

MAGNETOMETER SURVEY REPORT

BA – 195 Barataria Bay Rim Marsh Creation Jefferson & Plaquemines Parish, Louisiana

December 2017

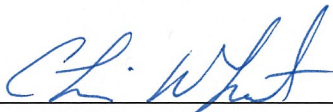
Prepared for:

Natural Resources Conservation Service
3737 Government Street
Alexandria, La 71302

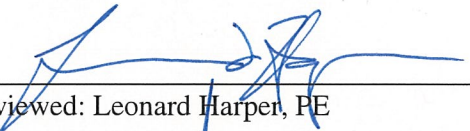
Attention: Ms. Vicki Supler, Contracting Officer

Prepared by:

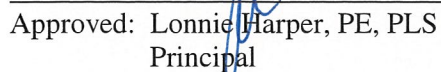
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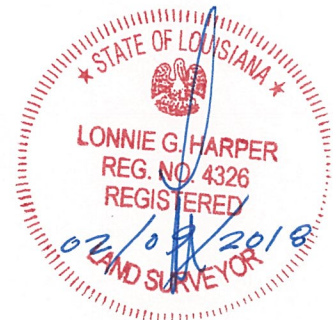
Author: Chris Wheat, PE



Reviewed: Leonard Harper, PE



Approved: Lonnie Harper, PE, PLS
Principal



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Scope of Work

The BA-195 Barataria Bay Rim Marsh Creation project site is located along the northern shore of Barataria Bay in Plaquemine and Jefferson Parishes, Louisiana. Lonnie G. Harper & Associates, Inc. (LHA) was tasked with performing a complete magnetometer survey of the BA-195 project site as defined by the area shown in LHA's *Scoping Meeting Report and Proposal*¹. The purpose of this survey is to delineate all existing magnetic anomalies, which may impact the planned construction activities for the BA-195 project. This report explains the surveying methodologies and equipment used to perform the magnetometer surveys associated with the project and discusses the results of the surveying efforts. All surveys completed under this task order were defined in the proposal submitted to and accepted by the Natural Resources Conservation Service (NRCS) dated June 30, 2017.

Survey Control

As defined in Section 7.1.1 of the *Scope of Services for Engineering Service* for this project and LHA's proposal, the establishment of a deep rod secondary control monument was required for this project. The secondary monument will serve as the survey control for all surveys performed for this project during the design and construction phases. As outlined in the *Secondary Monument Establishment* report prepared by LHA and dated August 2017, the secondary monument consists of a nine-sixteenths inch (9/16") diameter stainless steel rod driven 114 feet to refusal using hand tools and a gasoline powered reciprocating driver. Once constructed, the horizontal and vertical position of the monument was established in accordance with "A Contractor's Guide to the Standards of Practice for CPRA Contractors Performing GPS Surveys and Determining GPS Derived Orthometric Heights within the Louisiana Coastal Zone." The derived position of the secondary monument as determined by LHA is provided below. Reference the *Secondary Monument Establishment* report for further details of the monument establishment.

Table 1.1 – Barataria Bay Rim Marsh Creation (BA-195) Project Secondary Monument Information					
Monument Name	Northing	Easting	Latitude	Longitude	Orthometric Height (NAVD 88)
BA195-SM-01	353,241.24	3,722,287.07	N29°27'50.34131"	W89°56'45.94718"	2.530

¹Horizontal coordinates are referenced to the North American Datum of 1983 (NAD83) 2011 realization, Epoch 2010.00, La SPC, South Zone-1702 and are presented in U.S. survey feet.

²Orthometric heights (elevations) are referenced to the North American Vertical Datum of 1988 (NAVD 88), Geoid 12A and are presented in U.S. survey feet.

¹ Reference LHA's Scoping Meeting Report & Proposal report for the BA-195 Barataria Bay Rim Marsh Creation Project, Appendix A for the site plan depicting the limits of the project area and the planned survey sample lines for all topographic and bathymetric surveys.

Magnetometer Survey

The magnetometer survey performed for the BA-195 project was essentially completed in two phases. The first phase consisted of surveying sample lines in a grid pattern to help locate any anomalies that may be present in the area. Sample lines were spaced 500 feet apart in both directions (East-West and North-South) and extended slightly beyond the limits of the project areas. Magnetometer data was collected using a Geometrics G882 magnetometer, Trimble SPS461 differential GPS, and Hypack data collection software. All land/marsh based data and some water based data were collected with the magnetometer and GPS receiver mounted off the bow of an airboat. The GPS receiver was mounted directly over the magnetometer to maintain an offset distance of zero feet between the two devices. In areas where deep water occurred (5 feet or greater), the magnetometer was towed in the water while the GPS was mounted to the tow davit. This resulted in an offset that was field measured every time the device was put into use. Offset distances were entered into the HYPACK® software during post-processing.

Each day before data collection commenced, the operator started the magnetometer giving it sufficient time to “zero” itself to establish the baseline gamma reading. It should be noted that the baseline gamma value will change depending on transportation equipment used, geographical location, direction of travel, and survey methodology. During post-processing, this baseline gamma value was calculated and used to eliminate any signatures within ± 50 units from the baseline(s). Once processed, the anomaly hits were superimposed over aerial imagery and geo-referenced shape files obtained from www.sonris.com showing the permitted locations of oil and gas infrastructure within the project area. Anomaly signatures were compared to the permitted infrastructure locations to help determine their true position and identity.

The second phase of the magnetometer survey focused on the physically locating and identifying the anomalies detected by the magnetometer. LHA survey crews utilized multiple SubSurface Instruments, Inc. MUL-1 Magnetic Underwater Locator (gradiometer) to pinpoint the location of the associated anomalies. This was done by traversing tightly spaced grid patterns or concentric circles around suspected target locations. Once the anomalies were found, crews then used hand probes and/or visual observations to determine the anomalies identity, position, elevation, depth of cover, etc. Observed locations and corresponding data were then recorded using a Trimble R8/R10 receivers and Trimble TSCIII data collectors.

Findings and Anomaly Mitigation

The results of the magnetometer survey (phase I) yielded approximately 350-400 anomalies with gamma signatures in excess of the ± 50 . Each anomaly was investigated to the fullest extent practical in efforts to determine the source of the magnetic signature. Some locations within open water bodies no longer had a magnetic signature at the time of the phase II field work, indicating that a crab trap was most likely the source of the original magnetic signature. The remaining

anomalies were investigated by LHA survey crews and their locations and identities are shown in the drawings included in Appendix A.

Several pipelines and oil/gas wells were found to be in, or adjacent to, the project area. With the exceptions of few segments, all pipelines generally have very little to no cover (0 to 4 feet), and pipelines vary in diameter from 2-inches to 36-inches. At this time, LHA is of the opinion that some of the located pipelines will affect the future design and construction of the BA-195 project; however, there may be some cost-effective ways to mitigate these impacts and still achieve the project goals. These mitigation efforts include reconfiguring the planned marsh creation cells, adding additional dredge discharge corridors, incorporating pipeline crossing provisions within the design, etc. To date, pipeline owners have not been contacted to determine requirements with regards to placing fill on or adjacent to lines, operating equipment in close proximity to the lines, crossing pipelines with marsh construction equipment, etc. Additional consultation with NRCS and CPRA to determine the best path forward should also be considered prior to modifying the BA-195 project scope.

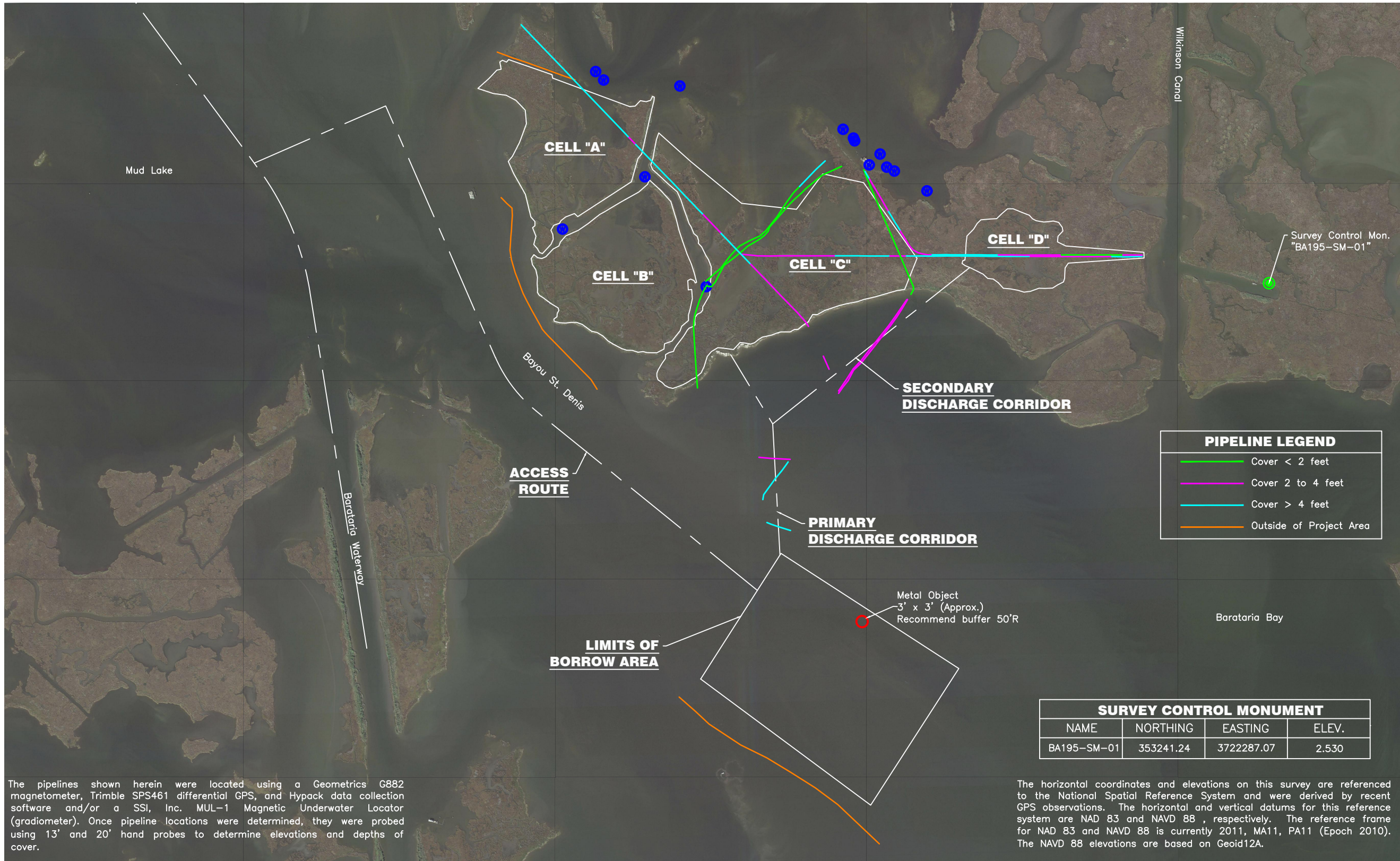
Quality Control, Quality Assurance, and Limitations

Default settings within the Trimble TSCIII data collectors result in RTK data that is accurate within 5 centimeters. All RTK data was collected using the Trimble's recommended default settings, which include a minimum of 3 epochs per RTK observation. The multiple epochs are averaged to produce the reported positions. This provides an internal statistical accuracy with a confidence interval of approximately 95 percent. Any interference with the radio link, poor satellite geometry, excessive Root Mean Square (RMS), etc. which would result in data not adhering to these precision standards, cannot be stored in the data collector without manually overriding the control settings. In addition, LHA survey crew chiseled an "X" mark on a nearby concrete oil platform, and it was observed by each data collector on each day that survey work was performed. The chisel mark served as a TBM that was used to verify that the base was setup with the correct horizontal and vertical positions and that the antenna height settings in the data collectors were correct.

All significant magnetic anomalies (>50 gamma) resulting from the magnetometer survey were investigated during the second phase of the survey work. While researching the permitted oil and gas infrastructure records on www.sonris.com, we discovered that some of the permitted pipelines had not been installed to date. There is a possibility that additional pipelines may be installed before commencement of construction on the BA-195 project. LHA recommends that a subsequent magnetometer survey be performed by the construction contractor, prior to performing any excavation at the site. Additional coordination with pipeline owners may also be warranted prior to the start of construction to insure no damages occur.

APPENDIX A
MAGNETOMETER SURVEY DRAWINGS
PREPARED BY: LONNIE G. HARPER & ASSOCIATES, INC.
(20 PAGES)

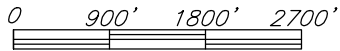
APPENDIX B
Magnetic Anomaly Plan
FROM LONNIE G. HARPER & ASSOCIATES, INC. SURVEY CREWS
(1 PAGE)



The pipelines shown herein were located using a Geometrics G882 magnetometer, Trimble SPS461 differential GPS, and Hypack data collection software and/or a SSI, Inc. MUL-1 Magnetic Underwater Locator (gradiometer). Once pipeline locations were determined, they were probed using 13' and 20' hand probes to determine elevations and depths of cover.

The horizontal coordinates and elevations on this survey are referenced to the National Spatial Reference System and were derived by recent GPS observations. The horizontal and vertical datums for this reference system are NAD 83 and NAVD 88, respectively. The reference frame for NAD 83 and NAVD 88 is currently 2011, MA11, PA11 (Epoch 2010). The NAVD 88 elevations are based on Geoid12A.

SURVEY CONTROL MONUMENT			
NAME	NORTHING	EASTING	ELEV.
BA195-SM-01	353241.24	3722287.07	2.530



NOTICE:

**72 HOURS BEFORE DIGGING
CALL 1-800-272-3020
TO LOCATE UTILITY LINES**

LEGEND:

- Survey Control Monument
- Oil & Gas Well (Recommend 200-ft Buffer)



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Date	Designed	Drawn	Checked	Approved
07/21/17	Chris Wheat	Aaron Harper	Leonard Harper	Lonnie Harper

MAGNETIC ANOMALY PLAN
BA-195 BARATARIA RIM MARSH CREATION PROJECT
Jefferson & Plaquemines Parishes, Louisiana
Page 1 of 1



Natural Resource Conservation Service
United States Department of Agriculture

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Drawing No.
BA-195
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Sheet 1 of 1

APPENDIX C
Survey Equipment Specifications
(27 PAGES)

Trimble TSC3 Controller

Key Features

Large, bright, high-resolution screen makes instrument control easy

Optimized for Trimble Access field software

Fully-integrated camera, GPS navigation, and communications

Improved collaboration and control through **constant connectivity**

The Trimble® TSC3 controller with Trimble Access™ software is a groundbreaking handheld field computing solution that streamlines the flow of everyday surveying work and the number of devices you need in the field.

A POWERFUL ENGINE FOR DRIVING TRIMBLE ACCESS SOFTWARE

Part of a trusted line of field controllers, the Trimble TSC3 controller is rugged and designed for surveyor's workflows. It performs Trimble Access operations fast and delivers ample power to run third-party applications on the Windows® platform.

Make Pictures an Essential Part of Your Workflow

With a built-in 5 MP Autofocus camera and LED flash, you can take digital photographs of your job site right from the controller. No extra devices, batteries, or file transfers are required, and images are automatically geotagged for easy identification.

Easily record the qualitative information that survey data alone can miss, such as site conditions or work progress. The benefits of including images as part of your workflow are almost limitless: from easy data handover to in-field quality assurance.

Communications that Bridge Field and Office in Real-Time

The TSC3 controller enables wireless Internet connectivity through an integrated GSM/GPRS/CDMA2 modem. This allows Trimble Access software to facilitate a constant flow of information between field and office, including real-time synchronization of field and office data with Trimble AccessSync software. You can download and upload important files any time and from anywhere, as needed. Data collection, processing, analysis, and delivery are faster and more efficient.

A wealth of communication options let you transfer critical information no matter the environment: Connect with VRS™ connections using the internal modem. Access your office network through 802.11 LAN, or USB and serial RS232 communication options.

For All of Your Surveying Applications

The rugged TSC3 controller is purpose-built to make both Integrated Surveying and Spatial Imaging jobs easier, more efficient, and more flexible:

Easy-to-Use Interface

Control your survey and verify your work on the large, bright, high-resolution LCD touchscreen. With the option of a QWERTY or conventional alpha-numeric keyboard, data entry is quick and easy.

An Internal Compass

Receive direction cues even when you are stationary or moving backwards.

Integrated GPS

Employ GPS Search on a conventional survey without an external GPS receiver. You can also navigate and find control points and other assets quickly.

Cables Eliminated

Bluetooth® wireless technology eliminates cables in surveying systems. An internal 2.4 GHz radio option is also ideal for controlling Trimble robotic systems.

Designed to Support Your Daily Workflows

Trimble Access field software available on the TSC3 controller offers numerous features and capabilities to streamline the flow of everyday surveying work. Streamlined workflows – such as Roads, Monitoring, Mines, and Tunnels —guide crews through common project types and allows crews to get the job done faster with less distractions.

Survey companies can also implement their unique workflows by taking advantage of the customization capabilities available in the Trimble Access Software Development Kit (SDK). The Trimble Access SDK provides software developers with the tools to customize and extend Trimble Access.

With a bright, daylight readable display, integrated communications, and integrated survey workflows, the fully integrated TSC3 controller will make your field work more efficient.



Trimble TSC3 Controller

TECHNICAL SPECIFICATIONS

Standard software

Windows Embedded Handheld 6.5 Professional operating system, including:

- SMS Text Messaging Support
- Microsoft Office Mobile:
 - Word Mobile
 - Excel Mobile
 - PowerPoint Mobile
 - Outlook Mobile
- Internet Explorer Mobile
- Notes / Tasks
- Task Manager
- Calculator
- Microsoft Pictures and Videos
- Customized Camera and Flash control including geo-tagging through Microsoft Pictures & Videos software
- Flashlight mode control application
- Calendar / Contacts
- Windows Media Player
- Messenger
- Adobe Acrobat Reader
- Trimble SatViewer (GPS interface software application)

Operating system languages options (customer provisionable):
Simplified Chinese, English, French, German, Japanese, Spanish

Trimble Field Software Solutions

The Trimble TSC3 controller runs the Trimble Access field software. In addition, a number of regional solutions are available. For more information on the field software that's best for you, contact your local Trimble authorized distribution partner.

Standard Accessories (included)

- 28.9 Wh Li-Ion battery
- International AC power supply
- Hand strap
- USB cable (mini)
- Stylus tether
- Stylus with spring tip (pkg of 2)
- Screen protectors
- Audio port dust cover
- I/O port dust covers
- Standard soft case
- Quick start guide sheet
- Radio antenna for integrated 2.4 GHz radio modem (optional)

Optional Accessories

- Deluxe carry case
- Individual battery charger
- Range pole bracket
- 12 V vehicle charging kit
- Desk docking cradle with USB host, USB client, and 10/100 Mbps Ethernet connections

All standard accessories are also available to order separately.

HARDWARE

Physical Specifications

Size	141 mm x 278 mm x 64 mm (5.6 in x 10.9 in x 2.5 in) 80 mm (3.2 in) at handgrip
Weight	1.04 kg (2.3 lb) including rechargeable battery 1.10 kg (2.4 lb) including rechargeable battery and optional internal 2.4 GHz radio-modem
Housing	Polycarbonate (case), Hytrel® (overmold)

- 1 Unit is idle with backlight turned on, no radios turned on, moderate temperatures.
- 2 CDMA modem only supports the Verizon network (USA).

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ENVIRONMENTAL SPECIFICATIONS

Meets or exceeds:

Operating Temperature	–30 °C to 60 °C (–22 °F to 140 °F)
Storage Temperature	–40 °C to 70 °C (–40 °F to 158 °F)
Temperature shock	–35 °C/65 °C (–31 °F/149 °F) MIL-STD-810G, Method 503.5, Procedure I
Humidity	90%RH temp cycle –20 °C/60 °C (–4 °F/140 °F) MIL-STD-810G, Method 507.5
Sand & dust	IP6x: 8 hours of operation with blowing talcum powder (IEC-529)
Water	IPx7: Immersed in 1 m of water for 30 minutes (IEC-529)
Drop	26 drops at room temperature from 1.22 m (4 ft) onto plywood over concrete MIL-STD-810G, Method 516.6, Procedure IV
Vibration	General Minimum Integrity and Loose Cargo test MIL-STD 810G, Method 514.6, Procedures I, II
Altitude	4,572 m (15,000 ft) at 23 °C (73 °F) and 12,192m (40,000 ft.) at –30 °C (–22 °F) MIL-STD-810G, Method 500.5, Procedures I, II, III

ELECTRICAL SPECIFICATIONS

- Processor: Texas Instrument Sitara™ 3715 series ARM® Cortex™—A8 Processor (800 MHz)
- Memory: 256 MB RAM
- Storage: 8 GB non-volatile NAND Flash onboard
- Expansion: SDHC memory slot, USB host internal embedded expansion slot (for future use)
- Batteries: 11.1 V, 2600 mAh, 28.9 Wh Li-Ion rechargeable pack
 - Battery life of 34 hours under normal operating conditions¹.
 - Full charge in 3.0 hours.
- Notification LEDs: 3 x tri-colored notification LEDs
- Display:
 - 4.2 in (107 mm) landscape VGA display, 640 x 480 pixels
 - Sunlight-readable color TFT with LED backlight, resistive touchscreen
- Keyboard:
 - Full QWERTY keypad with 10-key number pad, directional buttons, and 4 programmable buttons
 - "ABCD" style keypad option with 10-key number pad, directional buttons, and 4 programmable buttons available
- Audio: Integrated speaker and microphone with 3.5 mm stereo headset connection for audio system events, warnings, and notifications.
- I/O: USB Host (full speed), USB Client (high speed), DC power port, 9-pin serial RS-232
- Wireless:
 - Integrated Bluetooth 2.0+EDR, integrated Wi-Fi 802.11 b/g
 - Integrated quad-band GSM/GPRS/EDGE: 850/900/1800/1900 MHz
 - 2/6 Mbit/s 3G HSDPA GSM WWAN
 - Integrated 2.4 GHz frequency-hopping spread-spectrum radio modem (optional)
 - Dual band CDMA2000 in Bands BC0 and BC1 (800/900MHz)²
- Camera / GPS / Compass / Accelerometer:
 - 5 MP auto focus camera with dual white light LED flash, LED flashlight function
 - Integrated GPS (WAAS enabled)
 - Integrated compass
 - Integrated accelerometer

CERTIFICATIONS

Class B Part 15 FCC certification, CE Mark approval and C-tick approval. RoHS compliant. Bluetooth type approvals and regulations are country specific. MIL-STD-810G, IP 67, MIL-STD-461, PTCRB, GCF compliant, Wi-Fi Alliance certified, AT&T Network Compatible.

Country type certifications: USA, Canada, EU, New Zealand, Australia, Brazil. Pending certifications: Malaysia, China (PRC), India, Japan, Republic of Korea, Russia, Taiwan, Thailand, UAE

RECYCLING INFORMATION

For product recycling instructions and more information, please go to www.trimble.com/environment/summary.html.

Specifications subject to change without notice.



NORTH AMERICA

Trimble Navigation Limited
10368 Westmoor Dr
Westminster CO 80021
USA

EUROPE

Trimble Germany GmbH
Am Prime Parc 11
65479 Raunheim
GERMANY

ASIA-PACIFIC

Trimble Navigation
Singapore Pty Limited
80 Marine Parade Road
#22-06, Parkway Parade
Singapore 449269
SINGAPORE



TRIMBLE AUTHORIZED DISTRIBUTION PARTNER

A325 GNSS Smart Antenna

Affordable, Portable Solution With Professional Accuracy

key features

- Athena™ RTK capable
- Long range RTK baselines of up to 50 km
- Very fast RTK fix and reacquisition times
- Strong multipath mitigation and interference rejection
- Wide operating voltage range, 7-36 V, high transient protection for any power source
- Supports NMEA 2000 over Controller Area Network (CAN) for ISO bus connections



Work smarter, not harder. The A325 GNSS smart antenna offers an affordable, portable solution with professional level accuracy for agricultural, marine, GIS mapping, and other applications.

Focus on the job at hand with fast start-up and reacquisition times, and an easy-to-see status indicator for power, GNSS, and Bluetooth. The durable enclosure houses both antenna and receiver. It can be powered through various sources, making the A325 smart antenna ideal for a variety of applications. Dual-serial, CAN, and pulse output options make this GNSS receiver compatible with almost any interface.

Athena RTK

The A325 GNSS smart antenna supports Athena, our new core GNSS engine. Athena offers significant improvements in the areas of initialization time, robustness in very difficult operating environments, performance over long baselines, and performance under scintillation.



precision@hgnss.com
www.hgnss.com

A325 GNSS Smart Antenna

GNSS Receiver Specifications

Receiver Type:	GNSS L1 & L2 RTK with carrier phase
Signals Received:	GPS and GLONASS
Channels:	114
GPS Sensitivity:	-142 dBm
SBAS Tracking:	3-channel, parallel tracking
Update Rate:	10 Hz standard, 20 Hz optional
Timing (1PPS) Accuracy:	20 ns
Cold Start:	< 60 s typical (no almanac or RTC)
Warm Start:	< 20 s typical (almanac and RTC)
Hot Start:	< 5 s typical (almanac, RTC and position)
Maximum Speed:	1,850 kph (999 kts)
Maximum Altitude:	18,288 m (60,000 ft)

Positioning Accuracy

	RMS (67%)	2DRMS (95%)
RTK: ^{2,3}	10 mm + 1 ppm	20 mm + 2 ppm
SBAS (WAAS): ²	0.3 m	0.6 m
Autonomous, no SA: ²	1.2 m	2.5 m

Communications

Serial Ports:	2 full-duplex RS-232, Bluetooth, CAN
Baud Rates:	4800 - 115200
Correction I/O Protocol:	Hemisphere GNSS proprietary, RTCM v2.3 (DGPS), RTCM v3 (RTK), CMR, CMR+ ¹
Data I/O Protocol:	NMEA 0183, NMEA 2000, Hemisphere GPS binary, Bluetooth 2.0 (Class 2)
Timing Output:	1PPS, CMOS, active low, falling edge sync.
Event Marker Input:	10 k Ω , 10 pF load CMOS, active low, falling edge sync, 10 k Ω , 10 pF load

Power

Input Voltage:	7-36 VDC with reverse polarity
operation	
Power Consumption:	< 4.6 W nominal GPS (L1/L2), GLONASS (L1/L2)
Current Consumption:	0.34 mA nominal GPS (L1/L2), GLONASS (L1/L2)
Power Isolation:	No
Reverse Polarity Protection:	Yes
Antenna Voltage:	Internal antenna

Environmental

Operating Temperature:	-40°C to +70°C (-40°F to +158°F)
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Humidity:	95% non-condensing
Shock and Vibration:	Vibration: EP455 Section 5.15.1 Random Mechanical Shock: EP455 Section 5.14.1 Operational
EMC:	CE (ISO 14982 Emissions and Immunity) FCC Part 15, Subpart B CISPR 22 IP67
Enclosure:	

Mechanical

Dimensions:	10.4 H x 14.5 D cm (4.1 H x 5.7 D in)
Weight:	< 0.56 kg (< 1.23 lbs)
Status Indications (LED):	Power, GNSS lock, Bluetooth
Serial Port Extension:	Bluetooth communication
Power/Data Connector:	12-pin male (metal)
Antenna Mounting:	1-14 UNS-2A female, 5/8-11 UNC-2B adapter and mag-mount available

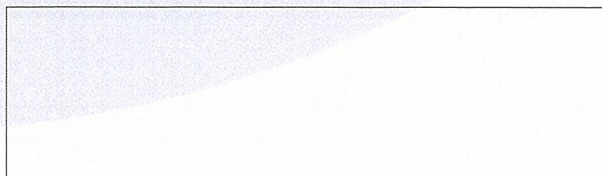
¹ Receive only, does not transmit this format

² Depends on multipath environment, number of satellites in view, satellite geometry, and ionospheric activity

³ Depends also on baseline length

Note: The Eclipse receiver technology is not designed or modified to use the GPSY-Code

Authorized Distributor:



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Rev. 09/15



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precision@hgnss.com
www.hgnss.com

Specifications

Trimble SPS461 Modular GPS Heading Receiver



Receiver Name	SPS461 GPS Heading Receiver
Configuration Option	DGPS
Type	Modular
Base and rover interchangeability	No, rover only
Base operation	NA
Rover operation	All models
Heading operation	All models ⁵
Rover position update rate	1 Hz, 2 Hz, 5 Hz, 10 Hz, 20Hz
Rover maximum range from base	Unlimited
Rover operation within a VRST [™] network	DGPS only
Factory options	Location RTK, OmniSTAR HP/XP, Precise Vertical, Precision RTK
General	
Keyboard and display	VFD display 16 characters by 2 rows On/Off key for one-button startup Escape and Enter keys for menu navigation 4 arrow keys (up, down, left, right) for option scrolls and data entry
Dimensions (L x W x D)	24 cm (9.4 in) x 12 cm (4.7 in) x 5 cm (1.9 in) including connectors
Weight	1.22 kg (2.70 lb) receiver only 1.37 kg (3.00 lb) receiver with internal radio
Antenna Options	
GA510	L1/L2 GPS, SBAS, and OmniSTAR (optimized for OmniSTAR)
GA530	L1/L2 GPS, MSK Beacon, SBAS, and OmniSTAR
L1/Beacon, DSM 232	Not supported
Zephyr [™] Model 2	L1/L2 GPS, SBAS, and OmniSTAR
Zephyr Geodetic [™] Model 2	L1/L2 GPS, SBAS, and OmniSTAR
Zephyr Model 2 Rugged	L1/L2 GPS, SBAS, and OmniSTAR
Zephyr, Zephyr Geodetic, Z-Plus, Micro-Centered [™]	Refer to antenna specification
Temperature	
Operating	-40 °C to +65 °C -40 °F to +149 °F ¹
Storage	-40 °C to +80 °C (-40 °F to +176 °F)
Humidity	MIL-STD 810F, Method 507.4
Waterproof	IP67 for submersion to depth of 1 m (3.3 ft), dustproof
Shock and Vibration	
Drop	Designed to survive a 1 m (3.3 ft) pole drop onto a hard surface
Shock – Non-operating	To 75 g, 6 ms
Shock – Operating	To 40 g, 10 ms, saw-tooth
Vibration	Tested to Trimble ATV profile (4.5 g RMS): 10 Hz to 300 Hz: 0.04 g/Hz; ² 300 Hz to 1,000 Hz; -6 dB/octave

Specifications

Trimble SPS461 Modular GPS Heading Receiver

Measurements

Advanced Trimble Maxwell™ 5 Custom GPS chip
High-precision multiple correlator for L1/L2 pseudo-range measurements

Unfiltered, unsmoothed pseudo-range measurements data for low noise, low multipath error, low-time domain correlation, and high-dynamic response

Very low noise carrier phase measurements with <1 mm precision
in a 1 Hz bandwidth

L1/L2 signal-to-noise ratios reported in dB-Hz
Proven Trimble low elevation tracking technology
72-channel L1 C/A code, L1/L2 Full Cycle Carrier

Trimble EVEREST™ multipath signal rejection
2-channel MSK Beacon (Optional)
4-channel SBAS (WAAS/EGNOS/MSAS)

Code Differential GPS Positioning²

Correction type	DGPS RTCM 2.x
Correction source	DGPS Base via radio or Internet
Horizontal accuracy	$\pm(0.25\text{m} + 1 \text{ ppm})$ RMS $\pm(0.8 \text{ ft} + 1 \text{ ppm})$
Vertical accuracy	$\pm(0.50\text{m} + 1 \text{ ppm})$ RMS $\pm(1.6 \text{ ft} + 1 \text{ ppm})$

SBAS (WAAS/EGNOS/MSAS) Positioning³

Horizontal accuracy	Typically <1 m (3.3 ft)
Vertical accuracy	Typically <5 m (16.4 ft)

OmniSTAR Positioning

VBS service accuracy	Horizontal <1 m (3.3 ft)
XP service accuracy	NA
HP service accuracy	NA

Location RTK Positioning²

Horizontal accuracy	NA
Vertical accuracy	NA

Precise Heading

Heading accuracy	
2 m antenna separation	0.09° RMS
10 m antenna separation	0.05° RMS

Power

Internal	NA
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External

Power input on the 26-pin D-sub connector is optimized for lead acid batteries
with a cut-off threshold of 11 V DC

11 V DC to 28 V DC external power input with over-voltage protection

Receiver automatically turns on when connected to external power

Power over Ethernet (PoE)

44 V DC to 57 V DC, IEEE802.3af compliant device

Power consumption

6.0 W in rover mode with internal receive radio



Specifications

Trimble SPS461 Modular GPS Heading Receiver

Operation Time on Internal Battery

Rover	NA
Base station	NA
450 MHz systems	

Regulatory Approvals

FCC: Part 15 Subpart B (Class B Device) and Subpart C, Part 90
Canadian ICES-003. Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.
Canadian RSS-310, RSS-210, and RSS-119.
Cet appareil est conforme à la norme CNR-310, CNR-210, et CNR-119 du Canada.
R&TTE Directive: EN 301 489-1/-5/-17, EN 300 440, EN 300 328, EN 300 113, EN 60950, EN 50371
ACMA: AS/NZS 4295 approval
CE mark compliance
C-tick mark compliance
RoHS compliant
WEEE compliant

Communications

Lemo (Serial)	NA
Modem 1 (Serial)	26-pin D-sub, Serial 2, Full 9-wire RS232, using adaptor cable
Modem 2 (Serial)	26-pin D-sub, Serial 3, 3 wire RS-232, using adaptor cable
1PPS (1 pulse-per-second)	Available
Ethernet	Through a multi-port adaptor
Bluetooth wireless technology	Fully-integrated, fully-sealed 2.4 GHz Bluetooth module ⁴
Integrated radios (optional)	Fully-integrated, fully-sealed internal MSK Beacon and 450 MHz (UHF) Rx only, Internal MSK Beacon only or Internal 900 MHz Rx only
Channel spacing (450 MHz)	12.5 kHz or 25 kHz spacing available
450 MHz output power	NA
900 MHz output power	NA
Frequency approvals (900 MHz)	NA

External GSM/GPRS, cell phone support	Supported for direct-dial and Internet-based correction streams Cell phone or GSM/GPRS modem inside controller
---------------------------------------	---

Internal MSK Beacon receiver	If internal MSK Beacon Radio is installed ⁶ Frequency range 283.5–325.0 kHz Channel spacing 500 Hz MSK bit rate 50, 100, and 200 bps Demodulation minimum shift key (MSK)
------------------------------	--

Correction data input	RTCM 2.x
Correction data output	Repeat DGPS RTCM from MSK Beacon or OmniSTAR VBS source
Data outputs	NMEA, GSOF, 1PPS Time Tags

Specifications

Trimble SPS461 Modular GPS Heading Receiver

Receiver Upgrades

Location RTK OmniSTAR, Location RTK PV, Precise RTK

Notes

1 Receiver will operate normally to -40°C .

2 Accuracy and reliability may be subject to anomalies such as multipath, obstructions, satellite geometry, and atmospheric conditions. Always follow recommended practices.

3 Depends on SBAS system performance.

4 Bluetooth type approvals are country specific. For more information, contact your local Trimble office or representative.

5 Two of the supported antennas (See Antenna Options) must be connected for heading.

6 One of the antennas must be a GA530 for MSK Beacon signal reception.

Specifications subject to change without notice.

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Trimble Authorized Distribution Partner



Trimble R8s

GNSS SYSTEM

One Receiver Configured for Today Scalable for Tomorrow

Rather than a pre-configured system, the Trimble® R8s GNSS system gives you just the features and benefits you need, in one flexible, scalable system. It's never been easier to build a system tailored to your job.

The Trimble R8s easily integrates with Trimble S-Series total stations and the innovative Trimble V10 imaging rover. Create a complete solution by combining the Trimble R8s receiver with a Trimble controller running Trimble Access™ field software, and Trimble Business Center office software.

Configure and Scale With Ease

With the Trimble R8s, it's easy and simple to build a receiver that is right for the job. Choose the configuration level that suits your needs best, whether it's post-processing, base, rover, or a combination of base and rover functionality. After you've selected a configuration level, additional individual options can be added to further extend the receiver functionality.

The Trimble R8s offers the ultimate in scalability. As your requirements change, the Trimble R8s can adapt. Simply add functionality whenever you need it.

Trimble 360 Technology

Each Trimble R8s comes integrated with powerful Trimble 360 tracking technology that supports signals from all existing and planned constellations, and augmentation systems. Trimble 360 technology can expand the reach of your GNSS rover to sites that were previously inaccessible due to moderate vegetation or other obstructions by taking advantage of the availability of additional satellite signals.

The Trimble R8s includes two integrated Maxwell™ 6 chips and 440 GNSS channels. Capable of tracking a full range of satellite systems, including GPS, GLONASS, Galileo, BeiDou and QZSS.

Communication Options and Remote Access Via Web UI

The Trimble R8s GNSS receiver provides data communication options including an integrated wide-band UHF radio or 3G cellular modem.

Trimble's exclusive Web UI eliminates the need to travel for routine monitoring of base station receivers.

The Complete Solution

Create an industry-leading field solution by pairing the Trimble R8s GNSS receiver with a powerful Trimble controller loaded with our easy-to-use Trimble Access field software.

Trimble Access field software offers the features and capabilities to simplify everyday work. Our streamlined workflow modules such as Roads, Monitoring, Mines, and Tunnels guide crews through common project types, enabling them to get the job done faster. Survey companies can also implement their unique workflows by taking advantage of the customization capabilities available in the Trimble Access Software Development Kit (SDK).

Once you're back in the office, Trimble Business Center enables you to check, process and adjust your data with confidence. No matter what Trimble solution you use in the field, you can trust that Trimble Business Center office software will help you generate industry leading deliverables.

Trimble Mobile App—A New Way to Quickly Collect GNSS Raw Data

The Trimble DL Android app provides a simple and easy to use mobile interface for collecting static GNSS raw data for post-processing purposes without the need of using a Trimble controller or Trimble Access field software. This free of charge app is available through the Google Play Store and operates on Android smart phones and tablets.

Key Features

- ▶ One configurable receiver that is scalable for future needs
- ▶ Available in post-processing, base only, rover only, or base & rover configurations
- ▶ Advanced satellite tracking with Trimble 360 receiver technology
- ▶ Includes Trimble Maxwell 6 chips with 440 channels
- ▶ Simple integration with Trimble S-Series Total Stations and the V10 Imaging Rover
- ▶ Intuitive Trimble Access Field Software and Trimble Business Center Office Software



PERFORMANCE SPECIFICATIONS¹

Measurements

- Advanced Trimble Maxwell 6 Custom Survey GNSS chips with 440 channels
- Future-proof your investment with Trimble 360 tracking
- High precision multiple correlator for GNSS pseudorange measurements
- Unfiltered, un-smoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Signal-to-Noise ratios reported in dB-Hz
- Proven Trimble low elevation tracking technology
- Satellite signals tracked simultaneously:
 - GPS: L1C/A, L1C, L2C, L2E, L5
 - GLONASS: L1C/A, L1P, L2C/A, L2P, L3
 - SBAS: L1C/A, L5 (for SBAS satellites that support L5)
 - Galileo: E1, E5A, E5B
 - BeiDou (COMPASS): B1, B2
- SBAS: QZSS, WAAS, EGNOS, GAGAN
- Positioning rates: 1 Hz, 2 Hz, 5 Hz, 10 Hz, and 20 Hz

POSITIONING PERFORMANCE²

Code differential GNSS positioning

Horizontal	0.25 m + 1 ppm RMS
Vertical	0.50 m + 1 ppm RMS
SBAS differential positioning accuracy ³	typically <5 m 3DRMS

Static GNSS surveying

High-Precision Static	
Horizontal	3 mm + 0.1 ppm RMS
Vertical	3.5 mm + 0.4 ppm RMS

Static and Fast Static

Horizontal	3 mm + 0.5 ppm RMS
Vertical	5 mm + 0.5 ppm RMS

Postprocessed Kinematic (PPK) GNSS surveying

Horizontal	8 mm + 1 ppm RMS
Vertical	15 mm + 1 ppm RMS

Real Time Kinematic surveying

Single Baseline <30 km	
Horizontal	8 mm + 1 ppm RMS
Vertical	15 mm + 1 ppm RMS
Network RTK ⁴	
Horizontal	8 mm + 0.5 ppm RMS
Vertical	15 mm + 0.5 ppm RMS
Initialization time ⁵	typically <8 seconds
Initialization reliability ⁵	typically >99.9%

HARDWARE

Physical

Dimensions	19 cm x 10.4 cm (7.5 in x 4.1 in), including connectors
Weight	1.52 kg (3.35 lb) with internal battery, internal radio and antenna 3.81 kg (8.40 lb) items above plus range pole, controller & internal radio

Operating Temperature ⁶	–40 °C to +65 °C (–40 °F to +149 °F)
Storage Temperature	–40 °C to +75 °C (–40 °F to +167 °F)
Humidity	100%, condensing
Ingress Protection	IP67 dustproof, protected from temporary immersion to depth of 1 m (3.28 ft)

Shock and vibration. Tested and meets the following environmental standards:

Shock. Non-operating: Designed to survive a 2 m (6.6 ft) pole drop onto concrete. Operating: to 40 G, 10 msec, sawtooth

Vibration. MIL-STD-810F, FIG.514.5C-1

ELECTRICAL

- Power 10.5 V DC to 28 V DC external power input with over-voltage protection on Port 1 (7-pin Lemo)
- Rechargeable, removable 7.4 V, 2.8 Ah Lithium-ion smart battery
- Power consumption is <3.2 W in RTK rover mode with internal radio and Bluetooth[®] in use⁷
- Operating times on internal battery⁸:
 - 450 MHz receive only option. 5.0 hours
 - 450 MHz receive/transmit option (0.5 W) 2.5 hours
 - Cellular receive option. 4.0 hours

COMMUNICATIONS AND DATA STORAGE

- Serial: 3-wire serial (7-pin Lemo) on Port 1; full RS-232 serial (Dsub 9 pin) on Port 2
- Radio Modem¹: fully integrated, sealed 450 MHz wide band receiver/transmitter with frequency range of 403 MHz to 473 MHz, support of Trimble, Pacific Crest, and SATEL radio protocols:
 - Transmit power: 0.5 W
 - Range: 3–5 km typical / 10 km optimal⁹
- Cellular¹: fully integrated, sealed internal GSM/GPRS/EDGE/UMTS/HSPA+ modem option. CSD (Circuit-Switched Data) and PSD (Packet-Switched Data) supported. Global Operation:
 - Penta-Band UMTS/HSPA+ (850/800, 900, 1900, and 2100 MHz)
 - Quad-Band GSM/CSD & GPRS/EDGE (850, 900, 1800, and 1900 MHz)
- Bluetooth: fully integrated, fully sealed 2.4 GHz communications port (Bluetooth)¹⁰
- External communication devices for corrections supported on Serial and Bluetooth ports
- Data storage: 56 MB internal memory, 960 hours of raw observables (approx. 1.4 MB/day), based on recording every 15 sec from an average of 14 satellites

Data Formats

- CMR, CMR+, CMRx, RTCM 2.1, RTCM 2.3, RTCM 3.0, RTCM 3.1, RTCM 3.2 inputs and outputs
- 23 NMEA outputs, GSOF, RT17 and RT27 outputs, supports BINEX and smoothed carrier

WebUI

- Offers simple configuration, operation, status, and data transfer
- Accessible via Serial and Bluetooth

Supported Trimble Controllers¹

- Trimble TSC3, Trimble Slate, Trimble CU, Trimble Tablet Rugged PC

CERTIFICATIONS

IEC 60950-1 (Electrical Safety); FCC OET Bulletin 65 (RF Exposure Safety); FCC Part 15.105 (Class B), Part 15.247 Part 90: PTCRB (AT&T); Bluetooth SIG; IC ES-003 (Class B); Radio Equipment Directive 2014/53/EU, RoHS, WEEE; Australia & New Zealand RCM; Japan Radio and Telecom MIC

- 1 Based on Trimble R8s GNSS receiver configuration. Radio frequency settings are country specific.
- 2 Precision and reliability may be subject to anomalies due to multipath, obstructions, satellite geometry, and atmospheric conditions. The specifications stated recommend the use of stable mounts in an open sky view, EMI and multipath clean environment, optimal GNSS constellation configurations, along with the use of survey practices that are generally accepted for performing the highest-order surveys for the applicable application including occupation time appropriate for baseline length. Baselines longer than 30 km require precise ephemeris and occupations up to 24 hours may be required to achieve the high precision static specification.
- 3 Depends on SBAS system performance.
- 4 Network RTK PPM values are referenced to the closest physical reference station.
- 5 May be affected by atmospheric conditions, signal multipath, obstructions and satellite geometry. Initialization reliability is continuously monitored to ensure highest quality.
- 6 Receiver will operate normally to –40 °C, internal batteries are rated to –20 °C, optional internal cellular modem operates to –40 °C.
- 7 Tracking GPS, GLONASS and SBAS satellites.
- 8 Varies with temperature and wireless data rate. When using a receiver and internal radio in the transmit mode, it is recommended that an external 6 Ah or higher battery is used. The specified operating times on an internal battery for the cellular receive option are in GSM CSD (Circuit-Switched Data) or GPRS PSD (Packet-Switched Data) mode.
- 9 Varies with terrain and operating conditions.
- 10 Bluetooth type approvals are country specific.

Specifications subject to change without notice.



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Specifications

Trimble GA530 Antenna



Frequencies	Trimble GA530 Antenna L1/L2/OmniSTAR/Beacon/SBAS
Dimensions	dia 15.2 cm x 7.4 cm H (dia 6" x 2.9" H)
Weight	0.66 kgs (1.45 lbs)
Antenna cable connector	TNC. Sealed
Mounting	5/8"-11 UNC thread mount
Operation temperature	-40 °C to +70 °C (-40 °F to 158 °F)
Storage temperature	-55 °C to +85 °C (-67 °F to 185 °F)
Environmental	MIL-810-F Figure 514.5c-17 vibration levels on each axis Shock tested table MIL-810-F Table 516.5-I 2m drop, bouyant
Humidity	100% humidity proof, fully sealed
Feed	2 point
LNA(Low Noise Amplifier) input	5.5 V DC – 18 V DC (110 mA)
LNA(Low Noise Amplifier) gain	L1 45dB / L2 45dB
Antenna compliance	CE Mark, C-Tick, EN60945
Phase stability	< 5 mm

Specifications subject to change without notice.

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Trimble Authorized Distribution Partner

Trimble R10

GNSS SYSTEM

A NEW LEVEL OF PRODUCTIVITY

Collect more accurate data faster and easier – no matter what the job or the environment, with the Trimble® R10 GNSS System. Built with powerful technologies integrated into a sleek design, this unique system provides Surveyors with a powerful way to increase productivity in every job, every day.

Trimble HD-GNSS Processing Engine

The advanced Trimble HD-GNSS processing engine provides markedly reduced convergence times as well as high position and precision reliability while reducing measurement occupation time. Transcending traditional fixed/float techniques, it provides a more accurate assessment of error estimates than traditional GNSS technology.

Trimble SurePoint

With Trimble SurePoint™ technology, advanced sensors onboard the Trimble R10 continuously stream pole tilt and heading information that is used to display an electronic level bubble on the Trimble controller screen, allowing surveyors to maintain focus where it matters most. Full tilt compensation allows the survey pole to be tilted up to 15° when measuring, allowing the Trimble R10 to capture points that would be inaccessible to other GNSS surveying systems.

Trimble 360 Receiver

Powerful Trimble 360 receiver technology in the Trimble R10 supports signals from all existing and planned GNSS constellations and augmentation systems. With two integrated Trimble Maxwell™ 6 chips, the Trimble R10 offers 440 GNSS channels.

Trimble CenterPoint RTX

Trimble CenterPoint® RTX delivers RTK level precision anywhere in the world without the use of a local base station or VRS network.

Survey using satellite delivered, CenterPoint RTX corrections in areas where terrestrial based corrections are not available. When surveying over a great distance in a remote area, such as a pipeline or utility right of way, CenterPoint RTX eliminates the need to continuously move base stations or maintain connection to a cellular network.

Trimble xFill

Leveraging a worldwide network of Trimble GNSS reference stations and satellite datalinks, Trimble xFill™ seamlessly fills in for gaps in your RTK or VRS connection stream. Maintain centimeter level accuracy beyond five minutes with a CenterPoint RTX subscription.

Smart, Versatile

A smart lithium-ion battery inside the Trimble R10 system delivers extended battery life and more reliable power. A built-in LED battery status indicator allows the user to quickly check remaining battery life.

The Trimble R10 system provides a number of communications options to support any workflow. Receive VRS corrections and connect to the Internet from the field with the integrated cellular modem. Using Wi-Fi, easily connect to the Trimble R10 system using a laptop or smartphone to configure the receiver without a Trimble controller.

The Complete Solution

Bring the power and speed of the Trimble R10 system together with trusted Trimble software solutions, including Trimble Access™ and Trimble Business Center.

Trimble Access field software provides specialized and customized workflows to make surveying tasks quicker and easier while enabling teams to communicate vital information between field and office in real time. Back in the office, users can seamlessly process data with Trimble Business Center software.

Key Features

- ▶ Cutting-edge Trimble HD-GNSS processing engine
- ▶ Precise position capture and full tilt compensation with Trimble SurePoint technology
- ▶ Trimble CenterPoint RTX provides RTK level precision anywhere without the need for a base station or VRS network
- ▶ Trimble xFill technology provides centimeter-level positioning during connection outages
- ▶ Advanced satellite tracking with Trimble 360 receiver technology
- ▶ Sleek ergonomic design for easier handling



PERFORMANCE SPECIFICATIONS		
MEASUREMENTS		
	Measuring points sooner and faster with Trimble HD-GNSS technology	
	Increased measurement productivity and traceability with Trimble SurePoint electronic tilt compensation	
	Worldwide centimeter level positioning using Trimble CenterPoint RTX satellite delivered corrections	
	Reduced downtime due to loss of radio signal with Trimble xFill technology	
	Advanced Trimble Maxwell 6 Custom Survey GNSS chips with 440 channels	
	Future-proof your investment with Trimble 360 GNSS tracking	
	Satellite signals tracked simultaneously:	GPS: L1C/A, L1C, L2C, L2E, L5 GLONASS: L1C/A, L1P, L2C/A, L2P, L3 ¹ SBAS: L1C/A, L5 (For SBAS satellites that support L5) Galileo: E1, E5A, E5B, E5 AltBOC BeiDou (COMPASS): B1, B2, B3 ²
	CenterPoint RTX, OmniSTAR [®] HP, XP, G2, VBS positioning	
	QZSS, WAAS, EGNOS, GAGAN, MSAS	
	Positioning Rates	1 Hz, 2 Hz, 5 Hz, 10 Hz, and 20 Hz
POSITIONING PERFORMANCE ³		
CODE DIFFERENTIAL GNSS POSITIONING		
	Horizontal	0.25 m + 1 ppm RMS
	Vertical	0.50 m + 1 ppm RMS
	SBAS differential positioning accuracy ⁴	typically <5 m 3DRMS
STATIC GNSS SURVEYING		
High-Precision Static		
	Horizontal	3 mm + 0.1 ppm RMS
	Vertical	3.5 mm + 0.4 ppm RMS
STATIC AND FAST STATIC		
	Horizontal	3 mm + 0.5 ppm RMS
	Vertical	5 mm + 0.5 ppm RMS
REAL TIME KINEMATIC SURVEYING		
Single Baseline <30 km		
	Horizontal	8 mm + 1 ppm RMS
	Vertical	15 mm + 1 ppm RMS
Network RTK ⁵		
	Horizontal	8 mm + 0.5 ppm RMS
	Vertical	15 mm + 0.5 ppm RMS
RTK start-up time for specified precisions ⁶		2 to 8 seconds
TRIMBLE RTX (SATELLITE AND CELLULAR/INTERNET (IP))		
CenterPoint RTX		
	Horizontal	4 cm RMS
	Vertical	9 cm RMS
	RTX convergence time for specific precisions ⁷	< 30 min (typical)
	RTX QuickStart convergence time for specific precisions ⁷	< 5 min (typical)
	Operating range (inland)	Nearly worldwide
CenterPoint RTX Fast		
	Horizontal	2 cm RMS
	Vertical	5 cm RMS
	RTX convergence time for specific precisions ⁷	1-5 min (typical)
	Operating range (inland)	In select regions
TRIMBLE XFILL ⁸		
	Horizontal	RTK ⁹ + 10 mm/minute RMS
	Vertical	RTK ⁹ + 20 mm/minute RMS

Trimble R10 GNSS SYSTEM

HARDWARE		
PHYSICAL		
Dimensions (W×H)	11.9 cm x 13.6 cm (4.6 in x 5.4 in)	
Weight	1.12 kg (2.49 lb) with internal battery, internal radio with UHF antenna, 3.57 kg (7.86 lb) items above plus range pole, controller & bracket	
Temperature ¹⁰		
	Operating	–40° C to +65° C (–40° F to +149° F)
	Storage	–40° C to +75° C (–40° F to +167° F)
Humidity	100%, condensing	
Ingress Protection	IP67 dustproof, protected from temporary immersion to depth of 1 m (3.28 ft)	
Shock and vibration (Tested and meets the following environmental standards)		
	Shock	Non-operating: Designed to survive a 2 m (6.6 ft) pole drop onto concrete. Operating: to 40 G, 10 msec, sawtooth
	Vibration	MIL-STD-810F, FIG.514.5C-1
ELECTRICAL		
	Power 11 to 24 V DC external power input with over-voltage protection on Port 1 and Port 2 (7-pin Lemo)	
	Rechargeable, removable 7.4 V, 3.7 Ah Lithium-ion smart battery with LED status indicators	
	Power consumption is 5.1 W in RTK rover mode with internal radio ¹¹	
Operating times on internal battery ¹²		
	450 MHz receive only option	5.5 hours
	450 MHz receive/transmit option (0.5 W)	4.5 hours
	450 MHz receive/transmit option (2.0 W)	3.7 hours
	Cellular receive option	5.0 hours
COMMUNICATIONS AND DATA STORAGE		
	Serial	3-wire serial (7-pin Lemo)
	USB v2.0	Supports data download and high speed communications
	Radio Modem	Fully Integrated, sealed 450 MHz wide band receiver/transmitter with frequency range of 403 MHz to 473 MHz, support of Trimble, Pacific Crest, and SATEL radio protocols: Transmit power: 2 W Range: 3–5 km typical / 10 km optimal ¹³
	Cellular	Integrated, 3.5 G modem, HSDPA 7.2 Mbps (download), GPRS multi-slot class 12, EDGE multi-slot class 12, UMTS/HSDPA (WCDMA/FDD) 850/1900/2100MHz, Quad-band EGSM 850/900/1800/1900 MHz, GSM CSD, 3GPP LTE
	Bluetooth	Fully integrated, fully sealed 2.4 GHz communications port (Bluetooth®) ¹⁴
	Wi-Fi	802.11 b,g, access point and client mode, WPA/WPA2/WEP64/WEP128 encryption
	USB v2.0	Supports data download and high speed communications
	External communication devices for corrections supported on	Serial, USB, TCP/IP and Bluetooth ports
	Data storage	4 GB internal memory; over seven years of raw observables (approx. 1.4 MB /day), based on recording every 15 seconds from an average of 14 satellites
	CMR+, CMRx, RTCM 2.1, RTCM 2.3, RTCM 3.0, RTCM 3.1, RTCM 3.2 input and output	
	24 NMEA outputs, GSO, RT17 and RT27 outputs	

Trimble R10 GNSS SYSTEM

COMMUNICATIONS AND DATA STORAGE

WEBUI

Offers simple configuration, operation, status, and data transfer
Accessible via Wi-Fi, Serial, USB, and Bluetooth

SUPPORTED TRIMBLE CONTROLLERS

Trimble TSC3, Trimble Slate, Trimble CU, Trimble Tablet Rugged PC

CERTIFICATIONS

IEC 60950-1 (Electrical Safety); FCC OET Bulletin 65 (RF Exposure Safety); FCC Part 15.105 (Class B), Part 15.247, Part 90: PTCRB (AT&T); Bluetooth SIG; WFA IC ES-003 (Class B); Radio Equipment Directive 2014/53/EU, RoHS, WEEE; Australia & New Zealand RCM; Japan Radio and Telecom MIC

- 1 There is no public GLONASS L3 CDMA ICD. The current capability in the receivers is based on publicly available information. As such, Trimble cannot guarantee that these receivers will be fully compatible with a future generation of GLONASS satellites or signals.
- 2 Current BeiDou capability is based on publicly available information. The hardware of this product is designed for BeiDou B3 compatibility (trial version) and its firmware will be enhanced, where possible, to fully support such new signals as soon as the officially published signal interface control documentation (ICD) becomes available. As such, Trimble cannot guarantee full compatibility with future generations of BeiDou satellites or signals.
- 3 Precision and reliability may be subject to anomalies due to multipath, obstructions, satellite geometry, and atmospheric conditions. The specifications stated recommend the use of stable mounts in an open sky view, EMI and multipath clean environment, optimal GNSS constellation configurations, along with the use of survey practices that are generally accepted for performing the highest-order surveys for the applicable application including occupation times appropriate for baseline length. Baselines longer than 30 km require precise ephemeris and occupations up to 24 hours may be required to achieve the high precision static specification.
- 4 Depends on WAAS/EGNOS system performance.
- 5 Network RTK PPM values are referenced to the closest physical base station.
- 6 May be affected by atmospheric conditions, signal multipath, obstructions and satellite geometry. Initialization reliability is continuously monitored to ensure highest quality.
- 7 Receiver convergence time varies based on GNSS constellation health, level of multipath, and proximity to obstructions such as large trees and buildings. Convergences times decrease significantly when using a "RTX Quickstart" on a previously surveyed point or a known survey control point.
- 8 Precisions are dependent on GNSS satellite availability, xFill positioning without a RTX subscription ends after 5 minutes of radio downtime. xFill positioning with a RTX subscription will continue beyond 5 minutes providing RTX has converged, with typical precisions not exceeding 6 cm horizontal, 14 cm vertical. xFill is not available in all regions, check with your local sales representative for more information.
- 9 RTK refers to the last reported precision before the correction source was lost and xFill started.
- 10 Receiver will operate normally to -40° C, internal batteries are rated to -20° C.
- 11 Tracking GPS, GLONASS and SBAS satellites.
- 12 Varies with temperature and wireless data rate. When using a receiver and internal radio in the transmit mode, it is recommended that an external 6 Ah or higher battery is used.
- 13 Varies with terrain and operating conditions.
- 14 Bluetooth type approvals are country specific.

Specifications subject to change without notice.



Contact your local Trimble Authorized Distribution Partner for more information

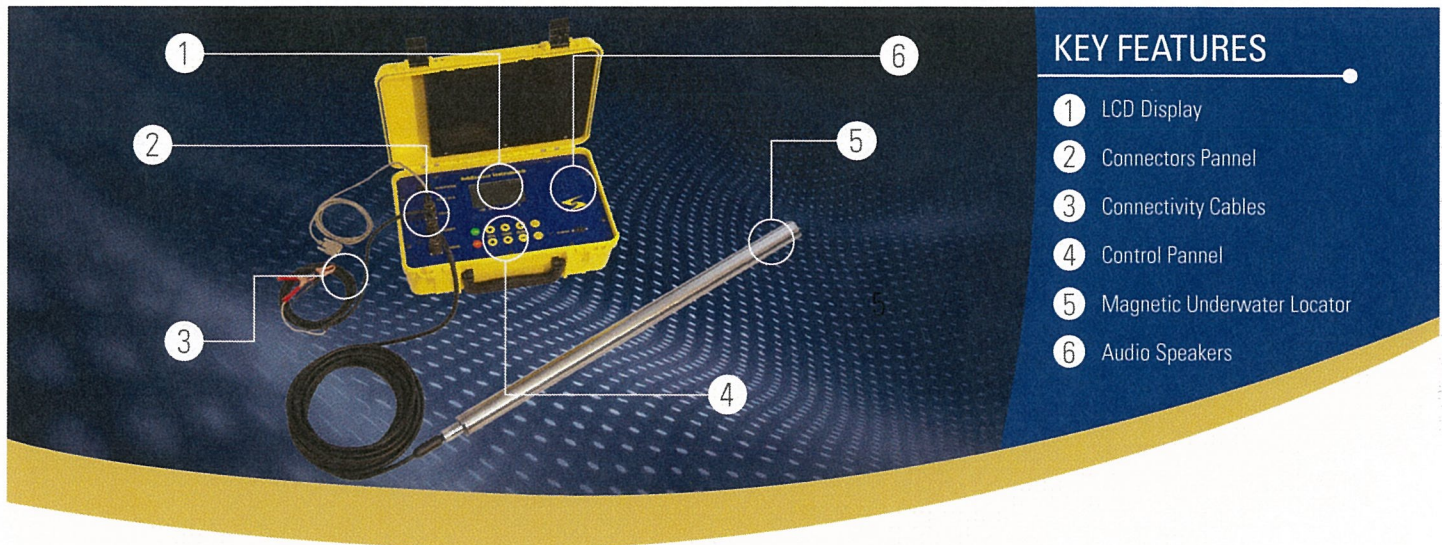
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MUL-1 MAGNETIC UNDERWATER LOCATOR



KEY FEATURES

- 1 LCD Display
- 2 Connectors Panel
- 3 Connectivity Cables
- 4 Control Panel
- 5 Magnetic Underwater Locator
- 6 Audio Speakers

FEATURES

- ▷ Heavy-duty sensor cable acts as lanyard. 30', 50', 100' (non-standard lengths available)
- ▷ High-quality connectors and "Toilet Seat" cover over headset jack. "Seacon" connectors available.
- ▷ Alligator clips for 12-volt auxiliary power.
- ▷ Gel-cell auto-charges when auxiliary power connected.
- ▷ "Zero" to "Null" gradient.
- ▷ Permanent gel-cell battery-mounted under electronics panel.
- ▷ Bull-nosed and tapered sensor on BHG; longer sensor on MUL for diver or boat towing.
- ▷ 1 year warranty



Magnetic Underwater Sensor

- ▷ Durable detector finds metal immersed in 1,000+ feet of water
- ▷ Longer sensor, for diver or boat towing.

SPECIFICATIONS

CONTROLS

- ▷ On, Off
- ▷ Volume Up and Down
- ▷ Range setting (Gain or Sensitivity) Up and Down
- ▷ Zero, Plus and Minus
- ▷ Auto Zero - Automatic self-adjusting

OUTPUTS

- ▷ Audio Frequency Pitch (speaker and jack for headset)
- ▷ Visual LCD Display
- ▷ Bar Graph - range Gain setting - milligauss
- ▷ RS-232 PC connection (cable included)
- ▷ Control all keypad functions data log range, keypad and signal settings works with hyper terminal or equivalent

POWER OPTIONS

- ▷ Internal Battery: 12-volt, 7.2Ah sealed lead acid
- ▷ Battery Life: 72 hours continuous use, charges to full overnight
- ▷ External Power: 12 to 15-volt, cable included
- ▷ Internal battery charging circuit is enabled when external power or AC charging cable is connected

DIMENSIONS

- ▷ Electronics: 16.9"w x 10"h x 6.5"d
- ▷ Sensor: 1.625"d x 34.375"L (4.13cm x 87.3cm)



Includes:

- ▷ ABS custom case
- ▷ Connectivity cables
- ▷ Instruction manual



SubSurface Instruments, Inc. | 1230 Flightway Drive, De Pere, WI. 54115
toll free: 855.422.6346 | Website: www.ssilocators.com | email: info@ssilocators.com





SPECS

The CastAway®-CTD with profiling and analysis software

The CastAway-CTD is a lightweight, easy to use instrument designed for quick and accurate conductivity, temperature, and depth profiles. Starting with a unique six-electrode conductivity cell and fast response thermistor the CastAway makes use of modern technology to provide state of the art CTD measurements.

The palm-sized CastAway-CTD can easily be deployed from small boats. Each cast is referenced with both time and location using its built-in GPS receiver. Plots of conductivity, temperature, salinity and sound speed versus depth can be viewed immediately on the CastAway's integrated color LCD screen in the field.

The rugged, non-corrosive housing, AA battery power and tool-free operation reflect the technician-friendly pedigree of the CastAway-CTD. Profile data is easily downloaded via Bluetooth to a Windows computer for detailed analysis and/or export. The CastAway software displays profiles of the casts in addition to mapping the locations of the data collection points. Data can also be exported to Hypack or Matlab and integrates with RiverSurveyor software for applying sound speed corrections.



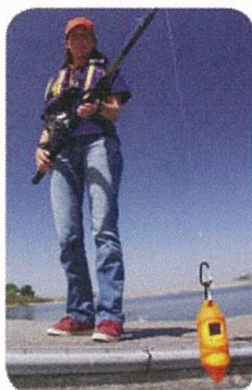
The CastAway incorporates the most modern technology available yet is simple to use. It is designed for profiling down to 100 m and is easy to deploy.



*The CastAway-CTD
Accurate, reliable data in
the palm of your hand!*

APPLICATIONS:

- Coastal Oceanography
- Hydrology
- Aquaculture/Fisheries
- Saltwater Intrusion
- Surveying/Hydrography
- Sound Velocity Profiles
- Field Sensor Verification
- Estuarine Research



HIGHLIGHTS:

- 5Hz response and sampling rate
- Accurate to 0.1 PSU, 0.05°C
- Internal GPS
- Bluetooth wireless data download
- No user calibration required
- No tools, computers or cables required



**The CastAway-CTD
is fully compatible with the
RiverSurveyor S5/M9**

sontek.com/castaway



Specifications

To order, or for more
information, contact
SonTek at inquiry@sontek.com

+1 858 546 8327 (Globally)
sontek.com/castaway

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ISO 14001

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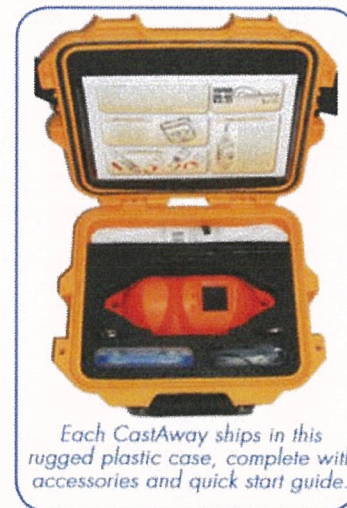
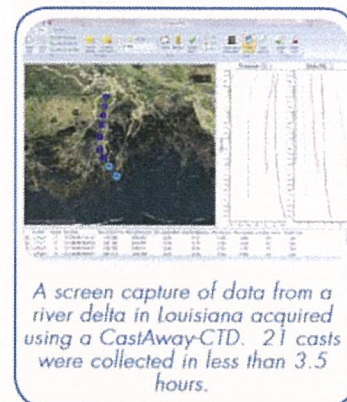
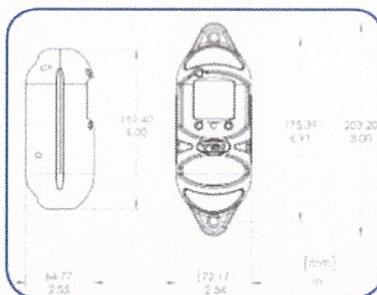
Sound Principles.
Good Advice.

- Memory** 15 MB (750+ casts based on typical usage)
- Communications** Bluetooth class II, up to 10 m range
- Power** 2 "AA" alkaline batteries, 40 hours continuous use
- Data Output Format** - ASCII (CSV)
- Hypack
- Matlab
- Environmental** - Depth range: 0-100 m
- Use temperature: -5° to 45° C
- Storage temperature: -10° to 50° C
- Sampling Modes** - Casting (up/down)
- Point sample (moving the unit back and forth)
- Software** - Windows XP/Vista/7
- Geo-referenced
- Multi-language
- Data plots, filtering, import/export
- Accessories** - Rugged plastic storage/shipping case
- Polyurethane jacket
- 15m deployment line
- Bluetooth dongle
- Two locking carabiners
- Three magnetic stylus pens
- Cleaning brush

Thermistor Response Less than 200 ms (5 Hz)

Sampling Rate 5 Hz

Weight In air: 1.0 lb (0.45 kg)
In water: 0.06 lbs (0.03 kg)



The CastAway-CTD Output Parameters

	Range	Resolution	Accuracy	Measured or Derived
Conductivity	0 to 100,000 $\mu\text{S}/\text{cm}$	1 $\mu\text{S}/\text{cm}$	$\pm 0.25\% \pm 5 \mu\text{S}/\text{cm}$	Measured
Temperature	-5° - 45° C	0.01° C	$\pm 0.05^\circ \text{C}$	Measured
Pressure	0 to 100 dBar	0.01 dBar	$\pm 0.25\% \text{FS}$	Measured
Salinity	Up to 42 (PSS-78)	0.01 (PSS-78)	$\pm 0.1 \text{ (PSS-78)}$	PSS-78 ³
Sound Speed	1400 - 1730 m/s	0.01 m/s	$\pm 0.15 \text{ m/s}$	Chen-Millero ⁴
Density ¹	990 to 1035 kg/m^3	0.004 kg/m^3	$\pm 0.02 \text{ kg}/\text{m}^3$	EOS80 ⁵
Depth	0 to 100 m	0.01m	$\pm 0.25\% \text{FS}$	EOS80 ⁵
Specific Conductivity ²	0 to 250,000 $\mu\text{S}/\text{cm}$	1 $\mu\text{S}/\text{cm}$	$\pm 0.25\% \pm 5 \mu\text{S}/\text{cm}$	EOS80 ⁵
GPS			10 m	

¹Based on temperature resolution and accuracy.

²Based on 100,000 $\mu\text{S}/\text{cm}$ at -5° C.

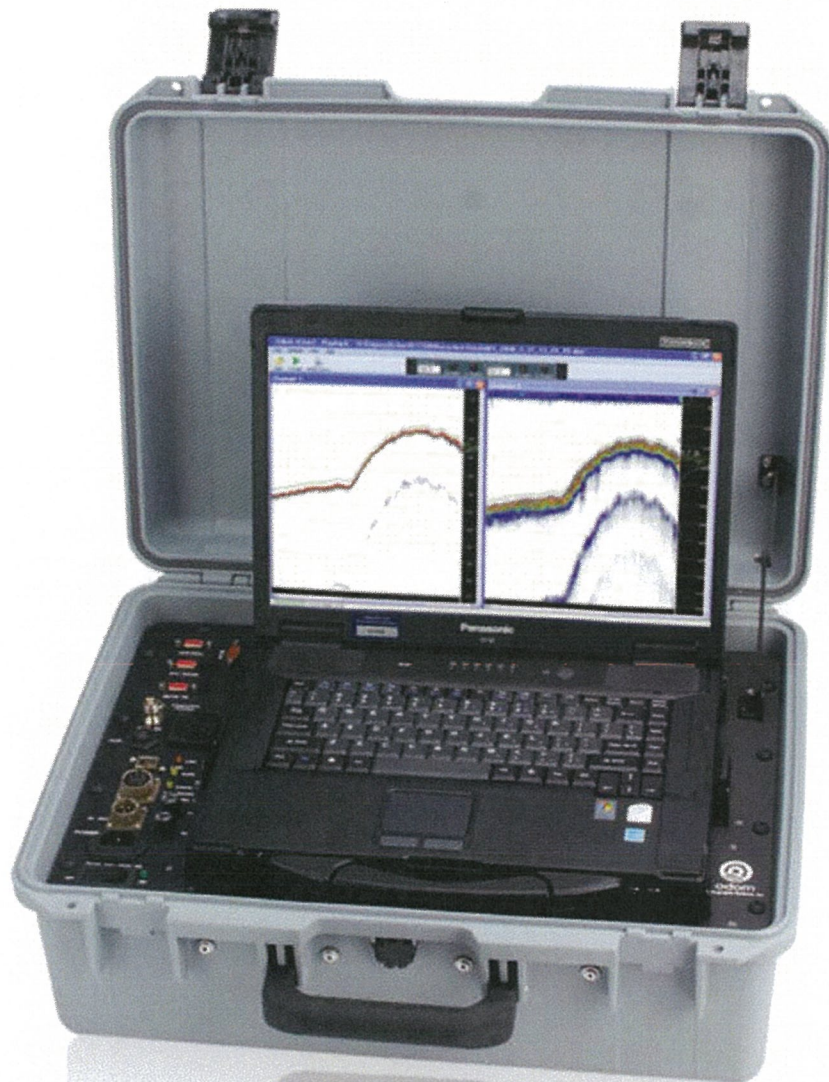
³1978 Practical Salinity Scale.

⁴Chen-Millero, 1977. Speed-of-sound in sea water at high pressures.

⁵International Equation of State for sea water (EOS-80).

sontek.com/castaway

► ECHOTRAC™ CVM

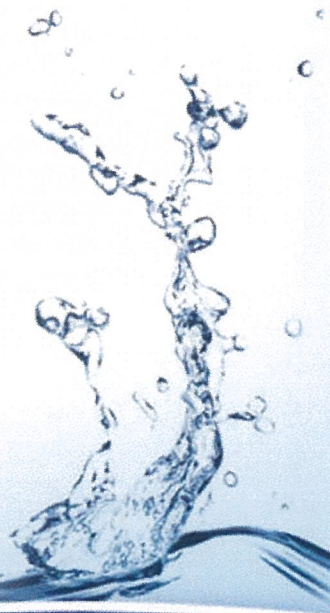


MOBILE HYDROGRAPHIC SYSTEM

- Portable carry-on case style supports a dual frequency echo sounder with optional DGPS receiver, notebook PC and bundled data acquisition software.
- Features include Ethernet LAN interface, frequency agile configurable transceivers, standard serial interfaces for data acquisition systems, motion sensors and DGPS receivers.



TELEDYNE
ODOM HYDROGRAPHIC
A Teledyne Technologies Company

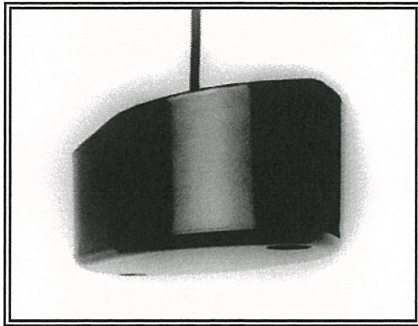




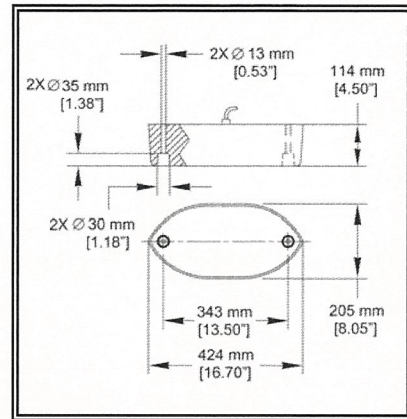
odom hydrographic.com

Odom Hydrographic Systems, Inc.
1450 Seaboard Avenue
Baton Rouge, LA. 70810 -6261
225.769.3051, Facsimile 225.766.5122

OTSBB200/24-4/20



Weight = 14.5Kg.



Performance Data

Frequency	200kHz	24kHz
Beam Width	4°	20°
Q (transmit)	4	7
Rated RMS Power	2KW	1.5KW
Balanced Impedance	ohms	
Peak Figure of Merit	-6db	-9db
Bandwidth		
Acoustic Window Material	Urethane	Urethane
Cable Type	C43 (2-14 AWG)	C43 (2-14 AWG)
Cable Size	10mm	10mm

The M42 houses Odom's best selling dual frequency transducer. Compatible with any hull material, its streamlined shape is designed for over-the-side or hull mounting, but it can be adapted to sea chest installation. Durable and reliable.

OTSBB200/24-4/20_information_sheet

Over-the-Side, 200BB/24khz-4/20d, M42, C44, 10m, 5P

SonarMite MILSpec™

benefits

- rugged, field-proven survey grade echo sounder
- Bluetooth technology integrated with Windows Pocket PC devices
- proven "Smart" transducer design with QA output
- easily integrates with other modern software and GPS technology



multibeam survey image

specifications

frequency	200 KHz
beam width	4 degrees
ping rate	6 Hz
depth accuracy	1cm / 0.1% of depth
output formats	NMEA, ASCII
range	0.3m–75m
I/O	serial, Bluetooth
environmental	IP-65
power	rechargeable 12v battery

about

The SonarMite MILSpec™ echo sounder is the result of nearly two years' research and development to further extend the boundaries of shallow water hydrographic survey equipment. The introduction by Ohmex in 1997 of the SonarLite, the world's first truly portable echo sounder system has been a hard act to follow and it remains the portable instrument of choice in many survey companies around the world. The release of the SonarMite MILSpec instrument marks the next stage introducing a series of equipment designed around the WinSTRUMENT concept using the latest portable computer integrated with new measurement technologies.

options

- data collection software
- heave, pitch and roll measurements
- sound velocimeter
- portable mounting bracket
- rugged shipping case
- extended warranty



SonarMite MILSpec echo sounder with cable

Seafloor Systems, Incorporated

3941 Park Drive, Suite 20-218 · El Dorado Hills, CA 95762 · USA
(530) 677-1019 · info@seafloorsystems.com · www.seafloorsystems.com

DMS

Dynamic Motion Sensors

Accurate motion measurement in all sea conditions

The DMS range of motion sensors is designed specifically for the motion measurement needs of the marine industry. Whether it is achieving IHO standard survey from any size of vessel, or providing safety critical monitoring of offshore platforms, large vessels, helicopter landing decks, cranes and positioning systems, the DMS provides accurate motion measurement in all sea conditions.

Incorporating an enhanced external velocity and heading aiding algorithm for improved accuracy during dynamic manoeuvres, the solid state angular rate sensors offer reliability in the highest performing vertical reference units ever produced by TSS.



Subsea



Surface

PRODUCT FEATURES AND BENEFITS

- Dynamic roll and pitch accuracy from 0.03° to 0.50° RMS
- Heave accuracy $\pm 5\text{cm}$ or 5%
- Solid state solution available in surface or subsea housings
- Survey to Class 1 IHO standard
- High dynamic accuracy during vessel turns
- High reliability
- Power and data over Ethernet (surface units)
- Independently configurable serial outputs
- Complies with IEC 60945
- 24 hour, 365 days per year technical support
- Intuitive control software with user-configurable outputs
- Real-time digital and analogue outputs
- Compact and lightweight
- Low power, cost-effective solutions



TELEDYNE TSS
Everywhere you look™

DMS

Dynamic Motion Sensors

The DMS range of sensors is available in surface or subsea variants - the subsea unit is rated to 3000m as standard with 6000m available on request. As with all TSS systems, the DMS is certified to meet all current and anticipated European legislation for electromagnetic compatibility and electronic emissions. The latest DMSView software programme is an intuitive Windows™ based programme enabling installation, set-up and integrity checking, and monitoring of the sensor. The user can select from a series of frequently used data protocols or configure a bespoke output from a selection of variables.

Product	Dynamic Accuracy	Depth Rating	Heave	Roll	Pitch
DMS-05	0.05°	✓	✓	✓	✓
DMS-10	0.10°	✓	✓	✓	✓
DMS-25	0.25°	✓	✓	✓	✓
DMS-RP25	0.25°	✓	x	✓	✓
DMS-RP30	0.30°	x	x	✓	✓
DMS-H	x	x	✓	x	x
DMS-525	0.25°	x	✓	✓	✓
DMS-525RP	0.25°	x	x	✓	✓
DMS-535RP	0.35°	x	x	✓	✓
DMS-550	0.50°	x	✓	✓	✓
DMS-550RP	0.50°	x	x	✓	✓
DMS-500H	x	x	✓	x	x

*Dynamic Accuracy at +/- 30°

No formal restrictions for most countries although heave products are subject to Export Licence.

Heave, Roll, Pitch

The DMS range of motion sensors is designed specifically for the motion measurement needs of the marine industry. Whether it is achieving IHO standard survey from any size of vessel, or providing safety critical monitoring of offshore platforms, large vessels, helicopter landing decks, cranes and positioning systems, the DMS provides accurate motion measurement in all sea conditions.

Incorporating an enhanced external velocity and heading aiding algorithm for improved accuracy during dynamic manoeuvres, the solid state angular rate sensors offer reliability in the highest performing vertical reference unit ever produced by TSS.



DMS-05
Subsea

PRODUCT FEATURES AND BENEFITS

- Dynamic roll and pitch accuracy to 0.03° (+/- 5°)
- Heave ±5cm
- Survey to Class 1 IHO standard
- High dynamic accuracy during vessel turns
- Surface and depth rated options available
- Real-time digital and analogue
- Compact and lightweight



Roll, Pitch

The DMS-RP sensors meet the requirements of the dynamic positioning industry for accurate vessel roll and pitch measurement. The units provide accurate motion measurement in all sea conditions.

Incorporating an enhanced external velocity and heading aiding algorithm for improved accuracy during dynamic manoeuvres, the solid state angular sensors offer reliability and a complimentary blending algorithm has proven that the DMS is the highest performance vertical reference unit ever produced by TSS.

The DMS-RP sensors are available in subsea and surface versions. The sensor can be supplied in various configurations for integration with towed vehicles and other bespoke applications.



DMS-RP25
Subsea

PRODUCT FEATURES AND BENEFITS

- Dynamic roll and pitch accuracy from 0.25° to 0.50° RMS
- Surface and subsea options available
- Independently configurable serial outputs
- Power and data over Ethernet (surface only)
- Survey to Class 1 IHO standard
- High dynamic accuracy during vessel turns
- DMSView intuitive control software
- User-configurable outputs
- Real-time digital outputs
- Compact and lightweight

Heave

Whether in ports or harbours, offshore or as part of a hydrographic mapping programme, the need to measure ocean depths with the utmost accuracy is vital.

The DMS-500H heave sensor has been developed to work with a wide range of modern single beam echosounders. With their design, allowing acceptance of correction data from the DMS-500H, real-time heave compensation of the sounder data is achievable. Providing heave data in analogue and digital format, the outputs of the DMS-500H are easily configurable via a simple operator menu.

Compact, ruggedised and quick to install, the sensor is supplied with the cable connector necessary for interfacing and is accompanied by a comprehensive operation manual. In addition to echosounder compensation, the DMS-500H is ideally suited to a wide range of offshore applications including crane and winch control, wave radar and ship motion measurement.



DMS-500H
Surface

PRODUCT FEATURES AND BENEFITS

- Measurement to meet IHO standards
- Provides cost savings by increasing weather windows for survey
- Solid state accelerometers and rate sensors
- Removes vertical motion errors from survey data to eliminate the need for post-processing
- Suitable for a wide variety of vessels
- IP 65 Rated
- Designed to provide operators with the optimum cost benefit solution
- Freephone telephone support for life of product

DMS

Dynamic Motion Sensors

TECHNICAL SPECIFICATIONS

	DMS-05	DMS-10	DMS-25	DMS-RP25	DMS-RP30	DMS-H	DMS-525	DMS-525RP	DMS-535RP	DMS-550	DMS-550RP	DMS-500H
PERFORMANCE												
Roll & Pitch °RMS												
+/- 5° Dynamic	0.03	0.06	0.15	0.25	0.30	N/A	0.05	0.25	0.35	0.10	0.50	N/A
+/- 30° Dynamic	0.05	0.10	0.25	0.25	0.30	N/A	0.25	0.25	0.35	0.50	0.50	N/A
Heave	5 cm or 5%	5 cm or 5%	5cm or 5%	N/A	N/A	5cm or 5%	5cm or 5%	N/A	N/A	5cm or 5%	N/A	5cm or 5%
Maximum Calibrated Range	Heave ±10m, Roll & Pitch ±30°						Heave ±10m, Roll & Pitch ±30°					
Data Resolution	Heave 1cm, Roll & Pitch 0.01°						Heave 1cm, Roll & Pitch 0.01°					
DATA OUTPUT RATE												
Digital	Up to 100Hz						Up to 100Hz					
Analogue	Up to 500Hz (with optional DMS repeater)						N/A					
PHYSICAL CHARACTERISTICS												
Dimensions	99mm (d) x 172mm (h) (excluding connector)						160mm x 160mm x 160mm (240mm max at base)					
Weight in Air	2.3kg (3000m), 4.0kg (6000m)						4.0kg					
Weight in Water	1.0kg (3000m), 2.7kg (6000m)				N/A	N/A	N/A					
Depth Rating	3000m standard, 6000m on request				N/A	N/A	N/A					
Power Supply	12 - 36Vdc (2A supply)						12 - 36Vdc (2A supply)					
Power Requirement	<6.5W						<12W					
Power Over Ethernet	N/A						IEEE 802.3AF-2003					
Temperature Range	-15°C to +55°C operating, -20°C to +70°C storage						-15°C to +55°C operating, -20°C to +70°C storage					
Shock (survival)	30g peak (40ms half sine)						30g peak (40ms half sine)					
Vibration (operating)	IEC 60945						IEC 60945					
INTERFACE FORMATS												
Sensor Aiding Velocity	NMEA0183 (VTG & GLL or GGA)						NMEA0183 (VTG & GLL or GGA)					
Sensor Aiding Heading	NMEA0183, SGB, Robertson; Sperry LR40/60						NMEA0183 (DMS-550)					
Output Data Formats	Industry Standard formats						Industry Standard formats					
INTERFACE												
Digital	RS232 or RS422 (software selectable)						RS232 or RS422 (software selectable), Ethernet					
Analogue	Via optional DMS repeater						Via optional DMS repeater					
Ethernet	N/A						Dual redundant frequencies. Packet output via TCP, UDP or UDP multicast					
Application Software	DMSView for Windows™						DMS500View for Windows™					
SYSTEM												
MTBF	50,000 hours											
Warranty	24 months international warranty including parts and labour											
Export Compliance (ECCN)	7A103.a.2 for DMS-05, DMS-10, DMS-25, DMS-H											

COMPANY WITH
MANAGEMENT SYSTEMS
CERTIFIED BY DNV
= ISO 9001 =
= ISO 14001 =
= OHSAS 18001 =

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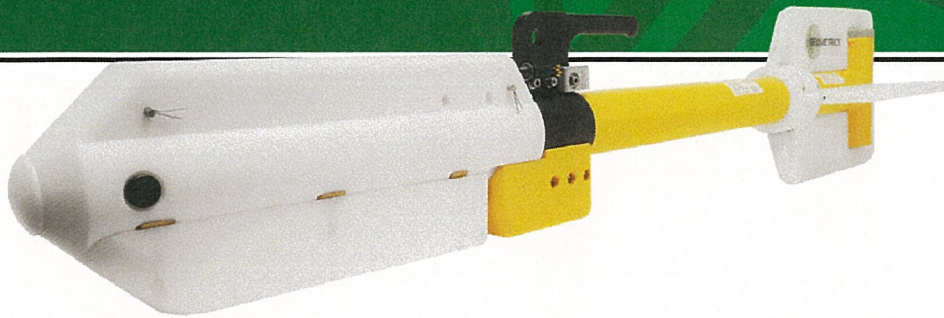
G-882

Cesium Marine Magnetometer



GEOMETRICS

Innovation • Experience • Results



Geometrics offers a very high-resolution Cesium vapor marine magnetometer which is low in cost, small in size, and ready for professional surveys in shallow or deep water. The proven Cesium sensor is combined with our unique CM-221 Larmor counter and ruggedly packaged for small or large boat operation. Use your personal computer with our MagLog™ software to log, display and print GPS position and magnetic field data.

The G-882 offers flexibility for operation from shallow water surveys to deep-tow applications. The system directly interfaces to all major side-scan manufacturers for tandem tow configurations. Being small and lightweight, it is easily deployed and operated by one person. But add several streamlined weight collars and the system can quickly weigh more than 100 lb for deep tow applications.

This marine magnetometer system is particularly well-suited for the detection and mapping of all sizes of ferrous objects. This includes anchors, chains, cables, pipelines, ballast stones and other scattered shipwreck debris, munitions of all sizes (UXO), aircraft, engines and any other object with a magnetic expression. The G-882 is also perfect for geological studies. Its high sensitivity and high sample rates are maintained for all applications.

Objects as small as a 5-inch screwdriver are readily detected provided that the sensor is close to the seafloor and within practical detection range (refer to table on back).

FEATURES & BENEFITS

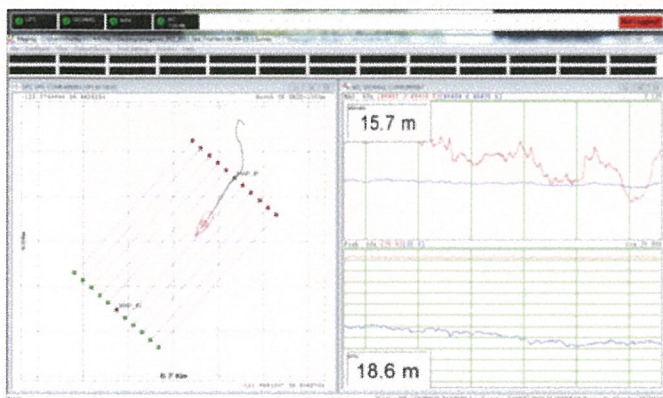
- **Cesium Vapor High Performance** – Highest detection range and high probability of detecting all sized ferrous targets.
- **Streamlined Design for Tow Safety** – Low probability of fouling in fishing lines or rocks. Rugged fiber-wound fiberglass housing.
- **Quick Conversion from Nose Tow to CG Tow** – Simply remove an aluminum locking pin, move tow point and reinsert.
- **Sample at up to 20Hz** – Unparalleled data density while also covering larger areas per day.
- **Sensor can be rotated for optimal signal** – Can be used worldwide.
- **Easy Portability and Handling** – No winch required. Built-in easy-carry handle. Operable by a single man; only 44 lb with 200 ft cable.
- **Combine Multiple Systems for Increased Coverage** – Internal CM-221 Mini-counter provides multi-sensor sync and data concatenation, allowing side-by-side coverage which maximizes detection of small targets and reduces noise.
- **Export version available** – Use anywhere in the world without need for an export license (except embargoed countries). See specifications.



GEOMETRICS

Innovation • Experience • Results

SPECIFICATIONS | G-882 Cesium Marine Magnetometer



MagLogLite™ Data Logging software is included with each magnetometer and allows recording and display of data and position with automatic anomaly detection. Additional software options include: MagLog Pro™, advanced logging software; MagMap™, a plotting and contouring package; and MagPick™ post-acquisition processing software.

MAGNETOMETER / ELECTRONICS

Operating Principle: Self-oscillating split-beam Cesium vapor (non-radioactive).

Operating Range: 20,000 to 100,000 nT.

Operating Zones: The earth's field vector should be at an angle greater than 10° from the sensor's equator and greater than 6° away from the sensor's long axis. Automatic hemisphere switching.

Noise: $<0.004 \text{ nT}/\sqrt{\text{Hz}}_{\text{rms}}$. (SX (export) version: $<0.02 \text{ nT}/\sqrt{\text{Hz}}_{\text{rms}}$).

Max Sample Rate: 20 Hz.

Heading Error: $<1 \text{ nT}$ (over entire 360° spin).

Output: RS-232 at 1,200 to 19,200 Baud.

Power: 24 to 32 VDC, 0.75 A at power-on and 0.5 A thereafter.

MECHANICAL

Sensor Fish

DIA: 7 cm; L: 137 cm (2.75x54 in) (with fin assembly)

Weight: 18 kg (40 lb)

Includes sensor and electronics and 1 main weight. Additional collar weights are 6.4 kg (14 lb) each; total of 5 capable.

Tow Cable

DIA: 12 mm; L: 800 m (.48 in x 2,625 ft).

Weight: 7.7 kg (17 lb) with terminations.

Break strength: 1,630 kg (3,600 lb)

Bend diameter: 30 cm (12 in).

Typical Detection Range for Common Objects

1. Ship: 1000 tons	0.5 to 1 nT at 800 ft (244 m)
2. Anchor: 20 tons	0.8 to 1.25 nT at 400 ft (120 m)
3. Automobile	1 to 2 nT at 100 ft (30 m)
4. Light Aircraft	0.5 to 2 nT at 40 ft (12 m)
5. Pipeline (12 inch)	1 to 2 nT at 200 ft (60 m)
6. Pipeline (6 inch)	1 to 2 nT at 100 ft (30 m)
7. Iron: 100 kg	1 to 2 nT at 50 ft (15 m)
8. Iron: 100 lb	0.5 to 1 nT at 30 ft (9 m)
9. Iron: 10 lb	0.5 to 1 nT at 20 ft (6 m)
10. Iron: 1 lb	0.5 to 1 nT at 10 ft (3 m)
11. Screwdriver: 5-inch	0.5 to 2 nT at 12 ft (4 m)
12. Bomb: 1000 lb	1 to 5 nT at 100 ft (30 m)
13. Bomb: 500 lb	0.5 to 5 nT at 50 ft (16 m)
14. Grenade	0.5 to 2 nT at 10 ft (3 m)
15. Shell: 20 mm	0.5 to 2 nT at 5 ft (1.8 m)

ENVIRONMENTAL

Operating Temperature: -35°C to +50°C (-30°F to +122°F).

Storage Temperature: -45°C to +70°C (-48°F to +158°F).

Altitude: 9,000 m (30,000 ft).

Depth: 2,700 m (8860 ft).

Water Tight: O-Ring sealed for up to 2,750 m (9,000 ft) depth operation.

ACCESSORIES

Standard: Operation manual, shipping/storage container, ship kit with tools and hardware, power supply, MagLogLite™.

Optional: Steel tow cable to 6,000 m (19,600 ft) with telemetry, longitudinal or transverse gradiometer, aluminum shipping case, MagLogPro™.

Specifications subject to change without notice. G-882_v1 (0317)



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APPENDIX D
Survey Field Notes
(79 PAGES)

NRCS BA-195

10 men crew traveled to job site to construct survey monument for tower job.

10 men 6 hrs travel time

4 Trucks -

1- 225 hp boat

30 gallons gas

2- gator tails 60 lbs each

1- Cargo trailer

Once crew arrived at launch 7 men traveled by boat to job site by boat to build monument.

38 - 3/4" diam. rods

1 GPS unit (G4)

1- Vibratory Hammer

1- datum point

1- drive point

1- TSS grease

1- TSS Blue

4' 6" sch. 40 PVC

7-23-17

Hot & Clear

Arrived 11

Chris F.

Belle Chase, La

1- PVC slum

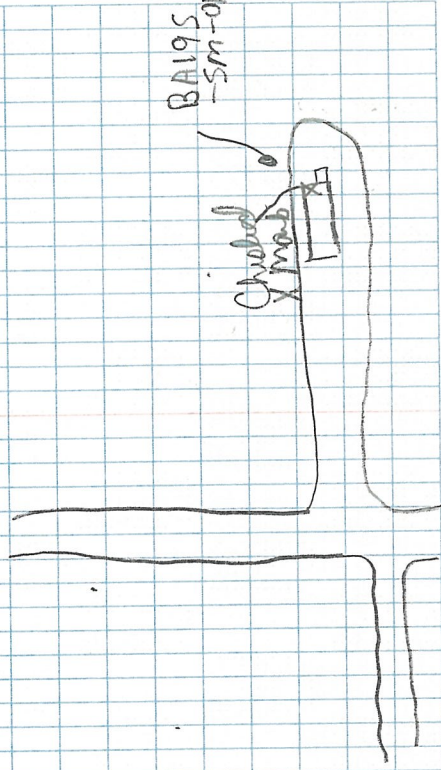
2- Bags sand

2- Bags cement

40 back washers

7 men 4 hrs Boat

3 men cranked into hole while monument was being built.



Daddy D

James D

Catherine H

Lucas J

Anthony M

Stephen P

Nick C

Leonard H

NRCS BA 195

3 men crew traveled to base location + CUC'd base point and checks in point.

Crew then set base @ Pt# 688 ant right

Crew checked in 7 GPS receivers while while equipment was transferred to barge.

Crew began doing bar check + speed of sound test 4950 was speed of sound Crew bar checked at 5 ft + 10 ft

Crew then collected hydro data along the ocean front

12 hrs
11 hrs boat
TSC 0271
Start 7000
End 7007

7-24-17

Chris
Anthony M
Don H

Belle Chase, MD Not a Clear

Sn: 0271

Start 7000

End: 7007

0271
0271
0271



March Aviation
Area

3 men
1 - 225 hp 40 gal
1 - odorn CVM
1 - Hypack PC
1 - 545461
1 - generator 8.5 gal
1 - motion sensor
1 - G882 mag
1 - R10/DC

NRCS BA-195

Base set on BA195-5M-01

Pt # 9999

Ant Ht: 6.88 ft

TSC3 2011

File BA1952011

Start 10000

End 10057

Used reference point on
nearby platform for checkin.

2 man crew collected RTK
data

2-men 12-Hours

1- go to start

1- R8

1-TSC3

1- fixed height pole with
6 in diameter aluminum
shoe.

Hot + Sunny
07/24/17

LADD D
JAMES D

NPES BA-195

Base Set on BA195-SM-01

Pt # 9999

Ant Ht: 6.88 sft

TSC3 1034

File BA1951034

Start 50000

End 50182

Used reference point on
nearby platform for check in.

1 man crew collected RTK
data.

1-man 12-hours

1-Airboat w/Driver

1-P8

1-TSC3

1-fixed height pole with
1-in diameter aluminum shoe

Hot + Sunny

Belle Chasse, LA

07/24/17

LEONARD H

Hot + Sunny · Nick C

Belle Chasse, LA 07/24/17

NRCS BA-195

Base set on BA195-SM-01

Pt #9999

Ant Ht: 6.885 ft

TSC3 1035

File BA1951035

Start 30000

End 30051

Used reference point on nearby platform for check in

1 man crew ran design lines with magnetometer in order to locate pipelines and other magnetic signals.

1 - man 12-Hours

1 - Airboat w/ Driver

1 - Flycatcher PC 1 - generator

1 - G882 mag 1 - hemispheric

1 - R8 1 - TSC3

1 - fixed height pole with 6 in diameter aluminum shoe.

* Crew had equipment issues and had to stop magnetometer work. Crew instead collected RTK data.

NKCS BA-195

Base set on BARS-SM-01

Pt# 9999

Ant Hght: 6.88 sft

TSC3: 1032

File: BARS1032

Start: 40000

End: 40057

Used reference point on nearby platform for checkin.

One man crew collected RTK Data.

1-man

12-Hours

1-Airboat w/ Driver

1-RS

1-TSC3

1-fixed height pole with 6" diameter aluminum shoe.

Hot + Sunny

Belle Chasse, LA

7/24/17

Stephen P.

NRCS BA-195

Base set on BA195-SM-61

Pt # 9999

Ant height: 6.88 ft

TSC3: 1033

File: BA1951033

Start: 6000

End: 6055

Used reference point on nearby platform for check in.

One man crew collected RTK

Date.

1- man 12-4000s

1- Airboat w/ driver

1- R8

1- TSC3

1- fixed height Pole w/ 6" diameter aluminum shoe.

Hot & Sunny

Belle Chasse, LA

7/24/17

Cathryn H.

NRCS BA-195

Base set on BA195-SM-01
Pl# 9999

Ant height: 6.88 sft

TSC3: 2010

File: BA1952010

Start: 2000

End: 2008

Used reference point on nearby
platform for check in.

One man crew collected RPK
Data.

1- man 12-Hours

1- Aircraft w/ driver

1- R6

1- TSC3

1- fixed Height pole w/ 6"
diameter aluminum shoe

Hot & Sunny

7/24/17

Belle Chasse, LA

Lucas H.

N RCS BA195

3 men over checked in @
Chris Marks then performed
bar check @ 5.4' & 10'

over then collected
mag + hydro data in
Borrow Area + pipeline
corridor.

12 hrs
11 hrs lost

3 men
1- 225 hp 40 gals
1- Ddorn CUM
1- Veracarb PC
1- SPS 461
1- generator 60 gals
1- photon sensor
1- 6882 mag
1- RIO/DC

TS 0271 Start 7008
End 7011

7-25-17

Chris F
Goren H
Anthony M

Not a clear

Belle Chase, Ga

Marsh Creation
Area

Sn. 0271
Start: 7008
End: 7011

Pipeline
Corridor

Borrow Area

NRCS BA-195

Base set on BA195-5M-01

Pt # 9999

Ant Ht: 6.88 ft

TSC3 2011

File BA1952011

Start 10058

End 10212

Used reference point on
nearby platform for checkin

2 man crew collected
RTK data

2 men 12-Hours

1-gator tail

1-R8

1-TSC3

1-fixed height pole with
1in diameter aluminum
shoe.

Hot + Sunny

Belle Chasse, LA

07/25/17

LADD D

JAMES D

NRCS BA-195

Base set on BA195-SM-01

PT # 9999

Ant Ht: 6.88 sft

TSC3 1034

File BA1951034

Start 50183

End 50762

Used reference point on
nearby platform for check in.

1 man crew collected RTK
data.

1-man 12-Hours

1-Airboat w/ Driver

1-R8

1-TSC3

1-fixed height pole with
6in diameter aluminum shoe

LEONARD H

Hot + Sunny

07/25/17

Belle Chasse, LA

NRCS BA-195

Base set on BA195-SM-01

pt # 9999

Ant Ht: 6.88 ft

TSC3 1035

File BA1951035

Start 30052

End 30454

Used reference point on
nearby platform for check in

1 man crew collected RTK data

1- man 12-Hours

1- Airboat w/ Driver

1- RB 1-TSC3

1- fixed height pole with
6 in diameter aluminum shoe

Nick C

Hot + Sunny

Belle Chasse, LA 07/25/17

NRCS BA-195

Base set on BA195-SM-01

Pt # 9999

Ant height: 6.885ft

TSC3: 1032

File: BA1951032

Start: 40058

End: 40202

Used reference point on nearby platform for check in.

One man crew collected RTK Data.

1- man 12-Hours

1- Aircraft with Driver

1- RTK

1- TSC3

1- fixed height pole with 6" diameter aluminum shoe.

Belle Chasse, LA

Hot and Sunny
7/25/17

Stephen P.

NRCS BA195

Base set on BA195-SM-01

Pt. # 9999

Ant height: 6.88 sft.

TSC3: 1033

File: BA1951033

Stand: 60056

End: 60228

Used reference point on nearby platform for check in.

One man crew collected RTK data.

1- man 12-Hours

1- Hitchhiker w/ driver

1- TSC3

1- R8

1- fixed height pole w/ 6" diameter Aluminum shoe.

Hot & Sunny

Belle Chasse, LA

7/25/17

Catlyn H.

NRCS BA-195

Base set on BA195-SM-01

PT# 9999

Ant height: 6.88 sf

TSC3: 2010

File: BA195 2010

Start: 20079

End: 20276

Used reference point on nearby platform for check in.

One man crew collected
RTK Data.

1-man 12-Hours

1-Airboat w/ driver

1-R6

1-TSC3

1-fixed height pole w/ 6" diameter aluminum shoe.

Hot & Sunny
7/25/17
Belle Chasse, LA
Lucas H.

NRCS BA195

7 man crew finished hydro
after airboat probe down
see Donado notes for
morning work.

Crew collected mag &
hydro data along
secondary pipeline
corridor

3 hrs

3 hrs boat

2 men

1 - 225 hp logs

1 - ODOM CVM

1 - Hypack PC

1 - 545461

1 - generator Hgalo

1 - mention sensor

1 - G88 & mag

1 - R8/TSC2

13C1034

start 50798

end 50801

Belle Chase

7-26-17

Hot & Clear

Donado
Canon 7

~~start~~

~~start~~

~~start~~

NRCS BA-195

Base set on BA195-SM-01

PT #99999

Ant Ht: 6.88 spt

TSC3 1034

Pile BA195/1034

Start 50763

End 50798

Used reference point on nearby platform for checkin

2-man crew probed design locations outside known oyster leases in order to locate pipelines and measure their coverage.

2-men 9-Hours

1-Airboat w/ Driver

1-P8 1-TSC3

2-Probes

1-Fixed height pole with 6in diameter aluminum shoe.

LEONARD H
ARON H

Hot + Sunny

Belle Chasse, LA

01/26/17

NRCS BA-195

Base set on BA195-SM-01

Pt # 9999

Ant ht: 6.885ft

TSC3 2011

File BA1952011

Start 10273 } RTK

End 10408 }

Start 3669

} Sonarwhite

End 6169

Used reference point on
nearby platform for checkin

2 man crew collected RTK
and Sonarwhite data

2-men 12-Hours

1-gator tail

1-P8

1-TSC3

1-Sonarwhite

1-fixed height pole with 6in
diameter aluminum shoe.

Hbt + Sunny

Belle Chasse, LA 07/26/17

LAPD D
JAMES D

NRCS BA-195

Base set on BA195-SM-01

pt #9999

Ant ht: 6.88 sft

TSC3 1035

file BA1951035

Start 30455 3 ched in

End 30457

Used reference point on nearby platform for check in.

1 man over van design lines with magnetometer in order to locate pipelines and other magnetic signals

1-man 12-HOURS

1-Airboat w/ Driver

1-Hypack PC 1-generator

1-G882 mag 1-Hemisphere

1-R8 1-TSC3

1-fixed height pole with 6in diameter aluminum

stave

NICK C.

Hot + Sunny

Belle Chasse, LA 07/26/17

NRCS BA-195

Base Set on BA195-SM-01

7+ 9999

Ant height: 6.88 sft

TSC3: 1032

File: BA1951032

Start: 40203

End: 40438

Used reference point on nearby platform for check in.

One man crew collected RTK data.

1- man 12-Hours

1- Airboat with driver

1- R2

1- TSC3

1- fixed height pole with 6" diameter aluminum shoe.

Hot and Sunny

Belle Chasse, LA

7/26/17

Stephan P.

NRCS BA-195

Base set on: BA195-SM-01

74# 9999

Ant height: 6.885ft

TSC3: 1033

File: BA1951033

Start: 60229

End: 60512

Used reference point on nearby
platform for check in

One man crew collected RTK

Date:

1- man 12-Hours

1- Airboat w/ driver

1- R8

1- TSC3

1- fixed height pole w/ 6"
diameter aluminum shoc.

Belle Chasse, LA

Hot & Sunny

7/26/17

Cathryn H.

NRCS BA-195

Base set on BAMS-SM-01

Pt# 9999

Ant height: 6.88 sft

TSC3: 2008

File: BAMS2008

Stand: 80003

End: 80294

Used reference point on nearby platform for checkin.

Three man crew collected RTK data.

3-men 12-flows

1- gator-tail

1-R8

1-TSC3

1- fixed height pole w/ 6" diameter aluminum foot

Hot + Sunny

7/26/17

Belle Chasse, LA

Chris F.
Chris M.
Anthony M.

NRCS BA-KS

Base set on BAKS-sm-01

Pt# 9999

Air hght: 6.88 sft

TSC3: 2010

File: BAKS2010

Start: 20277 ~~20519~~ LA

End: 20519

Used reference point on nearby platform for checkin.

One run crew collected RTK Data.

1- Run 12-Hours

1- Air boat w/ driver

1- TSC3

1- RB

1- fixed height pole w/ 6" diameter aluminum shoe.

Belle Chesse, LA

Hot + Sunny

7/26/17

Lucas H.

NRCS BA-195

Beel set on BA195-Sm-01

pt #9999

Ant Ht: 6.88 ft

TSC3 2011

File BA1952011

Start 10409 } RTK

End 10528 }

Start 6170 } Sonarmite

End 8281 }

(Used reference point on nearby platform for check in

2 man crew collected RTK and Sonarmite data

2-men 12-gloves

1-gatorail

1-P8

1-TSC3

1-Sonarmite

1-Fixed height pole with 6cm diameter aluminum shoe

Hot + Sunny

Belle Chasse, LA

07/27/17

LADD D

JAMES D

AARON H
ANTHONY

Hot + Sunny

07/27/17

Belle Chasse, LA

NRCS BA-195

Base set on BA195-SM-01

Pt # 9999

Ant Ht: 6.88 sft

TSC3 1034

File BA1951034

Start 50802

End 50831

Used reference point on nearby
platform for check in

2 men crew probed design
locations outside known oyster
leases in order to locate pipelines
and measure their coverage.

2-men 12-Hours

1-Airboat w/ Driver

1-R8 1-TSC3

2-Probes

1-fixed height pole with 6in
diameter aluminum shore

NICK

Hdt + Sunny

Belle Chasse, LA 07/27/17

NRCS BA-195

Base set on BA195-SM-01

Pt # 9999

Ant Ht: 6.885ft

TSC3 1035

File BA1951035

Start 30458 } checkin

End 30460 }

Used reference point on nearby platform for checkin

1 man crew ran design lines with magnetometer in order to locate pipelines and other magnetic signals.

1 - man 12-Hours

1 - Airboat w/ Driver

1 - Hypack PC 1-generator

1 - G882 mag 1-Hemisphore

1 - RB 1-TSC3

1-fixed height pole with 6in diameter aluminum floor.

NRCS BA-195

Base Section BA195-SM-01

Pt. # 9999

Airt height: 6.885 ft

TSC3: 1032

File: BA1951032

Stand: 40439

End: 40609

Used reference point on nearby platform for check in.

One man crew collected
RTIC Data.

1- man 12-Hours

1- Airboat w/ driver

1- R8

1- TSC3

1- fixed Height pole w/ 6" diameter aluminum shoe.

Hot & Sunny

7/27/17

Belle Chasse, LA

Stephen P.

NRCS BA-195

Base set on BA195-SM-01

Pl# 9999

Ant height: 6.885 ft.

TSC3: 1033

File: BA1951033

Start: 60513

End: 60723

Used reference point on nearby platform for check in.

One man crew collected
RTIC Data.

1- man 12-Hours

1- Hitchhiker w/ driver

1- TSC3

1- R28

1- Fixed Height Pole w/ 6" diameter
Aluminum shoe.

Hot & Sunny

7/27/17

Belle Chasse, LA

Cattlyn H.

NRCS BA-193

Base set on BAKS-SM-01

Pl # 9999

Airt height: 6.88 sf

TSC3: 2008

File: BAKS2008

Start: 80295

End: 80648

Used reference point on nearby
platform for check in.

Two man crew collected RMC
Data.

2- Men

12- Hoes

1- gator tail

1- R8

1- TSC3

1- fixed height pole 1' 6"
diameter aluminum shoe

Hot + Sunny

7/27/17

Belle Chasse, LA

Chris F.

Chris M.

NRCS BA-195

Base set on BA195-SM-01

Pl # 9999

Ant height: 6.88 ft

TSC3: 2010

File: BA1952010

Start: 20520

End: 20550

Used reference point on nearby platform for check in.

Two men crew probed design locations outside known oyster leases in order to locate pipelines and measure their coverage.

2- Men 12-Hours

1- Airboat w/ driver

1- R8

1- TSC3

1- fixed height pole w/ 6" diameter aluminum shoe.

Hot and Sunny

7/27/17

Belle Chasse, LA

Lucas H.
Leonard H.

NRCs BA195

2 man crew performed mag survey of baring locations in barrow area.

4 hrs

4 hrs Boat

2- men

1- 225 hp Boat / 15 gals

1- SP546

1- 6882 mag

1- Hypack PC

1- generator 4 gals

1- RB/TSC 25

SAC #034

stork

stork

Bill Chase

07-28-07 Anomyl
Dot + Chan Leonard H

* Crew worked half day then
denobilized due to field crew
personnel incident

NRCS BA-195

Base set on BA195-SM-01

Pt #9999

Avg Ht: 6.88 ft

TSC3 2011

File BA1952011

Start 10529 } RTK

End 10533 }

Start 8282

End 9241 } Sonarmité

Used reference point on nearby platform for check in.

1 man crew collected RTK and Sonarmité data

1-man

16-Hours

1-gator tail

1-R8

1-TSC3

1-Sonarmité

1-fixed height pole with 6in diameter aluminum shoe

LADD D

Hot + Sunny

Belle Chasse, LA 07/28/17

* Crew worked half day then demobilized due to field crew personnel incident.

Hot + Sunny
Belle Chasse, LA 07/28/17
Charles F
Lucas H
Anthony

* Crew worked half day then
demobilized due to field crew
personnel incident

NRCS BA-195

Base set on BA195-SM-01

Pt # 9999

ANA Ht: 6.88sf

TSC3 1034

File BA1951034

Start 50832

End 50840

Used reference point on
nearby platform for check in

3 man crew prebed design
locations outside known oyster
leaves in order to locate
pipelines and measure their
coverage.

3 - men 16 - Hovels

1 - getortail

1 - P8 1 - TSC3

2 - Probes

1 - fixed height pole with 6in
diameter aluminum shoe

Hot + Sunny
Belle Chasse, LA 07/28/17
NICK C

NRCS BA-195

Base set on BA195-SM-O

PT # 9999

Ant Ht: 6.98 m

TSC3 1035

File BA1951035

Start 30461 } check in

End 30463 }

Used reference point on
nearby platform for check in

1 man crew ran design lines
with magnetometer in order
to locate pipelines and other
magnetic signals.

1-man 16-HOURS

1-Airboat w/ Driver

1-Hy pack PC 1-generator

1-G882 mag 1-Hemisphere

1-P8 1-TSC3

1-Fixed height pole with

6 in diameter aluminum shoe

* Crew worked half day then
demobilized due to field crew
personnel incident.

NRCS-BAMS

Base set on BAMS-SM-01

Pt # 9999

Ant height: 6.885ft

TSC3: 1032

File: BAMS1032

Start: 4060

End: 40644

Used reference point on nearby platform for check in.

One man crew collected RTK data.

1- man 16-Hours

1- Airboat w/ driver

1- R8

1- TSC3

1- fixed height pole with 6" diameter aluminum shoe.

Hot + Sunny

7/28/17

Belle Chasse, LA

Stephen P.

* Crew worked half day then demobilized due to field crew personnel incident

NRC's BA-195

Base set on BA195-SM-01

Pl# 9999

Ant Height: 6.88 ft.

TSC3: 2008

File: BA1952008

Stand: 80649

End: 80701

Used reference point on nearby platform for check in.

One man crew collected

R1C Data.

1 - man 16-Hours

1 - Aircraft w/ driver

1 - R2

1 - TSC3

1 - fixed height pole w/ 6" diameter aluminum shoe.

Belle Chase, LA

Hot & Sunny

7/28/17

Chris M.

* Crew worked half day then demobilized due to field crew personnel incident

NRLS

Base set on mon.

Ant. 6.88

SN 1035

File BA1952NDPASS1035

Start 20610

End 20713

Check in on point on platform

3 men crew collected R+K Dots.

Sunny & Hot

Belle Chasse, LA 8-15-16

Catlyn
Lucas
Anthony

N R C S

Set Base on: mon

Check in on: X mark on Platform

File Name: BA1952NDP551034

SIN: 1034

Start: 20000

End: 22015

Ant HI: 6.90

2 men Crew Sonar mtd and Rtk Cleaned
lines and Staked 5 boring locations

2-men (11 hrs) 1-collapse
1- 37 HP Seta for 1
1- Sonar mtd

Cloudy & Rainy
8-15-17

Bellefleur, LA

Chris M
Chris F

N R C S

BASE set on mor BA195-sm-01
pr #7

Ant. 6.88

SN. 2009

File ba1952ndPASS2009

START 50000

END 50169

SONAR mite

START 1500

END 1926

11 HRS

Port
Cloudy w/showers

8-15-17

surpaser

LADD

MA77

BA 195

Spent the first half of the day marking Boring Locations. Ended the day working RTK Clean up. Arron was with me during the first part of

RTK Static

Base Head 88

Base Point BA195-SM-01

Check-in Platform 'X' Chislemark

SIN 2008

Head 80

Start 30000

End 30081

File BA195 2ND Pass 2008

Hot & Sunny

Belle Chasse, La 8/15/17

Nick, C

Arron, H

Equipment

2 crew,

1 Airboat and driver

1 RS Receiver

22 10' x 1" PVC pipe

1 Truck

NRCS

Base set on mon. BA195-SM-01

Ant. G. 88

S/N - 2010

File - b6195 and Pass 2010

Start - 40003

End - 40096

Imagery collected.

RTK Data.

Warm/Sunny
8/15/19

stephen P.

Belle Chasse, LA

NRCS

Base set on 1 man

Check in on 1 X mark on platform

File Name: BA198NDP652011

S/N: 2011

Ant HT: 6.50

Start: 20498

End: 20634

2 man crew shot Rtk clean up along
lines in marsh

1-374P garterail 2-men (1 hrs)

1-Rtk unit

1-cell phone

Clear lot
8-16-17

Bellchase, LA

Oct 17/18
Chris F

N RCS

BASE SET ON MON BA 195-SM-01

ANT. 6.88

PT #7

SN 2009

FILE BA 195 2ND PASS 2009

START 50170

END 50331

Check in on point on conc. Platform

11 HRS

Port
5419102

Sunny & HOT
8-16-17

LADD
MATT

BA195

First two hours spent on barge
trials trying to set Bering locations
in the lake. Then finished the day
collecting RTK data.

RTK-Static

Base Head 88

Base Point BA195-SM-01

Check-in Platform 'X' Chislemark

S/N 2008

Head 80

Start 30082

End 30250

File BA1952NDPass2008

Nick, C

Sunny & Hot

Belle Chasse, La 8/16/17

Equipment

1 Crew

1 Airboat with driver

1 R8 Receiver with data collector

1 Truck

NRCS

Base set on: mon

Checked in on: Xmark on platform

FileName: B#1952ND PSS 2011

Ant HI: 6.90

S/N: 2011

Start: 20634

End: 20724

2 men Crew continued Shooting Point
on cleanup lines in marsh

1- 37HP gator tail 2 men (12 hrs)

1-cell phone

1- RTR

Clerklot

8-17-17

Clerklot
Ch. SF

Bellechese, LA

NRC S

BASE SET ON MON BA195-SM-01

Ant. 6.88' PT #7

SN 2009

File BA195and PASS 2009

START 50332

END 50497

Check in on platform

12 APR 5

Port
Suipher

Sunny & Hot
8-17-12

LADD
MATT

BA195

4 Men crew set 5 boring locations
in the lake.

RTK-Static

Base Point BA195-SM-01

Base Head 88

Check-it Platform 'X' Chisle mark

S/M 2008

Head 80

File BA195 2NDP.53 2008

Start 30251

End 30253

Rapid Shot

Start 2804

End 2809

Belle Classe, La Hot Nick, C
8/17/17 Catelyn, H

Anthony, M
Stephan, P

Equipment

4 Crew

1 Boat

1 R8 Rover with Data Collector

5 10 10' 1" PVC Pipe

2 Trucks

BA195

Spent first half of day on barge

Setting Boring locations.

F Spent rest of day collecting RTK data.

RTK-Static

Base Head ~~80~~ 88

Base Point BA195-SM-01

Check-in Platform 'X' Chislemark

S/N 2008

Head 80

Start 30254

End 30513

File BA1952NDPass2008

Belle Chasse, La 8/17/17

Hot

Nick, C

Equipment

1 Crew

1 R8 Receiver with Data Collector

1 Airboat with Driver

1 Truck

NRCS

Base Set on: man

Checked in on: X mark on platform

SIN: 2011

Ant HT: 6.90

File Name: BA1952NDPSS 2011

Start: 20725

End: 20754

2 men crew finished shooting water
bottom and Elevation shots in marsh
Areas

1- 374P sector in 1

1-cell/plane

1-RTK

2-men (16.7 hrs)

Clear Hot

8-18-17

Be/le Chase, LA

Chism

Chase

NRC-5

BASE Set on mon. BA195-5m-01
ANT. 6.88' PT #7

SN 2009

FILE BA195 2nd PASS 2009

START 50498

END 50594

Checked in on MARK on Platform

16 NRS

Port
Supplier

Sunny + Hot

LADD
MATT

~~8-18-17~~
8-18-17

BA 195

Spent the whole day working on
RTK Clean up

RTK-Static

Base Head 88

Base Point BAP5-SM-01

Checkm Platform 'x' Chisole mark

S/N 2008

Head 80

File BAP5 2ND Pass 2008

Start 30514

End 30680

Nick, C

8/18/17

Equipment

1 Crew

1 R8 Receiver with Data Collector

1 Airboat with Driver

1 Truck

NRCS

Base set on mon. BA195-SM-01
Ant. 6.88 Pt #7

SN 1034

F.V. - BA1952NDPASS1034

Start - 22019

END - 22084

1 man crew collected RTK
Data with an R10 Head.

Warm/Sunny

8/18/17

Belle Chasse, LA

Stephent.

NRCS BA195

6 men crew loaded equipment
for trip to Belle Chase then
travelled to motel

3 trucks 228M
1 ATK Base / 5 Remens
3 - Radiometers
8 probes
1 - RDI p/c locator
1 - 400 hp barge
1 - Dutton tail
6 men 11 hrs

crew had to wait on aqua
tech for 1 hour for boat

along the way to Belle Chase
in Gonzales barge trailer
swearing / but was replaced
along interstate.

Grand Lake, La
10-16-2012

Coof + Lisa

Benjamin
Todd D

Chris F
Nick C
Stephen
Chris M

NRCS BA195

2 man crew traveled to Bonstoria Bay using 30ft aqua Barge to Get Base @ BA195-5m-01

Boat developed fuel leak so crew stopped to fix it

Set Base @ BA195-5m-01 (PE#1)

checked in on chisel marked on adjacent Platform.

Crew began pushing pipelines in the marsh

DC SN #2011

RC SN # 42

Base head #80

Start Pt 300,000

End Pt 300,027

Cool + Clear 10-17-2017 Belle Chase, La Conon 24 Nick C.

Crewed checked

A normally 10600169 - No signal found

Pipelines

600020 - 600018 - 1 line in field
600021 - 600019 pushed PC
600022 - 600023 1 line in field
600017 - 600019 straight to platform
600018 - 600016 straight to platform
600034 - 600038 - line pushed
600035 600031 - line pushed for 300'
600033 - 600024 line pushed for 300'

1- RTK Base/ Rover

1- Gradometer 2- trench 30m
2- men

1- Schonstedt

2- pipeline probes

1- RDI pipeline locator

1- 400 hp Barge 35gal

N R C S

BASE set on BA195-SM-1

ALT. 6.88

5 N 2009

File BA1953RDPASS2009

START 200000

END 200620

Check in on PT #7

Platform

Two men crew probed and identified magnetic anomalies within the project site.

Port

Sulpher

Sunny + mild

10-17-17

1420

Chc. S

NRCS

Base set on mon. BA 195-5m-01 #7

Ant. 7.093

S/N 2010

File BA1953RDPASS2010

Start 100,000

End 100,448

2 man crew collected RTK data
and probed for underground pipelines.

2 men - 12 hrs

1 airboat w/diver

1 R8 river with data collector

Cool, windy, sunny

10/17/17

Belle Chasse, LA

Stephen P.

Chris M.

NRCS BA195

2 man crew traveled to Bonatano Bay using 30 ft Orqua Barge to hit Base @ BA 195-5M-01

Checked in on chisel marks on adjacent Platform

Crew continued probing pipelines in the marsh

DCSN: 2011

RCSN: 42

Base head: 80

Start Pt: 300,028

End Pt: 300,081

Belle Glade, FLA

Chart Cool 10-18-2017

Donor 21
Tuck C

Crew checked

all remaining pipelines

1-PTK Base/Power 2 trucks 30m

1-Gradometer 2 men

1-Schmidt

2-Pipeline probes

1-RDI P/L locator

1-400hp barge 35 gal

1-Airboat

NRCS

BASE SET ON BA195-SM-1

ANT. 6.88'

SN 2009

FILE BA1953RDPASS2009

START 200621

END 200696

CHECK IN ON PTT7 Point on Platform

Two men crew probed and identified
magnetic anomalies within the BA-195
project site

Port Sunny + Warm LADD
Sulphur 10-18-17 Chris

NACS

Base seton mon. BA195-sh-01 #7

Ant. 7.093

S/n 1034

F.l.e BA1953RD PASS1034

Start 400003

End 400012

2 men crew probed for pipelines

2 men - 12 hrs

1 airboat w/ driver

1 RG rover with data collector

Warm, windy, Sunny

10/8/17

Belle Chasse, LA

Stephen R.
Chris M.

NRCS BA195

2 man crew traveled to Banatana
Bay using 30ft Aqua Barge
to set Base @ BA195-SM-01

checked in on Chisel marks
on adjacent Platform

Crew located anomalies on
east side of job site.

DC SN: 2011

RCSN: 42

Base head: 80

Start Pt: 300,082

End Pt: 300148

Crew had to refuel boat
due to fuel leak

Belle Chose, La

10-19-2017

Donor #
Nicks

1 RTK base / rover
1 - Radiometer
1 - Schonstedt
2 - pipeline probes
1 - RDI pipeline locator
1 - 400 hp barge 35gal
1 Airboat
2 trucks 30m
2 - men

NRCS

BASE set on BA195-sm-1

Ant. 6.88

SN 2009

FILE BA1953RDPASS2009

START 200697

END

CHECK in on PT #7 MARK ON SLAB

Two men crew probed and

Identified magnetic anomalies
within the BA-195 project site.

Port
surpacer

Sunny + warm
10-19-17

LADD
Chris

NACS

Base set on mon. BA195-SM-01 #17

ant. 7.093

S/N 1034

File BA195 BRD PASS 1034

Start 400,013

End 400,054

2-man crew searched for anomalies.

2 men - 12 hrs

1 airboat w/driver

1 R8 rover with data collector

Warm/windy, sunny

Belle Chasse, LA

10/19/17

Stephen P.

Chris M.

NRCS BARS

6 man crew loaded equipment
for return trip to Grand Lake

3 trucks 288 M

1 RTK Base / 5 Rovers

3 - Radiometers

8 probes

1 - RDT P/C locator

1 - 400 hp tractor

1 - gator tail

6 men 8 hrs

Belle Chose, La

10-20-2017

Coast Guard

Carson H
Todd D

Chris F
Steph H
Chris M
Nick C

NRCS BA195

1 man crew arrived at office
@ 11:30 AM. Crew loaded gear
and traveled to Belle Chase
to perform Peeling.

3 trucks 290 Miles
1 RTK Base / 4 Rovers
3 - Radiometers
1 - RDI P/L Locator
1 - 400 hp barge
1 - gator-tail
1 - 40 hp tunnel hull
4 men 7 hrs

Crew arrived @ boat
launch @ 6:00 p.m.
Crew launched barge
and changed equipment.

David Lake
Cool + Ula

10-29-17

Luong
Aaron
Nick
Stephen

NRCS BA195

3 man crew hauled
to job site and began
packing starting on
last end of job

2 trucks 30 miles
1 RTK base / 1 Rover
1 - Brookhaven
1 - RDI P/C locator
1 - Schenck
1 - 400 hp barge
1 - gator tail
3 men 12 hrs

Stephen was sick in the
morning and was given
part of day to recover.

Crew arrived @ motel
@ 6:00 then changed
equipment.

10-30-17 Belle Chase
local & clear

Leonard H
Carver H
Nick C

SN: 2008

4th name: BA195 4th pass 2008

start pt: 20116
end pt: 20208

Rec: 80 base
me: 99 lower

NRCS Ba 195

2 man crew traveled to job site and continued probing pipelines. Crew worked on marsh probing.

1-truck 8 miles
1-RTK base / 1 Rover
1-Trimble
1-RDI P/L locator
1-Schmidt
1-400 hp barge
2 men 1 1/2 hours
1-airecat

Crew arrived @ motel @ 6:00 PM. then changed equipment.

10-31-17

Belle Chase
Cool + clean
Bourne
Stephen P

SN: 2011

File name BA1954th Pass 2011

Start pt: 30,000

End pt: 30,074

rec: 20 base

rec: 42 rover

BA195

3 man crew located Pipe lines.

RTK

S/N 2008

Head 99

File BA195 44h Pass

Start 20209

End 20270

Equipment

3 men,

1 Beat, Gator tail

1 R8 rover with Data collector

1 Schonstedt

1 Gradiometer

1 (6") Probe

1 (8") Probe

1 (5") Probe

1 Truck

Nick, C

Leonardo, H

Chris, M

Sunny

10/31/17

Belle Chasse, La

N RCS BA195

Team crew traveled to job site and finished pulling P/C. Crew worked in lake and north west corner

1- truck 8 miles
1- RTK Base / 1 Rover
1- Prodimeter
1- Schonstedt
1 400 hp barge
2 men 1 Diver
1- 40 hp boat

Crew arrived @ motel @ 4:30 p.m. and changed equipment.

Cool & Clear Belle Chase 11-1-17

Arrived 24
Chris 74

SN: 2011

File Name: BA 195 4th Run 2011

Start ft 30,075

End ft 30,107

UC 80 base

UC 42 rover

BA195

2 man crew collected and ~~test~~ located
Pipeline.

RTK

S/N 2008

Head 99

File BA195 4th Pass

Start 20271

End 20302

Equipment

2 man crew

1 Boat, Gator tail

1 R8, Rover with Data Collector

1 Schonstedt

1 Gradiometer

1 (5') Probe

1 (6') Probe

1 (8') Probe

1 (15') Probe

1 Truck

Belle Chasse, La

Sunny

11/11/17

Nickel
Stephen, P

NRCS BA195

Crew packed gear +
returned home. Left
motel @ 8:00 arrived @
3:30

3-trucks 282 miles
1 PTK load / 4 Rows

3-quadromolans

1- PTK P/L Locator

1- 400 hp charge

1- gator tail

1- 40 hp tunnel hull
4 men 7 1/2 hrs

Bulle Chase

Wool + Glen 11-2-17

Donor H
Chris Tr
Nabe
Stephen P

NRCS BA195

Crew packed equipment for trip to Belle Chase then traveled to motel

Crew launched barge @ 5:45 p.m.

3 trucks 288 m

1 RTK base / 4 Rovers

3 graders

1 - Side scan

1 - 400 hp barge

1 - 40 hp barge

6 - men 10 hrs

11-13-17

Belle Chase

Barney

Chris Th

Ladd D

Chris F

Chris M

Nick C

Stephen D

NRCS BA195

Crew began side scanning sonar in harbor area.

1-hypack PC

1-SAB 461

1-rental boat (Patrick)

25 gal fuel

1-generator 5 gal

Crew ran most of harbor area before during inspection of data. Crew realized scanning locked up @ 10:30

Canon 4

Grand Lake

11-14-17

NRCs

BASE SET ON BA195-SM-1 PT#1

SN 2009

FILE BA1955THPASS2009

START 1213

END 1231

SN 2011

FILE BA195H20PROBE11

START 20621

END 20639

Checked in on Platform PT. 7

Probed 7/25

Port Sulphur

11-14-17

LADD
Chris
C Moore

PT#	Probe Length	TOW	Water Depth	Stephan
20624	20 FT	1213	0.60	Edm Dale
20625		1214	0.58	
20626		1215	0.57	
20627				
20628				
20629				
20630				
20631				
20632				
20633				
20634				
20635				
20636				
20637				
20638				
20639				
20640				
20641				

NRC5 BA195

2 man crew traveled to
Gob. side to locate anomalies
Using gradiometer since
side scan locked up

DCSN#2010

File: BA954120Probe 10 {
Start Pt 400,000
End Pt 400,038

1 - gradiometer
1 - GRTK box / 1 Rover
1 - Schonstedt
1 - rental boat (Patrick)
25 gallons

Noth gradiometer was
run @ 0073, 0074 & 0075
all the hits were shot
1 point @ 74 since nothing
found at these 3.

11-15-17

Belle Chase

Carroll
Chris M

500073	No hit	500001	- Mud ground bar
500074 <td>No hit</td> <td>500007</td> <td>Crab Pot</td>	No hit	500007	Crab Pot
500075 <td>No hit</td> <td>500008</td> <td>Crab Pot</td>	No hit	500008	Crab Pot
500080 <td>No hit</td> <td>500009<td>N & N</td></td>	No hit	500009 <td>N & N</td>	N & N
500081 <td>No hit</td> <td>500011</td> <td>Crab 1st</td>	No hit	500011	Crab 1st
500083 <td>Crab Pot</td> <td>500012</td> <td>No hit</td>	Crab Pot	500012	No hit
500076 <td>No hit</td> <td>500023</td> <td>Crab Pot</td>	No hit	500023	Crab Pot
500077 <td>No hit</td> <td>500025</td> <td>Crab Pot</td>	No hit	500025	Crab Pot
500048 <td>No hit</td> <td>500024</td> <td>Crab Pot</td>	No hit	500024	Crab Pot
500067 <td>No hit</td> <td>500027</td> <td>Crab Pot</td>	No hit	500027	Crab Pot
500066 <td>No hit</td> <td>500026</td> <td>Subis</td>	No hit	500026	Subis
500064 <td>No hit</td> <td>500028</td> <td>Crab Pot</td>	No hit	500028	Crab Pot
500063 <td>Subis</td> <td>500029</td> <td>No hit</td>	Subis	500029	No hit
500061 <td>No hit</td> <td>500036</td> <td>Debris</td>	No hit	500036	Debris
500060 <td>Debris</td> <td>500035</td> <td>Crab Pot</td>	Debris	500035	Crab Pot
500062 <td>Subis</td> <td>500034</td> <td>Crab Pot</td>	Subis	500034	Crab Pot
		500031	Crab Pot
		500030	No hit
		500032	Crab Pot
		500033	Crab Pot
		500037	Crab Pot
		500038	No hit

NRC5

Port sulfur 1A

1-15-77

pt	No	Probe Length	pt	Elev	water depth	Edm
	1281	20	1280	0.832	6.9	0.0
	1282	20	1283	0.840	7.0	0.0
	1285	20	1284	0.830	7.2	0.0

NRCS

BASE SET ON BA195-SM-1 PT#1

SN 2009

START 1232

END 1285

File BA1955THPass2009

SN 2011

START 20640

END 20647

File BA195-H2OProbe11

Check in on PT#7 MARK on Platform

Probed Existing Pipelines
Recorded Cover & Position

PORT		SALPHER		11-15-17		LADD Chris NICK SALPHER	
PT NO.	PROBE LENGTH	PT#	TOW	ELEV.	WATER DEPTH	E-DM	
1236	15	1235	0.227	3.9	0.0		
1238	15	1237	0.372	3.9	0.0		
1239	15	1240	0.368	4.7	0.0		
1241	15	1242	0.285	4.7	0.0		
1244	15	1243	0.344	5.0	0.0		
1246	15	1245	0.345	4.9	0.0		
1248	15	1247	0.365	5.4	0.0		
1249	15	1250	0.363	5.4	0.0		
20643	15	1251	0.551	5.6	0.0		
20644	15	1252	0.560	6.2	0.0		
1253	15	1255	0.714	6.1	0.0		
1258	15	1256	0.643	6.0	0.0		
20645	15	1259	0.691	6.7	0.0		
1261	20	1260	0.690	6.7	0.0		
20646	15	1262	0.682	6.6	0.0		
1264	20	1263	0.656	6.6	0.0		
20647	15	1265	0.645	6.7	0.0		
1267	20	1266	0.605	6.7	0.0		
1269	20	1268	0.789	6.7	0.0		
1270	20	1271	0.707	7.0	0.0		
1273	20	1272	0.781	6.9	0.0		
1274	20	1275	0.890	7.3	0.0		
1277	20	1276	0.847	7.4	0.0		
1278	20	1279	0.913	7.9	0.0		

NRCS BA195

2 men crew traveled to ph
site to locate anomalies
using gradiometer since
side scan locked up

DCSN 2010

File BA195H20 Prov#10

start pt 400,039
end pt

1- gradiometer

1- RTK base / Rover

1- Schenck

1- rental boat (Patrick's)
25 gallons

11-16-17

Belle Chasse

Bayou
Chauvin

crew finished Barrow area
then worked on secondary
Corridor

NRCs

BASE SET ON BA195-SM-1 PT#7
Checked in on PT#7 PT on Platform

SN 2009

File BA1955TH P<SS 2009

START 1286

END 1310

SN 2008

File BA185 H20 Probe 08

START 20389

END 20413

Probed 1/2 Recorded Depth
and Position

Port		11-16-17		LADD Chris Stephen NICK	
Salphor	PT#	probe Depth	PTE TOW	WATER Depth	EDM RDE
1290	20'	1289 0.29	8.0	0.0	
1291	20'	1292 0.23	8.0	0.0	
1293	20'	1294 0.39	7.9	0.0	
1302	20'	1301 0.55	6.4	0.0	
1303	20'	1304 0.61	6.4	0.0	
1306	20'	1305 0.70	6.6	0.0	
1310	20'	1309 0.72	8.8	0.0	

NRCS BA195

Crew repacked equipment
for trip. Back to ground
take from motor

3 - trucks 280m
1 RTK base / 4 rovers
3 - gradiometers
1 - Side Scan
1 - 400 hp barge
1 - 40 hp boat
6 men 8 hrs

11-17-17

Donor #1
NABC

Chris F
Todd D.
Stephen P
Chris M