W00449

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Survey

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	W00449

LOCALITY

State(s):	Maine
General Locality:	Maine Coastline
Sub-locality:	Saco River

2016

Maine Coastal Mapping Initiative

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**W00449**

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**Maine**
General Locality:	**Maine Coastline**
Sub-Locality:	**Saco River**
Scale:	**1:10,000**
Dates of Survey:	**05/19/2016 - 05/26/2016**
Project Number:	**ESD-AHB-18**
Data Source:	**Maine Coastal Mapping Initiative**
Chief of Party:	**Kerby Dobbs**
Soundings by:	**multibeam**
Imagery by:	**multibeam**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**Meters at Mean Lower Low Water**

Remarks:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Envitronmental Information (NCEI) and can be retrieved via http://www.ncei.noaa.gov/.

DESCRIPTIVE REPORT MEMO

April 12, 2019

MEMORANDUM FOR: Atlantic Hydrographic Branch

FROM: Kerby Dobbs
Contractor, Maine Coastal Program

SUBJECT: Submission of Survey W00449

This survey was conducted for seafloor mapping purposes

There were no products created for this survey.

Soundings were reduced to Mean Lower Low Water (MLLW) using predicted tides from NWLON reference station 8418150 Portland, ME, reference station 841606 Camp Ellis, ME, reference station 8418828, Biddeford, ME. Tide zones were provided by CO-OPS from the survey of this area. The zoned file, MCMICORP_modified.zdf, is in the submitted data files.

All survey systems and methods utilized during this survey were as described in 2016 Descriptive Report of Seafloor Mapping – Federal Navigation Channel of Saco River, Biddeford/Saco to Camp Ellis, Maine.

One DTON was submitted to NOAA Office of Coast Survey Marine Chart Division during office processing. The DTON was a 12 ft. shoal sounding that identified significant shoaling over the charted 16ft sounding.

Maine Coastal Mapping Initiative acquired the data outlined in this report.

This survey will be used to update NOAA navigational products where possible.

Survey W00449 meets charting specifications for External Source Data and is adequate to supersede prior data. This survey will be used to update NOAA navigational products where possible.

Metadata for Survey W00449	
Project	ESD-AHB-18
Survey	W00449
State	Maine
Locality	Maine Coastline
Sub-Locality	Saco River
Scale of Survey	1:10000
Sonars Used	Kongsberg Maritime EM 2040C (MBES)
Horizontal Datum	North American Datum 1983
Vertical Datum	Mean Lower Low Water
Vertical Datum Correction	
Projection	Projected UTM 19
Field Unit	Maine Coastal Mapping Initiative
Survey Dates	05/19/2016 - 05/26/2016
Chief of Party	Kerby Dobbs
Submission Date	10/24/2018

Prepared in cooperation with the National Oceanic and Atmospheric Administration (NOAA) and the Maine Submerged Lands Program on behalf of the towns of Biddeford and Saco, Maine

2016 Descriptive Report of Seafloor Mapping – Federal Navigation Channel of Saco River, Biddeford/Saco to Camp Ellis, Maine

By Kerby Dobbs, Project Hydrographer, Contractor to the Maine Coastal Program

Maine Coastal Mapping Initiative, February 2017

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 thank Rumery's Boatyard in Biddeford, Maine for providing dockage and insight pertaining to potential submerged nautical hazards for the duration of this investigation. We would also like to acknowledge the efforts of Maine Coastal Program, Maine Geological Survey, and United States Army Corps of Engineers New England District staff members who contributed throughout the remote reconnaissance and planning process prior to survey efforts. This project opportunity was made possible with funding through a 2016 Memorandum of Understanding between the Maine Coastal Program and the Maine Submerged Lands Program within in the Department of Agriculture, Conservation and Forestry.

Table of Contents

Suggested citation:
Dobbs, K.M., 2017. 2016 Descriptive report for seafloor mapping – Federal Navigation Channel of Saco River, Biddeford/Saco to Camp Ellis, Maine. Maine Coastal Mapping Initiative, Maine Coastal Program, Augusta, ME. 43 p.

ABSTRACT

In May of 2016 the Maine Coastal Mapping Initiative (MCMI) conducted hydrographic surveying within the navigable waters of the Saco River between Camp Ellis and the Biddeford/Saco area located approximately 8 km (5 mi) upstream. Bathymetric (e.g. depth) and backscatter (e.g. seafloor substrate) data were collected using a multibeam echosounder (MBES). Preliminary analyses of these data provided the basis for a more specific investigation using underwater video recordings to help characterize the distribution and nature of submerged debris in the vicinity of a proposed dredging of the federal channel in the Biddeford/Saco portion of the Saco River. The submerged debris investigation was performed at the request of the Maine Submerged Lands Program on behalf of the Cities of Saco and Biddeford, Maine. The results of the submerged debris investigation, outlined in a separate report (see Dobbs, 2016), may facilitate further assessment of potential hazards posed by submerged debris and/or shallow portions of navigable waters within this portion of Saco River. This project also coincides with state efforts to update coastal data sets and increase high resolution bathymetric coverage for Maine's navigable waters and provides new data in the areas covered by National Oceanic and Atmospheric Administration (NOAA) nautical charts (e.g. coastal and harbor) 13286 and 13287 in southern Maine.

1.0 Introduction

In May of 2016 the Maine Coastal Mapping Initiative (MCMI) conducted hydrographic surveying within the navigable waters of the Saco River between Camp Ellis and the Biddeford/Saco area located approximately 8 km (5 mi) upstream. Bathymetric (e.g. depth) and backscatter (e.g. seafloor substrate) data were collected using a multibeam echosounder (MBES). Preliminary analyses of these data provided the basis for a more specific investigation using underwater video recordings to help characterize the distribution and nature of submerged debris in the vicinity of a proposed dredging of the federal channel in the Biddeford/Saco portion of the Saco River. This investigation was performed at the request of the Maine Submerged Lands Program on behalf of the Cities of Saco and Biddeford, Maine. The results of the submerged debris investigation, outlined in a separate report (see Dobbs, 2016), may facilitate further assessment of potential hazards posed by submerged debris and/or shallow portions of navigable waters within this portion of Saco River. This project also coincides with state efforts to update coastal data sets and increase high resolution bathymetric coverage for Maine's navigable waters and provides new data in the areas covered by National Oceanic and Atmospheric Administration (NOAA) nautical charts (e.g. coastal and harbor) 13286 and 13287 in southern Maine.

During the survey season (April-October) of 2016 the Maine Coastal Mapping Initiative (MCMI) also conducted hydrographic surveying using a multibeam echosounder (MBES) in the waters off of mid-coast Maine. The mid-coast surveys were the main focus of the MCMI and are not discussed in this report. For a full descriptive report for the mid-coast surveys and related sediment sampling see Dobbs, 2017a and 2017b. This report contains details pertaining only to the hydrographic survey and the associated data post-processing procedures for Saco River data only.

These data were not collected or processed for specifically for navigational purposes, but are freely provided to NOAA for any use the agency deems appropriate.

2.0 Survey Purpose

The purpose of this survey was to help characterize the distribution and nature of submerged debris in the vicinity of a proposed dredging of the federal navigation channel in the Biddeford/Saco portion of the Saco River (pink hatched polygon in Figure 1) and also coincides with state efforts to update coastal data sets for Maine's coastal waters and provides new data in the areas covered by National Oceanic and Atmospheric Administration (NOAA) nautical charts (e.g. coastal and harbor) 13286 and 13287 in southern Maine.

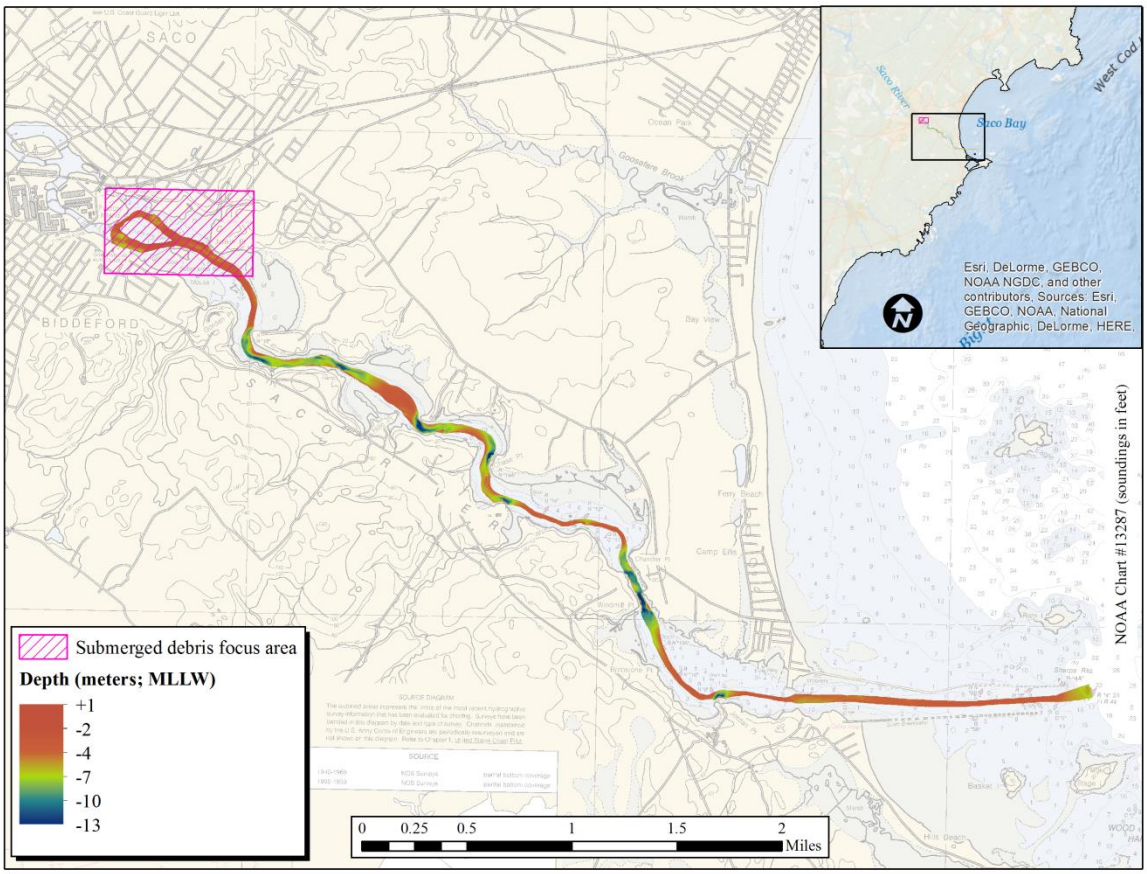


Figure 1. Overall multibeam survey coverage area in Saco River and submerged debris focus area (patterned pink rectangle; see Dobbs, 2016) in vicinity of Biddeford and Saco, ME.

3.0 Areas Surveyed

Hydrographic surveying was conducted in May of 2016 within the federal navigation channel of the estuarine portion of the Saco River (Figure 1), which extends upstream from Camp Ellis to the head of tide below dams at Factory Island in the Biddeford/Saco area of southern Maine. This section of the Saco River is estuarine and has a mean tidal range of 2.76 m. It is within this upper reach of the estuary that shoaling occurs that requires periodic maintenance dredging by the U.S. Army Corps of Engineers in order to maintain safe navigation depths as authorized by Congress. Survey limits are listed in Table 1.

Specific dates of data acquisition are listed in Appendix A.

Table 1. Saco River survey limits

Southeast Limit	Northwest Limit
43° 27.662” N	43° 29.666” N
70° 21.177” W	70° 26.849” W

3.1 Survey Coverage

Multibeam swath coverage was 100% or greater within the surveyed area, with the exception of a few small holidays in vicinity of mooring fields in Biddeford/Saco area and two very small holidays near the Camp Ellis jetty (Figure 2). Overall, it can be assumed with confidence that the shallowest depths of all features within the 2016 survey areas have been identified.

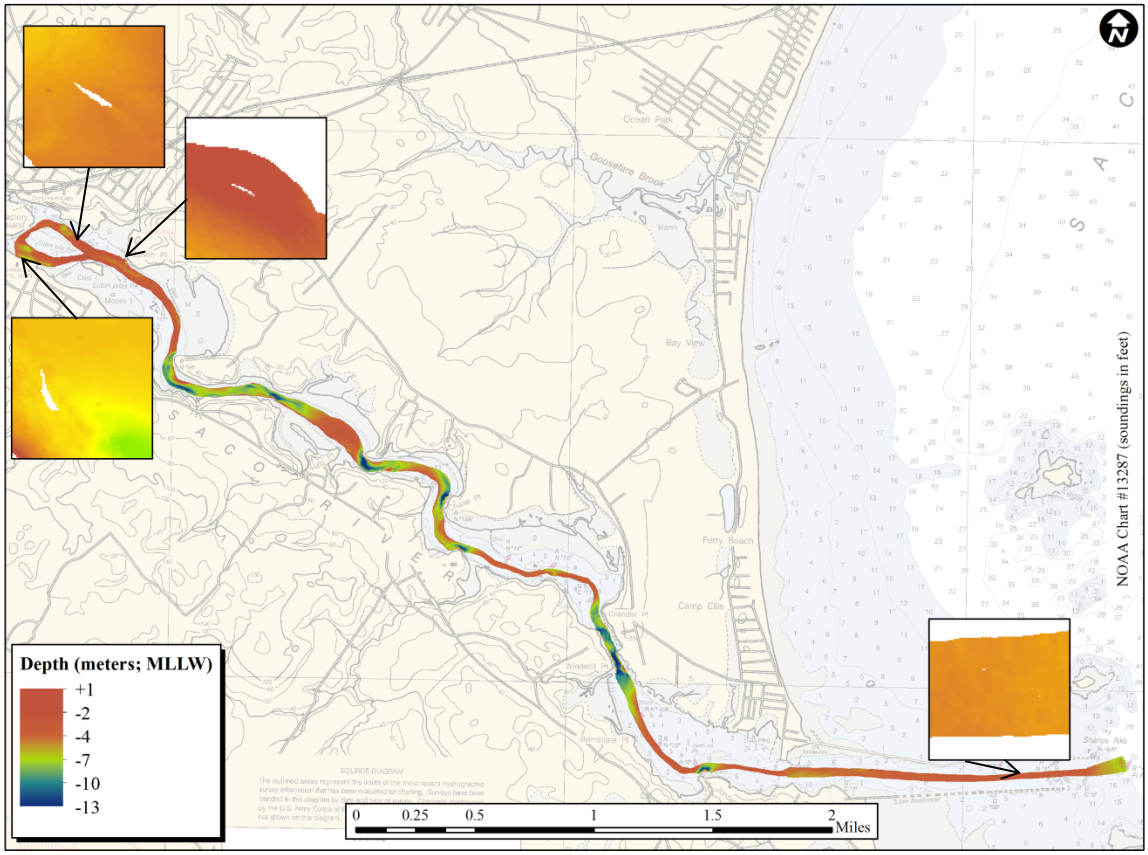


Figure 2. Multibeam coverage and holidays.

4.0 Data Acquisition

The following sub-sections contain a summary of the systems, software, planning, and systems calibration used for acquisition and preliminary processing of survey data.

4.1 Survey Vessel

All data were collected aboard the Research Vessel (R/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 3) 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. R/V Amy Gale shown with pole-mounted dual GPS antennas, Kongsberg EM2040c multibeam sonar, MRU (not visible), and surface sound speed probe (not visible) in acquisition mode.

4.2 Acquisition Systems

The real time acquisition systems used aboard the R/V Amy Gale are outlined in Table 2. Data acquisition was performed using the Quality Positioning Services (QPS) QINSy (Quality Integrated Navigation System; v.8.12) acquisition software. The modules within QINSy integrated all systems and were used for real-time navigation, survey line planning, data time tagging, data logging, and visualization.

Table 2. Summary of acquisition systems used aboard R/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.8.12 (Build 2016.03.16.2) 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/Sediment Sampling 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 2016 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 3) and converted so all outgoing datagrams would be relative to the location of the EM2040c transducer (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 B) and for the template database (Appendix C) used during data acquisition while online in QINSy. Configuration settings of the EM2040c were assigned in the EM Controller module of QINSy (see Appendix D).

Table 3. 2016 equipment reference frame measurements for Seapath 330

	x (m)	y (m)	z (m)
MRU	0.000	0.000	0.00
Antenna 1 (port)	0.155	-1.250	-3.007
Antenna 2 (starboard)	0.155	1.250	-3.007
EM2040C	0.039	0.000	0.132

4.4 Sound Speed Methods

Sound speed casts were taken as needed throughout the survey, which was generally when the observed surface sound speed differed from the surface sound speed in the active profile by more than 2 meters per second. In certain instances supplemental casts were taken when there was reason to suspect significant changes in the water column (e.g. change in tide, abrupt changes in seafloor relief, etc.). During the collection of sound speed casts, logging was stopped to download and apply the new cast and was resumed when the boat circled around and came back on the survey line. Although sound speed data were recorded in raw sonar files, the raw sound velocity profiles (.csv) were also submitted with the survey data.

4.5 Survey Planning

Due to logistical challenges over a 4-day survey window and very shallow low tide water levels in the Biddeford/Saco area the survey was broken up into 3 phases: planning, survey, and submerged debris targeting. Any additional time leftover would be used for additional MBES surveys in the Camp Ellis area. The first phase consisted of scouting the entire length of the river to further assist with the overall survey planning and submerged debris investigation strategy. During this phase acquisition was minimal and mainly consisted of the central portion of the navigation channel between the Camp Ellis marina and Rumery's boatyard in Biddeford. To allow for a more favorable tide (e.g. high tide) in the Biddeford/Saco portion of the river during daylight hours, the second phase consisted of data acquisition along the bulk of the navigation channel between Chandler point and Junkin Point. The third phase included MBES data acquisition in the Biddeford/Saco area and investigating submerged debris targets with an underwater video camera. The early conclusion of the submerged debris investigation allowed for additional surveying in the Camp Ellis portion of the river on the last day of the time window. Due to logistical challenges, this portion of the survey was conducted at low-incoming tide.

Overall, lines were tightly spaced to obtain a minimum of 40% overlap between full swaths. Soundings from beam angles outside of ±60 degrees from the nadir were blocked from visualization during acquisition, thus increasing the true minimum full-swath overlap. This online blocking filter was recommended by Quality Positioning Services field engineers with the intent of eliminating noisy outer beams from the final product, thereby increasing the overall contribution of higher quality soundings. Additional lines were run in select areas to increase the density of soundings around potential targets. All lines were run at approximately 4 knots, although some areas required slower speeds to ensure safe operation of the vessel around obstructions (e.g. fishing gear, docks, moored vessels, etc.).

4.6 Calibrations

One patch test was conducted aboard the R/V Amy Gale at the beginning of the 2016 survey season to correct for alignment offsets (Table 4). During the 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 Qimera (v.1.2.0) patch test tool. After calibration was complete, offsets were entered in to the template database in QINSy.

Table 4. 2016 patch test calibration offsets for EM2040c

	4/27/2016
Latency (seconds)	0.00
Roll (degrees)	0.19
Pitch (degrees)	0.89
Heading (degrees)	-0.40

5.0 Data Post-processing

The following is a summary of the procedures used for post-processing and analysis of survey data using Qimera (v.1.3.6) and Fledermaus (v.7.7.0) software.

5.1 Horizontal Datum

The horizontal datum for these data is WGS 84 projected in UTM zone 19N (meters).

5.2 Vertical Datum and Water Level Corrections

The vertical datum for these data is mean lower-low water (MLLW) level in meters. A tidal zoning file (.zdf; provided by NOAA CO-OPS) was used to apply tide data to 3 discrete zones within the coverage area (Figure 4). NA167, the eastern-most zone, generally encompassed all survey coverage seaward of the shoreline at Camp Ellis. Time (0 minutes) and range (0.97x) corrections for verified data referenced from the Portland, ME (8418150) tide gauge were applied to this zone (Figure 4). NA167A spans the length of the Saco River between Camp Ellis and Hills Point. NA167B, the western-most zone, spans the upstream length from Hills Point to the head of tide below dams at Factory Island in the Biddeford/Saco area. Since no time and/or range corrections for a known reference station currently exist for the two upstream zones, predicted tide data (6-minute intervals) spanning the range of survey dates (May 19, 2016 – May 26, 2016) were downloaded from the NOAA Tides & Currents webpage and applied for these zones with a linear co-tidal interpolation strategy for the two available stations.

Table 5. Tide zones, reference stations, corrections

Zone ID	Time Correction (mins.)	Tide Offset (m)	Tide Scale	Reference Station(s)
NA167	0	0	0.97	Portland (8418150)
NA167A	Linear co-tidal interpolation			Camp Ellis* (8418606) and Biddeford* (8418828)
NA167B	Linear co-tidal interpolation			Camp Ellis* (8418606) and Biddeford* (8418828)

*indicates station with predicted tide data only

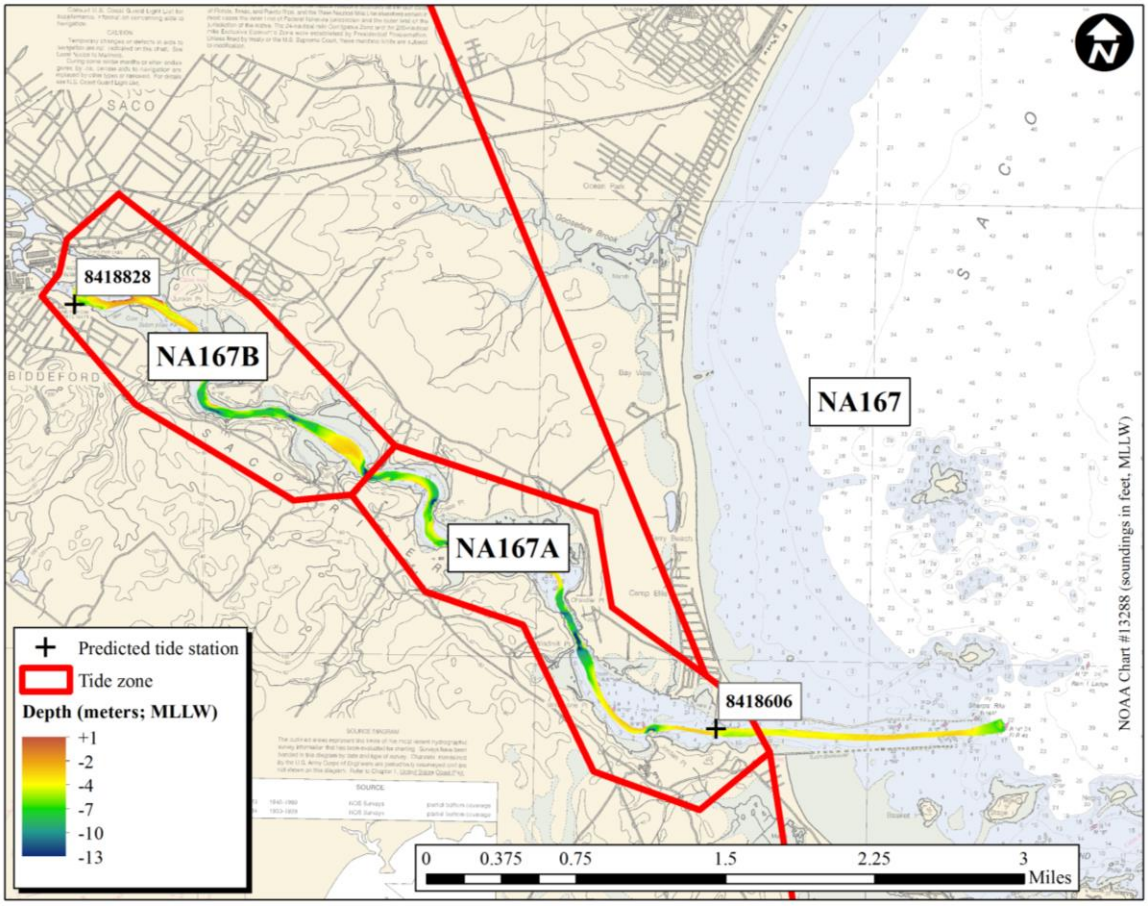


Figure 4. Tide zones (outlined in red) and predicted tide data stations relative to survey coverage. Zones NA167A and NA167B incorporated predicted tide data from the Camp Ellis (ID: 8418606) and Biddeford (ID: 8418828) locations, respectively.

5.3 Processing Workflow

Qimera (v.1.3.6) was used for post-processing. The general work flow was as follows:

1. Create project
2. Add raw sonar files (e.g. metadata extracted and processed bathymetry data converted to .qpd, including vessel configuration and sound velocity)
3. Add tide zoning file (.zdf) and associated tide data and integrate into raw files
4. Create dynamic surface with shallow water CUBE settings enabled
5. Review and edit soundings/clean surface with 3D editor tool
6. Export final surface to .BAG file and CUBE surface
7. Export processed bathy in .GSF format

CUBE

A CUBE (Combined Uncertainty and Bathymetry Estimator) surface was created for editing and as a starting point for final products. The 'Shallow Water' configuration (Figure 5) was selected for each surface based on a recommendation by QPS support engineers who confirmed these CUBE parameters were in accordance with those employed by NOAA. All CUBE settings in

this configuration are constant for all grid resolutions except for the CUBE capture distance, which equals 0.71 x grid resolution. The survey was gridded at 50 cm and in accordance with NOAA's survey recommendations (NOAA, 2014). Manual editing of soundings was performed in the 3D editor tool of Qimera.

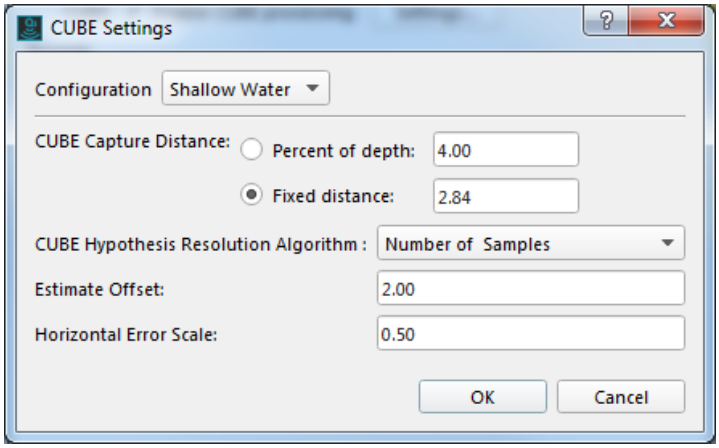


Figure 5. CUBE settings parameters window shown with shallow water settings for 4-meter grid resolution.

The initial output surface contained vertical disagreement in many areas of overlapping coverage between adjacent lines. Surfaces within zone NA167 did contain vertical offset in some areas of overlap between adjacent lines but the majority of disagreement was found in areas corrected with predicted tide data. The areas of greatest disagreement were almost always coincident with the data collected on 5/19/16, suggesting there was disagreement between the observed and predicted water levels in similar areas of overlap between surveys on different days. If coverage from adjacent lines was sufficient, data collected on 5/19/16 was removed to improve vertical agreement in the final surface. However, all survey data were submitted with this report regardless of exclusion from the submitted surface.

6.0 Results

6.1 Final Surfaces

The surfaces and BAGs listed in Table 6 were submitted with the survey data.

Table 6. Surfaces submitted with Saco River survey data

Surface Name	Resolution (m)	Depth Range (m)
Saco_river_co-tidal_50cm	0.5	0 – 15

6.2 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. Processed files containing multibeam backscatter data (snippets and beam-average) were exported from Qimera v.1.3.6. in .GSF format. QPS Fledermaus Geocoder Toolbox (FMGT) v.7.7.0 (Build 372, 64-bit edition) was used to import, process, and mosaic time-series backscatter data. The GSF files containing the extracted were submitted with the data in this survey. Processed mosaics (Figure 6; Table 7) were saved in geoTiff format and also submitted.

Table 7. Backscatter mosaics submitted with Saco River survey data

Mosaic Name	Pixel Size (m)
Saco_river_backscatter_2016_50cm	0.5

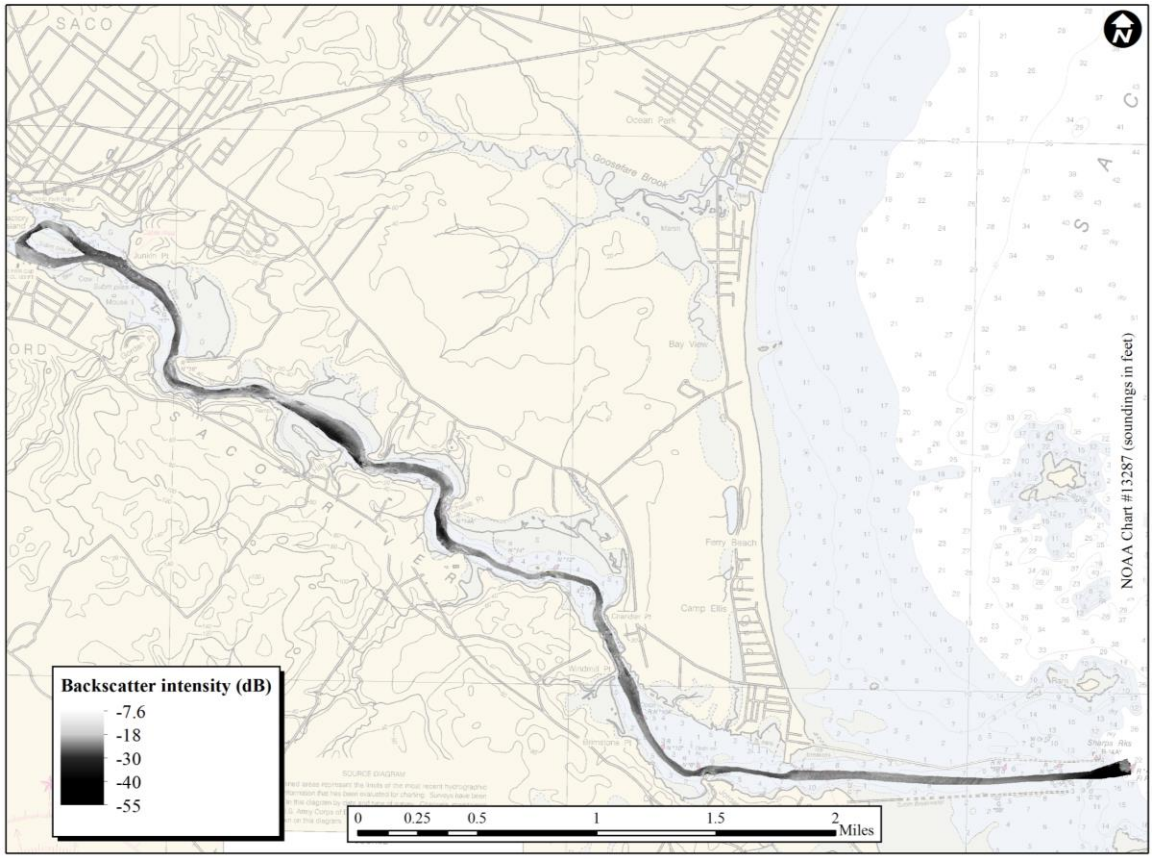


Figure 6. Saco River backscatter intensity (0.5-meter grid) mosaic.

6.3 Charts and Prior Surveys

The largest scale raster navigational charts which cover the survey areas are listed in Table 8. These data were not compared with data collected by the MCMI.

Table 8. Largest scale raster charts in survey areas

Chart	Scale	Source Edition	Source Date	NTM Edition	NTM Date
13287	1:20,000	13	6/1/2013	29	2/28/2015

6.4 Seafloor Anomalies

The Saco River bed contained many anomalies throughout the coverage area and the Biddeford/Saco portion of the river contained the largest concentration of submerged debris of natural and anthropogenic origins. A full description of seafloor anomalies and the procedure used to investigate suspected submerged debris targets in the Biddeford/Saco portion of the river can be found in Dobbs 2016. Since object detection was not a primary objective for the entire coverage area only a two distinct anomalies/objects are highlighted below. A feature file containing the locations and attributes of these features was submitted with the data in this report.

The area immediately east-southeast of the mooring field at Camp Ellis shown in Figure 7 contained a possible uncharted wreck or large piece of submerged debris. The feature (ID S01) had dimensions of approximately 5.8 m in length and 1.7 m width. The shoalest point associated with this feature is 2.76 m (MLLW) and is not suspected to pose a hazard to safe navigation.

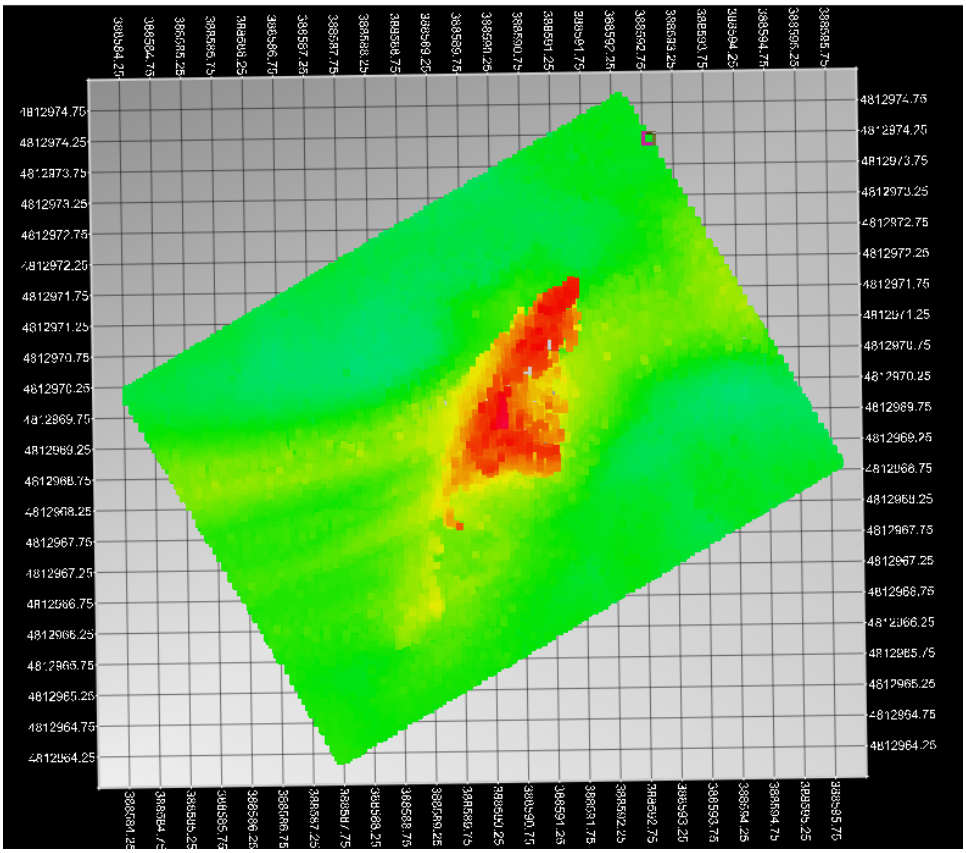


Figure 7. Sounding image of possible uncharted wreck or submerged debris. Length is approximately 5.8 m length is located at position 388590 E 4812969 N (UTM Zone 19N meters).

The area northwest of Chandler Point shown in Figure 8 contained a possible uncharted wreck. The feature (ID S02) appears to be small vessel with dimensions of approximately 4 m in length and 1.2 m width. The shoalest point associated with this feature is 3.25 m (MLLW) and is not suspected to pose a hazard to safe navigation.

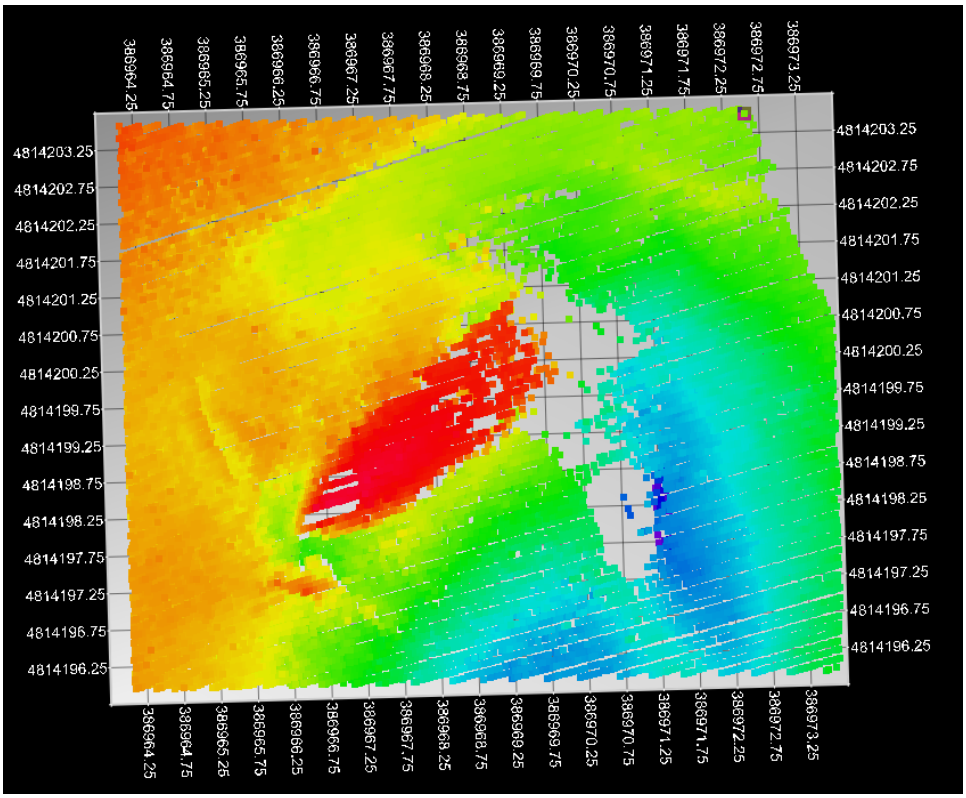


Figure 8. Sounding image of possible uncharted wreck of approximately 4 m length is located at position 386968 E 4814199 N (UTM Zone 19N meters).

7.0 Summary

In May of 2016 the Maine Coastal Mapping Initiative (MCMI) conducted hydrographic surveying within the navigable waters of the Saco River between Camp Ellis and the Biddeford/Saco area located approximately 8 km (5 mi) upstream to help characterize the distribution and nature of submerged debris in the vicinity of a proposed dredging of the federal navigation channel in the Biddeford/Saco portion of the Saco River as well as for state efforts to update coastal data sets for Maine's coastal waters. Seafloor/riverbed anomalies were present in virtually all areas portion of the coverage area but the majority of these features are not a danger to safe navigation. Submerged debris was most concentrated in the Biddeford/Saco area channel between Junkin Point and Cow Island. The findings of the investigation specific to characterizing submerged debris in this area were outlined in a separate report (Dobbs 2016). Post-processing of the data indicate that considerable vertical disagreement exists in certain areas within the submitted surfaces due to the incorporation of unverified tide data and possibly due to application of an imperfect tide strategy. Although these data may serve as a resource for parties interested in the general attributes of the Saco River bed, they are not to be used for navigation purposes. It is recommended that these data be evaluated and reprocessed using more advanced water level correction methods (e.g. Tidal Constituent and Residual Interpolation (TCARI)) to refine bathymetric surfaces, validate soundings, and identify potential uncharted wrecks.

References

Dobbs, K.M., 2016. Preliminary report of Saco River submerged debris investigation. Maine Coastal Mapping Initiative, Maine Coastal Program, Augusta, ME. June 2016. 45p.

Dobbs, K.M., 2017a. 2016 Descriptive report for seafloor mapping: Mid-coast Maine. Maine Coastal Mapping Initiative, Maine Coastal Program, Augusta, ME. January 2017. 86p.

Dobbs, K.M., 2017b. 2016 Seafloor sediment analysis and mapping: Mid-coast Maine. Maine Coastal Mapping Initiative, Maine Coastal Program, Augusta, ME. 120 p.

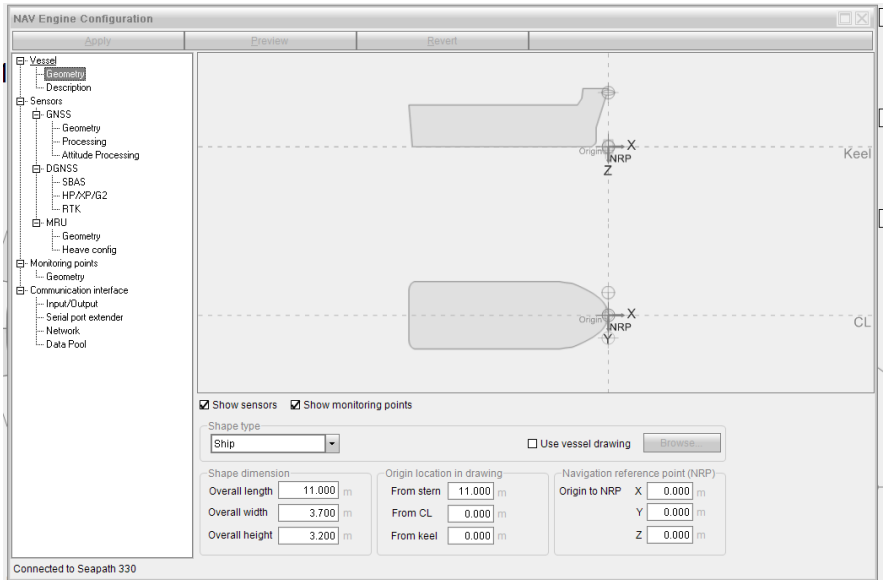
NOAA, 2014. NOS hydrographic surveys specifications and deliverables: U.S Department of Commerce National Oceanic and Atmospheric Administration. Page 89.

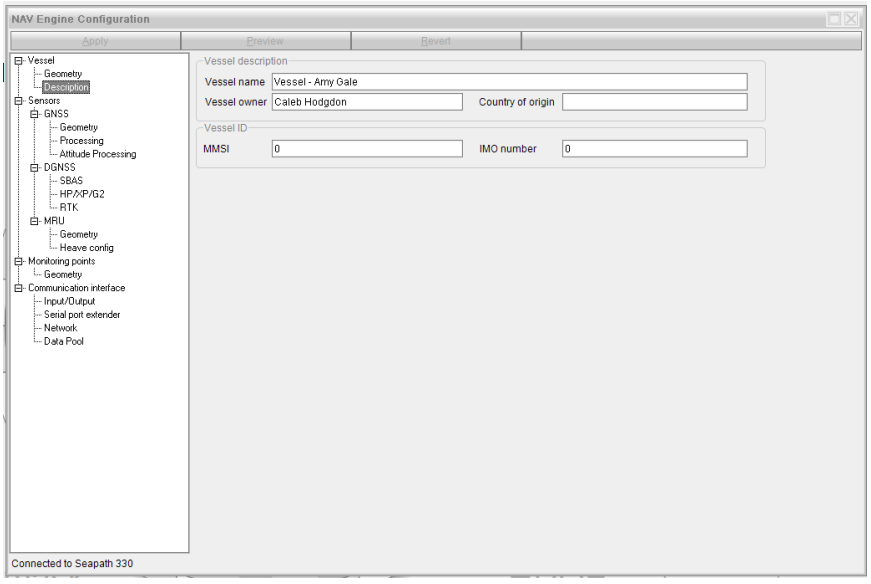
U.S. Department of the Interior, 2014. Proposed Geophysical and Geological Activities in the Atlantic OCS to Identify Sand Resources and Borrow Areas North Atlantic, Mid-Atlantic, and South Atlantic-Straits of Florida Planning Areas, *Final Environmental Assessment.* OCS EIS/EA BOEM 2013-219 U.S. Department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

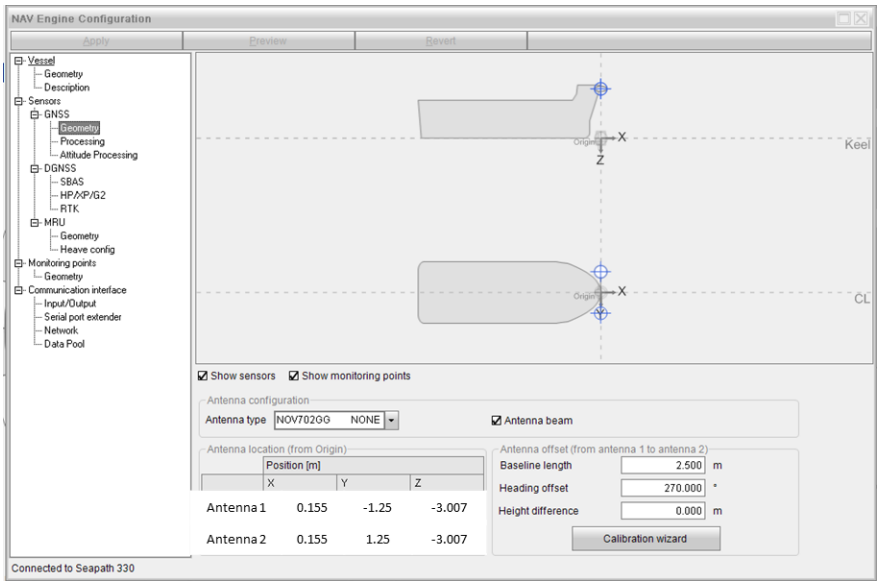
Appendix A - Specific dates of data acquisition

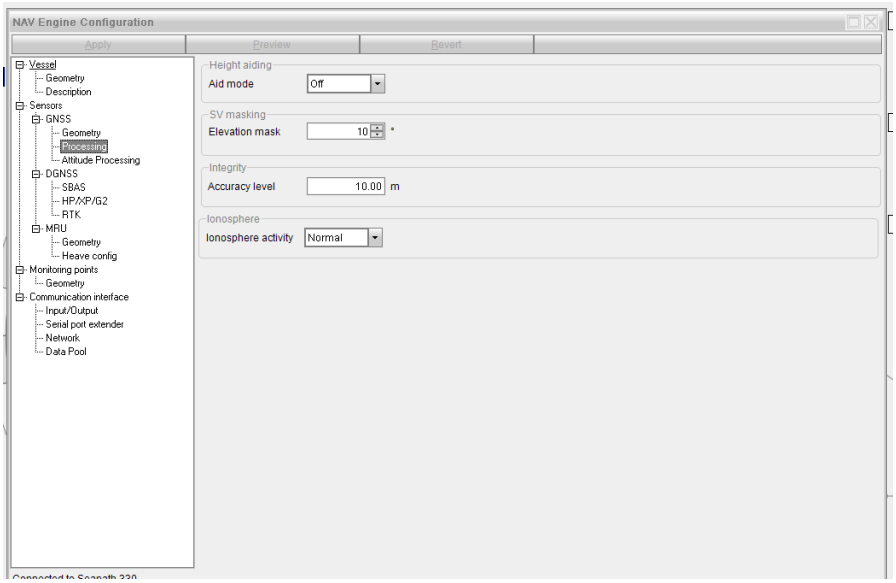
Dates of acquisition
05/19/16
05/23/16
05/24/16
05/26/16

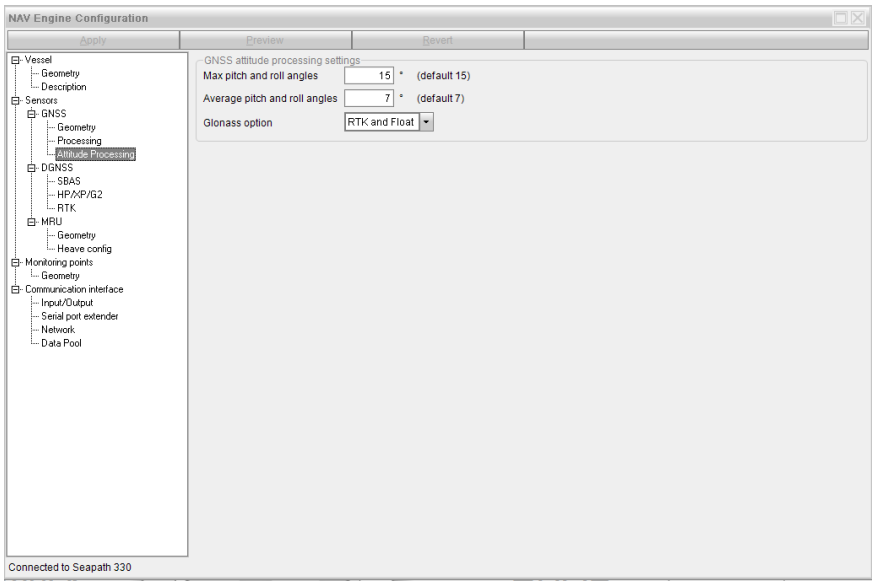
Appendix B – Configuration settings for Seapath 330

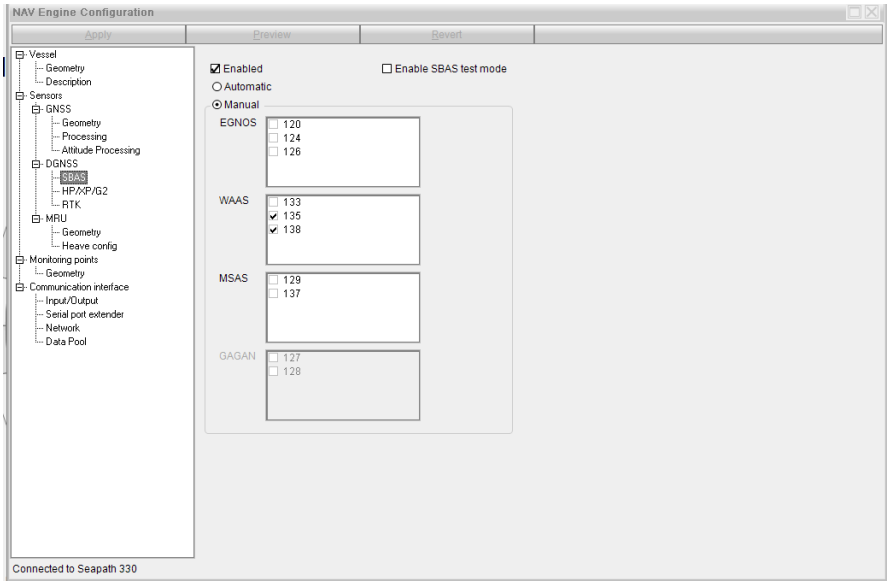


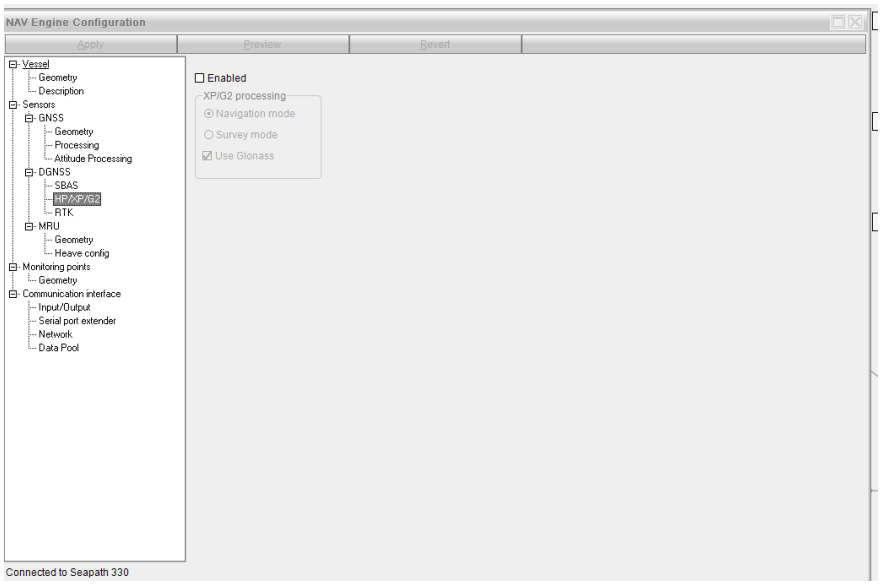


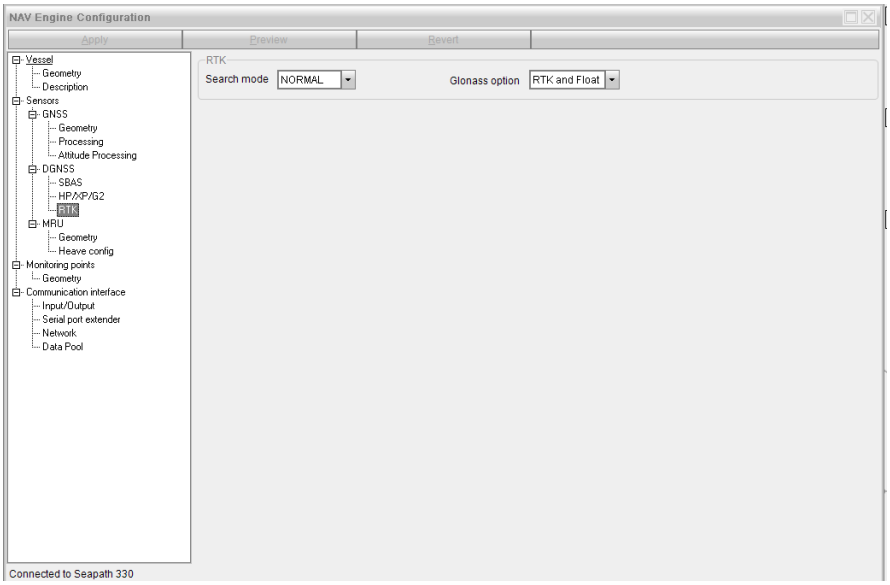

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Keel
CL
Origin
X
Z
Show sensors
Show monitoring points
Antenna configuration
Antenna type
NOV702GG
NONE
Antenna beam
Antenna location (from Origin)
Position [m]
X
Y
Z
Antenna 1
0.155
-1.25
-3.007
Antenna 2
0.155
1.25
-3.007
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

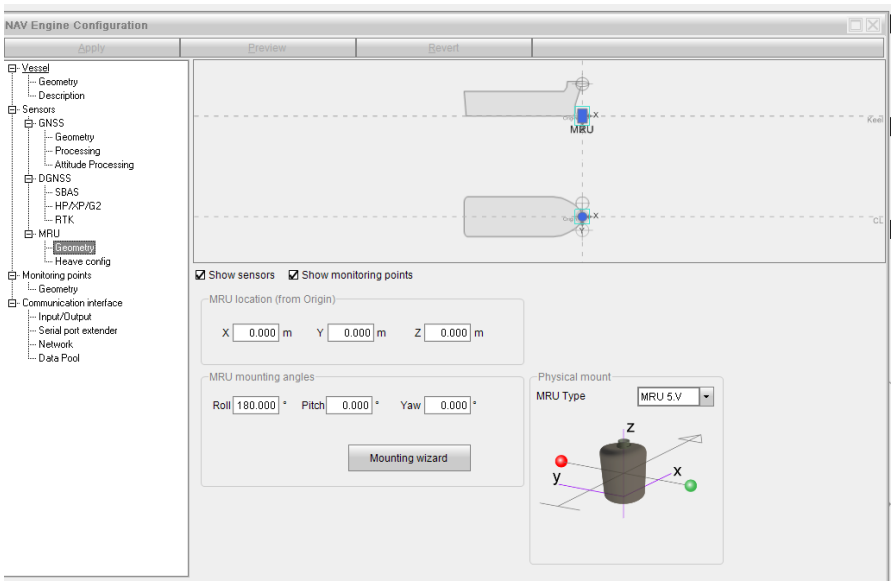

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Height aiding
Aid mode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

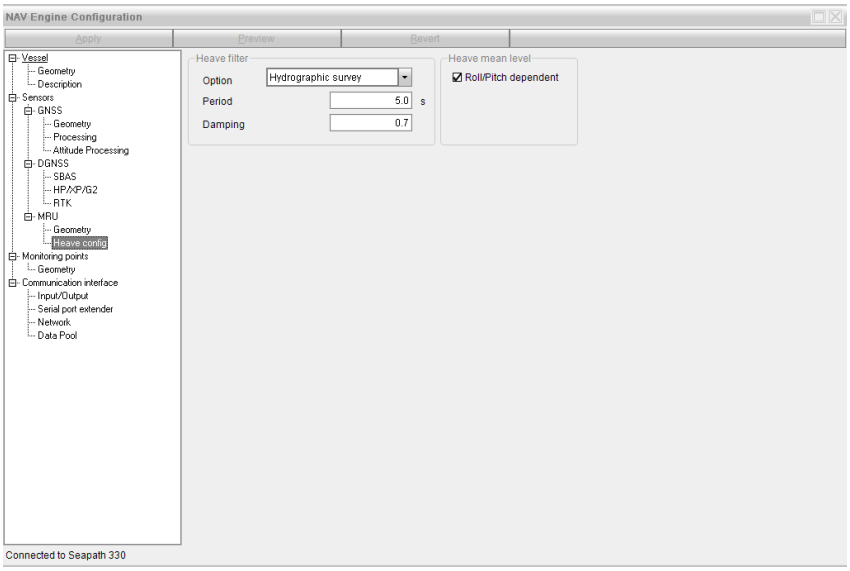

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
GNSS attitude processing 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

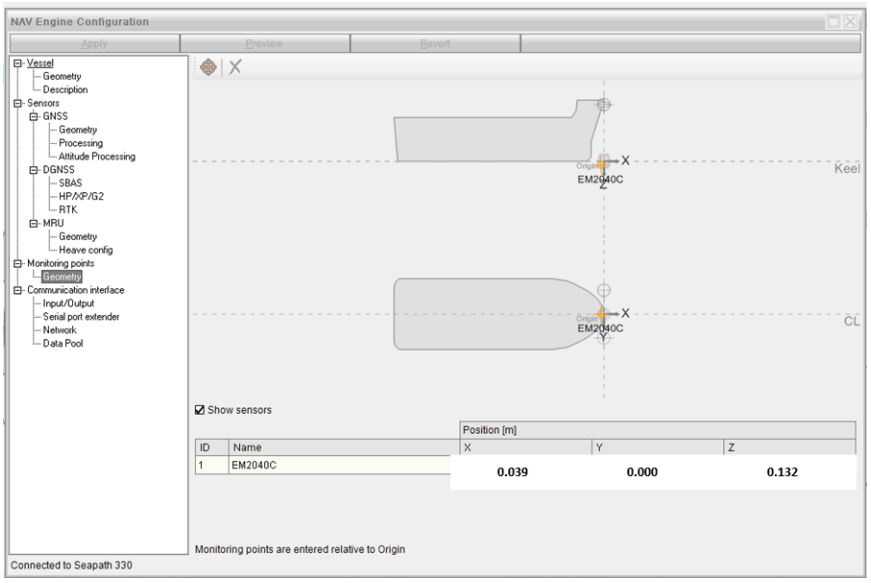

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Enabled
Enable SBAS test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

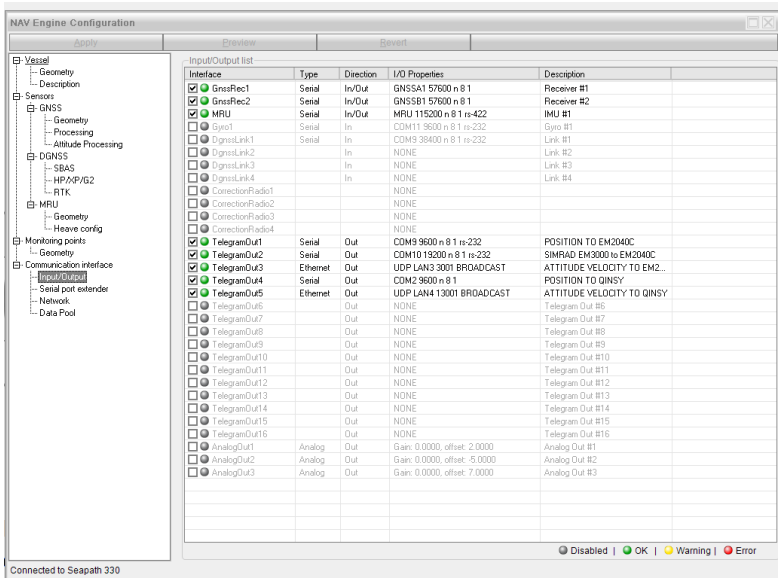

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Enabled
XP/G2 processing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

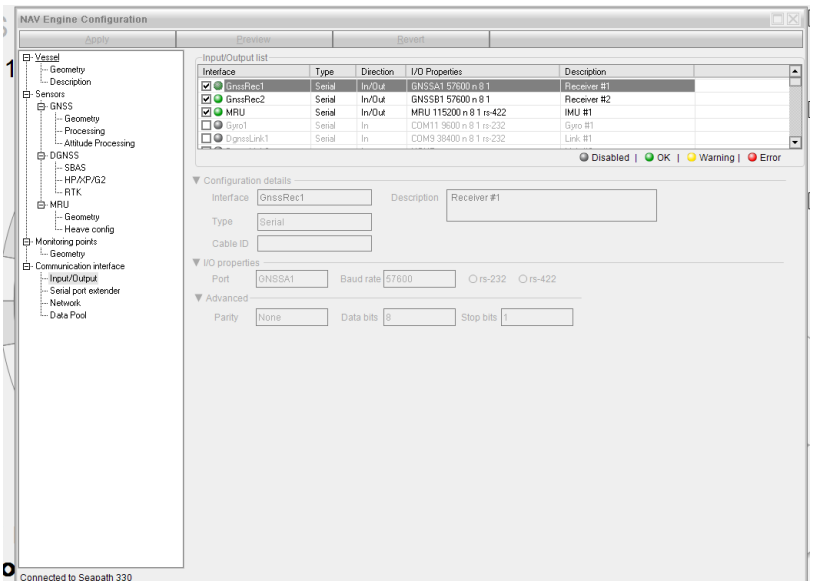

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
RTK
Search mode
NORMAL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

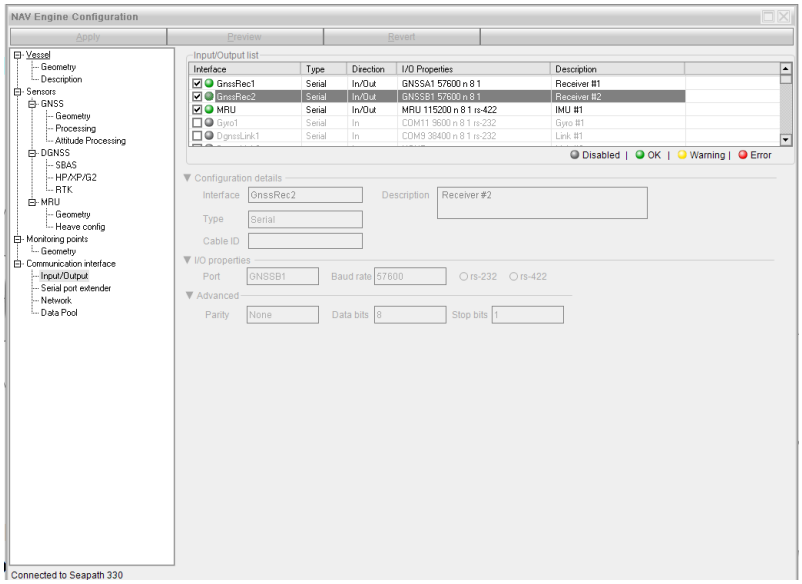

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
MRU
Show sensors
Show 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
z
y
x

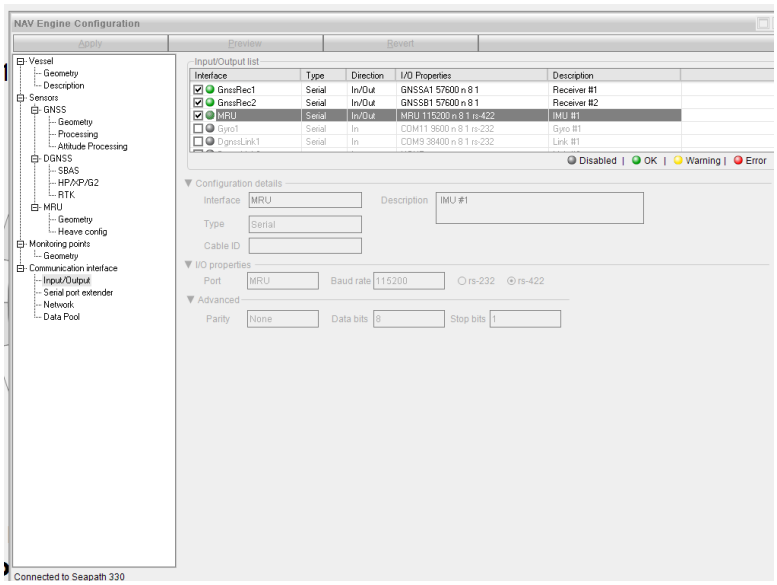

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Heave filter
Option
Hydrographic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

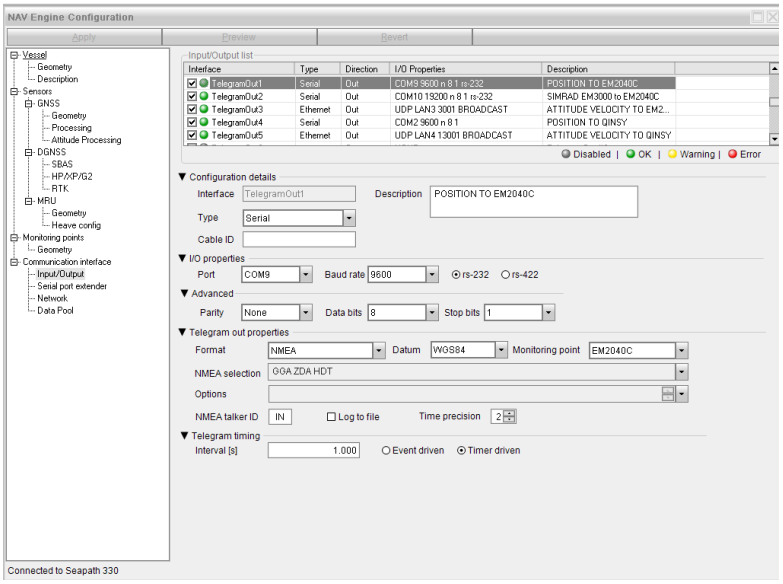

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Origin
EM2040C
Keel
CL
Show sensors
Position [m]
ID
Name
X
Y
Z
1
EM2040C
0.039
0.000
0.132
Monitoring points are entered relative to Origin
Connected to Seapath 330

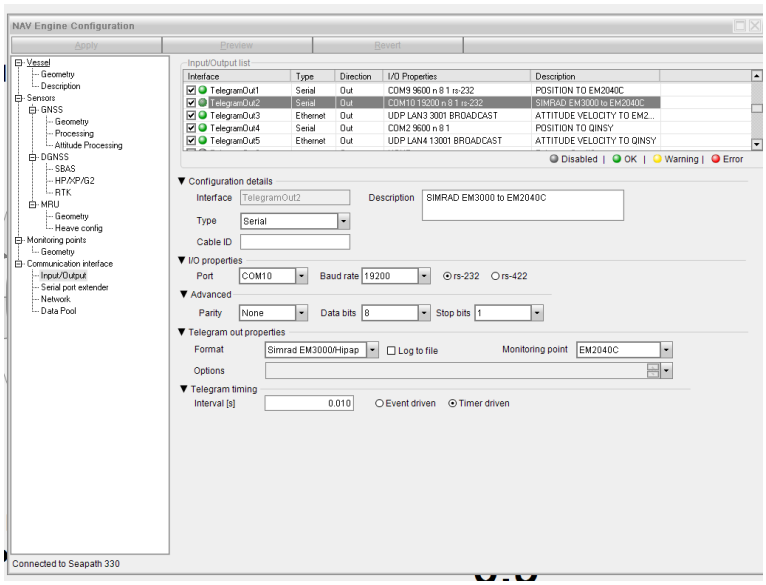

NAV Engine Configuration
Apply
Preview
Revert
Input/Output list
Interface
Type
Direction
I/O Properties
Description
GnssRec1 Serial In/Out GNSSA1 57600 n 8 1 Receiver #1
GnssRec2 Serial In/Out GNSSB1 57600 n 8 1 Receiver #2
MRU Serial In/Out MRU 115200 n 8 1 rs-422 IMU #1
Gyro1 Serial In COM11 9600 n 8 1 rs-232 Gyro #1
DgnssLink1 Serial In COM3 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

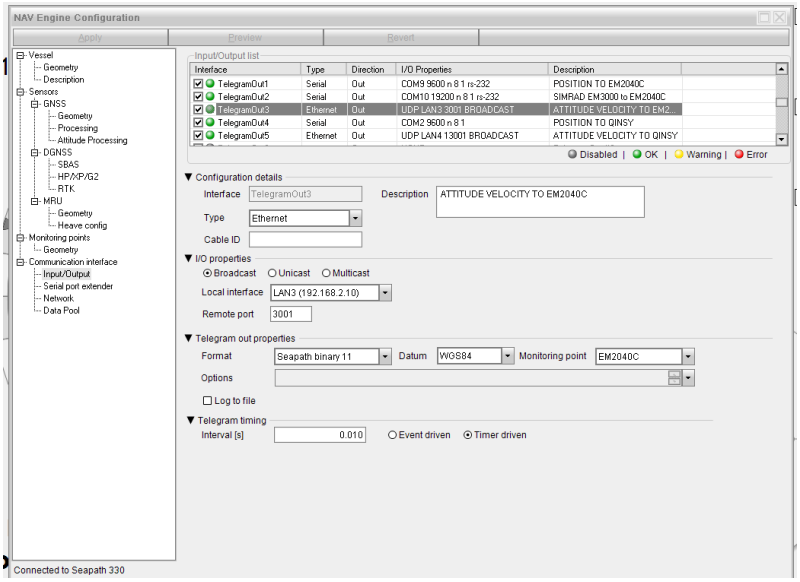

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
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

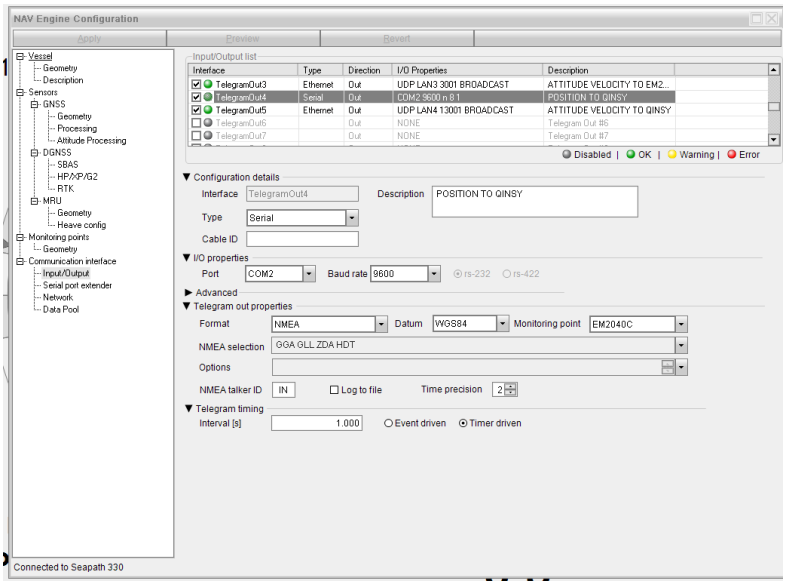

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
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

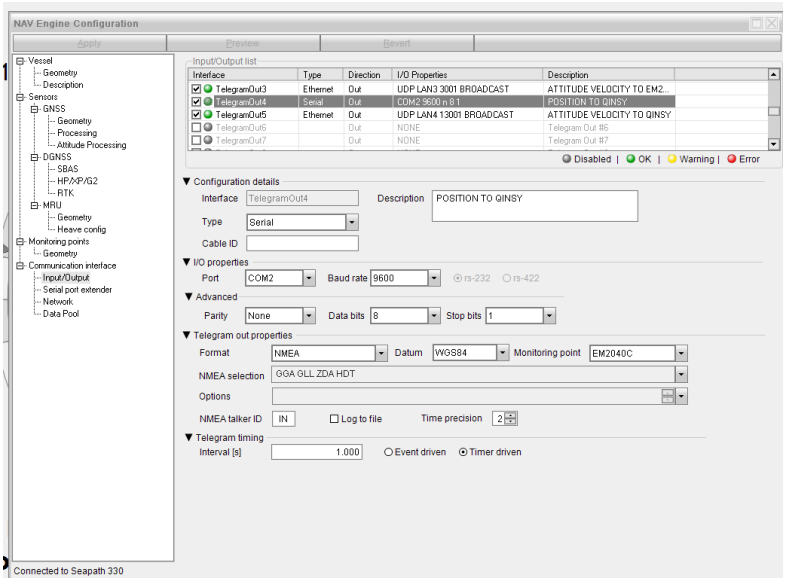

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Altitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
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
COM3 38400 n 8 1 rs-232
Link #1
Disabled | OK | Warning | Error
Configuration details
Interface
MRU
Description
IMU #1
Type
Serial
Cable ID
I/O properties
Port
MRU
Baud rate
115200
rs-232
rs-422
Advanced
Parity
None
Data bits
8
Stop bits
1
Connected to Seapath 330

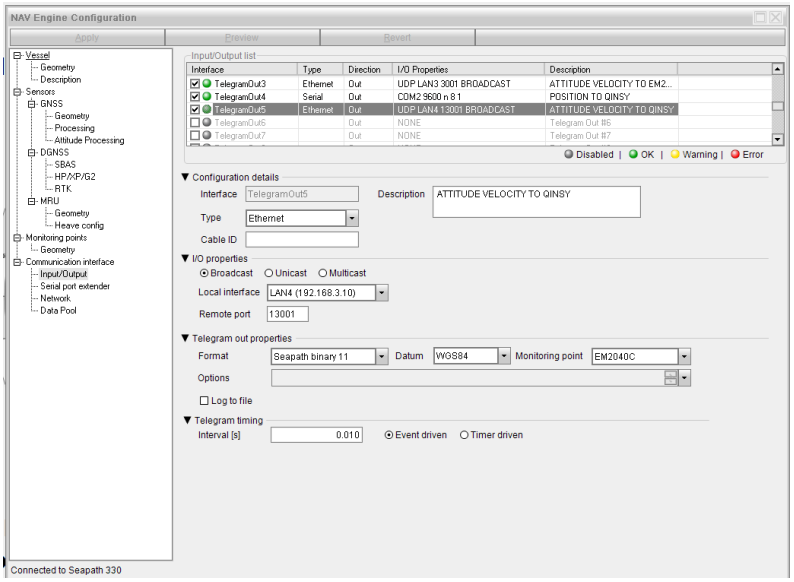

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Altitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
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
TelegramOut1
Description
POSITION TO EM2040C
Type
Serial
Cable ID
I/O properties
Port
COM9
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 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

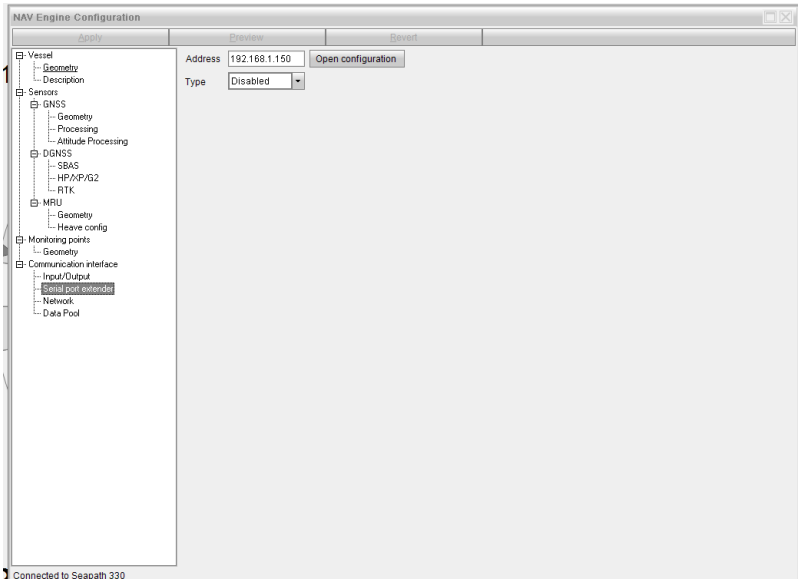

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
Type
Direction
I/O Properties
Description
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

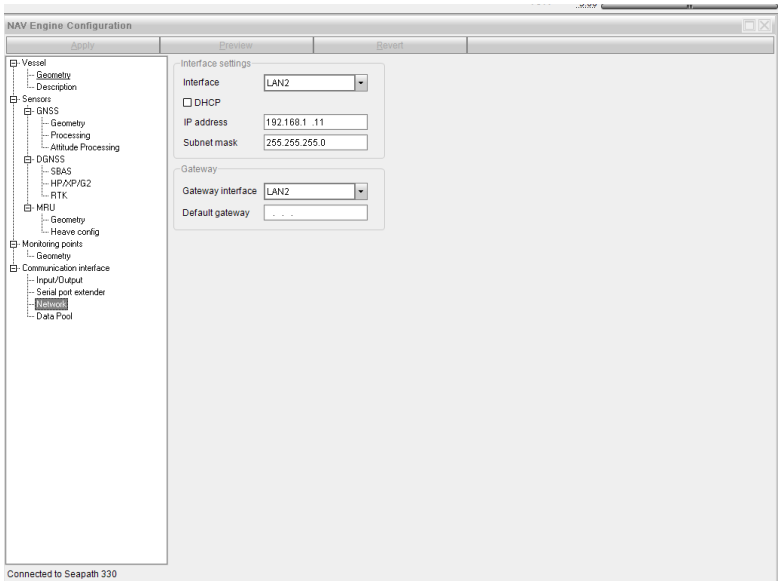

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
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

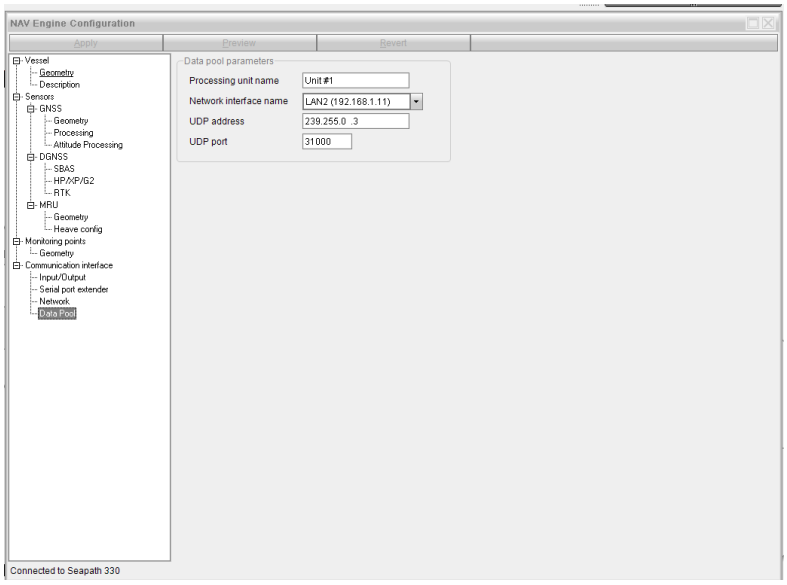

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Altitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
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
Altitude 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

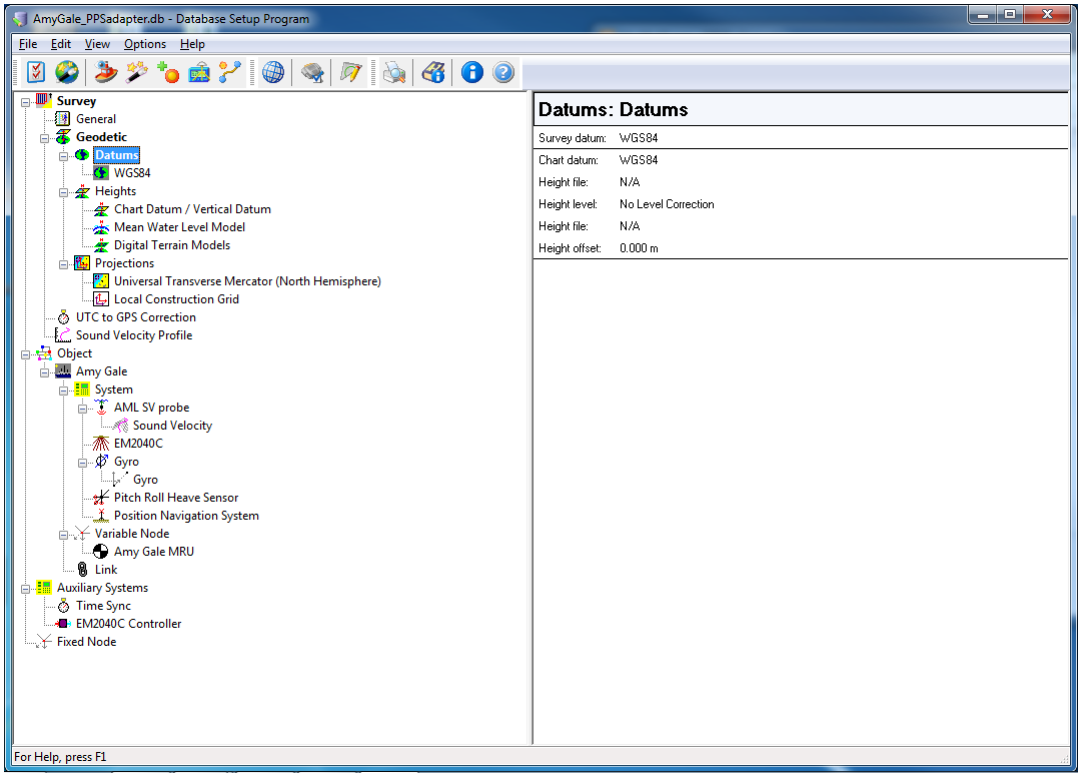

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Altitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Input/Output list
Interface
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
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

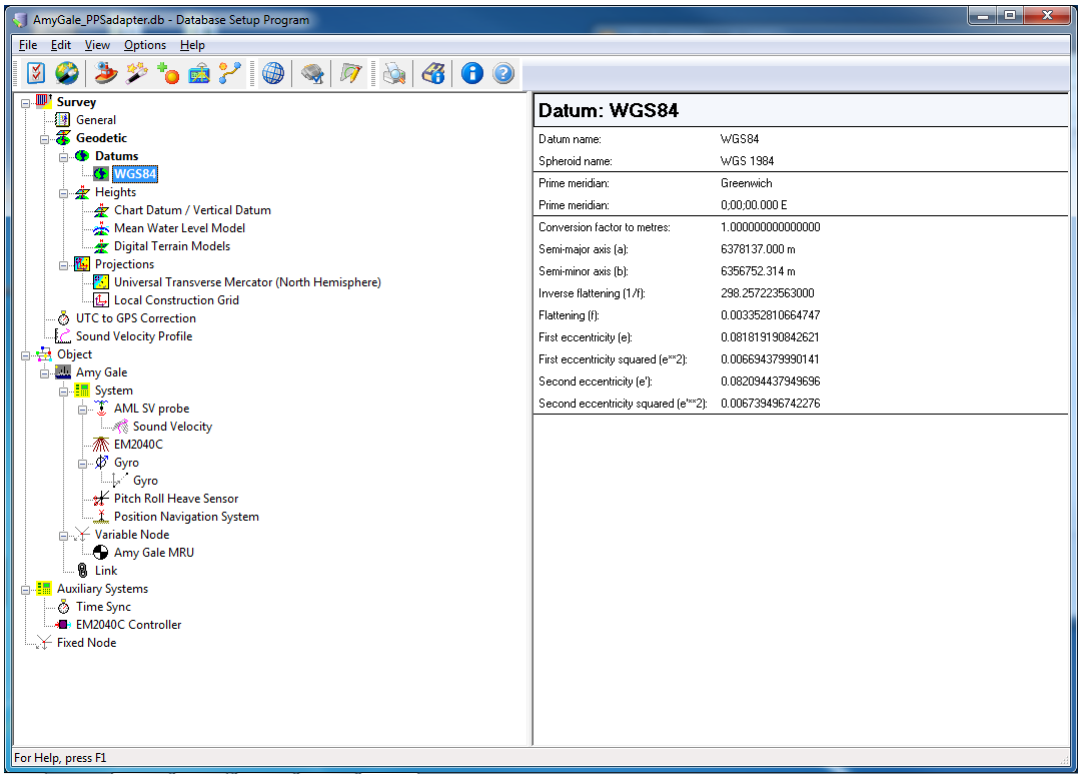

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Altitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Address
192.168.1.150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

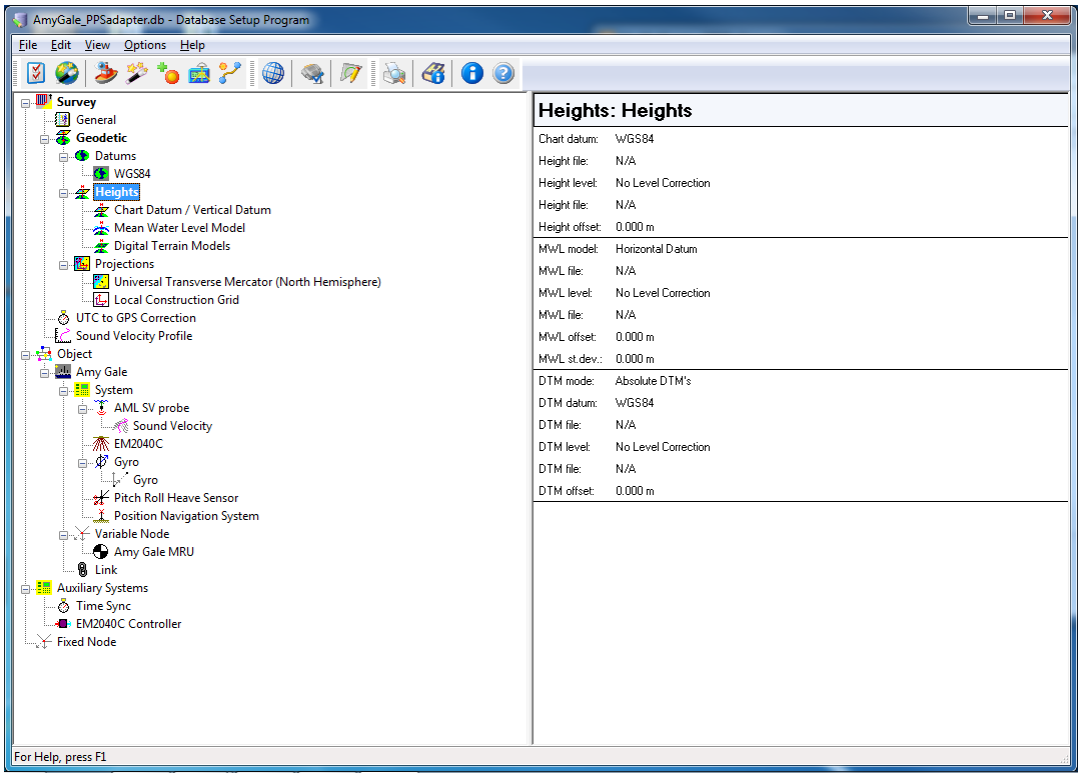

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Interface settings
Interface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

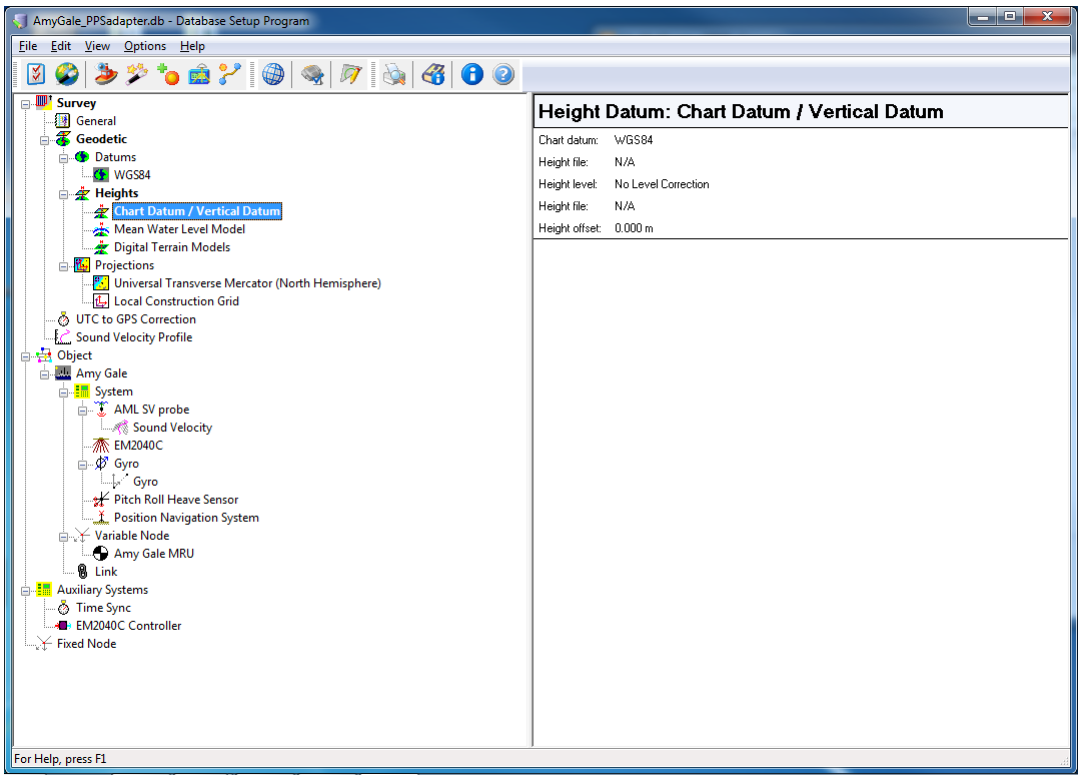

NAV Engine Configuration
Apply
Preview
Revert
Vessel
Geometry
Description
Sensors
GNSS
Geometry
Processing
Attitude Processing
DGNSS
SBAS
HP/XP/G2
RTK
MRU
Geometry
Heave config
Monitoring points
Geometry
Communication interface
Input/Output
Serial port extender
Network
Data Pool
Data pool parameters
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 C – 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
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Universal Transverse Mercator (North Hemisphere)
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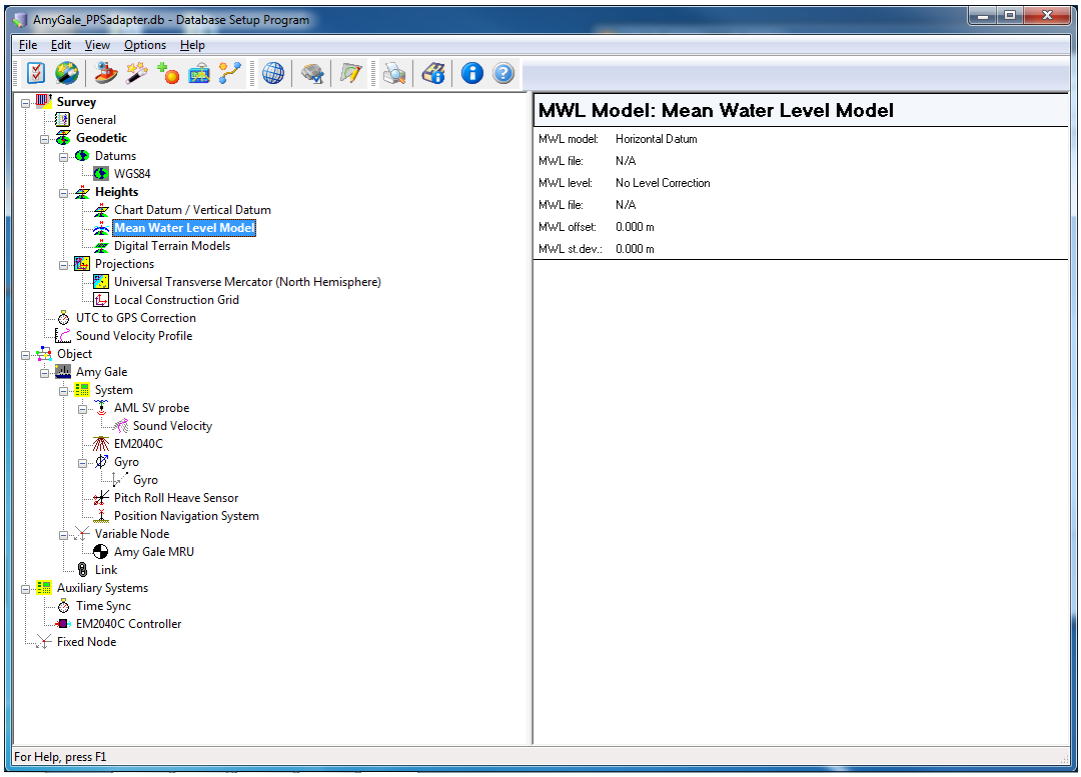
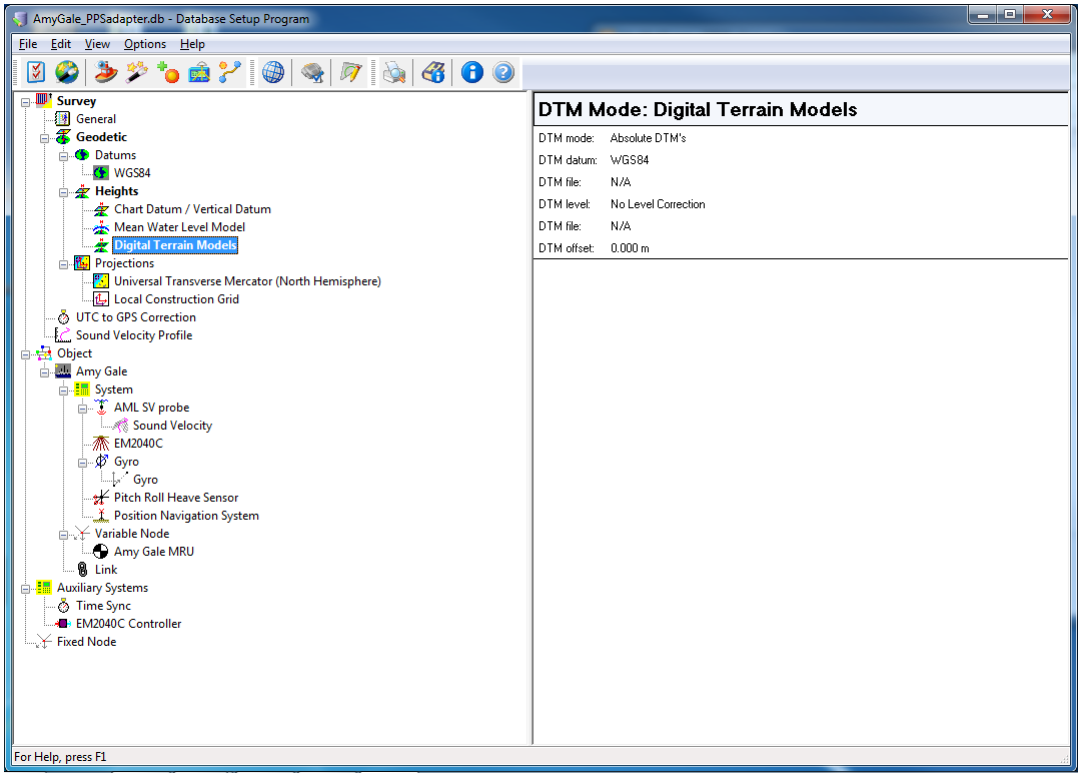
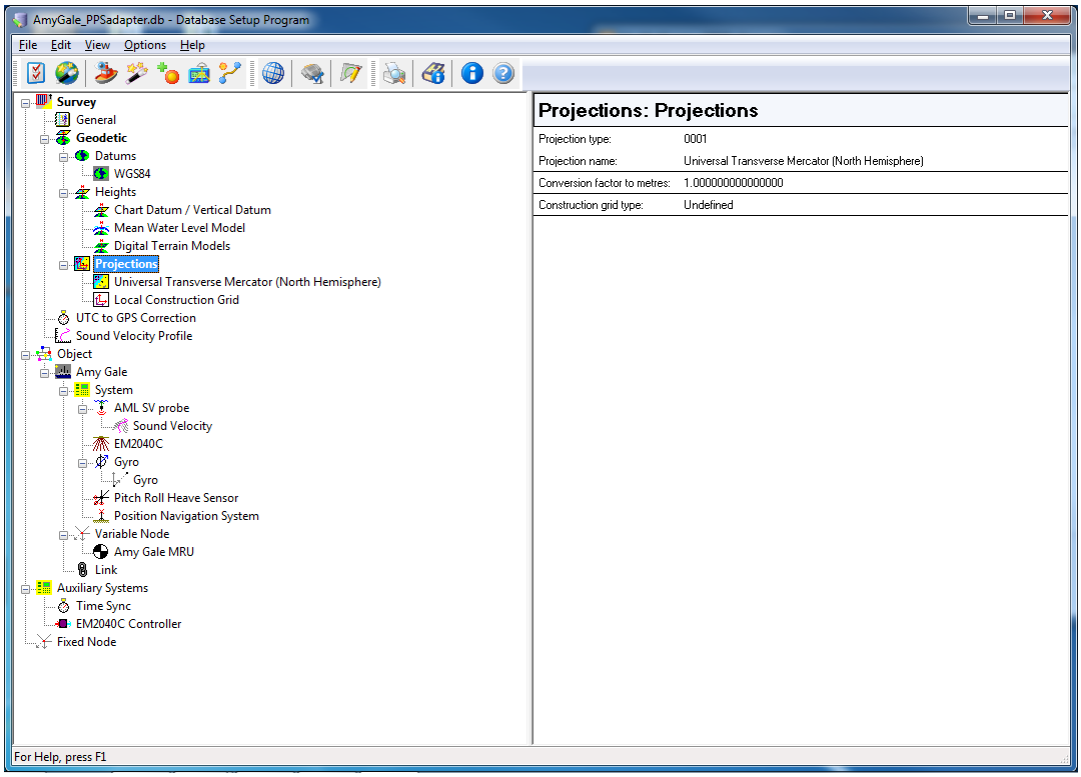
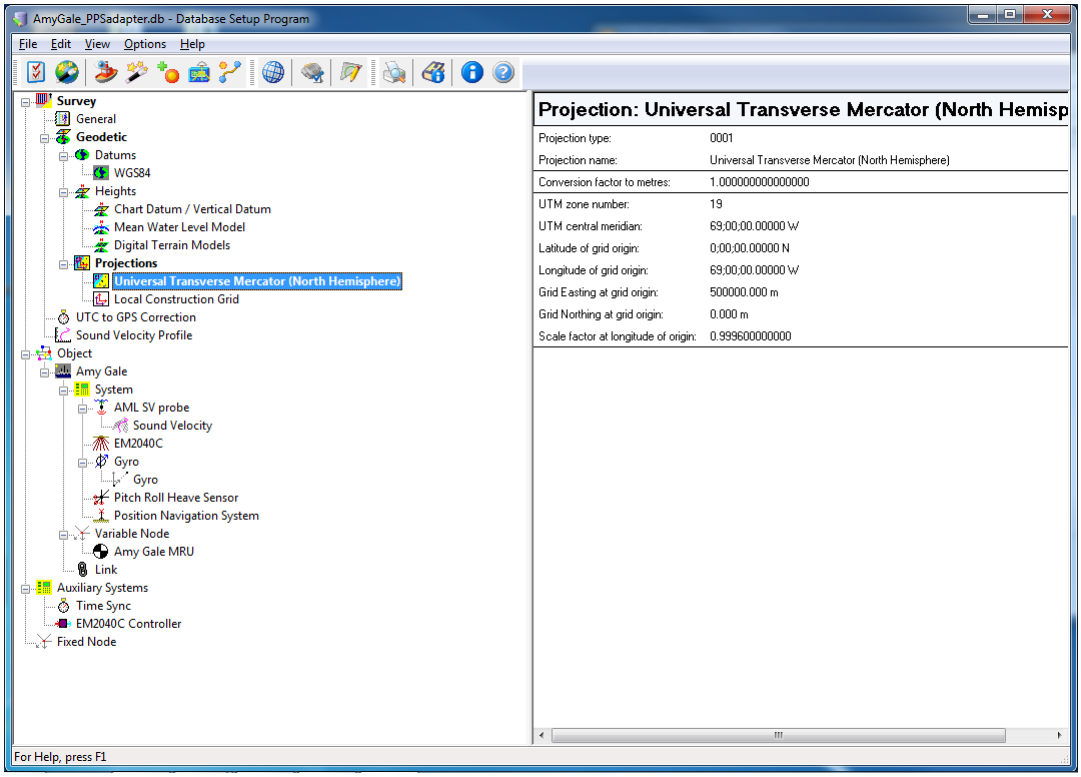
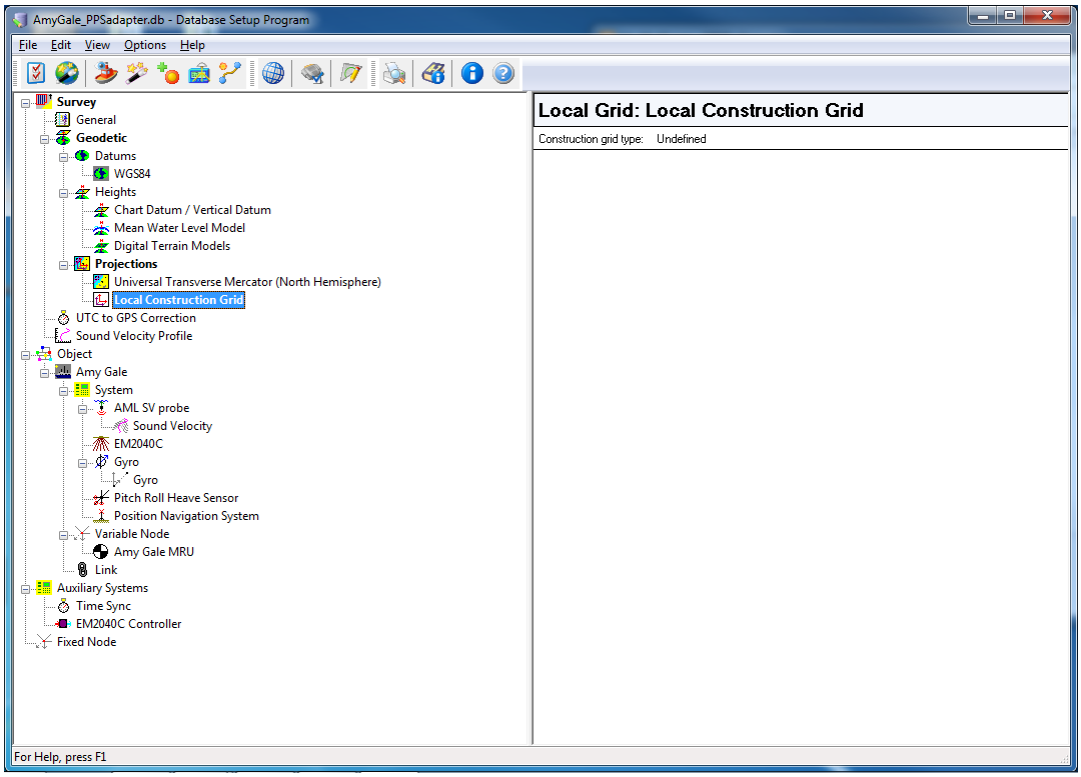
UTC to GPS Correction
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Height Datum: Chart Datum / Vertical Datum
Chart datum: WGS84
Height file: N/A
Height level: No Level Correction
Height file: N/A
Height offset: 0.000 m
For Help, press F1

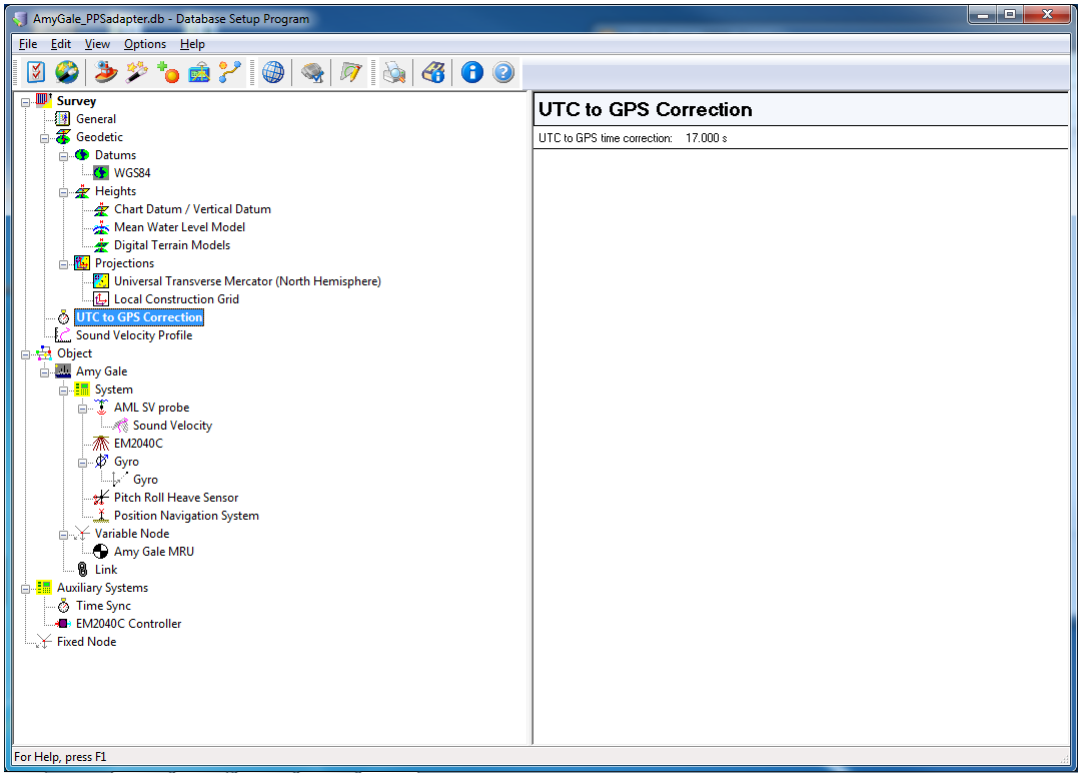

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
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

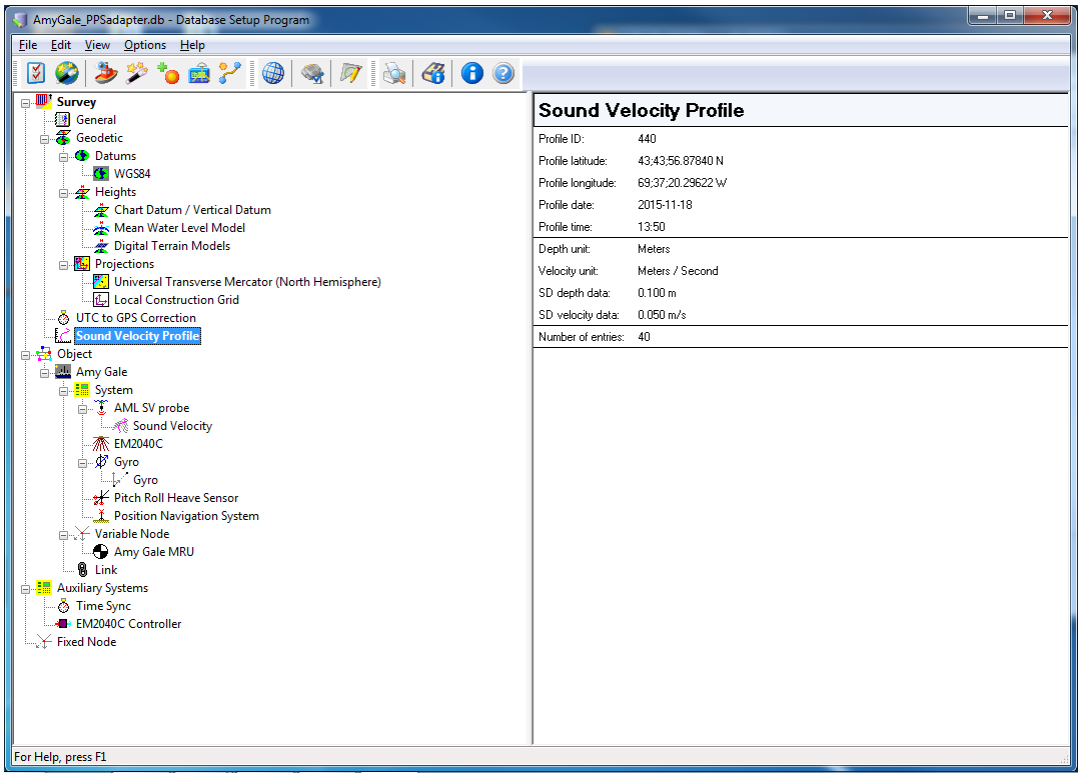

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
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

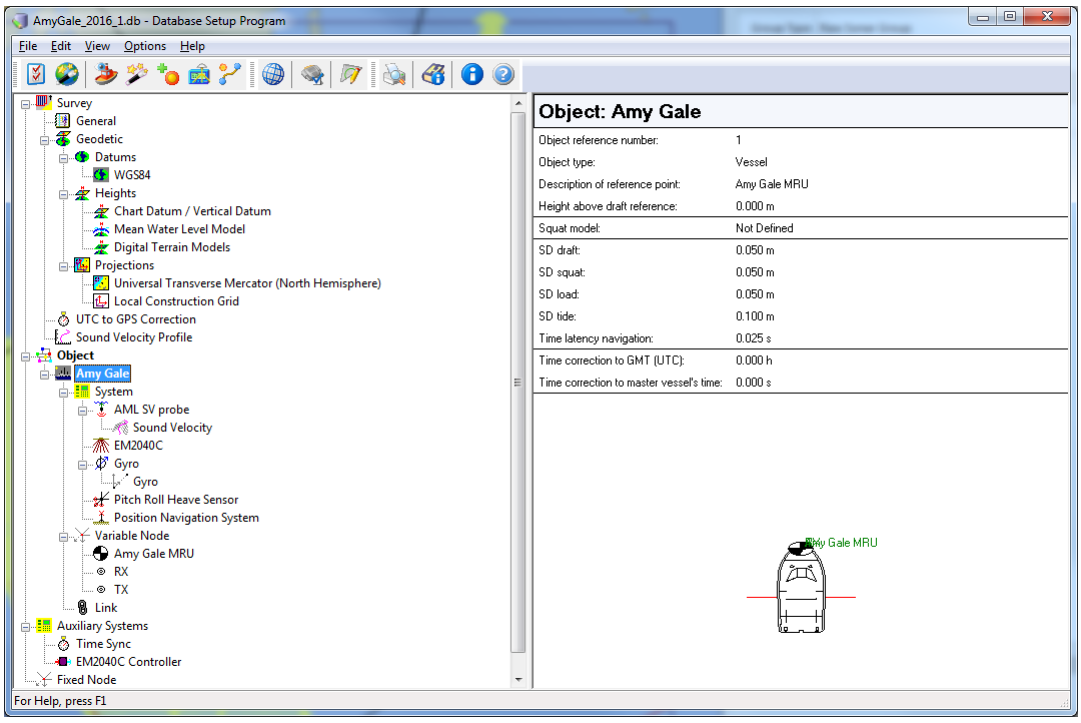

AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
Digital Terrain Models
Projections
Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
UTC to GPS Correction
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
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
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
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


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
Local Grid: Local Construction Grid
Construction grid type: Undefined
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
UTC to GPS Correction
UTC to GPS time correction: 17.000 s
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
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_2016_1.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
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Heights
Chart Datum / Vertical Datum
Mean Water Level Model
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Local Construction Grid
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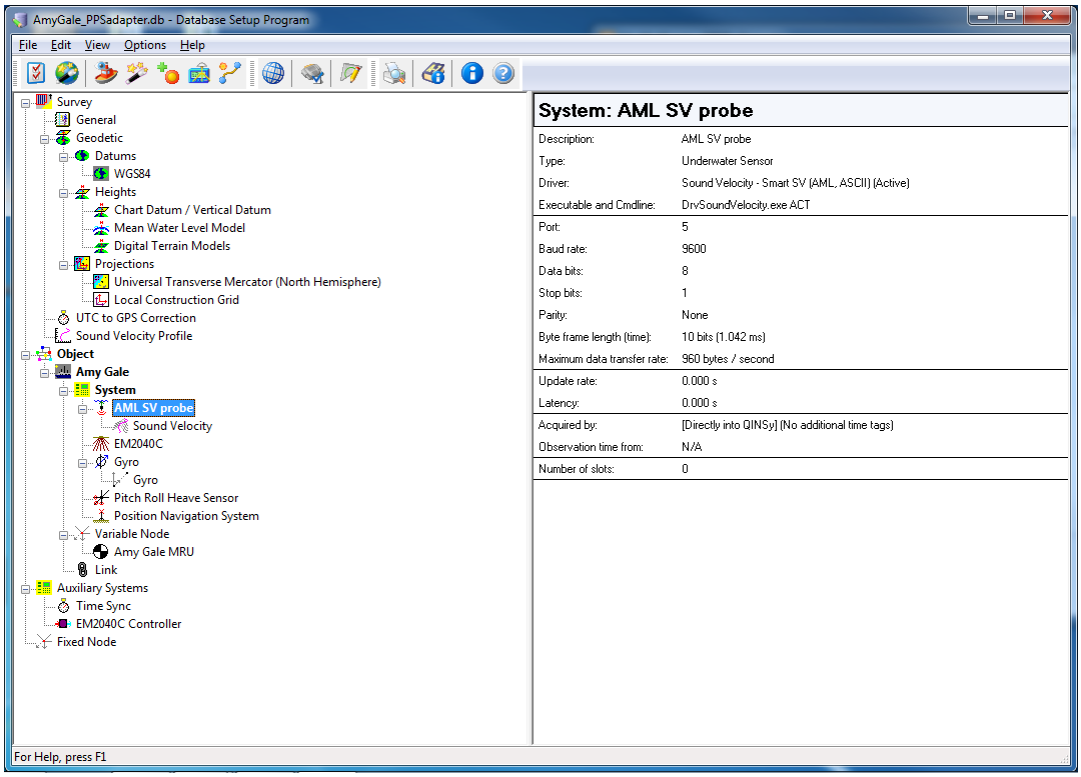
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Object: Amy Gale
Object reference number: 1
Object type: Vessel
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
Amy Gale MRU
For Help, press F1


AmyGale_PPSadapter.db - Database Setup Program
File Edit View Options Help
Survey
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Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
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Universal Transverse Mercator (North Hemisphere)
Local Construction Grid
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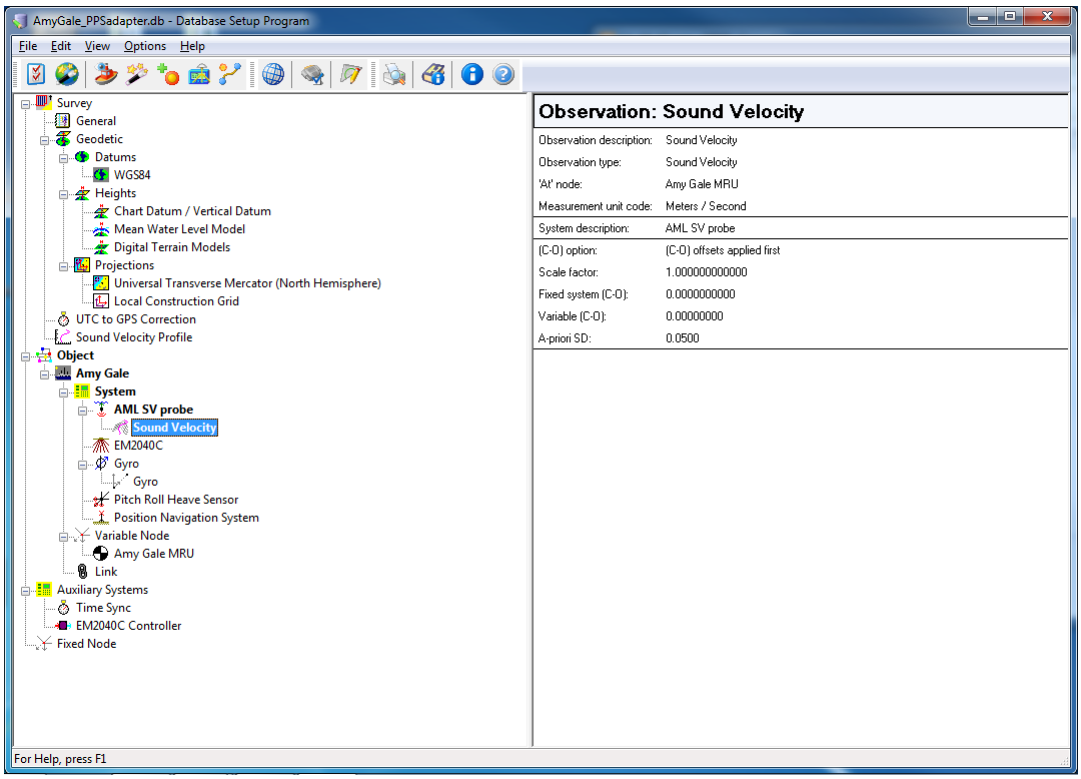
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
System: AML SV probe
Description: AML SV probe
Type: Underwater Sensor
Driver: Sound Velocity - Smart SV (AML, ASCII) (Active)
Executable and Cmdline: DrvSoundVelocity.exe ACT
Port: 5
Baud rate: 9600
Data bits: 8
Stop bits: 1
Parity: None
Byte frame length (time): 10 bits (1.042 ms)
Maximum data transfer rate: 960 bytes / second
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
File Edit View Options Help
Survey
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Mean Water Level Model
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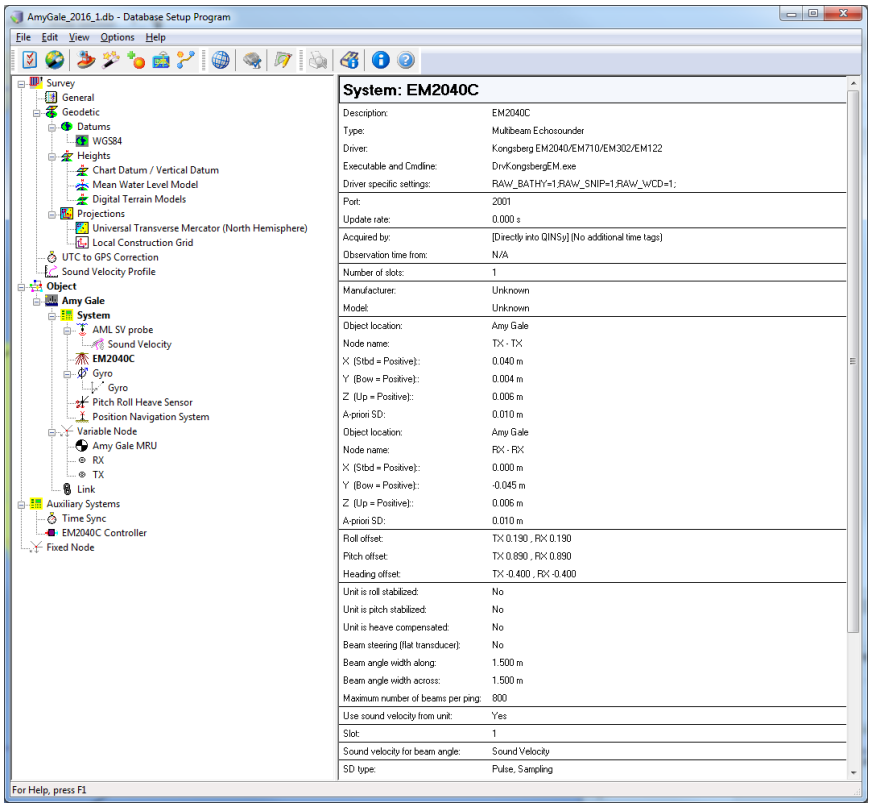
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Observation: Sound Velocity
Observation description: Sound Velocity
Observation type: Sound Velocity
'At' node: Amy Gale MRU
Measurement unit code: Meters / Second
System description: AML SV probe
(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: 0.0500
For Help, press F1


AmyGale_2016_1.db - Database Setup Program
File Edit View Options Help
Survey
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Geodetic
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WGS84
Heights
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Mean Water Level Model
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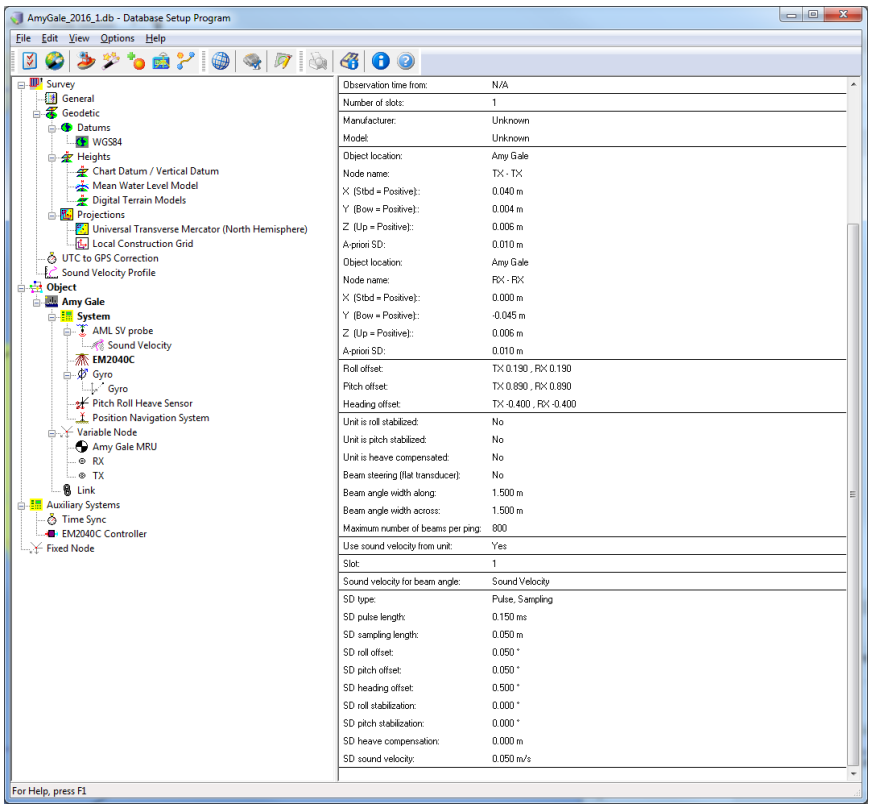
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
System: EM2040C
Description: EM2040C
Type: Multibeam Echosounder
Driver: Kongsberg EM2040/EM710/EM302/EM122
Executable and Cmdline: DrvKongsbergEM.exe
Driver specific settings: RAW_BATHY=1;RAW_SNIP=1;RAW_WCD=1;
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: TX - TX
X (Stbd = Positive): 0.040 m
Y (Bow = Positive): 0.004 m
Z (Up = Positive): 0.006 m
A-priori SD: 0.010 m
Object location: Amy Gale
Node name: RX - RX
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): -0.045 m
Z (Up = Positive): 0.006 m
A-priori SD: 0.010 m
Roll offset: TX 0.190 , RX 0.190
Pitch offset: TX 0.890 , RX 0.890
Heading offset: TX -0.400 , RX -0.400
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
For Help, press F1


AmyGale_2016_1.db - Database Setup Program
File Edit View Options Help
Survey
General
Geodetic
Datums
WGS84
Heights
Chart Datum / Vertical Datum
Mean Water Level Model
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Projections
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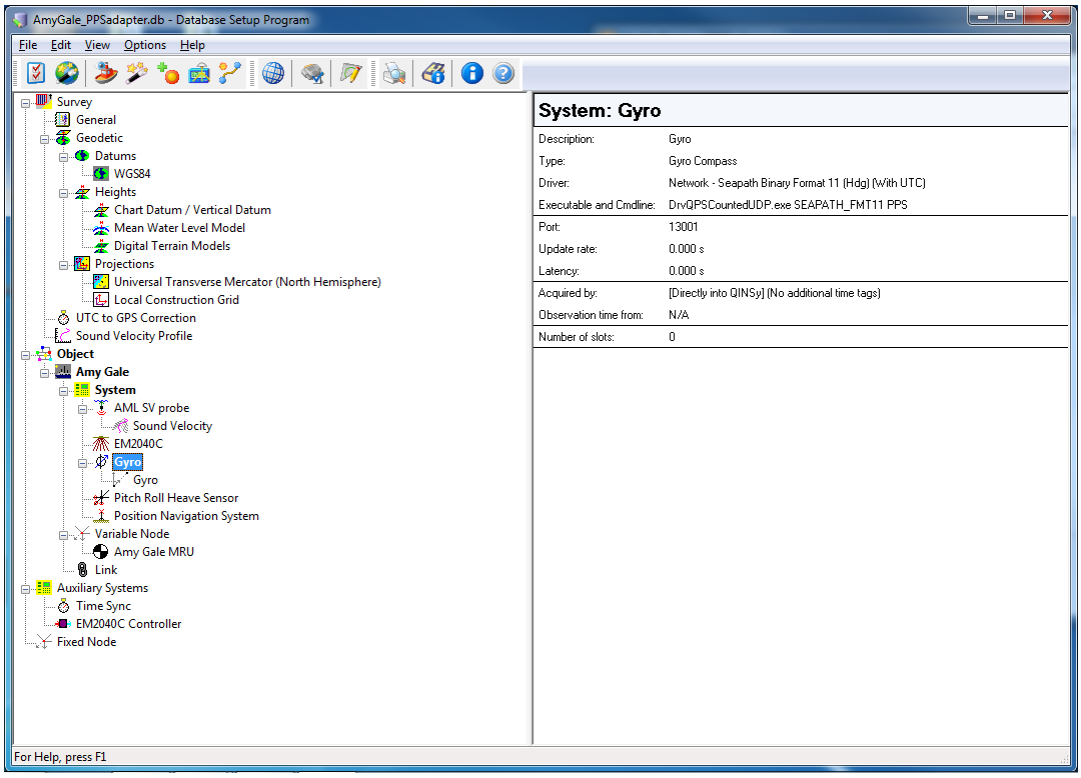
Sound Velocity Profile
Object
Amy Gale
System
AML SV probe
Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
Observation time from: N/A
Number of slots: 1
Manufacturer: Unknown
Model: Unknown
Object location: Amy Gale
Node name: TX - TX
X (Stbd = Positive): 0.040 m
Y (Bow = Positive): 0.004 m
Z (Up = Positive): 0.006 m
A-priori SD: 0.010 m
Object location: Amy Gale
Node name: RX - RX
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): -0.045 m
Z (Up = Positive): 0.006 m
A-priori SD: 0.010 m
Roll offset: TX 0.190 , RX 0.190
Pitch offset: TX 0.890 , RX 0.890
Heading offset: TX -0.400 , RX -0.400
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
File Edit View Options Help
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AML SV probe
Sound Velocity
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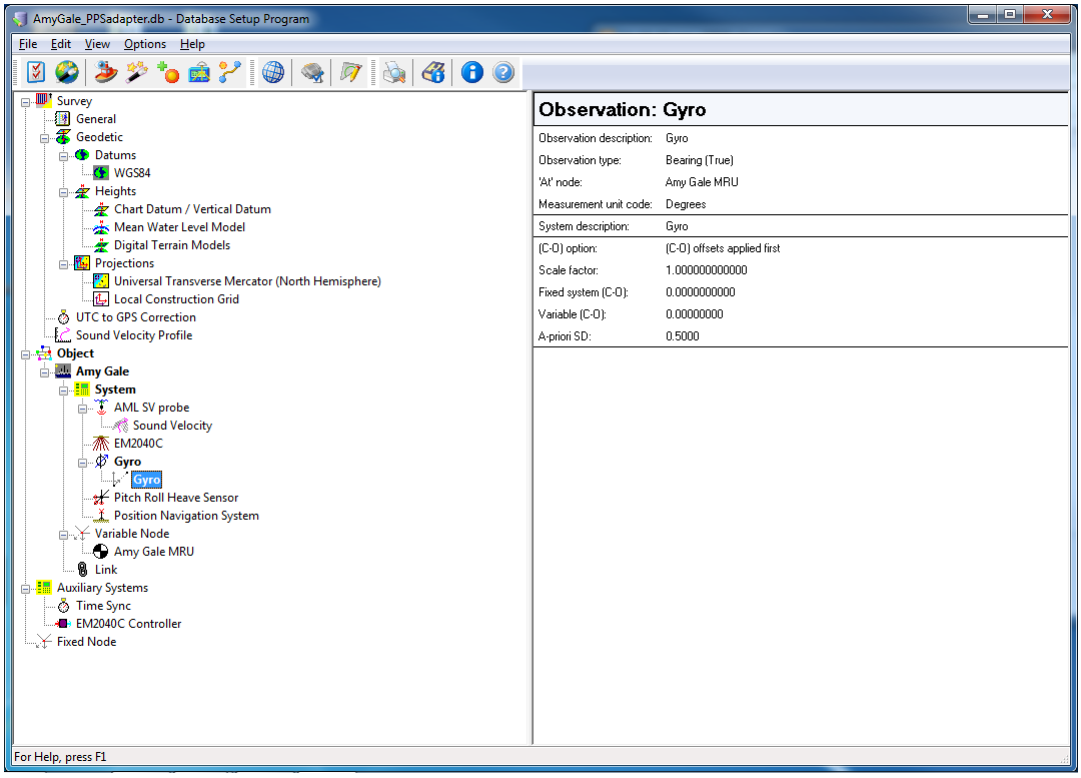
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
Link
Auxiliary Systems
Time Sync
EM2040C Controller
Fixed Node
System: Gyro
Description: Gyro
Type: Gyro Compass
Driver: Network - Seapath Binary Format 11 (Hdg) (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe 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
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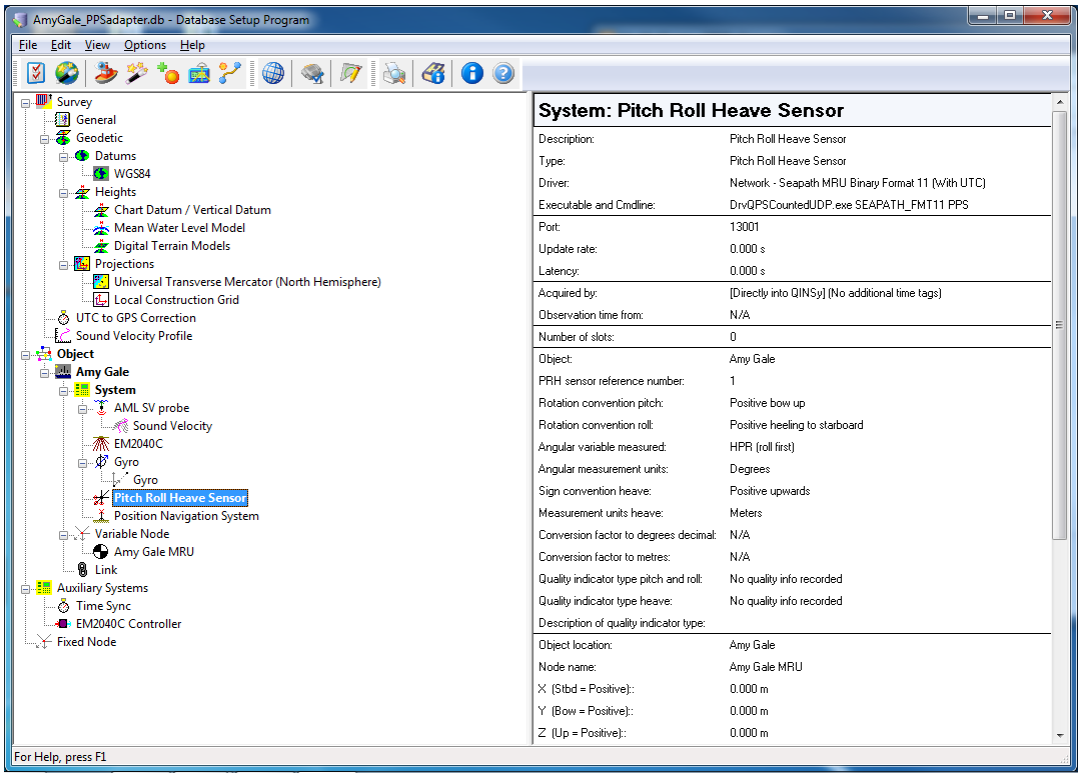
EM2040C Controller
Fixed Node
Observation: Gyro
Observation description: Gyro
Observation type: Bearing (True)
'At' node: Amy Gale MRU
Measurement unit code: Degrees
System description: Gyro
(C-O) option: (C-O) offsets applied first
Scale factor: 1.000000000000
Fixed system (C-O): 0.0000000000
Variable (C-O): 0.00000000
A-priori SD: 0.5000
For Help, press F1


AmyGale_PPSadapter.db - Database Setup Program
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Variable Node
Amy Gale MRU
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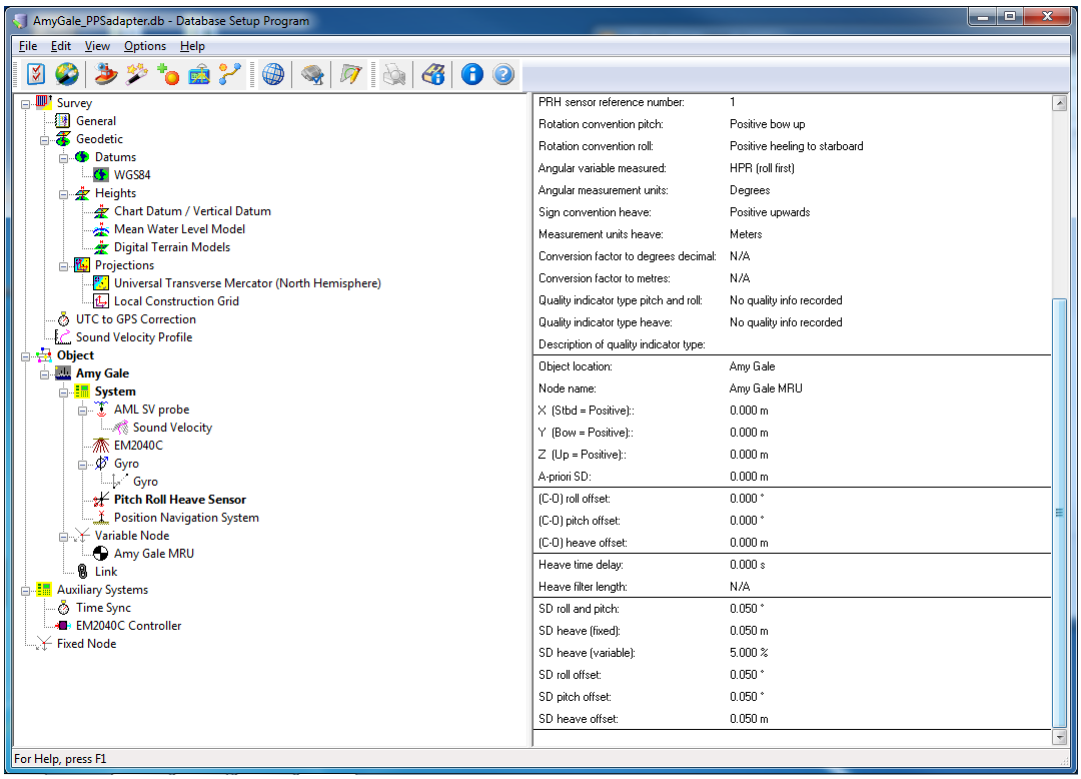
EM2040C Controller
Fixed Node
System: Pitch Roll Heave Sensor
Description: Pitch Roll Heave Sensor
Type: Pitch Roll Heave Sensor
Driver: Network - Seapath MRU Binary Format 11 (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 s
Acquired 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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Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
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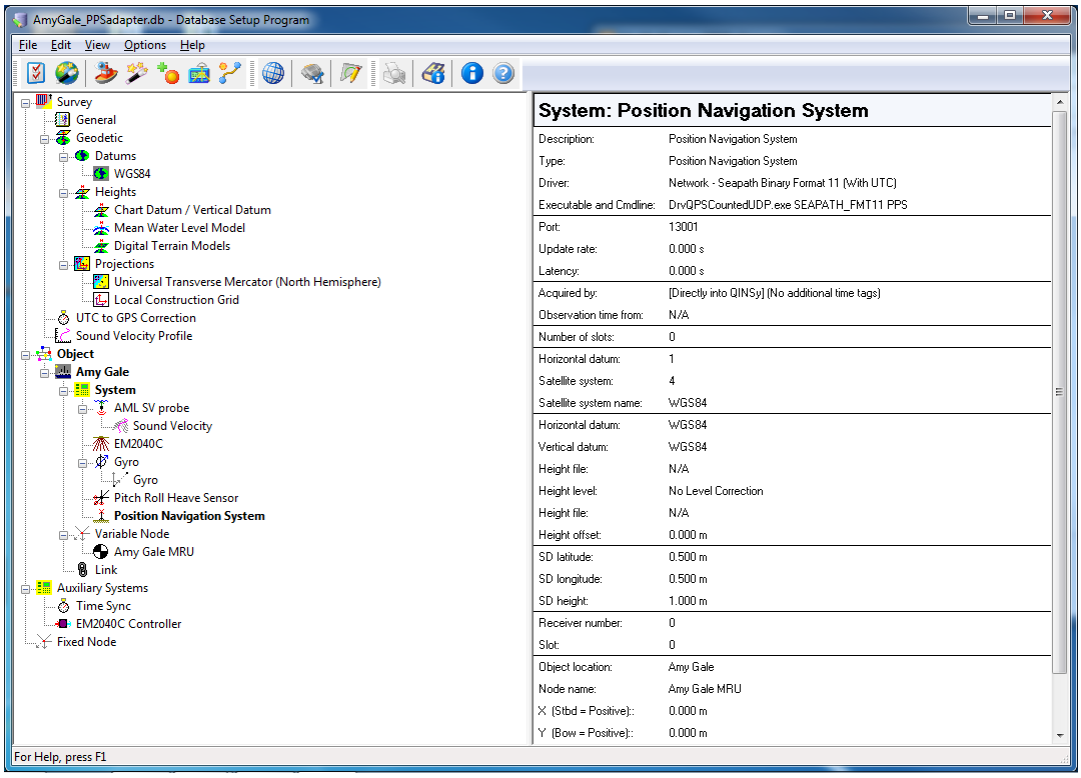
Fixed Node
PRH sensor reference number: 1
Rotation convention pitch: Positive bow up
Rotation convention roll: Positive heeling to starboard
Angular variable measured: HPR (roll first)
Angular measurement units: Degrees
Sign convention heave: Positive upwards
Measurement units heave: Meters
Conversion 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
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Sound Velocity
EM2040C
Gyro
Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
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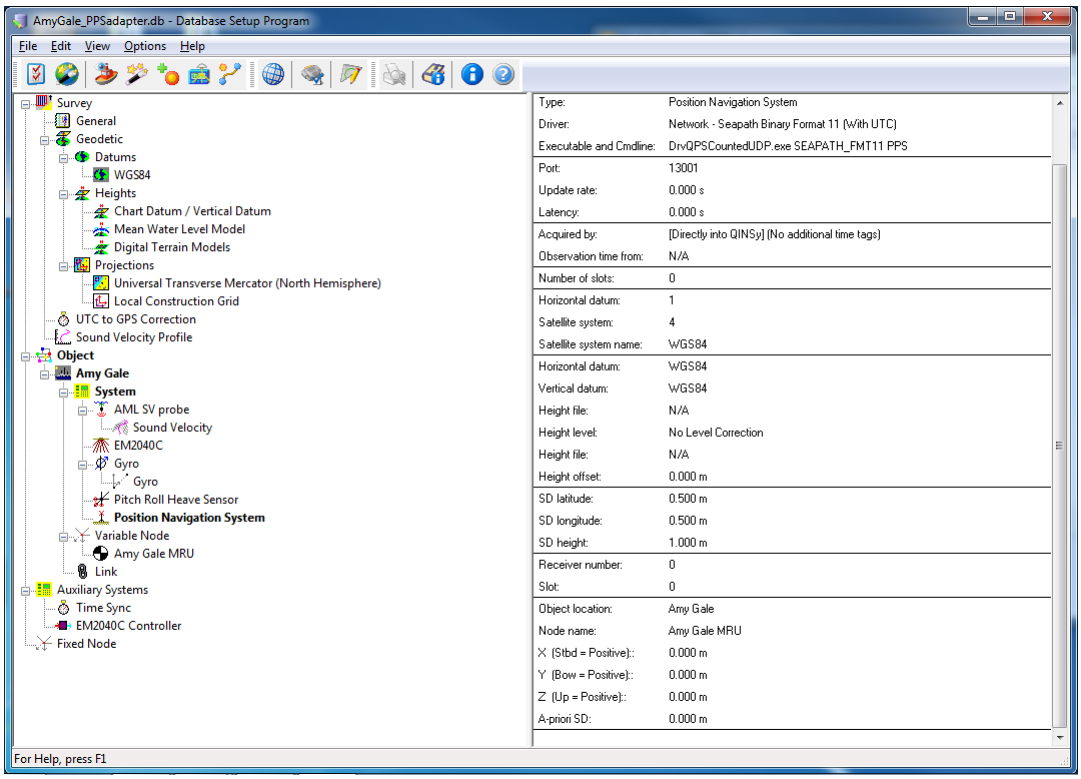
EM2040C Controller
Fixed Node
System: Position Navigation System
Description: Position Navigation System
Type: Position Navigation System
Driver: Network - Seapath Binary Format 11 (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 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
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Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
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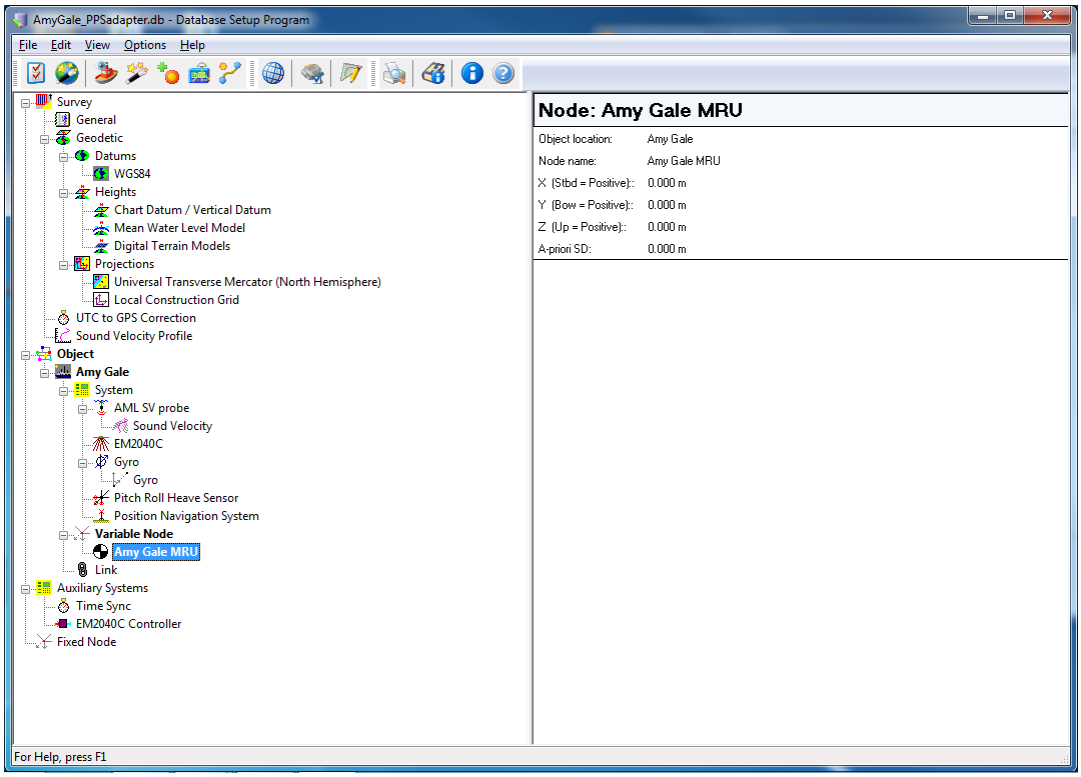
EM2040C Controller
Fixed Node
Type: Position Navigation System
Driver: Network - Seapath Binary Format 11 (With UTC)
Executable and Cmdline: DrvQPSCountedUDP.exe SEAPATH_FMT11 PPS
Port: 13001
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation 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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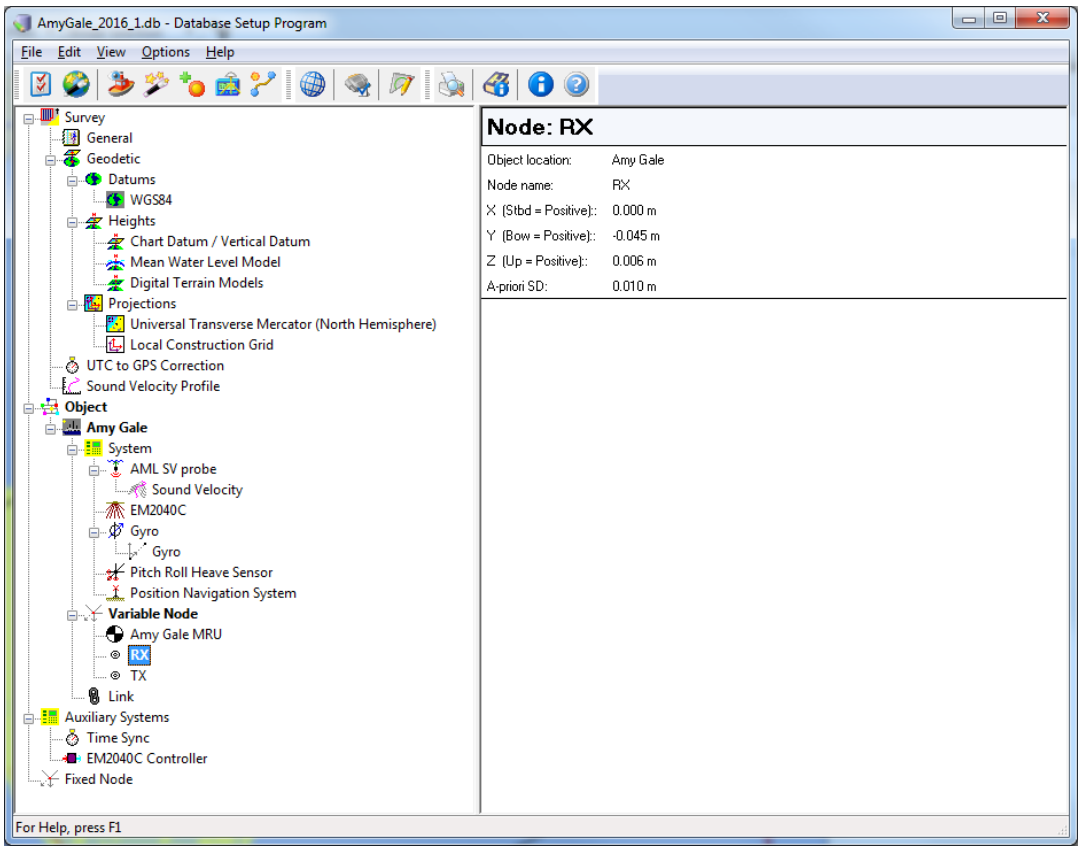
Fixed Node
Node: Amy Gale MRU
Object location: Amy Gale
Node name: Amy Gale MRU
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): 0.000 m
Z (Up = Positive): 0.000 m
A-priori SD: 0.000 m
For Help, press F1


AmyGale_2016_1.db - Database Setup Program
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Variable Node
Amy Gale MRU
RX
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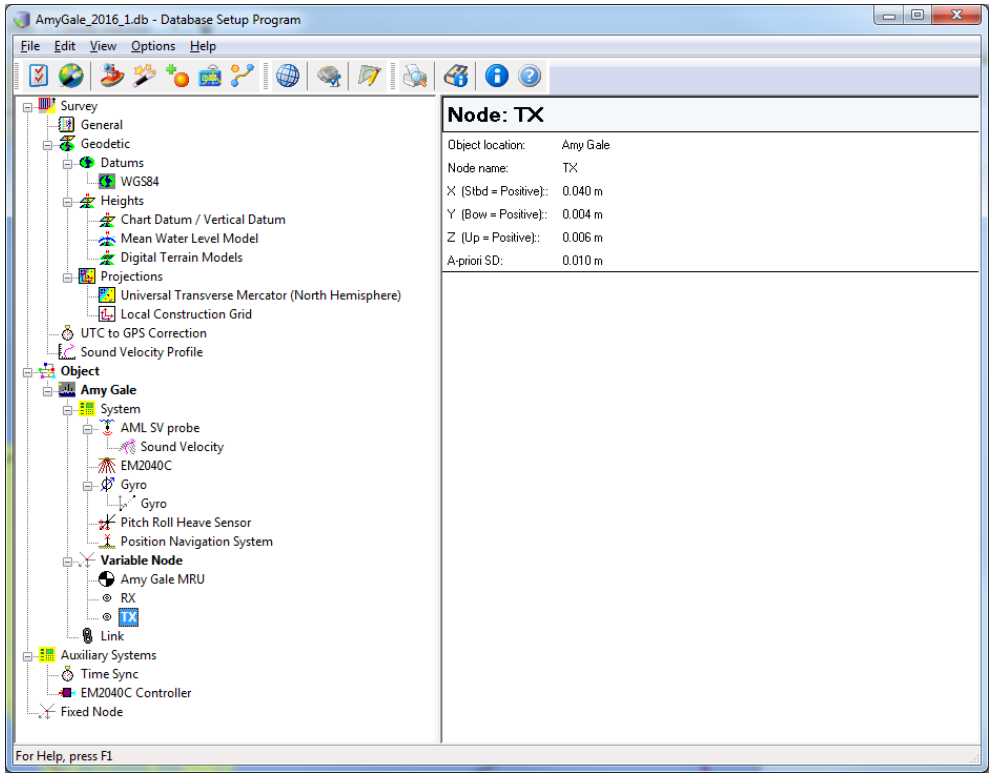
Time Sync
EM2040C Controller
Fixed Node
Node: RX
Object location: Amy Gale
Node name: RX
X (Stbd = Positive): 0.000 m
Y (Bow = Positive): -0.045 m
Z (Up = Positive): 0.006 m
A-priori SD: 0.010 m
For Help, press F1


AmyGale_2016_1.db - Database Setup Program
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Gyro
Pitch Roll Heave Sensor
Position Navigation System
Variable Node
Amy Gale MRU
RX
TX
Link
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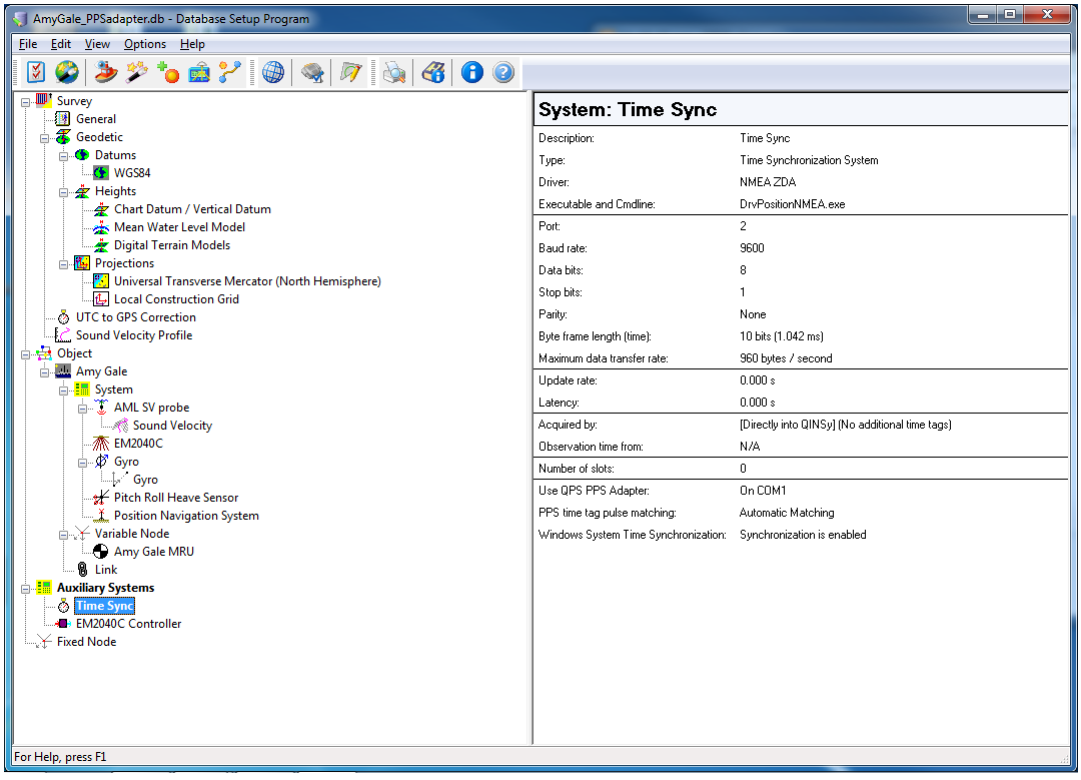
Time Sync
EM2040C Controller
Fixed Node
Node: TX
Object location: Amy Gale
Node name: TX
X (Stbd = Positive):: 0.040 m
Y (Bow = Positive):: 0.004 m
Z (Up = Positive):: 0.006 m
A-priori SD: 0.010 m
For Help, press F1


AmyGale_PPSadapter.db - Database Setup Program
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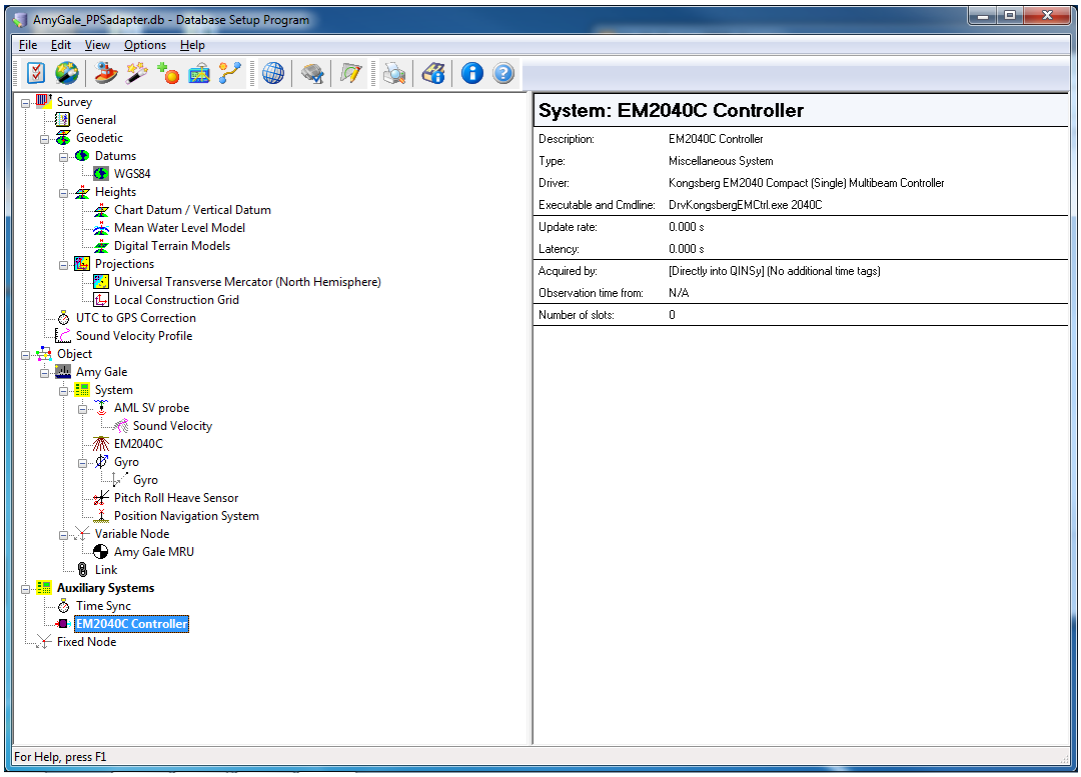
Fixed Node
System: Time Sync
Description: Time Sync
Type: Time Synchronization System
Driver: NMEA ZDA
Executable and Cmdline: DrvPositionNMEA.exe
Port: 2
Baud rate: 9600
Data bits: 8
Stop bits: 1
Parity: None
Byte frame length (time): 10 bits (1.042 ms)
Maximum data transfer rate: 960 bytes / second
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
Use QPS PPS Adapter: On COM1
PPS time tag pulse matching: Automatic Matching
Windows System Time Synchronization: Synchronization is enabled
For Help, press F1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Gyro
Pitch Roll Heave Sensor
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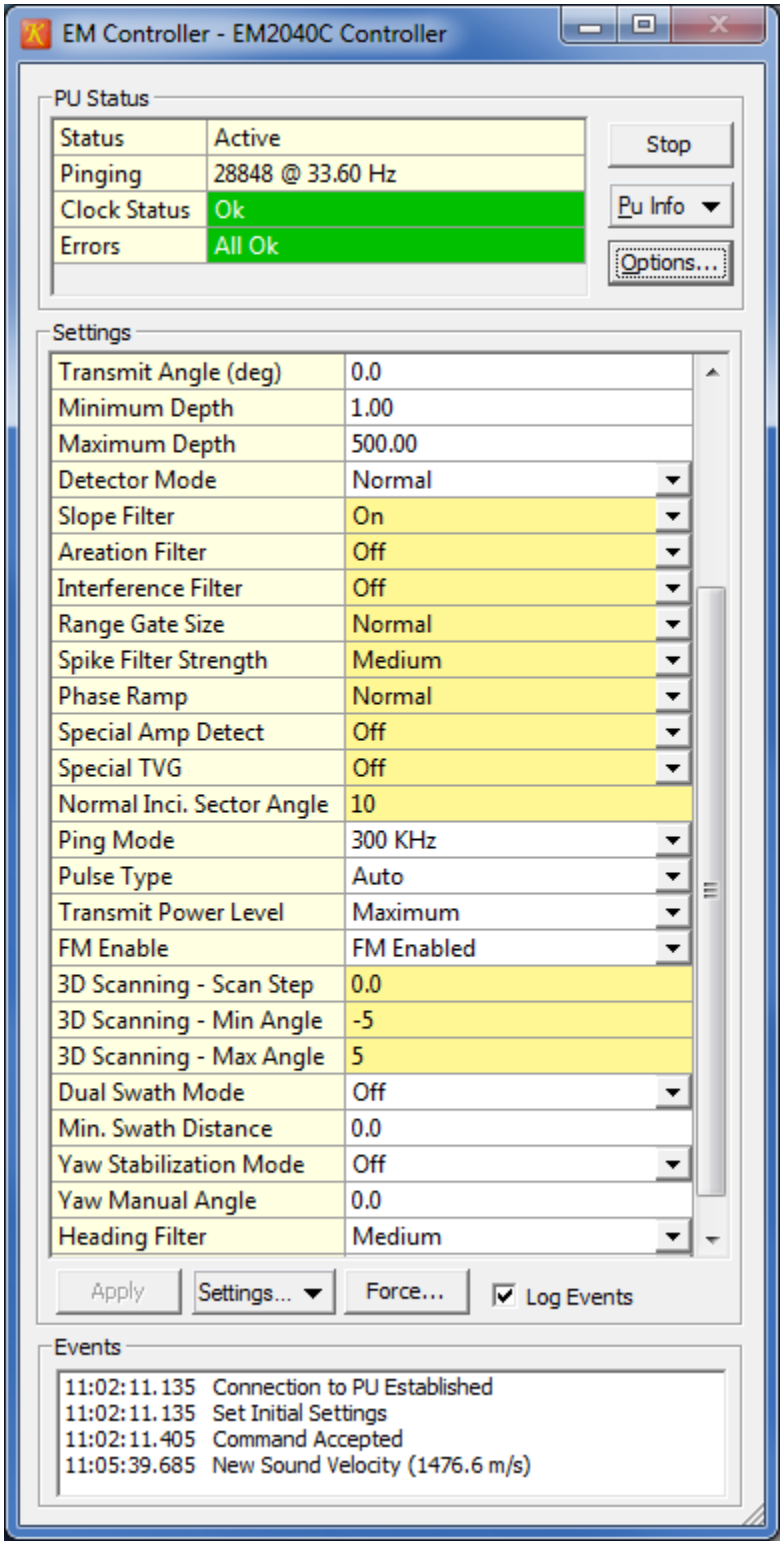
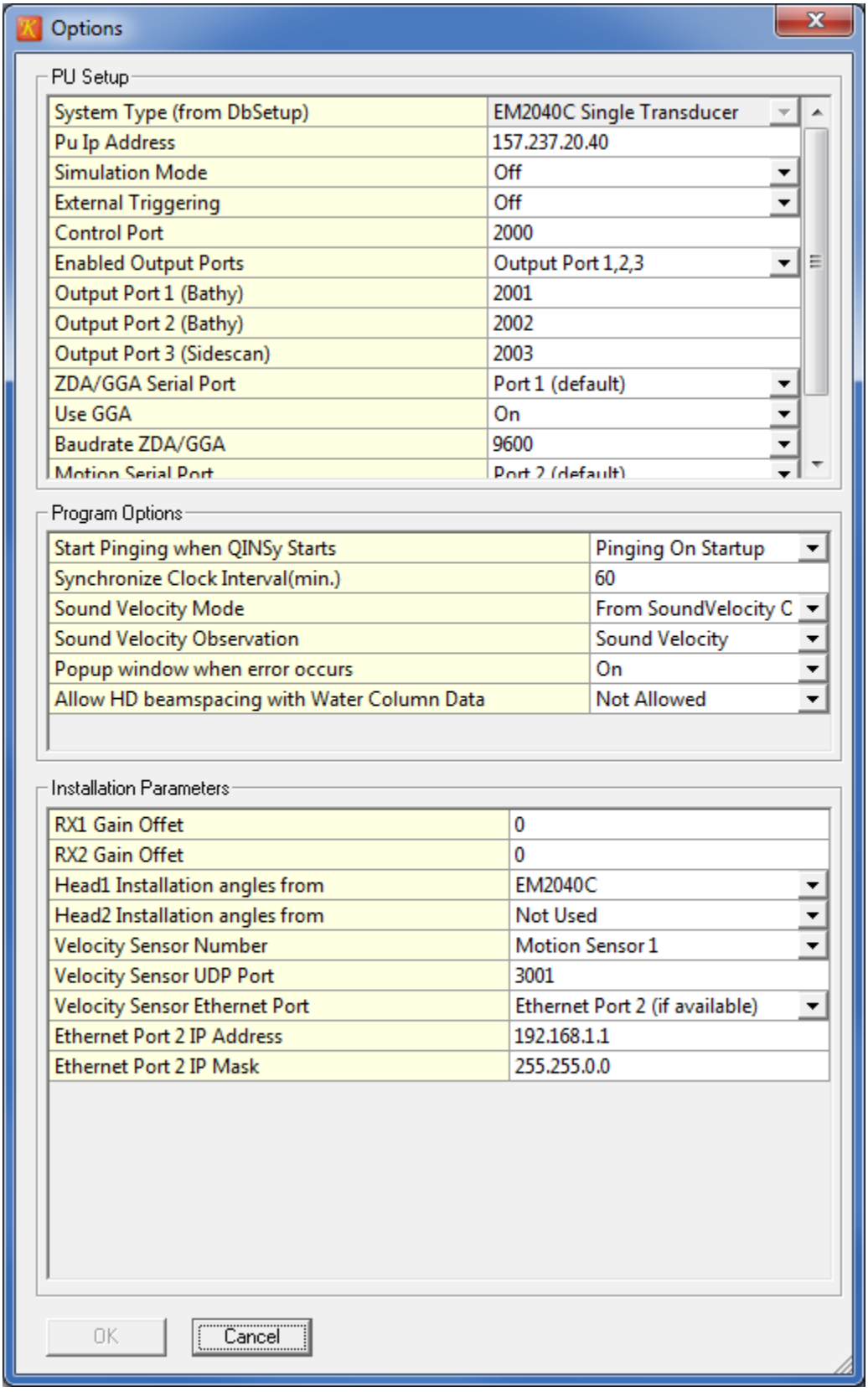
EM2040C Controller
Fixed Node
System: EM2040C Controller
Description: EM2040C Controller
Type: Miscellaneous System
Driver: Kongsberg EM2040 Compact (Single) Multibeam Controller
Executable and Cmdline: DrvKongsbergEMCtrl.exe 2040C
Update rate: 0.000 s
Latency: 0.000 s
Acquired by: [Directly into QINSy] (No additional time tags)
Observation time from: N/A
Number of slots: 0
For Help, press F1

Appendix D – 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

APPROVAL PAGE

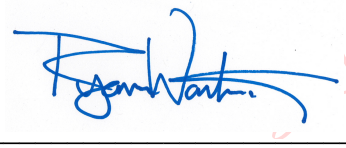
W00449

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive:

- Descriptive Report Memo
- Bathymetric Attributed Grid (BAG)
- Processed survey data and records
- GeoPDF of survey products
- Backscatter mosaic

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved: 

Lieutenant Commander Ryan Wartick, NOAA
Chief, Atlantic Hydrographic Branch