



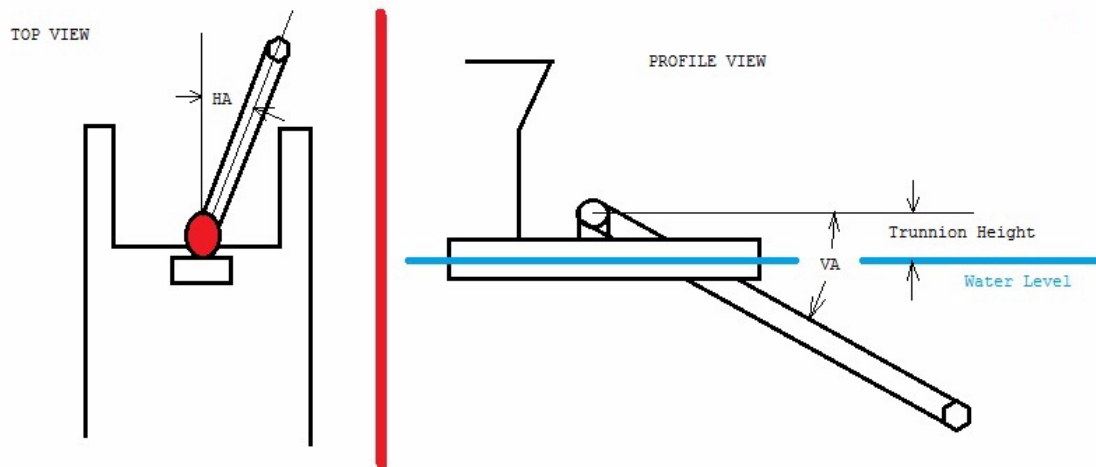
DREDGEPACK® Installation Guide for Cutter Suction Dredges

By Roy Goyette

One of the main purposes of DREDGEPACK® is to determine the position and depth of the cutter head. By knowing the following, we can compute the position of the cutter head:

- Position of the dredge (GPS)
- Heading of the dredge (gyro or directional GPS)
- Height of the Trunnion Above the Static Water Line
- Length of the Ladder Arm
- Vertical Angle (and optionally the Horizontal Angle) of the ladder arm

FIGURE 1. *Cutter Suction Dredge Diagram*



The minimum equipment needed to instrument a simple cutter suction dredge consists of:

- **GPS Positioning System** (to position the dredge).

A DGPS (Differential Mode) will provide a position of its antenna with accuracies of approximately 50cm to 2m. A kinematic GPS (Fixed RTK Mode) will provide a position with an accuracy of approximately 10cm. The GPS unit should be set up to output a 1Hz. There is no benefit in having it update faster on a slow moving vessel.

Most all manufacturer models are acceptable, providing they output NMEA 2.0 or higher formatted sentences.

- **Heading Device** (Gyro or GPS System)

On most installations, we prefer a GPS system that has a directional antenna system. The benefits of these systems are several:

- You have a heading as soon as you power up the GPS. Conventional gyros have long power-up cycles and special power requirements.
- You don't have 'vibration' problems that you have with a typical gyro on a dredge.
- The heading accuracy is more than sufficient for a dredge.

If the dredge has a "ship's gyro", then it might be possible to integrate it into DREDGEPACK®. If the unit has an RS-232 output of NMEA standard messages, it will be simple to integrate, provided your DREDGEPACK® computer has sufficient serial

ports. If it only has 'synchro' or 'stepper' output, then you will need to have a Digital Gyro Repeater installed that provides a NMEA output. In this case, you can save time and money by just opting for the directional GPS system.

Important! *Under no circumstances should you try to integrate a 'flux-gate'-style heading device on your dredge.* There is too much iron moving around to get an accurate heading and HYPACK® will not integrate them.

- **Inclinometer** (to measure the vertical angle between the water surface and the ladder arm).
HYPACK® currently recommends the Etrac inclinometer. They are simple to wire and have ruggedize cabling and a water-resistant enclosure.
Use of other inclinometers will require an on-site visit by HYPACK® personnel.
- **Swing Indicator**
On more complex cutter suction dredges where the ladder arm can be swung left-right, a device to measure the horizontal angle of the ladder arm, relative to the centered position is required.
HYPACK® currently recommends the USDigital HD25A.

MOUNTING INSTRUCTIONS

- **GPS Positioning system**
Follow the manufacturer's instructions for installation of the GPS. Most systems that include the heading feature require the antennas to be installed along the center axis of the dredge in order to obtain heading. Most also require a specific antenna be forward and a specific antenna be aft. All antennas require clear sight lines to the sky for proper reception of the satellite signals.
- **Inclinometer**
The inclinometer is installed high-and-dry on the ladder of the dredge. It is recommended that you install the unit as high above the water line as possible and as close to the trunnion of the dredge as possible using the arrows on the casing for orientation.
- **Optional H25A** (for swing ladders only)
The swing indicator may require some small modification to accommodate its function it is normally installed on the center axis of the dredge close to the ladder and additional components are normally welded to the ladder to engage the indicator arm when the ladder swings left or right.

VESSEL DIMENSIONS

Before configuring your system, you will need to know the *exact* measurements of:

- The height of the trunnion pivot point above the static waterline.
- The height of the GPS antenna above the static water line.

- The distance of the GPS starboard and forward of the trunnion pivot point. (If it is port or aft of the trunnion point, just enter those distances with minus signs.)
- The length of your ladder arm from the trunnion point to the tip of the digging tool.

DREDGEPACK® SETUP

1. **Open HYPACK®'s HARDWARE program.**

FIGURE 2. Adding a Mobile for the Ladder

2. **Add a mobile to the Hardware configuration.** Optionally you can rename this mobile "Ladder".
3. **Click on the Boat Mobile**
4. **Add the GPS.dll to the Boat Mobile** as your position device.

- **Functions:** Place check marks in the Position and Heading function check boxes (provided you are using a directional GPS).
- **Options:** Are not required.
- **Offsets:** Enter the appropriate horizontal offsets referencing the dredge's trunnion point.
- **Connect:** Enter the connection parameters necessary for communication with the device.

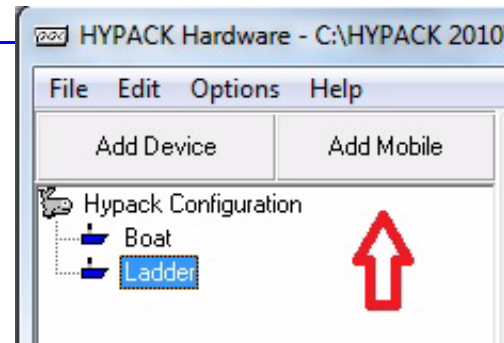
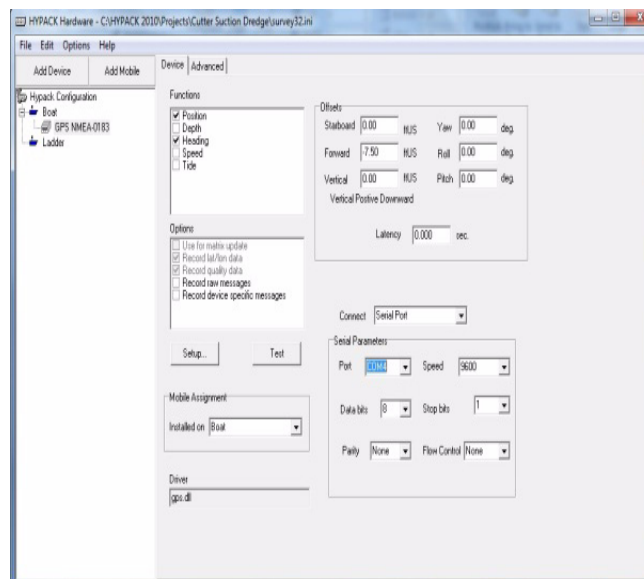


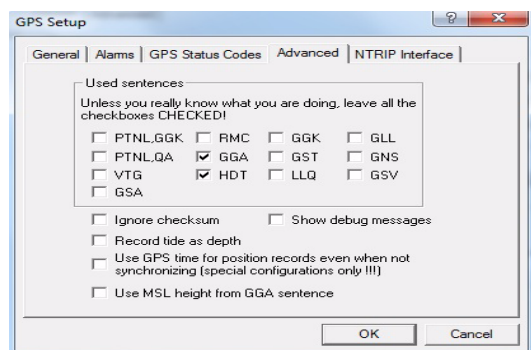
FIGURE 3. Configuring the GPS Driver



- **Setup:**
Adjust setup settings for your GPS.

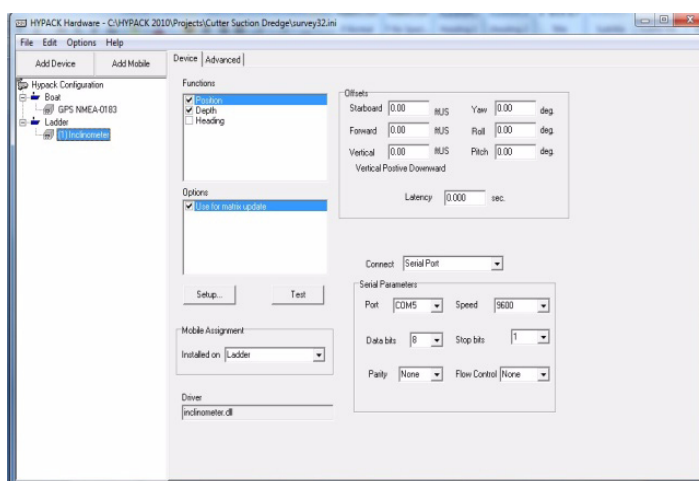
We recommend that you use a GGA sentence for position and HDT for heading. Remove all the other check marks from the other sentences on the Advanced tab.

FIGURE 4. GPS Setup - Select GGA for Position and HDT for Heading



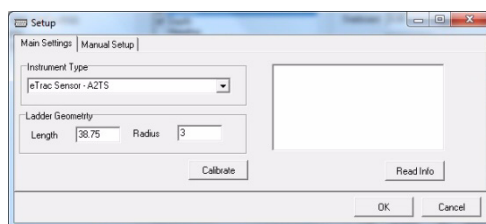
5. **Click On the Ladder Mobile item** (Mobile 1 if you did not rename it).
6. **Add Inclinometer.dll.**

FIGURE 5. Adding the Inclinometer Driver to the Ladder



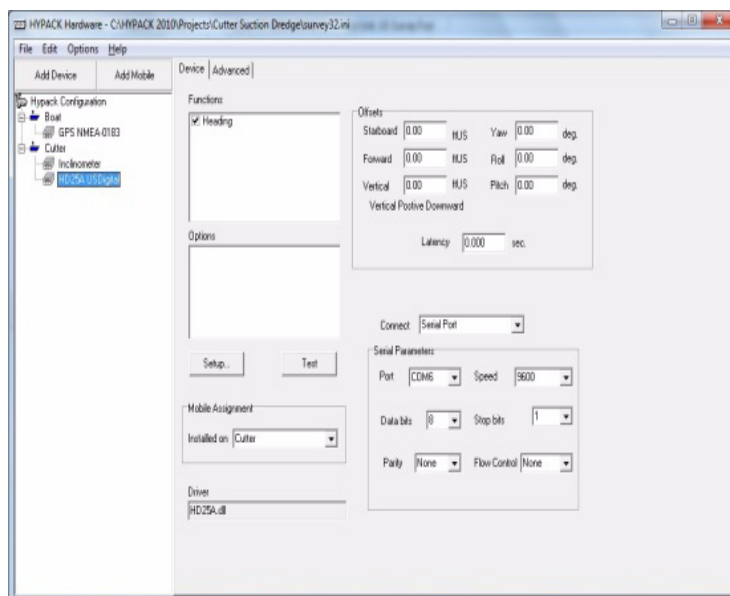
- **Functions:** Place check marks in Position and Depth.
- **Options:** Select use for Matrix update.
- **Offsets:** No offsets are required.
- **Connect:** Enter the connection parameters necessary for communication with the device.
- **Setup:**
 - i. **Click [Setup].**
 - ii. Using the drop-down menu, **select the Etrac AT2S inclinometer.**
 - iii. In the ladder geometry field, **enter the total length of the ladder from the center of the trunnion to the face and center of the cutter head.**
 - iv. In the radius field, **enter the radius of the cutter head.**

FIGURE 6. Inclinator Setup



7. If you have a ladder arm that can swing left and right, add Optional HD25A.

FIGURE 7. Configuring the HD25A Driver



- **Functions:** Place a check mark in Heading.
- **Options:** Not required.
- **Offsets:** Not required.
- **Connect:** Enter the connection parameters necessary for communication with the device.
- **Setup:** See “System Calibration”.

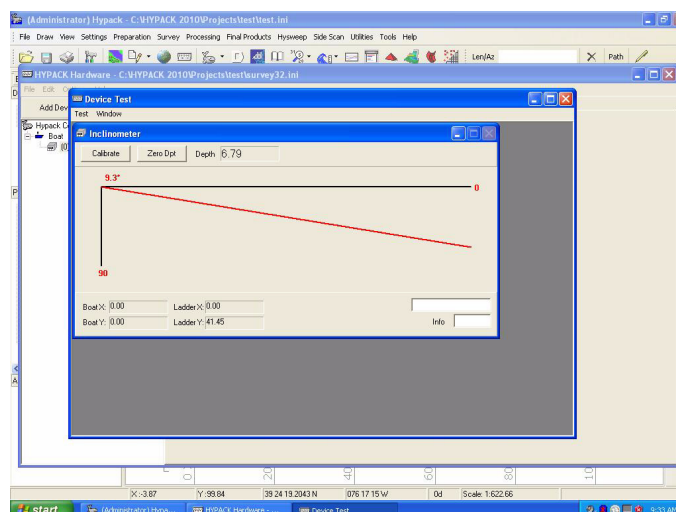
SYSTEM CALIBRATION

Inclinometer Calibration:

1. In the HYPACK® HARDWARE program, click on the Inclinator device in your setup to highlight it.
2. Click [Setup].
3. Raise the ladder of the dredge to the top of the water surface or the zero mark and click [Calibrate]. This puts '0' in the depth field.

4. **Lower the ladder to a known depth and check the results in the depth window for accuracy.** It may be necessary to repeat several times to calibrate the device.

FIGURE 8. Calibrating the System

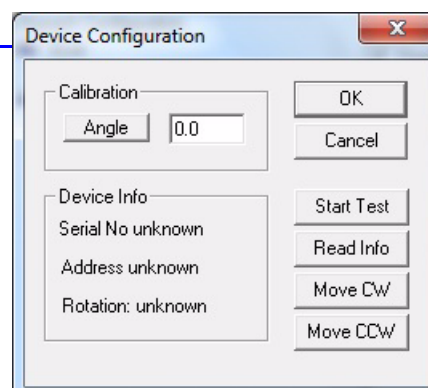


Swing ladder optional HD25A:

This is only for cutter suction dredges with a ladder arm that can swing left-right from the center.

FIGURE 9. HD25A Setup

1. **In HYPACK® HARDWARE, click on the HD25A device in your setup to highlight it.**
2. **Click [Setup].**
3. **Position your ladder at the center position.**
4. **Enter 0 (zero) in the Angle field then click [Angle].**
5. **Move the ladder left or right to its full range of motion then return to the 0 (zero) position and check your calibration.** It may be necessary to repeat the procedure.



VESSEL DRAFT

Your cutter suction dredge may move vertically in the water column based on different loading conditions (full fuel vs. low fuel, etc.). This vertical change is called the 'Draft'. When you first configure your vessel, make a mark at the static water line. This will be your reference line. When you note that the static waterline has moved up or down from this mark, you can correct for this change in the DREDGEPAK® program by either of the following methods:

- Re-calibrating the inclinometer in real time. (Preferred)
- Making an adjustment to the Draft setting in the Vessel parameters menu.