SYQWEST INCORPORATED
High Resolution Echo Sounders and Acoustic Systems
For Precision Seafloor Exploration

HydroBox HD™

Hydrographic Echosounder

Installation
Operation
Maintenance

ver 3.2.16

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1.0 INTRODUCTION

1.1 General Information

The HydroBox HD™ is a portable, low power, high-resolution, and water-resistant marine hydrographic echosounding instrument capable of delivering cm resolution for bottom depth measurements. When used with SyQwest's survey grade transducers the instrument provides depth measurement accuracy that meets all of the IHO requirements. It is designed exclusively for inshore and coastal hydrographic marine survey up to 1,000 meters of water depth and operates at either 33, 50, or 210kHz. An simultanious dual channel dual frequency option is also available for dual frequency surveys. Included with the HydroBox HD™ product is the following:

- HydroBox HD™ Sensor Unit (Single or Dual)
- HydroBox HD™ Installation CD
- HydroBox HD™ Manual

HydroBox HD™ Sensor Unit provides all of the transmit/receive electronics, and all of the signal processing functions. It is powered from a 10-30VDC source and consumes 10 watts of power. It interfaces to the Host PC via a single Ethernet Connection. The mechanical case for the Electronics Unit is Water Resistant to the EN60529 IP65 Specification and is also UV Stable and Chemical Resistant.

There are a lot of transducer options that may be used with the HydroBox HD™ Sensor Unit. Transducer selection depends upon a number of application parameters: maximum depth, bottom type, single or dual frequency operation. All of the Transducer assemblies are lightweight and designed for portable pole or small plate mounting. Transducer options are identified and described in further detail in the Installation section.

The HydroBox HD™ Installation CD will install the PC software used to configure, control, and acquire data from the HydroBox HD Sensor device. It will also include this manual in PDF format and any Release Notes that have been generated.

A hardcopy of the HydroBox HD™ Manual is also included so that the user may learn to install, operate, and maintain the HydroBox HD™ Equipment and Accessories. The manual also includes a section on acoustic theory.

The HydroBox HD PC software was designed for use with the Windows operating system, and should operate under Windows 7-10 and Windows XP also. The software is compatible with most standard desktop and laptop computers with a Windows operating system but real time performance may be affected by the computer hardware. Since the HydroBox HD is a real time data acquisition system, it is best to use the product with a computer of at least moderate hardware capability. The software requires at least 1 available Ethernet Port for connection to the HydroBox HD instrument, and optionally, additional Serial Ports for NMEA Navigation/GPS Input, NMEA Depth Out, and External Annotation. The software features Navigation Input, External Annotation, Data Storage, Zoom Modes, Thermal Printer output, Automatic/Manual Eventing, and more. The HydroBox HD software interface is divided into two fields. The **Controls** field is located on the left and contains navigation/depth information, configuration buttons, and system status. The **Data** field is located on the right and contains the actual acoustic echo data.

The HydroBox HD provides the user with a number of significant enhancements when compared to the predecessor product (HydroBox HD). The following table highlights the major enhancements:

Product Feature	HydroBox HD	HydroBox HD
Data Processing	CHIRP & Energy Mode, 16 bit	Energy Mode only, 8 bit
SEGY Data Sampling	80KHz A/D sample rate, raw or processed sample data, 16 bit	Decimated sample data 400 samples per ping, 8 bit
Interface Connection	Ethernet/Network port	Serial Port
SEGY Data Storage	Up to 100msec (16,000bytes per ping)	Decimated data (400 bytes per ping)
Ping Rate	Up to 10Hz	Up to 8Hz
SEGY Data Storage Options	SEGY Manual or Auto, 16 bit	None odc only, 8 bit
External Interfaces	GPS, Data Logger, Annotations and Heave via serial or UDP	GPS, Data Logger and Annotations via serial

1.2 About This Manual

This manual contains important information regarding acoustic theory, installation, operation and maintenance of your new equipment. The user should take sufficient time to read the entire manual and to understand the full functionality of the HydroBox HD Sensor and PC Software.

The manual is organized into four chapters:

1) An introduction (this section), which provides a system overview and basic outline of echosounding acoustics.
2) Installation, which provides details on how to properly mount all of the HydroBox HD System components. Details on installing the HydroBox HD PC Software package are included also.
3) Operational instructions describing how to operate the HydroBox HD Sensor unit and the HydroBox HD PC Software.
4) Maintenance, which provides information on replaceable parts and troubleshooting guidelines.

The user should pay attention to notes that are displayed in a gray box. These notes contain important information regarding installation and use of the HydroBox HD System. An example is given below:

NOTE: Important operation and installation information is provided in gray boxes throughout the manual.

1.3 Echosounding Principals

Basic echo sounding principles that should be understood by all operators of hydrographic equipment are provided in this section

1.3.1 Underwater Acoustics

1.3.1.1 Decibels

The scale most often used to describe a measurement unit of sound is the decibel (abbreviated "dB"). The decibel system was selected for a number of reasons. First, it is a logarithmic system, which is useful for dealing with large changes in measured quantities. Decibel units make multiplication and division simple because they are reduced to an addition and a subtraction operation respectively. Secondly, for underwater acoustics, the primary concern is ratios of power levels and signal levels rather than absolute numeric values.

Transducer calibration values are typically provided in units of decibels, including source level, receive sensitivity and directivity index. These transducer calibration values are outlined later in this section. These quantities are used to predict performance levels of a given transducer used with a sonar system.

1.3.1.2 Sound Propagation

The sea, together with its boundaries, forms a remarkably complex medium for the propagation of sound. Figure 1-2 shows the interaction of a transmitted sound source and the water. Both signal loss and interference result from interactions with boundaries and components within the water column, causing the source to be delayed, distorted and weakened. The main components affecting sound propagation are spreading loss and attenuation loss.

Spreading Loss

As a transmitted pulse of sound leaves the transducer, it spreads out in all directions. At the transmission point, the sonar puts a fixed amount of energy into the water. As the pulse travels away from the transducer, it occupies a greater and greater volume. This effect is called spherical spreading. The general rule is that the intensity of the sound falls off as the square of the distance traveled. In respect to typical acoustic measurements, this mathematically becomes a loss of 6 decibels for each doubling of the distance.

For echo sounders, the distance actually traveled is two times the distance to the seafloor from the source transducer (from the transmission source, to the bottom and back again). This results in a significant source of signal loss for the system receiving the sound pulse, which must be compensated for at the receiver. Typically a Time Varied Gain (TVG) amplifier is used to correct for spherical spreading loss in an acoustic receiver. A TVG amplifier works by applying an increasing amount of gain to the return signal as time of travel increases.

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Attenuation Loss

Attenuation of sound energy in the oceans comes from three factors: absorption, scattering (or reverberation) and bottom loss. Sound absorption takes place at two levels; one, absorption in the actual seawater medium, and two, absorption into the seafloor. Primary causes of absorption are viscosity and thermal conductivity in the molecules of water as the sound travels. At the molecular level, absorption is primarily related to frequency. At high frequencies- 500 kHz, for example, a loss of 0.14 dB/meter occurs in seawater, while at 50 kHz the loss is only 0.014 dB/meter. This is a major concern when selecting a transducer required to meet specified depth criteria. A graph showing the attenuation loss versus frequency is shown in Figure 1-1.

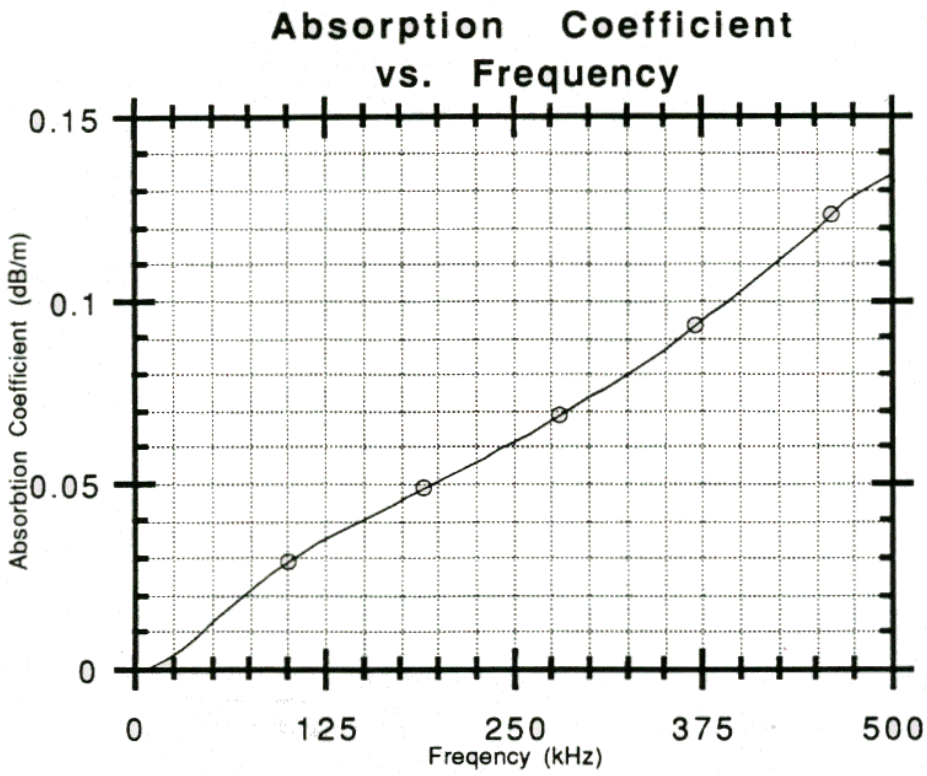


Figure 1-1 Absorption Coefficient Versus Frequency

Sound reflected off the seafloor usually suffers a significant loss in intensity. Part of this loss is due to scattering (reflection) but most of it results from the portion of sound entering the new medium and traveling into the seafloor until it is completely absorbed. The amount of energy lost by this effect varies greatly and depends on bottom type, sound frequency, and the angle at which the sound intersects the seafloor. Total losses can vary from 10 dB to 40 dB, with hard bottoms (packed sand, rock outcrops) causing little loss, and soft bottoms causing a significant amount of energy loss (muddy, silt-like sediments). Therefore, it is necessary when designing an echo sounder to compensate for this wide range in signal variation.

Another form of attenuation is scattering, also called reverberation, which results when sound reflects off components in the water column. Some of these reflectors include boundaries (sea surface and bottom), bubbles, biological material, suspended particulate and water type boundaries such as thermoclines. As the sound pulse travels from the transducer, it will reflect off these objects in many different directions. The larger the area of the reflector compared to the wavelength of the transmitted sound, the more effective it is as a scatterer. During the scattering process, part of the sound is reflected back to the surface, and the rest is scattered in all directions. This will cause a reduction in the acoustic energy that can travel to the seafloor and back to the transducer. For echosounding, this causes a reduced signal strength, which complicates location of the bottom. In the extreme case, scatterers will cause such a good reflection it looks like the bottom to the echo sounder and corrections must be made by the user to properly determine the digitized bottom value.

Bottom reverberation occurs whenever a sound pulse strikes the ocean bottom. In deep water this condition normally does not cause serious problem, but in shallow water reverberation can happen multiple times, causing high background signal levels (i.e. the sound travels from the surface to the bottom and back again many times).

Noise Sources

Background noise can cause interference with the reception of the desired acoustic echo return from the seafloor. Unlike reverberation, however, noise does not result from the transmitted pulse but from active producers of noise located at the ship or in the water. Noise can be classified as self produced or ambient noise.

Self-noise

Self-noise is produced by noisy ship components, electrical circuitry, and water turbulence around the transducer, including noise caused by water flow and cavitation.

Machinery noise and other sonar systems are the main components of ship produced self-noise. The dominant source of machinery noise is the ship power plant, including the main engine, generators, and propellers. The only way to reduce the effect of these noise makers is in proper selection of the transducer frequency for the echo sounder, and to locate the transducer as far away as possible from the noise sources. Typically, these sources are of lower frequencies than the echo sounder, but some mechanical and electrical equipment will produce sound in the ultrasonic region (above 15 kHz) which can detrimentally affect the performance of a system.

In general echosounding, flow noise, cavitation, and sonar circuitry are more important than other noise sources. Flow noise results when there is a difference in the relative motion between the transducer and water surrounding it. As flow increases, friction between an object and water increases, resulting in increased turbulence and, thus, increasing noise due to varying static pressure in the water. Flow noise is directly related to the speed of the ship and, on an improperly mounted transducer, there is usually a certain speed threshold that will cause the echo sounder to start picking up unwanted noise. Increased flow noise over time can usually be attributed to growth of marine animals and plants on the bottom of the ship.

Cavitation is a result of the pressure on the face of the transducer reducing to a level that permits the water to boil (i.e. turn from a liquid to a gas). This is directly related to the flow around the transducer as described above. Cavitation is also related to the depth, source level, and frequency of the transducer being used. As the depth of the transducer increases, static pressure increases to levels that will prevent cavitation from occurring. If the transducer is mounted properly, with flow noise and cavitation levels considered, this phenomenon should never affect an echo sounder.
Cavitation may also occur on a ship's propeller. As the speed of the water increases over the surface of the propeller, turbulence causes changes in the static pressure of the water. At this point, if the pressure is low enough, boiling will occur. This process releases a large quantity of bubbles into the water, causing noise that can affect the performance of an echo sounder. Care should be taken to mount a transducer as far as possible from this noise source.

Ambient Noise

Ambient noise is always present in the ocean. This noise is caused by both natural or human-made events. For echosounding principles, ambient noise sources that are significant include hydrodynamic boundaries, ocean traffic and biological transmitters.
Hydrodynamic noise results from natural phenomenon such as wind, waves, rain or currents. The levels produced vary greatly, but are largely related to the sea state level. In severe storms, hydrodynamic noise can reach levels that make reception of a transmitted signal very difficult, if not impossible.
Ocean traffic noise is dependent on the number of ships, the distance from noise sources, and the current propagation conditions due to thermoclines and sea state. Ocean traffic generally produces acoustic noise that is not within the frequency bandwidth of most navigational echo sounders, except when ships pass very near to the receiving transducer.
Biological noise producers include marine life such as shrimp, fish, and mammals. Mechanical movements of crustaceans, with their hard shells, may produce significant noise when in large schools. Likewise, certain fish species produce noise by reflecting noise off their swim bladder.

Transducer Properties

Properties of a chosen transducer affect sonar performance which directly relates to depth measurements. The source level, directivity index, and beam width of a transducer have a relationship with how the sonar system performs under different conditions.

Source Level

Sound is created by a transducer from a mechanical vibration of the ceramic material of which underwater transducers are made. The movement of the transducer face creates alternating regions of high and low pressure, resulting in an acoustic wave. The amount of energy transmitted into the water column is defined as the acoustic source level. A source level is expressed in units of decibels that describe the intensity of sound relative to a reference intensity at one unit distance from the sound source. For the user, a source level is useful for selecting a transducer for a particular use.
The amount of movement on the face of the transducer is linearly related to the voltage difference created across the ceramics of the transducer. Normally it would seem desirable to put as much power into the water as possible to achieve maximum depth performance. Cavitation, however, which results from high source levels and small transducer depths below the sea surface, is generally the limiting factor when driving a transducer. The electrical and mechanical design of the transducer, which has a maximum recommended input power level, must also be considered.

Beam Width

The beam width of a transducer is described as the width of the main lobe of a transmit pattern. The width is usually measured between the -3 dB points on either side of the beam pattern. Shown in Figure 1-2 is a transmit beam pattern for a 125 kHz transducer. The shape of the transducer beam pattern is a result of the transducer design. An array of ceramic elements, or a single ceramic element, emits sound at given frequency. The spacing of the elements and the frequency being used can control the shape of the beam pattern. At the center of the beam pattern is the main lobe of the transducer, with a width of 7 degrees (centered at zero degrees). The -3 dB point is shown as a dashed line on the graph. The side lobes of this transducer are the smaller lobes, approximately 18 dB below the level of the main lobe.

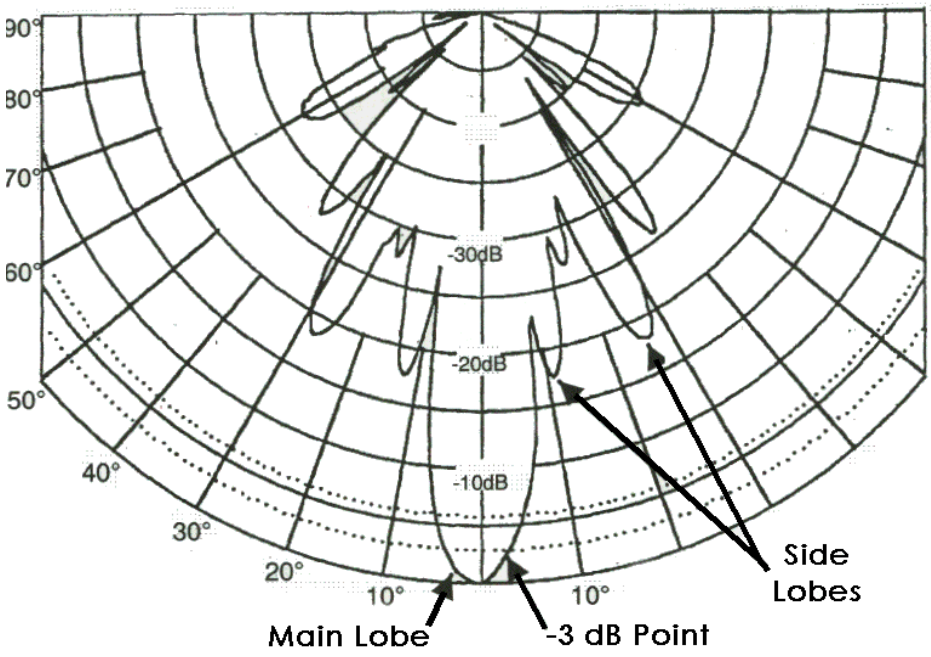


Figure 1-2 Acoustic Beam Pattern

The width of a beam is important for calculating how small an object the system can detect. If two objects fall within the main beam the object will appear as one object when it is received by the system. Thus, a narrow beam width is required for navigational echo sounders so it is capable of discriminating small objects.

The size of the transducer sidelobes (smaller beams off to the side of the main lobe) is important in determining how the system will behave on steep slopes. On steep slopes, transmitted acoustic energy from the side lobes will be received first and reveal a signal that looks like the actual bottom. In reality, the bottom is directly below the ship, and as seen by the main lobe, is much deeper. For this reason, it is important to select a transducer, which has reduced sidelobes.

Directivity Index

The directivity index measures the ability of a transducer to reject noise from extraneous sources. In the ocean, noise may be coming from all directions, but a narrow beam transducer will only "hear" noise within the beam width pattern. A sonar systems signal to noise ratio (SNR) will be affected by the ability of a transducer to reject unwanted noise, and thus is related to the directivity index. The higher the directivity index of a transducer, the better the ability to reject unwanted noise.

1.4 HydroBox HD Sensor Specifications

Units	Feet or Meters
Depth Ranges	0-15, 0-30, 0-60, 0-120, 0-240, 0-450, 0-900, 0-1500, 0-2400 Feet 0-5, 0-10, 0-20, 0-40, 0-80, 0-150 ,0-300, 0-500, 0-800 Meters
Shift Range	0-450 Feet in 1 Foot increments 0-150 Meters in 1 Meter increments
Zoom Range	15, 30, 60, 120, 240 Feet 5, 10, 20, 40, 80 Meters
Zoom Modes	Bottom Zoom, Bottom Lock Zoom, Marker Zoom, GUI Zoom (Playback Only)
Display	Color Control for Data: 4 Selections or Custom (User Input), Data Color/ Invert
Depth Resolution	0.1 foot, 0.01 meters. (in less than 100 meters) , 0.1 meters for depths greater than 100 meters
Depth Accuracy	Meets or exceeds all current IHO hydrographic requirements for single beam echo sounders; 0-40m 2.5cm, 40-200m 5.0cm, >200m 10.0cm
Sweep Bandwidth	1kHz ,2kHz ,4kHz and 6kHz
Speed of Sound	1400-1600 Meters/Second, 4595-5250 Feet/Second
Operational Modes	CW or FM CHIRP
Geographic Position	NMEA 0183, GLL, GGA, RMC, VTG, VHW, HDT, ZDA Selectable Baud Rates (RS-232): 4800 - 230400
Data Interface	SYQWEST HydroBox HD Interface, Ethernet port
Printer Output	Centronics (Parallel Port) interface to TDU Series Thermal Printers (via PC)
Minimum/Maximum Depth Operation	0.31 Meters to 200 meters @210kHz 1.00 Meter to 800 meters @ 33kHz ; bottom type dependent
Transmit Rate	Up to 10 Hz per Channel ,depth and operator mode dependent
Event Marks	Periodic, External, and/or Manual (Periodic selectable in 1 minute intervals)
Data File Output	Stores Depth, Navigation, and Graphic Data in ODC format (Proprietary) Normal and Zoom Data stored is Pixel data and can be played back and/or printed Seg-y data Format
Data File Playback	Files can be played back and/or printed at Normal or Fast-Forward speed, with Pause and GUI Zoom available
Frequency Output	210 KHz Standard, 33Khz, and others optional
Transmit Output Power	500 Watts (Pulsed), 1000 Watts capable
Input Power	10-30 Volts DC, Nominal power 16 Watts, Reverse Polarity and Over Voltage Protected
Dimensions	25.4 cm (10") Length, 15.876 cm (6.25") Width, and 6.25 cm (2.5") Height
Weight	0.9 kg (2.0 lbs)
Environmental	-25°C to +60°C Operating Temperature (-55°C to +90°C Storage) Water Resistant to EN60529 IP65 EMC meets EN60945 Emissions; CE Compliant

1.5 Software Improvements

The Hydrobox product has gone through a significant Hardware, Software and Firmware update based on feedback from our customers. All of the updates have been incorporated to provide the user with enhanced performance during data acquisition and data storage. Hydrobox HD data storage has been enhanced to provide position and depth information in a comma separated variable format (.CSV). The major system improvements are listed and described in detail below:

1.5.1 Improved Shallow Water Digitizing Performance

This enhancement provides for better "hands off" operation in shallow water and also allows for operation down to the shallowest of depths in manual mode.

1.5.2 Improved Auto All Operation

This product improvement includes the updates for shallow water operation but also provides for reliable depth digitizing in deeper water depths and at both high and low frequencies of operation.

1.5.3 Bottom Digitizer Threshold Parameter

The Bottom Digitizer Threshold parameter has been incorporated to allow the user to manually adjust the amplitude threshold that is recognized as a valid bottom target. The scale is 0 through 9. A "0" setting allows the digitizer to lock onto the strongest returns (i.e. dark colors such as red in the RAINBOW pallet). A "9" setting allows it to lock onto the weaker returns (i.e. lighter colors such as green in the RAINBOW pallet). In shallow water and soft sediment survey conditions a higher value is required to consistently digitize on the bottom without saturating the first few meters of bottom penetration. The default setting is "0", which should work under most conditions. Increase incrementally as required.

1.5.4 User selectable Gate Limits

Bottom Gate Limits are provided to help the user ensure that the data captured reflects the correct digitized bottom depth when conditions are difficult. The Hydrobox is intended for use in shallow water. Unfortunately, using any sonar in very shallow water creates challenges due to surface reverberation and multiple echo issues. By using the Bottom Gate Limits the user can ensure that the digitizer does not lock on a transmit reverberation or a 2nd echo return. The Bottom Gate Limit values for Shallow and Deep limits are entered in the selected units (Feet or Meters) and the "Enable Gate Limits" check box allows the Gate Limits to be Enabled or Disabled. Please note Gate Limits will only work in manual range and gain mode (not for use in auto mode). When Manual Gate Limits are enabled their selected values will show up in the lower right corner of the screen as GLS (Gate Limit Shallow) and GLD (Gate Limit Deep). Also, once enabled if the actual bottom moves out of the selected window you will no longer be able to digitize (you will get -.- for depth). When the Gate Limits are disabled a message is displayed to alert the user that they have been disabled and should be re-checked.

1.5.5 Sensor Reset on Program Exit

This feature causes the Hydrobox HD sensor to be reset whenever the user exits the Windows Application software. It eliminates the need for a cycle of the sensor power to reset the sensor interface.

1.5.6 NMEA Depth Output written to .CSV file

The Hydrobox HD host application has been updated to write the NMEA Depth output string to a comma separated variable file that can be easily imported into an MS Excel spreadsheet or another application for processing. The .CSV file is written in the format selected via the NMEA Out Dialog box as selected by the user (DPT, DBT, PMC, or ODEC). Whenever the user "Starts Recording" the .CSV file is saved along with the .ODC file. The .CSV file is saved in the user specified directory that is set in the "User Preference" Dialog Box. We had a number of requests for this feature and hopefully many of our customers will put the data to good use.

1.5.7 NMEA I/O and External Event COM Port Settings

The COM port selection settings for the NMEA Input, NMEA Output, and External Events was updated to support a more flexible for the user. Each of the functions can be connected via a separate COM port or used together to minimize COM port usage. Previous versions of the Hydrobox HD required the NMEA In and NMEA Out ports to be connected to the same COM port. This update allows for a simpler connection between the Hydrobox HD and the HyPack or HyDroPro software packages.

1.5.8 NMEA I/O Output written to Port during Playback

This feature allows the user to produce a comma separated variable (CSV) type file from ODC files collected in the past through the use of HyperTerminal or another terminal emulator program. This feature is helpful in situations where the Depth and/or Time and Position information was not logged properly during the acquisition portion of the survey. To execute this feature, set the Hydrobox HD up such that it would output NMEA depth via your selected COM port and using a NULL MODEM cable connect to another open COM port that you can run terminal software such as Windows Hyperterminal. Insure that you have the button checked for ODEC string. Set up Hyperterminal to store (capture text) then simply playback the collected file as you normally would. During playback, the Hydrobox HD software will send ASCII data out to Hyperterminal.

There are a number of speed, timing and test improvements that are included in this update as well that allow the application to start up faster, run with less CPU usage, and provide the developers and users with debug information when needed. These updates need not be described in further detail.

2.0 INSTALLATION

2.1 HydroBox HD System Installation Overview

This section presents instructions for initial setup and installation of the HydroBox HD Sensor. Physical and electrical installation details are provided for connecting, mounting, and getting started with the HydroBox HD. A summary is given of the software installation and setup procedure as well.

Although the HydroBox HD Sensor is designed to deliver the highest levels of quality and performance, it can best attain those standards when the equipment has been properly installed. Because of the great variety of vessels that will employ the HydroBox HD Sensor, it is not feasible to provide complete and detailed instructions that will fit all installation possibilities. Therefore, this section will provide practical guidelines to assist the user in planning a typical installation of the HydroBox HD System aboard the vessel.

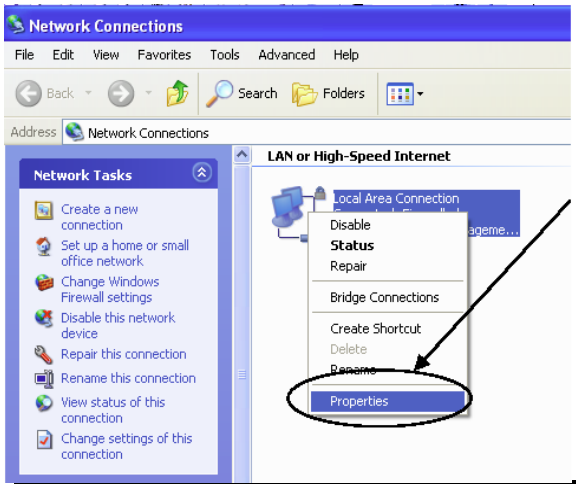
Shown in Figure 2-1 is a system-interconnecting diagram. Optional items are shown with dashed lines. A minimum operational system configuration requires:

PC running Windows 7-10, moderate capability laptop or desktop
HydroBox HD Sensor Unit
HydroBox Transducer Assembly
HydroBox HD Cables (Power, Ethernet, Transducer)
10-30 Volt DC Power Source (16 Watts)
Transducer Mounting Hardware

The GPS, NMEA Depth Out, and External Eventing connections are optional but, if used, will require the PC to have additional COM ports. For many portable PC's additional COM ports may be installed via one of the PCI Express or PCMCIA expansion slots or via USB 2.0 to RS-232 Adapters.

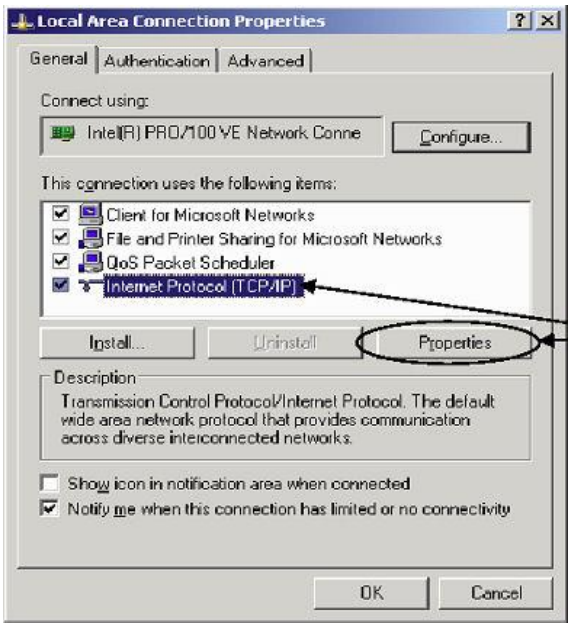
The TDU Printer, if used, is attached via the PC's Printer Port.

2.1.1 Setting a Static IP Address for Network Connection



To set up your computer, follow these steps.
Go to: Start Settings Network Connections

Right click on the "Local Area Connection" icon and select "Properties"
You should see the following screen:

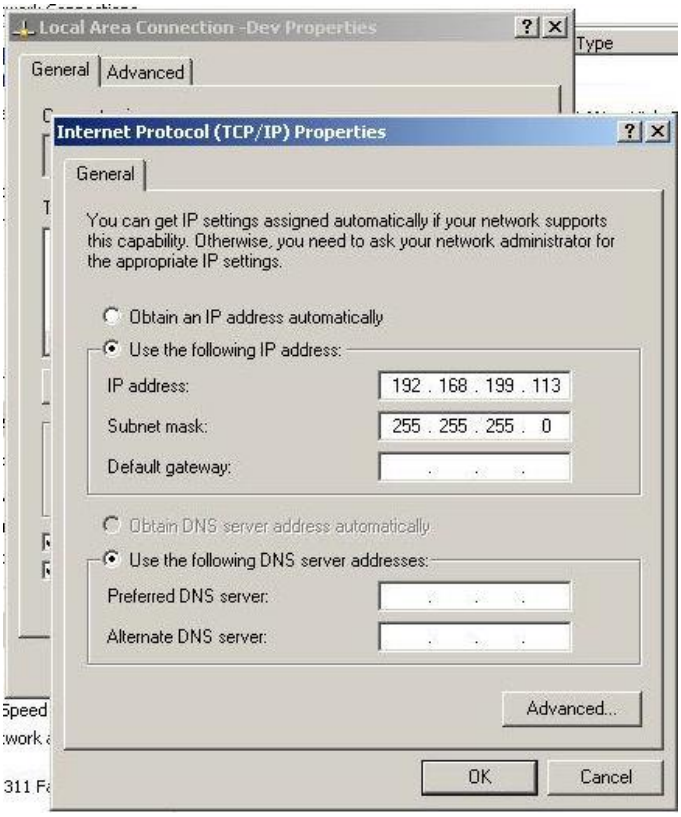


Scroll to and Click on "Internet Protocol" and then on "Properties"
You should see the "Internet Protocol (TCP/IP) Properties" window.
Click on the "Alternate Configuration" Tab

You can either set up the interface under the "General" setup or the "Alternate Configuration" tab.
If you have 2 or more Network connections available, you may want to use the "General" settings on your selected Network card. Click the "Use the following IP address" radio button and set it up with the IP address shown below (same as the alternate). If you already use that connection, or you are limited on your network connections, you can select the alternate tab. When selected it will be displayed with "Automatic private IP address" selected.

Click the "Use the following IP address" radio button
Enter the IP address information shown below
Select "OK"

For use with the HydroBox HD, it is required that you use the 192.168.199.113 address.

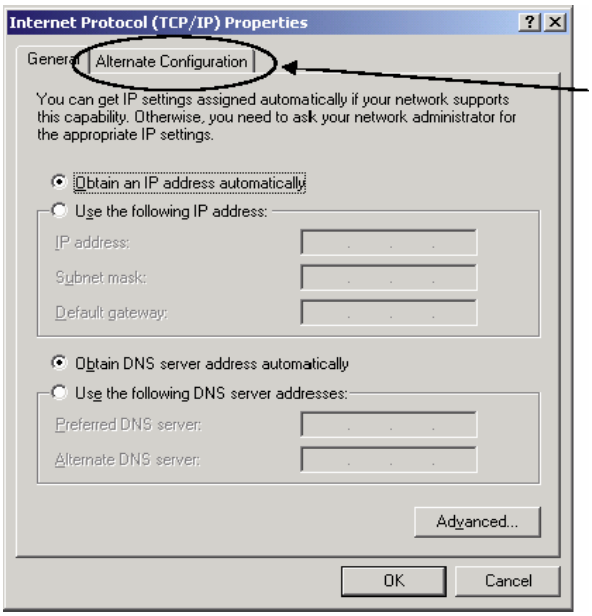


If you have only one network connection, and you move the network cable from your standard network connection to the HydroBox HD when collecting data, you may prefer to set up the "alternate configuration" as shown on next page.

This will preserve your "main" network settings, and default to these only when plugged into the HydroBox HD.

2.1.2 Setting an Alternate Static IP Address for Network Connection

If you move your computer from being connected from a LAN using DHCP to your HydroBox HD or other equipment that uses a static IP address, you can set your computer up to automatically switch to the "alternate" static IP address.
The use of the alternate IP address occurs when the computer cannot find a DHCP server such as when it is connected to your HydroBox HD.



END OF SOFTWARE INSTALLATION

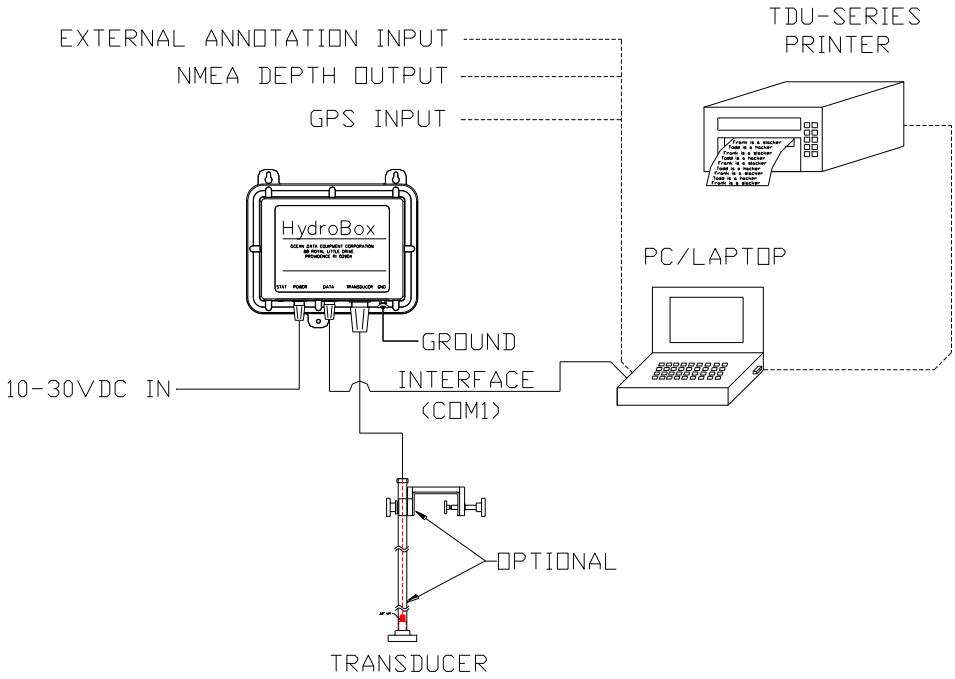


Figure 2-1 System Interconnect Diagram

2.2 - Getting Started

Unpacking and Inspection

Use care when unpacking the unit from it's shipping carton to prevent damage to the contents. It is also recommended that the carton and the interior packing material be saved even after the unit has been installed on the vessel. In the unlikely event that it is necessary to return the unit to the factory, the original carton and packing material should be used. Verify that all parts described in the next section have been shipped with the unit.

Basic Equipment

The following (Table 2-1) is a list of the basic equipment supplied with the HydroBox HD Hydrographic Echo Sounder.

SINGLE CHANNEL SYSTEM				DUAL CHANNEL SYSTEM		
Part Number	Item	Qty		Part Number	Item	Qty
P04503-xHD	HydroBox HD Sensor Unit	1*		P04803-xHD	HydroBox HD Sensor Unit	1*
P04412	Power Cable (10 feet)	1		P04412	Power Cable (10 feet)	1
C00210	Data Cable (10 feet)	1		C00210	Data Cable (10 feet)	1
P04521	HydroBox HD Software CD	1		P04521	HydroBox HD Software CD	1
P04525	HydroBox HD Manual	1		P04525	HydroBox HD Manual	1

Table 2-1 Basic Equipment

Accessories and Options

The following items are available to complement and enhance the operation of the HydroBox HD echosounder. Please contact your authorized SyQwest distributor or visit our web site for information and assistance in obtaining any of these items.

Product Code	Item	Quantity
P04515	Transducer, 210Khz	1
P04516	Transducer, 33Khz	1
P04517	Transducer 50Khz	1
P04816HD	Transducer, 33/210Khz	1
P04817HD	Transducer 50/210Khz	1
P02553	TDU-850 Thermal Printer	1
P03100	TDU-1200 Thermal Printer	1
P03120	TDU-2000F Thermal Printer	1
P03050	12 Channel DGPS System w/ Combo Antenna	1
Optional	Over-the-Side Mounting Kit (OTSM)	1

Table 2-2 Accessories and Options

2.3 TRANSDUCERS (DIMENSIONS & MOUNTING)

(Transducer drawings and specifications are for reference only and are subject to change; please contact SYQWEST for current transducer information.) For installation suggestions, please visit our website *http://www.syqwestinc.com/*

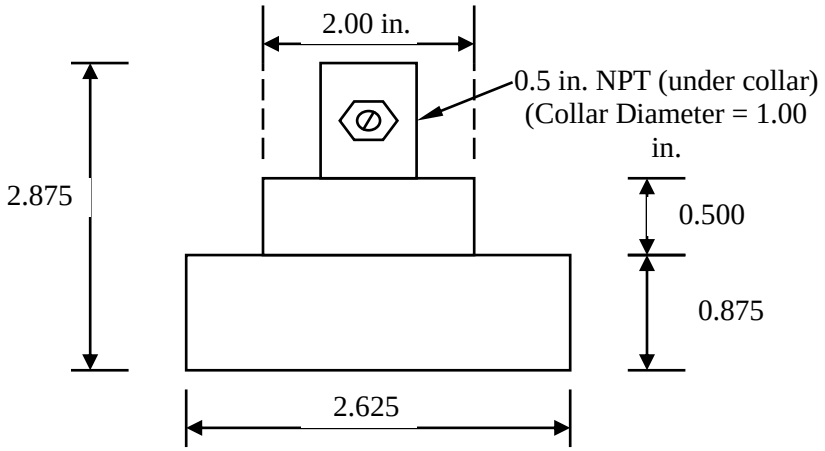
P/N P04816HD TRANSDUCER 33/210Khz

Resonant Frequency: 33/210 KHz.

Nominal Impedance:	60/60 ohms
Beamwidth (@ 3 dB point):	33khz 23° 210khz 8°
Cable:	30 feet (2x18AWG Pr) (with plug)
Housing Material:	Urethane
Stem	Stainless Steel ½-14NPS Thread
Weight:	15 lbs

P/N P04515 TRANSDUCER 210Khz 8 deg

Resonant Frequency:	210 KHz. (nominal)
Nominal Impedance:	50 ohms
Beamwidth (@ 3 dB point):	8 degrees
Cable:	30 feet (with plug to mate with recorder)
Housing Material:	Stainless Steel (with urethane acoustic window)
Piezo Material:	Barium Titanate



P/N P04517 TRANSDUCER 50Khz 18 deg

Resonant Frequency: 50 KHz.

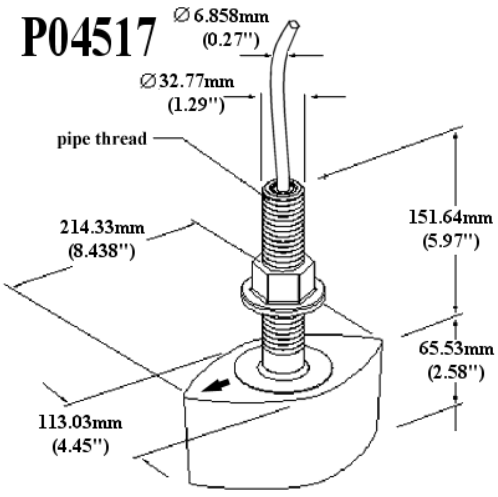
Nominal Impedance: 60 ohms

Beamwidth (@ 3 dB point): 18 degrees

Cable: 30 feet (with plug)

Housing Material: Brass (with urethane acoustic window)

Piezo Material: Barium Titanate



2.4 - Installing the HydroBox HD Electronics

Instructions are provided in this section regarding the physical installation of the HydroBox HD Sensor Unit and the PC that is used for the User Interface. Guidelines are provided for locating and/or mounting the HydroBox HD Sensor unit and the PC. The installer should refer to Section 2.5 for information on electrical hookup.

Selecting a Location for the Electronics

The HydroBox HD Sensor Unit is designed for portable, marine applications but maybe used in permanent installations as well. The user must determine if the HydroBox HD Sensor Unit is to be mounted on the vessel or just placed in a convenient place on-board the vessel. Either way the appropriate location for the unit needs to be determined. The following considerations should be investigated before deciding upon a location:

1.1 User Supplied Personal Computer

The first step in the equipment location process is to determine the optimum place for viewing the data. The unit should be positioned to provide the optimum viewing angle and within easy reach of the operator whenever possible. This will vary depending on the size of the vessel and type of Personal Computer (Desktop or Laptop) but is most important to insure the comfort and success of the user. The location selection should consider that standard PC displays are not easily readable in direct sunlight. Adequate space for the computer and any peripherals that need to be connected should be considered as well. Finally, provisions need to be made to properly secure the equipment for the worst sea conditions that may be encountered.

2.1 Cable Lengths.

Both the Ethernet Cable and the DC Power Cable supplied with the product are 10 feet long. Thus, the Sensor Unit must be installed within 10 feet of both the user supplied Personal Computer and a 10-30VDC Power Source. The unit must also provide adequate access for cabling termination without binding, and allow suitable space for servicing the equipment. (If necessary, the Ethernet cable may be extended beyond 10 feet. See Section 2.5 for more information)

3.1 Water Resistance.

The Sensor Unit has passed the EN60529 IP65 Water Resistance Standard which insures that the unit is completely sealed and is Splash Proof. The unit should NOT however be installed in an area where the unit may be submerged in water.

4.1 Environmental.

The operating temperature of the HydroBox HD Sensor is –25C to +60C thus the operating temperature range of the PC is likely the limiting factor for temperature. The unit has also passed all of the EN60945 emission tests (radiation and immunity). For optimum system performance it is still recommended that the installer mount or place the Sensor unit in an area that is at least several feet away from any other electronic equipment or machinery on the vessel. The unit should also be mounted or placed in an area that won't be exposed to water if practical.

2.4.1 Mounting the Sensor Unit

This section outlines the steps for mounting the Sensor Unit. Refer to Figure 2-2 while installing. The unit may be mounted either horizontally or vertically. The keyhole slots make installation in hard to

reach areas easier, but be sure to tighten all mounting hardware securely. Insure that adequate room is left for installing and removing the cable connections. Also, verify that the status indicator (labeled STAT) is visible.

Step 1) Confirm that the area behind the intended-mounting surface on the bulkhead is clear of equipment, panels, electrical cables, conduits, hydraulic, air, water lines or pipes.

Step 2) Using the Sensor Unit as a template mark a drill point for each of the mounting holes. Insure that the marks for the keyholes are placed in the smaller, slotted areas.

Step 3) Drill three (3) holes that will work with the mounting hardware that has been selected (not supplied). The 3 holes on the Electronic unit are .195 inches in size (#8 size Screw recommended for installation).

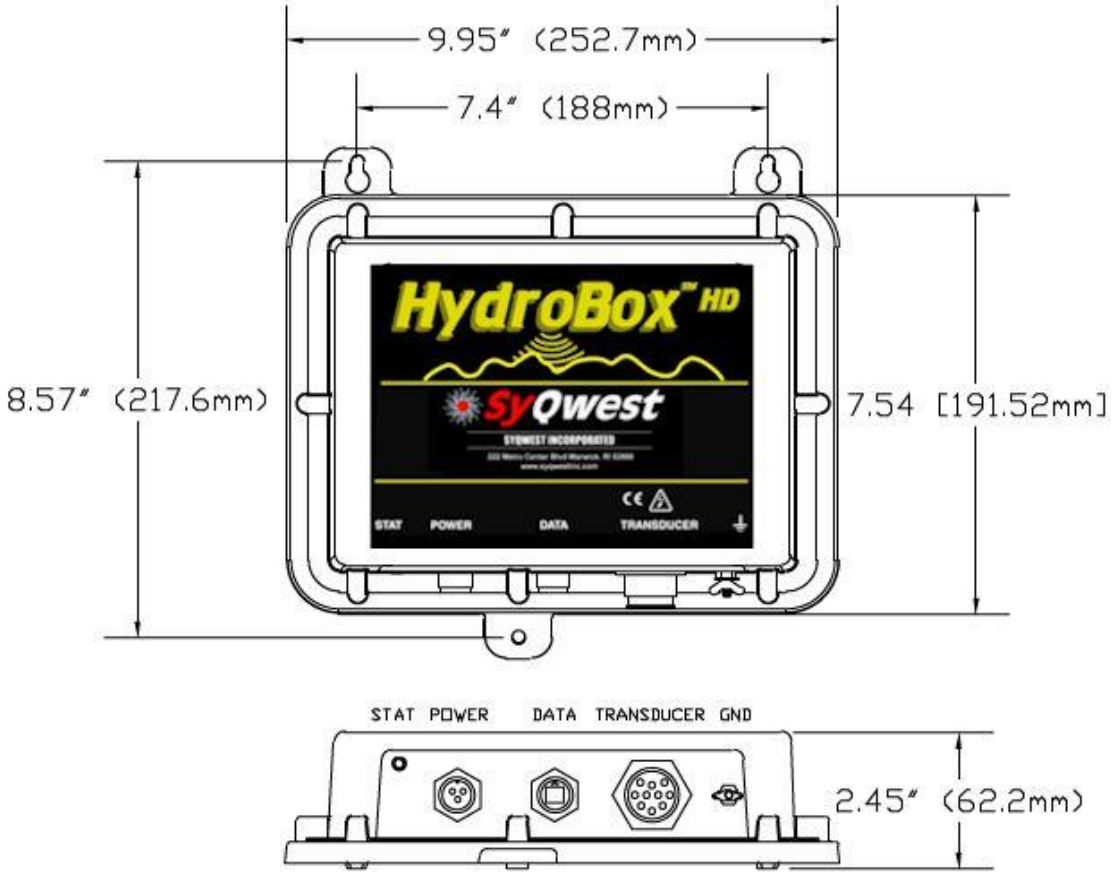


Figure 2-2 Bulkhead Mounting the Sensor Unit

2.5 - Electrical Connections

WARNING: Be sure to turn the vessel power off at the main switchboard before proceeding with the installation. If power is left on or turned on during the installation, then fire, electrical shock or other serious injury may occur.

There are 3 connections that need to be made to the HydroBox HD Sensor Unit and the PC for the system function properly. The user also has the option of connecting a GPS input and/or a Thermal Printer. The sections below describe the connection details for each.

All electrical connections to the HydroBox HD Sensor unit are to the side of the unit. Refer to the sections on each individual connector for information on connector type, recommended cable and wiring specifics. Figure 2-1 at the beginning of the chapter shows the overall systems interconnect for the system.

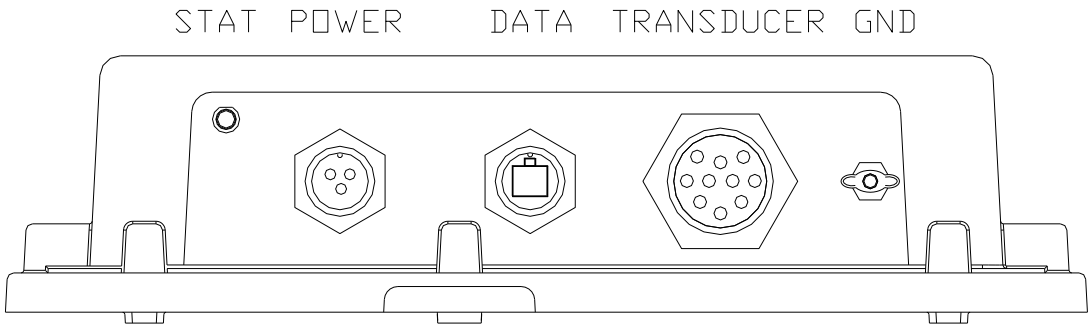


Figure 2-3 HydroBox HD Sensor Unit Connections

Figure 2-3 shows the basic connections to the unit. In all installations, all of the connections must be made for the unit to function. As shown above, there is a status indicator (STAT) and there are 3 connectors from left to right: DC Power (3 pins), Data Interface (RJ45), and the Transducer (10 Pins). A grounding screw, located to the right of the Transducer connector, is provided to connect the HydroBox HD to the vessel's earth ground system. The cables supplied with the HydroBox HD are ready to plug into the HydroBox HD Sensor Unit. No user wiring is necessary. The cables associated with the HydroBox HD Sensor Unit are listed below (Table 2-3). The user should make sure that, after wiring is complete, each plug is firmly attached to the unit via the twist-lock mechanism.

Part Number	Item	Quantity
P04412	DC Power Cable (10 feet)	1
C00210	Ethernet Interface Cable (10 feet)	1
P04415	Transducer Cable (30 feet)	1

Table 2-3 HydroBox HD System Cables

DC Power Connection

Before installing the power connection to the unit, the installer must first insure that the DC power source is in the range of 10-30VDC and is capable of providing 8 watts of power to the unit. Although the HydroBox HD Sensor unit is reverse polarity and over-voltage protected, it is always required that the power mains be turned off during system wiring for both personal and equipment safety.

The Power Cable supplied with the system is 10 feet long, and includes 3 conductors. The wires in the power cable must be connected as follows:

RED – Positive DC Voltage (Fused Lead), DC IN+
BLACK – DC Return, DC IN-
WHITE – Earth Ground, SHLD

The Positive DC Voltage lead includes a 3 Amp in-line Fuse. In the unlikely event that the fuse is blown it should be replaced with a fuse of the same amperage. Installing an incorrect fuse can result in damage or fire to the unit if it is not operating properly.

The Power Connector on the Sensor Unit is shown below in Figure 2-4.

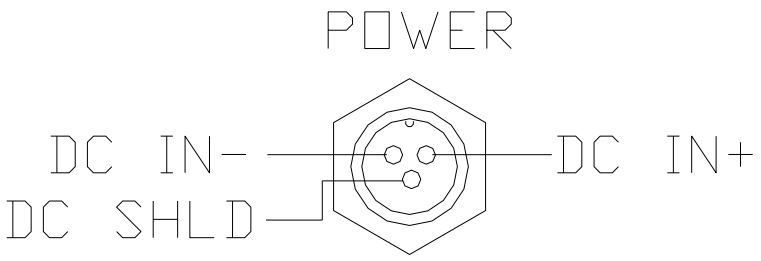


Figure 2-4 HydroBox HD Sensor Power Connector

Electrical wiring standards require that the HydroBox HD Sensor Unit be properly attached to a solid chassis ground via the ground stud on the bottom of the unit, or the Earth Ground wire (WHITE) in the power cable. When connecting to the ground stud, a tinned copper braided wire (0.190 gauge or greater) is recommended.

NOTE: Connecting the Earth Ground is required for optimum system performance and safe operation. The white wire in the power cable OR (BUT NOT BOTH) a ground wire to the unit ground stud is needed. Connecting both the white wire and the ground stud to earth ground may degrade performance due to induced ground loops.

Data Interface Connection

The Data Interface cable supplied with the HydroBox HD is 10 feet long. If the 10 foot length of cable is not enough, the Data Interface Cable may be extended by using a standard Ethernet CAT-5 cable.

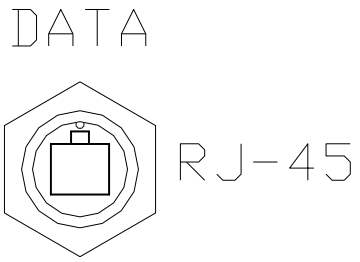


Figure 2-5 HydroBox HD Sensor Data I/O Connector

Transducer Connection

The HydroBox HD 10Khz transducer wiring is comprised of 2 cable sections.

The first cable section is 6 feet long and is directly connected to the ceramic inside the transducer. There is a waterproof inline connector at the end of this cable section suitable for connection in a flooded seachest or in seawater.

The second cable section is 30 feet in length and has the waterproof mate to the first cable section on one end and a 10 pin connector on the other end that mates to the Transducer connector Figure 2-6 on the HydroBox HD Sensor Unit. For standard single frequency units, only 3 of the pins on the 10 pin connector are wired to the unit. Other frequency and transducer options are available upon request. The standard wiring is defined as:

WHITE - Transducer +
BLACK - Transducer –
GREEN - Transducer Shield
The Transducer Connector on the Sensor Unit is shown below in Figure 2-6.

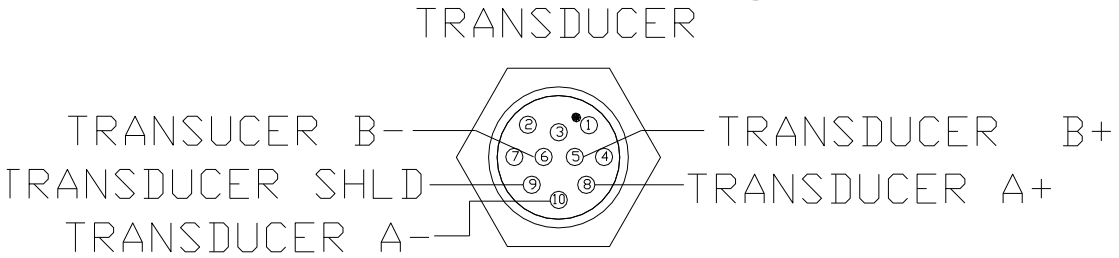


Figure 2-6 HydroBox HD Sensor Transducer Connector

GPS Connection

Connecting a GPS or other Navigation input to the PC running the HydroBox HD™ software allows the user to store and annotate Date, Time, Position, and Heading information to the Acoustic data returns.

The HydroBox HD PC Software supports the NMEA 0183 protocol on a 2nd COM port that is software selectable by the user. When selecting a PC to use with the HydroBox HD system the user should insure that PC hardware supports 2 COM Ports if a Navigation input is desired (the HydroBox HD Sensor/PC interface requires 1 COM port). For Portable PC's, a USB 2.0 or PCMCIA COM port card can often be used to provide a 2nd COM port.

The user should refer to the GPS NMEA 0183 output connection information in their GPS Manual as well as the PC COM port wiring information in their PC Manual to insure that the Navigation input is wired correctly.

The HydroBox HD can also interface to a GPS using a UDP interface via IP 127.0.0.0 using port number 4543

Printer Connection

The HydroBox HD PC Software allows the user to interface to the all of the SYQWEST TDU Thermal Printers. The connection is established through the PC's Parallel Printer Port (25-pin D-Type) as shown below in Figure 2-7. Once the software has been started, all displayed acoustic data can be printed to the TDU in either Acquisition or Playback mode.

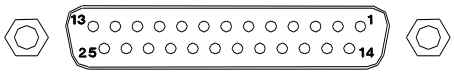


Figure 2-7 Printer Port

The standard TDU Printer cable is provided with the printer and is 12 feet long and does not require any user wiring. Installers must locate the printer accordingly.

2.6 - HydroBox HD PC Software Installation

This section describes how to install the HydroBox HD PC software package. It is assumed that the reader has a working knowledge of installing Windows Vista/XP/7/8® software. The installation software is located on the CD-ROM disc included with your HydroBox HD.

NOTE: It is recommended that you exit all running applications before inserting the CD and beginning the installation.

To install the PC software, insert the HydroBox HD CD into an available drive. If **Auto Insert Notification** is enabled on the CD-ROM drive, then the HydroBox HD PC installer will begin automatically. If the CD does not auto-start, simply execute the `SETUP.EXE` file in the root directory of the CD.

If you are trying to install the HydroBox HD software on a PC with a Windows 7 or Windows 8 Operating system platform. Please browse the HydroBox HD CD and locate the SETUP.EXE file and right click on the file and select the option Run as Administrator.

**** Installing the software in this manor is required with Windows 7 & 8 as the HydroBox HD software requires access to the Windows registry and without access to the Windows registry the HydroBox HD software will not operate correctly.***

The operating system will the as you to confirm the installation and click yes. Then follow the installation prompts as with a normal installation.

Once the installer is running, it will verify that your operating system is compatible with the HydroBox HD software, and then it will check which version of the Windows Installer program is installed in your system. If the Windows Installer program is not found or out of date, it will update it and prompt you to restart your computer. Once restarted, the HydroBox HD installation will continue automatically.

The InstallShield Wizard will guide you through the next step where you have the option of choosing an install directory. By default, the HydroBox HD PC software is installed in the Program Files folder under the sub-directory ODEC.

In the next step, you may choose a **Typical**, **Minimal**, or **Custom** installation. Selecting Typical will perform a complete install of both the HydroBox HD application and Sample Data for playback. A Minimal installation will only install the HydroBox HD application. Additionally, you can choose Custom to manually select what you would like installed. Click the next button to continue to the next step.

The rest of the installation process consists of verifying your settings and clicking the install button. Also, once the installation is complete, you can check the **Launch the program** box to execute the HydroBox HD software as soon as you close the installer. If not, you can run the HydroBox HD PC software by using the Windows **Start** button to find the *HydroBox HD* menu under **Programs**, or simply double-click on the *HydroBox HD* icon located on your Desktop.

2.7 General Transducer Installation

The HydroBox HD is typically equipped with a single lightweight, 210kHz transducer that is designed for portable, over-the-side mount applications. It may also be used in permanent installations but will need to be mounted in a water filled seachest in those installations. Before installing the transducer, the installer should read and understand the appropriate section below to insure that all of the installation issues are considered. Other transducers are available upon request.

Selecting a Location for the Transducer

The location of the transducer is very important for maintaining reliable bottom tracking and optimum performance of the equipment. Avoid installing transducers in locations where the transducer will be subjected to turbulent water, air bubbles, or vibration. The best clear water location on most vessels meeting these criteria is approximately 1/3 the length of the vessel, aft from the bow.

For many portable applications and some permanent applications it is not practical to mount the transducer in the forward section of the vessel. For these applications the transducer can be located in the aft third of the vessel; away from and forward of shafts and propellers, clear of hull openings, sea chests, outlets or protuberances. It is preferable to mount the transducer on the side of the hull where the

propeller blades are normally moving downwards. The upward motion of the propeller can generate pressure waves, which push air bubbles up against the hull. By mounting the transducer on the downward side, the hull will tend to protect the transducer from this effect.

The transducer should be mounted adjacent to the ship's centerline. The radiating face should be flush with the hull and, wherever practical, the face should be parallel to the waterline. A maximum deadrise angle of 3 degrees is allowable.

The transducer must be mounted such that it will always remain submerged during operation. Thus, the depth of the transducer should take into account the location on the vessel and the worst case sea state conditions. Turbulent flow across the radiating face of the transducer and/or the presence of air bubbles will degrade system performance significantly as well and must be considered.

The area selected for mounting must provide sufficient space for access to the transducer and cable, and for routing cable and conduit. In addition, there should be sufficient room to permit use of the necessary tools to facilitate the installation-mounting requirements. Ideally, the location would provide a relatively direct cable run to the site of the HydroBox HD Sensor Unit.

The cable path from the Electronics to the transducer should be routed as far as possible from other electrical cables. Although the cable is shielded, the acoustic reply from the transducer can be on the order of microvolts, thus any cable crosstalk emissions can cause a decrease in acoustic sensitivity.

Handling Transducers

The transducer is the heart of the HydroBox HD system and, in spite of its appearance and size, is a delicate instrument. Although it is designed to be in contact with and survive tough marine environments, it should not be dropped or mishandled during the installation. Caution is advised when handling the transducer to prevent any damage to the transducer face or radiating surface.

The transducer is comprised of a ceramic element, The transducer and mounting assembly should be as clean and smooth as possible so the path of the sounding energy is uninterrupted. The transducer face must not be painted with lead based bottom paint. In portable applications the transducer and mounting assembly should be cleaned with fresh water after use.

WARNING: Do not expose the transducer to any solvents when cleaning any excess sealants. Strong solvents may damage the face of the transducer.

Also, when handling the transducer, avoid lifting or pulling on the transducer cable. Although the cable appears thick and substantial, the internal cable wiring could be damaged by stress from the sheer weight of the transducer and cause a malfunction at the most inopportune time.

Portable Transducer Installation

Portable installations of the HydroBox HD transducer for most survey vessels will be of the over-the-side pipe mount type. This type of installation is achieved with the following list of materials:

Part Number	Item	Quantity
P04515	Transducer, HydroBox 210Khz	Optional
P01735-1	OTSM, 200Khz Over the side mount kit,	Optional
P04816HD	Transducer, HydroBox HD 33/210Khz	Optional
P01826-1	OTSM, 33/210Khz Transducer Mounting Assembly	Optional
User Supplied	Silicone grease or petroleum jelly (Vaseline®)	1
User Supplied	Pipe coupling	1
User Supplied	Pipe with threads to match the pipe coupling and length to give proper transducer depth	1
User Supplied	Pipe coupling adapter	1
User Supplied	Support Lines or cables	2
User Supplied	Pipe Clamps to affix the Pipe to the 4x4	1 (or 2)
User Supplied	Pressure Treated 4x4x (Ship's Beam Width + 2 feet)	1
User Supplied	Large "C" Clamps to affix the 4x4 across the beam of the vessel	2
User Supplied	Protective Pads or Carpet Remnants	2
User Supplied	Mild Household Detergent (i.e.,dishwashing liquid)	1

Table 2-4 Portable Transducer Installation Parts

Refer to Figure 2-9 below while reading and implementing the Installation procedure listed below.

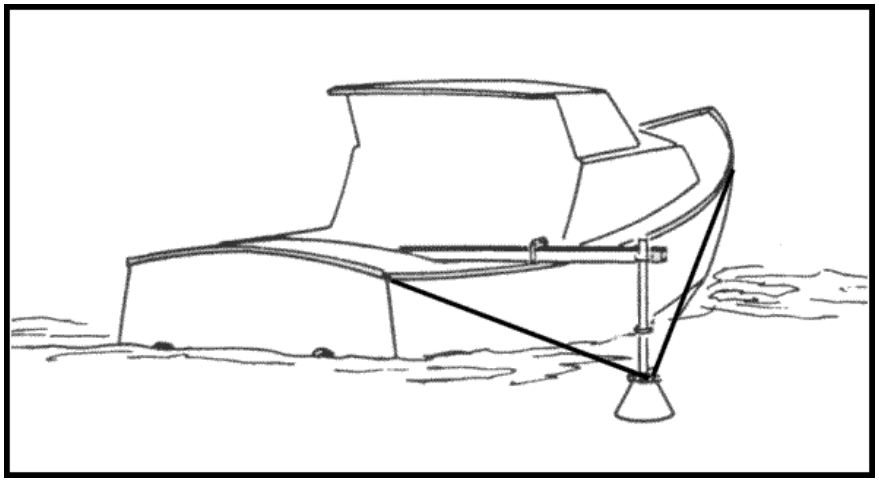


Figure 2-8Typical Over the Side Mount (reference drawing)

Over The Side Transducer Mounting (Example mount shown as reference only)

Figure 2-9 Over The Side Transducer Mounting

CAUTION: Never pull, carry or hold the transducer by the cable as this may sever internal connections.

Installation Procedure:

1. Apply silicone grease or petroleum jelly to the threads of the pipe to facilitate later disassembly.
2. Twist the pipe coupling onto the pipe.
3. Push the transducer cable through the pipe. Alternately after the transducer is attached, clamp the cable to the outside of the pipe using cable clamps.
4. Apply silicone grease or petroleum jelly to the transducer stem. Insure that the grease does not smear the face of the transducer.
5. Attach 2 lines or cables to the Transducer Mounting Assembly. These lines or cables will support the pipe from the force of the water when the boat is underway.
6. Attach the Pipe Clamp(s) near the end of the 4x4 insuring that there is enough clearance for the transducer to hang over the side of the vessel.
7. Place the 4x4 across the beam of the vessel near the stern and fasten it to the gunnels with the C Clamps. Use the Protective Pads or Carpet Remnants to protect the gunnels of the vessel. Insure that the 2 foot extra length of the 4x4 extends beyond the beam of the vessel on the appropriate side and that the Pipe Clamp(s) attached to the 4x4 are on the extra length as well.
8. Attach the Transducer/Pipe Assembly to the 4x4 using the Pipe Clamps. Insure that the transducer is deep enough into the water that sea conditions will not cause the transducer to get to the surface.
9. Fasten the line(s) or cable(s) fore and aft with sufficient tension to support the pipe when the boat is underway.

10. Route the cable to the instrument being careful not to tear the cable jacket. To reduce electrical interference, separate the transducer cable from other electrical wiring. Coil any excess cable and secure it in a place with zip-ties to prevent damage.

Portable Transducer Maintenance

Aquatic growth can accumulate rapidly on the transducer's surface reducing its performance in weeks. Clean the surface, keeping it free of marine growth and petroleum residue, with a soft cloth and mild household detergent. Inspect the cable periodically for kinks, abrasions and cuts. Repair any damage using an approved waterproofing cable repair system. Inspect connections for indications of corrosion.

WARNING: NEVER USE SOLVENTS!
Certain cleaners, gasoline, paint, sealants and other products may contain strong solvents, such as acetone, which can attack many plastics dramatically reducing their strength. Clean surface of transducer with a mild detergent only.

Permanent Transducer Installation

For some applications it may be necessary and/or convenient to mount the HydroBox HD Transducer permanently in the hull of the vessel. Due to the construction of the HydroBox HD Transducer it may NOT be directly affixed to the hull of the vessel. A Seachest Installation is required. Guidelines for performing a Seachest installation are described in the following sections.

Seachest Transducer Installation

Interior Seachest installations are best suited for solid fiberglass hulls to permit a minimum attenuation of acoustic reply signals. Hulls of other type material types may be considered but most other hull types will require that a Seachest design be built into the hull with an acoustic window across the face of the enclosure (i.e. a significant hole must be cut out of the hull).

Inside mounting to the hull does minimize drag to allow faster survey speeds, however, significant loss of subbottom performance may result due to the attenuation loss in the hull.

Locate the transducer where the hull is solid fiberglass resin to maximize sound transmission. Do not locate over balsa wood core material. Consult the hull manufacturer if you are unsure of the core material or the best location. Never bond large resin housings directly to the hull; always use a liquid-filled box.

In any permanent installation the intended final configuration should be tested before it is implemented, if possible.

For more information regarding the installation of a Seachest or other permanent transducer mount, refer to our website at http://www.syqwestinc.com/support/install/xducer.htm, or contact us directly.

END OF SECTION TWO

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3.0 OPERATION

3.1 HydroBox HD PC Software

This section describes how to operate the HydroBox HD Sensor using the PC Software package included with your HydroBox HD.

3.2 - The Main Window (11/12)

The HydroBox HD Main interface is divided into two fields, the **Controls and Status** field, and the **Data** field. The vertical window boundary between the fields may be positioned by the user as desired.

The **Controls and Status** field is located in the left portion of the window. It provides access to all of the user controlled parameters. Specifically, the **Controls and Status** field includes digital depth, an animated compass with heading marks in degrees, GPS Position, Time/Date, Ping Count, available disk space (for data storage), and HydroBox HD Sensor status.

The **Data** field is located in the right portion of the window. It displays the actual echo data. The **Data** field can be viewed in either *Normal* or *Zoom* mode. In Normal Mode, the entire **Data** field is used for displaying non-zoomed bottom data. In Zoom Mode, the **Data** field is divided in half to show zoomed data on the left and normal bottom data on the right. While echo data is being shown in either mode, the user may use the mouse to obtain a digital depth value anywhere in the water column by pointing and clicking. See Figure 3-1 and table for more info. (The picture reflects the software in Zoom mode)

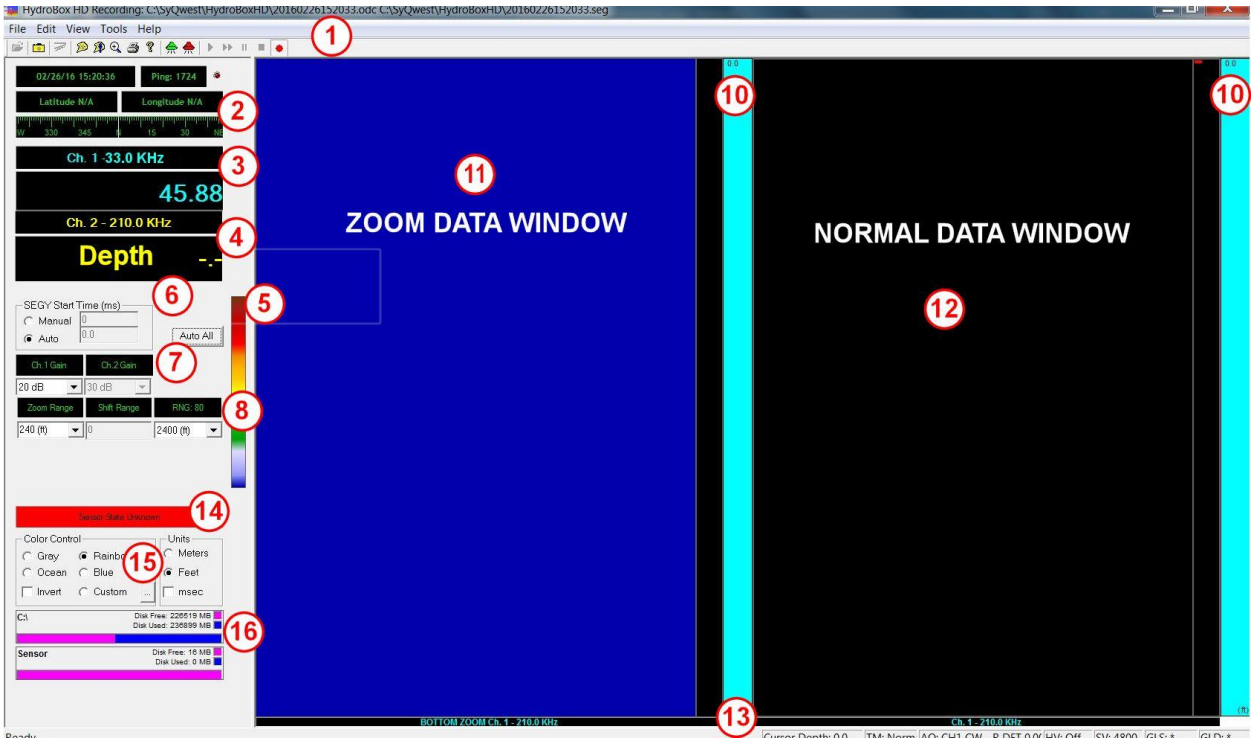


Figure 3-1 Host Software Main Window

NOTE: The current on-screen bottom image in both Zoom and Data windows will be lost upon resizing the window

3.2.1 The Toolbar (Figure 3-1, 1)

Quick access to common HydroBox HD functions. From left to right they include:


Open A Playback File


Insert Text Annotation


Insert Manual Event Mark


Toggle Playback Zoom


Toggle TDU Printer On or Off


Get HydroBox HD Software And Version Info


Starts the HydroBox HD Sensor Pinging


Stops the HydroBox HD Sensor Pinging


Playback a Previously Recorded File


Toggle Fast Forward/Normal Playback


Pause Playback


Stop Playback

NOTE: Playback buttons are available in Playback mode only and will be disabled otherwise.

3.2.2 Function Key Controls

The Function Keys on the Keyboard are setup to allow the operator easy access to the most frequently used parameter controls in the HydroBox HD system. A mouse or trackball can be used to access all of the parameters as well but often in shipboard conditions, the use of pointing devices can be difficult so having "Hot Keys" is beneficial.

Function Keys F1 through F11 are all available and each key's purpose is described below:

F1 – Gain

F2 – System Range

F3 – System Power Level

F4 – BT Gain

F5 – Playback, Play Button

F6 – Playback, Fast Forward Button

F7 – Playback, Pause Button

F8 – Playback, Stop Button

F9 – Manual Event Mark

F10 – Manual Annotation

F11 – Toggle Auto All Button

NOTE: When changing the system parameters press the corresponding Hot Key and use the up/down key on the directional pad to select the desired parameters.

3.2.3 Navigation/Depth Display (Figure 3-1, 2/3/4)

These indicators provide navigation and digital depth info to the user in real-time. Navigation/Depth information includes the digital depth, current Date/Time, global position, and ping count.

The digital depth is shown to 1 decimal place in both Feet and Meters and is displayed in a large font to make viewing easier from a distance. The depth value is updated once per ping and will show **-.-** if the depth is not found or invalid.

The Date/Time shown is based on the user's PC clock by default and can be displayed in Local time or GMT (See User Preferences in Section 3.6.7). If the PC is connected to a GPS receiver that is receiving valid navigation data, the Date and Time on the user's PC can be synchronized to the UTC Date/Time transmitted from the GPS (See "Configure NMEA I/O" in Section 3.6 for more information).

Position info is also provided when a GPS receiver is connected to the PC and the HydroBox HD Software is configured and receiving valid GPS data. When GPS Position data is not available, the display will show "Latitude N/A" and "Longitude N/A". If the HydroBox HD PC Software is receiving position data, it will be provided in Decimal Minutes format. (i.e. 41° 22.74402' N, 71° 36.25902' W)

The ping count is included to provide the user with a means of estimating how fast the HydroBox HD Sensor is pinging, and also for how long. The ping count is reset to zero when any of the following events occur:

The HydroBox HD PC Software is restarted.
A Recording or Playback file has begun.
The HydroBox HD Sensor has temporarily lost power and reset.

In addition, the HydroBox HD software features an animated compass which displays the current heading. The compass is located underneath the GPS position information.

3.2.4 Gain and Auto All Controls (Figure 3-1, 7)

The Gain controls consist of two pull-down menus that control the HydroBox HD Sensor's gain settings (one for each data channel). The HydroBox HD *Hardware* gain is controlled by the **Ch1 Gain** control and can be set either from 0-75 dB, or to Auto Mode. For Dual channel systems the hardware gain for Channel 2 is similarly controlled by the **Ch2 Gain** control.

Depressing the **Auto All** button sets the HydroBox HD Sensor to automatically choose the best Range (Refer to next section for more information on Range) and hardware Gain settings for the given bottom conditions, making bottom tracking easier for the user. Clicking the **Auto All** button again will toggle the HydroBox HD back to manual mode. **Note that using Auto All will provide the easiest bottom tracking for the user but in most cases it is NOT the best way to use the HydroBox HD system for sub-bottom sediment data collection.** This is because frequent system gain

changes may occur in **Auto All** mode which is not beneficial when trying to view and evaluate sub-bottom data records.

NOTE: When in Auto All mode, the Ch. 1 and Ch. 2 Gain control is not available and will be controlled by the HydroBox HD automatically. While the control is disabled, it will automatically indicate the hardware gain setting that the auto gain function has selected for each data channel.

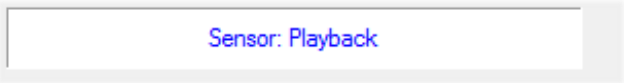
3.2.5 Range, Zoom Range, and Shift Controls (Figure 3-1, 8)

The **Range** control allows you to choose a manual range for the HydroBox HD Sensor. It includes six range settings presented in either Feet or Meters.

The **Zoom Range** control has five settings which are used to set the range of the Zoom window. These values will be in either Feet or Meters depending on which units are selected.

NOTE: When in Auto All mode, the Range control is not available and will be controlled by the HydroBox HD automatically. While the Range control is disabled, it will indicate the current Range setting that the Data Acquisition /Playback unit has chosen. Shift Range will also not be available nor have any effect in Auto All mode.

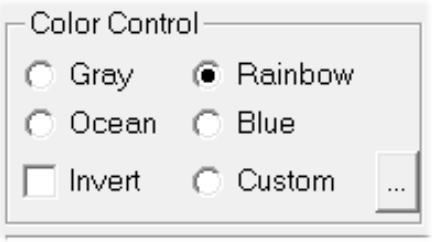
3.2.6 Data Acquisition / Playback Unit State (Figure 3-1, 14)



This indicator shows the current state of the HydroBox HD Sensor. There are a total of 6 different states:

Unknown	- No communication is present between the Data Acquisition / Playback Unit and the HydroBox HD Software.
Power On	- Power has been applied to the HydroBox HD and the Data Acquisition / Playback Unit has begun communicating.
Initializing	- The HydroBox HD software is handshaking with the Data Acquisition / Playback Unit to establish a reliable connection.
Idle	- A connection between the HydroBox HD Software and the HydroBox HD Data Acquisition / Playback Unit has been established, but no commands have been received yet.
Pinging	- The HydroBox HD Data Acquisition / Playback Unit is transmitting and receiving real-time bottom data.
Playback	- The HydroBox HD Software is displaying previously recorded data from a playback file.
Post Failure	- The HydroBox HD Data Acquisition / Playback Unit did not pass the initial Power On Self Test. This error will always include an error code.
Flash Failure	-The sensor unit had a self test failure.

3.2.7 Color Palette and Unit Controls (Figure 3-1, 15)



The HydroBox HD PC Software allows you to choose from 4 standard color palettes by clicking on one of the radio buttons located in the **Color Control** section. If you wish to create your own palette, you can do so by selecting **Custom** and clicking on the button to right of it. You can also reverse the current palette by using the **Invert** box.

3.2.8 Unit Controls (Figure 3-1, 15)

Along side the Color Control is the Units control. You can choose to display depth and range information in Feet or Meters. You can also check the Milliseconds box to display range and zoom range scale bars in Milliseconds rather than Feet or Meters.

3.2.9 File Capture Status (Figure 3-1, 16)

This feature allows the user to view the Recording status when capturing data to a hard disk. The status shows the drive letter of the destination drive as well as a graph depicting how much free/used space is present on that drive. During recording, the current file size will be shown also.

3.2.10 Range Markers (Figure 3-1, 10)

These scalebars show the full range of the data windows and are based in the current unit selected. Also, if GUI Zoom is activated, two slider bars will be visible on the right scalebar. They are used to specify the GUI zoom window boundaries. In addition, when Marker Zoom is enabled, a single slider bar will appear and is used to specify where the water column will begin in the marker zoom window.

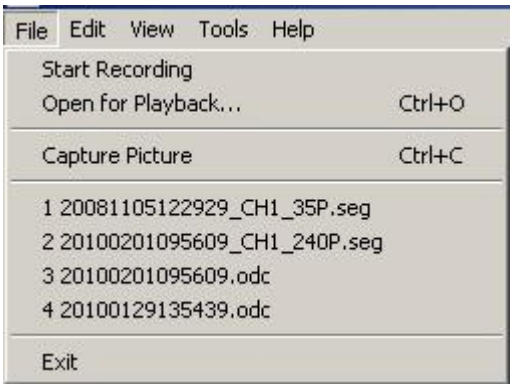
3.2.11 Mouse Depth Fields (Figure 3-1, 13)

Using the mouse, the user may obtain a digital depth value anywhere in the water column by moving the cursor within the Normal or Zoom data display windows. The cursor depth field on the lower left side of the window shows the digital depth value in feet or meters, depending on which has been selected. This window may be conveniently moved anywhere on the screen and will remain open until it is closed.

NOTE: To fine-tune in on a depth value, the user just has to move the mouse over the data screen. The digital depth shown in the status bar display will be continuously updated.

3.3 – File Menu

The HydroBox HD PC Software has 4 menus on the menubar including **File**, **Edit**, **View**, and **Help**. Most of the HydroBox HD Software Preferences and Navigation configuration are accomplished through these menus.



3.3.1 Start/Stop Recording

Creates a new file on the specified hard disk for capturing acquisition data. If the HydroBox HD Sensor is already pinging, then the software will start the data recording immediately. When recording is started, both ODC and SEGY files are stored for the acoustic data from every ping cycle.

The **ODC file** stores the pixel data (8 bit) from each ping along with all of the time, GPS, and parameter information to allow the Playback function to replay any survey data just as it was recorded in real time. The data resolution is NOT as high as the SEGY data but the file is very useful for reviewing data quality. It is also useful when addressing any issues regarding the settings for data collection. The ODC filename format is shown below:

<path>YYYYMMDDhhmmss.odc

<path> - This represents the path to a directory where the recorded files should be stored. The file path is selected with the Data Confirmation Window (see below) using the associated "Browse" button for ODC and SEGY files. CSV files are stored in the same directory with the ODC files.

YYYY - 4-digit Year
MM - 2-digit Month
DD - 2-digits Days
hh - 2-digits for Hours
mm - 2-digits for Minutes
ss - 2-digits for Seconds
.odc - ODEC's Proprietary File Extension

The **SEGY file** stores the acoustic data (16 bit) from each ping in the industry standard SEGY format. The acoustic data is stored at the native sample rate of the system (80KHz) and the user can select either PROCESSED or RAW data collection based on their post processing needs.

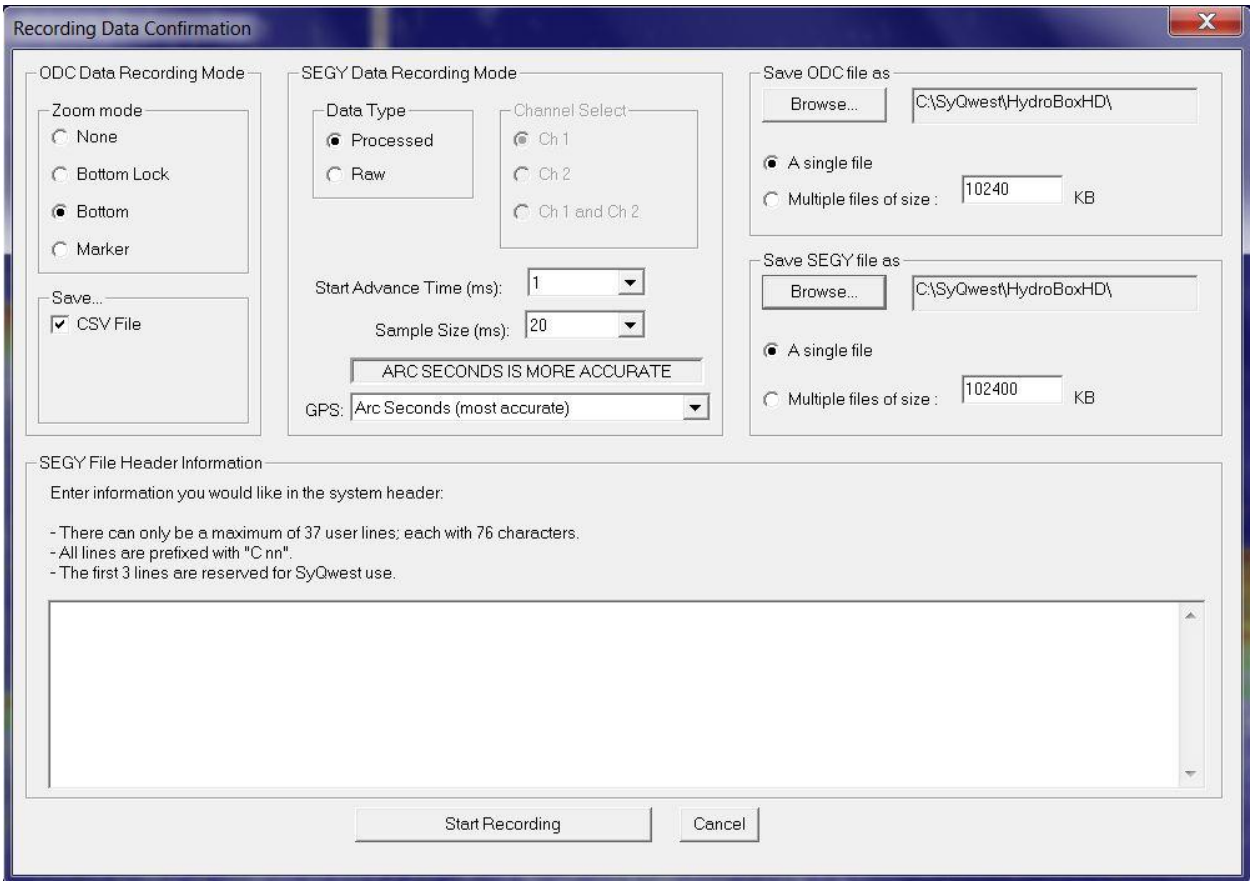
The SEGY file also stores all of the time, GPS, and associated parameter information in the field locations specified by the SEGY specification. The SEGY filename format is shown below:

<path>YYYYMMDDhhmmsspff.seg

<path> - This represents the path to a directory where the recorded files should be stored. The file path is selected with the Data Confirmation Window (see below) using the associated "Browse" button for ODC and SEGY files. CSV files are stored in the same directory with the ODC files.

YYYY - 4-digit Year
MM - 2-digit Month
DD - 2-digits Days
hh - 2-digits for Hours
mm - 2-digits for Minutes
ss - 2-digits for Seconds
p - 1-digit for Processed(p) OR RAW(r) data storage type
ff - 2-digits for Low Frequency (lf) or High Frequency (hf) channel
.seg - SEGY File Extension

NOTE: Once recording is started, this option will become "Stop Recording".



Recording Data Confirmation

Allows the user to select the data storage format, file size and annotate SEG-Y header information.

ODC Data Recording Mode

Zoom Mode

In most data applications it is best to make use of a zoom mode. Zoom mode allows for high resolution viewing of the bottom or sub-bottom. The high resolution zoom data is ONLY STORED in the ODC file if one of the zoom modes are enabled. In deeper water application much of the sub bottom layering information will not be available with the ODC file if a zoom mode is not enabled (it will still be available with the SEGY file).

None – This mode displays the normal bottom data by itself without any zoom information.

Bottom lock – Locks the bottom data to the upper portion of the zoom screen so the user can monitor the sub-bottom data.

Bottom – Centers the zoom display at the current depth

Marker – The user controls the portion, which the zoom display focuses on.

Save CSV File

Comma Separated Variable File. If this is checked, a CSV file is stored with all of the serial data logger output information.

SEGY Data Recording Mode

Data Type

The Data setting has two options, Processed and Raw. The Processed option is used for 16 bit data stored after FM (correlation) or CW (energy detection) processing. The Raw option is used for 16 bit, two's complement value, directly from the analog to digital converted. Raw reflects the signal that has been amplified and filtered but no DSP process to signal. In most cases, the Processed data (Envelope) is the preferred selection but some scientists prefer to re-process the Raw (A/D input) data themselves.

NOTE: Most of the subbottom data post processing packages make use of the PROCESSED SEGY data so users should verify the data type they want to store BEFORE going out on their survey. If there is a question on this field, the user should select PROCESSED.

Start Advanced Time

The start advanced time option allows the user to choose the amount of acoustic data that is recorded above the bottom. The time intervals offered are 1, 2, 3, and 5 msec. The total sub bottom data recorded is the difference of the start advanced time and the sample size i.e.(50 msec with a 5msec start time will record 45msec below the bottom. In most cases the 1,2 msec options are best. In certain situations where the bottom digitizer is jumping due to softer sediments choose the 3 or 5 msec option to ensure no sub bottom data is lost.

Sample Size (msec)

The sample size setting has four options, 25msec, 50msec, 100mec and 200msec. These numbers represent how much sub-bottom data is being recorded and are dependent upon the sound velocity that the user has selected. The approximate amounts of subbottom strata stored for each of the settings listed above is 0.75 meters per 1msec:

25msec = 18.75 meters

50msec = 37.50 meters

100msec = 75 meters

200msec = 150 meters

The user should consider the survey depth conditions and the bottom type to determine the appropriate sample size. The sample size should be large enough to make sure all the useful data is retained but note that the file sizes get larger as the sample size increases. For most applications 50msec or 100msec are the best selections to use. In depths greater than 70 meters the 200 msec selection is preferred. Note that when post processing data it is best to NOT change the sample size within a data set as it makes the post processing effort more difficult.

GPS

The GPS setting has two options, seconds and degrees. The user should set this option to the format that is best suited for their post processing software. "Seconds" is for GPS output data in "Degrees, Minutes, Seconds" format and "Degrees" is for GPS output data in "Decimal Degrees" format.

Note: In almost all cases, the "Seconds" format should be chosen. The SEGY field formatting is setup to allow for finer resolution position data when the "Seconds" format is used.

SEGY File Header Information

The SEGY header is a 40 line, 80 bytes per line, EBCDIC header. The user can enter file information in this text box. There are 37 user lines, which can store up to 76 characters per line. The first three lines are reserved for SyQwest information.

Recommended information for the EBCDIC header is:

-Client
-Company
-Geographical Area
-Start date and time of the Recording
-Observer Name
-Line Number

Save ODC and SEGY File

The "Save ODC File as" and "Save SEGY File as" fields provide the user a way to organize the file folders for both ODC and SEGY file storage. The sub menus show the user the current file path for each type of file and allow the user to select a different file path via the browse button.

This sub menu also provides the user two choices for saving the data: Single File or Multiple Files. The Single File option is simple and is fine for most survey applications. The Multiple file option allows the user to create sequential files of a certain size (in KB) so that the file sizes can be more easily managed when need be. When the Multiple file option is selected the Host software automatically terminates the SEGY file and starts a new file when the data size is reached. The result is multiple SEGY files of equal size denoted with a -1, -2, -3…etc. extension after the normal base file name.

3.3.2 Open for Playback

Allows the user to select a stored ODC or SEG-Y file from file storage for playback and Post-Processing. All other Playback functions are controlled by the coinciding buttons in the toolbar, or "Hot Keys". Playback filenames are created based on the date/time. (Refer to the above section for more information) **.**

3.3.3 Capture Picture

The Capture Picture function is a useful feature. By depressing the Camera Icon on the Tool Bar, the user will cause a Screen Shot of the entire HydroBox HD display to be sent to the path selected in the User Preferences dialog box. The file format for the Screen Shot is Jpeg and thus can be shared and viewed using any standard picture viewing software package. The file name for the screen shot reflects the date and time of capture:

YYYYMMDDHHMMSS.jpg where:

YYYY - 4-digit Year
MM - 2-digit Month
DD - 2-digits Days
HH - 2-digits for Hours
MM - 2-digits for Minutes
SS - 2-digits for Seconds
.jpg - Standard Jpeg File extension

The Capture Screen Shot feature is most useful for storing historical information as it provides an instantaneous shot of any interesting bottom contour activity. When used in conjunction with a GPS (the position will be stored in the screen shot as well if a GPS is connected), the exact location, date, and time are all accessible at a moments notice

Recent Files

The HydroBox HD software keeps a list of the 4 most recently opened playback filenames for easy access. These filenames are found between the "User Preferences" and "Exit" menu options. Clicking one will immediately begin playback of the file.

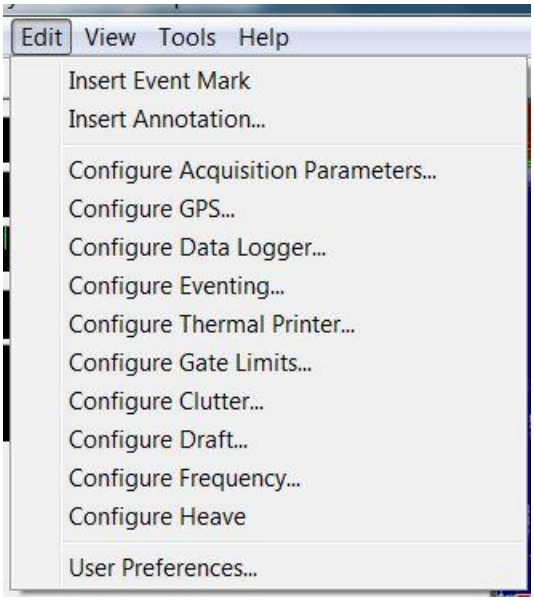
Exit

You can exit the HydroBox HD PC Software by either using the "Exit" on this file menu, or by simply clicking on the windows default close button.

3.3.4 The Menu Bar

The HydroBox HD PC Software has 4 menus on the menubar including **File**, **Edit**, **View**, and **Help**. Most of the HydroBox HD Software Preferences and Navigation configuration are accomplished through these menus.

3.4 – The Edit Menu

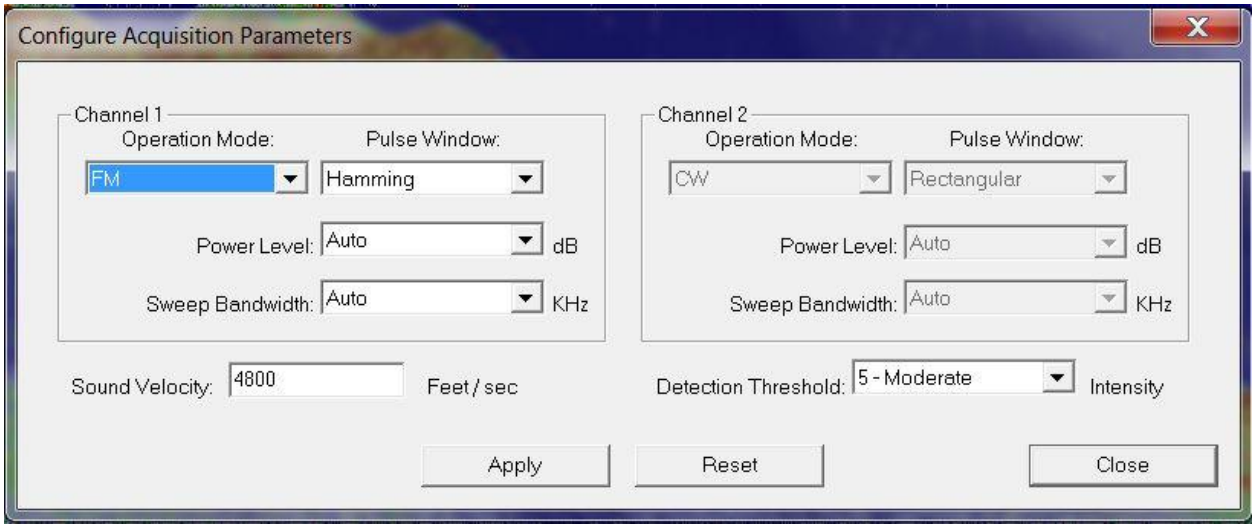


Insert Event Mark
Selecting this option will generate and insert a formatted event mark on the display, in the recorded file (if recording is on), and if enabled, the thermal printout. The event mark contents can be configured by selecting "Configure Events…" under the File menu. In addition, an event mark can also be inserted by clicking the corresponding toolbar button. (See Section 3.2)

Insert Annotation
Selecting this option will allow you to enter a custom text message to be inserted on the display, the recorded file (if recording is on), and if enabled, the thermal printout. In addition, annotation text can also be inserted by clicking the corresponding toolbar button. (See Section 3.2)

3.5 Configure Acquisition Parameters

Allows the user to select the Operational mode, Pulse Window, Power Level, Sweep Bandwidth, Sound Velocity, and Detection Threshold adjustments.



Operating Mode

Selects transmit waveform and detection processing mode of operation. Selectable modes are: CW (Energy) OR FM (Chirp).

Transmit Rate

The transmit pulse repetition rate varies from 4Hz to 10Hz dependent on depth range and selected pulse length**. The Transmit Rate is selected automatically to provide the maximum bottom coverage for a given depth range**.

Pulse Length

The transmit pulse length varies from 0.2ms to 5ms (.2ms, .5ms, 1 ms, 2ms, 5ms) and is dependent upon the operating mode (CW or FM) and the depth range selection. **The transmit Pulse Length is selected automatically by the system to provide the optimum system performance based on the processing mode selected and depth of operation.**

.Pulse Window

Transmit waveform shaping is provided to allow for maximum average power or a reduction in range side lobes, resulting in higher resolution sub-bottom profiles and slope tracking. Selectable windows are: Rectangular, Cosine, Hamming, or Blackman

Sound Velocity

Allows the user to adjust the speed of sound adjustment 1400-1600 meters/second or 4595-5250 feet/second, in 1 unit increments.

Sweep Bandwidth

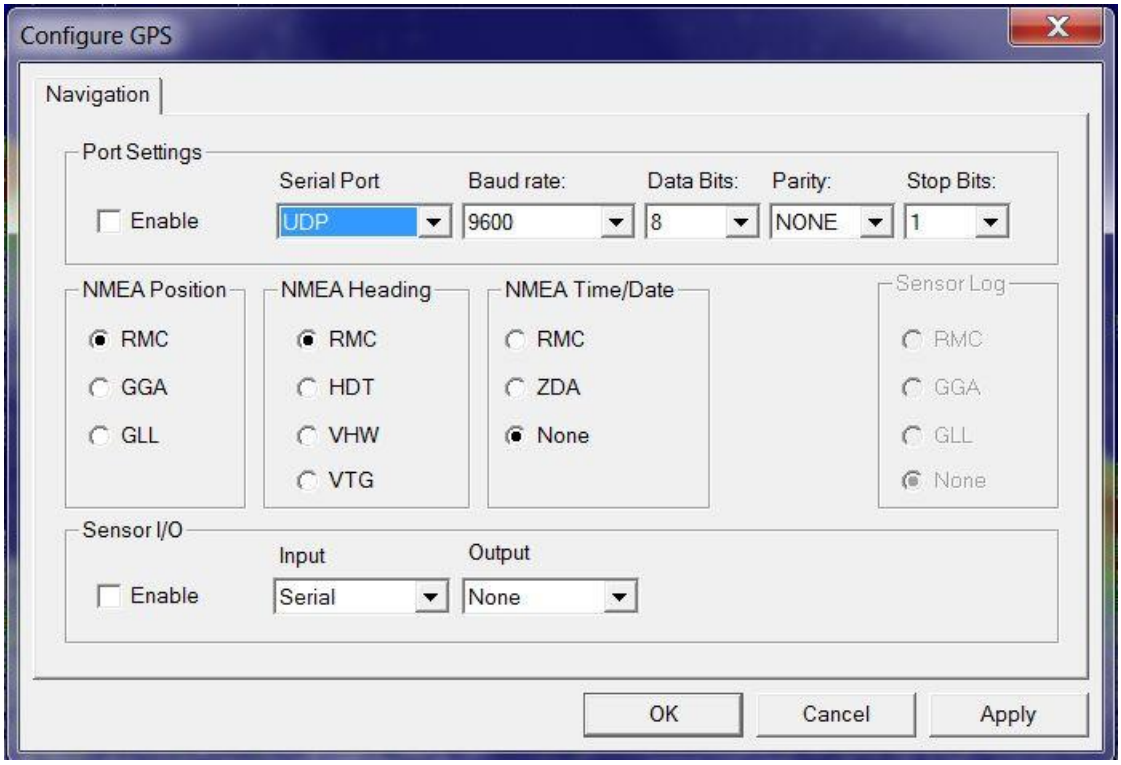
FM sweep frequency bandwidth. User selectable bandwidths are: AUTO, 1KHz, 2KHz, 4KHz and 8kHz (only to be used with wideband transducers). AUTO is the best selection in most cases here as it selects the widest usable bandwidth for the system (4KHz or 8KHz).

Detection Threshold

The Detection Threshold value is provided to allow the user to vary the echo reply level that is recognized by the Bottom digitizing function as a valid bottom echo. The Detection Threshold value can be varied from 0 -> 9 with 0 representing the highest echo threshold and 9 representing the lowest. An AUTO selection is also available. In most cases, AUTO or level 5 is the best setting. In shallow water the lower threshold level selections (7-9) may be needed to minimize reverberation and 2nd return effects. In moderate and deeper depths higher threshold levels (0-4) maybe useful if the AUTO or level 5 is not providing optimum bottom tracking.

3.6 Configure Serial Ports,

3.6.1 Configure Serial /UDP Port, Navigation



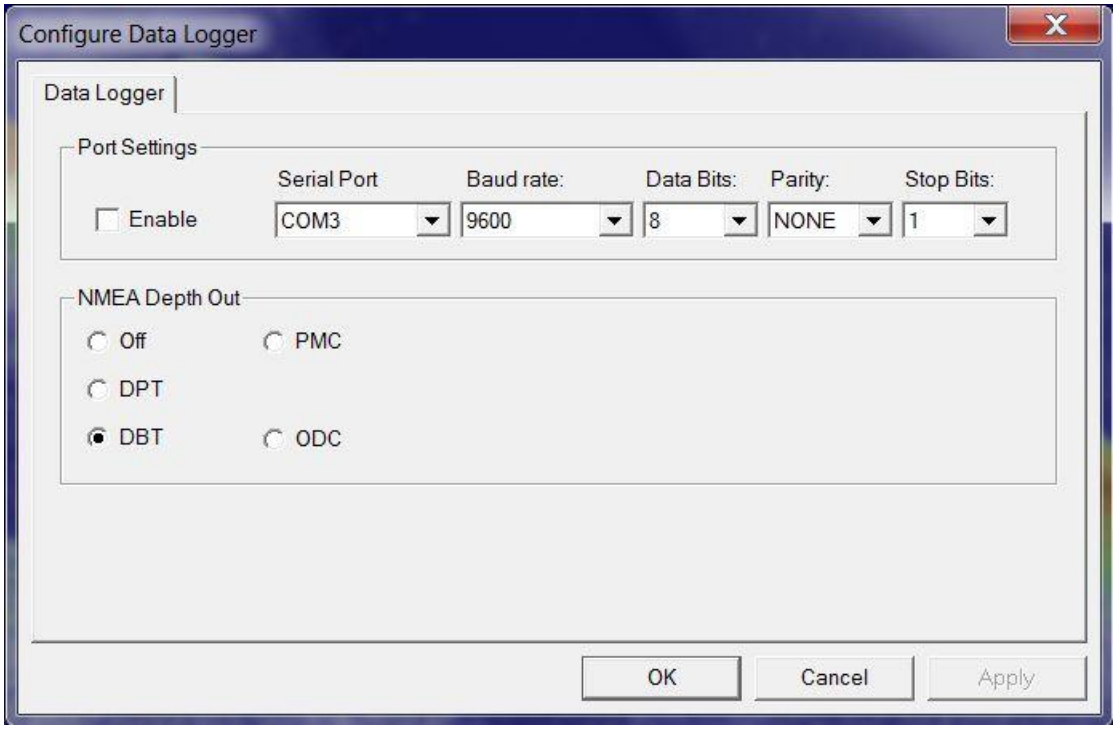
This menu allows the user to configure the HydroBox HD software to receive NMEA 0183 navigational information from a GPS receiver, or equivalent. The GPS NMEA 0183 serial data is received on the COM port chosen or UDP and configured by the user.

The HydroBox HD can interface to a GPS using a UDP interface via IP 127.0.0.0 using port number 4543

Using the "Enable" checkbox in the Port Settings area, the user can enable/disable the NMEA navigation input. When enabled, the appropriate PC COM port and communication parameters need to be setup. The serial GPS data string is setup to use 8 Data bits, No Parity, 1 Stop bit, and the matching baud rate as a default setting. Make sure a format that matches the GPS receiver settings is selected. Check your GPS manual for more information.

In addition, you must choose which NMEA GPS sentence or sentences the software will use to collect navigational data. If available, the RMC string is the best to select for all because it includes NMEA position, heading, time and date in a single NMEA string. If RMC is NOT available GGA is next best because it at least has NMEA position and time. Other strings may be used to input Heading information and if the PC's local time and date is preferred, the NMEA Time/Date should be set to NONE.

3.6.2 Configure Serial Ports , Data Logger

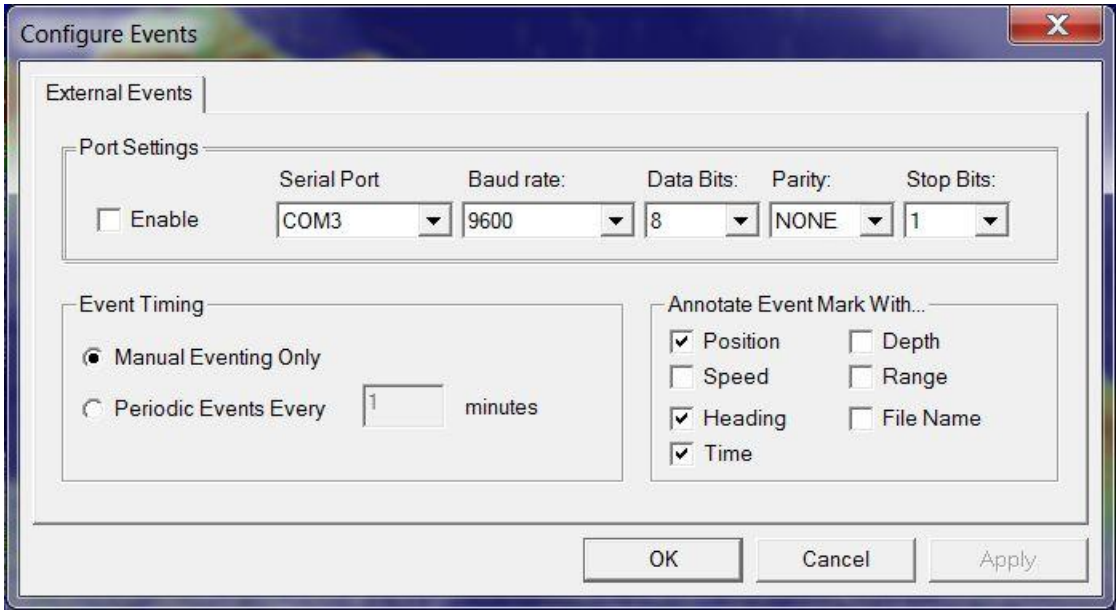


The Data Logger tab allows the user to configure the HydroBox HD software to output NMEA 0183 depth information to a survey software package or other logging device. The GPS NMEA 0183 serial data is transmitted on the COM port chosen and configured by the user.

Using the "Enable" checkbox in the Port Settings area, the user can enable/disable the NMEA data logger output. When enabled, the appropriate PC COM port and communication parameters need to be setup. The serial data logger string is setup to use 8 Data bits, No Parity, 1 Stop bit, and the matching baud rate as a default setting. Make sure the parameters are updated to match the logging software settings. Check your survey of logging manual for more information.

The user must also select a NMEA depth sentence format for the serial output. There are four depth output strings to select from: NMEA DPT, NMEA DBT, SYQWEST PMC, and SYQWEST ODC. The PMC format is fully compatible with any third party software, such as HYPACK, SonarWiz5. The ODC output includes the position information along with the depth.

3.6.3 Configure Serial Ports, External Events



The External Events tab allows the user to configure the HydroBox HD software to receive a serial event message from a survey software package or other survey control device. The external event message is received on the COM port chosen and configured by the user.

Using the "Enable" checkbox in the Port Settings area, the user can enable/disable the External Events input. When enabled, the appropriate PC COM port and communication parameters need to be setup. The serial event string is setup to use 8 Data bits, No Parity, 1 Stop bit, and the matching baud rate as a default setting. Make sure the parameters are updated to match the event software settings.

Configuring External Events is described in Section 3.6.3 below. Please refer this section for more information on External Events.

3.6.4 Configure Eventing

The Configure Events box is used to setup the format and timing of event marks that are stamped on the video display, stored in the data files, and tagged on the printout when a printer is connected to the system. Events are generated in three ways:

Manual - Events initiated by a by user action with the HydroBox HD host software

Periodic – Event is setup in the Configure Events box above and occurs every X minutes in time.

External – Event is initiated by an external survey program or survey tool and is sent via a serial message.

The "Event Timing" controls the Manual and Periodic eventing that is initiated within the HydroBox HD host application.

The "Annotate Event Mark With…" area allows the user to select from a list of important data acquisition parameters to display and store when the event occurs. The parameters that are checked are included in

the event mark as an annotated string next to the mark. The parameters selected here are used for both manual and periodic event marks.

Manual Events are initiated by a user action in a number of ways. Depressing the toolbar Event button, or selecting the corresponding menu option "Insert Event Mark" under the *Edit* menu both will insert an event mark.

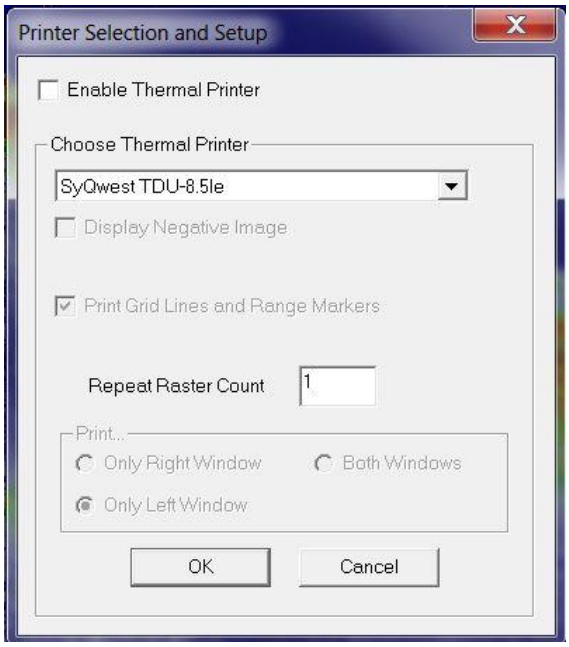
Periodic Events allow the HydroBox HD software to insert events at a specific interval, depending on the number of minutes entered by the user (see figure above). When periodic eventing is enabled the marks will be repeated at the selected time interval whenever the system is pinging. While in periodic mode, the user may still insert manual event marks in addition to the periodic ones.

External Eventing has been implemented as means of allowing third party survey software, such as HYPACK, to remotely generate Event marks and annotation in the HydroBox HD software. It can be configured by enabling the "External Eventing" option and setting the communication parameters such as UDP or COM Port, Baud Rate, Start Bits, Stop Bits, and Parity to match the configuration of the third party software. The HydroBox HD software accepts external annotation/eventing with the same format that the Bathy-500MF uses. That format is as follows:

(CTRL F) (CTRL A) (Annotation String) (CTRL D)	- Generates an event mark containing the text in the Annotation String
(CTRL F)	- Generates an empty event/fix mark

NOTE: External Eventing requires an additional COM Port.
Periodic Eventing is not available when External Eventing has been enabled.
All event marks and text annotation shown on the screen are inserted BETWEEN the acquired bottom data so that there is no loss of information.

3.6.5 Configure Thermal Printer



This menu allows you to configure a thermal printer for use with the HydroBox HD software. It supports 3 different models from the Raytheon/SYQWEST TDU series, including the TDU-8.5ie, TDU-850, TDU-1200, and the TDU-2000.

In addition to Enabling or Disabling the printer, there are a number of other options available to the user. These settings only affect the thermal printout, not the on-screen display. They include:

Display Negative Image

- Enabling this option will invert the gray scale colors on the thermal printout.

Flip Rasters Left to Right or Top to Bottom

- Enabling this option will print a mirror image of the event/annotation marks. This option is to be used in conjunction with the L/R dip switch located on the back of the TDU Printer (Refer to your TDU Manual for more information). By default, the switch is set to the L position and so this option should not be enabled. However, if the dip switch is set to R, enable this option to print the event/annotation marks correctly.

Print Grid Lines and Range Markers

- Enabling this option will print the data along with 4 grid lines and periodic range markers.

Print Annotation Text Transparently

- By default, this option is not enabled and annotation is printed with a solid background so that the text is always readable. This will cause some bottom data not to be shown on the printout, but will still be present on the display and recording file (if recording is on). Enabling this option will print annotation text without a solid background. This may make annotation text hard to read when printed over bottom data.

Repeat Raster Count

- A Repeat Raster Count can be entered between 1 and 10. The default count is 1 Raster. Increasing this value will cause the printout to be stretched horizontally. This option is useful when using a TDU-1200 or TDU-2000 printer which has a finer vertical resolution. (i.e. Pixels are small)

3.6.6 Configure Gate Limits

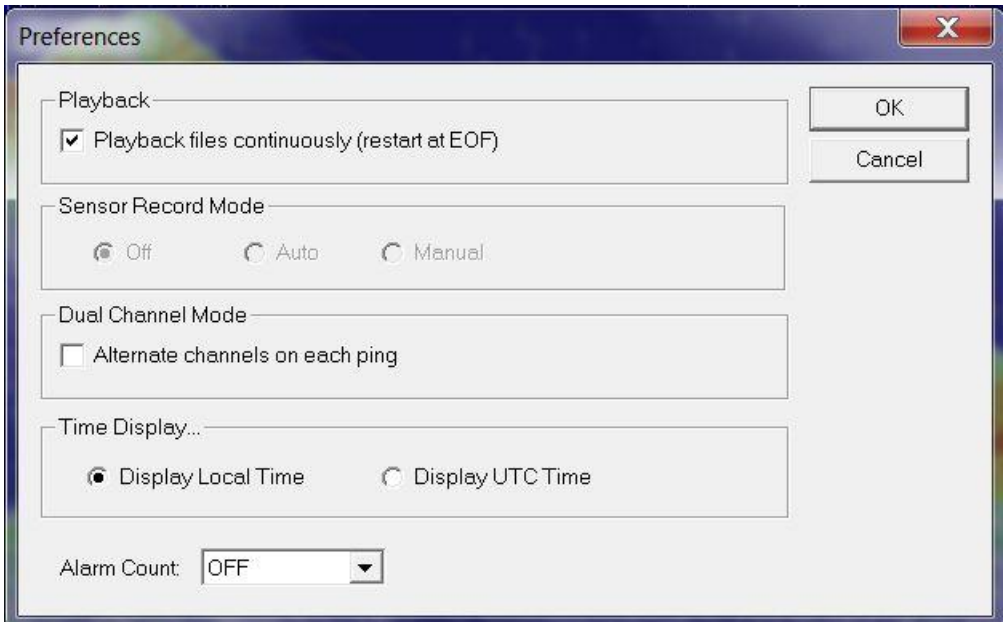
Gate Limits. Select from Edit pull-down menu. The Bottom Gate Limits are provided to help the user ensure that the data captured reflects the correct digitized bottom depth when conditions are difficult. The HydroBox HD is intended for use in shallow water. Unfortunately, using low frequency sonar is best for strata penetration but it also causes significant surface reverberation and multiple echo issues. By using the Bottom Gate Limits the user can ensure that the digitizer does not lock on either of the following two shallow water conditions:

· **Transmit pulse reverberation near the surface** (close to 0 meters). For transmit pulse reverb issues the Shallow Limit should be set to a depth where the transmit pulse reverb is no longer visible on the data display.

· **2nd echo return (2X real bottom depth)** – For 2nd return issues the Deep limit should be set to a value well below the 1st return on the data display but well above the 2nd return depth.

The Bottom Gate Limit values for Shallow and Deep limits are entered in the selected units (Feet or Meters) and the "Enable Gate Limits" check box allows the Gate Limits to be Enabled or Disabled. Please note they only work in manual range and gain mode (not for use in auto mode). When Manual Gate Limits are enabled their selected values will show up in the lower right corner of the screen as GLS (Gate Limit Shallow) and GLD (Gate Limit Deep). Also, once enabled if the actual bottom moves out of the selected window you will no longer be able to digitize (you will get -.- for depth). When the Gate Limits are disabled a message is displayed to alert the user that they have been disabled and should be re-checked.

3.6.7 User Preferences



Playback

This menu allows you to configure recording and playback options. By selecting “Playback files continuously”, the current playback file will repeat from the beginning when it reaches the end.

Time Display

Allows the user to specify which UTC Time Zone the Date/Time should be based on. The Date/Time shown on the display will also be the value recorded to a file if recording is active. Choosing “Local Time” will enable whichever Time Zone is currently selected in the Windows operating system.

Alarm Count

This menu also allows the user select the Alarm Count which is a threshold on which if the bottom is lost for a user selectable number of pings the HydroBox HD will then signal; bottom lost.

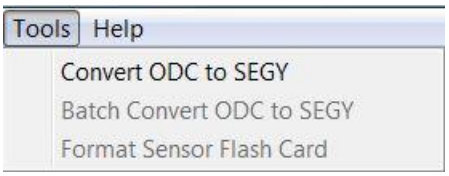
3.6.8 Configure Clutter

The Clutter Level setting allows the user to dynamically adjust the color palette to eliminate low level noise in areas where the water is contaminated. The Auto setting is good for most applications but manual Clutter setting from 1 to 9 can be selected to the user liking. Level 1 permits the lowest signal levels to be viewed. The optimum values for most applications are in the 4-6 range.

3.6.9 Configure Draft

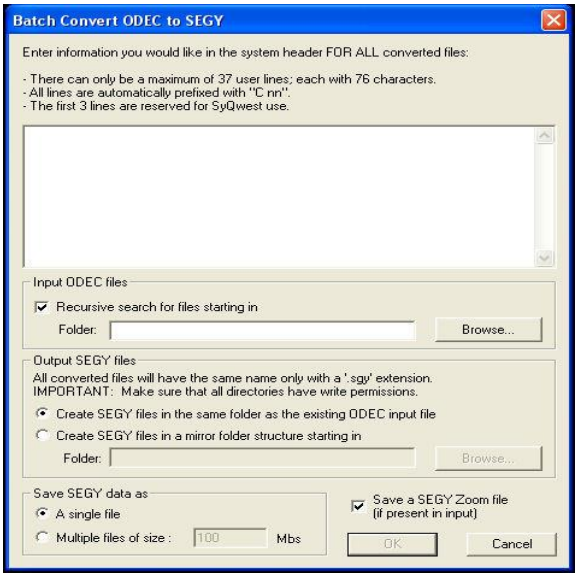
Allows the user to compensate all sounding data for transducer location and ship's draft. The value can be entered in tenths of units.

3.7 The Tools Menu

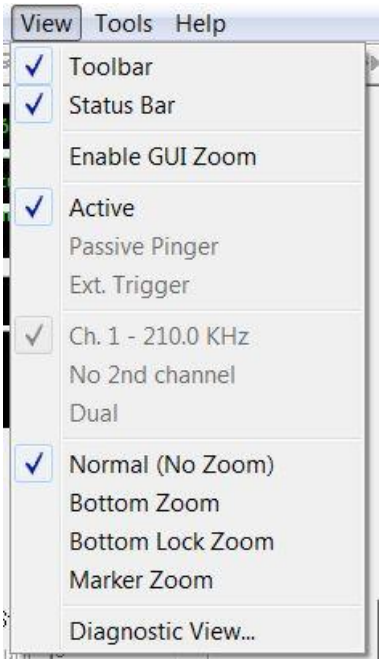


Convert an .odc to SEG-Y (.seg) file converter. Is selectable from tools drop-down menu.

Batch Convert .odc to SEG-Y (.seg) multi-file batch converter. Select from Tools pull-down menu. Useful for HydroBox HD customers who have many .odc files to convert.



3.8 – The View Menu



Toolbar

Selecting this will toggle the toolbar on and off. (Refer to Section 3.2 for more information on toolbar).

Status Bar

Selecting this will toggle the Status Bar on and off. The Status bar is located at the bottom of the HydroBox HD application and displays extended information about a particular button or function.

Raster View / Wiggle Trace

The HydroBox HD software allows the user to display bottom information in two formats, Raster view or Wiggle Trace. In Raster view, bottom information is depicted graphically with bottom intensity being represented by the different colors in a specified color palette. In Wiggle Trace view, the bottom information is shown ping by ping with acoustic energy being represented horizontally.

NOTE: Wiggle Trace mode is only available in the Normal display. All zoom data will appear in Raster mode.

Enable GUI Zoom

This option allows the user to digitally scale bottom data from a playback file and can function as a manual zoom. This feature was included in order to provide a method to zoom in on bottom data previously recorded without one of the HydroBox HD Sensor's enhanced zoom modes enabled. When enabled, two zoom bars will appear on the scalebar of the Normal Data window. These bars can be dragged up or down in order to set the GUI zoom range. Data displayed in GUI Zoom is derived from recorded Normal data.

Display Modes

The HydroBox HD Sensor features an enhanced multi-mode zoom. It provides a smooth, magnified high-resolution window of the bottom. The enhanced zoom modes are acquired in real-time and are displayed/recorded at higher sample rates than the Normal data (assuming the zoom range is smaller than the normal range).

There are 4 display modes available with HydroBox HD software, including 3 Zoom modes, and 1 without any zoom. They include:

Normal

This mode displays the normal bottom data by itself without any zoom information. When selected, this mode will use the entire viewing area.

Bottom Zoom

When selected, this mode will split the viewing area in half. The left side will be used to show zoom information, and the right side for normal bottom data. Bottom Zoom mode centers the zoom display around the current depth allowing you to follow it up and down the water column at a high resolution. In addition, the user can use the Zoom Range Control to zoom in or out. The Zoom Range value represents the zoom range in whichever units are currently selected. When the zoom window moves up or down to track the bottom, it does so in **Zoom Range / 2** increments.

Bottom Lock Zoom

This mode functions the same way as Bottom Zoom, however it does not show the bottom moving through the water column. Instead, it will lock the bottom to the upper portion of the zoom view so that the user may continuously monitor sub-bottom information.

Marker Zoom

Like in the other modes, Marker Zoom provides a high-resolution zoomed view of the water column, however in this mode, the user can specify where in the water column the zoom range will begin. This is accomplished by dragging the marker zoom bar up or down the normal view scalebar to the point you want the zoom range to begin. The start of the zoom range can be observed at the top of the zoom window while you drag the marker zoom bar, but the marker zoom isn't set until the mouse button is released.

3.9 – The Help Menu

This menu includes a software **Help** guide along with an **About HydroBox HD** option. Clicking it will display a window with information such as the HydroBox HD software version and SYQWEST company information. In addition, the software will request and display Hardware/Firmware version information from the HydroBox HD Sensor providing the Sensor is connected and communicating properly.

END OF SECTION

4.0 MAINTENANCE

4.1 – POST (Power On Self Test)

Each time power is applied to the HydroBox HD Sensor, it performs a series of self-tests to ensure that it is working optimally. The tests occur as follows:

Test 1 – Initialization Test
Checks overall functionality of the sensor hardware to verify it is operational.

Test 2 – RAM Test
Verifies that the system RAM is operational.

Test 3 – Serial EPROM Test
Verifies that the Serial EPROM is operational and it's checksum is valid.

Test 4 – Flash Memory Test
Verifies that the Flash Memory is working and it's checksum is valid.

If Test 1, 2, or 3 fail, the Sensor's green LED will blink rapidly at 4 Hz indicating an error. The HydroBox HD Sensor will not be operational and the user should contact SYQWEST's Support Dept. for assistance. If the Sensor fails Test 4, the green LED will blink normally at 1 Hz, but will not function until it is reprogrammed. The HydroBox HD PC Software will detect this problem and notify the user. (Refer to **Troubleshooting** Section 4.7)

If the Sensor passes these tests, the green LED will blink at 1 Hz indicating that it's working and waiting for communication with the PC and HydroBox HD PC Software.

4.2 – LED Indicator

The HydroBox HD Sensor is equipped with a green LED which was designed to give the user immediate information regarding the Sensor's status. When power is supplied to the Sensor and it is working properly, the LED will blink at 1 Hz indicating that the unit has powered up correctly and is waiting for communication with the PC and HydroBox HD software. Once communication is established, the LED will stay on continuously. However, if the unit is powered up and the green LED blinks at 4 Hz, then the unit is problematic and will not be able to communicate with the PC until the problem is rectified. (See **Troubleshooting** Section 4.7)

4.3 – Firmware Update

The HydroBox HD Sensor is a self-contained unit and has it's own set of Firmware. Periodically, SYQWEST may offer Sensor Firmware upgrades which add new features and functionality. This section describes the process involved in updating that firmware.

4.4 – Connection

The HydroBox HD Sensor Firmware does not need any special connection cables or connectors to perform an update. The Sensor is connected to an Ethernet Port on a Portable PC as if it were being used to acquire data. (See **Data Interface Connector** in Section 2.5).

4.5 – Firmware Update File

If a Firmware Update file is available, SYQWEST can send the user a disk containing the file, or it may be downloaded from our website (http://www.syqwestinc.com). The file will always be called `HydroBoxHD.hex` This file should NOT be renamed because the HydroBox HD PC Software is configured to only detect it's specific filename.

This file should always be **COPIED** from the disk to the PC rather than being moved. This allows the user to retain a copy of the file on disk for backup purposes. Before copying the file, the HydroBox HD PC Software should **NOT** be running. The file should be copied to the same directory as the HydroBox HD executable file. (Usually `C:\Program Files\SYQWEST\HydroBox HD`, unless otherwise specified).

4.6 – HydroBox HD PC Software Firmware Update

The HydroBox HD PC Software is designed to automatically detect the presence of a firmware update file upon startup. If the file is detected, the user will be notified and asked whether the firmware update should take place. If the user chooses "No", then the HydroBox HD PC Software continues to run normally.

NOTE: If the user chooses "No", the firmware file will REMAIN in the HydroBox HD directory. The file must be manually removed to avoid being detected each time the software is run.

Before the user chooses "Yes", the HydroBox HD Sensor must be reset back to the Power-up state. This can be done by removing power from the Sensor (Either at the connector, or power supply) and then reapplying it. The green LED on the Sensor should be blinking at 1 Hz indicating that it's in the Power-up state. For more information regarding the LED indicator, see Section 4.2.

When the user clicks "Yes", then the PC Software will attempt to communicate with the HydroBox HD Sensor while giving the user status message updates. If there are no problems, the firmware upload will begin and a progress indicator will be shown to the user. Refer to Section 4.7 for troubleshooting information.

NOTE: If the firmware update is successful, the firmware file WILL be removed from the HydroBox HD directory to prevent it from being detected again. Make sure you have a backup copy of this file.

4.7 – Troubleshooting

4.7.1 – HydroBox HD Sensor Troubleshooting

Symptom	Possible Cause	Solution
Green LED on Sensor does not turn on	Sensor is not receiving power	Check the power supply, inline fuse, and connections to the Sensor with a voltmeter
Green LED on Sensor blinks rapidly at 4 Hz	Power on Self Test 1, 2 or 3 has failed	Contact SYQWEST Support Dept for assistance
Green LED on Sensor blinks at 1 Hz but cannot establish communication with PC software	Connection problem between PC and Sensor PC Software not setup to use correct COM port Flash Memory is corrupt	1) Check connections between PC and Sensor 2) Select the correct COM port in the "Sonar Port" menu 3) Contact SYQWEST Support Dept for assistance

4.7.2 – HydroBox HD PC Software Troubleshooting

Symptom	Possible Cause	Solution
Sensor State always shows *Unknown*	PC Software not receiving communication from Sensor	Check connections between PC and Sensor Make sure the Sensor's LED is blinking at 1 Hz indicating that is ready for communicating Verify the software is setup to use the correct COM port for communicating with Sensor
Sensor State stuck in Power-up	PC Software was executed after Sensor has already been initialized	Cycle (remove then reapply) power to the HydroBox HD Sensor
PC Software not receiving GPS information	PC Software is not setup correctly There is a connection problem between the PC and GPS Receiver	1) Correctly configure PC Software in the "NMEA I/O" menu to the correct COM port and to a compatible NMEA string with your GPS Receiver 2) Check connections between PC and GPS Receiver
PC Software is non-responsive or lagged	Thermal Printing is enabled but no TDU is connected	Check connection between PC and TDU or disable Thermal Printing in software

5.0 SYQWEST SEG-Y INFORMATION

5.1 SYQWEST SEG-Y FILE INFORMATION

All of the SyQwest sonar systems store the data from each ping cycle in the industry standard SEGY format. The format includes 2 File headers at the start of each file and 1 trace header for every ping cycle followed by the sub-bottom or bottom data associated with that ping cycle.

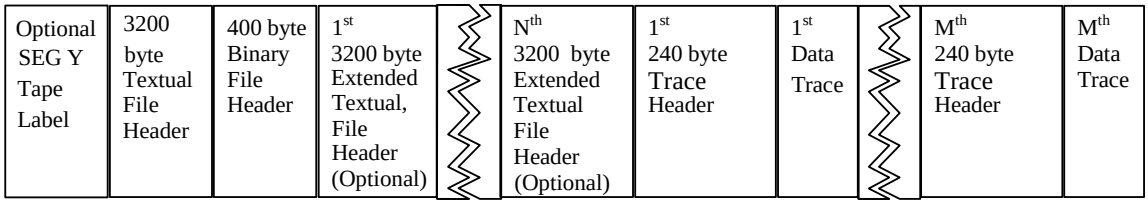


Figure 5-1 General SEGY File Structure

Figure 5-1 above illustrates the structure of a general SEG Y file as defined in the SEGY specification. The first 3600-bytes of the file are the Textual File Header and the Binary File Header written as a concatenation of a 3200-byte record and a 400-byte record. This is optionally followed by Extended Textual File Header(s), which consists of zero or more 3200-byte Extended Textual File Header records. SyQwest SEGY files do NOT make use of optional textual file header so all of the text information for a SyQwest file is included in the first 3200 byte textual file header. The remainder of the SEG Y file contains a variable number of Data Trace records that are each proceeded by a 240-byte Trace Header. For SyQwest SEGY files there is one trace header and one data trace for every system ping cycle. For SyQwest dual channel systems, a separate SEGY file is stored for each data acquisition channel with the channel number noted on the file name extension.

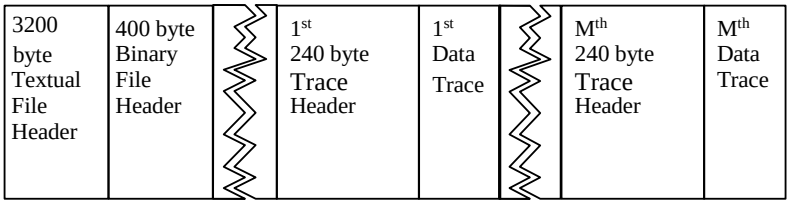


Figure 5-2 SyQwest Specific SEGY File Structure

The SEGY file format supports data collection for all types of seismic applications. There are many fields in the specification that are useful for sub-bottom profiling systems and a sizable quantity of fields that are NOT used as well. This section lists all of the fields that are required to create a compatible SEGY file and also identifies the fields that are populated by the SyQwest system applications with information pertinent to the data collection.

All of the SyQwest data acquisition systems store the subbottom (and bottom) data in 16 bit two's complement, fixed point format for all samples within a ping. The data is captured at the native system sample rate of 80KHz for the StrataBox HD and HydroBox HD so the data resolution is much finer than the legacy Hydrobox and Stratabox sensors. The quantity of samples stored for each ping is dependent upon the user selected Sample Size in the Recording Data Confirmation window. The Sample Size selections range from 20 - 200 msec which provides the user a range from 5 m to 150 m of strata storage.

The stored SEG-Y data can be stored in one of two ways: RAW data (before processing, i.e. direct from the A/D input) and PROCESSED data (after processing, i.e. post energy detection or chirp processing). In nearly ALL cases, the user should store PROCESSED data which is analogous to storing envelope data. Most of the post processing tools make better use of the PROCESSED SEG-Y data.

5.2 SEG-Y Textual File Header

The first 3200-byte, Textual File Header record contains 40 lines of textual information, providing a human-readable description of the seismic data in the SEG Y file. This information is free form and is the least well defined of the headers in the SEGY standard, although the standard did provide a suggested layout for the first few lines.
The textual data header is stored in EBCDIC format and is made up of the standard 40 lines of 80 columns EBCDIC textual data. For lines that contain no specific data, the line number text (C01, C02,…) is still included.

Table 5-1 SEG-Y Textual File Header Format

SEG-Y Textual File Header Format			
Line	Line Text	Status	Description
1	C01 Bathy2010 – V2. 0. 1. 24 August 19, 2013 HH:MM:SS	M	System, Version, Date, Time
2	C02 SyQwest Inc, 222 Metro Center Blvd, Warwick, RI, 02886,	M	SyQwest Company information
3	C03 Reel ID: 1, Record Mode: Processed	M	Reel ID & Processed OR Raw
4	C04	O	User specified text
5	C05	O	User specified text
6	C06	O	User specified text
7	C07	O	User specified text
8	C08	O	User specified text
9	C09	O	User specified text
10	C10	O	User specified text
11	C11	O	User specified text
12	C12	O	User specified text
13	C13	O	User specified text
14	C14	O	User specified text
15	C15	O	User specified text
16	C16	O	User specified text
17	C17	O	User specified text
18	C18	O	User specified text
19	C19	O	User specified text
20	C20	O	User specified text
21	C21	O	User specified text
22	C22	O	User specified text
23	C23	O	User specified text
24	C24	O	User specified text
25	C25	O	User specified text
26	C26	O	User specified text
27	C27	O	User specified text
28	C28	O	User specified text
29	C29	O	User specified text
30	C30	O	User specified text
31	C31	O	User specified text
32	C32	O	User specified text
33	C33	O	User specified text
34	C34	O	User specified text
35	C35	O	User specified text
36	C36	O	User specified text
37	C37	O	User specified text
38	C38	O	User specified text
39	C39	O	User specified text
40	C40	O	User specified text

For SyQwest SEGY files the first three lines of the text header are filled in automatically by the host application. The format for the data is shown in Figure X above and the information includes:

- Line 1 - SyQwest system type, Host software version number, file start date/time
- Line 2 – SyQwest Company information
- Line 3 – Reel ID number, Data recording mode (Processed or Raw data)

Lines 4 through 40 of the file text header are available for user input and can be typed in when SEGY file storage is initiated via the Recording Data Confirmation window. The text information is entered by the system operator in the "SEGY File Header Information" box. Up to 37 lines of text information can be entered and each line can be up to 76 characters in length.

5.3 SEG-Y Binary File Header

The 400-byte Binary File Header record contains binary values that affect the processing and interpretation of the entire SEG Y file. The values in the Binary File Header are defined as two-byte or four-byte, two's complement integers. Certain values in this header are crucial for the processing of the data in the file, particularly the sampling interval, samples per ping and format code.

SyQwest SEGY files have all binary file header fields populated as required by the specification. All of the mandatory fields are populated and updated to provide the SEGY post processing application all of the information pertinent to the data collected on all data acquisition cycles. The table below identifies all of the SEGY binary file header fields along with a field description and the value that is recorded in a SyQwest SEGY file.

The most important information in the Binary File Header as mentioned above is:

- Sample Interval
- Number of Samples per Ping
- Data format code

These parameters define the sample resolution, the length of data stored for each ping cycle and the format of the data being stored. The size of each SEG-Y ping record is determined by the user selected Sample Size (25, 50, 100, or 200msec). The Sample Size parameter can also be customized in cases where the available selections are NOT optimum. For SyQwest SEG-Y files the following exhibits how these important fields are determined:

- Sample Interval – Fixed by Product, B2010 = 50usec, Strata/HydroBox = 12.5usec
- Number of Samples per Ping = Sample Size/Sample Interval
- Data format code = Fixed point, 2 byte for all SyQwest products

Table 5-2 SEG-Y Binary File Header Format

SEG-Y Binary File Header Format			
Byte Numbers	**Value in SyQwest-SEGY**	**Status**	**Description**
3201-3204	0	U	Job identification Number
3205-3208	1	M	Line number (only one line per reel)
3209-3212	1	O	Reel number
3213-3214	1	M	Number of data traces per record
3215-3216	0	U	Number of auxiliary traces per record
3217-3218	Sample interval (μS)	M	Sample interval of this reel's data (μS)
3219-3220	Sample interval (μS)	M	Sample interval of original field recording (μS)

3221-3222	Number of samples per ping	M	Number of samples per data trace (this reel)
3223-3224	Number of samples per ping	M	Number of samples per data trace (original field recording)
3225-3226	3 (=fixed point, 2 bytes)	M	Data sample format code (1=4 byte floating point, 2=4 byte fixed point, 3=2 byte fixed point, 4=4 byte fixed point with gain code)
3227-3228	1	O	CDP Fold (expected number of data traces per CDP ensemble)
3229-3230	1 (=as recorded, no sorting)	O	Trace sorting code (1=as recorded, 2=CDP ensemble, 3=single fold continuous profile, 4=horizontally stacked)
3231-3232	1 (=no sum)	O	Vertical Sum Code (1=no sum, 2=two sum, etc
3233-3234	Sweep Start Frequency (Hz)	R	Sweep frequency at start (Hz)
3235-3236	Sweep End Frequency (Hz)	R	Sweep frequency at end (Hz)
3237-3238	Pulse Length (mSec)	U	Sweep length (mS)
3239-3240	1 (=Linear)	O	Sweep type (1=linear, 2=parabolic, 3=exponential, 4=other)
3241-3242	1	U	Trace number of sweep channel
3243-3244	0	U	Sweep trace taper length at start (mS)
3245-3246	0	U	Sweep trace taper length at end (mS)
3247-3248	0	U	Taper type (1=linear, 2=cos squared, 3=other)
3249-3250	2	U	Correlated data traces (1=yes, 2 =no)
3251-3252	2	U	Binary gain recovered (1=yes, 2 =no)
3253-3254	1 (=none)	O	Amplitude recovery method (1=none, 2=spherical divergence, 3=AGC, 4=other)
3255-3256	1 (=metres or feet)	M	Measurement system (1=metres, 2=feet)
3257-3258	0	U	Impulse signal polarity: increase in pressure or upward geophone case movement gives 1=-ve, 2=+ve number
3259-3260	0	U	Vibratory polarity code: seismic signal lags pilot signal by: 1=337.5˚→22.5˚, 2=22.5˚→67.5˚, 3=67.5˚→112.5˚, 4=112.5˚→157.5˚, 5=157.5˚→202.5˚, 6=202.5˚→247.5˚, 7=247.5˚→292.5˚, 8=292.5˚→337.5˚
3261-3600		U	Unassigned

Several other parameters in the binary file header are also populated in SyQwest SEG-Y files. The transmit waveform parameters are included (Sweep Start and End Frequency, Sweep type, and Pulse Length). The measurement units (Meters or Feet) information is also included in this header. The rest of the fields in this header are always filled with the single, non-changing value listed in the table.

5.4 SEG-Y Binary Trace Header

SyQwest SEG-Y files store a single data record for each data acquisition or ping cycle. The single data record in the SEG-Y file is called a trace. Each SEG-Y trace will store several thousand bytes of data based on the user selected sample size (20msec – 200msec). At the beginning of each trace/data record is a binary record trace header. The information in each trace header is 240 bytes in length and each field in the header is defined as a two-byte or four-byte, two's complement integer. The values in bytes 1-180 are

used and defined as described in the SEG-Y standard. Bytes 181-240 are used for SyQwest optional parameters that are used internally by SyQwest for testing and evaluation.

The information in the SEG-Y Trace Header for each data record has specific data fields that allow a post processing application to properly analyze the seismic data in the trace record. The values included in the Trace Header are limited and intended to provide information that may change on a trace-by-trace basis and the basic information needed to process and identify the trace. Many of the header fields are populated and many others are unused and are therefore zeroed. The most important fields in the SEG-Y trace header are listed below:

- Date and Time of the record (bytes 157-168)
- Geographic Position of the record (bytes 071-090)
- Water Depth (bytes 061-70)
- Number of Data Samples in the record (bytes 115-116)
- Sample Rate of Data Collection (bytes 117-118)

The Date, Time, and Position put a unique stamp on every data record in the SEG-Y file. The Water Depth provides the digitized bottom depth which is the end result for all hydrographic surveys and also very useful in seismic analysis. The number of data samples and the system sample rate permit the post processing to decipher the acoustic data properly. There are a number of other fields that are populated as well, some to conform to the SEG-Y standard and others to provide other useful information about the trace/data record. Finally, there are some SyQwest specific fields in the unassigned part of the record information header that are used by SyQwest to analyze our data processing. The following table shows the fields that are used by SyQwest SEG-Y files:

Table 5-3 SEG-Y Binary Trace Header Format

SEG-Y Binary Trace Header Format				
Byte Numbers	**Type**	**Value in SyQwest SEGY**	**Status**	**Description**
001-004	int	Ping Number	R	Trace sequence number within line
005-008	int	10001	R	Trace sequence number within reel
009-012	int	Ping number	M	Original field record number
013-016	int	1	O	Trace number within the original field record
017-020	int	0	R	Energy source point number
021-024	int	10001	R	CDP ensemble number
025-028	int	1	O	Trace number within the CDP ensemble
029-030	short	1 (=seismic))	O	Trace ID code (1=seismic, 2=dead, 3=dummy, 4=time break, 5=uphole, 6=sweep, 7=timing, 8=water break, 9-32767=optional
031-032	short	0	U	Number of vertically summed traces yielding this trace
033-034	short	0	U	Number of horizontally stacked traces yielding this trace
035-036	short	1 (=production)	O	Date use (1=production, 2=test)
037-040	int	0	U	Distance from source point to receiver group
041-044	int	0	U	Receiver group elevation
045-048	int	0	U	Surface elevation at source
049-052	int	Transducer Draft * 100	T	Source depth below surface (positive number)
053-056	int	Heave Value	T	Datum elevation at receiver group

057-060	int	Heave Value	U	Datum elevation at source
061-064	int	Water depth * 100 or 10	R	Water depth at source
065-068	int	Water Depth * 100 or 10	U	Water depth at group
069-070	short	-100 or -10	M	Scalar for elevations and depths; Divide by 100 for HydroBox, Divide by 10 for Stratabox
071-072	short	-1000 for Lat/Long	M	Scalar for coordinates; positive=multiplier, negative=divisor
073-076	int	Longitude coordinate scalar	R	Source X coordinate (Longitude if coord units are seconds of arc, +ve=East of Greenwich Meridian, -ve=West)
077-080	int	Latitude coordinate scalar	R	Source Y coordinate (Latitude if coord units are seconds of arc, +ve=North of equator, -ve=South)
081-084	int	Longitude coord scalar	R	Group X coordinate (see Source X description)
085-088	int	Latitude coord scalar	R	Group Y coordinate (see Source Y description)
089-090	short	2 = sec of arc	M	Coordinate units (1=length; metres or feet), 2=seconds of arc). See also bytes 189-204.
091-092	short	0	U	Weathering velocity
093-094	short	Speed of sound	O	Subweathering velocity
095-096	short	0	U	Uphole time at source
097-098	short	0	U	Uphole time at group
099-100	short	0	U	Source static correction
101-102	short	0	U	Group static correction
103-104	short	0	U	Total static applied
105-106	short	0	U	Lag Time A. Time between end of header and time break (mS)
107-108	short	0	U	Lag Time B. Time between time break and shot time (mS)
109-110	short	Start delay (mSec)	M	Delay According time. Time between shot and recording start time (mS)
111-112	short	0	U	Mute time start
113-114	short	0	U	Mute time end
115-116	short	Num samples	M	Number of samples in this trace
117-118	short	Sample interval	M	The sample interval in micro-seconds for this trace
119-120	short	1 (=fixed)	O	Gain type of field instrument (1=fixed, 2=binary, 3=floating point, 4-32767=optional)
121-122	short	0	U	Instrument gain constant
123-124	short	0	O	Instrument early or initial gain (dB)
125-126	short	0	O	Correlated (1=no, 2=yes)
127-128	short	Sonar Start frequency	O	Sweep frequency at start
129-130	short	Sonar End frequency	O	Sweep frequency at end
131-132	short	Pulse Length (mSec)	U	Sweep length (mS)
133-134	short	1 (=linear)	O	Sweep type (1=linear, 2=parabolic, 3=exponential, 4=other)
135-136	short	0	U	Sweep trace taper length at start (mS)
137-138	short	0	U	Sweep trace taper length at end (mS)
139-140	short	0	O	Taper type (1=linear, 2=cos squared, 3=other)
141-142	short	0	O	Alias filter frequency, if used

143-144	short	0	U	Alias filter slope
145-146	short	0	U	Notch filter frequency, if used
147-148	short	0	U	Notch filter slope
149-150	short	0	U	Low cut frequency, if used
151-152	short	0	U	High cut frequency, if used
153-154	short	0	U	Low cut slope
155-156	short	0	U	High cut slope
157-158	short	Ping year	O	Year data recorded
159-160	short	Ping day of year	O	Day of year
161-162	short	Ping hour of day	O	Hour of day (24 hour clock)
163-164	short	Ping minute	O	Minute of hour
165-166	short	Ping second	O	Second of minute
167-168	short	1 or 2	R	Time basis code (1=local, 2-GMT, 3=other)
169-170	short	0	U	Trace weighting factor
171-172	short	0	U	Geophone group number of roll switch position one
173-174	short	0	U	Geophone group number of first trace of original field record
175-176	short	0	U	Geophone group number of last trace of original field record
177-178	short	0	U	Gap size (total number of groups dropped)
179-180	short	0	O	Overtravel associated with taper (1=down/behind, 2=up/ahead)
SyQwest Specific fields				
181-240		SyQwest Specific Data Fields	O	SyQwest Data Acquisition Parameter Information

END OF SEG-Y INFORMATION

END OF MANUAL

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