320B SERIES ECHOSOUNDER

HARDWARE MANUAL

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ENGINEERING LIMITED

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Perth, Ontario, Canada

WARNING!

The 320B series of echosounders are capable of generating hazardous voltages at the outputs of the transmitters.

Transducers, connectors, and cables should not be handled while the sounder is operating.

Protective panels should not be removed except by qualified technical personnel.

CONTENTS

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1 INTRODUCTION

1.1 About this manual

This manual provides an introduction to the basic hardware of the echosounder with important reference information for both the novice and the advanced user.

1.2 The 320B Black Box Echosounder

The 320B Series Black Box Echosounder was designed and built in Canada by Knudsen Engineering Limited (KEL). The 320B model is distinguished by compact size, and high performance; with the flexibility, versatility and accuracy provided by Digital Signal Processing. The Echosounder is configurable for one or two sounding channels with frequency of operation from 3.5 kHz to 250 kHz .

There are four different package options for the 320B Echosounder series, each designed for different applications and environments.

Model #	Basic Description
320B	Aluminum case, bulkhead-mounted
320B/P	Plastic case, portable
320B-Rackmount	Aluminum case, rack-mounted
320B/R	Aluminum case, rack-mounted, specialized hardware for deep water applications

This manual contains all installation and operating instructions for each type of system. Most information is common to all four types of system; it will be explicitly noted where there are any specialized differences.

The 320B Series Black Box Echosounder is not a stand-alone instrument. It is designed to be used with a personal computer (referred to throughout this manual as the host PC) which provides the user interface, display and data logging functions through special purpose software which is provided with the echosounder.

1.3 Technical Support

KEL can assist with transducer selection, special serial interfacing, and custom 320B functions. In addition, KEL extends the following support services to 320B owners:

- Module swap under warranty
- Module repair, refurbishment or test
- Software modifications via the Internet to your field site
- Emergency 320B Spares
- Diagnostic assistance and consultation

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/

2 INSTALLATION

2.1 Shipment, Storage, and Unpacking

All 320B echosounder models are securely packed in rugged shipping/storage cases. In the standard shipment will be the following items:

- 320B Series Black Box Echosounder (320B, 320B/, 320B-Rack, or 320B/R)
- Detachable DC power cable
- Transducer cable connector(s)
- RS-232 null modem serial communications cable
- 320B Series Echosounder User Manual
- Software CD-ROM

The echosounder is ready to be installed and operated immediately upon being unpacked. There are no special procedures to be performed before the unit is packed away for storage or shipping.

2.2 Physical Characteristics

2.2.1 320B

The 320B model is a compact, bulkhead-mountable, aluminum unit designed for permanent shipboard installation. Its significant dimensions and weight are: 240x75x371mm and 7kg, (9.45" x 2.95" x 14.6" and 15.4 lb).

2.2.2 320B/P

The 320B/P model is a small, portable, water-resistant, plastic unit designed for easy portability and small open boat applications . Its significant dimensions and weight are: 470x371x191mm and 12 kg, (18.5" x 14.6" x 7.5" and 26.4 lb).

2.2.3 320B-Rackmount

The 320B-Rackmount model is a rack-mounted, aluminum unit designed for temporary shipboard installation. Its significant dimensions and weight are: 19" rack, 3U, 19.0"deep and 15.4lb, (483x133x483mm and 7 kg)

2.2.4 320B/R

The 320B/R model is a rack-mounted, aluminum unit designed for deep-water applications. Its significant dimensions and weight are: 19" rack, 5U, 19.0"deep and 40 lb, (483x223x483mm and 18.2kg)

2.3 Electrical Requirements

2.3.1 320B and 320B/P

The 320B and 320B/P echosounders are configured with a DC power input range of 9 to 36V.

Power input: 9 to 36 VDC (nominal 24 VDC) at approximately 40 Watts.

If the power input is connected with the wrong polarity, a protective diode shunts the current to the breaker, causing it to trip. Check the input wiring, then reset the breaker.

If the power input is accidentally connected to AC power, the large currents involved can cause the protective diode to fail shorted. The diode must be replaced before the system can be properly powered-up.

2.3.2 320B/R and 320B-Rackmount

The 320B/R and 320B-Rackmount echosounders are configured with an AC power input range of 85-265 VAC, 47-440Hz.

2.4 Transducer Interface Description

Single Frequency **Dual Frequency**

The transducer connection setup is dependent upon the model, the connector panel version installed in the particular model, and the configuration requirements for the particular customer.

Any connector panel that includes only one transducer connector is set with a dual frequency connection. For applications using separate transducers, an optional splitter box assembly is provided to adapt the dual connection to two single connections.

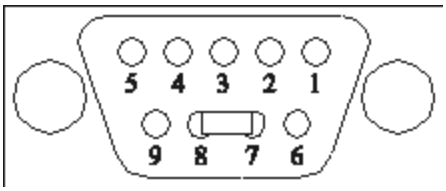
Any connector panel that includes two transducer connectors, can be set up for dual integrated frequency transducer connections or single discrete frequency connections.

Please refer to Figures 2-1 to 2-4 for the connector panel layouts.

2.5 Serial Communications Interface Specifications

All of the communication ports on the echosounder are DB-9M RS-232 ports wired in the same configuration as a PC communication port, but without any of the hardware handshaking lines connected. For most communications programs, hardware handshaking is not required and a standard null modem RS-232 serial cable is all that is required to establish the link between the echosounder and a PC.

2.5.1 RS-232 Com Port Wiring



Pin 2 - RXD Received Data
Pin 3 - TXD Transmitted Data
Pin 5 - GND Signal Ground
Pin 7 - RTS Request To Send: Jumpered to Pin 8
Pin 8 - CTS Clear To Send: Jumpered to Pin 7
Pin 1 ,4 ,6 , & 9 - not connected

2.6 SCSI Interface Specifications

The SCSI connector on the 320B, 320B/R, and 320B-Rackmount systems is a 50 pin Centronics SCSI-1 type connector. On the 320B/P system, the SCSI interface connector is a 50 pin Centronics SCSI-2 type connector.

2.7 Other Interfaces

2.7.1 Fix In/Out

The Fix In connection is available on the 320B/R and the 320B-Rackmount systems. The Fix Mark In can be connected to a TTL signal or a contact closure to initiate a fix mark.

The Fix Out connection is available on the 320B/R system only. The echosounder generates a signal strobe on the Fix Out connector for any fix mark condition including the signal from the Fix In connection. This allows the user access to the same fix signal for more than one device.

2.7.2 Sync In/Out

The Sync In connection is available on the 320B/R package only. The Sync In can be connected to a TTL signal or a contact closure to synchronize the echosounder to an external transmit trigger signal.

The Sync Out connection is available on the 320B/R and the 320B-Rackmount packages. This synchronization signal is generated by the echosounder, based on its own internal timebase-controlled ping cycle or from the external Sync In (320B/R model only). This signal allows the user access to the same trigger signal for more than one device.

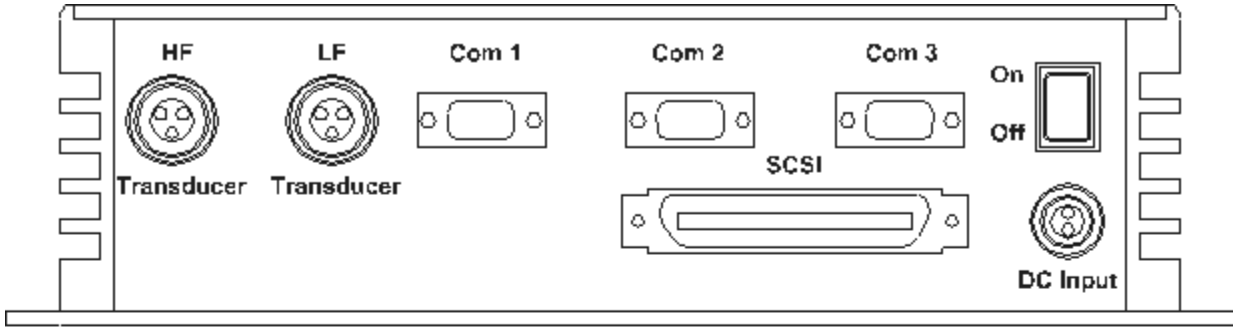
2.7.3 LF/HF In

These are standard BNC connections available on the 320B/R package only. The In connectors are used to inject external analog signals into the echosounder's internal receive circuitry. This is usually the case when external pinger units are used instead of the echosounder's internal transmit circuitry. Used in conjunction with the Sync In signal.

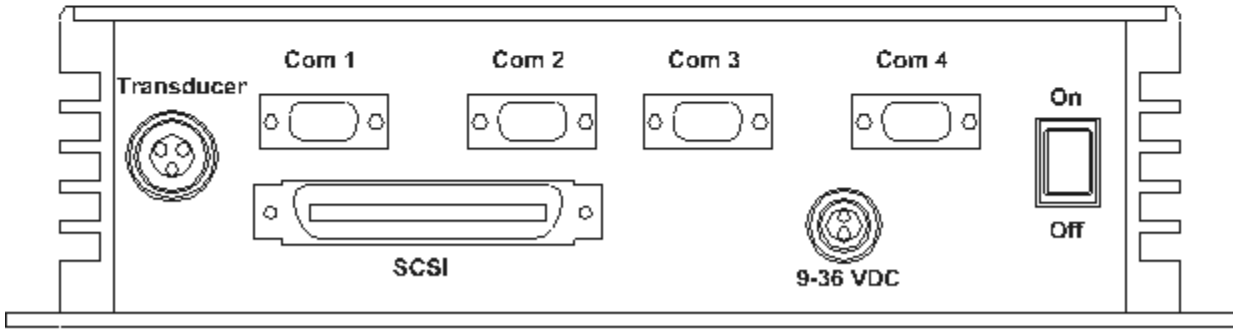
2.7.4 LF/HF Analog

These are standard BNC connections available on the 320B/R and the 320B-Rackmount models only. These connectors provide direct access to the echosounder's internal analog receiver signal after bandpass anti-aliasing filtering. This interface is typically used for external analog data loggers or monitoring with an oscilloscope.

Figure 2-1. 320B Connector Panels

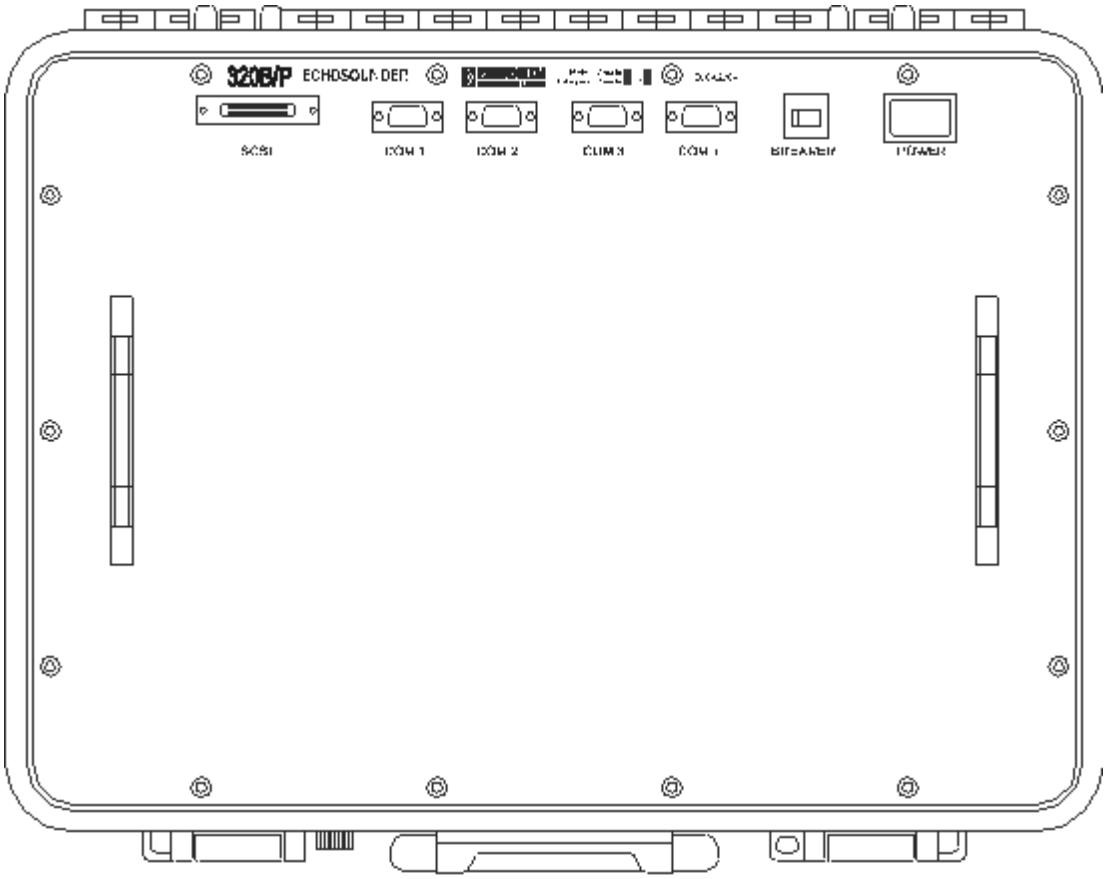


320B DUAL CHANNEL CONNECTOR PANEL

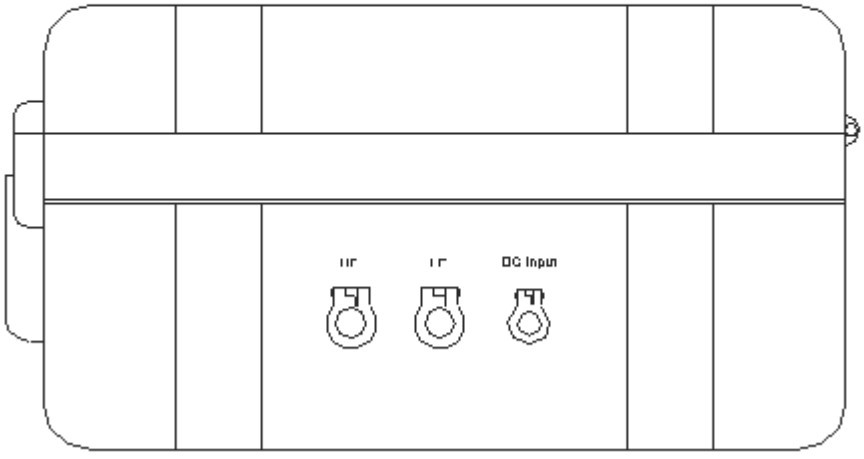


320B SINGLE CHANNEL CONNECTOR PANEL

Figure 2-2. 320B/P Connector Panel - Rev 1 to 4

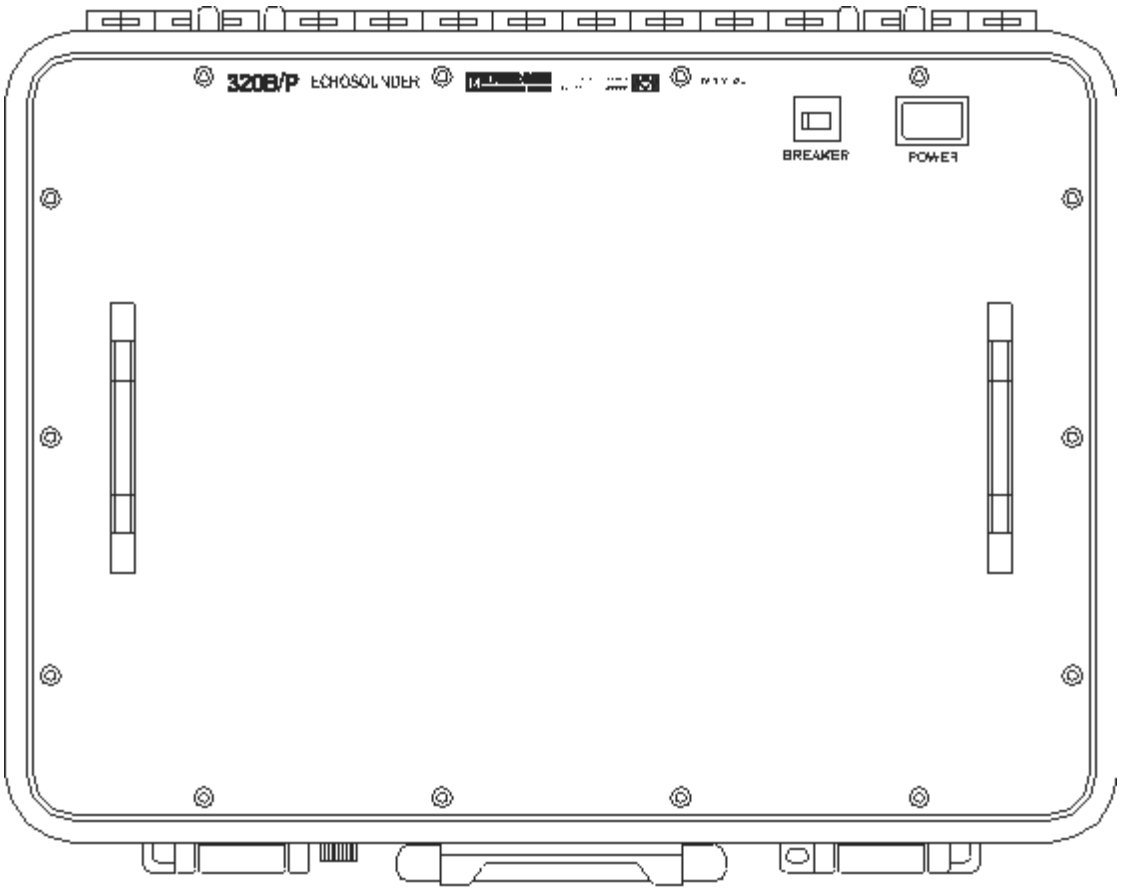


INSIDE VIEW

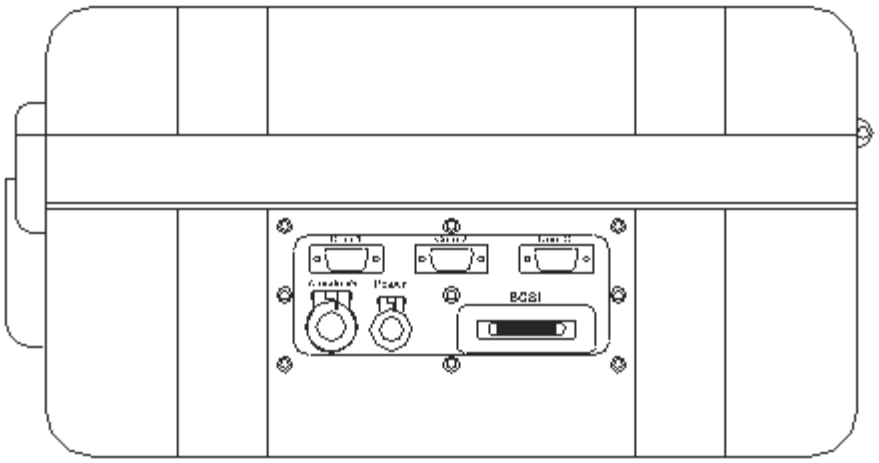


SIDE VIEW

Figure 2-3. 320B/P Connector Panel - Rev 5



INSIDE VIEW



SIDE VIEW

Figure 2-4. 320B/R Deep Water System Connector Panel

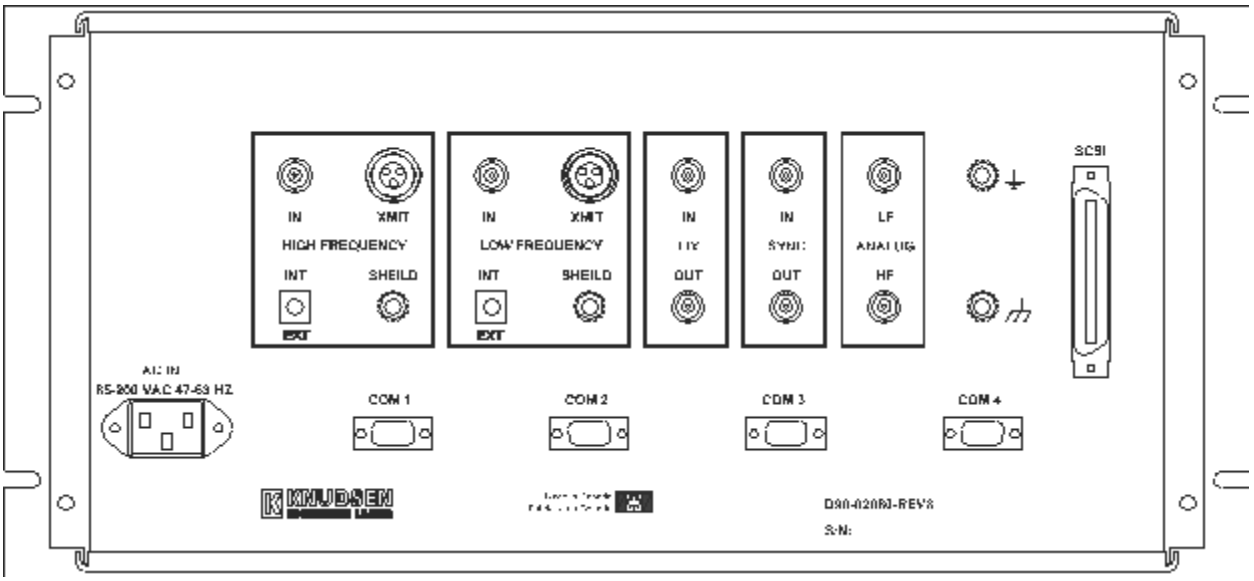
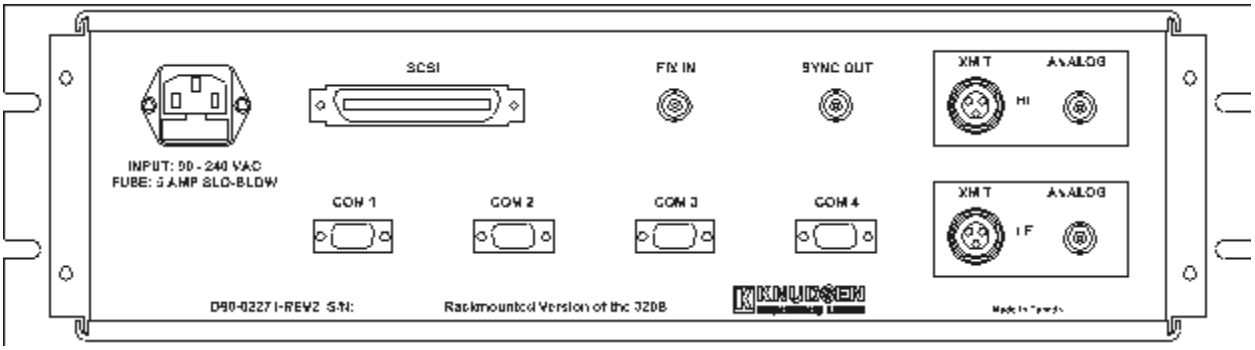


Figure 2-5. 320B-Rackmount Connector Panel



3 BASIC OPERATING INSTRUCTIONS

3.1 Power On

After the echosounder has been installed with the appropriate transducer, power, host PC, and peripheral devices connected, it is ready for operation.

The echosounder is turned on with the **POWER** switch. Immediately upon power-up the echosounder performs a number of self-test diagnostics. These consist of memory tests, and various other internal checks. If an error was detected, the appropriate error code is output via the serial monitor (COM3) port or the SCSI interface.

For users with parallel port SCSI adaptors, the echosounder must be powered on before the host PC. These adaptors get their operational power from the echosounder and must already be powered-up for the host PC to load the necessary drivers.

3.2 Echosounding

Once the echosounder is powered-up and the host PC has booted with the necessary drivers, run the appropriate control program on the host PC. Select the **Sounder: Controls** option from the application menu.

Set **Power** to any power level setting and click the desired Channel button to start the transmission and reception of pings, and the echosounder will attempt to detect bottom echoes. If it is successful, digitized depths will appear on the appropriate frequency channel depth display. Regardless if a bottom is detected, the program will start the real-time greyscale display of the received signal.

Typically, it is simplest to start sounding using the automatic controls and letting the sounder determine its optimum operating parameters. These automatic controls are **Agc** and **AutoPhase**. If the user uses these controls, it will be necessary only to ensure that the **Range** selection has a window setting that includes the expected depth value, and that the **Power** setting is neither too strong nor too weak for the water column being examined.

If stable, reasonable depths do not appear, the echosounder has probably not been able to locate the bottom. The first thing to check is the location in the water column of the *window*, which is controlled by the **Range** and **Phase** controls. The echosounder only looks for the bottom in the window, and only the window is displayed on the greyscale display. The **Range** control defines the size of the window, and the **Phase** control defines its location (or depth), with a 50% overlap between settings.

Start with a **Phase** setting of 1, which puts the window at the top of the water column, and select a **Range** value larger than the expected depth of the water. In all probability a bottom echo will now be visible on the display, and a stable depth value will appear on the digital depth display.

Once an echo is obtained, the **Power** and **Gain** controls should be adjusted for the most satisfactory results. Generally speaking, the lowest value of **Power** which provides a clean bottom record and a stable depth

value should be used. The **Agc** setting will usually provide the best results.

If stable, reasonable results do not appear and a clear bottom trend is not presented on the display, the operator needs to take corrective action. Loss of bottom may be due to several reasons:

- The bottom may be outside the selected **Range**/**Phase** window; adjust the window appropriately for the expected depth. Narrow windows tend to provide good records, but risk losing the bottom unless **AutoPhase** is selected.
- In shallow water, the **Power** and/or the **Gain** may be too high.
- In deep water, the **Power** and/or the **Gain** may be too low.

3.3 Advanced Echosounding

In most instances, the simple instructions provided in the previous section will be fully adequate to operate the echosounder. More advanced operations will require an understanding of the control program and its use. A detailed description and reference for the control program is provided in the Online SCSI Control Software User's Manual.

3.4 Interfacing to the Survey Computer/Datalogger

The 320M's COM3 serial port is the port dedicated to communications with the survey computer. It is a 3-wire (RXD, RXD and GND in a DB-9M connector, no modem control lines) RS-232 interface which requires a null modem cable to connect to a standard PC. This is the port used for serial datalogging, and the port through which the survey computer can initiate event marks and send event mark annotation to the echosounder. It is also the port used for configuration and control of the echosounder, either by the Windows application program "320cfg.exe" supplied with the echosounder, or by the user's own software.

The COM3 serial interface protocol is described in "Serial Configuration Utility Software User's Manual".

3.5 Interfacing to Peripheral Devices

The following steps describe how to connect a standard peripheral device to the echosounder.

1. Connect an RS-232 cable between the peripheral device and one of the comm ports on the echosounder's connector panel. Please note:
   a. all survey computers or data loggers must be connected to Com3 on the echosounder. Other receivers and sensors can be connected to either Com 1, 2 or 4 on the echosounder.
   b. the echosounder can only accept one device of a particular type: ie. it cannot interface to 2 heave sensors at one time, or 2 GPS receivers, but it can interface to 1 heave sensor and 1 GPS receiver simultaneously.
2. Power up the echosounder and wait for the power-up initialization to complete.
3. Run the SCSI control program, Echo Control.exe.
4. Select the Com port setup option for the desired echosounder com port.
5. Select the device driver, communication settings and loopthru options required for the desired peripheral device. If Loopthru is selected(checkmarked) and the selected peripheral device outputs

printable ASCII strings, the echosounder will echo these strings upon receipt out Com3 to any attached survey computer/datalogger.

3.6 Customizing the Serial Data Output

The echosounder can be configured to output serial depth logging strings in special formats. When the system leaves the factory, the default output format is one that is compatible with the Hypack survey program. The Windows-compatible serial utility program, 320CFG.EXE, can be used to selected the desired output format, and to customize the configurable output format.

3.7 Time Synchronization

The Main Processing Module of the 320 series echosounders contains a battery-backed real time clock/calendar device, similar to the one found on PC motherboards. The date and time stored in this clock can be set by the user with the serial utility program "320CFG.EXE" or the SCSI control program Echo Control.exe. Both applications allow the user time synchronization between the survey computer and the echosounder to less than a second.

The serial utility application program, which communicates with the echosounder's COM3 serial port, has a menu command which synchronizes the echosounder to the PC to a hundredth of a second (see command string "$PKEL37: Set Time in milliseconds since midnight" in the "Serial Configuration Utility Software User's Manual"). The SCSI control application also has a menu command that synchronizes the echosounder to the PC to a hundredth of a second.

Note: the real-time-clocks in both the echosounder and the PC are subject to drift, typically up to about a second per hour. It may be necessary to occasionally re-synchronize the echosounder to the PC depending on the requirements of the survey.

4 MAINTENANCE AND TROUBLESHOOTING

4.1 Hardware Architecture

4.1.1 Module Interconnections

The 320B series of Echosounders incorporate a very modular architectural design. The system is composed of the following modules along with their accompanying mechanical and cable assemblies.

MPM: Main Processor Module,
SPM: Signal Processing Module,
STM: Switchmode Transmit Module,
PDM: Power Distribution Module,

The MPM is the host board of the system, the brain of the system, which uses a TMS320C25 as the DSP processor. This board controls all the internal modules as well as providing interfaces to external computers or sensors such as GPS and Heave. This board interfaces with one or two SPMs and STMs depending on single or dual frequency configurations. The MPM takes power from a 5Vdc power cable form the PDM. It interfaces to external devices through three serial port 3-wire cable assemblies and one SCSI port ribbon cable assembly.

Each SPM connects to the MPM as a daughter board using a 36-pin SBX connector, drawing power through this connector in addition to exchanging commands and data with the MPM.

The STMs interface using a 10-pin ribbon cable for transmit drive signals from the MPM, 48Vdc power from the PDM, and a twisted cable for the received analog signal to the SPM.

All cable end connectors are polarized and fitted to avoid improper insertion.

4.1.2 Power Distribution

The PDM provides the various DC voltages (5Vdc and 48Vdc) to power the digital portions of the system (MPM, SPM's, and the STM's). The PDM has limited adjustment over the range of output voltage and comes factory set. There should be no need to adjust the voltage outputs of this module. If you suspect a problem with the PDM or any other part of the system, please do not hesitate to contact the factory.

4.2 USER MAINTENANCE

4.2.1 User-serviceable Components

The only-user serviceable components in the system are the protection fuses located on the MPM, and the STM's. These fuses are standard 5mm x 20mm slow blow glass type. If a module has a blown fuse, check the input power source to confirm the setting is within specification (9-36Vdc). Replace the fuse and test. If the fuse blows again, please consult the factory. If normal functionality is achieved, continue with use. If a module is determined to be faulty, typically a new replacement module is provided in exchange for the

faulty one. A board replacement is easily accomplished and allows for faster system repair than trying to find and repair faulty board components in the field.

4.2.2 Software Upgrades in the Field

There may be a time when a software upgrade is desired, or required to meet a specific user's special requirement. Knudsen Engineering Limited provides Internet FTP downloads so that the user can get new or revised software. The user can then upload this software into the 320M. The Flash Eprom technology allows serial RS232 software transfer and programming thus eliminating the need to replace eproms. Refer to the Software Installation/Upgrade Manual for instructions to complete the upgrade.

4.3 Basic Troubleshooting Procedures

The 320B echosounders can be bench tested with a transducer using in-air echoes from a wall or other hard surfaces. There are no exposed hazards inside the unit, although the Transmitters can generate several hundred volts at the secondary of the output transformer. These points are under a removable protective cover.

With the unit set up, attempt to apply power. Some basic strategy is offered in the following sections.

4.3.1 System Appears Dead

If the system is totally lifeless, start by examining for obvious problems. Remove the cover plate and check the power distribution module. It has two LEDs which should all be ON in order for the unit to operate; one is for +5V and one for +48 V. The power distribution module has a backup fuse inside, check it first.

4.3.2 Breaker Tripped

After resetting the breaker, check the input DC polarity, then remove the cover plate and check the status of the shunt diode across the supply. Then, one by one, start disconnecting power cables at the power distribution module from the STM's and the MPM until a module is isolated or fault appears.