U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

Data Acquisition & Processing Report

Type of Survey Navigable Areas & Field Examination

Project No OPR-G347-NRT2-08

Time Frame May 2008 to May 2009

LOCALITY

State South Carolina

General Locality Charleston

2008

CHIEF OF PARTY

David B. Elliott – Team Leader

Library & Archives

DATE

Data Acquisition & Processing Report
Title Sheet

Project No. OPR-G347-NRT2-08

Date of Project Instructions: 09 April, 2008

Vessel NOAA Launch 1210

Field Unit Navigation Response Team 2

Chief of Branch LCDR. Lawrence T. Krepp

Chief of Party David B. Elliott – Team Leader

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Data Acquisition and Processing Report
For Calendar year 2008-2009

NOAA Launch 1210, Navigation Response Team 2

A. Equipment

The following sections describe major operational systems used to acquire survey data or control survey operations:

A.1 Platform

NOAA launch 1210, a 30-foot SeaArk with an 8.5-foot beam and draft of 0.5 meters, was used to collect all survey data. Launch 1210 is equipped with a J-arm to deploy the side scan sonar. An electric winch controls the tow-fish height during side scan acquisition. The operator maintains the proper depth for the best coverage at the sonar scale. The vessel DGPS (POS MV) was checked weekly to a known GPS reference point. There were no unusual vessel configurations or problems encountered with the vessel.

Launch 1210 is equipped with a Dynapar Cable counter that measures the side scan towfish tow cable by counting revolutions of the towing block on the J-Arm. The length of cable deployed is computed automatically and output to Hypack.

Launch 1210 is equipped with a POS MV Applanix system for heave, pitch and roll corrections, as well as vessel position and speed.

Coastal Oceanographic Hypack Max is used for survey navigation, Detached Positioning (DP), and VBES data logging bathymetry. Sonar Pro was used for on line acquisition of side scan sonar. Caris & Pydro were used for data processing, and MapInfo Professional, were used to support processing and plotting.

The PCs running Hypack and Sonar Pro are automatically synchronized to UTC time from the NMEA-0183 (zda) GPS messages. The time update occurs during the start and stop logging messages on the Hypack computer.

A.2 Sounding Instruments

<u>Vertical Beam Echo Sounder</u>

An ODOM EchotracCV Fathometer, Ser # 23031 was used to collect all echo soundings on this survey. A standard lead line calibrated in meters, was used during this survey for depth comparison checks with the echo sounder. No problems were encountered with

any of the sounding equipment.

Side Scan Sonar

A Klein 3000 side scan sonar system was used throughout this survey. The Model # 3110 TPU (Topside Processing Unit) Ser# 315 and Model # 3210 Towfish Ser# 414 are part of this system. The side scan sonar equipment was used to conduct dual beam surveying and investigate AWOIS items. The system frequency used was 100 & 500 kHz. The recorder was set on one of either 75/100-meter range scales. The confidence checks were performed daily by identifications made to known features, such as active buoy blocks.

Side scan sonar lines are planned to run parallel to bottom contours, spaced in accordance with the Side Scan Sonar Manual. Lines are planned with at least 15m of overlap with adjacent swaths on either side. Range scales during acquisition are determined primarily by water depth. Vessel speed is adjusted to ensure that an object one meter in characteristic size would be detected and clearly imaged across the sonar swath.

A.3 Positioning and Attitude Instruments

An Applanix POS MV 320 Ver3 (S/N 2546) was used as the primary navigation station and motion sensor on launch 1210 for all hydrographic data acquisition.

A Trimble DGPS Beacon Receiver (S/N 0220261525) was used to supply the RTCM corrector to the POS MV.

A Trimble Pathfinder ProXRS (S/N 0224010201) and antenna (S/N 0220170250) were used for all ENC high accuracy positioning and establishment of calibration points.
The Trimble Pathfinder DGPS Backpack was used for collecting and processing the ENC high accuracy position data.

A.4 Ancillary Instruments

The Instruments used for determining corrections for the speed of sound through the water column were an ODOM Digibar Ser # 98295-020606 and a Seabird-Seacat Velocity Profiler, model 19-03, Ser# 198671-1477. Velocity casts are downloaded and processed in the Velociwin program supplied by the Hydrographic Systems and Technology Program (HSTP).

Lead Line

Leadline comparisons are conducted weekly, these calibrations show that under the prevailing conditions at that time and location, Launch 1210's fathometer meets the International Hydrographic Organization "Special Order" specification for vertical soundings.

Diver Least Depth Gauge

Not Applicable

Bottom Samples

Where required by project instructions, NRT2 personnel acquire sediment samples from the sea floor in the survey area. The primary tool for this operation is a "clamshell" style gravity-closed sediment sampler, which penetrates approximately 0.05m into the bottom. Subset method of samples showed agreement with charted sedimentary descriptions in all cases except any specifically noted in respective surveys.

A.5 Data Acquisition and Processing Software

6/3/2008 15:20:24

NRT-2 / S-1210

Active Software Versions

Name	Version	SP/HF	Remarks
Caris Hips/Sips	6.1	SP-1 / hf-13	Processing
Pydro	8.5{2360}		Processing
Velocity	8.91		Processing
MapInfo Professional	9.0.2		Processing
Hydro_MI	8.3{r250}		Processing
Vertical Mapper	3.1.1.002		Processing
SBE Data Processing	SBEDataProcessing_Win32_V5_37e		Processing
Sea-Term	Seaterm_Win32_V1_57		Processing
Pathfinder Office	3.00		Processing
ArcView GIS	3.20		Processing
Digibar Pro	2.3		Processing
Didson	5.10		Processing
QC Tools	2.1.6.5		Processing Mag Data
Tide Tool	7.4.1		Processing
Adobe 8.0 Pro	8.1		Documentation
MV- POSVIEW	3.3.2.2	sw:03.26 HW: 2.9-7	Controller PGM
Hypack	8.0.0.8		Acquiring / Processing
SonarPro	11.2		Acquiring / Processing
Odom C/V	4.01	1.22/1.22	Controller PGM
Odom eChart	1.1.12	1.22/1.22	Controller PGM
TSIP Talker	2.00		Communication DGPS
Trimble DM12/212L	1.71		Acquiring (Firmware)
Trimble XRS Pro	1.70		Acquiring (Firmware)
Fugawi	3.1.4.881		Secondary Navigation
TerraSync	2.41 HPC2000 (ARM)		Acquiring
SeaLink	8.0		Acquiring Mag

Offshore Navigator	5.08	Secondary Chart viewer
Active Sync	4.50	Data Transfer

Calibrations:

Digibar Pro	s/n: 98295	21 Jan 2008
Sea-Bird SBE 19	s/n: 198671-1477	03 Jan 2008

B. Quality Control

B.1 Bathymetry Data

Vertical Beam Sonar Data

Survey data for single beam and side scan sonar Hydrography is transferred to a removable hard drive on the launch and entered into the post processing system in the Office trailer. Vertical Beam sonar data is converted from Hypack format to CARIS format using the CARIS "Hypack" data converter. After conversion, the data is opened in CARIS Navigation Editor, Attitude Editor, and Single Beam Editor. Vessel navigation data is manually checked for speed jumps greater than 2 knots, which are rejected with interpolation. Attitude data (if present) are checked for errors or gaps. Sounding data are checked for irregular pings.

Final Processing of Sounding Data

Survey personnel scan raw VBES soundings in CARIS Single Beam Editor, any sounding questions are then compared directly to the sounders graphic record file (.bin) for edits required to validate or correct the values in question. Once VBES soundings are scanned, the raw data is corrected with sound velocity and tides and true heave, then TPE values are applied, and then the data is merged. The tide data is applied either by Pydro via TCARI, or Caris by a ZDF file. This project utilized TCARI process to apply tidal correctors throughout.

B.2 Side Scan Sonar Imagery

All side scan sonar imagery is converted from SDF formats to CARIS format using CARIS SDF converters. After conversion, the data is opened in CARIS Navigation Editor, Attitude Editor, and Side Scan Editor. Survey personnel check vessel attitude (if present), cable out, Gyro, and sonar height. Vessel navigation data is manually checked for speed jumps greater than 2 kts. Data showing these speed jumps may be rejected with interpolation.
After confirming the validity of the vessel navigation, cable out, and towfish depth values, survey personnel then use the "recompute towfish navigation" function to calculate towfish position.

Side scan sonar data is scanned in CARIS Side Scan Editor. Survey personnel correct errors in bottom tracking, slant range correct the imagery at 0.03m resolution and scan the data for significant contacts. Contacts deemed "significant" include, but are not limited to, contacts with a shadow indicating a contact height of 1.0 m or greater in water depths of 20m or less or contact heights 10% of the water depth in water deeper than 20m. Other contacts considered significant by NRT2 personnel include smaller contacts in particularly shoal areas or channels, cables and pipelines, and contacts of possible historical significance.

Point feature contacts are picked using CARIS "single point contacts". Larger contacts and line features are picked using CARIS "multipoint contacts". All contacts are descriptively labeled and feature codes selected if conclusive identification is possible. TIF format images of all contacts are saved. After the initial SSS imagery scan, a check scan of all data is conducted.

HSTP's Pydro software package is the primary tool for sounding and feature integration and assessment. Side scan contacts and detached positions are inserted into the Pydro Preliminary Smooth Sheet (PSS).

Coverage of 200% was obtained in the required survey areas and where AWOIS items and water depth or hazards permitted. Side scan sonar coverage was conducted to the 12-foot depth curve and single beam reduced line spacing was performed in other areas where warranted. The towfish was deployed off the starboard quarter of the vessel, which proved very stable. Distorted images caused by strong tidal currents were seen periodically.

Pydro provides five flags for categorizing features: "Significant", "Chart", "Report", "Investigate", and "DTON". In addition, pydro provides "Primary" and"Secondary" flags for grouping correlated features. After insertion, SSS features are first categorized by significance. Contacts that meet the standard of significance described in section B.2. are marked as such; those contacts which are deemed insignificant are marked "Resolved" and not investigated further. Also, multiple contacts representing the same physical feature are grouped. The contact that the hydrographer believes well represents the feature (typically, the most clear SSS image) is selected as the "Investigate" contact.

"Investigate" flagged contacts are then reassessed to determine if additional investigation (typically VBES development) is required. After contacts are sufficiently investigated, they are further assessed to determine whether they require charting. Features that the hydrographer believes should be added or retained on the chart are marked as such. Features that will be reported in the survey Descriptive Report are flagged "Report." Features that pose a special threat to vessel traffic have their shoal soundings marked as "DTONS", and a Danger to Navigation Report is generated.

The High accuracy DGPS positions for ENC (Electronic Navigational Chart) are transferred to Trimble Pathfinder Office software on the post processing system in the Office trailer. The data points are then plotted via MapInfo and processed into shape files

for MCD. The data upon completion is posted on the FTP site for the Navigation Response Branch.

The NOS program Velocity, and MS Word was also used during survey post processing.

C. Corrections to Echo Soundings

C.1 Vessel Offsets and Static Draft

It is OCS and NRT2 policy that all data be acquired and logged in raw format without application of any corrections for vessel offsets, sensor alignment, sound velocity profile, or tides. These factors are logged separately or contained in the CARIS "Vessel Configuration File" (VCF), and applied in post-acquisition data processing.

The lead line for launch 1210 was calibrated using a steel tape on Jan. 11, 2008 (DN: 011). No corrections were necessary.

The Caris waterline value was determined by the difference in the vertical "Z" of the reference point to the transducer face.

C.2 Dynamic Draft

Settlement and squat measurements for launch 1210 were taken on Jan. 15, 2008 (DN: 015). These measurements were conducted in Carolina Beach, NC using the level method. Settlement and squat correctors were entered into the Caris vessel configuration file for Launch 1210.

C.3 Attitude and Heave

An Applanix POS MV 320 Ver3 (S/N 2546) was used as the primary navigation station and motion sensor on launch 1210 for all hydrographic data acquisition. The POS MV was calibrated on May 13,2008. Detailed supporting documentation can be found in the HSRR for 2008.

POS MV Cal Report Inserted below:

POS/MV Calibration Report

Field Unit:

SYSTEM INFORMATION

Vessel: Launch 1210

Date: 5/13/08 **Dn:** 134

Personnel: D.Elliott, B. Ramsey, D. Jacobs

PCS Serial # 2546

IP Address: 129.100.1.231

POS controller Version (Use Menu Help > About) 2.10d

POS Version (Use Menu View > Statistics) MV320 Ver3

GPS Receivers

Primary Receiver SGN 99330009

Secondary Receiver SGN 98370085

CALIBRATION AREA

Location: Charleston, SC

		D	M	S
Approximate Position:	**Lat**	32	49	0
	Lon	79	54	0

DGPS Beacon Station:

Frequency: 323 kHZ

Satellite Constellation

(Use View> GPS Data)

Primary GPS (Port Antenna)

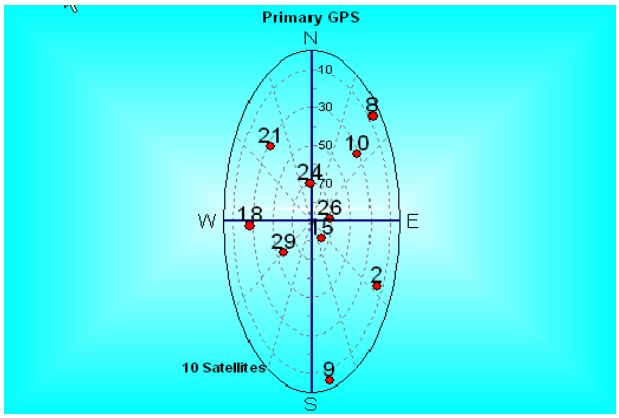
HDOP: 0.884

VDOP: 1.029

Sattelites in Use: 10

2,8,9,10,15,18,21,24,26,29

PDOP 1.810 (Use View> GAMS Solution)



Note: Secondary GPS satellite constellation and number of satellites were exactly the same as the Primary GPS

POS/MV CONFIGURATION

Settings

Gams Parameter Setup (Use Settings > Installation > GAMS Intallation)

User Entries, Pre-Calibration		Baseline Vector	
1.547	Two Antenna Separation (m)	0	X Component (m)
0.50	Heading Calibration Threshold	0	YComponent (m)
0	Heading Correction	0	Z Component (m)

Configuration Notes:

POS/MV CALIBRATION

Calibration Procedure:

(Refer to POS MV V3 Installation and Operation Guide, 4-25)

Start time: 14:16
End time: 14:26
Heading accuracy achieved for calibration: 0.026

Calibration Results:

Gams Parameter Setup (Use Settings > Installation > GAMS Intallation)

POS/MV Post-Calibration Values		Baseline Vector	
1.544	Two Antenna Separation (m)	-0.028	X Component (m)
0.500	Heading Calibration Threshold	-1.544	YComponent (m)
0	Heading Correction	0.01	Z Component (m)

GAMS Status Online? X
Save Settings? X

Calibration Notes:

Save POS Settings on PC (Use File > Store POS Settings on PC)
File Name: POSMV_05122008.nvm

GENERAL GUIDANCE

The POS/MV uses a Right-Hand Orthogonal Reference System

The right-hand orthogonal system defines the following:

• The x-axis is in the fore-aft direction in the appropriate reference frame.

• The y-axis is perpendicular to the x-axis and points towards the right (starboard) side in the appropriate reference frame.

• The z-axis points downwards in the appropriate reference frame.

The POS/MV uses a Tate-Bryant Rotation Sequence

Apply the rotation in the following order to bring the two frames of reference into complete alignment:

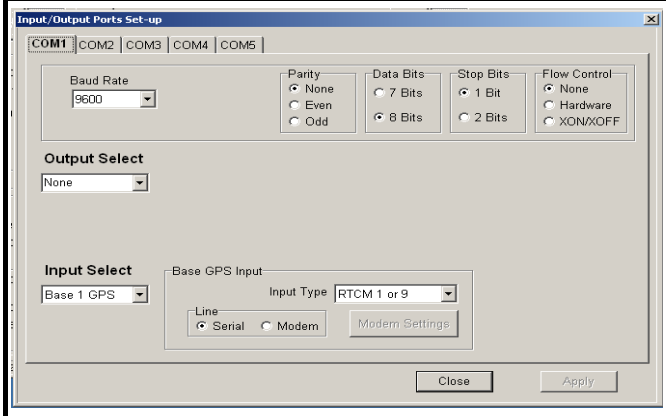
a) Heading rotation - apply a right-hand screw rotation θz about the z-axis to align one frame with the other.

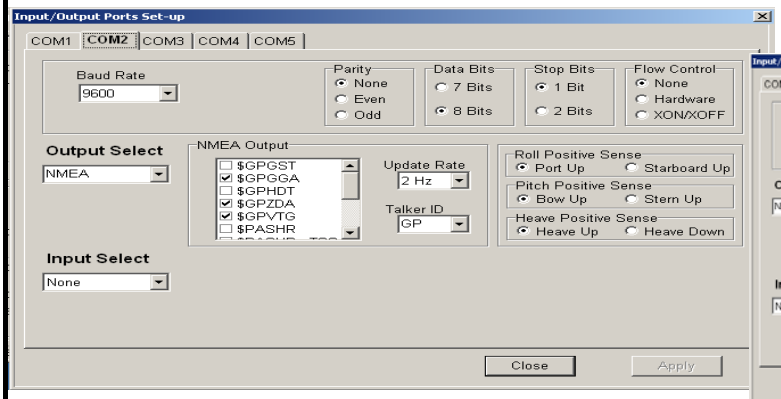
b) Pitch rotation - apply a right-hand screw rotation θy about the once-rotated y-axis to align one frame with the other.

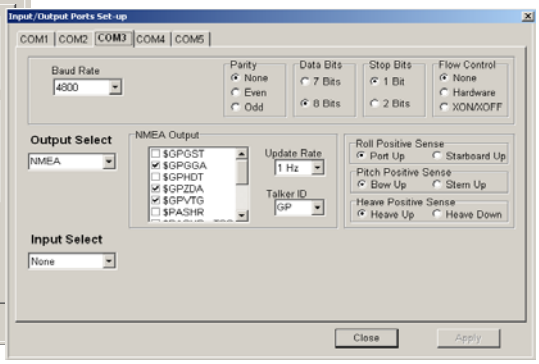
c) Roll rotation - apply a right-hand screw rotation θx about the twice-rotated x-axis to align one frame with the other.

SETTINGS (insert screen grabs)

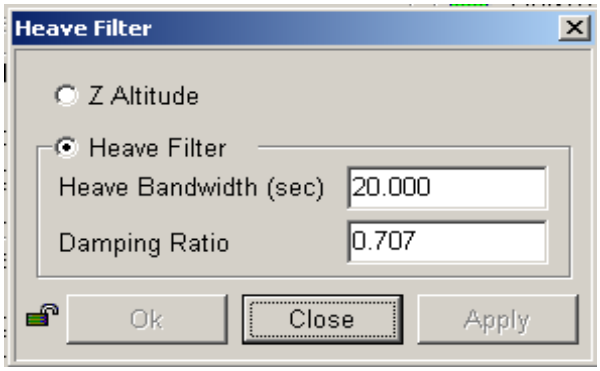
Input/Output Ports (Use Settings > Input/Output Ports)



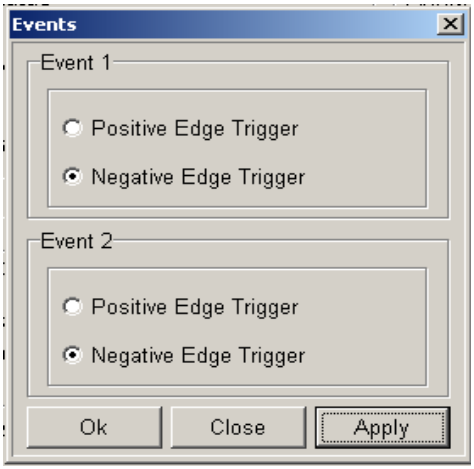




Heave Filter (Use Settings > Heave)



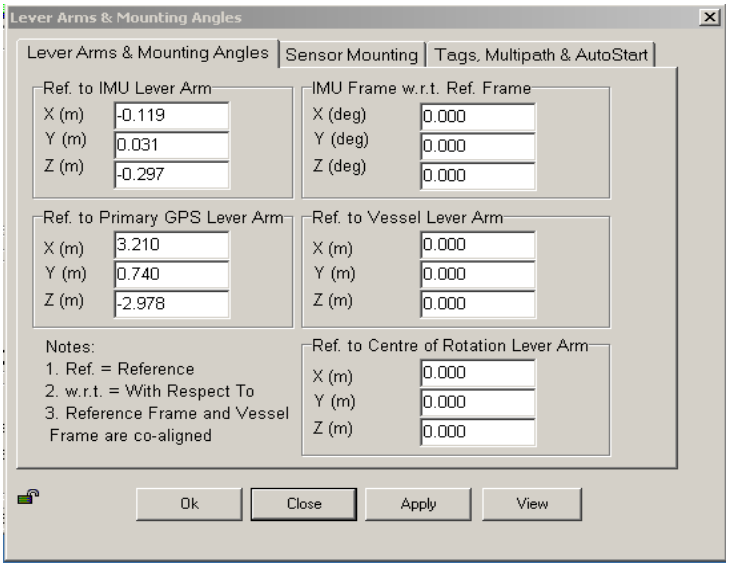
Events (Use Settings > Events)



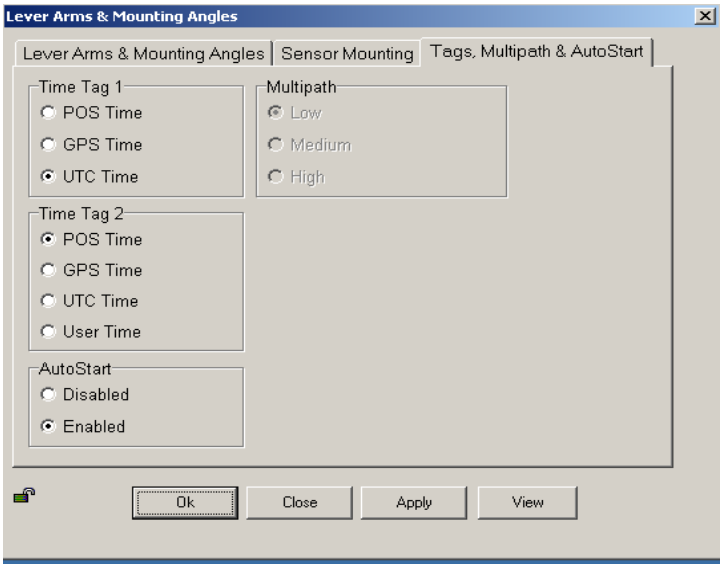
Time Sync (Use Settings > Time Sync)

Not Applicable

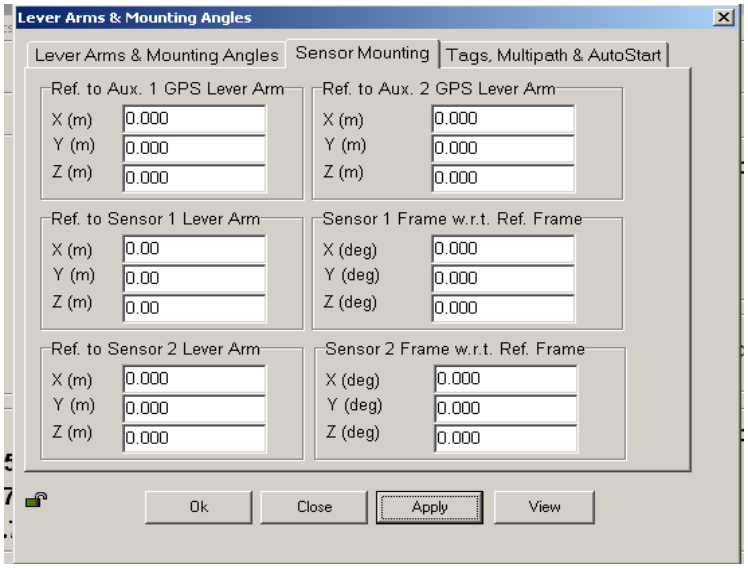
Installation (Use Settings > Installation)



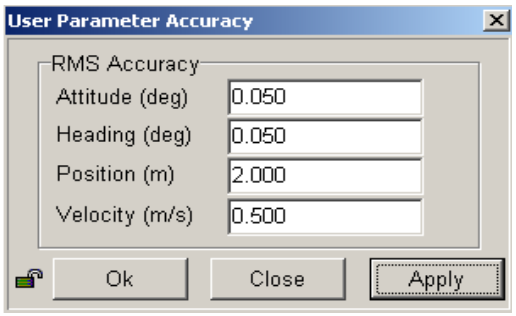
Tags, Multipath and Auto Start (Use Settings > Installation > Tags, Multipath and Auto Start)



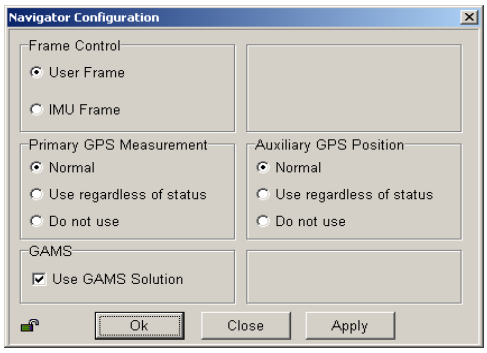
Sensor Mounting (Use Settings > Installation > Sensor Mounting)



User Parameter Accuracy (Use Settings > Installation > User Accuracy)

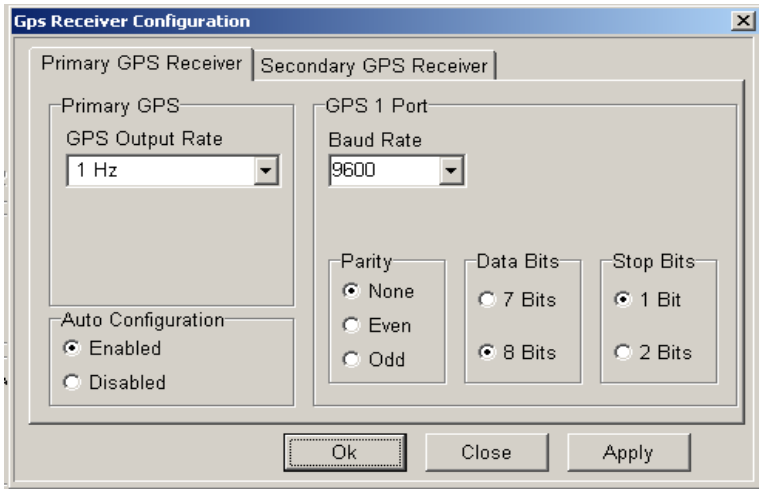


Frame Control (Use Tools > Config)

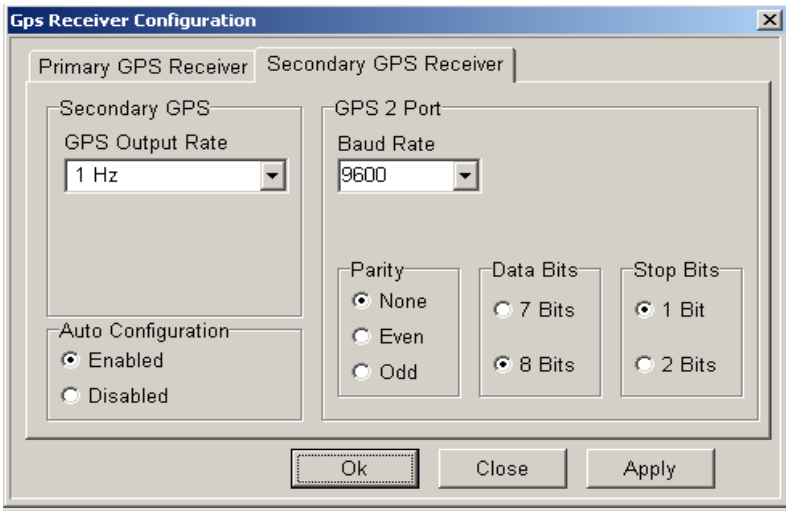


GPS Receiver Configuration (Use Settings> Installation> GPS Receiver Configuration)

Primary GPS Receiver



Secondary GPS Receiver



C.4 Sound Velocity Profile

Conductivity, temperature, and depth profiles are acquired
using two velocity (CTD) profilers. The primary instrument used for determining corrections for the speed of sound through the water column was a Digibar-Pro, S/N 98295-011007. (January 21, 2008 last calibrated). Data quality assurance tests were performed by the "Compare two Profiles" method of two casts acquired at the same time with two different instruments.

The check instrument used for determining corrections for the speed of sound through the water column was a Seabird-Seacat Velocity Profiler, model 19-03, S/N 198671-1477. (January 03, 2008 last calibrated). The calibration records are included with the HSSR for 2007.

C.5 Water Levels

Field soundings are corrected by verified tides data from NOAA/CO-OPS, as per
WATER LEVEL INSTRUCTIONS
OPR-G347-NRT2-2008 Charleston, SC
(2/04/2008 MC)

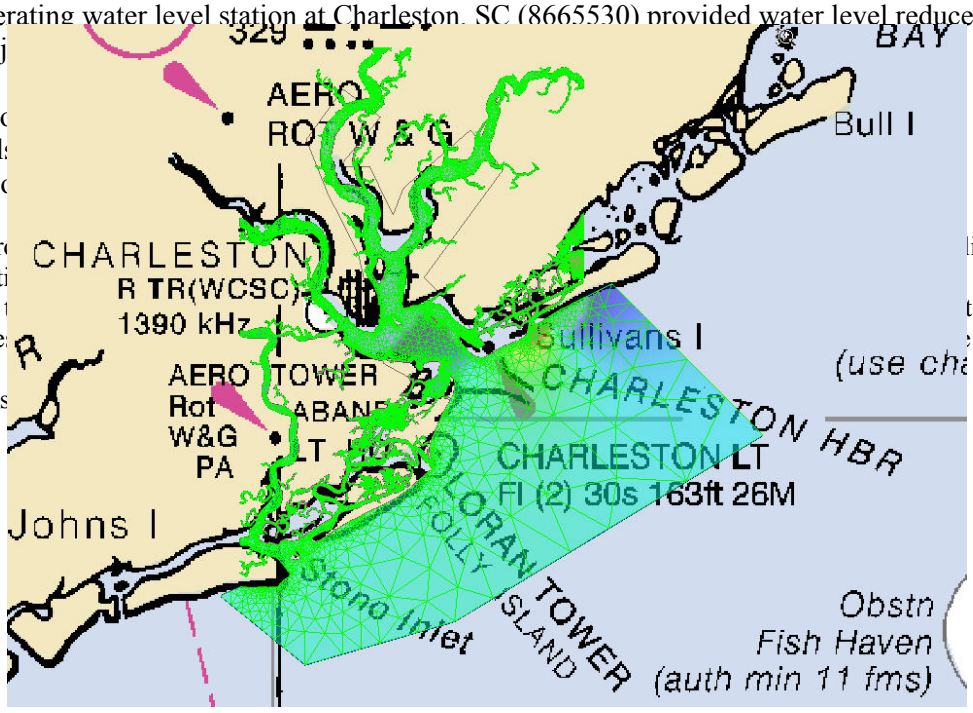
This is a TCARI controlled project.

Pertinent water level data were provided via email data transmissions through TIDEBOT, to the Field unit. Water level data requested and used were both 6 min Preliminary; and Verified for final data submission

The operating water level station at Charleston, SC (8665530) provided water level reducers for this proj

Tidal Co and residuals correctio

For hydr lied in conjuncti used. Refer to t t water level file would be "E:\Caris



D. APPROVAL SHEET

Data Acquisition and Processing Report
For Calendar year 2008-2009

For Accompanying Surveys

The Data Acquisition and Processing Report information and all accompanying records and data are approved.

Submitted by: 
David B. Elliott
2008.06.03
15:43:00 Z

David B. Elliott – Team Leader
Navigation Response Team 2