KNUDSEN
ENGINEERING LIMITED

1st Annual
Knudsen 320BR Users Forum

For

UNOLS

at

University of Rhode Island

October 25, 2001

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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

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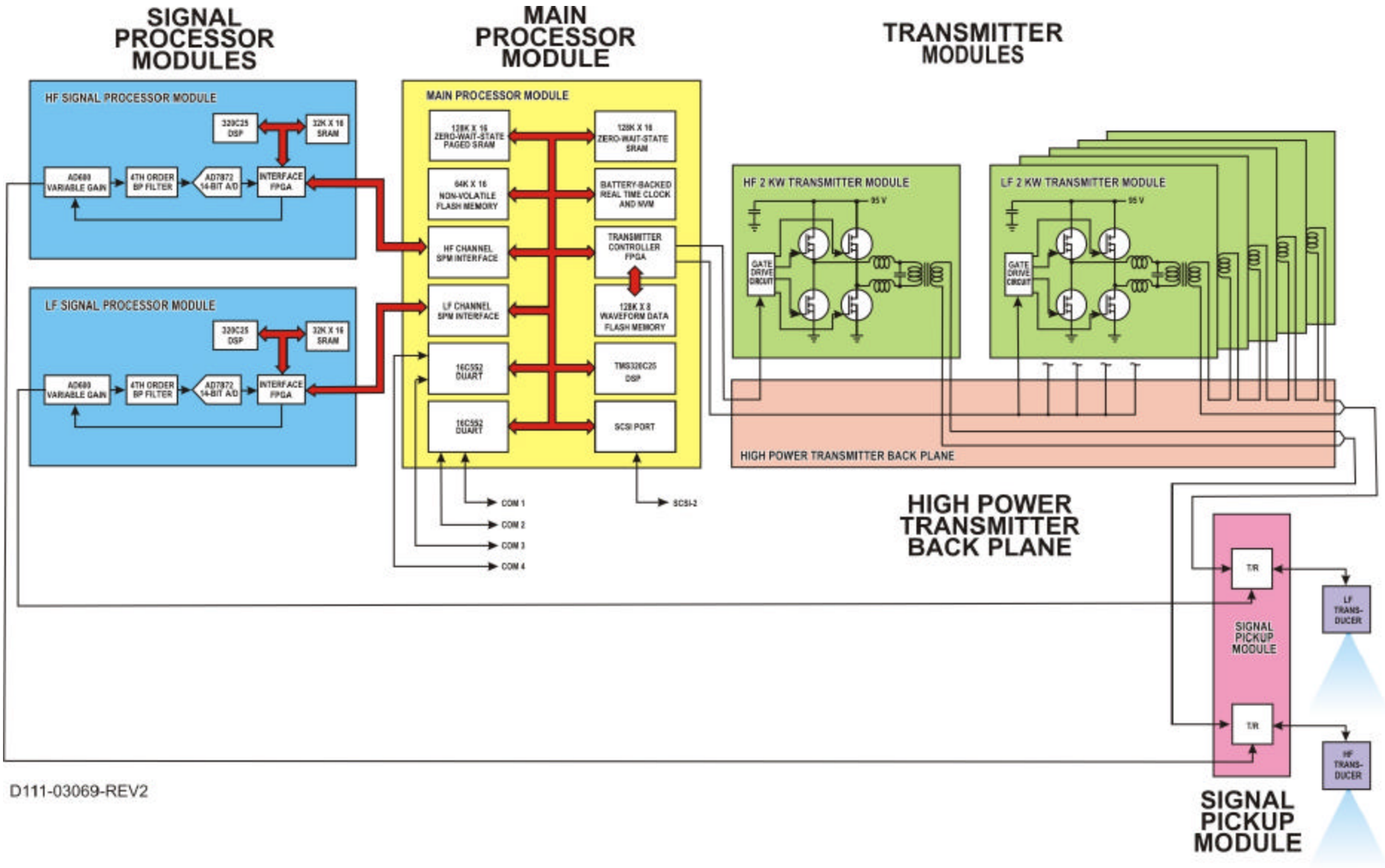
Knudsen 320BR System Architecture



D111-03069-REV2

D121-03178-Rev1

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Front Panel

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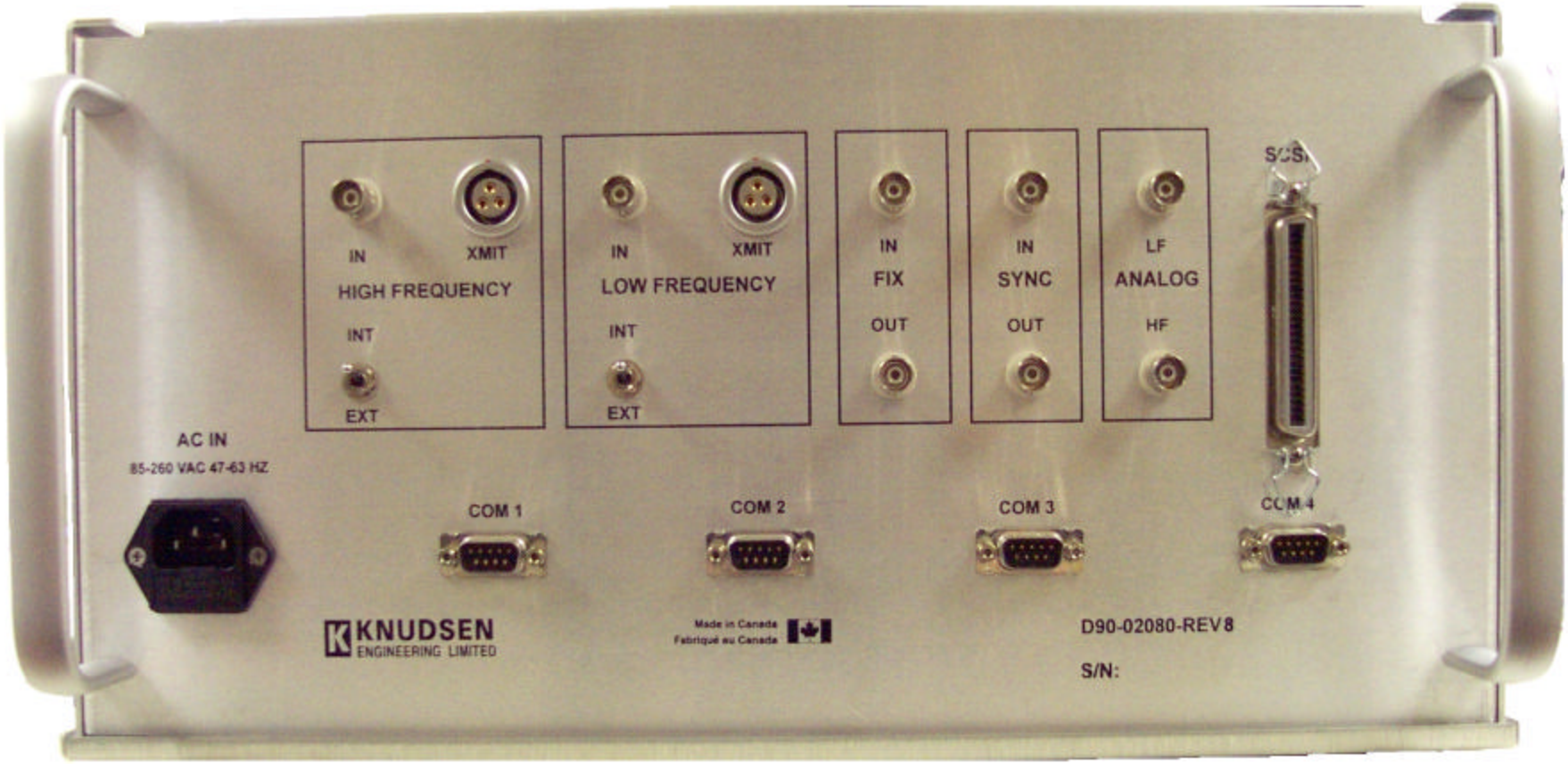
Back Connector Panel



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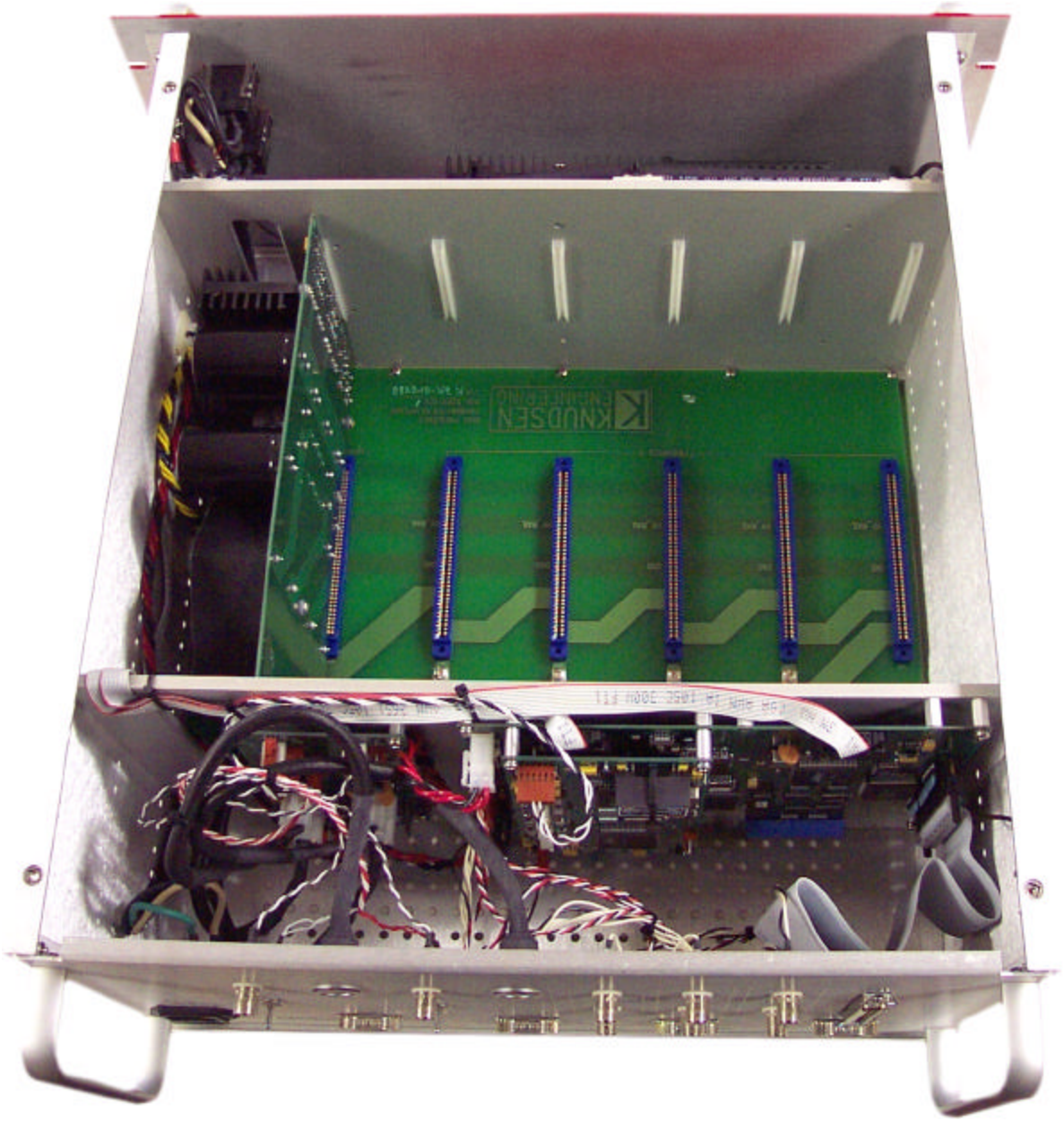
Inside The 320BR System



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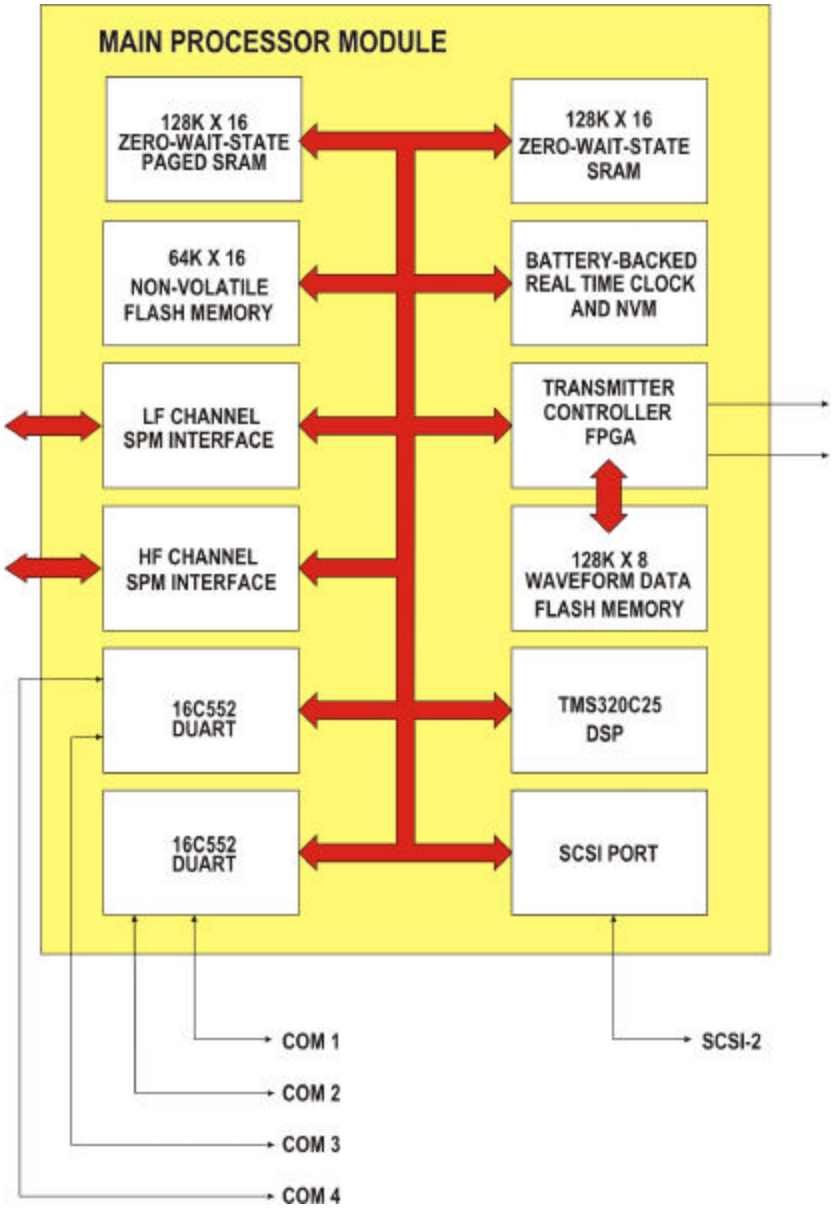
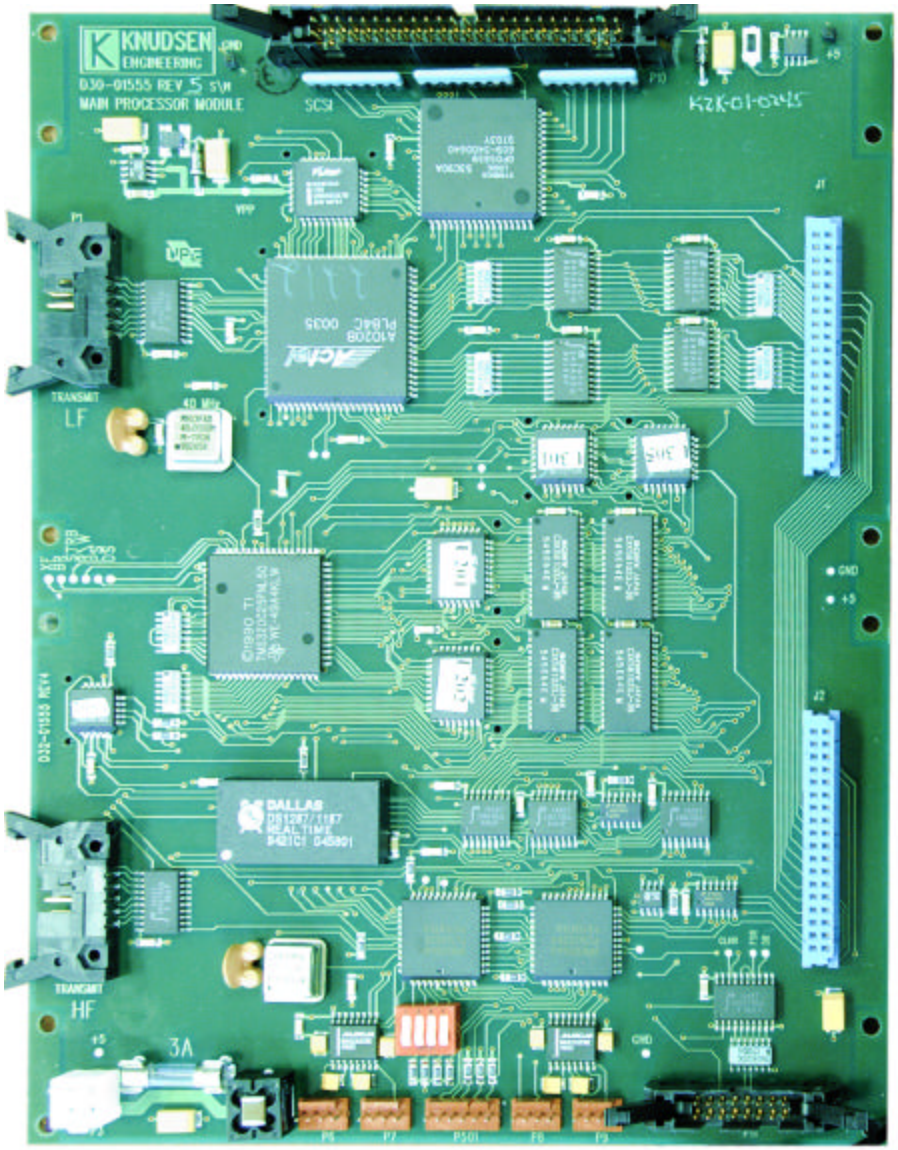
Main Processing Module (MPM)





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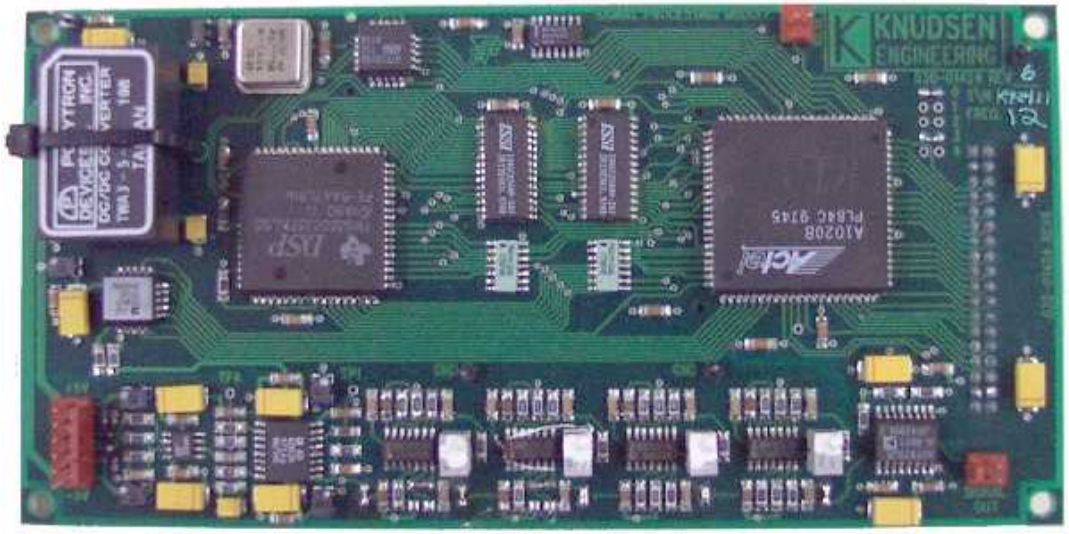
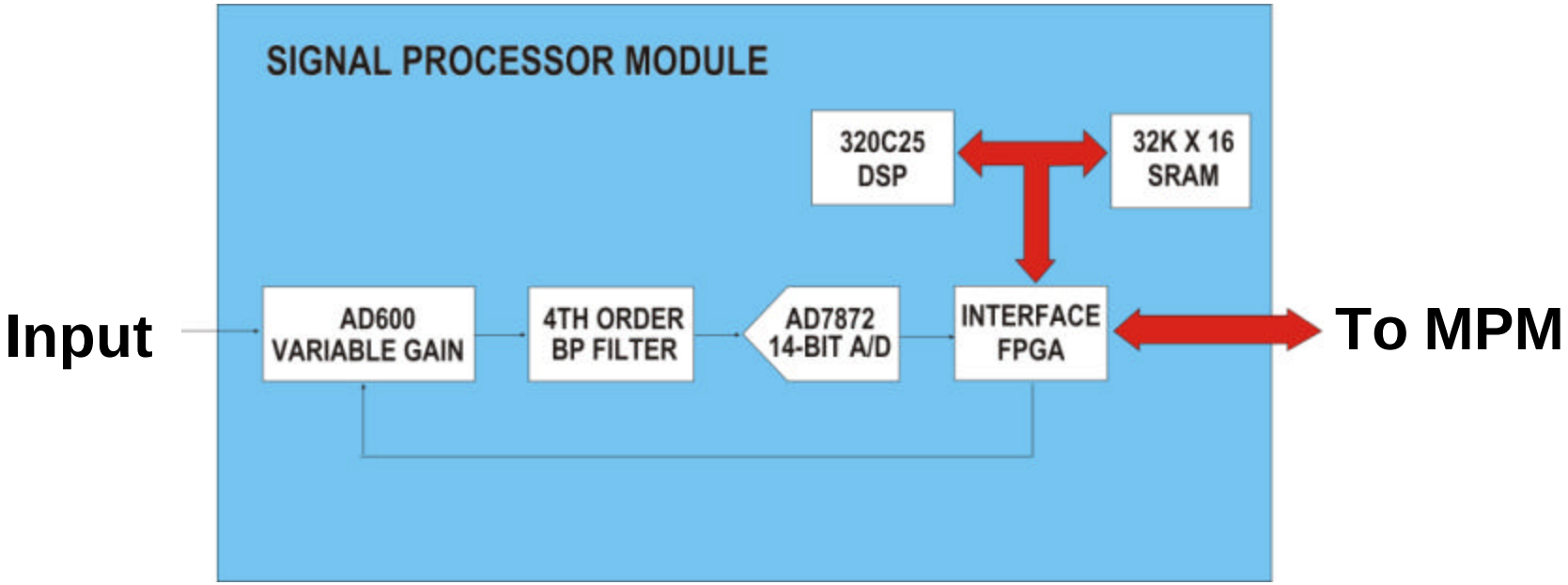
Signal Processing Module (SPM)





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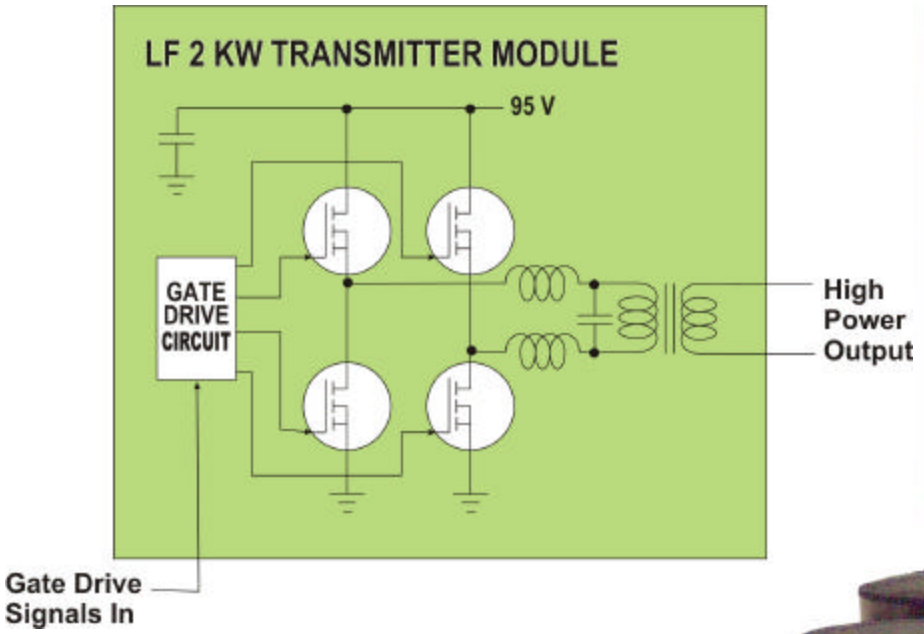
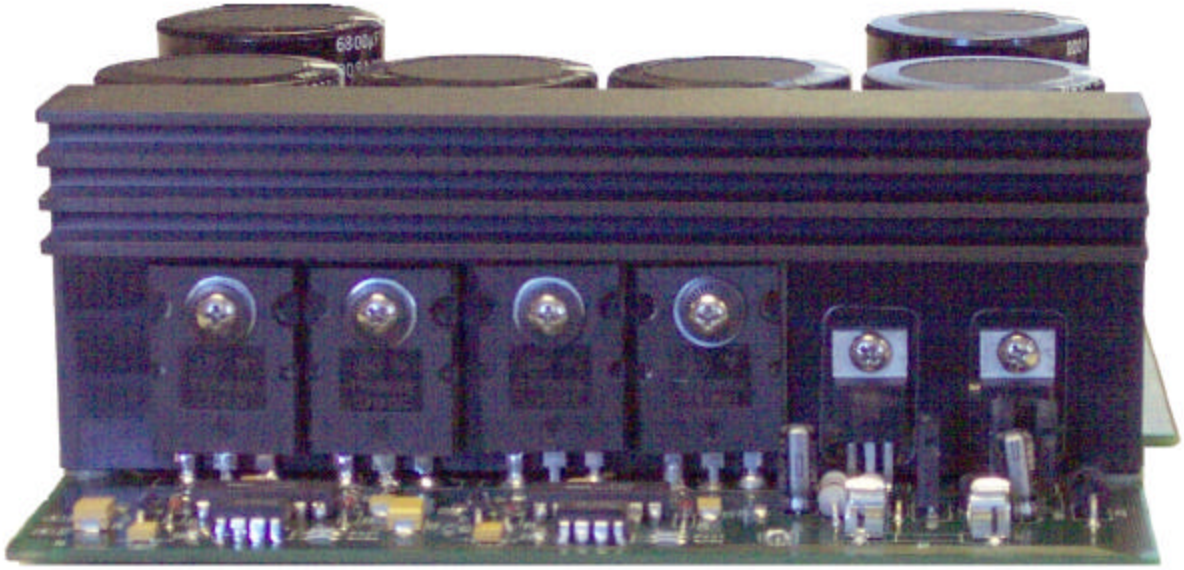
High Power Transmitter Module





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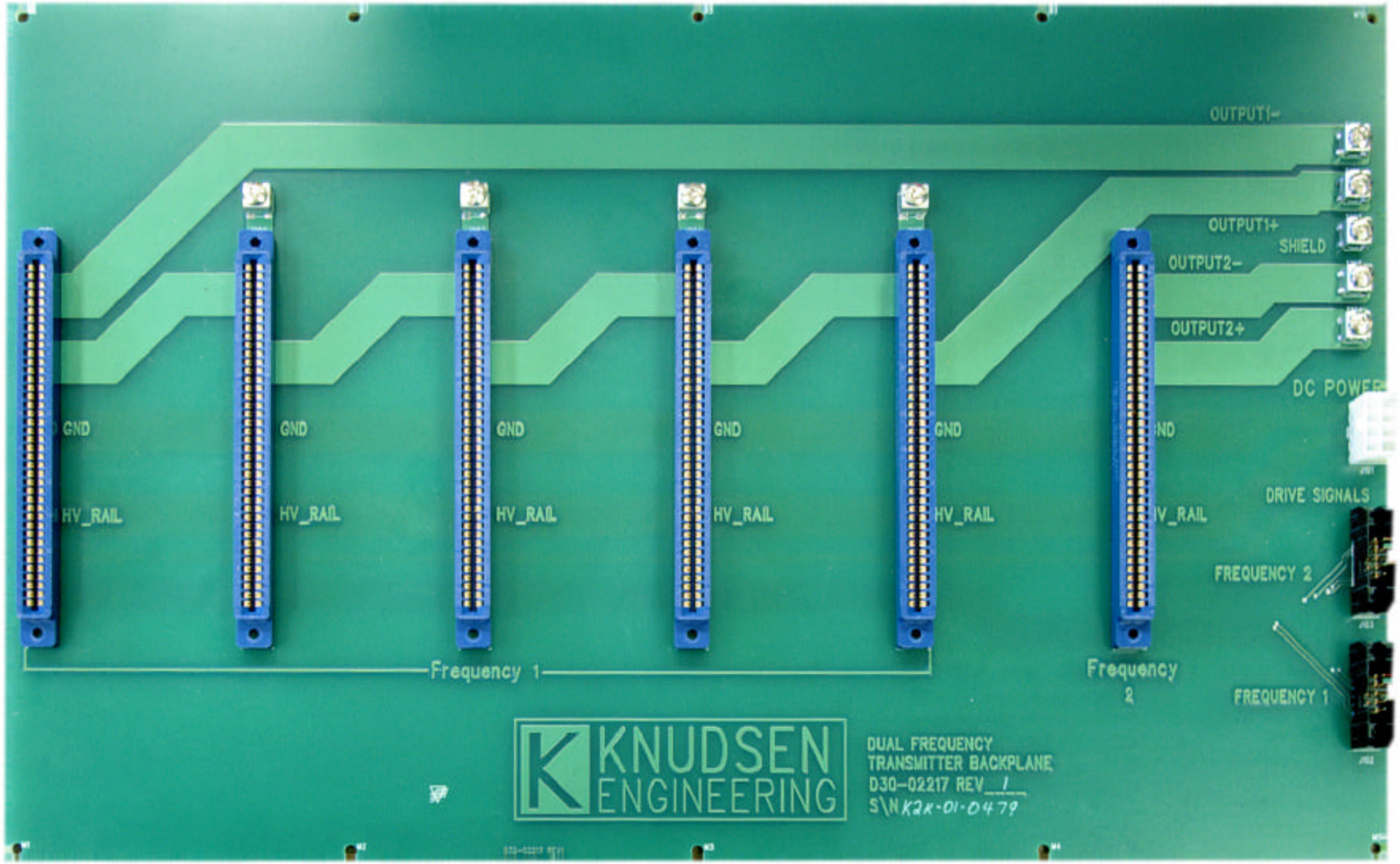
Dual Frequency Transmitter Backplane



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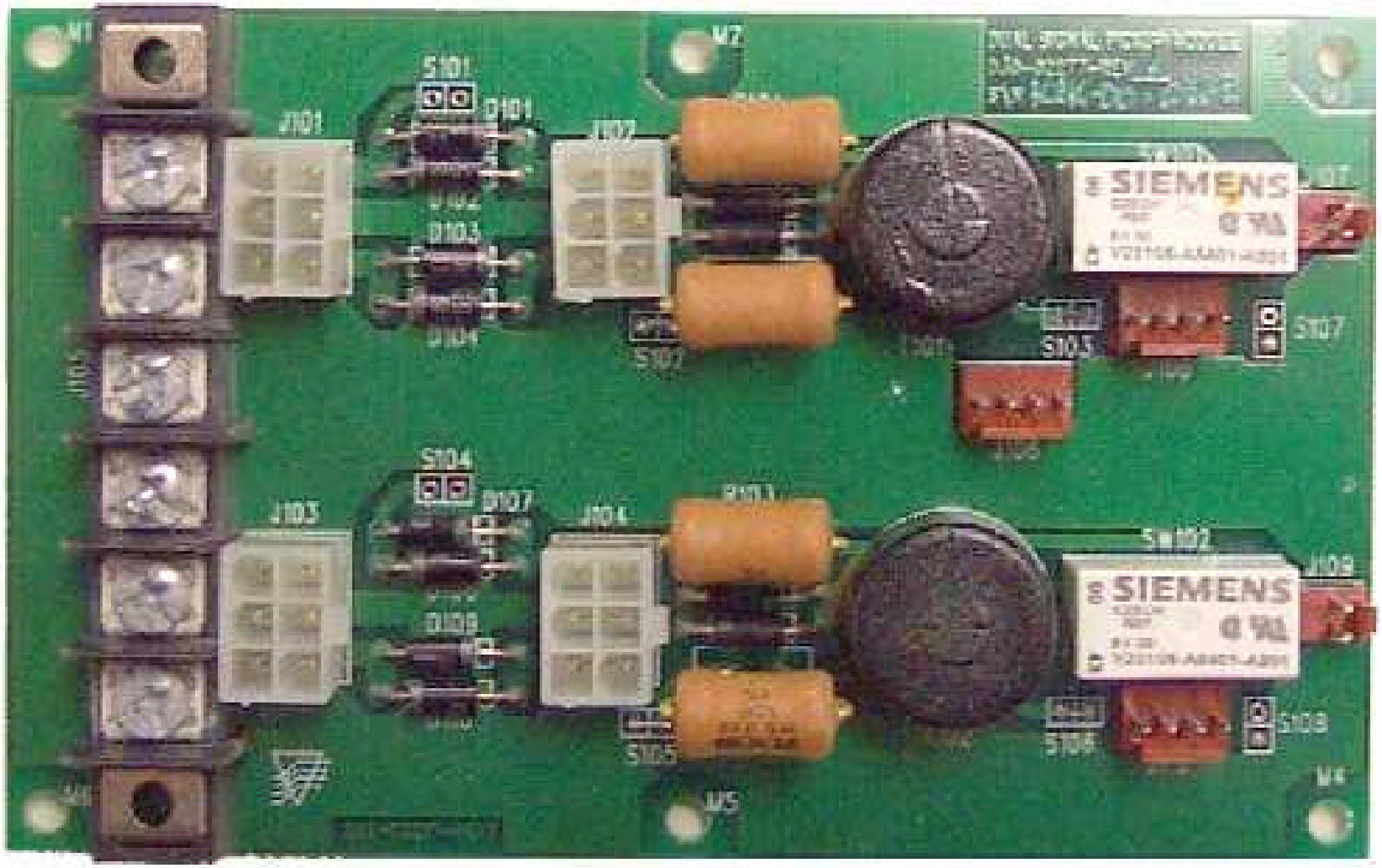
Signal Pickup Module



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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

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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.

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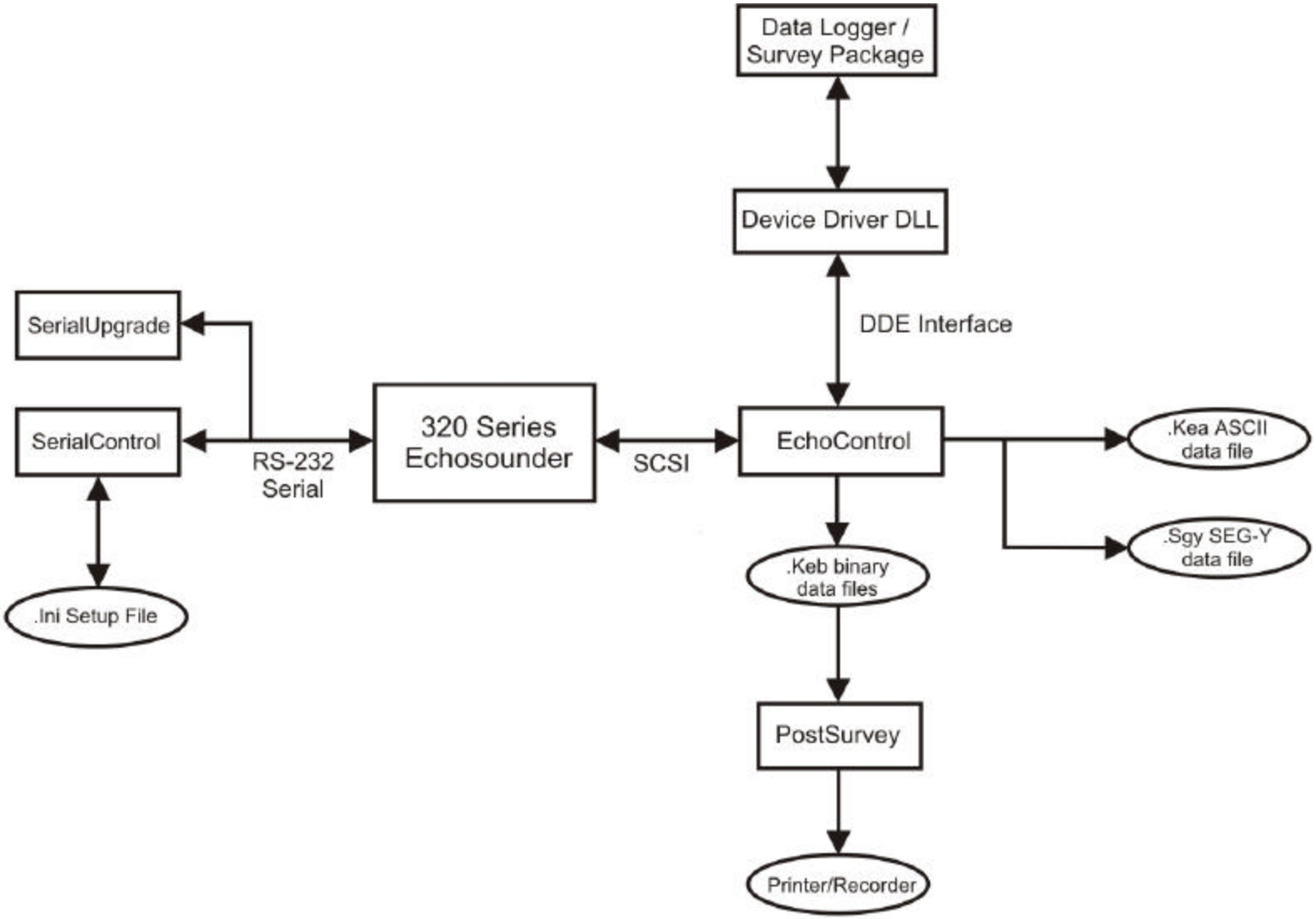
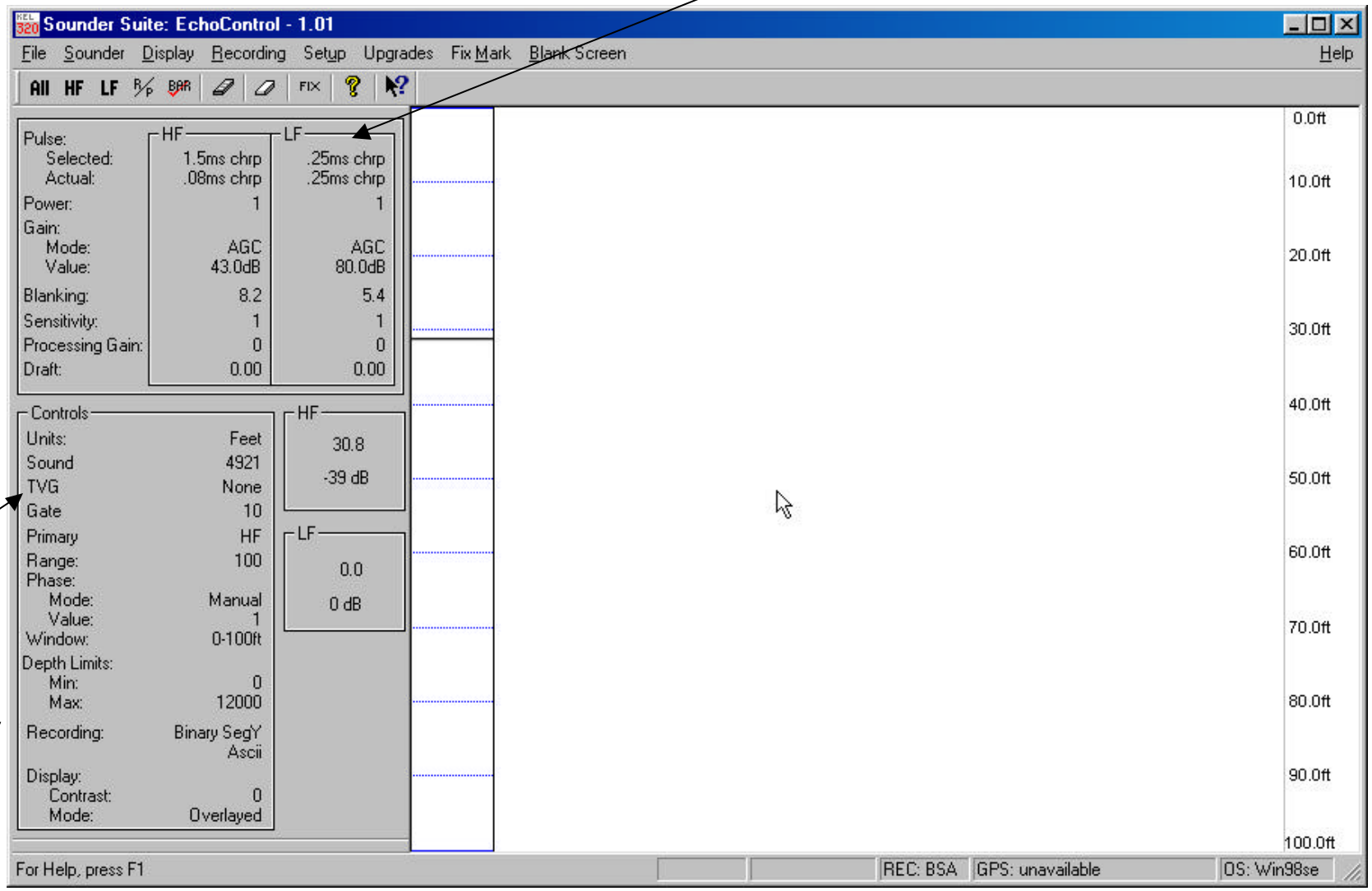
Software Architecture



EchoControl Software

Selected vs. actual



Control Status Display

File Recording Status

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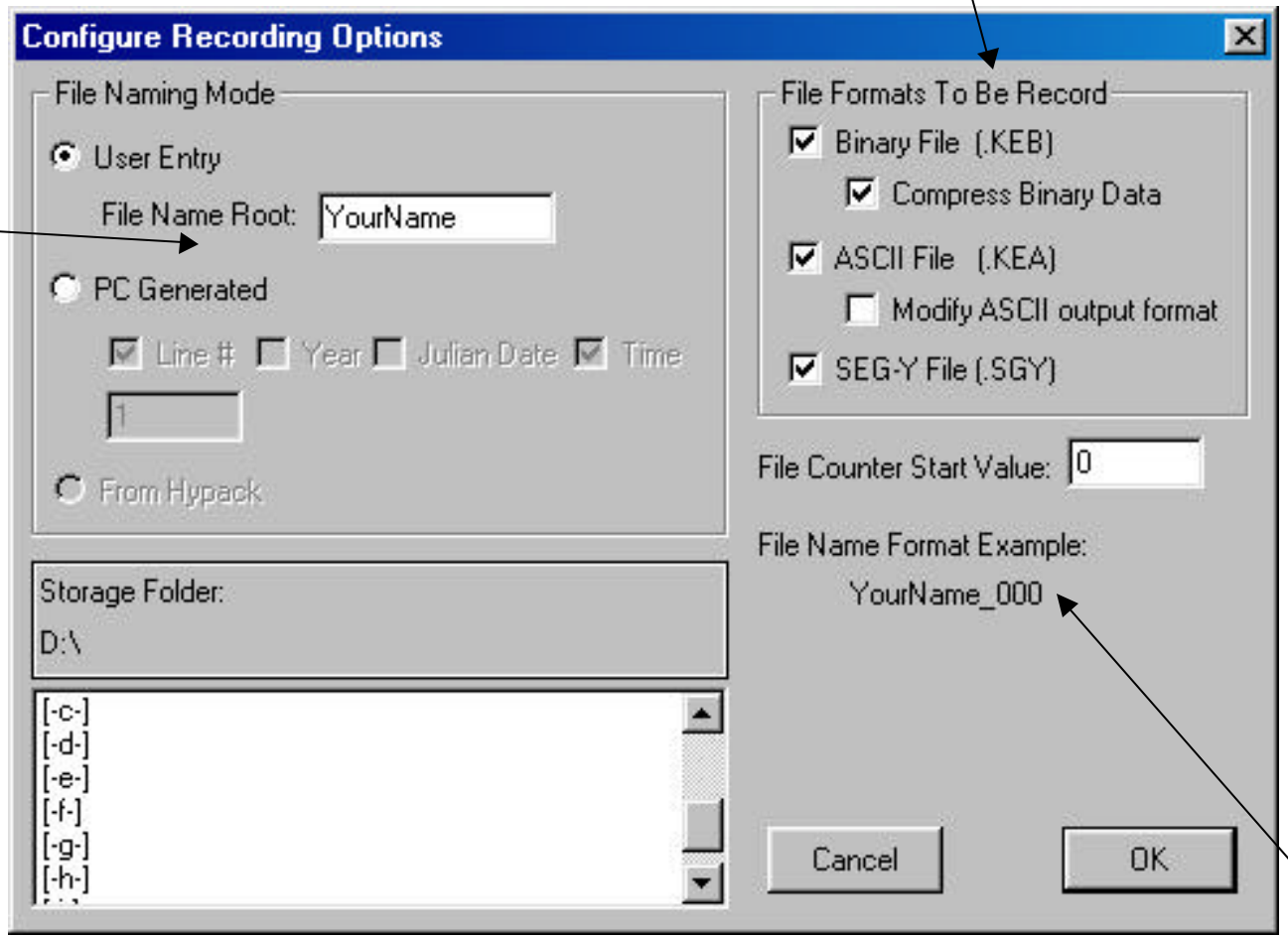
EchoControl - Configure Recording Options

Current File Format

New File Naming Options



Sample Name Format

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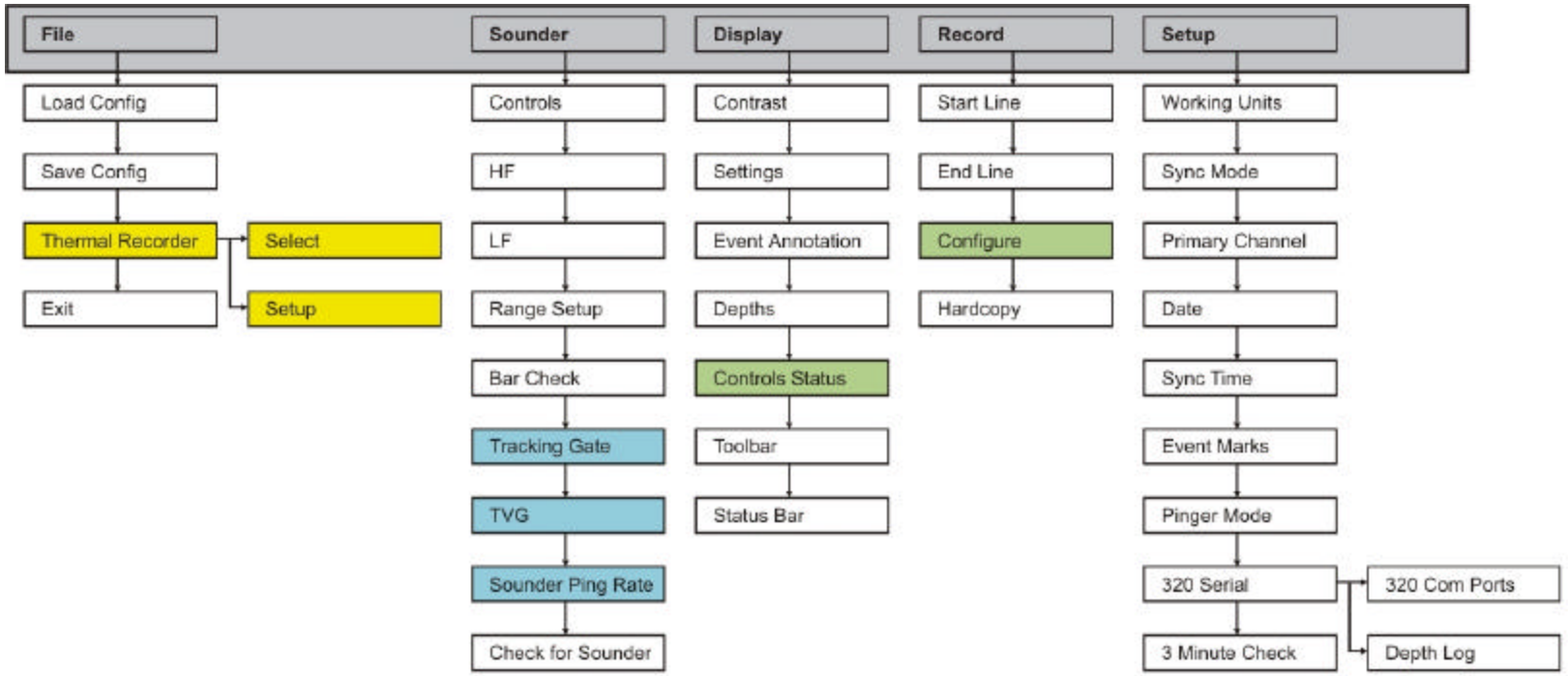
EchoControl - Menu Tree



Top Level Menu Bar

Moved From Setup Menu

Revised

NEW

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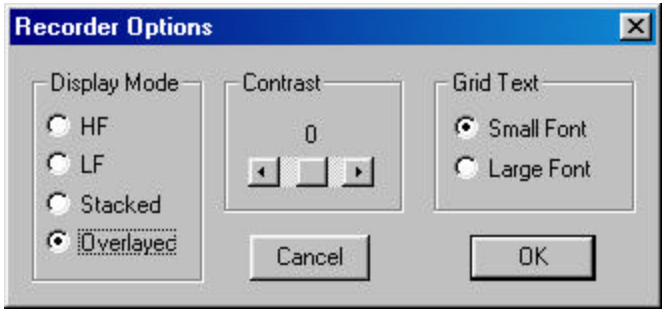
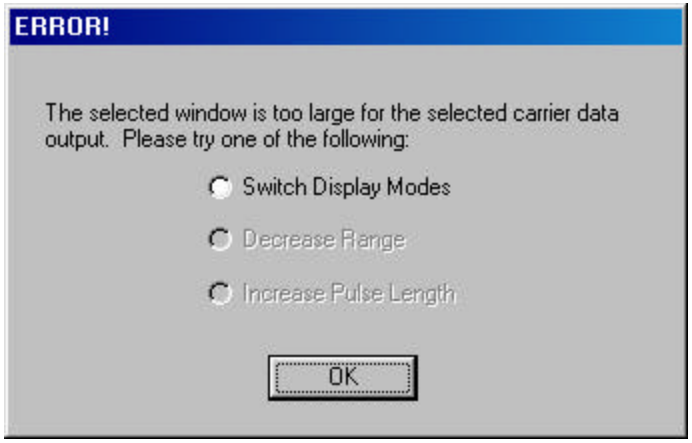
EchoControl - New Controls



New Recorder Setup Options separate from Display Options

New Warning Dialog for SEG-Y data display



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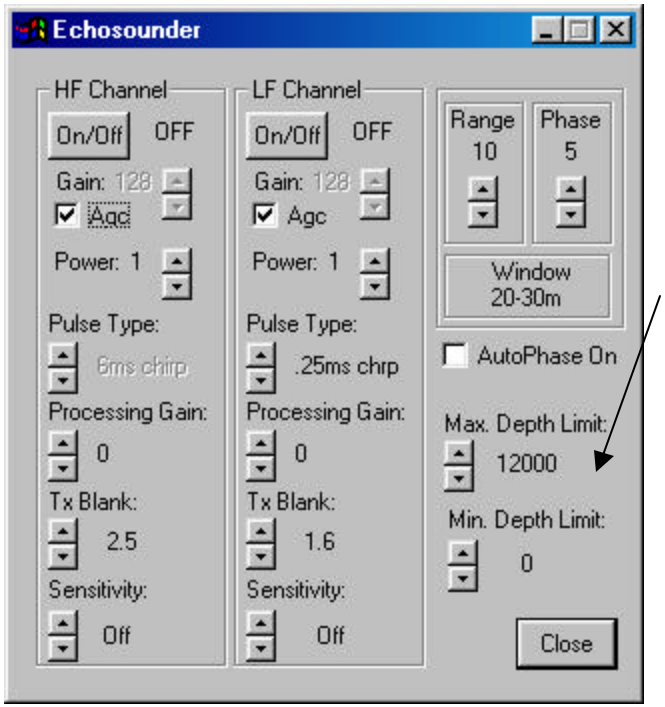
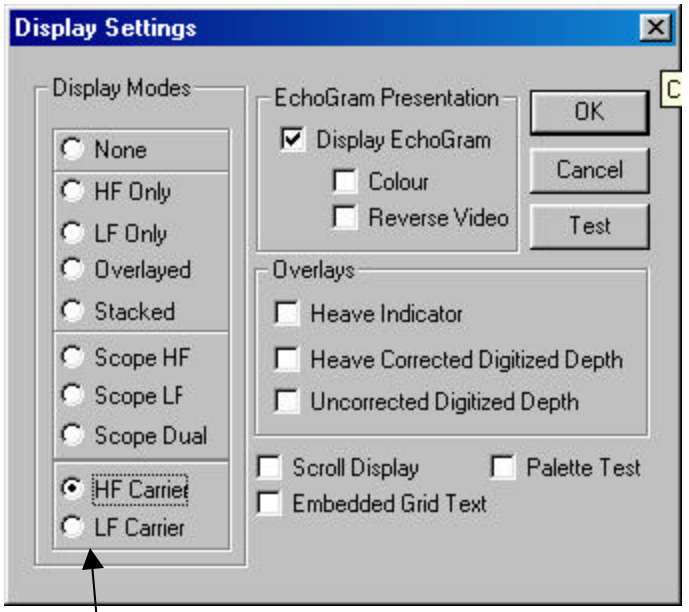
EchoControl - Modified Controls

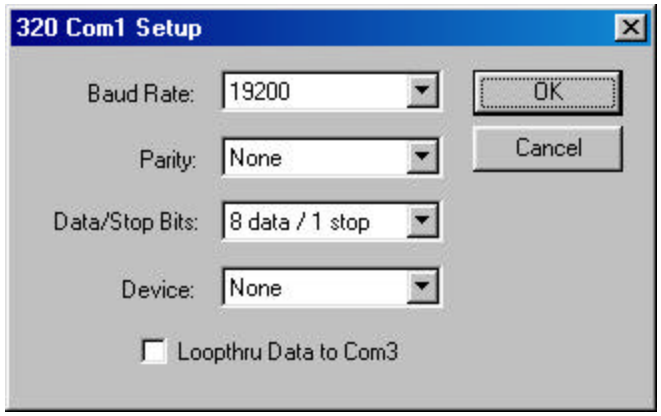


New Depth Limits Active at all times



New

Carrier (SEG-Y) data display option



New Layout for COM Setup

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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

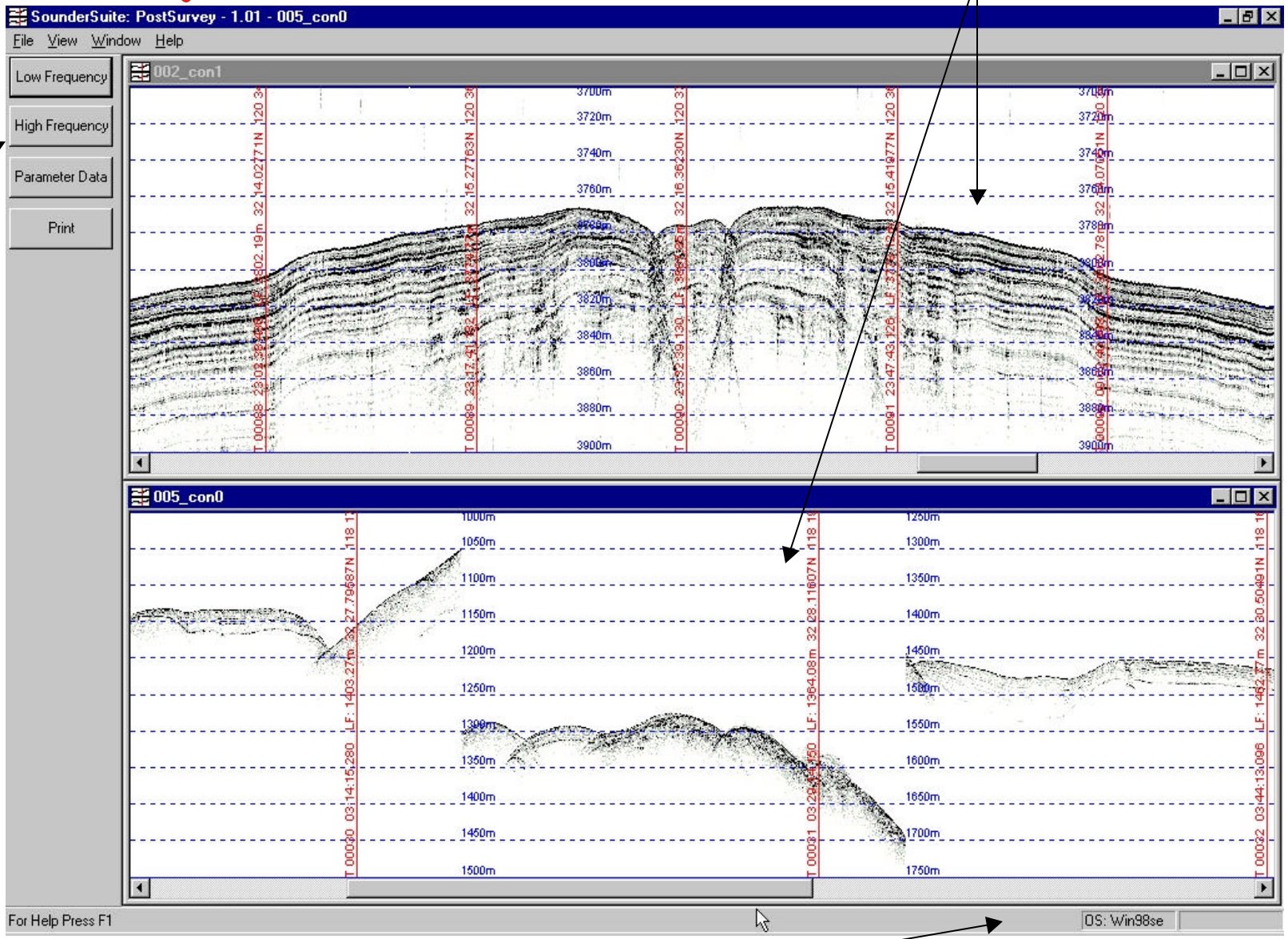
EchoControl - Underused / Misused Controls

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

PostSurvey

Open Multiple Data Sets At Once

New Dialog Sidebar



New & Improved Status Bar

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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

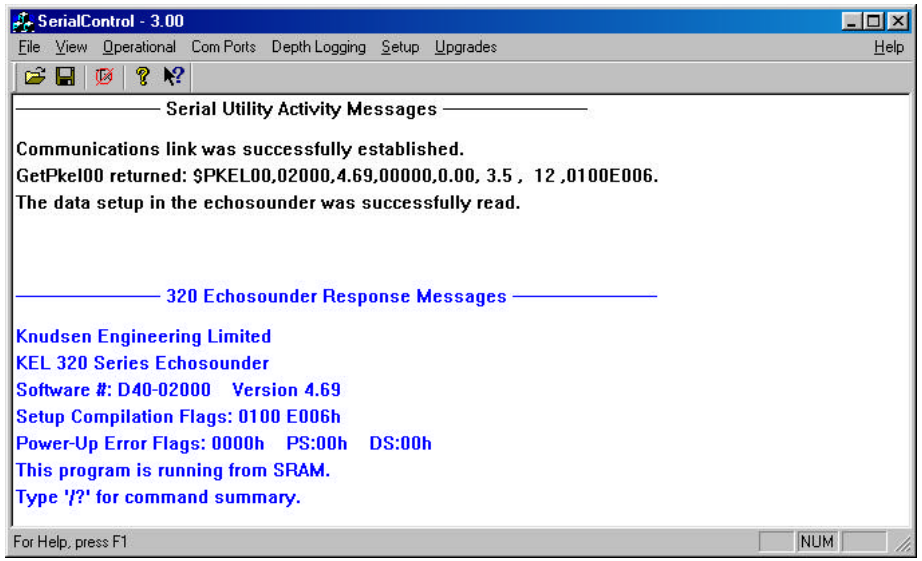
- load multiple data for side by side comparison

Scrolling Data Sets

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

Support For All Windows Printers

SerialControl & SerialUpgrade

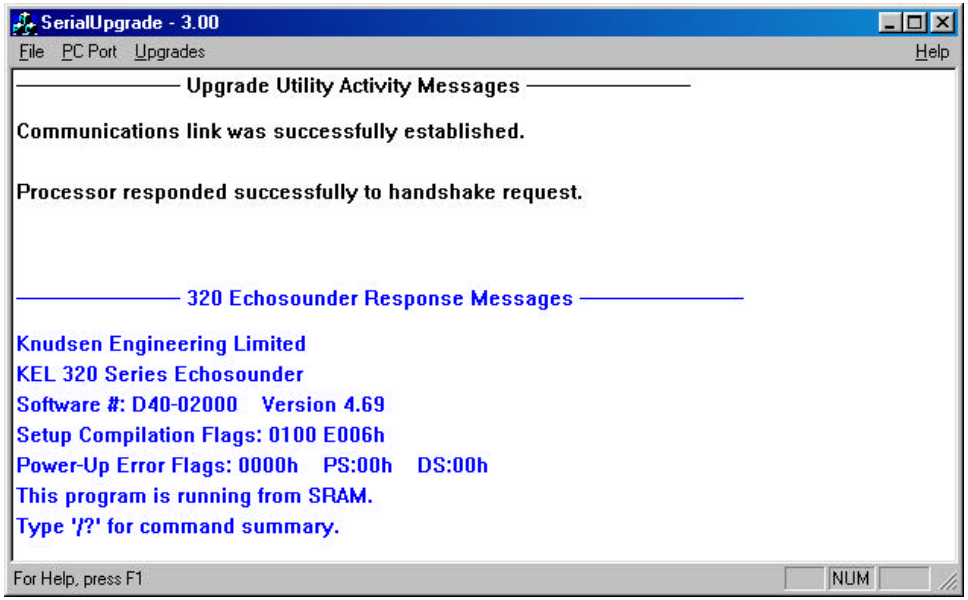


Serial Control

- 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



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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**

Chirp & Correlation Processing

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

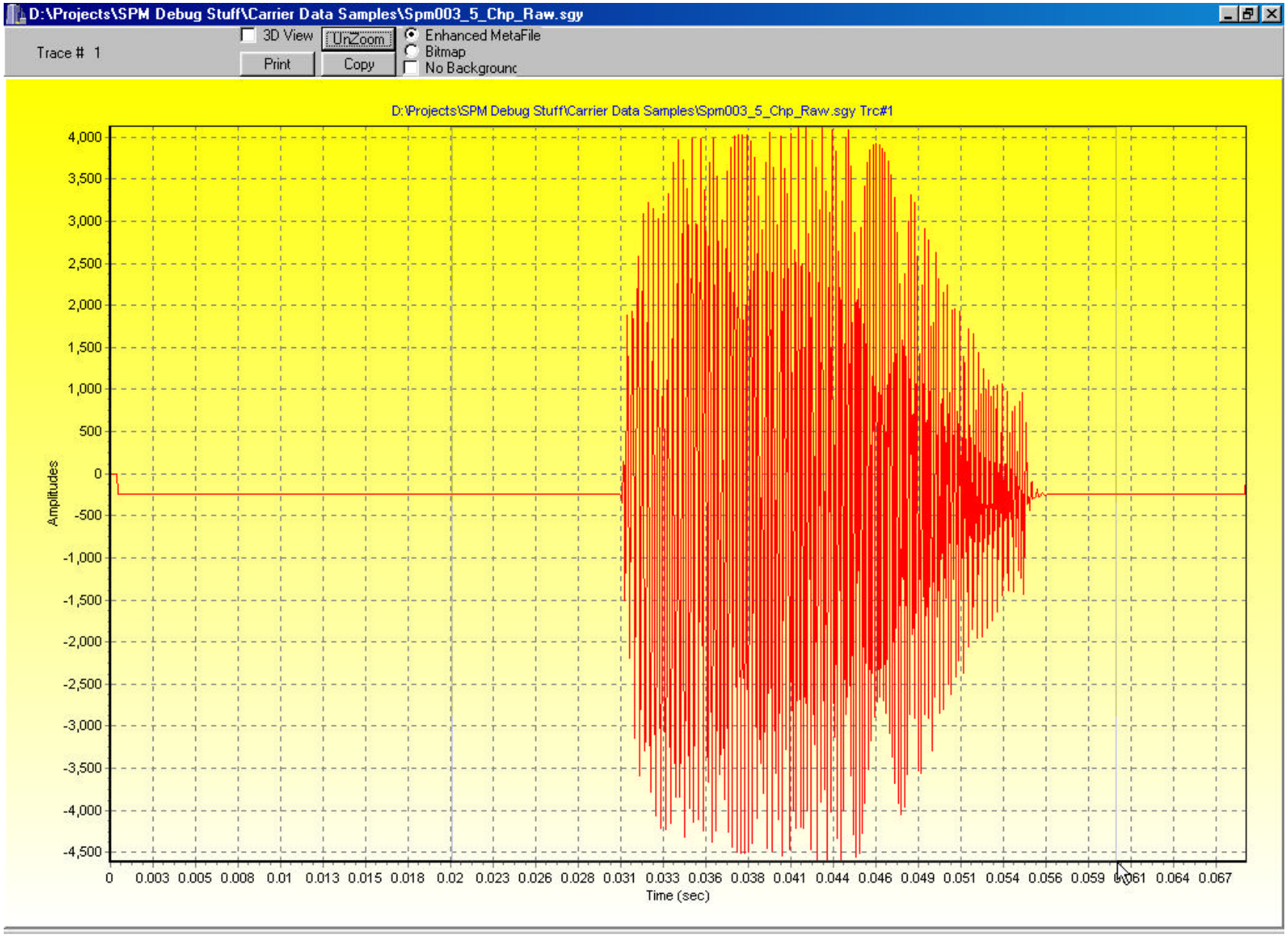
Advantages of Correlation Processing

1) Pulse Compression:

$$\tau = 1/\Delta f$$

2) Improved Signal to Noise:

$$\Delta \text{ SNR} = 10 \log T\Delta f \quad \text{dB}$$



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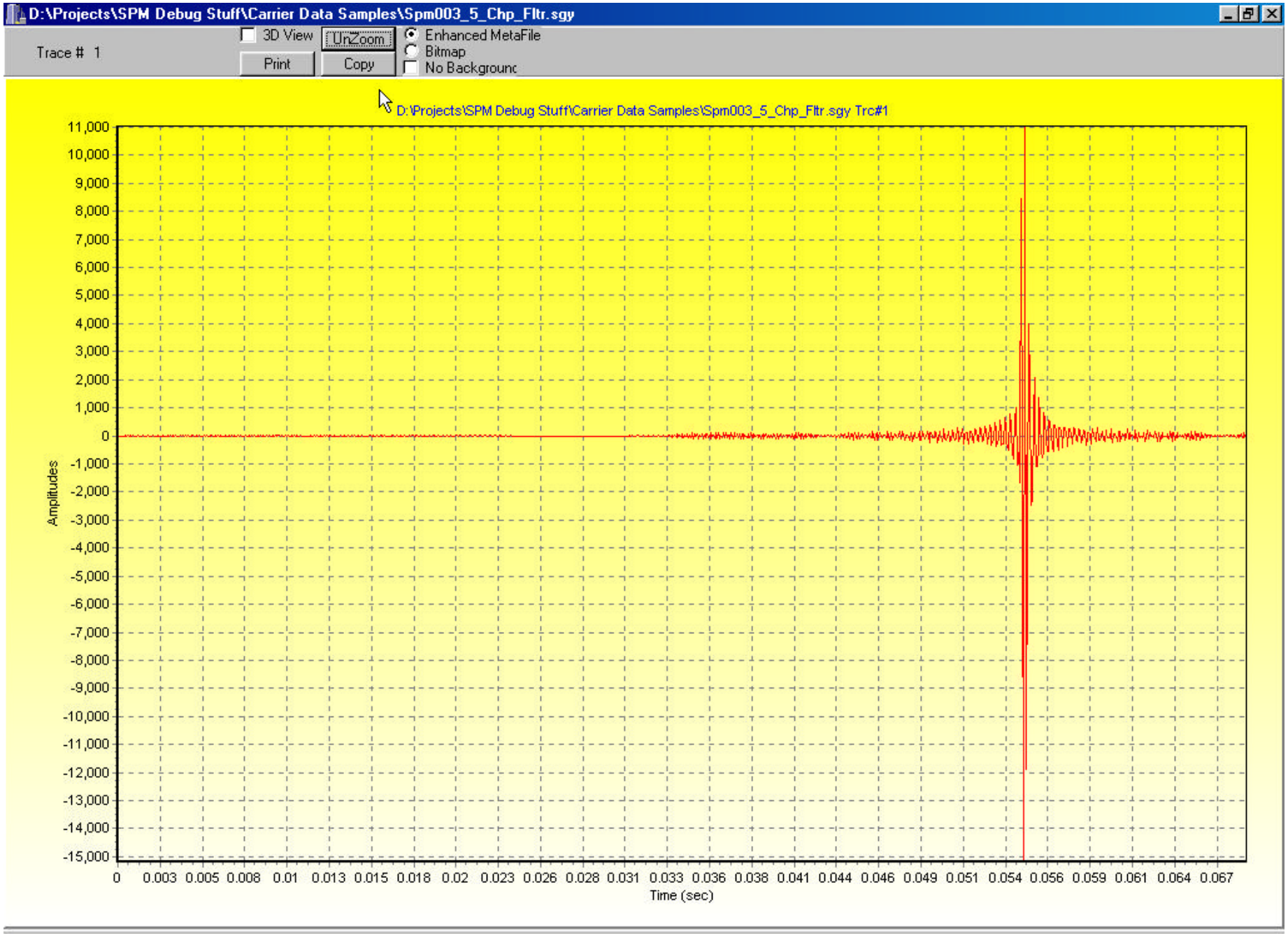

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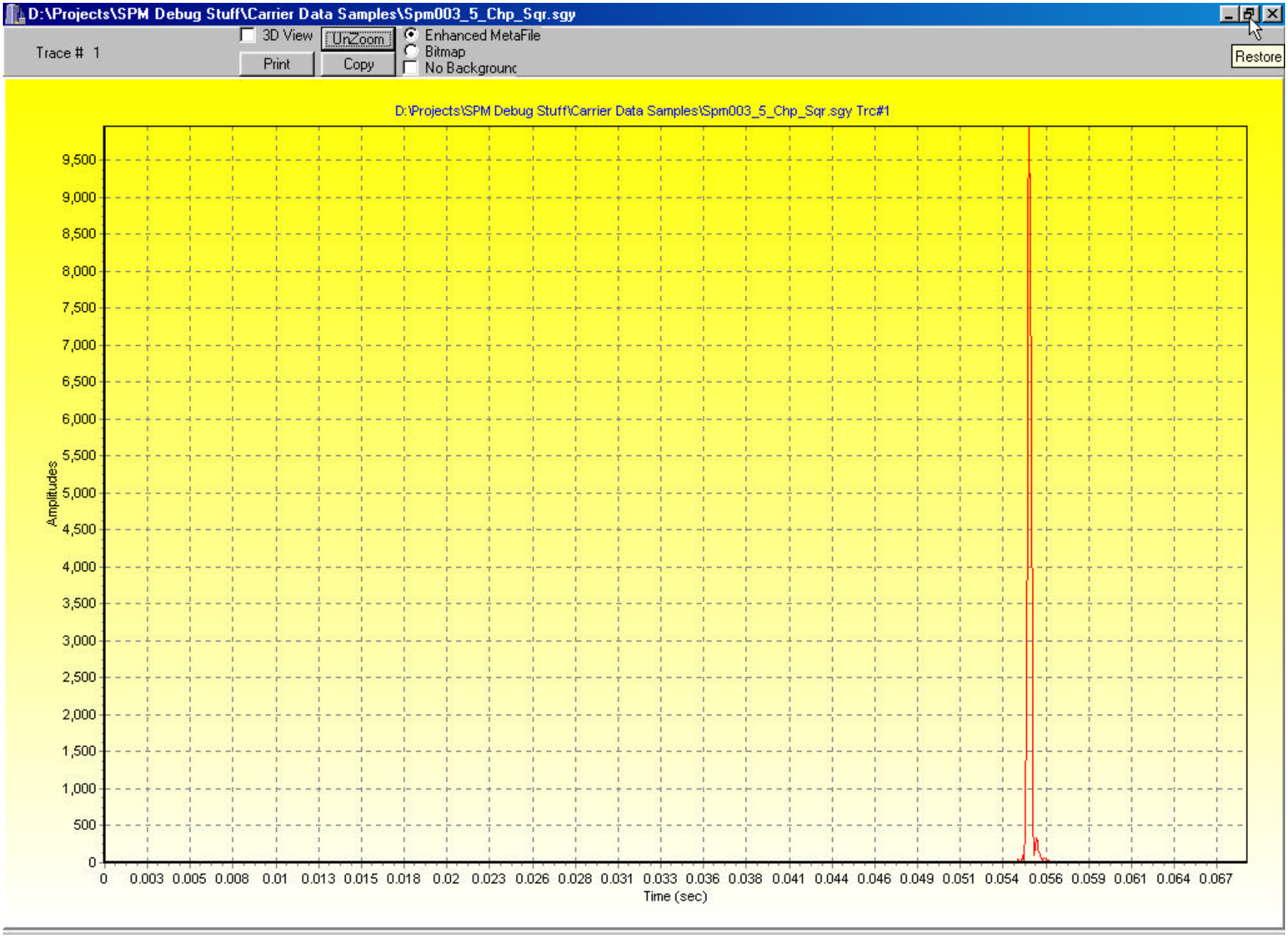

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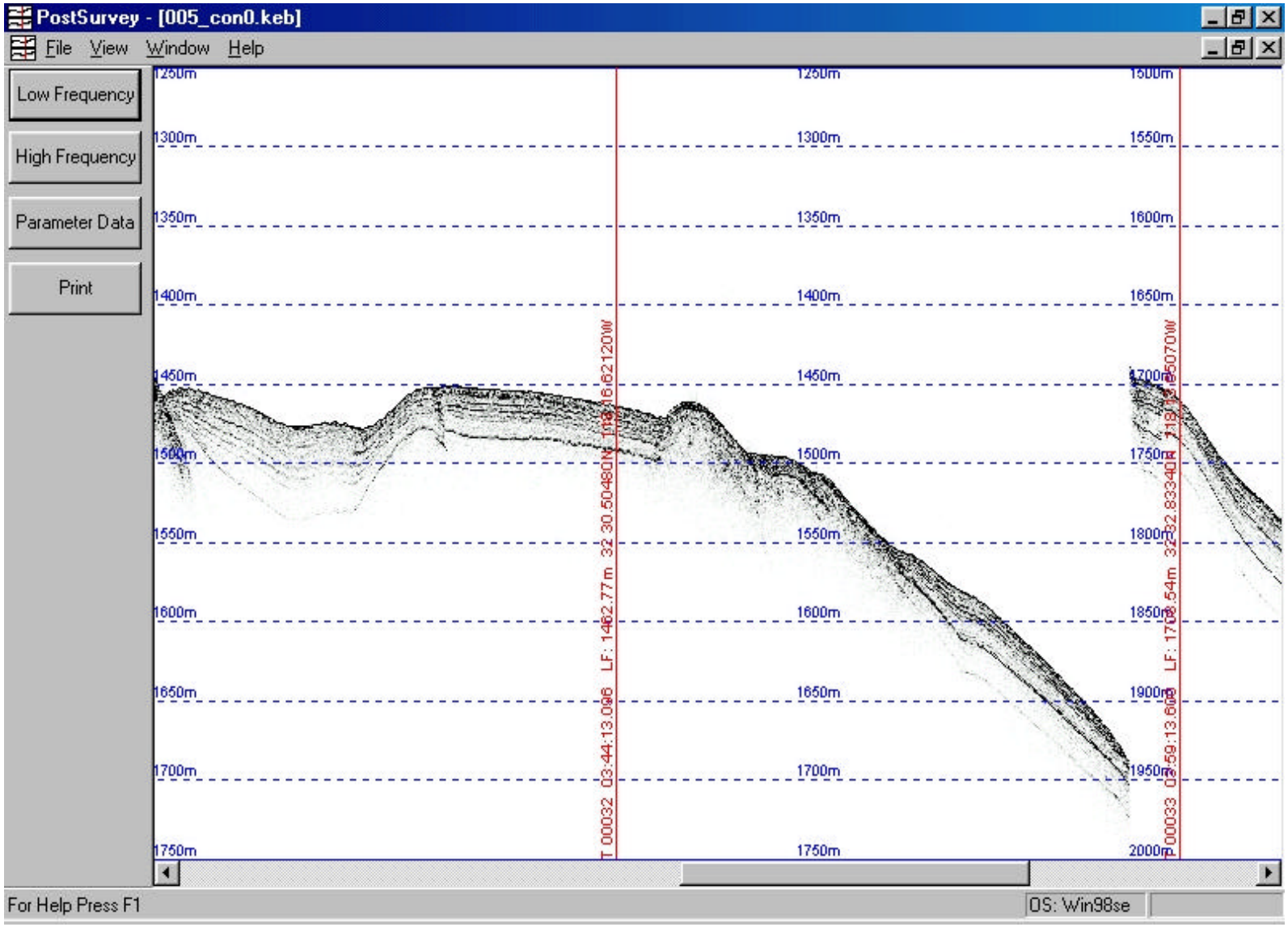
Mid-Depth Data (1500 m)



Data Taken From A Knudsen 320BR @ 3.5 kHz

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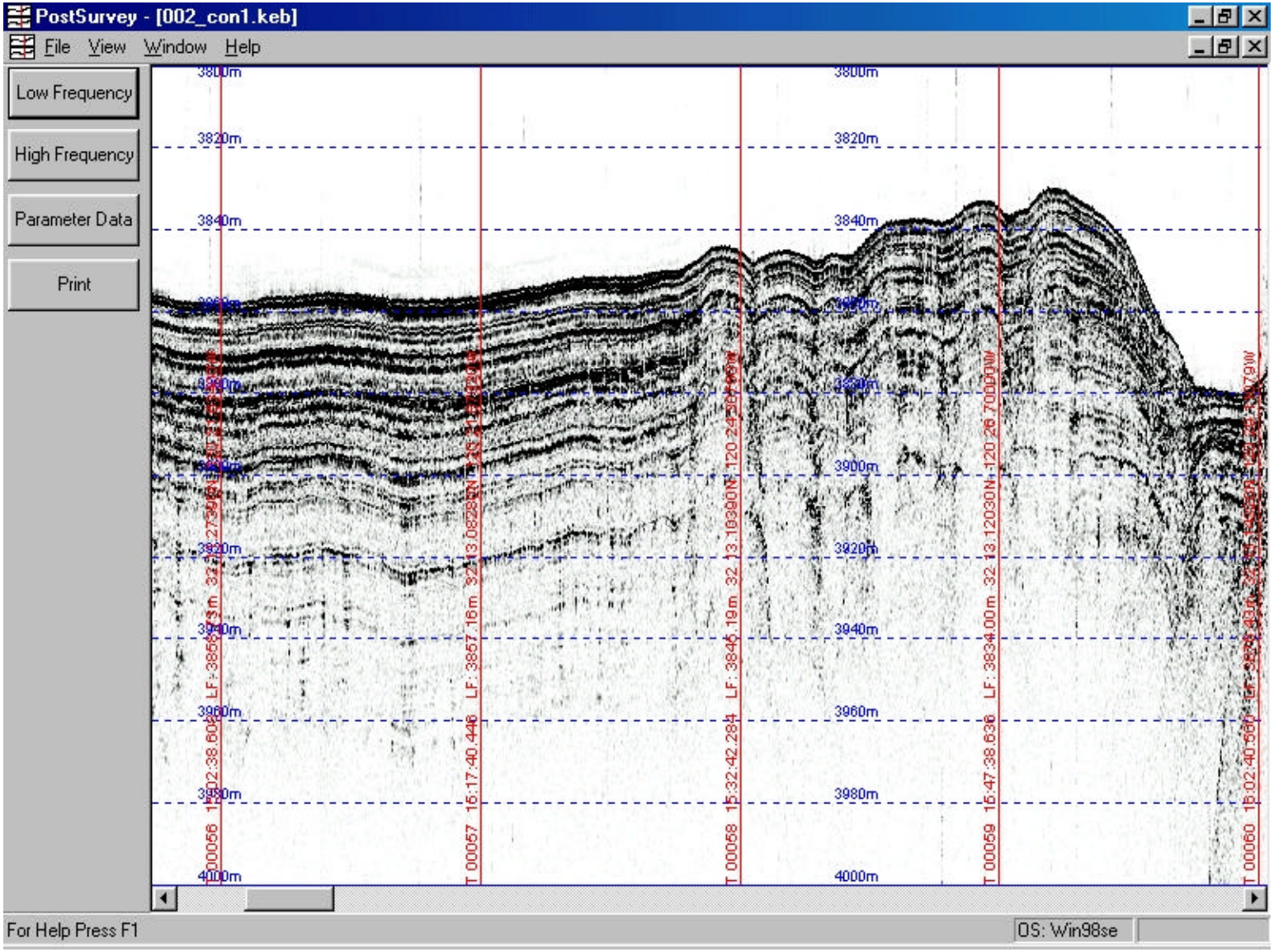
Deep Water Data (3800 m)



Taken From A Knudsen 320BR @ 3.5 kHz

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