

320 SERIES ECHOSOUNDER

ONLINE SCSI CONTROL SOFTWARE MANUAL

Supports Software: ECHO CONTROL.EXE: D40-02382 V2.00

D10 - 02139
Revision 3.0
November 5, 1999

Knudsen Engineering Limited
10 Industrial Road
Perth, Ontario, Canada

The information contained in this document is proprietary data of Knudsen Engineering Limited. Any disclosure, use or reproduction of this information for other than the specific purpose intended is expressly prohibited unless agreed to in writing by Knudsen Engineering Limited.

CONTENTS

| | | |
|------------|---|------|
| 1 | INTRODUCTION | 1-1 |
| 1.1 | About this manual | 1-1 |
| 1.2 | Technical Support | 1-1 |
| 1.3 | Compilation Options | 1-1 |
| 2 | OPERATING INSTRUCTIONS - SCSI CONTROL INTERFACE | 2-1 |
| 2.1 | Overview | 2-1 |
| 2.2 | The Physical SCSI Interface | 2-1 |
| 2.3 | ASPI | 2-1 |
| 2.3.1 | SCSI Adaptors | 2-1 |
| 2.3.1.1 | Special Note | 2-1 |
| 2.3.2 | Echo Control.exe and Windows NT | 2-2 |
| 3 | SOFTWARE OPERATING INSTRUCTIONS | 3-1 |
| 3.1 | Description | 3-1 |
| 3.2 | File | 3-2 |
| 3.2.1 | Load Config | 3-2 |
| 3.2.2 | Save Config | 3-2 |
| 3.2.3 | Recorder Setup..... | 3-2 |
| 3.2.4 | Exit | 3-3 |
| 3.3 | Sounder | 3-4 |
| 3.3.1 | Controls | 3-4 |
| 3.3.1.1 | On/Off Buttons | 3-4 |
| 3.3.1.2 | Gain | 3-4 |
| 3.3.1.3 | Agc | 3-5 |
| 3.3.1.4 | Power | 3-5 |
| 3.3.1.5 | Pulse Type | 3-5 |
| 3.3.1.6 | Processing Gain | 3-6 |
| 3.3.1.7 | TxBBlank | 3-6 |
| 3.3.1.8 | Sensitivity | 3-6 |
| 3.3.1.9 | Range | 3-6 |
| 3.3.1.10 | Phase | 3-7 |
| 3.3.1.10.1 | Small Phase Overlap Compilation Option | 3-7 |
| 3.3.1.11 | AutoPhase Mode | 3-7 |
| 3.3.1.11.1 | AutoPhase On | 3-7 |
| 3.3.1.11.2 | Max. Limit | 3-7 |
| 3.3.1.11.3 | Min. Limit | 3-8 |
| 3.3.1.11.4 | Bottom Tracking | 3-8 |
| 3.3.1.11.5 | Extended Phases Compilation Option | 3-8 |
| 3.3.2 | HF/LF | 3-9 |
| 3.3.3 | Range Setup | 3-10 |
| 3.3.4 | Bar Check | 3-11 |
| 3.3.4.1 | Depth | 3-11 |
| 3.3.4.2 | Sound Speed | 3-11 |
| 3.3.4.3 | HF / LF Draft | 3-12 |

| | | | |
|-----|---------|--|------|
| | 3.3.4.4 | Speed of Sound | 3-12 |
| | 3.3.5 | Multiplexer - HF/LF | 3-12 |
| | 3.3.6 | Check for Sounder | 3-12 |
| 3.4 | Display | | 3-13 |
| | 3.4.1 | Contrast | 3-13 |
| | 3.4.2 | Settings | 3-14 |
| | | 3.4.2.1 Display Modes | 3-14 |
| | | 3.4.2.2 EchoGram Presentation | 3-15 |
| | | 3.4.2.2.1 Display EchoGram | 3-15 |
| | | 3.4.2.2.2 Colour | 3-15 |
| | | 3.4.2.2.3 Reverse Video | 3-15 |
| | | 3.4.2.3 Overlays | 3-15 |
| | | 3.4.2.3.1 Heave Indicator | 3-15 |
| | | 3.4.2.3.2 Heave Corrected Digitized Depth | 3-16 |
| | | 3.4.2.3.3 Uncorrected Digitized Depth | 3-16 |
| | | 3.4.2.4 Scroll Display | 3-16 |
| | | 3.4.2.5 Embedded Grid Text | 3-16 |
| | | 3.4.2.6 Palette Test | 3-16 |
| | | 3.4.2.7 Test | 3-17 |
| | 3.4.3 | Event Annotation | 3-17 |
| | 3.4.4 | Depths | 3-18 |
| | 3.4.5 | Toolbars | 3-18 |
| | 3.4.6 | Status Bars | 3-18 |
| 3.5 | Record | | 3-18 |
| | 3.5.1 | Start Line | 3-19 |
| | | 3.5.1.1 Binary File Format | 3-19 |
| | | 3.5.1.2 SEG-Y File Format | 3-25 |
| | | 3.5.1.3 ASCII File Format | 3-25 |
| | | 3.5.1.4 Data Set Log Files | 3-25 |
| | | 3.5.1.5 Modify ASCII output format | 3-26 |
| | | 3.5.1.6 Compress Binary Data | 3-27 |
| | 3.5.2 | End Line | 3-27 |
| | 3.5.3 | Hardcopy | 3-27 |
| 3.6 | Setup | | 3-27 |
| | 3.6.1 | Working Units | 3-27 |
| | 3.6.2 | TVG | 3-27 |
| | 3.6.3 | Sync Mode | 3-28 |
| | 3.6.4 | Primary Channel | 3-28 |
| | 3.6.5 | Date | 3-28 |
| | 3.6.6 | Sync Time | 3-29 |
| | 3.6.7 | Event Marks | 3-29 |
| | 3.6.8 | SCSI Ping Rate | 3-30 |
| | 3.6.9 | Tracking Gate | 3-30 |
| | 3.6.10 | Pinger Mode | 3-31 |
| | 3.6.11 | 320 Serial... | 3-31 |
| | | 3.6.11.1 320 Com Ports: Com 1/ Com 2/ Com 3/ Com 4 | 3-31 |
| | | 3.6.11.2 Depth Log | 3-32 |
| | 3.6.12 | 3 Minute Check | 3-37 |

| | | |
|------|---------------------------------|------|
| 3.7 | Upgrades | 3-37 |
| | 3.7.1 Load Tag | 3-37 |
| | 3.7.2 Initialize NVM | 3-38 |
| | 3.7.3 Program PS | 3-38 |
| | 3.7.4 Program TX | 3-38 |
| 3.8 | Fix Mark | 3-38 |
| 3.9 | Blank Screen | 3-38 |
| 3.10 | Help | 3-39 |
| | 3.10.1 320 Identification | 3-39 |
| | 3.10.2 Tech Support | 3-40 |
| | 3.10.3 About Echo... | 3-40 |
| 4 | SCSI ERROR MESSAGES | 4-1 |
| 5 | AUTHORIZATION ERRORS | 5-1 |
| | 5.1 Missing file KEL.DAT | 5-1 |
| | 5.2 Authorization Failed | 5-2 |

LIST OF TABLES

| | | |
|------------|--|------|
| Table 3-1: | Index Entry for Envelope Data Record Type B2 | 3-21 |
| Table 3-2: | Variable Length Dual Channel Envelope Data Record Type: B2 | 3-21 |
| Table 3-3: | SPM Frequency Code Definitions | 3-24 |

1 INTRODUCTION

1.1 About this manual

This manual describes the Windows Online SCSI Echo Control Software, D40-02382, Echo Control.exe. It is used to control operating parameters and to record data from 320 Series Echosounders via the sounder's SCSI port.

1.2 Technical Support

For technical support or to report problems please contact your local representative or:

Technical Support
Knudsen Engineering Limited
10 Industrial Road
Perth, Ontario
K7H 3P2

Voice: (613) 267-1165 8:30 am to 5:00 pm E.S.T. Core Hours

Fax: (613) 267-7085

E-Mail: support@knudsenengineering.com

WebSite: <http://knudsenengineering.com/>

1.3 Compilation Options

The operational characteristics of the echosounder are completely under software control. On occasion it is convenient to produce versions of this software with different operational characteristics to meet different user requirements. This is done at the software compilation stage so these differences are referred to as compilation options. A small number of compilation options are available for the 320 Echosounder. These are identified and described in the relevant sections of the manual.

Compilation options may be specified by the customer at the time the system is ordered, or subsequently whenever custom software modification is required..

2 OPERATING INSTRUCTIONS - SCSI CONTROL INTERFACE

2.1 Overview

The 320 Echosounder was designed with a SCSI Interface port to provide advanced remote control and signal data acquisition and recording capabilities. KEL has developed a specialized PC control program that runs under Windows. This program allows the user to control the echosounder, display in real-time a greyscale graphic on the PC monitor (similar to a hardcopy record), capture envelope signal data, perform standard depth-logging, and record in real-time to a thermal recorder.

2.2 The Physical SCSI Interface

SCSI (Small Computer System Interface) is a special hardware and software specification designed for high data transfer rates. There is an accepted standard followed by device designers (such as KEL) to allow users to interface numerous types of devices to their PC. Before a user can interface to these devices, there must be a SCSI host adaptor and its driver software installed in the PC.

2.3 ASPI

The 320 Echosounder is designed to be compatible with SCSI (Small Computer System Interface) interfaces which support the industry standard ASPI (Advanced SCSI Programming Interface) protocol. Most SCSI interface products include ASPI support with their distribution software. ASPI support generally requires a device driver for the specific interface hardware, plus ASPI layer driver files loaded into the appropriate Windows operating system sub-directories (see the Software Installation / Upgrade Manual for details).

2.3.1 SCSI Adaptors

SCSI host adaptors are available in many forms from numerous suppliers. There are internal interface cards, PCMCIA plug-in cards and external parallel-port adaptor cables. This SCSI control software has been used extensively with Adaptec's AHA-1542C, AHA-2920 and AHA-2930 internal interface modules and the APA-1460 PCMCIA model. KEL does not recommend using the echosounder with a parallel-port adaptor.

2.3.1.1 Special Note

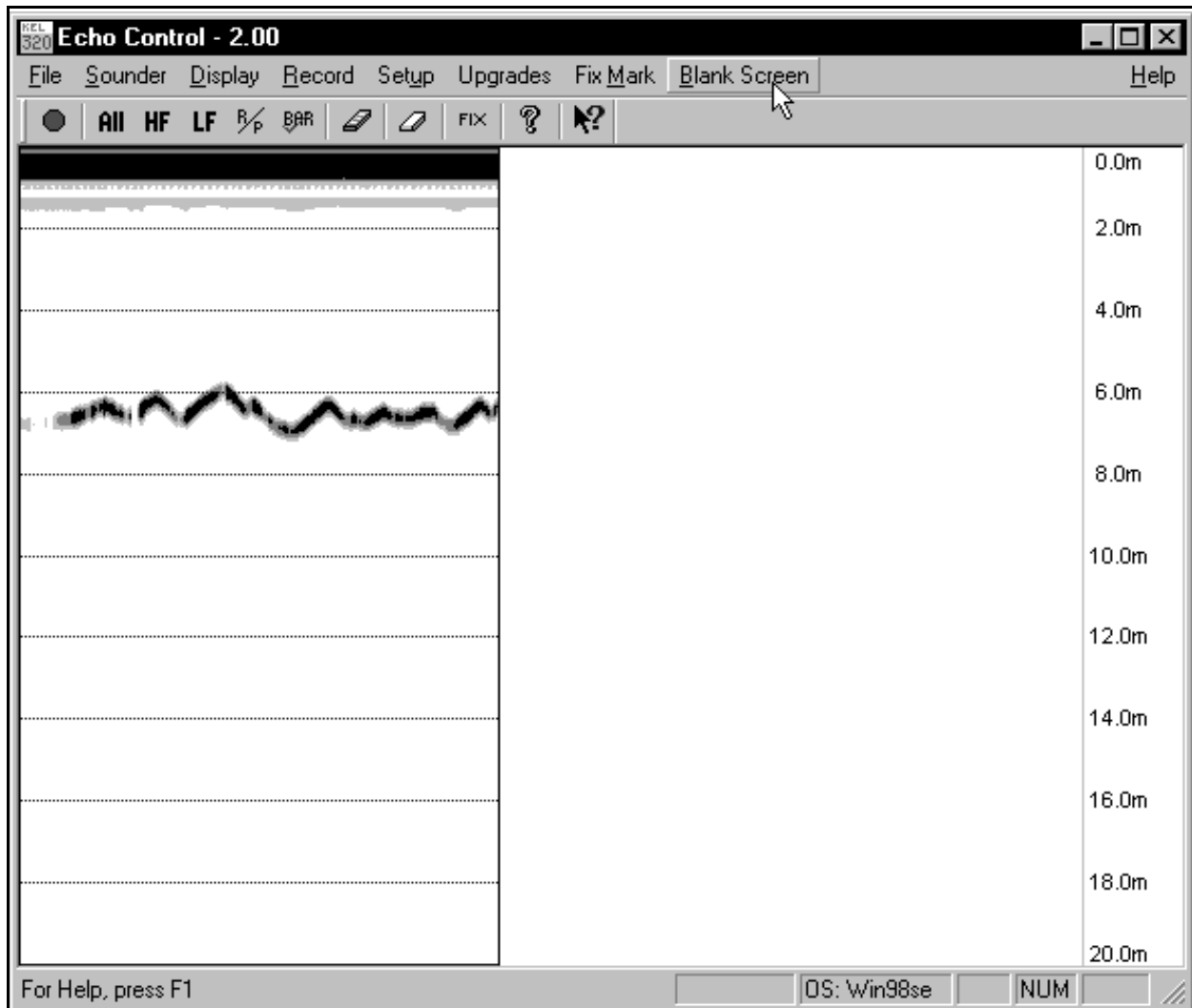
For some adaptors, the echosounder must be connected and powered up before the host PC is powered up for the PC to properly load the necessary SCSI drivers. Some external adaptors actually get their operational power from the echosounder; if the sounder is not powered up, the adaptor is not powered and the PC cannot detect the adaptor's presence. For some plug-and-play adaptors, the adaptor may be powered up, but if the sounder is not, the PC may not detect the need to load the necessary drivers. In general, it is usually better to have the sounder powered up before the host PC is started.

2.3.2 Echo Control.exe and Windows NT

Unlike Windows 95, Windows NT requires that the EZ-SCSI software provided by Adaptec with the SCSI host adaptor be installed for the appropriate driver DLLs to be loaded into the system. The EZ-SCSI installation loads the required DLLs and sets the system up to locate the necessary DLLs used when the Echo Online SCSI Control application is run. When the EZ-SCSI installation provides the option, the typical file installation should be performed to ensure all the necessary files are properly loaded; customized installations do not necessarily set the system up properly and the Echo Control.exe application may not run successfully.

3 SOFTWARE OPERATING INSTRUCTIONS

3.1 Description



The Online SCSI Control software is a Windows program that contains all the necessary controls for standard operation of the echosounder and any data recording activities on the PC. When the program is invoked, a window pops up with nine control groups offered on the main menu bar, a blank display area for graphical presentation of real-time received data, and a grid scale bar for the data presentation.

This stand-alone application uses Window's DDE (Dynamic Data Exchange) protocol to interface to a special HYPACK DLL device driver. This DDE interface allows the stand-alone application to pass depth, heave, and eventually other data to the Hypack data logger program and potentially any other Window's data logger.

3.2 File

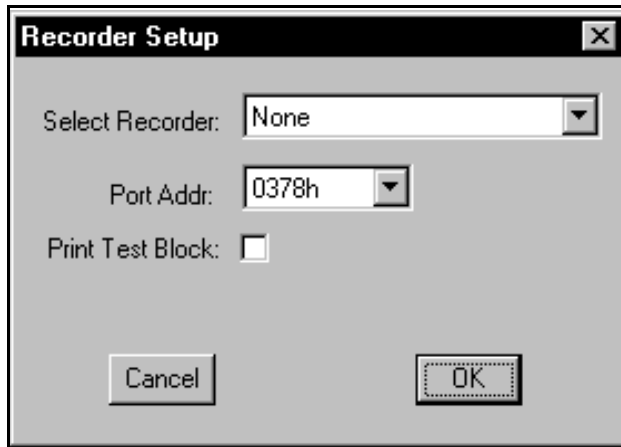
3.2.1 Load Config

The **Load Config** option allows the user to select and load a previously saved configuration file (typically a “.cfg” file, but it could have any extension) that has any or all of the system control settings defined to pre-configured values. When the configuration file is loaded, the Echo Control application configures the echosounder to all the new parameter values defined in the file. Thus, if the user has determined optimal parameters settings for a particular mission or site survey, he can save the settings to a configuration file and the next time the unit taken out for the same job conditions, he can restore them from the saved file.

3.2.2 Save Config

The **Save Config** option allows the user to save his current echosounder control settings to a file that can be used to restore the same settings into the sounder at a later date. Any file name can be used, but the application’s initial default search condition for loading configuration files is for those with an extension of “.cfg”.

3.2.3 Recorder Setup...



This option brings up a dialogue box that allows the user to select a thermal recorder to be used for making hardcopies. The thermal recorders that are currently supported are: **EPC 9800**, **EPC GSP-1086**, and **Raytheon TDU-850**.

The **EPC GSP-1086** driver expects the user to have set the following parameters to the values listed via the unit's front panel menus:

DATA INPUT = PARALLEL
SWEEP = FORWARD
SHADES = 064
DATA TYPE = 6BITS
WIDTH = 2048
LPI = 200 nominal (not EXTERNAL)

The **Port Addr** option allows the user to specified the proper output port address for the printer port. For most systems, this value should be 0378h, but for some laptops and secondary printer ports the alternate value of 0278h could be required.

The **Print Test Block** check box allows the user to tell the application to send some test data to the selected thermal recorder to confirm it is interfaced properly. The test block consists of greyscale ramps with samples of imbedded grid and fix annotation text.

The recorder selection and port address settings are stored in the application's INI file and restored the next time the program is invoked.

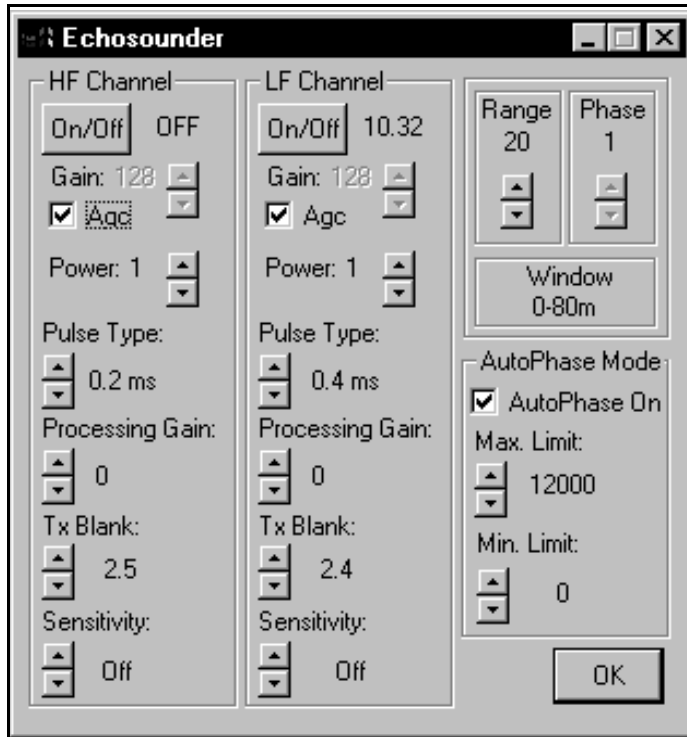
Note: the program will only record on the thermal recorder if the Record: Hardcopy menu option is selected (indicated by a check mark beside the menu item).

3.2.4 Exit

The user can terminate the Echo Control program using the **Exit** command. The echosounder will continue any sounding operation left active when the control program is terminated.

3.3 Sounder

3.3.1 Controls



The **Controls** option pops up a dialogue box that allows access to the functions that control the physical echosounder unit. The functions accessible from this box are the most commonly modified parameters during a sounding session. The user can minimize this box when it is not being used. The initial values for these controls are read from the echosounder's internal values.

3.3.1.1 On/Off Buttons

The user can start the echosounder sounding on desired channels using the **On/Off** button for the appropriate channel. If the user clicks on one of the buttons, the corresponding channel will acquire, digitize and log data. The display boxes beside the buttons display either OFF or the appropriate digitized depth for the channel.

3.3.1.2 Gain

The **Gain** parameter controls the analog receive gain of the relevant channel. Reducing the analog receive gain is useful when sounding in extremely shallow water. This reduces the overall noise while not seriously affecting echo strength. Increasing the analog gain is useful when sounding in very deep water.

3.3.1.3 Agc

The **Agc** selection invokes automatic gain control of the analog receive gain which is the recommended setting for most operating conditions. **Agc** is active when there is a check mark in the check box.

3.3.1.4 Power

The **Power** parameter is used to specify the transmit power level of the pulse being transmitted. Power levels are controlled by changing the duty cycle of the switchmode transmitter output stage. Although high power signals will always give the strongest echoes, they also produce more ringing and reverberation which may obscure the bottom echo in shallow water. Using high receive gain in combination with high transmit power in shallow water may cause signal levels high enough to saturate (overload) the receiver, which will mask any echoes.

3.3.1.5 Pulse Type

The **Pulse Type** parameter allows the user to specify the pulse length (the duration of the transmit pulse) usually specified in milliseconds or fractions of a millisecond. The choices are frequency specific. Generally, the higher frequencies use shorter pulses and vice versa.

By specifying the pulse length, the user indirectly specifies the bandwidth of the digital noise rejection filter applied to the incoming acoustic signal data. The filter bandwidth is usually set to the inverse of the pulse length (this relationship is true for the standard continuous wave (CW) signals, but not necessarily for the CHIRP signals used in the very low frequency channels).

Normally, long pulses with narrow bandwidth filters provide better noise rejection in deeper water or noisy conditions, while short pulses with wide bandwidth filters provide better resolution when conditions permit or the water is shallow.

The signal data rate (in samples per second) is also related to the pulse length because of the Nyquist requirement that the sampling frequency be at least twice the signal bandwidth. Under rare extreme conditions where the user has specified a very short pulse in deep water or a very long pulse in shallow water, the echosounder will override the user's **Pulse Type** selection to meet data rate requirements. When this happens, the **Pulse Type** parameter value is not changed, and is used again as soon as the extreme conditions are removed. When the echosounder is overriding the **Pulse Type** selection, the selection in the control box will change from black text to greyed text. When the selected **Pulse Type** is no longer overridden by the echosounder, the text will return to solid black.

3.3.1.6 Processing Gain

The **Processing Gain** parameter provides for additional gain in the digital signal processing software which can be used with very low level signals. It is mainly used for the very low frequency sub-bottom profiling systems (under 10 kHz) where very low amplitude echoes from sub-bottom layers are of interest. The default processing gain value is zero and this should be suitable for almost all conditions. Each level above 0 is effectively a 1-bit left shift in the processed digital data (a 1-bit left shift is equivalent to multiplying the data by a factor of 2).

3.3.1.7 TxBlank

The **TxBBlank** parameter sets the transmit blanking distance used by the echosounder's internal digitizer to avoid false triggering on transmit reverberation.

The **TxBBlank** value, or transmit blanking, is the distance, measured from the face of the channel's transducer, to the point in the water column at which the bottom detection software begins to look for the bottom. Transmit blanking must be set large enough that transducer ringing following the tail end of the transmit pulse is not falsely interpreted as the echo from a very shallow bottom, but small enough not to unduly limit the minimum depth capability of the echosounder. The optimum value depends on the expected depth conditions, the pulse length, the transmit power level and the signal frequency. It is best determined by experimentation. Note that transmit blanking has effect only when it extends into the *window*, typically when Phase is 1.

3.3.1.8 Sensitivity

The **Sensitivity** parameter is useful in areas where soft sediments overlay harder materials, and where buried layers may often produce stronger echoes than the real bottom. If **Sensitivity** is **OFF** (the default condition), the bottom detection software will always select the strongest echo in the *window*. With layered bottoms, the strongest echo is not necessarily the shallowest echo. Increasing the **Sensitivity** causes the bottom detection software to accept a weaker but shallower echo. The higher the **Sensitivity**, the weaker the echo, relative to the strongest echo in the *window*, that will be selected. On the other hand, if the **Sensitivity** is too high, the bottom detection software will often trigger on noise or small items in the water column.

3.3.1.9 Range

The **Range** parameter selects the size of the active *window* in the water column. The active *window* is the only part of the water column in which the echosounder operates. It is the portion of the water column which is printed on the hard copy recorder, and in which the bottom detection software looks for the bottom echo. The bottom *must* be in the selected *window* for the echosounder to function. Nine ranges are available: 10, 20, 50, 100, 200, 500, 1000, 2000 and 5000 metres (or feet or fathoms). A box below this selection displays the actual **Window** limits corresponding to the current combination of the **Range** and **Phase** selections.

3.3.1.10 Phase

The **Phase** parameter selects the depth, or location in the water column, of the active *window* (see explanation in previous section). The effect of the **Phase** parameter depends on the current **Range** setting. The standard 320 echosounder software compilation provides a 50% overlap between **Phase** settings.

3.3.1.10.1 Small Phase Overlap Compilation Option

A software compilation option is available for a smaller, 20% overlap between PHASES, but this is only recommended for the special case where a very small *window* is autophased in an area with extended steep slopes.

3.3.1.11 AutoPhase Mode

3.3.1.11.1 AutoPhase On

When the **AutoPhase On** box is checked, the phase changes are performed automatically in response to information provided by the primary channel bottom tracking algorithm. The auto phasing software adjusts the phase setting automatically to maintain the bottom in the active *window*. It should be understood that the auto phasing software is critically dependent on the bottom tracking software - if the bottom is not being tracked successfully, auto phasing will not work.

It is helpful to think of the auto phasing software as having two distinct operating states - searching for the bottom and tracking the bottom. When the **AutoPhase Mode** is initially invoked, or whenever the bottom tracking software loses track of the bottom, the auto phasing software shifts into the *bottom search* state. In this state the *window* is opened up to the full extent of the water column from the autophase minimum search depth (**Min. Limit**) to the autophase maximum search depth (**Max. Limit**). The ping rate usually slows down noticeably because of the larger *window*, and the printer stops printing until the bottom is located. When the bottom is found, the auto phasing software selects the appropriate phase and shifts into the *bottom tracking* state. In this state, the autophase minimum search depth and maximum search depth parameters have no effect.

Once the auto phasing software is in the *bottom tracking* state, it will continue to auto phase as long as the primary channel is being tracked successfully. It will re-enter the *bottom search state* if 5 consecutive samples are declared invalid by the bottom tracking software.

One other parameter is relevant to auto phasing operation - this is the **Primary Channel**, accessible through the **Setup** menu, and described in Section 3.6.4). This parameter can be set to either **HF** (the default) or **LF**. It specifies the channel which is used as the depth reference for phase changes.

3.3.1.11.2 Max. Limit

The **Max. Limit** parameter allows the user to adjust the autophase maximum search depth to a value that is optimal for the current operating conditions and acquisition requirements. See Section 3.3.1.11.1 for the details regarding the use of this parameter.

3.3.1.11.3 Min. Limit

The **Min. Limit** parameter allows the user to adjust the autophase minimum search depth to a value that is optimal for the current operating conditions and acquisition requirements. See Section 3.3.1.11.1 for the details regarding the use of this parameter.

3.3.1.11.4 Bottom Tracking

Although the bottom tracking process is operational at all times, it is discussed here because it becomes critically important when auto phasing is enabled.

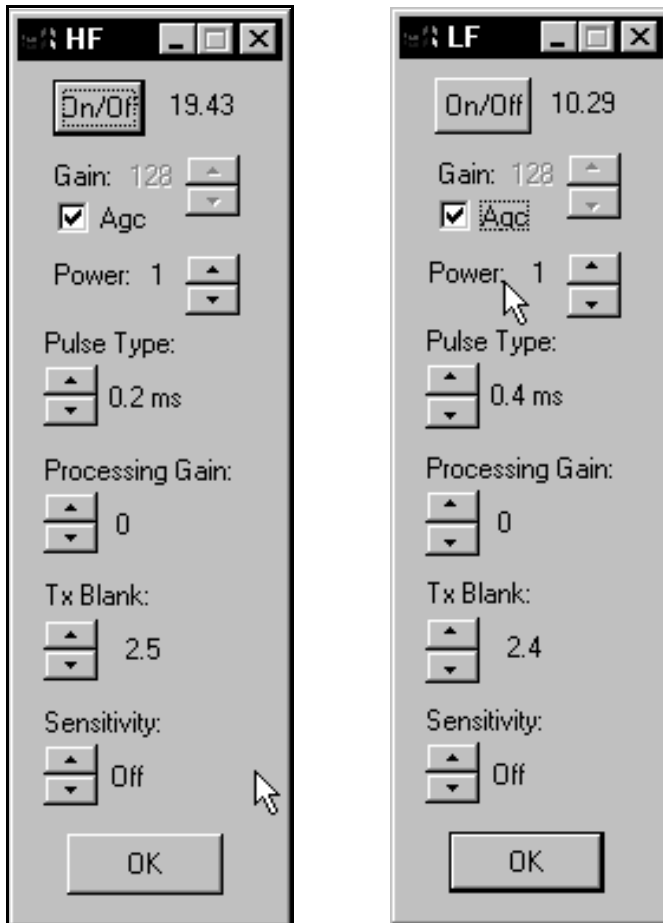
Locating and tracking the bottom is one of the more important software functions performed by the echosounder. The term *bottom tracking* encompasses the process of identifying the bottom echo in the received acoustic signal, locating the precise leading edge of the echo, computing the depth based on travel time and sound speed considerations, and most importantly, deciding whether the result represents a valid depth measurement (it might be a fish, or transducer ringing, or reverberation, or just noise, or even the second echo from the previous ping). The decision must be made immediately, before sending the depth value to the datalogger. The echosounder software, running in real time, does not have the luxury of looking ahead - it can only look back at previous depth samples. The algorithm used in the 320M uses the several previous samples, regardless of whether they were determined at the time to be valid or not (the rationale for including invalid samples in the test is the fundamental uncertainty in the validity designation). A variety of “least squares curve fitting” exercises is then carried out using the current sample and all or some of the previous several samples. If at least one of the curves fits the data to within a user-specified **tracking gate** tolerance, the current sample is declared to be valid.

Note that bottom tracking is performed independently for each channel. The depth value used by the auto phasing software is specified by the **primary channel** parameter.

3.3.1.11.5 Extended Phases Compilation Option

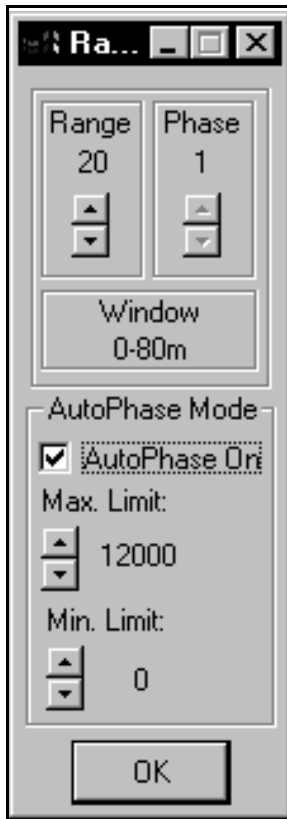
Manual phase control always is limited to the 7 selections provided by the **PHASE** switch. The standard software compilation provides these same seven phases in **autophase** operation. A compilation option is available which provides up to 254 phases in **autophase** mode. This permits a relatively small window to be used in deep water. If this compilation option is in effect, it is important to set the **autophase maximum search depth** value using the secondary controls menu, otherwise the sounder will appear to shut down while it searches to full ocean depth for the bottom.

3.3.2 HF/LF



These options bring up dialogue boxes used to control channel specific controls only. These boxes provide independent channel access to the following controls exactly the same as those used in the global **Controls** dialogue box (Section 3.3.1): channel **On/Off**, **Gain**, **Agc**, **Power**, **Pulse Type**, **Processing Gain**, **TxBBlank**, and **Sensitivity**.

3.3.3 Range Setup



The **Range Setup** option pops up a dialogue box that allows access to the window control parameters only. These are exactly the same controls for **Range**, **Phase**, **AutoPhase Mode**, **Max. Limit** and **Min. Limit**, as those used in the global **Controls** dialogue box (Section 3.3.1).

3.3.4 Bar Check



The **Bar Check** dialogue box access to the primary calibration parameters: sound velocity, HF draft and LF draft. When **Bar Check Mode On** is selected, the echosounder is put into a special bar check mode in which one additional parameter, **Depth**, becomes active in the dialogue box. In the special bar check mode, the digitizer search window is centred on the specified bar **Depth** and is narrowed to the width of the tracking gate (see Section 3.6.9). When the **Bar Check Mode On** option is deselected, the echosounder deactivates the bar check mode and restores the standard digitizer search window; but the user can still modify the sounder speed and draft parameters if desired. If the **Bar Check** dialogue is closed while the **Bar Check Mode On** is selected, the Echo Control application automatically deactivates the bar check mode in the echosounder.

For a description of typical bar check procedures, see D10-02251 Echosounder Concepts Technical Note.

3.3.4.1 Depth

The user adjusts this parameter to centre the digitizer search window around the expected depth of the test bar. The width of the search window around this centre value is determined by the size of the tracking gate (Section 3.6.9). The echosounder will digitize on the strongest target that falls within this search window. If no target is found, any of the dialogue boxes that display the depth will indicate an invalid depth return ("0.0" appears in the depth display).

3.3.4.2 Sound Speed

This feature allows the adjustment of the speed of sound value used by the echosounder for all depth calculations. The user adjusts this value in the course of a bar check, or enters the average expected velocity of sound over the water column of interest obtained from a sound speed sensor.

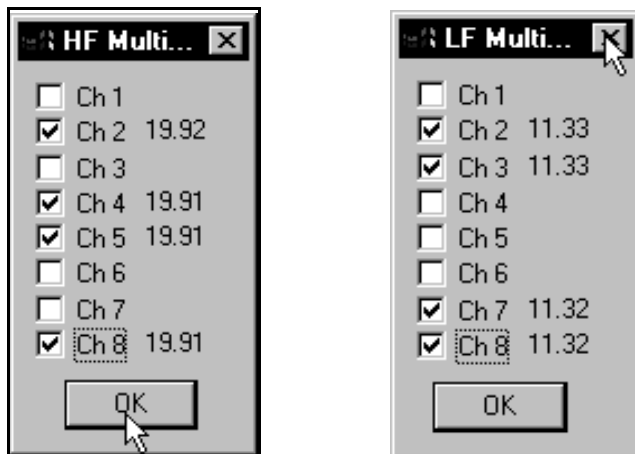
3.3.4.3 HF / LF Draft

Draft indicates the vertical distance from the surface of the water to the active face of the transducer. Its main use is to ensure that the echosounder's output is corrected for the transducer depth. The draft can be set independently for the low frequency and high frequency channels.

3.3.4.4 Speed of Sound

This feature allows the adjustment of the velocity of sound value used by the echosounder for all depth calculations. The user adjusts this value in the course of a bar check, or enters the average expected velocity of sound over the water column of interest, obtained from a speed sensor.

3.3.5 Multiplexer - HF/LF



The **Multiplexer** controls are only needed for echosounders using the KEL 8:1 Multiplexer box. The Multiplexer allows for more than one transducer channel to be connected to a single echosounder transmitter output. The Multiplexer Selection dialogue box lets the user select which channels of the Multiplexer are to be used. A special compilation code read from the echosounder when this application initializes, indicates if the sounder is configured to use any multiplexer boxes; this application will enable only those control options supported by the sounder.

3.3.6 Check for Sounder

This menu item is usually disabled (greyed out) if the sounder was detected properly when the program was initially started. If the program could not detect the sounder on startup, all sounder control options are disabled and this option is enabled. This gives the user the ability to retry the sounder detection without having to exit and re-invoke the program. Thus, if the echosounder was powered off or disconnected when the program was invoked, the user can power-on or connect the sounder, and simply click on this menu item to detect the sounder and proceed with system operations.

NOTE: Some adaptors require that the sounder be connected and powered up for the necessary drivers to be

loaded when the PC boots up. If the message "**ASPIStatus: No ASPI managers are loaded**" appears on program start up, the necessary device drivers are not loaded. The system will have to be re-booted with the sounder powered up and connected to properly load the drivers.

3.4 Display

This control group allows access to functions that control the greyscale presentation of the real-time received data and any recorded data during playback.

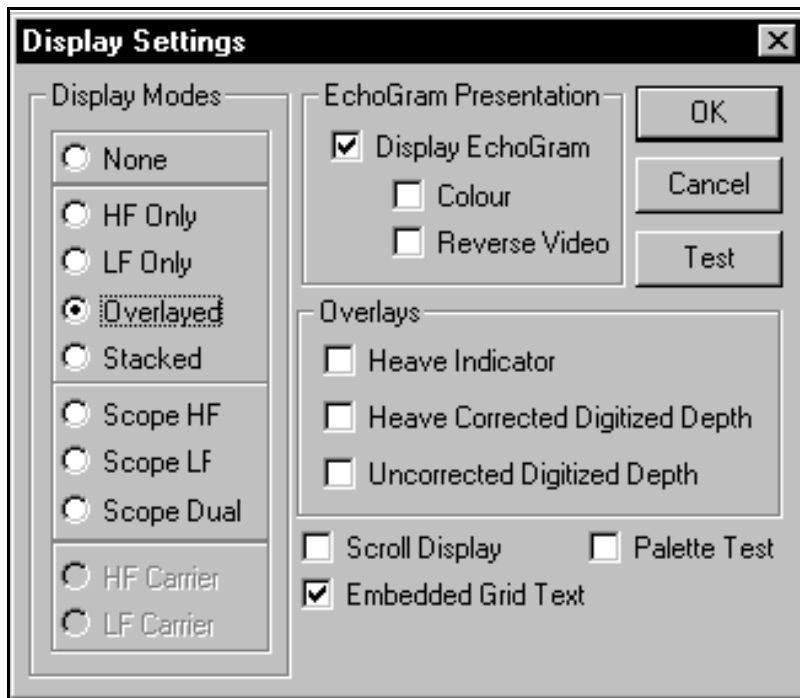
3.4.1 Contrast



This option pops up a dialogue box with a single control that allows the user to increase/decrease the contrast of the displayed greyscale data. This contrast control also adjusts the contrast of the thermal recorder hardcopy if the recording option is active.

This setting is stored in the application's INI file and restored the next time the program is invoked.

3.4.2 Settings



The **Settings** option brings up a dialogue box that allows the user to customize the display presentation to a configuration that suits his personal requirements. All of these settings are stored in the application's INI file and restored the next time the program is invoked.

NOTE: None of the display options adjusted by this dialogue will affect any of the recorded data. If the echogram data is being recorded to the binary file, the data is always stored in the same form it is received from the echosounder. All display transformations are applied to the independently from the recorded data.

3.4.2.1 Display Modes

There are eight display mode options available. They include four standard presentational formats, three special purpose formats, and the ability to turn the display off (**None**). The standard presentations formats are:

1. **LF only** displays the low frequency channel only, using the entire display window height.
2. **HF only** displays the high frequency channel only, using the entire display window height.
3. **Overlaid** displays both channels, if selected, overlaid together, using the entire display window height.
4. **Stacked** displays both channels separately, with the HF channel in the top half of the display and the LF in the bottom half.

The two specialized display modes are most useful for system debug purposes:

1. **Scope HF** provides a graphical presentation for the HF channel similar to an oscilloscope trace.
2. **Scope LF** provides a graphical presentation for the LF channel similar to an oscilloscope trace.
3. **Scope Dual** provides a graphical presentation for both channels similar to an oscilloscope trace, with the HF channel in the top half of the display and the LF in the bottom half.

Note: if the display window being used is fairly small and the return echo is very short in duration, the display presentation may not actually display the return. This is an artifact of the current scaling scheme to fit the return data completely inside the display window. Also, if the data display contains a large amount of black, the screen refresh rate can slow down considerably, especially on slower computers.

3.4.2.2 EchoGram Presentation

3.4.2.2.1 Display EchoGram

The **Display EchoGram** check box allows the user to turn the envelope data presentation on or off. When the box is checked, the actual envelope data is displayed in the window; if this item is not selected, the envelope data is not displayed in the window. For some applications, it may be more useful for the user to simply have the digitized depth overlays displayed instead the entire envelope record.

3.4.2.2.2 Colour

When **Colour** mode is selected (box checked), the envelope data displayed in the program window is in 15 colour levels, mapped from lowest to highest levels as follows: White(normal video) or Black (reverse video), Light Grey, Dark Grey, Cyan, Blue, Dark Blue, Dark Cyan, Dark Green, Dark Yellow, Green, Yellow, Magenta, Dark Magenta, Red, Dark Red. If this item is not checked, the envelope data is displayed in levels of grey, where for normal video mode white is the lowest level return and black is the highest. For reverse video mode, white is the highest level return and black is the lowest.

3.4.2.2.3 Reverse Video

When **Reverse Video** mode is selected, the display colours are configured to make black the main background colour. For both colour and greyscale modes, the lowest level return is assigned the colour black. When **Reverse Video** is not selected (normal mode), the lowest level return is assigned the colour white.

3.4.2.3 Overlays

3.4.2.3.1 Heave Indicator

The **Heave Indicator** option allows the user to enable or disable an overlay that shows the amount of heave relative to a nominal position on the graphical display. This overlay is only relevant if a heave sensor is interfaced to one of the input ports on the echosounder.

3.4.2.3.2 Heave Corrected Digitized Depth

The **Heave Corrected Digitized Depth** option allows the user to enable or disable an overlay that shows the positions of the heave corrected digitized depth to surface values for each channel displayed. If there is no heave sensor interfaced to the echosounder, this overlay is equivalent to the **Uncorrected Digitized Depth** overlay.

3.4.2.3.3 Uncorrected Digitized Depth

The **Uncorrected Digitized Depth** option allows the user to enable or disable an overlay that shows the positions of the digitized depth to surface values for each channel displayed. These depth values are the depth to surface values compensated for draft but not heave.

3.4.2.4 Scroll Display

The **Scroll Display** option affects the scanning of the display data in the window. If **Scroll Display** is selected (box checked), the displayed data "scrolls" from the right to the left of the window. The newest data line is always printed at the right side of the window, and the old data scrolls left until it reaches the end of the window and disappears. When **Scroll Display** is deselected, the data starts printing at the left side of the window, with the newest data line always advancing across the window to the right. When the right side of the window is reached, the new data line wraps back to the left side of the window and starts to overwrite the previous data. A solid black line is used to indicate the location of the newest data line on the display.

3.4.2.5 Embedded Grid Text

The **Embedded Grid Text** option allows the user to enable or disable the use of embedded grid text. The current grid scale is always indicated in the block on the right side of the window. For additional information, the user can enable **Embedded Grid Text** (box checked). This will result in grid text being displayed within the envelope data display whenever a range or phase change occurs, or at evenly spaced intervals if no changes have occurred. The embedded text can be disabled for cases when the grid text changes obscure the envelope data. The current scale will still be displayed in the right hand scale block.

3.4.2.6 Palette Test

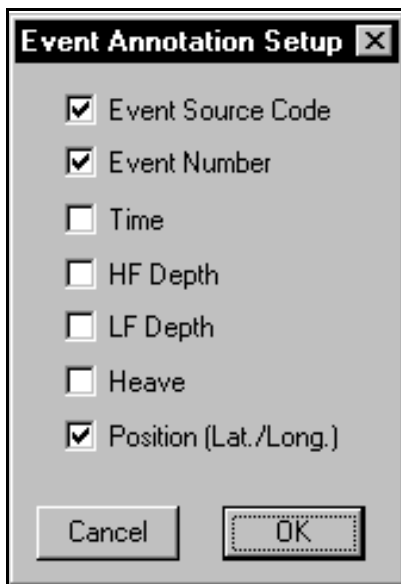
The **Palette Test** option allows the user to test the display capabilities of the host PC system being used. When the **Palette Test** is selected, for each ping cycle, instead of displaying the echogram data, the application displays a data ramp illustrating the colour or greyscale mapping from the lowest level (starting at the top of the display) to the maximum level. For some older systems, the greyscale levels are limited to as little as 4 levels mapped over the entire 0 to 255 data values; this limited mapping capability can result in poor echogram display especially for weaker echo returns. For such a situation, the colour mode would provide better echogram presentation.

3.4.2.7 Test

The **TEST** button allows the user to test the selected display settings while the dialogue box is still active without having to exit the dialogue box. If the selected settings are not desired, the original settings can be restored if the user presses the **CANCEL** button instead of **OK**.

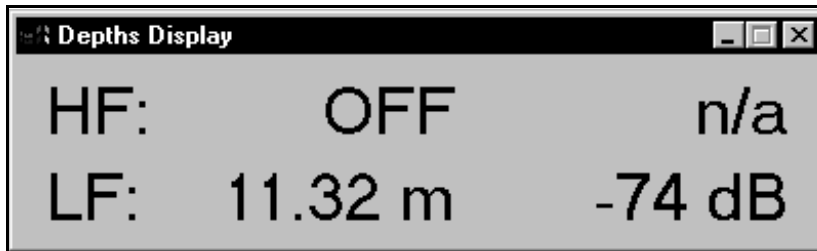
Note: the sounder must be running for any changes to have an effect; the changes are applied only to new data, not to previously displayed data.

3.4.3 Event Annotation



This menu item brings up a dialogue box that allows the user to select which of the available data parameters will be printed out on the event mark annotation line. The selections made here apply to the display, the Windows printer outputs, and the thermal recorder output. The user has no control on the ordering of the parameters; they are output in the order they are listed if they are checked off.

3.4.4 Depths



This option allows the user to enable large digit depths display dialogue box. This box uses a very large font for easier readability from a distance. This box also displays the echo strength parameter read from the echosounder.

The echo strength is the amplitude of the echo signal, at the transducer connector, in decibels relative to one volt. The echo strength value is meaningful in a relative sense, in that it accurately indicates ping to ping echo strength variations, but has not been calibrated individually for each frequency. The absolute value of the echo strength parameter should not be relied upon.

3.4.5 Toolbars

This control allows the user to enable and disable the application's toolbar as desired. The toolbar is a "bar" located at the top of the application's window, just below the main menu bar. When active, it displays pushbutton controls that provide shortcuts to desired menu controls. When the toolbar is active, the effectively usable display area is decreased by the amount used for the toolbar. Disabling the toolbar can give a slightly larger display area in the same size application window.

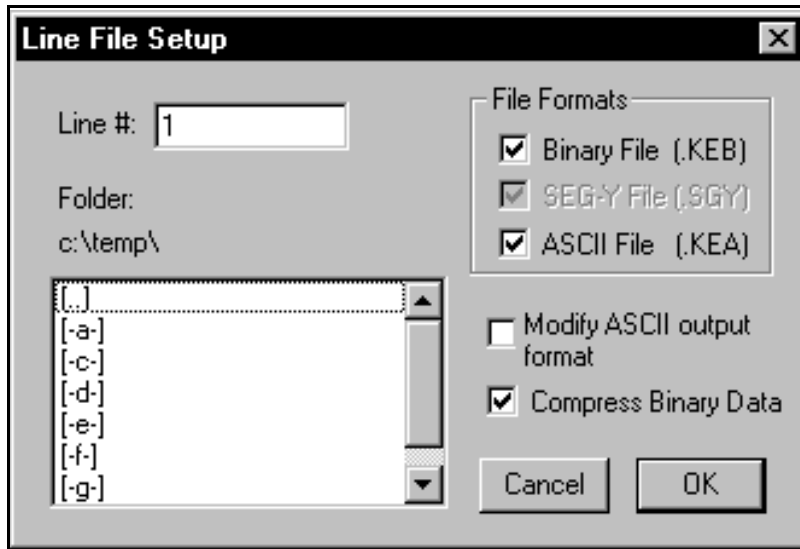
3.4.6 Status Bars

This control allows the user to enable and disable the application's status bar. The status bar is located at the bottom of the application's window. The status bar provides helpful messages in the left hand corner that describe menu controls, and other helpful items.

3.5 Record

This control group allows access to functions that control the recording of data from the echosounder onto the PC drive and a hardcopy recorder. All data recording options can be active simultaneously.

3.5.1 Start Line



The **Start Line** selection pops up a dialogue box that allows the user to select the folder (or directory) where the data file set is to be recorded, the line number used to identify the data set, and the desired output data formats (all can be active at the same time).

To modify the folder selection, the user simply double-clicks on the [..] to back up from the current directory, or double-clicks on the new directory or drive name desired. The currently selected folder is displayed in the text line above the selection box.

There are three possible output file formats: Binary, SEG-Y, and ASCII as well as a log file for each data file set.

3.5.1.1 Binary File Format

The envelope data for each channel can be recorded in a binary data file for use by post-processing software. Every ping cycle, one record (see Table 3-2) is stored with header information and raw data for each frequency channel. Each record is variable in length with a current maximum possible number of 3416 bytes, and can be compressed using a Huffman compression algorithm. The storage device for these files should have sufficient disk space free to store the vast amounts of data generated, especially when working in shallow water where the faster ping rate results in a larger volume of data being generated.

The binary data files are recorded using the following basic structural format:

- File Type Id Preamble (32 bytes)
- Index Record Block (16384 bytes)
- Data Records

The recording program will write records to one file until the index record block is filled; then the current file will be closed and a new one will be opened for subsequent data recording.

The application determines the output file names using the line number assigned to the data set and the computer's time when the file is opened for recording. The binary file name format is typically as follows:

nnn_hhmm.keb

where nnn = line number of the data set
hh = computer's time - hour
mm = computer's time - minutes
keb = extension for KEL binary data files

If the system tries to open another file with the same hour and minute time stamp, the “_” character is replaced with an alphabetic character, starting with “a” and working through the alphabet to “z”. If the system has used all the alphabetic characters and still tries to open a file with a common time stamp, the file recording for file type affected will be terminated, and the user alerted to the error condition; this is very unlikely to happen.

File Type Id Preamble

The first 32 bytes of the file are used for a file type identification preamble for the playback software to use to determine if the file is in the valid format supported by the version of software being used.

Example:

KEB D40-02382 V2.00 Huffman
(pad unused character locations with spaces)

where, KEB identifies the file as a KEL Binary file,
D40-02382 identifies the part number of the program used to record/convert the data,
V2.00 identifies the version of the program used to record/convert the data.
Huffman indicates that the data is in a compressed format (not present for uncompressed files)

Index Record

After the identification preamble, a block of bytes is reserved for an index of the records in the data file. There are 512 index entries, and each entry contains 32 bytes (512x32 bytes = 16384 bytes in the reserved block). This index block is initially loaded with zeros. For all records, the index entry will record a time stamp (PC time at receipt of SCSI record), the offset into file to the record, and record type code. The remaining bytes in the entry are available for record typespecific data to be stored for quick retrieval by post-processing applications.

Table 3-1: Index Entry for Envelope Data Record Type B2

| Entry Field | Description | Format | # Bytes |
|---------------------|---|-------------------------|---------|
| Time Stamp | PC time record received, milliseconds since midnight | 32-bit unsigned integer | 4 |
| Offset | Byte count offset from start of file to start of record | 32-bit unsigned integer | 4 |
| Record Code | A hexadecimal code defining record type | 8-bit hex code | 1 |
| Active Channel Code | Code indicating which channel(s) were active for this ping record: 0 = Both on, 1 = HF only, 2 = LF only | 8-bit unsigned integer | 1 |
| HF Depth | HF channel uncorrected depth to surface value, in metres, feet, or fathoms | floating point | 4 |
| LF Depth | LF channel uncorrected depth to surface value, in metres, feet, or fathoms | floating point | 4 |
| Record Number | Record number for current ping record | 16-bit unsigned integer | 2 |
| Fix Number | Fix number for current ping record, if applicable (0 if no fix) | 16-bit unsigned integer | 2 |
| Unused Bytes | Pad unused bytes with zeros | not applicable | 10 |

Data Records

After the Index block, the actual data records are stored as they are received. As soon as a record is received, it is be recorded to the disk file. Records are recorded to the file in the same order as they were received (time stamps must be in sequential order). Multiple types of records can be stored in the binary file; ie Envelope data records, serial port sensor data records (only Envelope records are actually implemented at this time). The original data record format is shown in Table 3-2. The data can be stored in this format, or the user can enable data compression. When compression is enabled, each data record as shown in Table 3-2 has a Huffman compression algorithm applied to it. The result of the compression is stored in the file. The playback application runs the matching decompression algorithm to access the data records.

Table 3-2: Variable Length Dual Channel Envelope Data Record Type: B2

| FIELD DESCRIPTION | DATA FORMAT / RANGE | BYTE COUNT |
|---|---------------------|------------|
| Record Identification Information | | |
| Header | B2h | 1 |
| Record Length | data dependent | 2 |
| Record # | 0 to 65536 | 2 |
| # of Channel Records | 1-2 | 1 |
| Ping Specific Parameters Shared for Each Channel | | |
| Time @ Start of Ping: hours | 0 to 23 | 1 |

| FIELD DESCRIPTION | DATA FORMAT / RANGE | BYTE COUNT |
|---|--|------------|
| Time @ Start of Ping: minutes | 0 to 59 | 1 |
| Time @ Start of Ping: seconds | 0 to 59 | 1 |
| Time @ Start of Ping: milliseconds | 0 to 999 | 2 |
| Working Units Flag | 0 = metres 1 = feet 2 = fathoms | 1 |
| Speed of sound | 1300 to 1700 m/s 4265 to 5577 ft/s 710 to 929 fm/s | 2 |
| Start depth | 0 to 10000 | 2 |
| End depth | 10 to 12000 | 2 |
| Heave (expressed in cm, $\frac{1}{100}$ ft, $\frac{1}{100}$ fm) | data dependent | 2 |
| Heave Latency | max. 9999 ms | 2 |
| Tide | not used, loaded with 0 | 2 |
| Tide Latency | not used, loaded with 0 | 1 |
| Latitude (expressed in degrees) | data dependent | 8 |
| Longitude (expressed in degrees) | data dependent | 8 |
| Position Latency | max. 9999ms | 2 |
| Record Latency | max. 9999ms | 2 |
| Pinger Mode | 0 = off, 1 = on | 1 |
| Primary Channel | 0 = HF, 1 = LF | 1 |
| Spare Bytes | 0 | 3 |
| Event Mark Condition | | |
| Event Mark Code | 0 to 6 | 1 |
| Number of Event Mark Data Bytes | 0 to 130 | 1 |
| Fix Mark Number | 0 to 65536 | 2 |
| Fix Mark Annotation String | data dependent | variable |
| High Frequency Channel Parameters | | |
| HF SPM Frequency Code | 0 to 31 | 1 |
| Number of HF Data Bytes | 0 - 65535 possible (currently fixed at 1600) | 2 |
| Sample Data Type | 00h | 1 |
| Transmit power level | frequency specific | 1 |
| Analog Rx gain code | 0 to 255 | 1 |
| Pulse length code | frequency specific | 1 |

| FIELD DESCRIPTION | DATA FORMAT / RANGE | BYTE COUNT |
|--|--|------------|
| Filter type code | frequency specific | 1 |
| Draft (expressed in cm, $\frac{1}{100}$ ft, $\frac{1}{100}$ fm) | 0 to 10000 [cm] 0 to 32808 [$\frac{1}{100}$ ft] 0 to 5468 [$\frac{1}{100}$ fm] | 2 |
| Digitized Depth (expressed in metres, feet, fathoms) | 0.00 to 12000. | 4 |
| Multiplexer Channel | 0 to 8 | 1 |
| Echo Strength (expressed in decibels) | -128 to 0 | 1 |
| Processing Gain | 0 to 8 | 1 |
| Sensitivity | Off, 2 - 100 | 1 |
| TxBBlank (expressed in dm, $\frac{1}{10}$ ft, $\frac{1}{10}$ fm) | 0 to 3000 [dm] 0 to 9843 [$\frac{1}{10}$ ft] 0 to 1640 [$\frac{1}{10}$ fm] | 2 |
| Echo Threshold Level | 0 - 32767 | 2 |
| Spare Bytes | 0 | 2 |
| High Frequency Signal Data | | |
| Signal Data | 0 to 255 | variable |
| Low Frequency Channel Parameters | | |
| LF SPM Frequency Code | 128 to 159 | 1 |
| Number of LF Data Bytes | 0 - 65536 possible (currently fixed at 1600) | 2 |
| Sample Data Type | 00h | 1 |
| Transmit power | frequency specific | 1 |
| Analog Rx gain code | 0 to 255 | 1 |
| Pulse length code | frequency specific | 1 |
| Filter type code | frequency specific | 1 |
| Draft (expressed in cm, $\frac{1}{100}$ ft, $\frac{1}{100}$ fm) | 0 to 10000 [cm] 0 to 32808 [$\frac{1}{100}$ ft] 0 to 5468 [$\frac{1}{100}$ fm] | 2 |
| Digitized Depth (expressed in metres, feet, fathoms) | 0.00 to 12000. | 4 |
| Multiplexer Channel | 0 to 8 | 1 |
| Echo Strength (expressed in decibels) | -128 to 0 | 1 |
| Processing Gain | 0 to 8 | 1 |
| Sensitivity | Off, 2 - 100 | 1 |
| TxBBlank (expressed in dm, $\frac{1}{10}$ ft, $\frac{1}{10}$ fm) | 0 to 3000 [dm] 0 to 9843 [$\frac{1}{10}$ ft] 0 to 1640 [$\frac{1}{10}$ fm] | 2 |

| FIELD DESCRIPTION | DATA FORMAT / RANGE | BYTE COUNT |
|----------------------------------|---------------------|------------|
| Echo Threshold Level | 0 - 32767 | 2 |
| Spare Bytes | 0 | 2 |
| Low Frequency Signal Data | | |
| Signal Data | 0 to 255 | variable |

The SPM Frequency code is the frequency identification code number read from the actual SPM hardware. For the HF channel, the raw 8-bit hex code is used. For the LF channel, the 8-bit hex code is bit-wise “or’ed” with 080h (MSB set to one); this enables the Echo Control and Post Survey applications to distinguish which channel has been recorded when an echosounder is only using one channel for data acquisition. The echosounder only sends the envelope data for the active channel and the Echo Control program only records the one channel; this saves on data transfer times and disk space requirements for the data recording

Table 3-3: SPM Frequency Code Definitions

| SPM Frequency | HF Code (raw code) | | LF Code (raw code 80h) | |
|---------------|--------------------|-----------------|--------------------------|-----------------|
| | Binary | Hexadecima l | Binary | Hexadecima l |
| 3.5 | 00001000 | 08 | 10001000 | 88h |
| 7.0 | 00001110 | 0E | 10001110 | 8E |
| 12 | 00001001 | 09 | 10001001 | 89 |
| 15 | 00010010 | 12 | 10010010 | 92 |
| 24 | 00000010 | 02 | 10000010 | 82 |
| 26 | 00001111 | 0F | 10001111 | 8F |
| 28 | 00000011 | 03 | 10000011 | 83 |
| 30 | 00000111 | 07 | 10000111 | 87 |
| 33 | 00001011 | 0B | 10001011 | 8B |
| 38 | 00001010 | 0A | 10001010 | 8A |
| 41 | 00001100 | 0C | 10001100 | 8C |
| 50 | 00000001 | 01 | 10000001 | 81 |
| 100 | 00010001 | 11 | 10010001 | 91 |
| 120 | 00000100 | 04 | 10000100 | 84 |
| 150 | 00010000 | 10 | 10010000 | 90 |
| 200 | 00000000 | 00 | 10000000 | 80 |
| 208 | 00001101 | 0D | 10001101 | 8D |
| 210 | 00000110 | 06 | 10000110 | 86 |

3.5.1.2 SEG-Y File Format

The SEG-Y output file format is only available on deep-water systems with 3.5kHz correlation processing code compiled to support carrier data acquisition. The file format has been defined to meet as accurately as possible the format specifications defined by the Society of Exploration Geophysicists.

3.5.1.3 ASCII File Format

The ASCII output file can be used to log many data fields such as depth, echosounder time, GPS position, heave. Since these files do not contain any of the raw envelope data, they use substantially less disk space than the binary files. Every ping cycle, the application records one output string.

The application determines the output file names using the line number assigned to the data set and the computer's time when the file is opened for recording. The ASCII file name format is typically as follows:

nnn_hhmm.kea

where nnn = line number of the data set
hh = computer's time - hour
mm = computer's time - minutes
kea = extension for KEL ASCII data files

If the system tries to open another file with the same hour and minute time stamp, the “_” character is replaced with an alphabetic character, starting with “a” and working through the alphabet to “z”. If the system has used all the alphabetic characters and still tries to open a file with a common time stamp, the file recording for file type affected will be terminated, and the user alerted to the error condition; this is very unlikely to happen.

The user can request to modify the desired output data format by checking the **Modify ASCII output format** box. This causes the application to pop up a configuration dialogue box after the Line File Setup dialogue box options have been accepted.

3.5.1.4 Data Set Log Files

There is an extra file recorded for each output format mentioned in the previous sections. This file is referred to as the data set log file. The log file name format is typically as follows:

nnn_ttt.log

where nnn = line number of the data set
ttt = reference for data output format: keb for binary, kea for ASCII, sgy for SEG-Y
log = extension for log data files

The log file contains a record of all the file names for the files recorded in a particular line file data set. For example, if a binary file data set with a line number of 3 consisted of two files recorded at 11:15am and

11:17am, the log file would contain the file names: 003_1115.keb and 003_1116.keb. This log file is critical for the Playback and Printing software to determine what files are to be used for playback.

3.5.1.5 Modify ASCII output format

When the Modify ASCII output format box is checked, the application will pop up a dialogue box that provides access to the file format configuration items, but only when the Line File Setup selections have actually been accepted (click OK). The modifications made here only apply to the ASCII file output, not the COM3 echosounder output. See the section for **Depth Log** in Section 3.6 for information on modifying the COM3 output.

Depth Log String Formatting

User Defined Preamble String

KEL Proprietary Header String

Record Number

Fix Indicator

Date

Time: hhmms

Time: milliseconds

Ping Start to Output Latency

LF Header

LF Depth To Transducer

LF Depth To Surface

LF Depth To Surface, Corrected for Heave

LF Depth Valid Flag

LF Mux Channel

LF Draft

HF Header

HF Depth To Transducer

HF Depth To Surface

HF Depth To Surface, Corrected for Heave

HF Depth Valid Flag

HF Mux Channel

HF Draft

Sound Speed

Heave

Heave Latency

Position [Latitude, Longitude]

Position Latency

CheckSum

Example String:

\$PKEL99,F0012,234520.695,24.65,25.40,-04.00 ,

Buttons: OK, Cancel, Clear All

This dialogue box allows the user to customize the ASCII file format string with certain limitations. The fields can only appear in the order listed (ie header string, HF depth, LF depth, checksum) separated only by commas (except hhmms and milliseconds), and terminated only at the very end by <CR><LF>.

As various fields are selected or deselected, the **Example String** at the bottom of the dialogue box changes to illustrate the expected output format.

Some fields can only be selected if other fields are also selected and will be inactive (greyed out) if the required field is not selected. For example, the Position Latency field is an active option only if the Position field is selected.

The format configuration selected is stored in the application's INI file and restored the next time the program is invoked.

3.5.1.6 Compress Binary Data

When the Compress Binary Data box is checked, the application will compress all the binary data records using a Huffman compression algorithm on each record. The File Type Id Preamble in each data file will indicate that Huffman compression has been applied. This control gives the user has the option to store in a compressed or uncompressed format.

3.5.2 End Line

The **End Line** selection causes all data file recording to be terminated and all open data files to be closed.

3.5.3 Hardcopy

The **Hardcopy** selection toggles the state of the hardcopy option on (checkmarked) and off. If a thermal recorder has been selected, the program will send the envelope data to the recorder when the hardcopy option is selected. This setting is stored in the application's INI file and restored the next time the program is invoked.

3.6 Setup

The sub-menus under this item give the user access to parameters and features not required on a regular basis.

3.6.1 Working Units

The **Working Units** option allows the user to select the desired operating units from three sub-menu options. The operating **Units** can be toggled between **Metres**, **Feet**, and **Fathoms**. The currently active selection is indicated by a checkmark on the sub-menu item. When these units are switched, the echosounder recomputes the speed of sound and draft into the appropriate new units.

3.6.2 TVG

This option allows the user to select **TVG** (time varied gain) on the analog receivers. A check mark indicates the currently selected option. The **OFF** setting provides constant receive gain throughout each pulse-echo cycle (note that receive gain will still vary from ping to ping if **AGC** is on). When set to **20 log R**, the receive gain is increased linearly (logarithmically if gain is expressed in decibels) with time and range from the instant of transmission, to compensate for signal amplitude loss due to spherical spreading. The **40 log R** setting provides for spherical spreading of both outgoing and returning signals. The bottom referenced setting (**bottom ref'd**) provides a gain ramp at the bottom (as determined from the previous ping) to provide

approximate compensation for attenuation in sub-bottom sediments. The last setting is intended for sub-bottom profiling applications.

TVG may help to prevent the depth digitizer from falsely triggering on fish or other water column targets at the expense of slightly greater susceptibility to locking on the second echo from the bottom.

Note that TVG operates in addition to the **AGC** or **manual gain** settings which are applied independently to each channel, and which effectively define the starting gain for each channel at the instant of transmission.

3.6.3 Sync Mode

The **Sync Mode** option allows the user to select between the echosounder's own internal timebase-controlled ping cycle synchronization, or an external ping cycle synchronization signal.

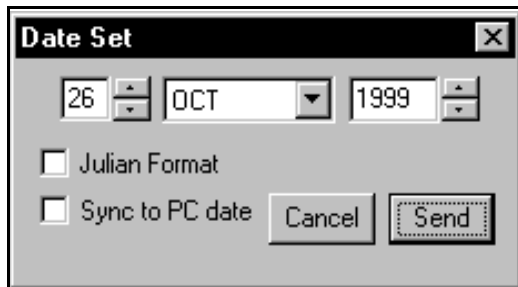
WARNING: If the **Sync Mode** is toggled to external sync, the echosounder will not ping unless there is an external sync signal fed to the appropriate signal on the sounder. Currently, only the 320B/R provides an external connector for this signal connection. Please contact KEL if you wish to use this feature on any other 320 models.

3.6.4 Primary Channel

The **Primary Channel** parameter defines the frequency channel used as the reference depth for the auto phasing algorithm. The 320M's printing software uses **Primary Channel** data for channel-specific overlays in the case where both channels are superimposed and only one channel's overlays can be printed.

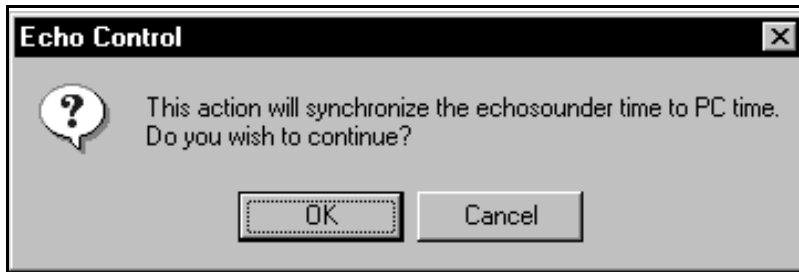
The **Primary Channel** designation only has effect when both channels of a dual-channel echosounder are ON. If only one channel is on, it is automatically considered to be the primary channel.

3.6.5 Date



The **Date** option brings up a dialogue box that allows the user to set the date manually, or to tell the program to sync the echosounder to the current PC date. If the **Sync to PC date** check box is marked, the program ignores the date value displayed in the box and automatically sends the current PC date to the sounder. If the **Julian Format** check box is marked, the application toggles the echosounder's date format presentation mode to Julian.

3.6.6 Sync Time



The **Time** option brings up a dialogue box that allows the user to sync the echosounder to the current PC time. This function syncs the echosounder to the survey computer to a hundredths of a second.

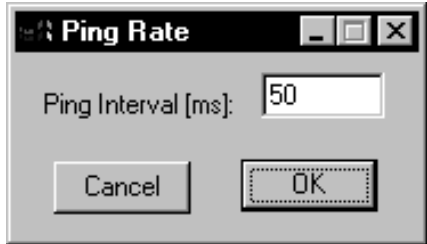
3.6.7 Event Marks



The **Event Marks** option pops up a dialogue box that allows the user to adjust the event marking options. The **Next Event Number** will set the echosounder's event counter to the desired value when the **Send** box is clicked. The **Timed Event Marks** check box allows the user to select the echosounder's internally timed event marks. If this box is checked, the echosounder will cause internally generated event mark at the time interval selected in the **Timed Event Interval** box. The units for this interval measurement are seconds.

WARNING: Modification of any data in this dialogue box will always cause the Event Number to be modified in the sounder. This application cannot always monitor what is currently set in the sounder, so it is possible to reset the event number to an undesired value.

3.6.8 SCSI Ping Rate



As soon as this Echo Control application is activated and establishes contact with the echosounder, it takes over control of the echosounder's ping rate. The user can adjust this ping rate to the optimal value for his application. The echosounder will then ping at this rate if possible; the echosounder has built-in ping rate limitations that may override the basic value selected here. When this Echo Control application is terminated, the echosounder is restored to its internal timebase-controlled ping rate.

Note: if external sync mode has been selected, neither the SCSI-controlled ping rate nor the internal timebase-controlled ping rate options are functional. The sounder will simply wait until an external synchronization signal is applied and not all echosounders are equipped with an external sync input connector.

3.6.9 Tracking Gate



The **tracking gate** parameter is used by the bottom tracking algorithm to determine the validity of the current depth value. It is a depth variability tolerance value, defined as a distance above or below the bottom depth trend established by the current and several previous samples. If the most recent depth value fits this established trend to within the range defined by the **tracking gate**, it is considered valid and is displayed on the four-digit LCD. If a depth return falls outside of this range, it is deemed invalid and "0.0" is displayed in all the dialogue boxes with depth displays.

For a discussion of the bottom tracking algorithm see Section 3.3.1.11.4.

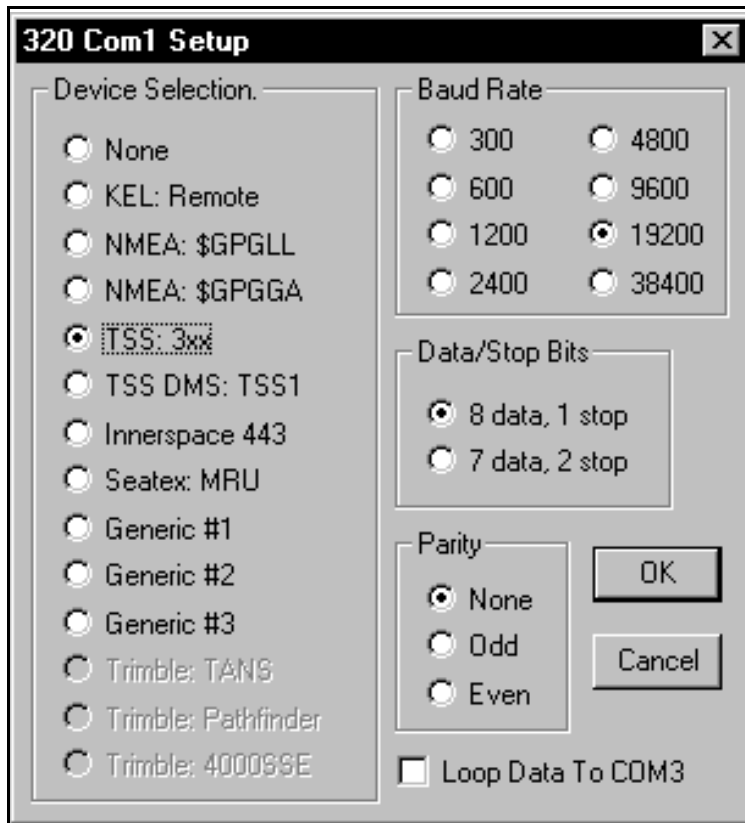
3.6.10 Pinger Mode

This option allows the user to toggle the echosounder's specialized Pinger mode On or Off. It also allows the Pinger time reference to be "skewed" up or down from the current reference.

The Pinger Mode is a special operational mode that is currently only supported on 3.5kHz and 12kHz frequency channels. When the Pinger Mode is on, the echosounder does not transmit at all but simply listens, typically for an external pinger device, and displays the received data on one second intervals. The only channel control that has any effect in Pinger Mode is Manual **Gain**, (**Agc** must be toggled off). For frequencies that have **Processing Gain** support, the sounder will use the gain value used during the last normal transmit/listen ping cycle; any attempt to modify the parameter during Pinger Mode will be ignored.

3.6.11 320 Serial...

3.6.11.1 320 Com Ports: Com 1/ Com 2/ Com 3/ Com 4



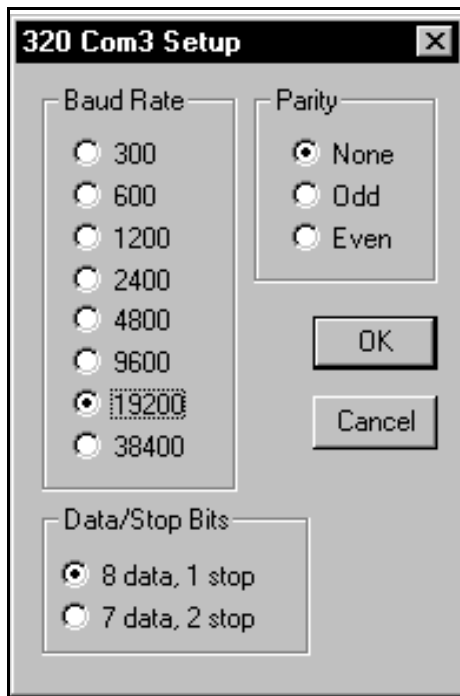
For the menu options for the 320's Com Ports 1, 2, and 4, a dialogue box like the one illustrated above is activated. These three ports can be configured to accept input from external devices. Simply select the desired device driver, and then set up the baud rate, parity, and data/stop bits settings to match those required by the external device.

Note: The Com Port 4 is not available on 320M models; it is used for the built-in control panel.

If the **Loop Data to COM3** box is checked and the selected peripheral device outputs printable ASCII strings, the echosounder will echo these strings upon receipt out Com3 to any attached survey computer / data logger.

Only specialized versions of the application allow access to the extra disabled GPS options.

Note: The echosounder can support only one device of a particular type, such as one heave sensor or one GPS receiver. If one port has already been configured to a particular type of sensor, any attempt to configure another port to the same type of sensor will fail. For example, if Com 1 has been configured for TSS:3xx (a heave sensor), Com 2 cannot be configured for either TSS:3xx or Seatex: MRU (another heave sensor).



The Com 3 on the echosounder is a special com port. It cannot be connected to other external devices like the other three ports. It is used for data logging to survey computers, and for remote control from a host PC; thus the only settings to be adjusted on this port are the actual communication settings of baud rate, parity, and data/stop bits.

3.6.11.2 Depth Log

The echosounder is capable of outputting on the serial port COM3, different types of depth log strings to fit individual customer needs, or to not output any data at all if desired. To select a depth format, simply click on the appropriate menu item; a check mark indicates if a format is selected. Note: only one format can be selected at any given time.

The **None** option simply turns off the serial depth logging on the echosounder.

Depth Log String Formatting

User Defined Preamble String
 KEL Proprietary Header String
 Record Number
 Fix Indicator
 Date
 Time: h:mm:ss
 Time: milliseconds
 Ping Start to Output Latency

LF Header
 LF Depth To Transducer
 LF Depth To Surface
 LF Depth To Surface, Corrected for Heave
 LF Depth Valid Flag
 LF Mux Channel
 LF Draft

HF Header
 HF Depth To Transducer
 HF Depth To Surface
 HF Depth To Surface, Corrected for Heave
 HF Depth Valid Flag
 HF Mux Channel
 HF Draft

Sound Speed
 Heave
 Heave Latency
 Position [Latitude, Longitude]
 Position Latency
 CheckSum

Example String:
 24.65,25.40,-04.00 ,

OK
 Cancel
 Clear All

The **Configure** option pops up a dialogue box that allows the user to customize the depth logging string with certain limitations. The fields can only appear in the order listed (ie., header string, HF depth, LF depth, checksum) separated only by commas (except h:mm:ss and milliseconds), and terminated only at the very end by <CR><LF>. As various fields are selected or deselected, the **Example String** at the bottom of the dialogue box changes to illustrate the expected output format.

Some fields can only be selected if other fields are also selected and will be inactive (greyed out) if the required field is not selected. For example, the Position Latency field is an active option only if the Position field is selected.

ISAH: Knudsen selects the depth format shown below. This format outputs the depth to surface uncorrected for heave offset for a dual channel system. (ie. LF and HF channels.)

```
$PKEL,007,hhmmss,LF,x.x,HF,x.x*hh<cr><lf>
```

where: hhmmss = 320B system's time
x.x = depth expressed in metres.

ISAH: Elac selects the depth format that will interface with the Elac, STG 721C Depth Digitizer record format option on the ISAH package from Questor Tangent. This format outputs the depth to surface uncorrected for heave offset.

```
Low Frequency:  AxxxxxxO<cr><lf>
High Frequency: ExxxxxxO<cr><lf>
```

where: xxxxxx = depth expressed in centimetres.

Echotrac Format selects the Echotrac emulation string. This format outputs depth to surface corrected for heave.

```
HF Frequency only:  fceH xxxxx<CR>
LF Frequency only:  fceL yyyyy<CR>
Both Frequencies:  fceB xxxxx yyyyy <CR>
```

where: f = space if no event mark, F if event mark condition
cc = ET for [dm], et for [cm]
e = space if depth data okay, E if data bad
H,L,B = data indicators: H=HF, L=LF, B=both
xxxxx = HF channel depth,
yyyyy = LF channel depth

Note: The echosounder only emulates the Echotrac output string. It cannot accept the annotation commands normally sent to an Echotrac system.

Digitrace Format [dm] selects the Digitrace emulation string for units that output the depth to decimetre resolution. This format outputs depth to surface corrected for heave.

```
HF Frequency only:  fDTeH xxxxx<CR>
LF Frequency only:  fDTeL xxxxx<CR>
```

where: f = space if no event mark, F if event mark condition
e = space if depth data okay, E if data bad
H,L = data indicators: H=HF, L=LF
xxxxx = depth

Note: The echosounder only emulates the Digitrace output string. It cannot accept the annotation commands normally sent to a Digitrace system.

Digitrace Format [cm] selects the Digitrace emulation string for units that output the depth to centimetre resolution. This format outputs depth to surface corrected for heave.

HF Frequency only: fDTeH xxxxx<CR>
 LF Frequency only: fDTeL xxxxx<CR>

where: f = space if no event mark, F if event mark condition
 e = space if depth data okay, E if data bad
 H,L = data indicators: H=HF, L=LF
 xxxxx = depth

Note: The echosounder only emulates the Digitrace output string. It cannot accept the annotation commands normally sent to a Digitrace system.

Simrad EA200 (6 byte) selects the Simrad EA200 - 6 byte format emulation string. This format outputs depth to surface corrected for heave. Depth value expressed is HF depth value if HF channel is turned on (regardless if LF is on), LF depth value if LF channel only is on.

Dxxxxx

where: xxxxx = depth expressed in decimetres

Note: The echosounder only emulates the Simrad EA200 output string. It cannot accept the annotation commands normally sent to an Simrad system.

SimradEA200 (7 byte) selects the Simrad EA200 - 7 byte format emulation string. This format outputs depth to surface corrected for heave. Depth value expressed is HF depth value if HF channel is turned on (regardless if LF is on), LF depth value if LF channel only is on.

Dxxxx.x

where: xxxx.x = depth expressed in metres

Note: The echosounder only emulates the Simrad EA200 output string. It cannot accept the annotation commands normally sent to an Simrad system.

Deso 20 selects the Deso 20 emulation string. This format outputs depth to surface corrected for heave.

For this emulation mode, the depth log output format supported is as follows:

Both frequencies: DAXXXXXX.XX mDBXXXXXX.XX m<CR><LF>
 High Frequency only: DBXXXXXX.XX m<CR><LF>
 Low Frequency only: DAXXXXXX.XX m<CR><LF>

where: DB = high frequency channel identifier
 DA = low frequency channel identifier
 X = number 0 .. 9
 m = metre units identifier.

The text annotation format supported is as follows:

TXxxxx...xxxx<CR><LF>

where TX = text identifier
 x = ASCII character between 20h and 7Fh.

When this line is received by the sounder, the ASCII characters are stored in the event mark annotation buffer. If an invalid character or more than 50 characters are received, the entire data line received is discarded and the event mark annotation buffer is cleared.

EM3<CR><LF>

When this line is received by the echosounder, it creates an event mark with the current contents of the event mark annotation buffer.

NMEA: SDDBT(HF): selects the NMEA depth below transducer format string. This format outputs depth to transducer for the HF channel only, in either feet, metres, or fathoms in the appropriate field location dependent on the current working units.

\$SDDBT,x.x,f,x.x,M,x.x,F*hh<CR><LF>

NMEA: SDDBT(LF): same format as NMEA:SDDBT(HF) except outputs LF channel data.

Serial to BCD (HF): is a special compilation option that provides interface capability for the 320 echosounder to a specific external Serial-to-BCD converter. This format outputs depth to surface corrected for heave for the HF channel only.

```
<STX><POL><DATA><L/K><G/N><STATUS><CR><LF>
```

where: STX = 02h

POL = polarity = 02h for plus, 2Dh for minus

DATA = seven character with embedded decimal point, leading zeros suppressed as 02h

L/K = units: L(4Ch) for pounds, K(4Bh) for kilograms: arbitrarily set to K

G/N =Gross or Net mode: G(47h) or N(4Eh): arbitrarily set to G

STATUS = Space (02h) for normal, M(4Dh) for motion, I(49h) for invalid data,
O(4Fh) for over/under range

Serial to BCD (LF): same format as **SER to BCD(HF)** except outputs LF channel data.

3.6.12 3 Minute Check

The 3 Minute Check initiates a specialized mode in the Echo Control application. When the mode is activated, the Echo Control application pops up a dialogue box for opening a configuration file (see Section 3.2.1 for details about configuration files). Once a file has been selected, the Echo Control program continues basic sounder operation as selected by the configuration file; it also starts recording a special ASCII depth log output file. Then, every three minutes the Echo Control application will check the previously selected configuration file to determine if it has changed. If the file has changed, the Echo Control application loads the new version and implements the control changes specified in the file. At the three minute interval, the Echo Control program also closes the current special ASCII depth log file and opens a new one. This was a specialized mode created for a particular customer to allow remote control of the echosounder using a dial-up connection and to allow the user access to the most recently acquired depth readings. This option is available for all users but it is advisable that the user contact KEL personnel for more details regarding system operation in this mode. Disabling the mode (re-selecting the menu option once it is checkmarked) will close all special ASCII file and terminate the three minute check process.

3.7 Upgrades

3.7.1 Load Tag

The **Load Tag** option is used for doing echosounder firmware upgrades. The file selection box that pops up lets the user select the desired tag file to be downloaded to the echosounder. Once a file has been selected by the user, the program downloads it to the echosounder over the SCSI connection. The application displays an hour-glass icon until the download has completed.

3.7.2 Initialize NVM

The **Initialize NVM** option is used to reset the echosounder's non-volatile memory parameters to factory default values. This causes all the sounder's operational parameters to be modified from any user selected values back to the original defaults. The application displays an hour-glass icon until this operation has completed.

3.7.3 Program PS

The **Program PS** option is only needed after a **Load Tag** command has been performed, to program the new firmware permanently into the echosounder's FLASH eproms. If a new tag file has been downloaded, and the echosounder is powered down before a **Program PS** command has been performed, the new firmware is lost and the echosounder will power back up with the old firmware. The application displays an hour-glass icon until this operation has completed.

3.7.4 Program TX

The **Program TX** option is only needed after a **Load Tag** and a **Program PS** command have been performed, to program the Transmit data prom with the internally generated transmit data used by the new firmware.

3.8 Fix Mark

The **Fix Mark** control is a special case menu item. It does not display any sub-menus, but causes an event mark when clicked. If there are no other dialogue boxes active, simply pressing **Alt-M** will cause a fix mark.

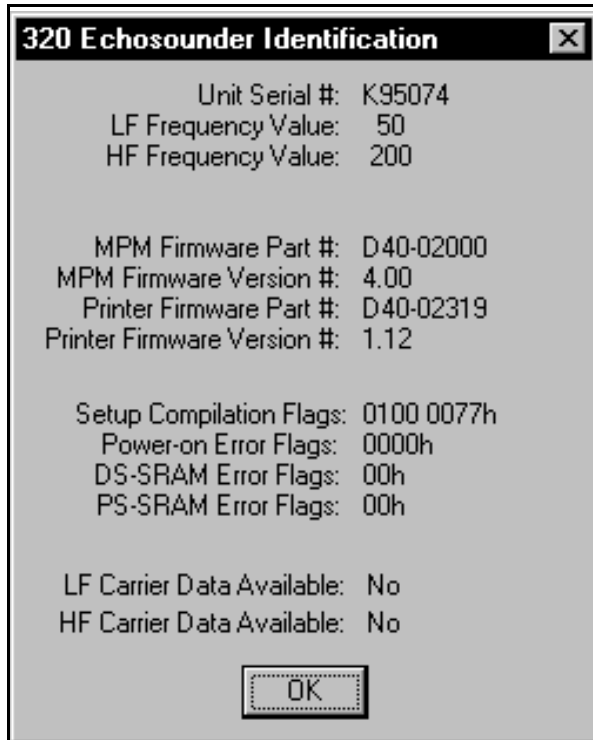
3.9 Blank Screen

The **Blank Screen** control is another special case menu item. It, too, does not display any sub-menus, but causes the greyscale display window to be cleared of any data when clicked. If there are no other dialogue boxes active, simply pressing **Alt-B** will cause the display to clear.

3.10 Help

The **Help** menu provides access to two options that provide the user with system configuration information that is most useful when contacting the factory for technical assistance. There are no other help features implemented yet

3.10.1 320 Identification

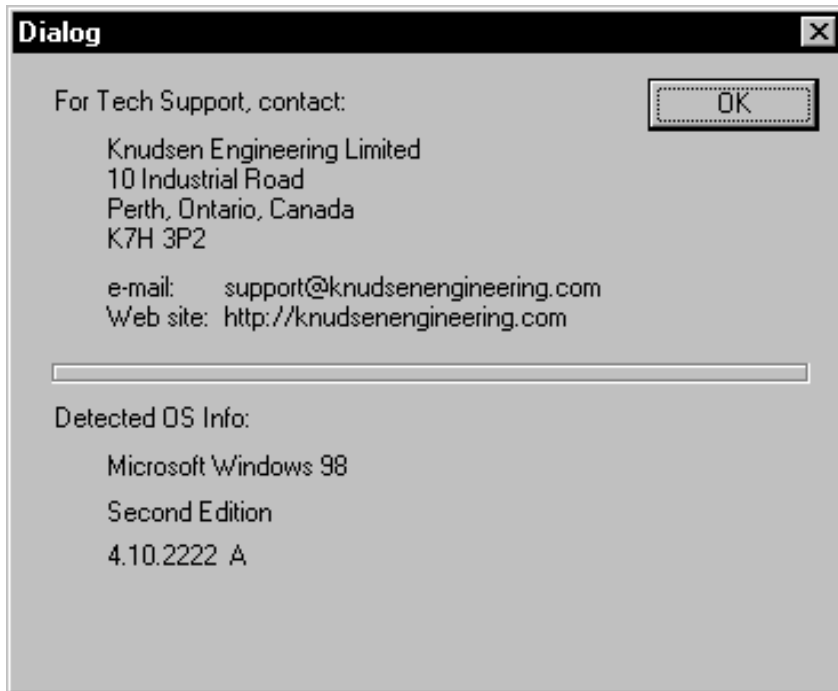


This option pops up a dialogue box that reports the echosounder system information read from the echosounder when the program was invoked and initiated communication with the echosounder. It reports the system's serial number, frequency configuration, and controlling firmware part number and version.

The setup compilation flags are merely an indicator of the particular code options compiled into a user's specific system. This information is really only useful to KEL personnel, and it is helpful if it can be provide when users contact the factory for assistance.

The error flags indicate when problems are occurring in the echosounder. If the user is having trouble with the system and any of the error flag values are non-zero, the user should contact the appropriate technical personnel to have the system serviced.

3.10.2 Tech Support



This option brings up a simple dialogue box that provides contact information for technical support. It also provides information about the type of Windows operating system the Echo Control program has detected.

3.10.3 About Echo...



The **About ECHO...** menu item brings up a simple dialogue box stating the name of the PC software program, the KEL part number for the program, and the latest revision number.

4 SCSI ERROR MESSAGES

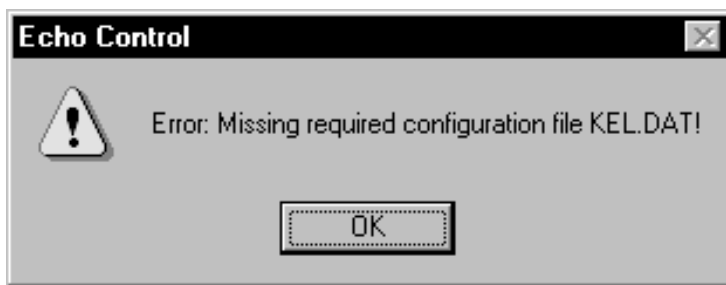
Dialogue boxes with SCSI error messages may appear under certain conditions relating to power sequencing. When this occurs, the "OK" boxes should be clicked and the operation (which brought up the dialogue box) repeated.

Some adaptors require that the sounder be connected and powered up for the necessary drivers to be loaded when the PC boots up. If the message "**ASPIStatus: No ASPI managers are loaded**" appears on program start up, the necessary device drivers are not loaded. The system will have to be rebooted with the sounder powered up and connected to properly load the drivers.

5 AUTHORIZATION ERRORS

All 320B Series Echosounder users must have the Echo Control application to be able to operate their sounders. For 320M Series Echosounder users, the Echo Control and SCSI interface are only available as options for a licencing fee. The Echo Control application uses a special authorization file to determine a 320M Series Echosounder's eligibility to use the SCSI interface. There are various "error" messages that could occur relating to the authorization file and the eligibility of the sounder to use the SCSI control interface.

5.1 Missing file KEL.DAT



If the necessary authorization file, KEL.DAT, is missing or is not located in the same directory as the application, the Echo Control application will display a message indicating the inability to find the file. If the file has accidentally been moved from the Echo Control application's directory, simply copy back to the appropriate directory. (See the Software Installation / Upgrade Manual for details about file locations.) If the file is missing, the installation procedure should be repeated.

5.2 Authorization Failed



If the Echo Control application cannot verify that the echosounder being used has the SCSI interface enabled or the eligibility to use the interface, the application brings up a dialogue box stating that the authorization has failed. Users need to contact their local representative or the factory to purchase a site licence and an updated authorization file, and perhaps, a new software package will be provided to enable the SCSI interface option. If the user has already purchased a site licence for the unit in question, an updated authorization file would be provided to correctly enable the option.



There is an option for a password entry; the password is released only to sales representatives to provide them with the ability to demo the application to prospective customers. All customers desiring the SCSI option must purchase the site licence and they will be provided the appropriate authorization file that will allow immediate access to the application's functionality.