Marine Magnetics Towfish Magnetometer (SeaSpy): Quick User Guide

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Introduction

Here-in known as the **maggie** or **towfish**

For detailed information about the operation of the SeaSpy see the Operation Manual (rev. 4.7). For detailed information about the SeaLINK software (v. 8.00042) see the Operation Manual (rev. 4.90).

When installing SeaLINK, an MCS must be in Administrator mode. The below information is required each time SeaLink is installed – also listed in the front of the Marine Magnetics manual. Once installed, open the application while still in the Administrator account and enter the below information. This information will not save automatically unless input from the Admin account.
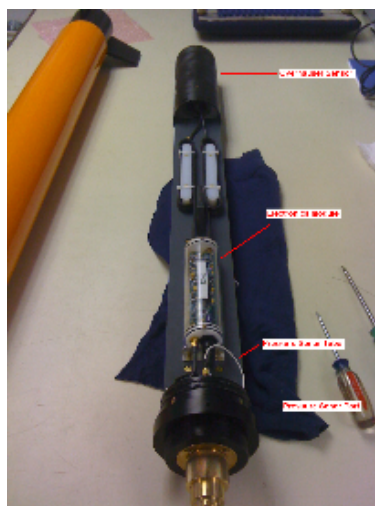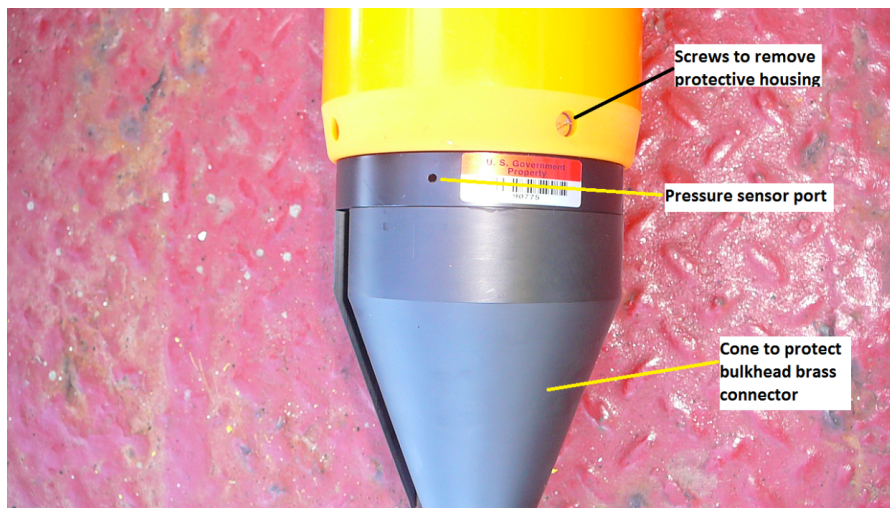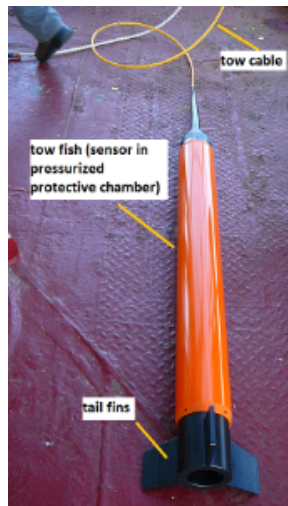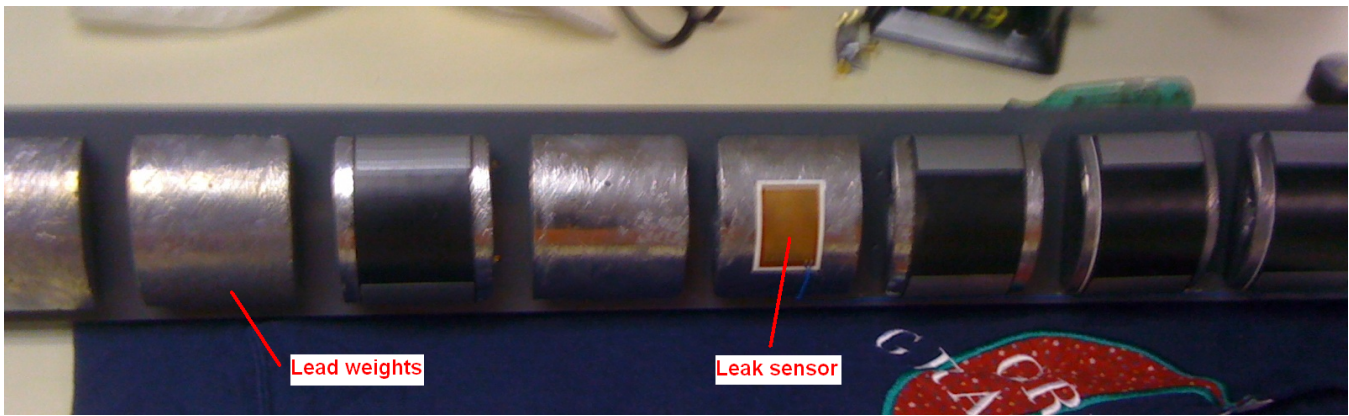
Name: Registered User

Company: Texas A&M University

Serial Number 21176928

The SeaSpy magnetometer is a high sensitivity total field magnetometer packaged in a rugged marine housing that is towed behind the vessel. It encompasses the following components:

- Towfish that contains the Overhauser magnetometer sensor and driving electronics. **See Figure 1** & **Figure 3**. It consists of a filament-wound fiberglass cylinder coated with polyurethane for abrasion and shock resistance. The nose contains a brass tow connector that is designed to bear the entire load of the tow system in addition to providing a two-conductor electrical connection. Note that the shell of the connector bears the system common ground and is connected electrically to the surrounding water.
- A high strength marine tow cable, containing a twisted wire pair with a high strength, lightweight braided Vectran strength member. See **Figure 1** & **Figure 5**. It can withstand loads up to 1000lb without any damage and loads up to 6000lb without breaking. It is sheathed in a tough polyurethane jacket and is fully water blocked.
- A deck leader cable that is waterproof but designed to be used out of the water. It connects the main tow cable spool (through the drum's slip-ring) to the communication transceiver. Its jacket is very tough polyurethane designed to withstand extreme abrasion and crushing, but it is not designed to withstand a towing force.
- A communications interface unit **Figure 14**. It translates the RS232 signal from the PC into the SeaSpy two-conductor telemetry format. It also multiplexes towfish power with the telemetry.
- SeaLINK software. SeaLINK is a windows application that interfaces with the maggie, allowing interaction, and displays and records incoming data. Commands can be sent to the maggie in a variety of ways including: 1) typed keyboard commands in the terminal window, 2) by selecting menus with the mouse and 3) clicking shortcut buttons on a toolbar. See **Figure 8**.

tow cable

tow fish (sensor in
pressurized
protective chamber)

tail fins

Screws to remove
protective housing

Pressure sensor port

U. S. Government
Property

Cone to protect
bulkhead brass
connector

Lead weights   **Leak sensor**

Use caution when removing the internals from the protective housing. DO NOT partially remove the internals, letting a portion hang from the housing. Pay careful attention to the leak sensor on the under-body of the internals when removing or inserting the internal structure. See **Figure 4**.
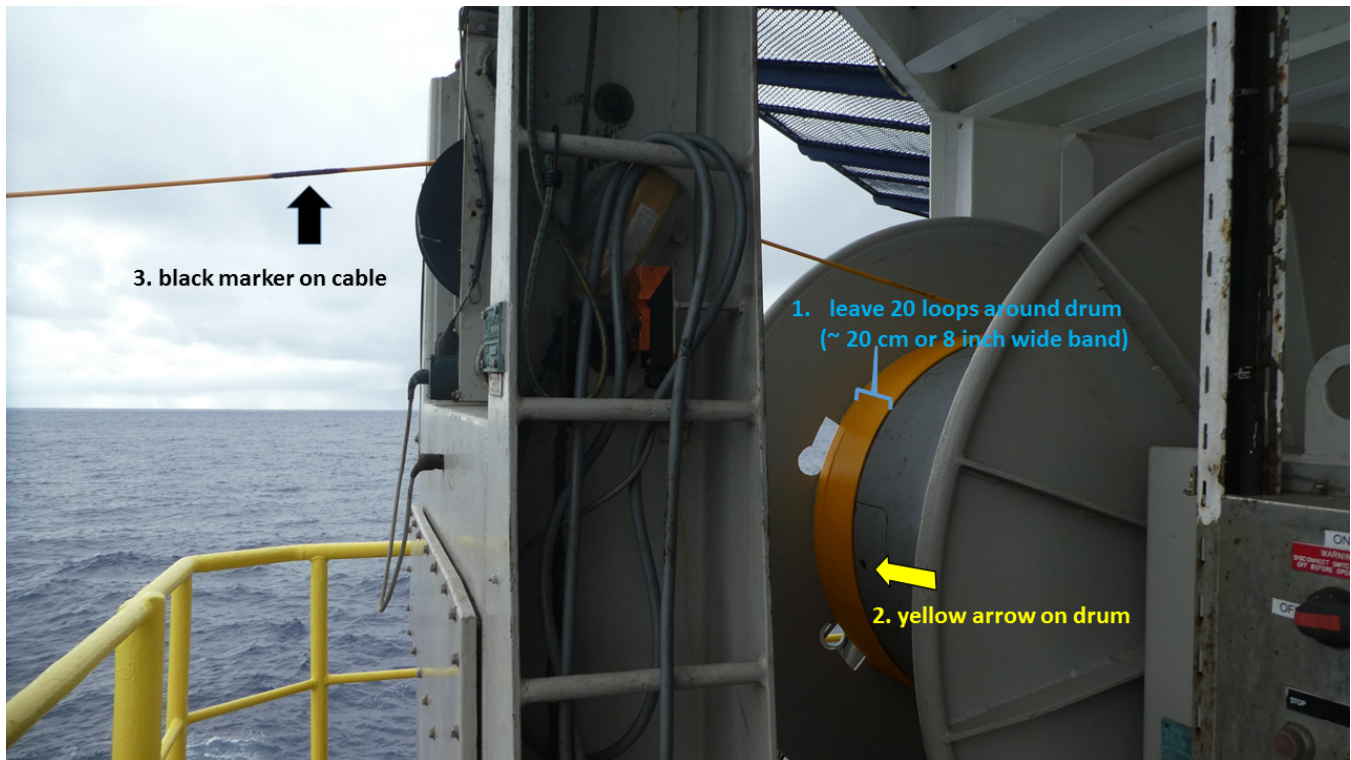
Even a small drop of water will activate the leak sensor. If the leak warning sounds, the chances are that a leak has developed in the towfish housing and it should be retrieved immediately. The internal structure is completely sealed, but is not pressure tolerant. If the towfish is allowed to fill with water to high pressure, damage may result to the electronics module or Overhauser sensor.

Deploying the Maggie

Check with the EPM/Staff Scientist and Operations Superintendent for clearances to collect data before deployment of the Magnetometer. IODP must have permission to collect data in a country's territorial waters. Obtain permission from the LO/ALO on shift to deploy the magnetometer. Obtain permission from the Bridge to deploy the Maggie and inform the ECR.

This procedure involves a team of at least two, preferably three. One person will control the drum winch, one person will handle the towfish, a third person can assist with the towfish and power switches on the winch

The maggie is to be deployed (towed) to an approximate distance of 435m behind the vessel (at least 2.5 times the ship length). There is 500m of tow cable on the drum, so if we are to leave 64.6m of cable on the drum, this would be about 20 wraps of the tow cable, making up an 8-inch wide band around the drum (circumference = 3.23 m).

3. black marker on cable

1. leave 20 loops around drum
(~ 20 cm or 8 inch wide band)

2. yellow arrow on drum

Using the real-time layback correction

GPS data are streamed to SeaLINK from WinFrog. SeaLINK can offset the GPS coordinates to account for the distance between the ship and the towfish. This allows one to obtain an estimate of the co-ordinates of the maggie in real-time, rather than the position of the ship. Our ship's position has a -74m offset because the GPS antenna is on the helideck. The offset should be configured in WinFrog and since SeaLINK gets its GPS position from WinFrog (via a NMEA COM feed) we do not have to define an offset into SeaLINK. If you are streaming a GPS signal without the offset, then define the offset in SeaLINK.

The layback length is therefore **507m** from the moonpool. This offset should be set in WinFrog (see WinFrog Cookbook.)

1. Connect towfish to tow cable. **See Figure 1**.
2. Connect power to isolation transceiver. See **Figure 14**.
3. Start SeaLINK software. See Figure 8.
    a. Confirm communication w/ towfish
    b. Power-up towfish (Ctrl-O) if it is OFF. Commands are entered in the *Terminal window* of SeaLINK.
4. Test communication by pressing spacebar (gets time) and entering the 'd' command (or click on the *Extra info* icon)
5. Confirm GPS NMEA signal coming in from WinFrog (*NMEA log field*).
6. The procedure to get the towfish in the water is a team effort. **Safety of the team is just as important as the safety of the magnetometer**.

    Turn on main circuit to Maggie winch (Port side - **Figure 9**.) The drum winch also has a breaker type switch plus "Start" and "Stop" buttons (**Figure 10**.) The drum control handle/joystick is on top of the box with the on/off buttons (**Figure 10**.)

    Releasing cable from the drum and operating the crane boom are done in tandem and good communication between all team members is important. It is not going to be explained exactly how to do each step; everyone may do it a bit differently. The result will be the same though.

    Slowly lower the towfish into the water. See **Figure 12**.

    Deploy towfish so it is just below the surface of the water. This is done to equilibrate the towfish with the water temperature and to zero the pressure at the water line. Wait fifteen minutes. See **Figure 13**. Make sure the towfish is deployed far enough so that the cable does not jerk and snap in the waves. In heavier seas the Maggie may need to be let out a bit further

7. Zero the pressure sensor in SeaLINK. The pressure sensor is a Wheatstone bridge on a silicon diaphragm. The maximum pressure that this sensor can stand before potentially suffering damage is 2500psi (1725m of water). The sensor is an analog device that may drift with temperature and with time. It has a 0.5m sensitivity. For proper operation, the zero-level should be reset before every survey.
    • Enter 'p' command (or click on the *Zero Pressure* icon).
        ○ Exp 328 : at 11.5kts and 450m of cable deployed, the towfish was about 8.8m below the water surface. Minimal swells.
8. Slowly deploy the tow cable. Increase speed as the drag tension increases. Deploy the remainder of the cable leaving ~12in left on the winch (**Figure 5**.)
9. Sync time source

- Either press the F7 key or click on the *PC TIME* icon.
10. Enter the layback distance (507m) by clicking on the *Update the layback length* icon (Unless layback is entered in WF.)
11. Sync GPS w/ the towfish
    - Either press the F8 key or click on the *SYNC GPS* icon.
    - Click through any warning windows about the sync failing.
12. Set the GPS position to append the magnetometer data by clicking on the *Appending GPS position to Fish output* icon.
13. Turn on auto-tuning: **COMMAND – Auto tuning on** or enter **x** in the terminal window.
14. Start cycling data by pressing on one of the frequency icons
    - 0.3Hz cycling frequency should be fine for a general survey
15. Check SeaLINK warning bar to ensure that the Signal Strength and Quality indicators are Excellent or Good or Acceptable and ensure that there is no high magnetic gradient (warning indicator is "OK"). See Table 1. for interpreting the warning bar.
16. Start logging (saving data) by pressing the *Toggle SeaLINK File Logging* icon. Note that the file-logging indicator on the SeaLINK warning bar turns from red (OFF) to gray (ON), to indicate that data is being saved to disk.
    - To change the logging filename or directory, select **File – Preferences** and select the **Output Streams** tab. Use the **Browse...** buttons to select the save location for both the Raw Data log and the optional Geosoft XYZ Data Log.
    - Data files;
        - .mag
            - SeaLINK raw data log that records the ASCII data generated by the magnetometer electronics. The file can be opened and viewed by any text editing program (ex. WordPad).
        - .XYZ
            - ASCII data format that can be easily imported into data processing and analysis software (ex. GeoSoft's Oasis) or Microsoft Excel. File format is based on the industry standard GeoSoft XYZ format.
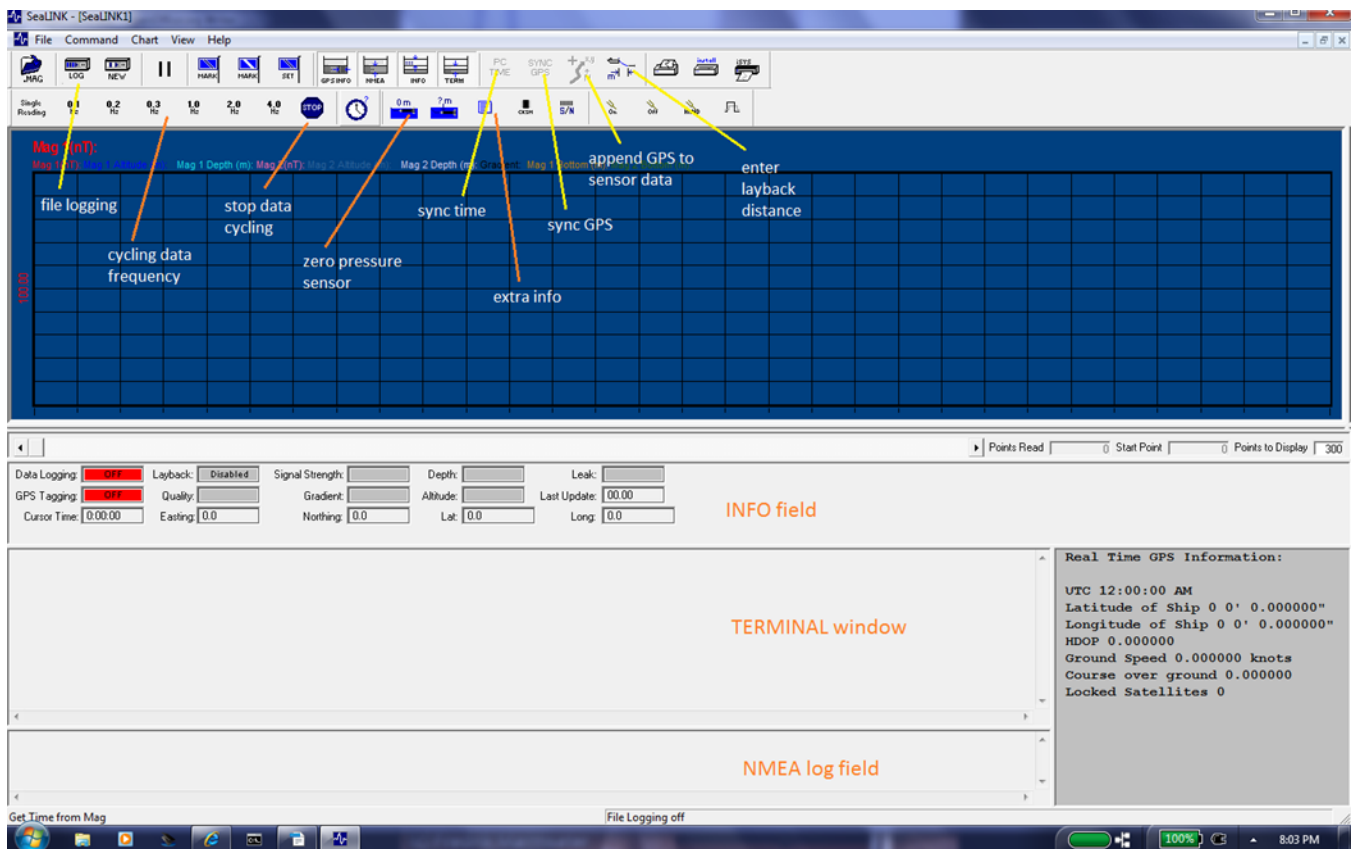
- You can move the plot line in the chart window by holding the SHIFT button and moving the cursor keys up/down.

| Field	RED	YELLOW	GREY
Data Logging	"OFF" – Incoming data is not saved to disk.		"ON" – Incoming data is being logged to the hard disk
GPS Tagging	"OFF"		"ON" – GPS co-ordinates are being appended to each magnetometer reading.
Layback		"ON" – GPS Layback calculations are being applied to the GPS co-ordinates.	"OFF"
Quality	"Poor" – signal below 49	"Acceptable" – signal above or equal to 49 but below 98	"Excellent" signal above 98
Signal Strength	"Poor" – signal below 110	"Acceptable" – signal above or equal to 110 but below 150	"Good" signal above or equal to 150 or "Excellent" - signal above 180
Gradient	"YES" – magnetic gradient conditions are not acceptable for surveying		"OK" – Gradient conditions satisfactory for surveying
Depth	"Warning" – towfish depth is deeper than user specified threshold.		"OK" – towfish depth is shallower than user specified threshold.
Altitude	"Warning" – towfish altitude is higher than user specified threshold.		"OK" – towfish altitude is lower user specified threshold.
Leak	"Yes" – Leak sensor detects water. Retrieve towfish immediately!		"No" – Leak senor does not detect water in the interior of the towfish.
Last Update	This field displays the last time the warning bar was updated with new information from the magnetometer.		

Towfish retrieval

This is another operation that will involve a Technician team effort.

When the towfish is ready to be brought back on-board:

1. Stop data cycling (press the blue *STOP* icon).
2. Stop data logging (press the *LOG* icon).
3. Turn off power to the towfish (CTRL-O).
4. Disconnect power to the isolation transceiver. See **Figure 14**.
5. Start to spool the towcable being careful not to criss-cross the towcable on the drum. Assistance will be required for this task.

6. Careful retrieve the towfish, trying not to bang it on the ship's hull nor the railings.
7. Once the towfish is on deck, spray all components (including towcable) with fresh water.
8. Remove the protective cone from the bulkhead and disconnect the towcable from the towfish. Cap both ends.
9. Spray the pressure sensor port with ship's air after the fresh water rinse to prevent salt crystals from forming inside.
10. Wipe the towfish and store in its case in the UWGL.
11. Secure the crane and winch drum.
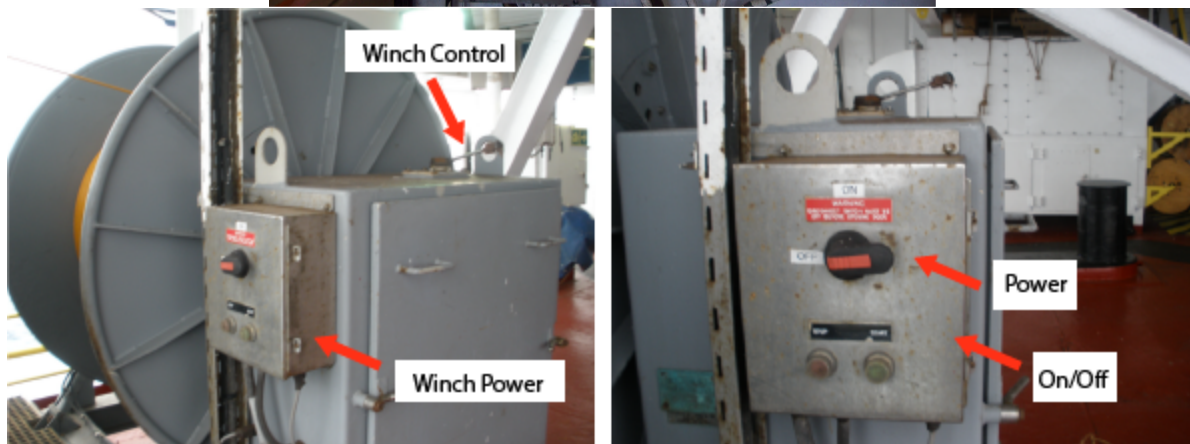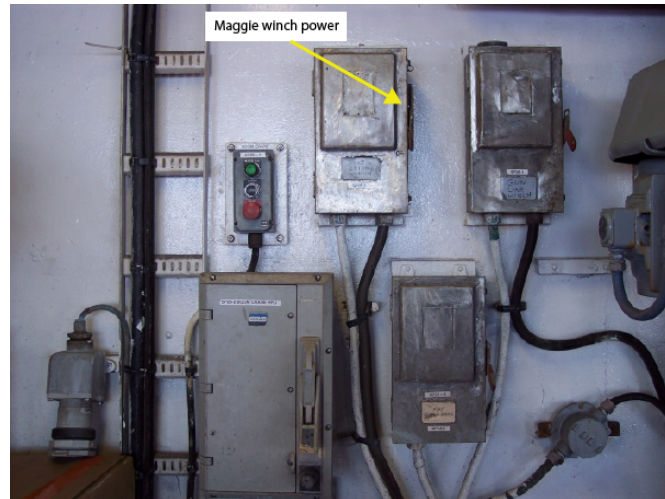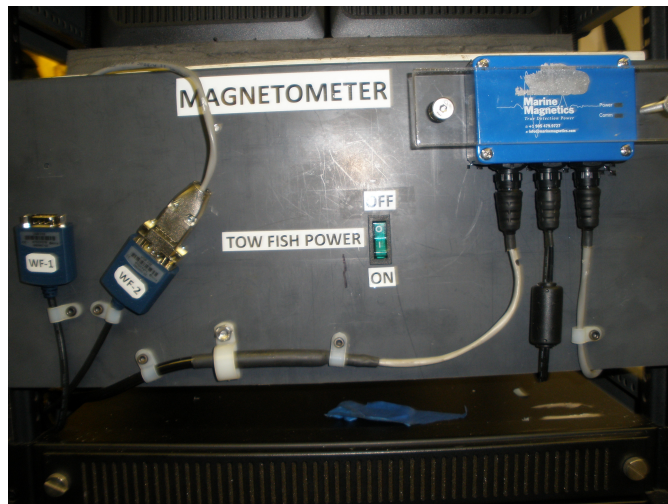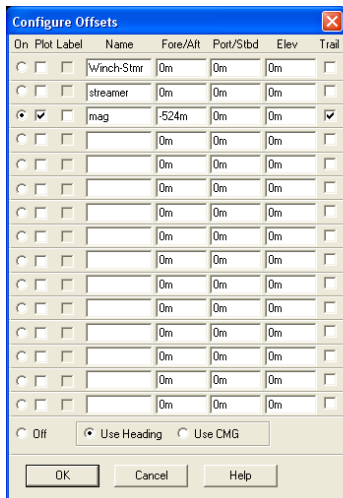
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