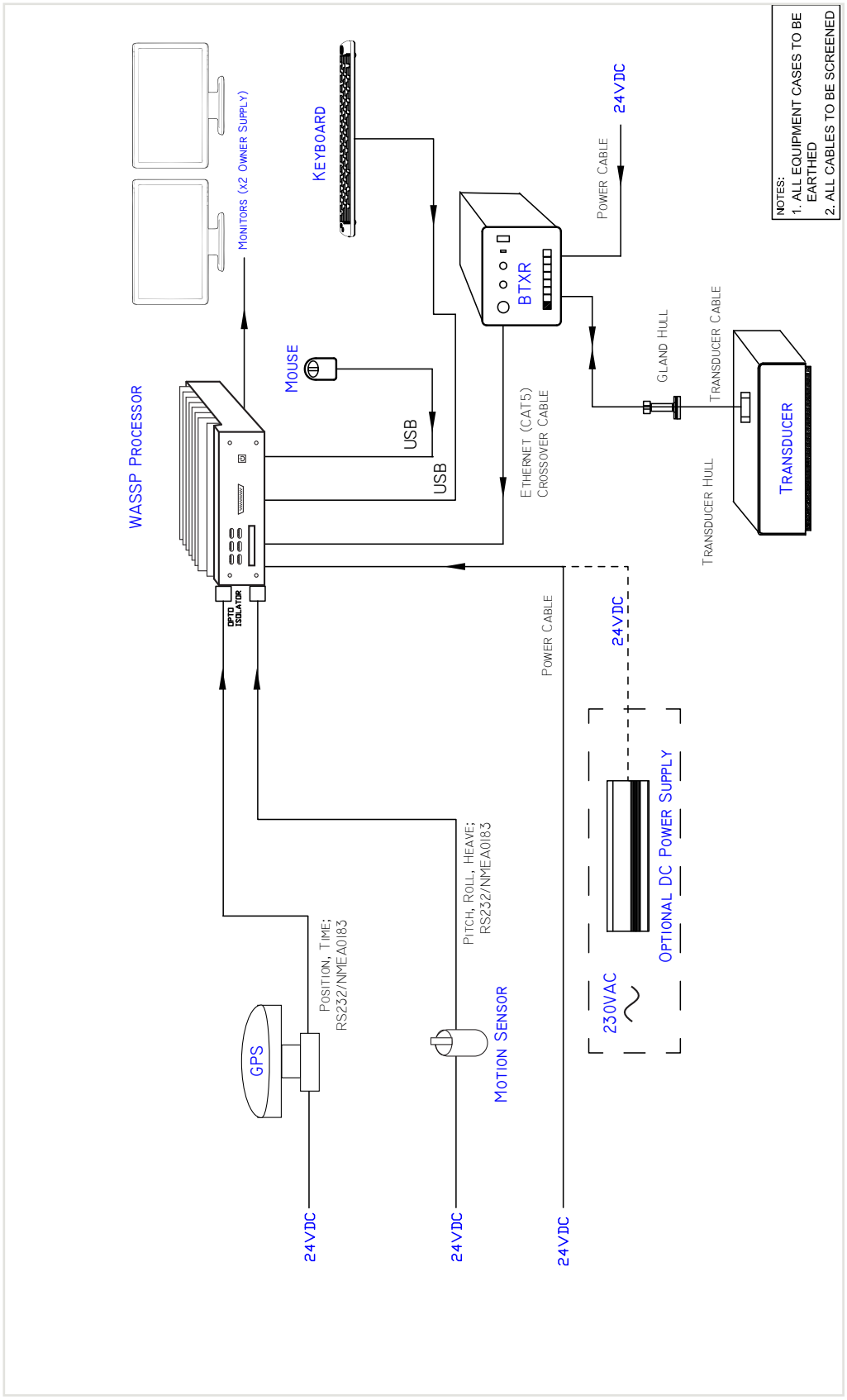


Figure 1. A fully functional WASSP system.

4. Installation Flow

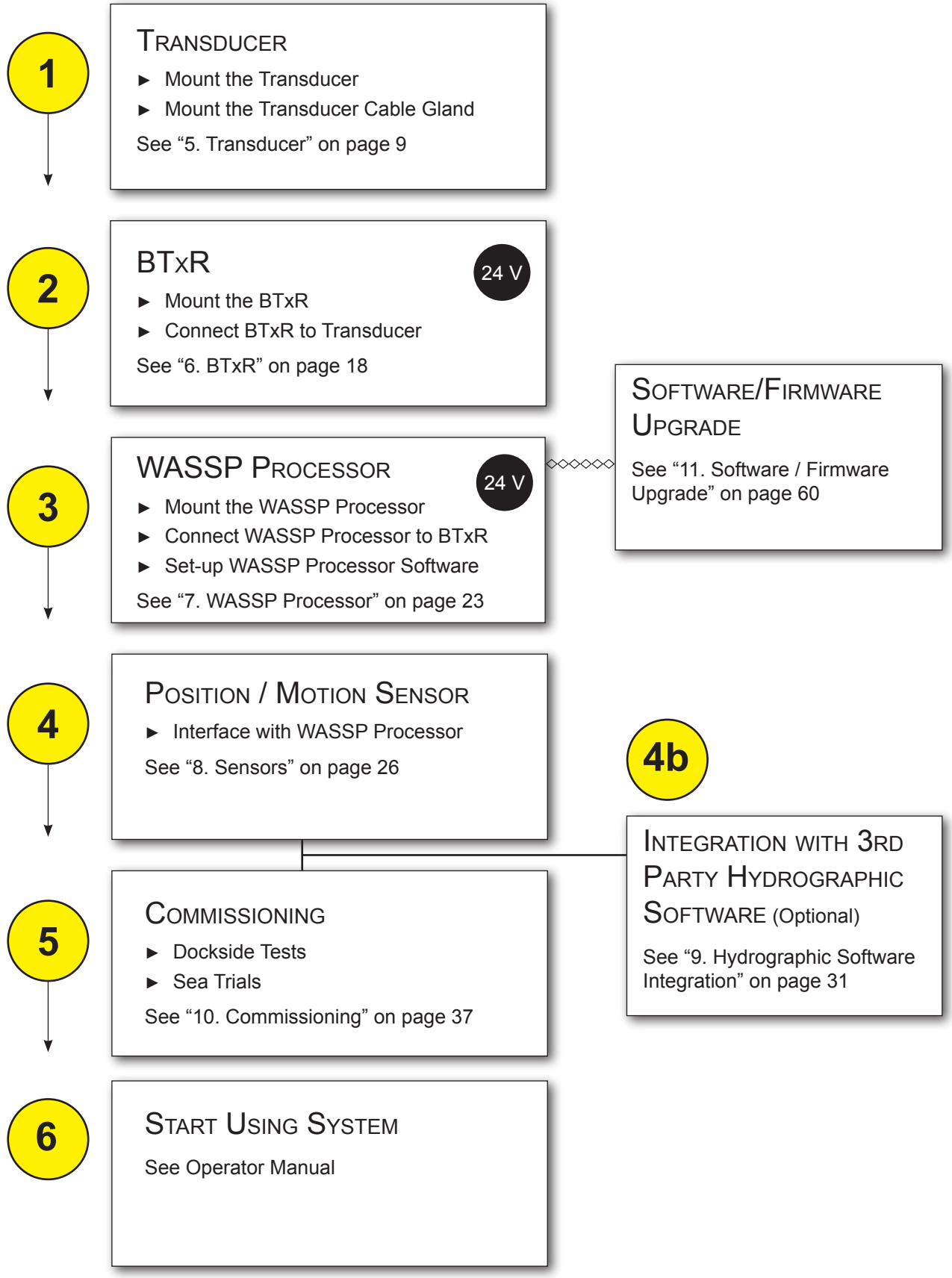


Figure 2. Basic Installation Flow

5. Transducer

5.1 Transducer Type

The WASSP system uses a transducer intended to be either pole mounted or flush mounted inside the hull through a suitable opening to allow the bottom face of the transducer to be in contact with the sea water.

The transducer is a rectangular-shaped, low-profile transducer for through-hull mounting, encased in a sealed sea chest made to suit the vessel's hull dead rise angle. The transducer is best suited to steel and aluminium hulls.

A sea chest for housing and sealing the transducer should be designed and constructed by a reputable shipyard to suit the size and contours of the hull of each individual vessel. This must be sized and constructed accurately.

The sea chest provides a stable platform for the transducer and must be mounted as horizontal to the vessel's waterline as possible. An optional gland supplied by WASSP Ltd. in alloy, plastic, or steel, provides the transducer cable through-hull seal.

The transducer is supplied standard with a 10m cable. Different cable lengths are available. Please ask your WASSP representative for details.

5.2 Transducer Dimensions

The drawing below gives the overall dimensions of the WASSP Transducer. The recommended cut-out dimensions for a mounting plate are also shown.

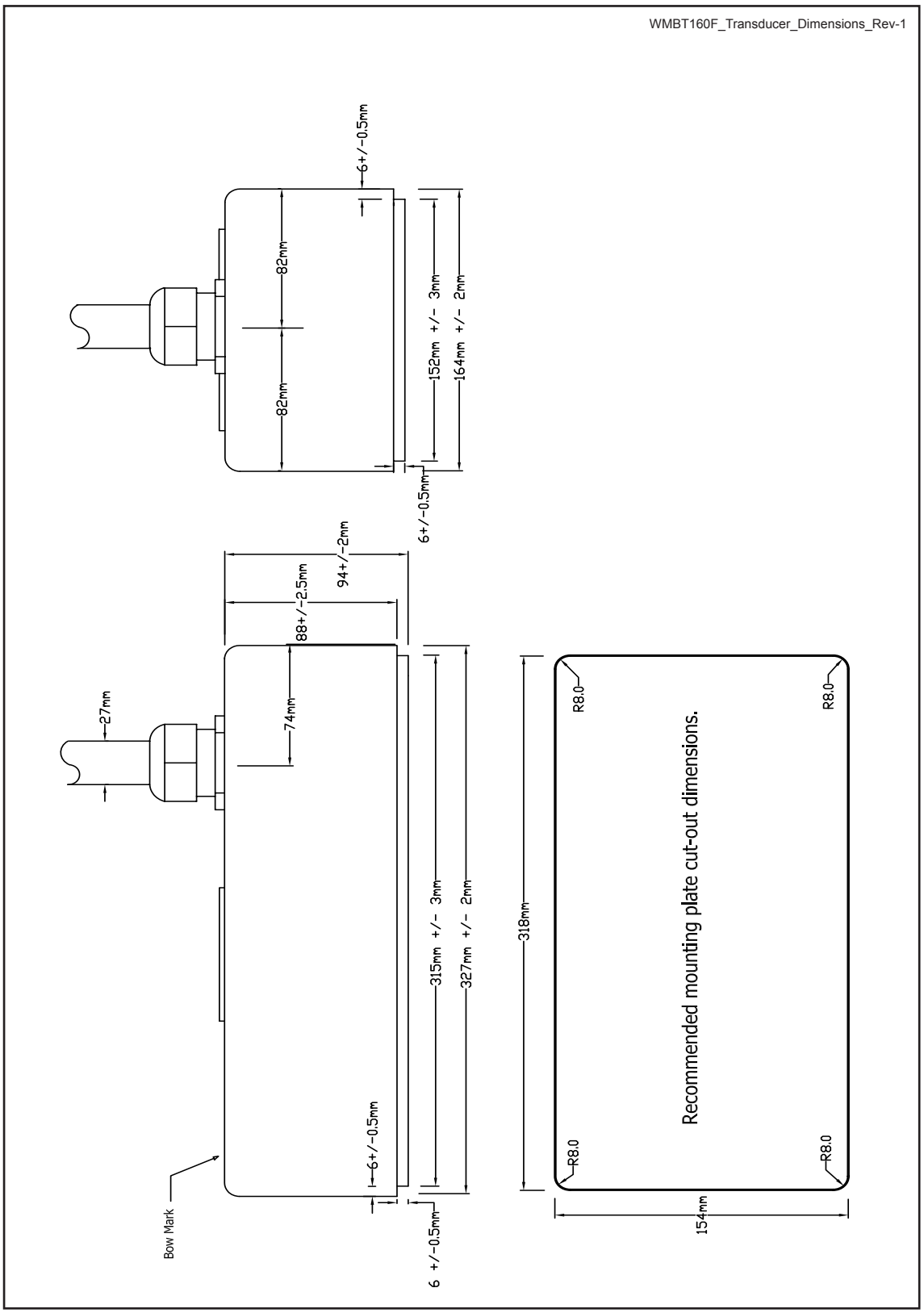


Figure 3. Transducer Dimensions

5.3 Transducer Mounting Methods

5.3.1 Through Hull Mounting

When mounting the transducer, ensure it is accurately running parallel to the keel in a bow-stern direction. See below.

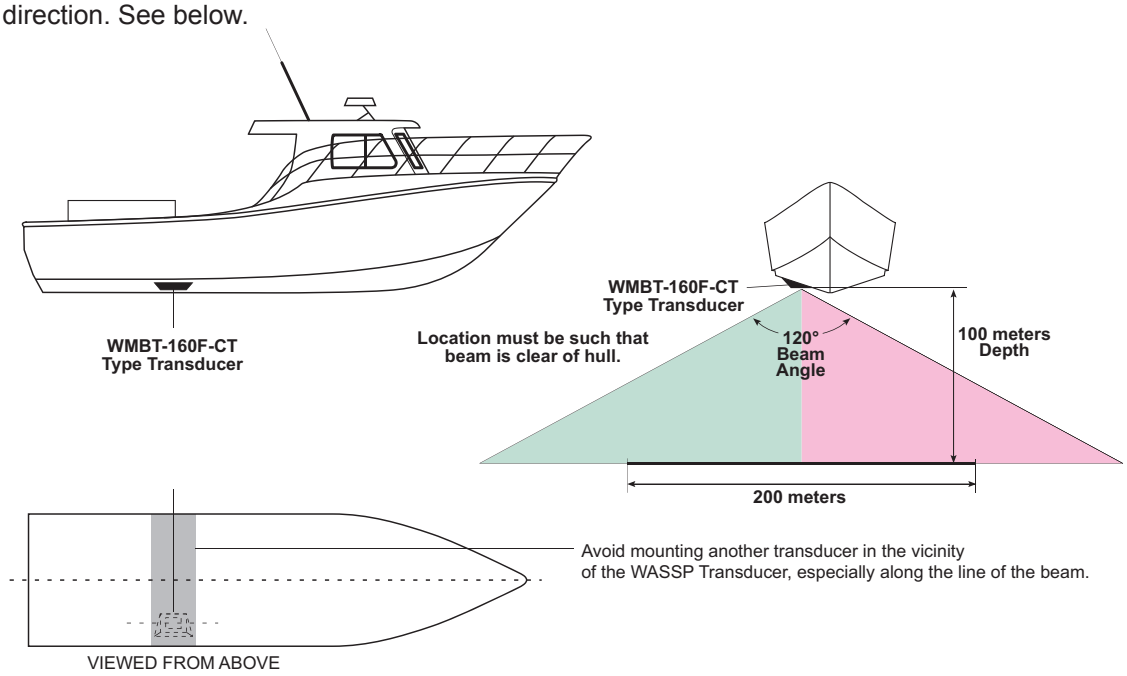


Figure 4. Through Hull Transducer Mounting

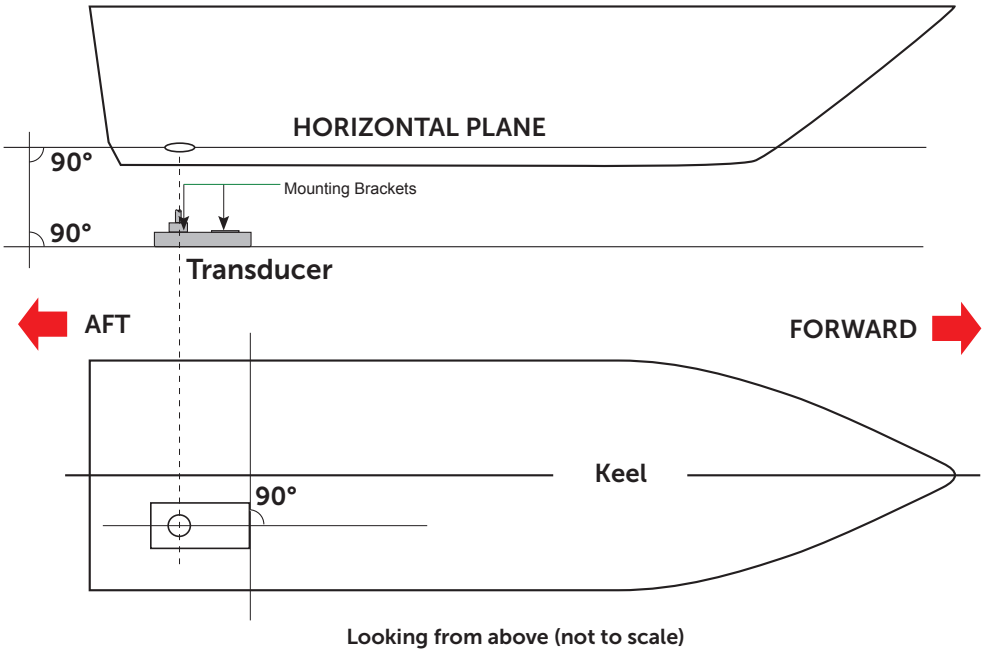


Figure 5. Placing the Transducer on the Keel

CAUTION **The above mounting example is provided as a guide. WASSP Ltd. recommend that a reputable boat builder is used to install the transducer to prevent damage to the vessel's hull.**

5.3.2 Pole Mounting

The transducer can be used with a temporary mounting assembly. The assembly would typically incorporate transducer, position and motion sensors, and be deployed on a rigid mount over the side or the stern of the vessel for use during survey operations.

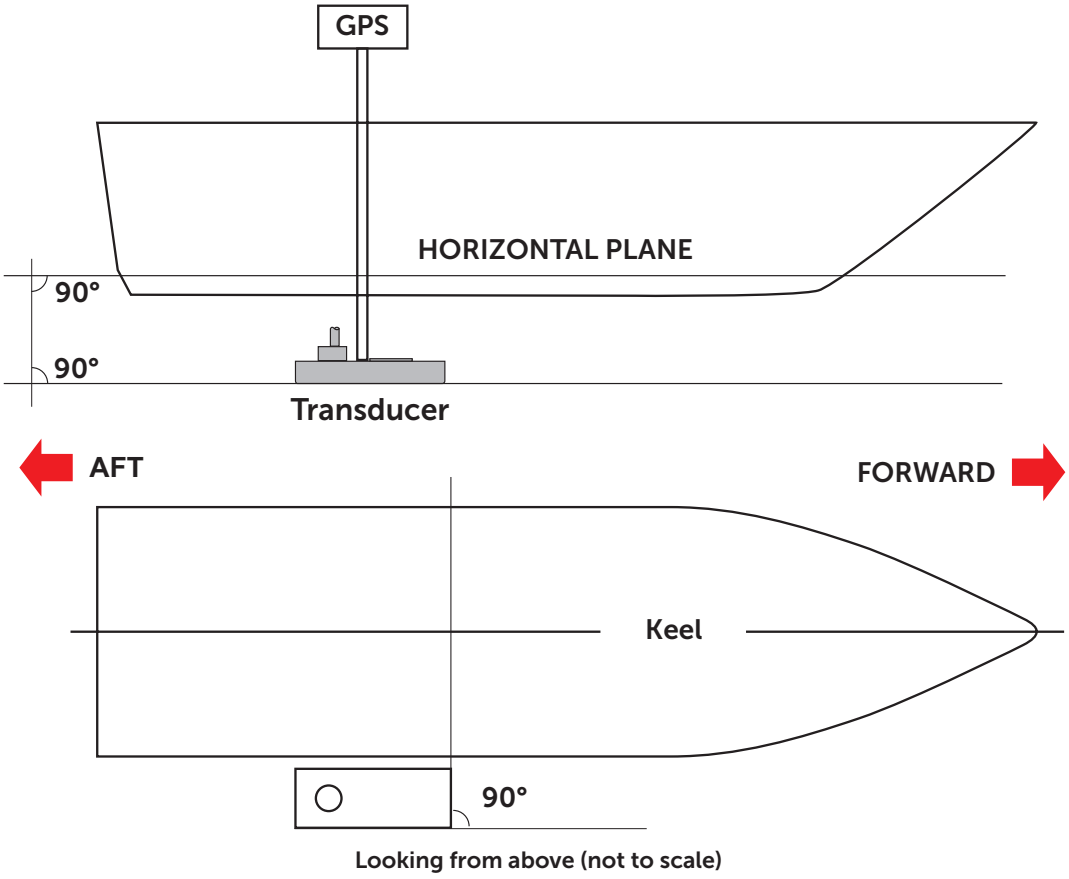


Figure 6. Pole Transducer Mounting

CAUTION

The above mounting example is provided as a guide. WASSP Ltd. recommend that a reputable boat builder is used to fabricate the pole mount assembly.

Any flex in the pole mount during operation will introduce errors.

5.4 Transducer Mounting - General Considerations

The transducer is mounted on the hull below the water line or as a rigid structure attached to the hull, normally using a permanent sea chest. The transducer must be mounted so that it is aligned with the fore-aft axis of the vessel. It must also be mounted so that the flat underside of the transducer is as close to horizontal as possible when the vessel is travelling at survey speed.

If the vessel has a keel, the transducer can be mounted somewhere along the length of it. If it is mounted on the hull, it should be far enough away from the keel so that the keel will not be detected within the 120° beam angle. “Figure 4. Through Hull Transducer Mounting” on page 11 shows a sea chest type through-hull mounting designed specifically for a fast moving, alloy hull boat.

The performance of the system is directly related to the mounting location of the transducer, especially for high-speed cruising. The installation should be planned in advance, keeping in mind the fixed cable length of 10 meters and the following factors:

- Air bubbles and turbulence caused by movement of the vessel seriously degrade the sounding capability of the transducer. The transducer should be located in a position with the smoothest water flow.
- The transducer should not be mounted close to propellers because noise from propellers can adversely affect the performance of the transducer.
- Mount the transducer inboard of lifting strakes as these create acoustic noise.
- The transducer must always remain submerged, even when the boat is rolling, pitching or planing at high speed.
- A practical choice would be somewhere between a ⅓ and a ½ of the boat’s length from the stern. For planing hulls, a practical location is generally towards the rear of the vessel, to ensure that the transducer is always submerged, regardless of the planing angle.
- Do not mount another transducer near the WASSP transducer as it is likely to interfere with the signal received by the WASSP system.

5.5 Gland Assembly

“Figure 7. Gland Assembly Outline and Dimensions”shows the physical dimensions of the WASSP Ltd. supplied gland assembly.

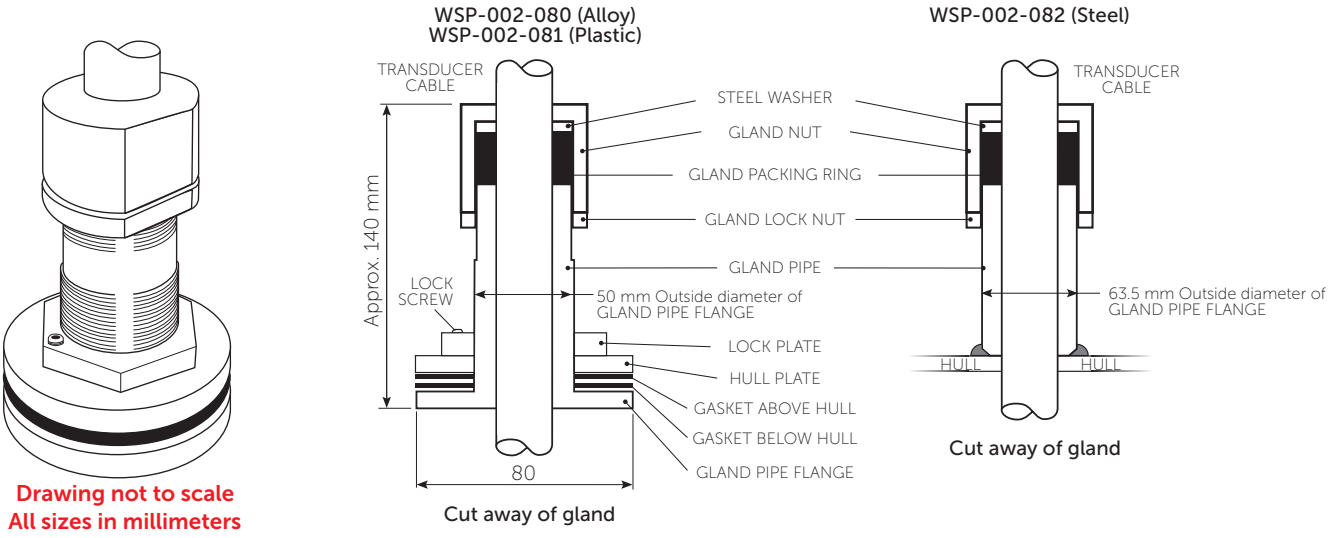


Figure 7. Gland Assembly Outline and Dimensions

5.5.1 Mount the Transducer Cable Gland

See “Figure 8. Mounting the Gland Assembly” and “Figure 9. Gland Assembly - Cable Connectors”.

In the external sea chest and fairing type installations, the cable gland forms a seal where the transducer cable passes through the hull. In low profile sea chest installations, the gland passes through the sea chest cover.

The gland pipe and a single gasket are the only parts of the gland that are located inside the sea chest or outside the hull, all other parts are attached to the gland pipe inside the vessel.

Gland Mounting Instructions

Depending on the type of installation, there are various ways of mounting the cable gland to the hull. The following example describes how to mount the gland through the hull and then feed the cable through the gland. Adapt the following procedure to suit your installation while taking the following into consideration:

- Always use a good quality marine sealant to seal across areas that can leak.
- When installing the gland packing ring, apply soapy water to the inside of the packing ring and pass it over the transducer cable until it is sitting on top of the gland pipe. The soapy water allows the packing ring to slide easily down the cable. When sitting on top of the gland pipe, clean as much of the soapy water off as possible to ensure the packing ring grips the cable when pressure is applied by the gland nut.
- Tighten the gland nut by hand until secure. With the vessel in the water, check for leaks at the gland and if leaking slightly, tighten the gland nut with a spanner until the leak stops.
- When all leaks are stopped, tighten the gland lock nut against the gland nut.

1. Place the bottom gasket over the gland pipe and apply marine sealant to both sides of the gasket. See “Figure 8. Mounting the Gland Assembly” below.
2. Push the gland pipe into the hole.
3. Place the top gasket over the gland pipe and apply marine sealant to both sides of the gasket.
4. Place the plate over the gland pipe and onto the top gasket.
5. Screw the lock plate onto the gland pipe until a good joint is achieved. Clean away any excess marine sealant.
6. Feed the transducer cable through the gland. See “Figure 9. Gland Assembly - Cable Connectors” on page 16 for a set of steps to feed a RJ-45 type cable through the gland pipe.
7. Screw the gland lock nut as far as it can go onto the gland pipe.
8. Place the gland packing ring over the cable until it sits on top of the gland pipe.
9. Place the steel washer and gland nut over the cable and screw the nut onto the gland pipe firmly by hand.
10. With the vessel in the water, check for leaks at the gland and if leaking slightly, tighten the gland nut with a spanner until the leak stops.
11. With all leaks stopped and while holding the gland nut with a spanner, tighten the gland lock nut against the gland nut with a spanner.

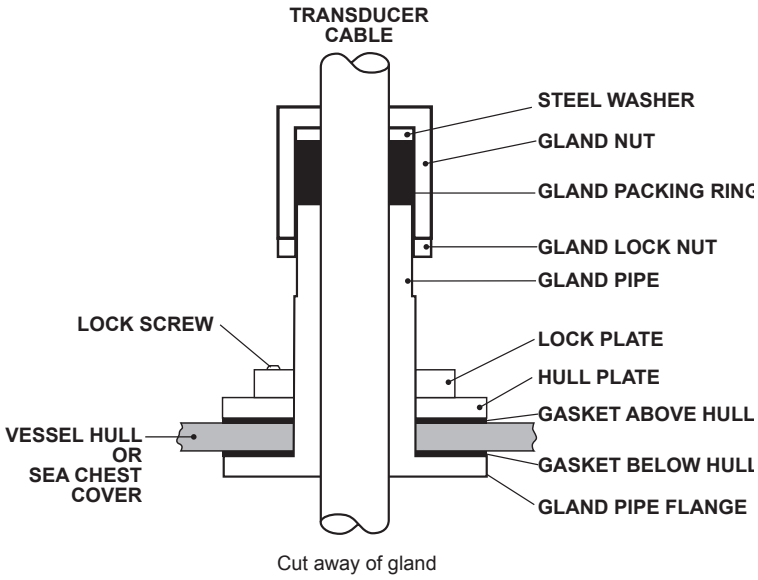


Figure 8. Mounting the Gland Assembly

5.5.2 Transducer cable Installation

The transducer cable consists of seven CAT-5 cables and one screened pair for the transmit connection.

To fit the RJ-45 connectors and cable through the gland, no special preparation is required.

The BTxR cable end has the RJ-45 connectors fitted with “staggered” cable lengths. This allows each RJ-45 connector and its associated cable to be fed through the gland fitting easily.

Commencing with the black RJ-45 cable and black transmit cable, feed each cable in turn through the gland, finishing off with the grey RJ-45 connector and cable.

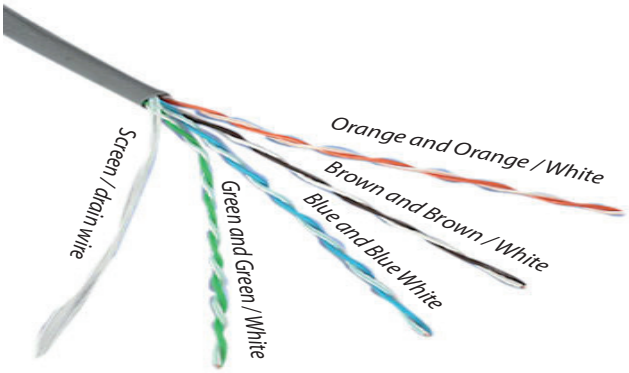
Complete fitting and tightening the gland as shown in “Figure 9. Gland Assembly - Cable Connectors” on page 16.

Note colour code for transmit cable conductors: White, Black and Green.

Figure 9. Gland Assembly - Cable Connectors

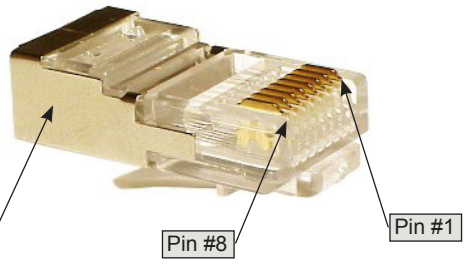
5.5.2.1 Replacing / Repairing an RJ-45 Connector

If one or more of the RJ-45 connectors gets damaged during the installation process, the connector can be easily replaced. Wiring details and colour codes used are shown below.

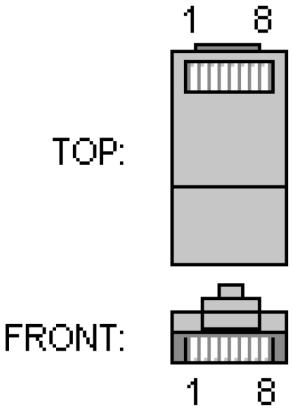


The CAT5E cables used in the transducer cable follow standard CAT5 colour codes but the RJ-45 plug wiring is specific to the BTxR and does NOT conform to T568A or B:

RJ-45 Plug Pin Number	CAT 5 conductor colour
1	Orange
2	Orange / White
3	Green
4	Green / White
5	Blue
6	Blue / White
7	Brown
8	Brown / White
Case	Screen / drain wire (solder)



The screen / drain wire should be soldered onto the side of the RJ-45 connector. Scratch the side of the connector with something sharp before soldering to assist with the join.



6. BTxR

6.1 BTxR Connections and Dimensions

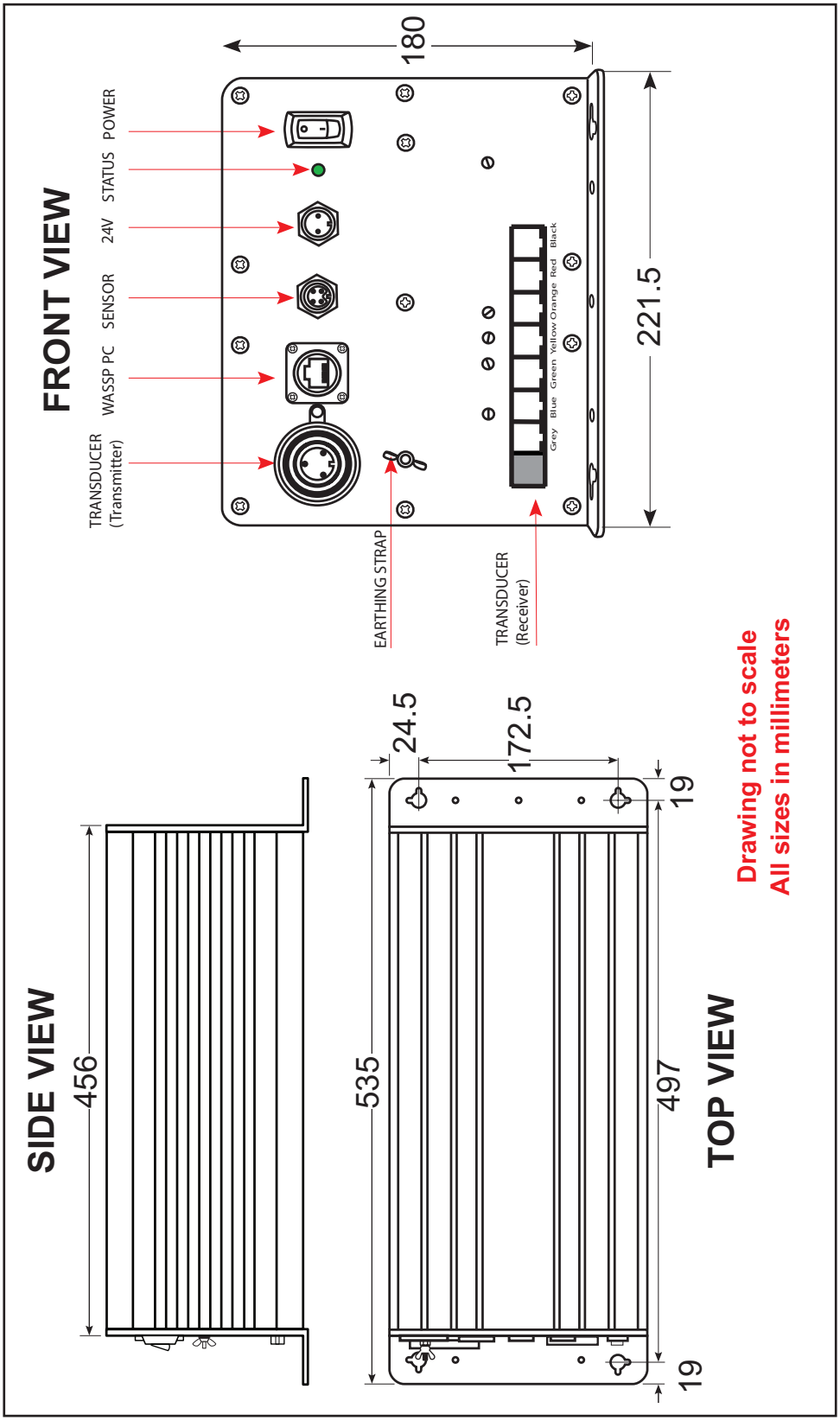


Figure 10. BTxR Connections and Dimensions

6.2 BTxR Installation

6.2.1 BTxR Installation Considerations

For maintenance purposes, the PCB assembly can be removed from the case in situ. Always leave at least 600 mm clearance at the faceplate end cover to allow the PCB assembly to be withdrawn from the case.

6.2.2 BTxR Installation

Using the mounting flanges on the end covers, the BTxR can be mounted vertically on a bulkhead, or horizontally on the floor. See “Figure 10. BTxR Connections and Dimensions” on page 18 and “Figure 11. BTxR Mounting Diagram” on page 19 for BTxR dimensions and mounting clearances.

1. Using the mounting holes on the mounting flanges, secure the BTxR to the mounting surface.

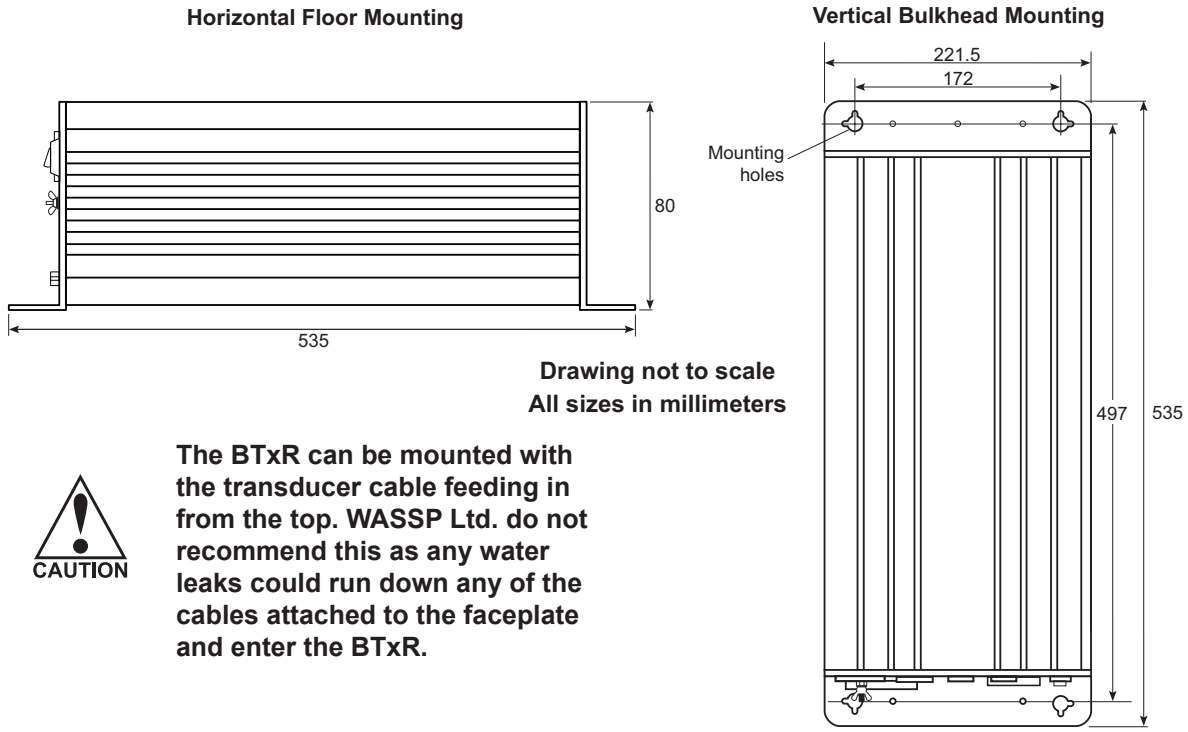
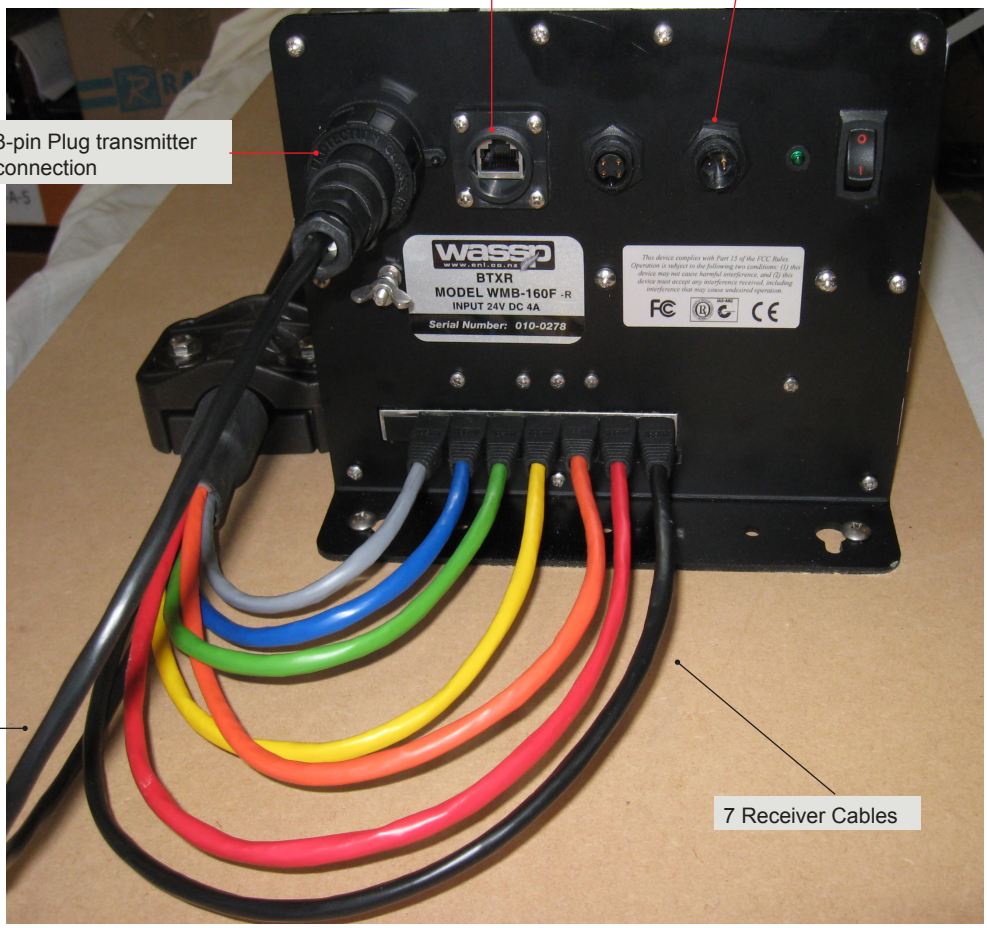


Figure 11. BTxR Mounting Diagram

2. Connect the following cables to the faceplate end cover. See “6.2.2.1 BTxR Connections” on page 20 for cable connection details:

- Transducer cable to BTxR.
- WASSP Processor CAT5 cable to BTxR
- 24 V DC power to BTxR

6.2.2.1 BTxR Connections



CAUTION

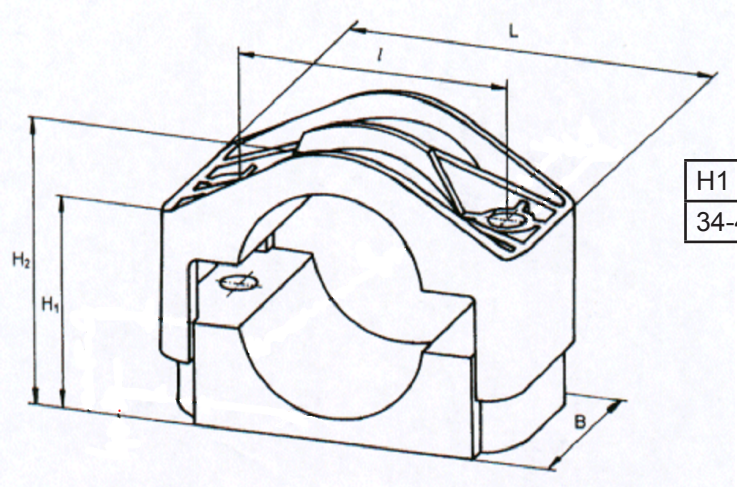
The seven receiver cables MUST be connected in the colour order shown. Failure to do this will result in faulty operation of the WASSP system.

Figure 12. Transducer to BTxR Cable Connections

CAUTION

The BTxR cable MUST be fitted with the supplied cable clamp to prevent strain on the RJ-45 connectors where they plug into the front of the BTxR.

Figure 13. BTxR Cable Clamp



H1	H2	l	L	B
34-46	45-57	60	90	60

Figure 15. Cable Clamp dimensions

6.2.3 Power to BTxR

24 V DC power is input to the BTxR from the vessel's power supply through the connector on the BTxR's faceplate end cover marked **24 V**.

The power input uses a Switchcraft-EN3 2-way connector to connect to the faceplate end cover. See below for connection details.

Pin No.	Colour
1 (+)	RED or CLEAR
2 (-)	BLACK

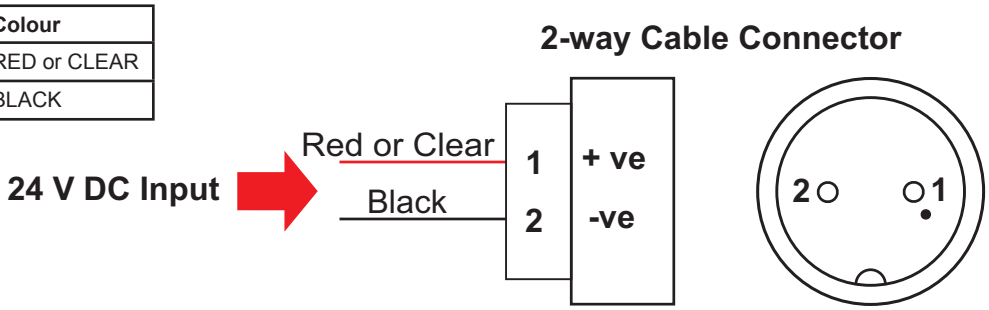


Figure 14. BTxR 24 V DC Input Connector Pin out Diagram

6.2.3.1 Transmitter Cable Socket Assembly

If the transmitter cable socket needs to be disassembled, use the locking ring tightening tool supplied with the BTxR to loosen the locking ring. To assemble the 3-pin sealed plug on the end of the transmitter cable:

1. Push the following parts over the transmitter wires:
   - Gland Nut.
   - Gland Cage.
   - Gland.
   - Main Body.

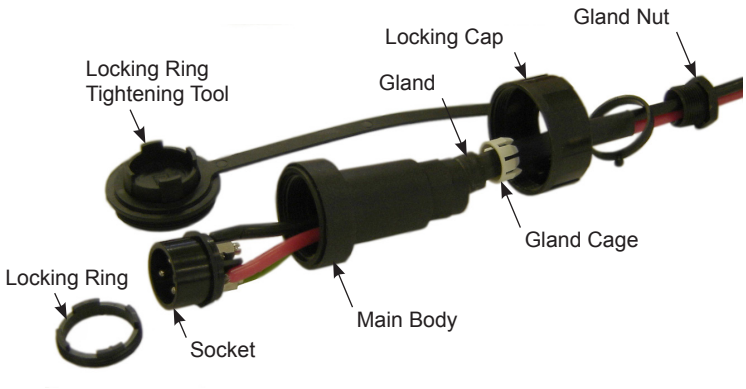


Figure 16. Cable Socket Assembly

2. Attach the RED or WHITE wire to L, the BLACK wire to N, and the GREEN wire to E on the socket and tighten all three screws.

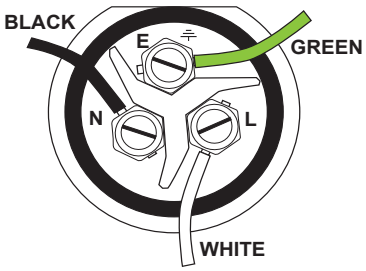


Figure 17. Later cable colour code

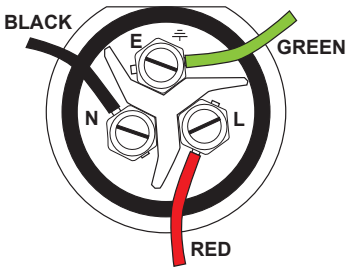
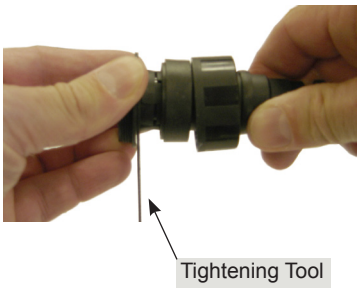


Figure 18. Early cable colour code

3. Push the socket into the main body, rotating to make sure that the flat edge on the socket is aligned with the flat edge on the main body.
4. Using the tightening tool, screw the locking ring into the front of the socket until tight.
5. Push the gland, gland cage, and gland nut into the main body as far as it will go and tighten the nut securely.



7. WASSP Processor

Due to changes in technology and advanced software updates, the requirements of the WASSP Processor are dynamic. As such, this section does not contain specific details pertaining to the PC included with your WASSP system, and instead only provides generic information, standard for the WMB-3250 PC specification. Refer to Appendix for information on specific connections on particular WASSP Processors.

7.1 WASSP Processor Connections

A CAT5 ethernet crossover cable, with RJ-45 connectors, connects the BTxR to the WASSP Processor through the connector socket on the BTxR's faceplate.

WASSP Processor Connections include (minimum):

- Ethernet #1 — Dedicated connection to BTxR
- Ethernet #2 — Connection to Third party software / local network
- DVI / VGA — Dual video output, supporting 2x HD monitors (1920x1080)
- USB x 4 — Keyboard, Mouse, WASSP Dongle, USB Card Reader
- RS232 x 4 — Serial communication ports for interfacing with GPS Satellite Antennae and Motion Sensors.

7.2 WASSP Processor Mounting Considerations

The supplied WASSP Processor must be mounted on a flat, stable surface. The computer can be mounted horizontally using the supplied stand. Keep the following in mind when selecting a mounting location for the computer:

- Secure the computer so that it cannot come loose in rough seas.
- Keep the computer out of direct sunlight.
- The temperature and humidity of the location where the computer is mounted should be moderate and stable.
- Locate the computer away from exhaust pipes and vents.
- The mounting location should be well ventilated.
- Mount the computer where shock and vibration are minimal.
- Keep the computer away from electromagnetic field-generating equipment, such as motors or generators.
- For maintenance and checking purposes, leave sufficient space at the sides and rear of the computer installation location.
- A magnetic compass will be affected if placed too close to the computer. Do not locate the computer closer than the following compass safe distances to prevent interference with the magnetic compass:
  - Standard compass: 0.8 meters.
  - Steering compass: 0.6 meters.

7.3 Software Installation

Your WASSP Processor comes preloaded with the WASSP Application Software.

- WASSP GUI — Used for user interaction and Control
- Processing Module — Used for Signal Processing
- Transfer Task — Used for serial data control. See “8. Sensors” on page 26
- Navigator — Optional Chart Overlay Viewer
- Diagnostics — Used by Technician. The Diagnostics Task may be started separately. See section: “14. APPENDIX B - Remote Diagnostics Utilities” on page 65

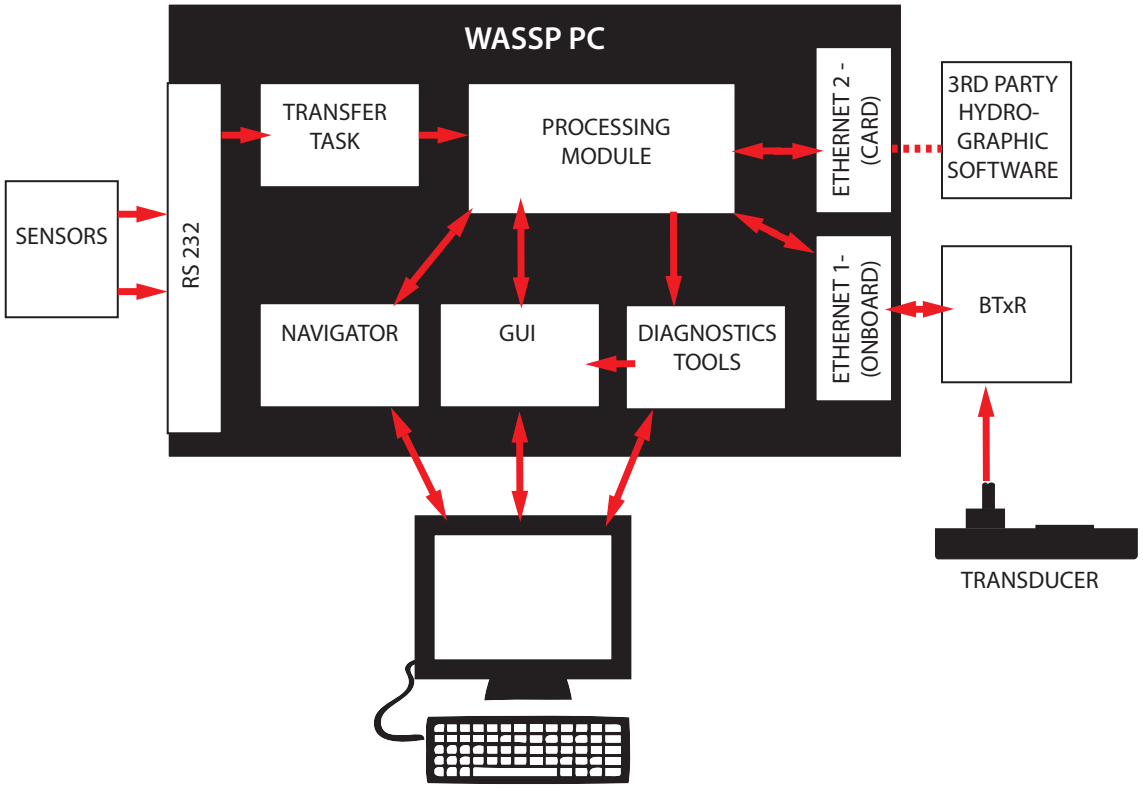


Figure 19. Basic Layout of Software Components

7.3.1 User Dongle

To run the system, you must connect the supplied WASSP user dongle. If you do not have a dongle attached to the system you will not be able to run the WASSP program with BTxR input or GPS input. The software prompts you that a dongle is not connected and Start/Stop button status is ‘DEMO’.

If operating without a dongle you can play recorded WASSP data files and view the four displays. The **TX Mode** button has the text **DEMO** to show that you cannot operate the transducer or BTxR.

If you attach a dongle after running the WASSP software program, select **Rescan Dongle** or restart the WASSP program or press the Transmit button.

For a complete description of the WASSP Multibeam Sonar System program functions, refer to the **WMB-3250 Operator Manual**.

7.4 WASSP Software Operation

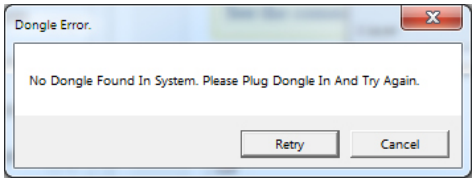
For full operating instructions, refer to the WMB-3250 Operator Manual.

1 **Start up WASSP Application**

a. The WASSP Processor Application software self loads on system start up.

If no dongle is found, a **Dongle Error** box appears on the screen.

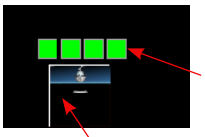
Ensure a dongle has been plugged into the computer's USB port and click **Retry**.



You can click **Cancel** and run a demo file from the System Configuration Utility.

b. Verify that the BTxR and appropriate sensors are switched on.

c. Check the connection status for Processing Module, Transfer Task, BTxR and Navigator. Connection Status icons will appear green when connected. If red, refer to "7. Frequently Asked Questions (FAQs)" on page 49 in the Operators Manual.



Connection status icons will appear green if connected, red if not.

MODE button controls transmit and displays transmit status.

2 **Perform the set up and commissioning operations you require**. See Sections "10. Commissioning" on page 37 .

Note: The MODE button is disabled while playing back a demo file. While in the transmit mode, a demo file cannot be played back.

3 **Quit the WASSP GUI program**:

a. Click the **Transmit Mode** button to set the BTxR to standby.

b. Click **Close** on the task bar.

The **Exit System** box appears.

Follow the defined shut down procedure in order not to lose data

c. Click **OK**.

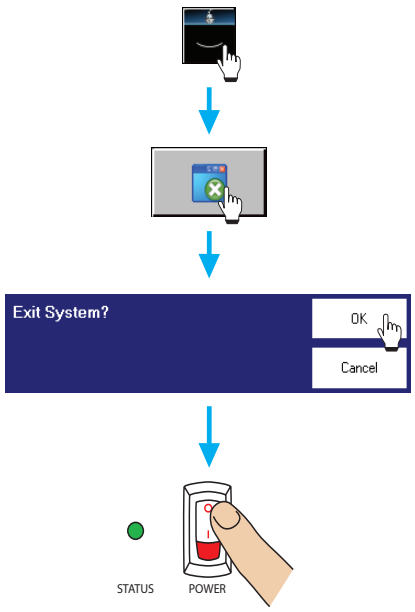
All files opened by the system are closed automatically and the program shuts down.

d. Shut down the computer following standard Windows procedure.

e. Turn the BTxR OFF using the POWER button on the faceplate.

f. Turn off the sensors according to the manufacturer's instructions.

The WASSP system is now shut down.



CAUTION

The WASSP Processor should always be shut down through the operating system.
Pulling the power can cause unrecoverable corruption.

8. Sensors

The WASSP system requires position, heading, attitude, heave, speed and time information in order to be fully functional. The overall performance will be directly affected by the quality of the sensors chosen.

8.1 NMEA Interconnection

The WASSP system will extract the required data from NMEA input format sentences as well as proprietary RS232 from supported motion sensors.

For full details on installation and connection, refer to Equipment Manuals.

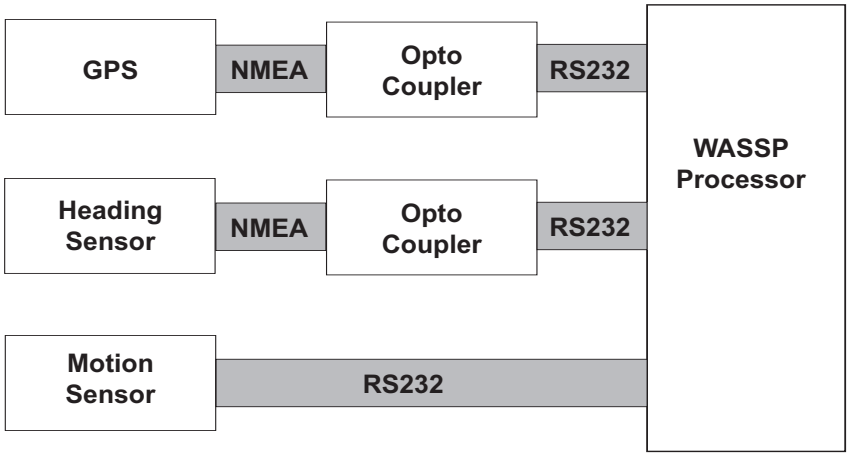
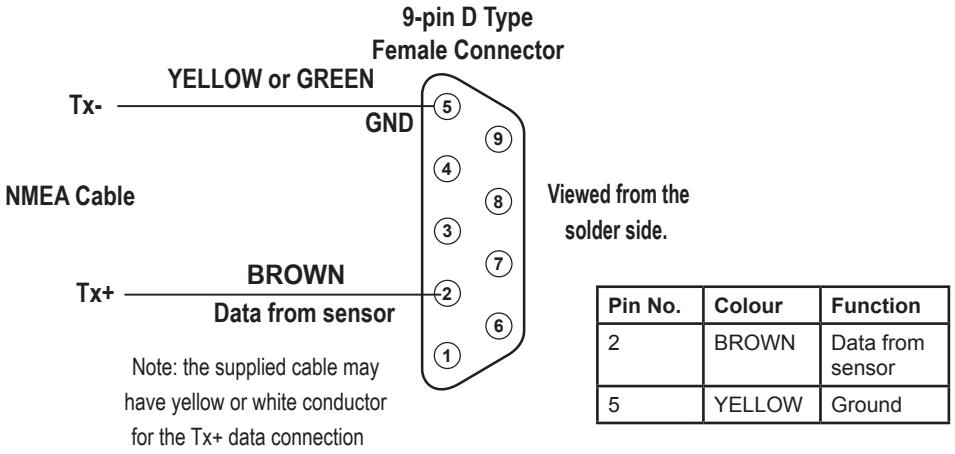


Figure 20. Example NMEA /RS232 Sensor Connections



Pin No.	Colour	Function
2	BROWN	Data from sensor
5	YELLOW	Ground

Figure 21. NMEA Pin in Pin Out

CAUTION

NMEA sentences need to be converted from the current loop to the RS232 that is used by the computer.

If the data sources (talkers) do not have the capability of doing this themselves, a data converter must be used.

Data cables should be run from existing sensors on the vessel to the WASSP Processor serial ports using 9-pin female D connectors.

8.2 WASSP Transfer Task Settings

Connect the sensors to the PC via the serial cables. Once the sensors are turned on, the WASSP Transfer Task can be configured to read the NMEA sentence output from each of the connected sensors.

The WASSP Transfer Task has three tabbed pages for configuring serial transfer settings:

- NMEA: See “Figure 22. WASSP Transfer Task NMEA Tab” on page 27
- Network
- RTS/CTS

To open the WASSP Transfer Task window and enter the NMEA and communication port settings:

1. Right-click the **WASSP Transfer Task** icon on the Windows Task bar. Click **Setup.**

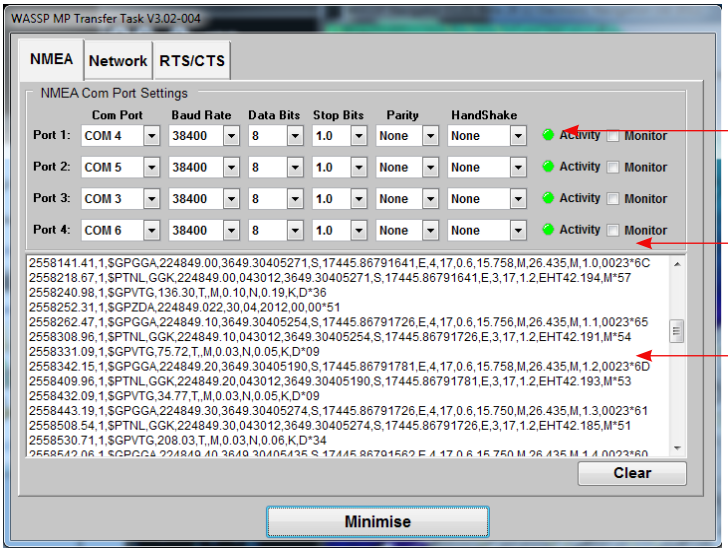
   The **WASSP Transfer Task** opens.

2. The **NMEA** Settings are used to configure the transport protocol between sensors and the WASSP system.

   Select the appropriate COM Port and configure as required for the sensor.

   For full details on installation and connection, refer to Equipment Manuals.

Note: If the WASSP Transfer Task icon is not available on the Task Bar, click Start > All Programs > WASSP > Transfer Task.



The **Activity** indicator will show data activity. Green is connected and active, clear is not active and red indicates an error on the COM port.

Select **Monitor** to see the real-time output sentences from the sensor in the display area.

The display area.

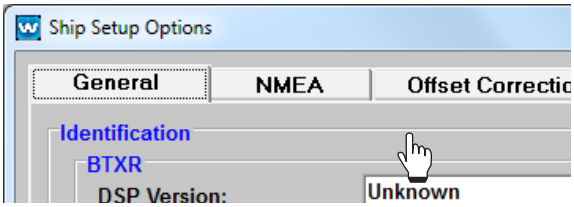
Figure 22. WASSP Transfer Task NMEA Tab

8.3 NMEA Tab (Ship Setup)

1. With the WASSP program running, click the **Ship Setup** icon on the **Menu** task bar.

   The Ship Setup Options window opens.

2. Click the **NMEA** tab.



3. a. Select the **Sensor** category on the left.

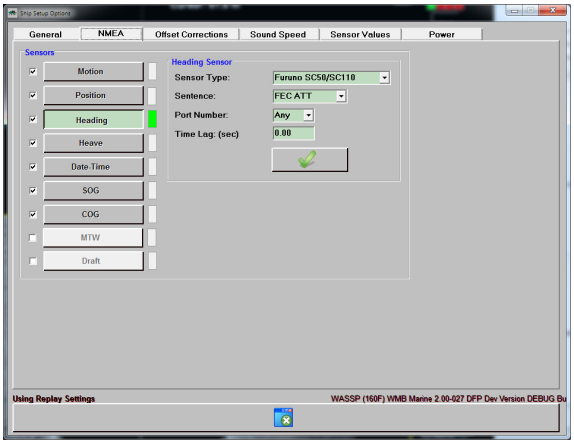
   b. Select the **Sensor Type** from the drop down menu.

   c. Select the output **Sentence** from the drop down menu.

   d. Select the **Port Number** as outlined in “8.2 WASSP Transfer Task Settings” on page 27

   e. Set the **Time Lag**. The Time Lag can be determined during the Commissioning Steps, see “10.2.6 Sea Trial - Commissioning Step 13 : GPS Time Delay (Required)” on page 54

   f. Click the tick button to save settings for each sensor.



The Furuno SC30 and SC50 have been prepopulated with Time Lag based on experimentation. These values should be verified during commissioning.

4. Click **Close**.

   The **Ship Setup Options** box closes.

8.4 Accurate Time Synchronisation using PPS

If you are using a third party application such as HYPACK® or QINSy then accurate time syncronisation may be requred. The best time syncronisation is achieved using a PPS input.

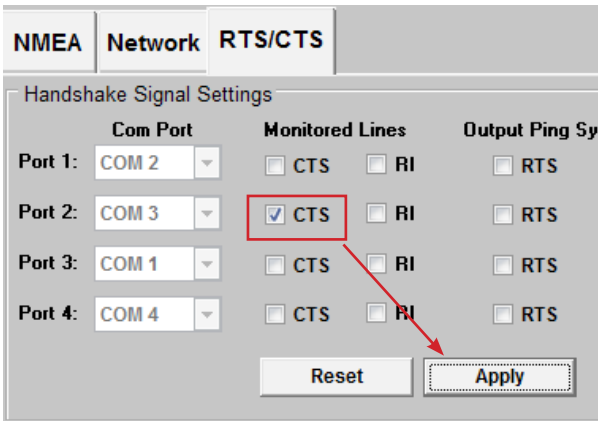
If you wish to synchronise your WASSP system to UTC time using a PPS pulse, you will need to complete the following steps:

1. Wire the PPS line from your device to the CTS pin of any one of the COM ports availble on the WASSP Processor (pin 8 on a standard DB9).

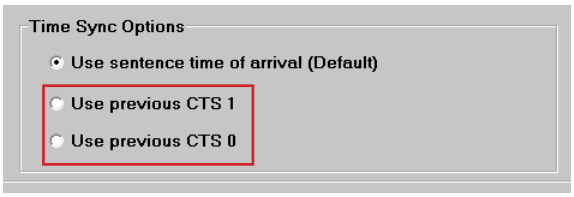
> NOTE: A voltage converter may be required to convert the PPS line to RS232 voltage levels.

2. Open the **RTS/CTS** tab of the **WASSP Transfer Task**, and enable monitoring of the CTS line on the appropriate COM port. Click **Apply**.

   If the PPS COM port is also being used by WASSP for NMEA data, then ensure the selected baud rate for that port is correct under the NMEA tab. Otherwise, the selected baud rate of the PPS port is unimportant.



3. Open the **Sensor Values Tab** under **Ship Setup** of the **WASSP GUI**, and select either '**Use previous CTS 1**' or '**Use previous CTS 0**'.



4. Click **Close**.
   The **Ship Setup Options** box closes.

> NOTE: You will also need to configure WASSP to receive a Date/Time sentence (ZDA or RMC) from the GPS device producing the PPS.
>
> See "8.3 NMEA Tab (Ship Setup)" on page 28.

8.5 Supported Sentences

The following two tables show supported Sensors. This is not a definitive list and is updated as required.

Device	Configuration Suggestions
Applanix POS MV V4	Position and heading, pitch, roll, heave, PASHR sentence
Furuno SC30/SC50	Position and heading, pitch, roll, heave via IF-NMEASC Interface unit *Select Sentence #7 when configuring the IF-NMEASC port. This will output ATT, HVE, GGA, VTG and ZDA NMEA sentences. Set baud rate to 38400bps and interval to 25ms.*
Kongsberg MRU	Heading, roll, pitch, heave, PSXN sentence
SMC IMU-108	Roll, pitch, heave, TSS sentence
Trimble GPS	Position, heading, speed, TNL GGK, HDT, VTG sentences
JRC JLR-20	Heading, pitch, roll, PJRCD sentence
CDL MiniSense 2	TOGS ASCII format
Maretron SSC200	Roll, pitch, PMAROUT sentence

Table 3 Supported Sensors

NMEA /RS232 Sentence	Description
PFEC ATT	True heading, pitch, roll (Furuno proprietary sentence)
GGA	Global positioning system (GPS) fix data.
GLL	Geographic position, Latitude and Longitude
HDG	Magnetic Heading
HDT	True Heading
PFEC HVE	GPS antenna up-down motion amplitude (Furuno proprietary sentence)
VTG	Course over ground and ground speed
ZDA	Time and date
TSS/TS1	Roll, pitch, heave
SHR	Heading, roll, pitch, heave
PTNL GGK	Trimble Geographic Position

Table 4 Supported NMEA / RS232 Sentences

9. Hydrographic Software Integration

9.1 HYPACK® Integration

With WASSP / HYPACK® integration, the WMB-3250 acts as a realtime data acquisition system and sends raw angles and depths to HYPACK® along with timestamped position and attitude data. The two systems use the GPS ZDA sentence to remain synchronised. No information is sent until time sync with GPS time is established by WASSP.

9.1.1 Configuration

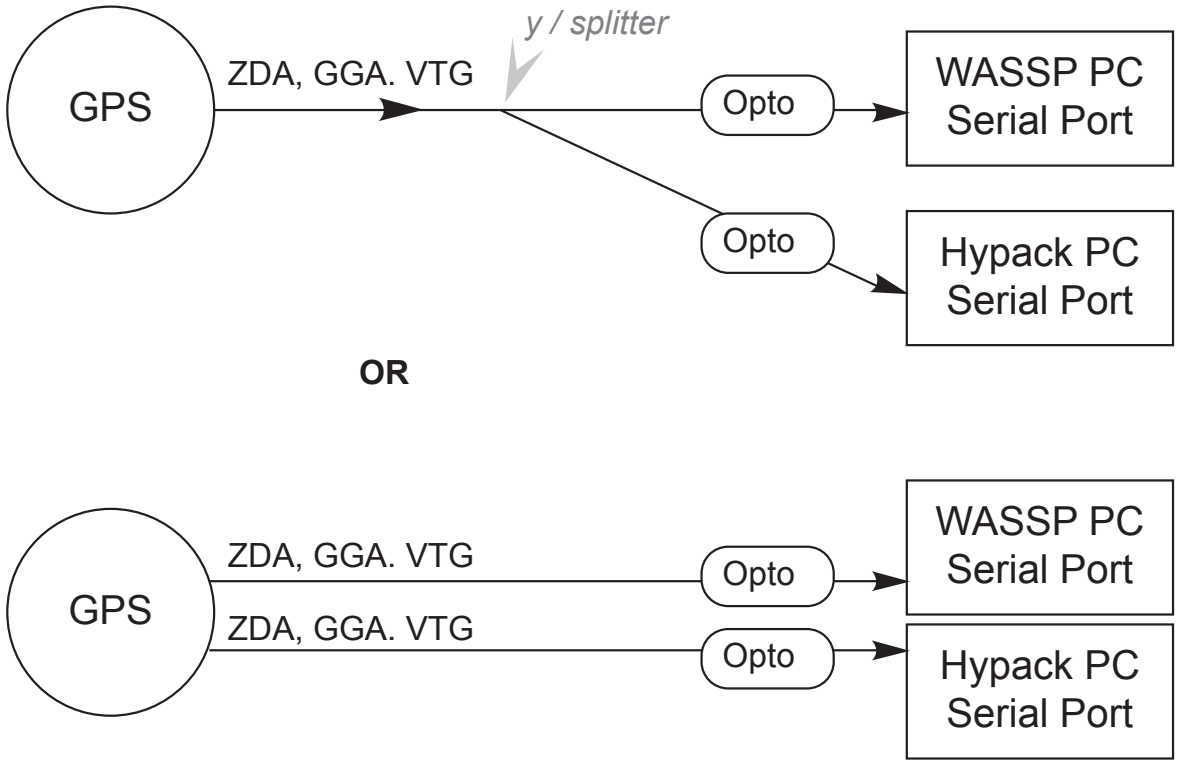
9.1.1.1 Computer

HYPACK® needs to be installed on a separate PC. Check with HYPACK® for the specifications required for this unit.It is important to ensure the computer has a low latency RS232 serial port for syncing the two systems.

9.1.1.2 Serial

Choose a device to use for time synchronisation. This device must output NMEA or RS232 serial ZDA. Use duplication, a 'y cable' or a low latency splitter (<1ms) to send this information to both WASSP Processor and HYPACK® computer. It is normal to also send position and speed information from this same device along with ZDA. See "8. Sensors" on page 26 for NMEA 0183 devices.

ZDA should be configured to output at 1Hz. There should only be one ZDA source



If output from the GPS is RS232 or the PC has optical isolation on the COM port, then the Optoisolators (Opto) are not required.

9.1.1.3 Network

The WASSP Processor has an onboard Ethernet network connection which should be connected directly to the BTxR and a second Ethernet network connection to be used directly to connect to the HYPACK® PC. Do not connect the onboard connection to an ethernet network as delays on this link will directly effect timestamp performance of the WASSP system. This ethernet network card is configured for automatic configuration, so if you wish it to use a specific address you will need to change the connection TCP/IP configuration.

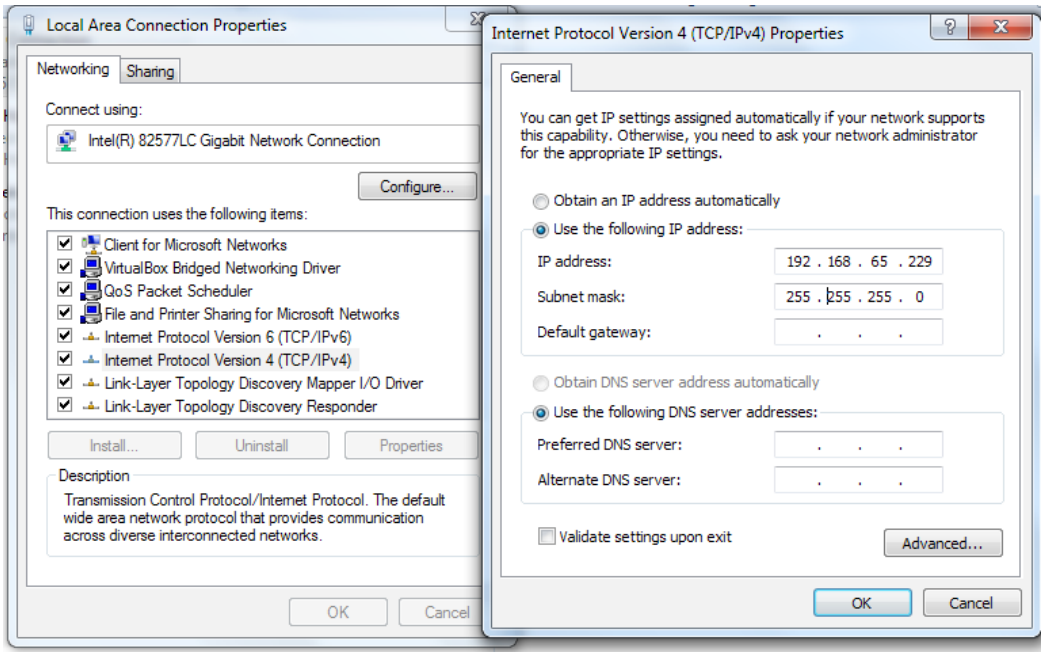


Figure 23. HYPACK® IP Configuration

9.1.2 Software Configuration Basics

1. Insert your HYPACK®/HYSWEEP dongle then run HYPACK® 2012 or later, with WASSP Multibeam support.

2. Open HYPACK® Hardware once the basic Survey settings have been set in your project.

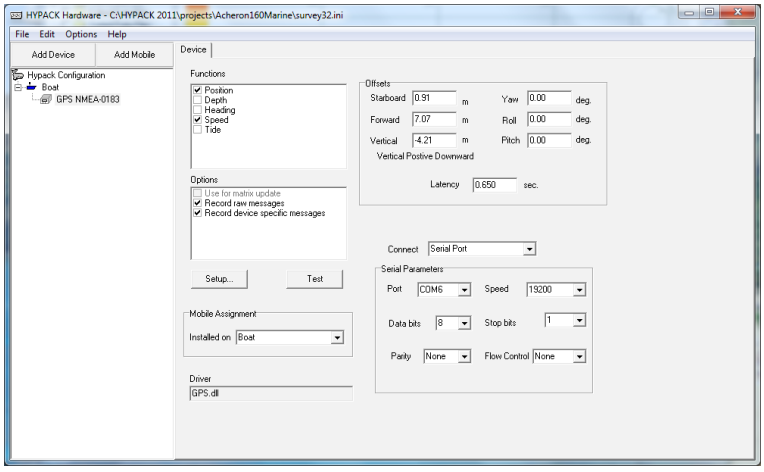


Figure 24. HYPACK® Hardware Device Setup

3 Add a GPS device and select this for Position update (also Speed or anything else this device is providing you). Set any offsets and connection settings as per normal. Test the GPS configuration using the **Test** button.

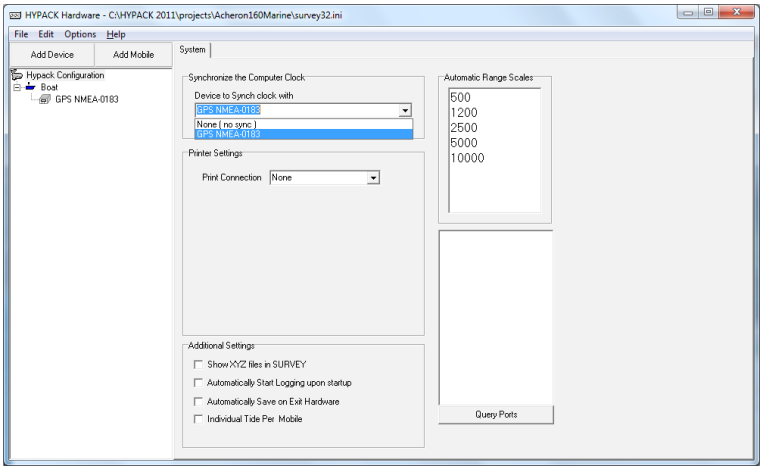


Figure 25. HYPACK® Hardware System Setup

4 Once the GPS device is created, select the base of the HYPACK® Configuration Tree. This will then show an potion to Synchronize the Computer Clock. Select the GPS device from the list. If this is not done the systems will run out of sync and pings will not appear in the correct position.

5 Save all of these changes and close these windows.

6 Open up the HYSWEEP Hardware configuration.

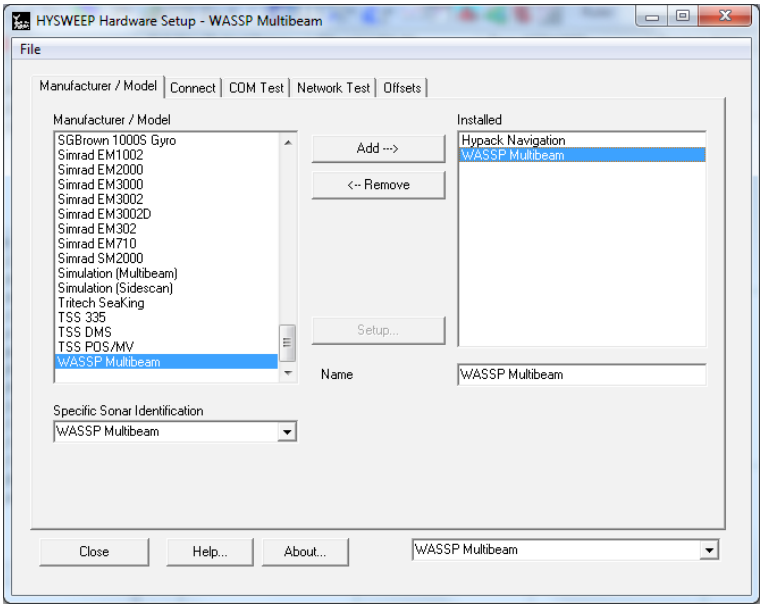


Figure 26. HYSWEEP Hardware Selection

7 Select WASSP Multibeam and Add the device to the project.

8 Now select the WASSP Multibeam device on the right hand list and then choose the Connect Tab.

9

The HYPACK® system talks on an ethernet network to the WASSP system. The WASSP software always uses the port 18007. The Internet Address should be the address of the 2nd ethernet network on the WASSP Processor, used for the HYPACK® connection. This should be a hard coded IP address rather than using DHCP or DNS server. Enter the relevant values into the ethernet network Connection Settings spaces provided.

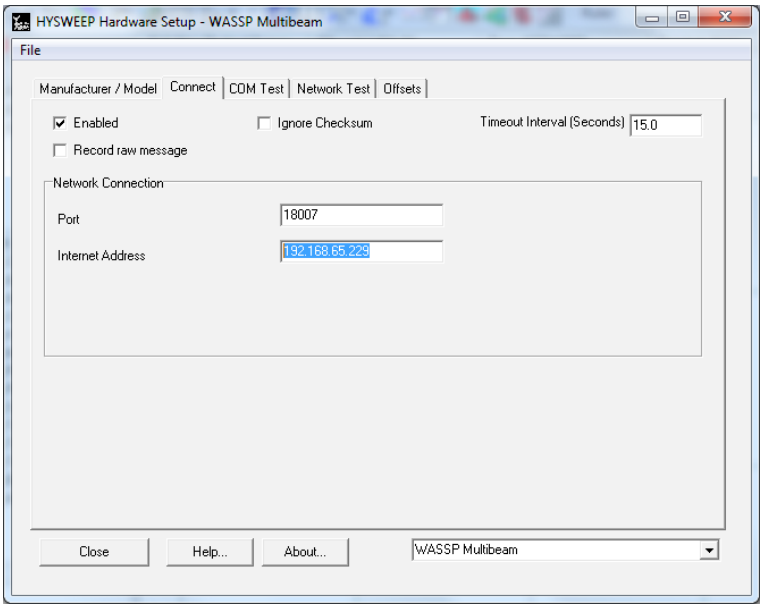


Figure 27. HYSWEEP Network Setup

10

Next setup the Offsets for the Sonar Head and any other device parameters. The GPS offsets for HYSWEEP will be added under the HYPACK® Navigation device. If the WASSP system is running you can test the Network connection is receiving data but it is easier to test by running up the data collection process.

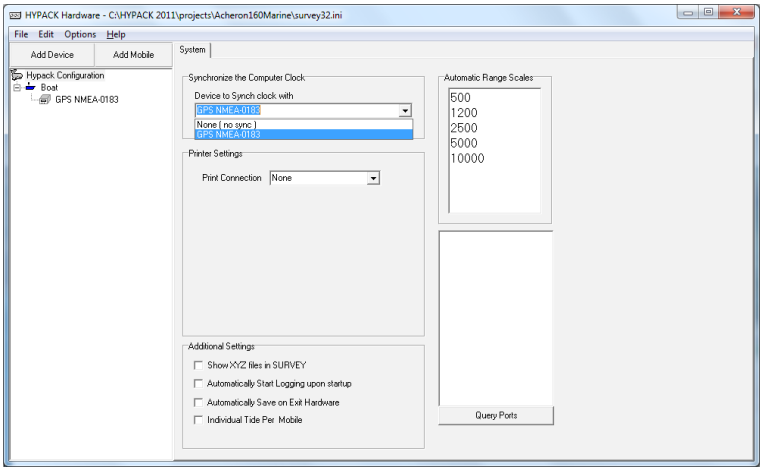


Figure 28. HYSWEEP Device Offsets

9.1.3 Data Collection

When everything is configured select Survey and HYSWEEP Survey. This will open the HYPACK® survey program and the HYSWEEP Survey interface. The HYPACK® side takes care of position and the HYSWEEP side connects to the WASSP Multibeam to collect Multibeam data, Attitude and Heave data.

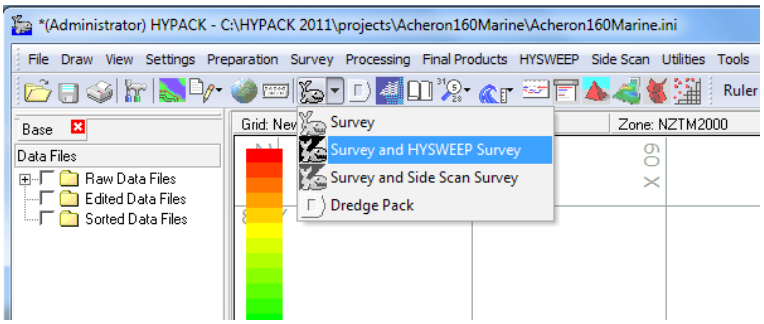


Figure 29. HYPACK® Survey

When the system first starts, the Survey window will have to sync to the WASSP data stream, this could take up to one minute. The HYSWEEP Survey program once connected will update the Depth, Time, Roll, Heave, Heading, Pitch and Sound Velocity values as they are received from the WASSP system.

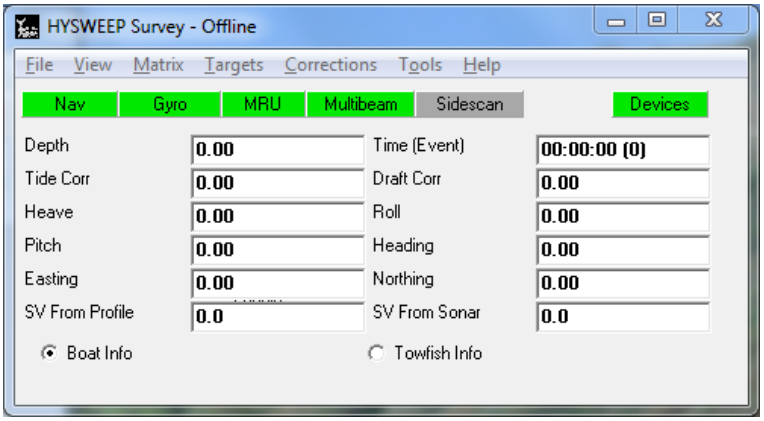


Figure 30. HYSWEEP Data Streams

Ensure that Boat Info is selected and if the connection succeeds but some data is not updating there are a few possibilities. Check the Device Selection used by HYSWEEP, under normal conditions it would be expected that these would be:

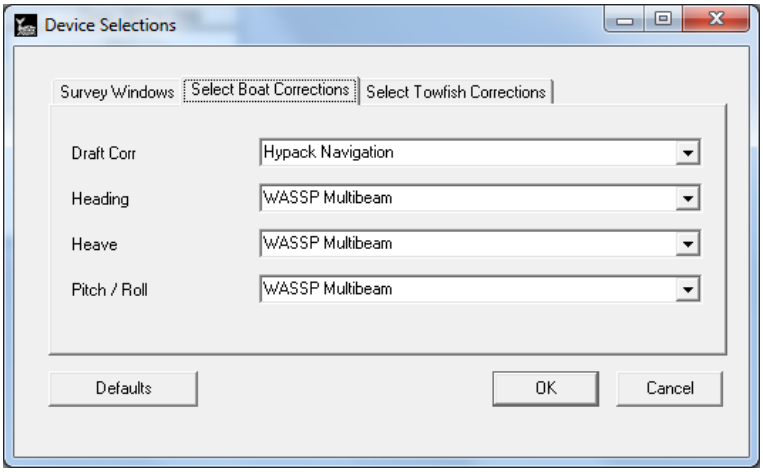


Figure 31. HYSWEEP Device Selections

If a Roll sensor that is not recognised by HYSWEEP is used it may be possible to configure the WASSP system to convert the sentence to one recognised by HYSWEEP.

If the Roll sensor is not recognised by WASSP you can still feed this to the HYPACK® computer and use this for roll correction.

WASSP and HYSWEEP can be configured to use the same or different sensors for correction. As long as the two systems share the same ZDA, the multibeam data will be able to be synchronised by HYSWEEP along with any other data collected by HYPACK® or HYSWEEP.

10. Commissioning

Commissioning should be performed by a trained WASSP technician immediately after installation of the system.

The commissioning procedures are designed to be carried out in sequential order. If a test fails, fix the system until that test can be completed satisfactorily before continuing. Failure to do this may invalidate the commissioning procedure. Commissioning procedures are divided into two sets:

1) Dockside Tests.

2) Sea Trials.

For all commissioning steps, the WASSP software needs to be running. See “7.4 WASSP Software Operation” on page 25.

Before these tests are carried out, fill in the **Vessel Identification** on the **General Tab** in **Ship Setup Options** as this allows data collected on this vessel to be clearly identified for diagnostic purposes.

Fill in the **Transducer Serial Number**

Click **Temperature Sensor** if the supplied transducer has an embedded temperature sensor

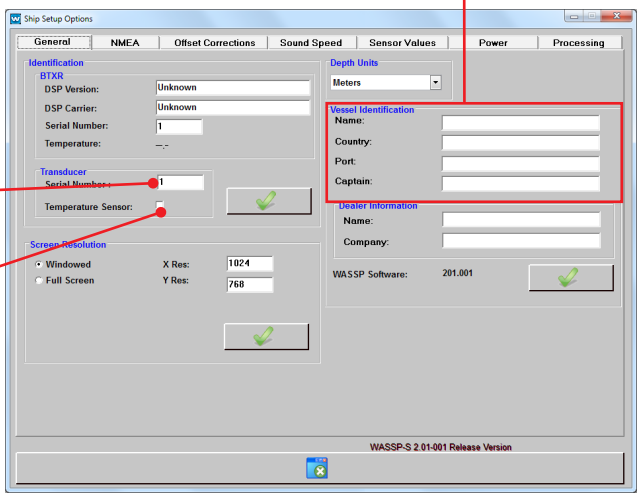


Figure 32. General Tab Settings

10.1 Dockside Tests

The first part of the commissioning procedures requires a number of **dockside tests** to confirm that the WASSP system is installed and operating correctly, before actually taking to sea.

10.1.1 Commissioning Step 1: Ship Measurements

Take measurements on the vessel between the vessel's reference point, the GPS antenna, and the transducer's receiver face. These measurements must be as accurate as possible. See "Figure 34. Ship Measurements Diagram" on page 39. The accuracy of these measurements has a direct effect on the accuracy of depth soundings. Enter these values in the spaces below, and on the **Offset Corrections** tab in the **Ship Setup** box, see "Figure 33. Ship Setup Options - Offset Corrections Tab" below.

Note: The Ships Reference Point is an Arbitrary point close to the ships centre of Pitch and Roll. It pays to make this point easy to measure to for improved accuracy of measurements. A good guideline for a reference point is a point near the water line in the centre of the ship (port to starboard) and half way down the length of the ship.

Transducer Tx Depth (Draft) Displacement:	m	A _____
GPS X Displacement from reference:	m	B _____
GPS Y Displacement from reference:	m	C _____
GPS Z Displacement from reference:	m	D _____
Transducer Tx X Displacement from reference:	m	E _____
Transducer Tx Y Displacement from reference:	m	F _____
Transducer Tx Z Displacement from reference:	m	G _____
Motion Sensor X Displacement from reference:	m	H _____
Motion Sensor Y Displacement from reference:	m	I _____
Motion Sensor Z Displacement from reference:	m	J _____

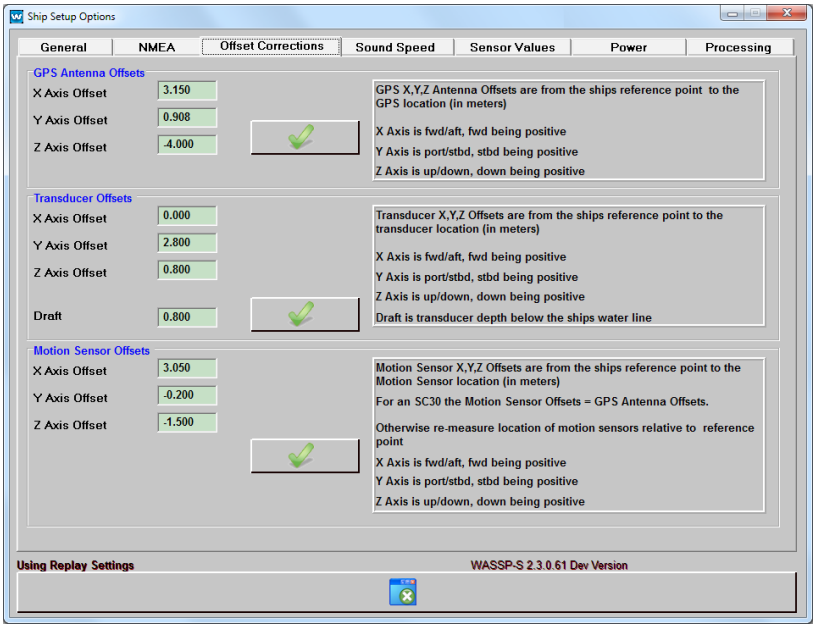


Figure 33. Ship Setup Options - Offset Corrections Tab

If using an SC30, the Motion Sensor position is the same as the GPS position.

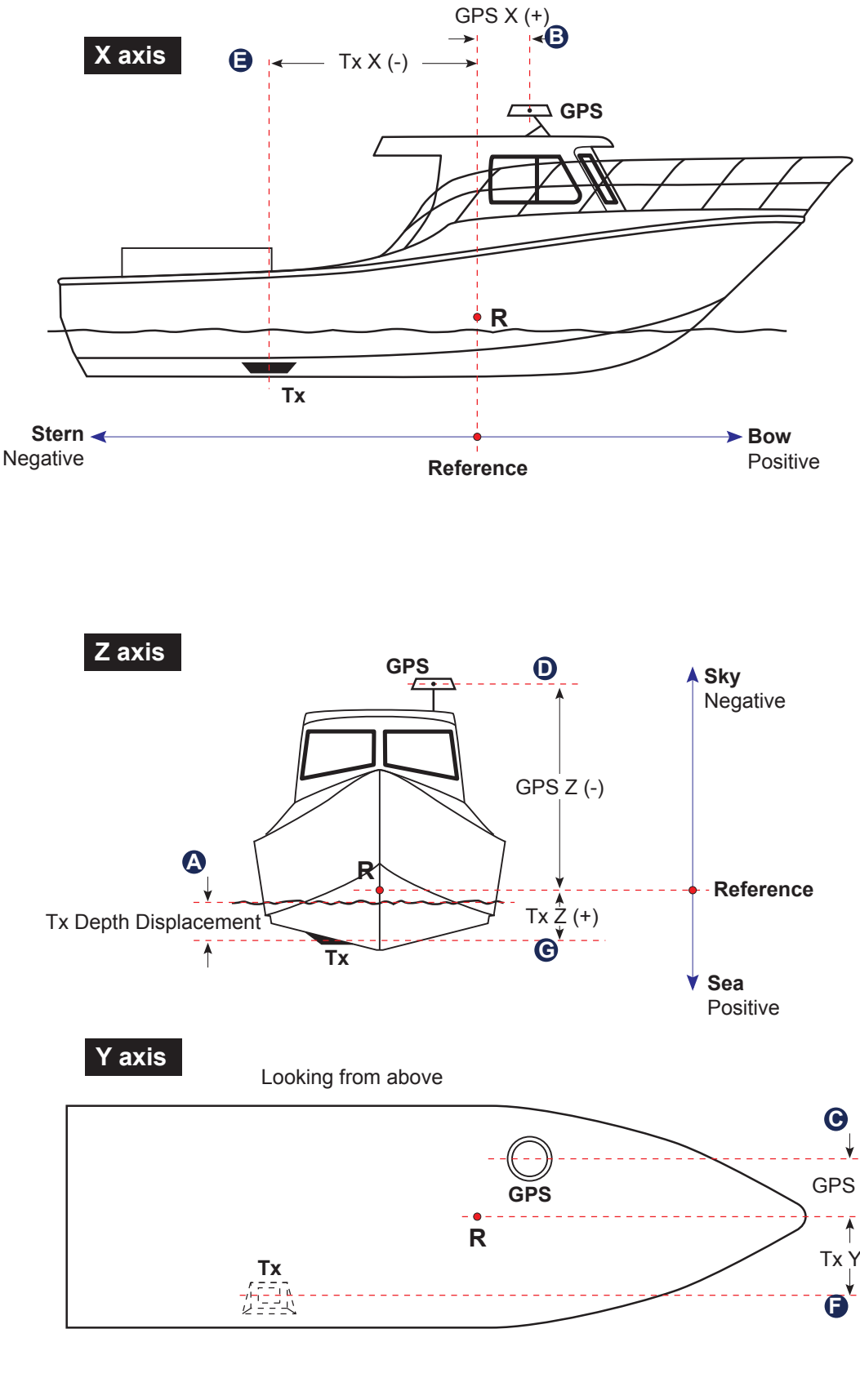


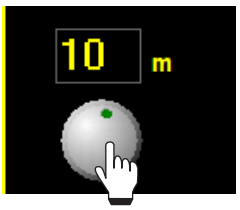
Figure 34. Ship Measurements Diagram

10.1.2 Commissioning Step 2: Channel Gain

1. Start the BTxR and run the WASSP program. See “7.4 WASSP Software Operation” on page 25. With the BTxR ON, configured and connected correctly, the system should now be ready to acquire data.
2. **Ensure the transducer is submerged** in water.

On the **Menu Task Bar**, set the **Power Level** to manual (double click switches between auto and manual, manual being yellow) and set to 01

3. Click the **Transmit Mode** button to begin pinging.
4. On the **Menu Task Bar**, set the **Range Knob** to manual (double click switches between auto and manual, manual being yellow) and set to show seafloor .



If the I/Q Bars window is blank then the system is not acquiring sonar data. Check that the system is pinging.

5. Open the **Remote Diagnostics** window. Refer to Section “14.1 Open Remote Diagnostics Utilities” on page 65

The **Bar Graph** tab is used to diagnose issues with the transducer and wiring. Major problems with any of the receiver channels should be easy to spot using this facility.

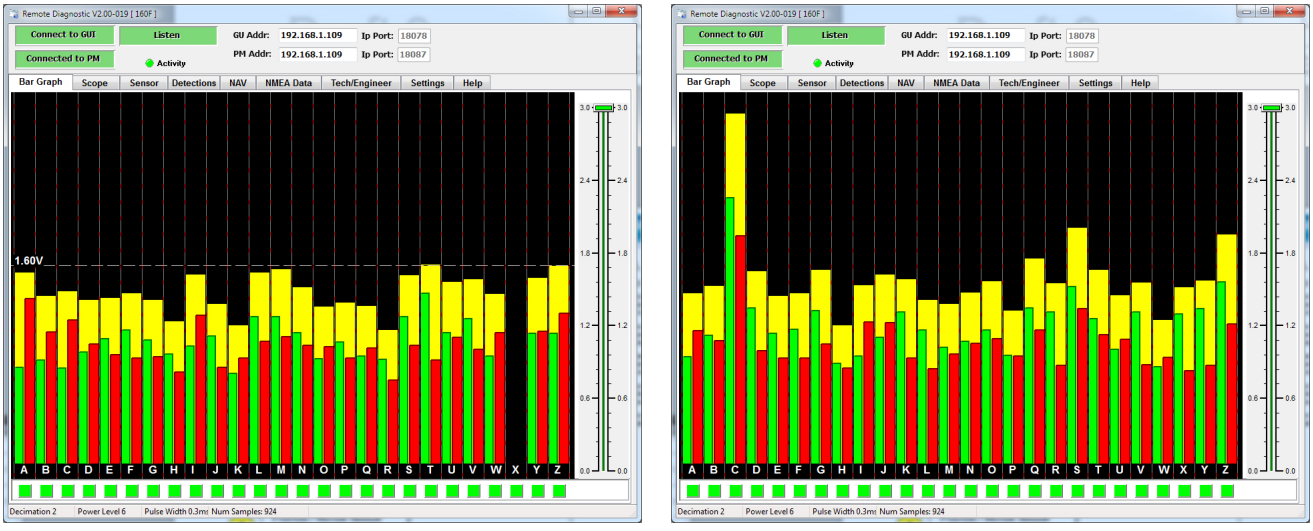
See “Figure 35. I/Q Bar Graphs showing Good Reading” on page 41. As the data comes in throughout the duration of a ping, the display instantly changes. The I channel is displayed in GREEN, the Q channel is displayed in RED and magnitude in YELLOW.

The letters along the lower axis are directly linked to the respective 26 channels on the receiver board and the transducer elements. The slider bar to the right of the bars controls the gain of the display.

Use the slider bar on the side of the box to adjust the bars so that they fill about a third of the form height. Ensure there are no extreme (more than 200%) changes in signal strength across the channels. The display should update regularly and the values should fluctuate, If one or more bars are full ON or full OFF there is a problem that you need to resolve before continuing.

The source of problems identified in this test is most likely to be in the connections from the transducer cable into the BTxR receiver board. If a wire/connector is loose or has lost some of its insulation you will likely see a blank or very high channel. See “Figure 36. I / Q Bar Graphs showing problems” on page 41 .

Figure 35. I/Q Bar Graphs showing Good Reading



I/Q Bars with Channel X Disconnected

I/Q Bars with Channel C Noisy

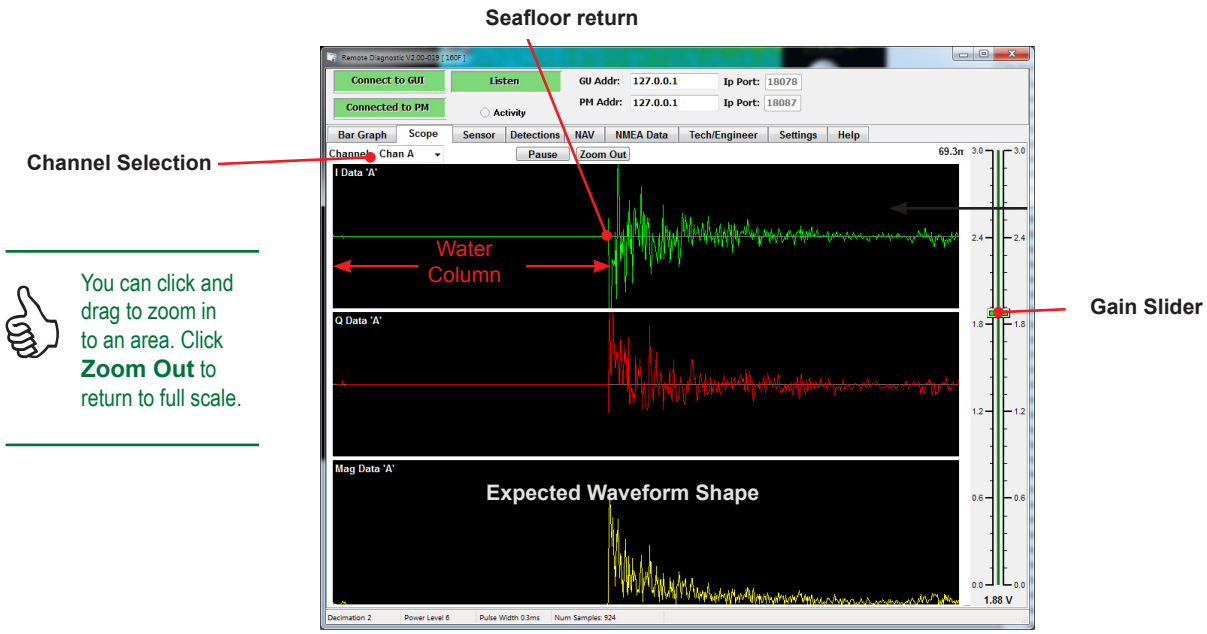
Figure 36. I / Q Bar Graphs showing problems

10.1.3 Commissioning Step 3: Channel Signal Function

The **Scope** tab on the **Remote Diagnostics Utilities** shows a voltage graph of signals received over a single ping. By clicking and dragging across the display, you can zoom in to see more detail, or increase the gain slider if the signal is too low.

You can select the desired channel from the **Channel** drop-down box. “Figure 37. A typical Channel Signal Function Diagram” shows a regular transmission pulse with a reasonably weak bottom return, which is a typical shape. When functioning correctly, all 26 channels should display very similar information to each other.

Adjust the gain and range of the graph so that the graph’s maximum range only just fits on the axis. The graph should have a small ripple at the beginning followed by a relatively blank period and then a strong pulse with a rippling tail. This strong pulse is the return from the seafloor. Use the selections in the Channel box to view channels A to Z. Check that all of the channels have similar shaped waveforms on them. If any have non-random noise, significant DC offsets or are without the correct general shape, resolve these problems electrically (check connections).



You can click and drag to zoom in to an area. Click **Zoom Out** to return to full scale.

Figure 37. A typical Channel Signal Function Diagram

10.1.4 Commissioning Step 4: Array Geometry

Depending on the depth in the dock it may be necessary to start the sea-trial before this test can be completed fully but overt problems should be able to be seen even with only 1m of water beneath the transducer.

Note: In very shallow water it may help to increase the minimisation to 5000 as this will suppress problems caused by too much power which could confuse this process.

The transducer number should have been entered in the Ship Setup form by this stage. If you are unsure of your transducer number, try '1' or '200'. These two numbers will give different responses, as they relate to two different series of transducer builds, and inputting the incorrect value will result in a strange mirror effect (see "Figure 38. Sonar View with Transducer Number set to correct and incorrect values" below).

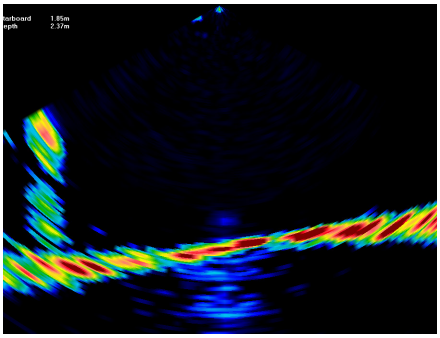
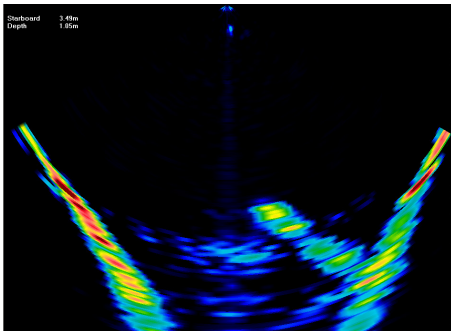
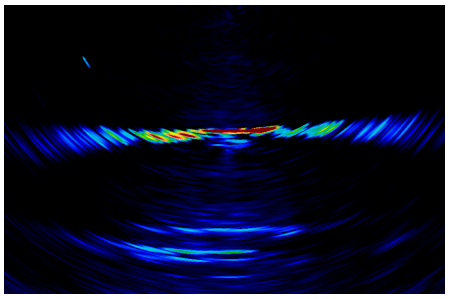
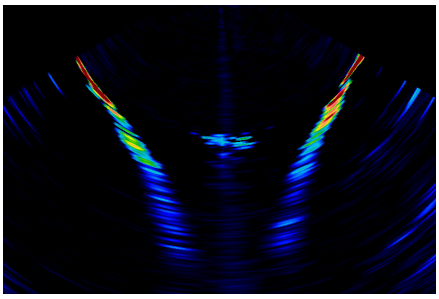
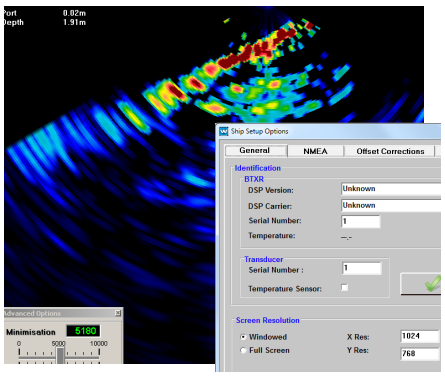
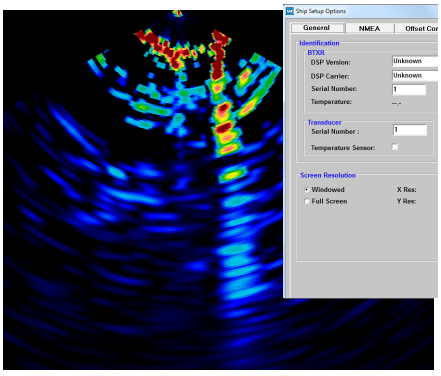
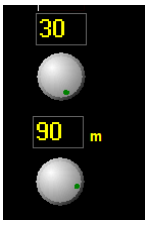
Correct Transducer Number	Incorrect Transducer Number
	
8 metres deep sloped seafloor with pier pole adjacent to the transducer.	Incorrect transducer number makes the seafloor and pole very hard to interpret
	
Almost flat seafloor with transducer numbers correct and incorrect.	With incorrect transducer number the flat seafloor becomes impossibly deep chasm that always follows the ship.
	
Very shallow <1m below transducer. Slope getting deeper off to port side.	Incorrect transducer number makes the slope look like a sea wall with a ring.

Figure 38. Sonar View with Transducer Number set to correct and incorrect values

10.1.5 Commissioning Step 5: Electrical Noise

1. Open a **Sonar** display as a full screen display. See section “5.1 Sonar View” on page 33 of the Operator Manual.

2. On the **Menu Task Bar**, set the **Range Knob** to manual (double click switches between auto and manual, manual being yellow) and change the range dial to 90 m. Double click on the Sonar display to ensure all 90 metres are displayed.



3. On the **Menu Task Bar**, set the **Gain Control Knob** to 30.

4. Double click on the **Gain Control Knob**

To adjust the minimisation and the clutter for a clearer display, access Advanced Options, by double clicking on the Gain Control button.

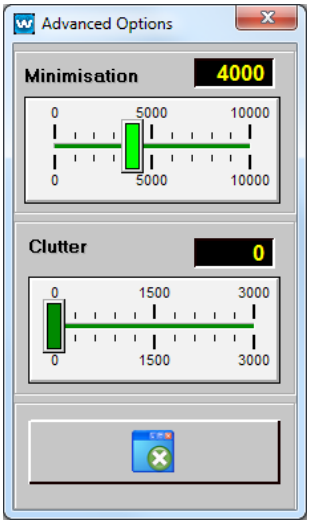
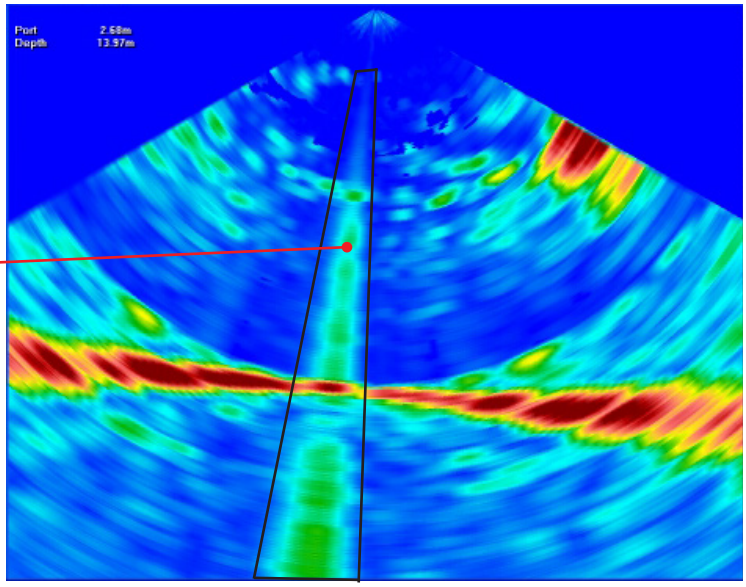


Figure 39. Advanced Options

If possible, do this test at rest with the engine out of gear and with all other sounding devices off.

Check the centre line of the Sonar display for a consistent signal or a consistent pulse down a radial line. If present, this is evidence of noise signals common to all channels. If this noise can be clearly seen as more than a faint blue-white vertical line on the display, it is likely that all of the receiver channels are picking up electrical noise. If the display is relatively clean, move on to the next test. The most likely cause of noise problems is incorrect termination of the transducer cable grounding and screening. Ensure a low gauge grounding wire is attached to a solid ground which is common to the power supply ground.



Noise seen as a constant torch beam which moves with vessel motion. Noise could fade in and out down this line depending on the frequency.

Figure 41. System with Significant Electrical Noise

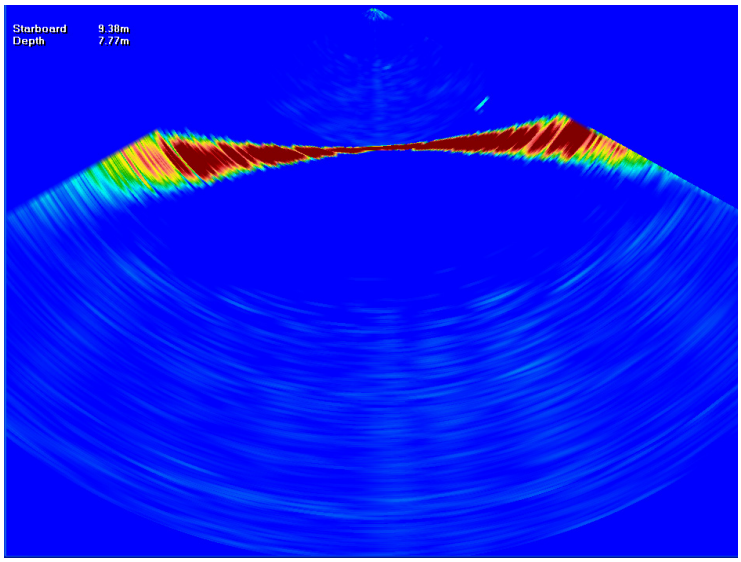


Figure 40. WASSP sonar display with low electrical noise

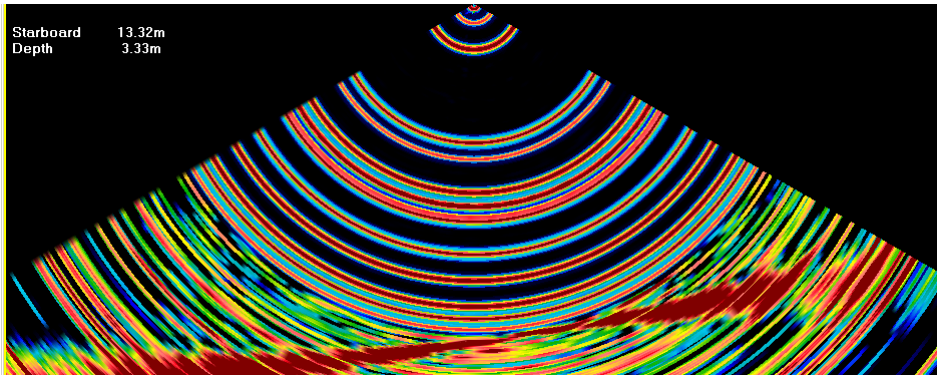


Figure 42. Sonar display with one very noisy channel can make the Sonar difficult to use. This particular failure might have been detected by Commissioning Step 1 and Commissioning Step 2.

10.1.6 Commissioning Step 6: Heading (Yaw) Offset

WASSP will operate better with a source of true heading. If magnetic heading is the only heading available then enter the magnetic deviation into the Heading Offset. The Heading offset can also be used to correct for alignment problems between the transducer and the heading source. Refining this offset is a complex process and requires good position accuracy (DGPS or better).

On the **Menu Task Bar**, click **Ship Setup** Button

In the **Sensor Values** tab, enter a value of 0 if your true heading sensor is correctly aligned, or enter the heading offset (due to misalignment or magnetic heading if using HDG).

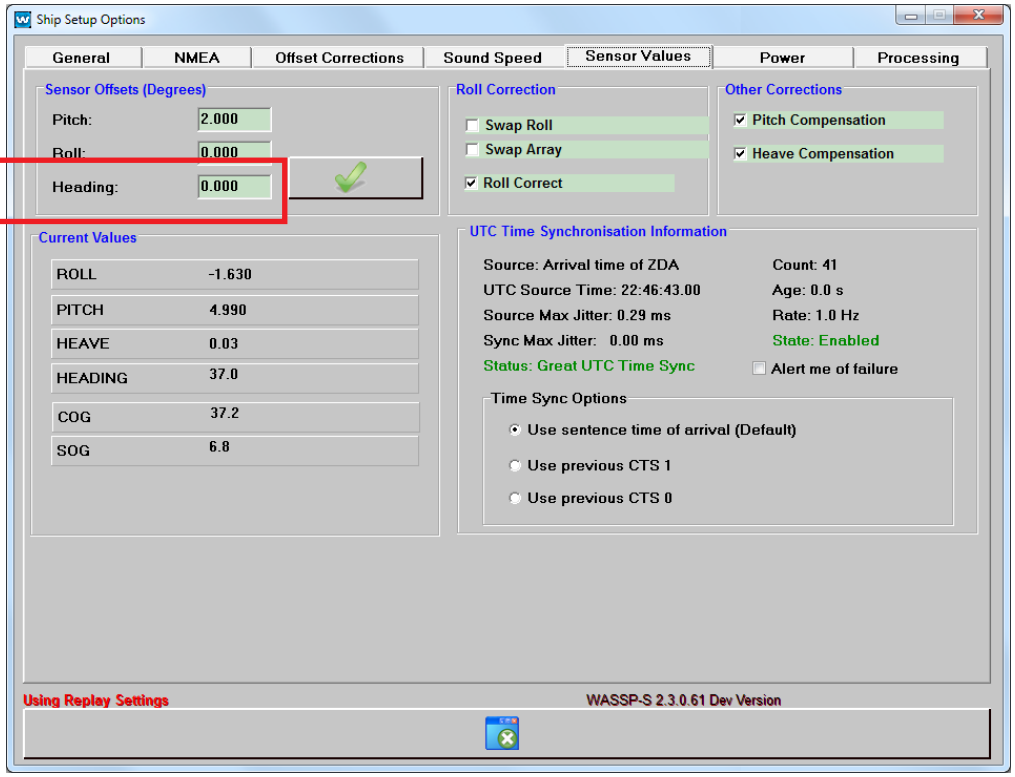


Figure 43. Heading (Yaw) Configuration Settings

10.1.7 Commissioning Step 7: Tide Configuration

Use the Tides page under the **System Configuration Utility** menu can be used to view current tide offsets. Tide correction is enabled by default. Tide calculation requires Position and Time - if these are not present, the entire **Tides** page will be blank.

Check that the Current Time reads as the Current Local Time. If not, enter a number in the Local Time Adjustment until the Current Time is the same as the Local Time, this number will be the Time Difference in hours of your current location from UTC time, e.g. +12 for New Zealand.

If you are using your WASSP system on a lake, or any other place unaffected by tidal movement, tides should be disabled. Check the **Disable Tides** box to do this.

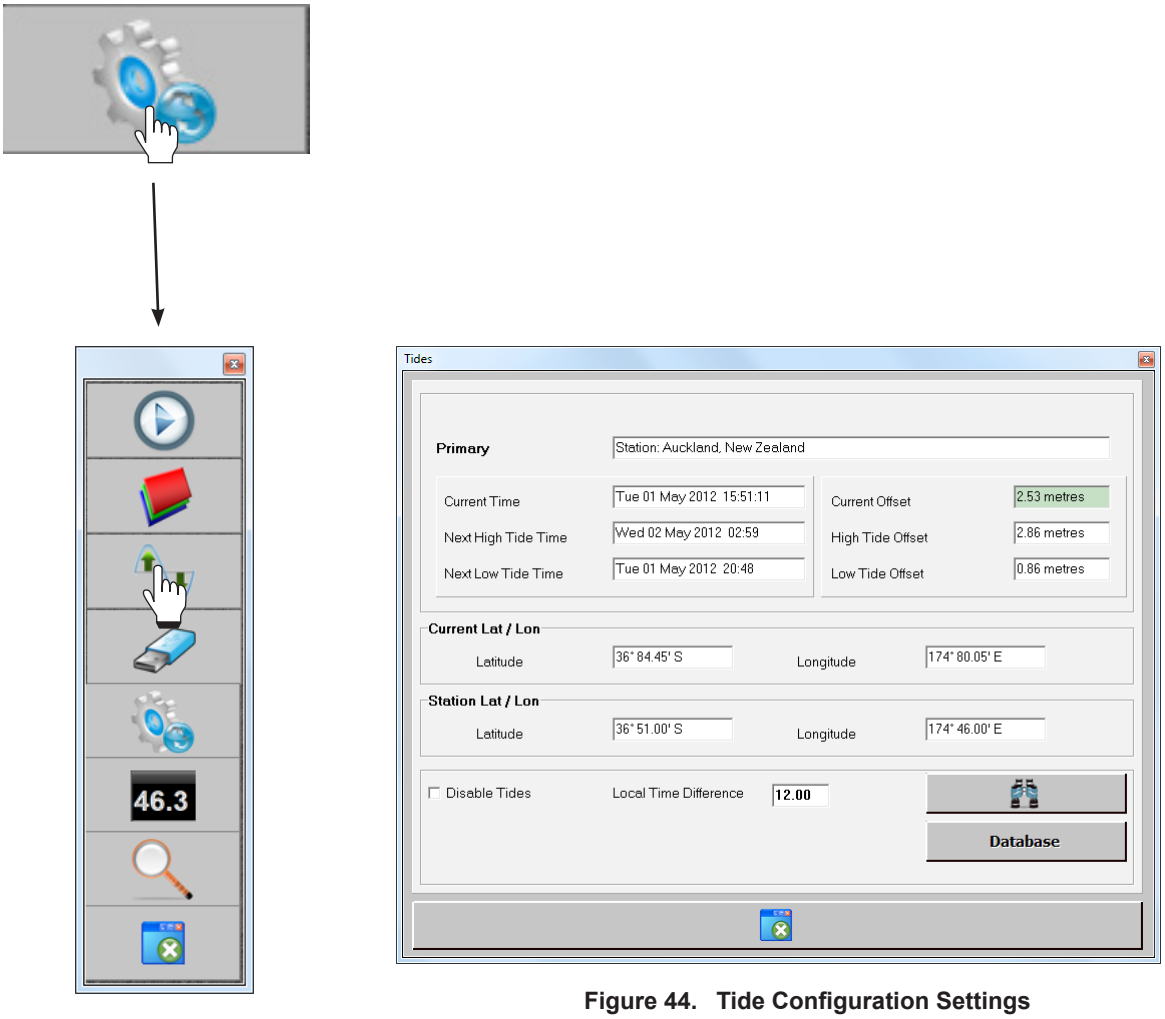


Figure 44. Tide Configuration Settings

10.2 Sea Trials

The second part of the commissioning procedures requires taking the vessel on a short sea trial. This requires the vessel to leave the dock and perform some basic manoeuvres. The deeper the water the more accurate the tests can be. Ideally, this would be at least 20 metres of water.

10.2.1 Sea Trial - Commissioning Step 8: Array Polarity

With the WASSP running and displaying the sonar view, determine if the right side of the sonar display shows topography that is on the starboard side of the vessel.

If you are unsure of the nature of the seafloor you will need to find a feature such as a rock, bank or significantly sloped sea profile. Use the waterfall view to navigate and cross your own track in opposite directions over this feature. If the display seems incorrect, change the polarity of the **Swap Array** check box in the **Sensor Values** tab of the **Ship Setup Options** tab. See “Figure 45. Swap Array and Swap Roll Check Boxes”.

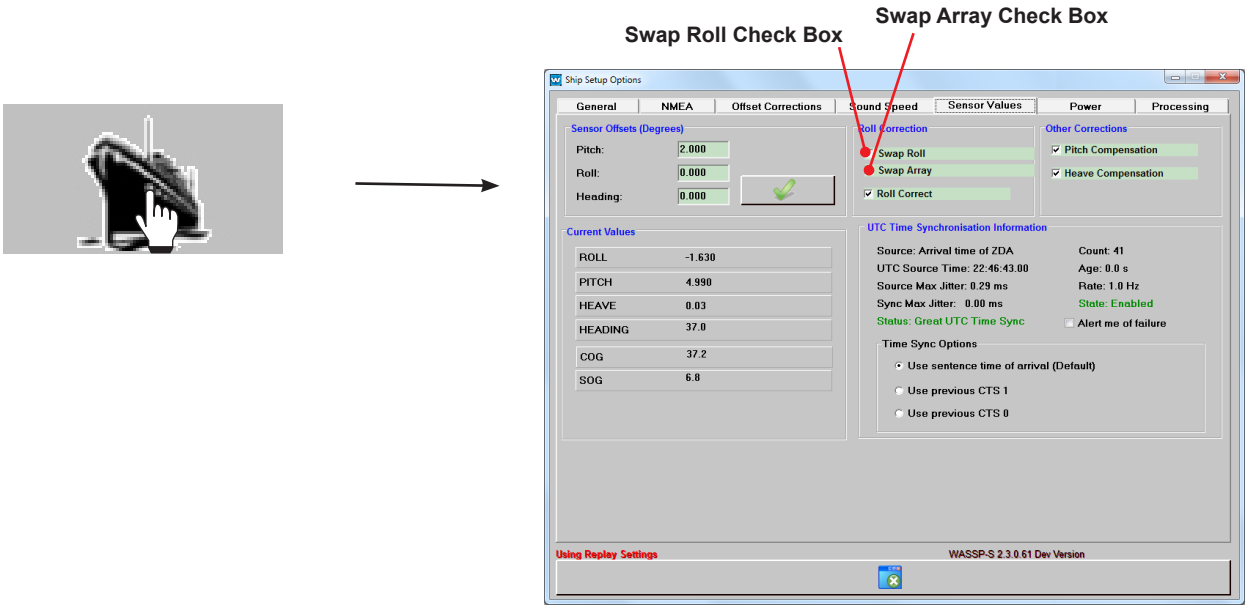


Figure 45. Swap Array and Swap Roll Check Boxes

10.2.2 Sea Trial - Commissioning Step 9 : Roll Correction Polarity

Watch the **sonar** view carefully when the vessel is subject to some roll. If the roll polarity is correct the seafloor shown on the **sonar** view should stay steady as the vessel rolls. If the roll polarity is not correct, the roll of the **sonar** display will double what is actually present. If you are unsure, compare the results with the **Swap Roll** check box selected and then de-selected.

Note down the correct polarity value below and leave the **Swap Roll** check box in that state.

Swap Roll: ENABLED DISABLED (Circle one)

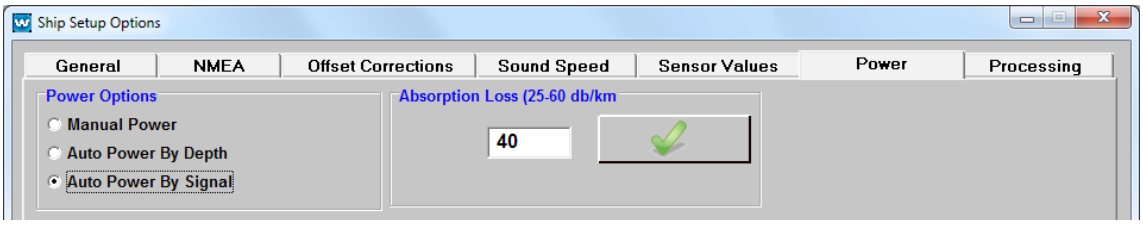
10.2.3 Sea Trial - Commissioning Step 10: Side Lobe Levels

Before this test can be done the WASSP system must be operating at the correct power level.

1. Set the WASSP system to use Automatic Power, double click the power level display so that it turns green.

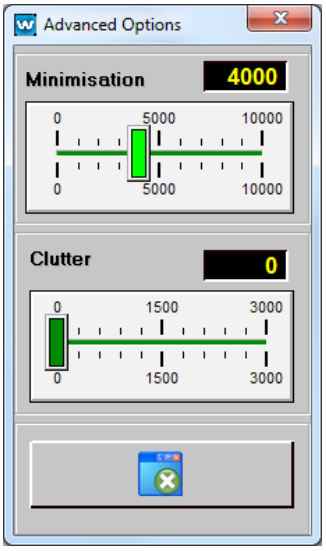
Ensure that **Automatic Power By Signal** is selected in the **Ship Setup Options - Power Tab.**

Note: Commissioning Step 10 is also required for the seafloor detection process to operate correctly.



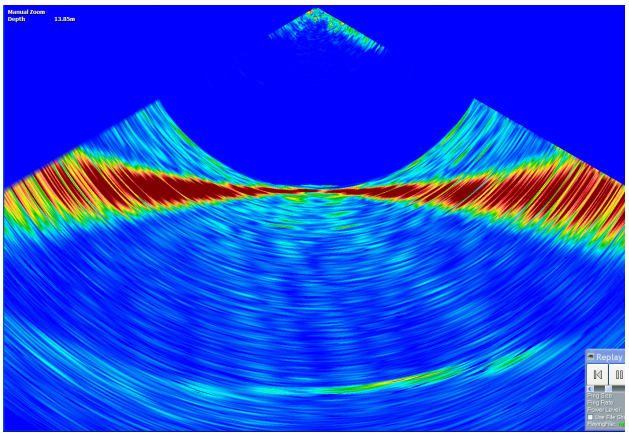
2. Wait until the blue power level display is set to at least 2.

3. On the **Menu Task Bar**, double click on the **Gain Control Knob** to open the **Advanced Options** controls. Move this window so that you can adjust the Minimisation while watching the sonar display area above the seafloor change. Look at the pictures in “Figure 46. Side Lobe Levels”.

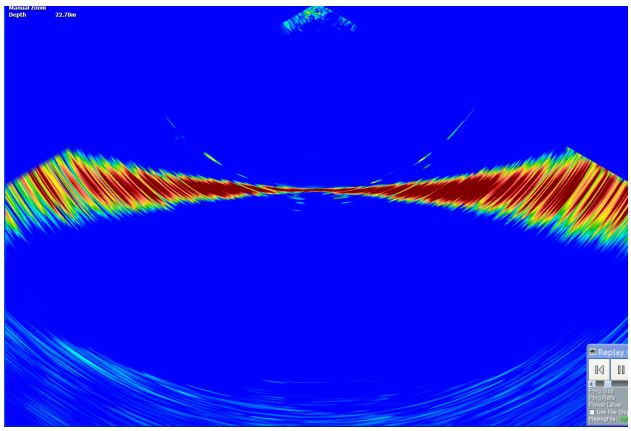


4 First set the Minimisation to 0. Then move it up to 1000, 2000,3000,4000 to get a sense for how the ring shown at the first echo return becomes less and less noticeable. Set the Minimisation at the lowest value at which the ring is not visible. See the Full Side Lobe Suppression image of “Figure 46. Side Lobe Levels” below.

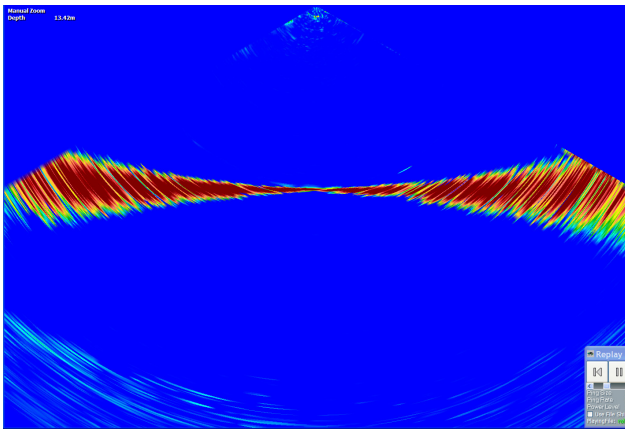
If this value required is greater than 5000 then it is likely that something is wrong. Check that the power level is not too high and that you have followed the configuration above and Automatic Power by Signal is set. Otherwise, re-check the individual receiver channels for anomalies and check that all receiver cables from the transducer are connected to the correct sockets.



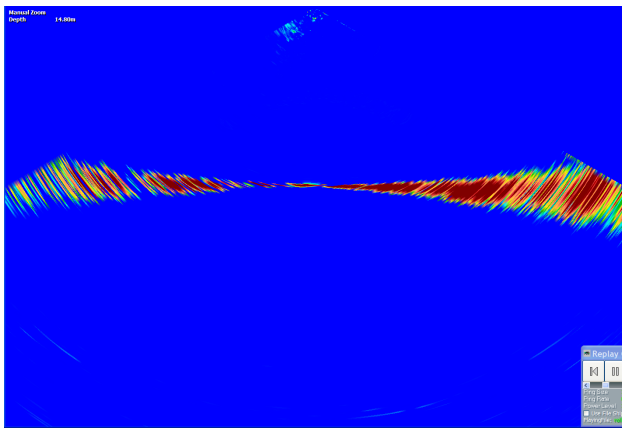
No Minimisation



Light Minimisation



Full Side Lobe Suppression

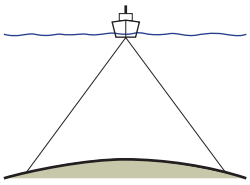


Too Much Minimisation

Figure 46. Side Lobe Levels

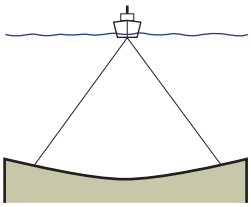
10.2.4 Sea Trial - Commissioning Step 11 : Sound Speed

Sound speed varies with temperature so this changes throughout the year. Use a temperature sensor to set the sound speed if possible. Otherwise, the operator should become familiar with this process themselves and adjust on a regular (at least monthly) basis as necessary.



Seafloor Profile:
Convex or flat
INCREASE
sound speed value

Seafloor Profile



Seafloor Profile:
Concave
DECREASE
sound speed value

Seafloor Profile

10.2.4.1 Option 1: Manual Sound Speed Correction:

1. Set the screen display (user interface) to **Sonar** view.

2. Set the sound speed computation method to **Manual Entry** in the **Ship Setup Options - Sound Speed** Tab.

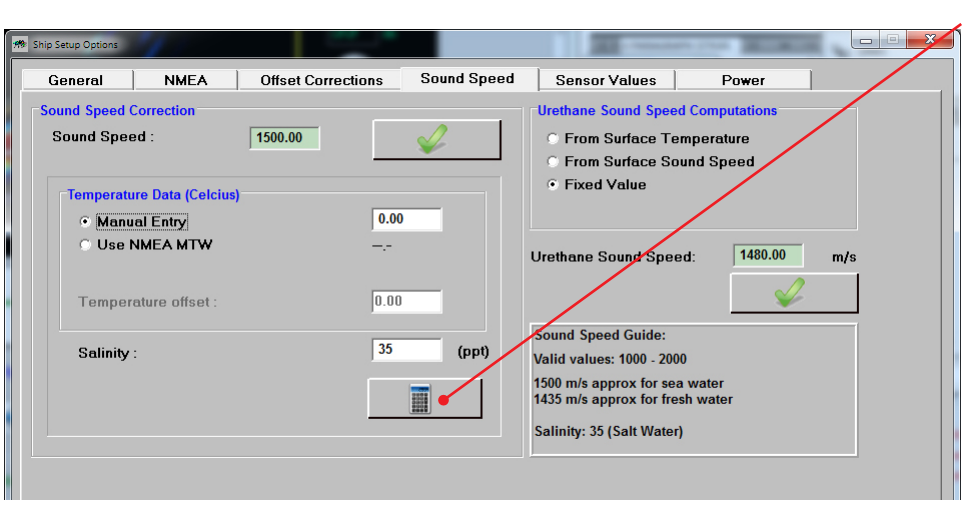


Figure 47. Ship Setup Sound Options - Manual Speed Correction

3. Find a section of seafloor that is known to be flat, preferably 20-100m deep.

4. Cross over the section of seafloor and adjust the sound speed value in the **Ship Setup Sound Options - Speed Tab** until any curve in the seafloor has been removed.

5. In Manual Entry, Sound Speed can be entered directly or calculated from a known or estimated Temperature and Salinity by clicking on the **Sound Speed Calculator** button. When a Temperature Sensor is active a Temperature Offset can be applied to adjust for errors.

10.2.4.2 Option 2 and 3: Surface Temperature Correction (NMEA or WASSP)

New WASSP Transducers may be equipped with a temperature sensor. If this is the case, a WASSP Temperature reading will be shown on the Sound Speed Tab next to the **Use WASSP Temperature** when the system is pinging. If NMEA MTW is being received, this will be shown next to the **Use NMEA MTW** option.

1. Set the screen display (user interface) to **Sonar** view.

2. In **Ship Setup Options,** in the **Sound Speed** tab, set the sound speed computation method to **Use NMEA MTW** or **Use WASSP Transducer.**

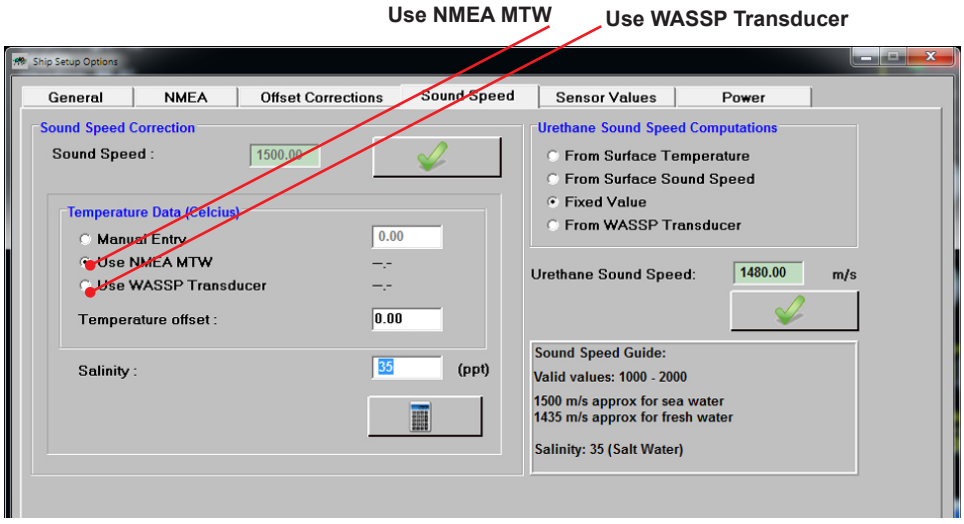
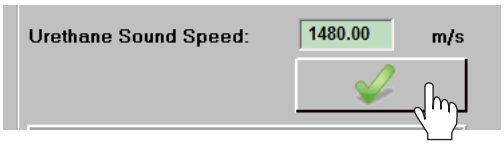


Figure 48. Ship Setup Sound Options - Surface Temperature Correction

3. Find a section of seafloor that is known to be flat, preferably 20-100m deep.

4. Cross over the section of seafloor and adjust the **Temperature Offset** until the seafloor curve has been removed.

5. Sound speed increases with increasing temperature.
The urethane also behaves differently with temperature and thus when a WASSP Transducer temperature sensor is available the urethane correction will be applied automatically. The **Urethane Sound Speed** will change as temperature changes. If it appears impossible to remove the bend of the seafloor, it may help to fix the **Urethane Sound Speed**. If this is the case, manually change the value of the **Urethane Sound Speed** and click on the tick button.



10.2.5 Sea Trial - Commissioning Step 12: Beam Width Reduction

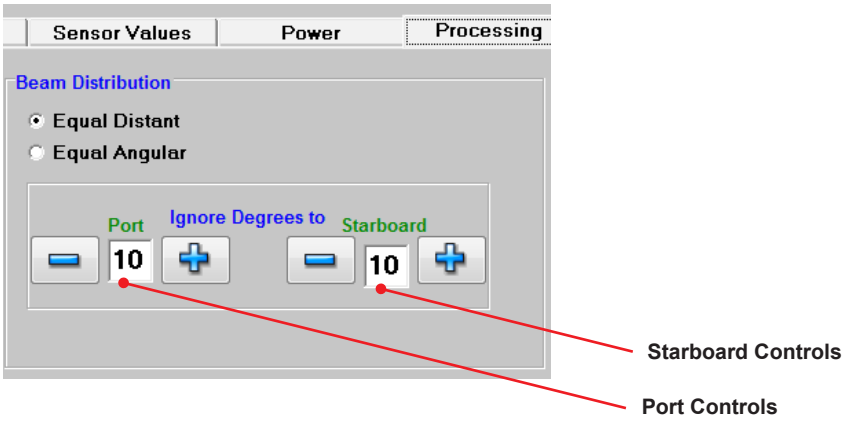
The usable area of the swath may be limited due to reduced beam width caused by low temperatures, turbulent flow, aeration, high sea state, quick temperature fluctuations or shading of the transducer.

Watch the outer edges of the **Sonar View** carefully with the seafloor line shown. If the outside edges of the seafloor line appear to vary much more than the area immediately adjacent, consider reducing the beam width.

These variances can be seen as frilly edges at the side of the swath on the **Waterfall View** and as perpetually weak echoes on the outer beams on the **Sonar** display. Failure to reduce the beam width will introduce false data on the outer edges into the backscatter and depth maps.

To reduce the beam width:

1. On the **Menu Task Bar**, click on the **Ship Setup Options**, and open the **Processing Tab**.
2. Adjust the **Beam Width** using the **Port** and **Starboard** controls.



Frilly edges will appear on the Waterfall View outer 5 degrees of each side of the mapped track caused by low temperature environment. To remove this area we can reduce the beam width on both port and starboard by 5 degrees.

10.2.6 Sea Trial - Commissioning Step 13 : GPS Time Delay (Required)

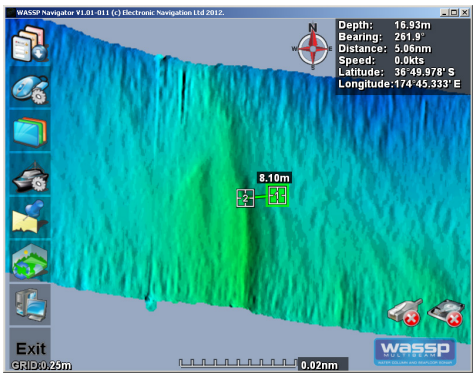
Most GPS sources used in conjunction with WASSP will have a significant delay between when the ship passes through a position and that position is sent on the serial port. This delay may be in the order of 1 second. This means at 10 knots an object will move 10 metres if passed in opposite directions at this speed.

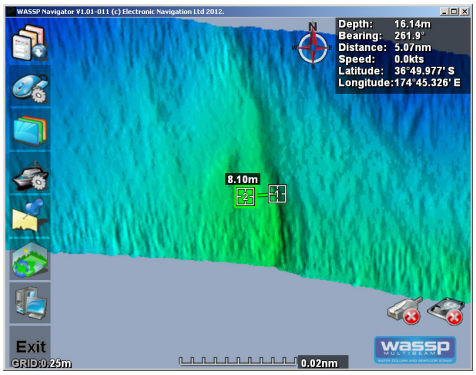
Some GPS sensors can smooth the output introducing more than 15 seconds delay! Remove GPS Smoothing if the GPS has this option.

10.2.6.1 Test 1: For use with standard GPS

To perform this test, find a distinct feature eg. big rock, sharp slope or cable.

- Start a new database in Navigator and run over the distinct object at SOG (e.g. 5kts).
- Start a 2nd new database, run back over object in the opposite direction, same SOG (eg. 5kts).
- Use the measure tool to measure the difference between the object's position in the direction the vessel travelled. If the object appears earlier than the previous pass then the time delay is positive.





The formula below outlines this process, the delay adjustment is added to the current **Time Lag (Sec)** value on the **Ship Setup Options - Sensor Values Tab** - **Position**

$$\text{adjustment} = \frac{\text{(- late / + early) change in position in metres}}{\text{speed in knots used in both directions}}$$

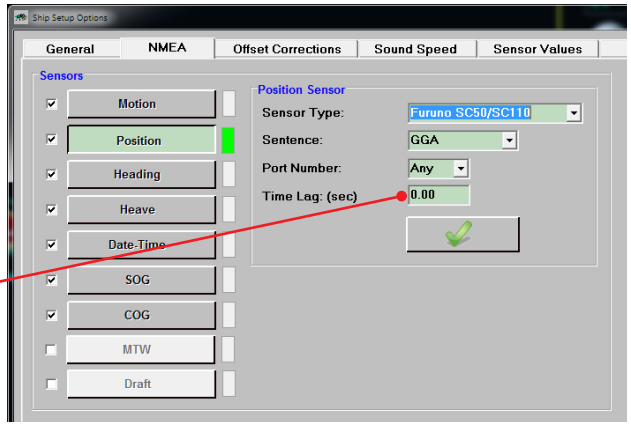


Figure 49. GPS Time Delay Settings

10.2.6.2 Test 2: For use with DGPS

The advantage of this approach over the previous test is it will eliminate pitch errors, however, the displacement of the object will be smaller and this will be difficult to measure accurately as GPS errors can make this impossible.

Approach the distinct feature from the **same direction** at two vastly different known speeds, as close to zero and at the fastest mapping speed. If the object moves by delta metres further along the vessel track (+ve) at a faster speed the adjustment to the time delay will be:

$$\text{delay adjustment} = \frac{\text{(- late / + early) 2 x delta}}{\text{(fast speed in knots) - (slow speed in knots)}}$$

10.2.7 Sea Trial - Commissioning Step 14 : Patch Test (Roll)

Before attempting the roll patch test it is suggested that the GPS Time lag and any latencies are accounted for. Also, it is recommend that you conduct a preliminary adjustment of the **Sound Speed** settings to get things in the correct ballpark. Configure **Navigator** to use **Overwrite** mode when mapping depths so that the full extent of any difference is recorded.

1. Use the local chart and local knowledge to identify a spot for the roll patch test – ideally a flat area between 20-40m – shallower than 10m will make it hard to get an accurate reading.

2. Run the ship along a line in direction A (it may help to run with the tide and wind behind the vessel as the return journey is the important one).

3. Turn the ship and make a return journey B so that the same area is mapped but which the exact opposite heading is used (It may help to use the navigator heading up function and COG functions).

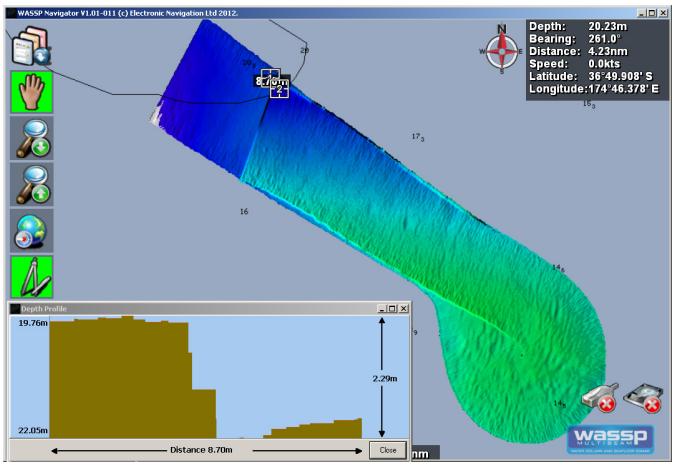


Figure 50. Showing Path A and path B overlapping. Measurement D is the change in the depths (2.29m in this case) between the edges of swaths.

Travelling with the tide/wind/ swell (whichever has the biggest effect on the ships course over ground if they are in different directions) on the first pass will make things much easier.

4. Use the Navigator Profile tools to measure the depth displacement between the edges of the swath on one side. This value is D. It will help to stop pinging while making the measurement so that the swath does not get overwritten.

5 Measure the entire width of the swath at the point you have measured the displacement. This value is H.

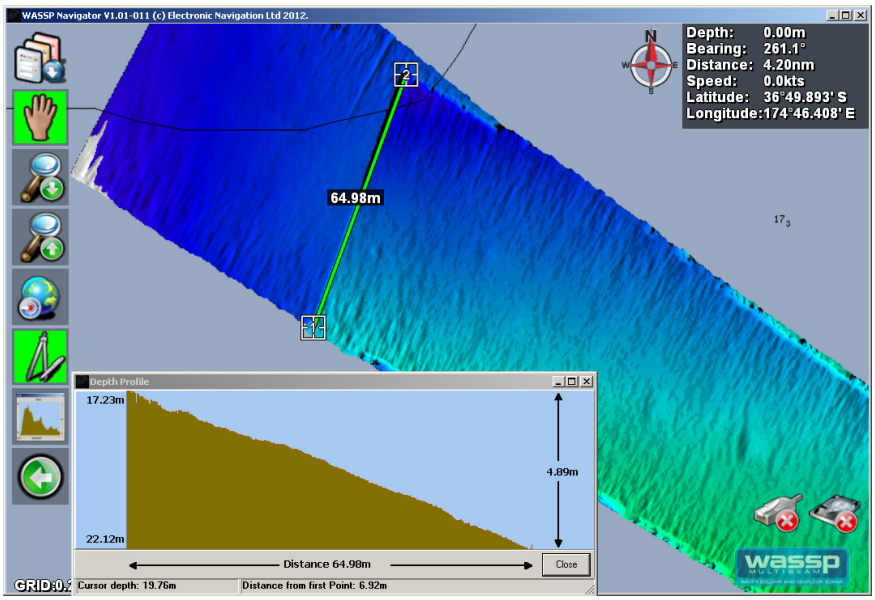


Figure 51. Measurement of swath width H (64.98m in this case). Note the measurement is the distance of the line in this case rather than the depth change – this depth change across the swath is not used.

6 Use a calculator (one is present in Windows) to compute atan(D/H) e.g.

a. Run window Calculator
b. Select View: Scientific Mode
c. Enter D (e.g. 2.29)
d. Press /
e. Enter H (e.g. 64.98)
f. Press =
g. Select Inv
h. Press $\tan^{-1}$
i. Record this number as the Patch Roll Quantity.

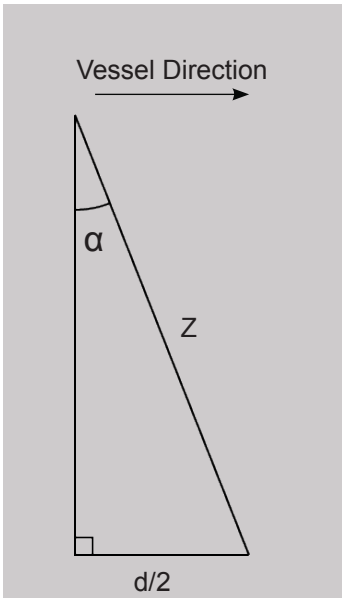
7 To compute the sign of the Roll patch look at the Starboard sidetrack as journey B is made. If this is shallower than track A then the sign for the roll offset is positive. If this is deeper than the depths from track A the sign for the roll offset is negative.

8 Enter the Roll offset value computed into the Roll Offset setting in the Ship Setup

9 Repeat these steps in a different area, or on a different Navigator database. If there is still a significant difference > 50cm add any difference generated to the Roll offset already computed and then test again. It should be possible to generate a roll offset within 0.1 degrees.

10.2.8 Sea Trial - Commissioning Step 15 : Pitch and Heading (Optional)

If GPS Time delay could be completed using variable speed then attempt to compute pitch offset as follows:



d = distance object moves
Z = depth
α = pitch offset
(-ve pitch offset if object moves ahead of vessel)

$$\alpha = \sin^{-1}\left(\frac{d/2}{Z}\right)$$

10.2.8.1 Pitch Correction

Requires: >10m depth, Distinct Object, DGPS or better, Accurate Time Lag.

Once the Time Lag is accurately ascertained **using the variable speed method** described in the previous commissioning step, a Pitch Correction value can be ascertained by having the Ship travel over a distinct object in opposite directions. The object will move if the Pitch offset is incorrect and use of trigonometry will determine the Pitch offset between the Motion Sensor and the Transducer. Enter this number into the Pitch Offset on the Sensor Values Tab.

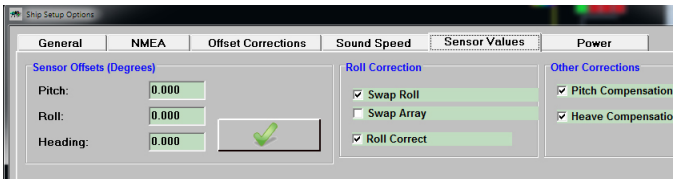
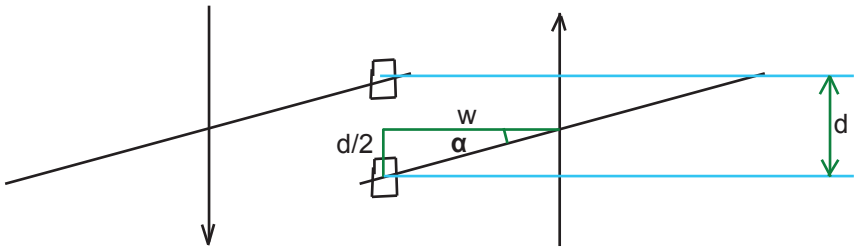


Figure 52. Pitch Corrections

10.2.8.2 Heading Correction

Requires: DGPS or better, Distinct Object and >10m depth.

A note on heading correction was included in “10.1.6 Commissioning Step 6: Heading (Yaw) Offset” on page 46. To determine a more accurate heading correction between the heading sensor and the transducer orientation we need high accuracy position sensors and corrected seafloor data. Approach a small distinct seafloor feature so that the port side of the swath covers the object. Next pass over the object so that the starboard side of the swath crosses the same object in the opposite direction. It is important that these two tracks are on exactly parallel heading lines. Use basic trigonometry to calculate the required heading offset that will allow the object to remain stationary. Redo the heading test to check that the heading offset was entered correctly.



$\tan(\alpha) = -d/(2w)$

$\alpha = \tan^{-1}(-d/2)$

If object moves as above the sign is negated otherwise remove the -ve sign from this equation.

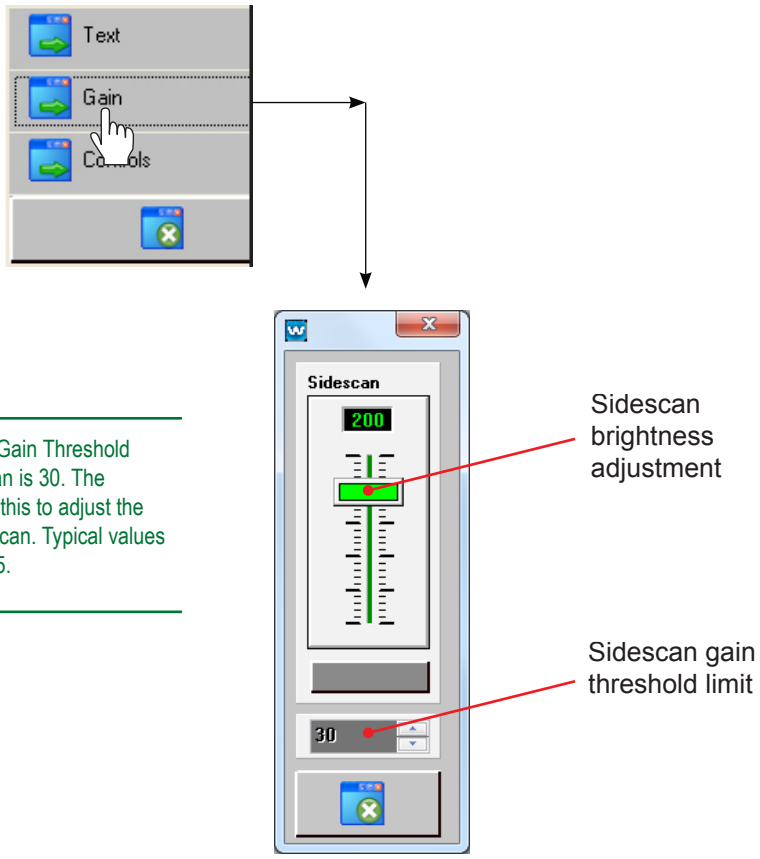
Enter the calculated value for **α** into the Heading Offset on the Sensor Tab.

Re-running the same test with the offset modified is another way to check the sign has been entered correctly. The object will not move if everything is correctly configured.

10.2.9 Sea Trial - Commissioning Step 16 : Setting Sidescan Gain Limit

On the **Sidescan** View, adjust the Sidescan **Gain** and Sidescan Gain Threshold to a level that shows good seafloor definition.

The Sidescan Gain control can be varied at any time. Changing the Sidescan Gain Threshold will cause a big step in the Sidescan and the old data will not be reprocessed to conform to this gain change. Suggested values are 20-35.



Note: Recommended Gain Threshold Setting for the Sidescan is 30. The Operator may change this to adjust the sensitivity of the Sidescan. Typical values are between 20 and 35.

Figure 53. Sidescan Gain Setting Box

10.2.10 Sea Trial - Commissioning Step 17: Map an area

Now that everything is configured as well as you can configure it, you can check your work and showcase the WASSP system's performance. Find an area with some feature such as sand waves, depth variance, rocks - whatever is handy. Have the skipper map an area, ideally with parallel tracks and 'mow the lawns' so that the coverage between each track on the contour display has some overlap.

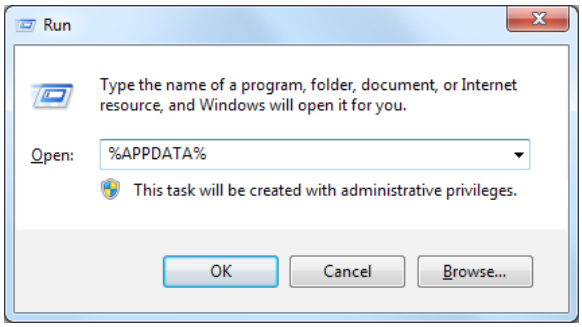
It is a good idea to take a copy of raw data recorded during this Mapping as the data can be analysed in closer detail at a desk and can be compared to any subsequent data received from the vessel and may help isolation of a post commissioning fault.

Note: Recording raw data using the data recorder at this point will provide evidence of the systems performance immediately after commissioning. This can help identify the source of failures later in the life of the system.

10.2.11 Sea Trial - Commissioning Step 18: Copy Final System Configuration

Now the system has been configured we will take a copy of this ship's configuration for future reference. This involves copying a small file onto a USB memory stick such as the technician dongle.

1. Ensure the WASSP Application is Closed and that all configuration has been finalised.
2. Open the 'Run...' dialog box. This can be found in the Start Menu, or by holding down the Windows Key and pressing 'R' (+ R)
3. Type **%APPDATA%** and press Enter



4. Open WASSP > WMBMarine > GUI

   Copy the file **WASSPPRO.INI** to external storage (rename or archive in such a way as to note what ship this file was taken from for ease of file management).

Note: No mention has been made of training the operator on how to use their system. If there is time and the operator can spare some time during the sea trial they may appreciate being run through a few of the basics on how to get started to supplement the operator manual.

11. Software / Firmware Upgrade

Software / Firmware upgrades can be supplied on a CD, USB memory stick or via download from the Internet.

The Upgrade procedure is as follows:

1. **Close ALL open WASSP applications**.
   This includes the WASSP GUI, Processing Module and Transfer Task. Check that the icons are not visible in the Task Bar.

   Keep the **BTxR ON**, as it may require a firmware upgrade.

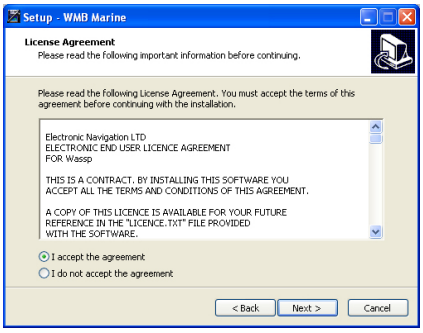
2. Insert Dongle or other upgrade media.

   Run **WMB-3250_Setup.exe**.
   This opens the WASSP Setup Wizard.

   Click **Next**

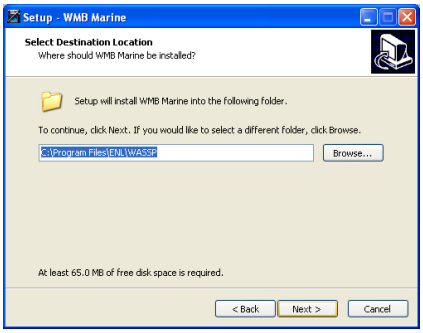
3. Read the agreement and then click **I accept the agreement** box.

   Click **Next**



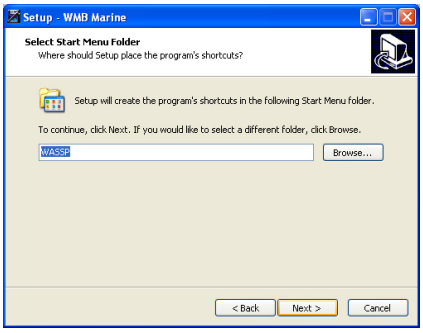
4. The default is to save the software in **C:\Program Files (x86)\ENL\WASSP**
   If you require this to be saved elsewhere, **Browse** and select location.

   Click **Next**



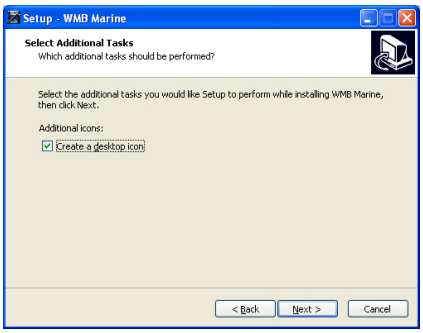
5 The default is to create a start menu shortcut folder named WASSP.

Click **Next**



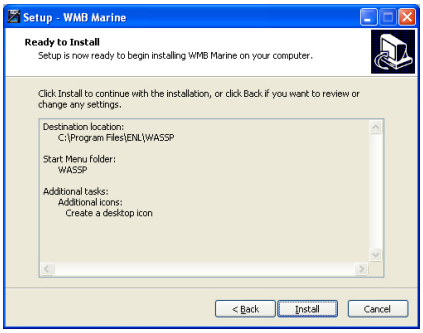
6 The default is to create a desktop icon.

Click **Next**



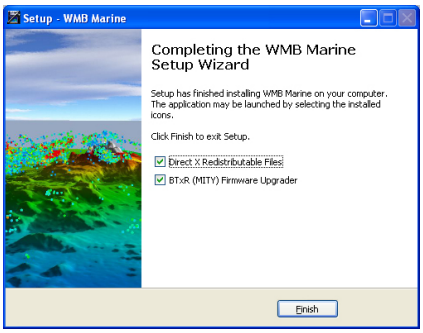
7 Click **Install**

Software will install.



8 The default is to have DirectX and BTxR selected.

Click **Finish**

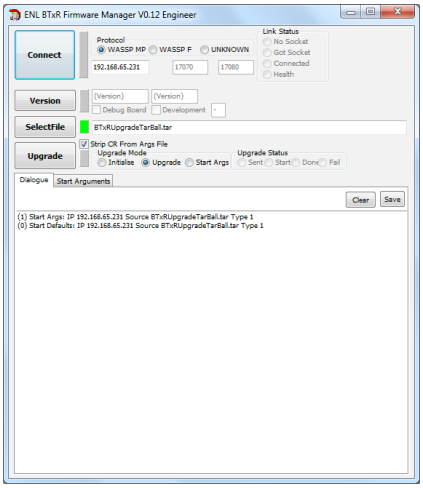


9 Install DirectX

10

Upgrade window for BTxR.

This program will automatically upgrade the BTxR firmware to the version supplied with the install that has just completed.



12. Troubleshooting

Installer Notes

13. APPENDIX A - Part Numbers

13.1 WASSP-CT System – Standard Supply

Table 1 lists the equipment and cabling shipped with a standard WASSP-CT Type System.

Table 1 – Standard Equipment: Multibeam 160 kHz System Compact Type Transducer					
Name		**Part Number**	**Qty.**	**Weight**	**Remarks**
Transducer with 5m cable		WMBT-160F-CTR05	1	9 kg	WASSP Multibeam Sonar System with 5m cable
Transducer with 10m cable		WMBT-160F-CTR10	1	12 kg	WASSP Multibeam Sonar System with 10m cable
Transducer with 20m cable.		WMBT-160F-CTR20	1	19 kg	WASSP Multibeam Sonar System with 20m cable
BTxR		WMB-BTxR-160S	1	5 kg	Electronics housing
WASSP Processor	w/ Navigator	WSP-002-047	1	~8 kg	Computer c/w keyboard and mouse/trackball. Pre-loaded with WASSP software.
	w/o Navigator	WSP-002-048	1	~8 kg	
USB dongle with software		WSP-002-003	1	-	Required to operate transducer and BTxR.
Cable Clamp		WSP-201-020	1	-	Clamps transducer cable
Keyboard		WSP-002-002	1	-	
Trackball		WSP-002-001	1	-	
Ethernet cable		WSP-002-020	1	-	15 m
Delock CFAST to SD Adapter		WSP-002-086	1	-	
NMEA optocoupler		WSP-002-004	1	-	
NMEA 9-pin cable		WSP-002-021	1	-	5 m
Power cable (BTxR)		WSP-002-022	1	-	5 m
Transmitter Plug		WSP-100-029	1	-	Not Connected when Shipped
Installation Manual		WSP-009-005	1	-	This manual
Operator Manual		WSP-009-004	1	-	Related manual
Navigator Manual		WSP-009-003	1	-	Related manual

13.2 WASSP-CT System – Options

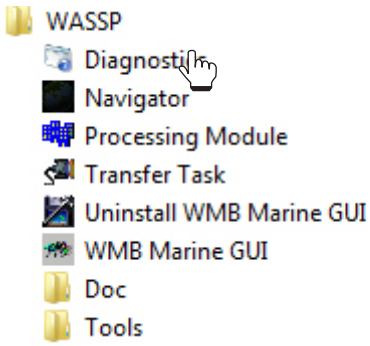
Table 2 lists the options available for use with the WASSP Compact Transducer Type System.

Table 2 – Optional Equipment			
Name	**Part Number**	**Qty.**	**Remarks**
AC-DC Power Adapter	WSP-002-064	1	DC Power supply for WASSP Processor
Aluminium gland	WSP-002-080	1	Through hull type.
Plastic gland	WSP-002-081	1	Through hull type.
Steel gland	WSP-002-082	1	Through hull type.

14. APPENDIX B - Remote Diagnostics Utilities

14.1 Open Remote Diagnostics Utilities

1 To open the Remote Diagnostic Utility:



2 All Progams > WASSP > Diagnostics or from the Desktop

Click **Listen** button to connect to data source

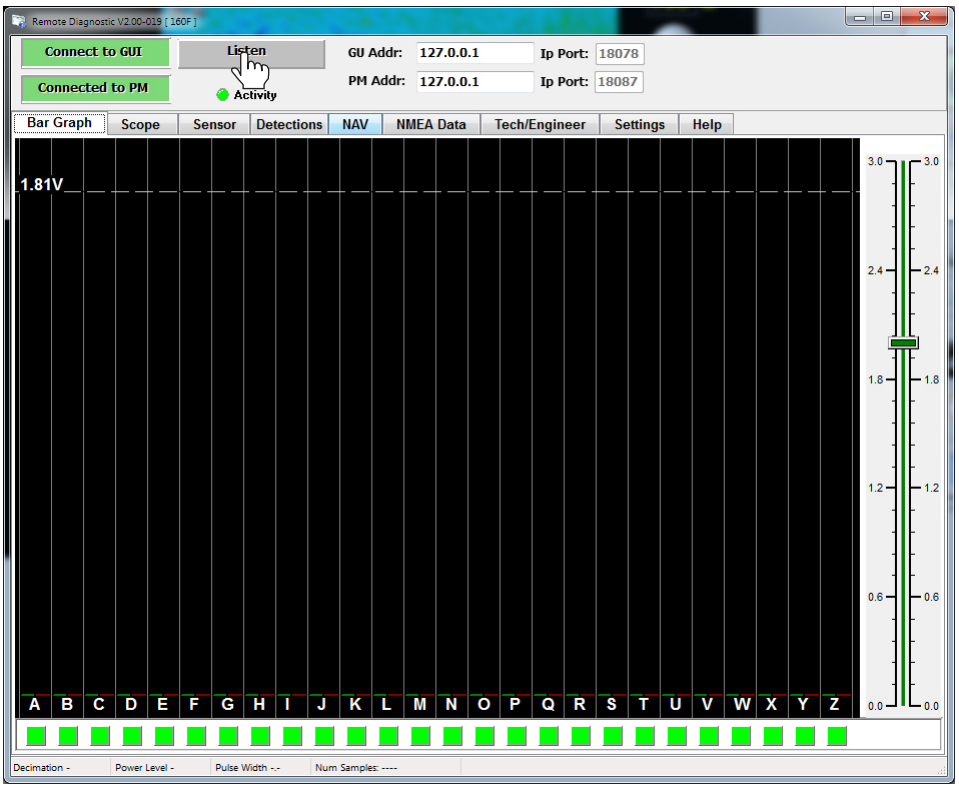


Figure 54. Remote Diagnostics Utility

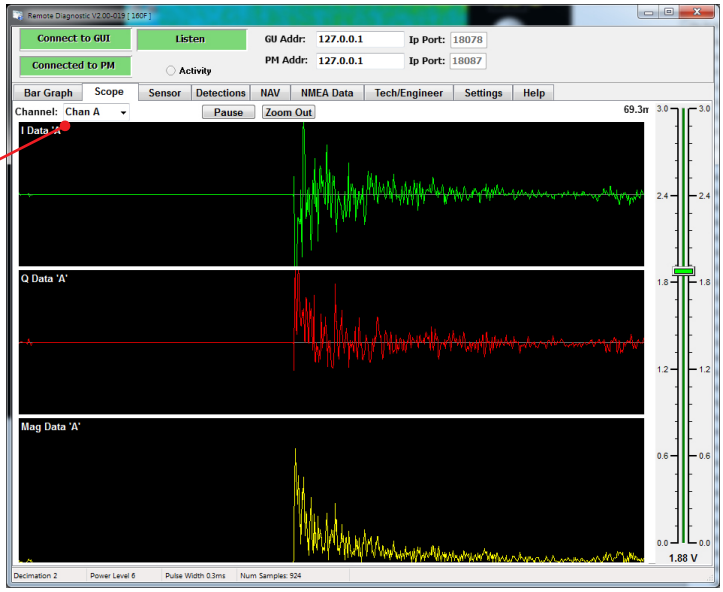
14.4 Bar Graph

The Bar Graph gives a visual representation of the strength of each channel of data received by the multibeam system. This is shown as magnitude, in YELLOW, as well as I & Q data in RED and GREEN. The slider on the right hand side scales the display.

14.2 Scope

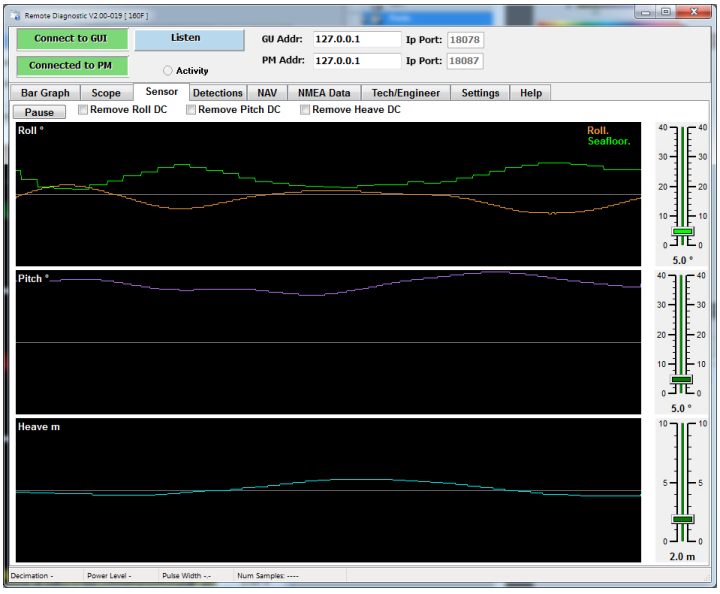
The Scope shows data for a single received channel. The slider on the right hand side shows the signal voltage.

The channel of interest can be selected using the channel drop down menu.



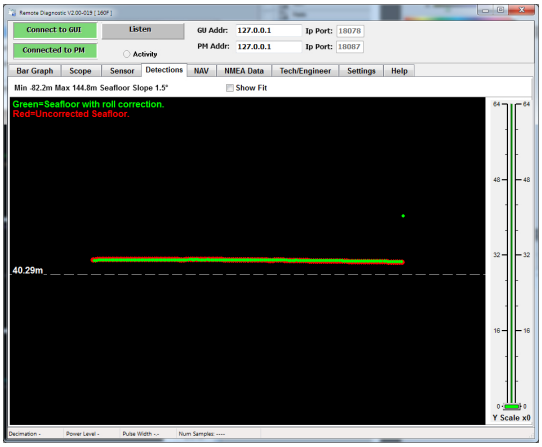
14.3 Sensor

The Sensor display gives magnitude of roll, pitch and heave with time.



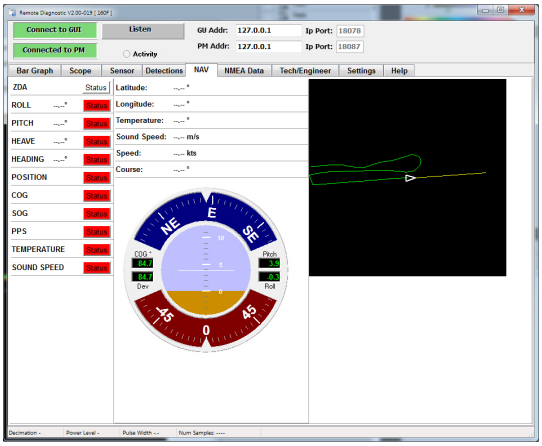
14.5 Detections

The Detections window shows corrected and uncorrected seafloor returns.



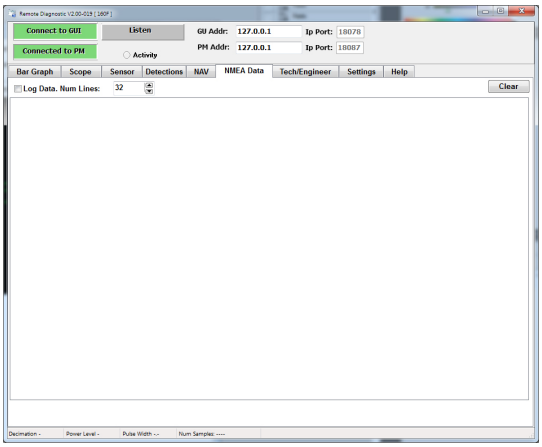
14.6 Nav

Received navigation data from the sensors can be verified.



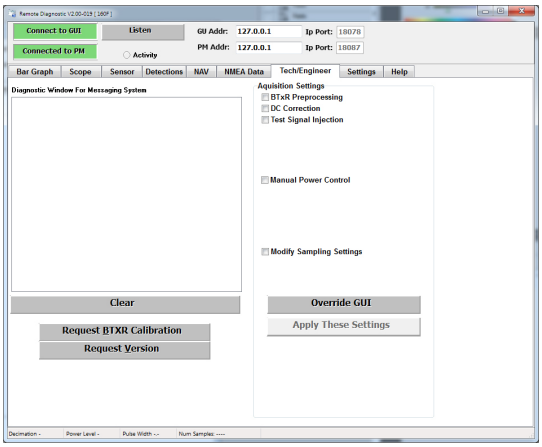
14.7 NMEA Data

By enabling ‘Log Data’, raw NMEA data can be displayed on screen.



14.8 Tech/Engineer

WASSP Processor BTxR communication can be directly driven through the Tech/Engineer tab. This tab should only be used by a technician that has had the appropriate training through the WASSP Service Training Program.



15. APPENDIX C - Specific WASSP Processor Information

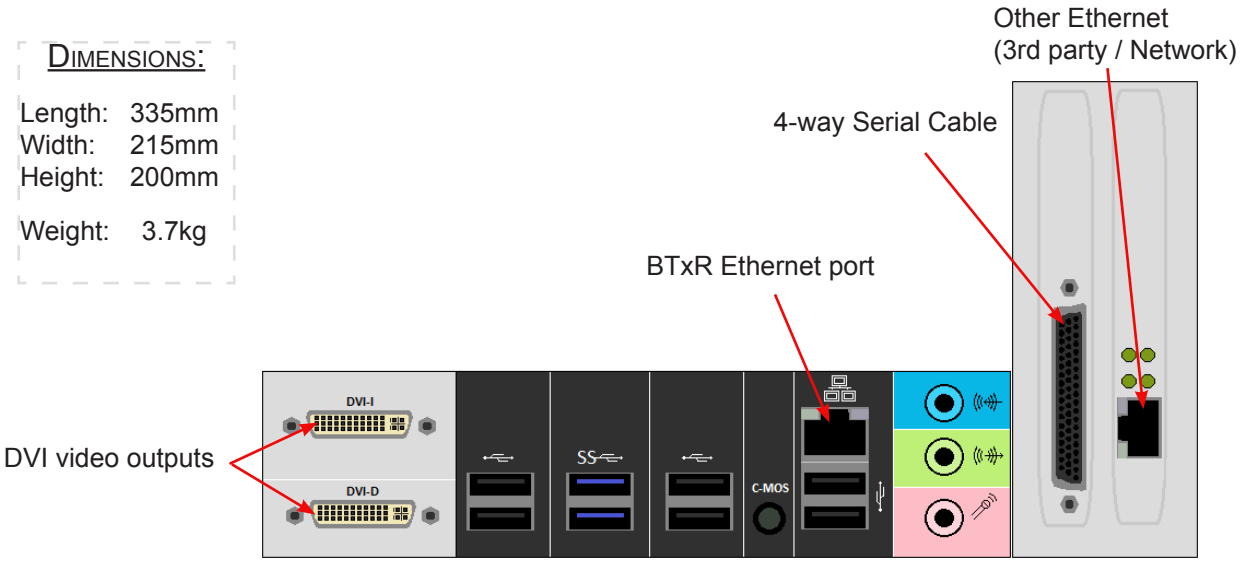
This section contains information on different interfaces or connections between particular WASSP Processors.

15.1 Shuttle 2 (Q2 2012)

DIMENSIONS:

Length: 335mm
Width: 215mm
Height: 200mm

Weight: 3.7kg

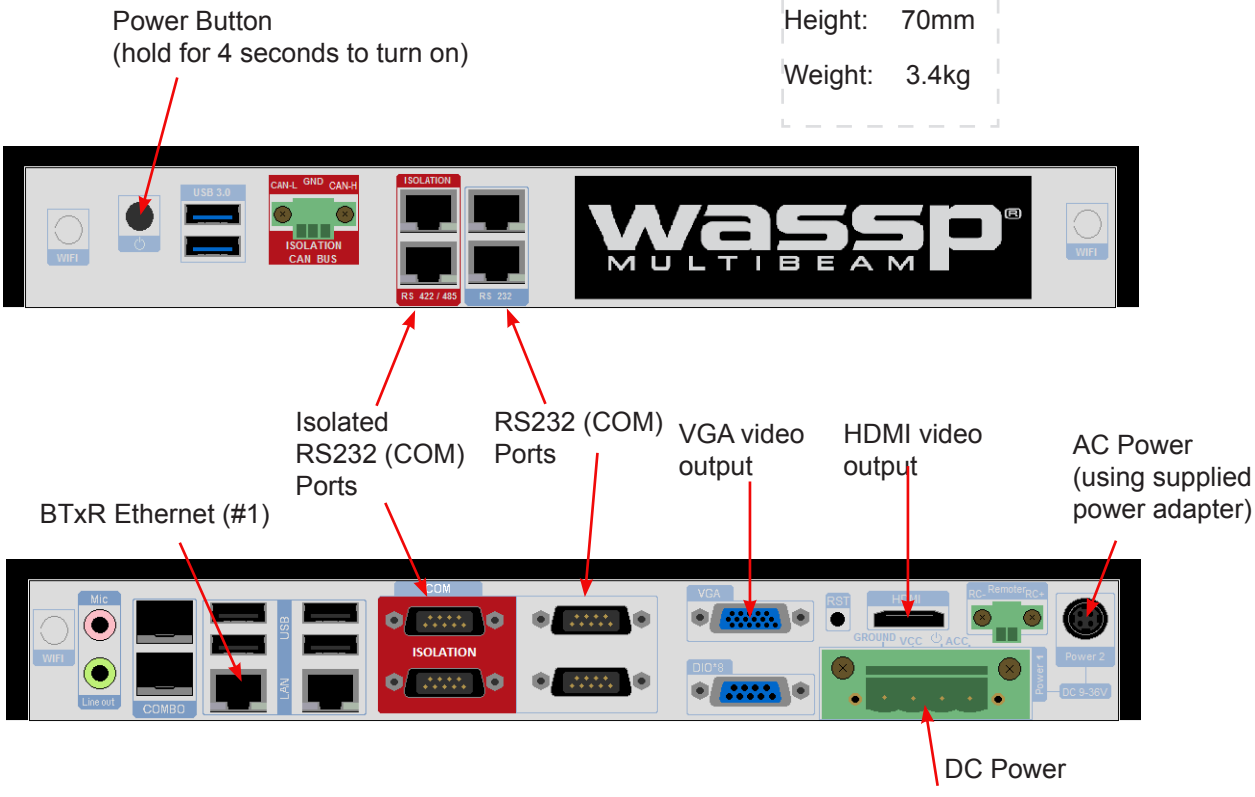


15.2 iEi Tank-700 (Q3 2012)

DIMENSIONS:

Length: 310mm
Width: 200mm
Height: 70mm

Weight: 3.4kg

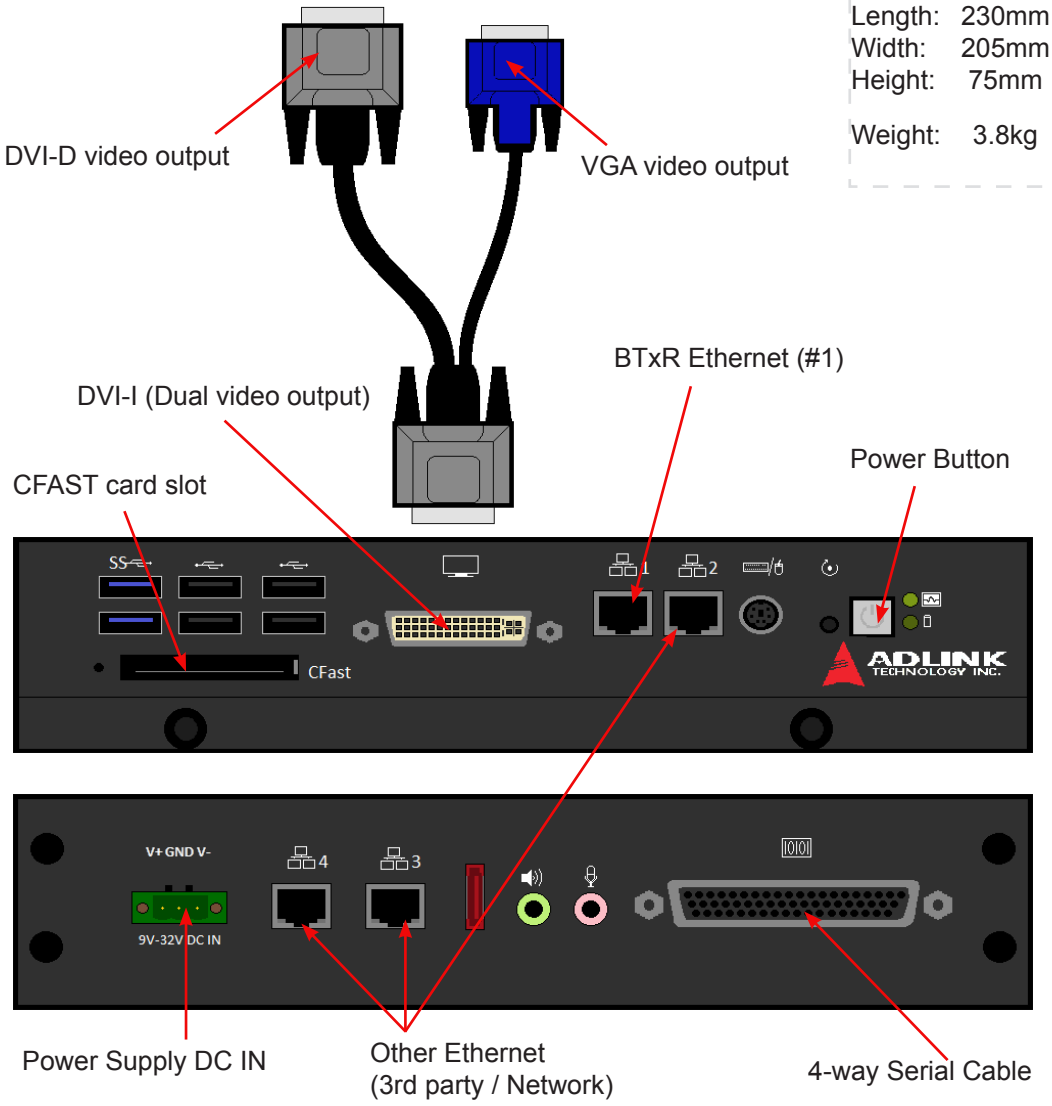


15.3 MXE5301/ENL (Q4 2012)

DIMENSIONS:

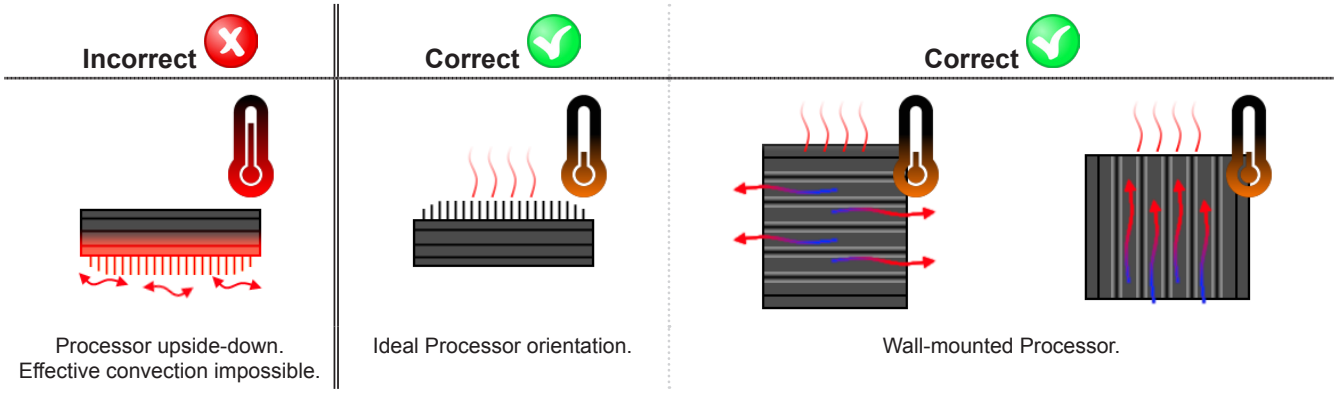
Length: 230mm
Width: 205mm
Height: 75mm

Weight: 3.8kg



CAUTION

Fanless, industrial grade WASSP Processors rely on air convection to maintain operating temperatures. As such, DO NOT mount these units upside-down.



Technical Specifications

Dimensions

BTxR:	Height: 180 mm.	**Transducer**:	Height: 94 ± 2 mm.
	Width: 221.5 mm.		Width: 164 ± 2 mm.
	Length: 535 mm.		Length: 327 ± 2 mm.

WASSP Processor

Serial Ports:	4 - Motion / Position Sensors.
Ethernet Port:	2 - BTxR / 3rd Party Hydrographic Software
Displays:	1 or 2 - Owner supplied. Minimum resolution 1024x768.
Inputs:	Keyboard and Mouse / Trackball

BTxR

Output power:	14 power settings from 40 W to 1 kW.
Pulse Lengths:	0.1 - 2.0 ms
TX rate:	Automatic ping rate, determined by depth. Max ping rate 40 Hz.
Frequency:	160 kHz.
Beam width:	224 beams equidistant spacing over 120º port/starboard swath, Transmit 4º fore/aft, Receive 10º fore/aft.
Depth Range:	2 - 200 m.
Depth Resolution:	75 mm.

Display

Display range:	
Range	5 to 200 m.
Shift	5 to 200 m.
Display modes:	Sonar View. Single Beam View. Waterfall View. Sidescan View.
Display windows:	The eight window layout options: Single Screen Layout. Vertical Split Screen Layout Horizontal Split Screen Layout 3-Screen (3 options) 4-Screen Layout Resize individual windows button.
Advance speed:	Slow – fast (5 speeds).

Interface

Inputs:	NMEA 0183 and RS232 Position, Roll, Pitch, Heave.
Outputs:	Ethernet Navigator, Third Party Hydrographic Software Raw Data GSF Data
Recording:	Navigator maps (bathymetric data) Raw Data GSF Data

Power Supply

BTxR:	24 V DC, 70 W.
WASSP Processor:	9 - 32 V DC (230 V AC with DC power adapter) **Check the PC power supply to verify this before connecting an incorrect voltage!**

Environmental

Temperature:	0 to 40 ºC.
Relative humidity:	5 to 95% non condensing.
Vibration:	IEC 60945, protected equipment.

Weight

BTxR:	5 kg.
Transducer:	12 kg including cable (10m).

Equipment List

Standard:	See “13. APPENDIX A - Part Numbers” on page 64 for a full list.
Transducer:	Mounting options through hull or pole mounted. Optional cable lengths; 5 m, 10 m and 15 m
Glands: BTxR WASSP Processor	Options for alloy, steel or plastic.
Options:	See “13. APPENDIX A - Part Numbers” on page 64 for a full list.

Specifications subject to change without notice.

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