KNUDSEN ENGINEERING LIMITED

1st Annual Knudsen 320BR Users Forum

For UNOLS at

University of Rhode Island

October 25, 2001





Knudsen 320BR

Rackmount High Power System for Full Ocean Depth Survey



System Applications

- Precision Hydrographic Surveys
- Pre & Post Dredge
- Scientific Sounding (sediment & sub-bottom)
- Full Ocean Depth Sounding

System Overview

- Simple Architecture
- Software Driven
- Easily Reconfigured & Reprogrammed
- DSP Based



Knudsen 320BR System Architecture













Back Connector Panel





Inside The 320BR System





Main Processing Module (MPM)







Signal Processing Module (SPM)







High Power Transmitter Module





Dual Frequency Transmitter Backplane





Signal Pickup Module





Hardware Related Issues

Common Problems:

Hi Power Transmitter Failure

Probable Causes:

Impedance Mismatch Waveform Synthesis

Solutions:

Transducer Impedance Measurements Square Wave Modulation vs PWM Restricted Frequency Sweep





New Software Release

Knudsen Engineering Ltd. SounderSuite

comprised of:



EchoControl

Sounder Control via SCSI, Data Recording to file.

PostSurvey

Display & Printing of recorded Sounder data files.

SerialControl

Sounder Configuration and Control via serial port, no data recording.

SerialUpgrade

Sounder Configuration upgrade via serial port.

Hypack MAX DLL

Specialized driver DLL for use with Coastal Oceanographic's Hypack MAX.



Software Architecture



D11-02213-Rev1.3





EchoControl Software

Selected vs. actual

	Sounder Suit	e: EchoContro	I - 1.01			
	All HF LF ^B /P	BAR ⊿ 0	ig set <u>u</u> p opgra	cieen		<u></u> t
	Pulse: Selected: Actual: Power:	HF 1.5ms chrp .08ms chrp 1	LF .25ms chrp .25ms chrp 1			0.0ft 10.0ft
	Mode: Value:	AGC 43.0dB	AGC 80.0dB			20.0ft
	Blanking: Sensitivity: Processing Gain: Droft:	8.2 1 0	5.4 1 0			30.0ft
	Controls	Feet	HF			40.0ft
	Sound TVG Gate	4921 None 10	-39 dB	Å		50.0ft
	Primary Range: Phase:	HF 100	_ LF			60.0 1 1
ontrol	Mode: Value: Window: Depth Limits:	Manual 1 0-100ft	0 dB			70.01
iaius isnlav	Min: Max: Recording:	0 12000 Binary SeqY				80.0f
iopiay	Display: Contrast: Mode:	Ascii 0 Overlayed				90.0f
	For Help, press F1				REC: BSA GPS: unavailable	05: Win98se

File Recording Status





EchoControl - Configure Recording Options

Current File Format

	Configure Recording Options	Eile Formats To Be Record
New File_ Naming Options	User Entry File Name Root: YourName PC Generated M Line # Year Julian Date M Time 1 From Hypack	Image Formats To be Record Image Formats To be Record
	Storage Folder: D:\ [-c-] [-d-] [-d-] [-e-] [-f-] [-g-] [-g-] [-h-]	YourName_000 Cancel OK

Sample Name Format





EchoControl - Menu Tree









EchoControl - New Controls

Recorder Options	:	×
Display Mode C HF C LF C Stacked	Contrast 0 	Grid Text Small Font Large Font
• Overlayed	Cancel	ОК

New Recorder Setup Options separate from Display Options

New Warning Dialog for SEG-Y data display

ERROR!	
The selected windo output. Please try o	w is too large for the selected carrier data ne of the following:
C	Switch Display Modes
c	Decrease Range
C	Increase Pulse Length
	ОК



EchoControl - Modified Controls



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New Layout for COM Setup



EchoControl - Changes Requested By Users

All controls that have a direct bearing on sounding performance in one location

• Moved all relevant controls under the main menu item "Sounder"

All control settings displayed clearly in front of the user

• Added Controls Status display bar that can be toggled on & off

Indication of File Recording

 Added recording indicators to Controls Status display & Application Status Bar

More data parameters recorded to SEG-Y file

- Used additional fields in standard header such as GPS
- Option to Record extra KEL data in unused bytes in the trace header



EchoControl - Underused / Misused Controls

- Tracking Gate Width
- Processing Gain
- Tx Blank
- Min / Max Depths
- TVG
- Sensitivity



PostSurvey

Open Multiple Data Sets At Once



PostSurvey - New Features

Conversion Utility

- converts entire data sets to new KEL format
- larger file sizes means fewer files to load

View Multiple Data Sets At Once

• load multiple data for side by side comparison

Scrolling Data Sets

- entire line set is loaded
- scroll through entire line set

Support For All Windows Printers



SerialControl & SerialUpgrade

Ele View Operational Com Ports Depth Logging Setup Upgrades He Image: Second	SerialControl - 3.00	_ 🗆 🗙
Serial Utility Activity Messages	File View Operational ComPorts Depth Logging Setup Upgrades	Help
Serial Utility Activity Messages Communications link was successfully established. GetPkel00 returned: \$PKEL00,02000,4.69,00000,0.00, 3.5 , 12 ,0100E006. The data setup in the echosounder was successfully read. 		
Communications link was successfully established. GetPkel00 returned: \$PKEL00,02000,4.69,00000,0.00, 3.5 , 12 ,0100E006. The data setup in the echosounder was successfully read. 320 Echosounder Response Messages		
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	The data setup in the echosounder was successfully read.	
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Knudsen Engineering Limited KEL 320 Series Echosounder Software #: D40-02000 Version 4.69 Setup Compilation Flags: 0100 E006h Power-Up Error Flags: 0000h PS:00h DS:00h Fhis program is running from SRAM. Fype '/?' for command summary.		
Knudsen Engineering Limited KEL 320 Series Echosounder Software #: D40-02000 Version 4.69 Setup Compilation Flags: 0100 E006h Power-Up Error Flags: 0000h PS:00h DS:00h Fhis program is running from SRAM. Fype '/?' for command summary.		
CEL 320 Series Echosounder Software #: D40-02000 Version 4.69 Setup Compilation Flags: 0100 E006h Power-Up Error Flags: 0000h PS:00h DS:00h Fhis program is running from SRAM. Fype '/?' for command summary.	Knudsen Engineering Limited	
Software #: D40-02000 Version 4.69 Setup Compilation Flags: 0100 E006h Power-Up Error Flags: 0000h PS:00h DS:00h Fhis program is running from SRAM. Fype '/?' for command summary.	KEL 320 Series Echosounder	
Setup Compilation Flags: 0100 E006h Power-Up Error Flags: 0000h PS:00h Fhis program is running from SRAM. Fype '/?' for command summary.	Software #: D4U-U2UUU Version 4.69	
Power-Up Error Flags: 0000h PS:00h DS:00h Fhis program is running from SRAM. Fype '/?' for command summary.	Setup Compilation Flags: U1UU EUU6h	
Fhis program is running from SRAM. Fype '/?' for command summary.	Power-Up Error Flags: 0000h PS:00h DS:00h	
Type '/?' for command summary.	This program is running from SRAM.	
	Type '/?' for command summary.	
or Help, press F1	For Help, press F1	

Serial Control

- Serial interface only
- Provides access to all the same controls as Echo Control (if enabled)
- Saves / Restores sounder control settings

Serial Upgrade

- Serial interface only
- Used for upgrades only
- Supports upgrading 320M printers

💑 SerialUpgrade - 3.00	X
<u>File PC Port Upgrades</u>	<u>H</u> elp
Communications link was successfully established.	
Processor responded successfully to handshake request.	
	_
Knudsen Engineering Limited	
KEL 320 Series Echosounder	
Software #: D40-02000 Version 4.69	
Setup Compilation Flags: 0100 E006h	
Power-Up Error Flags: 0000h PS:00h DS:00h	
This program is running from SRAM.	
Type '/?' for command summary.	
i For Help, press F1	



Upcoming Software Features

EchoControl

- Network Capability
- XTF File Format Recording
- Waterfall Display
- Simplified user interface with more "hot key" definitions
- TCP/IP protocol for third party data logging applications

PostSurvey

- SEG-Y File Format Support
- XTF File Format Support
- Digital Depth Trace Windows
- "Oscilloscope" trace graph for individual pings with stop / forward / reverse controls
- Zoom Capabilities



Software Related Issues

Problems:

- Autophasing
- Bottom Tracking
- Reacquisition in Autophase Mode
- Interface to EPC Printers

Solutions:

- Revised algorithms
- Tightened tracking gate algorithms
- Reworked EPC interface handling
- Sea trials aboard the following to test and improve algorithms
 - Moss Landing's PT. SUR
 - NOAA's **Ka'imimoana**
 - Woods Hole RV KNORR







Low Frequency Channel (3.5 kHz)

 Chirp:
 2500 Hz to 5500 Hz

 Df:
 3000 Hz

 Pulse Lengths:
 0.25 ms to 24 ms

High Frequency Channel (12 kHz)

Chirp: 10,500 Hz to 13,500 Hz Df: 3000 Hz Pulse Lengths: 0.25 ms to 24 ms



Advantages of Correlation Processing

1) Pulse Compression:

 $\tau = 1/\Delta f$

2) Improved Signal to Noise:

$$\Delta$$
 SNR = 10 log T Δ f dB















Mid-Depth Data (1500 m)



Data Taken From A Knudsen 320BR @ 3.5 kHz



Deep Water Data (3800 m)



Taken From A Knudsen 320BR @ 3.5 kHz



