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

DATA ACQUISITION AND PROCESSING REPORT

Type of Survey **Hydrographic**

Project Nos. **OPR-E349-BH, S-E906-BH & S-E915-BH**

Time Frame **January 2006 - December 2006**

LOCALITY

State/Territory **Maryland and Virginia**

General Locality **Chesapeake Bay**

2006

CHIEF OF PARTY
LT(jg) Briana Welton, NOAA

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DATE

DATA ACQUISITION AND PROCESSING REPORT

NOAA S/V BAY HYDROGRAPHER

Chief of Party: Lieutenant Junior Grade Briana Welton, NOAA

Effective Dates

January 2006- December 2006

Applicable Surveys

OPR-E349-BH-05
H11450 – Cedar Point to Little Cove Point
Chesapeake Bay, Maryland
Hydrographic Letter Instructions dated May, 2005

S-E906-BH-06
F00515 – Baltimore Inner Harbor and Patapsco River Pier Ruins
Baltimore Harbor, Maryland
Hydrographic Letter Instructions dated March, 2006

S-E915-BH-NRT7-06
H11599 – Elizabeth River Demonstration Project
Elizabeth River- Sewells Point to Norfolk, Virginia
Hydrographic Letter Instructions dated May 22, 2006

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A. EQUIPMENT

BAY HYDROGRAPHER was used for the acquisition and post-processing of all side scan-sonar (SSS) data, vertical-beam echo sounder (VBES) data, shallow-water multibeam (SWMB) data, sound speed profiles (SVP) and detached positions (DP's) unless otherwise noted in the Descriptive Report. BAY HYDROGRAPHER was used as the dive platform for all diver investigations conducted during these projects. No unusual vessel configurations or problems were encountered on these projects. Vessel configuration and offset measurements are included in Appendix III of this report.

Three different types of sonar systems (VBES, SWMB, and SSS) were utilized for these projects unless otherwise noted in the Descriptive Report. The methods and systems used to meet full-coverage requirements for the projects were determined by the Hydrographer and are in accordance with guidance provided in the Hydrographic Survey Letter Instructions and the Field Procedures Manual. Other considerations included system performance limitations, complexity of bathymetry, water depth, and ability of the vessel to safely navigate a particular area. Bathymetric data were acquired using either VBES or SWMB systems. Side scan sonar was utilized for imagery and object detection. These sonar systems are described individually in the following sections of this report.

SOUNDING EQUIPMENT

Vertical-Beam Echo Sounder (VBES)

BAY HYDROGRAPHER is equipped with an Odom Echotrac MKIII Precision Survey Echo Sounder. The Odom Echotrac is a dual frequency digital recording vertical-beam echo sounder with the capability to record water column data either via analog paper trace or into digital files. BAY HYDROGRAPHER's current configuration is to record water column data to digital .bin files that can be viewed by a utility in the Pydro Post Acquisition Tools. Transducer frequencies utilized are 24 kHz and 100 kHz. Unless edited by the hydrographer, selected soundings were acquired in meters using high frequency. Vertical-beam echo sounder data were acquired in conjunction with SSS. In areas where 200% SSS revealed no point features requiring further investigation, VBES was determined adequate to define the natural depth contours of the area.

Shallow-Water Multibeam (SWMB)

BAY HYDROGRAPHER is equipped with Reson Seabat 7125 shallow water multibeam sonar. The system is installed on a retractable arm that deploys over the starboard side of the vessel. The Seabat 8125 is a 400 kHz system that measures relative water depths across a 128^{o} swath. The sonar utilizes 256 individual beams, each with a footprint of 1.0^{o} x 0.5^{o}. The sensor head is mounted vertically (0^{0} mount) at a depth of 5.3ft below the water line. Prior to March 2006, Bay Hydrographer was equipped with a Reson Seabat 8125 in the same mounting configuration as the Reson Seabat 8125. The Seabat 8125 is a 455 kHz system that measures relative water depths across a 120^{o} swath. The sonar utilizes 240 individual beams, each with a footprint of 1.0^{o} x 0.5^{o}. The sensor head is mounted vertically (0^{0} mount) at a depth of 5.3ft below the water line.The SWMB systems were used to develop significant contacts identified with SSS and to

provide additional bathymetric data in critical areas such as along commercial pier faces and shipping terminals.

Multibeam operations were limited to speed-over-ground of 6.0 knots to ensure the required along-track coverage for object detection as stated in the NOS Specifications and Deliverables and to prevent arm "wobble". Line spacing for item investigations was set at two times the water depth, while main scheme SWMB sounding lines were generally run at three times the water depth. Both Reson Seabat systems also provide a low-resolution digital SSS record of the multibeam swath. This SSS imagery was used during processing of the multibeam depth data to aid in determining whether anomalous soundings are true features or noise.

Diver's Least-Depth Gauge (DLDG)

BAY HYDROGRAPHER no longer maintains a Diver's Least-Depth Gauge onboard. No contacts were investigated using such equipment.

Lead Line

A lead line comparison to the Odom Echotrac VBES and RESON 8125 was performed August 16, 2005 (DN 228) at Calvert Marina, Solomons, MD. BAY HYDROGRAPHER does not maintain traditional lead lines. In lieu of this equipment, a lead was attached to a metal measuring tape and measurements were corrected to account for the weight assembly. The vessel was port side to the bulkhead at the time of the comparison. Due to typical shoaling along bulkheads and the fact the VBES transducer is located on the vessel's starboard side, lead line readings were taken on the starboard side only. The water was calm, enabling the leadsman to make multiple rapid readings and providing a steady fathometer reading. Copies of the lead line calibration reports are included in Appendix IV of this report. Lead lines were not used to acquire depths over rocks and other features over the course of this survey.

IMAGING EQUIPMENT

Side Scan Sonar (SSS)

BAY HYDROGRAPHER is equipped with a Klein System 5500 (S/N 101) High-Speed, High Resolution Side Scan Sonar (HSHRSSS) System. This integrated system includes the Model 5250 HSHRSSS towfish and the T5100 Transceiver Processing Unit (TPU). The Klein 5250 operates at a frequency of 455 kHz and has a 40^0 vertical beam angle. The towfish contains transducers, sonar processing and control electronics, attitude and heading sensors, the down-link de-multiplexer (for control signals), and the uplink multiplexer (for sonar and auxiliary sensor data). The T5100 TPU contains electronics to de-multiplex the sonar signal from the towfish and multiplex the control signals transmitted to the towfish via a coaxial tow cable. The T5100 also contains a network card for transmission of the sonar data to the **ISIS** acquisition computer.

The Klein System 5500 is unique in that each transducer simultaneously forms five dynamically focused beams per side (channel), allowing increased resolution along track (20-75 cm) and across track (7.5 cm). The Klein System 5500 multibeam transducer technology also enables higher tow speeds of up to 10 knots.

The Klein towfish is deployed on a 100 meter armored cable via an Oceans Engineering electric winch. The tow cable is fed from the winch drum to a stern mounted hydraulic A-frame and through a snatch block with a metered sheave. At the winch, the tow cable connects to a deck cable through a slip ring assembly mounted coaxially on the winch. Cable out is controlled remotely at the acquisition station (or locally at the winch) and is monitored using a MKII cable counter. This sensor computes cable out by the number of revolutions of the block's sheave. The MKII cable counter provides a serial message to the **ISIS** acquisition computer. The cable-out value was checked prior to each SSS deployment and recalibrated if necessary. Throughout the 2006 field season, the MKII cable counter experienced operating difficulty. BAY HYDROGRAPHER crewmembers used a metric tape and electrical tape to mark 5 meter increments on the side scan cable. When the MKII did not function correctly, the correct cable out was read directly from the cable and entered manually in **ISIS**.

Line spacing for SSS operations is determined as a function of the most suitable range scale. Typically when acquiring 100% SSS coverage, 80 meter line spacing is used while operating at a 50 m SSS range scale, 120 meter line spacing is used with a 75 m range scale, and 160 m line spacing is used with a 100 meter range scale. For 200% coverage SSS coverage, the line spacing for each range scale is half the line spacing for 100% coverage. A sonar altitude of eight to twenty percent of the range scale was maintained during data acquisition whenever possible without endangering either vessel or equipment safety. SSS altitude for towed operations was maintained by a combination of adjusting both the amount of deployed tow cable and vessel speed.

Imagery was monitored in real time using the side scan sonar waterfall display window in the **ISIS** acquisition software. Vessel speed was adjusted during SSS acquisition to insure that along-track coverage for object detection, as required by the NOS Specifications and Deliverables, was met. Confidence checks were performed by noting changes in linear bottom features extending to the outer edges of the digital side scan image and by verifying aids to navigation or other known features on the side scan record.

POSITIONING EQUIPMENT

Trimble DSM212L DGPS Receiver

BAY HYDROGRAPHER is equipped with a Trimble DSM212L to measure and calculate differential GPS (DGPS) position. The DSM212L is an integrated 12-channel GPS receiver and dual-channel differential beacon receiver. The beacon receiver can simultaneously monitor two U.S. Coast Guard (USCG) DGPS beacon stations. The Trimble DSM212L was configured in manual mode to allow reception of only one beacon station during data acquisition. Correctors for these projects were received from either the Annapolis, MD or Cape Henry, VA radio beacons, depending upon proximity and beacon status.

The DSM212L was configured using Trimble **TSIPTalker** version 2.0 software. The configuration was checked if problems were encountered throughout the project period. Parameters included number of visible satellites (∃4 SV's), positional dilution of precision (PDOP < 8), maximum pseudo range corrector age (#30 sec), and satellite elevation mask (∃8°).

The DSM212L was <u>not</u> used for survey positioning. The Trimble feeds a GGA data string to the KLEIN TPU as required for the calculation of number of beams to be used by the side scan sonar. However, this GGA string is only used for this purpose, never for survey positioning. The Trimble is also configured to provide DGPS beacon data to the POS/MV (see below) in the form of an RTCM message.

Applanix POS/MV Position and Orientation System

All survey positioning data were acquired using an Applanix POS/MV v 4 (S/N 2084) (Position and Orientation System for Marine Vessels). The POS/MV is a GPS-aided inertial positioning system that functions as an aided strap down inertial navigation system, providing a composite position solution derived from both an Inertial Measurement Unit (IMU) and dual-frequency GPS receivers. The IMU and GPS receivers are complementary sensors; data from one are used to filter and constrain errors from the other resulting in high position accuracy. The POS/MV v.4 uses an algorithm known as "tightly coupled data." Instead of processing the GPS data and inertial motion data for positioning and then filtering the two, the version 4 uses the raw ranges to satellites and raw accelerations from the IMU to calculate a "tighter" solution.

Position accuracy and quality were monitored in real time using the POS/MV Controller software to ensure positioning accuracy requirements in the NOS Hydrographic Surveys Specifications and Deliverables were met. The POS/MV Controller software provides clear visual indications whenever accuracy thresholds are exceeded. However, because of the "tightly coupled" solution, the POS/MV can deliver DGPS quality positioning for up to 4 or 5 minutes after losing a differential beacon signal. The unit gives no indication that it is not receiving differential correctors until the positioning drops below the DGPS accuracy level. Therefore it is not possible to monitor the NOS Hydrographic Specification that (3.2.1): "The age of pseudo-range correctors used in position computation will not exceed 20 seconds . . ." At all times, the POS/MV position user accuracy parameter was set to 2.0 meters, and data were recollected if the accuracy exceeded 2.0 meters.

HEADING AND ATTITUDE EQUIPMENT

Applanix POS/MV Position and Orientation System

POS/MV Heading Computation

The POS Computer System (PCS) blends data from both the IMU and the two GPS receivers to compute highly accurate vessel heading. The IMU determines accurate heading during aggressive maneuvers and is not subject to short-period noise. However, IMU accuracy characteristically degrades over time. The GPS receivers compute a vector between two fixed antennas and provide azimuth data using the GPS Azimuth Measurement Subsystem (GAMS). GPS heading data is accurate over time, but is affected by short-period noise. The POS/MV combines both heading measurement systems into a blended solution with accuracies greater than either system could achieve alone. Heading accuracy in the POS/MV Controller software was set to 0.050°.

POS/MV Heave, Pitch, and Roll Computation

The POS version 4 has two types of heave outputs: real-time heave and TrueHeave. Real-time heave is computed by performing a double integration on the IMU sensed vertical accelerations. A heave filter must be used for real-time heave to counteract minor noise that will eventually become significant due to the nature of mathematical integration. BAY HYDROGRAPHER's filter settings for 2006 were set to a heave bandwidth of 6-20 seconds depending on sea state, and to a dampening ratio of 0.707 (critically damped). TrueHeave is a software option that is based on a two-way filter that analyzes both past and present vertical motion data to provide a more accurate heave solution. Because TrueHeave uses both future and past heave data to provide the best solution, the TrueHeave solution is only available three minutes after the data have been collected. The TrueHeave data are acquired in a separate raw file and applied in post processing. Due to the size of these files, TrueHeave is only collected during SWMB operations.

Both roll and pitch measurements are computed by the IMU after sensor alignment and leveling. The IMU mathematically simulates a gimbaled gyro platform and applies the sensed angular

accelerations to this model to determine roll and pitch. Attitude accuracy parameters were set to 0.050° in the POS/MV Controller software.

SOFTWARE

All VBES data were acquired using Coastal Oceanographic's **HYPACK MAX** software, and processed with the **CARIS HIPS** Single Beam Editor. Detached positions (DPs) were also acquired with **HYPACK MAX** in the format of target ("*.tgt") file and converted in **PYDRO** using the "Insert **HYPACK** DP" tool. **HYPACK MAX** was also used for vessel navigation and line tracking during all data acquisition.

Shallow-water multibeam and side scan data, along with position and attitude data, were acquired using **TRITON-ELICS' ISIS** software and logged in the Extended Triton Format (*.XTF). SWMB and SSS data were processed using **CARIS HIPS** and **SIPS** software.

All Detached Positions, SWMB and VBES soundings, and side scan and SWMB features were analyzed during post-processing using **PYDRO**. **PYDRO** is an extension package created by the NOS Hydrographic Systems and Technology Programs N/CS11 (HSTP) using the Python 20 programming language to interface with the **CARIS HDCS** data directly.

Soundings and features were exported from **PYDRO** by saving the Preliminary Smooth Sheet (PSS) and drawing into **MAPINFO** using the **HYDRO_MI** "Draw PSS" function. **MAPINFO** was used for final data analysis and for creating final plots. The **HYDRO_MI** application created by HSTP was used for drawing features, tracks, depths, and Preliminary Smooth Sheets.

Raw sound speed data were processed using **VELOCWIN** supplied by HSTP. **VELOCWIN** uses raw salinity, temperature, and pressure measurements to create a sound speed profile using Wilson's Equation for the speed of sound.

A complete list of software and versions is included in Appendix I.

B. DATA PROCESSING AND QUALITY CONTROL

SHALLOW WATER MULTIBEAM DATA

Shallow-water multibeam data were monitored in real-time using the 2-D and 3-D data display windows in **ISIS** and the on-screen display for the Reson Seabat sonar processor. Adjustable user parameters are range scale, power, gain, pulse width, swath width and bottom slope type. These parameters were adjusted as necessary to insure the best data quality. Additionally, vessel speed was adjusted as necessary, in accordance with the NOS Specifications and Deliverables and Standing Project Instructions, to ensure the required along-track coverage for object detection.

Following acquisition, shallow-water multibeam data were converted from raw .XTF files to **CARIS**' Hydrographic Data Cleaning System (HDCS) format using **CARIS'** convert utility. After conversion, the multibeam data were corrected with tide, sound speed, and Trueheave corrections and then merged with vessel position and orientation. The Total Propagated Error was also computed, and CUBE surfaces of appropriate resolution, as defined by the NOS Specifications and Deliverables, were created. The resulting spatially referenced data were then analyzed using **CARIS** HIPS editing tools in conjunction with the various CUBE layers. Data that did not contribute to a CUBE depth surface of appropriate resolution that adequately represents the probable sea floor were inspected using Caris subset, swath, or sidescan editing tools. "Flyers" were flagged as rejected. Systematic errors were corrected or addressed as noted in the Descriptive Report.

VERTICAL BEAM ECHO SOUNDER DATA

VBES data was acquired using **HYPACK MAX** software. **CARIS HIPS** tools generic data parser and **HYPACK** converter were utilized for converting raw-data into readable digital format for **HIPS** Single Beam Editor. In addition, **HYPACK** created .bin files that digitally record the full water column data, in lieu of paper records; .bin files are viewed in PYDRO Post Acquisition Tools when necessary. All selected VBES soundings were combined with SWMB soundings, excessed using **PYDRO** and plotted in **MAPINFO** to compare the two types of bathymetric data with each other as well as with charted depths.

To produce the reduced, shoal-biased data set represented in the final field sheet, all non-rejected soundings that passed all other quality-assurance checks were imported into **PYDRO** using the "Insert **CARIS** Line Bathy" tool. Depths were inserted into **PYDRO** using a 15 meter bathymetry grid resolution and an over-plot removal character size of 1.5 millimeters at the scale of the survey.

Data processing flow diagrams are included in Appendix II of this report.

SIDE SCAN SONAR DATA

Side scan sonar data were acquired with the Klein 5500 Towfish using **ISIS**. Side scan sonar data were converted from .XTF and post-processed using **CARIS SIPS**.

Post-processing of side scan data consisted of first examining and editing fish height, heading (gyro), and vessel navigation records. Fish navigation was then recalculated using the **CARIS SIPS "**Recompute Towfish Navigation" sub-program. During "Recompute Towfish Navigation", tow point measurements (A-frame and cable out), fish height, and depth are used to calculate horizontal layback. Once fish navigation was re-calculated, side scan imagery data were slant-range corrected. The slant-range corrected side scan imagery was scanned, and check-scanned, for any significant contacts. Contacts in less than or equal to 20 meters of water were determined significant if their computed target height (based on shadow lengths obtained using SIPS) were at least one meter. In depths greater than 20 meters, contacts with computed target heights rising above the bottom at least ten percent of the depth were considered significant. Significant contacts were saved in a **CARIS** contact file, and contact snapshot (.tif) images were created to aid in analysis and contact classification in **PYDRO**.

All contacts were imported into **PYDRO** using the "Insert **CARIS** Line Features" tool. Contacts were arranged by day and line and could be selected in the data "Tree" window. Information concerning a specific contact was displayed in **PYDRO**'s "Editor Notebook Window", including contact position, AWOIS item positions, surrounding depths, contact cross references, and charting recommendations. Each contact was reviewed, and information flags were set accordingly. If there were multiple contacts for a single feature, then the one providing the best SSS image of the feature was chosen as "Primary". Any items that were to be addressed in the Item Investigation section of the Descriptive Report were flagged as "Chart". Items which had the "Chart" flag set could also be further designated for inclusion in the Danger To Navigation Report by choosing the "DTON" flag. "Snapshots" of contacts were displayed in **PYDRO**'s "Image Notebook Editor". Contacts appearing significant were further investigated with SWMB. Final positioning and least depth determinations of significant items were accomplished using multibeam and/or diver investigation.

Side scan sonar coverage was verified using **CARIS SIPS** generated side scan mosaics imported into **MAPINFO** for analysis. Any deficiencies in the side scan sonar data were filled by completing a holiday line plan to meet the 200% requirement. Confidence checks were performed by noting changes in linear bottom features extending to the outer edges of the digital side scan image and by correlating sonar contacts to known features such as aids to navigation. These checks were performed in real time during data acquisition each day.

PRELIMINARY SMOOTH SHEET

Once all sounding data and features were reviewed and analyzed using **PYDRO**, the data was saved into a Preliminary Smooth Sheet (PSS). The PSS is a working file that does not actually contain data, but contains links to the data with specific path information as well as ancillary data flag information which is not supported in the **HDCS** file structure. The PSS was then imported into **MAPINFO** via the **HYDRO_MI** "Draw PSS" function. Final field analysis of the PSS was performed in **MAPINFO**.

C. CORRECTIONS TO ECHO SOUNDINGS

SOUND SPEED CORRECTION

Sound speed profiles were acquired with a SeaBird Electronics SeaCat SBE19 Conductivity, Temperature, and Depth (CTD) profiler (S/N 1913768-2039). Raw conductivity, temperature, and pressure data were processed using the program **VELOCWIN** that generates sound speed profiles for **CARIS**. Sound speed correctors were applied to SWMB and VBES soundings in **CARIS HIPS** during post processing. CTD calibration reports and dates are included in Appendix IV of this report.

The speed of sound through water was determined by a minimum of one cast every four hours of SWMB acquisition, and one cast every week for VBES acquisition, in accordance with the Standing Project Instructions and NOS Specifications and Deliverables for Hydrographic Surveys. Additional casts were conducted when changing survey areas or if it was judged that conditions, such as a change in weather, tide, or current, would warrant additional sound speed profiles.

In order to correctly form its beams, the RESON Seabat 8125 and 7125 require a surface sound speed. BAY HYDROGRAPHER uses an ODOM Digibar to provide surface sound speed to the multibeam. Two Digibar units were used over the course of 2006, the calibrations for each can be found in Appendix 4 of this report.

VESSEL OFFSETS AND DYNAMIC DRAFT CORRECTORS

A separate HIPS Vessel File (HVF) was created for each type of survey required. Sometimes the HVFs are redundant, e.g. the HVF for 100% and 200% side scan coverage have the exact same offsets, but they are kept different to facilitate ease of processing. The following table lists each HIPS Vessel File.

HVF NAME	SURVEY SYSTEM
BH_S5501_KLEIN5000_SSS100	Side scan configuration for 100% Side Scan Lines
BH_S5501_KLEIN5000_SSS200	Side scan configuration for 200% Side Scan Lines
BH_S5501_RESON7125	Multibeam configuration file
BH_S5501_RESON8125	Multibeam configuration file
BH_S5501_SB	Standard VBES configuration
BH_S5501_DP	Used for detached positions only, vertically corrected

Vessel offsets were measured on September 14 and 15, 2004, by Kendall Facher of the National Geodetic Survey. A Leica TC2002 Total Precision Station was used to measure offsets to GPS antennae, sonar transducers, the POS IMU, and various vessel benchmarks. A report from this survey is included in Appendix 3. Vessel waterline was measured on March 10, 2005 by taking the top off the vessel's moon pool and using a steel ruler to directly measure to the waterline. A value of 3.4 cm below the reference point was found. All offsets are included in the HIPS Vessel file reports included in Appendix 3.

Settlement and squat correctors for BAY HYDROGRAPHER were determined on February 26, 1998 using on the fly GPS for relative measurements. An Ashtech M12 receiver was set up on a mark on the pier at NOAA's Atlantic Marine Center, Norfolk, VA and a second was set up on BAY HYDROGRAPHER. Both receivers logged data for two continuous hours as the vessel ran a series of reciprocal courses at varying speeds. The data was then processed to yield a relative vertical change versus time and speed table. These values were confirmed in May 2000, using rod level techniques. On May 19, 2005, Settlement and squat data were run using kinematic GPS techniques with the POS/MV. These data are pending processing at the Hydrographic Systems and Technologies Program (HSTP).

Sensor offsets and dynamic draft values are stored in the **CARIS** HVFs and were applied to VBES, SWMB and SSS data in **CARIS** during post-processing. The Reference Point (RP) used in all HVFs is the small divot in the moon pool in BAY HYDROGRAPHER's middle hold. Vessel offset diagrams are included in Appendix III of this report. The HIPS Vessel Files have been submitted with the digital processed data.

HEAVE, PITCH, ROLL AND HEADING,
INCLUDING BIASES AND NAVIGATION TIMING ERRORS

BAY HYDROGRAPHER is configured for the so-called Precise Timing setup for SWMB operations. In this method of minimizing timing errors, a UTC serial time stamp is output from the POS/MV and received by the ISIS PC and the RESON processing unit. All data (navigation, heave, pitch, roll, and bathymetry) are time stamped according to this string at acquisition, as opposed to upon arrival at ISIS. Because these data are time-stamped at acquisition and the time stamp is honored in post-processing, the timing errors between navigation, heave, pitch, and roll are minimized. For more detailed information on this setup, see the Field Procedures Manual.

Patch tests were conducted throughout the year after each removal and replacement of the RESON 8125 and/or the 7125 SWMB head. These patch tests are designed to find any roll, pitch, and yaw, and remaining time offset between the MB reference frame and the navigation reference frame. Results of the patch tests are included in the Hips Vessel Files (HVF) reported in Appendix 3. All HVFs are digitally submitted with project data.

As per the Specifications and Deliverables, pitch and roll are not applied to VBES soundings.

WATER LEVEL CORRECTION

Soundings were reduced to Mean Lower-Low Water (MLLW) using final, approved zoned tide data (unless otherwise noted in the DR) from each tide station applicable for a specific survey sheet. All tide data were obtained from the Center for Operational Oceanographic Products and Services (CO-OPS) web site https://tidesandcurrents.noaa.gov/olddata. These data were used to create a CARIS HIPS Tide file (.tid). Refer to individual Descriptive Reports for further information regarding water levels specific to each survey.

BAY HYDROGRAPHER personnel installed no tide gauges in conjunction with the survey projects referenced in this report.

D. APPROVAL

As Chief of Party, I have ensured that standard field surveying and processing procedures were utilized in accordance with the Hydrographic Manual, Fourth Edition; Hydrographic Survey Guidelines; Field Procedures Manual, and the NOS Hydrographic Surveys Specifications and Deliverables.

I acknowledge that all of the information contained in this report is complete and accurate to the best of my knowledge.

LT(jg) Briana Welton

APPENDIX I

- $ Software Versions
- $ Hardware Serial Numbers

Software Versions and Hardware Serial Numbers

Software Manufacturer & Version

Software	Version
Acquisition	
Hypack Max	4.3A, 6.2
Isis	6.6, 6.7, 6.9, 7.0
Processing	
MapInfo	6.5, 8.0
Vertical Mapper	2.0
CARIS GIS	4.4a
CARIS HIPS/SIPS	5.4, 6.0 SP2
Pydro	5.2.1 – 5.9.4
Utilities	
Tides and Currents for Windows	3.0
Horizontal Control	
TSIP Talker	2.00
Sound Velocity	
VelocWin	8.52
Leveling	
n/a	
Tides	
n/a	

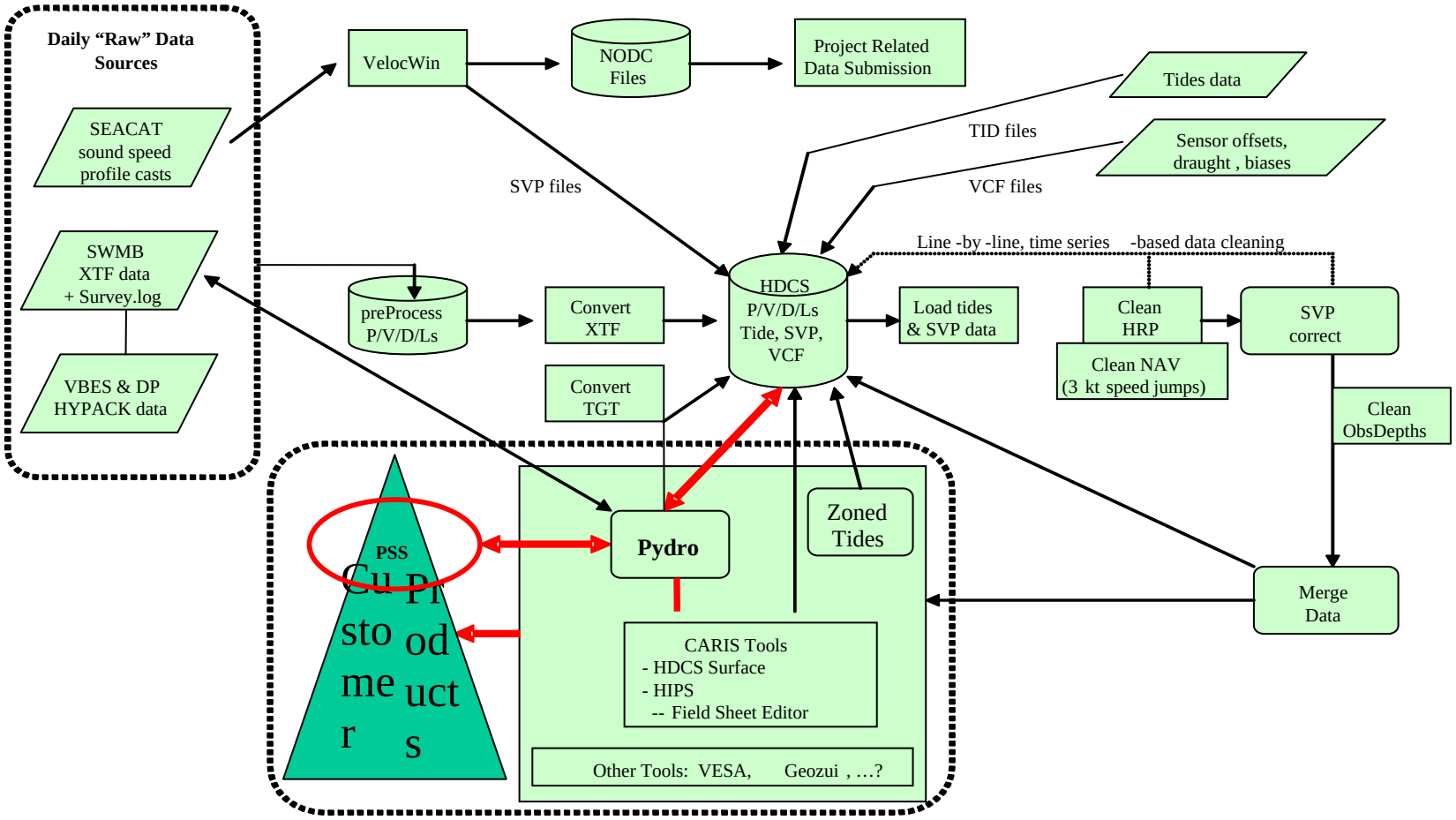
Equipment Manufacturer

Description	Serial Number
Odom Echotrac MKIII	21093
RESON 8125 SONAR Head	0802092
RESON 8125 SONAR Processor	31546
RESON 7125 SONAR Head	Various
RESON 7125 SONAR Processor	Various
Klein System 5500 Side Scan Sonar	101
Klein System 5500 Side Scan Sonar (Light Weight)	
SEABIRD Electronics, Inc. SEA-BIRD 19 profiler	4677
SEABIRD Electronics, Inc. SEA-BIRD 19 profiler	4634
SEABIRD Electronics, Inc. SEA-BIRD 19 profiler	2039
Odom Digibar	3002
Odom Digibar	98303
Odom Digibar	98351
Trimble DSM212L GPS Receiver	0220177299
Trimble Sensor	27207-00
POS/MV ver 4	2084

APPENDIX II

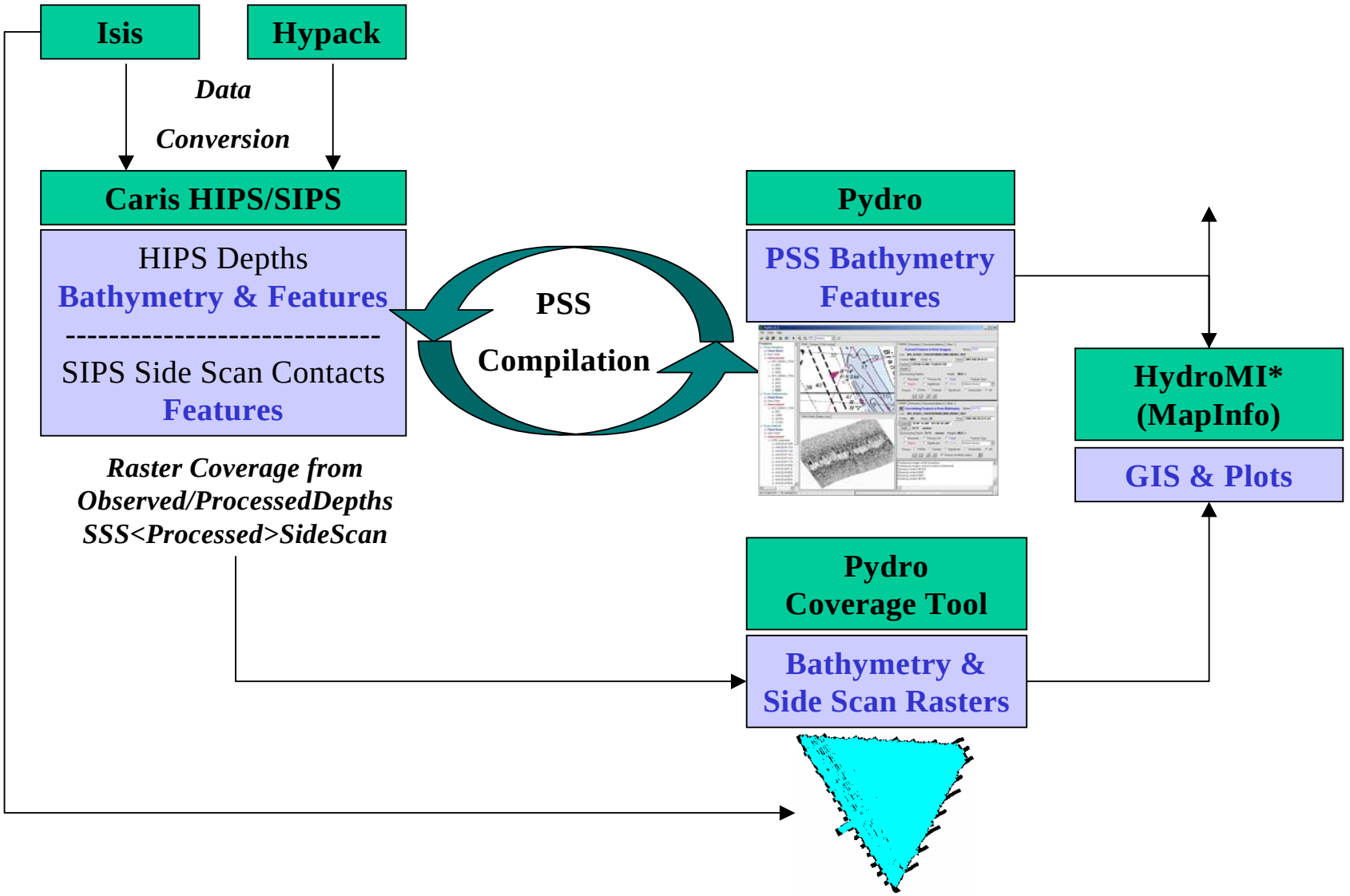
1. Bathymetry Cleaning Flow Chart
2. Pydro Data Integration Flow Chart

Bathymetry Data Cleaning to PSS

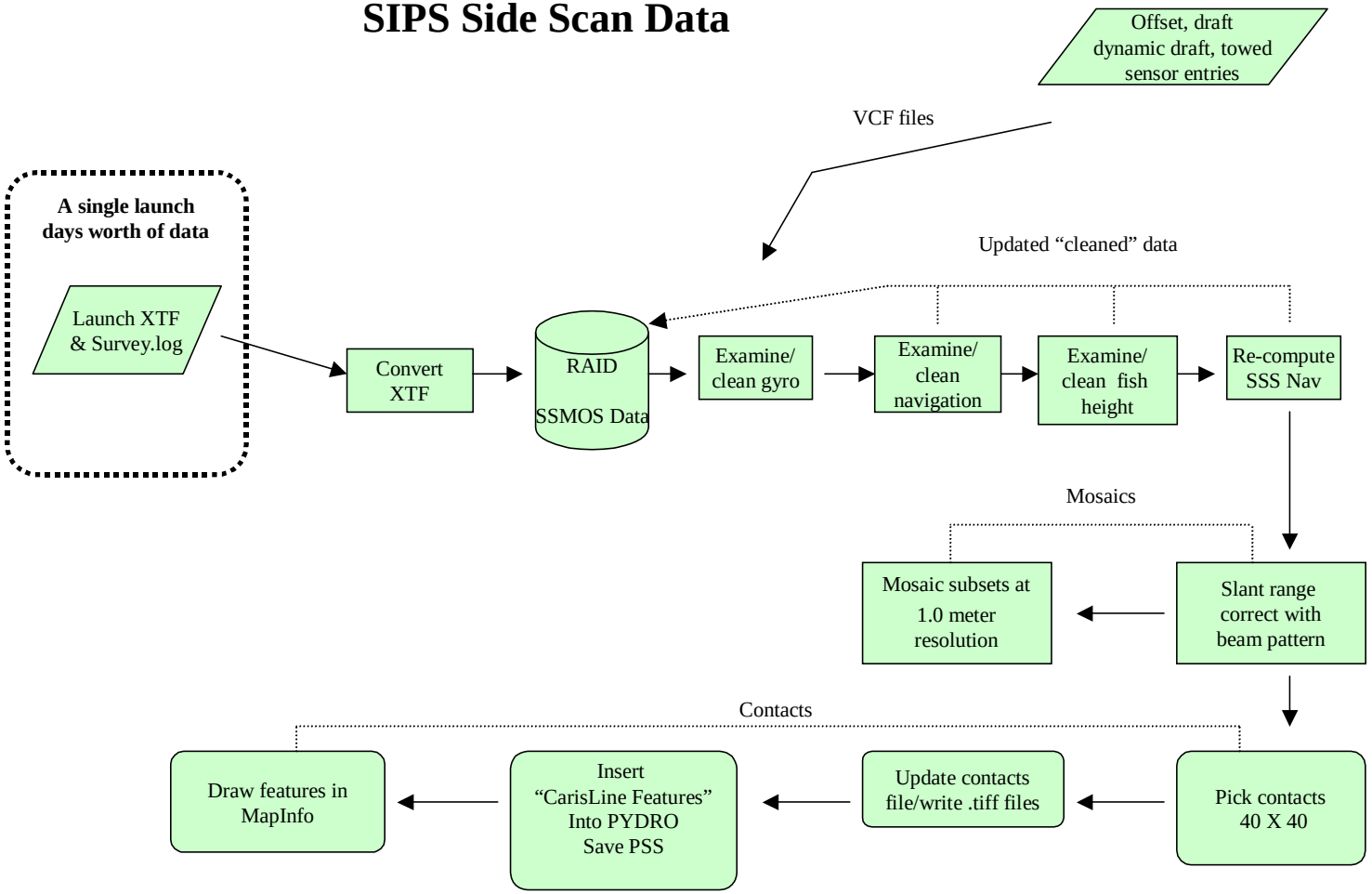


Area -based cleaning; multiple lines at -a-time

Data Flow Diagram -- Data Integration with Pydro



SIPS Side Scan Data



APPENDIX III

1. Bay Hydrographer Offset Drawing
2. Bay Hydrographer Configuration Files (contained as separate documents within the digital data package)

Bay Hydrographer Vessel Offset Measurements

Description: Class III Motor Boat
LOA: 55 feet 10 inches
Weight: 22 G.T.

BAY HYDROGRAPHER

Position/Equipment	Positive Starboard X	Positive Forward Y	Positive Down Z
A. Reference Point (RP)	0	0	0
B. Centerline Scribe on Frame	0	-	-
C. Waterline			0.034
D. High Frequency Transducer	.757	.214	0.84
F. POS/MV IMU	0.002	0.346	0.137
G. Towpoint	0	-8.36	-2.63
H. GPS L1/l2 Antenna (Trimble)	-0.467	-0.545	-6.703
I. Reson 8125 Transducer Head	3.775	-5.776	1.764
J. Port POS/MV GPS Antennae	-1.621	2.181	-3.842
K. Stbd POS/MV GPS Antenna	1.653	2.201	-3.840

BAY HYDROGRAPHER

		Observed Position			Δ Reference Point Moon Pool			Δ Reference Point IMU		
POINT	Name	e (m)	n (m)	u (m)	Δx (m)	Δy (m)	Δz (m)	Δx (m)	Δy (m)	Δz (m)
TP01	Temp point 1	1000.000	1000.000	1000.000	-32.734	0.000	-1.462	-33.080	0.002	-1.325
TP02	Temp point 2	1000.002	1030.326	1002.390	-2.408	0.002	0.928	-2.754	0.004	1.065
TP03	Temp point 3	1006.991	1053.097	1000.055	20.363	6.991	-1.407	20.017	6.993	-1.270
CL01	Moon Pool	1000.000	1032.734	1001.462	0.000	0.000	0.000	-0.346	0.002	0.137
IMU	IMU	999.998	1033.080	1001.325	0.346	-0.002	-0.137	0.000	0.000	0.000
CL02	Ref Point CL Stern	999.999	1024.904	1002.287	-7.830	-0.001	0.825	-8.176	0.001	0.962
CL03	Ref Point CL GPS Mount Bar	1000.001	1034.878	1005.234	2.144	0.001	3.772	1.798	0.003	3.909
CL04	Ref Point CL Bow	1000.029	1040.635	1003.716	7.901	0.029	2.254	7.555	0.031	2.391
GPS1	Top Center of Bolt GPS Ant (Port)	998.379	1034.915	1005.261	2.181	-1.621	3.799	1.835	-1.619	3.936
GPS1	GPS Ant Phase Center (Port)	998.379	1034.915	1005.304	2.181	-1.621	3.842	1.835	-1.619	3.979
GPS2	Top Center of Bolt GPS Ant (Starboard)	1001.653	1034.935	1005.259	2.201	1.653	3.797	1.855	1.655	3.934
GPS2	GPS Ant Phase Center (Starboard)	1001.653	1034.935	1005.302	2.201	1.653	3.840	1.855	1.655	3.977
DGPS	Top Center of Bolt DGPS Ant Mount	999.533	1032.189	1008.165	-0.545	-0.467	6.703	-0.891	-0.465	6.840
Single Beam	Single Beam Phase Center	1000.757	1032.948	1000.586	0.214	0.757	-0.876	-0.132	0.759	-0.739
MBSP	Multibeam Support	1002.225	1027.807	1002.225	-4.927	2.225	0.763	-5.273	2.227	0.900
MBBM	Multibeam Bench Mark	1003.731	1027.114	1002.035	-5.620	3.731	0.573	-5.966	3.733	0.710
MBPC	Multibeam Phase Center	1003.775	1026.958	999.778	-5.776	3.775	-1.684	-6.122	3.777	-1.547
MBPC2	Multibeam Phase Center under Stress	1003.765	1026.921	999.784	-5.813	3.765	-1.678	-6.159	3.767	-1.541

Azimuth check to IMU X 0.002(m) Y0.001(m) Z 0.004(m)

Azimuth check to remaining objects X 0.000(m) Y0.001(m) Z 0.003(m)

Temp Points are not permanently monumented

Vessel Name: BH_S5501_DP
Vessel created: August 23, 2005

Depth Sensor:

Sensor Class: Swath
Time Stamp: 1999-070 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 1.700
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 1.980

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2000-001 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 2.250
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2002-091 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-073 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-135 00:00

Transduer #1:

Pitch Offset: 3.400
Roll Offset: -2.300
Azimuth Offset: 4.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-212 00:00

Transduer #1:

Pitch Offset: 4.400
Roll Offset: -1.900
Azimuth Offset: -4.200

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2004-257 00:00

Transduer #1:

Pitch Offset: 2.100
Roll Offset: -1.380
Azimuth Offset: 1.800

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2005-081 00:00

Transduer #1:

Pitch Offset: 1.700
Roll Offset: -1.430
Azimuth Offset: 1.900

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2005-157 00:00

Transduer #1:

Pitch Offset: -2.170
Roll Offset: -1.150
Azimuth Offset: 1.550

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2005-188 00:00

Transduer #1:

Pitch Offset: -4.830
Roll Offset: -1.330
Azimuth Offset: 2.030

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Navigation Sensor:

Time Stamp: 1999-070 00:00

Comments
Latency 0.300
DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-343 00:00

Comments
Latency -1.000

DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-347 20:15

Comments
Latency 0.300
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Latency 0.000
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-244 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.740

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-297 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -7.330

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-310 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.790

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Latency -0.160
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-212 00:00

Comments
Latency -0.200
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: (null)
Serial Number: (null)

Gyro Sensor:

Time Stamp: 1999-070 00:00

Comments
Latency 2.500

Time Stamp: 2002-091 00:00

Comments
Latency 2.400

Time Stamp: 2003-073 00:00

Comments
Latency 2.400

Time Stamp: 2004-135 00:00

Comments
Latency 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Latency 0.000

Heave Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number: (null)

Pitch Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Roll Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Draft Sensor:

Time Stamp: 1999-070 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.030 Speed: 6.000
Entry 4) Draft: 0.050 Speed: 7.200
Entry 5) Draft: 0.100 Speed: 8.400
Entry 6) Draft: 0.110 Speed: 9.600
Entry 7) Draft: 0.080 Speed: 10.800
Entry 8) Draft: -0.100 Speed: 12.000

Time Stamp: 1999-271 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-073 00:00

Apply Yes
Comments

Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-135 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2004-257 00:00

Apply Yes
Comments (null)
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

TPE

Time Stamp: 2004-287 00:00

Comments

Offsets

Motion sensing unit to the transducer 1
- X Head 1 3.777
- Y Head 1 -5.810
- Z Head 1 1.627

Motion sensing unit to the transducer 2
- X Head 2 0.000
- Y Head 2 0.000
- Z Head 2 0.000

Navigation antenna to the transducer 1
- X Head 1 3.777
- Y Head 1 -5.810
- Z Head 1 1.627

Navigation antenna to the transducer 2
- X Head 2 0.000
- Y Head 2 0.000
- Z Head 2 0.000

Roll offset of transducer number 1 -1.333
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000" of heave amplitude.
Measurement errors: 0.001
Motion sensing unit alignment errors
Gyro:0.010 Pitch:0.010 Roll:0.010
Gyro measurement error: 0.020
Roll measurement error: 0.020
Pitch measurement error: 0.020
Navigation measurement error: 2.000
Transducer timing error: 0.000
Navigation timing error: 0.001
Gyro timing error: 0.001
Heave timing error: 0.001
PitchTimingStdDev: 0.001
Roll timing error: 0.001
Sound Velocity speed measurement error: 0.500
Surface sound speed measurement error: 0.050
Tide measurement error: 0.010
Tide zoning error: 0.100
Speed over ground measurement error: 0.000
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000

Delta draft measurement error: 0.000

Svp Sensor:

Time Stamp: 1999-070 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 180.000

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2002-091 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-073 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-135 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850

DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2005-081 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

WaterLine:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
WaterLine 0.010

Time Stamp: 2002-091 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-073 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-135 00:00

Comments
Apply No

WaterLine 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
WaterLine 0.000

Vessel Name: BH_S5501_KLEIN5000_SSS100
Vessel created: February 14, 2005

Depth Sensor:

Sensor Class: Swath
Time Stamp: 1950-001 00:00

Transduer #1:

Pitch Offset: 2.100
Roll Offset: -1.380
Azimuth Offset: 1.800

DeltaX: 3.777
DeltaY: -5.810
DeltaZ: 1.627

Manufacturer: RESON
Model: Unknown
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 1999-070 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 1.700
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 1.980

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2000-001 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 2.250
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2002-091 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-073 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-135 00:00

Transduer #1:

Pitch Offset: 3.400
Roll Offset: -2.300
Azimuth Offset: 4.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-212 00:00

Transduer #1:

Pitch Offset: 4.400
Roll Offset: -1.900
Azimuth Offset: -4.200

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2004-257 00:00

Transduer #1:

Pitch Offset: 2.100
Roll Offset: -1.380
Azimuth Offset: 1.800

DeltaX: 3.777
DeltaY: -5.810
DeltaZ: 1.627

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Navigation Sensor:

Time Stamp: 1950-001 00:00

Comments
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: POS M/V
Serial Number:

Time Stamp: 1999-070 00:00

Comments
Latency 0.300
DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-343 00:00

Comments
Latency -1.000
DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-347 20:15

Comments
Latency 0.300
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments

Latency 0.000
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-244 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.740

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-297 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -7.330

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-310 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.790

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Latency -0.160
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-212 00:00

Comments
Latency -0.200
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: (null)
Serial Number: (null)

Gyro Sensor:

Time Stamp: 1950-001 00:00

Comments
Latency 0.000

Time Stamp: 1999-070 00:00

Comments
Latency 2.500

Time Stamp: 2002-091 00:00

Comments
Latency 2.400

Time Stamp: 2003-073 00:00

Comments
Latency 2.400

Time Stamp: 2004-135 00:00

Comments
Latency 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Latency 0.000

Heave Sensor:

Time Stamp: 1950-001 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: POS/MV
Serial Number:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments

Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes

Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number: (null)

Pitch Sensor:

Time Stamp: 1950-001 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Roll Sensor:

Time Stamp: 1950-001 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Draft Sensor:

Time Stamp: 1950-001 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800

Time Stamp: 1999-070 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.030 Speed: 6.000
Entry 4) Draft: 0.050 Speed: 7.200
Entry 5) Draft: 0.100 Speed: 8.400
Entry 6) Draft: 0.110 Speed: 9.600
Entry 7) Draft: 0.080 Speed: 10.800
Entry 8) Draft: -0.100 Speed: 12.000

Time Stamp: 1999-271 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-073 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-135 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2004-257 00:00

Apply Yes
Comments (null)
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Tow Point:

Time Stamp: 1999-070 00:00

Comments
Latency 0.000
DeltaX: 0.000
DeltaY: -8.360
DeltaZ: -2.630

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-085 00:00

Comments
Latency 0.000
DeltaX: 0.000
DeltaY: -8.360
DeltaZ: -2.630

Manufacturer:
Model:
Serial Number:

TPE

Time Stamp: 2004-287 00:00

Comments
Offsets

Motion sensing unit to the transducer 1
- X Head 1 3.777
- Y Head 1 -5.810
- Z Head 1 1.627

Motion sensing unit to the transducer 2
- X Head 2 0.000
- Y Head 2 0.000
- Z Head 2 0.000

Navigation antenna to the transducer 1
- X Head 1 3.777
- Y Head 1 -5.810
- Z Head 1 1.627

Navigation antenna to the transducer 2
- X Head 2 0.000
- Y Head 2 0.000
- Z Head 2 0.000

Roll offset of transducer number 1 0.000
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000" of heave amplitude.
Measurement errors: 0.001
Motion sensing unit alignment errors
Gyro:0.000 Pitch:0.000 Roll:0.000

Gyro measurement error: 0.020
Roll measurement error: 0.020
Pitch measurement error: 0.020
Navigation measurement error: 0.000
Transducer timing error: 0.000
Navigation timing error: 0.010
Gyro timing error: 0.010
Heave timing error: 0.010
PitchTimingStdDev: 0.010
Roll timing error: 0.010
Sound Velocity speed measurement error: 0.500
Surface sound speed measurement error: 0.050
Tide measurement error: 0.010
Tide zoning error: 0.100
Speed over ground measurement error: 0.030
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000

Svp Sensor:

Time Stamp: 1950-001 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.777
DeltaY: -5.810
DeltaZ: 1.627

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 1999-070 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 180.000

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2002-091 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000

Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-073 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-135 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.777
DeltaY: -5.810
DeltaZ: 1.627

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

WaterLine:

Time Stamp: 1950-001 00:00

Comments
Apply Yes
WaterLine 0.000

Time Stamp: 1999-070 00:00

Comments
Apply Yes
WaterLine 0.010

Time Stamp: 2002-091 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-073 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-135 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
WaterLine 0.000

Vessel Name: BH_S5501_KLEIN5000_SSS200
Vessel created: December 10, 2004

Depth Sensor:

Sensor Class: Swath
Time Stamp: 1999-070 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 1.700
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 1.980

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2000-001 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 2.250
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2002-091 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-073 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-135 00:00

Transduer #1:

Pitch Offset: 3.400
Roll Offset: -2.300
Azimuth Offset: 4.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-212 00:00

Transduer #1:

Pitch Offset: 4.400
Roll Offset: -1.900
Azimuth Offset: -4.200

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2004-257 00:00

Transduer #1:

Pitch Offset: 2.100
Roll Offset: -1.380
Azimuth Offset: 1.800

DeltaX: 3.777
DeltaY: -5.810
DeltaZ: 1.627

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Navigation Sensor:

Time Stamp: 1999-070 00:00

Comments
Latency 0.300
DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-343 00:00

Comments
Latency -1.000
DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-347 20:15

Comments
Latency 0.300
DeltaX: -0.510

DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Latency 0.000
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-244 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.740

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-297 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -7.330

Manufacturer:

Model:
Serial Number:

Time Stamp: 2002-310 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.790

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Latency -0.160
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-212 00:00

Comments
Latency -0.200
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: (null)
Serial Number: (null)

Gyro Sensor:

Time Stamp: 1999-070 00:00

Comments
Latency 2.500

Time Stamp: 2002-091 00:00

Comments
Latency 2.400

Time Stamp: 2003-073 00:00

Comments

Latency 2.400

Time Stamp: 2004-135 00:00

Comments
Latency 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Latency 0.000

Heave Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number: (null)

Pitch Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes

Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Roll Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:

Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Draft Sensor:

Time Stamp: 1999-070 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.030 Speed: 6.000
Entry 4) Draft: 0.050 Speed: 7.200
Entry 5) Draft: 0.100 Speed: 8.400
Entry 6) Draft: 0.110 Speed: 9.600
Entry 7) Draft: 0.080 Speed: 10.800
Entry 8) Draft: -0.100 Speed: 12.000

Time Stamp: 1999-271 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-073 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-135 00:00

Apply Yes
Comments

Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2004-257 00:00

Apply Yes
Comments (null)
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Tow Point:

Time Stamp: 1999-070 00:00

Comments
Latency 0.000
DeltaX: 0.000
DeltaY: -8.360
DeltaZ: -2.630

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-085 00:00

Comments
Latency 0.000

DeltaX: 0.000
DeltaY: -8.360
DeltaZ: -2.630

Manufacturer:
Model:
Serial Number:

TPE

Time Stamp: 2004-287 00:00

Comments
Offsets

Motion sensing unit to the transducer 1
- X Head 1 3.777
- Y Head 1 -5.810
- Z Head 1 1.627

Motion sensing unit to the transducer 2
- X Head 2 0.000
- Y Head 2 0.000
- Z Head 2 0.000

Navigation antenna to the transducer 1
- X Head 1 3.777
- Y Head 1 -5.810
- Z Head 1 1.627

Navigation antenna to the transducer 2
- X Head 2 0.000
- Y Head 2 0.000
- Z Head 2 0.000

Roll offset of transducer number 1 0.000
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000" of heave amplitude.
Measurement errors: 0.001
Motion sensing unit alignment errors
Gyro:0.000 Pitch:0.000 Roll:0.000
Gyro measurement error: 0.020
Roll measurement error: 0.020
Pitch measurement error: 0.020

Navigation measurement error: 0.000
Transducer timing error: 0.000
Navigation timing error: 0.010
Gyro timing error: 0.010
Heave timing error: 0.010
PitchTimingStdDev: 0.010
Roll timing error: 0.010
Sound Velocity speed measurement error: 0.500
Surface sound speed measurement error: 0.050
Tide measurement error: 0.010
Tide zoning error: 0.100
Speed over ground measurement error: 0.030
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000

Svp Sensor:

Time Stamp: 1999-070 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 180.000

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2002-091 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-073 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000

DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-135 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.777
DeltaY: -5.810
DeltaZ: 1.627

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

WaterLine:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
WaterLine 0.010

Time Stamp: 2002-091 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-073 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-135 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
WaterLine 0.000

Vessel Name: BH_S5501_RESON7125
Vessel created: August 15, 2006

Depth Sensor:

Sensor Class: Swath
Time Stamp: 1999-070 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 1.700
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 1.980

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2000-001 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 2.250
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2002-091 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-073 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-135 00:00

Transduer #1:

Pitch Offset: 3.400
Roll Offset: -2.300
Azimuth Offset: 4.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-212 00:00

Transduer #1:

Pitch Offset: 4.400
Roll Offset: -1.900
Azimuth Offset: -4.200

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2004-257 00:00

Transduer #1:

Pitch Offset: 2.100
Roll Offset: -1.380
Azimuth Offset: 1.800

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2005-081 00:00

Transduer #1:

Pitch Offset: 1.700
Roll Offset: -1.430
Azimuth Offset: 1.900

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2005-157 00:00

Transduer #1:

Pitch Offset: -2.170
Roll Offset: -1.150
Azimuth Offset: 1.550

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2005-188 00:00

Transduer #1:

Pitch Offset: -4.830
Roll Offset: -1.330
Azimuth Offset: 2.030

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2006-078 00:00

Transduer #1:

Pitch Offset: -1.760
Roll Offset: -0.690
Azimuth Offset: 0.700

DeltaX: 3.658
DeltaY: -5.816
DeltaZ: 1.805

Manufacturer: RESON
Model: sb7125a
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2006-169 00:00

Transduer #1:

Pitch Offset: -1.760
Roll Offset: -0.690
Azimuth Offset: 0.700

DeltaX: 3.658
DeltaY: -5.816
DeltaZ: 1.805

Manufacturer: RESON
Model: sb7125c
Serial Number:

Navigation Sensor:

Time Stamp: 1999-070 00:00

Comments
Latency 0.300
DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-343 00:00

Comments
Latency -1.000
DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:

Model:
Serial Number:

Time Stamp: 1999-347 20:15

Comments
Latency 0.300
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Latency 0.000
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-244 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.740

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-297 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -7.330

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-310 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.790

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Latency -0.160

DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-212 00:00

Comments
Latency -0.200
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Latency -0.200
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: (null)
Serial Number: (null)

Gyro Sensor:

Time Stamp: 1999-070 00:00

Comments
Latency 2.500

Time Stamp: 2002-091 00:00

Comments
Latency 2.400

Time Stamp: 2003-073 00:00

Comments
Latency 2.400

Time Stamp: 2004-135 00:00

Comments
Latency 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Latency 0.000

Heave Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments

Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes

Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number: (null)

Pitch Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Roll Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Draft Sensor:

Time Stamp: 1999-070 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.030 Speed: 6.000
Entry 4) Draft: 0.050 Speed: 7.200
Entry 5) Draft: 0.100 Speed: 8.400
Entry 6) Draft: 0.110 Speed: 9.600
Entry 7) Draft: 0.080 Speed: 10.800
Entry 8) Draft: -0.100 Speed: 12.000

Time Stamp: 1999-271 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-073 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200

Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-135 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2004-257 00:00

Apply Yes
Comments (null)
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

TPE

Time Stamp: 2004-287 00:00

Comments
Offsets

Motion sensing unit to the transducer 1
X Head 1 3.777
Y Head 1 -5.810

Z Head 1 1.627
Motion sensing unit to the transducer 2
X Head 2 0.000
Y Head 2 0.000
Z Head 2 0.000
Navigation antenna to the transducer 1
X Head 1 3.777
Y Head 1 -5.810
Z Head 1 1.627
Navigation antenna to the transducer 2
X Head 2 0.000
Y Head 2 0.000
Z Head 2 0.000

Roll offset of transducer number 1 -1.333
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000" of heave amplitude.
Measurement errors: 0.001
Motion sensing unit alignment errors
Gyro:0.010 Pitch:0.010 Roll:0.010
Gyro measurement error: 0.020
Roll measurement error: 0.020
Pitch measurement error: 0.020
Navigation measurement error: 2.000
Transducer timing error: 0.000
Navigation timing error: 0.001
Gyro timing error: 0.001
Heave timing error: 0.001
PitchTimingStdDev: 0.001
Roll timing error: 0.001
Sound Velocity speed measurement error: 0.500
Surface sound speed measurement error: 0.050
Tide measurement error: 0.010
Tide zoning error: 0.100
Speed over ground measurement error: 0.000
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000

Svp Sensor:

Time Stamp: 1999-070 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 180.000

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2002-091 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000

DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-073 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-135 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2005-081 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.775

DeltaY: -5.475
DeltaZ: 1.764

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2006-078 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.658
DeltaY: -5.816
DeltaZ: 1.805

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2006-169 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.658
DeltaY: -5.816
DeltaZ: 1.805

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

WaterLine:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
WaterLine 0.010

Time Stamp: 2002-091 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-073 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-135 00:00

Comments
Apply No

WaterLine 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
WaterLine 0.034

Vessel Name: BH_S5501_RESON8125
Vessel created: March 30, 2006

Depth Sensor:

Sensor Class: Swath
Time Stamp: 1999-070 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 1.700
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 1.980

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2000-001 00:00

Transduer #1:

Pitch Offset: 2.500
Roll Offset: 2.250
Azimuth Offset: 4.500

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2002-091 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-073 00:00

Transduer #1:

Pitch Offset: 1.500
Roll Offset: -2.350
Azimuth Offset: -1.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-135 00:00

Transduer #1:

Pitch Offset: 3.400
Roll Offset: -2.300
Azimuth Offset: 4.500

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-212 00:00

Transduer #1:

Pitch Offset: 4.400
Roll Offset: -1.900
Azimuth Offset: -4.200

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2004-257 00:00

Transduer #1:

Pitch Offset: 2.100
Roll Offset: -1.380
Azimuth Offset: 1.800

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2005-081 00:00

Transduer #1:

Pitch Offset: 1.700
Roll Offset: -1.430
Azimuth Offset: 1.900

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2005-157 00:00

Transduer #1:

Pitch Offset: -2.170
Roll Offset: -1.150
Azimuth Offset: 1.550

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2005-188 00:00

Transduer #1:

Pitch Offset: -4.830
Roll Offset: -1.330
Azimuth Offset: 2.030

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2006-078 00:00

Transduer #1:

Pitch Offset: -4.750
Roll Offset: -1.020
Azimuth Offset: 0.950

DeltaX: 3.775
DeltaY: -5.665
DeltaZ: 1.764

Manufacturer: RESON
Model: sb8125
Serial Number: 31546

Navigation Sensor:

Time Stamp: 1999-070 00:00

Comments
Latency 0.300
DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-343 00:00

Comments
Latency -1.000
DeltaX: -0.510
DeltaY: 1.480
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 1999-347 20:15

Comments
Latency 0.300
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Latency 0.000
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-244 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.740

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-297 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -7.330

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-310 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970

DeltaZ: -6.790

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Latency -0.160
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3
Serial Number:

Time Stamp: 2003-212 00:00

Comments
Latency -0.200
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS MV 320 v3

Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: (null)
Serial Number: (null)

Gyro Sensor:

Time Stamp: 1999-070 00:00

Comments
Latency 2.500

Time Stamp: 2002-091 00:00

Comments
Latency 2.400

Time Stamp: 2003-073 00:00

Comments
Latency 2.400

Time Stamp: 2004-135 00:00

Comments
Latency 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Latency 0.000

Heave Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.790
DeltaZ: 0.080

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: POS/MV 320 v3
Serial Number: (null)

Pitch Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Roll Sensor:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2002-091 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-073 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2003-135 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Draft Sensor:

Time Stamp: 1999-070 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.030 Speed: 6.000
Entry 4) Draft: 0.050 Speed: 7.200
Entry 5) Draft: 0.100 Speed: 8.400
Entry 6) Draft: 0.110 Speed: 9.600
Entry 7) Draft: 0.080 Speed: 10.800
Entry 8) Draft: -0.100 Speed: 12.000

Time Stamp: 1999-271 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-073 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2002-135 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

Time Stamp: 2004-257 00:00

Apply Yes
Comments (null)
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 3.600
Entry 3) Draft: 0.020 Speed: 4.800
Entry 4) Draft: 0.040 Speed: 6.000
Entry 5) Draft: 0.060 Speed: 7.200
Entry 6) Draft: 0.100 Speed: 8.400
Entry 7) Draft: 0.120 Speed: 9.600
Entry 8) Draft: 0.080 Speed: 10.800
Entry 9) Draft: -0.100 Speed: 12.000

TPE

Time Stamp: 2004-287 00:00

Comments
Offsets

Motion sensing unit to the transducer 1
- X Head 1 3.777
- Y Head 1 -5.810
- Z Head 1 1.627

Motion sensing unit to the transducer 2
- X Head 2 0.000
- Y Head 2 0.000
- Z Head 2 0.000

Navigation antenna to the transducer 1
- X Head 1 3.777
- Y Head 1 -5.810
- Z Head 1 1.627

Navigation antenna to the transducer 2
- X Head 2 0.000
- Y Head 2 0.000
- Z Head 2 0.000

Roll offset of transducer number 1 -1.333
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000" of heave amplitude.
Measurement errors: 0.001

Motion sensing unit alignment errors
Gyro:0.010 Pitch:0.010 Roll:0.010
Gyro measurement error: 0.020
Roll measurement error: 0.020
Pitch measurement error: 0.020
Navigation measurement error: 2.000
Transducer timing error: 0.000
Navigation timing error: 0.001
Gyro timing error: 0.001
Heave timing error: 0.001
PitchTimingStdDev: 0.001
Roll timing error: 0.001
Sound Velocity speed measurement error: 0.500
Surface sound speed measurement error: 0.050
Tide measurement error: 0.010
Tide zoning error: 0.100
Speed over ground measurement error: 0.000
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000

Svp Sensor:

Time Stamp: 1999-070 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 180.000

DeltaX: 1.400
DeltaY: -7.720
DeltaZ: 2.150

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000

DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2002-091 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-073 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-135 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.850
DeltaY: -3.950
DeltaZ: 1.610

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.775

DeltaY: -5.475
DeltaZ: 1.764

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2005-081 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.775
DeltaY: -5.475
DeltaZ: 1.764

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2006-078 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 3.775
DeltaY: -5.665
DeltaZ: 1.764

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

WaterLine:

Time Stamp: 1999-070 00:00

Comments
Apply Yes
WaterLine 0.010

Time Stamp: 2002-091 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-073 00:00

Comments
Apply No
WaterLine 0.000

Time Stamp: 2003-135 00:00

Comments
Apply No

WaterLine 0.000

Time Stamp: 2004-257 00:00

Comments (null)
Apply Yes
WaterLine 0.034

Vessel Name: BH_S5501_SB
Vessel created: February 21, 2006

Depth Sensor:

Sensor Class: Swath
Time Stamp: 1998-365 23:59

Transduer #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.770
DeltaY: 1.680
DeltaZ: 0.000

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-086 00:00

Transduer #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.770
DeltaY: 1.680
DeltaZ: 0.840

Manufacturer: Airmar
Model: Unknown
Serial Number: LF P/N 41-861-1

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2004-259 00:00

Transduer #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.757
DeltaY: 0.214
DeltaZ: 0.876

Manufacturer: Airmar
Model: ODOM
Serial Number: LF P/N 41-861-1

Navigation Sensor:

Time Stamp: 1998-365 23:59

Comments
Latency 0.400
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2002-091 00:00

Comments
Latency 0.000
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2002-244 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.740

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2002-297 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -7.330

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2002-310 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.790

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2003-086 00:00

Comments (null)
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV
Serial Number: 342

Time Stamp: 2004-259 00:00

Comments
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: POSMV V4
Serial Number: 2084

Gyro Sensor:

Time Stamp: 1998-365 23:59

Comments
Latency 0.000

Entry 0) Draft: 0.000 Speed: 0.000

Time Stamp: 2003-086 00:00

Comments
Latency 0.000

Entry 0) Draft: 0.000 Speed: 0.000

Time Stamp: 2004-259 00:00

Comments
Latency 0.000

Heave Sensor:

Time Stamp: 1998-365 23:59

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2003-086 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV
Serial Number: 342

Time Stamp: 2004-259 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346

DeltaZ: 0.137

Manufacturer: TSS
Model: POS MV
Serial Number: 2084

Pitch Sensor:

Time Stamp: 1998-365 23:59

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2003-086 00:00

Comments
Apply No
Latency 0.000
Pitch offset: 0.000

Manufacturer: TSS
Model: POS/MV
Serial Number: 342

Time Stamp: 2004-259 00:00

Comments
Apply No
Latency 0.000
Pitch offset: 0.000

Manufacturer: TSS
Model: POS MV
Serial Number: 2084

Roll Sensor:

Time Stamp: 1998-365 23:59

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2003-086 00:00

Comments
Apply No
Latency 0.000
Roll offset: 0.000

Manufacturer: TSS
Model: POS/MV
Serial Number: 342

Time Stamp: 2004-259 00:00

Comments
Apply No
Latency 0.000
Roll offset: 0.000

Manufacturer: TSS
Model: POS MV v4
Serial Number: 2084

Draft Sensor:

Time Stamp: 1999-270 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 2.400
Entry 3) Draft: 0.010 Speed: 3.600
Entry 4) Draft: 0.020 Speed: 4.800
Entry 5) Draft: 0.040 Speed: 6.000
Entry 6) Draft: 0.060 Speed: 7.200
Entry 7) Draft: 0.100 Speed: 8.400
Entry 8) Draft: 0.120 Speed: 9.600
Entry 9) Draft: 0.080 Speed: 10.800
Entry 10) Draft: -0.100 Speed: 12.000

Time Stamp: 2003-086 00:00

Apply Yes
Comments (null)
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 2.400
Entry 3) Draft: 0.010 Speed: 3.600
Entry 4) Draft: 0.020 Speed: 4.800
Entry 5) Draft: 0.040 Speed: 6.000
Entry 6) Draft: 0.060 Speed: 7.200
Entry 7) Draft: 0.100 Speed: 8.400
Entry 8) Draft: 0.120 Speed: 9.600
Entry 9) Draft: 0.080 Speed: 10.800
Entry 10) Draft: -0.100 Speed: 12.000

TPE

Time Stamp: 2004-259 00:00

Comments
Offsets

Motion sensing unit to the transducer 1
X Head 1 0.759
Y Head 1 -0.132
Z Head 1 0.739
Motion sensing unit to the transducer 2
X Head 2 0.000
Y Head 2 0.000

Z Head 2 0.000
Navigation antenna to the transducer 1
X Head 1 0.759
Y Head 1 -0.132
Z Head 1 0.739
Navigation antenna to the transducer 2
X Head 2 0.000
Y Head 2 0.000
Z Head 2 0.000

Roll offset of transducer number 1 0.000
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000" of heave amplitude.
Measurement errors: 0.001
Motion sensing unit alignment errors
Gyro:0.010 Pitch:0.010 Roll:0.010
Gyro measurement error: 0.020
Roll measurement error: 0.020
Pitch measurement error: 0.020
Navigation measurement error: 2.000
Transducer timing error: 0.000
Navigation timing error: 0.001
Gyro timing error: 0.001
Heave timing error: 0.001
PitchTimingStdDev: 0.001
Roll timing error: 0.001
Sound Velocity speed measurement error: 0.500
Surface sound speed measurement error: 0.050
Tide measurement error: 0.010
Tide zoning error: 0.100
Speed over ground measurement error: 0.000
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000

Svp Sensor:

Time Stamp: 1998-365 23:59

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.770
DeltaY: 1.680
DeltaZ: 0.840

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-086 00:00

Comments (null)
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.757
DeltaY: 0.214
DeltaZ: 0.876

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2004-259 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.757
DeltaY: 0.214
DeltaZ: 0.876

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

WaterLine:

Time Stamp: 1998-365 23:59

Comments
Apply Yes
WaterLine 0.000

Time Stamp: 2003-086 00:00

Comments
Apply Yes
WaterLine 0.000

Time Stamp: 2004-259 00:00

Comments
Apply Yes
WaterLine 0.034

Vessel Name: BH_S5501_SBX_LINES
Vessel created: February 23, 2006

Depth Sensor:

Sensor Class: Swath
Time Stamp: 1998-365 23:59

Transduer #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.770
DeltaY: 1.680
DeltaZ: 0.000

Manufacturer:
Model: Unknown
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2003-086 00:00

Transduer #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.770
DeltaY: 1.680
DeltaZ: 0.840

Manufacturer: Airmar
Model: Unknown
Serial Number: LF P/N 41-861-1

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2004-259 00:00

Transduer #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.757
DeltaY: 0.214
DeltaZ: 0.876

Manufacturer: Airmar
Model: ODOM
Serial Number: LF P/N 41-861-1

Navigation Sensor:

Time Stamp: 1998-365 23:59

Comments
Latency 0.400
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2002-091 00:00

Comments
Latency 0.000
DeltaX: -0.510
DeltaY: 0.310
DeltaZ: -6.870

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2002-244 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.740

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2002-297 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -7.330

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2002-310 00:00

Comments
Latency 0.000
DeltaX: -0.530
DeltaY: 0.970
DeltaZ: -6.790

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2003-086 00:00

Comments (null)
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV
Serial Number: 342

Time Stamp: 2004-259 00:00

Comments
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model: POSMV V4
Serial Number: 2084

Gyro Sensor:

Time Stamp: 1998-365 23:59

Comments
Latency 0.000

Entry 0) Draft: 0.000 Speed: 0.000

Time Stamp: 2003-086 00:00

Comments
Latency 0.000

Entry 0) Draft: 0.000 Speed: 0.000

Time Stamp: 2004-259 00:00

Comments
Latency 0.000

Heave Sensor:

Time Stamp: 1998-365 23:59

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2003-086 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: 0.000
DeltaY: 1.720
DeltaZ: -0.170

Manufacturer: TSS
Model: POS/MV
Serial Number: 342

Time Stamp: 2004-259 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: -0.002
DeltaY: 0.346

DeltaZ: 0.137

Manufacturer: TSS
Model: POS MV
Serial Number: 2084

Pitch Sensor:

Time Stamp: 1998-365 23:59

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2003-086 00:00

Comments
Apply No
Latency 0.000
Pitch offset: 0.000

Manufacturer: TSS
Model: POS/MV
Serial Number: 342

Time Stamp: 2004-259 00:00

Comments
Apply No
Latency 0.000
Pitch offset: 0.000

Manufacturer: TSS
Model: POS MV
Serial Number: 2084

Roll Sensor:

Time Stamp: 1998-365 23:59

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer: (null)
Model: (null)
Serial Number: (null)

Time Stamp: 2003-086 00:00

Comments
Apply No
Latency 0.000
Roll offset: 0.000

Manufacturer: TSS
Model: POS/MV
Serial Number: 342

Time Stamp: 2004-259 00:00

Comments
Apply No
Latency 0.000
Roll offset: 0.000

Manufacturer: TSS
Model: POS MV v4
Serial Number: 2084

Draft Sensor:

Time Stamp: 1999-270 00:00

Apply Yes
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 2.400
Entry 3) Draft: 0.010 Speed: 3.600
Entry 4) Draft: 0.020 Speed: 4.800
Entry 5) Draft: 0.040 Speed: 6.000
Entry 6) Draft: 0.060 Speed: 7.200
Entry 7) Draft: 0.100 Speed: 8.400
Entry 8) Draft: 0.120 Speed: 9.600
Entry 9) Draft: 0.080 Speed: 10.800
Entry 10) Draft: -0.100 Speed: 12.000

Time Stamp: 2003-086 00:00

Apply Yes
Comments (null)
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: 0.010 Speed: 2.400
Entry 3) Draft: 0.010 Speed: 3.600
Entry 4) Draft: 0.020 Speed: 4.800
Entry 5) Draft: 0.040 Speed: 6.000
Entry 6) Draft: 0.060 Speed: 7.200
Entry 7) Draft: 0.100 Speed: 8.400
Entry 8) Draft: 0.120 Speed: 9.600
Entry 9) Draft: 0.080 Speed: 10.800
Entry 10) Draft: -0.100 Speed: 12.000

TPE

Time Stamp: 2004-259 00:00

Comments
Offsets

Motion sensing unit to the transducer 1
X Head 1 0.759
Y Head 1 -0.132
Z Head 1 0.739
Motion sensing unit to the transducer 2
X Head 2 0.000
Y Head 2 0.000

Z Head 2 0.000
Navigation antenna to the transducer 1
X Head 1 0.759
Y Head 1 -0.132
Z Head 1 0.739
Navigation antenna to the transducer 2
X Head 2 0.000
Y Head 2 0.000
Z Head 2 0.000

Roll offset of transducer number 1 0.000
Roll offset of transducer number 2 0.000

Heave Error: 0.050 or 5.000" of heave amplitude.
Measurement errors: 0.001
Motion sensing unit alignment errors
Gyro:0.010 Pitch:0.010 Roll:0.010
Gyro measurement error: 0.020
Roll measurement error: 0.020
Pitch measurement error: 0.020
Navigation measurement error: 2.000
Transducer timing error: 0.000
Navigation timing error: 0.001
Gyro timing error: 0.001
Heave timing error: 0.001
PitchTimingStdDev: 0.001
Roll timing error: 0.001
Sound Velocity speed measurement error: 0.500
Surface sound speed measurement error: 0.050
Tide measurement error: 0.010
Tide zoning error: 0.100
Speed over ground measurement error: 0.000
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000

Svp Sensor:

Time Stamp: 1998-365 23:59

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.770
DeltaY: 1.680
DeltaZ: 0.840

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2003-086 00:00

Comments (null)
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.757
DeltaY: 0.214
DeltaZ: 0.876

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Time Stamp: 2004-259 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.757
DeltaY: 0.214
DeltaZ: 0.876

SVP #2:

Pitch Offset: 0.000
Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

WaterLine:

Time Stamp: 1998-365 23:59

Comments
Apply Yes
WaterLine 0.000

Time Stamp: 2003-086 00:00

Comments
Apply Yes
WaterLine 0.000

Time Stamp: 2004-259 00:00

Comments
Apply Yes
WaterLine 0.034

APPENDIX IV

- SeaCat CTD Sensor #2039 Calibration Report
- SeaCat CTD Sensor #4634 Calibration Report
- SeaCat CTD Sensor #4637 Calibration Report
- Odom Digibar 3002-062405 Calibration Report
- Odom Digibar 98351-032305 Calibration Report
- Odom Digibar 98376-030106 Calibration Report

Sea-Bird Electronics, Inc. FAX: (425) 643-9954
1808 136th Place NE, Bellevue, Washington 98005 USA Tel:(425)643-9866
Website: http://www.seabird.com Email: seabird@seabird.com

Service Report

SBE Job Number: 38203 Date: 19, January 2005

Customer: Atlantic Marine Center

Customer Identified Problem:

1. Calibrate SBE 19 SEACAT Profiler, S/N 1913768-2039.

Services Performed:

1. Calibrations and services performed on SBE 19 SEACAT Profiler, S/N 1913768-2039.
   Post calibrated the temperature and conductivity sensors.
   Calibrated the pressure sensor.
   Performed full diagnostic evaluation.

Sea-Bird Electronics, Inc.
1808 136th Place NE
Bellevue, WA 98005
USA

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Web: www.seabird.com

APPLICATION NOTE NO. 42 **Revised September 2001**

ITS-90 TEMPERATURE SCALE

Beginning January 1995, Sea-Bird temperature calibration certificates list a new set of coefficients labeled *g*, *h*, *i*, *j*, and *F0*. These coefficients correspond to ITS90 (T90) temperatures and should be entered by those researchers working with SEASOFT-DOS Versions 4.208 and higher (and all versions of SEASOFT-Win32). For the convenience of users who prefer to use older SEASOFT versions, the new certificates also list *a*, *b*, *c*, *d*, and *F0* coefficients corresponding to IPTS68 (T68) temperatures as required by SEASOFT-DOS versions older than 4.208.

It is important to note that the international oceanographic research community will continue to use T68 for computation of salinity and other seawater properties. Therefore, following the recommendations of Saunders (1990) and as supported by the Joint Panel on Oceanographic Tables and Standards (1991), SEASOFT-DOS 4.200 and later and all versions of SEASOFT-Win32 convert between T68 and T90 according to the linear relationship:

$$T_{68} = 1.00024 * T_{90}$$

The use of T68 for salinity and other seawater calculations is automatic in all SEASOFT programs. However, when selecting **temperature** as a display/output variable, you will be prompted to specify which standard (T90 or T68) is to be used to compute temperature. SEASOFT recognizes whether you have entered T90 or T68 coefficients in the configuration (.con) file, and computes T90 temperature directly or calculates it from the Saunders linear approximation, depending on which coefficients were used and which display variable type is selected.

For example, if *g, h, i, j, F0* coefficients (T90) are entered in the .con file and you select temperature variable type as T68, SEASOFT computes T90 temperature directly and multiplies it by 1.00024 to display T68. Conversely, if *a, b, c, d,* and *F0* coefficients (T68) are entered in the .con file and you select temperature variable type as T90, SEASOFT computes T68 directly and divides by 1.00024 to display T90.

Note: The CTD configuration (.con) file is edited using the Configure menu (in SEASAVE or SBE Data Processing in our SEASOFT-Win32 suite of programs) or SEACON (in SEASOFT-DOS).

Also beginning January 1995, Sea-Bird's own temperature metrology laboratory (based upon water triple-point and gallium melt cell, SPRT, and ASL F18 Temperature Bridge) converted to T90. These T90 standards are now employed in calibrating *all* Sea-Bird temperature sensors, and as the reference temperature used in conductivity calibrations. Accordingly, all calibration certificates show T90 (g, h, i, j) coefficients that result directly from T90 standards, and T68 coefficients (a, b, c, d) computed using the Saunders linear approximation.

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SENSOR SERIAL NUMBER: 2039
CALIBRATION DATE: 07-Jan-05

SBE19 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPRATURE SCALE

ITS-90 COEFFICIENTS

g = 4.17253325e-003
h = 5.99020477e-004
i = 7.02372106e-006
j = -9.92287747e-007
f0 = 1000.0

ITS-68 COEFFICIENTS

a = 3.64763384e-003
b = 5.84364649e-004
c = 9.68782285e-006
d = -9.91685900e-007
f0 = 2426.936

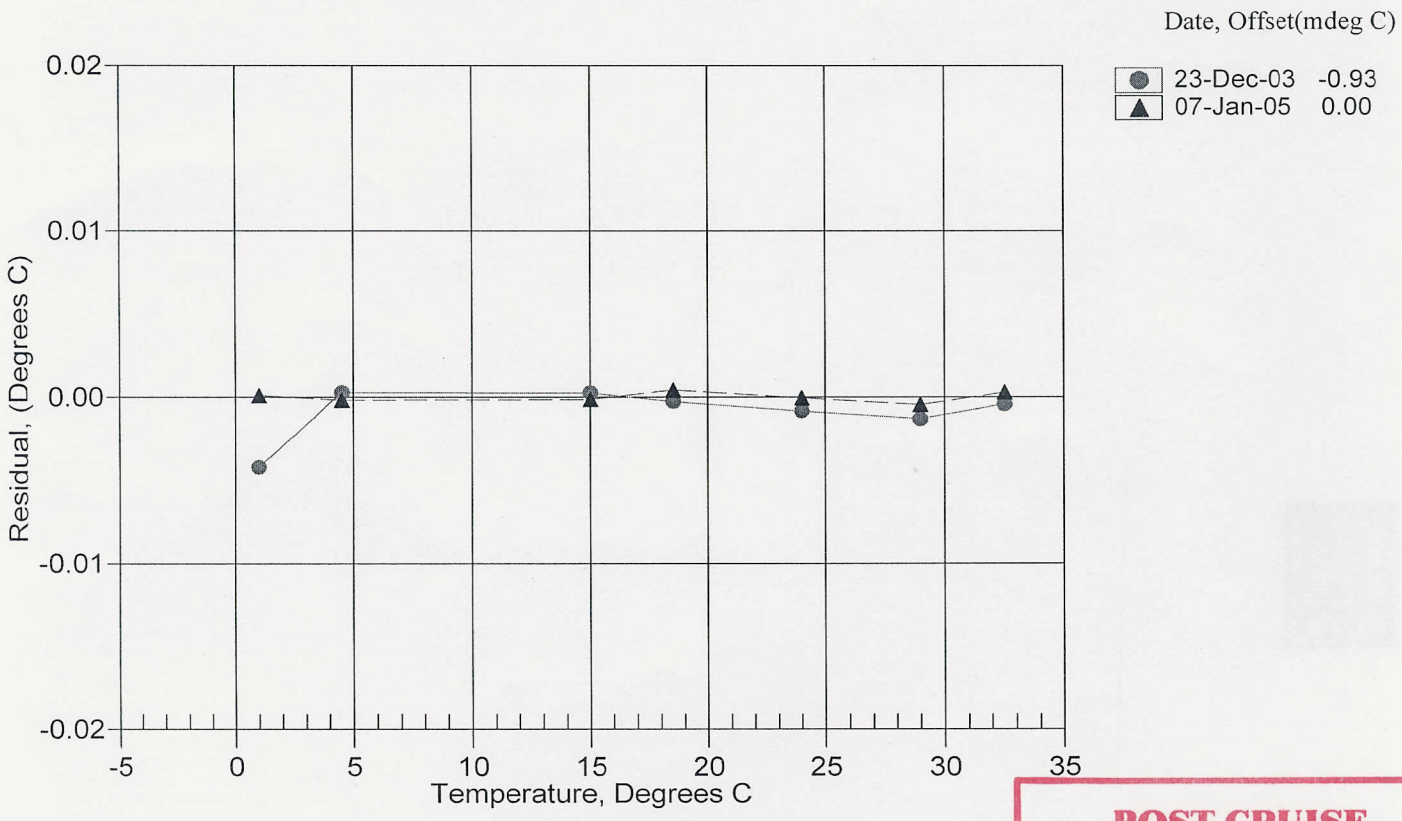
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	2426.936	1.0001	0.00011
4.4999	2625.917	4.4997	-0.00019
15.0000	3292.209	14.9999	-0.00014
18.4999	3538.532	18.5004	0.00043
24.0000	3951.183	23.9999	-0.00005
29.0000	4354.436	28.9996	-0.00045
32.5000	4653.240	32.5003	0.00028

Temperature ITS-90 = $1/\{g + h[ln(f_0/f)] + i[ln^2(f_0/f)] + j[ln^3(f_0/f)]\} - 273.15$ (°C)

Temperature ITS-68 = $1/\{a + b[ln(f_0/f)] + c[ln^2(f_0/f)] + d[ln^3(f_0/f)]\} - 273.15$ (°C)

Following the recommendation of JPOTS: T_{68} is assumed to be 1.00024 * T_{90} (-2 to 35 °C)

Residual = instrument temperature - bath temperature



POST CRUISE CALIBRATION

SEA-BIRD ELECTRONICS, INC.
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Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Temperature Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	38203	Date of Report:	1/7/2005
Model Number:	SBE 19	Serial Number:	1913768-2039

Temperature sensors are normally calibrated 'as received', without adjustments, allowing a determination sensor drift. If the calibration identifies a problem, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing coefficients to convert sensor frequency to temperature. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients using the program SEACON. The coefficient 'offset' allows a small correction for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 1/7/2005 Drift since last cal: +.00089 Degrees Celsius/year

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: Degrees Celsius/year

Comments:

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SENSOR SERIAL NUMBER: 2039
CALIBRATION DATE: 07-Jan-05

SBE19 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Seimens/meter

GHIJ COEFFICIENTS

g = -3.94457994e+000
h = 4.70359496e-001
i = 1.30083749e-003
j = -3.71045035e-005
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

ABCDM COEFFICIENTS

a = 4.66877779e-002
b = 4.20740738e-001
c = -3.93339282e+000
d = -1.24588043e-004
m = 2.1
CPcor = -9.5700e-008 (nominal)

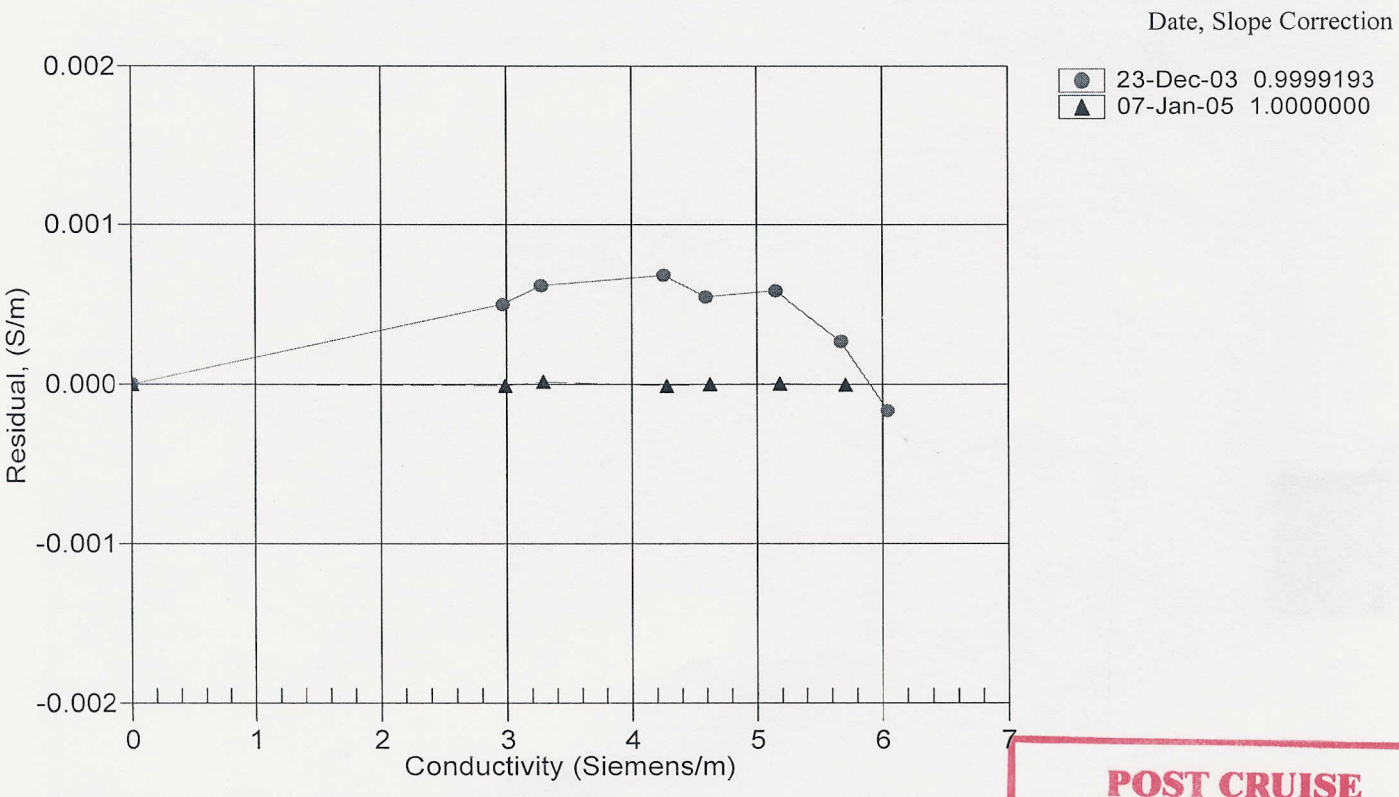
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2.88537	0.00000	0.00000
1.0000	34.9207	2.98403	8.40124	2.98402	-0.00001
4.4999	34.8999	3.29183	8.77341	3.29184	0.00002
15.0000	34.8553	4.27589	9.86852	4.27588	-0.00001
18.4999	34.8457	4.62184	10.22544	4.62184	-0.00000
24.0000	34.8353	5.18114	10.77729	5.18114	0.00001
29.0000	34.8299	5.70430	11.26887	5.70429	-0.00000

Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \varepsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10 (1 + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients



POST CRUISE CALIBRATION

SEA-BIRD ELECTRONICS, INC.
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Conductivity Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	38203	**Date of Report:**	1/7/2005
Model Number:	SBE 19	**Serial Number:**	1913768-2039

Conductivity sensors are normally calibrated 'as received', without cleaning or adjustments, allowing a determination of sensor drift. If the calibration identifies a problem or indicates cell cleaning is necessary, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing the coefficients used to convert sensor frequency to conductivity. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients using the program SEACON. The coefficient 'slope' allows small corrections for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair or cleaning apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 1/7/2005 Drift since last cal: -.00020 PSU/month*

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: PSU/month*

Comments:

**Measured at 3.0 S/m*

Cell cleaning and electrode replatinizing tend to 'reset' the conductivity sensor to its original condition. Lack of drift in post-cleaning-calibration indicates geometric stability of the cell and electrical stability of the sensor circuit.

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SENSOR SERIAL NUMBER: 2039
CALIBRATION DATE: 11-Jan-05

SBE19 PRESSURE CALIBRATION DATA
300 psia S/N 133248 TCV: 489

QUADRATIC COEFFICIENTS:

PA0 = 1.485128e+002
PA1 = -3.905488e-002
PA2 = 2.403427e-008

STRAIGHT LINE FIT:

M = -3.905257e-002
B = 1.486480e+002

PRESSURE PSIA	INST OUTPUT(N)	COMPUTED PSIA	ERROR %FS	LINEAR PSIA	ERROR %FS
14.61	3437.8	14.53	-0.02	14.39	-0.07
59.69	2281.2	59.55	-0.05	59.56	-0.04
119.69	743.1	119.51	-0.06	119.63	-0.02
179.68	-796.1	179.62	-0.02	179.74	0.02
239.68	-2330.4	239.66	-0.01	239.66	-0.01
299.68	-3860.3	299.63	-0.02	299.40	-0.09
239.68	-2333.0	239.76	0.03	239.76	0.03
179.69	-801.9	179.85	0.05	179.96	0.09
119.69	737.1	119.74	0.02	119.86	0.06
59.70	2273.9	59.83	0.04	59.85	0.05
14.61	3433.0	14.72	0.04	14.58	-0.01

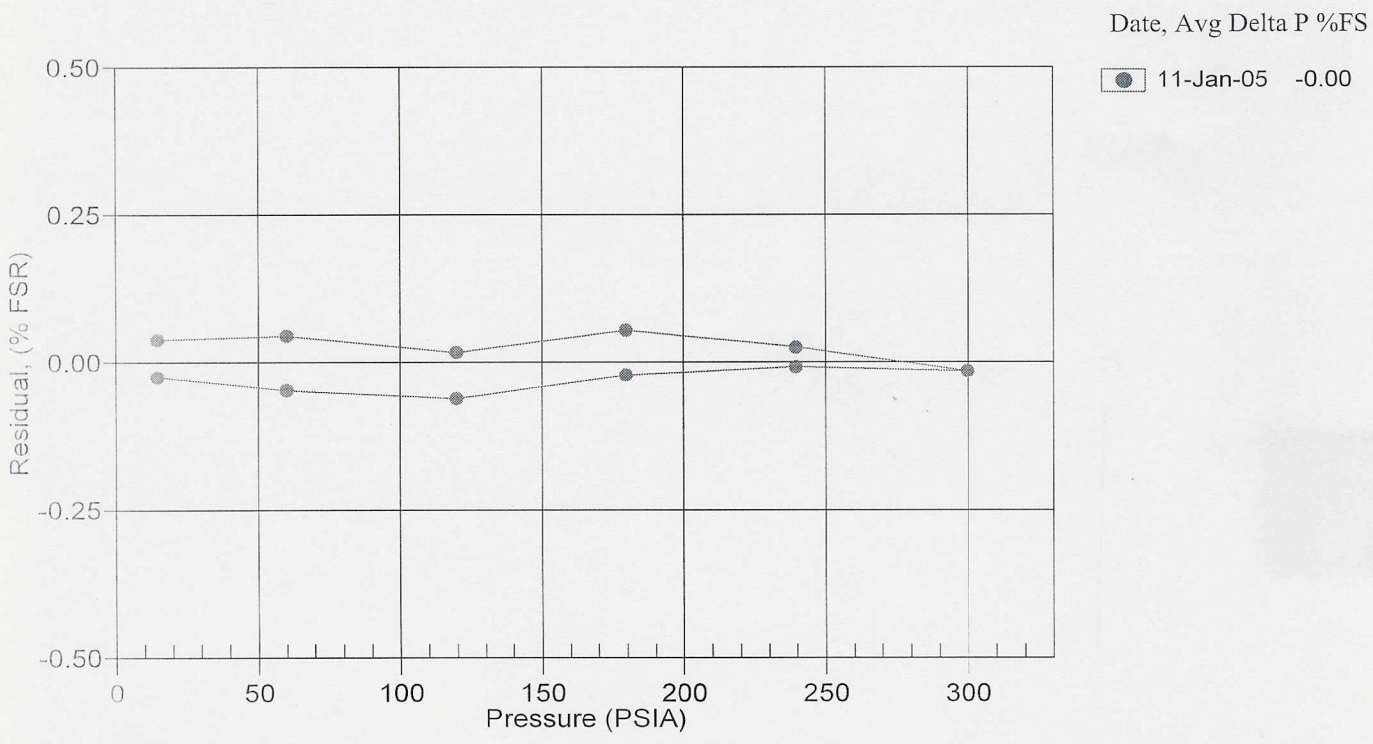
Straight Line Fit:

Pressure (psia) = M * N + B (N = binary output)

Quadratic Fit:

pressure (psia) = PA0 + PA1 * N + PA2 * N^2

Residual = (instrument pressure - true pressure) * 100 / Full Scale Range



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SENSOR SERIAL NUMBER: 4634
CALIBRATION DATE: 07-Mar-06

SBE19plus TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = 1.219982e-003
a1 = 2.623437e-004
a2 = 6.736023e-008
a3 = 1.473496e-007

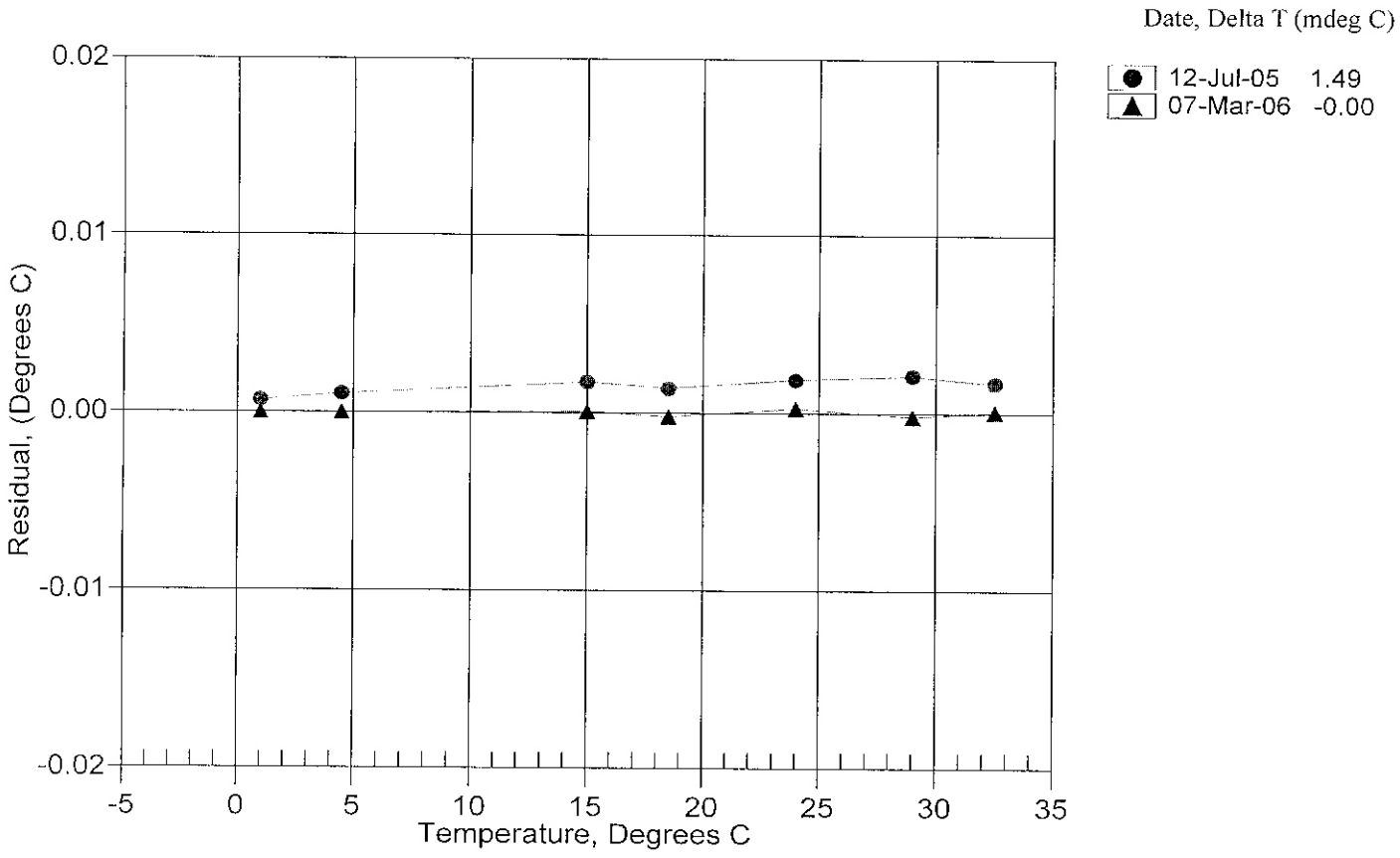
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT(n)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	672500.627	1.0000	-0.0000
4.5000	600070.373	4.5000	0.0000
15.0000	417962.932	15.0001	0.0001
18.5000	368478.915	18.4998	-0.0002
23.9999	300871.288	24.0001	0.0002
29.0000	249082.780	28.9998	-0.0002
32.5000	217653.763	32.5001	0.0001

MV = (n - 524288) / 1.6e+007

R = (MV * 2.900e+009 + 1.024e+008) / (2.048e+004 - MV * 2.0e+005)

Temperature ITS-90 = $1/\{a0 + a1[ln(R)] + a2[ln^2(R)] + a3[ln^3(R)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



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Temperature Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	42160	**Date of Report:**	3/7/2006
Model Number:	SBE 19Plus	**Serial Number:**	19P36399-4634

Temperature sensors are normally calibrated 'as received', without adjustments, allowing a determination sensor drift. If the calibration identifies a problem, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing coefficients to convert sensor frequency to temperature. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients using the program SEACON. The coefficient 'offset' allows a small correction for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 3/7/2006 Drift since last cal: -.00228 Degrees Celsius/year

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: Degrees Celsius/year

Comments:

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SENSOR SERIAL NUMBER: 4634
CALIBRATION DATE: 07-Mar-06

SBE19plus CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

g = -1.037311e+000
h = 1.303562e-001
i = -2.809762e-004
j = 3.687493e-005

CPcor = -9.5700e-008
CTcor = 3.2500e-006

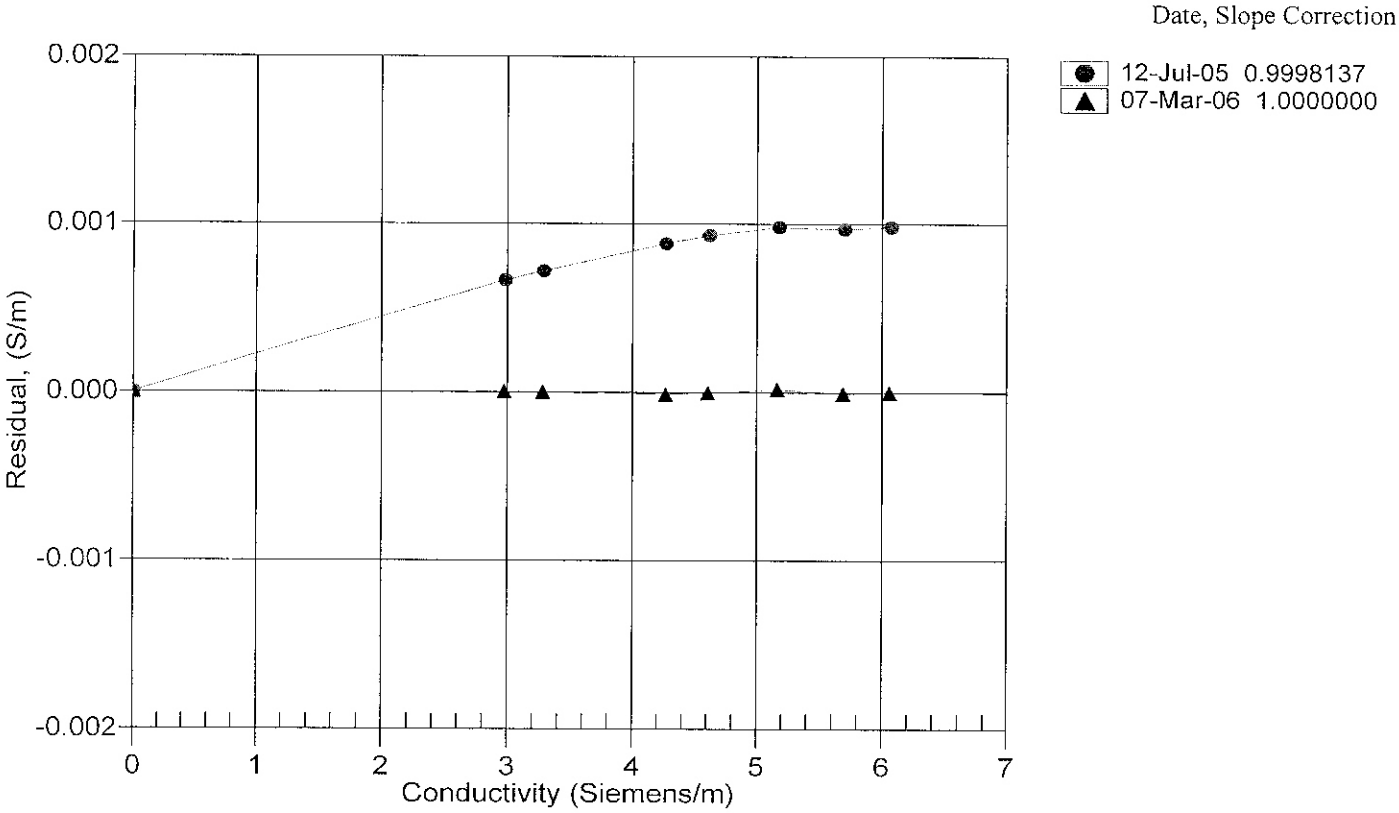
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2826.33	0.0000	0.00000
1.0000	34.7847	2.97352	5555.94	2.9735	0.00000
4.5000	34.7646	3.28033	5763.92	3.2803	0.00000
15.0000	34.7220	4.26127	6382.74	4.2613	-0.00001
18.5000	34.7132	4.60617	6586.23	4.6062	-0.00000
23.9999	34.7036	5.16370	6902.15	5.1637	0.00002
29.0000	34.6989	5.68525	7184.73	5.6852	-0.00001
32.5000	34.6970	6.05754	7379.62	6.0575	-0.00000

f = INST FREQ / 1000.0

Conductivity = $(g + hf^2 + if^3 + jf^4) / (1 + \delta t + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = instrument conductivity - bath conductivity



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Conductivity Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	42160	Date of Report:	3/7/2006
Model Number:	SBE 19Plus	Serial Number:	19P36399-4634

Conductivity sensors are normally calibrated 'as received', without cleaning or adjustments, allowing a determination of sensor drift. If the calibration identifies a problem or indicates cell cleaning is necessary, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing the coefficients used to convert sensor frequency to conductivity. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients using the program SEACON. The coefficient 'slope' allows small corrections for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair or cleaning apply only to subsequent data.

'AS RECEIVED CALIBRATION' ✓ Performed | | Not Performed

Date: 3/7/2006 Drift since last cal: -.00070 PSU/month*

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING' Performed ✓ Not Performed

Date: Drift since Last cal: PSU/month*

Comments:

**Measured at 3.0 S/m*

Cell cleaning and electrode replatinizing tend to 'reset' the conductivity sensor to its original condition. Lack of drift in post-cleaning-calibration indicates geometric stability of the cell and electrical stability of the sensor circuit.

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SENSOR SERIAL NUMBER: 4634
CALIBRATION DATE: 02-Mar-06

SBE19plus PRESSURE CALIBRATION DATA
160 psia S/N 5653

COEFFICIENTS:

PA0 =	-6.950090e-002	PTCA0 =	5.247933e+005
PA1 =	4.845291e-004	PTCA1 =	-4.405216e+000
PA2 =	-3.896820e-012	PTCA2 =	-1.378342e-001
PTEMPA0 =	-7.306469e+001	PTCB0 =	2.528012e+001
PTEMPA1 =	5.039444e+001	PTCB1 =	-3.775000e-003
PTEMPA2 =	-4.566089e-001	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE PSIA	INST OUTPUT	THERMISTOR OUTPUT	COMPUTED PRESSURE	ERROR %FSR
14.58	554778.0	1.9	14.58	0.00
29.56	585655.0	1.9	29.58	0.01
59.70	647701.0	1.9	59.69	-0.00
94.70	719909.0	1.9	94.70	0.00
124.70	781845.0	1.9	124.70	-0.00
159.70	854185.0	1.9	159.70	-0.00
124.70	781855.0	1.9	124.71	0.00
94.70	719918.0	1.9	94.71	0.00
59.73	647760.0	1.9	59.72	-0.00
30.67	587823.0	1.9	30.63	-0.02
14.58	554797.0	1.9	14.59	0.01

THERMAL CORRECTION

TEMP ITS90	THERMISTOR OUTPUT	INST OUTPUT
32.50	2.14	555265.98
29.00	2.06	555302.51
24.00	1.96	555362.10
18.50	1.85	555427.54
15.00	1.78	555454.81
4.50	1.56	555524.36
1.00	1.49	555548.37

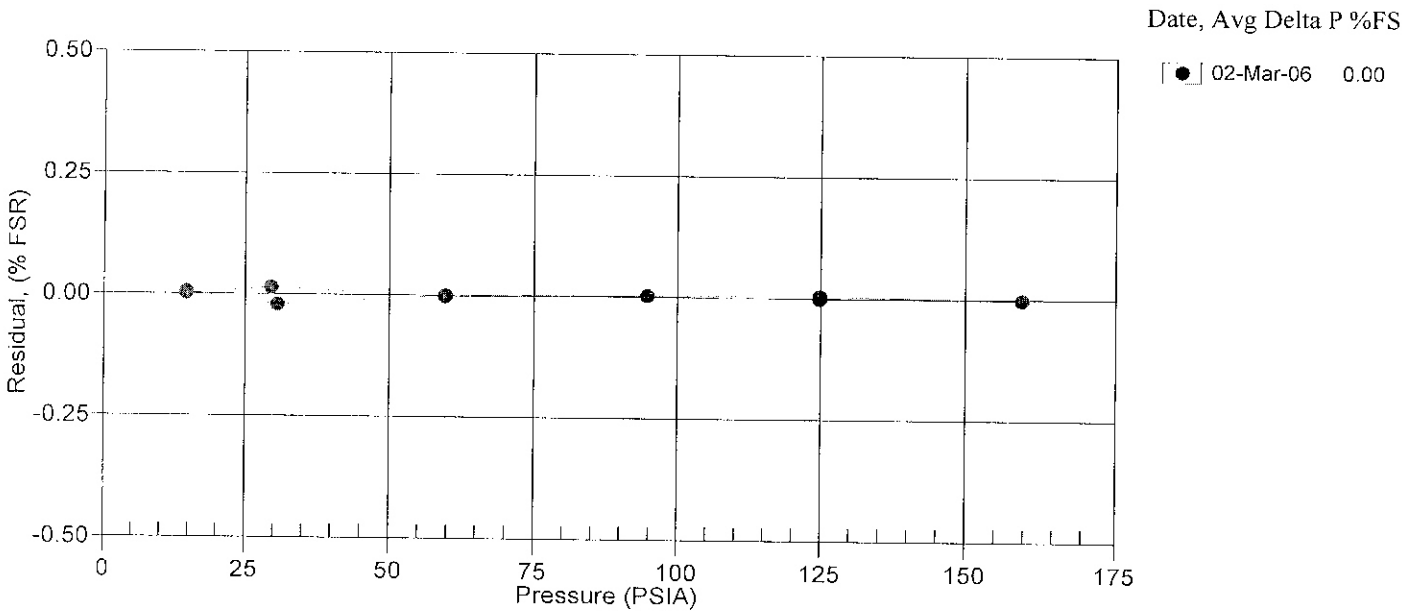
TEMP(ITS90)	SPAN(mV)
-5.00	25.30
35.00	25.15

y = thermistor output; $t = PTEMPA0 + PTEMPA1 * y + PTEMPA2 * y^2$

x = pressure output - $PTCA0 - PTCA1 * t - PTCA2 * t^2$

$n = x * PTCB0 / (PTCB0 + PTCB1 * t + PTCB2 * t^2)$

pressure (psia) = $PA0 + PA1 * n + PA2 * n^2$



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SENSOR SERIAL NUMBER: 4677
CALIBRATION DATE: 02-Aug-05

SBE19plus TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = 1.163688e-003
a1 = 2.732557e-004
a2 = -8.680925e-007
a3 = 1.761143e-007

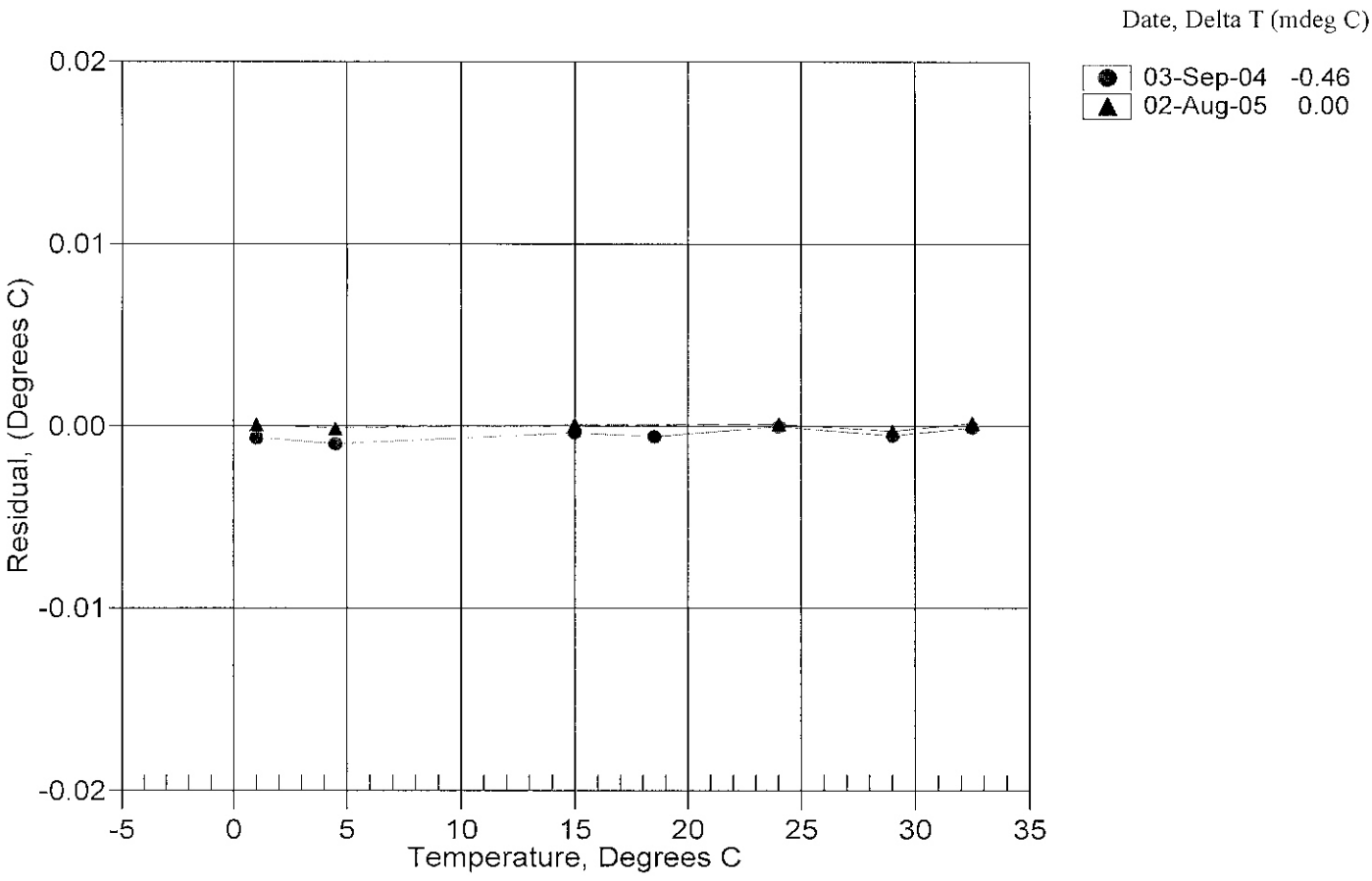
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT(n)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	693693.119	1.0001	0.0001
4.5000	620421.706	4.4999	-0.0001
15.0000	435173.727	15.0000	0.0001
24.0000	315226.021	24.0001	0.0001
29.0000	261939.917	28.9997	-0.0003
32.5000	229523.040	32.5002	0.0002

MV = (n - 524288) / 1.6e+007

R = (MV * 2.900e+009 + 1.024e+008) / (2.048e+004 - MV * 2.0e+005)

Temperature ITS-90 = $1/\{a0 + a1[ln(R)] + a2[ln^2(R)] + a3[ln^3(R)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



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Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 4677
CALIBRATION DATE: 23-Jul-05

SBE19plus TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = 1.173695e-003
a1 = 2.695727e-004
a2 = -4.175859e-007
a3 = 1.578212e-007

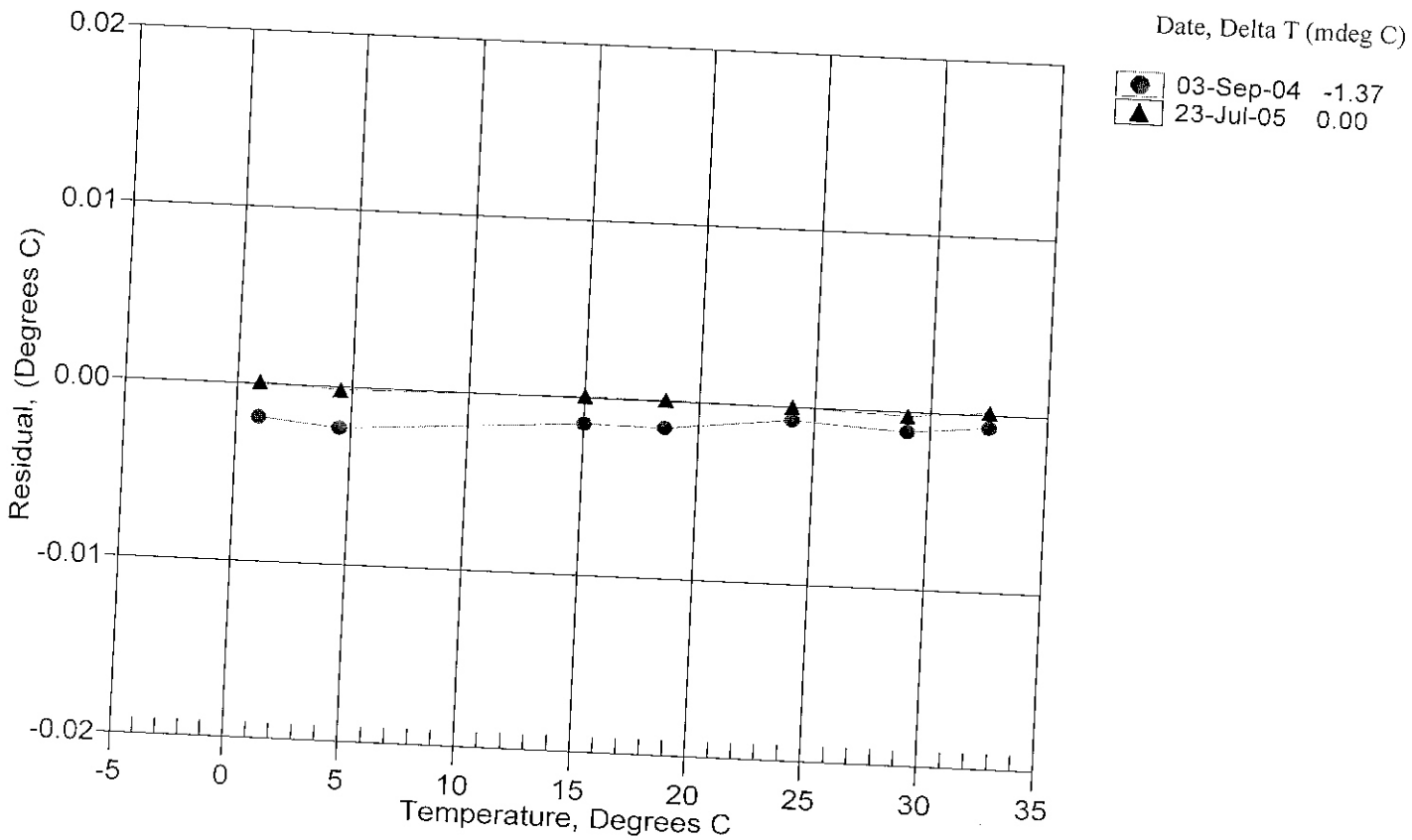
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT(n)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
0.9999	693668.527	1.0000	0.0001
4.5000	620395.798	4.4998	-0.0002
15.0000	435156.427	15.0001	0.0001
18.5000	384551.321	18.5001	0.0001
24.0000	315219.538	24.0000	0.0000
29.0000	261933.823	28.9998	-0.0002
32.5000	229517.813	32.5002	0.0001

MV = (n - 524288) / 1.6e+007

R = (MV * 2.900e+009 + 1.024e+008) / (2.048e+004 - MV * 2.0e+005)

Temperature ITS-90 = $1/\{a0 + a1[ln(R)] + a2[ln^2(R)] + a3[ln^3(R)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



SEA-BIRD ELECTRONICS, INC.
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Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Temperature Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	40157	Date of Report:	8/2/2005
Model Number:	SBE 19Plus	Serial Number:	19P37217-4677

Temperature sensors are normally calibrated 'as received', without adjustments, allowing a determination sensor drift. If the calibration identifies a problem, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing coefficients to convert sensor frequency to temperature. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients using the program SEACON. The coefficient 'offset' allows a small correction for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 7/23/2005 Drift since last cal: +.00155 Degrees Celsius/year

Comments:

'FINAL CALIBRATION' ☑ Performed ☐ Not Performed

Date: 8/2/2005 Drift since 03 Sep 04 +.00050 Degrees Celsius/year

Comments:

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA

Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 4677
CALIBRATION DATE: 02-Aug-05

SBE19plus CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

g = -1.056520e+000
h = 1.400218e-001
i = -5.551181e-004
j = 6.142018e-005

CPcor = -9.5700e-008
CTcor = 3.2500e-006

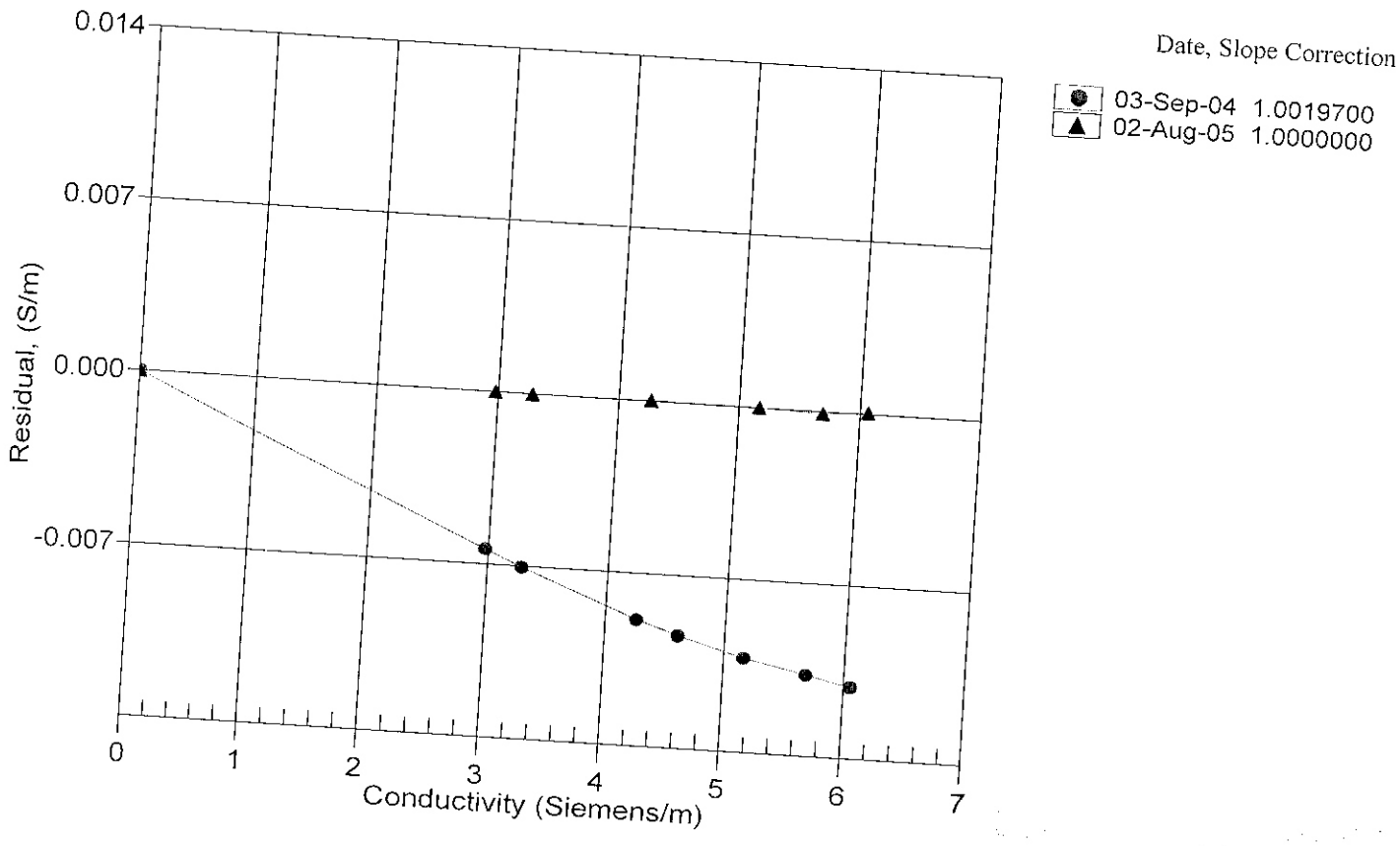
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2757.38	0.0000	0.00000
1.0000	34.8134	2.97574	5389.62	2.9757	0.00000
4.5000	34.7933	3.28277	5590.57	3.2827	-0.00002
15.0000	34.7509	4.26443	6188.61	4.2645	0.00004
24.0000	34.7312	5.16736	6690.35	5.1674	0.00001
29.0000	34.7284	5.68954	6963.42	5.6895	-0.00008
32.5000	34.7267	6.06213	7151.73	6.0622	0.00005

f = INST FREQ / 1000.0

Conductivity = $(g + hf^2 + if^3 + jf^4) / (1 + \delta t + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = instrument conductivity - bath conductivity



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Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 4677
CALIBRATION DATE: 23-Jul-05

SBE19plus CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

g = -1.056993e+000
h = 1.398743e-001
i = -4.600543e-004
j = 5.227341e-005

CPcor = -9.5700e-008
CTcor = 3.2500e-006

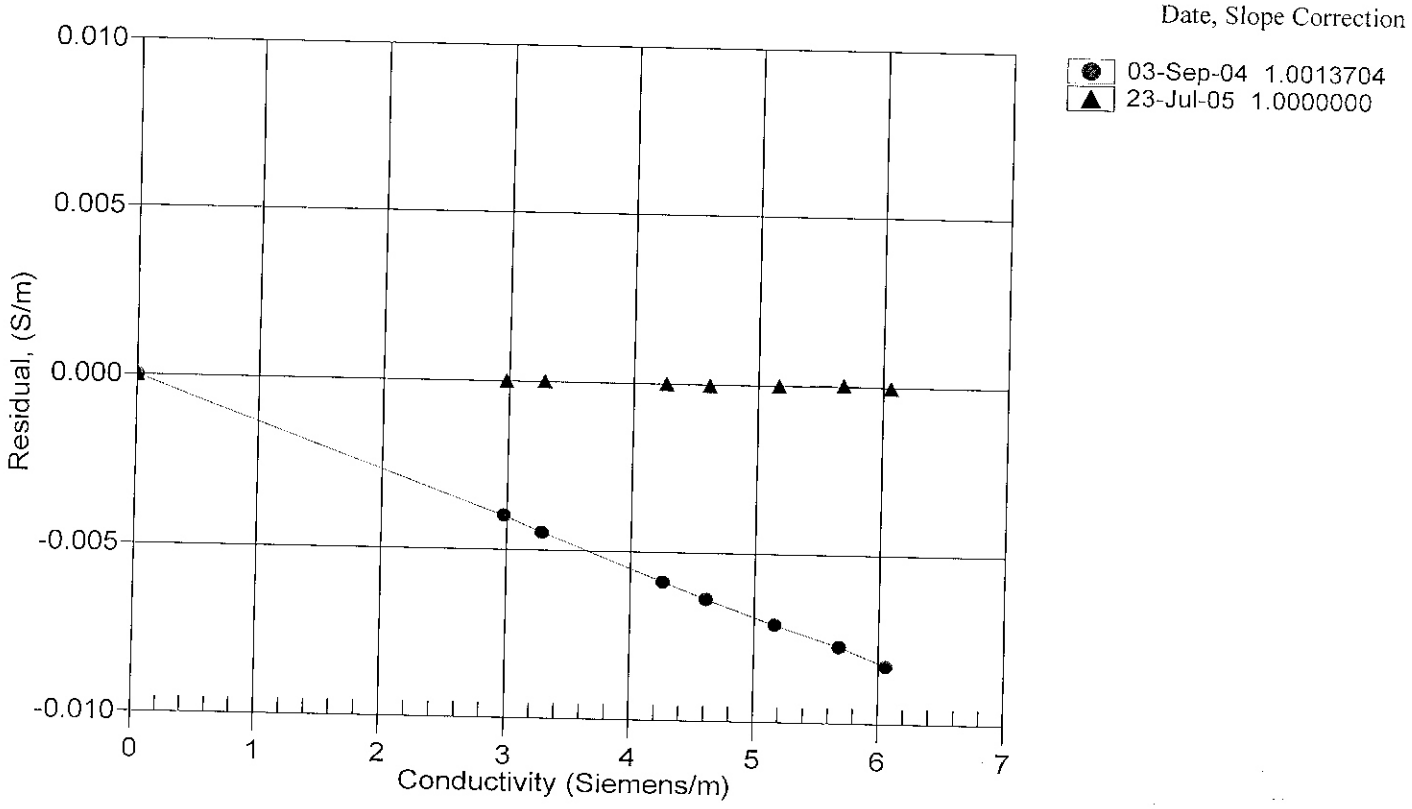
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2757.55	0.0000	0.00000
0.9999	34.7726	2.97258	5385.90	2.9726	-0.00000
4.5000	34.7524	3.27929	5586.69	3.2793	0.00001
15.0000	34.7092	4.25987	6184.21	4.2599	-0.00000
18.5000	34.7003	4.60464	6380.70	4.6046	-0.00002
24.0000	34.6905	5.16197	6685.82	5.1620	0.00000
29.0000	34.6855	5.68330	6958.76	5.6833	0.00004
32.5000	34.6831	6.05539	7146.92	6.0554	-0.00003

f = INST FREQ / 1000.0

Conductivity = $(g + hf^2 + if^3 + jf^4) / (1 + \delta t + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = instrument conductivity - bath conductivity



SEA-BIRD ELECTRONICS, INC.
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Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Conductivity Calibration Report

Customer:	Atlantic Marine Center
Job Number:	40157
Model Number:	SBE 19Plus
Date of Report:	8/2/2005
Serial Number:	19P37217-4677

Conductivity sensors are normally calibrated 'as received', without cleaning or adjustments, allowing a determination of sensor drift. If the calibration identifies a problem or indicates cell cleaning is necessary, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing the coefficients used to convert sensor frequency to conductivity. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients using the program SEACON. The coefficient 'slope' allows small corrections for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair or cleaning apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 7/23/2005

Drift since last cal: +.00390 PSU/month*

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING' ☑ Performed ☐ Not Performed

Date: 8/2/2005

Drift since Last cal: +.00540 PSU/month*

Comments:

**Measured at 3.0 S/m*

Cell cleaning and electrode replatinizing tend to 'reset' the conductivity sensor to its original condition. Lack of drift in post-cleaning-calibration indicates geometric stability of the cell and electrical stability of the sensor circuit.

SEA-BIRD ELECTRONICS, INC.

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Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 4677
CALIBRATION DATE: 20-Jul-05

SBE19plus PRESSURE CALIBRATION DATA
508 psia S/N 6135

COEFFICIENTS:

PA0 =	3.507473e-002	PTCA0 =	5.152371e+005
PA1 =	1.549122e-003	PTCA1 =	4.047694e+000
PA2 =	7.579088e-012	PTCA2 =	-1.328164e-001
PTEMPA0 =	-7.881323e+001	PTCB0 =	2.429287e+001
PTEMPA1 =	4.780233e+001	PTCB1 =	-6.250000e-004
PTEMPA2 =	-2.444233e-001	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE PSIA	INST OUTPUT	THERMISTOR OUTPUT	COMPUTED PRESSURE	ERROR %FSR
14.65	524675.0	2.2	14.63	-0.00
99.75	579560.0	2.2	99.74	-0.00
199.75	643996.0	2.2	199.72	-0.01
299.75	708404.0	2.2	299.71	-0.01
404.73	775998.0	2.2	404.72	-0.00
504.73	840323.0	2.2	504.72	-0.00
404.72	776021.0	2.2	404.76	0.01
299.74	708435.0	2.2	299.76	0.00
199.75	644028.0	2.2	199.77	0.00
99.75	579572.0	2.2	99.76	0.00
14.65	524695.0	2.2	14.67	0.00

THERMAL CORRECTION

TEMP ITS90	THERMISTOR OUTPUT	INST OUTPUT
32.50	2.36	524901.88
29.00	2.28	524903.81
24.00	2.17	524920.04
18.51	2.06	524935.69
15.00	1.98	524940.80
4.50	1.76	524918.38
1.00	1.68	524908.10

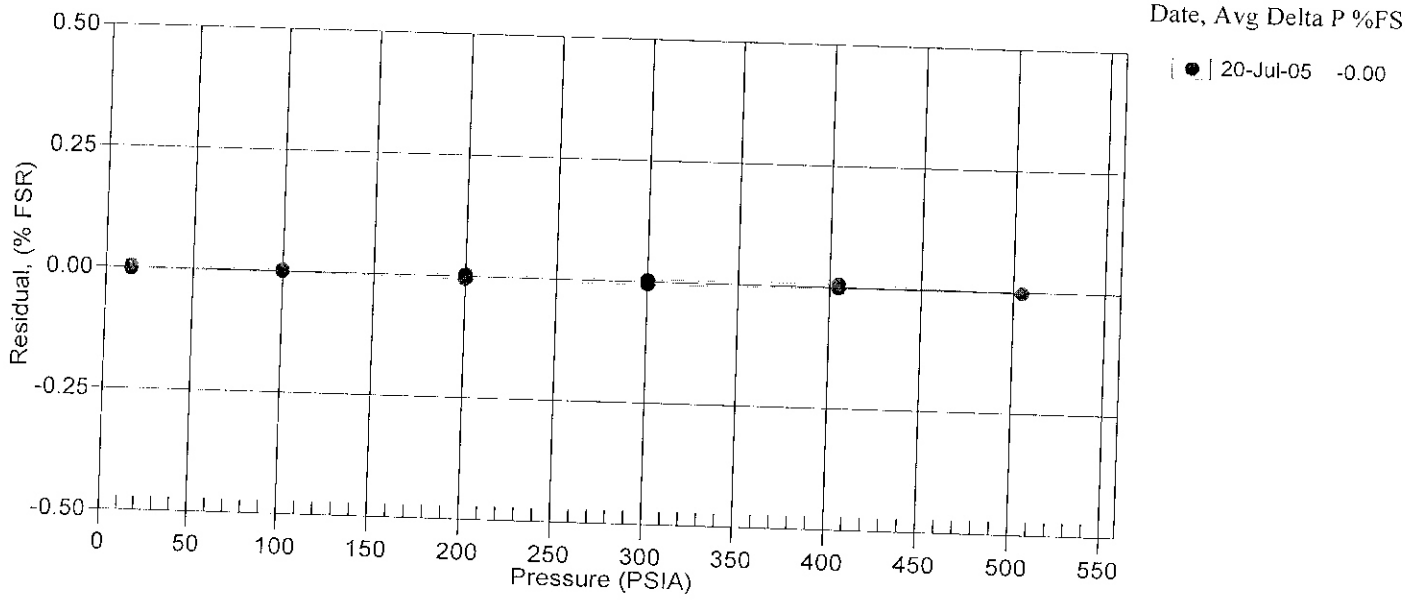
TEMP(ITS90)	SPAN(mV)
-5.00	24.30
35.00	24.27

y = thermistor output; $t = PTEMPA0 + PTEMPA1 * y + PTEMPA2 * y^2$

x = pressure output - $PTCA0 - PTCA1 * t - PTCA2 * t^2$

$n = x * PTCB0 / (PTCB0 + PTCB1 * t + PTCB2 * t^2)$

pressure (psia) = $PA0 + PA1 * n + PA2 * n^2$



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Pressure Test Certificate

Customer	Atlantic Marine Center
Job Number	40157
Date	7/22/2005
Technician	BLT

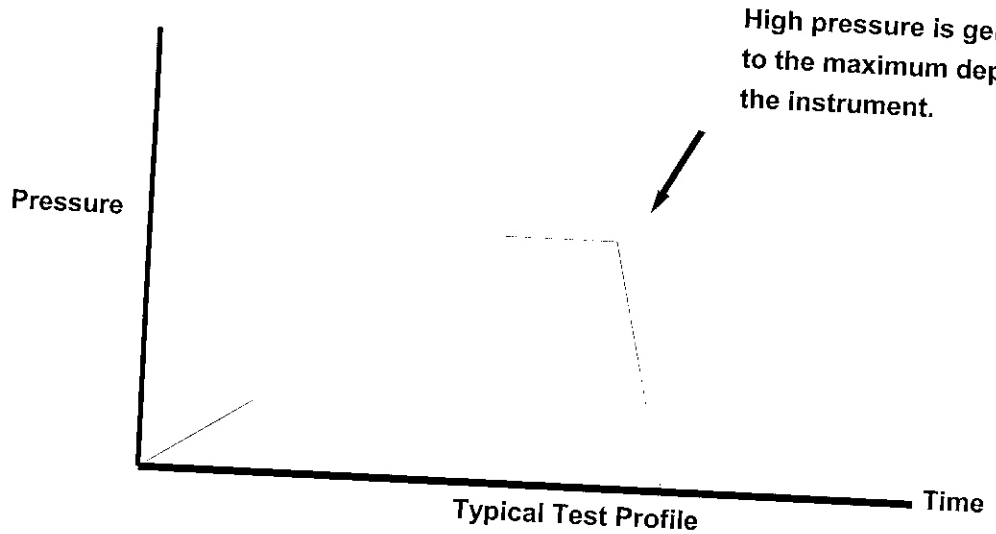
Serial Number	19P37217-4677	
Low Pressure (PSI)	50	PSI
Time (Minutes)	15	Minutes
High Pressure (PSI)	500	PSI
Time (Minutes)	30	Minutes

Pass [x]

Fail [ ]

Comments

Replaced 4-pin I/O connector. Replaced the main piston "O"-Rings.



odom
HYDROGRAPHIC SYSTEMS

1450 Seaboard Avenue • Baton Rouge, Louisiana 70810-6261 USA
E-mail: email@odomhydrographic.com • http://www.odomhydrographic.com
Telephone: (225) 769-3051 • Facsimile: (225) 766-5122

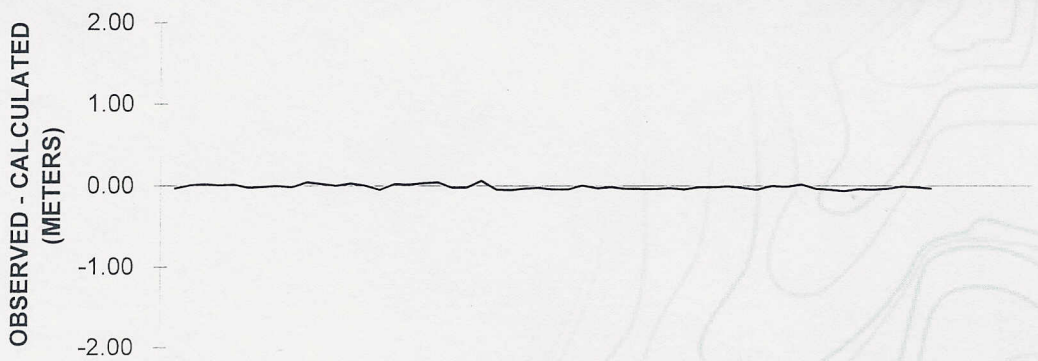
6/24/2005

STANDARD DEL GROSSO H2O SERIAL # 3002-062405

TEMP	VELOCITY	MEASURED FREQUENCY	RES VEL	OBS-CAL	TEMP	VELOCITY	MEASURED FREQUENCY	RES VEL	OBS-CAL
4.0	1421.62	5432.3	1421.6	-0.03	17.5	1474.38	5630.2	1474.3	-0.04
4.5	1423.90	5441.0	1423.9	0.01	18.0	1476.01	5636.5	1476.0	0.01
5.0	1426.15	5449.5	1426.2	0.02	18.5	1477.62	5642.4	1477.6	-0.03
5.5	1428.38	5457.8	1428.4	0.01	19.0	1479.21	5648.4	1479.2	-0.02
6.0	1430.58	5466.1	1430.6	0.02	19.5	1480.77	5654.2	1480.7	-0.04
6.5	1432.75	5474.1	1432.7	-0.02	20.0	1482.32	5660.0	1482.3	-0.03
7.0	1434.90	5482.2	1434.9	-0.01	20.5	1483.84	5665.7	1483.8	-0.04
7.5	1437.02	5490.2	1437.0	0.00	21.0	1485.35	5671.4	1485.3	-0.02
8.0	1439.12	5498.0	1439.1	-0.02	21.5	1486.83	5676.9	1486.8	-0.04
8.5	1441.19	5506.0	1441.2	0.05	22.0	1488.29	5682.5	1488.3	-0.01
9.0	1443.23	5513.6	1443.3	0.03	22.5	1489.74	5687.9	1489.7	-0.02
9.5	1445.25	5521.1	1445.3	0.00	23.0	1491.16	5693.3	1491.2	0.00
10.0	1447.25	5528.7	1447.3	0.03	23.5	1492.56	5698.5	1492.5	-0.02
10.5	1449.22	5536.0	1449.2	0.01	24.0	1493.95	5703.6	1493.9	-0.05
11.0	1451.17	5543.1	1451.1	-0.05	24.5	1495.32	5708.9	1495.3	0.00
11.5	1453.09	5550.6	1453.1	0.03	25.0	1496.66	5713.9	1496.6	-0.01
12.0	1454.99	5557.7	1455.0	0.02	25.5	1497.99	5719.0	1498.0	0.02
12.5	1456.87	5564.8	1456.9	0.03	26.0	1499.30	5723.7	1499.3	-0.04
13.0	1458.72	5571.8	1458.8	0.05	26.5	1500.59	5728.5	1500.5	-0.05
13.5	1460.55	5578.4	1460.5	-0.02	27.0	1501.86	5733.2	1501.8	-0.06
14.0	1462.36	5585.2	1462.3	-0.02	27.5	1503.11	5738.0	1503.1	-0.04
14.5	1464.14	5592.2	1464.2	0.06	28.0	1504.35	5742.6	1504.3	-0.05
15.0	1465.91	5598.4	1465.9	-0.04	28.5	1505.56	5747.2	1505.5	-0.04
15.5	1467.65	5604.9	1467.6	-0.05	29.0	1506.76	5751.8	1506.8	-0.01
16.0	1469.36	5611.4	1469.3	-0.03	29.5	1507.94	5756.2	1507.9	-0.02
16.5	1471.06	5617.8	1471.0	-0.02	30.0	1509.10	5760.5	1509.1	-0.03
17.0	1472.73	5624.0	1472.7	-0.04					

constants: 3412 264

CALIBRATION GRAPH



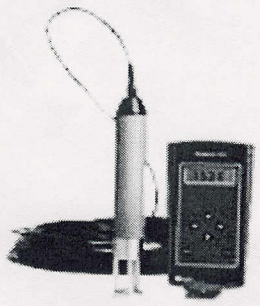
Date:
Aug 27, 2004

Serial #:
SN:98303-082704

DIGIBAR CALIBRATION REPORT

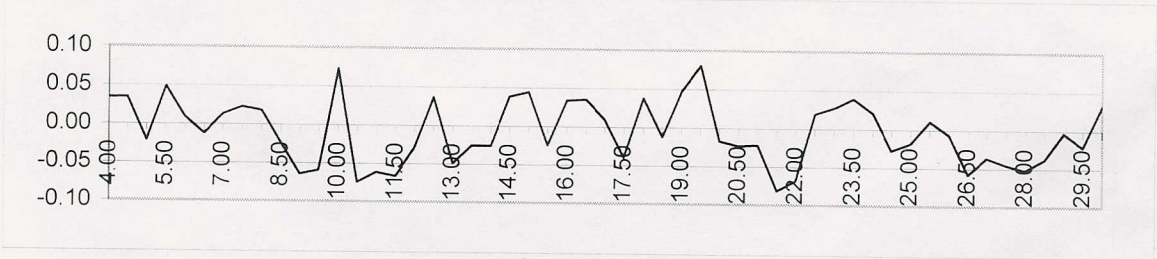
version 1.0 (c) 2004

ODOM HYDROGRAPHIC SYSTEMS, Inc.



STANDARD DEL GROSSO H^2O

TEMP	VELOCITY	MEASURED FREQUENCY	RES_VEL	OBS-CAL
4.00	1421.62	5544.07	1421.65	0.03
4.50	1423.90	5552.78	1423.94	0.04
5.00	1426.15	5561.17	1426.13	-0.02
5.50	1428.38	5569.94	1428.43	0.05
6.00	1430.58	5578.19	1430.59	0.01
6.50	1432.75	5586.41	1432.74	-0.01
7.00	1434.90	5594.71	1434.91	0.01
7.50	1437.02	5602.85	1437.04	0.02
8.00	1439.12	5610.84	1439.14	0.02
8.50	1441.19	5618.59	1441.16	-0.02
9.00	1443.23	5626.25	1443.17	-0.06
9.50	1445.25	5633.99	1445.20	-0.06
10.00	1447.25	5642.12	1447.32	0.07
10.50	1449.22	5649.09	1449.15	-0.07
11.00	1451.17	5656.58	1451.11	-0.06
11.50	1453.09	5663.91	1453.03	-0.07
12.00	1454.99	5671.31	1454.97	-0.03
12.50	1456.87	5678.73	1456.91	0.04
13.00	1458.72	5685.48	1458.68	-0.05
13.50	1460.55	5692.56	1460.53	-0.03
14.00	1462.36	5699.46	1462.34	-0.03
14.50	1464.14	5706.52	1464.18	0.04
15.00	1465.91	5713.27	1465.95	0.04
15.50	1467.65	5719.65	1467.62	-0.02
16.00	1469.36	5726.43	1469.40	0.03
16.50	1471.06	5732.91	1471.09	0.04
17.00	1472.73	5739.20	1472.74	0.01
17.50	1474.38	5745.32	1474.34	-0.04
18.00	1476.01	5751.84	1476.05	0.04
18.50	1477.62	5757.79	1477.61	-0.01
19.00	1479.21	5764.08	1479.25	0.05
19.50	1480.77	5770.19	1480.85	0.08
20.00	1482.32	5775.72	1482.30	-0.02
20.50	1483.84	5781.52	1483.82	-0.02
21.00	1485.35	5787.27	1485.32	-0.02
21.50	1486.83	5792.71	1486.75	-0.08
22.00	1488.29	5798.35	1488.22	-0.07
22.50	1489.74	5804.20	1489.76	0.02
23.00	1491.16	5809.67	1491.19	0.03
23.50	1492.56	5815.08	1492.60	0.04
24.00	1493.95	5820.30	1493.97	0.02
24.50	1495.32	5825.33	1495.29	-0.03
25.00	1496.66	5830.51	1496.64	-0.02
25.50	1497.99	5835.69	1498.00	0.01
26.00	1499.30	5840.62	1499.29	-0.01
26.50	1500.59	5845.35	1500.53	-0.06
27.00	1501.86	5850.29	1501.82	-0.04
27.50	1503.11	5855.04	1503.07	-0.05
28.00	1504.35	5859.73	1504.29	-0.05
28.50	1505.56	5864.43	1505.52	-0.04
29.00	1506.76	5869.14	1506.76	0.00
29.50	1507.94	5873.58	1507.92	-0.02
30.00	1509.10	5878.23	1509.14	0.03



Odom Hydrographic Systems, Inc.
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Telephone: (225)-769-3051, Facsimile: (225)-766-5122
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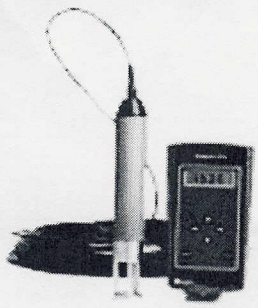
Date:
Aug 27, 2004

Serial #:
SN:dbp082704

DIGIBAR CALIBRATION REPORT

version 1.0 (c) 2004

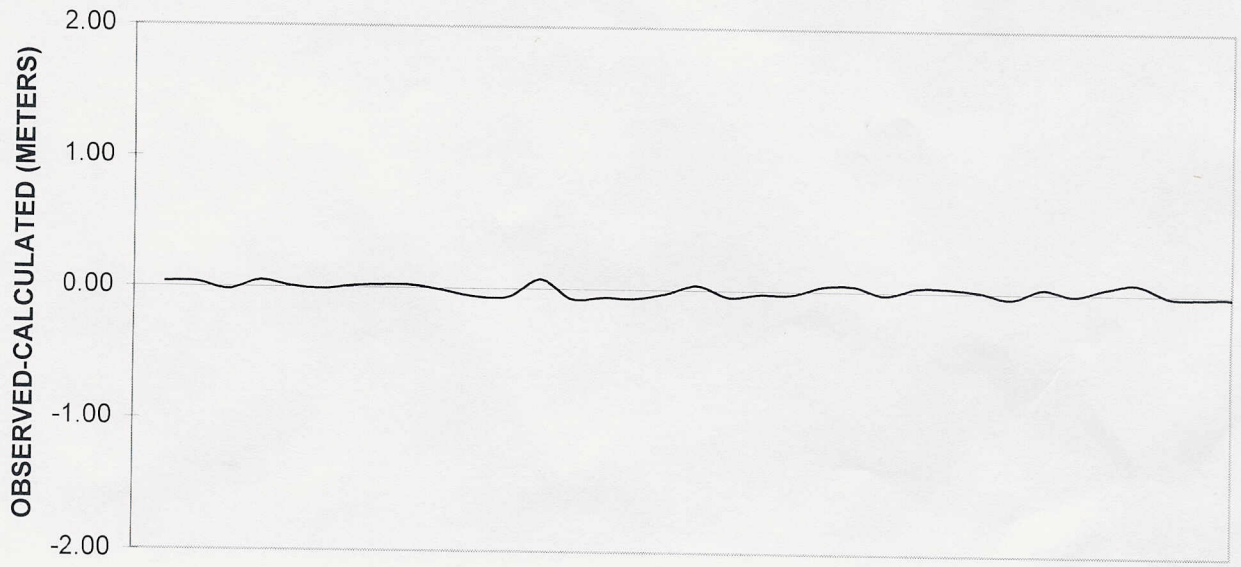
ODOM HYDROGRAPHIC SYSTEMS, Inc.



Burn these numbers to EPROM:

Gradient	**3351**
Intercept	**298**

Calibration Graph



TEMPERATURE (CENTIGRADE)

Odom Hydrographic Systems, Inc.
1450 SeaBoard Avenue, Baton Rouge, Louisiana 70810-6261, USA
Telephone: (225)-769-3051, Facsimile: (225)-766-5122
E-mail: email@odomhydrographic.com, HTTP: www.odomhydrographic.com

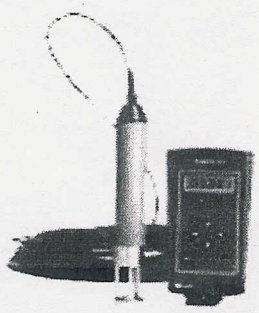
Date:
Mar 23, 2005

Serial #:
SN:98351-032305

DIGIBAR CALIBRATION REPORT

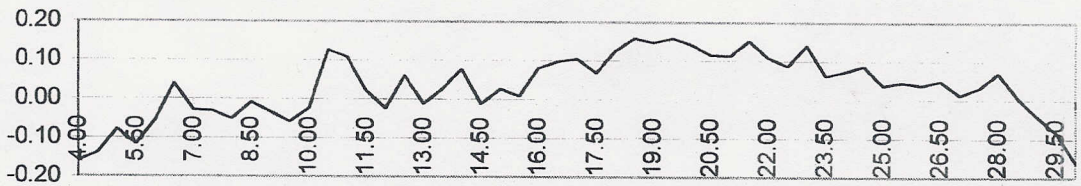
version 1.0 (c) 2004

ODOM HYDROGRAPHIC SYSTEMS, Inc.



STANDARD DEL GROSSO H^2O

TEMP	VELOCITY	MEASURED FREQUENCY	RES_VEL	OBS-CAL
4.00	1421.62	5546.53	1421.46	-0.16
4.50	1423.90	5555.25	1423.76	-0.14
5.00	1426.15	5564.01	1426.07	-0.08
5.50	1428.38	5572.30	1428.26	-0.12
6.00	1430.58	5580.87	1430.52	-0.05
6.50	1432.75	5589.46	1432.79	0.04
7.00	1434.90	5597.34	1434.87	-0.03
7.50	1437.02	5605.37	1436.99	-0.03
8.00	1439.12	5613.24	1439.07	-0.05
8.50	1441.19	5621.25	1441.18	-0.01
9.00	1443.23	5628.91	1443.20	-0.03
9.50	1445.25	5636.47	1445.20	-0.06
10.00	1447.25	5644.17	1447.23	-0.02
10.50	1449.22	5652.21	1449.35	0.13
11.00	1451.17	5659.52	1451.28	0.11
11.50	1453.09	5666.48	1453.12	0.02
12.00	1454.99	5673.51	1454.97	-0.02
12.50	1456.87	5680.94	1456.93	0.06
13.00	1458.72	5687.69	1458.71	-0.01
13.50	1460.55	5694.77	1460.58	0.03
14.00	1462.36	5701.81	1462.44	0.08
14.50	1464.14	5708.23	1464.13	-0.01
15.00	1465.91	5715.05	1465.93	0.03
15.50	1467.65	5721.57	1467.65	0.01
16.00	1469.36	5728.35	1469.44	0.08
16.50	1471.06	5734.83	1471.15	0.10
17.00	1472.73	5741.20	1472.83	0.11
17.50	1474.38	5747.32	1474.45	0.07
18.00	1476.01	5753.71	1476.14	0.13
18.50	1477.62	5759.93	1477.78	0.16
19.00	1479.21	5765.90	1479.35	0.15
19.50	1480.77	5771.88	1480.93	0.16
20.00	1482.32	5777.67	1482.46	0.14
20.50	1483.84	5783.35	1483.96	0.12
21.00	1485.35	5789.04	1485.46	0.11
21.50	1486.83	5794.81	1486.98	0.15
22.00	1488.29	5800.19	1488.40	0.11
22.50	1489.74	5805.58	1489.82	0.09
23.00	1491.16	5811.18	1491.30	0.14
23.50	1492.56	5816.20	1492.63	0.06
24.00	1493.95	5821.49	1494.02	0.07
24.50	1495.32	5826.72	1495.40	0.09
25.00	1496.66	5831.63	1496.70	0.04
25.50	1497.99	5836.69	1498.03	0.05
26.00	1499.30	5841.62	1499.34	0.04
26.50	1500.59	5846.55	1500.64	0.05
27.00	1501.86	5851.23	1501.87	0.01
27.50	1503.11	5856.05	1503.14	0.03
28.00	1504.35	5860.87	1504.42	0.07
28.50	1505.56	5865.24	1505.57	0.01
29.00	1506.76	5869.61	1506.72	-0.04
29.50	1507.94	5873.92	1507.86	-0.08
30.00	1509.10	5878.03	1508.94	-0.16



Odom Hydrographic Systems, Inc.
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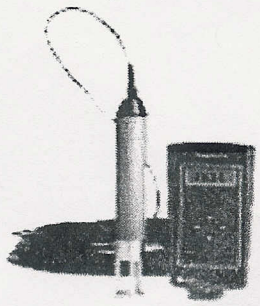
Date:
Mar 23, 2005

Serial #:
SN:98351-032305

DIGIBAR CALIBRATION REPORT

version 1.0 (c) 2004

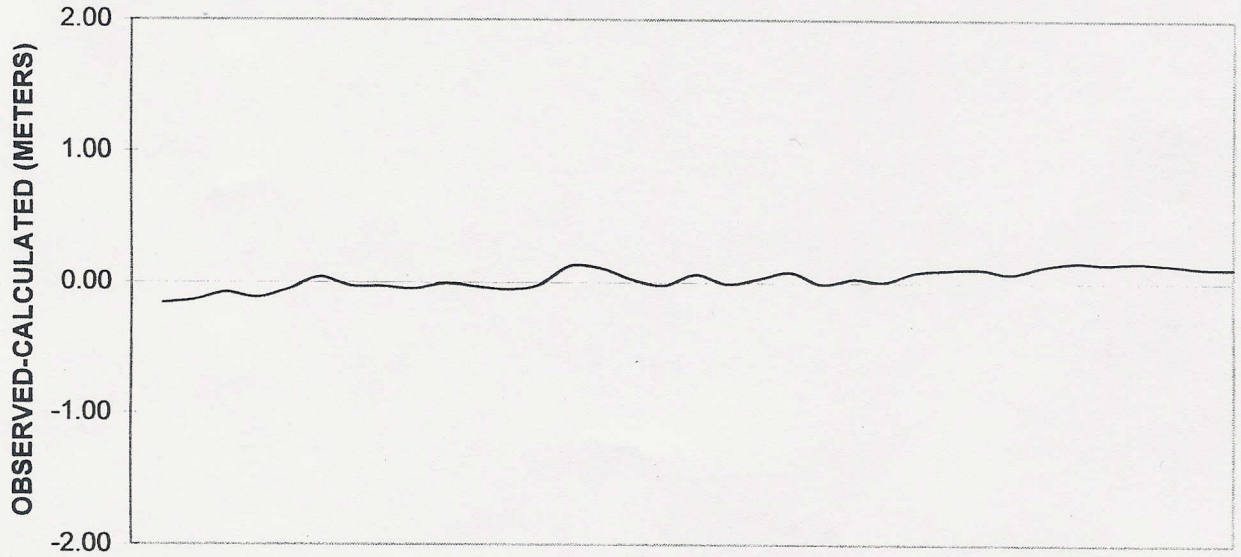
ODOM HYDROGRAPHIC SYSTEMS, Inc.



Burn these numbers to EPROM:

Gradient	**3378**
Intercept	**423**

Calibration Graph



TEMPERATURE (CENTIGRADE)

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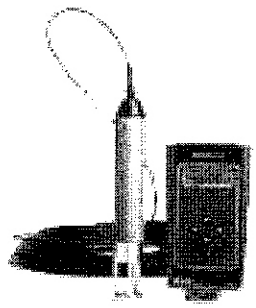
Date:
Mar 01, 2006

Serial #:
98376-030106

DIGIBAR CALIBRATION REPORT

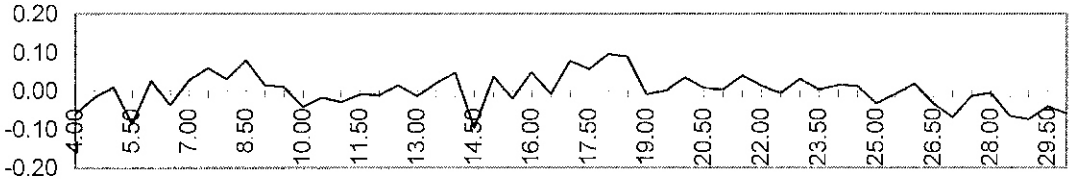
version 1.0 (c) 2004

ODOM HYDROGRAPHIC SYSTEMS, Inc.



STANDARD DEL GROSSO H^2O

TEMP	VELOCITY	MEASURED FREQUENCY	RES_VEL	OBS-CAL	TEMP	VELOCITY	MEASURED FREQUENCY	RES_VEL	OBS-CAL
4.00	1421.62	5552.60	1421.56	-0.06	17.50	1474.38	5756.04	1474.44	0.06
4.50	1423.90	5561.53	1423.88	-0.02	18.00	1476.01	5762.46	1476.11	0.10
5.00	1426.15	5570.30	1426.16	0.01	18.50	1477.62	5768.62	1477.71	0.09
5.50	1428.38	5578.50	1428.29	-0.08	19.00	1479.21	5774.35	1479.20	-0.01
6.00	1430.58	5587.39	1430.60	0.03	19.50	1480.77	5780.41	1480.77	0.00
6.50	1432.75	5595.51	1432.71	-0.04	20.00	1482.32	5786.49	1482.35	0.03
7.00	1434.90	5604.02	1434.93	0.03	20.50	1483.84	5792.25	1483.85	0.01
7.50	1437.02	5612.31	1437.08	0.06	21.00	1485.35	5798.02	1485.35	0.00
8.00	1439.12	5620.26	1439.15	0.03	21.50	1486.83	5803.87	1486.87	0.04
8.50	1441.19	5628.42	1441.27	0.08	22.00	1488.29	5809.40	1488.31	0.01
9.00	1443.23	5636.04	1443.25	0.02	22.50	1489.74	5814.88	1489.73	-0.01
9.50	1445.25	5643.80	1445.27	0.01	23.00	1491.16	5820.50	1491.19	0.03
10.00	1447.25	5651.28	1447.21	-0.04	23.50	1492.56	5825.80	1492.57	0.00
10.50	1449.22	5658.96	1449.21	-0.02	24.00	1493.95	5831.17	1493.96	0.01
11.00	1451.17	5666.41	1451.14	-0.03	24.50	1495.32	5836.42	1495.33	0.01
11.50	1453.09	5673.89	1453.09	-0.01	25.00	1496.66	5841.42	1496.63	-0.03
12.00	1454.99	5681.19	1454.98	-0.01	25.50	1497.99	5846.62	1497.98	-0.01
12.50	1456.87	5688.51	1456.89	0.01	26.00	1499.30	5851.76	1499.32	0.02
13.00	1458.72	5695.53	1458.71	-0.01	26.50	1500.59	5856.52	1500.55	-0.03
13.50	1460.55	5702.70	1460.57	0.02	27.00	1501.86	5861.28	1501.79	-0.07
14.00	1462.36	5709.76	1462.41	0.05	27.50	1503.11	5866.31	1503.10	-0.01
14.50	1464.14	5716.07	1464.05	-0.10	28.00	1504.35	5871.09	1504.34	-0.01
15.00	1465.91	5723.36	1465.94	0.04	28.50	1505.56	5875.54	1505.50	-0.07
15.50	1467.65	5729.83	1467.63	-0.02	29.00	1506.76	5880.12	1506.69	-0.07
16.00	1469.36	5736.70	1469.41	0.05	29.50	1507.94	5884.79	1507.90	-0.04
16.50	1471.06	5743.00	1471.05	-0.01	30.00	1509.10	5889.19	1509.04	-0.06
17.00	1472.73	5749.77	1472.81	0.08					



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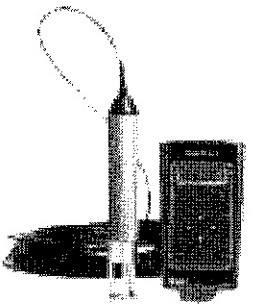
Date:
Mar 01, 2006

Serial #:
98376-030106

DIGIBAR CALIBRATION REPORT

version 1.0 (c) 2004

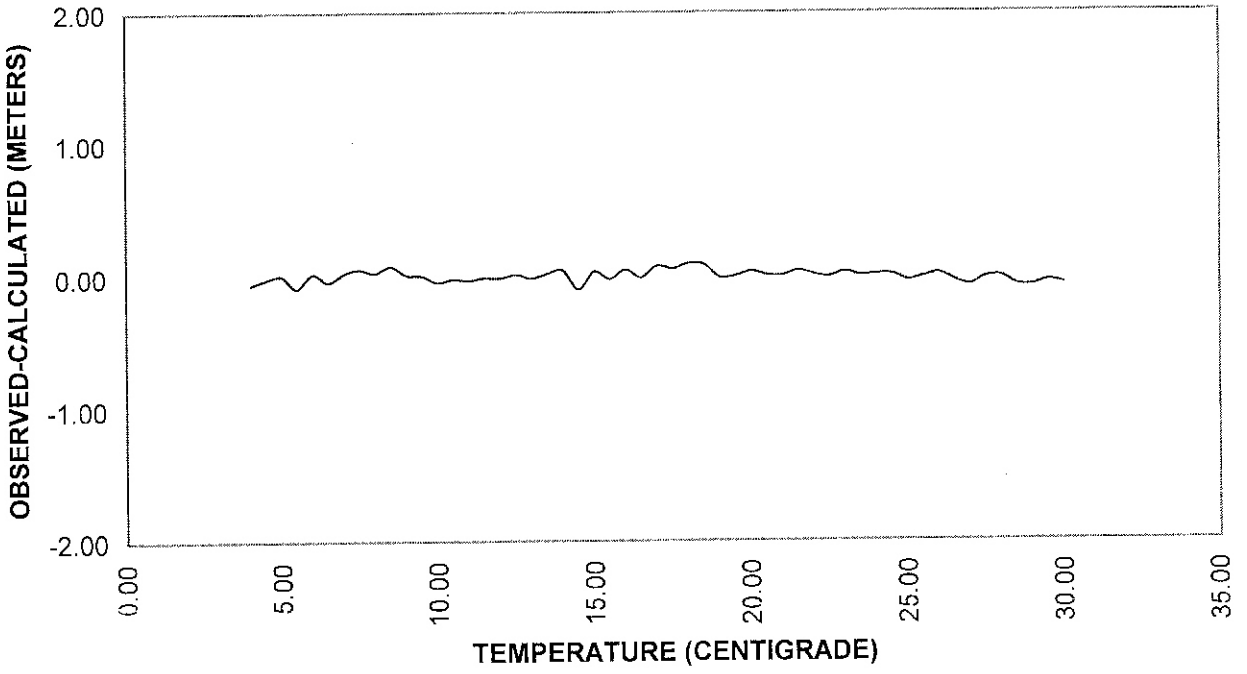
ODOM HYDROGRAPHIC SYSTEMS, Inc.



Burn these numbers to EPROM:

Gradient	**3327**
Intercept	**216**

Calibration Graph



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LEAD-LINE COMPARISON

DATE: August 16, 2005

Model: RESON 8125 Nadir Beam | Vessel: BAY HYDROGRAPHER S5501 | Registry No.: H-11450

Echosounder Serial No.: 31546 | Draft: 1.73 meters | Field Sheet: F

Leadline Serial No.: Steel tape | Depth Units: Meters | Sound Velocity: 1522 m/s

DN 176	Lead-Line Depth (meters)	Lead-Line Correction (meters)	Corrected Lead-Line Depth (meters) (A)	Digital Raw Depth (meters)	Corrected Digital Depth (meters) (D=B+Draft)	Digital Instrument Error (meters) (A-D)
1	2.74	+0.25	2.99	1.26	2.99	0.00
2	2.75	+0.25	3.00	1.26	2.99	0.01
3	2.75	+0.25	3.00	1.27	3.00	0.00
4	2.75	+0.25	3.00	1.29	3.02	-0.02
5	2.75	+0.25	3.00	1.28	3.01	-0.01

Leadsman: PS Moore Recorder: PS Turner Computed by: LT Yoos

The lead line comparison was performed at Calvert Marina, Solomons, MD. Bay Hydrographer was port side to a floating dock. The leadsman stood out on the multibeam arm in order to measure directly below the multibeam head. A wide flange was used in order for the lead not to sink into the soft bottom of the marina.

Note: Bay Hydrographer does not maintain any traditional lead lines. In lieu of this equipment, a lead was attached to a metal metric measuring tape. Measurements were corrected to account for the length of the weight assembly

LEAD-LINE COMPARISON

DATE: August 16, 2005

Model: ODOM ECHOTRAC MKIII | Vessel: BAY HYDROGRAPHER S5501 | Registry No.: H-11450

Echosounder Serial No.: 21093 | Draft: 0.84 meters | Field Sheet: F

Leadline Serial No.: Steel tape | Depth Units: Meters | Sound Velocity: 1522 m/s

DN 176	Lead-Line Depth (meters) Port	Stbd	Lead-Line Correction (meters) Stbd	Port	Corrected Lead-Line Depth (meters) (A)	Digital Raw Depth (meters)	Velocity Corrected Depth (Raw Depth *1522/1500) (B)	Corrected Digital Depth (D=B+Draft)	Digital Instrument Error (A-D)
1		3.92		+0.25	4.17	3.39	3.44	4.28	-0.11
2		3.92		+0.25	4.17	3.39	3.44	4.28	-0.11
3		3.92		+0.25	4.17	3.39	3.44	4.28	-0.11
4		3.92		+0.25	4.17	3.38	3.43	4.27	-0.10
5		3.92		+0.25	4.17	3.38	3.43	4.27	-0.10

Leadsman: PS Moore Recorder: PS Turner Computed by: LT Yoos

The lead line comparison was performed at Calvert Marina, Solomons, MD. Bay Hydrographer was port side to a floating dock. Since the VBES transducer is located on the starboard side of the vessel, lead line readings were taken on the starboard side only. The lead line measurements were taken as close to the transducer as possible in the fore/aft direction, however, due to her beam, the lead line soundings are approximately 2 meters outboard of the single beam soundings. The marina bottom could easily vary 1 decimeter over the course of 2 meters. The Hydrographer believes this distance accounts for the apparent difference between the ODOM measurements and the lead line measurements. Compare with accompanying multibeam lead line comparison. In that case, the lead line is able to be deployed at the multibeam head.

Note: Bay Hydrographer does not maintain any traditional lead lines. In lieu of this equipment, a lead was attached to a metal metric measuring tape. Measurements were corrected to account for the length of the weight assembly