Prepared in cooperation with the Bureau of Ocean Energy Management

2015 Descriptive Report of Seafloor Mapping - Midcoast Maine

By Kerby Dobbs

Maine Coastal Mapping Initiative, January 2016

Disclaimer

This report is preliminary, but data and information published herein are accurate to the best of our knowledge. Data synthesis, summaries and related conclusions may be subject to change as additional data are collected and evaluated. While the Maine Coastal Program makes every effort to provide useful and accurate information, investigations are site-specific and applicability of results to other regions in the state is not yet warranted. The Maine Coastal program does not endorse conclusions based on subsequent use of the data by individuals not under their employment. The Maine Coastal Program disclaims any liability, incurred as a consequence, directly or indirectly, resulting from the use and application of any of the data and reports produced by staff. Any use of trade names is for descriptive purposes only and does not imply endorsement by The State of Maine.

For an overview of the Maine Coastal Mapping Initiative (MCMI) information products, including maps, data, imagery, and reports visit http://www.maine.gov/dacf/mcp/planning/mcmi/index.htm.

Acknowledgements

The Maine Coastal Mapping Initiative would like to acknowledge the efforts of UMaine sediment laboratory personnel, Bowdoin college interns, Emily Schumchenia at E & C Enviroscape, Maine Department of Transportation, and Maine Geological Survey staff for contributing to the success of the 2015 survey season. The individual contributions made by many were an integral part of sampling, analysis, and synthesis of data collected for this project. Funding for this study was provided by provided by the Bureau of Ocean Energy Management (cooperative agreement number M14AC00008) and the National Oceanic and Atmospheric Administration (award numbers NA13NOS4190045 and NA14NOS419006).

Table of Contents

Suggested citation:
Dobbs, K.M., 2016. 2015 Descriptive report for seafloor mapping - Midcoast Maine: Maine Coastal Program Report, 45p.

ABSTRACT

During the survey season (May-November) of 2015 the Maine Coastal Mapping Initiative (MCMI) conducted hydrographic surveying using a multibeam echosounder (MBES) in the waters off of mid-coast Maine. The survey was conducted in part to support the federal Bureau of Ocean and Energy Management's (BOEM) efforts to enhance coastal resiliency through identification and characterization of potential sand and gravel resources on the outer continental shelf that may be used for beach renourishment and for state efforts to update coastal data sets and increase high resolution bathymetric coverage for Maine waters. A total of approximately 82.5 mi^2 (213.5 km^2), 80 mi^2 (207 km^2) mainscheme and 2.5 mi^2 (6.5 km^2) inshore, of high-resolution multibeam data were collected by MCMI between May and November 2015. During the 2015 survey season the MCMI also collected sediment samples in 61 locations, 43 in state water and 18 in federal waters, in the approximately 80mi^2 (207 km^2) mainscheme survey area.

In the coming months, MCMI plans to utilize final data products for high-resolution backscatter and bathymetry to refine existing seafloor sediment maps and determine the spatial extent of sand deposits within federal water. When combined with existing geophysical (e.g. seismic reflection profiles and side-scan sonar) data, these data may also be used to refine interpretations of coastal/nearshore geomorphology and three-dimensional assessments of potential sediment resources/valley fill in the region.

1.0 Introduction

During the survey season (May-November) of 2015 the Maine Coastal Mapping Initiative (MCMI) conducted hydrographic surveying using a multibeam echosounder (MBES) in the waters off of mid-coast Maine. The survey was conducted in part to support the federal Bureau of Ocean and Energy Management's (BOEM) efforts to enhance coastal resiliency through identification and characterization of potential sand and gravel resources on the outer continental shelf that may be used for beach renourishment. The project also coincides with state efforts to update coastal data sets and increase high resolution bathymetric coverage for Maine waters. The project provides new data in the areas covered by National Oceanic and Atmospheric Administration (NOAA) nautical charts (e.g. coastal and harbor) 13293, 13295, 13296, and 13288 in Midcoast Maine. These data were not collected or processed for navigational purposes, but are freely provided to NOAA for any use the agency deems appropriate.

2.0 Survey Purpose

The purpose of these surveys was to obtain bathymetric and backscatter data to meet the needs of habitat classification, bathymetric mapping, and sediment resource objectives set forth by the MCMI, NOAA, and BOEM (see Dobbs, 2016; Ozmon, 2016).

3.0 Areas Surveyed

The survey areas were located in Maine's Midcoast region in state and federal waters extending to ~8 nm offshore. The approximately 80 mi^2 (207 km^2) mainscheme survey area (Figure 1) coincides with the Kennebec River paleodelta, and was selected for this study due to the high probability of being able to identify sand resources at this location (Figure 1; Barnhardt et al., 1997; 1998). This area extends from the southern tip of Southport Island for approximately 11 nautical miles, and to the west along the coast to Orr's Island in Harpswell. Inshore surveying was conducted within Boothbay Harbor, Linekin Bay, and in the vicinity of Ocean Point to adjoin with and extend the surveys conducted by the MCMI in 2014 (Figure 2).

3.1 Mainscheme Survey

Mainscheme surveying was conducted on a daily basis, weather permitting, between May and November 2015. The location and extent of each day's coverage was variable and highly dependent on the observed and forecasted sea-state. As a result, the locations of daily surveys were selected to maximize time spent surveying relative to transit time. For example, if conditions were forecast to deteriorate on a given day, then a nearshore or more protected portion of the survey area was selected.

3.2 Inshore Survey

Inshore surveying was conducted on an irregular basis between September and November 2015 to supplement 2014 survey data collected in the vicinity of Boothbay Harbor (Figure 2). The decision to conduct inshore surveying typically occurred when conditions were unsuitable for surveying in the mainscheme area, which happened more frequently as conditions became more variable as the survey season progressed into the fall months.

3.3 Survey Coverage

There are numerous small holidays within the mainscheme coverage area. Many of the smallest holidays distributed throughout the entire coverage area are sonic shadows caused by areas of locally high relief and/or highly irregular bathymetry. The three largest holidays occurred in the northwestern-most portion and were the result of small rocky islands (e.g. Tom Rock). With the exception of the holiday centered over 446847 E, 4847427 N (WGS 84, UTM Zone 19N, meters) in the northeastern portion of the coverage area, which was not ensonified due to obstructions by dense fishing gear, it can be assumed with confidence that the shallowest depths of all features within the survey area have been identified. The highest concentrations of holidays occurred in the northern-most and southeastern-most portions, and were largely the result of equipment interference (discussed further in section 4.8 Equipment Issues).

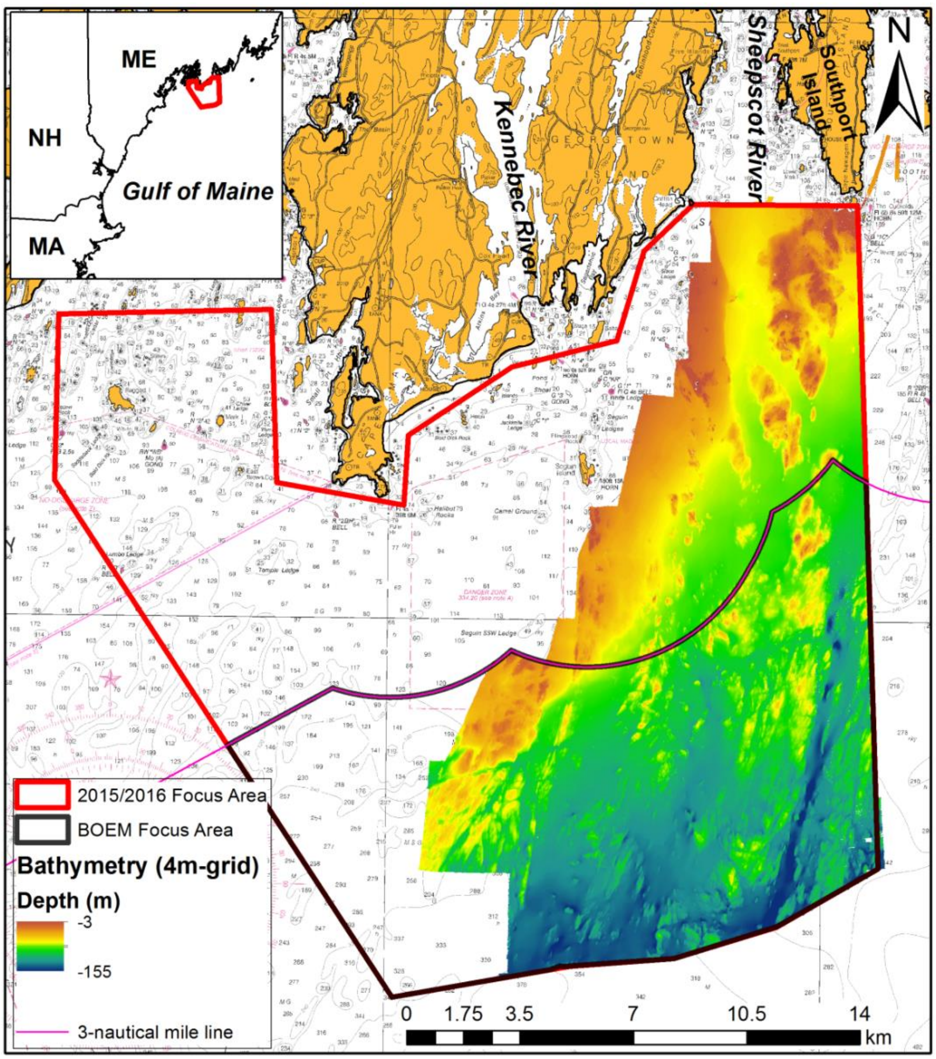


Figure 1. MCMI collected ~80 mi^2 of high resolution bathymetric off of Midcoast Maine in the 2015 mainscheme focus area, which includes portions of NOAA nautical charts 13288, 13293, and 13295.

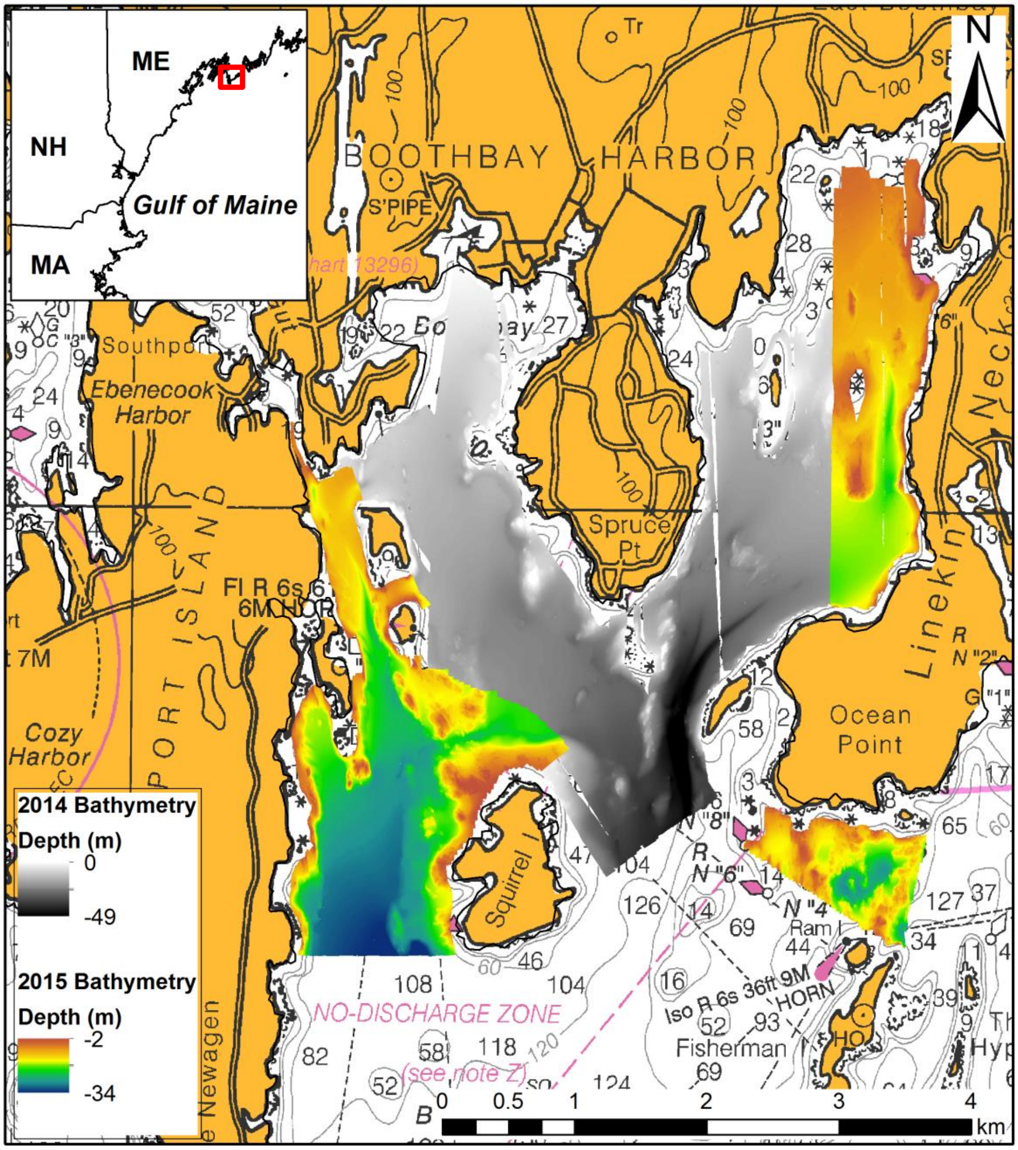


Figure 2. MCMI 2014 (color scale) and 2015 (grey scale) inshore survey coverage within Boothbay Harbor, Linekin Bay, and Ocean Point. The inshore focus area includes coverage within NOAA nautical charts 13288, 13293, and 13296 in the Midcoast region of Maine.

4.0 Data Acquisition and Processing

The following sub-sections contain a summary of the systems, software, and general operations used for acquisition and preliminary processing during the 2015 survey season.

4.1 Survey Vessel

All data were collected aboard the F/V Amy Gale (length = 10.7 m, width = 3.81 m, draft = 0.93 m) (Figure 3), a former lobster boat converted to a survey vessel, contracted to the MCMI. The vessel was captained by Caleb Hodgdon of Hodgdon Vessel Services based out of Boothbay Harbor, Maine. The multibeam sonar, motion reference unit (MRU), surface sound speed probe, and dual GNSS antennas were pole-mounted (Figure 4) to the bow and were raised (for transit) and lowered (for survey) via a pivot point at the edge of the bow. The main cabin of the vessel served as the data collection center and was outfitted with four display monitors for real time visualization of data during acquisition.

Figure 3. Survey vessel F/V Amy Gale shown with pole-mounted hardware in raised position during transit.

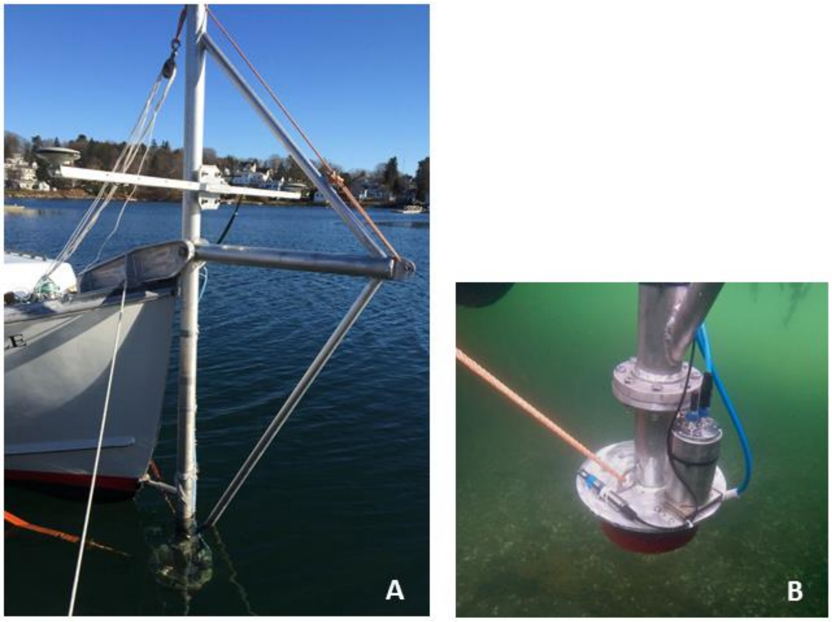


Figure 4. Pole-mount with dual GPS antennas (a), multibeam sonar, MRU, and surface sound speed probe (b) shown in deployed position used during acquisition.

4.2 Acquisition Systems

The real time acquisition systems used aboard the F/V Amy Gale during the 2015 survey are outlined in Table 1 below. Data acquisition was performed using the Quality Positioning Services (QPS) QINSy (Quality Integrated Navigation System) acquisition software. The modules within QINSy integrated all systems and were used for real-time navigation, survey planning, data time tagging, data logging, and visualization during acquisition.

Table 1. Summary of acquisition systems used aboard F/V Amy Gale.

Sub-system	**Components**
Multibeam Sonar	Kongsberg EM2040C and processing unit
Position, Attitude, and Heading Sensor	Seapath 330 processing unit, HMI unit, dual GPS/GLONASS antennas, and MRU 5 motion reference unit
Data Acquisition and Display	QINSy software v.8.10 and 64-bit Windows 7 PC console
Surface Sound Velocity (SV) Probe	AML Micro X with SV Xchange
Sound Velocity Profiler (SVP)	Teledyne Odom Digibar S sound speed profiler
Ground-truthing Platform	Ponar grab sampler, GoPro Hero video camera, dive light, dive lasers, YSI Exo I sonde

4.3 Vessel Configuration Parameters

Prior to the start of the survey season, the acquisition system components (e.g. MRU, GPS antennas, and EM2040C) were measured in reference to the MRU, which served as the origin (e.g. 0,0,0), where 'x' was positive forward, 'y' was positive starboard, and 'z' was positive down. Reference measurements for each component were entered into the Seapath 330 Navigation Engine (Table 2) and converted so all outgoing datagrams would be relative to the location of the EM2040C (e.g. EM2040C was used as the monitoring point for all outgoing datagrams being received by QINSy during acquisition). Additional configuration and interfacing of all systems were established during the creation of a template database in the QINSy console. See appendices for specific settings as entered in the Seapath 330 Navigation Engine (Appendix A) and for the template database (Appendix B) used during data acquisition while online in QINSy. Configuration settings of the EM2040C were assigned in the EM Controller module of QINSy (see Appendix C).

Table 2. Reference measurements for Seapath 330.

	x (m)	y (m)	z (m)
MRU	0.000	0.000	0.000
Antenna 1	-0.010	-1.250	-2.979
Antenna 2	-0.010	1.250	-2.979
EM2040C	-0.152	0.000	0.194

4.4 Survey Operations

The following is a general summary of daily survey operations. Once the survey destination was reached, the sonar pole mount was lowered into survey position and its bracing rods were fastened securely to the hull of the ship via heavy-duty ratchet straps. Electric power to the computers was provided by a 2000 watt Honda generator. Immediately following power-up, all interfacing instruments were given time to stabilize (e.g. approximately 30-45 minutes for Seapath to acquire time tag for GPS). Next, (as recommended by QPS personnel during in-field training) a new project was created in QINSy and given a name to correspond with the day's date. The template database (e.g. AmyGale.db) containing all configuration settings was copied into the project folder and activated for use during acquisition. All subsequent files (e.g. raw sonar files, SVP casts, grid files, etc.) were recorded and stored in that day's project folder. Prior to surveying, an SVP cast was taken and imported into the 'imports' folder of the current project. After confirming a close match between the upcast and downcast data, the profile was applied to the sonar (EM2040C) in the QINSy Controller module. Additional sound speed casts were taken as needed throughout the survey, which was generally when the observed surface sound speed differed from the sound speed profile by more than 2 meters per second or when there was reason to suspect significant changes in the water column (e.g. change in tide, abrupt changes in seafloor relief). During the collection of SVPs, logging was paused long enough to download and apply the new SVP and was resumed when the boat circled around and came back on the survey line. Raw sonar files were logged in the QINSy Controller module in .db format and saved directly onto the hydrographic workstation computer.

At the end of each day's survey, sonar and navigation systems were powered down and the pole mount was raised and fastened in preparation for transit back to port. Upon arriving at the dock, all external instruments/hardware were visually inspected and rinsed with freshwater to prevent corrosion.

Raw xyz data (e.g. bathymetry and backscatter) were exported and total daily coverage was calculated using the QINSy Process Manager. These data were then used to create progress maps and to supplement daily logs, which were submitted to the project manager on a weekly basis. All data were backed up daily on an external hard drive.

4.5 Survey Planning

Line planning and coverage requirements were designed to meet the specifications set forth in the BOEM grant, but also met requirements for NOAA hydrographic standards (see 2014 NOAA Field Procedures Manual). Parallel lines were planned in real time and run in a north south pattern, generally following the strike of major bedrock structures and/or isobaths. Lines varied in length from 1 to 3 nautical miles, and depending on the expected bathymetric relief were spaced at consistent intervals to obtain a minimum of 10% overlap between swaths. In situations where bottom relief was highly irregular, typically in shallow water (e.g. <40 meters), overlap between swaths was increased considerably but not to exceed 50%. Less overlap was typically planned in deeper water to maximize coverage. Surveying was conducted at approximately 6.5 knots.

4.6 Calibrations

Five patch tests were conducted aboard the Amy Gale throughout the 2015 survey season to correct for alignment offsets and evaluate any adjustments caused by general wear-and-tear of the pole mount hardware and fasteners (Table 3). During each test, a series of lines were run to determine the latency, pitch, roll, and heading offset. The patch test data were processed in the field using the QINSy Process Manager module. After calibration was complete, offsets were entered in to the template database in QINSy prior to the following survey. Overall, roll and pitch offsets calculated for individual patch tests were very consistent throughout the season. The heading offset varied the most and may be attributed to the addition of new, more robust fastening straps on July 28, 2015 or general wear of the rubber mounting bracket (e.g. stabilization point where pole mount contacts the stem of the Amy Gale) as the season progressed. Full built-in self-tests (BIST) were performed at the same frequency as patch tests to determine if any significant deviations in background noise were present at the chosen survey frequency of 300KHz.

Table 3. Patch test calibration offsets.

	5/20/2015	**6/9/2015**	**7/31/2015**	**8/5/2015**	**8/10/2015**
Latency (s)	0.00	0.00	0.00	0.00	0.00
Roll (degrees)	-0.22	-0.27	-0.13	-0.18	-0.16
Pitch (degrees)	0.00	-0.02	-0.21	-0.16	-0.02
Heading (degrees)	-1.28	-0.95	-0.30	-0.08	-0.20

4.7 Crosslines

Crosslines were run every 900 meters (as per BOEM requirement; U.S. Department of the Interior, 2014) to act as a data quality check (Figure 5). A surface difference test was performed between post-processed mainscheme survey data and crossline data.

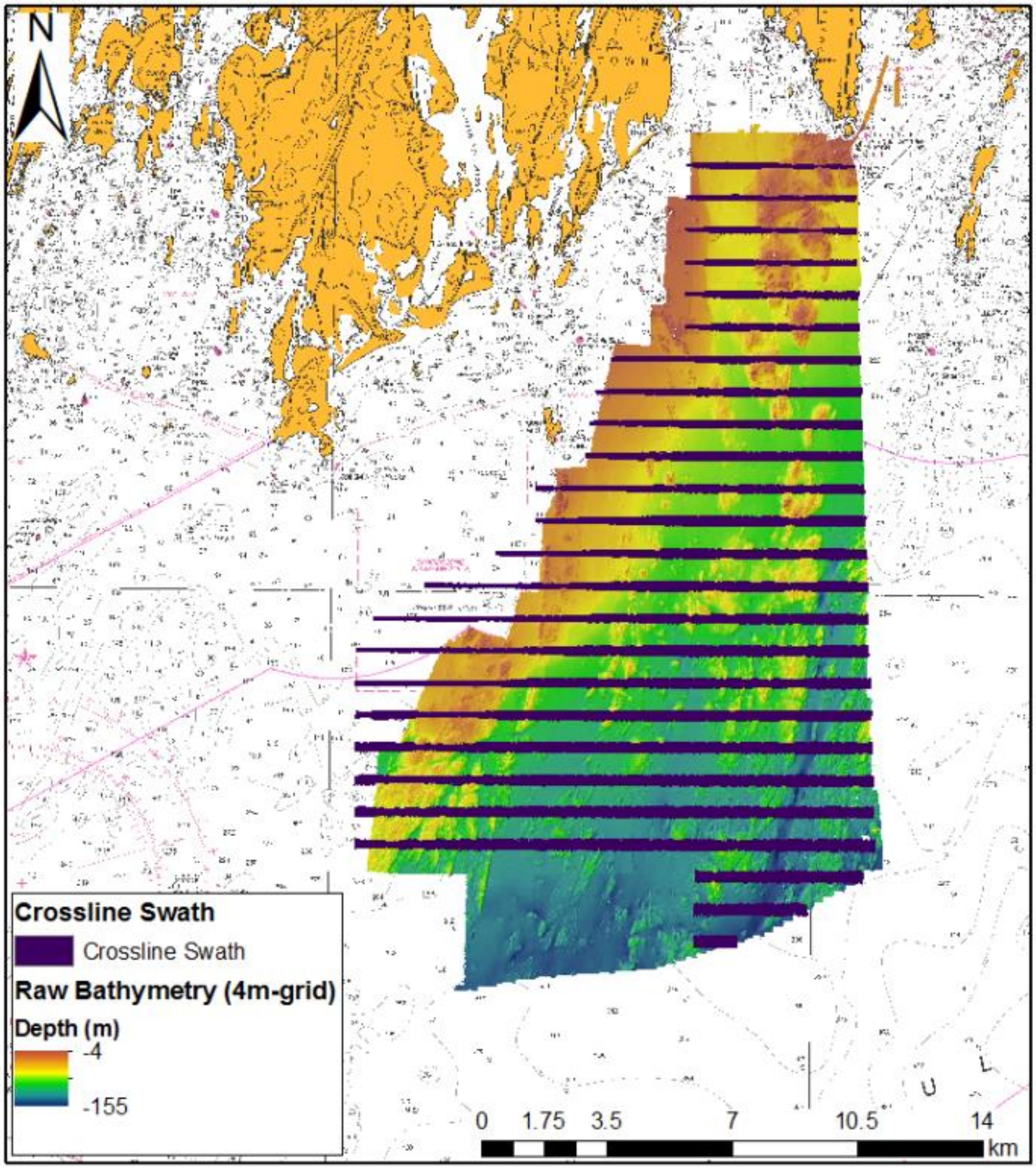


Figure 5. Crossline swaths (purple, east-west trending) relative to mainscheme coverage.

4.8 Equipment Issues

The first two months, May and June 2015, of the survey season were partially compromised due to extensive troubleshooting of an issue that was generally characterized by frequent loss of datagrams being sent from the EM2040C, resulting in a high density of holidays (Figure 6) in the mainscheme survey (as mentioned in section 3.3 Survey Coverage). Although the symptoms of the issue suggested data loss was being caused by a poor (e.g. loose) connection somewhere within the hardware, the error was highly erratic and difficult to reproduce under the same survey conditions. The most common occurrence between day-to-day testing was that the error would usually not occur until the vessel had been surveying for at least 30 minutes. Multiple consultations (in-field and remote) with Kongsberg and QPS support personnel and additional testing would eventually rule out outdated firmware, improper configuration settings, timing errors (e.g. installation of PPS timing adapter), and inadequate software capabilities (e.g. testing with SIS), which further supported the initial notion that the error was rooted within the hardware. Eventually, a complete EM2040C demo kit (transducer head, transducer cable, and processing unit) was loaned to MCMI from Kongsberg to begin testing on individual hardware components.

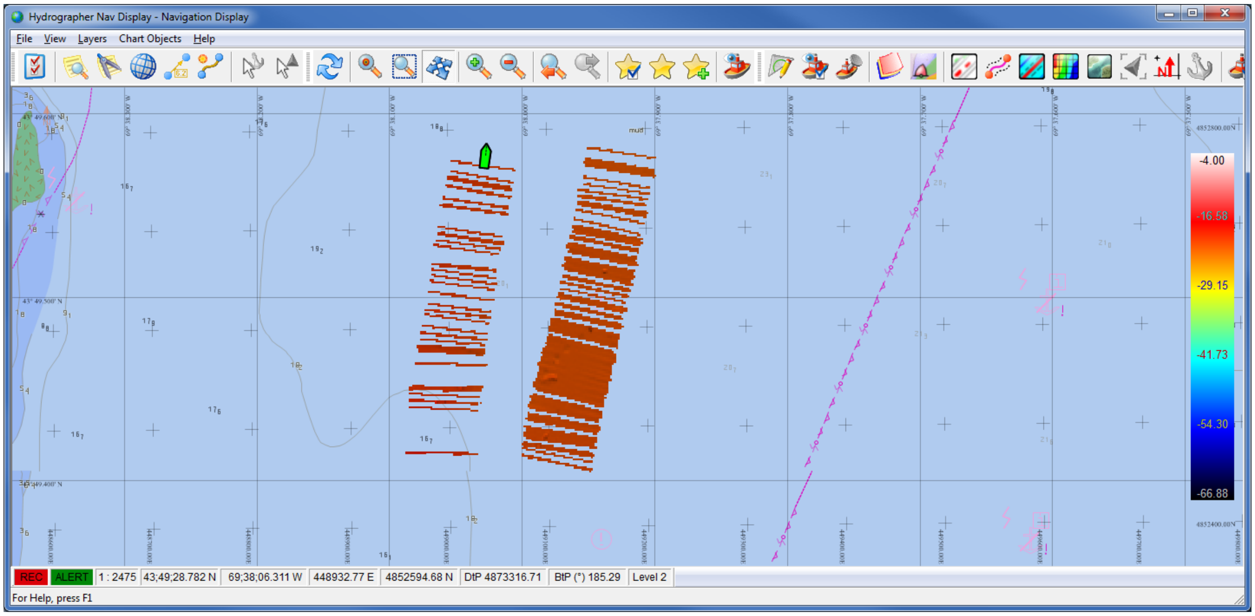


Figure 6. QINSy navigation display showing gaps in MBES coverage caused by frequent loss of datagrams sent from EM2040C.

After replacing the transducer cable on July 3, 2015 the error no longer occurred, regardless of survey conditions. An evaluation of the original transducer cable performed by engineers at Kongsberg suggested that the errors were being caused by inadequate support/protection and combined with an excessive bend radius of the cable. These two factors were thought to cause frequent agitation of the cable, which ultimately resulted in sufficient interference and the loss of datagrams. Although the initial presumption that the errors were being caused by a hardware connection was correct, it was quite surprising due to the fact that the same configuration was used throughout the entirety of the 2014 survey season, when no errors were reported. This type of error can easily be avoided in future surveys by taking all measures necessary to secure and protect the integrity of all external components subject to the elements, and by conducting routine inspections of the cables to identify potentially abraded sites before they degrade to the point where data transfer is disrupted.

5.0 Data Post-processing

All mainscheme, crossline, and inshore survey data were sent to E&C Enviroscape, for post-processing. The following is a summary of the procedures used for post-processing and analysis of survey data using Qimera and Fledermaus software.

5.1 Horizontal Datum

The data were collected and processed in WGS 84 projected in UTM zone 19N (meters).

5.2 Water Level Corrections and Vertical Datum

Tidal data from the Portland, ME (8418150) tide gauge referenced to mean lower-low water (MLLW, meters) was applied to survey data with time and range corrections recommended by the NOAA CO-OPS (Center for Operational Oceanographic Products and Services) division (Table 4).

Table 4. Time and range corrections applied to Portland tide gauge reference data.

Survey Area	Time Correction (mins)	Height Offset (feet)
Mainscheme	-6	0.95
Inshore	-7	0.97

5.3 Processing Workflow

1. Create project
2. Add raw sonar files (e.g. metadata extracted and real time xyz converted to .qpd, including vessel configuration and sound velocity)
3. Create initial dynamic surface
4. Add tidal data
5. Create Cube surface
6. Edit surface and finalize
7. Export data

CUBE

Once preliminary surfaces were built and any obvious issues (e.g. inappropriate tide corrections, corrupted data files, software issues, etc.) were addressed, a CUBE (Combined Uncertainty and Bathymetry Estimator) surface was created for editing and as a starting point for final products. CUBE surfaces with ± 1 standard deviation were built for each survey area. The mainscheme survey was gridded at 4 m, and the inshore survey was gridded at 0.5 m resolution, based on the average depth of the area and in accordance with NOAA's survey recommendations (NOAA, 2014). Editing of the CUBE surface was done in the 3D editor tool of Qimera.

Data Control

A surface difference test between finalized crossline and mainscheme surveys was conducted as a quality assurance check (Table 6). The crossline CUBE surface used for this test included a ±

45° angle filter (used to remove soundings greater that 45° from the nadir). This filter was used to reduce the number of outliers, which are typically caused by high incidence angles and exaggerated motion in the outer beams.

5.4 Backscatter

Backscatter was logged in the raw .db files. The .db files also hold the navigation record and bottom detections for all lines of surveys. Multibeam backscatter data (snippets and beam-average) were contained in .GSF files exported from final bathymetry surface objects using QPS Qimera version 1.1.2. QPS Fledermaus FMGeocoder Toolbox (FMGT) version 7.4.5a (64-bit) was used to process all GSF format data. The GSF files containing the extracted backscatter are submitted with the data in this survey.

6.0 Results and Discussion

A total of approximately 82.5 mi^2 (213.5 km^2), 80 mi^2 (207 km^2) mainscheme and 2.5 mi^2 (6.5 km^2) inshore, of high-resolution multibeam data were collected by MCMI between May and November 2015 (Figures 7 and 8). Mainscheme and inshore surveys were processed with 4 m and 0.5 m grid resolution, respectively. Summary statistics for the bathymetry data are shown in Table 5.

Table 5. Summary statistics of post-processed bathymetry.

Survey	Min. (m)	Max. (m)	Mean (m)
Mainscheme	-155.41	-2.02	-69.68
Inshore	-37.90	-1.51	-17.20

Overall consistency between successive patch test calibrations suggests the Amy Gale survey platform configuration was reliable and maintained integrity suitable for high-quality data acquisition throughout the survey season. The high-quality of the hydrographic data was reflected in the results of the surface difference test between crosslines and mainscheme survey data, where a mean difference of 0.05 m between corresponding cells was achieved (Table 6).

Table 6. Surface difference test results conducted between finalized crossline and mainscheme survey areas.

Surface Characteristics Information	
Name	surface_difference2
Dimensions	7137 rows x 4257 columns
Cell Size (m)	4 x 4
Bounds (meters)	
X Range	433734 to 450758
Y Range	4823990 to 4852534
Z Range	-16.68 to 45.8
Horizontal Coordinate System	FP_WGS_84_UTM_zone_19N
Statistics (meters)	
Median	0.04
Mean	0.05
Standard Deviation	0.77
Total 2D Area	29671200
Positive (above 0.0) 2D Surface Area	16567744
Negative (below 0.0) 2D Surface Area	13103456
Total Volume	1328632.66
Positive (above 0.0) Volume	6653273.46
Negative (below 0.0) Volume	5324640.81

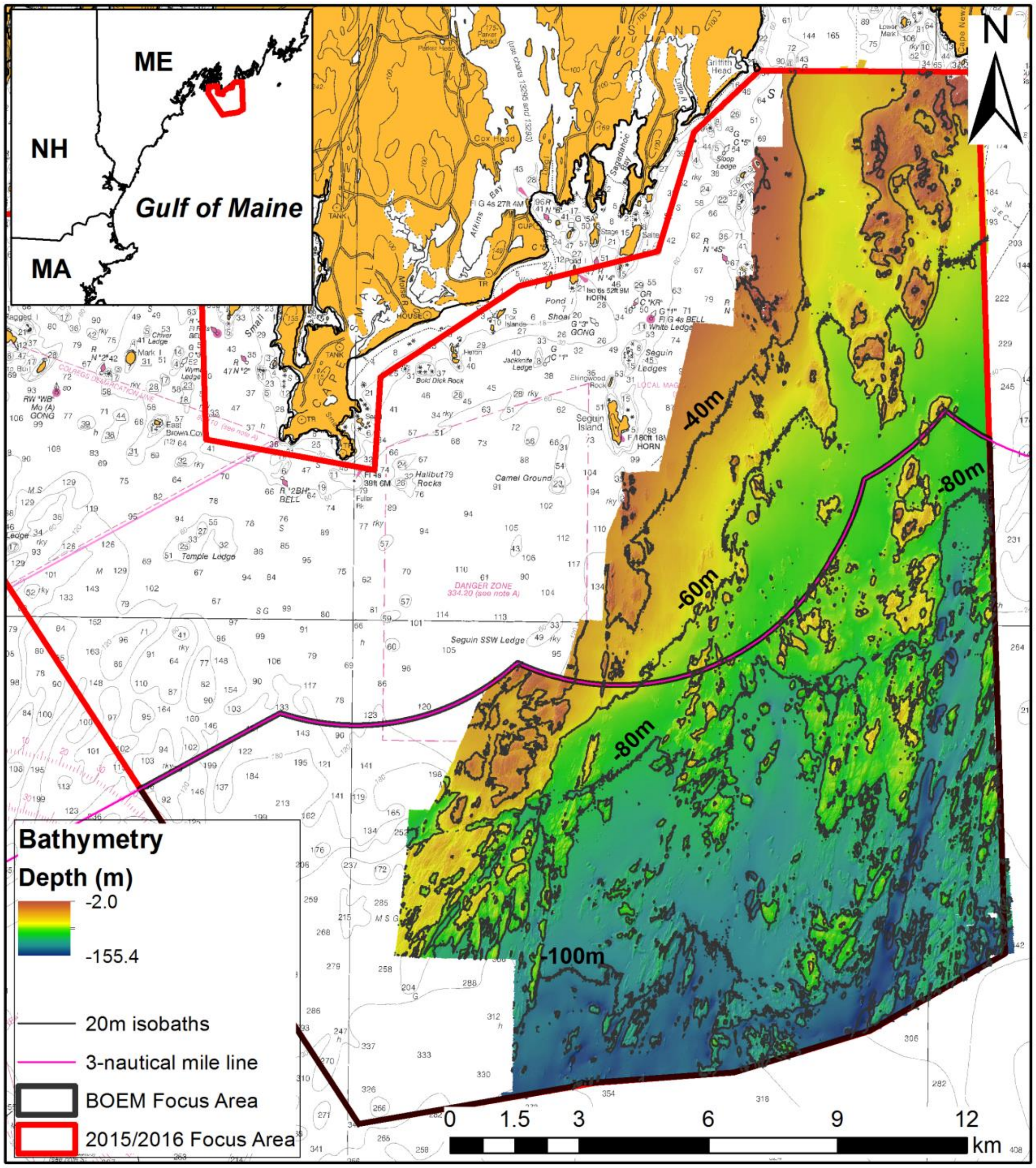


Figure 7. Post-processed 2015 mainscheme survey bathymetry (4 m grid resolution) with 20 m interval isobaths.

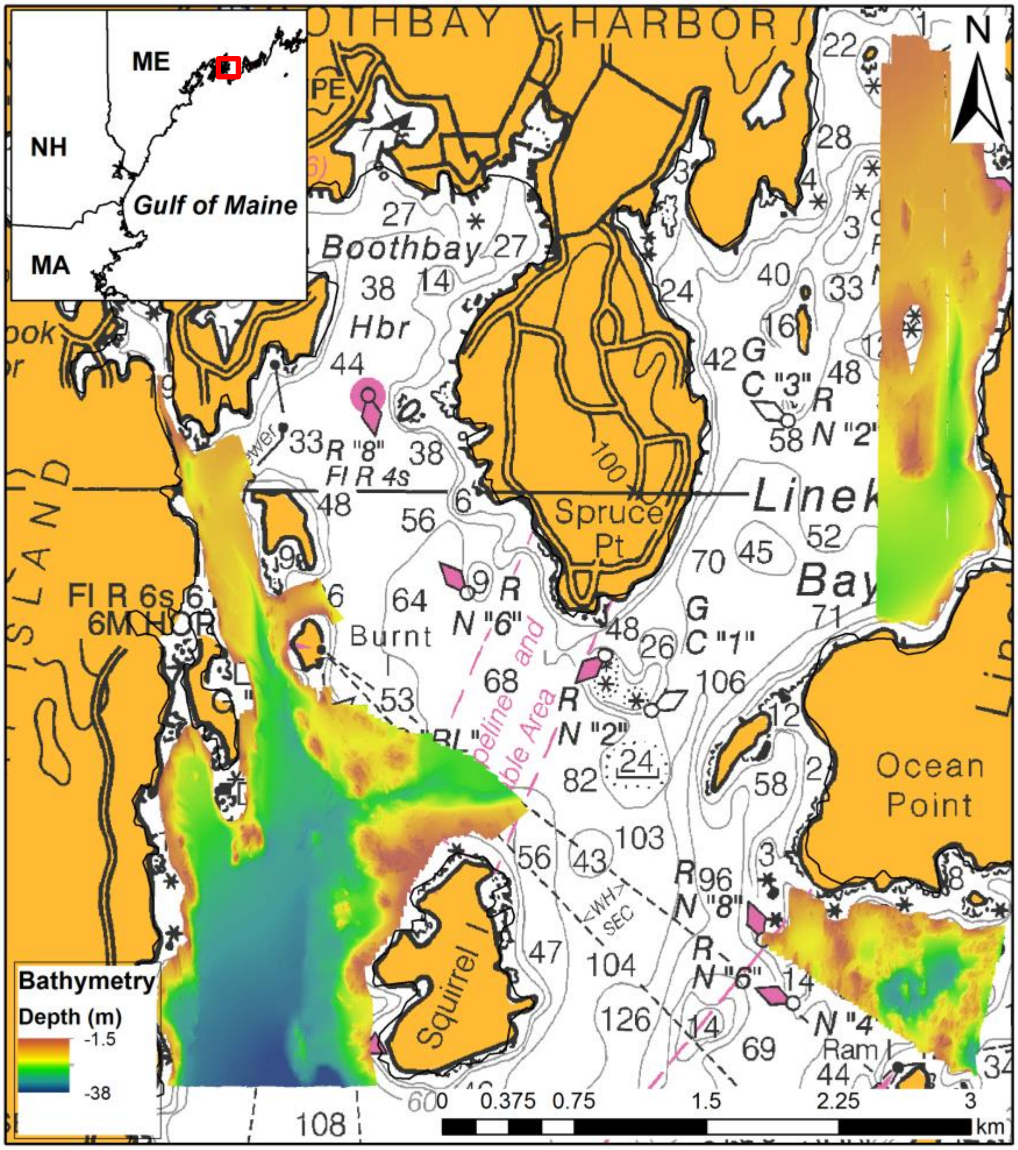


Figure 8. Post-processed 2015 inshore survey bathymetry (0.5 m grid resolution).

A total of 61 bottom samples (Figure 9), 43 in state water and 18 in federal waters, were collected in the approximately 80 mi^2 (207 km^2) mainscheme survey area on 11 separate occasions between May and November 2015. The results of grain-size analyses were used to calibrate and refine interpretations of sediment distribution using backscatter intensity data. The results of these analyses, a general synthesis of the nature of the seafloor, and how these data relate to benthic infauna in the survey area are presented in Dobbs (2016) and Ozmon (2016), respectively.

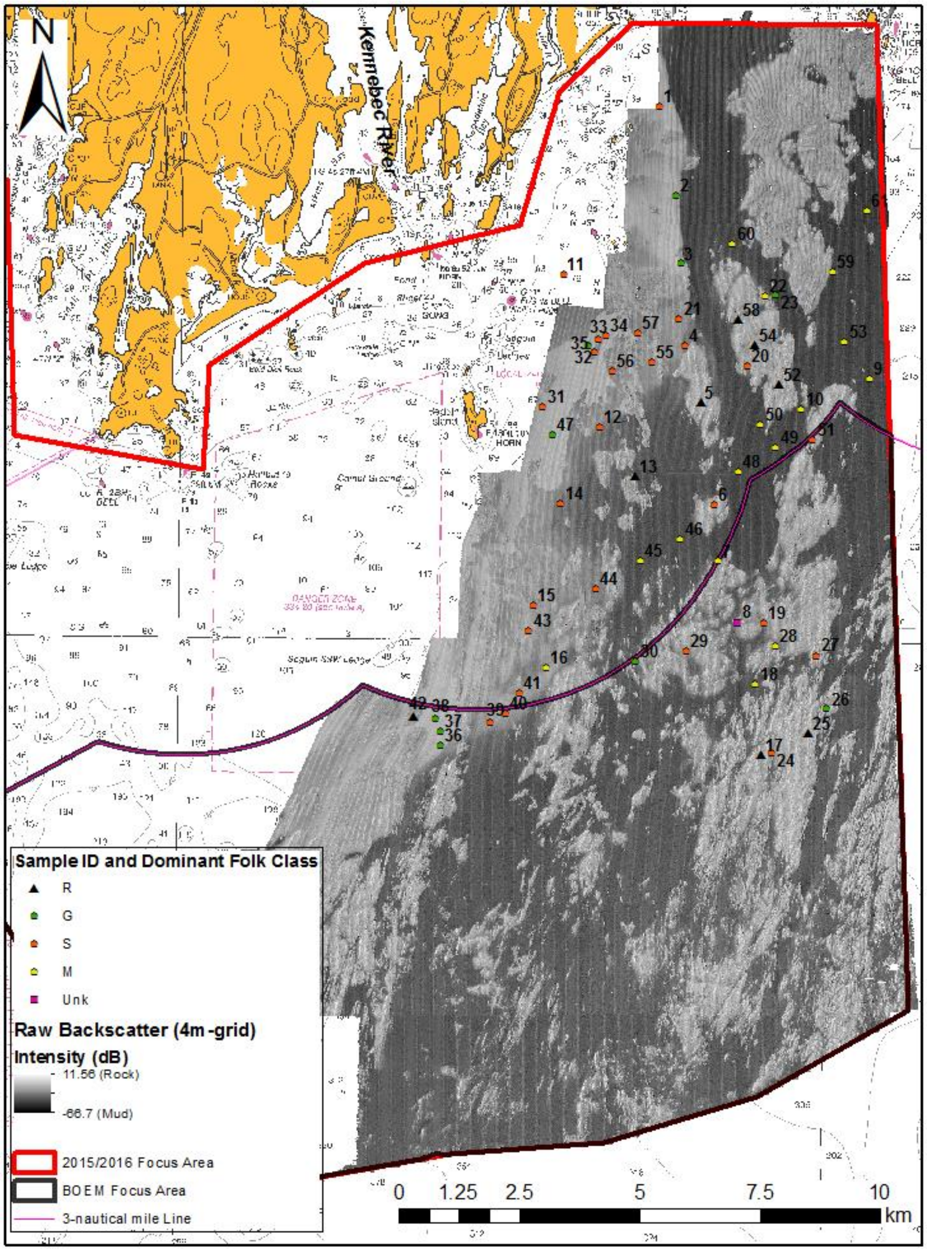


Figure 9. Unfiltered backscatter intensity (4m grid resolution) map and bottom sampling locations colored by predominant substrate type (R = rocky, G = gravel, S = sand, M = mud, and Unk = unknown). Results of bottom sample analyses are presented in Dobbs (2016).

7.0 Conclusion

During the 2015 survey season the Maine Coastal Mapping Initiative collected approximately 82.5 mi^2 (213.5 km^2), 80 mi^2 (207 km^2) mainscheme and 2.5 mi^2 (6.5 km^2) inshore, of high-resolution multibeam data. The consistency of equipment calibration conducted throughout the survey season and statistical comparisons of multibeam data suggest the current survey platform aboard the Amy Gale was robust and reliable for high-quality data acquisition. The technical difficulties encountered during the first two months of the season reinforced the importance of equipment maintenance and configuration. As a result of these difficulties, additional measures will be taken prior to future surveys to secure and protect the integrity of all external components subject to harsh environmental conditions.

During the 2015 survey season the MCMI also collected sediment samples in 61 locations, 43 in state water and 18 in federal waters, in the approximately 80mi^2 (207 km^2) mainscheme survey area. The results of grain-size analyses were used to calibrate and refine interpretations of sediment distribution using backscatter intensity data. The results of these analyses, a general synthesis of the nature of the seafloor, and how these data relate to benthic infauna in the survey area are presented in Dobbs (2016) and Ozmon (2016), respectively.

In the coming months, MCMI plans to utilize final data products for high-resolution backscatter and bathymetry to refine existing seafloor sediment maps and determine the spatial extent of sand deposits within federal water. When combined with existing geophysical (e.g. seismic reflection profiles and side-scan sonar) data, these data may also be used to refine interpretations of coastal/nearshore geomorphology and three-dimensional assessments of potential sediment resources/valley fill in the region. In addition, these data are a critical component of benthic habitat classification and modeling performed by MCMI (see Ozmon, 2016). Overall, these data have a variety of applications and are an invaluable resource to public and private agencies who wish to more effectively manage and understand coastal and marine resources.

References

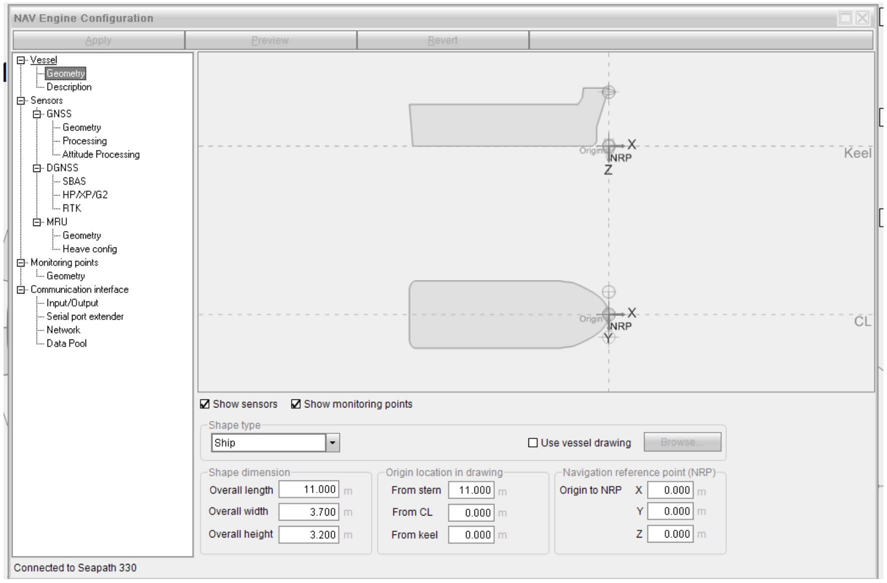
Dobbs, K.M., 2016. Seafloor sediment analysis and mapping – Midcoast Maine, Maine Coastal Mapping Initiative. Maine Coastal Program, Augusta, ME.

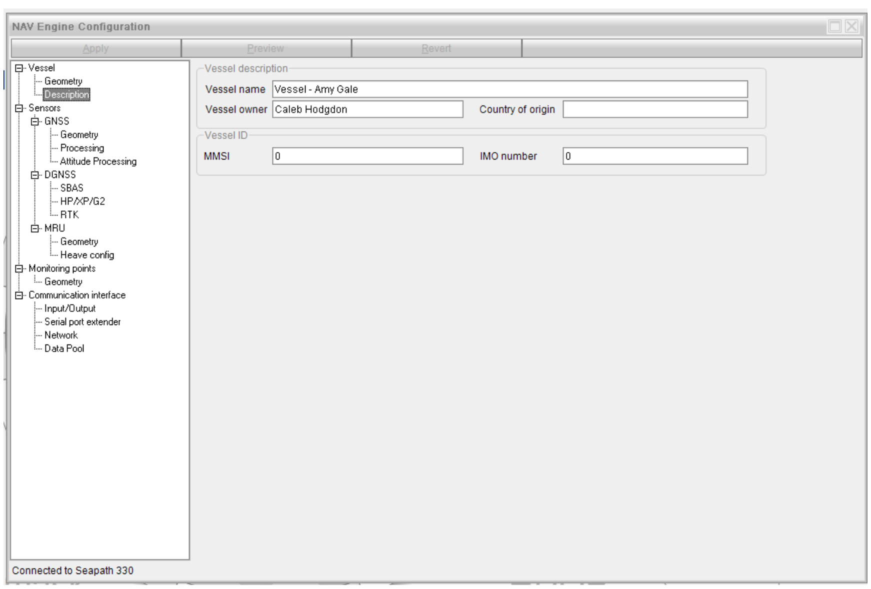
NOAA, 2014. NOS hydrographic surveys specifications and deliverables: U.S Department of Commerce National Oceanic and Atmospheric Administration. Page 89.

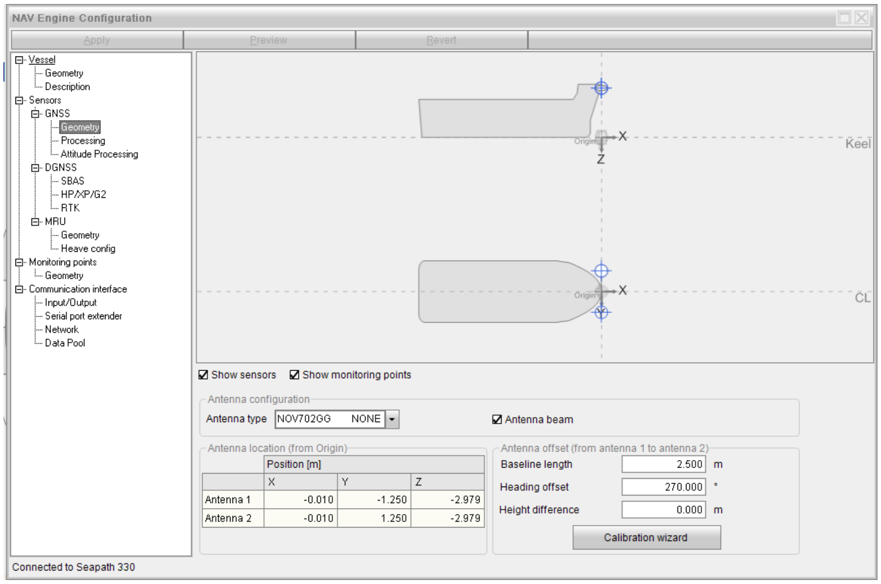
Ozmon, I.M., 2016. Maine Coastal Mapping Initiative: 2015 Benthic Habitat Classification Report (Manuscript). Maine Coastal Program, Augusta, ME.

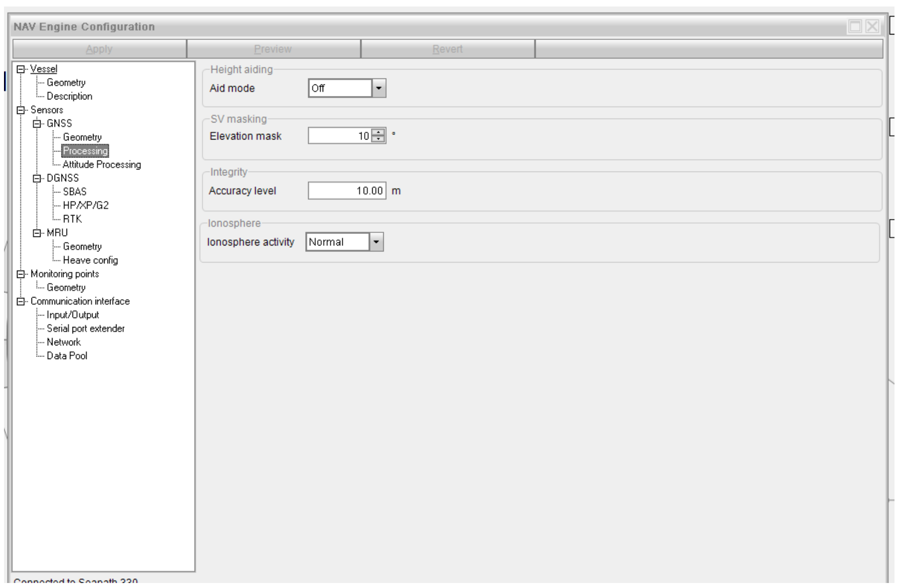
U.S. Department of the Interior, 2014. Proposed Geophysical and Geological Activities in the Atlantic OCS to Identify Sand Resources and Borrow Areas North Atlantic, Mid-Atlantic, and South Atlantic-Straits of Florida Planning Areas, *Final Environmental Assessment.* OCS EIS/EA BOEM 2013-219 U.S. Department of the Interior Bureau of Ocean Energy Management Division of Environmental Assessment Herndon, VA, January 2014.

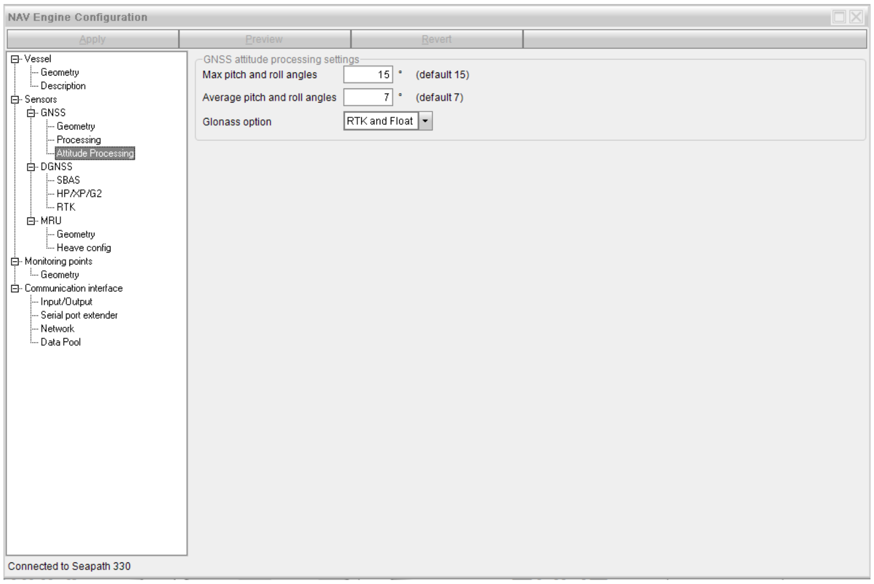
Appendix A – Configuration settings for Seapath 330

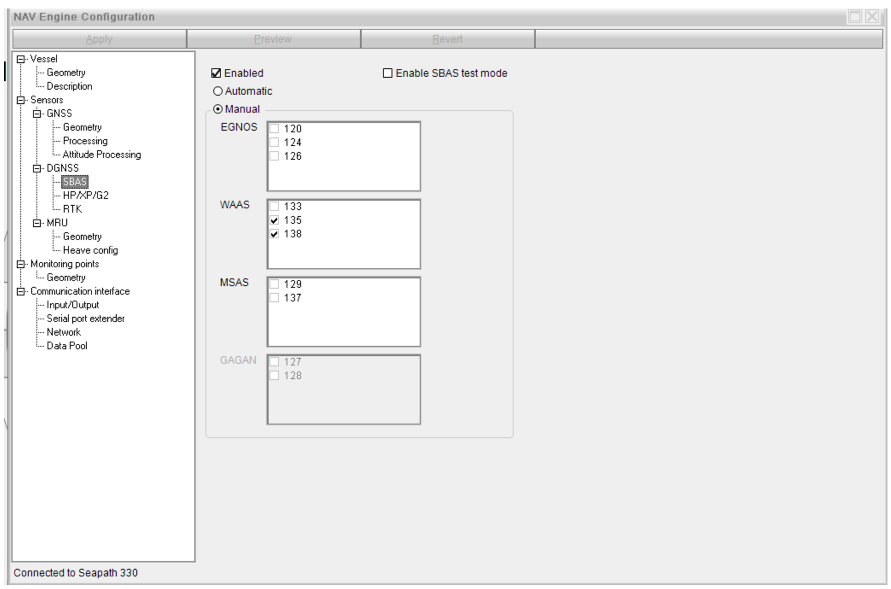


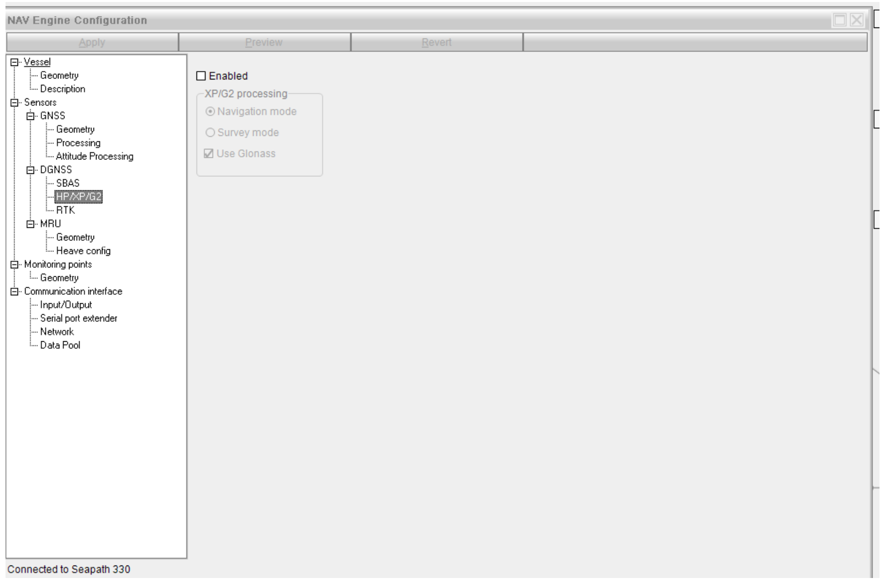


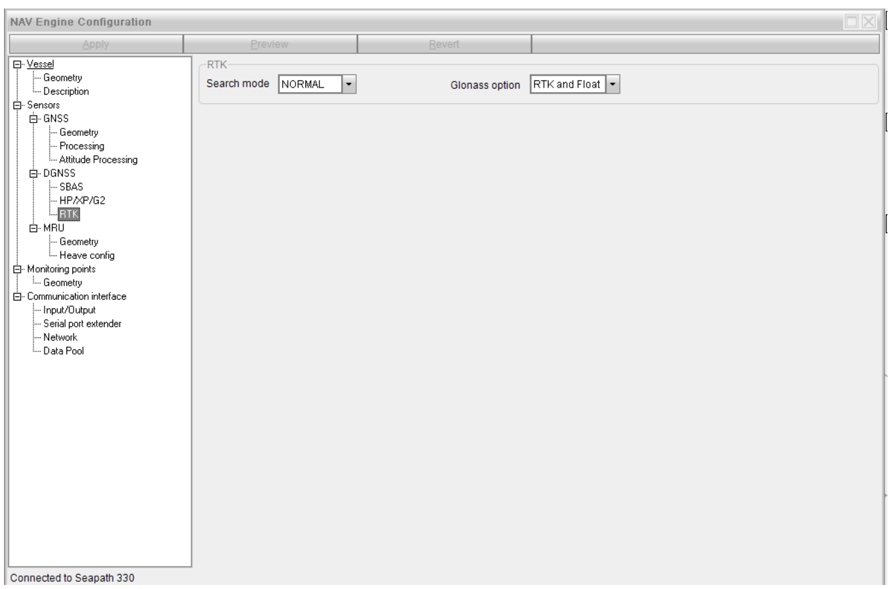

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
X
Z
Keel
X
CL
Show sensors
Show monitoring points
Antenna configuration
Antenna type NOV702GG NONE
Antenna beam
Antenna location (from Origin)
Position [m]
X Y Z
Antenna 1 -0.010 -1.250 -2.979
Antenna 2 -0.010 1.250 -2.979
Antenna offset (from antenna 1 to antenna 2)
Baseline length 2.500 m
Heading offset 270.000 °
Height difference 0.000 m
Calibration wizard
Connected to Seapath 330

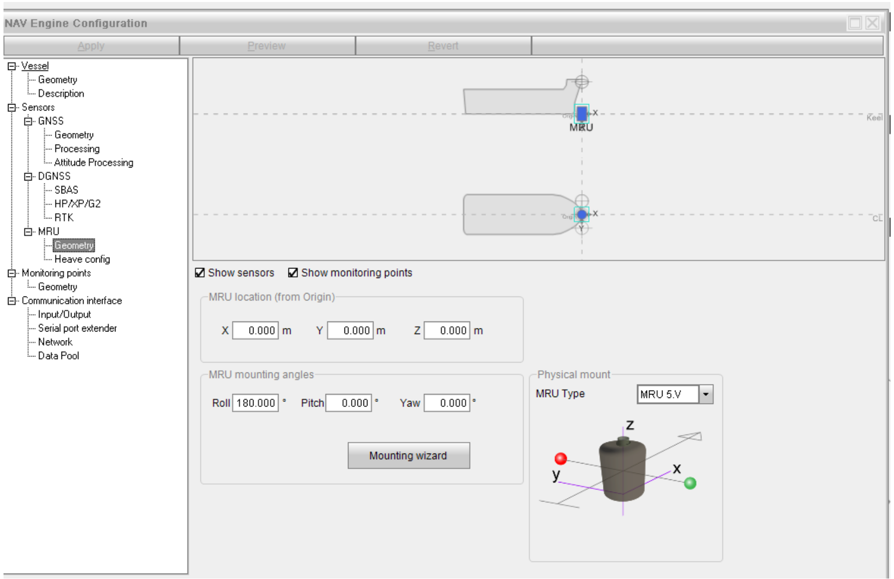

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Height aiding
Aid mode Off
SV masking
Elevation mask 10 °
Integrity
Accuracy level 10.00 m
Ionosphere
Ionosphere activity Normal


NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
GNSS attitude processing settings
Max pitch and roll angles 15 ° (default 15)
Average pitch and roll angles 7 ° (default 7)
Glonass option RTK and Float
Connected to Seapath 330

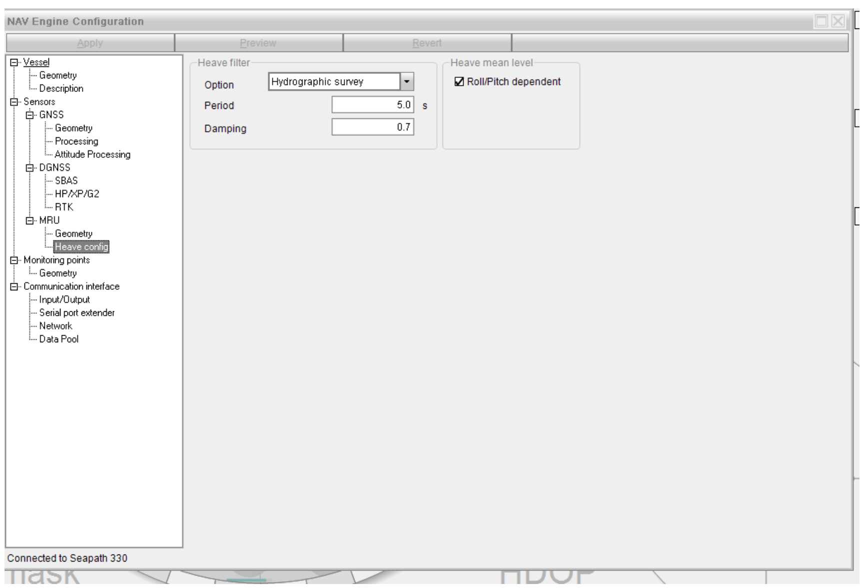

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Enabled
Enable SBAS test mode
Automatic
Manual
EGNOS
120
124
126
WAAS
133
135
138
MSAS
129
137
GAGAN
127
128
Connected to Seapath 330


NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Enabled
XP/G2 processing
Navigation mode
Survey mode
Use Glonass
Connected to Seapath 330

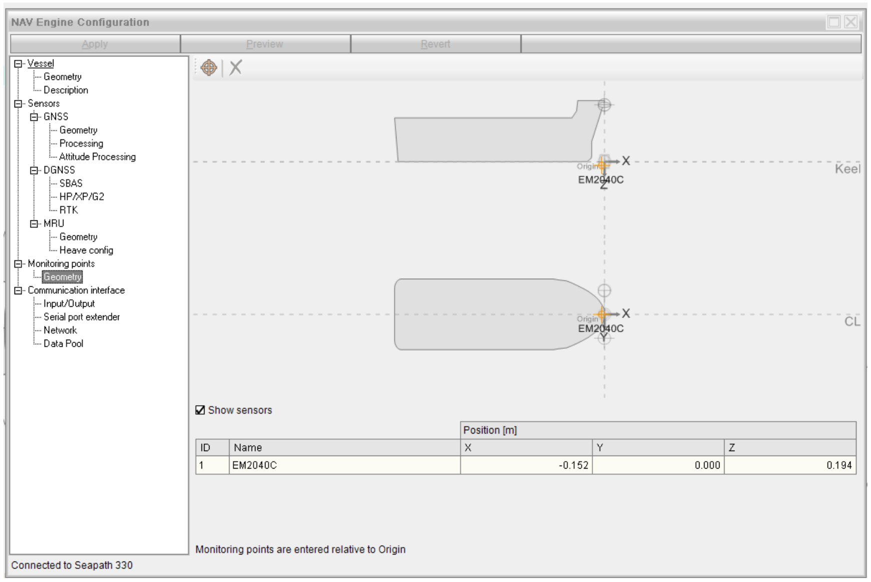

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
RTK
Search mode
NORMAL
Glonass option
RTK and Float
Connected to Seapath 330

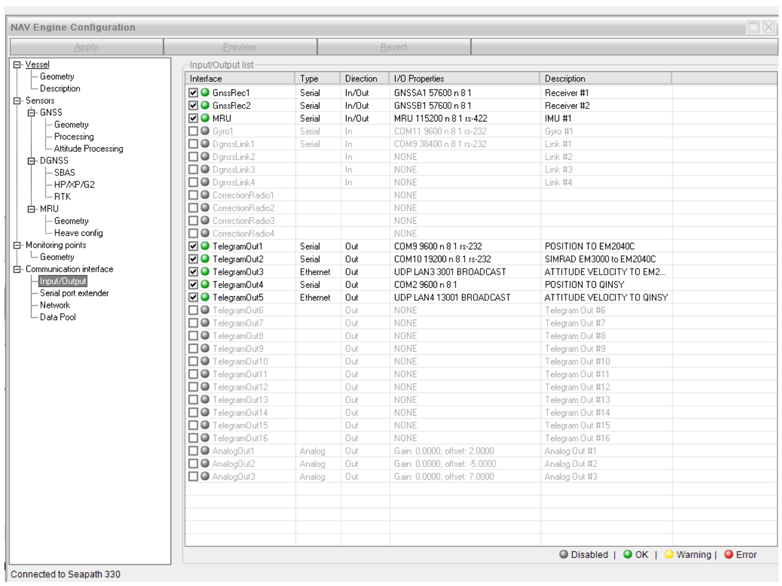


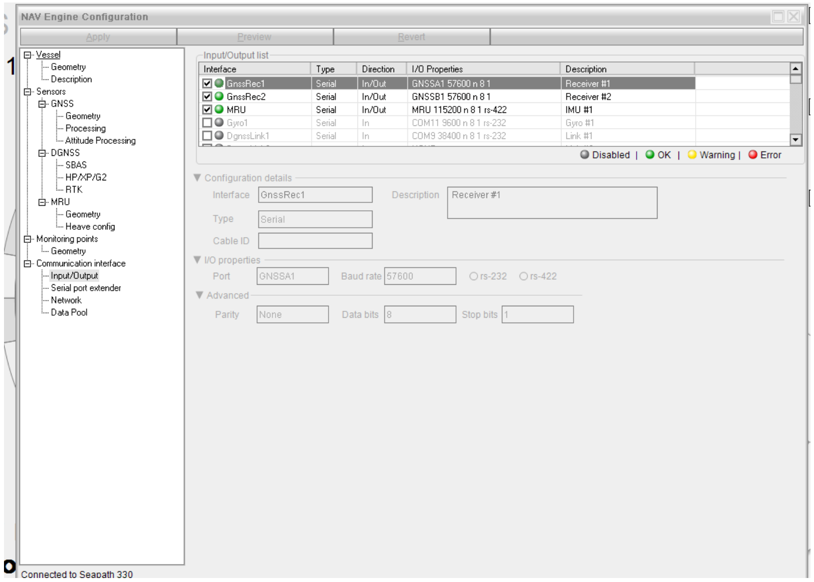
NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
MRU
Show sensors
Show monitoring points
MRU location (from Origin)
X 0.000 m
Y 0.000 m
Z 0.000 m
MRU mounting angles
Roll 180.000 °
Pitch 0.000 °
Yaw 0.000 °
Mounting wizard
Physical mount
MRU Type
MRU 5.V

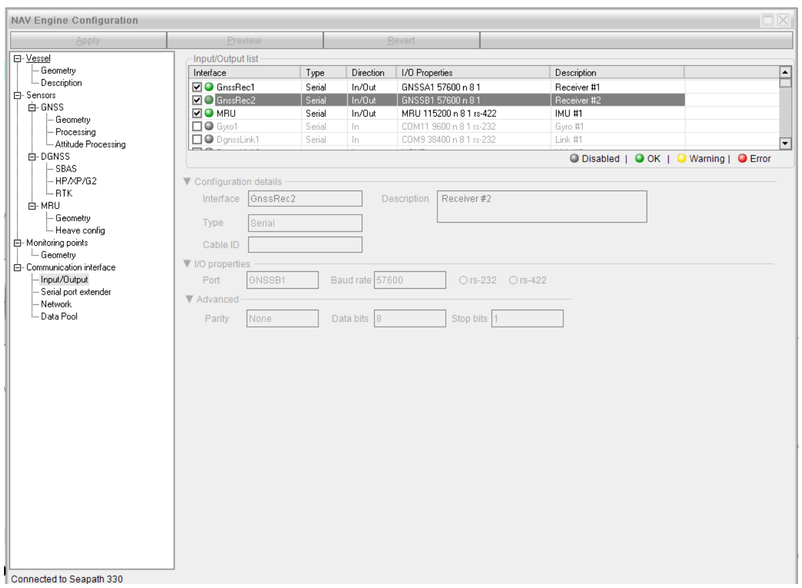


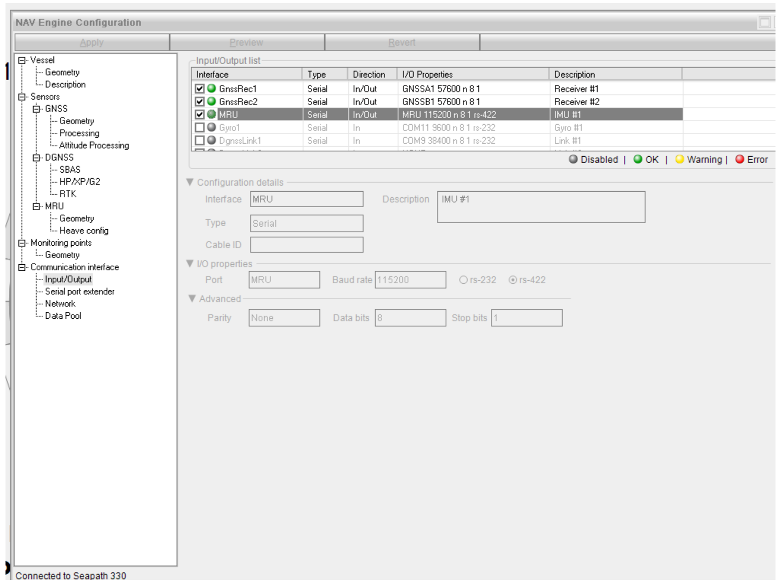
NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Heave filter
Option
Hydrographic survey
Period
5.0
s
Damping
0.7
Heave mean level
Roll/Pitch dependent
Connected to Seapath 330

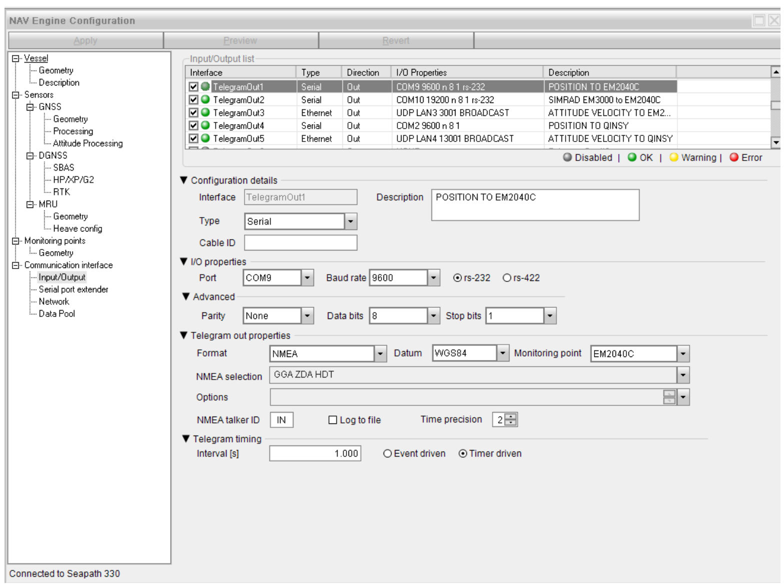

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
X
Keel
EM2040C
X
CL
EM2040C
Show sensors
Position [m]
ID
Name
X
Y
Z
1
EM2040C
-0.152
0.000
0.194
Monitoring points are entered relative to Origin
Connected to Seapath 330

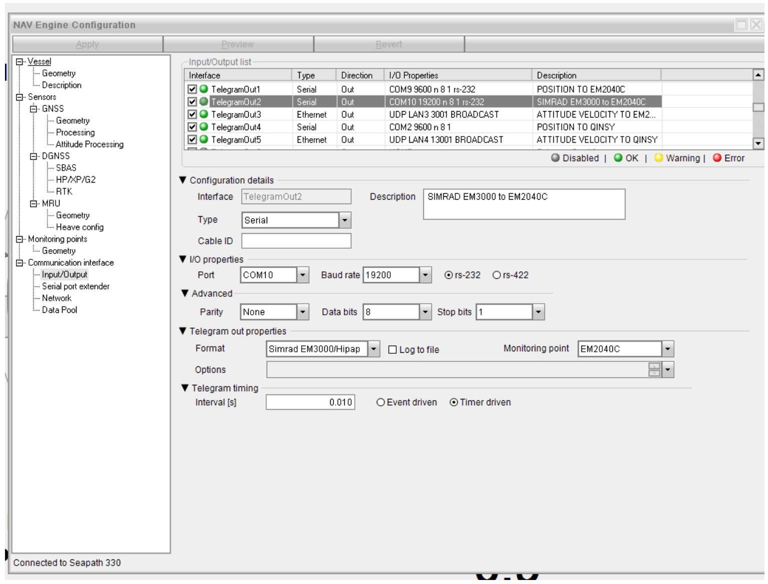

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface | Type | Direction | I/O Properties | Description
GnssRec1 | Serial | In/Out | GNSSA1 57600 n 8 1 | Receiver #1
GnssRec2 | Serial | In/Out | GNSSB1 57600 n 8 1 | Receiver #2
MRU | Serial | In/Out | MRU 115200 n 8 1 rs-422 | IMU #1
Gyro1 | Serial | In | COM11 9600 n 8 1 rs-232 | Gyro #1
DgnssLink1 | Serial | In | COM9 38400 n 8 1 rs-232 | Link #1
DgnssLink2 | In | NONE | Link #2
DgnssLink3 | In | NONE | Link #3
DgnssLink4 | In | NONE | Link #4
CorrectionRadio1 | NONE
CorrectionRadio2 | NONE
CorrectionRadio3 | NONE
CorrectionRadio4 | NONE
TelegramOut1 | Serial | Out | COM9 9600 n 8 1 rs-232 | POSITION TO EM2040C
TelegramOut2 | Serial | Out | COM10 19200 n 8 1 rs-232 | SIMRAD EM3000 to EM2040C
TelegramOut3 | Ethernet | Out | UDP LAN3 3001 BROADCAST | ATTITUDE VELOCITY TO EM2...
TelegramOut4 | Serial | Out | COM2 9600 n 8 1 | POSITION TO QINSY
TelegramOut5 | Ethernet | Out | UDP LAN4 13001 BROADCAST | ATTITUDE VELOCITY TO QINSY
TelegramOut6 | Out | NONE | Telegram Out #6
TelegramOut7 | Out | NONE | Telegram Out #7
TelegramOut8 | Out | NONE | Telegram Out #8
TelegramOut9 | Out | NONE | Telegram Out #9
TelegramOut10 | Out | NONE | Telegram Out #10
TelegramOut11 | Out | NONE | Telegram Out #11
TelegramOut12 | Out | NONE | Telegram Out #12
TelegramOut13 | Out | NONE | Telegram Out #13
TelegramOut14 | Out | NONE | Telegram Out #14
TelegramOut15 | Out | NONE | Telegram Out #15
TelegramOut16 | Out | NONE | Telegram Out #16
AnalogOut1 | Analog | Out | Gain: 0.0000, offset: 2.0000 | Analog Out #1
AnalogOut2 | Analog | Out | Gain: 0.0000, offset: -5.0000 | Analog Out #2
AnalogOut3 | Analog | Out | Gain: 0.0000, offset: 7.0000 | Analog Out #3
Disabled | OK | Warning | Error
Connected to Seapath 330

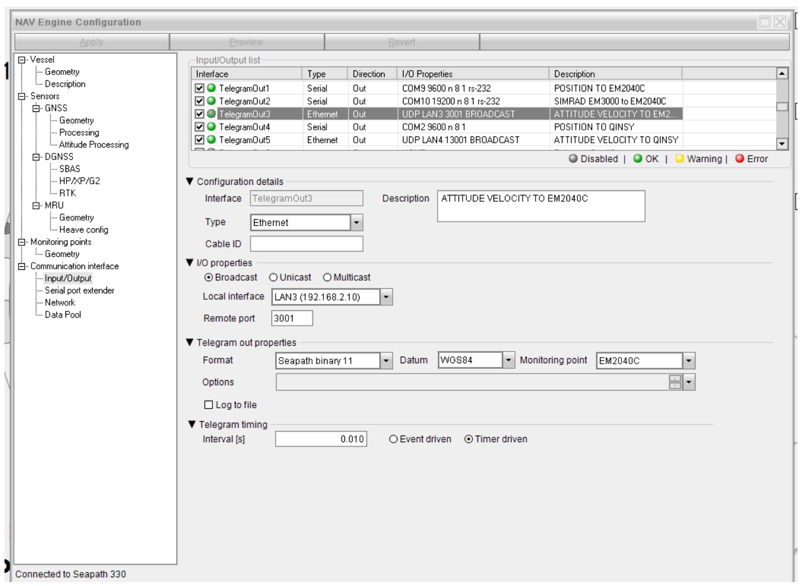

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface | Type | Direction | I/O Properties | Description
GnssRec1 | Serial | In/Out | GNSSA1 57600 n 8 1 | Receiver #1
GnssRec2 | Serial | In/Out | GNSSB1 57600 n 8 1 | Receiver #2
MRU | Serial | In/Out | MRU 115200 n 8 1 rs-422 | IMU #1
Gyro1 | Serial | In | COM11 9600 n 8 1 rs-232 | Gyro #1
DgnssLink1 | Serial | In | COM9 38400 n 8 1 rs-232 | Link #1
Disabled | OK | Warning | Error
Configuration details
Interface GnssRec1
Description Receiver #1
Type Serial
Cable ID
I/O properties
Port GNSSA1
Baud rate 57600
rs-232
rs-422
Advanced
Parity None
Data bits 8
Stop bits 1
Connected to Seapath 330

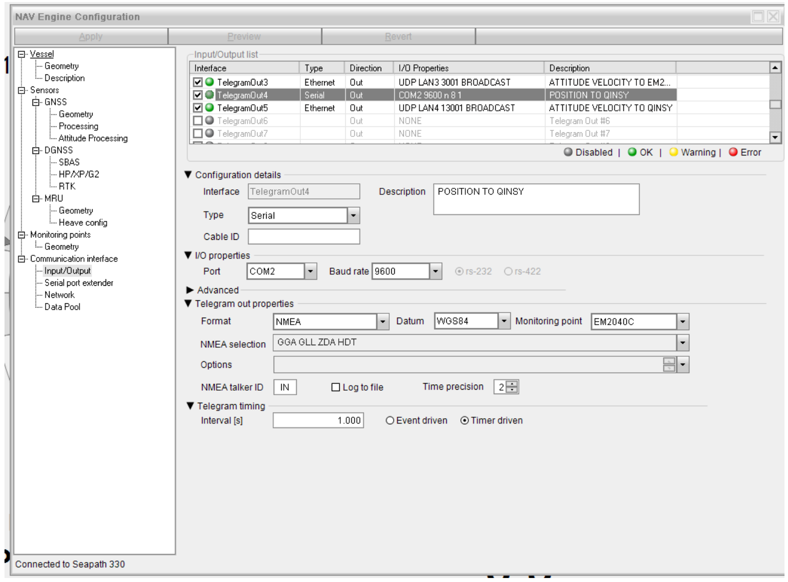

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface | Type | Direction | I/O Properties | Description
GnssRec1 | Serial | In/Out | GNSSA1 57600 n 8 1 | Receiver #1
GnssRec2 | Serial | In/Out | GNSSB1 57600 n 8 1 | Receiver #2
MRU | Serial | In/Out | MRU 115200 n 8 1 rs-422 | IMU #1
Gyro1 | Serial | In | COM11 9600 n 8 1 rs-232 | Gyro #1
DgnssLink1 | Serial | In | COM9 38400 n 8 1 rs-232 | Link #1
Disabled | OK | Warning | Error
Configuration details
Interface GnssRec2
Description Receiver #2
Type Serial
Cable ID
I/O properties
Port GNSSB1
Baud rate 57600
rs-232
rs-422
Advanced
Parity None
Data bits 8
Stop bits 1
Connected to Seapath 330

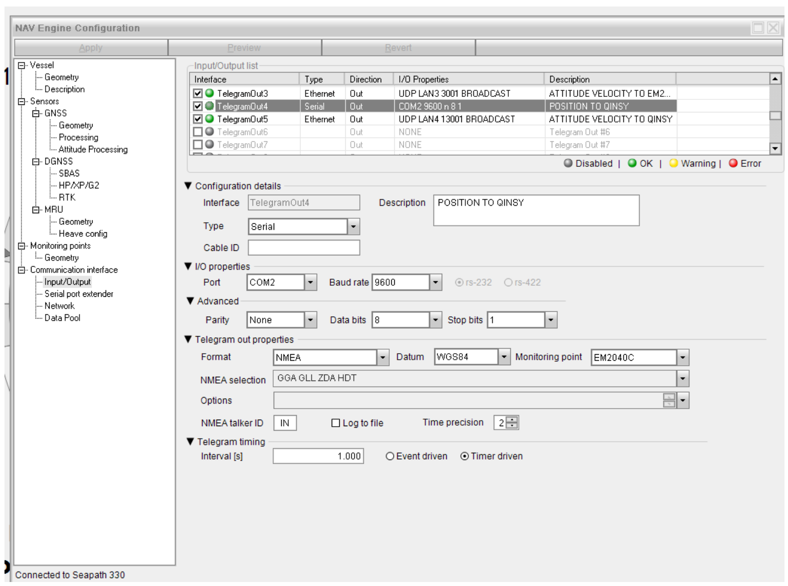

NAV Engine Configuration
Apply
Preview
Revert
Input/Output list
Configuration details
I/O properties
Advanced
Connected to Seapath 330

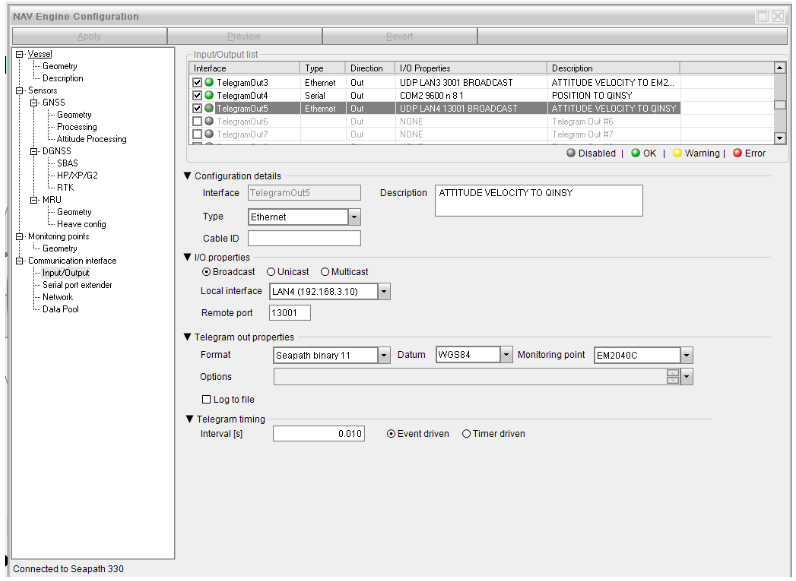

NAV Engine Configuration
Apply
Preview
Revert
Input/Output list
Configuration details
I/O properties
Advanced
Telegram out properties
Telegram timing
Connected to Seapath 330

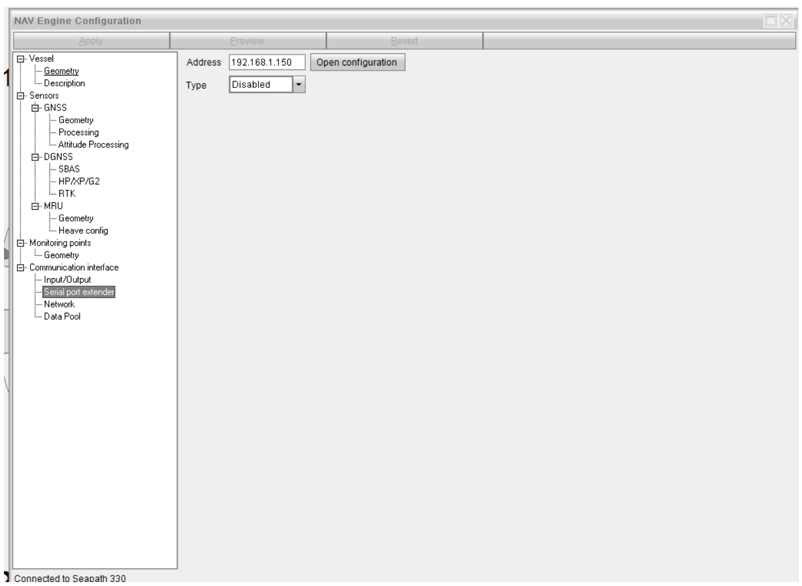

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
Type
Direction
I/O Properties
Description
TelegramOut1 Serial Out COM9 9600 n 8 1 rs-232 POSITION TO EM2040C
TelegramOut2 Serial Out COM10 19200 n 8 1 rs-232 SIMRAD EM3000 to EM2040C
TelegramOut3 Ethernet Out UDP LAN3 3001 BROADCAST ATTITUDE VELOCITY TO EM2...
TelegramOut4 Serial Out COM2 9600 n 8 1 POSITION TO QINSY
TelegramOut5 Ethernet Out UDP LAN4 13001 BROADCAST ATTITUDE VELOCITY TO QINSY
Disabled | OK | Warning | Error
Configuration details
Interface
TelegramOut2
Description
SIMRAD EM3000 to EM2040C
Type
Serial
Cable ID
I/O properties
Port
COM10
Baud rate
19200
rs-232
rs-422
Advanced
Parity
None
Data bits
8
Stop bits
1
Telegram out properties
Format
Simrad EM3000/Hipap
Log to file
Monitoring point
EM2040C
Options
Telegram timing
Interval [s]
0.010
Event driven
Timer driven
Connected to Seapath 330

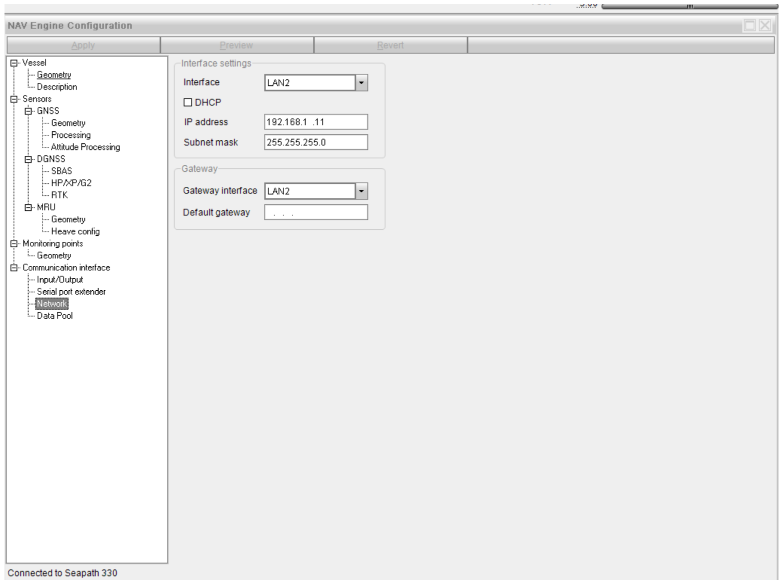

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
Type
Direction
I/O Properties
Description
TelegramOut1 Serial Out COM9 9600 n 8 1 rs-232 POSITION TO EM2040C
TelegramOut2 Serial Out COM10 19200 n 8 1 rs-232 SIMRAD EM3000 to EM2040C
TelegramOut3 Ethernet Out UDP LAN3 3001 BROADCAST ATTITUDE VELOCITY TO EM2...
TelegramOut4 Serial Out COM2 9600 n 8 1 POSITION TO QINSY
TelegramOut5 Ethernet Out UDP LAN4 13001 BROADCAST ATTITUDE VELOCITY TO QINSY
Disabled | OK | Warning | Error
Configuration details
Interface
TelegramOut3
Description
ATTITUDE VELOCITY TO EM2040C
Type
Ethernet
Cable ID
I/O properties
Broadcast
Unicast
Multicast
Local interface
LAN3 (192.168.2.10)
Remote port
3001
Telegram out properties
Format
Seapath binary 11
Datum
WGS84
Monitoring point
EM2040C
Options
Log to file
Telegram timing
Interval [s]
0.010
Event driven
Timer driven
Connected to Seapath 330

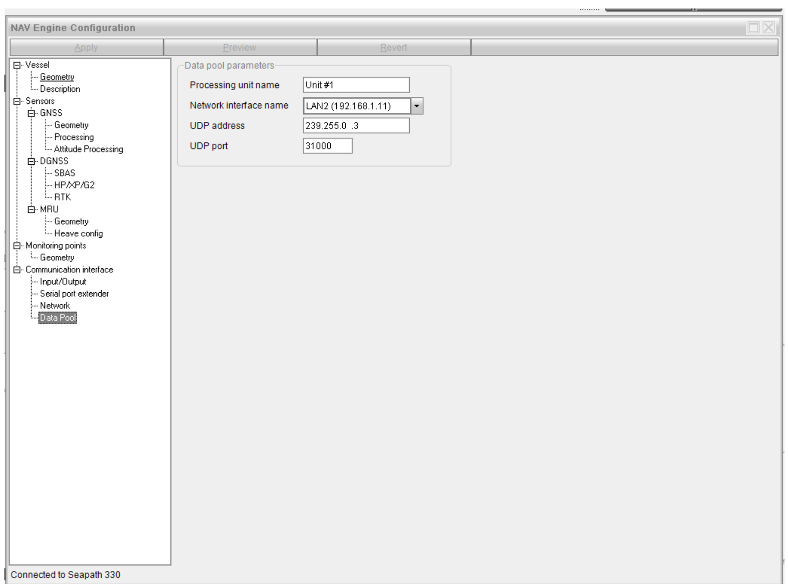

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface Type Direction I/O Properties Description
TelegramOut3 Ethernet Out UDP LAN3 3001 BROADCAST ATTITUDE VELOCITY TO EM2...
TelegramOut4 Serial Out COM2 9600 n 8 1 POSITION TO QINSY
TelegramOut5 Ethernet Out UDP LAN4 13001 BROADCAST ATTITUDE VELOCITY TO QINSY
TelegramOut6 Out NONE Telegram Out #6
TelegramOut7 Out NONE Telegram Out #7
Disabled | OK | Warning | Error
Configuration details
Interface TelegramOut4
Description POSITION TO QINSY
Type Serial
Cable ID
I/O properties
Port COM2
Baud rate 9600
rs-232
rs-422
Advanced
Telegram out properties
Format NMEA
Datum WGS84
Monitoring point EM2040C
NMEA selection GGA GLL ZDA HDT
Options
NMEA talker ID IN
Log to file
Time precision 2
Telegram timing
Interval [s] 1.000
Event driven
Timer driven
Connected to Seapath 330


NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface Type Direction I/O Properties Description
TelegramOut3 Ethernet Out UDP LAN3 3001 BROADCAST ATTITUDE VELOCITY TO EM2...
TelegramOut4 Serial Out COM2 9600 n 8 1 POSITION TO QINSY
TelegramOut5 Ethernet Out UDP LAN4 13001 BROADCAST ATTITUDE VELOCITY TO QINSY
TelegramOut6 Out NONE Telegram Out #6
TelegramOut7 Out NONE Telegram Out #7
Disabled | OK | Warning | Error
Configuration details
Interface TelegramOut4
Description POSITION TO QINSY
Type Serial
Cable ID
I/O properties
Port COM2
Baud rate 9600
rs-232
rs-422
Advanced
Parity None
Data bits 8
Stop bits 1
Telegram out properties
Format NMEA
Datum WGS84
Monitoring point EM2040C
NMEA selection GGA GLL ZDA HDT
Options
NMEA talker ID IN
Log to file
Time precision 2
Telegram timing
Interval [s] 1.000
Event driven
Timer driven
Connected to Seapath 330

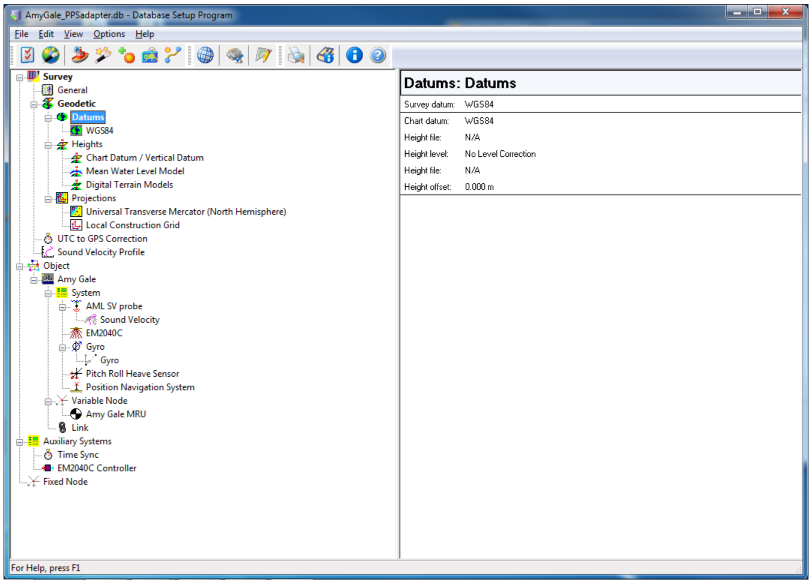

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
Type
Direction
I/O Properties
Description
TelegramOut3
Ethernet
Out
UDP LAN3 3001 BROADCAST
ATTITUDE VELOCITY TO EM2...
TelegramOut4
Serial
Out
COM2 9600 n 8 1
POSITION TO QINSY
TelegramOut5
Ethernet
Out
UDP LAN4 13001 BROADCAST
ATTITUDE VELOCITY TO QINSY
Disabled | OK | Warning | Error
Configuration details
Interface
TelegramOut5
Description
ATTITUDE VELOCITY TO QINSY
Type
Ethernet
Cable ID
I/O properties
Broadcast
Unicast
Multicast
Local interface
LAN4 (192.168.3.10)
Remote port
13001
Telegram out properties
Format
Seapath binary 11
Datum
WGS84
Monitoring point
EM2040C
Options
Log to file
Telegram timing
Interval [s]
0.010
Event driven
Timer driven
Connected to Seapath 330

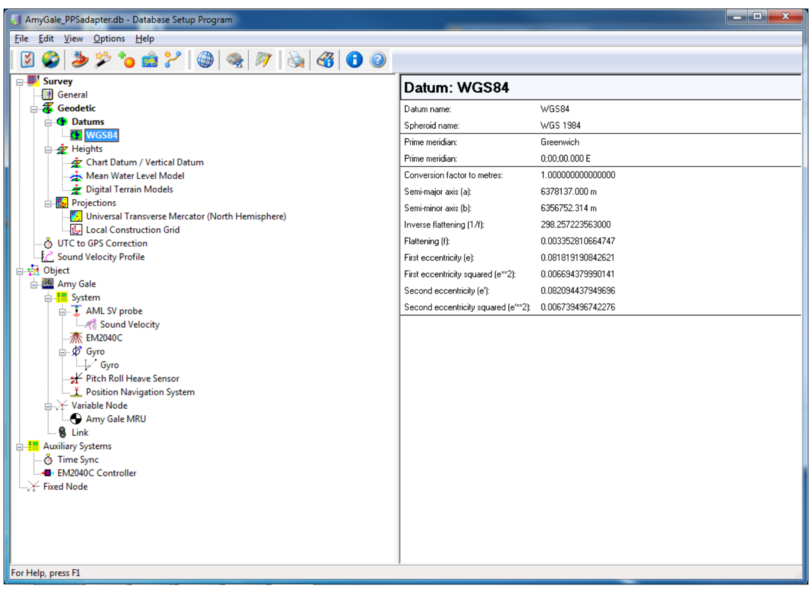

NAV Engine Configuration
Apply
Preview
Revert
Address
192.168.1.150
Open configuration
Type
Disabled
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Connected to Seapath 330

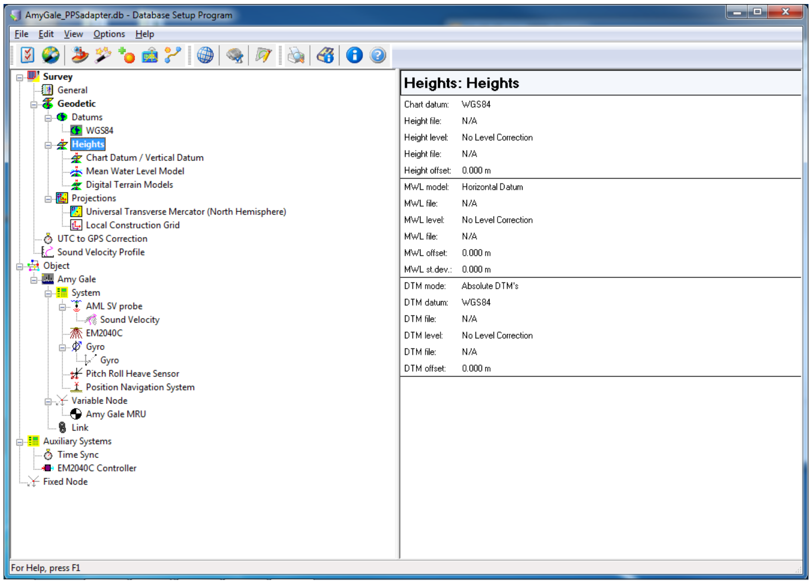

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Interface settings
Interface
LAN2
DHCP
IP address
192.168.1 .11
Subnet mask
255.255.255.0
Gateway
Gateway interface
LAN2
Default gateway
Connected to Seapath 330

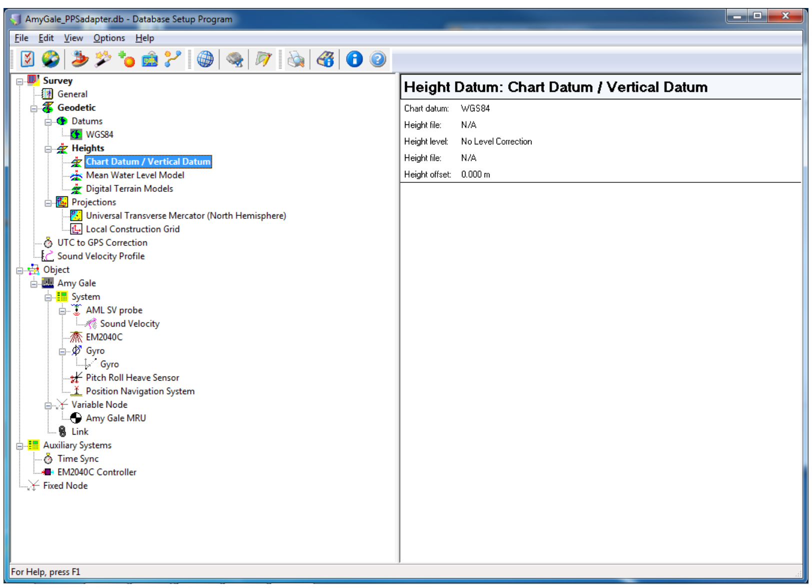

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Data pool parameters
Processing unit name
Unit #1
Network interface name
LAN2 (192.168.1.11)
UDP address
239.255.0 .3
UDP port
31000
Connected to Seapath 330

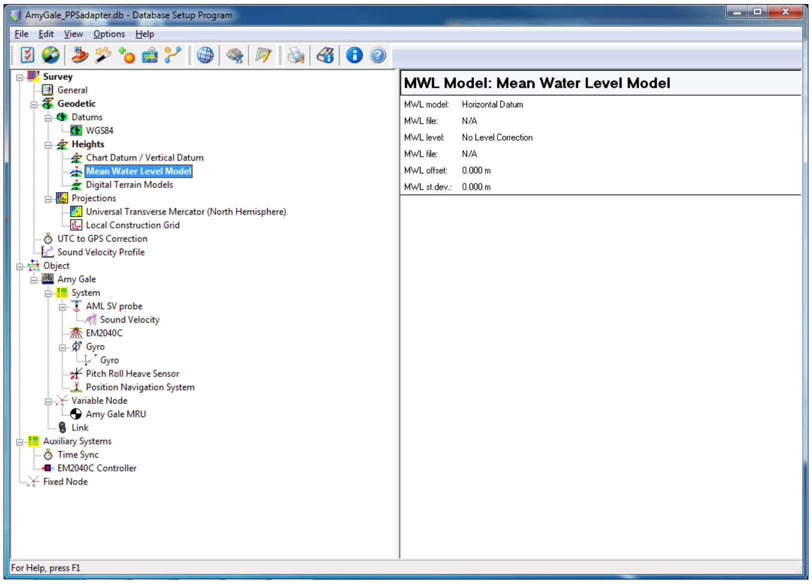
Appendix B – Template database settings in QINSy

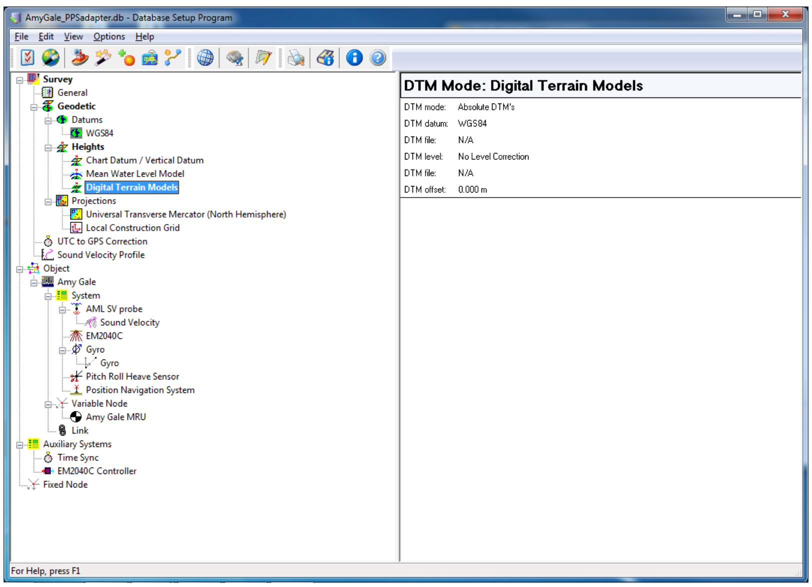


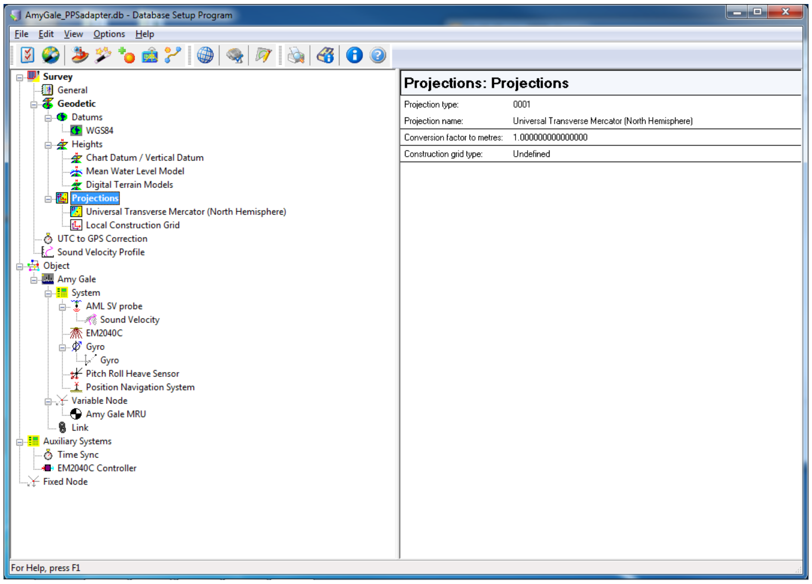


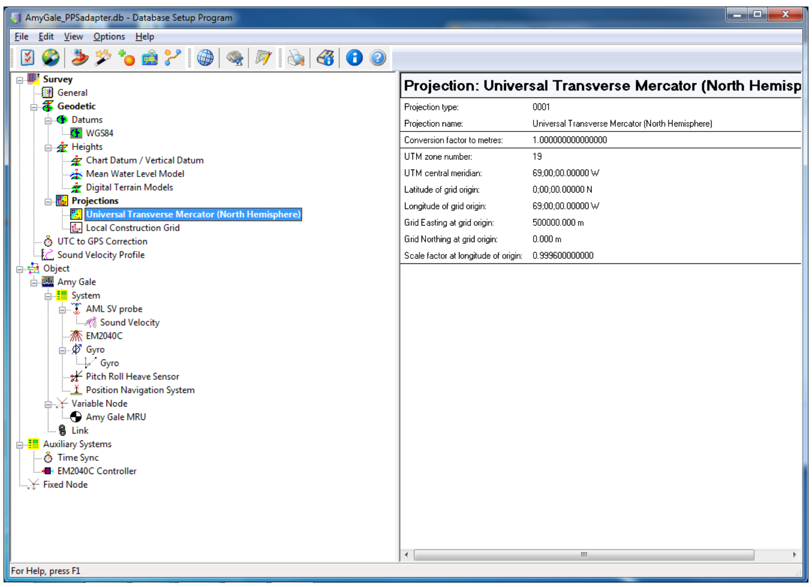

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Heights: Heights
Chart datum: WGS84
Height file: N/A
Height level: No Level Correction
Height file: N/A
Height offset: 0.000 m
MWL model: Horizontal Datum
MWL file: N/A
MWL level: No Level Correction
MWL file: N/A
MWL offset: 0.000 m
MWL st.dev.: 0.000 m
DTM mode: Absolute DTM's
DTM datum: WGS84
DTM file: N/A
DTM level: No Level Correction
DTM file: N/A
DTM offset: 0.000 m
For Help, press F1

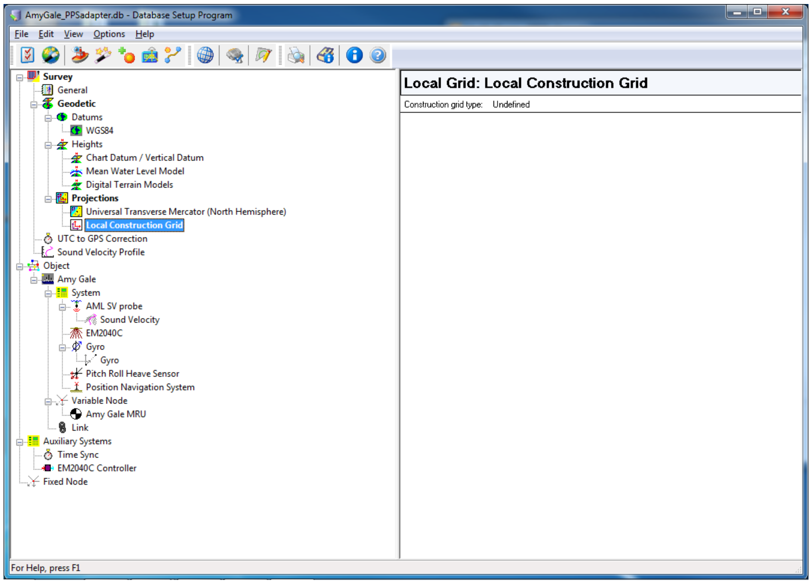

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Height Datum: Chart Datum / Vertical Datum
Chart datum: WGS84
Height file: N/A
Height level: No Level Correction
Height file: N/A
Height offset: 0.000 m
For Help, press F1

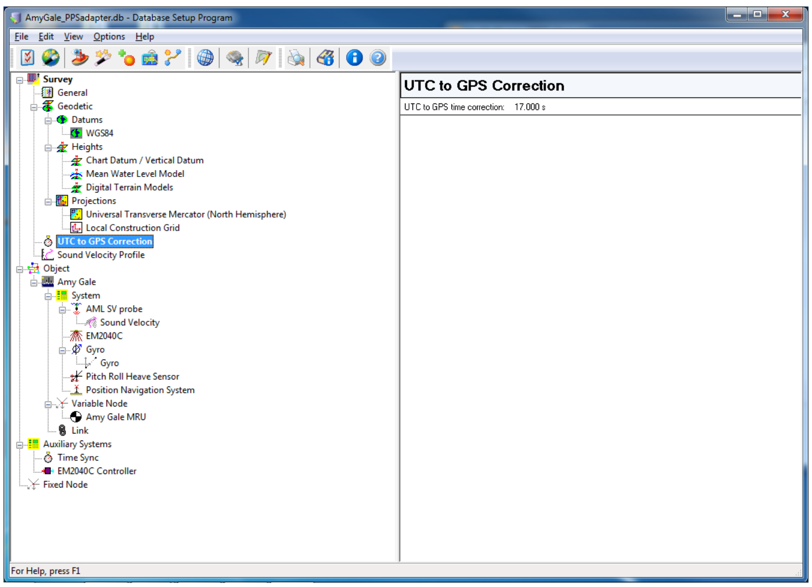

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
MWL Model: Mean Water Level Model
MWL model: Horizontal Datum
MWL file: N/A
MWL level: No Level Correction
MWL file: N/A
MWL offset: 0.000 m
MWL st.dev.: 0.000 m
For Help, press F1


AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
DTM Mode: Digital Terrain Models
DTM mode: Absolute DTM's
DTM datum: WGS84
DTM file: N/A
DTM level: No Level Correction
DTM file: N/A
DTM offset: 0.000 m
For Help, press F1

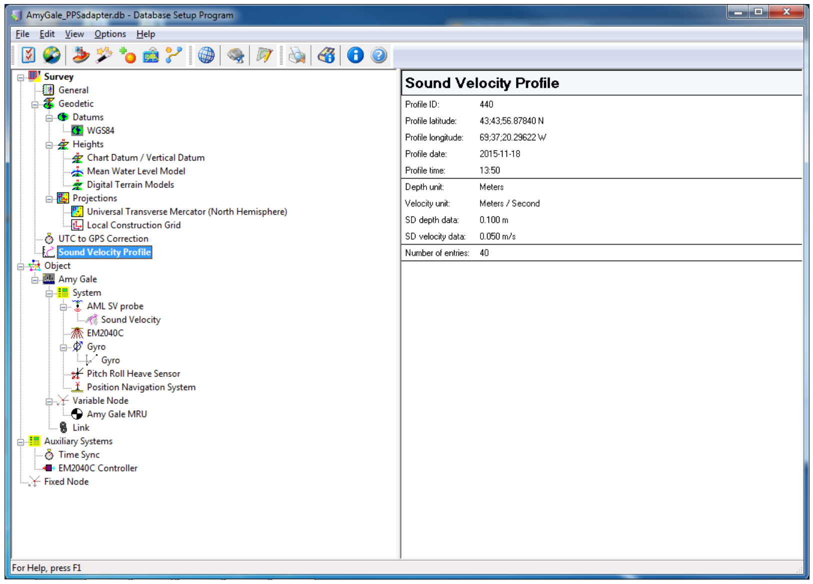

AmyGale_PPSadapter.db - Database Setup Program
Projections: Projections
Projection type: 0001
Projection name: Universal Transverse Mercator (North Hemisphere)
Conversion factor to metres: 1.000000000000000
Construction grid type: Undefined
For Help, press F1

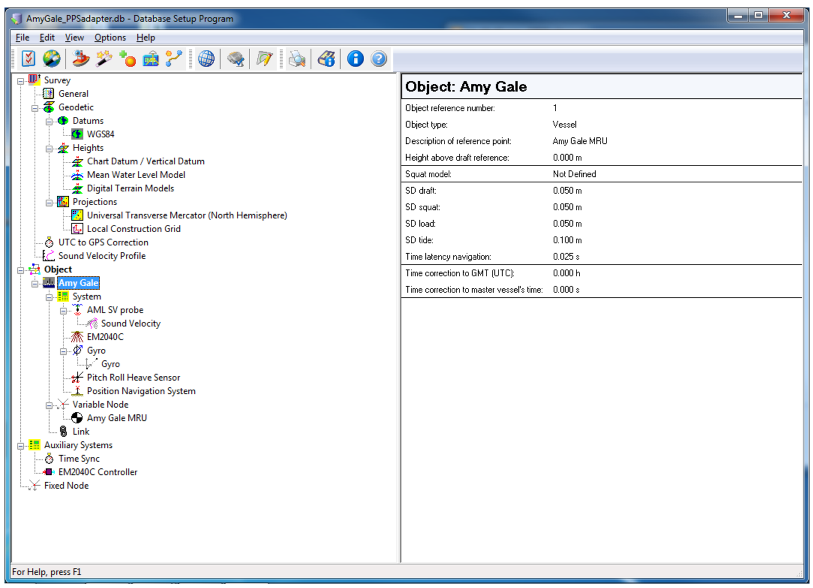

AmyGale_PPSadapter.db - Database Setup Program
Projection: Universal Transverse Mercator (North Hemisp
Projection type: 0001
Projection name: Universal Transverse Mercator (North Hemisphere)
Conversion factor to metres: 1.000000000000000
UTM zone number: 19
UTM central meridian: 69:00:00.00000 W
Latitude of grid origin: 0:00:00.00000 N
Longitude of grid origin: 69:00:00.00000 W
Grid Easting at grid origin: 500000.000 m
Grid Northing at grid origin: 0.000 m
Scale factor at longitude of origin: 0.999600000000
For Help, press F1

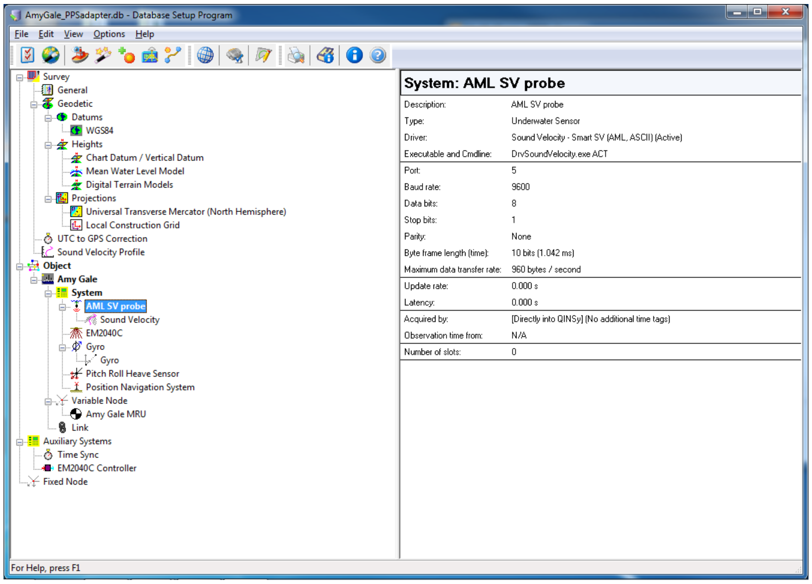


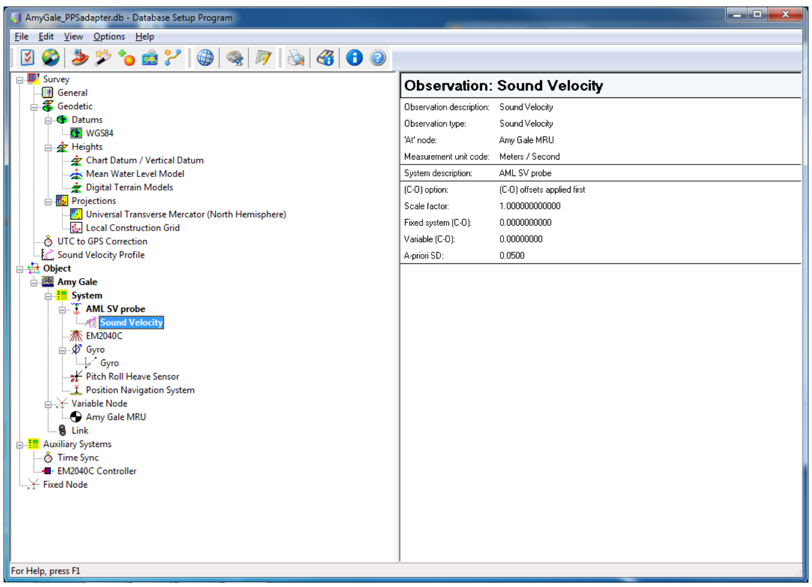


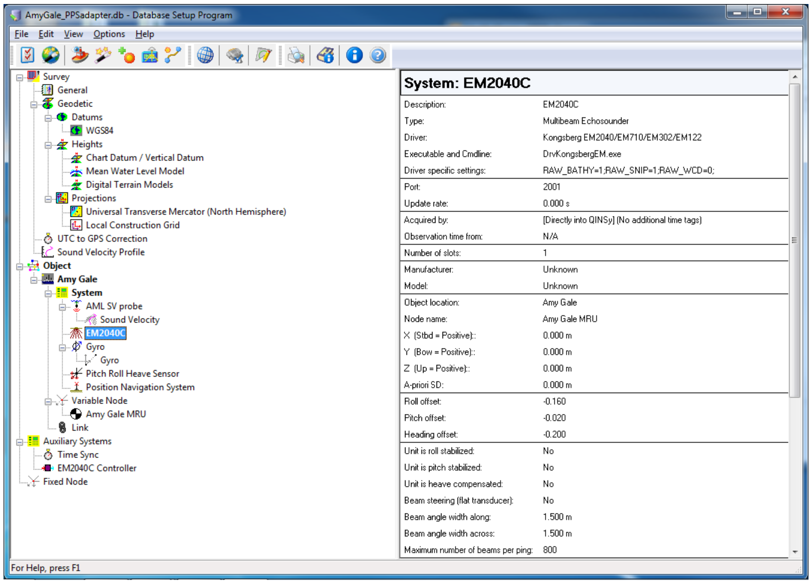
Note: As of July 1, 2015 UTC to GPS correction changed from 16 seconds to 17 seconds.

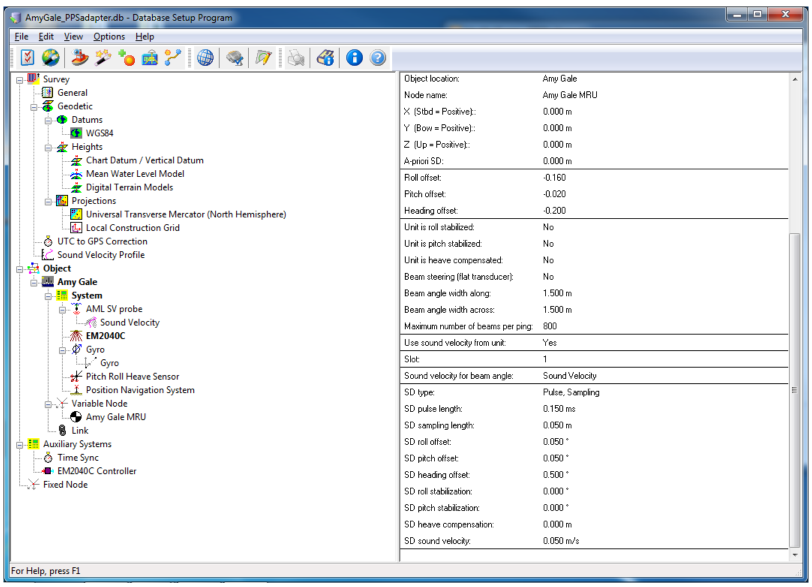

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Sound Velocity Profile
Profile ID: 440
Profile latitude: 43;43;56.87840 N
Profile longitude: 69;37;20.29622 W
Profile date: 2015-11-18
Profile time: 13:50
Depth unit: Meters
Velocity unit: Meters / Second
SD depth data: 0.100 m
SD velocity data: 0.050 m/s
Number of entries: 40
For Help, press F1

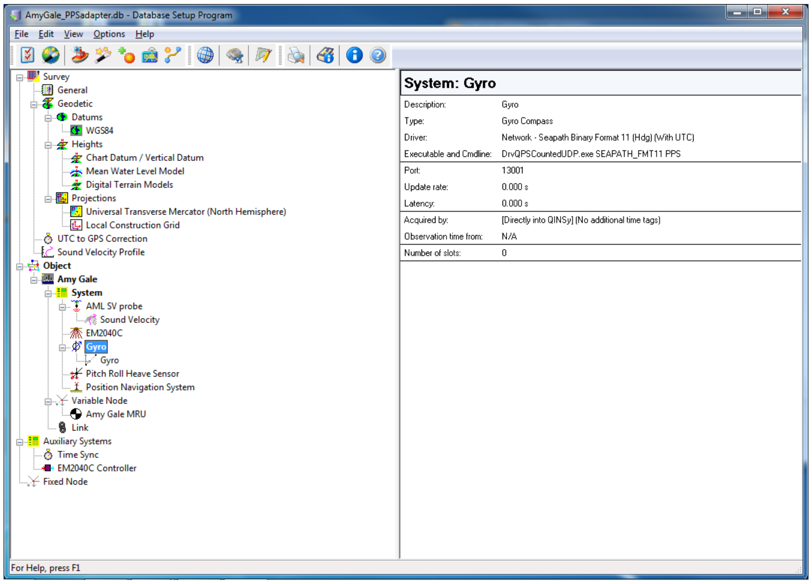

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Object: Amy Gale
Object reference number: 1
Object type: Vessel
Description of reference point: Amy Gale MRU
Height above draft reference: 0.000 m
Squat model: Not Defined
SD draft: 0.050 m
SD squat: 0.050 m
SD load: 0.050 m
SD tide: 0.100 m
Time latency navigation: 0.025 s
Time correction to GMT (UTC): 0.000 h
Time correction to master vessel's time: 0.000 s
For Help, press F1

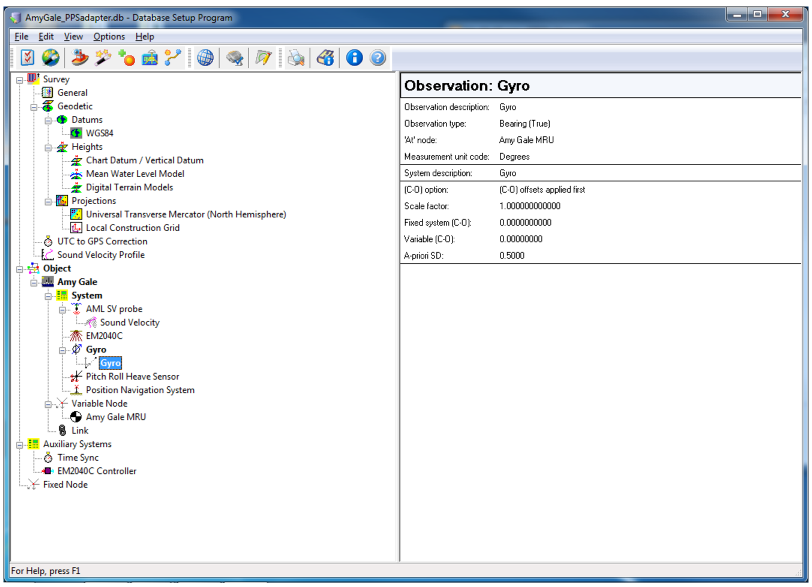

AmyGale_PPSadapter.db - Database Setup Program
System: AML SV probe
Description: AML SV probe
Type: Underwater Sensor
Driver: Sound Velocity - Smart SV (AML, ASCII) (Active)
Port: 5
Baud rate: 9600
Data bits: 8
Stop bits: 1
Parity: None
Update rate: 0.000 s
Latency: 0.000 s
Number of slots: 0
For Help, press F1

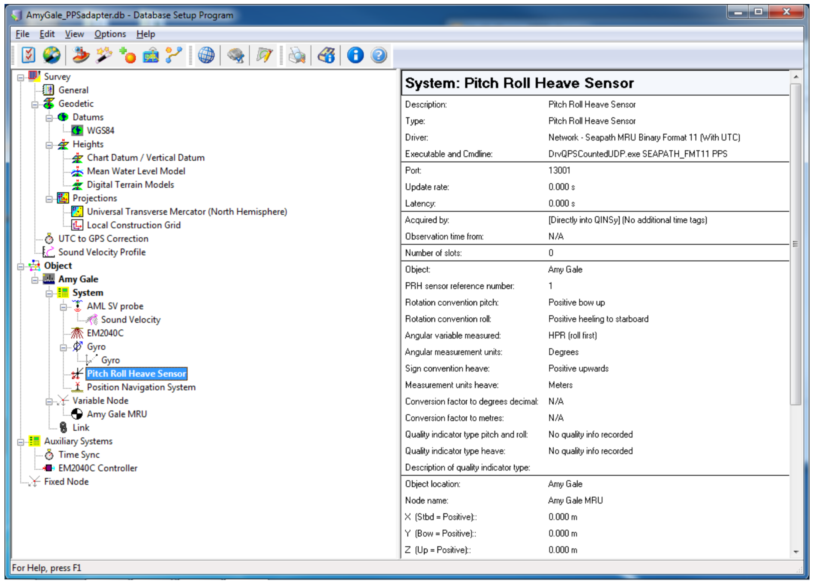

AmyGale_PPSadapter.db - Database Setup Program
Observation: Sound Velocity
Observation description: Sound Velocity
Observation type: Sound Velocity
'At' node: Amy Gale MRU
Measurement unit code: Meters / Second
System description: AML SV probe
Scale factor: 1.000000000000
A-priori SD: 0.0500
For Help, press F1

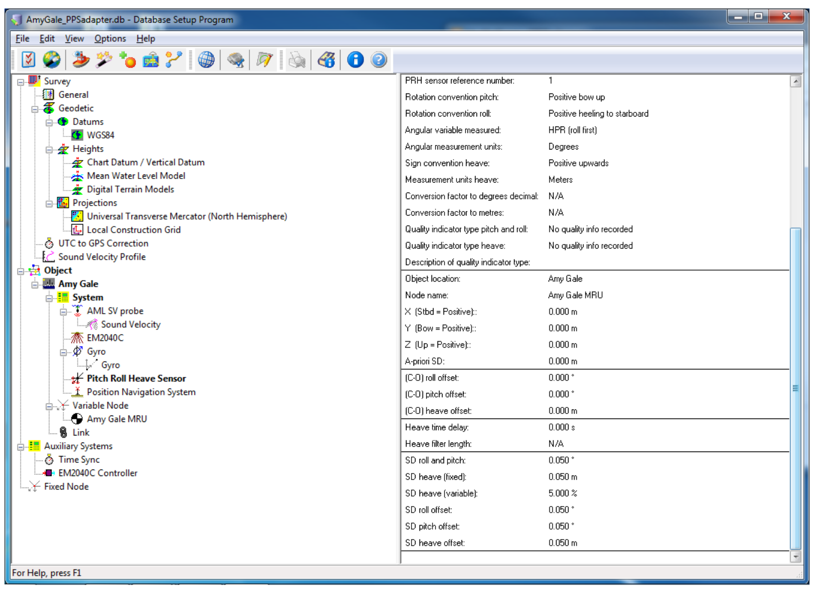

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
System: EM2040C
Description: EM2040C
Type: Multibeam Echosounder
Driver: Kongsberg EM2040/EM710/EM302/EM122
Executable and Cmdline: DrvKongsbergEM.exe
Driver specific settings: RAW_BATHY=1;RAW_SNIP=1;RAW_WCD=0;
Port: 2001
Update rate: 0.000 s
Acquired by: [Directly into QINSy] [No additional time tags]
Observation time from: N/A
Number of slots: 1
Manufacturer: Unknown
Model: Unknown
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): 0.000 m
Z (Up = Positive): 0.000 m
A-priori SD: 0.000 m
Roll offset: -0.160
Pitch offset: -0.020
Heading offset: -0.200
Unit is roll stabilized: No
Unit is pitch stabilized: No
Unit is heave compensated: No
Beam steering (flat transducer): No
Beam angle width along: 1.500 m
Beam angle width across: 1.500 m
Maximum number of beams per ping: 800
For Help, press F1

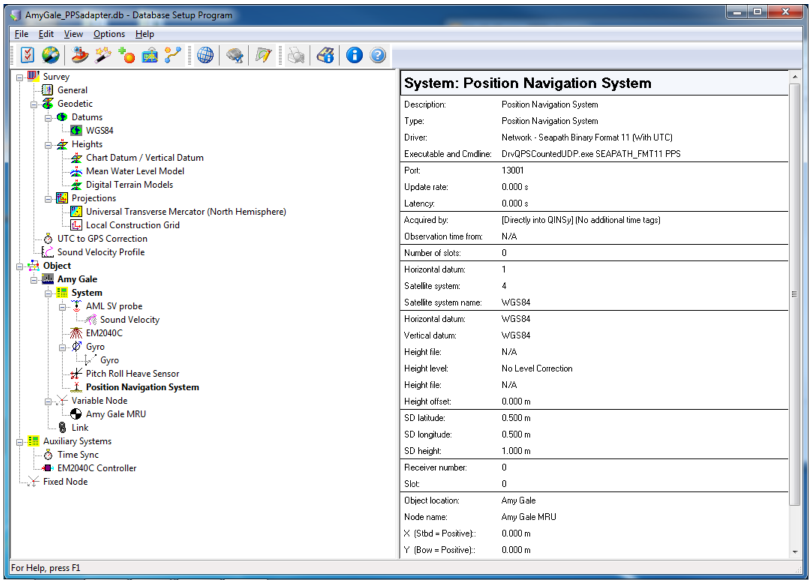

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): 0.000 m
Z (Up = Positive): 0.000 m
A-priori SD: 0.000 m
Roll offset: -0.160
Pitch offset: -0.020
Heading offset: -0.200
Unit is roll stabilized: No
Unit is pitch stabilized: No
Unit is heave compensated: No
Beam steering (flat transducer): No
Beam angle width along: 1.500 m
Beam angle width across: 1.500 m
Maximum number of beams per ping: 800
Use sound velocity from unit: Yes
Slot: 1
Sound velocity for beam angle: Sound Velocity
SD type: Pulse, Sampling
SD pulse length: 0.150 ms
SD sampling length: 0.050 m
SD roll offset: 0.050 °
SD pitch offset: 0.050 °
SD heading offset: 0.500 °
SD roll stabilization: 0.000 °
SD pitch stabilization: 0.000 °
SD heave compensation: 0.000 m
SD sound velocity: 0.050 m/s
For Help, press F1

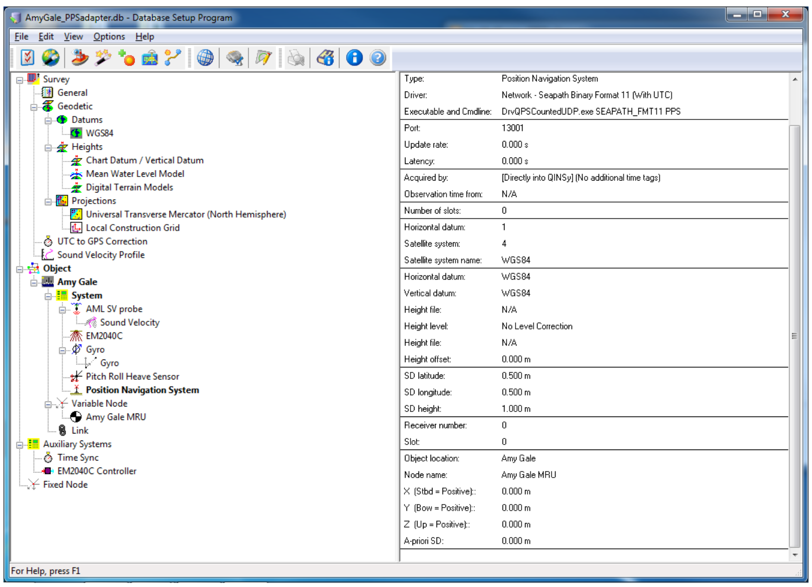

AmyGale_PPSadapter.db - Database Setup Program
System: Gyro
Description: Gyro
Type: Gyro Compass
Driver: Network - Seapath Binary Format 11 (Hdg) (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 0
For Help, press F1

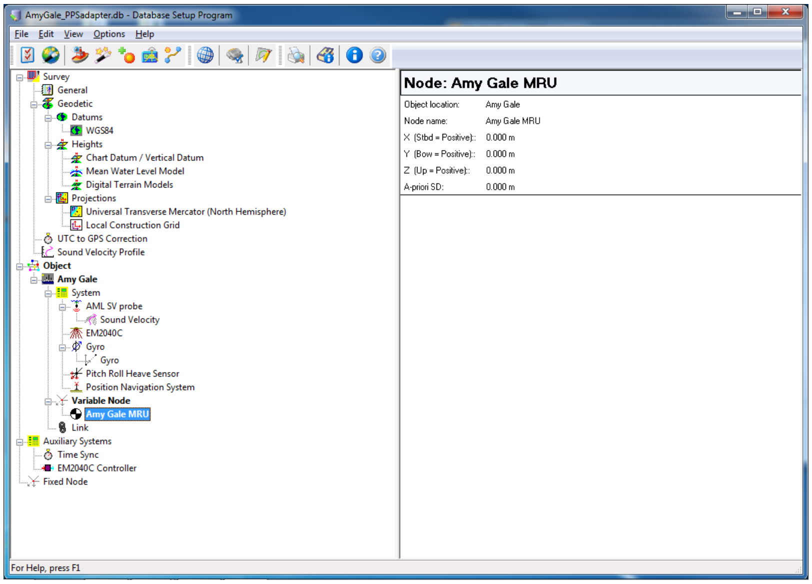

AmyGale_PPSadapter.db - Database Setup Program
Observation: Gyro
Observation description: Gyro
Observation type: Bearing (True)
'At' node: Amy Gale MRU
Measurement unit code: Degrees
System description: Gyro
(C-O) option: (C-O) offsets applied first
Scale factor: 1.000000000000
Fixed system (C-O): 0.0000000000
Variable (C-O): 0.00000000
A-priori SD: 0.5000
For Help, press F1

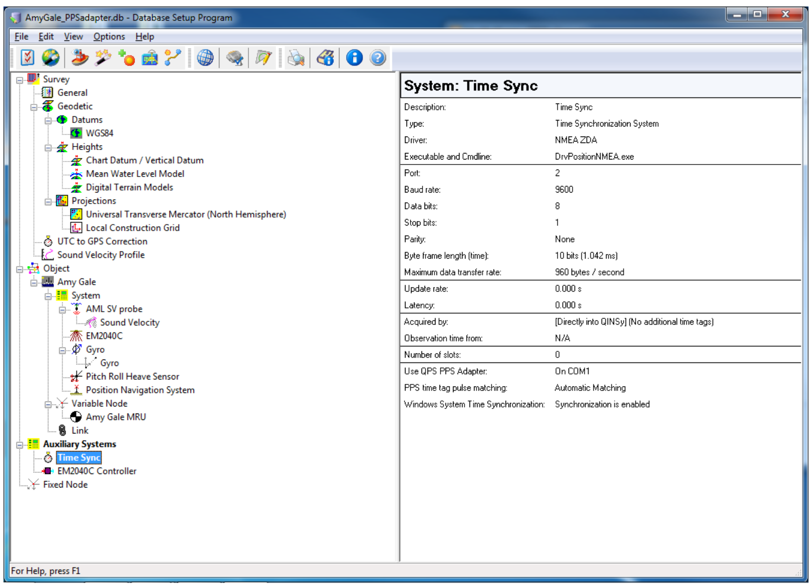

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
System: Pitch Roll Heave Sensor
Description: Pitch Roll Heave Sensor
Type: Pitch Roll Heave Sensor
Driver: Network - Seapath MRU Binary Format 11 (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] [No additional time tags]
Observation time from: N/A
Number of slots: 0
Object: Amy Gale
PRH sensor reference number: 1
Rotation convention pitch: Positive bow up
Rotation convention roll: Positive heeling to starboard
Angular variable measured: HPR (roll first)
Angular measurement units: Degrees
Sign convention heave: Positive upwards
Measurement units heave: Meters
Conversion factor to degrees decimal: N/A
Conversion factor to metres: N/A
Quality indicator type pitch and roll: No quality info recorded
Quality indicator type heave: No quality info recorded
Description of quality indicator type:
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): 0.000 m
Z (Up = Positive): 0.000 m
For Help, press F1

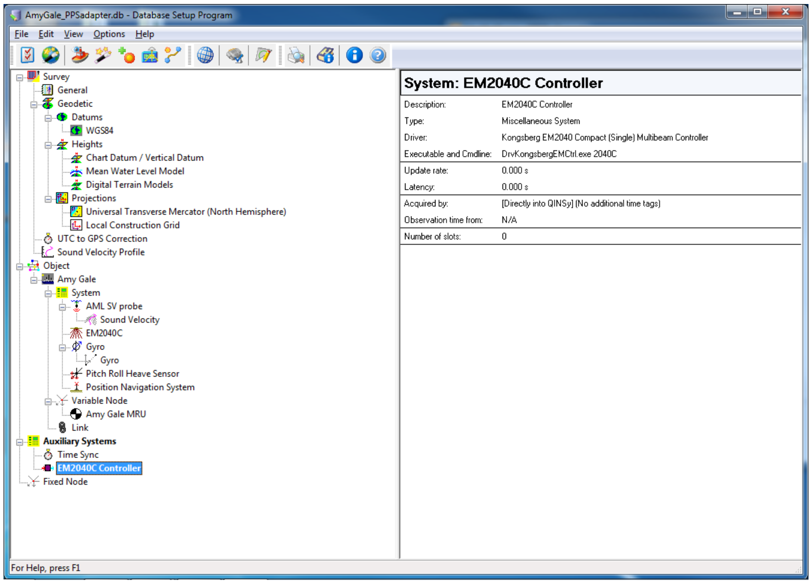

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
PRH sensor reference number: 1
Rotation convention pitch: Positive bow up
Rotation convention roll: Positive heeling to starboard
Angular variable measured: HPR (roll first)
Angular measurement units: Degrees
Sign convention heave: Positive upwards
Measurement units heave: Meters
Conversion factor to degrees decimal: N/A
Conversion factor to metres: N/A
Quality indicator type pitch and roll: No quality info recorded
Quality indicator type heave: No quality info recorded
Description of quality indicator type:
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): 0.000 m
Z (Up = Positive): 0.000 m
A-priori SD: 0.000 m
(C-O) roll offset: 0.000 °
(C-O) pitch offset: 0.000 °
(C-O) heave offset: 0.000 m
Heave time delay: 0.000 s
Heave filter length: N/A
SD roll and pitch: 0.050 °
SD heave (fixed): 0.050 m
SD heave (variable): 5.000 %
SD roll offset: 0.050 °
SD pitch offset: 0.050 °
SD heave offset: 0.050 m
For Help, press F1


AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
System: Position Navigation System
Description: Position Navigation System
Type: Position Navigation System
Driver: Network - Seapath Binary Format 11 (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] [No additional time tags]
Observation time from: N/A
Number of slots: 0
Horizontal datum: 1
Satellite system: 4
Satellite system name: WGS84
Horizontal datum: WGS84
Vertical datum: WGS84
Height file: N/A
Height level: No Level Correction
Height file: N/A
Height offset: 0.000 m
SD latitude: 0.500 m
SD longitude: 0.500 m
SD height: 1.000 m
Receiver number: 0
Slot: 0
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): 0.000 m
For Help, press F1

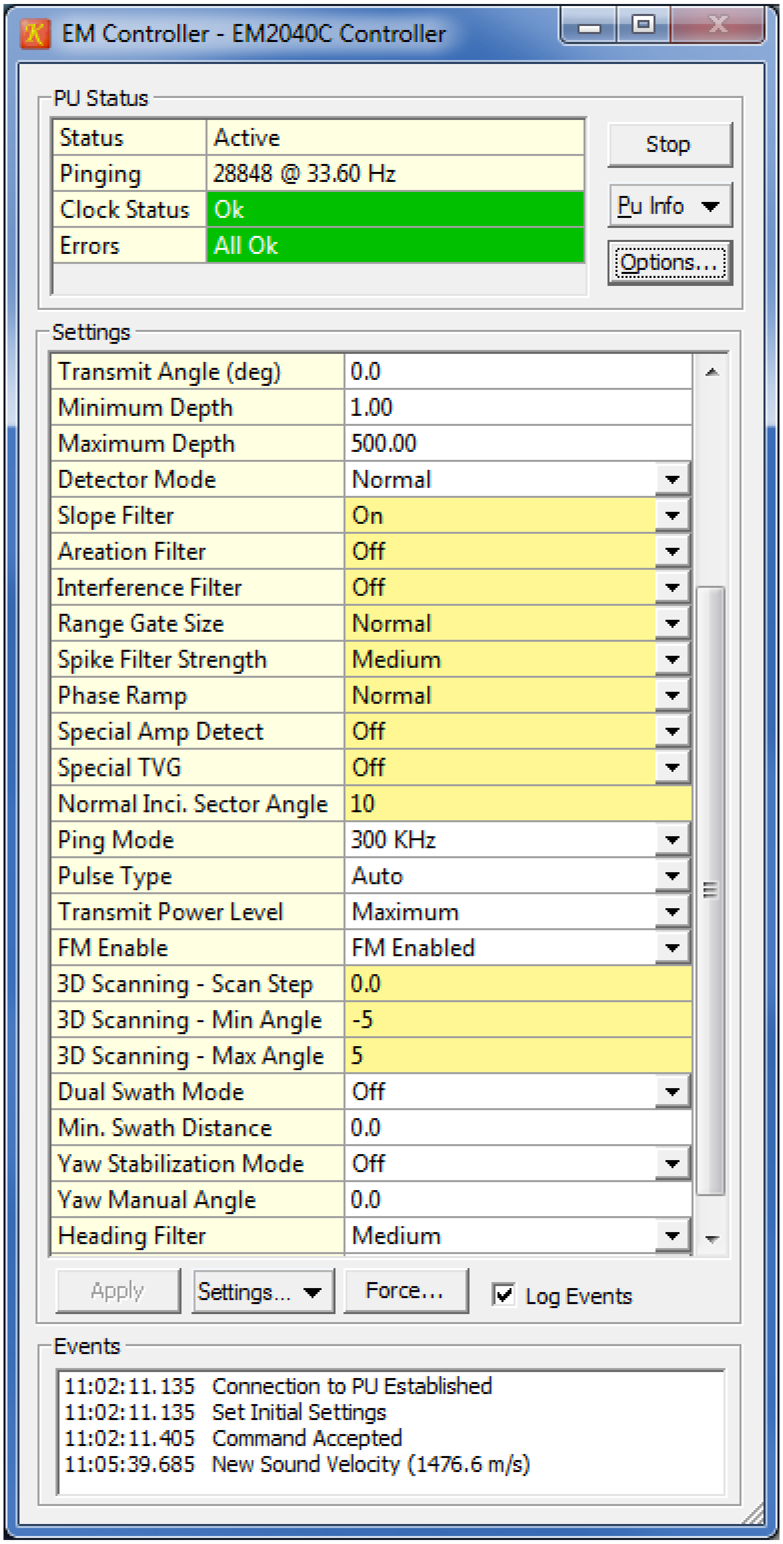

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Type: Position Navigation System
Driver: Network - Seapath Binary Format 11 (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] [No additional time tags]
Observation time from: N/A
Number of slots: 0
Horizontal datum: 1
Satellite system: 4
Satellite system name: WGS84
Horizontal datum: WGS84
Vertical datum: WGS84
Height file: N/A
Height level: No Level Correction
Height file: N/A
Height offset: 0.000 m
SD latitude: 0.500 m
SD longitude: 0.500 m
SD height: 1.000 m
Receiver number: 0
Slot: 0
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): 0.000 m
Z (Up = Positive): 0.000 m
A-priori SD: 0.000 m
For Help, press F1

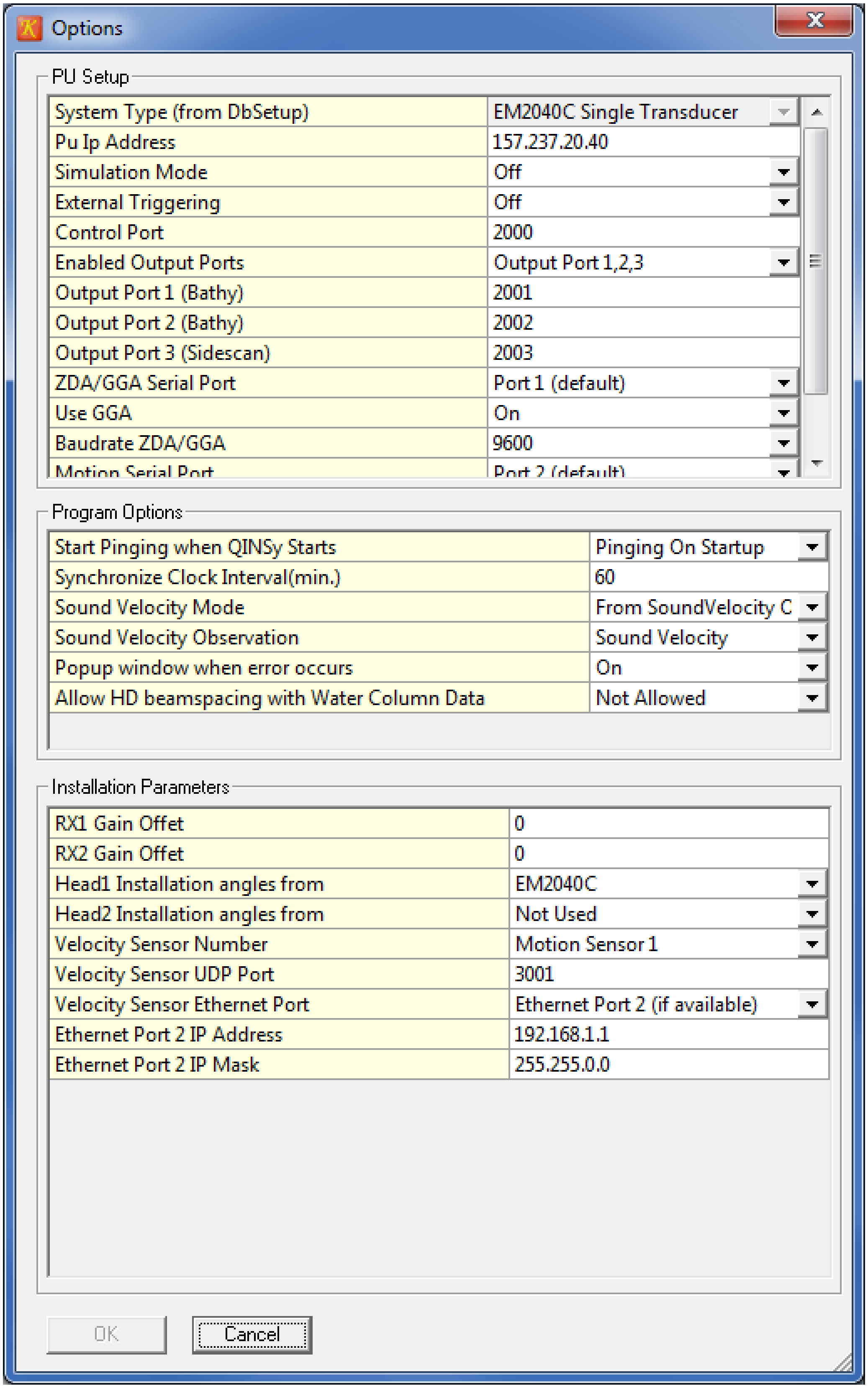





AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
System: EM2040C Controller
Description: EM2040C Controller
Type: Miscellaneous System
Driver: Kongsberg EM2040 Compact (Single) Multibeam Controller
Executable and Cmdline: DrvKongsbergEMCtrl.exe 2040C
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 0
For Help, press F1

Appendix C – Configuration settings for EM2040C shown in QINSy EM controller




Options
PU Setup
System Type (from DbSetup)
EM2040C Single Transducer
Pu Ip Address
157.237.20.40
Simulation Mode
Off
External Triggering
Off
Control Port
2000
Enabled Output Ports
Output Port 1,2,3
Output Port 1 (Bathy)
2001
Output Port 2 (Bathy)
2002
Output Port 3 (Sidescan)
2003
ZDA/GGA Serial Port
Port 1 (default)
Use GGA
On
Baudrate ZDA/GGA
9600
Motion Serial Port
Port 2 (default)
Program Options
Start Pinging when QINSy Starts
Pinging On Startup
Synchronize Clock Interval(min.)
60
Sound Velocity Mode
From SoundVelocity C
Sound Velocity Observation
Sound Velocity
Popup window when error occurs
On
Allow HD beamspacing with Water Column Data
Not Allowed
Installation Parameters
RX1 Gain Offet
0
RX2 Gain Offet
0
Head1 Installation angles from
EM2040C
Head2 Installation angles from
Not Used
Velocity Sensor Number
Motion Sensor 1
Velocity Sensor UDP Port
3001
Velocity Sensor Ethernet Port
Ethernet Port 2 (if available)
Ethernet Port 2 IP Address
192.168.1.1
Ethernet Port 2 IP Mask
255.255.0.0
OK
Cancel