Equipment Specifications
and
Standard Operating Procedures
Cable Arm Environmental Low Turbidity Dredging Procedure with Clamvision

SOP CA-99-02

1.0 Low Turbidity Dredging

1.1.0 Verify barge on target position (DGPS or survey)
1.2.0 Set boom angle “Y” (as per XY footprint map)
1.3.0 Open “decontaminated bucket” (yellow indicator light “ON”)
1.4.0 Rotate crane to starting “X” position (as per XY footprint map or WINOPS bucket pattern)
1.5.0 Lower bucket at a rate not to exceed 1 foot per second (machine capability) AVOID SPLASHING
1.6.0 Stop lowering bucket when penetration displays 6 ft
1.7.0 Hold position for 5 seconds (allow echo sounder display to stabilize)
1.8.0 Lower (1 ft/sec) until desired penetration or final depth (do not exceed final depth as specified)
1.9.0 Close bucket (red indicator lights “ON”)

[If red lights do not come “ON”]

1.9.1 Loosen & tighten closing line repeatedly
1.9.2 Open bucket slightly and lift about 1 ft and then close
1.9.3 Place bucket on bottom and slowly open to discharge sediment in original area.
1.9.4 Mark area using WINOPS’ target software tool
1.9.5 Reposition a few degrees from original swing position and repeat steps (1.5.0 - 1.9.0)

1.10.0 Lift bucket out of water just below rubber flapper vents
1.11.0 Allow water to drain
1.12.0 Rotate (swing) partially submerged bucket toward receiving scow
1.13.0 Lift and swing over scow
1.14.0 Open bucket completely (yellow indicator light “ON”) and discharge all contents (use vibrators if available)
1.15.0 Close bucket (red indicator lights “ON”) and move above wash tank
1.16.0 Open bucket (yellow light “ON”) and immerse completely into wash tank
1.17.0 Move bucket up and down to rinse internal walls and corners (bucket vibrators and or spray equipment)
1.18.0 Lift bucket 2 feet above wash tank
1.19.0 Close bucket (red indicator lights “ON”)
1.20.0 Swing to next position (as per bucket footprint map) and repeat steps (1.1.0 – 1.19.0)
**SEI 3000**

<table>
<thead>
<tr>
<th>TYPE:</th>
<th>Hopper Barge</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS:</td>
<td>Inland</td>
</tr>
<tr>
<td>STERLING #:</td>
<td>09-077</td>
</tr>
<tr>
<td>LENGTH:</td>
<td>260'</td>
</tr>
<tr>
<td>BEAM:</td>
<td>52.6'</td>
</tr>
<tr>
<td>DEPTH:</td>
<td>12'</td>
</tr>
<tr>
<td>GROSS TONNAGE:</td>
<td>1375</td>
</tr>
<tr>
<td>NET TONNAGE:</td>
<td>1375</td>
</tr>
<tr>
<td>YEAR BUILT:</td>
<td>1982</td>
</tr>
<tr>
<td>COMPARTMENTS:</td>
<td>12</td>
</tr>
<tr>
<td>BULKHEADS:</td>
<td>(2) Longitudinal (6) Transverse</td>
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<tr>
<td>SPUD WELLS:</td>
<td>None</td>
</tr>
<tr>
<td>SPUDS:</td>
<td>None</td>
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<tr>
<td>CAPACITY:</td>
<td>3000 Tons</td>
</tr>
<tr>
<td>OTHER:</td>
<td>Vessel is fitted with a bow rake and square stern.</td>
</tr>
</tbody>
</table>

www.sterlingequipment.com

62 Nay Street | East Boston, MA 02128 | Ph. 617-561-4460 | Fax. 617-561-0040
<table>
<thead>
<tr>
<th>TYPE:</th>
<th>Hopper Barge</th>
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<td>BEAM:</td>
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<td>DEPTH:</td>
<td>12'</td>
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<tr>
<td>GROSS TONNAGE:</td>
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<tr>
<td>NET TONNAGE:</td>
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<td>YEAR BUILT:</td>
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<tr>
<td>COMPARTMENTS:</td>
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<tr>
<td>BULKHEADS:</td>
<td>(2) Longitudinal</td>
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<td>(6) Transverse</td>
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<tr>
<td>SPUD WELLS:</td>
<td>None</td>
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<td>SPUDS:</td>
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<tr>
<td>CAPACITY:</td>
<td>3000 Tons</td>
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<tr>
<td>OTHER:</td>
<td>Vessel is fitted with a bow rake and square stern.</td>
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</table>
TYPE: Spud Barge
CLASS: Inland
STERLING #: 09-104
LENGTH: 250'
BEAM: 38'
DEPTH: 10'
GROSS TONNAGE: 855 (Approximately)
NET TONNAGE: 855 (Approximately)
YEAR BUILT: Unknown
COMPARTMENTS: 14
BULKHEADS: (13) Transverse
SPUD WELLS: (3) 20.5” Round
SPUDS: (3) 50’
OTHER: All welded steel former railroad car float, with flat deck, parallel straight sides with armor plating, and raked bottom plating at each end. The bottom has slight deadrise. The deck has a 5” concrete surface.
The Wood 1 is suitable for maintenance and capitol projects, such as pier dredging, channel maintenance and deepening, and pipe line crossings.

**TYPE:** Bucket Dredge  
**CLASS:** Inland  
**STERLING #:** 09-013  

**APPLICATIONS:**  
- Open Channel Excavation  
- Pier & Dock Excavation & Trenching  
- Maintenance Dredging  
- Rock & Hard Material Removal

**OPERATION:**  
- 15 & 18 yd. buckets for mud excavation.  
- 10 yd. bucket for firmer materials.  
- 6 yd. bucket for sand and hard materials.

The dredge works in conjunction with Cashman's fleet of 2,000 - 3,500 yd bottom dump barges & split hull dumpers on projects involving off-shore disposal. The dredge features GPS positioning equipment.
OPERATING SPECS

LINEPULL @ PARAM: 212 Fpm
DIGGING DEPTH: 60'-120'
LINEPULL: 136,000 Lbs
STALLPULL: 150,000 Lbs
FUEL CAPACITY: 4,000 Gal
FRESH WATER: 10,000 Gal

DIMENSIONS

LENGTH: 134'
BEAM: 50'
DEPTH: 11'
DRAFT: 6'
LOADLINE DRAFT: 3.5'
GROSS TONNAGE: 681
NET TONNAGE: 681

OTHER:

Crew day room and shop area. Precision dredging using GPS positioning system.

EQUIPMENT & MACHINERY SPECS

CRANE: 2400 Lima Crane
Boom 100' / 120'
CABLE SIZE: 1 1/2"
SPUDS: (3) 30" x 90'
SPUD WELLS: (3) 32"
SPUD WINCHES: 60,000 Lbs. / Line Pull
FLEETING WINCHES: 32,000 Lbs. / Line Pull
GENERATORS: (2) 35 Kw
HPU: 250 Hp

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62 Nay Street | East Boston, MA 02128 | Ph. 617-561-4469 | Fax. 617-561-0049
TYPE: Lima 2400B Crawler Crane SN/3445-4A

DESCRIPTION: 120' boom, 3rd drum set-up for clamshell. Bucket sizes from 6 Yd. heavy to 14 Yd. rehandling. Cable size: 1 1/4"

See Spec Sheet
Capacities given in tables below are based on 66-2/3% of tipping load and machine equipped with: Long crawler, Standard dragline-clamshell boom, Standard 40'-0" mast, pendent suspension of boom to mast. Maximum counterweight (52,000 lbs.). Minimum working radius with mast and pendent suspension 59'-0" with 80'-0" boom to 94'-0" with 150'-0" boom. For clamshell operation from 20° to 80° boom angle requires use of pendent and slings, omitting mast. Clamshell boom over 120'-0" length requires addition of center boom suspension.

### WORKING CAPACITIES — TYPE 2400 DRAGLINE

<table>
<thead>
<tr>
<th>Load Fad.</th>
<th>60°</th>
<th>63°</th>
<th>65°</th>
<th>67°</th>
<th>69°</th>
<th>71°</th>
<th>73°</th>
<th>75°</th>
<th>77°</th>
<th>80°</th>
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<td>80'-0&quot;</td>
<td>41,900</td>
<td>41,900</td>
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<tr>
<td>90'-0&quot;</td>
<td>41,650</td>
<td>41,650</td>
<td>41,650</td>
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<td>41,650</td>
<td>41,650</td>
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<tr>
<td>100'-0&quot;</td>
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<td>41,375</td>
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<td>41,375</td>
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<tr>
<td>110'-0&quot;</td>
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<tr>
<td>120'-0&quot;</td>
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<tr>
<td>140'-0&quot;</td>
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<td>33,020</td>
<td>33,020</td>
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<td>33,020</td>
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### WORKING CAPACITIES — TYPE 2400 CLAMShell CRANE

<table>
<thead>
<tr>
<th>Load Fad.</th>
<th>45°</th>
<th>50°</th>
<th>55°</th>
<th>60°</th>
<th>65°</th>
<th>70°</th>
<th>75°</th>
<th>80°</th>
<th>85°</th>
<th>90°</th>
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<tr>
<td>80'-0&quot;</td>
<td>100,750</td>
<td>88,050</td>
<td>77,750</td>
<td>69,630</td>
<td>63,075</td>
<td>57,925</td>
<td>52,800</td>
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<td>45,075</td>
<td>41,650</td>
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<tr>
<td>90'-0&quot;</td>
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<td>88,050</td>
<td>77,750</td>
<td>69,630</td>
<td>63,075</td>
<td>57,925</td>
<td>52,800</td>
<td>48,650</td>
<td>45,075</td>
<td>41,650</td>
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<tr>
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<td>85,150</td>
<td>74,430</td>
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<td>49,220</td>
<td>45,100</td>
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<td>61,475</td>
<td>55,075</td>
<td>49,725</td>
<td>45,620</td>
<td>41,500</td>
<td>38,375</td>
<td>35,420</td>
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<td>74,315</td>
<td>65,175</td>
<td>58,175</td>
<td>52,320</td>
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<td>39,375</td>
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<td>130'-0&quot;</td>
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<td>69,315</td>
<td>60,175</td>
<td>53,175</td>
<td>47,320</td>
<td>43,175</td>
<td>39,420</td>
<td>36,625</td>
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<td>31,520</td>
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<tr>
<td>140'-0&quot;</td>
<td>73,250</td>
<td>64,315</td>
<td>55,175</td>
<td>48,175</td>
<td>42,320</td>
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<td>30,420</td>
<td>27,625</td>
<td>25,020</td>
<td>22,520</td>
</tr>
</tbody>
</table>

**NOTE:** In order to maintain normal operating speeds under simultaneous hoisting and swinging conditions, the loaded clamshell bucket weight should not exceed 38,000 lbs.
<table>
<thead>
<tr>
<th><strong>TYPE:</strong></th>
<th>500 Hp Twin Screw Crewboat</th>
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</thead>
<tbody>
<tr>
<td><strong>CLASS:</strong></td>
<td>Coastwise C.O.I</td>
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<tr>
<td><strong>STERLING #:</strong></td>
<td>12-011</td>
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<tr>
<td><strong>LENGTH:</strong></td>
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<tr>
<td><strong>BEAM:</strong></td>
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</tr>
<tr>
<td><strong>DEPTH:</strong></td>
<td>6.5'</td>
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<tr>
<td><strong>GROSS TONNAGE:</strong></td>
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<tr>
<td><strong>NET TONNAGE:</strong></td>
<td>17</td>
</tr>
<tr>
<td><strong>YEAR BUILT:</strong></td>
<td>1982</td>
</tr>
<tr>
<td><strong>ENGINES:</strong></td>
<td>Twin Detroit Diesels 6V71N</td>
</tr>
<tr>
<td><strong>GENERATORS:</strong></td>
<td>8 Kw Northern Light Generator</td>
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<tr>
<td><strong>STEERING STATION:</strong></td>
<td>Main Pilot House</td>
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<tr>
<td><strong>ELECTRONICS:</strong></td>
<td>(2) Base Mounted Marine VHF</td>
</tr>
<tr>
<td></td>
<td>(1) Electronic GPS Chart Plotter</td>
</tr>
<tr>
<td></td>
<td>(1) Hailing System</td>
</tr>
<tr>
<td></td>
<td>(1) Radar</td>
</tr>
<tr>
<td></td>
<td>(1) Depth Finder</td>
</tr>
<tr>
<td></td>
<td>(1) Standard GPS</td>
</tr>
</tbody>
</table>

**OTHER:** Used as a survey boat. Outfitted with triple beam survey equipment mounted on bow.
The Dorothy Elizabeth

The Dorothy Elizabeth, originally the Mobil 11, is an 1800 horsepower single screw "Classic" steel tug. Built in 1951, she is 100 feet long with a single deck, curved stem, and elliptical stern.

This picture, taken by Steve Munez at the 2006 NYC Tug Boat Race, shows the Dorothy "ahead full" with flags and "crew members" as decoration. Click on the image to see an enlargement.

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GENERAL CHARACTERISTICS

- Dimensions: 66' X 24' X 6.5'
- Draft: 5' Normal
- Gross Tonnage: 91 Tons
- Net Tonnage: 62 Tons
- Official #: 536877

POWER & PROPULSION

- Main Engines: (2) Caterpillar D353
- Generator: (2) Norpro.30 KW
- Gears & Clutches: Twin Disc
- Ratio: 5 to 1
- Free Running Speed: 10 Knots
- Rated Horse Power: 900 H. P.

ELECTRONICS

- Radar: Furuno Model1942 Mark 2
- VHF: (2) Standard Horizon
- Fathometer: Garmin 2600
- GPS: Map Navigator
- I. D. System: AIS Nauticast X Pack
- Cellular Telephone: Nextel

LIQUID CAPACITIES

- Ships Water: 2,000 Gallons
- Fuel Capacity: 12,000 Gallons
- Lube Oil: 55 Gallons

PASSENGER / CREW ACCOMMODATIONS

- (1) 4-Bunk State Room
- (1) 2-Bunk State Room
Crescent® R100 Series DGPS Receiver
High Accuracy, Multipurpose Receivers

Complete your work quickly and accurately with the Crescent R100 series DGPS receiver. Rely on consistent sub-meter performance with standard SBAS differential and Hemisphere GPS’ exclusive COAST technology that maintains accuracy during temporary loss of differential signal. The Crescent R100 offers many differential correction options for various environments and worldwide coverage. The simple user interface and extensive software features make the Crescent R100 the ideal solution for professional mapping, guidance and navigation applications.

Key Crescent R100 Series Advantages

- Feature-packed sub-60cm DGPS Positioning
- Differential options including SBAS (WAAS, EGNOS, etc.), Radio Beacon, OmniSTAR
- Exclusive e-Dif® option where other differential correction signals are not practical
- COAST™ technology maintains accurate solutions for 40 minutes or more after loss of differential signal
- Fast output rates of up to 20 times per second provide the best guidance and machine control
- Compatible with our exclusive L-Dif™ technology, for applications requiring accuracy under 20cm
- The status lights and menu system make the R100 Series easy to monitor and configure
### Crescent® R100 Series DGPS Receiver

#### GPS Sensor Specifications

- **Receiver Type:** L1, C/A code, with carrier phase smoothing (Patented COAST™ technology during differential signal outage)
- **Channels:** 12-channel, parallel tracking (10-channel when tracking SBAS)
- **WAAS Tracking:** 2-channel, parallel tracking
- **Update Rate:** Up to 20 Hz position
- **Horizontal Accuracy:**
  - <0.6 m 95% confidence (DGPS*)
  - <2.5 m 95% confidence** (autonomous, no SA)
- **Cold Start:** 60 s (no almanac or RTC)
- **Antenna Input Impedance:** 50 Ω

#### Beacon Sensor Specifications

- **Channels:** 2-channel, parallel tracking
- **Frequency Range:** 283.5 to 325 kHz
- **Channel Spacing:** 500 Hz
- **MSK Bit Rates:** 50, 100, and 200 bps
- **Operating Modes:** Manual, automatic, database
- **Cold Start Time:** < 60 seconds typical
- **Reacquisition Time:** < 2 seconds typical
- **Demodulation:** Minimum Shift Keying (MSK)
- **Sensitivity:** 2.5 μV for 6 dB SNR @ 200 bps
- **Dynamic Range:** 100 dB
- **Frequency Offset:** ± 8 Hz (~ 27 ppm)
- **Adjacent Channel Rejection:** 61 dB ± 1 dB @ fo ± 400 Hz

#### Communications

- **Serial Ports:** 2 full duplex
- **Interface Level:** RS-232C
- **Baud Rates:** 4800, 9600, 19200, 38400, 57600
- **Correction Input / Output Protocol:** RTCM SC-104
- **Data Input / Output Protocol:** NMEA 0183
- **Raw Measurement Data:** Proprietary binary (RINEX utility available)
- **Timing Output:** 1 PPS (HCMOS, active high, rising edge sync, 10 kΩ, 10 pF load)

#### Environmental

- **Operating Temperature:** -32°C to +74°C (-25°F to +165°F)
- **Storage Temperature:** -40°C to +85°C (-40°F to +185°F)
- **Humidity:** 95% non-condensing
- **Shock and Vibration:** EP 455
- **EMC:** FCC Part 15, Subpart B, Class B CISPR 22

#### Power

- **Input Voltage Range:** 8 to 36 VDC
- **Reverse Polarity Protection:** Yes
- **Power Consumption:** 3W
- **Current Consumption:** < 250 mA @ 12 VDC
- **Antenna Voltage Output:** 5.0 VDC
- **Antenna Short Circuit Protection:** Yes

#### Mechanical

- **Enclosure:** Powder-coated aluminum
- **Dimensions:** 160 mm L x 114 mm W x 45 mm H (6.3” L x 4.5” W x 1.8” H)
- **Weight:** 0.54 kg (1.20 lb)
- **LED Indicators:** Power, GPS lock, DGPS position
- **Power Connector:** 2-pin micro-Conxall
- **Data Connectors:** DB9-female
- **Antenna Connector:** TNC-male

#### Data Pin-out

<table>
<thead>
<tr>
<th>Port A</th>
<th>Pin 2</th>
<th>Transmit Data A (Tx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 3</td>
<td></td>
<td>Receive Data A (Rx)</td>
</tr>
<tr>
<td>Pin 5</td>
<td></td>
<td>Signal Ground</td>
</tr>
<tr>
<td>Pin 6</td>
<td></td>
<td>Event Marker</td>
</tr>
<tr>
<td>Pin 9</td>
<td></td>
<td>1 PPS Output</td>
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</tbody>
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<table>
<thead>
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<th>Port B</th>
<th>Pin 2</th>
<th>Transmit Data B (Tx)</th>
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<tbody>
<tr>
<td>Pin 3</td>
<td></td>
<td>Receive Data B (Rx)</td>
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<tr>
<td>Pin 5</td>
<td></td>
<td>Signal Ground</td>
</tr>
</tbody>
</table>

* Depends on multipath environment, number of satellites in view, satellite geometry, baseline length (for local services) and ionospheric activity

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

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Operator Manuals
Trimble AG132 GPS Sensor Interface Manual
Revision 07.10.23
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About NexSens Technology, Inc.

NexSens software and real-time data logging systems are designed to simplify the setup and operation of environmental monitoring networks. NexSens products automate much of the tedious programming, data collection, and manual data processing common with other systems.

iChart is an easy-to-learn, easy-to-use Windows-based software program designed to interface with the industry’s most popular environmental monitoring sensors and systems. A large multi-vendor instrument library makes setup quick and easy. iChart automates much of the tedious programming, data collection and manual data processing common with other environmental data collection systems.

The NexSens iSIC (Intelligent Sensor Interface and Control) is a state-of-the-art line of data loggers that simplify the collection of real-time data from environmental sensors and monitoring instruments. The iSIC data logger supports multi-vendor sensor connections and is designed for environmental data monitoring with NexSens communication equipment and software.

How to Use This Manual

This manual is designed to provide you with detailed instructions for interfacing specific sensors to the NexSens iSIC data logger.

This manual provides you with all the information needed to interface your sensor with the iSIC data logger. For advanced system and sensor reference material:

- Review the material in the iSIC operations manual:
- Review the sensor manufacturer’s operations manual. This information should have been provided with the purchase of the sensor. This material can also typically be found at the instrument manufacturer’s website. If you are still having difficulty, email your technical support question to:
  support@nexsens.com
Keeping iChart Up to Date

NexSens periodically releases new versions of iChart software and iSIC firmware to be downloaded free of charge. The updated versions typically add new features, improve existing features, and/or add more reliability to the system. It is important that iChart is updated to the latest version before connecting a new sensor to your iSIC data logger. Your computer will require internet access to update automatically.

To obtain the latest version of iChart software, open the program on your computer. In the Help menu, select Check for Updates.

If your software is up to date, iChart will confirm that your computer is running the current software release.

If a newer version of iChart is available, a dialog box will appear asking if you would like to upgrade to download the update.

Click Yes. iChart will begin downloading the update.

Note: Depending on your connection speed, this update may take a few minutes. You can continue running other applications on your computer while the download is progressing.

When the update has finished the downloading process, click OK and close iChart.

Reopen iChart. When the program opens, iChart will automatically begin the installation process. Follow the step-by-step installation windows to complete the iChart software update.

Note: If an internet connection is unavailable on the computer, iChart can be downloaded onto another computer and then moved to the computer where it needs installed. The latest version of iChart can be downloaded here:

http://www.nexsens.com/support/downloads.htm
Wiring

**Trimble AG132**  
- DB9 Pin 2  
- DB9 Pin 3  
- DB9 Pin 5  
- Power +  
- Power -

**iSIC**  
- 6-P1.Tx  
- 5-P1.Rx  
- 4-GND  
- 3-BAT  
- 4-GND

**Color**  
- White  
- Blue  
- Green  
- Red  
- Black

The diagram above shows a Trimble GPS connected to Port 1 of the iSIC using a male DB9 to flying lead interface cable.

Up to three RS232 sensors can be connected to the digital terminal of the iSIC at one time. This number can increase two more by adding a factory installed Digital Expansion connector.

It is necessary that both the blue and white wires be connected to the Rx and Tx pins on the same port. For example, if you are adding second RS232 sensor to the iSIC, connect the blue and white wires to P2.Rx and P2.Tx respectively as shown in the diagram above.

When adding a third RS232 sensor, connect the blue and white wires to P3.Rx and P3.Tx respectively. Follow this wiring pattern for every RS232 sensor you interface with the iSIC.

After connecting the flying lead wires, power the iSIC by connecting the red and black battery terminals.
Adding to iChart

Once all wiring is completed, the device is ready to be added to an iChart database. To add the device to an existing database, select Instrument | Add Device. To create a new database, select File | New Project.

Setup Device Wizard

The Setup Device Wizard will begin. Click Next to continue.

Step 1 – Site Setup

The first step is to create a site for data loggers and sensors to be located in. If this is an existing project, sites may already exist. Enter a Site Name and click Add or simply select a site that has already been added from the navigation list.
Step 2 – Data Logger & Telemetry

The next step is to add the data logger(s) to the sites created in the previous step. Select a site to add a data logger to. Then select the data logger model number from the list at right and click Add or select a data logger that has already been added from the navigation list, if simply adding the sensor to a data logger that has already been setup.

The iSIC Data Logger Communication Properties dialog box will appear. Enter the required iSIC data logger connection information (see below for model-specific instructions) to finish adding the data logger to the selected site. When complete, click OK.

For an iSIC data logger, enter the iSIC address and select the PC COM Port that the data logger is connected to.

- The iSIC address is typically ‘1’. If unknown, enter ‘0’ and click Test Connection to determine the address.
- The PC COM Port drop-down menu is the list of available COM ports iChart detected on the computer.
For a **2100-iSIC**, enter the 2100-iSIC address, phone number, and PC COM Port that the computer phone modem is connected to.

- The 2100-iSIC address is typically ‘1’. If unknown, enter ‘0’ and click **Test Connection** to determine the address.
- The PC COM Port drop-down menu is the list of available COM ports iChart detected on the computer. Internal PC phone modems are typically set to COM3.

For a **3100-iSIC**, enter the 3100-iSIC address and the IP address of the data logger.

- The 3100-iSIC address is typically ‘1’. If unknown, enter ‘0’ and click **Test Connection** to determine the address.
- The IP address is provided by the cellular service provider in which your cellular data account is setup. The port is set to 500 by default.
For a **4100-iSIC**, select the method in which the 4100-iSIC is connected to your PC and enter the 4100-iSIC address.

- A 4100-iSIC can connect to a PC through a 4100-BASE or a 4200-iSIC.
  - A 4100-BASE system connects to a PC via RS-232 cable.
  - A 4200-iSIC connects to a PC via landline telephone.
- The 4100-iSIC address is ‘1’ by default.
  - If there is more than one 4100-iSIC in use, each 4100-iSIC should be programmed with different addresses (See the **4100-iSIC | iSIC Addressing** section in the iSIC manual).

![ISIC Data Logger Communication Properties](image)

For a **4200-iSIC**, enter the iSIC address and PC COM port the data logger is connected to.

- The 4200-iSIC address is typically 250. When communicating with a 4200-iSIC, any communication using the 4200-iSIC address will be sent to the 4200-iSIC data logger.
  - Communications using any other address will be broadcast to any 4100-iSIC(s) in your radio network.
  - **Note:** Do not use address ‘0’ when communicating to a 4200-iSIC.
- The drop down menu of PC COM Port’s is the list of available COM ports iChart detected on the computer. Internal phone modems are typically set to COM3.
**Step 3 – Sensor**

After selecting a data logger, click **Next** and select **Inficon** from the drop-down list of manufacturers. Then select the **Hapsite** model number associated with your device and click **Add**.

The **Sensor Properties** dialog box will come on the screen. From the **Available Parameters** column, move parameters to the **Selected Parameter** that you would like to log from the Trimble GPS.
Click **OK** and the sensor will be added to the selected data logger. More sensors can be added at this time by selecting the sensor manufacturer and then sensor model number from the drop down menu on the right. Click **Next** when finished adding sensors.
Step 4 – Input/Output

Enable any output and control features of the data logger. See the iSIC manual, section 4.4.2 iSIC Controls for more information on this functionality.

![Step 4 - Input/Output](image)

Step 5 – Log

Select each data logger from the site list and enter the desired Log Interval and Sample Interval for the data logger in the Interval section. In the Log Value section, select how the data logger should log data points.

![Step 5 - Log](image)

Log Mode

The Log Mode controls when data is logged by an iSIC. In Time-base (the default and most common), data is logged at a specified interval, controlled in the Time-base section. In Event-base log mode, data is only logged when a ground pulse is sent to the Rain input pin on the iSIC digital terminal strip (such as from the contact closure of a tipping bucket rain gauge).

Log Value
By default, the **Sample Interval** and **Log Interval** are equal. When a sampling interval is different than the log interval, all the sampled measurements for the iSIC are used to calculate the average, minimum, or maximum of that logging interval (based on the log type selected, only one can be selected at a time). The individual data points that comprise the samples are not saved; only the final, average, minimum or maximum data point is saved at the specified log interval.

**Log Memory Mode**

The default memory mode is **Roll over**, and is the recommended operating mode. In this mode, the last ~150K readings (when using 512K flash) will be stored in iSIC memory. When the iSIC memory has filled with readings it will “roll over” the original readings and keep logging. This is ideal for real time applications, where data is being uploaded to a PC

In **Stop** memory mode, the first ~150K readings (when using 512K flash) will be stored in the iSIC memory. When the iSIC memory has filled with readings, it will stop logging until memory is cleared. When operating in this mode, it is recommended that memory is cleared every time data is uploaded.
Step 6 – Finish
All data loggers and sensors must be programmed before data collection can begin.

- Select an iSIC data logger and click the ‘Program iSIC’ button. Before programming an iSIC:
  - The iSIC must be powered and connected to the computer.
  - The 2100-iSIC must be powered and connected to a phone line.
  - The 3100-iSIC must be powered and have a cellular data account.
  - The 4100-iSIC must be powered and be able to communicate to the computer through a 4100-base or 4200-iSIC
  - The 5100-iSIC must be powered and be able to communicate to the computer over Ethernet.

- Click Finish when programming is complete.

This wizard can always be revisited by selecting Project | Setup Device Wizard if you would like to program an iSIC at a later time or need to setup other sites, data loggers, and sensors.

Step 7 – Retrieve an Initial Data Set and Use the Instrument Within iChart
After your sensor has been added to the database, the main instrument control screen will appear.

Important: All parameters are initially displayed with blank values until after the first log interval has passed and data has been interrogated. Once data has been retrieved from the iSIC, these fields will show the most recent data set recorded by the instrument. By default, iChart will automatically interrogate devices five minutes after every hour.
ClamVision® Positioning System

Installation Guide
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This guide contains information about the installation and configuration of the ClamVision® positioning system. It provides a basic outline to hardware and software setup as well as suggestions for mounting components and making connections. Operating temperature for ClamVision System is -50°F to 104°F.

**Installation Practices**

A Cable Arm Clamvision® installation consists of four “phases”. They are usually completed in order for convenience and efficiency.

**Phase 1 – Mount all hardware.** Find adequate locations for the components with attention to climate, i.e. moisture, dust, etc. Areas chosen should be safe and protected from daily work hazards as well.

**Phase 2 – Route and run all wires and cables.** After all devices are mounted properly, system wires and cables should be run securely, keeping them away from any harmful situations, such as excessive heat or moving machinery.
Phase 3 – Add power to the system. Any power connection must be tested to ensure component safety and cleanliness of signal.

Phase 4 – Configure ClamVision® software. This includes taking specific physical measurements of the dredge, machine, and distances from certain GPS components. For more detailed software setup see the ClamVision® User Guide.

Note: Some devices may require configuration that is not discussed in this guide. A ClamVision® positioning system is comprised of many devices and come with their own manuals. Cable Arm, Inc. will include these manuals in the system portfolio that is put together and kept with the system. Often, a standard installation has to be changed to fit a specific crane or office setup. Extra wires and components are included for such customizations.

1. MOUNTING

Plan the location of monitors and other devices to be mounted so that they are not in harm’s way, in a location that allows the device to work to the best of its ability, and is easily accessible. In some cases, the hardware will not have a specific place or method to be mounted. At this time it is helpful to think about wire routing possibilities. This section discusses best practices for mounting monitors, waterproof enclosures, antennas, and other hardware in the ClamVision® system. While these suggestions have proven helpful to us, creative alternatives can be explored.

A. Monitors
There are a minimum of two LCD monitors used in a ClamVision® system; one by the computer, “office side”, and one in the crane, “machine side”. Additional monitors may be incorporated into the system in places such as the captain’s office, winch operator’s station, or tug boat. The LCD screen must be located in a dry place, as it is not waterproof. In the office side the monitor should go next to the computer. Since crane cabs vary the monitor for the machine will most likely need a custom mount. Most LCD monitors have four screw holes in the back panel that can be utilized. The location of this monitor is subject to operator preference.
A. Wireless Enclosures

The wireless transmitters and receivers used in a ClamVision® system need line of sight to work properly. This means no physical obstructions between the two devices. To achieve line of site certain devices are placed in a weather tight box mounted to the roof of the machine and office. On the office side this box should be mounted high enough to get good line of sight to the machine at all times while still easily accessible. This box will be stationary sending signals to and receiving signals from the machine. Since the machine is rotating, all four sides of its box should remain free from obstruction so the signal can be sent and received
from any angle. Notice the hole with a stress relief at the bottom of the enclosure should point down.
C. Other Equipment

1.a. Office side – In the office side most hardware can be organized on a desk or table:

1. **Set up battery backup unit.** Units may be shipped with battery disconnected. Consult the operator’s manual for your specific unit. This unit can be placed on a desk or the floor, if this area is safe and dry. A surge protector may be plugged into the battery backup if outlets are scarce.

2. **Set up the computer.** Place it on a flat surface with the LED lights on the front visible. Plug the power cord into the battery backup. Do **not** turn the computer on until all physical connections are made.

3. **Plug in the keyboard and mouse.** These items plug into the back of the computer into their color coded ports.
4. **Plug in the monitor.** The monitor power cord plugs into the battery backup. The video cord connects to the back of the computer.1

5. **Connect the serial to USB converter.** This unit plugs into any USB slot in the back of the computer.

6. **Plug in 12 Volt power supply.** The Radioshack 13.8 V DC plugs into the battery backup. Do not turn on until all physical connections are made.

7. **Mount barge GPS receiver.** Be sure to read the barge receiver manual for proper mounting procedure.

8. **Set up tide gauge radio.** This unit should be placed near the computer. The power leads connect to the 12v supply. Use a serial cable to connect the tide radio to the USB to serial converter. Record the port number for software setup.

Be sure to secure all items so they cannot fall or get damaged.

1b. **Machine side** - On the Machine side it is important to keep units away from wet places and as safe as possible. With safety in mind, the location is up to the installer. From a troubleshooting standpoint, however, it is best to have everything close to each other for easy access. Items that need to be secured include a Cable Arm keypad, radios, and power supplies.

1. Place the keypad in the cab within reach and visible to the operator.

---

1 See section 2a on cabling
2. Depending on the complexity of the system, radios may be mounted in the weatherproof box, inside the cab, or both. This is due to RF interference when multiple sets of radios are used. Remember that the radios have LED’s and should be visible from their mounted position.

3. Power units such as voltage converters or switch mode converters should be placed as close to the batteries as possible. We all know that most battery compartments are not the model of cleanliness and are certainly not dry. Keep the power units close to the batteries without putting the unit in any danger. In a central location, relative to the components mounted in the cab, fasten two terminal strips that will be used for power distribution.

D. **Antennas**

1. There are a few different antennas used in a ClamVision® system. First is the GPS antenna. The GPS antenna, along with its receiver, is used to position the boom tip as well as the barge it sits on. The boom GPS antenna should be mounted on the tip of the boom so that the phase center of the antenna is directly over the holding line. At different boom angle settings the holding line will come off of the shive at different angles. To solve this problem a gimble/pendulum mount is recommended. This mount should be as accurate as possible since no offset can be added in the software. When mounting the boom antenna,
also run the Boom GPS cable while the boom is down. Barge GPS mounts differ depending on what type of GPS is used. In some cases the position of the antennas affects the accuracy of the GPS receiver. Refer to the receiver’s manual for proper antenna mounting procedures or call Cable Arm Inc. Generally GPS antennas should be at least three feet away from electronics and other antennas. They must also have a clear 360° view of the horizon and be accessible.

2. Radio antenna placement is the key to achieving optimal signal quality. Cable Arm uses 900 MHz omni-directional fiberglass antennas. They should be at least three feet away from electronics and other antennas, including GPS antennas, as well as metal poles or walls. Additional antennas should not obstruct line of sight of previously installed antennas.

2. Cabling

Before starting, check to be sure that the wires are in good condition. They should be free of cuts, kinks, chafes, or poorly made connectors. All wires should be run in a safe path away from moving parts or anything that can damage or sever them. It may be easiest to route one type of wire at a time. For instance, run data wires between devices. Then route all video cables. Next run all coaxial antenna cables. Lastly, complete power connections. For convenience each type of wire is color coded.

A. Video Cables- green

Video cables (VGA cables) are used to get video signal from the computer to the wireless video transmitter and from the wireless video receiver to the operator’s LCD monitor. On the machine side one male to male VGA cable will be routed from the video receiver in the weatherproof enclosure on top of the cab to the LCD monitor inside the cab. This is the only video cable required crane side.

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2 See section 2c. on coaxial cables
In the office there are two ways to set up the video system. In a basic system there is one office monitor. When multiple monitors are required a VGA splitter is used. Be sure that the resolution of the computer is at 1024x768.

**Without using a VGA splitter**, start by connecting a 25’ male to female video cable between the computer and the video transmitter. The male end connects to the video card in the back of the computer. The female end of the cable connects to the blue male pigtail of the video transmitter. Now take a male to male cable and connect one end to the port on top of the video transmitter. The other end connects to the monitor near the computer.

**A VGA splitter is used** when a rig needs monitors in other places in addition to the ones in the machine and by the computer. When using a VGA splitter follow the instructions above until you connect the monitor. Instead of connecting to the monitor, connect to the *computer port* of the VGA splitter. The monitor will then connect to any *monitor port* of the VGA splitter. Any extra monitors will be connected to the VGA splitter using a VGA cable.

B. **Data- blue**

A minimum of **five** data cables are used in this system. Cable Arm-made DB-9 serial cables use pins 2, 3, and 5 only and are built specifically with regard to gender and length.

1. In the office one data cable connects the barge GPS (usually port A) to the USB to serial device.
2. The second cable connects the boom tip GPS radio to the USB to serial device.
3. The third data cable connects the tide data radio to the USB to serial device.
4. On the crane one data cable connects the keypad to the boom tip GPS receiver.
5. The final data cable connects the keypad to the boom tip GPS radio.
C. Coaxial- yellow

The cable connecting the boom GPS antenna to the boom GPS receiver is labeled *BOOM GPS*. It will be TNC male to TNC male using LMR400. One end of this cable has a thinner cable, rg-58, attached. This is used for the gimble/pendulum mount at the boom tip. For the boom GPS radio use a cable marked *BOOM GPS RADIO, RPSMA to N with RG-58*. RTK systems additionally employ a differential radio pair. This radio uses a different connector than the boom GPS radios and will be labeled *DIFFERENTIAL RADIO, SMA to N with RG-58*. Cables for barge GPS may not be labeled but are RG-58 TNC to TNC cables. Connect appropriate devices to their antennas.

D. POWER- red

Running power is the last step in cabling. On the office side, the computer, monitor, video splitter, battery backup, and 12V power supply use AC power. Refer to 1a Office side in the mounting section of this guide. This leaves the enclosures, barge GPS, and tide radio to connect to power. Run a length of power cable from the terminal blocks in the waterproof enclosure to the 13.8V supply. Also connect the power cables from the GPS and tide radio to the supply.

The power for all components on the machine is 12v DC converted from the batteries. Check the label on the converter to make sure that the unit matches the power system used on the machine. For example if the crane uses a 24v battery system you would need a 24v to 12v converter. Assuming there is a 24v system, run a wire from the batteries to the terminals on the power converter labeled 24v and Ground without connecting the 24v line. By not connecting the 24v line right away other power wires can be run and connected before a final power and polarity check is done. Included in the system is an on/off toggle switch. If installed, it must be placed on the 12v line between the batteries and power converter. Then from the 12v and ground terminals in the power converter run another wire to the power distribution blocks mounted in the cab. Determine and label which block is power and ground.
Use the remaining power wire to run power from the distribution blocks to all other devices on the machine. Some devices used in this system are equipped with AC plugs. These plugs will be cut to make use only of the jack that fits into the device itself. Have all power cords unplugged from their devices and connect the 24v line to the converter. Now with a multimeter check the voltage and polarity at the power distribution blocks and each plug. The tubular power jacks have 12v in the middle (inside) and ground on the outside.

3. Hardware Configuration

Unless preconfigured by Cable Arm the GPS and radios will need to be programmed. These instructions will be step by step so please follow the order. You will need the X-CTU software CD provided with the Maxstream radios, a terminal program such as HyperTerminal, and a laptop with a serial port. Most new laptops do not come with serial ports. Therefore a USB to serial converter is needed. If you are not familiar with HyperTerminal refer to pages 30-31. Port settings for all XStream are 9600, 8, none, 1, none. Some units may default to 19200 baud rate.

Radio Configuration

1. Use the included X-CTU software CD to install X-CTU.
2. Connect a boom tip radio to your computer. Then power the radio on.
3. Open X-CTU. Under the PC Settings tab highlight the com port that the radio is connected to and select the port settings listed above. Click Test/Query. If the software is unable to communicate with the radio, check connections, power, and port settings.
4. When connected select the Modem Configuration tab and click Read.
5. Under Networking click DT-Destination Address and change it to any random number between 0 and 9999. Record the number.
6. Now select *HP-Hopping Channel* and pick between 0 and 6. Record the number.
7. Lastly under *Serial Interfacing Options* set the *Interface Baud Rate* to 3-9600.
8. Complete this process for the second radio using the same numbers that were used for the first. Be sure the first radio is powered off while programming the second.

To test the radio link, a **range test** should be preformed:

1. Place a serial loopback on the crane side boom tip GPS radio. The loopback is a red double gendered DB9 connector that is included with the radio.
2. Open X-CTU on the office computer. Under the **Range Test** tab click **Start**. Let it run for a few minutes and observe the percentage of good packets vs. bad packets. The higher the percentage, the better the radio link. If everything looks good, then move on to programming the GPS.
3. If the Range test fails then switch the hopping channel in X-CTU to a different number. If a solid link cannot be established after reviewing settings and antenna placement contact Cable Arm for advanced assistance.

**GPS Configuration**

Barge GPS receivers need to display three pieces of information: position, heading, and speed. The following is a list of commands to be entered in order with a terminal program to configure the GPS. All commands are to be followed by pressing *ENTER*. If entered correctly you will receive an acknowledgement of *<OK>*. Save the configuration before powering down the unit. Upon power up
allow a few minutes for the GPS to acquire satellites before any valid information displays.

<table>
<thead>
<tr>
<th></th>
<th>Action</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stop data</td>
<td>$joff</td>
</tr>
<tr>
<td>2</td>
<td>Position</td>
<td>$jasc,gpgga,1</td>
</tr>
<tr>
<td>3</td>
<td>Heading</td>
<td>$jasc,hpr,5</td>
</tr>
<tr>
<td>4</td>
<td>Speed</td>
<td>$jasc,gpvtg,1</td>
</tr>
<tr>
<td>5</td>
<td>Baud Rate</td>
<td>$jbaud,9600</td>
</tr>
<tr>
<td>6</td>
<td>Save Config</td>
<td>$jsave</td>
</tr>
</tbody>
</table>

The boom tip GPS information uses position only. Use the order above omitting steps 3 and 4 to program the boom tip GPS. Make sure the configuration is saved before powering off the unit.

At this point the hardware should be installed and powered. You should have video in the crane cab and all data from the crane should show in a terminal program on the office side. If this occurs then software configuration is the next step. If this is not the case then troubleshoot by revisiting each part of the system, verifying sound hardware installation and solid wire connection.

4. Software configuration (Basic clamshell)

The software needs to be configured to match the layout of your equipment and job. This means that accurate measurements, drawings, and survey files need
to be loaded into the software. This section will summarize the minimum setup of software needed for the hardware to interact correctly with it. This section does not cover ClamVision® concepts, terminology, or additional tools available. For a full description of ClamVision® and its features refer to the ClamVision® user guide.

1. First, in the computer, close all programs and open ClamVision®. Make sure the Hardware lock, blue ClamVision® key, is connected to the computer.

2. When ClamVision® opens for the first time it directs you to start a new project or open an existing one. Select New to create a new project file.

3. In the New Project box, type the name of the project and browse to the desired location you want the file to be kept on the computer. Cable Arm creates a projects folder on the hard drive. Using this folder makes it easier on Cable Arm for troubleshooting although it really doesn’t matter where they are stored. Click OK.

4. Along the top left of the screen below the title bar, there is a list of menus where the settings and features can be accessed (Above). All essential
settings in the software are under the **settings** menu (below). Left click on the **settings** menu to display a list of submenus.

5. Now click **Dredge Setup**. The Barge Setup box is organized with tabs. Start with the **Barge** tab and enter all measurements. The Aux GPS to port and Aux GPS to bow should be left at zero when using a position/heading GPS. Enter values that apply to your equipment under all tabs. All measurements should be taken using the same units used for survey, in **Map Projections**. When finished click OK.
When all the measurements have been entered under all tabs you should be able to see spuds and the machine in their actual places on the barge.

6. The next step is to tell the software where you are in the world. To do this the map projections must be set. Under the Settings menu, select Map Projection. Verify with the surveyor the coordinate system, zone and units used. Set the fields accordingly and click OK. For basic operation the advanced command line is not used.

7. Now that the software and survey are on the same page, the information from the hardware can be set in ClamVision®. In the settings menu left click Hardware Settings. The Setup Window appears with Position selected on the left.

8. On the right side of the screen is the settings for the barge position GPS. The position setting is default to disabled. Click the down arrow to display a list of drivers. Select the Position/Heading GPS driver. Com port, baud rate, and offset settings appear under the driver drop down list. Select the proper com port for the barge GPS and set the baud rate to 9600. Information for the barge GPS will display below in the listener. A positive
or negative offset can be entered to adjust the heading of the barge due to possible mounting inaccuracies of the Barge GPS antennas. Do not click OK. If no information displays in the listener keep the settings and troubleshoot after setting up the software.

9. Along the left side skip Heading and click Boom Tip Position. Again the default setting is disabled. Click the down arrow to display the list of drivers. Select Crane Interface Keypad. Set the proper com port and baud rate (9600). The offset for the Boom Tip Position does not work. Boom Tip
GPS information should display in the listener. **Do not click OK.**

10. On the left side of the screen click Tide. Select the driver that corresponds to the method of receiving tide. For example if you are using a Cable Arm Tide Gauge select **Cable Arm Tide Gauge** in the drop down menu. Set the proper com port and baud rate. If no digital tide gauge is used then a manual tide can be set. To utilize Manual Tide select **Manual Tide** in the driver drop down list. An additional menu at the top named **Manual** will appear to the right side of the Help menu.

11. Now click OK at the bottom right of the setup window. Assuming that all information from the devices is present, you will see the barge and bucket move to where the GPS says they are. If the barge moves off the screen go to **View>Autotrack.** This tells the software to keep the barge in view at all times.
The barge information, device information, and map projection information is now set in ClamVision®.

12. The next step is to load job specific background files into the software. Most commonly loaded are DXF and XYZ files. A DXF is a drawing of the jobsite or dredge limits. An XYZ is survey data or soundings. Either can be loaded into ClamVision® using the file manager. To open the file manager click **settings>import>file manager**.

13. The file manager is a good way to add, remove, and view background files. To load a DXF file click Add DXF.

14. Then browse to the location of that file on the computer.

15. To add survey data click **Add Soundings** and browse to the file. When a file is added its name appears in the window above the add buttons. Each file has a check box next to it. Be sure the box next to the file you are using is checked or it will not display on the work screen.

16. The color scale on the right of the work screen is used to represent the color coded survey bottom. The color scale can be modified to accommodate any situation.\(^3\) A second color scale can be added for bite colors.\(^4\) It is located to the right of the survey color scale.

---

\(^3\) See color scales section of ClamVision® User Manual

\(^4\) One “bite” is one scoop of material with a clamshell bucket. See bite colors in ClamVision® User Manual
17. The final step in the basic setup of ClamVision® is the project depth. The system needs to know what grade is and Project Depth Setup is where you tell it. Select *dig to fixed depth or remove layer*. In both options you have the choice of entering a value or importing a design file. File formats include .DXF, .XYZ and .TXT.

Now that the hardware and software has been set up, it is important to test the accuracy of the system before starting a project. The best way to ensure the GPS unit(s) is functioning properly is to move the GPS antenna directly over a known point. Compare the readings from the GPS to the control point to see if the unit is running within specs. Aligning the bucket over each corner of the barge or spud is a good way to see if the barge, barge heading and boom tip GPS are in sync. If depth control is present find a reference to actual depth and compare to what the system displays. Use the *bucket depth offset* under hardware settings > bucket depth to adjust the readings. Calibration of a bucket depth sensor is outlined on page 29.

5. SYSTEM CALIBRATION

Before going to work, the different devices in a system need to be calibrated with the software. Calibration is a one-time thing with little maintenance. If the equipment has not been used for over a month, recalibration is recommended.

A. GPS

Gps receivers acquired from Cable Arm, Inc. will come programmed and calibrated. ClamVision allows for some mounting inaccuracies.

1a. Boom Tip GPS- The GPS antenna needs to be mount directly over the holding line. There is no offset or setting in ClamVision to adjust the position of the GPS antenna.

1b. Barge GPS- Barge position can be done two different ways in ClamVision. The most modern is the position/heading smart antenna. This all in one unit needs to be orientated properly or inaccurate results will occur. ClamVision offers an offset to compensate for
those mounting inaccuracies. Change the value in the **OFFSET** box to adjust the heading.

**B. DEPTH**

Cable Arm, Inc. offers two options for depth control. First is pressure depth. This method is the most accurate, +/-3in, but requires an imbulical to connect to the bucket. The pressure depth is recommended when accuracy is more important than production. The second method of depth control is a cable counting system. This system is less accurate but requires no attachments to the bucket. Cycle times will not be affected.

**1a. Pressure Depth** - The Spectre™ pressure/temperature sensor used to obtain accurate depth readings needs to be calibrated if moved from its mount on the bucket. If using a CableArm Level Cut™ bucket, calibration should be done with the bucket open. Others should be calibrated with the bucket closed.

1. Mount the sensor so that the threaded opening is pointing any direction but up. The sensor should be in the safest place possible.
2. Take a vertical measurement of the distance between the sensor and the cutting edge of the bucket.
3. In ClamVision™ disable the Tide driver through settings> hardware settings>Tide

4. Now select depth in hardware type. Below the com port settings there is an offset window. Enter the measurement from step 2 in this box. The value may be negative.

![SetupWindow](image)

To verify accurate readings, mark 10’ sections from the cutting edge of the bucket up to 30 or 40 feet. The sensor readings should match the marked intervals on the line. Make necessary adjustments to the offset value if needed. This process will also fine tune the barometer accuracy with the bucket sensor.

When a consistent and accurate reading is achieved calibration is finished. Remember that the bucket sensor only works when fully submerged underwater. Also remember to re enable the tide setting.

**1b. Cable Counter Depth**- Calibration of the cable counter depth system should be done once upon installation and again if any hardware is replaced. Under the UTILITIES menu open CABLE COUNTER CONFIGURATION.
1. First boom length and trunion height above water must be determined. This is the distance from the center point of the trunion to the end of the holding shive and the trunion to the water respectively.

2. Next is the position where the holding line leaves the last pulley in the system in relation to the trunion point. An X value and Y value from the center point of the trunion is needed. The same measurements are needed for the closing line.

3. The boom angle must be determined either with the existing boom angle indicator on the boom or a separate angle measurement tool. After the angle is determined an offset can be set to match the sensor reading with the actual boom angle. The same process can be used for the deck angle. If an angle appears to be moving in the wrong direction the clockwise option can be used.

4. Next, the number of pulses generated from the encoder per foot of cable must be found. In ClamVision, set the pulses per foot to 1. Mark a distance (ex: 10 feet) on the cable. Zero the counters by power cycling them. Cable out raw should read 0. Move the cable the distance marked and divide the number in cable out raw by the number of feet marked on the cable, 10. This is the pulses per foot value. Use the same
procedure for the closing line.

5. The last step is to zero the depth. With the bucket closed place the cutting edge at the waters’ surface. Click the zero button either in cable counter configuration or on the keypad in the cab of the crane.

C. Others

1a. Vacuum Sensors- Vacuum sensors are used in suction dredges to show the operator how much pressure is being used to suck material through the pipeline. Because it takes more suction pressure to move material than it does just water, the operator can determine if the cutter head needs to be lowered or raised. If the cutter head is too deep into material, access material can flow over the cutter head leaving it to be found by post dredge survey. The adverse is true with the cutter head being too high.

To calibrate the vacuum sensor adjust the offset in the field provided until the vacuum reading in ClamVision matches that of the physical gauge. The vacuum sensor info is located in HARDWARE SETTINGS then OTHER.
1b. **Ladder Angle**- ladder angle is used in suction dredges to measure the angle of the ladder. This combined with ladder length allows ClamVision to accurately show cutter head depth. To calibrate the ladder angle, put the cutter head at the surface of the water. Click the **ZERO BUTTON**. Adjust the offset further if needed. Lower the ladder and match ClamVision readings to physical readings. If the ladder indicates in Clamvision that it is being raised when it is being lowered, check **CLOCKWISE** to reverse the angle output. Ladder angle settings can be found in **HARDWARE SETTINGS** under **BOOM TIP POSITION**.

![SetupWindow](image)

1c. **Draft**- In **HARDWARE SETTINGS** under **DRAFT** use the offset box to enter a value that would correct the current reading.  
1d. **Tilt/Roll Sensors**- In **HARDWARE SETTINGS** under **Tilt** or **Roll** use the offset box to enter a value that would correct the current reading.  
1e. **Cable Arm Tide Gauge**- The tide gauge gives a tide reading on power up. Use the up/down arrows to set the correct tide.
### 6. TROUBLESHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>EXPLANATION</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOOM TIP GPS TIMED OUT</td>
<td>NO DATA FROM THE BOOM TIP GPS RECEIVER TO THE COMPUTER</td>
<td>CHECK POWER ON ALL HARDWARE, CHECK DATA CONNECTIONS AT KEYPAD (SEE DATA SECTION ON CABLING), CHECK PROGRAMMING OF RADIOS AND GPS, CHECK HARDWARE SETTINGS IN CLAMVISION</td>
</tr>
<tr>
<td>NO BOOM TIP GPS SOLUTION</td>
<td>BAD OR INCOMPLETE DATA FROM BOOM TIP GPS TO COMPUTER</td>
<td>CHECK BOOM TIP ANTENNA AND ANTENNA CABLE, CHECK RADIO LINK, CHECK LOCATION OF BOOM TIP RADIO ANTENNAS. POSSIBLE OUTSIDE INTERFERENCE. POSSIBLE GPS RECEIVER ERROR</td>
</tr>
<tr>
<td>POS/HEADING GPS TIMED OUT</td>
<td>NO DATA FROM BARGE GPS TO COMPUTER</td>
<td>CHECK POWER, CHECK CONNECTION FROM GPS RECEIVER TO EDGEPORT/8, CHECK GPS PROGRAMMING AND MOUNTING, CHECK HARDWARE SETTINGS IN CLAMVISION. POSSIBLE GPS RECEIVER ERROR</td>
</tr>
<tr>
<td>PORT OPEN FAILURE; CLOSE ALL PORTS</td>
<td>COM PORTS ARE FROZEN</td>
<td>RESTART THE COMPUTER</td>
</tr>
<tr>
<td>NO VIDEO IN OFFICE</td>
<td>NO SIGNAL FROM COMPUTER TO MONITOR</td>
<td>CHECK POWER. BE SURE THE CABLE FROM THE COMPUTER IS CONNECTED TO THE BLUE CONNECTOR ON THE TRANSMITTERS CABLE AND THE MONITOR TO THE PORT ON TOP OF THE TRANSMITTER. SET VIDEO RESOLUTION TO 1024X768. <strong>DO NOT UNPLUG POWER FROM UNIT!</strong> OUT OF RANGE. TURN TRANSMITTER ON FIRST THEN RECEIVER.</td>
</tr>
<tr>
<td>NO VIDEO IN CRANE</td>
<td>POSSIBLE SIGNAL INTERFERENCE</td>
<td>CHECK POWER. CHECK CONNECTIONS. SET VIDEO RESOLUTION TO 1024X768. POWER DOWN BOTH TRANSMITTER AND RECEIVER. WAIT TEN SECONDS THEN POWER UP TRANSMITTER. WAIT TEN SECONDS THEN POWER UP RECEIVER. <strong>DO NOT UNPLUG POWER FROM UNIT! USE THE AC WALL PLUG OR THE ACTUAL 12V SUPPLY.</strong></td>
</tr>
<tr>
<td>Issue</td>
<td>Description</td>
<td>Possible Causes</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Barge and Bucket Position in ClamVision</td>
<td>Barge heading may be off, or GPS positions do not match background files</td>
<td>Make sure datum and units match survey. Check mounting of barge GPS receiver and antenna(s). Check measurements in dredge setup. Adjust offsets. Possible GPS receiver error.</td>
</tr>
<tr>
<td>Background Files Will Not Import</td>
<td>ClamVision will through an error if files are wrong type or have extra information in them</td>
<td>Make sure the file is a compatible file type. (Ex: .xyz or .dxf). Files may not contain headers or footers. Files must be comma delimited. Sounding files must have positive depths. Files with many circles or text may have adverse affects on ClamVision.</td>
</tr>
<tr>
<td>Survey Colors Are Wrong</td>
<td>In accurate representation of survey background</td>
<td>All depths must be positive. Check color scales.</td>
</tr>
<tr>
<td>System Not Marking Bites</td>
<td>When the marking button is depressed but no marks show on screen</td>
<td>Set boom tip GPS driver to Crane Interface keypad. Open the simulator under the utilities menu, then under bucket depth type 0 and left click GO. Possible button malfunction. Mark with keypad.</td>
</tr>
<tr>
<td>Software Issues</td>
<td>Software Issues</td>
<td>Consult software guide or call Cable Arm, Inc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issue</th>
<th>Description</th>
<th>Possible Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bucket Transducer Timed Out</td>
<td>No depth sensor communication to the computer</td>
<td>Check encoders and counters. Check hardware settings, check wireless data link, check imbuical for twists, smashes, cuts, breaks</td>
</tr>
<tr>
<td>Depth Reading Drifts</td>
<td>Depth value steadily raises or falls</td>
<td>Rezero the transducer. Possible dirty power. Call Cable Arm, Inc. for more info</td>
</tr>
<tr>
<td>Sporadic Readings From Depth Sensor</td>
<td>Will read very high numbers for 1 to 2 seconds then return to normal</td>
<td>Check imbuical for twists, smashes, cuts, breaks. Possible short circuit or sensor malfunction.</td>
</tr>
<tr>
<td>Cannot Find the Job</td>
<td>Cannot see the background files imported.</td>
<td>Turn off devices through the run menu. Zoom extents. Check map projections. Zoom in. If multiple jobs are entered use center on point.</td>
</tr>
</tbody>
</table>
ON THE WORK SCREEN

Still having problems?

Call

Cable Arm, Inc.

Raymond Bergeron  734-676-6108

Harrison Steves  734-752-8240
7. Bucket Depth System

Cable Arm Pressure Depth

Cable Arm uses pressure to control depth in real time. The following will explain how to setup depth control to an existing ClamVision® system. External antennas may come with the depth system but should only be used if necessary. Unpack the contents of the shipment and ensure that everything is there and in new condition. The efficiency of the install can be increased by reading through
the following before starting. Remember to turn power off before making connections. This guide will walk through the setup of the office side first then the crane.

For the office side you will need one data radio with antennas, one Barometer, and one DB-9 cable.

First mount the barometer near the 13.8V power supply and connect it to power. Plug the DB-9 pigtail from the barometer to an empty com port on the Edgeport/8. Record the com port number. Next mount the depth radio and external antenna if necessary. Use the DB-9 cable to connect the radio to an empty com port on the Edgeport/8. Record the com port number. Connect it to power. After completing all connections, turn the power on.

Turn the computer on and open ClamVision®. Under the Settings menu select Hardware Settings. Left click on Bucket Depth. In the dropdown box select Spectra Depth. Select the previously recorded com port for the barometer and pressure transducer. Both baud rates are 9600. When the rest of the hardware is setup correctly readings from the bucket sensor will display in the listener. Click OK at the bottom. Now under the File menu select Save. Now that depth is being controlled in ClamVision® the information on the screen can be modified to
accommodate. Refer to the sections on Bite Colors, Data Viewer, Operators Data View, and Project Depth Setup.

On the crane side you will need a pressure transducer, bucket embilical, upper shive, a cable reel, a slip ring, boom data line, RS-232/485 converter, null modem serial cable, and data radio w/ external antenna. **All power to crane should be off while installing the depth system.**

First mount the data radio and RS-232/485 converter inside either the inside the externally mounted enclosure or inside the crane cab. Configure the radio link using the Hardware configuration section of this guide. Use the Null modem serial cable to connect the data radio to the RS-232/485 converter. Next mount the cable reel no further than a quarter of the distance from the boom pin to the boom tip. Now run the boom data wire from the cable reel to the RS-232/485 converter. Follow the pin out guide for wiring. Now mount the slip ring on the cable reel in a way that allows only the movable side to spin. Next connect the slip ring to the bucket embilical and secure it to the cable reel. Wrap the embilical around the wheel of the cable reel and tie off. Mount the upper shiv three quarters up the boom from the boom pin. Run the bucket embilical through the upper shive and secure it to the bucket. Mount the transducer parrell to the
cutting edge of the bucket and connect it to the bucket embelical. Power on system. If it doesn’t work the first time check the troubleshooting section.

8. References

HyperTerminal

1. Start the HyperTerminal .exe program (*hyperterm.exe*). Click on **START**, then **ACCESSORIES**, then **COMMUNICATIONS**, then **HYPERTERMINAL**, then chose the HyperTerminal entry that does not have an .ht extension.
   
   (Note: Some versions of Windows have Hyperterminal is Accessories.)

   ![Connection Description](image)

2. This brings up this dialog. Enter a Name (like 'Direct-Com-1'). Chose an ICON - whatever you wish. Click OK.

3. This dialog then appears. Click the selection arrow on the "Connect using" list box, and select the COM port your modem is connected to - **not** the modem name. When you select the COM port, the phone number to dial boxes is grayed. Click OK.
4. The COM port properties box comes up. For all hardware, make sure that you set the Bits per second to 9600, the data bits to 8, parity to none, stop bits to 1, and flow control to none. Click OK.

5. Now you have a white screen and are ready to issue commands to the device. When a command is entered you will not be able to see what you are typing. You will get a response if entered correctly.
Wcom32

1. Double click the W-Com32 icon on the desktop to open the terminal.

2. In the “port menu” select “open port” and choose the com port number that your device is connected to.

3. Set the port settings to 9600 baud rate, 8 data bits, none for parity, 1 stop bit, and none for flow control.
4. Similar to HyperTerminal, when commands are given, only responses will show on screen.

**RS 232 DB9 Connector Pinout**

<table>
<thead>
<tr>
<th>DB-9M</th>
<th>Function</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Data Carrier Detect</td>
<td>CD</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Receive Data</td>
<td>RD or RX or RXD</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Transmit Data</td>
<td>TD or TX or TXD</td>
</tr>
<tr>
<td>Pin 4</td>
<td>Data Terminal Ready</td>
<td>DTR</td>
</tr>
<tr>
<td>Pin 5</td>
<td>Signal Ground</td>
<td>GND</td>
</tr>
<tr>
<td>Pin 6</td>
<td>Data Set Ready</td>
<td>DSR</td>
</tr>
<tr>
<td>Pin 7</td>
<td>Request To Send</td>
<td>RTS</td>
</tr>
<tr>
<td>Pin 8</td>
<td>Clear To Send</td>
<td>CTS</td>
</tr>
<tr>
<td>Pin 9</td>
<td>Ring Indicator</td>
<td>RI</td>
</tr>
</tbody>
</table>

![DB-9 Connector Diagram](image)
ClamVision System

1 Computer w/ power cord
1 ClamVision software key
1 mouse
1 keyboard
1 17” monitor
1 15” monitor
1 battery backup
1 12v dc power supply
2 Maxstream radios
1 Avocent Longview wireless video set
1 Edgeport/8 USB – Serial Adaptor
1 pos/heading GPS
1 positioning GPS
2 Wireless boxes
1 power converter for machine
2 power Distribution Junction Blocks
1 keypad w/ marking button and power cord
10 male to female DB9 serial cables (lengths vary)
1 boom GPS cable
2 rg58 N to rpsma boom GPS radio antenna coaxial cable
100’ of 2 conductor power wire
3 25’ VGA monitor cables
1 on/off toggle switch

Options

RTK GPS –
1 base station
1 rover GPS
2 differential radios w/ antennas and cables

Depth –

Cable Arm Cable Counter -
1 boom angle sensor
1 deck angle sensor
1 rotary encoder
1 counter box
1 zero button
wiring

Cable Arm Pressure Depth -
1 pressure transducer (bucket)
1 bucket umbilical
1 cable reel
1 slipring
1 boom cable
1 RS-485 to RS-232 converter
2 data radios w/ antennas and cables
1 barometer

Draft Sensors-
  Pressure transducer
  Wiring

Pitch/Roll Sensors-
  Angle Sensor
  Wiring
Basic ClamVision System

The diagrams below show the wireless signal path as well as the main hardware components of several ClamVision® systems. The option of a Cable Arm Tide Gauge is also included. As this configuration is the least complicated in setup and hardware, it can be built upon and added to as preferences or job specifications change. Like the Cable Arm Tide Gauge, other options are available. These include the ability to realize bucket depth by means of a pressure transducer or a cable counter method. We also offer various accuracies and types of GPS to suit different requirements. Sensors to record draft, pitch and roll on a barge are also available. In some cases the use of imaging sonar has proven an effective tool.