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

DATA ACQUISITION AND PROCESSING REPORT

Type of Survey **Navigable Area**

Project Nos. **OPR-E349-BH-08**

Time Frame **June 2008 – May 2010**

LOCALITY

State/Territory **Maryland and District of Columbia**

General Locality **S. of Cedar Point, Central Chesapeake Bay**

2008-2010

CHIEF OF PARTY
LTjg Megan Guberski, NOAA

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1 February 2010

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A. EQUIPMENT

A.1 SURVEY PLATFORMS

Data for project OPR-E249-BH-08, Sheet H11918 was collected using two survey platforms: the 17m S/V *Bay Hydrographer* (S5501), and the 18m R/V *Bay Hydro II* (S5401).

R/V Bay Hyrographer

Figure 1. The *R/V Bay Hydrographer*

Table 1. Survey Vessel Characteristics, *R/V Bay Hydrographer*

LOA (ft)	Beam (ft)	Draft (ft)	Max Speed	Displacement
57’ 10”	17’	5’	11 knots	24.0 tons

The *S/V Bay Hydrographer* collected Side Scan Sonar (SSS) data, Vertical Beam Echosounder (VBES) data, and sound velocity profile data. The side scan was towed using a stern mounted hydraulic A-frame, and an Oceans Engineering model 1673-3 electric winch equipped with 100m of armored cable.

The vertical beam sonar was mounted to the vessel’s hull.

A complete National Geodetic Survey (NGS) survey of the vessel was performed in September of 2004. For more details refer to section C.3 of this document. In October of 2008 the vessel was taken out of service, and the remainder of the survey was completed by the *R/V Bay Hydro II*.

R/V Bay Hydro II

Figure 2. *R/V Bay Hydro II*

Table 2. Survey Vessel Characteristics, *R/V Bay Hydro II*

LOA (ft)	Beam (ft)	Draft (ft)	Max Speed	Displacement
54’	20’ 9”	5’ 9”	18 knots	42.0 tons

The *R/V Bay Hydro II* collected Multibeam Echosounder (MBES) data, and sound velocity profile data. The multibeam sonar is mounted to a pole arm and deployed through a moon pool located centerline, and aft of the house.

Figure 3. *R/V Bay Hydro II Multibeam arm, retracted*

A complete NGS survey of the vessel was performed in March 2008. For more details, refer to section C.3 of this document.

A.2 DATA ACQUSITION SYSTEMS

ODOM Echotrac MKIII Vertical Beam Echosounder.

The Odom Echotrac MKIII is a dual frequency digital recording echosounder, mounted to the hull of *S/V Bay Hydrographer*. On survey H11918, the low frequency channel was set to 28 kHz, with a pulse width of 357μsec, and the high frequency channel was set to 100 kHz, with a pulse with of 200μsec. The ping rate for both low and high frequency was set to auto, allowing the sonar to ping as rapidly as possible.

Bathymetric data from the ODOM Echotrac is used to provide generalized bathymetry across the survey area. The accuracy of the sonar's soundings was checked against a lead line on 25 March 2008 and found to be within NOAA standards. Quality was further controlled during the survey by the collection of crosslines.

RESON SeaBat 7125 Multibeam Echosounder

The RESON SeaBat 7125 system is a single-frequency, digital recording Multibeam echosounder, pole mounted aboard the *R/V Bay Hydro II*. The integrated system includes a 400 kHz Projector unit, a Receiver unit, a Link Control Unit (LCU), and a topside 7-P Sonar Processor Unit (TPU). The projector and receiver are set up in a Mills Cross configuration, and the pole arm is deployed through a bomb bay door located on the center line of the vessel.

The Seabat 7125 produces a 128° across track swath, that is resolved into 512 discreet equidistance beams by the receive array. Each beam has a resolution of 1.0^{o} along track, and 0.5° across track. Sound velocity at the face of the transducer is provided by an integrated ODOM Hydrographic Systems Digibar Pro sound velocimeter. This system will be discussed in further detail in the Sound Velocity Equipment Section.

Ping rate, range, power, gain and pulse width all varied with the depth of the area being surveyed.

The 7-P Sonar Processor Unit has the following software versions installed:

7K Center:	Version 3.0.7.1
7K IO:	Version: 3.2.0.7
7K UI:	Version 3.5.1.4

Bathymetric data from the RESON 7125 is used to provide object detection in shallow water. Since VBES data and MBES data were collected by different platforms, no Vertical Beam to Multibeam comparison was done. Quality for MBES data was controlled by the high degree of overlap between congruent lines.

Diver's Least-Depth Gauge (DLDG)

Neither the *S/V Bay Hydrographer*, nor the *R/V Bay Hydro II* maintains a Diver's Least Depth gauge.

Lead Line

Neither *S/V Bay Hydrographer*, nor *R/V Bay Hydro II* maintains a traditional lead line. In lieu of this equipment, a lead was attached to a metal measuring tape and measurements were corrected to account for the weight assembly. A lead line comparison to the Odom Echotrac VBES and RESON 7125 was performed March 25, 2008 (DN 085) at Calvert Marina, Solomons, MD.

Copies of the lead line calibration reports are included in Appendix III of this report.

KLEIN 5000 High-Speed Side Scan Sonar

The Klein High Speed, High Resolution Side Scan (SSS) Sonar system is a beam-forming acoustic imagery device that is towed behind the *S/V Bay Hydrographer* via a hydraulic A-frame. The KLEIN 5500 towfish operates at a frequency of 445 kHz with a vertical beam angle of 40°, and can resolve up to 5 discreet received beams per transducer stave. The integrated system includes a KLEIN 5500 light weight towfish, a tow cable telemetry system, and a Transceiver/Processing Unit (TPU).

Positioning of the Towfish is calculated using CARIS SIPS, and is derived from the amount of cable out (from a MKII cable counter), towfish depth (from the towfish pressure depth), the vessels Course Made Good (CMG), and the vessels heading. The calculated towfish position is then sent to the sonar data collection system in the form of a GGA NMEA string, where it is merged with the sonar data file.

Towfish altitude is maintained between 8% and 20% of the range scale. In regions of significantly shallow water, a float is attached to the towfish to prevent the sensor from striking bottom during speed changes. The float is adjusted to keep the towfish at the altitude required by the Hydrographic Survey Specifications and Deliverables; however choppy seas can induce motion in the towfish. The resultant imagery is degraded, but remains within object detection limits.

Vessel speed is adjusted during SSS acquisition to insure that along-track coverage for object detection, as required by the NOS Specifications and Deliverables, is met. Confidence checks are 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.

A.3 POSITION AND ORIENTATION EQUIPMENT

APPLANIX POS/MV

Both *S/V Bay Hydrographer* and *R/V Bay Hydro II* use a blended DGPS and inertial position orientation solution to position the vessel in space.

Position information for both vessels is acquired using a Trimble DSM212L DGPS receiver – an integrated 12-channel GPS receiver capable of receiving external RTCM correctors from a shore based reference station. The system operates at 1 Hz, with an expected accuracy of less than one meter, provided at least 5 satellites are visible. The software TSIPTalker is used to manual set the RTCM beacon, and to monitor system accuracy.

Inertial position calculations on both vessels is provided by an Applanix POS/MV V4. The POS MV V4 system includes dual GPS antennas, an inertial measurement unit (IMU), and data processor (PCS). The IMU measures linear and angular accelerations corresponding to the major motions of the vessel (heave, pitch, roll, yaw) and inputs this data to the PCS, where it is combined with a GPS position (determined by carrier-phase disambiguation) to give a final position solution.

Position accuracy and quality is monitored in real time, using the MV-POSView Controller software to ensure positioning accuracy requirements in the NOS Hydrographic Surveys Specifications and Deliverables are met.

Both platforms use True Heave to capture long period sea swells that cannot be detected using short period heave calculations. True Heave data is acquired in a separate raw file and applied in post processing.

A.4 SOUND VELOCITY PROFILES

Sea-Bird CDT Profilers

Both *S/V Bay Hydrographer* and *R/V Bay Hydro II* use a Sea-Bird Electronics SeaCat SBE19+ Conductivity, Temperature, and Depth (CTD) profiler to collect sound velocity profiles. Temperature is measured directly. Salinity is calculated from measured electrical conductivity. Depth is calculated from strain gauge pressure. CTD casts are processed using **VELOCWIN** software, and applied to MBES and VBES data using **CARIS HIPS**.

CTD calibration reports and dates are included in Appendix III of this report.

ODOM Hydrographic Systems Digibar Pro

The Digibar Pro is a sing-around transducer, measuring the speed of sound in water by finding the time needed for a ping to travel a known distance. Both the *S/V Bay Hydrographer* and *R/V Bay Hydro II* use a Digibar Pro to acquire speed of sound at the face of the RESON 7125 transducer. Data is then sent real time to the RESON 7125 processor unit.

Calibrations for the Digibar can be found in Appendix III of this report.

A.5 SOFTWARE

A.5.1 ACQUSITION SOFTWARE

HYPACK
Hypack is used to acquire VBES data in a *.raw format, and detached positions, in a *.tgt format. It is also used for vessel navigation during data acquisition.

HYSWEEP
Hysweep is a module for Hypack used to acquire RESON 7125 MBES data in a *.HSX format. I receives input from The Reson 7125, the Digibar Pro, and the Applanix POS/MV systems.

TRITON ISIS
Isis is used to collect SSS data in a *.xtf format.

NOTE: At the beginning of Field Year 2009 NOAA discontinued use of ISIS, replacing it with HYSWEEP and KLEIN SONARPRO. It is therefore not part of the *R/V Bay Hydro II*'s acquisition suite.

A.5.2 DATA COLLECTION AND PROCESSING SOFTWARE

CARIS HIPS & SIPS

CARIS HIPS (Hydrographic Information Processing System) is used for the initial processing of Multibeam echosounder data. The program applies vessel offsets to the raw sonar data, corrects for tide and sound velocity, and calculates a Total Propagated Uncertainty (TPU) for each sounding. Individual soundings are then processed into CUBE (Combined Uncertainty and Bathymetry Estimator) grids.

CARIS SIPS (Side-Scan Information Processing System) is used for processing of side-scan sonar imagery, including cable layback correction, slant range correction, contact selection, tow point entry, and mosaic generation.

HSTP PYDRO

HSTP PYDRO is a program for the classification of side-scan sonar and Multibeam bathymetry contacts and for the creation of preliminary smooth sheets. Multibeam contacts (designated soundings), side-scan sonar contacts, and detached position contacts are analyzed, grouped, and

assigned S-57 classifications. The bathymetric grid is imported for comparision between surveyed and charted depths, and to the side scan contacts. The sounding selection interval is dependent on the survey scale. The final product is a Preliminary Smooth Sheet file (PSS), which is delivered to the Atlantic Hydrographic Branch as part of the final submission package.

PYDRO is also used for chart comparisons, generation of chartlets, generation of Danger to Navigation reports, generation of appendices to the Descriptive Report, compilation of survey statistics, and generation of standard NOAA forms such as the Descriptive Report cover sheet.

HSTP VELOCWIN

HSTP VELOCWIN is a program used for the processing sound velocity casts. This program uses Sea-Bird Electronics SeaSoft software to convert hexadecimal SeaCat data into ASCII data, then converts the ASCII data into a depth-binned sound velocity file. The resulting .svp files are applied to MBES and VBES data during post processing to correct for sound velocity variation within the water column.

MAPINFO Professional

MapInfo is the Geographic Information System (GIS) software package used to plan survey lines.

B. DATA PROCESSING AND QUALITY CONTROL

H11918 spanned acquisition and processing years 2008-2010. There have been many hardware, software, and personnel changes during the survey. A final survey review was completed prior to submission with careful attention to the latest HSSD and FPM requirements.

B.1 DATA ACQUSITION

During data acquisition the Hydrographer-In-Charge (HIC) is responsible for maintaining data quality. A HIC's primary responsibility is to monitor the quality incoming data; and watch for alarms. SONARPRO, ISIS and HYSWEEP all show visible alarms if necessary inputs drop out, and the POS/MV alarms if positioning accuracies degrade past allowable thresholds.

B.2 DATA PROCESSING

After acquisition, all data is converted and analyzed. The following is a description of the work flow used for each type of data.

VBES Data

- Convert VBES data using CARIS HIPS;

- Scan Navigation and Attitude data, flagging erroneous data as rejected;

- Apply tide and speed of sound corrections, compute Total Propagated Uncertainty

    - Uncertainty values in the HVF follow recommendations of NOAA Field Procedures Manual (FPM), Appendix 4,

        - With the exception of MRU alignment uncertainties, which are calculated using the standard deviation of all angular biases found during a patch test;

    - For tidal zoning and speed of sound error modeling, refer to section B.2.4 of the Descriptive Report;

- Clean data using CARIS Single Beam Editor, flagging data from the water column and sub-bottom returns as rejected,

    - When definition of the true bottom is ambiguous, the full water column data can be inspected by viewing the HYPACK created .bin files using the Post Acquisition Tool;

- Create CARIS BASE Uncertainty Weighted Grids at 5 meter resolution.

    - For an in-depth discussion of how each sounding's TPU is propagated to the grid node, refer to the Bathymetric Processing section of the FPM,

    - The 2010 HSSD changed single beam grids requirements from the previous 2 – 5 meters, to 4 meters resolution. Since all VBES data was collected in 2008, grid resolution follows the 2008 requirements and is gridded at 5 meter resolution.

- Analyze grids for features and for areas of shoaling; flag for development by a Multibeam sonar.

MBES Data

- Convert MBES data using CARIS HIPS,

- Apply True Heave; correct for tide and speed of sound; compute Total Propagated Error

    - Uncertainty values in the HVF follow recommendations of FPM, Appendix 4,

        - With the exception of MRU alignment uncertainties, which are calculated using the standard deviation of all angular biases found during a patch test;

    - For tidal zoning and speed of sound error modeling, refer to section B.4.1 of the Descriptive Report;

- Scan Navigation and Attitude data, flagging erroneous data as rejected;

- Initial data cleaning using Swath Editor to reject gross flyers;

- Create CUBE grids. Grid resolution is dictated by the type of coverage required (Complete Coverage vs. Object Detection) and the depth of the water. Compliance with HSSD gridding requirements is strictly observed,

    - For an in-depth discussion of how the CUBE algorithm creates and disambiguates depth hypothesis, refer to the Bathymetry Processing section of the FPM,

    - For a discussion of disambiguation method used, refer to section B.4.2 of the Descriptive Report;

- Review the CUBE grids for holidays,

    - Create an initial holiday line plan;

- Review the uncertainty layer of the each CUBE grid. Address each area where uncertainly falls outside of the standards set by HSSD;

- Review the density layer of each CUBE grid for compliance with HSSD specified density requirements,

    - Add areas of rarefaction to the holiday line plan;

- Examine all surfaces for erroneous surface designation and evidence of systematic errors, for features, and for evidence shoaling,

    - Significant features are flagged ‘designated’, forcing the CUBE algorithm honor the depth of the sounding.

SSS Data

- Convert SSS data using CARIS SIPS;

- Scan Navigation and Attitude data, flagging erroneous data as rejected;

- Re-Compute towfish navigation. This is when tow point offsets and horizontal layback is applied to the data;

- Slant Range correct each line of data;

- A primary reviewer scans each line for significant contacts,

- A secondary reviewer makes an independent check-scan of all lines, verifying contacts and checking for missed contacts;

- If the Project Instructions call for 200% Side Scan coverage, the scanners check for correlation of contacts between 100% and 200% coverage,

    - Correlation is also used to reveal systematic errors, particularly if a contact shows up on lines collected in opposite or orthogonal directions;

- Create individual mosaics for 100% and 200% coverage. Examine for coverage,

    - If necessary, create a holiday line plan;

- Check each contact to ensure that it has Object Detection level Multibeam data over the feature.

B.3 FEATURE CLASSIFICATION AND ANALYSIS

Once all bathymetric and imagery data have been examined for quality and coverage, all designated soundings and SSS contacts are inserted into PYDRO. The hydrographer then examines each individual contact, grouping together multiple contacts that define an individual feature.

When a single feature has more than one associated contact, one of the contacts is made primary. The following criteria are used to classify contacts:

- MBES contacts will be classified as primary contacts over SSS, DP, and GP contacts;

- If there are two or more MBES contacts for the same feature, the MBES contact of least depth is classified as the primary contact;

- If there is no bathymetry contact for a feature, then the SSS position will be classified as primary contact over DP and GP contacts;

- If there are two or more SSS contacts for the same feature, then the SSS contact that best represents the feature is classified as the primary contact;

- If there are no bathymetry or imagery contacts, then the DP contact that best represents the feature is classified as the primary contact.

All features are then re-examined for significance. At this level of data analysis, significant is defined as meeting the criteria specified in HSSD (significant features are at least 1m x 1m x 1m in ≤ 20m of water, or a cube measuring 5% of the depth in > 20m of water) and being relevant at chart scale. Features that are found to be significant are flagged reportable. Features that pose a danger to navigation are further flagged as a “DTON”, and a report is sent to the Marine Charting Division (MCD)

All reportable features are then given an IHO s-57 attribution. Features that already appear on the chart are assigned a keyword of ‘chart’, while new features are given a keyword of ‘un-charted’. Each primary feature, both reportable and non-reportable, is then flagged as ‘resolved’.

C. CORRECTIONS TO ECHO SOUNDINGS

C.1 SOUND SPEED CORRECTION

Speed of Sound

Sound speed values at the transducer face are applied real-time. Accuracy of the transducer is checked against the data point closest to the transducer depth on every CTD cast.

The ODOM Digibar Pro is factory calibrated annually. Calibration reports can be found in Appendix III of this report.

CTD Profiles

Sound velocity profiles are taken once per week for VBES acquisition, and once every 2 - 4 hours for MBES. Profiles are collected more frequently when transiting more than 1 nautical mile between survey areas, or when current and weather conditions warrant. Sound velocity casts are applied to all bathymetric data during post processing.

The Sea-Bird CTD is sent for factory calibration annually. Calibration reports can be found in Appendix III of this report.

C.2 WATER LEVEL CORRECTORS

During data acquisition, bathymetric data is initially reduced to Mean Lower-Low Water (MLLW) using preliminary (observed) water level data. Water level stations and zone files are assigned by the Center for Operational Oceanographic Products and Services (CO-OPS). Preliminary water levels are downloaded though the CO-OPS website in six-minute intervals and applied to the data at the end of each day.

After acquisition is complete, preliminary tide levels and zoning are examined for veracity by CO-OPS. Once the field unit receives verification that levels and zoning are accurate, all bathymetric data is then re-reduced to the verified levels.

C.3 VESSEL OFFSETS AND DYNAMIC DRAFT CORRECTORS

S/V Bay Hydrographer

An NGS survey of *S/V Bay Hydrographer* was performed on 14 – 15 September 2004 using optical levels. The vessel’s waterline was measured on 10 March 2005 using a steel tape.

Dynamic draft values were determined on 9 April 2008 using the echosounder technique. The calculated settlement and squat values at normal survey speed are not significant, and are not applied in the vessel HVF.

R/V Bay Hydro II

An NGS survey of *R/V Bay Hydro II* was performed on 23 March 2009 using optical levels. Dynamic Draft values were determined on 2 March 2010 using the echosounder technique.

All vessel offsets are included in the HIPS Vessel file reports in Appendix II. Both vessels' dynamic draft reports are also in Appendix II.

C.3 HEAVE, PITCH, ROLL AND HEADING, INCLUDING BIASES AND NAVIGATION TIMING ERRORS

The acquisition suite of both *S/V Bay Hydrographer* and *R/V Bay Hydro II* are configured to use "Precise Timing". This method reduces latency, thereby minimizing timing errors, by sending UTC messages to the processing units of each sonar. This allows all side-scan and MBES data to be time stamped at acquisition, instead of upon arrival at the acquisition computer (ISIS for the *S/V Bay Hydrographer*, HYPACK for the *R/V Bay Hydro II*). For more detailed information on this setup, see the Field Procedures Manual.

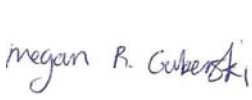
Patch tests are conducted throughout the year, following any removal or replacement of the RESON 7125 transducer head. These patch tests are used to determine and correct any angular bias between the IMU reference frame, and that of the sonar. Patch tests are also used to detect any remaining latency between navigation and bathymetric data, however the precise timing setup generally leaves no latency in the system. Results of all patch tests are included in the CARIS Hips Vessel Files (HVF) reported in Appendix II. All HVFs are digitally submitted with project data.

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

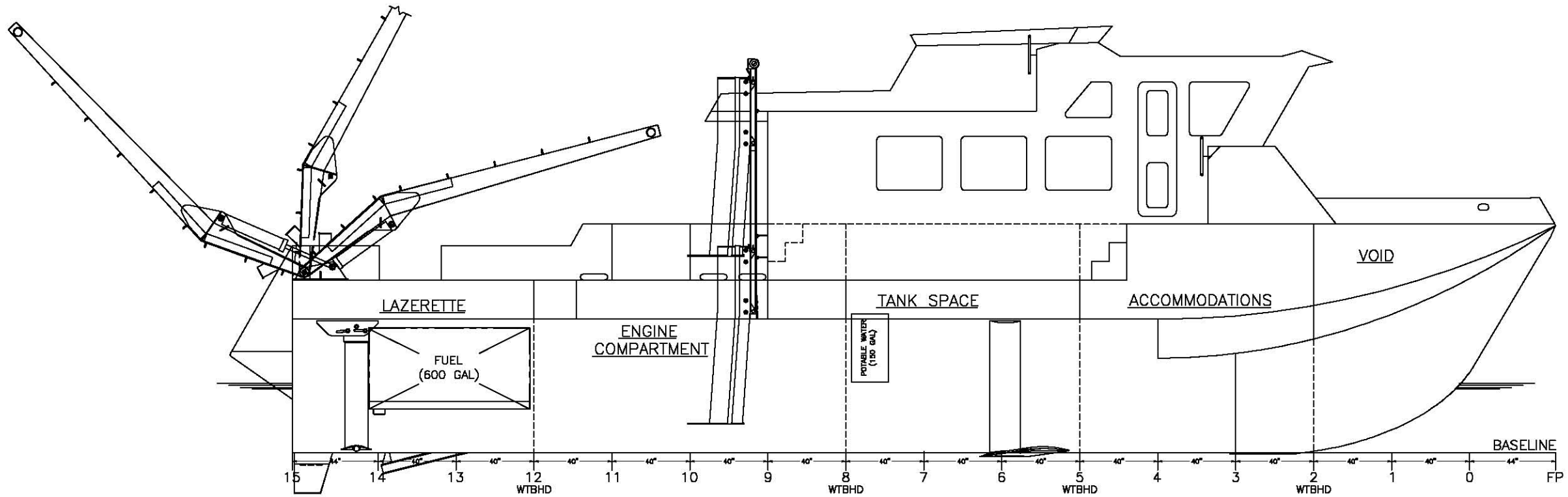
D. APPROVAL

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) Megan R. Guberski, NOAA
Officer In Charge – Bay Hydro II



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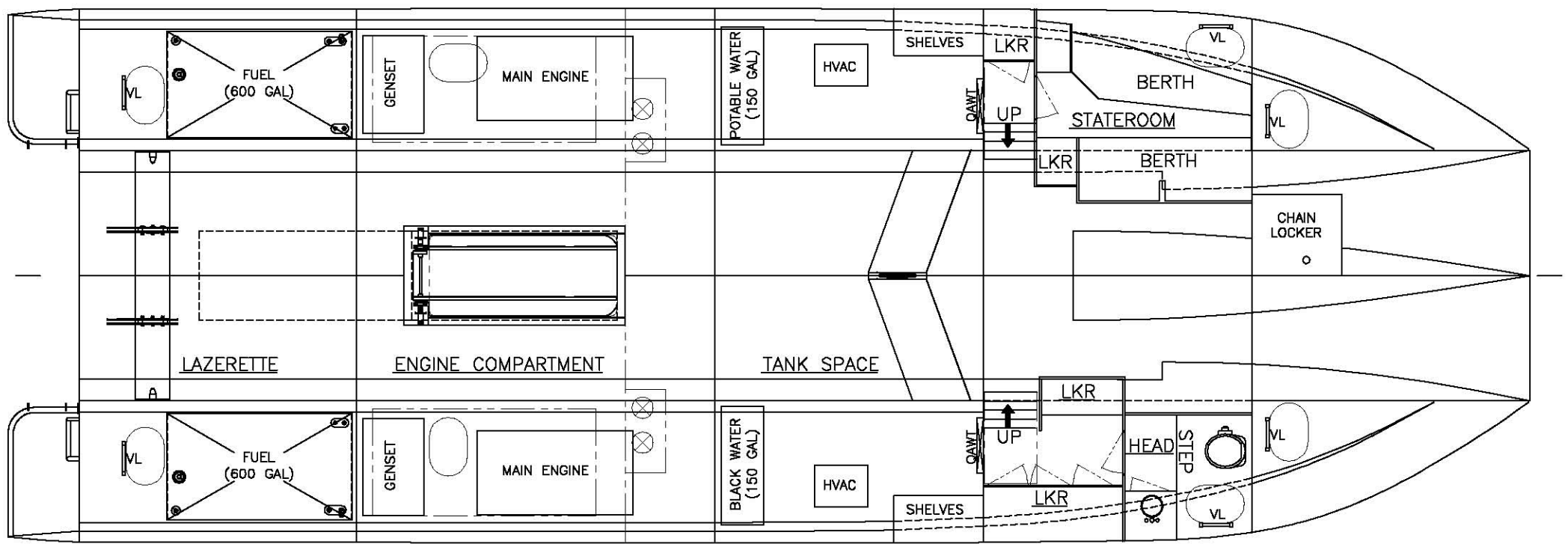

HOLD PLAN

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Kvichak Marine Industries, Inc.

54' SURVEY VESSEL

GENERAL ARRANGEMENT

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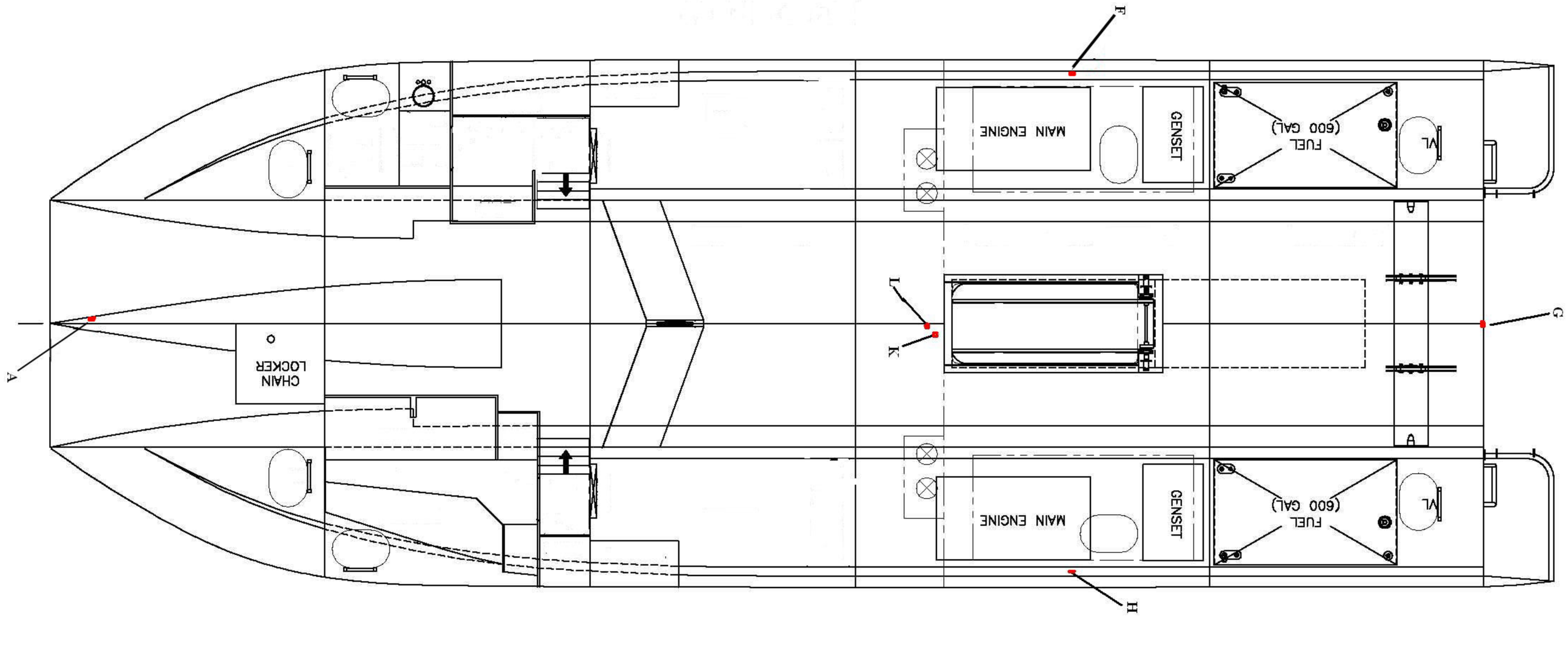
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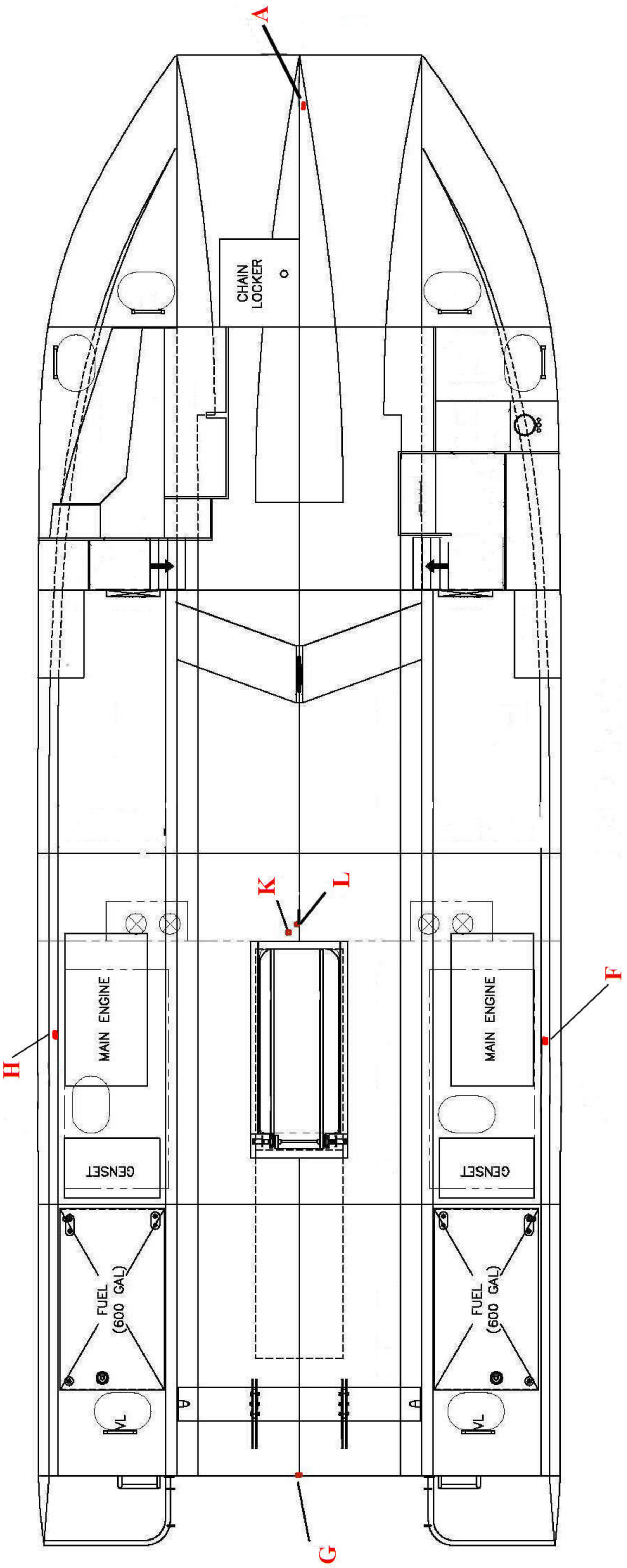
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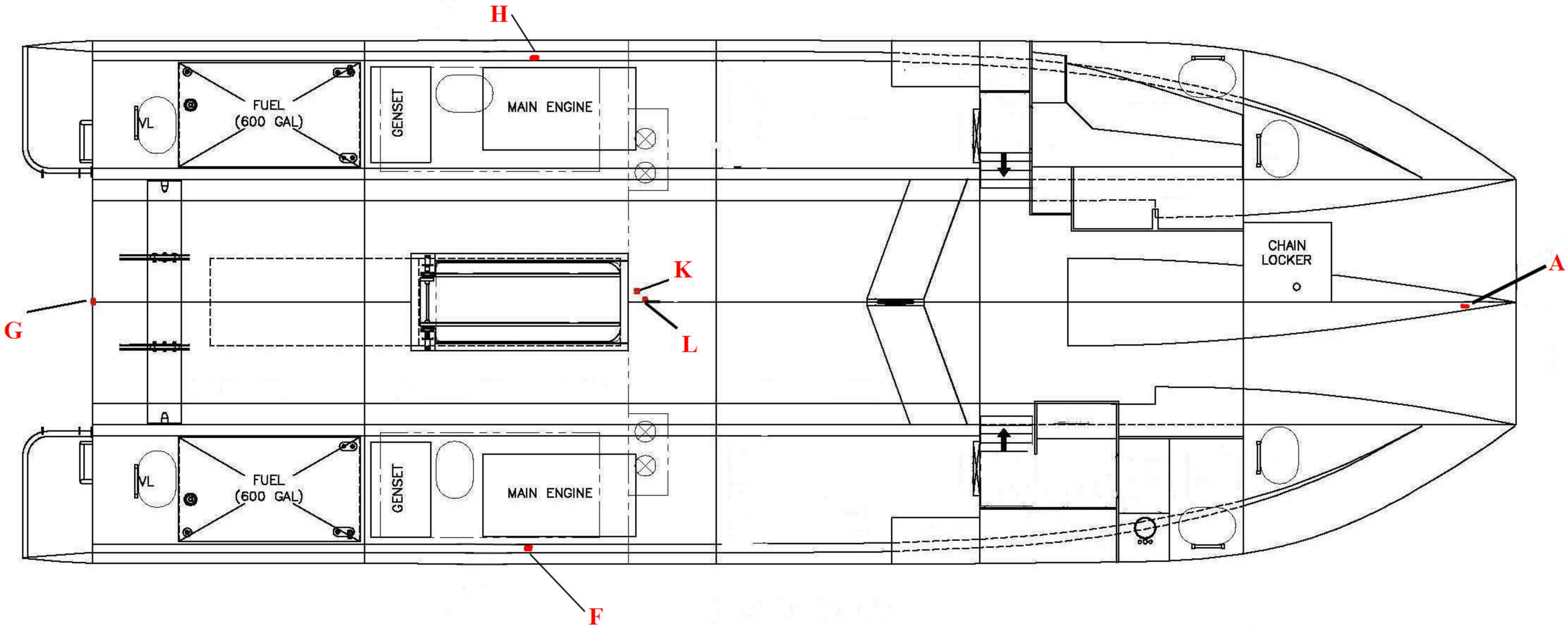
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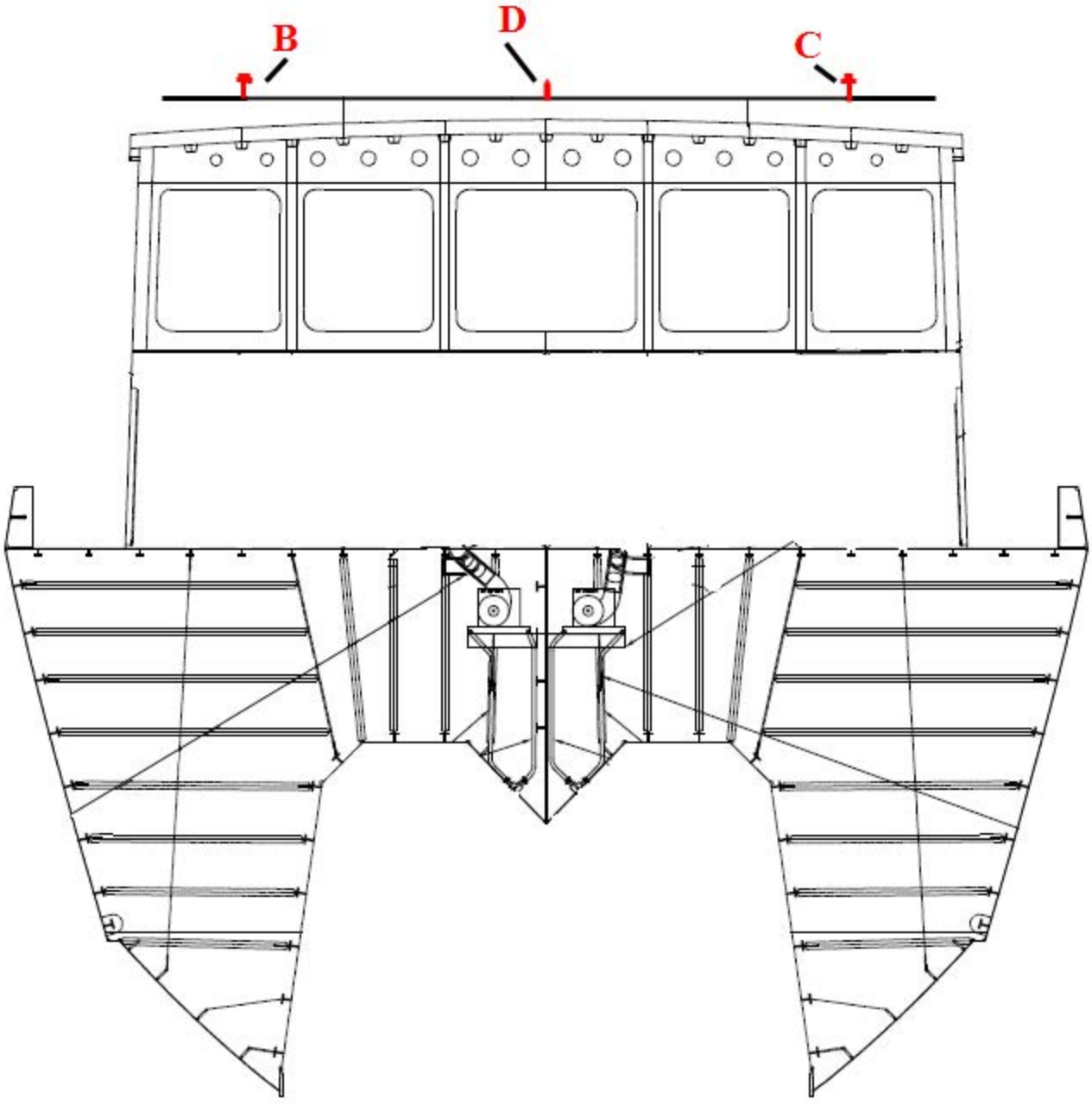
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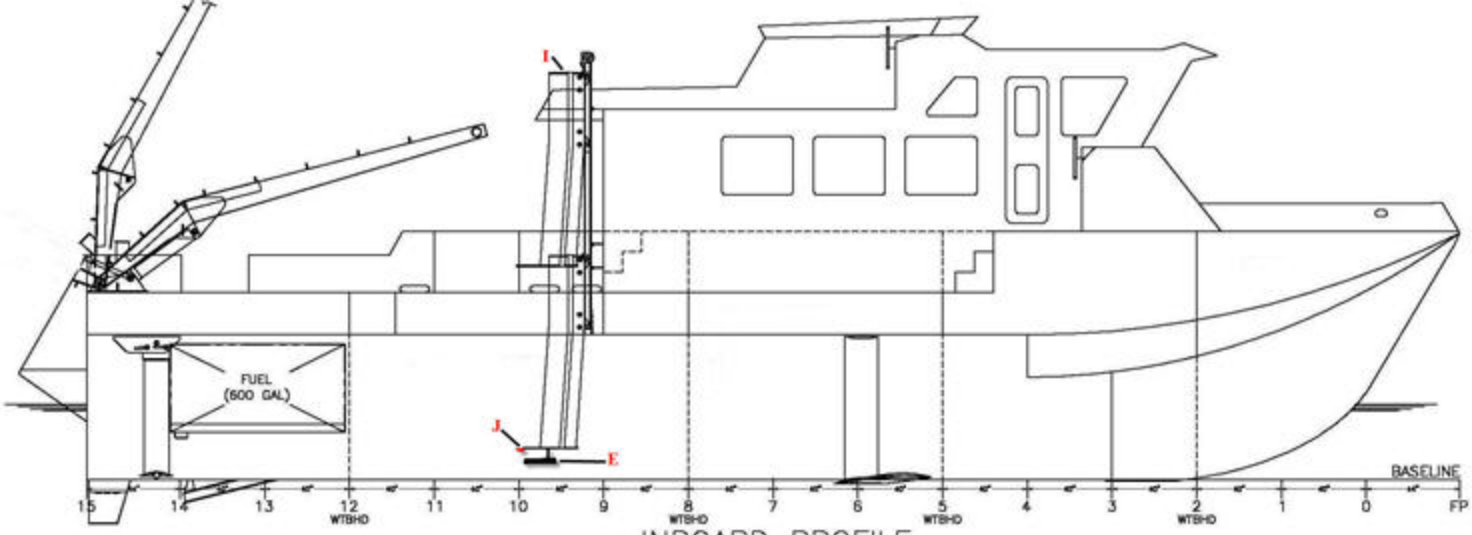

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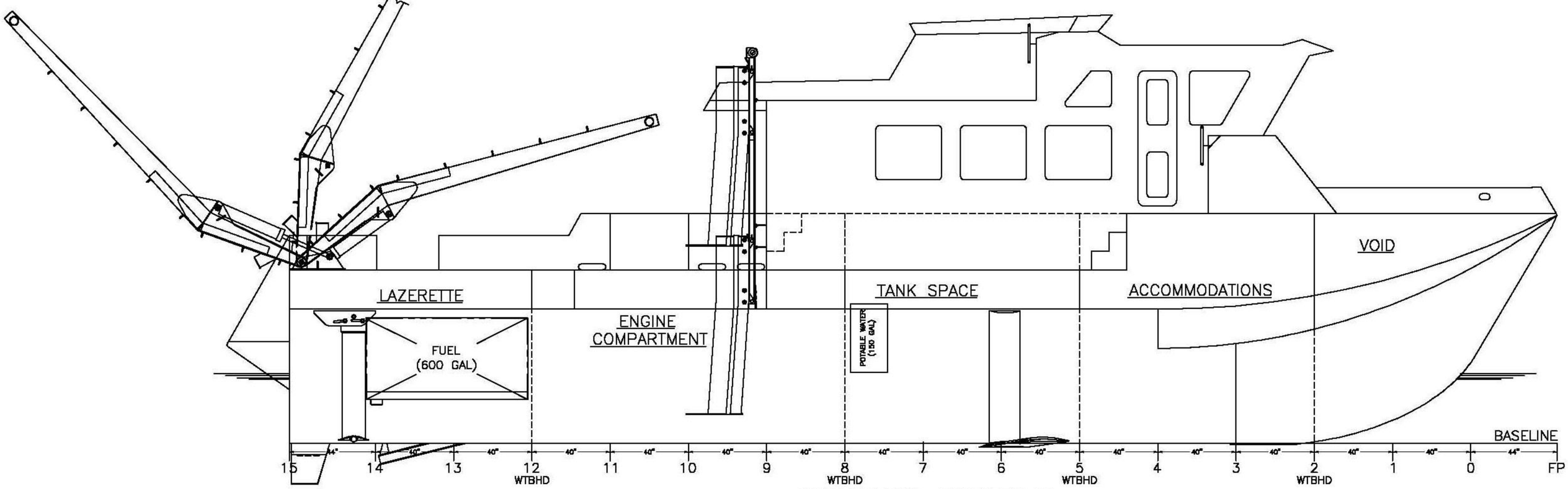

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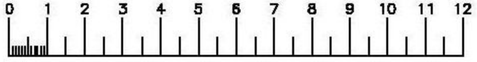

Kvichak Marine Industries, Inc.	54' SURVEY VESSEL
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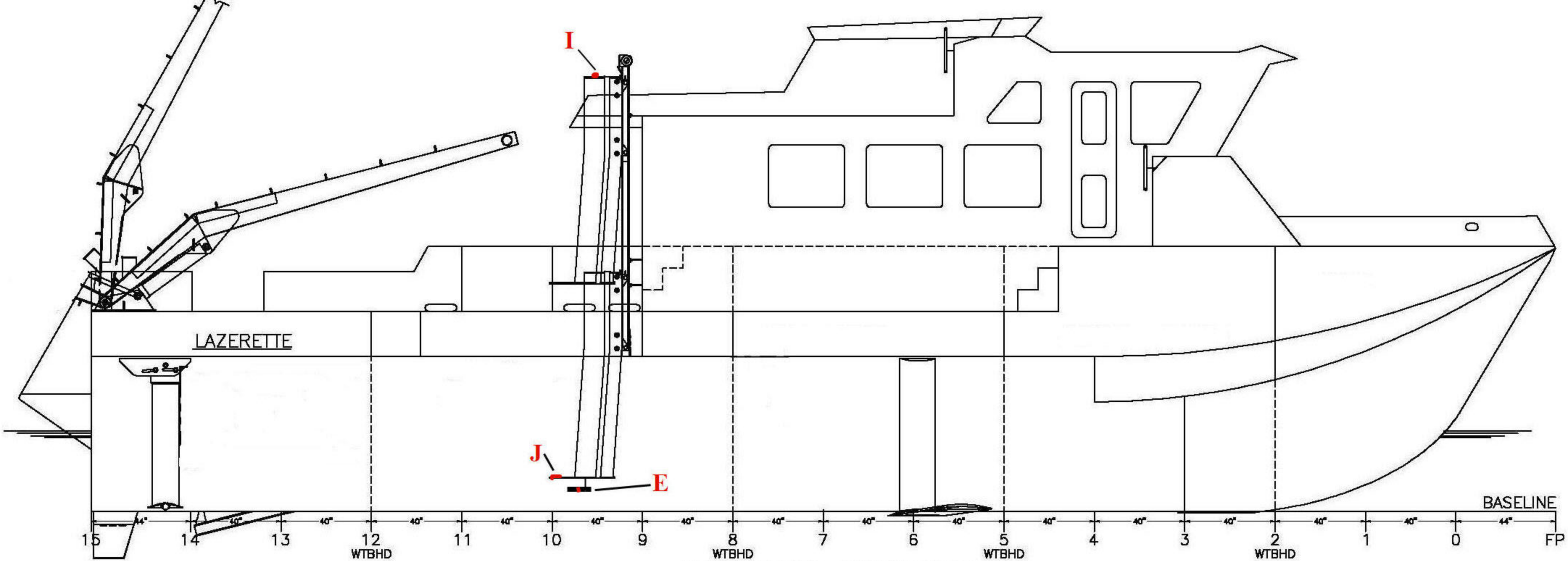

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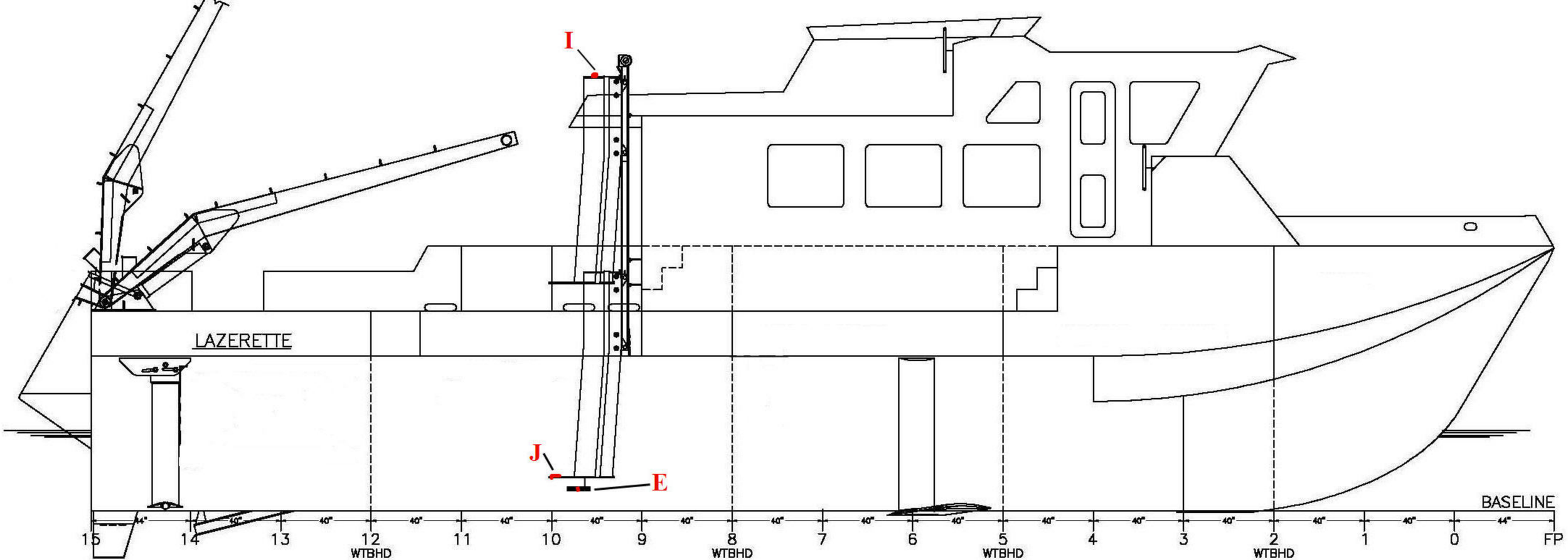

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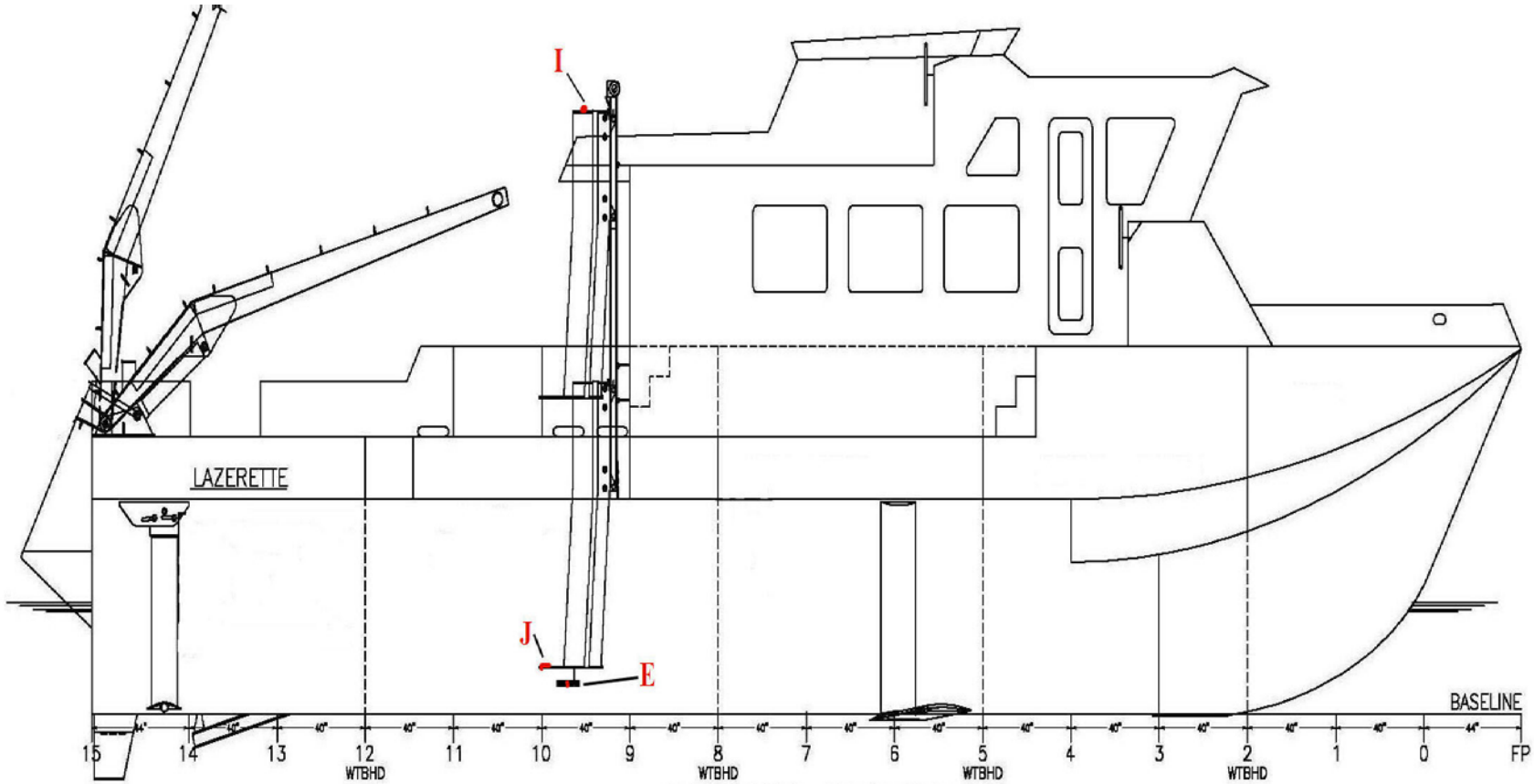

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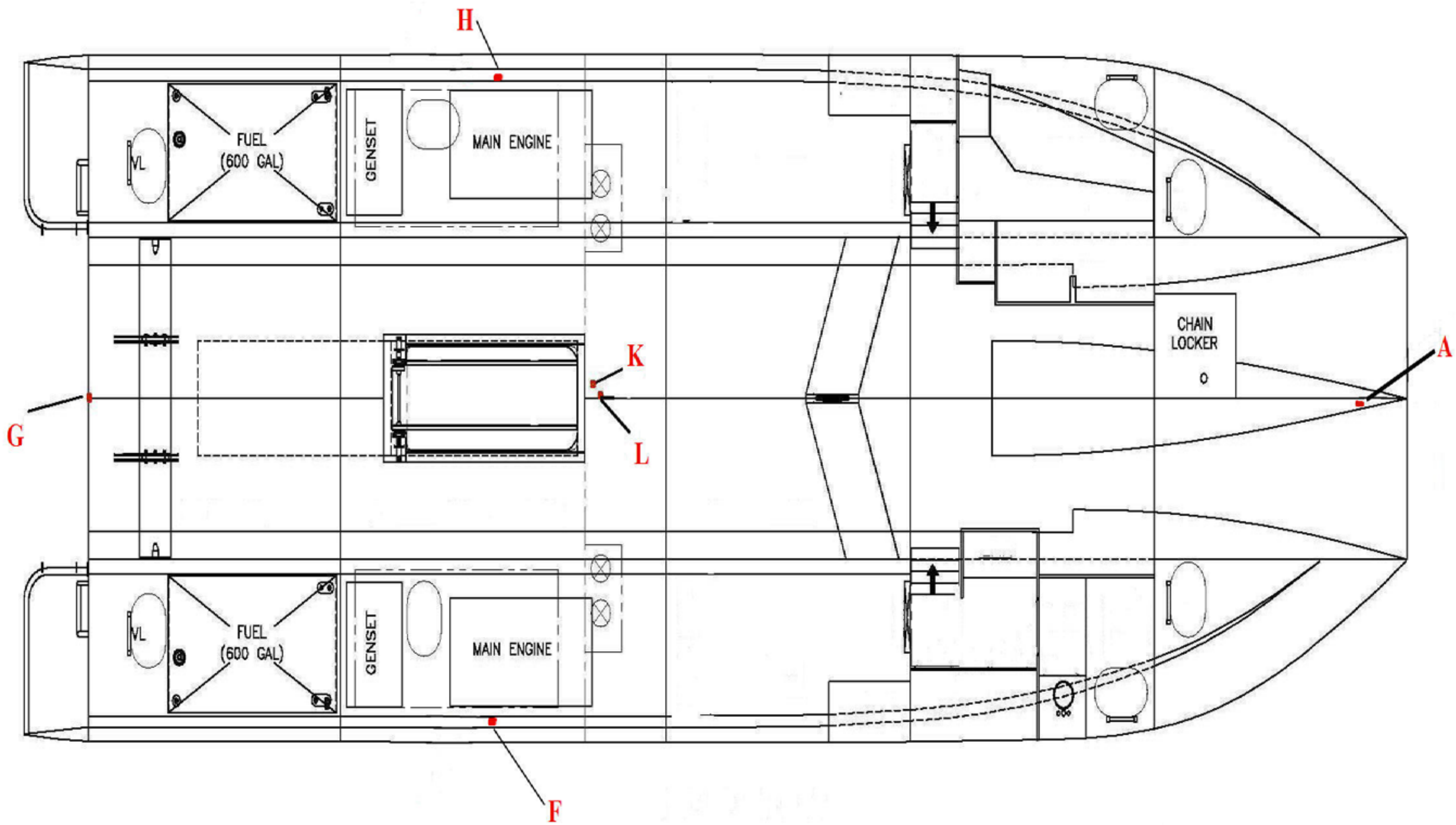
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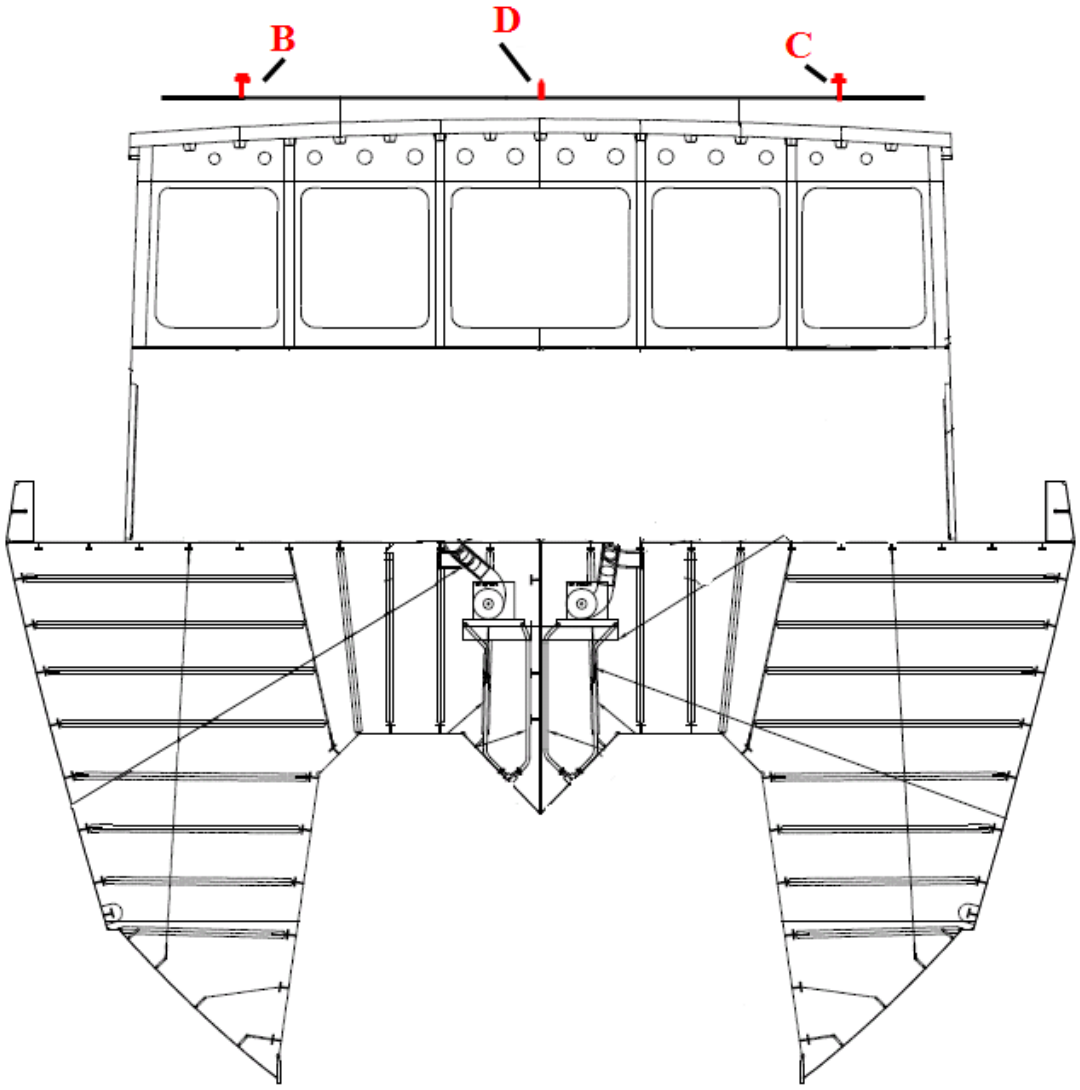
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Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Conductivity Calibration Report

Customer:	NOAA-NAVIGATION RESPONSE BRANCH		
Job Number:	49076	**Date of Report:**	1/7/2008
Model Number	SBE 19Plus	**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: 1/5/2008 Drift since last cal: -0.00050 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.

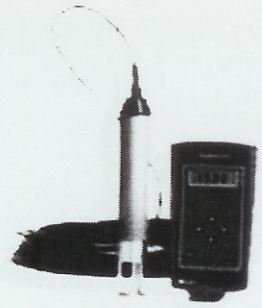
Date:
Feb 29, 2008

Serial #:
98376-022908

DIGIBAR CALIBRATION REPORT

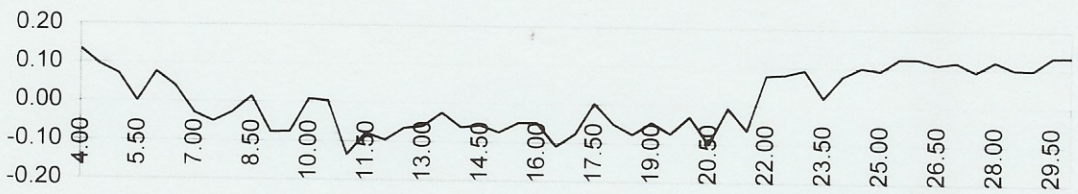
version 1.0 (c) 2004

ODOM HYDROGRAPHIC SYSTEMS, Inc



STANDARD DEL GROSSO H^2O

TEMP	VELOCITY	MEASURED FREQUENCY	RES_VEL	OBS-CAL
4.00	1421.62	5564.01	1421.76	0.13
4.50	1423.90	5572.49	1423.99	0.09
5.00	1426.15	5580.93	1426.22	0.07
5.50	1428.38	5589.09	1428.38	0.00
6.00	1430.58	5597.71	1430.65	0.08
6.50	1432.75	5605.80	1432.79	0.04
7.00	1434.90	5613.67	1434.87	-0.03
7.50	1437.02	5621.62	1436.97	-0.05
8.00	1439.12	5629.65	1439.09	-0.03
8.50	1441.19	5637.65	1441.20	0.01
9.00	1443.23	5645.05	1443.16	-0.08
9.50	1445.25	5652.71	1445.18	-0.08
10.00	1447.25	5660.59	1447.26	0.01
10.50	1449.22	5668.04	1449.23	0.00
11.00	1451.17	5674.89	1451.04	-0.13
11.50	1453.09	5682.39	1453.02	-0.08
12.00	1454.99	5689.52	1454.90	-0.10
12.50	1456.87	5696.74	1456.81	-0.07
13.00	1458.72	5703.78	1458.66	-0.06
13.50	1460.55	5710.84	1460.53	-0.02
14.00	1462.36	5717.54	1462.30	-0.06
14.50	1464.14	5724.32	1464.09	-0.06
15.00	1465.91	5730.92	1465.83	-0.07
15.50	1467.65	5737.60	1467.60	-0.05
16.00	1469.36	5744.10	1469.31	-0.05
16.50	1471.06	5750.29	1470.95	-0.11
17.00	1472.73	5756.75	1472.65	-0.08
17.50	1474.38	5763.30	1474.38	0.00
18.00	1476.01	5769.27	1475.96	-0.05
18.50	1477.62	5775.26	1477.54	-0.08
19.00	1479.21	5781.39	1479.16	-0.05
19.50	1480.77	5787.21	1480.70	-0.07
20.00	1482.32	5793.23	1482.29	-0.03
20.50	1483.84	5798.74	1483.74	-0.10
21.00	1485.35	5804.79	1485.34	-0.01
21.50	1486.83	5810.19	1486.76	-0.06
22.00	1488.29	5816.27	1488.37	0.08
22.50	1489.74	5821.75	1489.82	0.08
23.00	1491.16	5827.19	1491.25	0.09
23.50	1492.56	5832.23	1492.59	0.02
24.00	1493.95	5837.69	1494.03	0.08
24.50	1495.32	5842.95	1495.42	0.10
25.00	1496.66	5848.02	1496.75	0.09
25.50	1497.99	5853.17	1498.11	0.13
26.00	1499.30	5858.12	1499.42	0.12
26.50	1500.59	5862.95	1500.70	0.11
27.00	1501.86	5867.79	1501.98	0.12
27.50	1503.11	5872.44	1503.20	0.09
28.00	1504.35	5877.22	1504.47	0.12
28.50	1505.56	5881.75	1505.66	0.10
29.00	1506.76	5886.28	1506.86	0.10
29.50	1507.94	5890.88	1508.07	0.13
30.00	1509.10	5895.29	1509.24	0.13



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

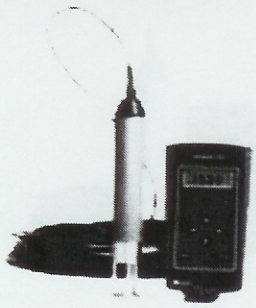
Date:
Feb 29, 2008

Serial #:
98376-022908

DIGIBAR CALIBRATION REPORT

version 1.0 (c) 2004

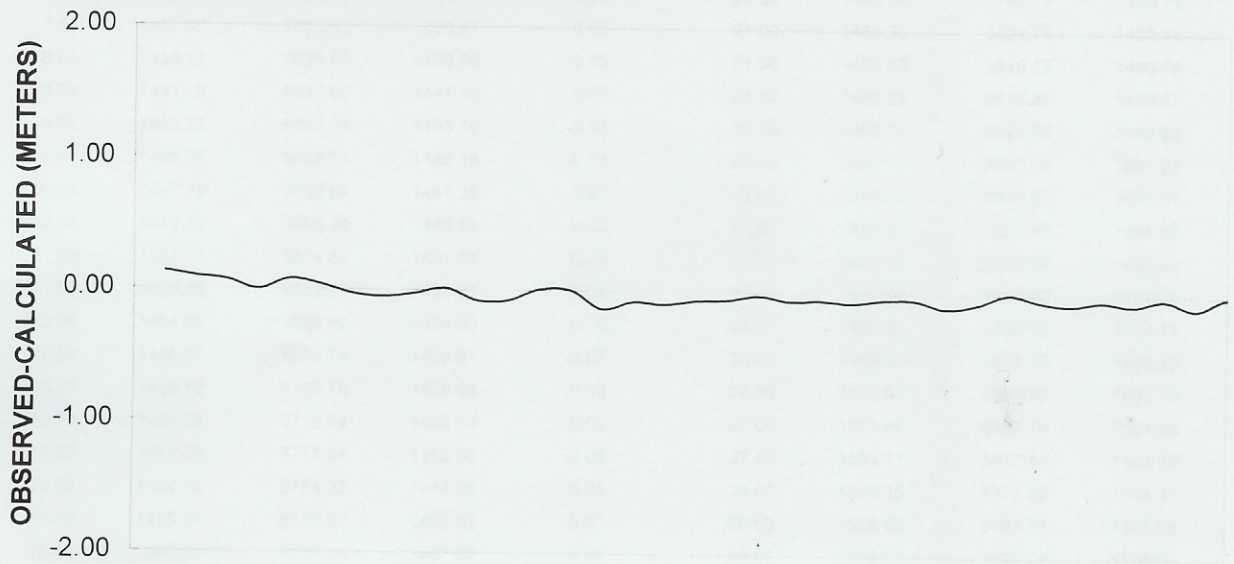
ODOM HYDROGRAPHIC SYSTEMS, Inc.



Burn these numbers to EPROM:

Gradient	**3381**
Intercept	**476**

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: 02/04/2008

ASCII file: C:\velocity\CONFIG\4677.con

Configuration report for SBE 19 Seacat plus CTD

Pressure sensor type : Strain Gauge
External voltage channels : 0
Mode : Profile
Scans to average : 1
Surface PAR voltage added : No
NMEA position data added : No

1) Count, Temperature

Serial number : 4677
Calibrated on : 05-Jan-08
A0 : 1.18631100e-003
A1 : 2.64973600e-004
A2 : 1.41867800e-007
A3 : 1.35048400e-007
Slope : 1.00000000
Offset : 0.0000

2) Frequency 0, Conductivity

Serial number : 4677
Calibrated on : 05-Jan-08
G : -1.05477900e+000
H : 1.39058700e-001
I : -2.37255200e-004
J : 3.43679200e-005
CTcor : 3.2500e-006
CPcor : -9.57000000e-008
Slope : 1.00000000
Offset : 0.00000

3) Count, Pressure, Strain Gauge

Serial number : 4677
Calibrated on : 31-Dec-07
PA0 : -9.86010600e-002
PA1 : 1.55042700e-003
PA2 : 8.16142200e-012
PTEMPA0 : -7.87512800e+001
PTEMPA1 : 4.77750700e+001
PTEMPA2 : -2.52930100e-001
PTCA0 : 5.15179900e+005
PTCA1 : -1.28514700e+000
PTCA2 : -8.07011900e-002
PTCB0 : 2.42928700e+001
PTCB1 : -6.25000000e-004

PTCB2 : 0.00000000e+000
Offset : 0.000000

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

Conductivity Calibration Report

Customer:	NOAA-NAVIGATION RESPONSE BRANCH		
Job Number:	49076	**Date of Report:**	1/7/2008
Model Number	SBE 19Plus	**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: 1/5/2008 Drift since last cal: -0.00050 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.

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: 05-Jan-08

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

COEFFICIENTS:

```
g = -1.054779e+000
h =  1.390587e-001
i = -2.372552e-004
j =  3.436792e-005

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

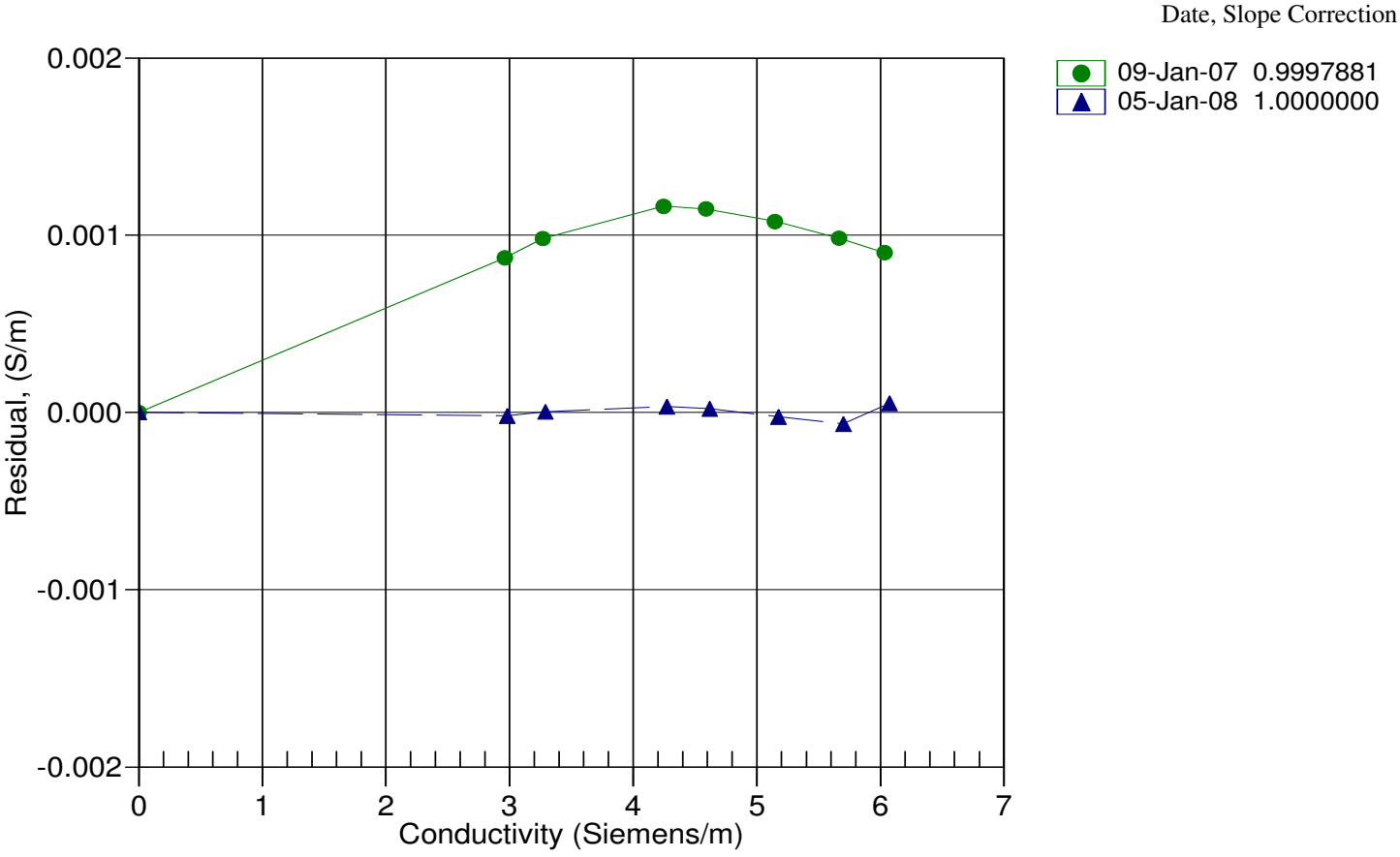
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2758.01	0.0000	0.00000
1.0000	34.8805	2.98093	5392.60	2.9809	-0.00002
4.5000	34.8606	3.28849	5593.78	3.2885	0.00000
14.9999	34.8171	4.27169	6192.51	4.2717	0.00003
18.4999	34.8075	4.61732	6389.41	4.6173	0.00002
23.9999	34.7965	5.17600	6695.15	5.1760	-0.00002
29.0000	34.7902	5.69852	6968.67	5.6985	-0.00006
32.5000	34.7854	6.07121	7157.27	6.0713	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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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: 31-Dec-07

SBE19plus PRESSURE CALIBRATION DATA
508 psia S/N 6135

COEFFICIENTS:

PA0 =	-9.860106e-002	PTCA0 =	5.151799e+005
PA1 =	1.550427e-003	PTCA1 =	-1.285147e+000
PA2 =	8.161422e-012	PTCA2 =	-8.070119e-002
PTEMPA0 =	-7.875128e+001	PTCB0 =	2.429287e+001
PTEMPA1 =	4.777507e+001	PTCB1 =	-6.250000e-004
PTEMPA2 =	-2.529301e-001	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE PSIA	INST OUTPUT	THERMISTOR OUTPUT	COMPUTED PRESSURE	ERROR %FSR
14.89	524774.0	2.1	14.88	-0.00
100.19	579741.0	2.1	100.18	-0.00
200.18	644139.0	2.1	200.18	-0.00
300.19	708492.0	2.1	300.18	-0.00
400.20	772806.0	2.1	400.18	-0.00
500.20	837089.0	2.1	500.21	0.00
300.20	708516.0	2.1	300.21	0.00
200.20	644156.0	2.1	200.21	0.00
100.21	579767.0	2.1	100.22	0.00
14.89	524784.0	2.1	14.90	0.00

THERMAL CORRECTION

TEMP ITS90	THERMISTOR OUTPUT	INST OUTPUT
32.50	2.36	524421.56
29.00	2.28	524438.64
24.00	2.18	524462.89
18.50	2.06	524495.80
15.00	1.98	524512.05
4.50	1.76	524536.73
1.00	1.68	524536.27

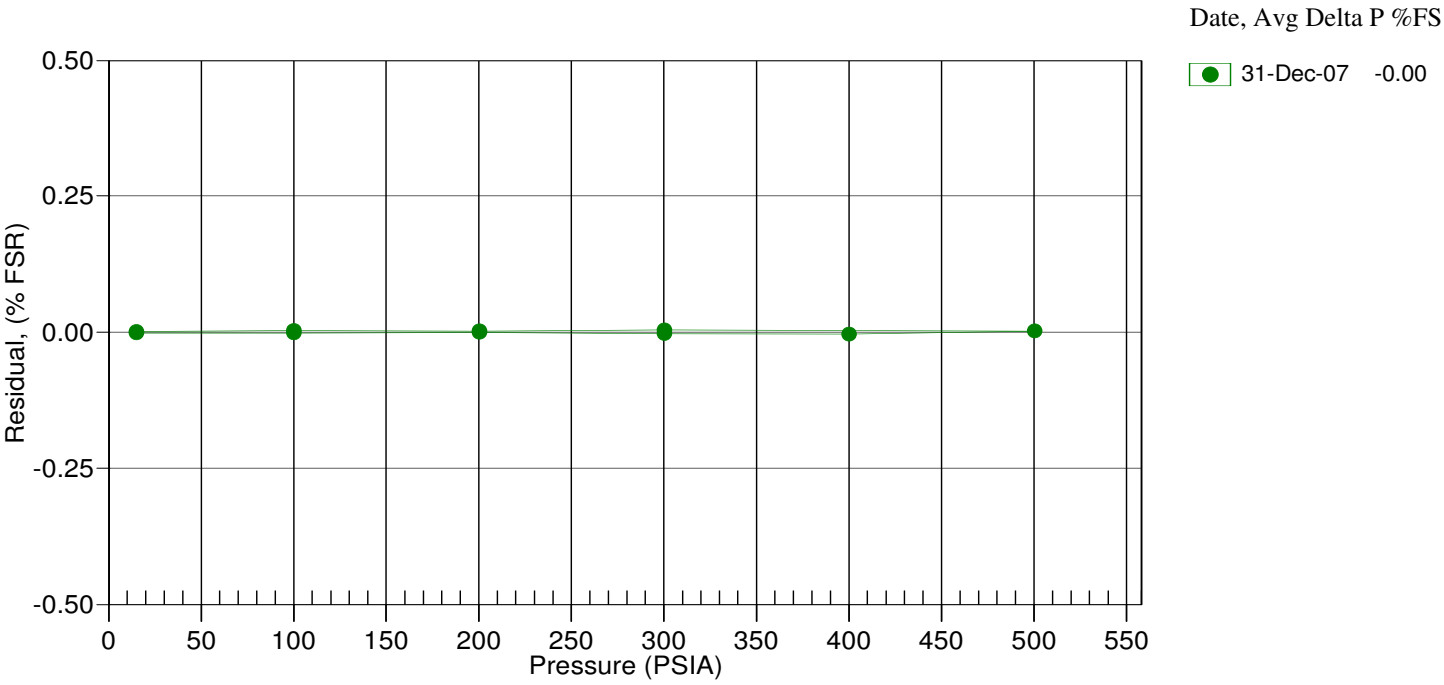
TEMP(ITS90)	SPAN(mV)
-5.00	24.30
35.00	24.27

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

SENSOR SERIAL NUMBER: 4677
CALIBRATION DATE: 05-Jan-08

SBE19plus TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = 1.186311e-003
a1 = 2.649736e-004
a2 = 1.418678e-007
a3 = 1.350484e-007

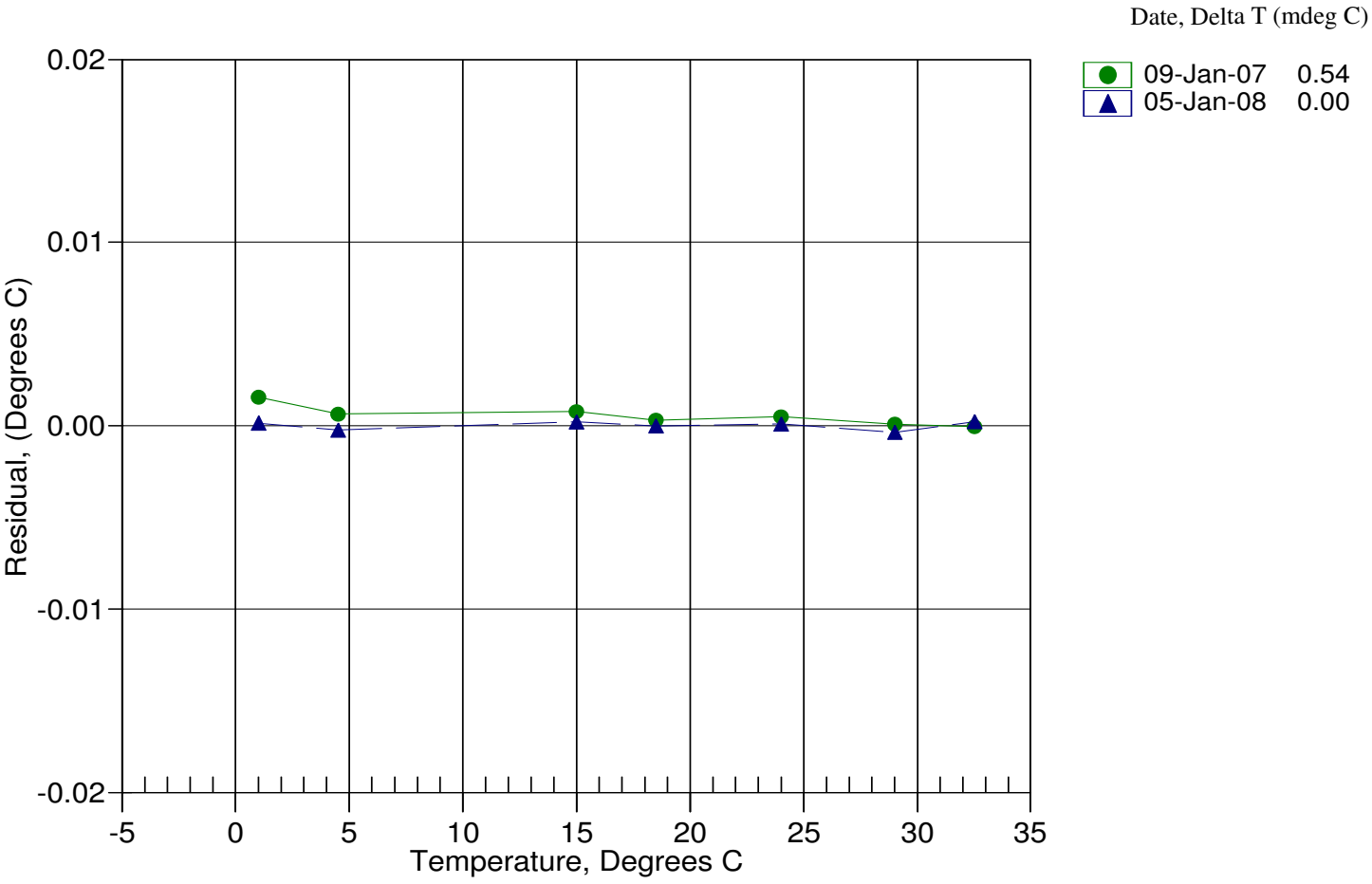
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT(n)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	693753.803	1.0001	0.0001
4.5000	620471.045	4.4998	-0.0002
14.9999	435201.788	15.0001	0.0002
18.4999	384593.091	18.4999	-0.0000
23.9999	315248.924	24.0000	0.0001
29.0000	261956.591	28.9996	-0.0004
32.5000	229533.288	32.5002	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



SEA-BIRD ELECTRONICS, INC.

1808 - 136th Place Northeast, Bellevue, Washington 98005 USA

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Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	05M0684
Model Number	SBE 05M

Services Requested:

1. Evaluate/Repair Instrumentation.

Problems Found:

Services Performed:

1. Performed initial diagnostic evaluation.

Special Notes:

SEA-BIRD ELECTRONICS, INC.

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

Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	19P37217-4677
Model Number	SBE 19Plus

Services Requested:

1. Evaluate/Repair Instrumentation.
2. Perform Routine Calibration Service.

Problems Found:

1. PN 17080 cable has an intermittent open in the pump end and requires replacement.

Services Performed:

1. Performed initial diagnostic evaluation.
2. Performed "Post Cruise" calibration of the temperature & conductivity sensors.
3. Calibrated the pressure sensor.
4. Installed NEW two pin to two pin cable, 15"
5. Performed complete system check and full diagnostic evaluation.

Special Notes:

SEA-BIRD ELECTRONICS, INC.

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Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	05M0684
Model Number	SBE 05M

Services Requested:

1. Evaluate/Repair Instrumentation.

Problems Found:

Services Performed:

1. Performed initial diagnostic evaluation.

Special Notes:

SEA-BIRD ELECTRONICS, INC.

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Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	19P37217-4677
Model Number	SBE 19Plus

Services Requested:

1. Evaluate/Repair Instrumentation.
2. Perform Routine Calibration Service.

Problems Found:

1. PN 17080 cable has an intermittent open in the pump end and requires replacement.

Services Performed:

1. Performed initial diagnostic evaluation.
2. Performed "Post Cruise" calibration of the temperature & conductivity sensors.
3. Calibrated the pressure sensor.
4. Installed NEW two pin to two pin cable, 15"
5. Performed complete system check and full diagnostic evaluation.

Special Notes:

SURFACE SOUND SPEED DQA

Surface sound speed instrument Serial Number: DB98376
Surface sound speed instrument Depth (m): 7.8
Surface sound speed Instrument reading (m/sec): 1460.9

Full profile sound speed at same depth (m/sec): 1462.8

DAILY DQA - SURFACE SOUND SPEED COMPARISON - TEST PASSED - Diff in sound speed <= 2 m/sec

Log file \VELOCITY\SVFILES\2008__HSRR.DQA has been updated in detail.

NOTE: All sound speed differences > 1 m/sec should be noted and tracked.

OK

SEA-BIRD ELECTRONICS, INC.
1808 - 136th Place Northeast, Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Temperature Calibration Report

Customer:	NOAA-NAVIGATION RESPONSE BRANCH		
Job Number:	49076	**Date of Report:**	1/7/2008
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: 1/5/2008 Drift since last cal: -0.00054 Degrees Celsius/year

Comments:

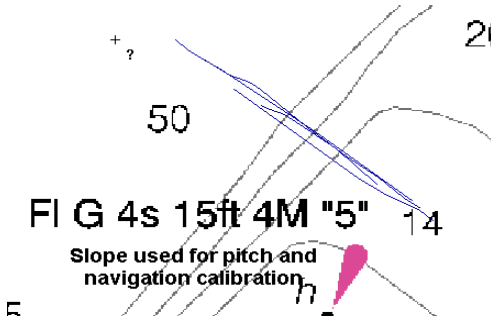
'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: Degrees Celsius/year

Comments:

Sonar	Reson 7125
Serial Number	
Date	March 24, 2008 (DN 084),
Sonar Installation	November 2006
Location	Patuxent River, Fishing Point
Personnel	Davidson, Mowery, Pradith
Weather	Wind WNW, Seas 1ft

Nav Timing 0



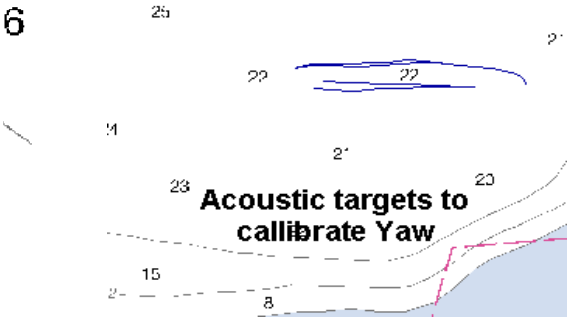
MULTIBEAM CALIBRATION

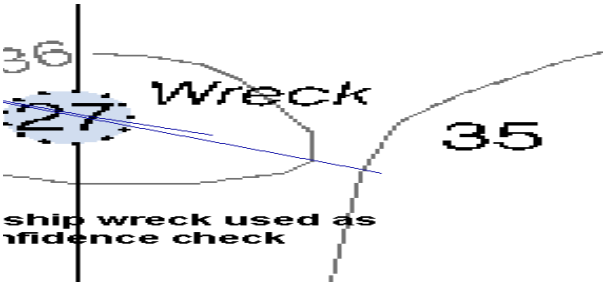
Line	Az	Bias	Speed	
051_1421	127.38	Pitch	3	
051_1426	307.38	Pitch	3	
051_1430	127.38	nav Time		
051_1434	307.38	Pitch (redo)		
052_1443	319.27	roll		
051_1453	319.27	roll		
052_1502	139.2	roll		
056_1524	90	yaw		
013_1528	271	yaw		

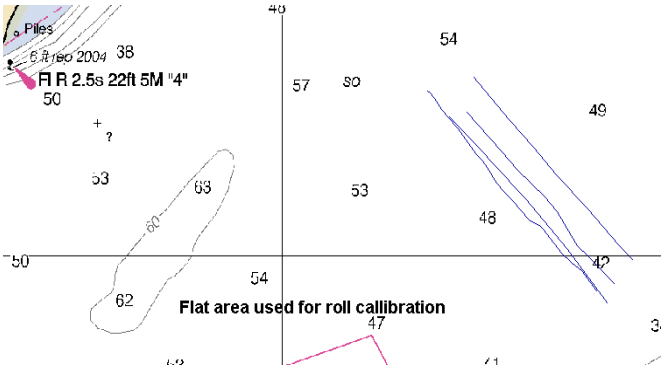
DYNAMIC DRAFT

Line	Az	Speed	RPM	
017_1610	78.62	1.73	400 (stbd only)	
017_1645	81	3	400 (stbd only)	
017_1707	261	3.3	400 (port and stbd)	
017_1714	81	3.73	400 (port and stbd)	
017_1721	261	3.95	600 (port &stbd)	
017_1727	81	4.75	600 (port &stbd)	
017_1734	261	5.27	800 (port & stbd)	
017_1738	81	5.7	800 (port & stbd)	
017_1743				
008_1837	205	0.8	0	TGT_C (east end of line)
008_1843	359	0.8	0	TGT_B (center of line)
008_1849	264	0.8	0	TGT_A (west of line)

Pitch	Roll	Yaw
2.7	-0.91	0.15







Date: 02/04/2008

ASCII file: C:\velocity\CONFIG\4677.con

Configuration report for SBE 19 Seacat plus CTD

Pressure sensor type : Strain Gauge
External voltage channels : 0
Mode : Profile
Scans to average : 1
Surface PAR voltage added : No
NMEA position data added : No

1) Count, Temperature

Serial number : 4677
Calibrated on : 05-Jan-08
A0 : 1.18631100e-003
A1 : 2.64973600e-004
A2 : 1.41867800e-007
A3 : 1.35048400e-007
Slope : 1.00000000
Offset : 0.0000

2) Frequency 0, Conductivity

Serial number : 4677
Calibrated on : 05-Jan-08
G : -1.05477900e+000
H : 1.39058700e-001
I : -2.37255200e-004
J : 3.43679200e-005
CTcor : 3.2500e-006
CPcor : -9.57000000e-008
Slope : 1.00000000
Offset : 0.00000

3) Count, Pressure, Strain Gauge

Serial number : 4677
Calibrated on : 31-Dec-07
PA0 : -9.86010600e-002
PA1 : 1.55042700e-003
PA2 : 8.16142200e-012
PTEMPA0 : -7.87512800e+001
PTEMPA1 : 4.77750700e+001
PTEMPA2 : -2.52930100e-001
PTCA0 : 5.15179900e+005
PTCA1 : -1.28514700e+000
PTCA2 : -8.07011900e-002
PTCB0 : 2.42928700e+001
PTCB1 : -6.25000000e-004

PTCB2 : 0.00000000e+000
Offset : 0.000000

Date: 02/04/2008

ASCII file: C:\velocity\CONFIG\4677.con

Configuration report for SBE 19 Seacat plus CTD

Pressure sensor type : Strain Gauge
External voltage channels : 0
Mode : Profile
Scans to average : 1
Surface PAR voltage added : No
NMEA position data added : No

1) Count, Temperature

Serial number : 4677
Calibrated on : 05-Jan-08
A0 : 1.18631100e-003
A1 : 2.64973600e-004
A2 : 1.41867800e-007
A3 : 1.35048400e-007
Slope : 1.00000000
Offset : 0.0000

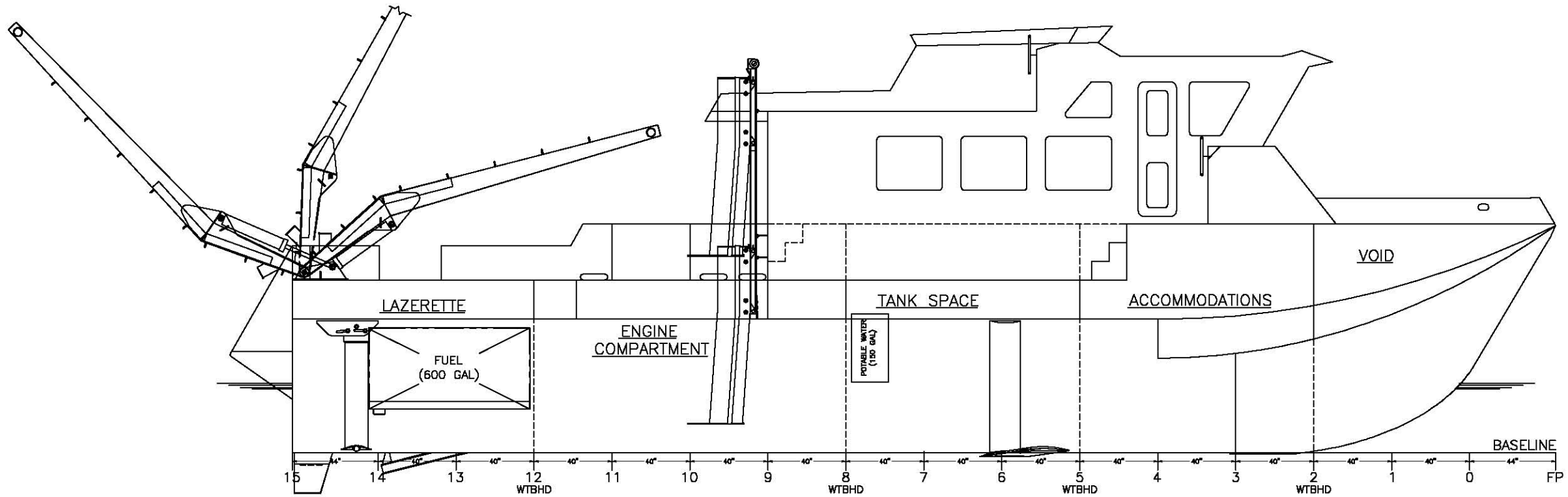
2) Frequency 0, Conductivity

Serial number : 4677
Calibrated on : 05-Jan-08
G : -1.05477900e+000
H : 1.39058700e-001
I : -2.37255200e-004
J : 3.43679200e-005
CTcor : 3.2500e-006
CPcor : -9.57000000e-008
Slope : 1.00000000
Offset : 0.00000

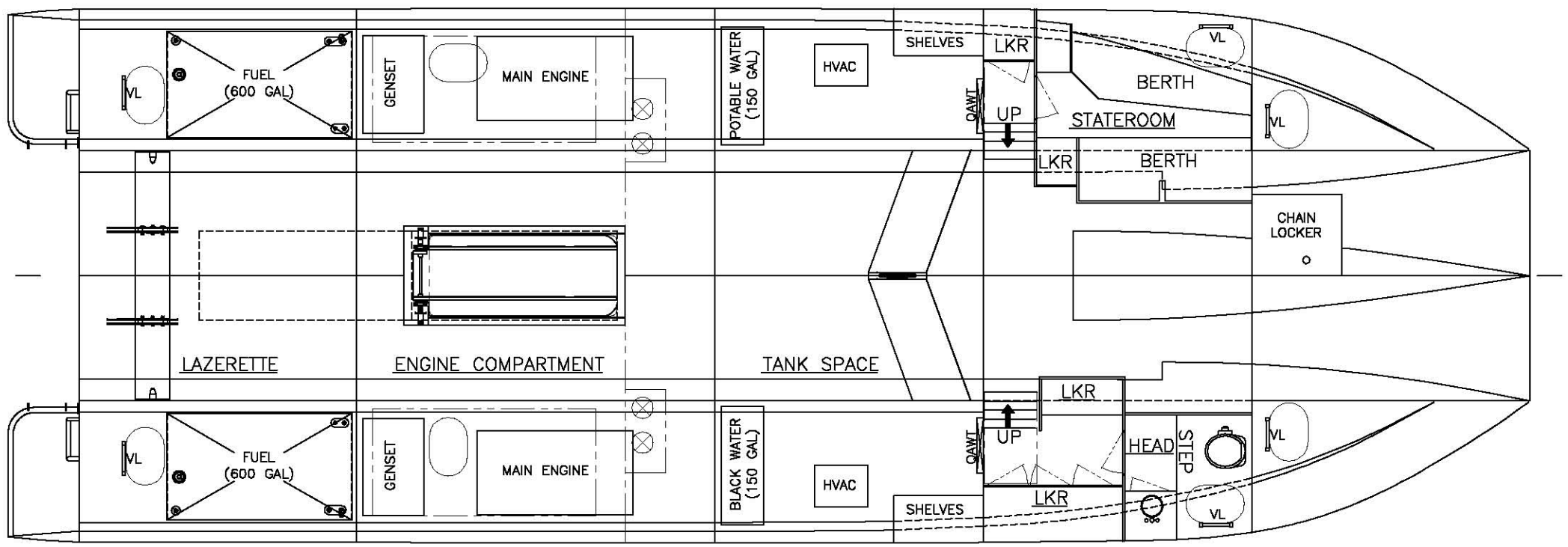
3) Count, Pressure, Strain Gauge

Serial number : 4677
Calibrated on : 31-Dec-07
PA0 : -9.86010600e-002
PA1 : 1.55042700e-003
PA2 : 8.16142200e-012
PTEMPA0 : -7.87512800e+001
PTEMPA1 : 4.77750700e+001
PTEMPA2 : -2.52930100e-001
PTCA0 : 5.15179900e+005
PTCA1 : -1.28514700e+000
PTCA2 : -8.07011900e-002
PTCB0 : 2.42928700e+001
PTCB1 : -6.25000000e-004

PTCB2 : 0.00000000e+000
Offset : 0.000000



INBOARD PROFILE



HOLD PLAN

0 1 2 3 4 5 6 7 8 9 10 11 12

Kvichak Marine Industries, Inc.

54' SURVEY VESSEL

GENERAL ARRANGEMENT

DWG 5463-110-001 REV A | PAGE 3 OF 3 | SCALE 1/4"=1'-0"

****

Center for Operational Oceanographic Products and Services Data Disclaimer

These preliminary data have not been subjected to the National Ocean Service's (NOS) Quality Control procedures, and do not necessarily meet the criteria and standards of official NOS data. They are released for limited public use with appropriate caution.

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Preliminary Acoustic Water Level Data (A1)

Station -- Unique seven character identifier for the station
D -- A one character identifier for the data collection platform (DCP) at a station
SE -- A two character identifer for the data sensor
Date Time -- Date and time the data were collected by the DCP
WL -- Water level height
Sigma -- Standard deviation of 1 second samples used to compute the water level height
O -- Count of number of samples that fall outside a 3-sigma band about the mean
F -- A flag that when set to 1 indicates that the flat tolerance limit was exceeded
R -- A flag that when set to 1 indicates that the rate of change tolerance limit was exceeded
T -- A flag that when set to 1 indicates that the temperature difference tolerance limit was exceeded
L -- A flag that when set to 1 indicates that either the maximum or minimum expected water level height limit was exceeded

Data are in Meters above MLLW
Times are on UTC (GMT)

8577330 Solomons Island , MD from 20080409 to 20080409
Click HERE for further station information.

Station	D	SE	Date	Time	WL	Sigma	O	F	R	T	L
8577330	1	A1	2008/04/09	00:00	0.468	0.003	0	0	0	0	0
8577330	1	A1	2008/04/09	00:06	0.460	0.003	2	0	0	0	0
8577330	1	A1	2008/04/09	00:12	0.447	0.002	5	0	0	0	0
8577330	1	A1	2008/04/09	00:18	0.436	0.002	2	0	0	0	0
8577330	1	A1	2008/04/09	00:24	0.425	0.002	0	0	0	0	0
8577330	1	A1	2008/04/09	00:30	0.414	0.002	1	0	0	0	0
8577330	1	A1	2008/04/09	00:36	0.404	0.002	1	0	0	0	0
8577330	1	A1	2008/04/09	00:42	0.393	0.003	0	0	0	0	0
8577330	1	A1	2008/04/09	00:48	0.382	0.002	4	0	0	0	0

8577330 1 A1 2008/04/09 00:54 0.374 0.002 2 0 0 0 0
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8577330 1 A1 2008/04/09 01:06 0.357 0.002 1 0 0 0 0
8577330 1 A1 2008/04/09 01:12 0.350 0.002 3 0 0 0 0
8577330 1 A1 2008/04/09 01:18 0.342 0.002 4 0 0 0 0
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8577330 1 A1 2008/04/09 01:42 0.320 0.001 3 0 0 0 0
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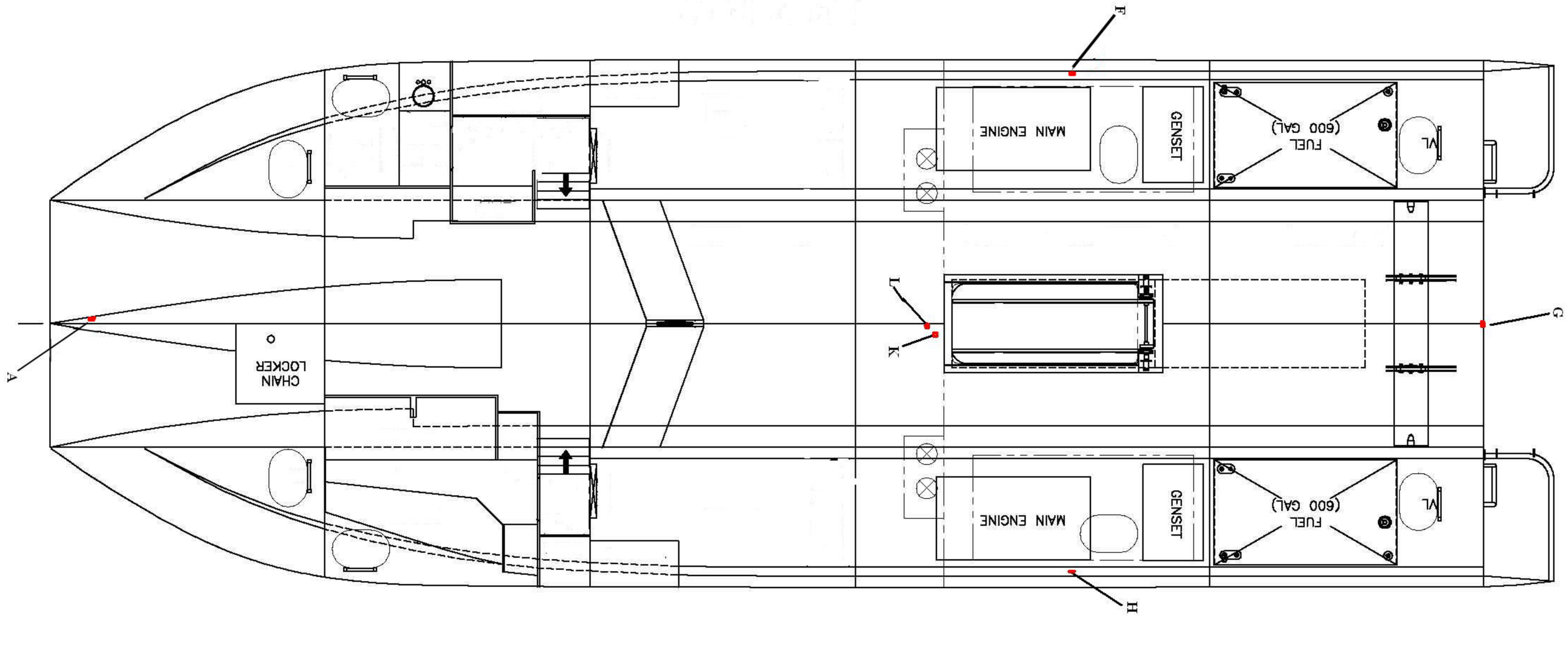
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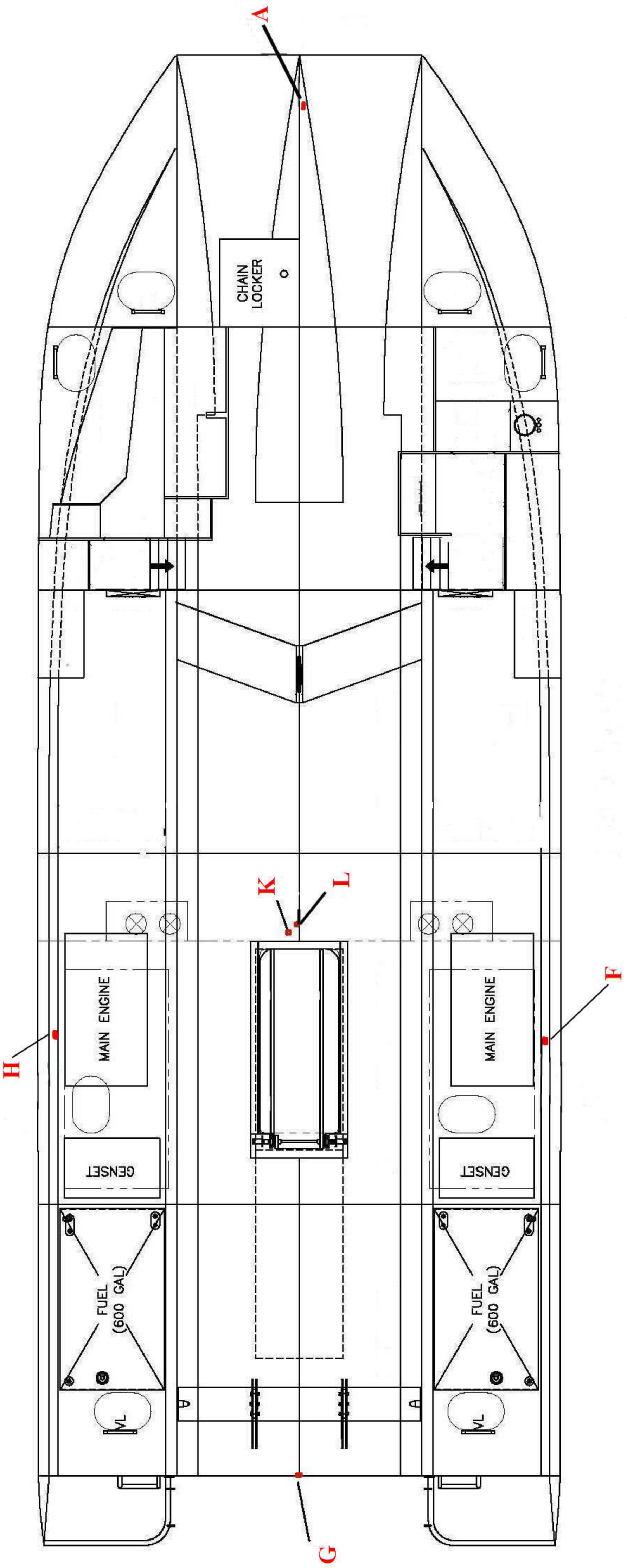
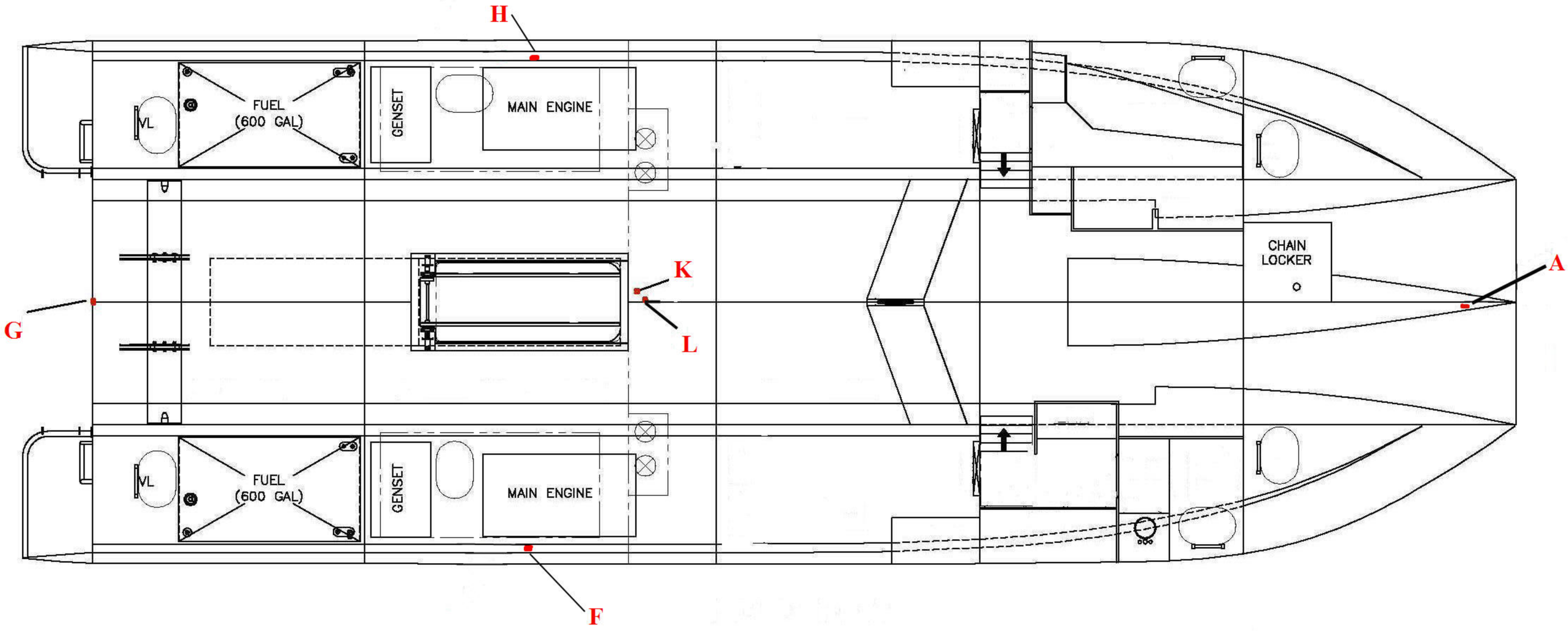
MAIN ENGINE
GENSET
FUEL
(600 GAL)
WL
A
G
L
K
A
CHAIN
LOCKER
MAIN ENGINE
GENSET
FUEL
(600 GAL)
WL
H


A
CHAIN LOCKER
K
L
F
H
MAIN ENGINE
MAIN ENGINE
GENSET
GENSET
FUEL (600 GAL)
FUEL (600 GAL)
VL
VL
G


H
FUEL
(600 GAL)
VL
GENSET
MAIN ENGINE
CHAIN
LOCKER
A
K
L
G
FUEL
(600 GAL)
VL
GENSET
MAIN ENGINE
F

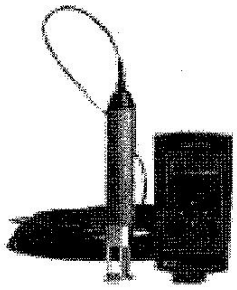
Date:
Jan 20, 2010

Serial #:
98376-012010

DIGIBAR CALIBRATION REPORT

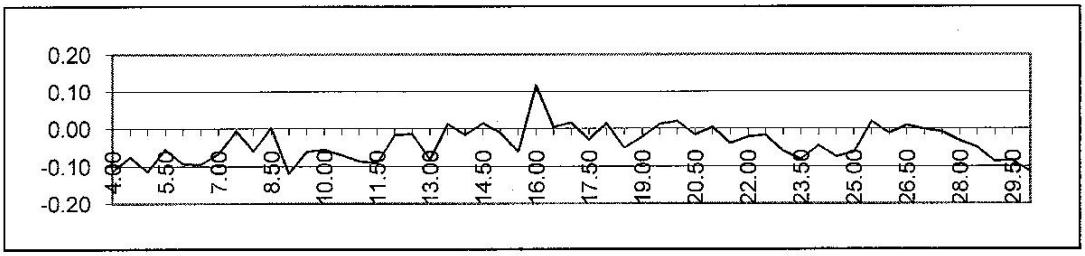
version 1.0 (c) 2004

ODOM HYDROGRAPHIC SYSTEMS, Inc.



STANDARD DEL GROSSO H^2O

TEMP	VELOCITY	MEASURED FREQUENCY	RES_VEL	OBS-CAL
4.00	1421.62	5555.31	1421.51	-0.11
4.50	1423.90	5564.19	1423.83	-0.07
5.00	1426.15	5572.67	1426.04	-0.11
5.50	1428.38	5581.42	1428.32	-0.05
6.00	1430.58	5589.70	1430.49	-0.09
6.50	1432.75	5598.02	1432.66	-0.09
7.00	1434.90	5606.35	1434.83	-0.07
7.50	1437.02	5614.71	1437.01	-0.01
8.00	1439.12	5622.54	1439.06	-0.06
8.50	1441.19	5630.71	1441.19	0.00
9.00	1443.23	5638.08	1443.12	-0.12
9.50	1445.25	5646.04	1445.19	-0.06
10.00	1447.25	5653.71	1447.20	-0.06
10.50	1449.22	5661.21	1449.15	-0.07
11.00	1451.17	5668.61	1451.09	-0.09
11.50	1453.09	5675.96	1453.00	-0.09
12.00	1454.99	5683.52	1454.98	-0.02
12.50	1456.87	5690.72	1456.86	-0.01
13.00	1458.72	5697.56	1458.64	-0.08
13.50	1460.55	5704.93	1460.57	0.01
14.00	1462.36	5711.74	1462.35	-0.02
14.50	1464.14	5718.69	1464.16	0.01
15.00	1465.91	5725.34	1465.90	-0.01
15.50	1467.65	5731.81	1467.58	-0.06
16.00	1469.36	5739.07	1469.48	0.12
16.50	1471.06	5745.13	1471.06	0.01
17.00	1472.73	5751.58	1472.75	0.02
17.50	1474.38	5757.73	1474.35	-0.03
18.00	1476.01	5764.14	1476.02	0.01
18.50	1477.62	5770.05	1477.57	-0.05
19.00	1479.21	5776.24	1479.18	-0.02
19.50	1480.77	5782.37	1480.78	0.01
20.00	1482.32	5788.32	1482.34	0.02
20.50	1483.84	5794.02	1483.83	-0.02
21.00	1485.35	5799.86	1485.35	0.00
21.50	1486.83	5805.38	1486.79	-0.04
22.00	1488.29	5811.05	1488.27	-0.02
22.50	1489.74	5816.60	1489.72	-0.02
23.00	1491.16	5821.89	1491.10	-0.06
23.50	1492.56	5827.19	1492.48	-0.08
24.00	1493.95	5832.63	1493.90	-0.04
24.50	1495.32	5837.75	1495.24	-0.07
25.00	1496.66	5842.95	1496.60	-0.06
25.50	1497.99	5848.35	1498.01	0.02
26.00	1499.30	5853.24	1499.29	-0.01
26.50	1500.59	5858.26	1500.60	0.01
27.00	1501.86	5863.09	1501.86	0.00
27.50	1503.11	5867.86	1503.10	-0.01
28.00	1504.35	5872.50	1504.31	-0.03
28.50	1505.56	5877.09	1505.51	-0.05
29.00	1506.76	5881.54	1506.67	-0.09
29.50	1507.94	5886.07	1507.86	-0.08
30.00	1509.10	5890.41	1508.99	-0.11



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

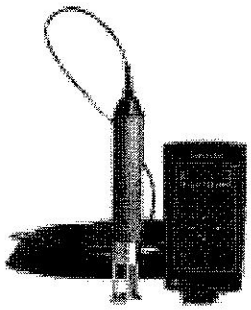
Date:
Jan 20, 2010

Serial #:
98376-012010

DIGIBAR CALIBRATION REPORT

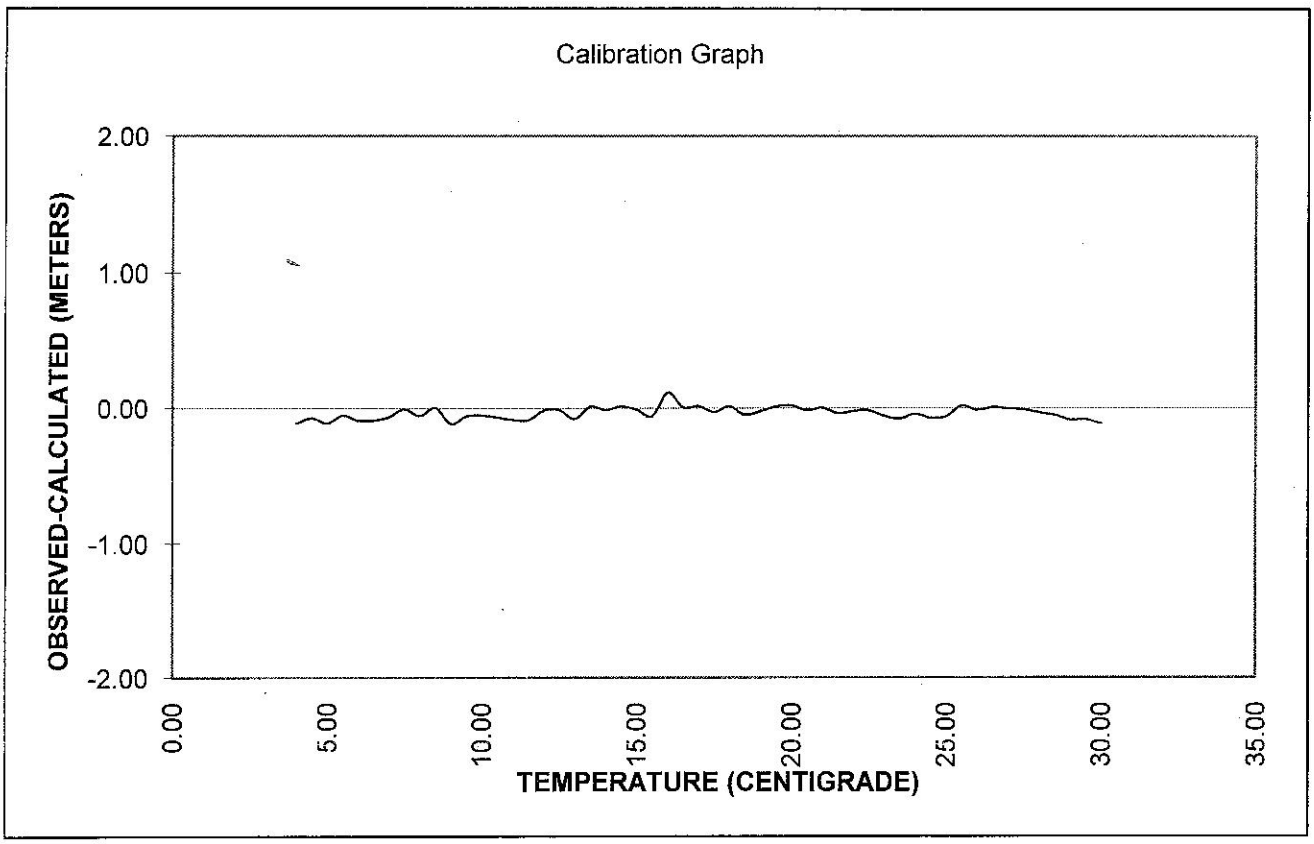
version 1.0 (c) 2004

ODOM HYDROGRAPHIC SYSTEMS, Inc.



Burn these numbers to EPROM:

Gradient	**3342**
Intercept	**288**



The instruments used in this calibration have been calibrated to the published manufacturer specifications using standards traceable to NIST, to consensus standards, to ratio methods, or to acceptable values of natural physical constants that meets the requirements of ANSI/NCSL Z540-1, ISO 9001, ISO 10012 and ISO 17025. Certificate/traceability numbers: 0002-2655.00-23491-001, 0002-2655.00-23491-002. ID#'s:294,295,762,172,56

Odom Hydrographic Systems, Inc.
1450 SeaBoard Avenue, Baton Rouge, Louisiana 70810-6261, USA
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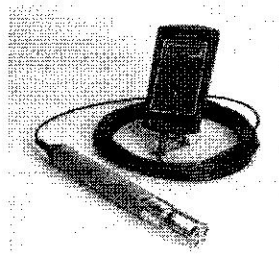
TELEDYNE
ODOM HYDROGRAPHIC
A Teledyne Technologies Company

Digibar



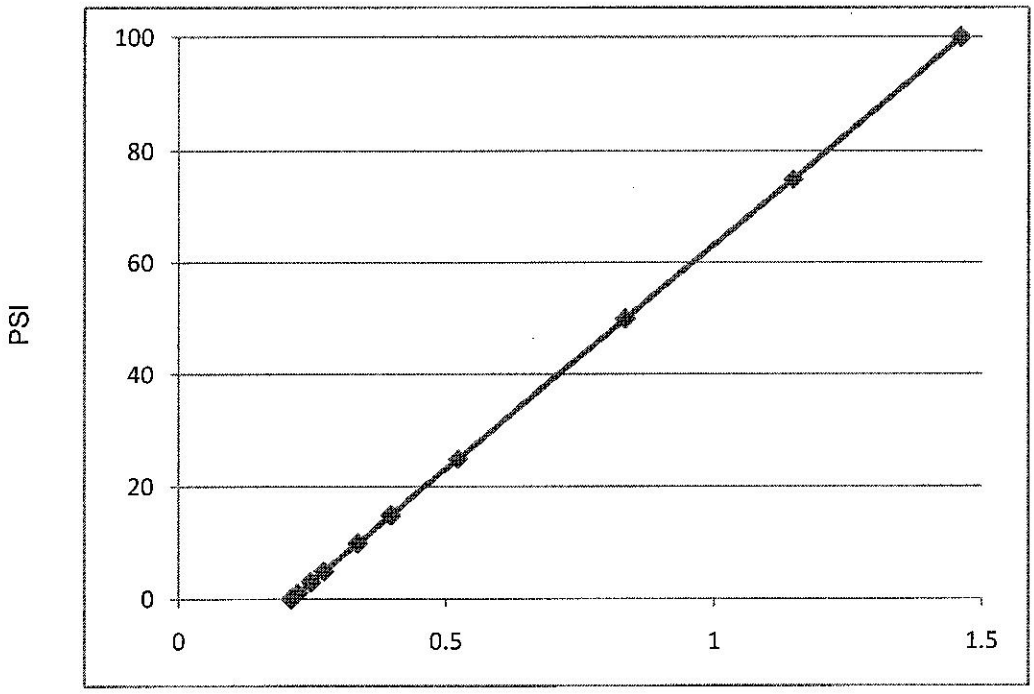
Date	1/27/2010
Serial #	98376
SW Version	1.08
Cable Length	20m

Press Transducer	71054
Zero Voltage	.21
Span Volage	2.71
Mid-Scale Voltage	1.46
R5	3.9K
R9	10K
Gradient	3342
Intercept	288

Max psi:	200psi
Velocity Check:	√
Depth Check:	√
Communications:	√
External Power:	NA

Board Identification	Serial #
Power Supply	
Control PCB	
LCD	
Probe Sensor	
Probe Controller	
Airmar Transducer	1557603

Pressure Transducer Linearity



Transducer Linearity	
PSI	DVM@L1
0	0.21
1	0.223
3	0.247
5	0.272
10	0.335
15	0.397
25	0.522
50	0.834
75	1.147
100	1.46

***R/V Bay Hydro II* (S5401)**
Dynamic Draft Determination 2010
LTjg Megan R. Guberski, ZT Robert Mowery, ERT Nichole Trenhoml
Performed: 2 March 2010 (Julian Day 061)

Background:

The Echosounder method was used to determine the dynamic draft for the *R/V Bay Hydro II* for the 2010 field season. The Echosounder method is described in the FPM section 1.4.2.1.2.1 and is adapted from a traditional practice whereby successive lines were run over a flat bottom at different speeds and the change in measured depth is recorded.

Location, Dat, and Personnel:

Data was acquired on the 2 March 2010 (Julian Day 061) by ZT Robert Mowery. The test was conducted at the Pinner Point Terminal in Norfolk, VA

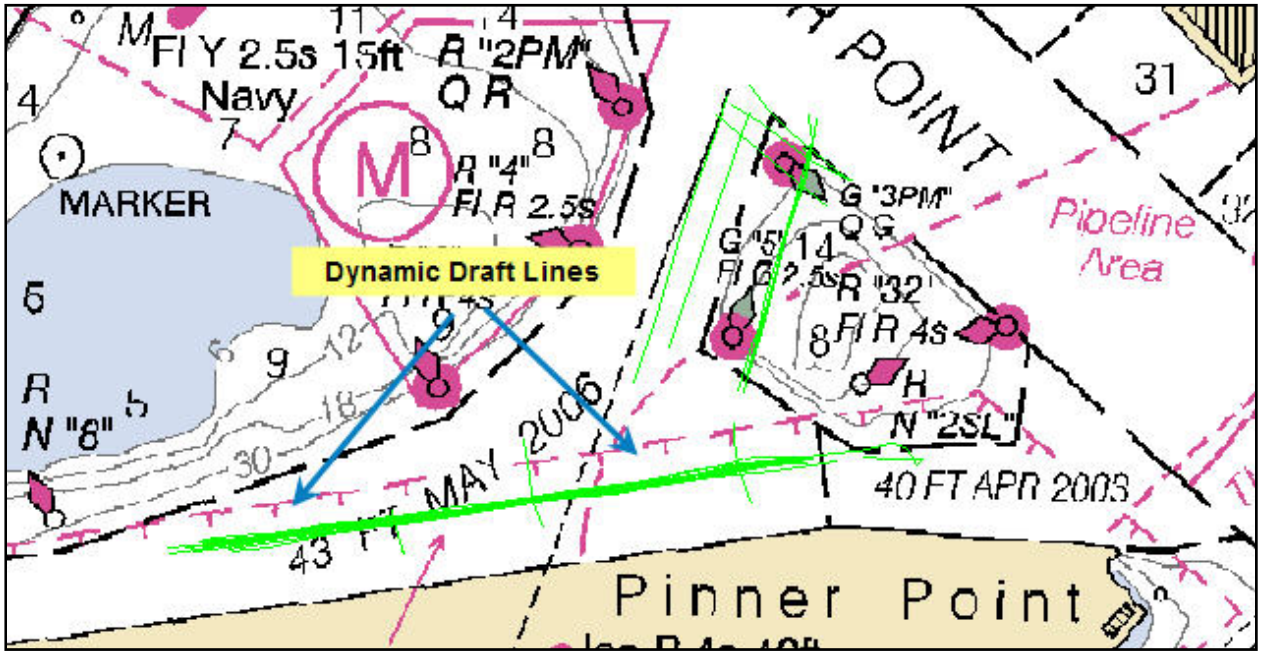


Figure 1: location of dynamic draft (chart 12253)

Process:

A total of 16 1000m lines were run in opposite directions for each of 8 different RPM's on the vessel's main engines. The initial two lines were run using a single engine, in order to maintain the slowest speed possible. The remaining 14 lines were run using both engines. The evolution was completed by acquiring 3 drift lines, run orthogonal to the azimuth of the main lines at . The relative engine RPMs, speed and directions are listed on table 1.

Line	RPM	Speed	Heading
Dyndraft	550 (one engine)	2.6	261
DynDraftA	550 (one engine)	2.8	081
DynDraftB	550	5.5	261
DynDraftC	550	4.6	081
DynDraftD	650	6.2	261
DynDraftF	650	7.1	081
DynDraftH	750	7.0	261
DynDraftI	750	6.5	081
DynDraftJ	850	7.8	261
DynDraftK	850	7.2	081
DynDraftM	950	8.0	261
DynDraftN	950	7.6	081
DynDraftO	1050	8.8	261
DynDraftP	1050	8.1	081
DynDraftR	1150	10.0	261
DynDraftS	1150	10.0	081
DynDraftT	Drift Line		
DynDraftU	Drift Line		
002_1823	Drift Line		

Table 1. characteristics of each line run

All Multibeam data was processed using CARIS HIPS and SIPS 6.1. The data was then analyzed using the following method

- At each intersection between drift line and main line a 20m x 20m subset was defined
- All the soundings inside the subset were queried for depth
- The median depth for lines run at the same RPM were calculated at each of the 3 drift line reference areas.
- The median depth of each drift line was calculated
- The Δdraft at for each line couplet, at each reference region, was calculated by subtracting the lines median depth from the median drift depth.

Chart 1 shows the resulting changes in draft at each of the reference regions.

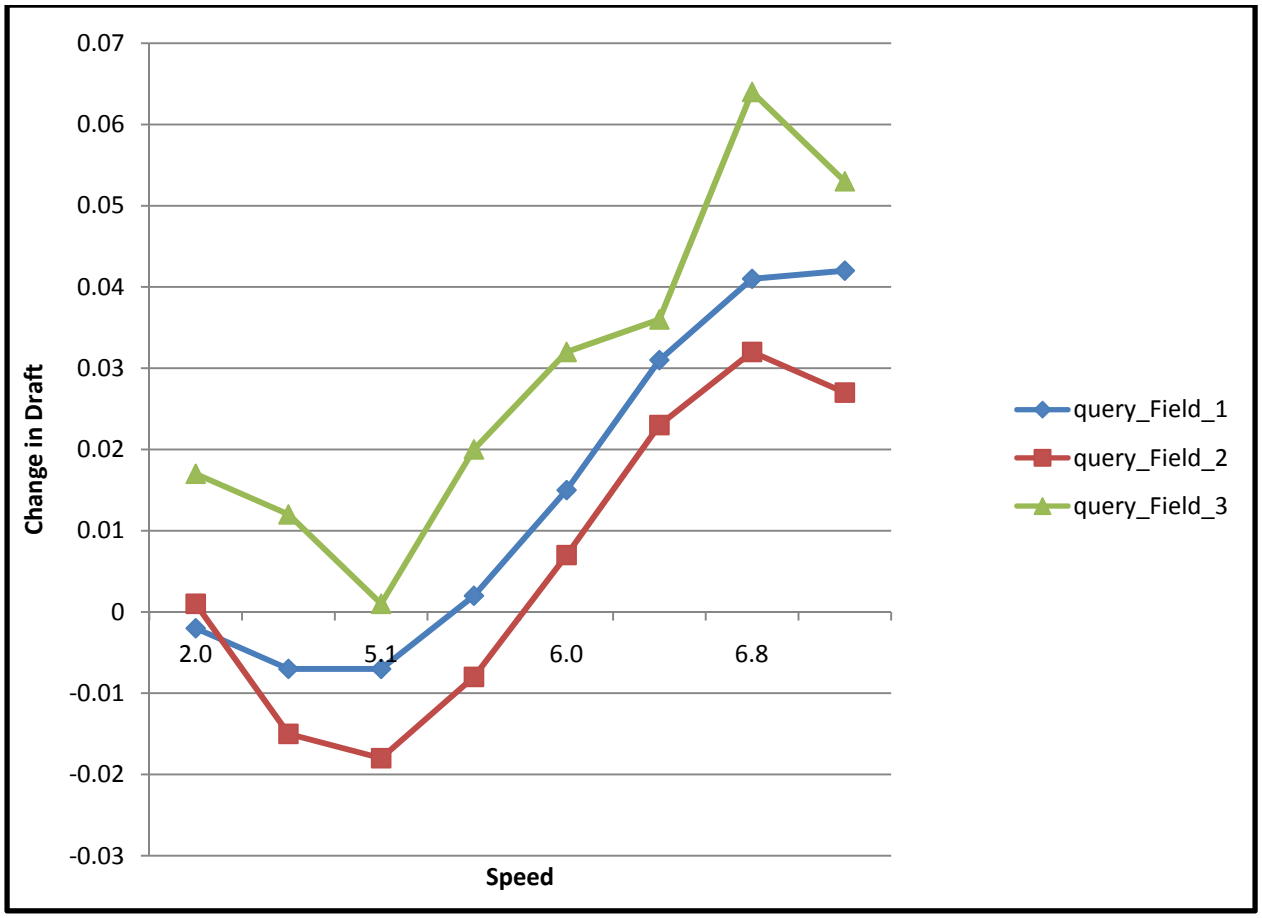


Chart 1. Draft relative to vessel speed at 3 reference areas

Results:

The change in draft at each of the reference areas clearly follow the same curve. Although query-Field_3 has a sharper profile, the variation is less than 4mm. The vessel's HFV was updated using values from query_Field-1.

Lead-Line Calibration
BAY HYDRO II
Date: 17 March 2010
TIME: 0900 hours
LOCATION: Floating pier, Calvert Marina, Solomons, MD
CONDITIONS: Clear skies, ~62^{o}F, winds 0-5 Knots
Lead-Line Identification Number: N/A
Chief of Party: LTJG Megan R. Guberski
Measurer: Robert Mowery (NOAA)
Recorder: Nicole Trenholm (Contractor)

PROCEEDURE

In lieu of a traditional lead-line or a sounding pole, the R/V BAY HYDRO II is equipped with a non-traditional lead-line fabricated from Amsteel® brand line (Amsteel Line is a registered trademark and for the remainder of this paper will be referred to as Amsteel) and an eight inch tall mushroom anchor. The Amsteel is marked in one meter graduations (A in Table I is the one meter graduation converted into feet) that start with the entirety of the anchor being included in the first meter. The non-traditional lead-line was pulled tight and compared to a steel measuring tape with zero on the measuring tape at the lowest most point of the mushroom anchor. The actual measurement at the graduation was recorded in meters and converted to feet (B in Table I); the difference between the graduation and the measured distance was recorded and used as the lead line corrector (C in Table I).

Graduated Markings in Meters	Graduated Markings in Feet (A)	Graduated Markings in Inches	Calibration Measurements in Meters	Calibration Measurements in Feet (B)	Calibration Measurements in Inches	Lead Line Corrector (C=B-A)
1.0	3.281	39.37	0.988	3.241	38.892	-0.04
2.0	6.562	78.74	1.983	6.506	78.072	-0.06
3.0	9.843	118.11	2.872	9.423	113.076	-0.42
4.0	13.12	157.48	3.957	12.982	155.784	-0.14
5.0	16.4	196.85	4.918	16.135	193.62	-0.26
6.0	19.69	236.22	5.892	19.331	231.972	-0.36
7.0	22.97	275.59	6.897	22.628	271.536	-0.34
8.0	26.25	314.96	7.891	25.889	310.668	-0.36
9.0	29.53	354.33	8.873	29.111	349.332	-0.42
10.0	32.81	393.7	9.853	32.326	387.912	-0.48
11.0	36.09	433.07	10.849	35.584	427.008	-0.51
12.0	39.37	472.44	11.833	38.822	465.864	-0.55

Table I: True measurements compared to marked graduations of the non-traditional lead line.

Results

This lead line was newly fabricated on 16 June 2009 by LT Michael C. Davidson. The eight pound mushroom anchor weight was attached to the Amsteel line with a shackle, the entire unit was pulled taught, and the graduations were made in one meter increments using a steal measuring tape by LT Davidson. To add to the precision of the graduations, the line was released from tension, re-pulled tight, and re-measured. Since there was zero deviation between the two sets of graduations, the line was permanently marked at the one meter increments.

Amsteel line was used due to its failure to stretch at low applied forces and its ability to resist salt water degradation. This is not to say that Amsteel does not stretch, it does, but the rate of stretch is ten percent at ten thousand pounds of applied force. The eight pounds of anchor will have a negligible effect on stretch in the line. The graduation marks on the lead-line are made of PVC tape woven into the Amsteel line itself, allowing the graduations to be highly visible for an accurate reading.

The largest discrepancy was found to be 0.042 feet (0.504 inches), with the average discrepancy being 0.330 feet (3.96 inches). This discrepancy is likely due to the fact that the initial measuring instrument that was used during lead line creation was a steel measuring tape in standard graduations. This calibration was conducted using a PVC measuring tape in metric graduations. The use of the metric measuring tape proved to be more accurate considering that there are more graduated markings provided than on a standard measuring tape.

Graduated Markings in Meters	Graduated Markings in Feet (A)	Graduated Markings in Inches	Calibration Measurements in Meters	Calibration Measurements in Feet (B)	Calibration Measurements in Inches	Lead Line Corrector (C=B-A)
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3.0	9.843	118.11	2.872	9.423	113.076	-0.42
4.0	13.12	157.48	3.957	12.982	155.784	-0.14
5.0	16.4	196.85	4.918	16.135	193.62	-0.26
6.0	19.69	236.22	5.892	19.331	231.972	-0.36
7.0	22.97	275.59	6.897	22.628	271.536	-0.34
8.0	26.25	314.96	7.891	25.889	310.668	-0.36
9.0	29.53	354.33	8.873	29.111	349.332	-0.42
10.0	32.81	393.7	9.853	32.326	387.912	-0.48
11.0	36.09	433.07	10.849	35.584	427.008	-0.51
12.0	39.37	472.44	11.833	38.822	465.864	-0.55

U.S. Department of Commerce

National Oceanic & Atmospheric Administration

National Ocean Service

National Geodetic Survey

Observation and Analysis Division

Field Operations Branch

NOAA Vessel – Bay Hydro II
Sensor Components Spatial Relationship Survey
Field Report

H. Stewart Kuper Jr.

March 23, 2009

NOAA Vessel – Bay Hydro II
Sensor Components Spatial Relationship Survey

PURPOSE

The purpose of this survey was to accurately position the Inertial Measuring Unit (IMU), associated components, and sensors on the new NOAA Vessel – Bay Hydro II S5401.

PROJECT DETAILS

This survey was conducted on March 23, 2009 at the OCEAN MARINE YACHT CENTER in Portsmouth, Virginia while the vessel was in dry dock. The weather was clear - sunny, cold, and windy on the day of the survey. This was an original Sensor Components Spatial Relationship Survey. LT Michael Davidson was consulted regarding points to survey. Recoverable benchmarks were established for future use this survey.

INSTRUMENTATION

The TOPCON GPT 3002LW Series Total Station (S/N: 4G0533) was used to make all measurements. The instrument used was in excellent adjustment and had been recently cleaned and calibrated in an authorized shop on March 4, 2009.

A SECO 25 mm Mini Prism System with a 30mm offset was used as target sighting and distance measurements.

SOFTWARE AND DATA COLLECTION

ADL Ver. 2.0.0 was used for data collection

ForeSight DXM Ver. 3.4.0 was used for post processing.

PERSONNEL

Perky Falconer NOAA/NOS/NGS/Field Operations Branch 757-441-3603

Kevin Jordan NOAA/NOS/NGS/Field Operations Branch 757-441-3603

H. Stewart Kuper Jr. NOAA/NOS/NGS/Field Operations Branch 757-441-6595

NOAA VESSEL BAY HYDRO II S5401

Station Coordinates

NAME	EASTING	NORTHING	UP
BOW BENCHMARK	-0.600	8.629	0.538
STARBOARD SIDE GPS (NOT CORRECTED to phase center)	1.296	5.432	3.009
STARBOARD SIDE GPS (corrected to phase center)	1.296	5.432	2.995
PORT SIDE GPS (NOT CORRECTED to phase center)	-1.963	5.208	3.041
PORT SIDE GPS (corrected to phase center)	-1.963	5.208	3.026
CL GPS	-0.351	5.277	2.942
MULTIBEAM (NOT CORRECTED to phase center)	0.008	-0.758 - 0.459	-2.401
MULTIBEAM (corrected to phase center of projector)	0.008	-1.217	-2.342
STARBOARD BENCHMARK	2.914	-1.166	0.567
STERN BENCHMARK	0.422	-6.518	-0.074
PORT BENCHMARK	-2.747	-1.553	0.639
TOP OF MULTIBEAM STRUT	0.044	-0.829	0.335
MULTIBEAM MOUNTING PLATE	0.046	-1.451	-1.942
IMU	-0.143	-0.161	0.165
CL IMU PLATE (Reference Point)	0.000	0.000	0.000

-0.014

-0.015

+0.059

Note: Units are meters.

Note: The EASTING runs perpendicular to the centerline of the vessel and runs in a positive direction to the right of the CL IMU PLATE, when looking at the CL IMU PLATE from the back of the vessel.

Note: The NORTHING runs along the centerline of the vessel in a positive direction from the CL IMU PLATE forward to the front of the vessel.

Note: The UP component is positive when above the level of the CL IMU PLATE.

Note: GPS antenna measurements were taken at the top center of each antenna and were not corrected to phase center initially. Corrections were measured using a steel metric ruler and additional entries were made depicting the corrected values.

Note: The multibeam measurement was taken in the center of the received transducer. The reference point for the Reson 7125 is 139mm aft of the prjector's forward edge and 26mm above the face of the projector. Corrections were measured using a steel metric ruler and a plumb bob. Additional entries were made depicting the corrected values.

Surveyed by:
NOAA/NOS/National Geodetic Survey/Observation and Analysis Division/Field Operations Branch
Norfolk, Virginia

Survey Date: March 23, 2009
Revised: June 18, 2009

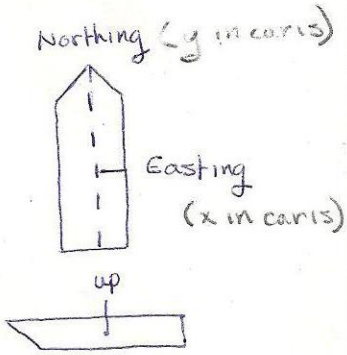
NOTE: STATIONS NOT ROTATED TO ALIGN VESSEL CENTERLINE TO NORTHING AXIS. CORRECTED ON JULY 7, 2009.

NOAA VESSEL BAY HYDRO II S5401

Station Coordinates

NAME	EASTING	NORTHING	UP
BOW BENCHMARK	-0.017	8.650	0.538
STARBOARD SIDE GPS (not corrected to phase center)	1.659	5.333	3.009
STARBOARD SIDE GPS (corrected to phase center)	1.659	5.333	2.995
PORT SIDE GPS (not corrected to phase center)	-1.607	5.329	3.041
PORT SIDE GPS (corrected to phase center)	-1.607	5.329	3.041 →
CL GPS	0.005	5.289	2.942
Multibeam (not corrected to phase center)	-0.043	-0.758	-2.401 * used in
MULTIBEAM (corrected to phase center of projector)	-0.043	-1.217	-2.342 → HVF
STARBOARD BENCHMARK	2.829	-1.359	0.567
STERN BENCHMARK	-0.017	-6.531	-0.074
PORT BENCHMARK	-2.844	-1.365	0.639
TOP OF MB STRUT	-0.011	-0.829	0.335
MB MOUNTING PLATE	-0.051	-1.451	-1.942
IMU	-0.153	-0.151	0.165
CL IMU PLATE (RP)	0.000	0.000	0.000

Note: Units are meters.



Note: The EASTING runs perpendicular to the centerline of the vessel and runs in a positive direction to the right of the CL IMU PLATE, when looking at the CL IMU PLATE from the back of the vessel.

Note: The NORTHING runs along the centerline of the vessel in a positive direction from the CL IMU PLATE forward to the front of the vessel.

Note: The UP component is positive when above the level of the CL IMU PLATE.

Note: GPS antenna measurements weretaken at the top center of each antenna and were not corrected to phase center initially. Corrections were measured using a steel metric ruler and additional entries were made depicting the corrected values.

Note: The multibeam measurement was taken in the center of the received transducer. The reference point for the Reson 7125 is 139mm aft of the projector's forward edge and 26mm above the face of the projector. Corrections were measured using a steel metric ruler and a plumb bob. Additional entries were made depicting the corrected values.

Surveyed by:
NOAA/NOS/National Geodetic Survey/Observation and Analysis Division/Field Operations Branch
Norfolk, Virginia

Revised: July 7, 2009

NOTE: STATION'S COORDINATES ROTATED TO ALIGN NORTHING AXIS TO VESSEL CENTERLINE.

NOAA VESSEL BAY HYDRO II S5401

Station Coordinates

NAME	EASTING	NORTHING	UP
BOW BENCHMARK	-0.017	8.650	0.538
STARBOARD SIDE GPS (not corrected to phase center)	1.659	5.333	3.009
STARBOARD SIDE GPS (corrected to phase center)	1.659	5.333	2.995
PORT SIDE GPS (not corrected to phase center)	-1.607	5.329	3.041
PORT SIDE GPS (corrected to phase center)	-1.607	5.329	3.041
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Multibeam (not corrected to phase center)	-0.043	-0.758	-2.401
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PORT BENCHMARK	-2.844	-1.365	0.639
TOP OF MB STRUT	-0.011	-0.829	0.335
MB MOUNTING PLATE	-0.051	-1.451	-1.942
IMU	-0.153	-0.151	0.165
CL IMU PLATE	0.000	0.000	0.000

Note: Units are meters.

Note: The EASTING runs perpendicular to the centerline of the vessel and runs in a positive direction to the right of the CL IMU PLATE, when looking at the CL IMU PLATE from the back of the vessel.

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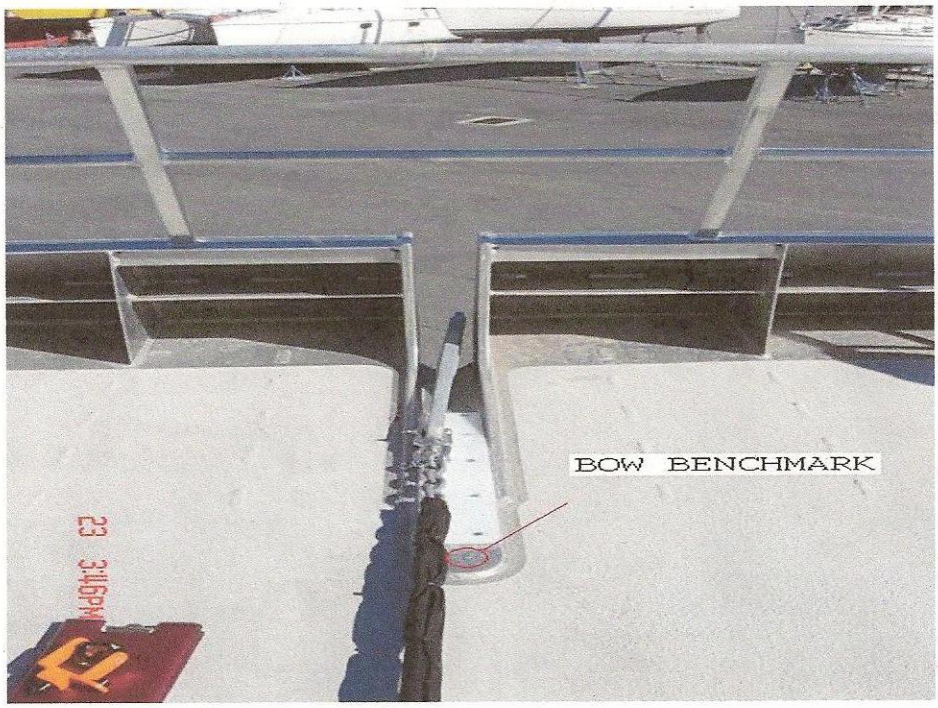
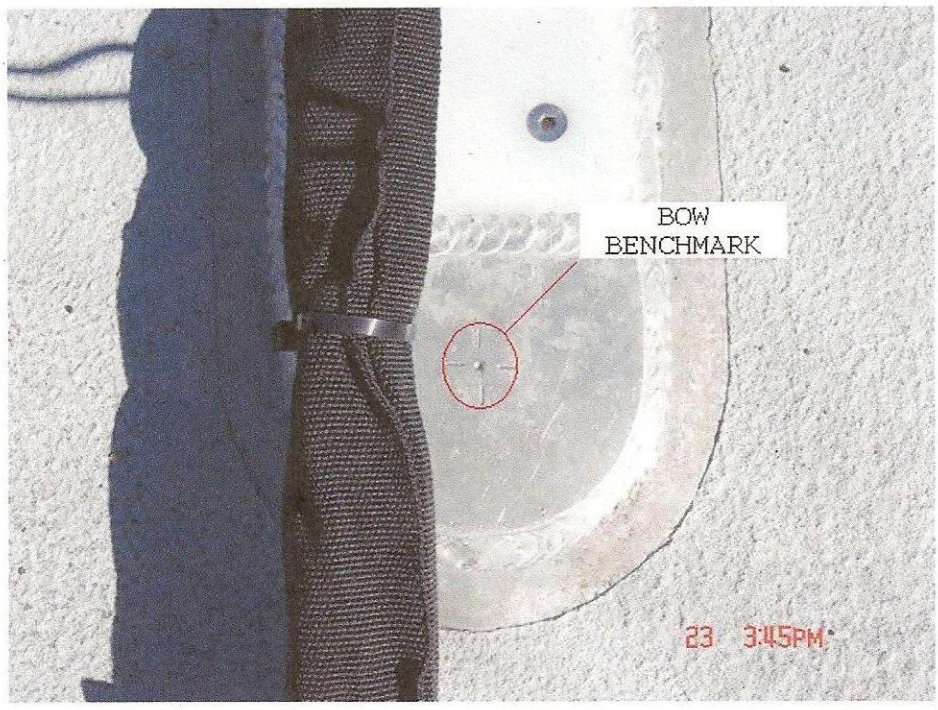
Surveyed by:
NOAA/NOS/National Geodetic Survey/Observation and Analysis Division/Field Operations Branch
Norfolk, Virginia

Revised: July 7, 2009

PHOTOGRAPHS



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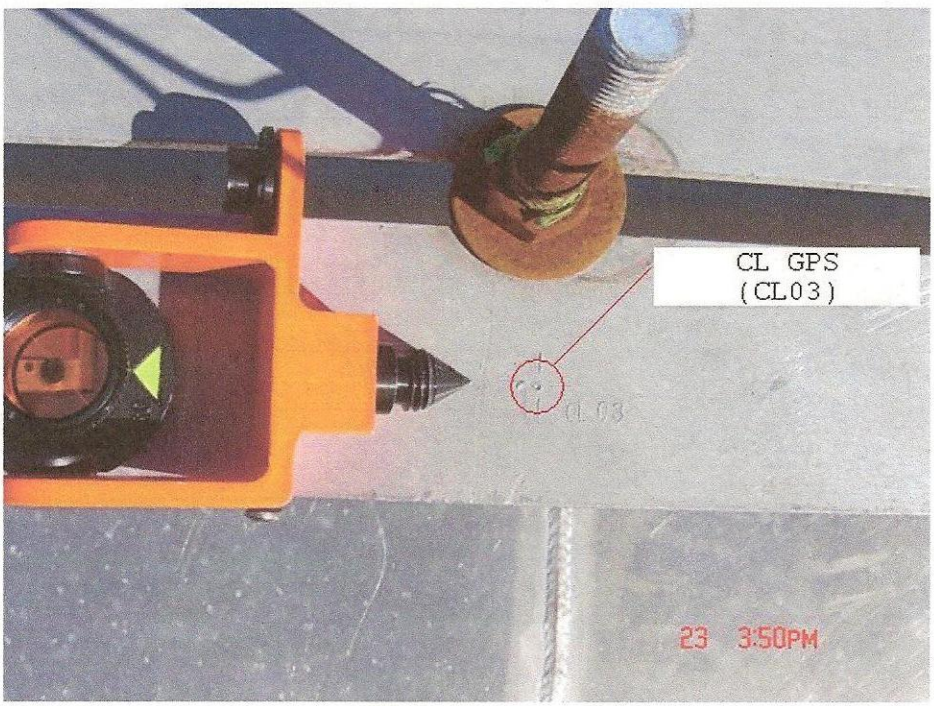
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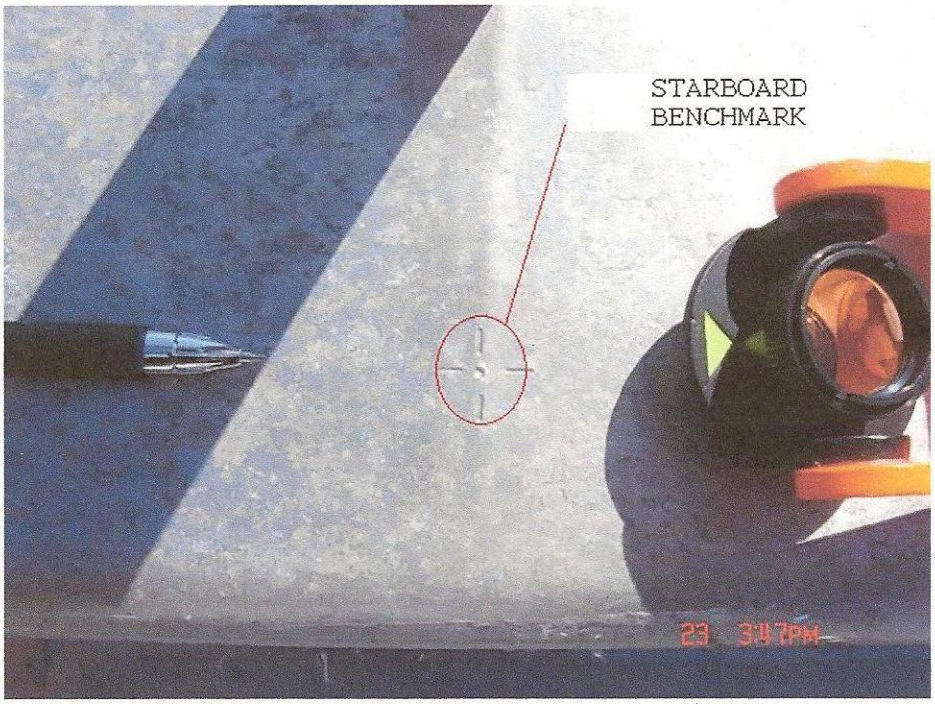
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BENCHMARK
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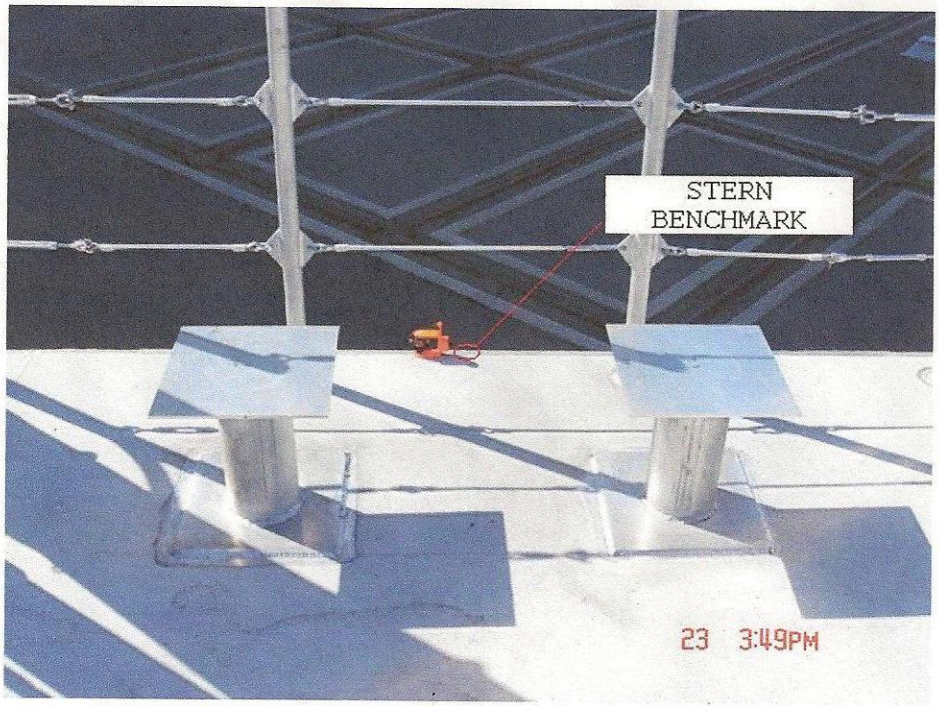
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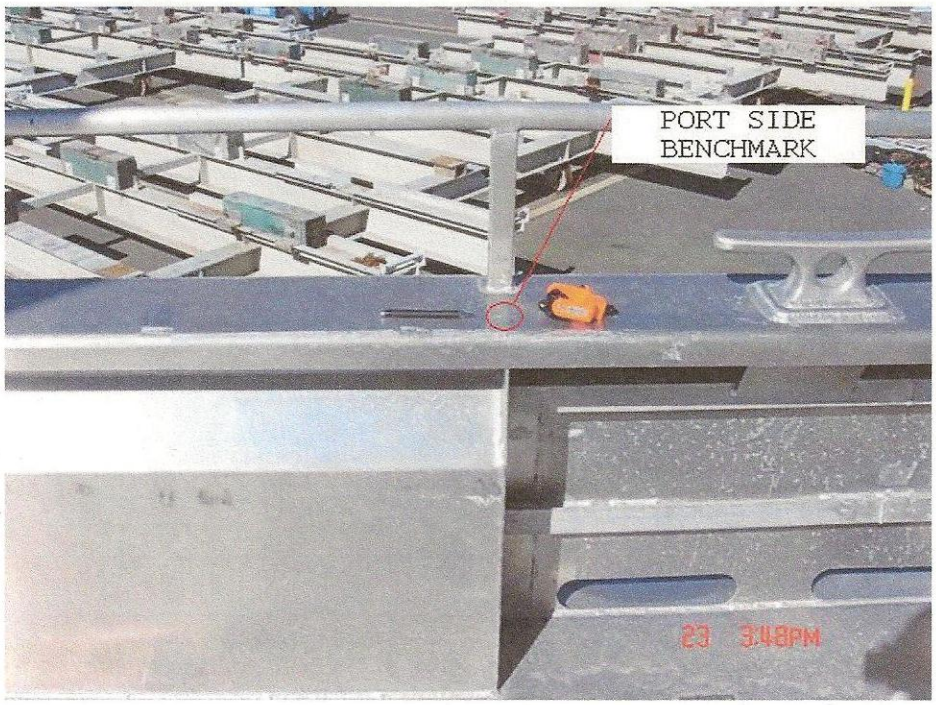
BENCHMARK
23 3:49PM


STERN BENCHMARK
23 3:49PM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BENCHMARK
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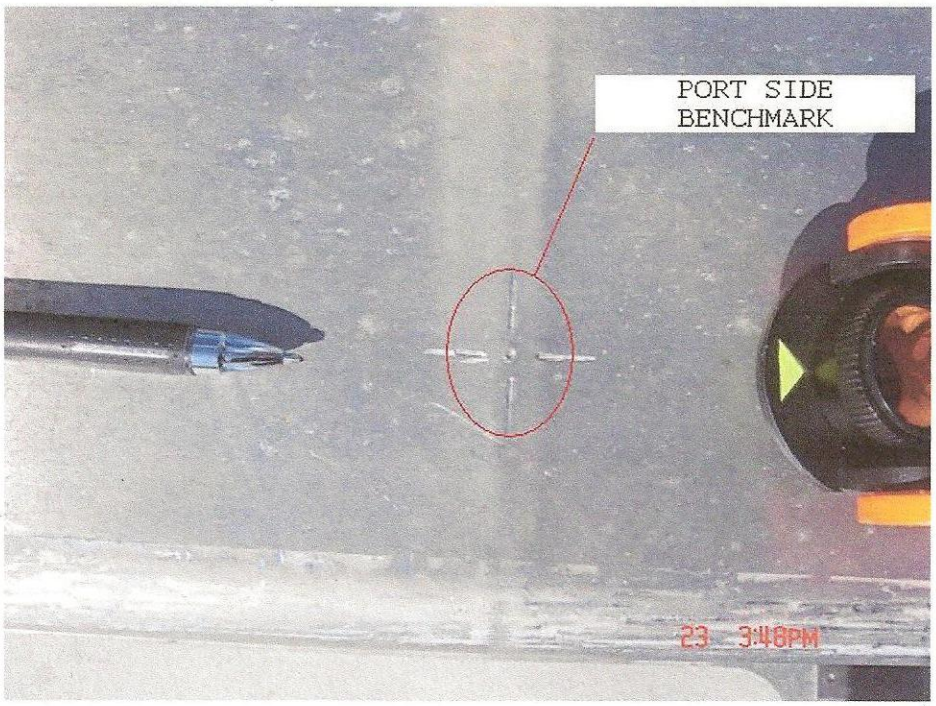
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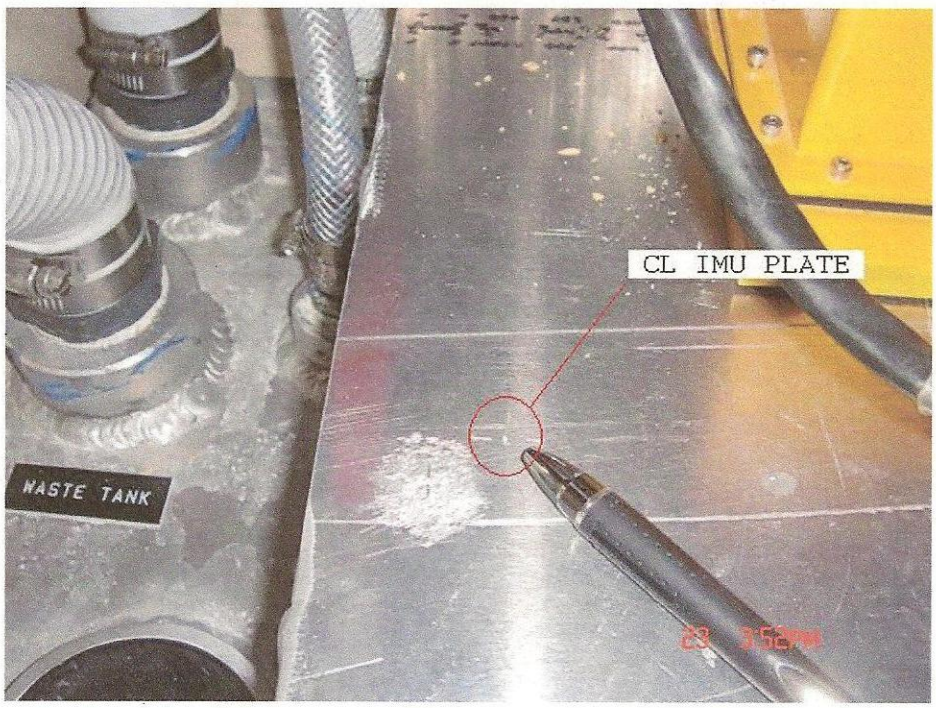
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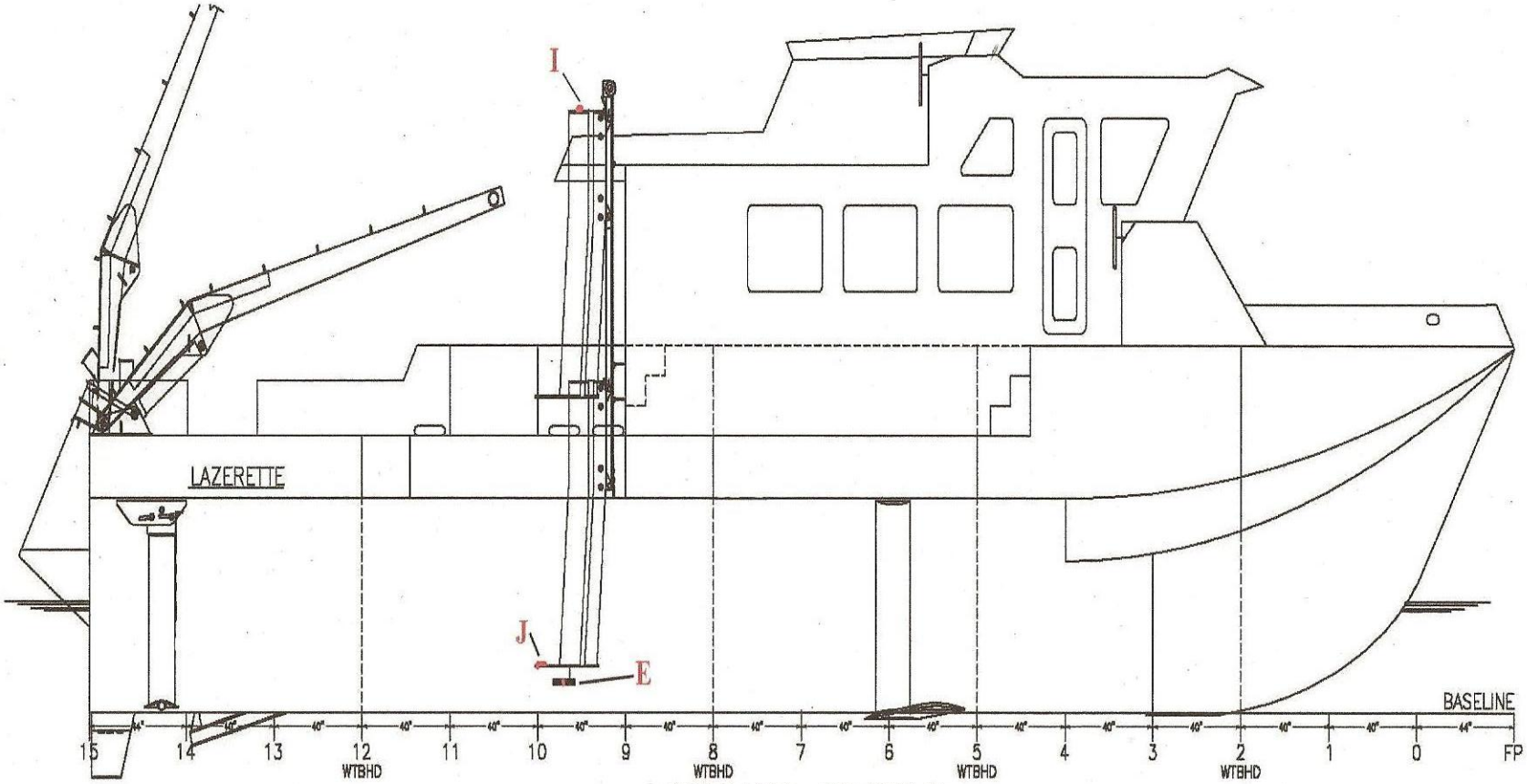

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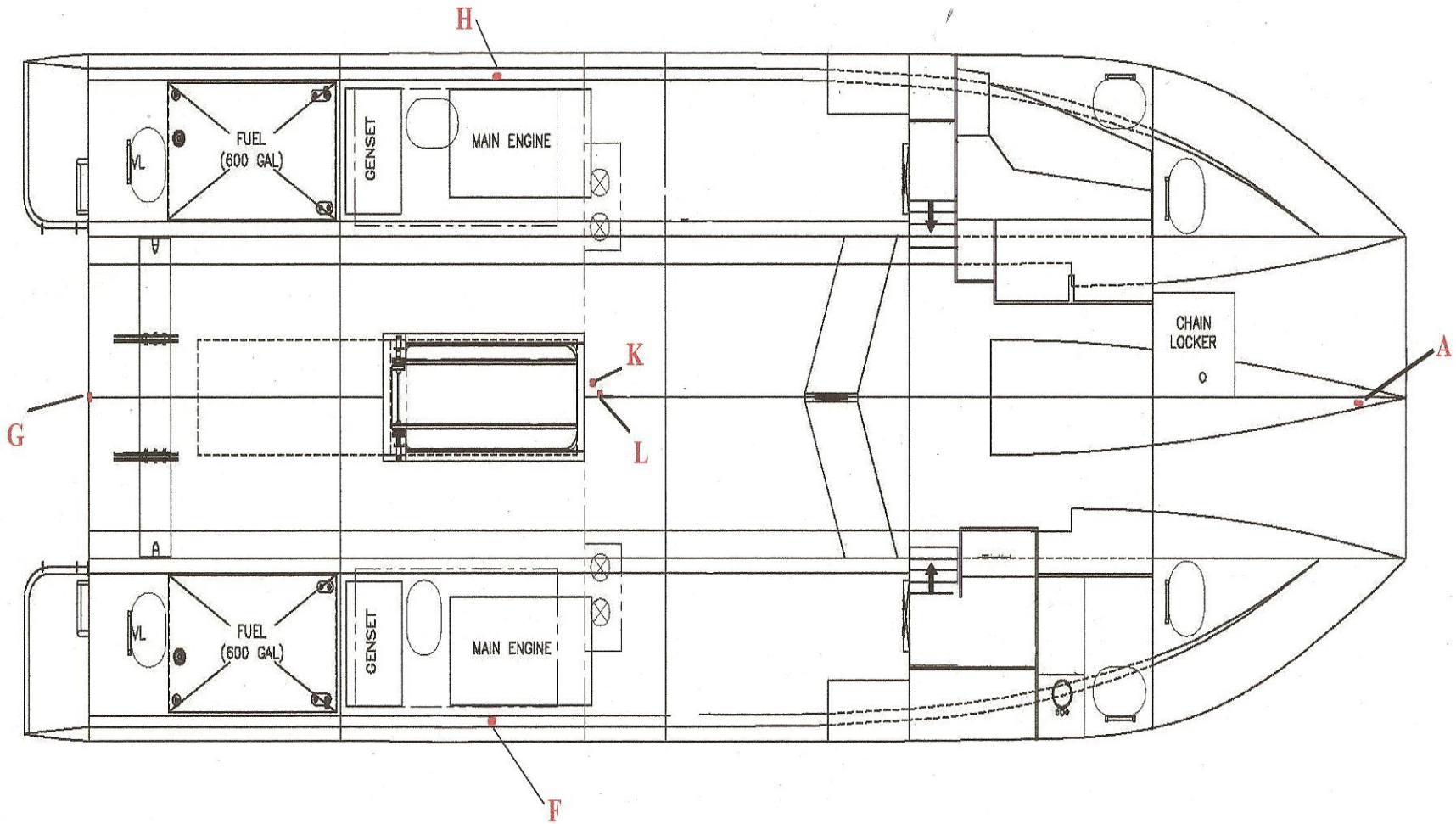
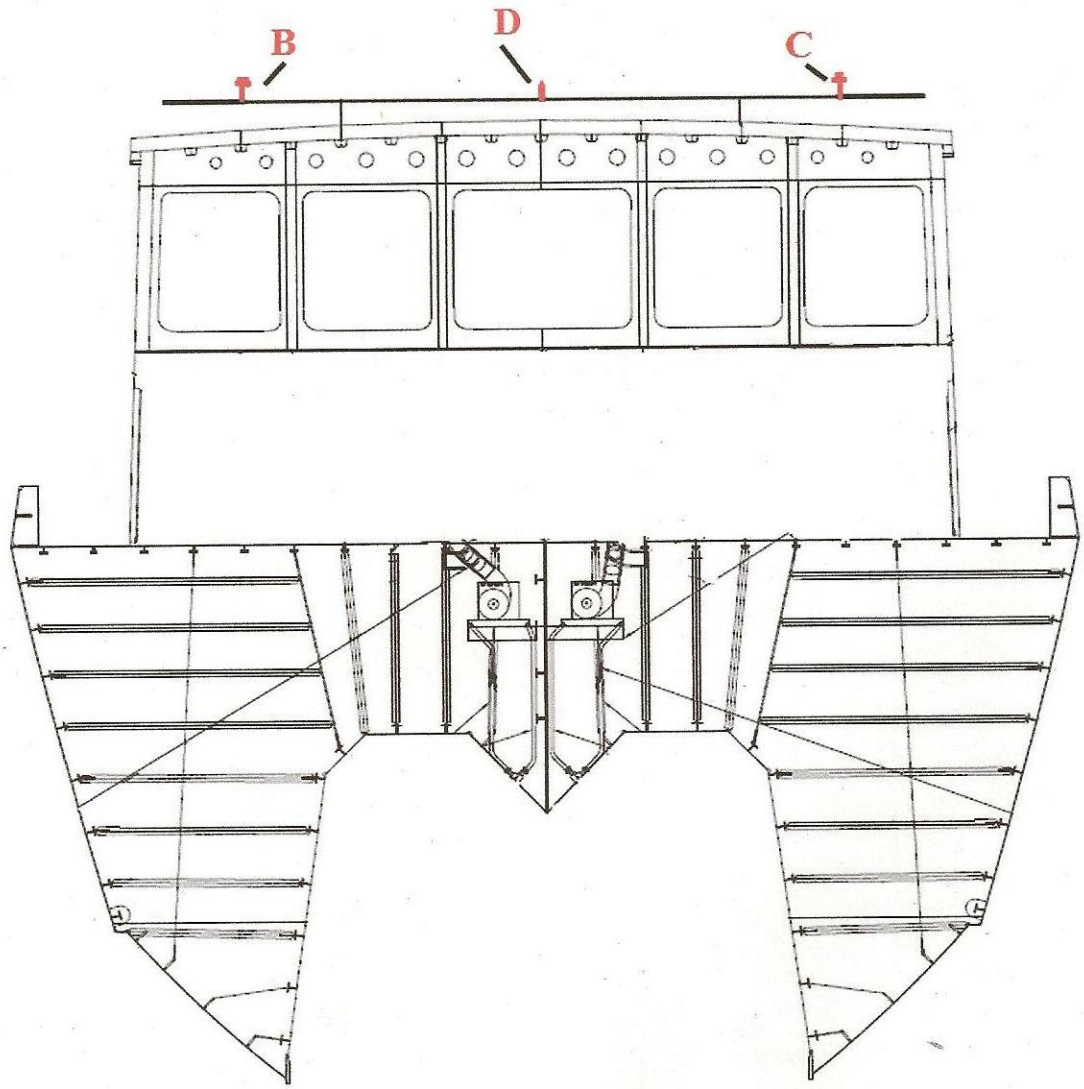
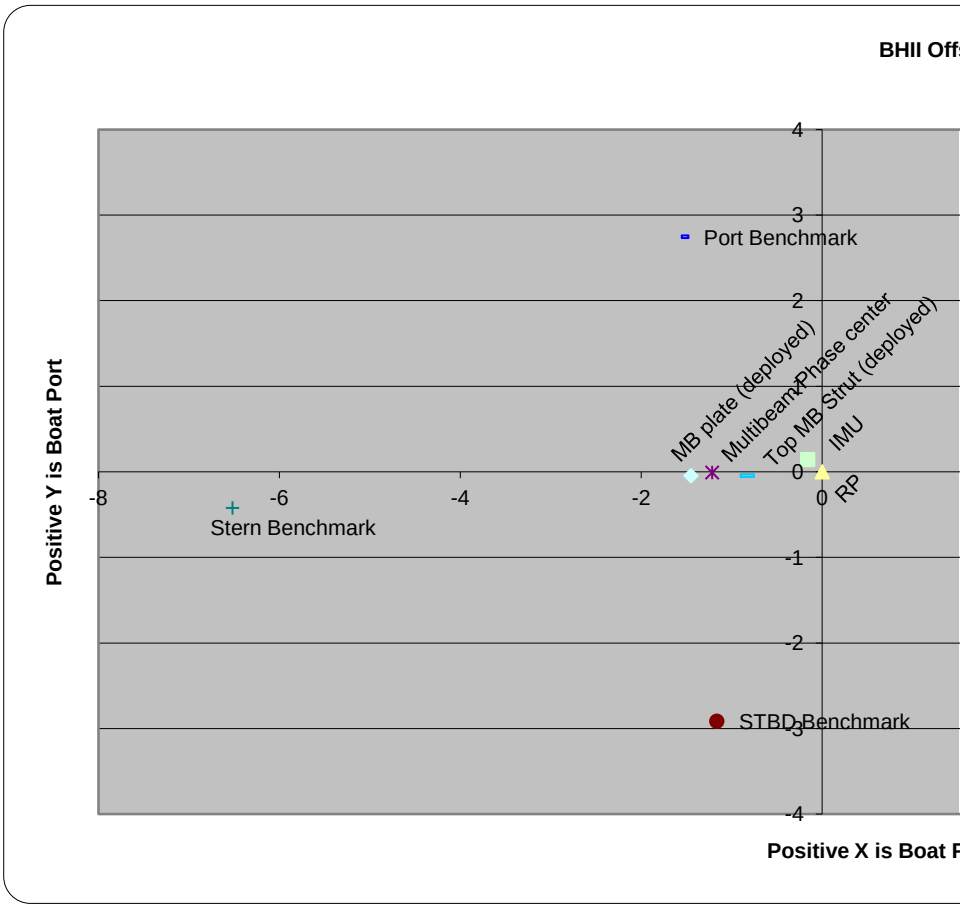
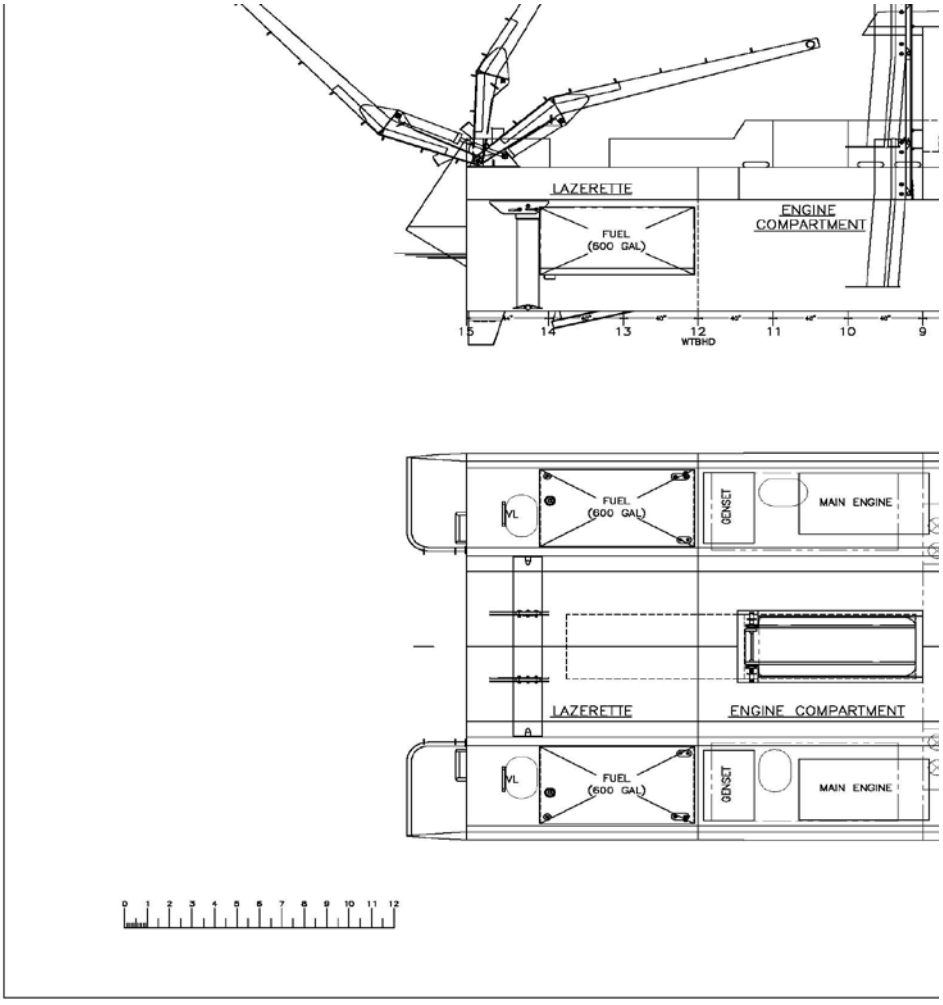

H
FUEL
(600 GAL)
VL
GENSET
MAIN ENGINE
CHAIN
LOCKER
K
L
G
A
FUEL
(600 GAL)
VL
GENSET
MAIN ENGINE
F


B
D
C

BHII Offsets and Alignments - Possible Baseline offset from vessel frame

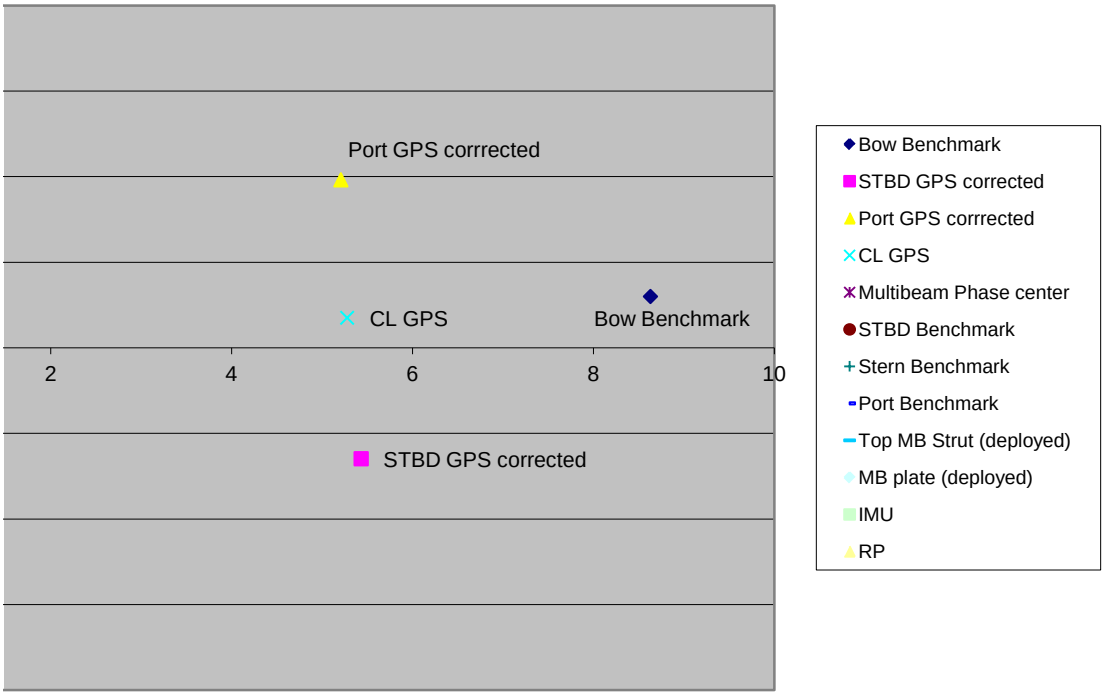
Device Name	POS M/V X (Northir	Inverse of POS M/V Y (Inverse Ea
Bow Benchmark	8.629	0.6
STBD GPS corrected	5.432	-1.296
Port GPS corrrected	5.208	1.963
CL GPS	5.277	0.351
Multibeam Phase center	-1.217	-0.008
STBD Benchmark	-1.166	-2.914
Stern Benchmark	-6.518	-0.422
Port Benchmark	-1.553	2.747
Top MB Strut (deployed)	-0.829	-0.044
MB plate (deployed)	-1.451	-0.046
IMU	-0.161	0.143
RP	0	0



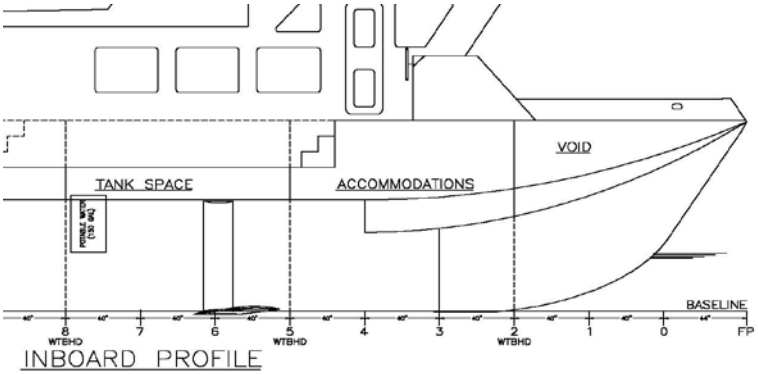

LAZERETTE
ENGINE
COMPARTMENT
FUEL
(600 GAL)
15
14
13
12
WTBHD
11
10
9
FUEL
(600 GAL)
VL
GENSET
MAIN ENGINE
LAZERETTE
ENGINE COMPARTMENT
FUEL
(600 GAL)
VL
GENSET
MAIN ENGINE
0 1 2 3 4 5 6 7 8 9 10 11 12

POS M/V Z
-0.538
-2.995
-3.026
-2.942
2.342
-0.567
0.074
-0.639
-0.335
1.942
-0.165
0

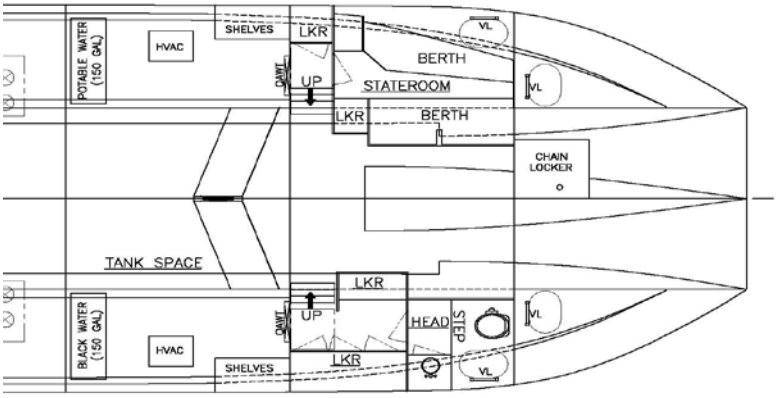
fsets and Alignments



Forward



INBOARD PROFILE



HOLD PLAN

Kvichak Marine Industries, Inc.	54' SURVEY VESSEL
	GENERAL ARRANGEMENT
DWG 5463-110-001 REV A	PAGE 3 OF 3 SCALE 1/4"=1'-0"

Hydrographic Systems inventory
Personnel Roster
Field Procedures Manual 1.3.1 (March 2007)
12 April 2010

1. Megan R. Guberski (NOAA Corp Officer)
   Officer in Charge (OIC)
   Education:
   BA- Anthropology; Smith College
   Training:
   VelocPy Training- February 2010
   Advanced POS PAC Training- February 2010
   Advanced Caris Training- February 2010
   Advanced Hydro Training- February 2009
   Advanced CUBE Training- February 2009
   Advanced POS PAC Training- February 2009
   NOAA Small Boat Component- March 2009
   Hydrographic Systems Integration Training - March 2009
   Multibeam Swath Sonar Seminar- January
   AB Special (National Certification); January 2007
   Assignments:
   BAY HYDRO II- OIC; January 2010 to Present
   NOAA Ship THOMAS JEFFERSON; Junior Officer; July 2007- January 2010
   NOAA Ship Rainer; AB April 2005- March 2007

2. Vitad Pradith (NOAA)
   Physical Scientist
   Education:
   Graduate Work- Geospatial Sciences; University of Maryland
   BS-Geography; San Francisco State University
   Training:
   Advanced POS PAC Training- February 2009
   Advanced Hydro Training- February 2009
   CARIS HIPS/SIPS Advanced- February 2008
   Reson Advanced Multibeam- February 2008
   Hydrographic Systems Integration Training- February 2008
   Incident Command System Compliant- May 2007
   US Coast Guard Operator of Un-inspected Passenger Vessel Captain's License- April 2007
   NDP Working SCUBA Diver- September 2006
   Backscatter Mapping with Swath Sonars- August 2006
   Simrad EM3002 Mutlibeam Systems Integration & Operations- March 2006
   Multibeam Swath Sonar Seminar- January 2006
   Hydro Training- February 2005

BST/Marine Firefighting-December 2004

Assignments:

BAY HYDRO II- Physical Scientist; January 2009 to Present
BAY HYDROGRAPHER-Physical Scientist;
June 2007 to January 2009
NRT 5- Physical Science Technician; October 2005 to May 2007
NRT 3-Physical Science Technician Associate;
June 2004 to September 2005

3. Robert W. Mowery (NOAA)
Physical Science Technician
Education:

BS-Biology; Salisbury University
BS-Marine Science; University of Maryland Eastern Shore

Training:

VelocPy Training- February 2010
Advanced POS PAC Training- February 2010
Advanced Caris Training- February 2010
Advanced Hydro Training- February 2009
Advanced CUBE Training- February 2009
Advanced POS PAC Training- February 2009
NOAA Small Boat Component- March 2009
Hydrographic Systems Integration Training - March 2009
Multibeam Swath Sonar Seminar- January 2009
BST/Marine Firefighting (Basic Safety Training)- January 2008
Hydro Training- February 2008
Incident Command System Compliant- August 2007

Assignments:

BAY HYDRO II- Physical Science Technician; January 2009 to Present
BAY HYDROGRAPHER- BAY HYDROGRAPHER Intern; August 2007 to January 2009

4. Nicole M. Trenholm (ERT)
Contractor
Education:

BA-Geology; Lasalle University

Training:

Plot Composer- February 2010
Advanced Caris 7.0- February 2010
Advanced POS PAC- February 2010
HSIT Training- February 2010
VelocPy Training- February 2010
Advanced Hypack 10.0- February 2010

NOAA Small Boat Component- March 2009
Caris Hips & Sips 6.1- February 2009
Caris Bathy Manager 2.1- February 2009
S-57 Composer- February 2009
NOAA Hydro Training- February 2009

Assignments:

Atlantic Hydrographic Branch (AHB); January 2009- January 2010
BAY HYDRO II; January 2010 - Present

HYDROGRAPHIC SOFTWARE INVENTORY

Field Unit *R/V Bay Hydro II*
Effective Date 29-May-10

Computer	Software Package	Version	Seriel/Key Number	Hotfix
OCS-W-NSD716681	Hyper Terminal	5.1 Service Pack 3	N/A	N/A
	Sonar Pro	11.0	N/A	N/A
	Sonar Pro	12.0	N/A	N/A
Hypack Computer	CARIS Hips & Sips	6.1 Service Pack 2	CW9603545	8
	Pydro	9.9 (r2712)	C240B6CDD875A38631	N/A
	Hypack	2009A 9.1.0.0	Key# 000493	12
	MapInfo Professional	10	MINWEU1000051178	N/A
	Hydro_MI	6.10.2	N/A	N/A
	TSIP Talker	2	N/A	N/A
	My-POSview	3.4.0.0	Part No. 10003370	N/A
	Odum Digibar Pro	2.3	N/A	N/A
	Sonar Pro	11.2	N/A	N/A
Navigation Computer	Nobeltac Navigation	8.1.2002	0175-806161-2999-414547	N/A
Proc I	MapInfo Professional	10	MINWEU1000051178	N/A
	CARIS Hips & Sips	6.1 Service Pack 2	CW9603545	12
	Pydro	9.9 (r2712)	80710C465D65DD457F	N/A
	NOAA Velocwin	8.85	N/A	N/A
	NOAA Chart Reprojector	2.0.4	N/A	N/A
	Sonar Pro	11	N/A	N/A
	Adobe Acrobat	8	1118-1476-1667-3536-3912-1029	N/A
	MicroSoft Office	Office 2007	xjm6q-bq8hw-t6dfb-yd4yt	N/A

	PathFinder office	4	011747-00300-07186-b374300b	N/A
Proc II	Caris Hips & Sips	6.1 Service Pack 2	Key On Loan To HQ	HF 8
	Pydro	9.9 (r2712)	1336cbe67cdafe7f77	N/A
	POS PAC MMS	5.3.3524.25247	No Key	N/A
	Caris Hips & Sips	7.0 Service Pack 1	Key On Loan To HQ	HF4
	Caris Bathy Database	Version 2.3	No Key	No HF
	Map Infro Professional	Version 10	MINWEU1000051179	N/A
	MicroSoft Office	Office 2007	9409-707-07364444-6538	N/A
	Velocwin	8.85	N/A	N/A
Dell LapTop	No Hydro Related Programs on Device			N/A

Hydrographic Vessel Inventory

Field Unit: S/V Bay Hydrographer

Effective Date: 27 March 2008

Updated Through: 27 March 2009

SURVEY VESSELS							
Vessel Name	NOAA S/V Bay Hydrographer 						
Hull Number	S 5501						
Call Letters	KNBG						
Manufacturer	Princess Yachts Everett, WA						
Year of Construction	1988						
Type of Construction	hand Lay-up FRP						
Length Overall	17.02m (55.833 feet)						
Beam	5.18m (17 feet)						
Draft	1.524m (5.0 feet)						
Date of Effective Full Vessel Static Offset Survey	14-Sep-04						
Organization which Conducted the Effective Full Offset Survey	NGS						
Date of Last Partial Survey or Offset Verification & Methods Used	Verification 27 March 2008 Traditional methods						
Date of Last Static Draft Determination & Method Used	25 March 2008 Reference Serface						
Date of Last Settlement and Squat Measurements & Method Used	23 March 2008 Reference Serface						
Additional Information							

Hydorographic Software Inventory

Field Unit *R/V Bay Hydrographer*
Effective Date 2008

Software Package	Version	Seriel Number (Key Number)	System Package is Installed on
CARIS Utility 2.0	5.1.2600.2180	N/A	Isis Computer
Sonar Pro	11	N/A	Isis Computer
Triton Isis	7.0.413.8	061 5Y21505A1 0	Isis Computer
CARIS Hips & Sips	6.1 Service Pack 2	CW9603545	Hypack Computer
Pydro	8.6 r(2366)	7c23b464cff4f0a64	Hypack Computer
Hypack	2008	Key# 000493	Hypack Computer
MapInfo Professional	9.0.2	MINWEU0900013978	Hypack Computer
Hydro_MI	6.10.2	N/A	Hypack Computer
TSIP Talker	2		Hypack Computer
POSview	3.4.0.0	Part No. 10003370	Hypack Computer
Odom Digibar Pro	2.3		Hypack Computer
Nobeltec Navigation	8.1.2002	0175-806161-2999-414547	Navigation Computer
MapInfo Professional	8.5	MIUWEU0850038683	Toshiba Laptop
Pydro	8.6 r(2366)	c78e1b9926db4e4aaa	Toshiba Laptop
MapInfo Professional	9.0.2	MIUWEU0900013979	Caris Computer
CARIS Hips & Sips	6.1 Service Pack 2	CW960316	Caris Computer
Pydro	7.3 (r2239)	82b5fe9acd65dd457f	Caris Computer
NOAA Velocwin	8.85	N/A	Caris Computer
NOAA Chart Reprojector	2.0.4	N/A	Caris Computer
Sonar Pro	11	N/A	Caris Computer
Adobe Acrobat	8	1118-1476-1667-3536-3912-1029	Caris Computer
Microsoft Office	Office XP	xjm6q-bq8hw-t6dfb-yd4yt	Caris Computer
PathFinder office	4	011747-00300-07186-b374300b	Caris Computer
Pydro	8.6 r(2366)	d217461ea3133f26b	Administration Computer
Map Infro Professional	9	MIUWEU0850038683	Administration Computer
Microsoft Office	Office XP	xjm6q-bq8hw-t6dfb-yd4yt	Administration Computer
Caris Hips & Sips	6.1 Service Pack 1		Administration Computer

Most Recent Hotfix
N/A
N/A
N/A
13
N/A
12
N/A
N/A
N/A
N/A
N/A
N/A
N/A
N/A
N/A
13
N/A
N/A
N/A
N/A
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N/A
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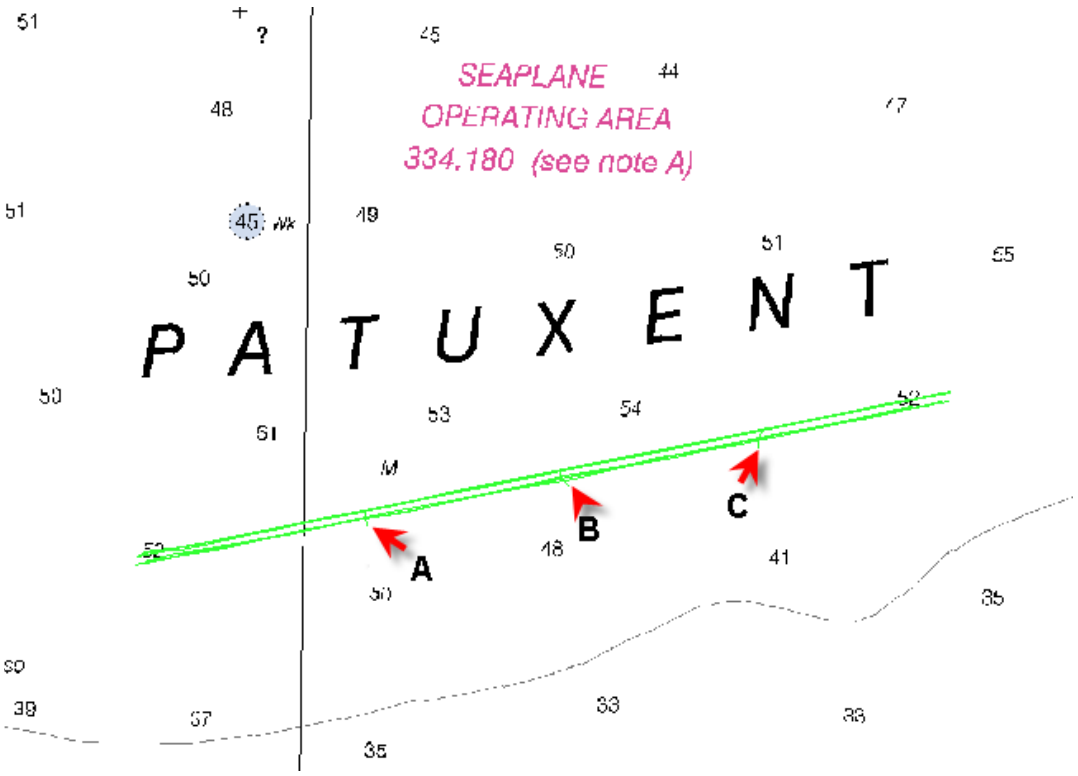
N/A
N/A
N/A
12

Settlement & Squat Test
BAY HYDROGRAPHER
2008 – Hydrographic Systems Readiness Review

DATE: 09 April 2008 (DN100)
TIME: 1100hours
LOCATION: Patuxent River near mergence with Chesapeake Bay
CONDITIONS: Cloudy, about 60°F, with winds 3-5knots

PROCEEDURE

A relatively flat area of the Patuxent River was chosen as the test area for the 2008 dynamic draft determination or settlement and squat measurements. A lineplan was created in MapInfo and imported into Hypack. The test line was 890m long with an azimuth of 259.00 degrees. Reson 7125 MBES data was acquired over the lines in each direction at the following engine RPM settings: one engine at clutch ahead, both engines clutch ahead, both engines at 750rpms, and both engines at 1000rpms, respectively. Three dead in the water measurements were made to provide static draft comparisons, labeled position A, B, and C in Figure I.



FigureI: Settlement & Squat calibration lines (890 meters long) with three dead in the water positions (labeled A, B, and C) that were used to provide static draft comparisons.

RESULTS

The results of the comparisons are plotted in the graph below. Position B measurements are considered outliers as they were caused by variation in the water bottom in that area and do not accurately represent the state of the vessels draft. For this reason, Position B measurements were disregarded for the purposes of this test. A change in draft of just over 0.1 meters was measured in both positions A and C (Figure II). Due to the relatively small change in draft and due to the difficulty of getting accurate speed through the water measurements to accurately apply the draft curve in Caris, settlement and squat are not applied in the Caris HVF for processing of MBES data on BAY HYDROGRAPHER.

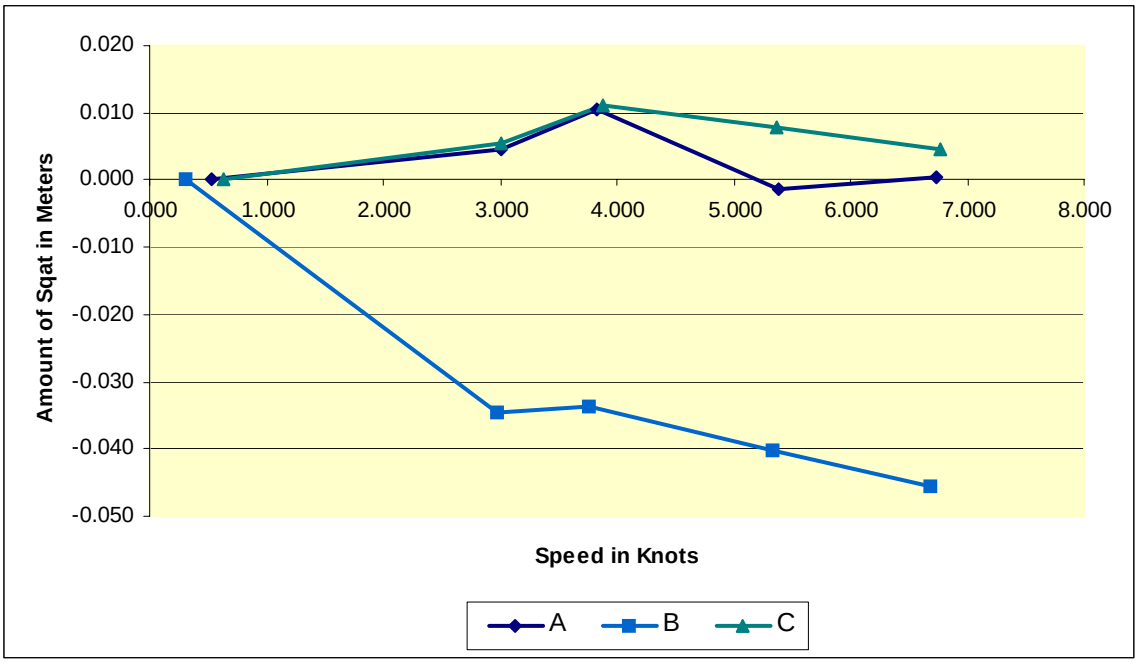


Figure II: Difference between depth when the vessel was dead in the water over position A, B, and C and various speeds of vessel as it passed the same positions.

Lead-Line Calibration
BAY HYDROGRAPHER
Date: 25 March 2008 (DN085)
TIME: 0900hours
LOCATION: Floating pier, Calvert Marina, Solomons, MD
CONDITIONS: Clear skies, ~60^{o}F, no winds
Lead-Line Identification Number: N/A
Chief of Party: LT Michael C. Davidson
Measurer: Robert Mowery
Recorder: Vitad Pradith

PROCEEDURE

In lieu of a traditional lead-line or a sounding pole, the S/V Bay Hydrographer is equipped with a non-traditional lead-line fabricated from poly propylene line and an eight inch tall mushroom anchor. The poly propylene is marked with two foot graduations (A in Table I) that start at the point where the line meets the anchor's eye. The non-traditional lead-line was pulled tight and compared to a steel measuring tape with zero on the measuring tape at the lowest most point of the mushroom anchor (Table I). The actual measurement at the graduation was recorded in feet (B in Table I); the difference between the graduation and the measured distance was recorded and used as the lead line corrector (C in Table I).

Graduated Markings in Feet (A)	Graduated Markings In Meters	Calibration Measurements (B)	Lead Line Corrector (C=B-A)
2.0	0.6096	2.67	0.67 (8.04inches)
4.0	1.2192	4.68	0.68 (8.16 inches)
6.0	1.8288	6.66	0.66 (7.92 inches)
8.0	2.4384	8.68	0.68 (8.16 inches)
10.0	3.0480	10.69	0.69 (8.28 inches)
12.0	3.6576	12.69	0.69 (8.28 inches)
14.0	4.2672	14.70	0.7 (8.4 inches)
16.0	4.8768	16.72	0.72 (8.64 inches)
18.0	5.4864	18.72	0.72 (8.64 inches)
20.0	6.0960	20.73	0.73 (8.76 inches)

Table I: True measurements compared to marked graduations of the non-traditional lead line.

Results

All of the measurements, with the exception of one, were over eight inches greater than the graduation. Seeing this trend, we measured the height of the mushroom weight and found it to be eight inches tall; showing us that the zero mark on the lead line is the highest point of the anchors eye. Once the height of the mushroom anchor is removed from the final distance, all of the graduations are within 0.75 inches (0.02m) of being true. From the table, the general error in the graduations is an increase over distance.

This error can probably be contributed to the initial marking of the line. It appears that the person who originally marked the line made the two foot graduation then moved the tape and made the next two foot graduation, instead of pulling the measuring tape once and making graduations at 2 feet, 4 feet, and so on.

Comment [BH1]: Is this the cause, or was the line stretched tighter on one set of measurements than on the other??

Lead Line & Sounding Pole Ca

Field unit: Bay Hydrographer

Lead Line / Sounding Pole Identification Number:
(Unique Identifier, with equipment type, date made, etc.)

Date of Calibration: 25 March 2008 (2008_085)

Method of Calibration: X☐ Steel tape ☐Pern

Location: Calvert Marina, Floating Dock at Solomon's Islanc

Chief of Party: LT Michael C. Davidson

Lead Line / Sounding Pole Unit of Measure: Feet

Measured by: Robert Mowery (contractor)	**Recorded by:** Vitad Pradith

Graduated Marking (a)	**Calibration Measurement (b)**
Graduations are at 2 foot intervals, starting from the point where the weight has a height of 8.0 inches that is accounted	
2.0 feet	2.67 feet
4.0 feet	4.68 feet
6.0 feet	6.66 feet
8.0 feet	8.68 feet
10.0 feet	10.69 feet
12.0 feet	12.69 feet
14.0 feet	14.70 feet
16.0 feet	16.72 feet
18.0 feet	18.72 feet
20.00 feet	20.73 feet

libration Report

nanent graduation marks ☐ Other

l, MD

Checked by:
LT Michael C. Davidson

Lead Line Corrector (c = b - a)
ooly-pro line ties into the anchor weight. Anchor l for in the lead line corrector.
+0.67 feet (8.04 inches)
+0.68 feet (8.16 inches)
+0.66 feet (7.92 inches)
+0.68 feet (8.16 inches)
+0.69 feet (8.28 inches)
+0.69 feet (8.28 inches)
+0.70 feet (8.4 inches)
+0.72 feet (8.64 inches)
+0.72 feet (8.64 inches)
+0.73 feet (8.76 inches)

LEAD-LINE COMPARISON
BAY HYDROGRAPHER (S5501)
2008-Hydrographic Systems Readiness Review

DATE: 25 March 2008 (DN085)
TIME: 1300hours
LOCATION: Along side at Calvert Marina in Solomons, MD
CONDITIONS: Sunny, about 70^{o}F, winds1-2 knots
SINGLE BEAM ECHOSOUNDER MODEL: Odom Echotrac MKIII
ECHOSOUNDER SERIAL NO.: 21093
LEADLINE SERIAL NO.: N/A
VESSAEL DRAFT: 084 meters
Leadsman: Robert Mowery Recorder: Vitad Pradith Computed by: Robert Mowery

PROCEDURES

While the vessel was port side to a floating dock in the marina, lead line depth measurements were taken off the starboard side of the vessel in as close a proximity to the ODOM Echotrac MKIII (VBES) as possible. Due to the echosounder placement on the bottom starboard side of the vessel, measurements could not be taken at the exact echosounder position. Instead, the lead line measurements were taken, as close to the transducer as possible in the fore/aft direction, and due to her beam, the lead line soundings were approximately 2 meters outboard of the single beam soundings. Five lead line soundings were recorded in meters and the correctors to the lead line and position of the measurements was added into the corrected lead line depth (A in Table I). A digital depth was measured, using the ODOM Echotrac MKIII VBES and the speed of sound through the water column was recorded in meters/second using a Digibar Pro sound velocimeter. Only the high frequency from the VBES was used to insure that soundings represented the actual water bottom and not a secondary layer beneath the soft surface sediment. The raw electronic depth was multiplied by 1461/1500, the recorded speed of sound through the water column, and a velocity corrected depth (B in Table I) was determined. This new, velocity corrected depth was then added to the depth of the transducer and a corrected digital depth
(D in Table I), total depth of the water column, was determined.

Note: The BAY HYDROGRAPHER is not equipped with a traditional lead line, so the crew has constructed a non-traditional lead line consisting of a mushroom weight attached to a poly propylene rope with two foot graduations.

Trial Number	Lead-Line Depth (Meters)	Lead-Line Correction (Meters)	Height of Deck above Water Line	Corrected Lead-Line Depth (Meters) **(A)**	Digital Raw Depth: Hi Frequency (Meters)	Velocity Corrected Depth (Raw Depth * 1461/1500) **(B)**	Transducer Draft	Corrected Digital Depth (B + Draft) **(D)**	Digital Instrument Error (A-D)
1	4.59	+0.22	-0.75	4.06	3.23	3.15	0.84	3.99	0.07
2	4.60	+0.22	-0.75	4.07	3.23	3.15	0.84	3.99	0.08
3	4.59	+0.22	-0.75	4.06	3.22	3.13	0.84	3.97	0.09
4	4.59	+0.22	-0.75	4.06	3.22	3.13	0.84	3.97	0.09
5	4.59	+0.22	-0.75	4.06	3.23	3.15	0.84	3.99	0.07

Table I: Physical and digital measurements from single beam echosounder calibration with all correctors accounted for.

RESULTS

The measured differences between the VBES and non-traditional lead line range from 0.07 to 0.09 meters. While this difference is labeled Digital Instrument Error, it is difficult to determine whether this difference is actually an error in the digital instrument or inaccuracies in the measurement due to the non-traditional lead line, the horizontal offset of the two measurements, or a combination of both. Therefore, a detailed depth comparison between the VBES and MBES has been conducted, see the Sounding Systems Comparison Log. Since the differences between the VBES and non-traditional lead line fall within all NOAA standards, not corrections to the ODOM Echotrach MKIII will be made at this time.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Ocean Service
National Geodetic Survey
Geodetic Services Division
Instrumentation & Methodologies Branch

NOAA Launch- Bay Hydrographer
POS Components Spatial Relationship Survey
Field Report

Kendall Fancher
September 14th & 15th, 2004

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

PURPOSE

The primary purpose of the survey was to accurately determine the spatial relationship of various components of a POS MV navigation system aboard the NOAA launch Bay Hydrographer. Additionally, various recoverable Reference Points were established onboard the vessel to aid in future spatial surveys aboard the ship.

PROJECT DETAILS

This survey was conducted on the 14th and 15th of September at Solomon's Island, Maryland while the ship was in dry dock. The weather on the 14th was partly sunny and mild. The weather on the 15th was cool with light to moderate rain throughout the morning and intermittently during the afternoon. Reconnaissance was conducted on the 14th, with the aid of Holly Dehart (Launch Captain), Charles Yoos, and Dave Pritchard to determine exactly what point was to be positioned on each sensor and where the Reference Points were to be established. Data collection was conducted on the 15th, once the rain had stopped in the early afternoon.

INSTRUMENTATION

The Leica (Wild) TC2002 precision total station was used to make all measurements.

Technical Data
Angle Measurement

Resolution	0.03 seconds
Smallest unit in display	0.1 seconds

Standard Deviation

Horizontal angle	0.5 seconds
Vertical angle	0.5 seconds
Distance Measurement	1mm + 1ppm

Two standard "peanut" prisms were used as sighting targets and for distance measurement during this project. These prisms are of the same model and have an offset of 30 mm. The prism offset was accounted for during data collection.

PERSONNEL

Kendall Fancher	NOAA/NOS/NGS/GSD/I&M Branch (540) 373-1243
Steve Breidenbach	NOAA/NOS/NGS/GSD/I&M Branch (540) 373-1243

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

SURVEY PROCEDURES

Establishing the IMU Coordinates

A dimple, located in the top center of the Moon Pool (CL01) was deemed to be on the centerline of the vessel during reconnaissance. At this same time, a mark was established on the back portion of the keel of the vessel that was also deemed to be on the centerline of the vessel. From these two points was established Temporary Point (TP01), directly in line with CL01 and the mark established on the keel. The following coordinates were assumed for TP01; easting of 1000.000m, northing of 1000.000m, and up of 1000.000m. While occupying TP01, a zero bearing was input into the instrument and CL01 was used for initialization. After initialization was conducted, angular measurements and distances were taken to establish Temporary Point 2 (TP02).

TP02 was occupied and TP01 was used for initialization. Angular measurements and distances were taken to establish a predefined point on the IMU. After establishing coordinates for the IMU, angular measurements and distances were taken to CL01 to determine an azimuth check. The azimuth check revealed a closure of 0.001m in the easting, 0.002m in the northing, and 0.004m in the up component.

Establishing all Other Points

While occupying TP01, a zero bearing was input into the instrument and CL01 was used for initialization. After initialization was conducted, angular measurements and distances were taken to establish the following points; two Centerline Reference Points (CL02 and CL03), The DGPS antenna (DGPS), The Multi Beam Sensor phase center (MBPC), a Multi Beam Bench Mark (MBBM), and Temporary Point 3 (TP03). Angular measurements and distances were taken to CL01 to determine an azimuth check. The

azimuth check revealed a closure of 0.000m in the easting, 0.000m in the northing, and 0.001m in the up component.

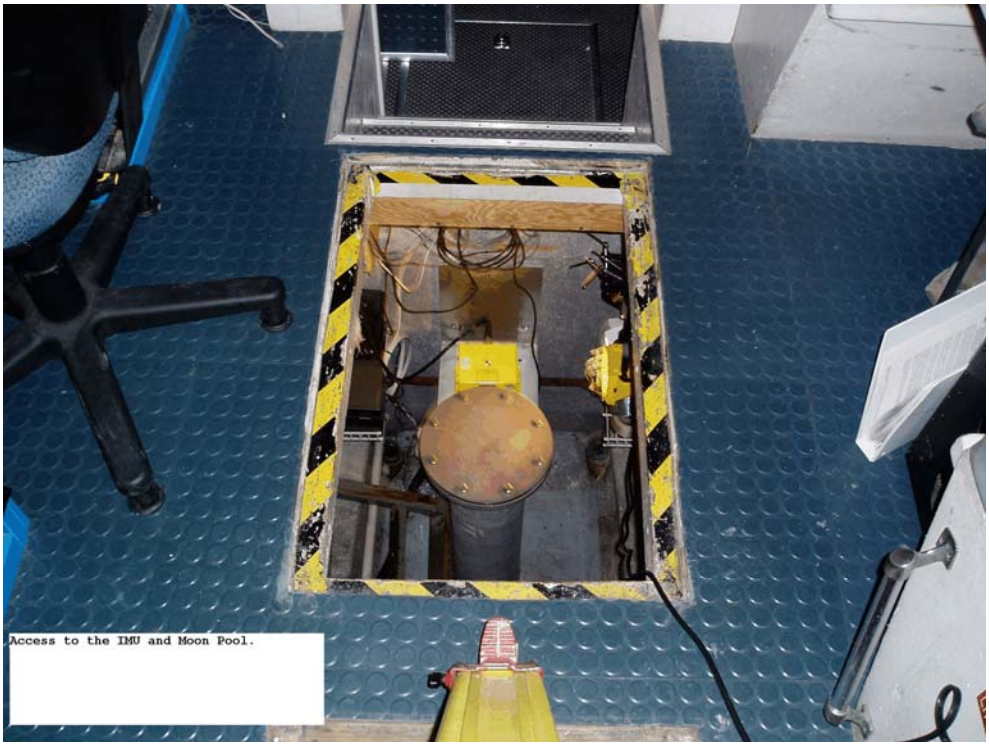
While occupying TP03, TP01 was used for initialization. After initialization was conducted, angular measurements and distances were taken to establish the following points; a Centerline Reference Point (CL04), Two GPS antenna (GPS1 and GPS2), a Multi Beam Support Bracket Reference Point (MBSP), and the Single Beam Sensor phase center (SBPC). Angular measurements and distances were taken to CL03 to determine an azimuth check. The azimuth check revealed a closure of 0.001m in the easting, 0.000m in the northing, and 0.003m in the up component. Angular measurements and distances were also taken to TP03 to determine an azimuth check. The azimuth check revealed a closure of 0.001m in the easting, 0.001m in the northing, and 0.001m in the up component.

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

Field Notes

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

Moon Pool



Moon Pool, View looking from above, the reference point (CL01) is the dimple in the top center of the plate.

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

Single Beam Sensor

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

CL04


CL04

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

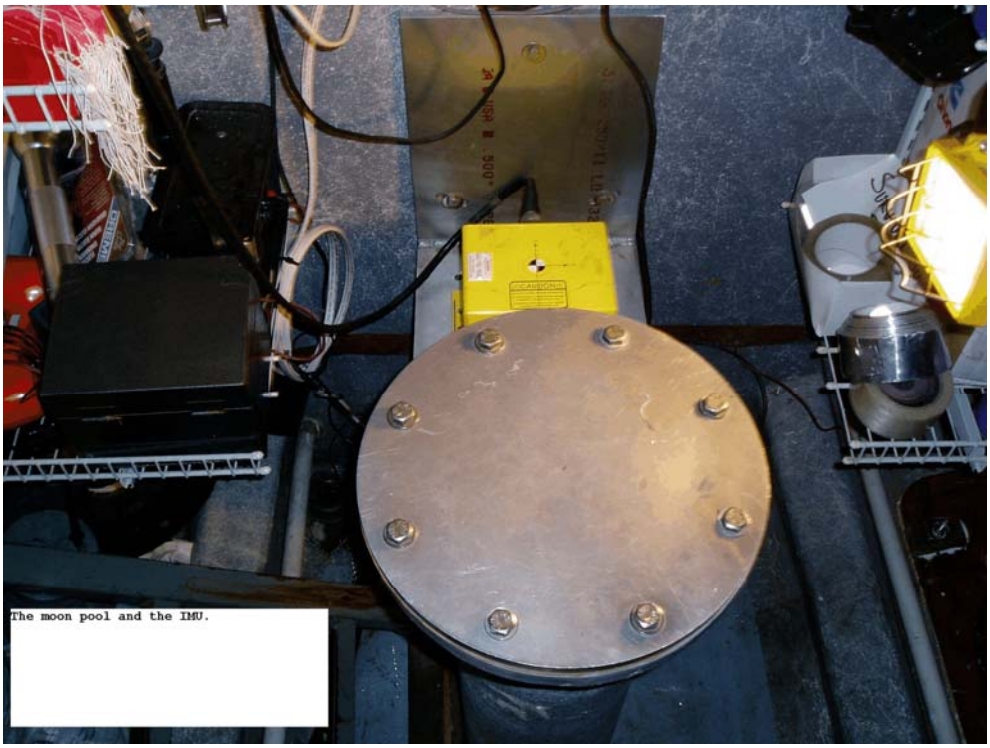
CL02

CL02-reference point established along the centerline, and near the stern, of the ship for future surveys. The reference point is a punch mark set in the metal support for a metal access cover.

Closeup view of CL02.

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

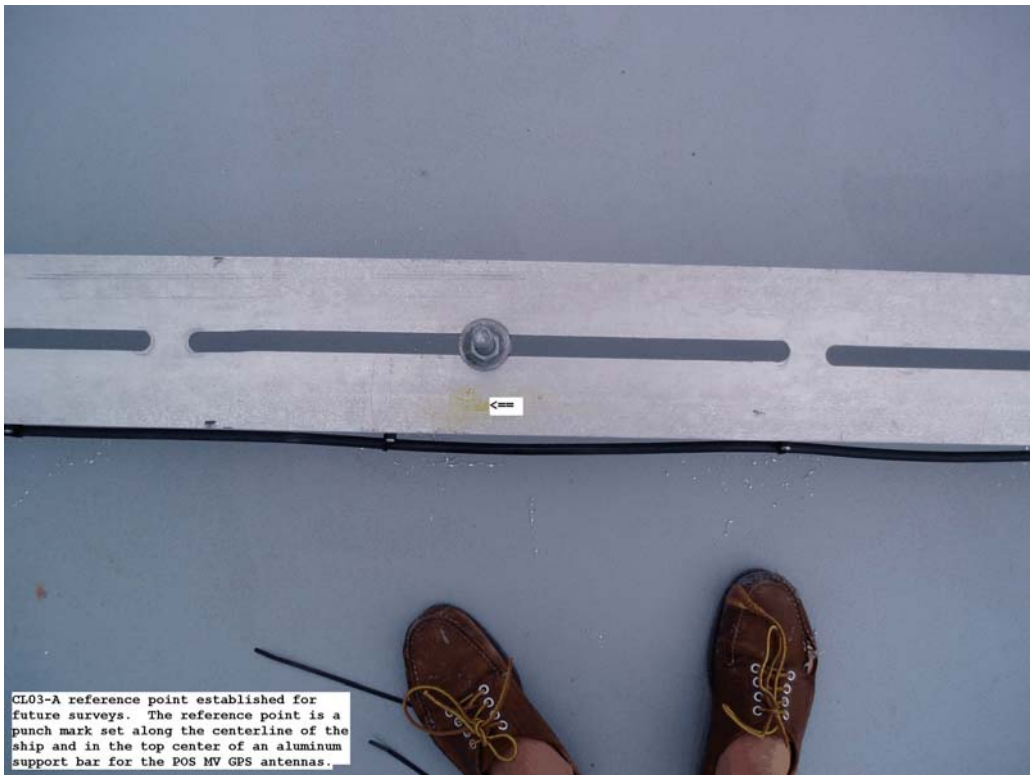
IMU/Moonpool



The moon pool and the IMU.

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

CL03



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POS MV Components Spatial Relationship Survey

MBBM

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

MBSB

MBSB. Top view of a reference point set in top of a support bracket for the multi Beam sensor. The reference point is a punch mark set in the top of the plate.

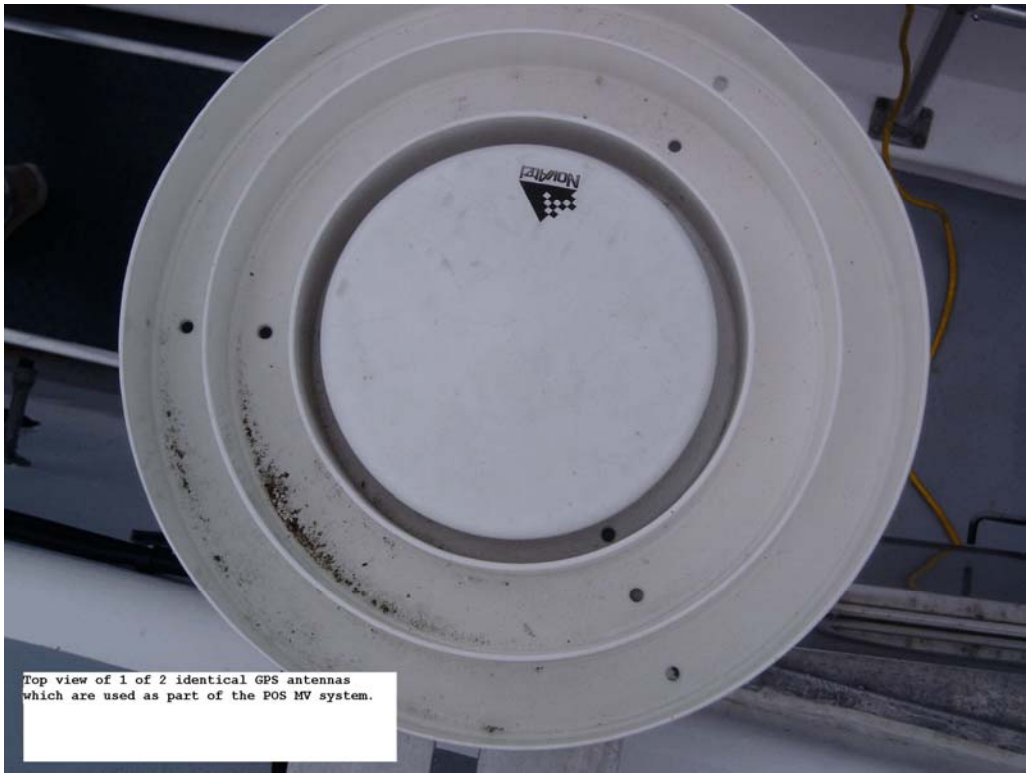
NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

MBPC/DGPS

The Multi Beam sensor. The reference point is the center of the vertical face of the black can.

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

GPS1



Top view of 1 of 2 identical GPS antennas which are used as part of the POS MV system.

NOAA Launch-Bay Hydrographer
POS MV Components Spatial Relationship Survey

GPS1-The top center of the antenna fastening bolt was positioned. The approriate corrections were then applied to account for the electronic phase center of the antenna with choke ring accessory.


S550I
BAY HYDROGRAPHER
National Geodetic Survey
CHEVROLET
C-18729
WM
8yd

Hydrographic Systems inventory
Personnel Roster
Field Procedures Manual 1.3.1 (March 2007)

1. Michael C. Davidson (NOAA Corp Officer)
   Officer in Charge (OIC)
   Education:
   Graduate Work- Applied Physical Geography;
   University of Alabama 2001 to 2003
   BS- Environmental Science; University of Alabama 1998
   Training:
   CARIS HIPS/SIPS Advanced- February 2008
   Reson Advanced Multibeam- February 2008
   Hydrographic Systems Integration Training- February 2008
   Incident Command System Compliant- May 2007
   NDP Working Diver Refresher Coarse- April 2007
   NDP Dive Master- January 2005
   Multibeam Swath Sonar Seminar-January 2005
   OOD U/W (TJ)-October 2004
   Coxswain (TJ)- July 2004
   Hydrographer in Charge (TJ)- June 2004
   NDP Working Diver- May 2004
   NOAA Hydro Training- February 2004
   STCW Certifications- December 2003
   Assignments:
   BAY HYDROGRAPHER- OIC- January 2007- Present
   NOAAS THOMAS JEFFERSON- Junior Officer;
   December 2004 to January 2006

2. Vitad Pradith (NOAA)
   Physical Scientist
   Education:
   Graduate Work- Geospatial Sciences; University of Maryland
   BA-Geography; San Francisco State University
   Undergraduate Work – Computer Science/Biology; University of Massachusetts-Boston
   Training:
   CARIS HIPS/SIPS Advanced- February 2008
   Reson Advanced Multibeam- February 2008
   Hydrographic Systems Integration Training- February 2008
   Incident Command System Compliant- May 2007
   US Coast Guard Operator of Un-inspected Passenger Vessel
   Captain's License- April 2007
   NDP Working SCUBA Diver- September 2006
   Backscatter Mapping with Swath Sonars (UNH) - August 2006
   Simrad EM3002 Multibeam Systems Integration &

Operation- March 2006
Multibeam Swath Sonar Seminar- January 2006
Hydro Training- February 2005
BST/Marine Firefighting-December 2004

Assignments:

BAY HYDROGRAPHER-Physical Scientist; June 2007 to Present
NRT 5- Physical Science Technician; October 2005 to May 2007
NRT 3-Physical Science Technician Associate;
June 2004 to September 2005

3. Robert W. Mowery (ERT Contractor)
Physical Science Technician

Education:

BS-Biology; Salisbury University
BS-Marine Science; University of Maryland Eastern Shore

Training:

BST/Marine Firefighting (Basic Safety Training)- January 2008
Hydro Training- February 2008
Incident Command System Compliant- August 2007

Assignments:

BAY HYDROGRAPHER- BAY HYDROGRAPHER Intern;
August 2007 to Present

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

Hydrographic IT Inven

Field Unit *R/V Bay Hydrographer*

Input Date	Physical		Computer Description
	Desktop Computers		
12/15/2008	Dell Precision 490	Windows XP Pro Service Pack 2	CARIS Computer
12/15/2008	Dell Precision 450	Windows XP Pro Service Pack 1	Admin
12/15/2008	Dell Precision 370	Windows XP Pro Service Pack 2	Bay Hydro HYPACK PC
12/15/2008	Dell Dimension 9150	Windows XP Pro Service Pack 2	ISIS PC
5/16/2008	Dell Dimension T3400	Windows XP Pro Service Pack 2	Replacement CARIS Computer
	Laptops		
12/15/2008	Toshiba Tecra Laptop A4-S313		Bay Hydro Laptop
12/15/2008	Toshiba Tecra Laptop AZ-S336		Toshiba
	Printers		
12/15/2008	HP OfficeJet G85xi		HP G85xi
12/15/2008	HP Designjet 1055cm Plus		HP Plotter
12/15/2008	HP PSC 2410		HP Printer
	Storage		
1/3/2008	Dynamic Network Factory	Windows Server 2003	DNF SAN (HOST) DNF Subsystem DNF Subsystem DNF Subsystem
1/3/2008	Network Storage Solutions		NSS NAS
1/3/2008	Network Storage Solutions		NSS NAS
	"To log in as Sys Admin:"		*User:system*
	Miscellany		
1/3/2008	HP Ultirum		Ultirum Tape Backup
	Switches		
1/7/2008	Netgear ProSafe GS724T v2		Gigabit SmartSwitch

**NOTE- This system is brand new and not fully operational.

tory

Computer Name	Internet Access	Serial Number		MAC Address	CD Number
CARIS	NO	GGR0TB1			CD0001044586
Admin	NO	B46JG31			CD0001354467
HYPACK2	NO	3N0CS71	Hardlock Key	00-04-75-d5-43-fe	CD0001740013
				00-13-20-48-6d-ba	
ISIS	NO	BM8FM91	Adapter #1	00-13-72-0f-c4-98	CD0000790981
			Adapter #2	00-02-b3-9b-17-6b	
			Adapter #3	00-02-b3-9b-15-11	
CARIS	No	29SJYF1			CD00016113011
Lappy	YES	X5035115Q			CD0001474760
Bridge	NO	SW64065115H			CD0001474800
G85xi	NO	SGG13E23MY			CD0000789592
Plotter	NO	C6074-60241			CD0001284544
HP 2410	NO	M1087			CD0001284564
BH_SAN	NO	D5001514 D500xxxxx D500xxxxx D500xxxxx		00-30-48-2B-29-C6	CD0001284568
BH Proc	NO				
BH Raw	NO				
Pass:SyStEm	*commands:*	*twa_cli info*			
Ultirum	NO	IE71L01152			

1C01655N00303

Service Tag	Static IP	Comments
GGR0T81		
B46J631	205.156.16.216	
3N0CS71	205.156.16.213, 129.100.1.232	
BM8FM91	205.156.16.215, 129.100.1.233, 192.168.0.82	
29SJYF1	205.156.16.225	
	192.168.0.3 unavailable	Internet Bridge
	n/a unavailable n/a	Plotter
	205.156.16.201	Windows Server 2003 Received from Timecharter via AHB on 12/4/2007
	n/a	Connected to DNF SAN

Vessel Name: BHII_S5401_RESON7125_2010.hvf
Vessel created: April 20, 2010

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2010-061 00:00

Transduer #1:

Pitch Offset: -2.500
Roll Offset: -0.090
Azimuth Offset: 2.386

DeltaX: -0.043
DeltaY: -1.217
DeltaZ: 2.342

Manufacturer: RESON
Model: sb7125d
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2010-084 00:00

Transduer #1:

Pitch Offset: -0.900
Roll Offset: -0.045
Azimuth Offset: 3.050

DeltaX: -0.043
DeltaY: -1.217
DeltaZ: 2.342

Manufacturer: RESON
Model: sb7125d
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2010-105 00:00

Transduer #1:

Pitch Offset: -4.367
Roll Offset: 0.300
Azimuth Offset: 3.900

DeltaX: -0.043
DeltaY: -1.217
DeltaZ: 2.342

Manufacturer: RESON
Model: sb7125d
Serial Number:

Navigation Sensor:

Time Stamp: 2010-061 00:00

Comments (null)
Latency 0.000
DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

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

Time Stamp: 2010-084 00:00

Comments
Latency 0.000
DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Manufacturer:
Model:
Serial Number:

Gyro Sensor:

Time Stamp: 2010-061 00:00

Comments (null)
Latency 0.000

Time Stamp: 2010-084 00:00

Comments
Latency 0.000

Heave Sensor:

Time Stamp: 2010-061 00:00

Comments (null)
Apply Yes
Latency 0.000
DeltaX: -0.153
DeltaY: -0.151
DeltaZ: -0.165
Offset: 0.000

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

Time Stamp: 2010-084 00:00

Comments
Apply Yes
Latency 0.000
DeltaX: -0.153
DeltaY: -0.151
DeltaZ: -0.165
Offset: 0.000

Manufacturer:
Model:
Serial Number:

Pitch Sensor:

Time Stamp: 2010-061 00:00

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

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

Time Stamp: 2010-084 00:00

Comments
Apply Yes
Latency 0.000
Pitch offset: 0.000

Manufacturer:
Model:
Serial Number:

Roll Sensor:

Time Stamp: 2010-061 00:00

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

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

Time Stamp: 2010-084 00:00

Comments
Apply Yes
Latency 0.000
Roll offset: 0.000

Manufacturer:
Model:
Serial Number:

Draft Sensor:

Time Stamp: 2010-061 00:00

Apply No
Comments
Entry 1) Draft: 0.000 Speed: 0.000
Entry 2) Draft: -0.002 Speed: 2.000
Entry 3) Draft: -0.007 Speed: 5.100
Entry 4) Draft: -0.007 Speed: 6.000
Entry 5) Draft: 0.002 Speed: 6.800
Entry 6) Draft: 0.015 Speed: 7.400
Entry 7) Draft: 0.031 Speed: 7.900
Entry 8) Draft: 0.041 Speed: 8.700
Entry 9) Draft: 0.042 Speed: 9.900

TPE

Time Stamp: 2010-084 00:00

Comments
Offsets

Motion sensing unit to the transducer 1
X Head 1 0.110
Y Head 1 -1.066
Z Head 1 2.507

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 -0.043
Y Head 1 -1.217
Z Head 1 2.342
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: 0.002
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: 1.000
Transducer timing error: 0.005
Navigation timing error: 0.005
Gyro timing error: 0.005
Heave timing error: 0.005
PitchTimingStdDev: 0.005
Roll timing error: 0.005
Sound Velocity speed measurement error: 0.000
Surface sound speed measurement error: 0.000
Tide measurement error: 0.000
Tide zoning error: 0.000
Speed over ground measurement error: 0.257
Dynamic loading measurement error: 0.100
Static draft measurement error: 0.020
Delta draft measurement error: 0.020
StDev Comment: 0>„J †J@3†Jp4†J 1†J0…J .†J0^„J`}€J°†Ja

Svp Sensor:

Time Stamp: 2010-061 00:00

Comments (null)
Svp #1:

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

DeltaX: -0.043
DeltaY: -1.217
DeltaZ: 2.342

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: 2010-084 00:00

Comments
Svp #1:

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

DeltaX: -0.043
DeltaY: -1.217
DeltaZ: 2.342

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: 2010-105 00:00

Comments
Svp #1:

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

DeltaX: -0.043
DeltaY: -1.217
DeltaZ: 2.342

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: 2010-084 00:00

Comments
Apply No
WaterLine 1.274

Time Stamp: 2010-105 00:00

Comments
Apply Yes
WaterLine 1.325

Time Stamp: 2010-106 00:00

Comments
Apply Yes
WaterLine 1.344

Time Stamp: 2010-111 00:00

Comments
Apply Yes
WaterLine 1.294

Time Stamp: 2010-112 00:00

Comments
Apply Yes
WaterLine 1.332

Time Stamp: 2010-117 00:00

Comments
Apply Yes
WaterLine 1.363

Time Stamp: 2010-118 00:00

Comments
Apply Yes
WaterLine 1.325

Time Stamp: 2010-120 00:00

Comments
Apply Yes

WaterLine 1.344

Time Stamp: 2010-124 00:00

Comments
Apply Yes
WaterLine 1.350

Time Stamp: 2010-125 00:00

Comments
Apply Yes
WaterLine 1.239

Vessel Name: BH_S5501_KLEIN5000_SSS100.hvf
Vessel created: December 14, 2007

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

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2008-192 00:00

Transduer #1:

Pitch Offset: -0.250
Roll Offset: -1.040
Azimuth Offset: -0.050

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Manufacturer: RESON
Model:
Serial Number:

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: 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)

Time Stamp: 2007-060 00:00

Comments
Latency -9.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer: TSS
Model:
Serial Number:

Time Stamp: 2008-067 00:00

Comments
Latency -9.000
DeltaX: -0.002
DeltaY: 0.346
DeltaZ: 0.137

Manufacturer:
Model:
Serial Number:

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
Offset: 0.000

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
Offset: 0.000

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
Offset: 0.000

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
Offset: 0.000

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

Offset: 0.000

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
Offset: 0.000

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
StDev Comment: 0>„J †J@3†Jp4†J 1†J0…J .†J0^„J`}€J°†Ja

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

Time Stamp: 2008-084 00:00

Comments
Svp #1:

Pitch Offset: 0.000
Roll Offset: 0.000

Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

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: 2008-192 00:00

Comments
Svp #1:

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

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

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.hvf
Vessel created: December 14, 2007

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

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2008-192 00:00

Transduer #1:

Pitch Offset: -0.250
Roll Offset: -1.040
Azimuth Offset: -0.050

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

Manufacturer: RESON
Model:
Serial Number:

Navigation Sensor:

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: 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
Offset: 0.000

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
Offset: 0.000

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
Offset: 0.000

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
Offset: 0.000

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
Offset: 0.000

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
StDev Comment: 0>„J †J@3†Jp4†J 1†J0…J .†J0^„J`}€J°†Ja

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

Time Stamp: 2008-192 00:00

Comments
Svp #1:

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

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.000

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_SB.hvf
Vessel created: December 14, 2007

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: 0.000
DeltaY: 0.000
DeltaZ: 0.876

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

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2007-152 00:00

Transduer #1:

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

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.876

Manufacturer: Odom
Model: oemk2
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2007-166 00:00

Transduer #1:

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

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.876

Manufacturer: Odom
Model: oemk2
Serial Number:

Depth Sensor:

Sensor Class: Swath
Time Stamp: 2007-167 00:00

Transduer #1:

Pitch Offset: 0.000

Roll Offset: 0.000
Azimuth Offset: 0.000

DeltaX: 0.000
DeltaY: 0.000
DeltaZ: 0.876

Manufacturer: Odom
Model: oemk2
Serial Number:

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
Offset: 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
Offset: 0.000

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
Offset: 0.000

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 (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

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

Time Stamp: 2008-192 00:00

Apply No
Comments

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: 0.010

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: 0.000
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000
StDev Comment: 0>„J †J@3†Jp4†J 1†J0…J .†J0^„J`}€J°†Ja

Time Stamp: 2008-192 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: 0.010
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: 0.000
Dynamic loading measurement error: 0.000
Static draft measurement error: 0.000
Delta draft measurement error: 0.000
StDev Comment: 0>„J †J@3†Jp4†J 1†J0…J .†J0^„J`}€J°†Ja

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: 0.000
DeltaY: 0.000
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: 0.000
DeltaY: 0.000
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: 2007-152 00:00

Comments (null)
Svp #1:

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

DeltaX: 0.000
DeltaY: 0.000
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: 2007-166 00:00

Comments (null)
Svp #1:

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

DeltaX: 0.000
DeltaY: 0.000
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: 2007-167 00:00

Comments
Svp #1:

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

DeltaX: 0.000
DeltaY: 0.000
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

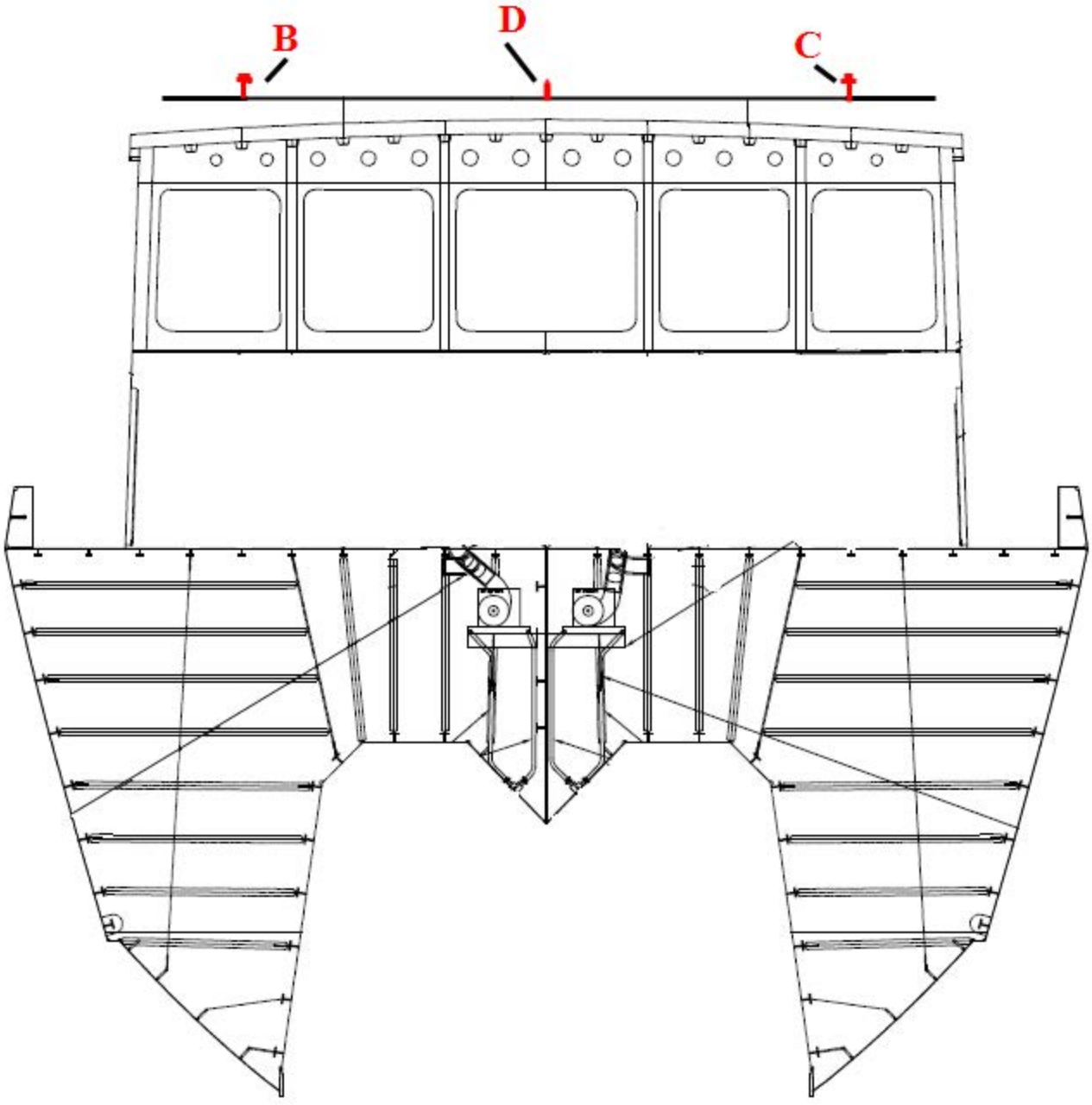
Comments
Apply Yes
WaterLine 0.000

Time Stamp: 2004-259 00:00

Comments
Apply Yes
WaterLine 0.030

Time Stamp: 2008-192 00:00

Comments
Apply Yes
WaterLine 0.030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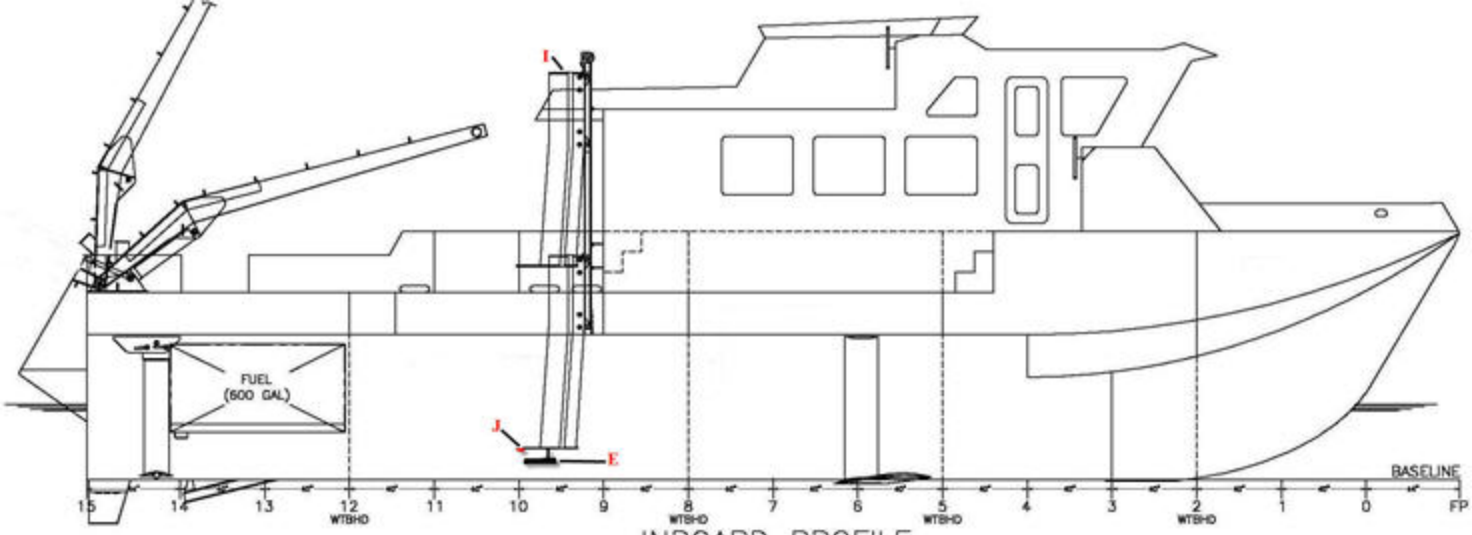
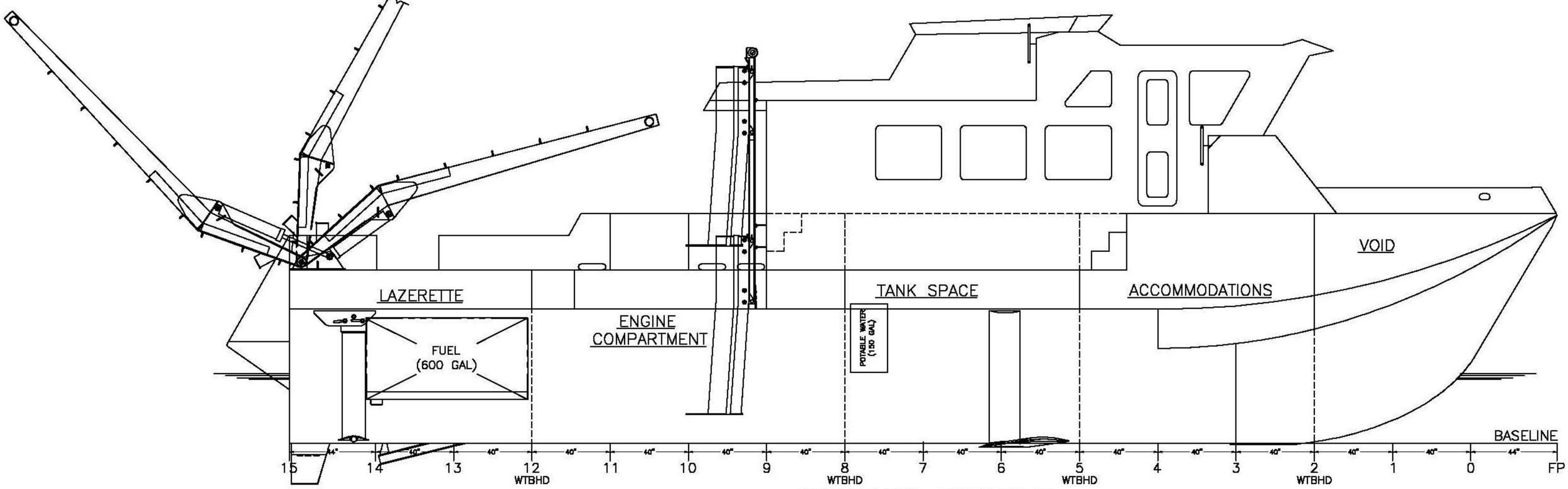
D
C



INBOARD PROFILE



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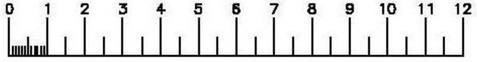
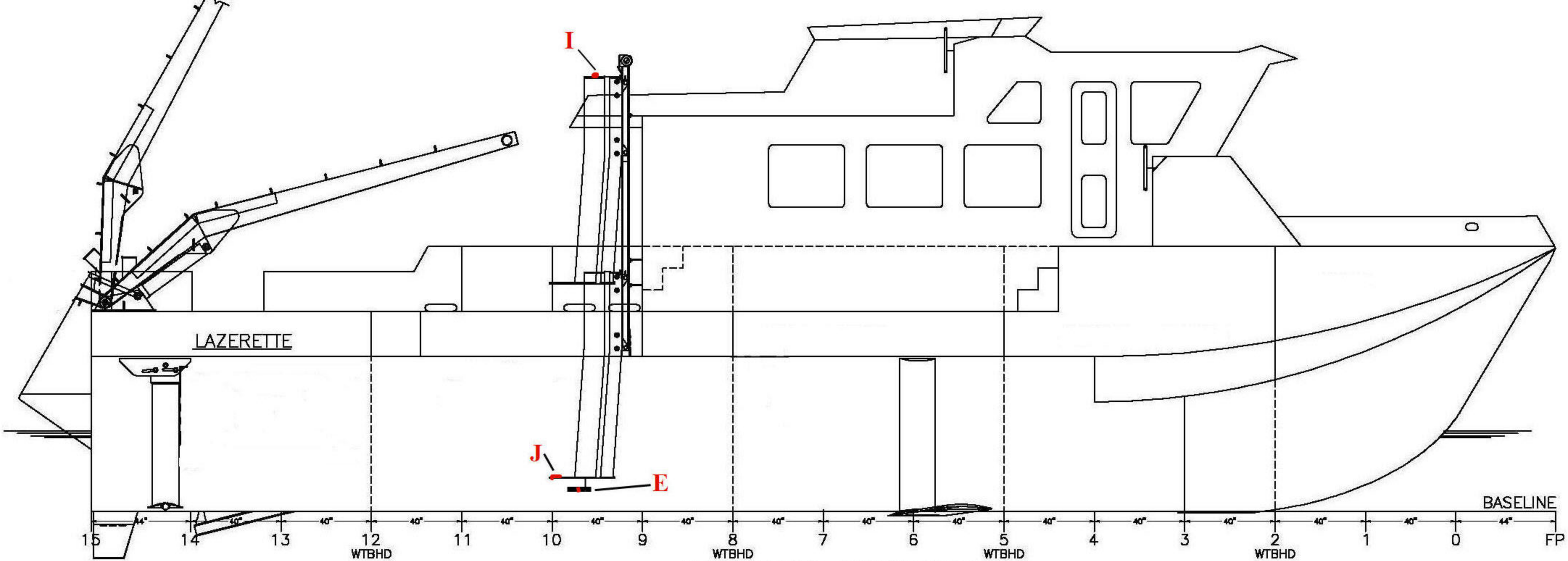


Kvichak Marine Industries, Inc.	54' SURVEY VESSEL
	GENERAL ARRANGEMENT
DWG 5463-110-001 REV A	PAGE 3 OF 3 SCALE 1/4"=1'-0"



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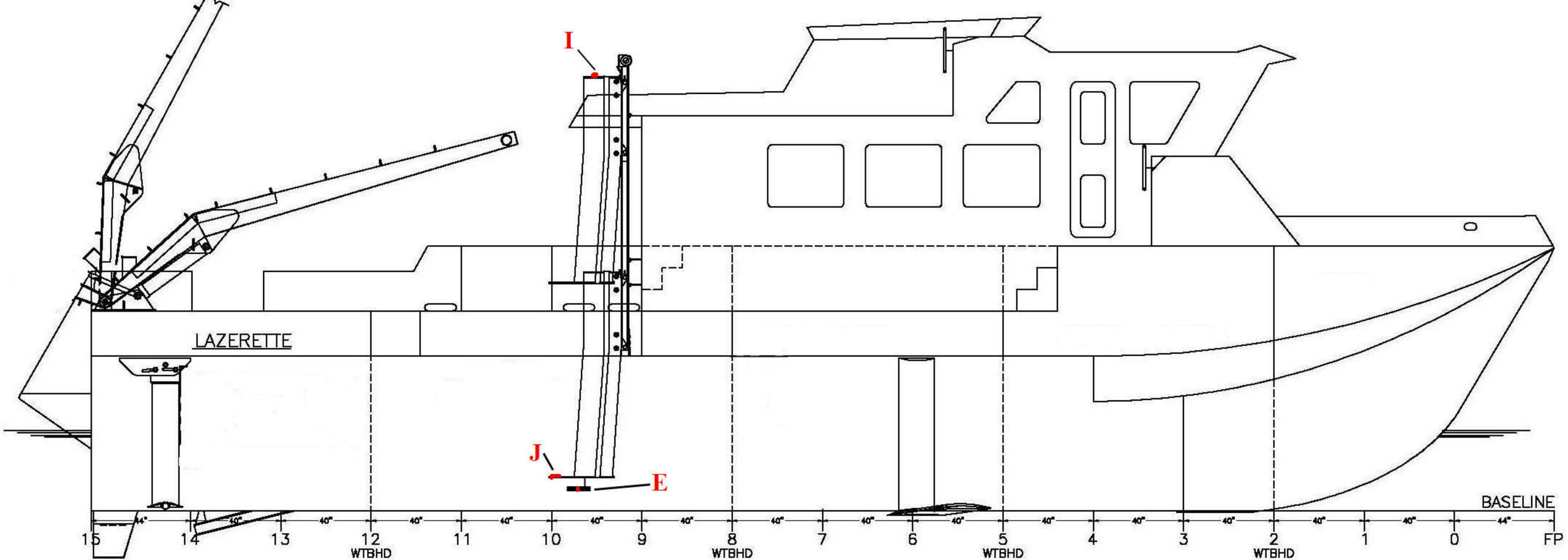


INBOARD PROFILE

SEA-BIRD ELECTRONICS, INC.
1808 - 136th Place Northeast, Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Conductivity Calibration Report

Customer:	NOAA-NAVIGATION RESPONSE BRANCH		
Job Number:	49076	**Date of Report:**	1/7/2008
Model Number	SBE 19Plus	**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: 1/5/2008 Drift since last cal: -0.00050 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.

SEA-BIRD ELECTRONICS, INC.
1808 - 136th Place Northeast, Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Conductivity Calibration Report

Customer:	NOAA-NAVIGATION RESPONSE BRANCH		
Job Number:	49076	**Date of Report:**	1/7/2008
Model Number	SBE 19Plus	**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: 1/5/2008 Drift since last cal: -0.00050 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.

SEA-BIRD ELECTRONICS, INC.
1808 - 136th Place Northeast, Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Conductivity Calibration Report

Customer:	NOAA-NAVIGATION RESPONSE BRANCH		
Job Number:	49076	**Date of Report:**	1/7/2008
Model Number	SBE 19Plus	**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: 1/5/2008 Drift since last cal: -0.00050 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.

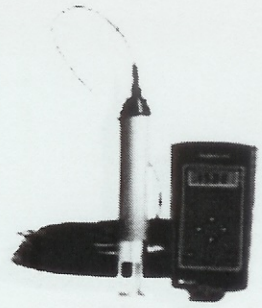
Date:
Feb 29, 2008

Serial #:
98376-022908

DIGIBAR CALIBRATION REPORT

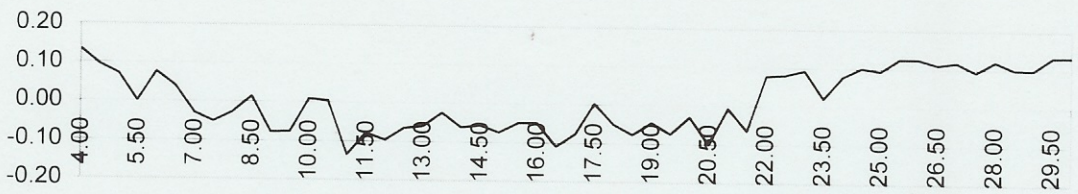
version 1.0 (c) 2004

ODOM HYDROGRAPHIC SYSTEMS, Inc



STANDARD DEL GROSSO H^2O

TEMP	VELOCITY	MEASURED FREQUENCY	RES_VEL	OBS-CAL
4.00	1421.62	5564.01	1421.76	0.13
4.50	1423.90	5572.49	1423.99	0.09
5.00	1426.15	5580.93	1426.22	0.07
5.50	1428.38	5589.09	1428.38	0.00
6.00	1430.58	5597.71	1430.65	0.08
6.50	1432.75	5605.80	1432.79	0.04
7.00	1434.90	5613.67	1434.87	-0.03
7.50	1437.02	5621.62	1436.97	-0.05
8.00	1439.12	5629.65	1439.09	-0.03
8.50	1441.19	5637.65	1441.20	0.01
9.00	1443.23	5645.05	1443.16	-0.08
9.50	1445.25	5652.71	1445.18	-0.08
10.00	1447.25	5660.59	1447.26	0.01
10.50	1449.22	5668.04	1449.23	0.00
11.00	1451.17	5674.89	1451.04	-0.13
11.50	1453.09	5682.39	1453.02	-0.08
12.00	1454.99	5689.52	1454.90	-0.10
12.50	1456.87	5696.74	1456.81	-0.07
13.00	1458.72	5703.78	1458.66	-0.06
13.50	1460.55	5710.84	1460.53	-0.02
14.00	1462.36	5717.54	1462.30	-0.06
14.50	1464.14	5724.32	1464.09	-0.06
15.00	1465.91	5730.92	1465.83	-0.07
15.50	1467.65	5737.60	1467.60	-0.05
16.00	1469.36	5744.10	1469.31	-0.05
16.50	1471.06	5750.29	1470.95	-0.11
17.00	1472.73	5756.75	1472.65	-0.08
17.50	1474.38	5763.30	1474.38	0.00
18.00	1476.01	5769.27	1475.96	-0.05
18.50	1477.62	5775.26	1477.54	-0.08
19.00	1479.21	5781.39	1479.16	-0.05
19.50	1480.77	5787.21	1480.70	-0.07
20.00	1482.32	5793.23	1482.29	-0.03
20.50	1483.84	5798.74	1483.74	-0.10
21.00	1485.35	5804.79	1485.34	-0.01
21.50	1486.83	5810.19	1486.76	-0.06
22.00	1488.29	5816.27	1488.37	0.08
22.50	1489.74	5821.75	1489.82	0.08
23.00	1491.16	5827.19	1491.25	0.09
23.50	1492.56	5832.23	1492.59	0.02
24.00	1493.95	5837.69	1494.03	0.08
24.50	1495.32	5842.95	1495.42	0.10
25.00	1496.66	5848.02	1496.75	0.09
25.50	1497.99	5853.17	1498.11	0.13
26.00	1499.30	5858.12	1499.42	0.12
26.50	1500.59	5862.95	1500.70	0.11
27.00	1501.86	5867.79	1501.98	0.12
27.50	1503.11	5872.44	1503.20	0.09
28.00	1504.35	5877.22	1504.47	0.12
28.50	1505.56	5881.75	1505.66	0.10
29.00	1506.76	5886.28	1506.86	0.10
29.50	1507.94	5890.88	1508.07	0.13
30.00	1509.10	5895.29	1509.24	0.13



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

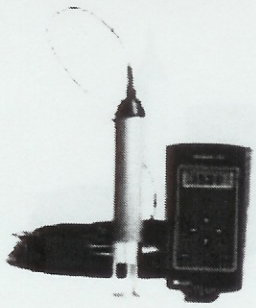
Date:
Feb 29, 2008

Serial #:
98376-022908

DIGIBAR CALIBRATION REPORT

version 1.0 (c) 2004

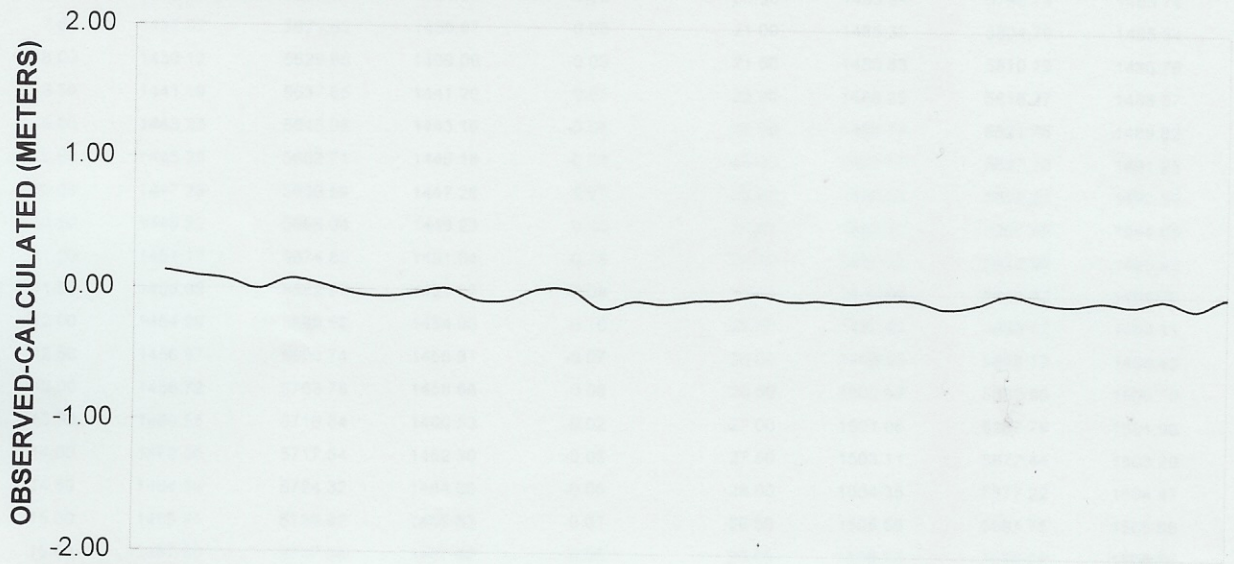
ODOM HYDROGRAPHIC SYSTEMS, Inc.



Burn these numbers to EPROM:

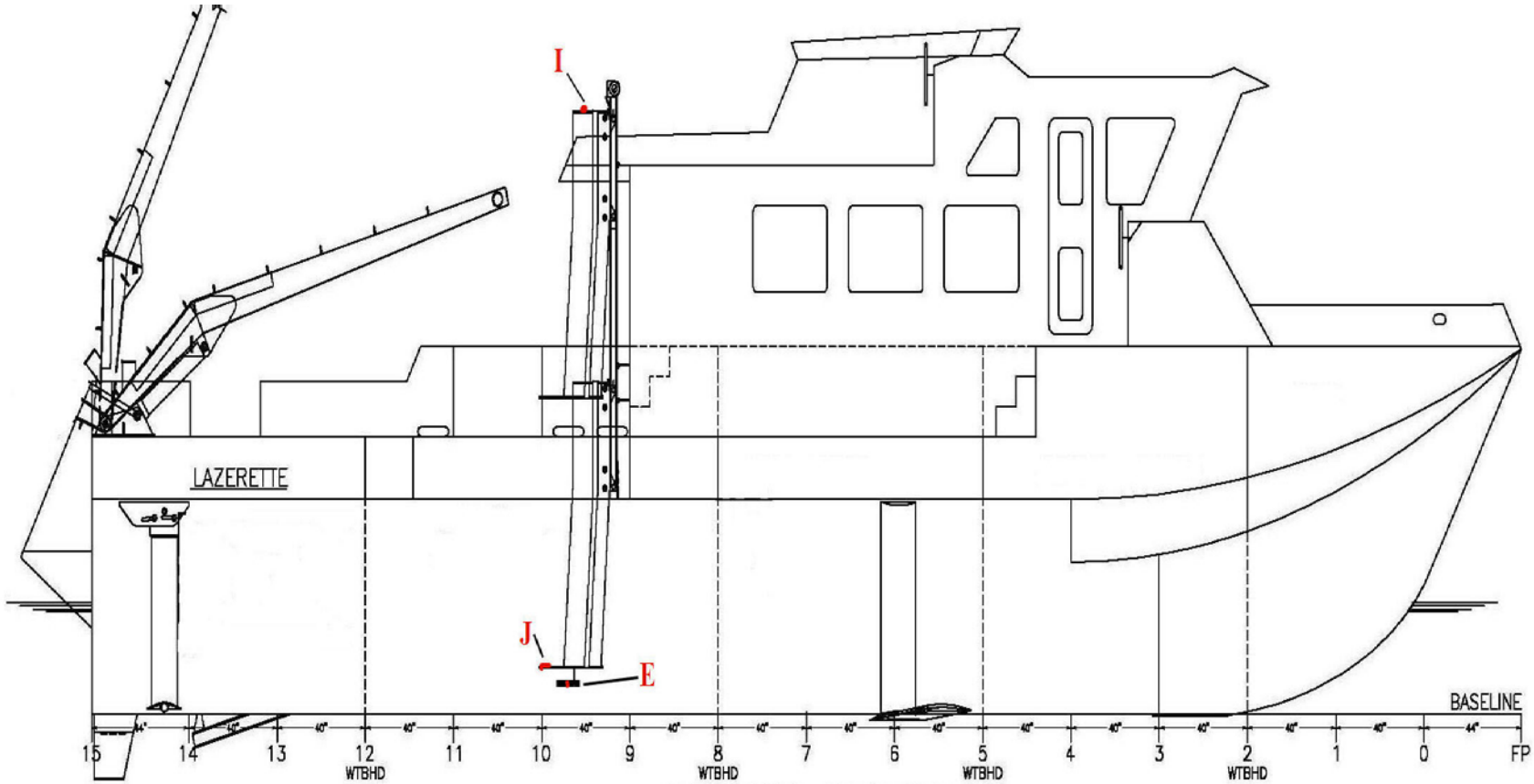
Gradient	**3381**
Intercept	**476**

Calibration Graph

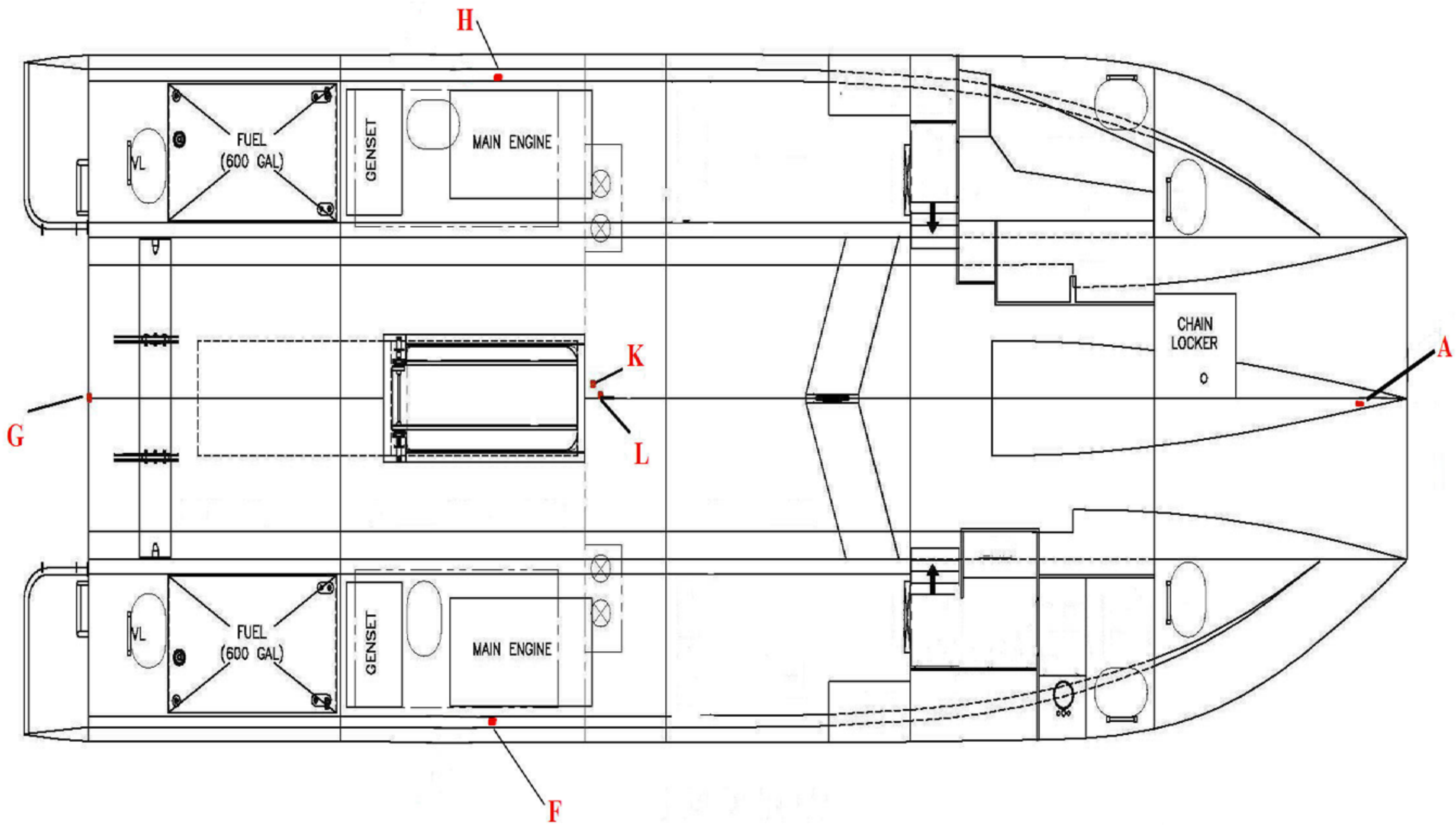


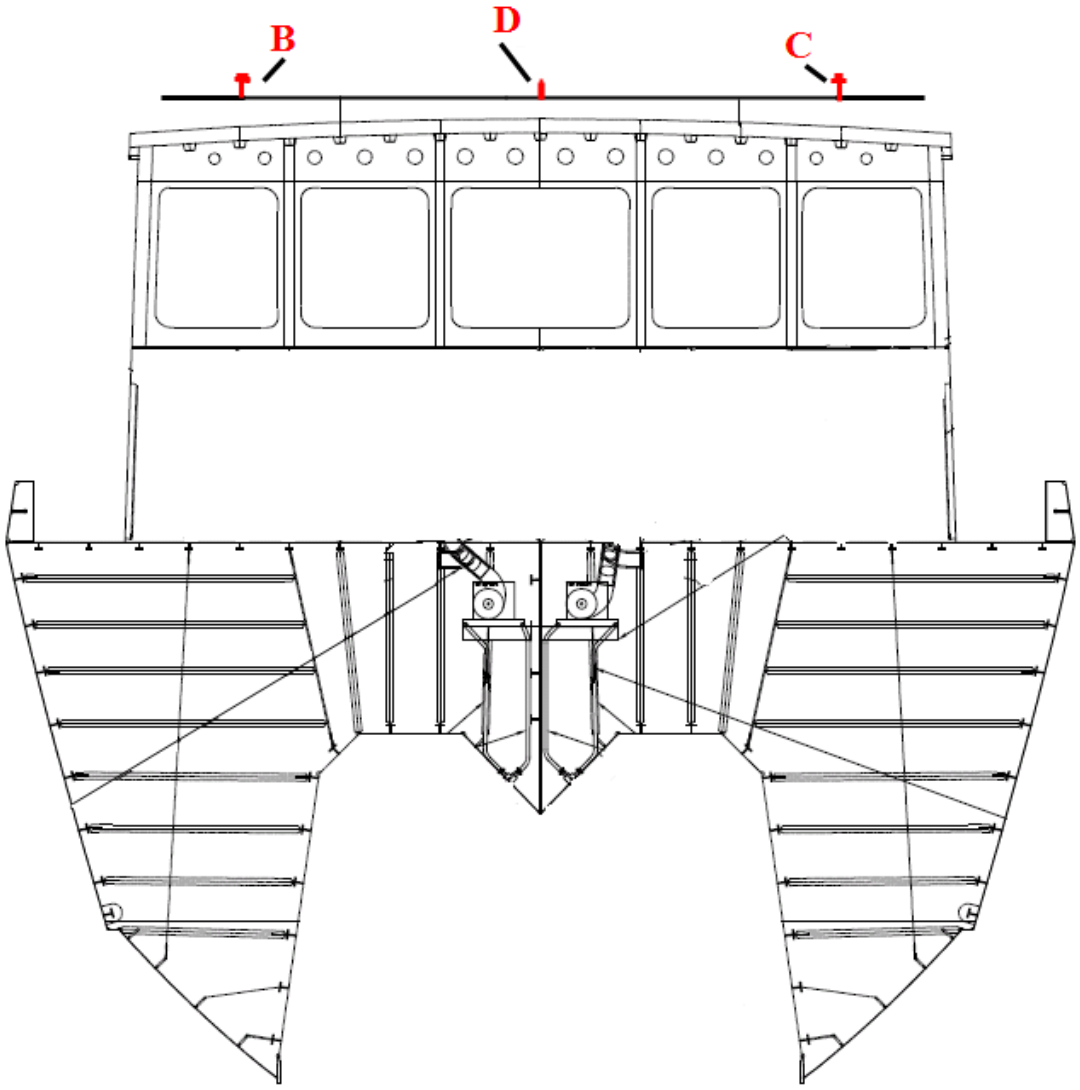
TEMPERATURE (CENTIGRADE)

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



INBOARD PROFILE


H
VL
FUEL
(600 GAL)
GENSET
MAIN ENGINE
K
G
L
CHAIN
LOCKER
A
VL
FUEL
(600 GAL)
GENSET
MAIN ENGINE
F


B
D
C

Bay Hydrographer Acquisition Log

Project: Patchtest 2008_084
Day Number: 2008_084
Data Destination:
Wind Speed:
Weather contitions:
Sea State:
Velocity Cast Times:
Crew: Davidson, Pradith, Mowery

Line Number	Comments	Azimuth	Series
051_1421	Patchtest NW - SE 3kts	127.38	Pitch
051_1426	Patchtest SE -NW 3 kts	307.38	Pitch
051_1430	NW-SE Nav Time	127.38	Nav Time
051_1434	SE-NW Pitch REDO	307.38	Pitch
052_1443	SE-NW Roll 1st line	319.27	Roll
051_1453	Roll SE-NW 2nd Roll Line	319.27	Roll
052_1502	Roll NW-SE 2nd Roll Line	139.2	Roll
012_1507	Roll SE-NW 3rd Roll Line		
056_1516	YAW		Yaw
056_1524	YAW	90	Yaw
013_1528	YAW	271	
017_1559	Clutch e-w 450 rpm1 engine	258.62	Dyn Draft
017_1610	Clutch w-e 450 rpm 1 engine	78.62	Dyn Draft
017_1621	Clutch Both Engines Ignore	258.62	Dyn Draft
	Network Problems!!!		Dyn Draft
017_1645	REDO Both Engines 450 rpm	78.62	Dyn Draft
017_1707	REDO Both Engines 450 rpm	258.62	Dyn Draft
017_1714	both 600 rpm	78.62	Dyn Draft
014_1721	both 600 rpm	258.62	Dyn Draft
017_1727	both 750	78.62	Dyn Draft
017_1734	both 750	258.62	Dyn Draft
017_1738	both 1000 rpm	78.62	Dyn Draft
017_1743	both 1000 rpm	258.62	Dyn Draft

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: 05-Jan-08

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

COEFFICIENTS:

```
g = -1.054779e+000
h =  1.390587e-001
i = -2.372552e-004
j =  3.436792e-005

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

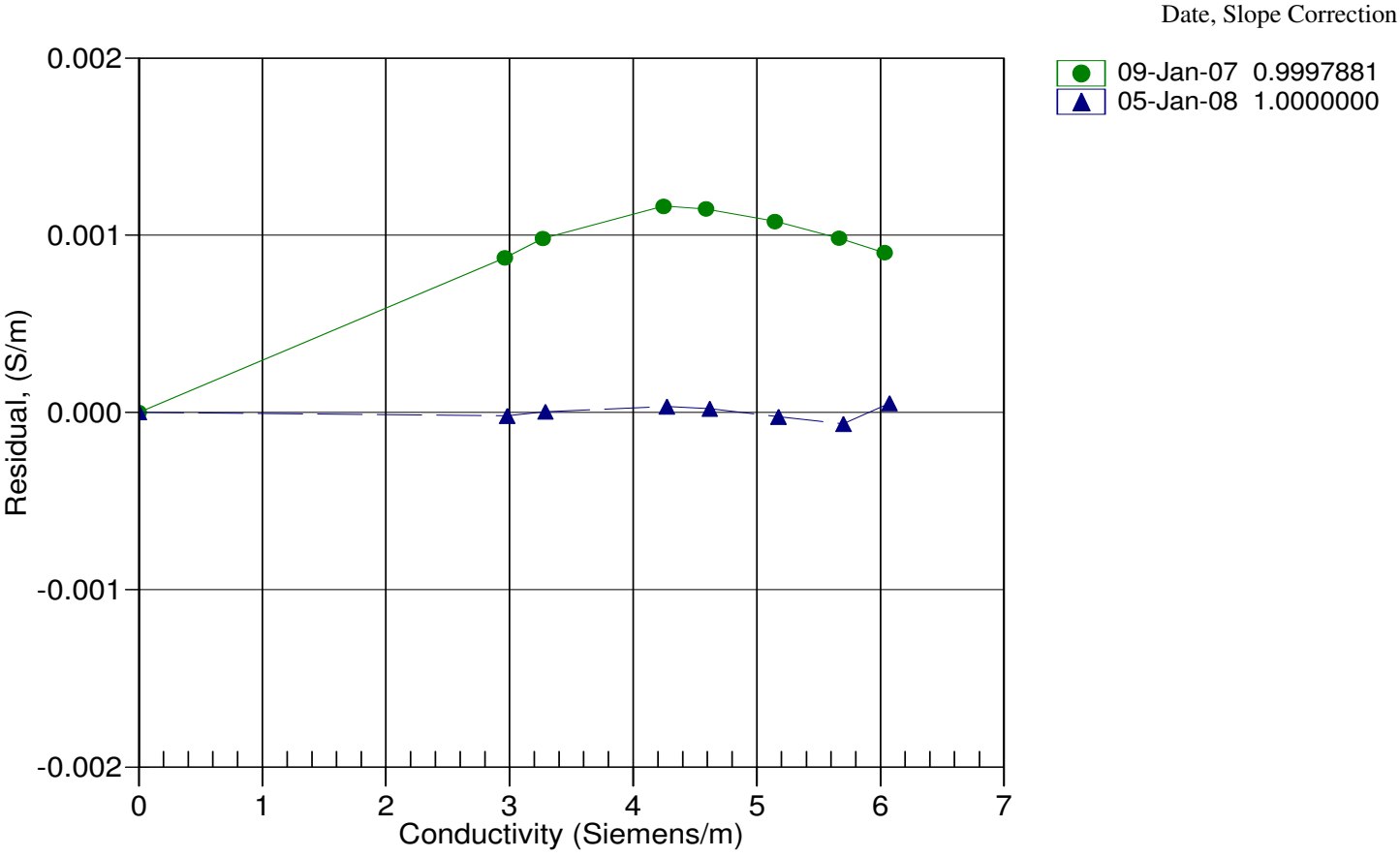
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2758.01	0.0000	0.00000
1.0000	34.8805	2.98093	5392.60	2.9809	-0.00002
4.5000	34.8606	3.28849	5593.78	3.2885	0.00000
14.9999	34.8171	4.27169	6192.51	4.2717	0.00003
18.4999	34.8075	4.61732	6389.41	4.6173	0.00002
23.9999	34.7965	5.17600	6695.15	5.1760	-0.00002
29.0000	34.7902	5.69852	6968.67	5.6985	-0.00006
32.5000	34.7854	6.07121	7157.27	6.0713	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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CALIBRATION DATE: 05-Jan-08

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h =  1.390587e-001
i = -2.372552e-004
j =  3.436792e-005

CPcor = -9.5700e-008
CTcor =  3.2500e-006
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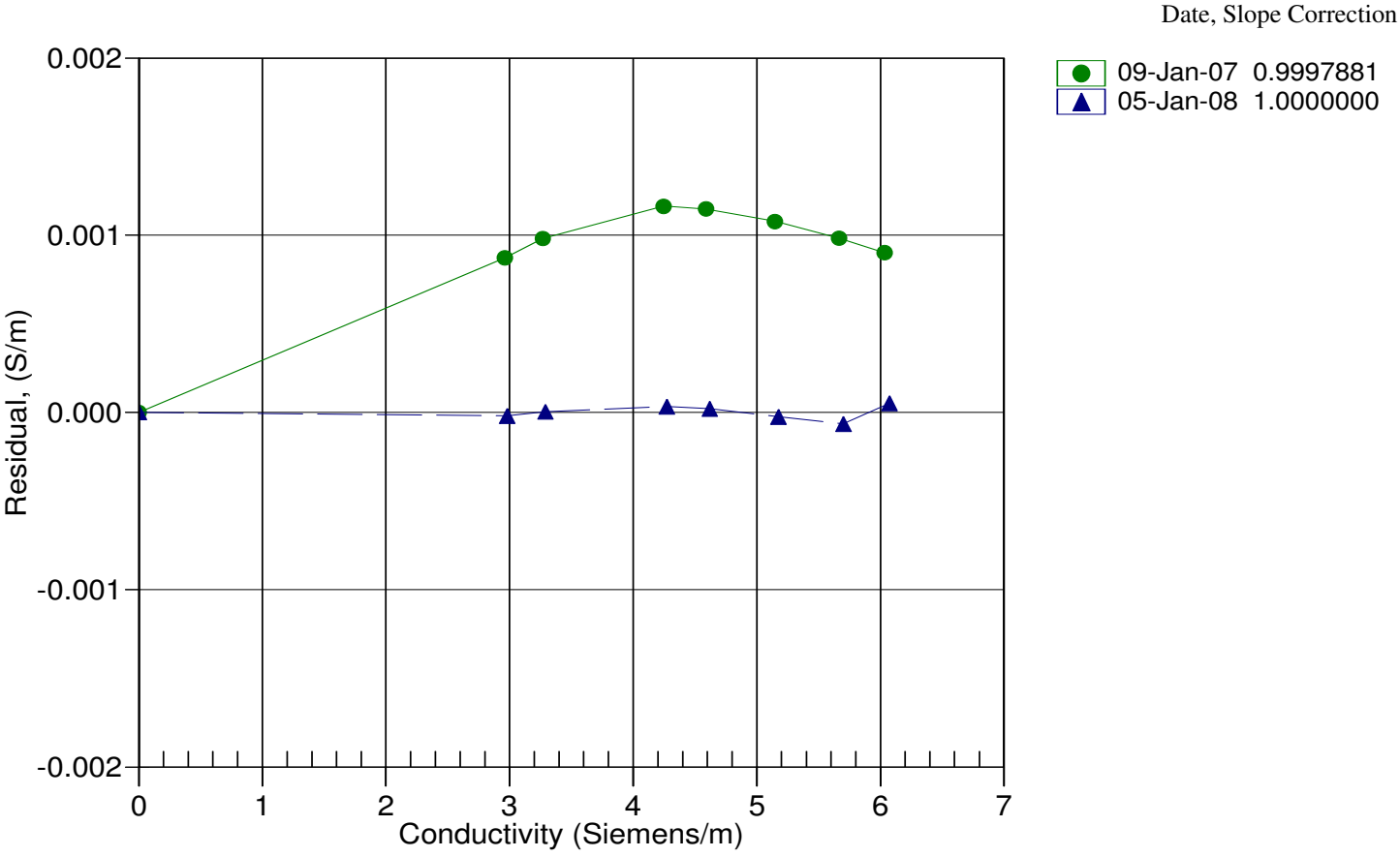
1.0000	34.8805	2.98093	5392.60	2.9809	-0.00002
4.5000	34.8606	3.28849	5593.78	3.2885	0.00000
14.9999	34.8171	4.27169	6192.51	4.2717	0.00003
18.4999	34.8075	4.61732	6389.41	4.6173	0.00002
23.9999	34.7965	5.17600	6695.15	5.1760	-0.00002
29.0000	34.7902	5.69852	6968.67	5.6985	-0.00006
32.5000	34.7854	6.07121	7157.27	6.0713	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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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: 31-Dec-07

SBE19plus PRESSURE CALIBRATION DATA
508 psia S/N 6135

COEFFICIENTS:

PA0 =	-9.860106e-002	PTCA0 =	5.151799e+005
PA1 =	1.550427e-003	PTCA1 =	-1.285147e+000
PA2 =	8.161422e-012	PTCA2 =	-8.070119e-002
PTEMPA0 =	-7.875128e+001	PTCB0 =	2.429287e+001
PTEMPA1 =	4.777507e+001	PTCB1 =	-6.250000e-004
PTEMPA2 =	-2.529301e-001	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE PSIA	INST OUTPUT	THERMISTOR OUTPUT	COMPUTED PRESSURE	ERROR %FSR
14.89	524774.0	2.1	14.88	-0.00
100.19	579741.0	2.1	100.18	-0.00
200.18	644139.0	2.1	200.18	-0.00
300.19	708492.0	2.1	300.18	-0.00
400.20	772806.0	2.1	400.18	-0.00
500.20	837089.0	2.1	500.21	0.00
300.20	708516.0	2.1	300.21	0.00
200.20	644156.0	2.1	200.21	0.00
100.21	579767.0	2.1	100.22	0.00
14.89	524784.0	2.1	14.90	0.00

THERMAL CORRECTION

TEMP ITS90	THERMISTOR OUTPUT	INST OUTPUT
32.50	2.36	524421.56
29.00	2.28	524438.64
24.00	2.18	524462.89
18.50	2.06	524495.80
15.00	1.98	524512.05
4.50	1.76	524536.73
1.00	1.68	524536.27

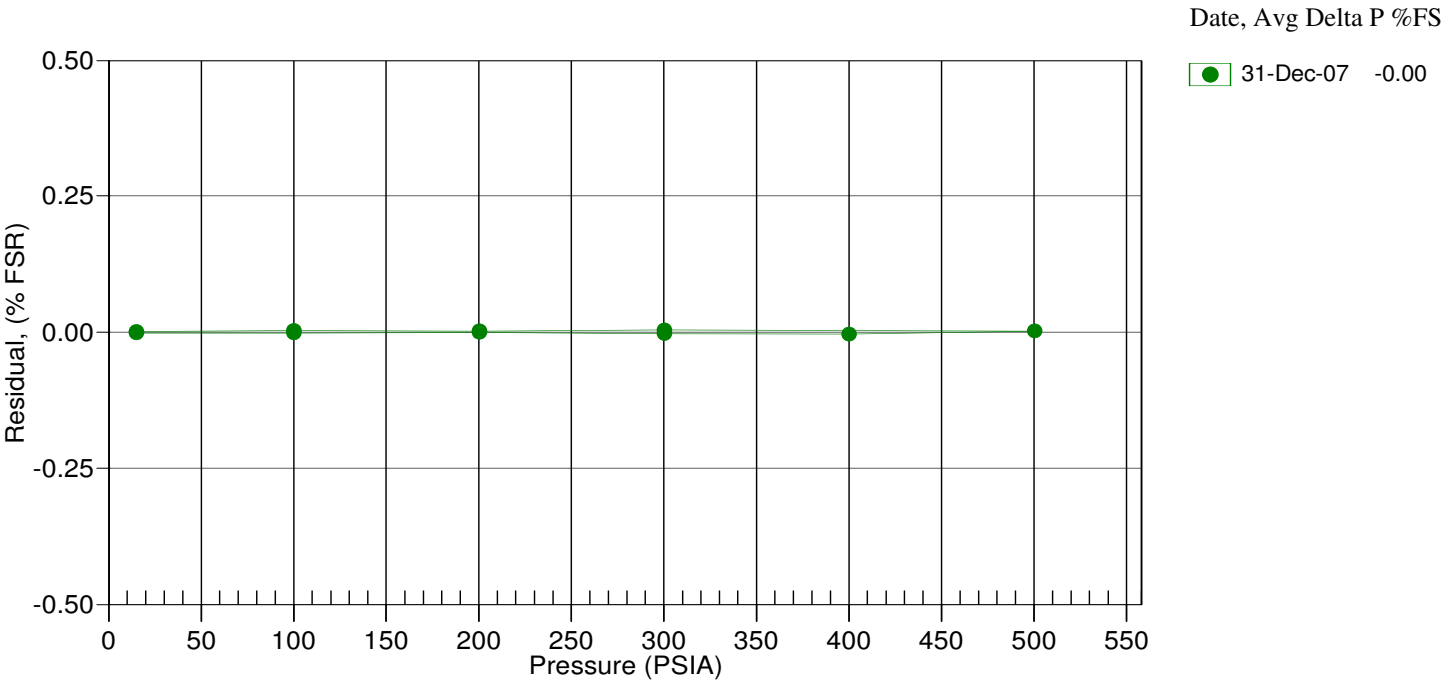
TEMP(ITS90)	SPAN(mV)
-5.00	24.30
35.00	24.27

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) = $PA0 + PA1 * n + PA2 * n^2$



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: 31-Dec-07

SBE19plus PRESSURE CALIBRATION DATA
508 psia S/N 6135

COEFFICIENTS:

PA0 =	-9.860106e-002	PTCA0 =	5.151799e+005
PA1 =	1.550427e-003	PTCA1 =	-1.285147e+000
PA2 =	8.161422e-012	PTCA2 =	-8.070119e-002
PTEMPA0 =	-7.875128e+001	PTCB0 =	2.429287e+001
PTEMPA1 =	4.777507e+001	PTCB1 =	-6.250000e-004
PTEMPA2 =	-2.529301e-001	PTCB2 =	0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE PSIA	INST OUTPUT	THERMISTOR OUTPUT	COMPUTED PRESSURE	ERROR %FSR
14.89	524774.0	2.1	14.88	-0.00
100.19	579741.0	2.1	100.18	-0.00
200.18	644139.0	2.1	200.18	-0.00
300.19	708492.0	2.1	300.18	-0.00
400.20	772806.0	2.1	400.18	-0.00
500.20	837089.0	2.1	500.21	0.00
300.20	708516.0	2.1	300.21	0.00
200.20	644156.0	2.1	200.21	0.00
100.21	579767.0	2.1	100.22	0.00
14.89	524784.0	2.1	14.90	0.00

THERMAL CORRECTION

TEMP ITS90	THERMISTOR OUTPUT	INST OUTPUT
32.50	2.36	524421.56
29.00	2.28	524438.64
24.00	2.18	524462.89
18.50	2.06	524495.80
15.00	1.98	524512.05
4.50	1.76	524536.73
1.00	1.68	524536.27

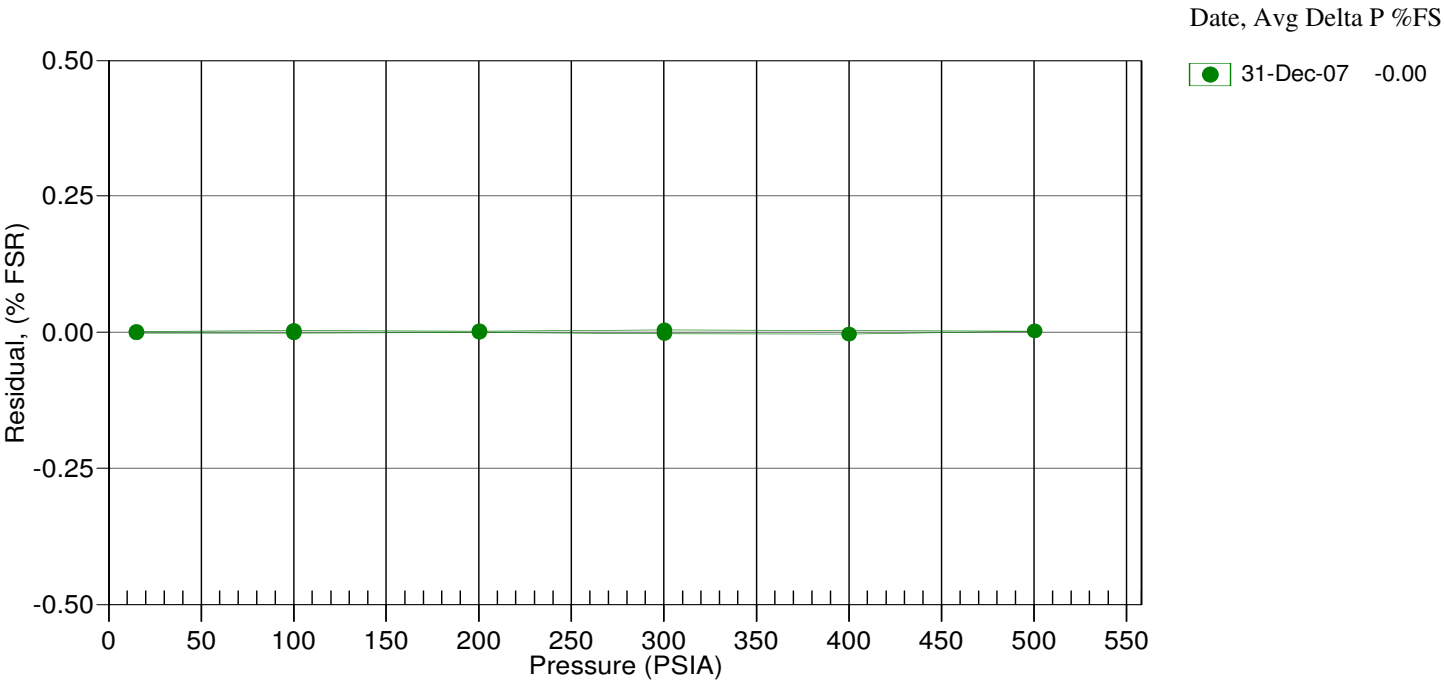
TEMP(ITS90)	SPAN(mV)
-5.00	24.30
35.00	24.27

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) = $PA0 + PA1 * n + PA2 * n^2$



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: 05-Jan-08

SBE19plus TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = 1.186311e-003
a1 = 2.649736e-004
a2 = 1.418678e-007
a3 = 1.350484e-007

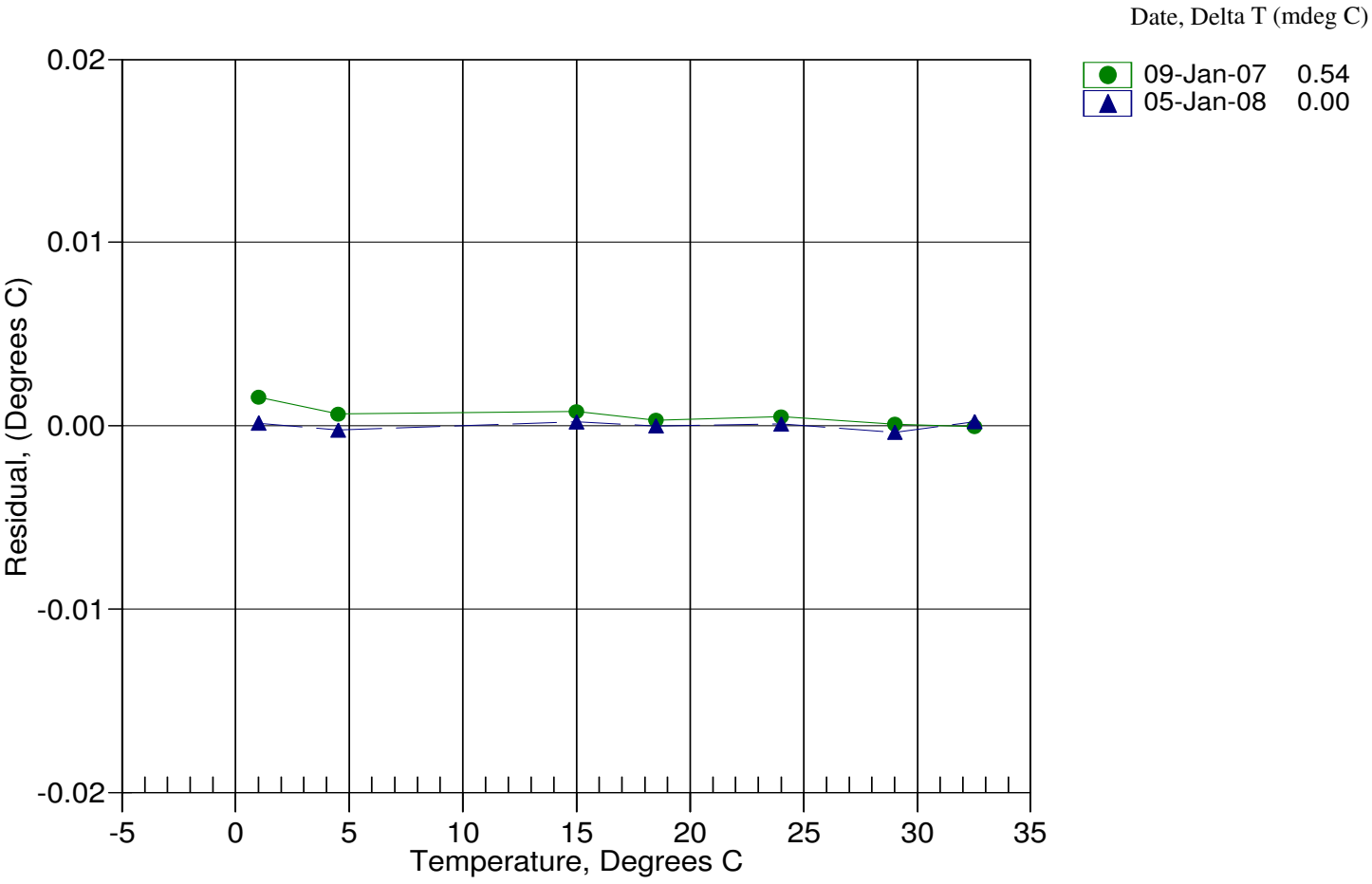
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT(n)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	693753.803	1.0001	0.0001
4.5000	620471.045	4.4998	-0.0002
14.9999	435201.788	15.0001	0.0002
18.4999	384593.091	18.4999	-0.0000
23.9999	315248.924	24.0000	0.0001
29.0000	261956.591	28.9996	-0.0004
32.5000	229533.288	32.5002	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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4.5000	620471.045	4.4998	-0.0002
14.9999	435201.788	15.0001	0.0002
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23.9999	315248.924	24.0000	0.0001
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32.5000	229533.288	32.5002	0.0002

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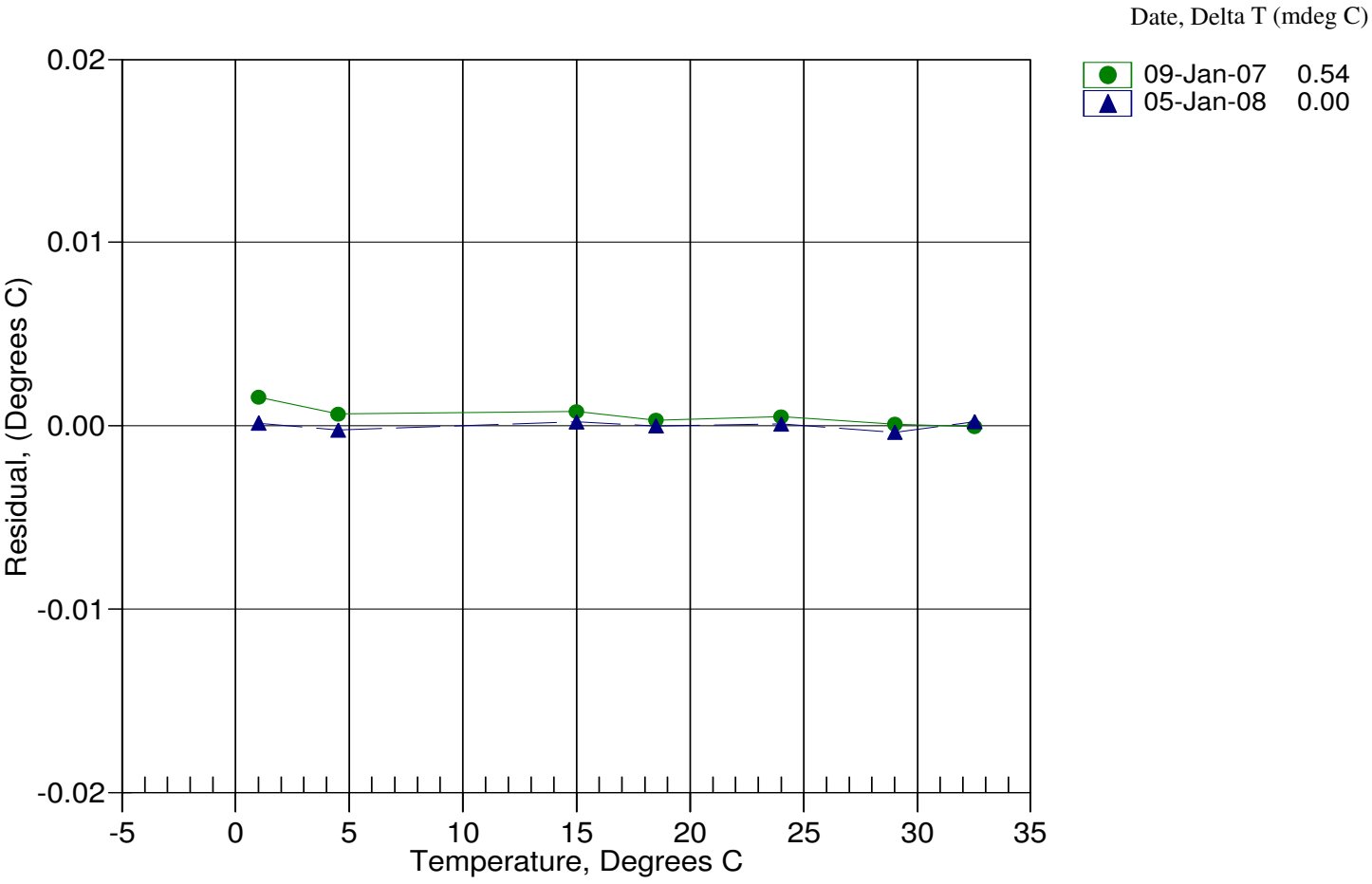
Temperature ITS-90 = $1/\{a0 + a1[ln(R)] + a2[ln^2(R)] + a3[ln^3(R)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



SEA-BIRD ELECTRONICS, INC.

1808 - 136th Place Northeast, Bellevue, Washington 98005 USA

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

Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	05M0684
Model Number	SBE 05M

Services Requested:

1. Evaluate/Repair Instrumentation.

Problems Found:

Services Performed:

1. Performed initial diagnostic evaluation.

Special Notes:

SEA-BIRD ELECTRONICS, INC.

1808 - 136th Place Northeast, Bellevue, Washington 98005 USA

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

Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	19P37217-4677
Model Number	SBE 19Plus

Services Requested:

1. Evaluate/Repair Instrumentation.
2. Perform Routine Calibration Service.

Problems Found:

1. PN 17080 cable has an intermittent open in the pump end and requires replacement.

Services Performed:

1. Performed initial diagnostic evaluation.
2. Performed "Post Cruise" calibration of the temperature & conductivity sensors.
3. Calibrated the pressure sensor.
4. Installed NEW two pin to two pin cable, 15"
5. Performed complete system check and full diagnostic evaluation.

Special Notes:

SEA-BIRD ELECTRONICS, INC.

1808 - 136th Place Northeast, Bellevue, Washington 98005 USA

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

Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	05M0684
Model Number	SBE 05M

Services Requested:

1. Evaluate/Repair Instrumentation.

Problems Found:

Services Performed:

1. Performed initial diagnostic evaluation.

Special Notes:

SEA-BIRD ELECTRONICS, INC.

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Service Report

RMA Number 49076

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Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	19P37217-4677
Model Number	SBE 19Plus

Services Requested:

1. Evaluate/Repair Instrumentation.
2. Perform Routine Calibration Service.

Problems Found:

1. PN 17080 cable has an intermittent open in the pump end and requires replacement.

Services Performed:

1. Performed initial diagnostic evaluation.
2. Performed "Post Cruise" calibration of the temperature & conductivity sensors.
3. Calibrated the pressure sensor.
4. Installed NEW two pin to two pin cable, 15"
5. Performed complete system check and full diagnostic evaluation.

Special Notes:

SEA-BIRD ELECTRONICS, INC.

1808 - 136th Place Northeast, Bellevue, Washington 98005 USA

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

Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	05M0684
Model Number	SBE 05M

Services Requested:

1. Evaluate/Repair Instrumentation.

Problems Found:

Services Performed:

1. Performed initial diagnostic evaluation.

Special Notes:

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Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	19P37217-4677
Model Number	SBE 19Plus

Services Requested:

1. Evaluate/Repair Instrumentation.
2. Perform Routine Calibration Service.

Problems Found:

1. PN 17080 cable has an intermittent open in the pump end and requires replacement.

Services Performed:

1. Performed initial diagnostic evaluation.
2. Performed "Post Cruise" calibration of the temperature & conductivity sensors.
3. Calibrated the pressure sensor.
4. Installed NEW two pin to two pin cable, 15"
5. Performed complete system check and full diagnostic evaluation.

Special Notes:

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Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	05M0684
Model Number	SBE 05M

Services Requested:

1. Evaluate/Repair Instrumentation.

Problems Found:

Services Performed:

1. Performed initial diagnostic evaluation.

Special Notes:

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Service Report

RMA Number 49076

Customer Information:

Company	NOAA-NAVIGATION RESPONSE BRANCH	**Date**	1/17/2008
Contact	Vitad Pradith		
PO Number	Visa		

Serial Number	19P37217-4677
Model Number	SBE 19Plus

Services Requested:

1. Evaluate/Repair Instrumentation.
2. Perform Routine Calibration Service.

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Special Notes:

Side Scan Sonar Internal Depth Gauge Test
BAY HYDROGRAPHER
2008-hydrographic Systems Readiness Review

DATE: 09 April 2008 (DN100)
TIME: 1345hours
LOCATION: Patuxent River under Thomas Johnson Memorial Fixed Bridge
CONDITIONS: Partly Sunny, about 65^{o}F, with winds 3-5knots

PROCEEDURE

A deep area, an area of 100 or more feet, of the Patuxent River was chosen as the test area for the 2008 side scan sonar internal depth gauge measurements (Figure I). Once the vessel reached the testing position, the engines were powered down so that the vessel was dead in the water with zero forward momentum. The side scan sonar was lowered into the water, straight down, to 5meters and held at the position. A voltage was recorded from Compute Depth From Voltage in the Klein Server of the Isis acquisition software. The side scan sonar was then lowered in 5meter (m) increments to 20m and then returned to the surface in 5m increments while recording the voltages from Isis. The process gave us two measurements at 5m, 10m, 15m, and 20m.

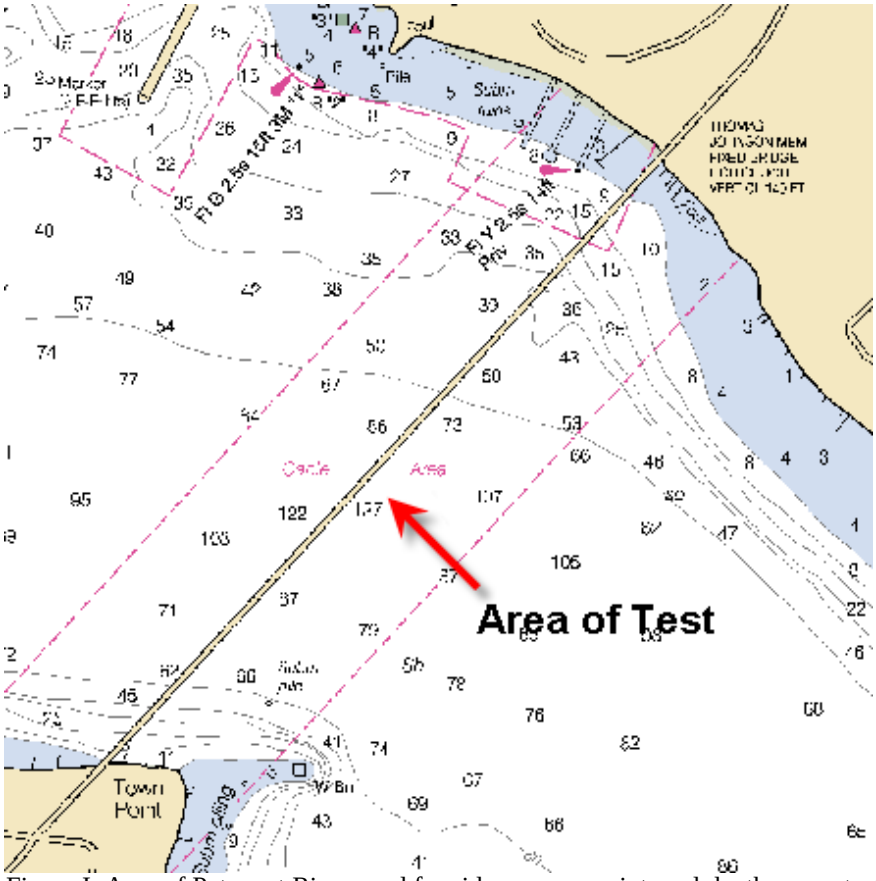


Figure I: Area of Patuxent River used for side scan sonar internal depth gauge test.

Results

The voltages recorded from Isis descended as the physical depth of the side scan sonar became deeper (Table I). The voltages that were compared to the physical depth measurements revealed a line with a slope of **y = 42.818x – 11.505** when graphed (Figure II). Since the graph was linear and voltages increased

with depth, it is understood that the equipment is working properly and the equation was entered into the Client Server in the Isis acquisition software as the new corrector.

Depth	Descending Voltage	Ascending Voltage	Average Voltage
5m	0.39	0.385	0.3875
10m	0.5	0.5	0.5
15m	0.62	0.615	0.6175
20m	0.725	0.75	0.7375

Table I: Recorded voltages from Isis at the four different depths measurements were taken.

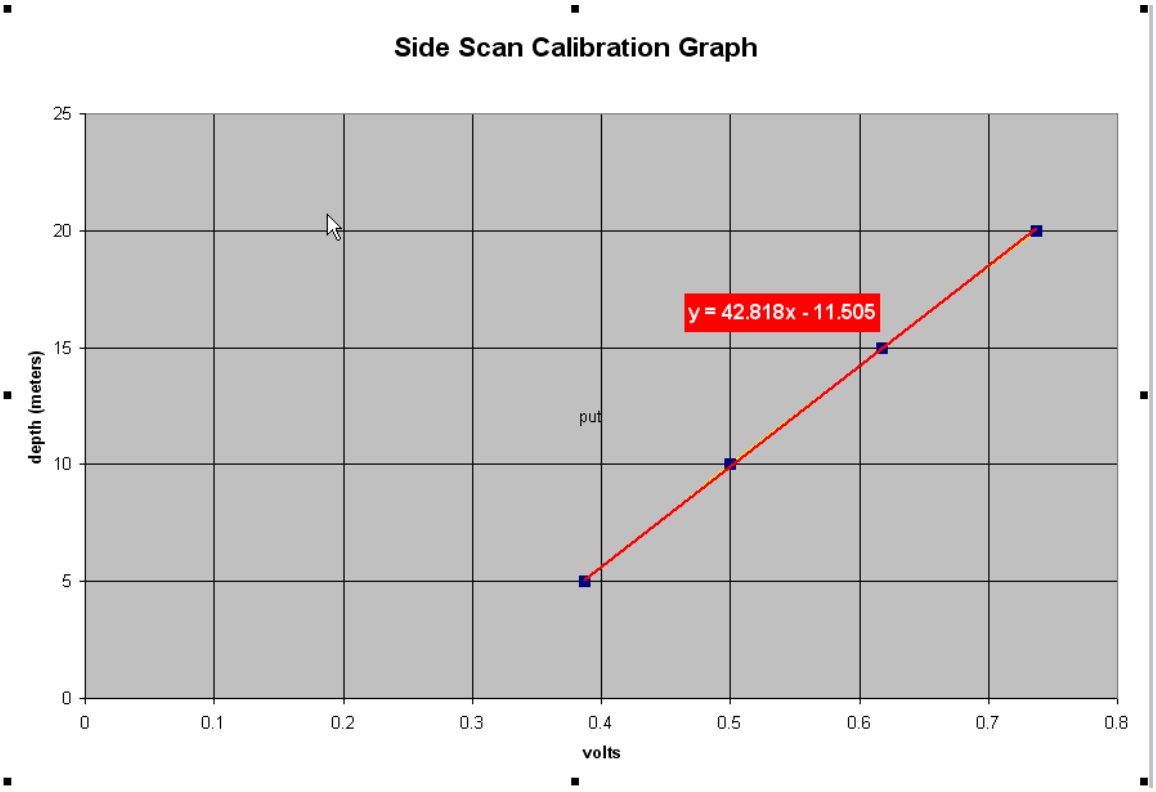


Table II: Voltage readings from Compute Depth From Voltage in the Klein Server of the Isis acquisition software graphed against the measured depths of the side scan sonar.

Side Scan Sonar Calibratic

Field Unit: Bay Hydrographer

Date of Test: 25 March 2008 (2008_085)

Calibrating Hydrographer(s): Vitad Pradith, Robert Mowery (Cont

SIDE SCAN SYSTEM INFORMATION

Side Scan System: Klein Series 5000

System Location:

TPU Serial Number: 184

Towfish Serial Number: 260

Cable Type: Steel Armored

Date of Most Recent EED / Factory Checkout:

Date of Most Recent Pressure Sensor Verification (if applicable): 24 March 2008

VESSEL INFORMATION

Sonar Configuration: towed

Cable Measurement System (if applicable): Measured with metal tape/ Hand mar

Date of Current Vessel Offset Measurement / Verification: 25 March 2008

Date of Current Cable Measurement / Verification (if applicable): 24 March 2008

TEST INFORMATION

Test Date(s) / DN(s): 02 April 2008 (DN 2008_093)

System Operator(s): Vitad Pradith, NOAA & Robert Mowery, ERT Contractor

Wind / Seas / Sky: Less Than 5 knots/ Less Than 1 Foot/ Clear

Locality: Patuxent River

Sub-Locality: Seaplane Operating Area East of Route 4 bridge

Description of Bathymetry: Relatively Flat

Bottom Type: Muddy/Silty

Approximate Water Depth: 45 feet

Description of Target: small pleasure craft

Approximate Target Size: 25 feet

TEST INFORMATION (continued)

Target Position: 38°18'21.18'N by 076°27'01.80"W

Description of Positioning Method: Center of wreck radius used to get DGPS co

Estimated Target Position Error: within 7 meters

Approximate Survey Speed: 2.5m/s

Approximate Towfish Altitude: 8.0 meters

DATA ACQUISITION INFORMATION

Line Number	heading
009_1740	181.336
012_1742	0.673
011_1746	181.179
009_1750	2.005
012_1753	182.531
011_1757	0.449
010_1801	91.209
005_1804	268.676
004_0808	91.486
010_1811	270.423
005_1815	91.194
004_0818	270.969
001_1837	359.984
003_1837	181.298
002_1841	0.301
001_1843	182.307
003_1846	2.253
002_1849	181.645
006_1855	269.853
007_1857	90.952
008_1900	270.811
006_1903	91.593
007_1906	270.831
008_1909	91.265

TEST RESULTS

Number of Passes on Target: 24

Succesful Target Detections: 24

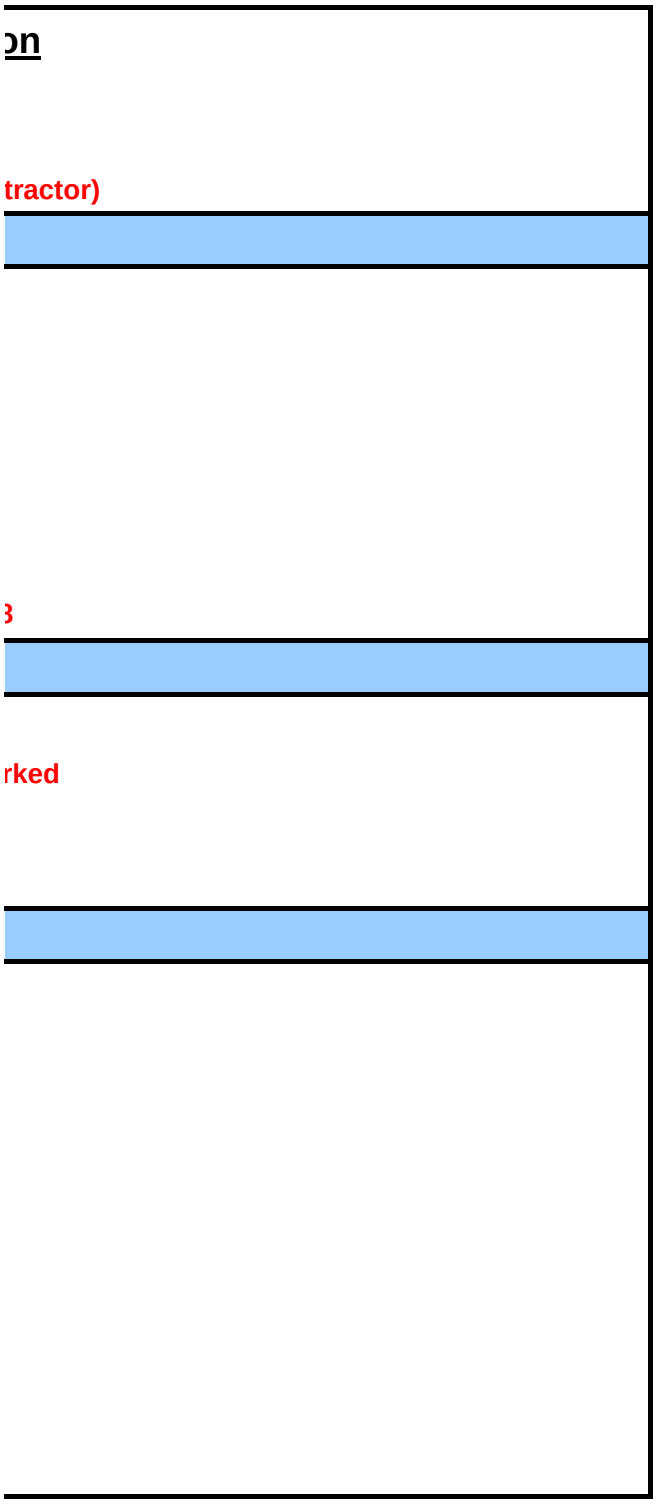
Mean Detected Position: 38°18'21.13"N by 076°27'02.67"W

Distance from Mean Position to True Position: Less than 5m

Approximate 95% Confidence Radius:

NARRATIVE

A gridded pattern was set up with 25 meter line spacing around a known wreck with thre
was run twice, once in either direction, so that the wreck could be observed on the port
closest two lines to the wreck were run at a 75m range scale, while the furthest line was
observed in all of the lines, with all CARIS targets being within 7m from the center. This
and there are no planned actions to be taken.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tractor)
ɜ
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Speed (m/s)
3.370
2.610
2.700
2.286
2.760
2.419
2.487
2.677
2.616
2.746
2.355
2.780
1.394
3.171
2.598
2.897
2.659
2.953
2.761
2.881
2.716
2.852
2.706
2.951

ee lines on all four sides of the wreck. Each line
side and the starboard side of the SSS data. The
s run at a 100m range scale. The wreck was
s SSS system is currently within NOAA standards

SURFACE SOUND SPEED DQA

Surface sound speed instrument Serial Number: DB98376
Surface sound speed instrument Depth (m): 7.8
Surface sound speed Instrument reading (m/sec): 1460.9

Full profile sound speed at same depth (m/sec): 1462.8

DAILY DQA - SURFACE SOUND SPEED COMPARISON - TEST PASSED - Diff in sound speed <= 2 m/sec

Log file \VELOCITY\SVFILES\2008__HSRR.DQA has been updated in detail.

NOTE: All sound speed differences > 1 m/sec should be noted and tracked.

OK

SURFACE SOUND SPEED DQA

Surface sound speed instrument Serial Number: DB98376
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NOTE: All sound speed differences > 1 m/sec should be noted and tracked.

OK

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Temperature Calibration Report

Customer:	NOAA-NAVIGATION RESPONSE BRANCH		
Job Number:	49076	**Date of Report:**	1/7/2008
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: 1/5/2008 Drift since last cal: -0.00054 Degrees Celsius/year

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: Degrees Celsius/year

Comments:

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Temperature Calibration Report

Customer:	NOAA-NAVIGATION RESPONSE BRANCH		
Job Number:	49076	**Date of Report:**	1/7/2008
Model Number	SBE 19Plus	**Serial Number:**	19P37217-4677

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'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 1/5/2008 Drift since last cal: -0.00054 Degrees Celsius/year

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: Degrees Celsius/year

Comments: