Single Beam Echosounder Test Equipment

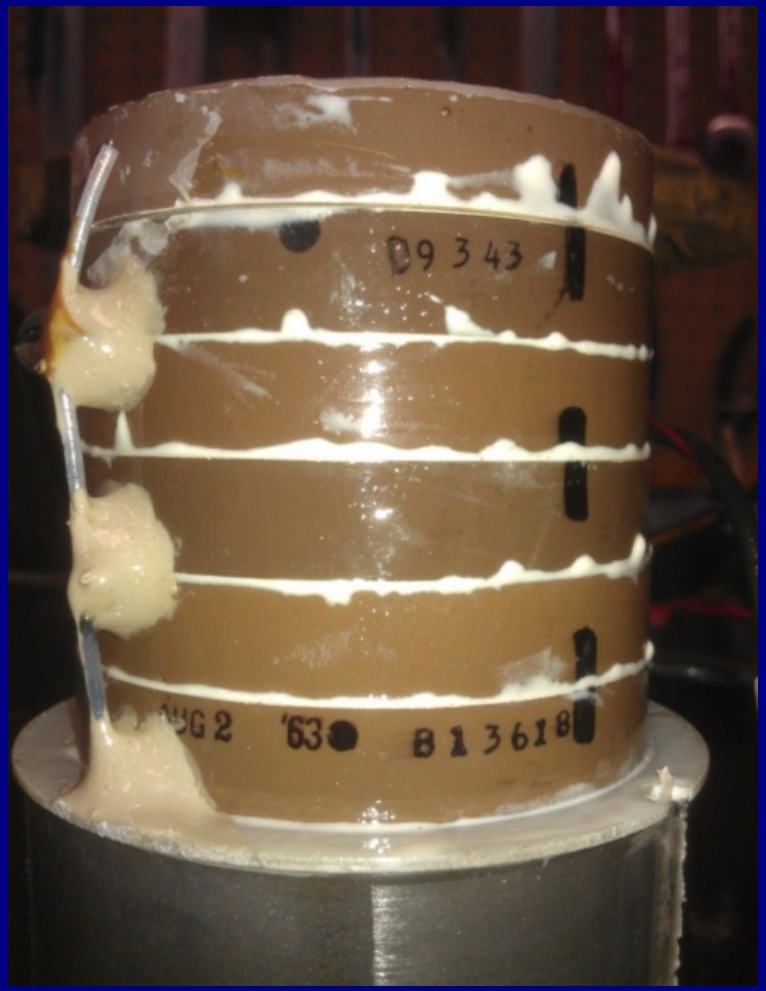
- Introduction
- SIO and Shipboard Technical Support Group
- Brief ship system overview
- Testing equipment
  - Functions
  - Examples of results
  - Advantages and disadvantages

12 kHz Transducer

EDO-Western 323B
Currently manufactured by Exelis, Inc.

3.5 kHz Transducers

Massa TR-1075A Unit



Piezoelectric Elements and Head Mass

Echosounder Systems Installed on SIO Vessels

- **<u>R/V Robert Gordon Sproul, 125 ft / 38 m</u>**
  - Single 12 kHz EDO-Western 323B Unit
  - 3.5 kHz array, 12 Massa TR-1075A Units

Echosounder Systems Installed on SIO Vessels

- **<u>R/V New Horizon, 170 ft / 52 m</u>**
  - Two 12 kHz EDO-Western 323B Units
  - 3.5 kHz array, 12 Massa TR-1075A units

Echosounder Systems Installed on SIO Vessels

- **<u>R/V Roger Revelle, 277 ft / 84 m</u>**
  - Two 12 kHz Massa Units
  - 3.5 kHz array, 12 ORE Offshore units

Echosounder Systems Installed on SIO Vessels

- **<u>R/V Sally Ride, 238 ft / 73 m</u>**
  - One 12 kHz Airmar CS229 unit
  - 3.5 kHz array, 16 Massa TR-1075 units

DSTS-5A/2C Chirp Sonar Test Set

Input bezel of the unit:
- Standard HV BNC connector
- Custom load switch

DSTS-5A/2C Chirp Sonar Test Set

Control bezel of the unit:

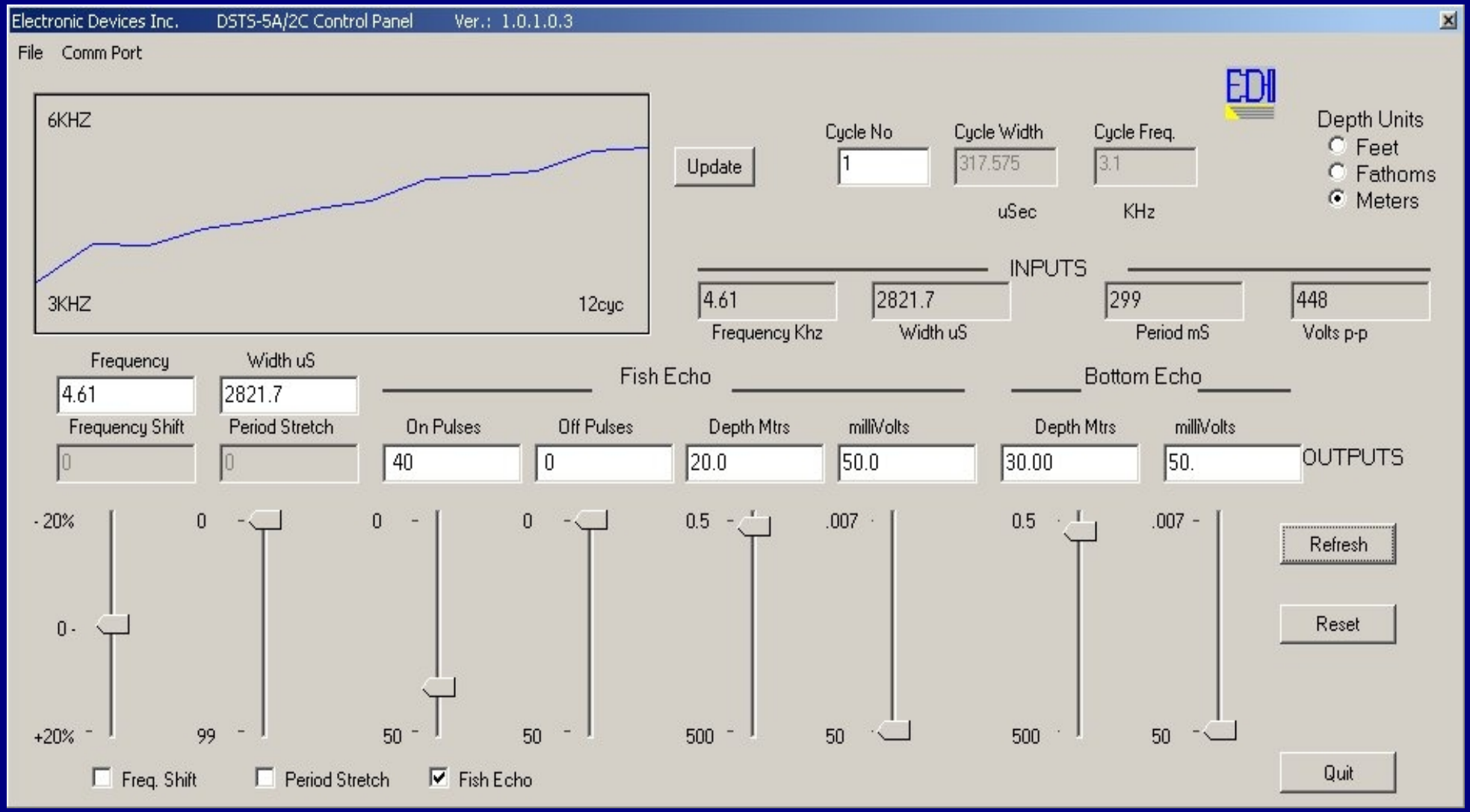
- Standard DB-9 RS-232 communication
- 9V wall transformer for mains power
- Trigger out is a HV BNC connector

DSTS-5A/2C Chirp Sonar Test Set

Functions of the unit:

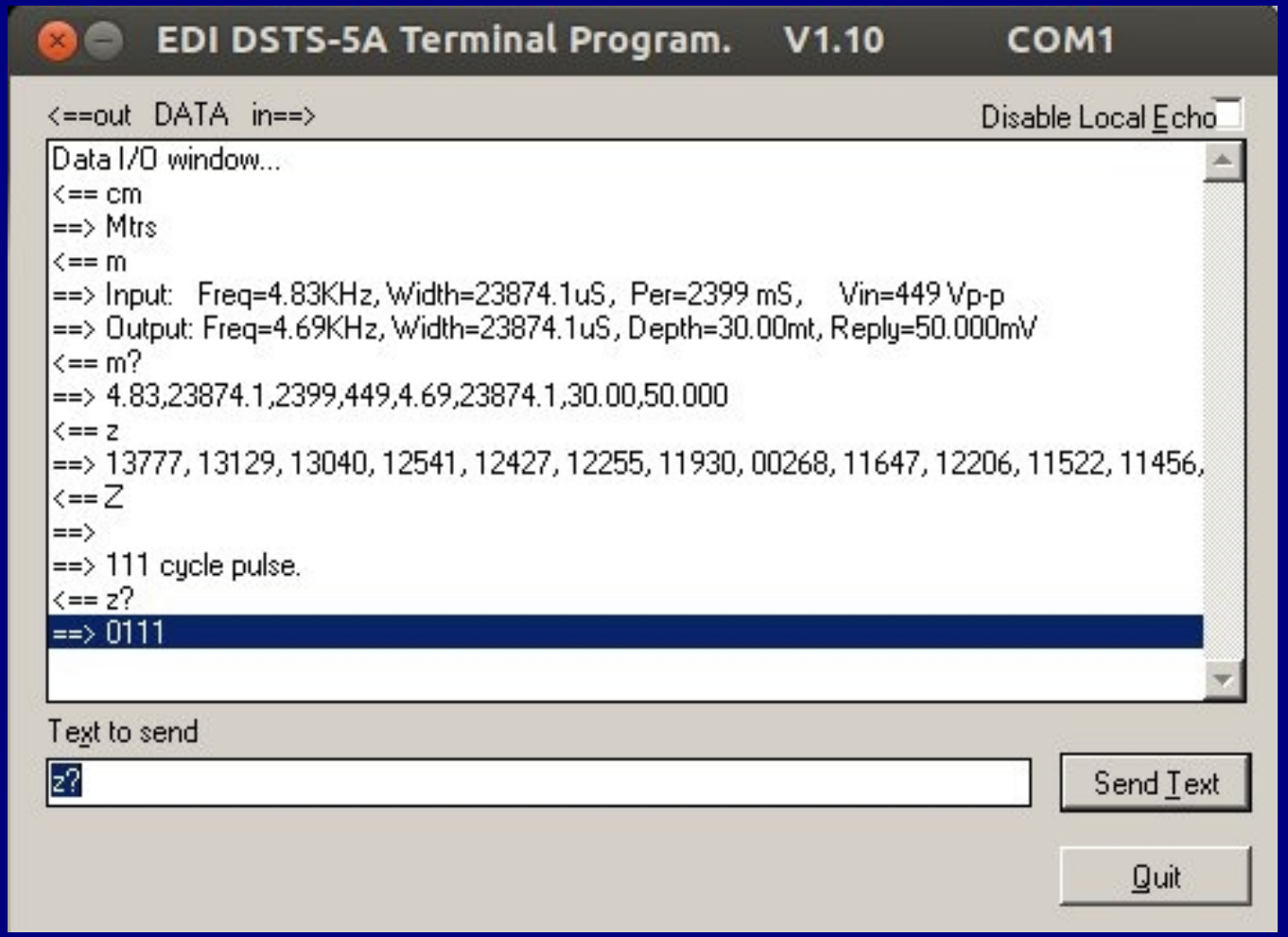
- Works with chirp and fixed frequency (CW) signals
- Takes an incoming pulse and digitizes it
- Measures from the pulse:
  - Period
  - p-p Voltage
  - Frequency
  - Pulse length
- Inserts a delay and generates a response:
  - Can simulate both a bottom return and fish echo
  - Can shift frequency and stretch period of return pulse

DSTS-5A/2C Chirp Sonar Test Set

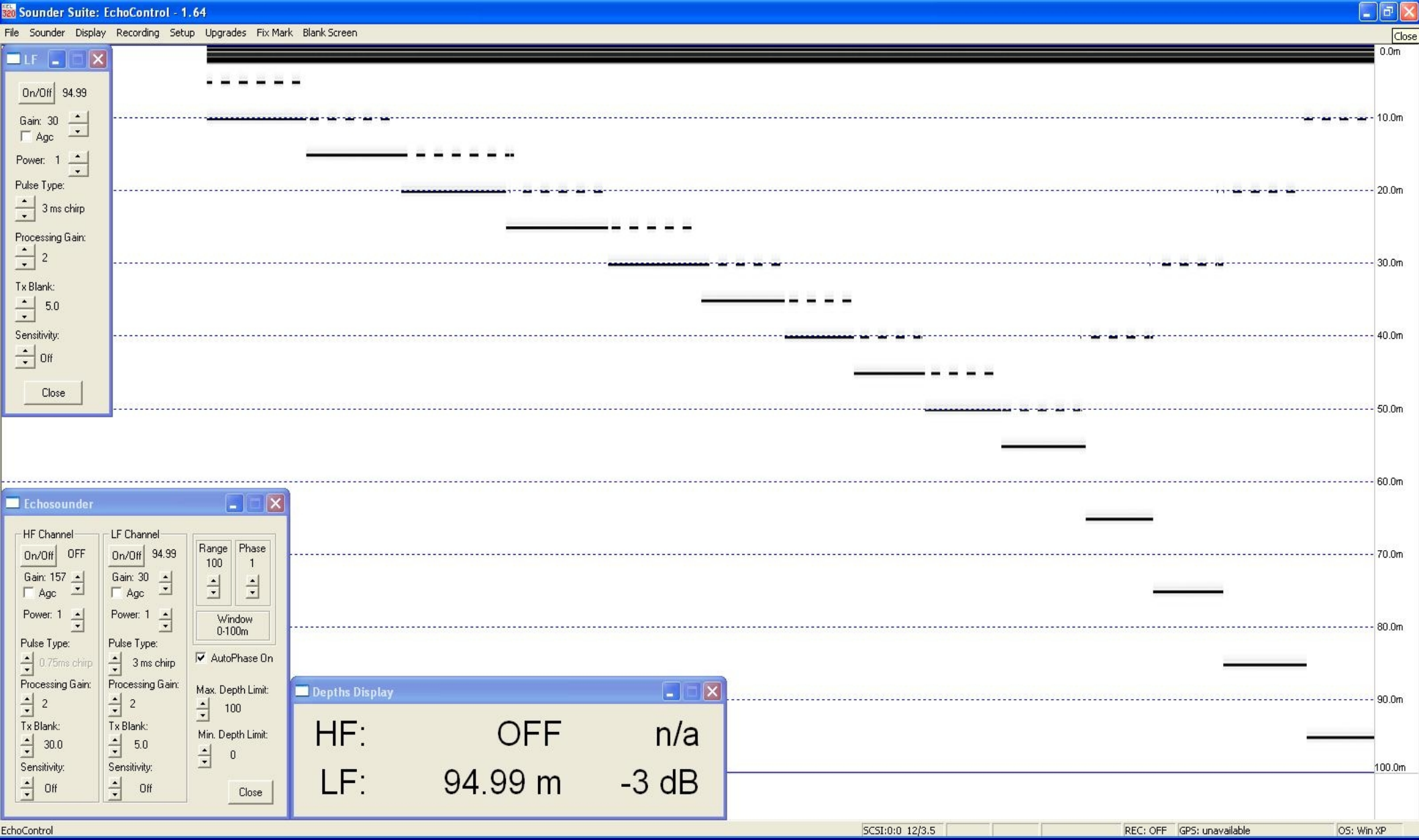


GUI Control Panel Interface

DSTS-5A/2C Chirp Sonar Test Set



Terminal Interface (Manufacturer Supplied)



Echogram produced with the DSTS unit displaying simulated fish echo and bottom return

DSTS-5A/2C Chirp Sonar Test Set

Advantages of the unit:

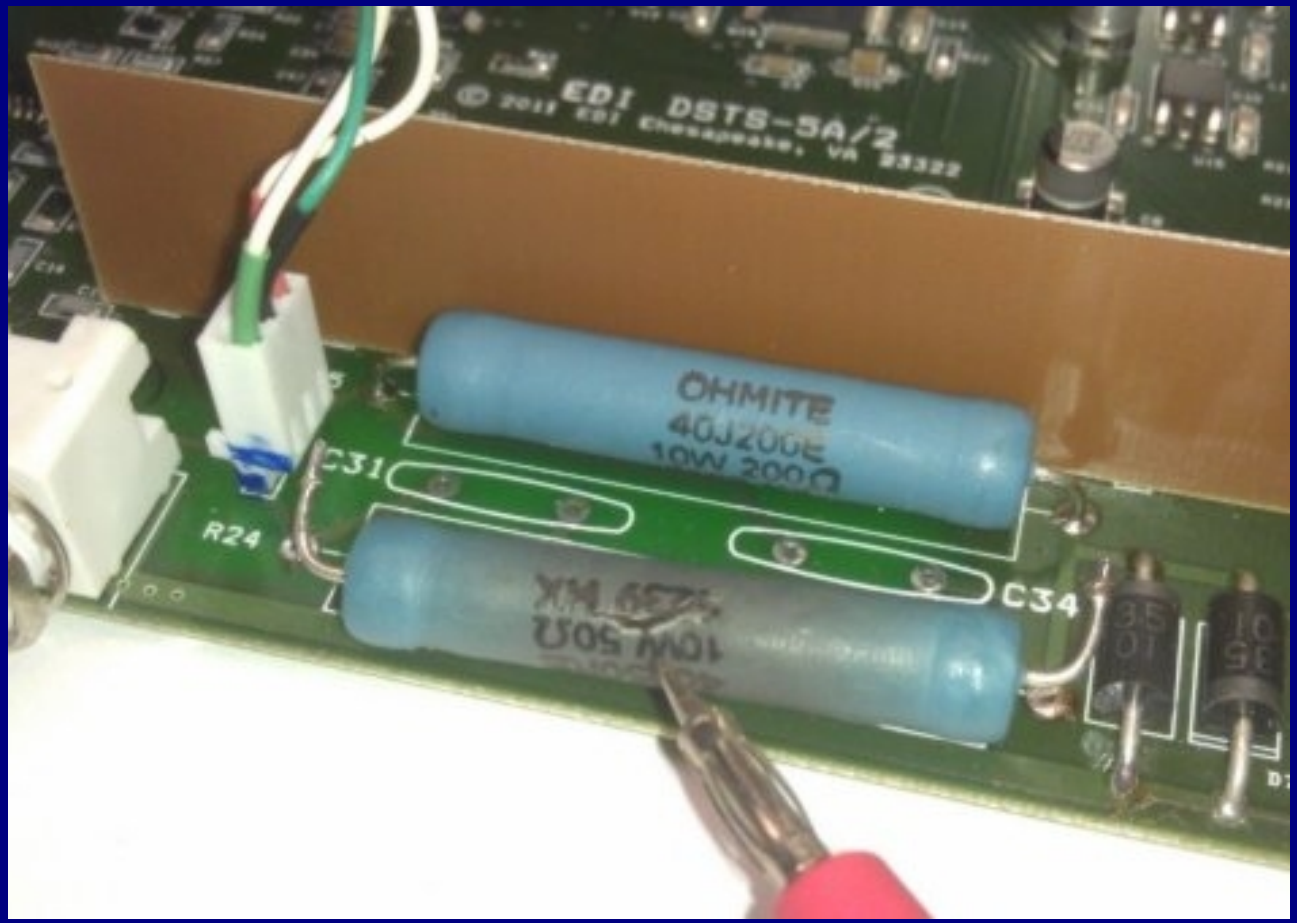
- GUI works with Windows and Linux (WINE)
- Terminal interface works with any RS-232 terminal
- Can work autonomously without a computer
- Can be batch-scripted to run a custom test suite
- Includes field calibration tests and procedures
- Firmware can be upgraded
- Manufacturer is responsive to customization (Ω, Hz)
- Unit cost is approximately $1,600

DSTS-5A/2C Chirp Sonar Test Set

Disadvantages of the unit:

- May require USB-to-Serial hardware to communicate
- Needs interface cables and mains power
- Input is sensitive to high frequency noise
- Longer duty cycles and higher Tx power pulses can be problematic (see next slide)

DSTS-5A/2C Chirp Sonar Test Set



Longer duty cycles at higher Tx power levels
may void your warranty

TT-2D Transducer Test Set

Front Display Bezel

- LCD Display
- Buttons for Selecting Range and Leakage
- Coarse Frequency Tuning
- Fine Frequency Tuning
- Standard RCA Connector for Transducer

TT-2D Transducer Test Set

Functions of the unit:

- Tests acoustic transducers for resonance
  - 500 Hz to 500 kHz
- Can test transformer-coupled (TR-1075A) units
- Displays load characteristics:
  - Capacitive
  - Resistive
  - Inductive
- Tests and displays impedance at resonance
- Can measure leakage resistance over broad range
  - 10 Ω to 5 MΩ

TT-2D Transducer Test Set

Advantages of the unit:

- Quickly evaluate a transducer unit or array
- Small, portable, and easy to setup and operate
- Three frequency ranges spanning 500 Hz to 500 kHz
- Does not require mains power

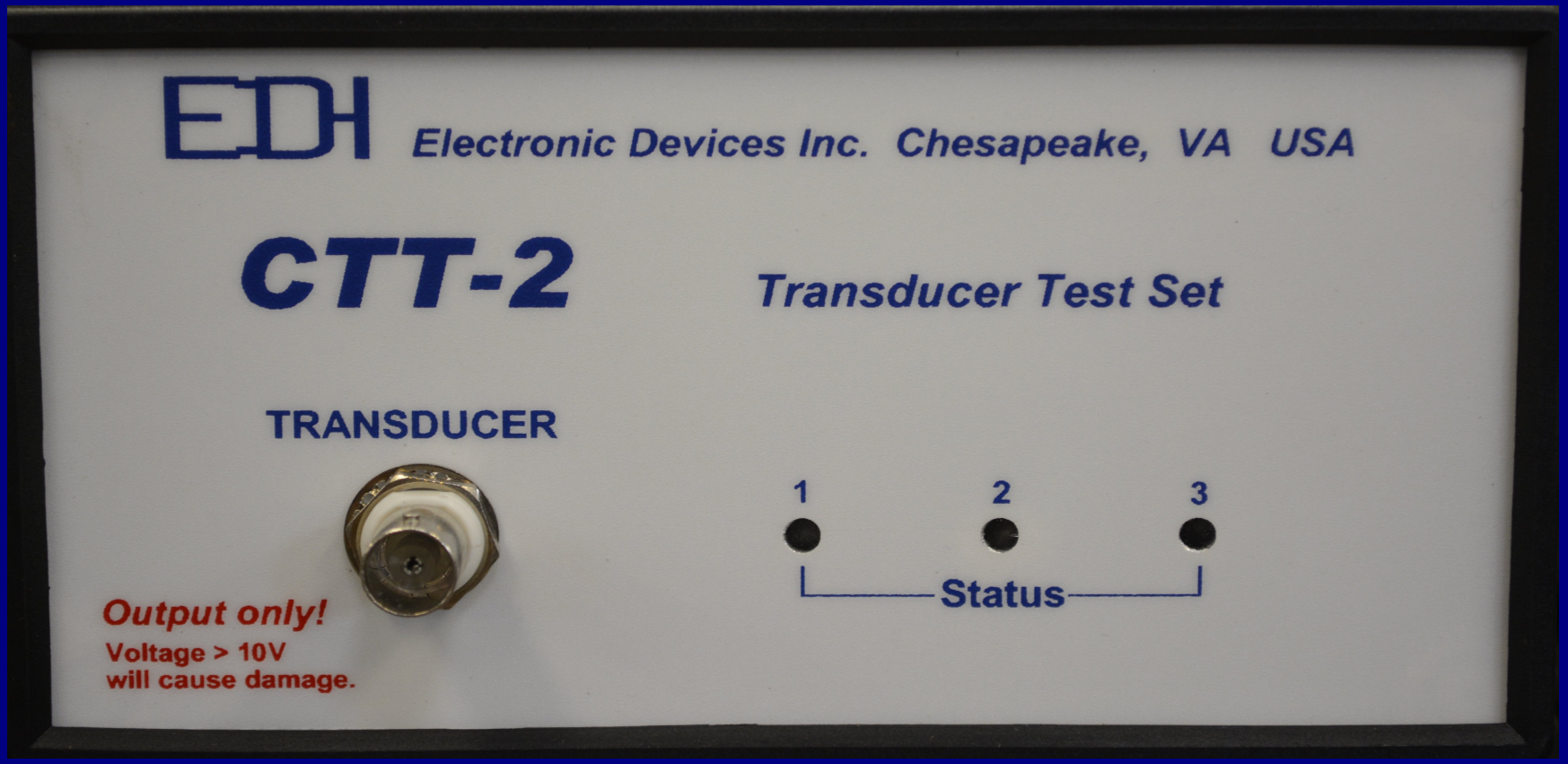
  - Can be taken into void spaces for use
- Includes field calibration tests and procedures
- Front LED is a strong visual indicator of resonance
- Unit cost is approximately $500

TT-2D Transducer Test Set

Disadvantages of the unit:

- Requires some technical knowledge to interpret results for general field applications
- Cannot save test results

CTT-2 Transducer Test Set



Input bezel of the unit:

- Transducer out is a HV BNC connector
- Three color status indication LEDs

CTT-2 Transducer Test Set

Control bezel of the unit:

- Standard DB-9 RS-232 communication
- 9V wall transformer for mains power
- O.C. Out is a HV BNC connector

CTT-2 Transducer Test Set

Functions of the unit:

- Computer controlled transducer testing unit
- Determines impedance and relative phase
- Measures leakage over a range of 100 Ω to 10 MΩ
- Can test transformer-coupled (TR-1075A) units
- Outputs results for plotting

CTT-2 Transducer Test Set

Advantages of the unit:

- Quickly evaluate a transducer unit or array
- Terminal interface works with any RS-232 terminal
- Samples many points in a short time interval
- Many test parameters can be varied
- Eases documentation of transducer test data
- Can be batch-scripted to run a custom test suite
- Includes field calibration tests and procedures
- Unit cost is approximately $2,000

CTT-2 Transducer Test Set

Disadvantages of the unit:

- May require USB-to-Serial hardware to communicate
- Needs interface cables and mains power
- System setup not very portable to void spaces

CTT-2 Transducer Test Set

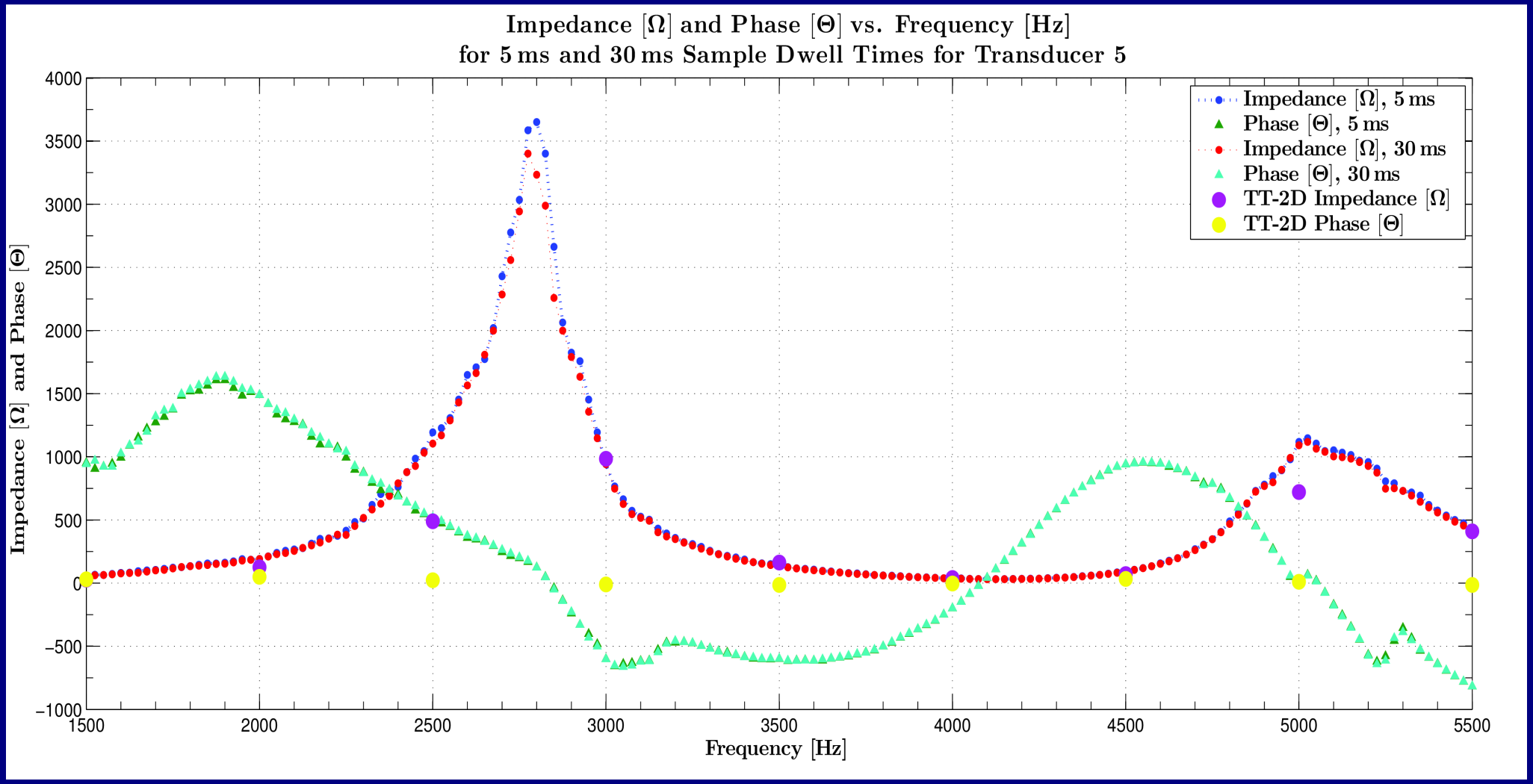


Figure 1: Plot of Impedance and Phase vs. Frequency for 5 ms and 30 ms Sample Dwell Times

Knudsen D229-0485 Sonar Simulator

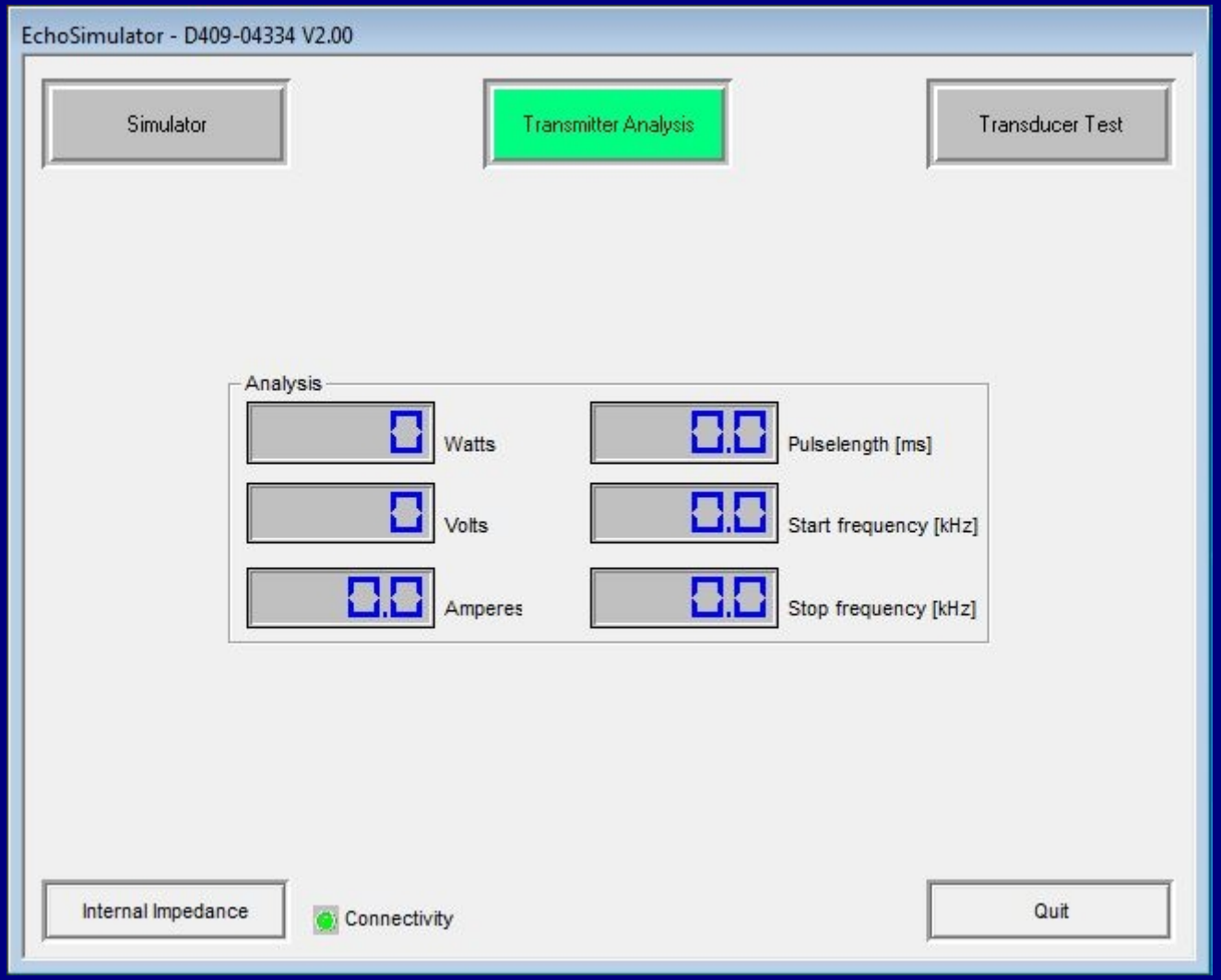
Front Bezel of the Unit:
- 3 and 4 pin Male and Female Amphenol Connectors
- USB Standard-B Connection to Computer
- Standard BNC for Volts, Amps, and AUX Connections

Knudsen D229-0485 Sonar Simulator

Functions of the unit:

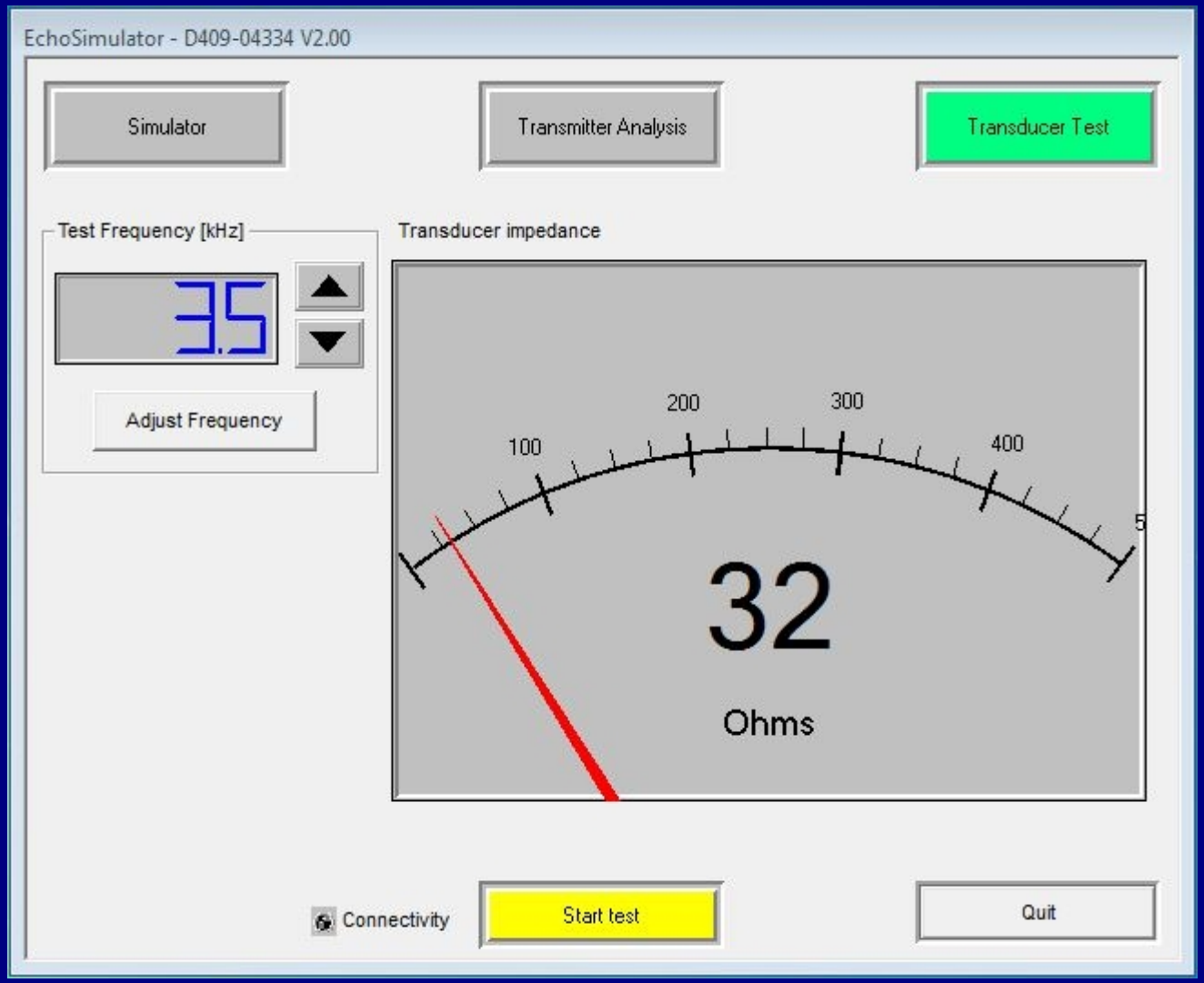
- Specifically evaluates Knudsen echosounders
- Works with chirp and tone pulses
- Tests transformer coupled (TR-1075A) impedance
- Measures and characterizes input pulses
- Simulates a transducer return pulse to a deck unit
- Adjustable parameters for deck unit calibration:
  - Return pulse depth
  - Return signal attenuation [dB]

Knudsen D229-0485 Sonar Simulator



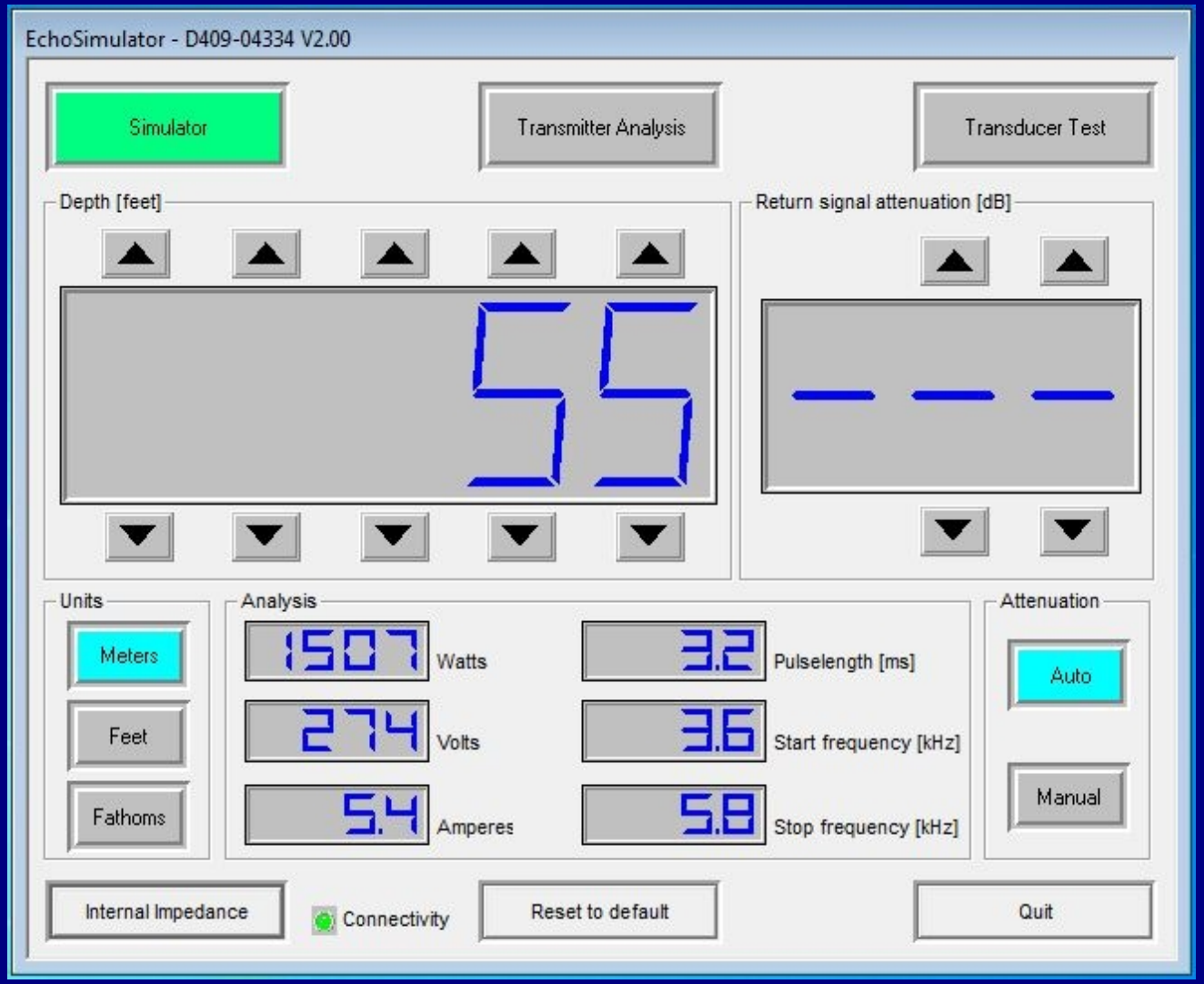
GUI Screen presenting Transmitter Analysis Mode (Passive Interface)

Knudsen D229-0485 Sonar Simulator

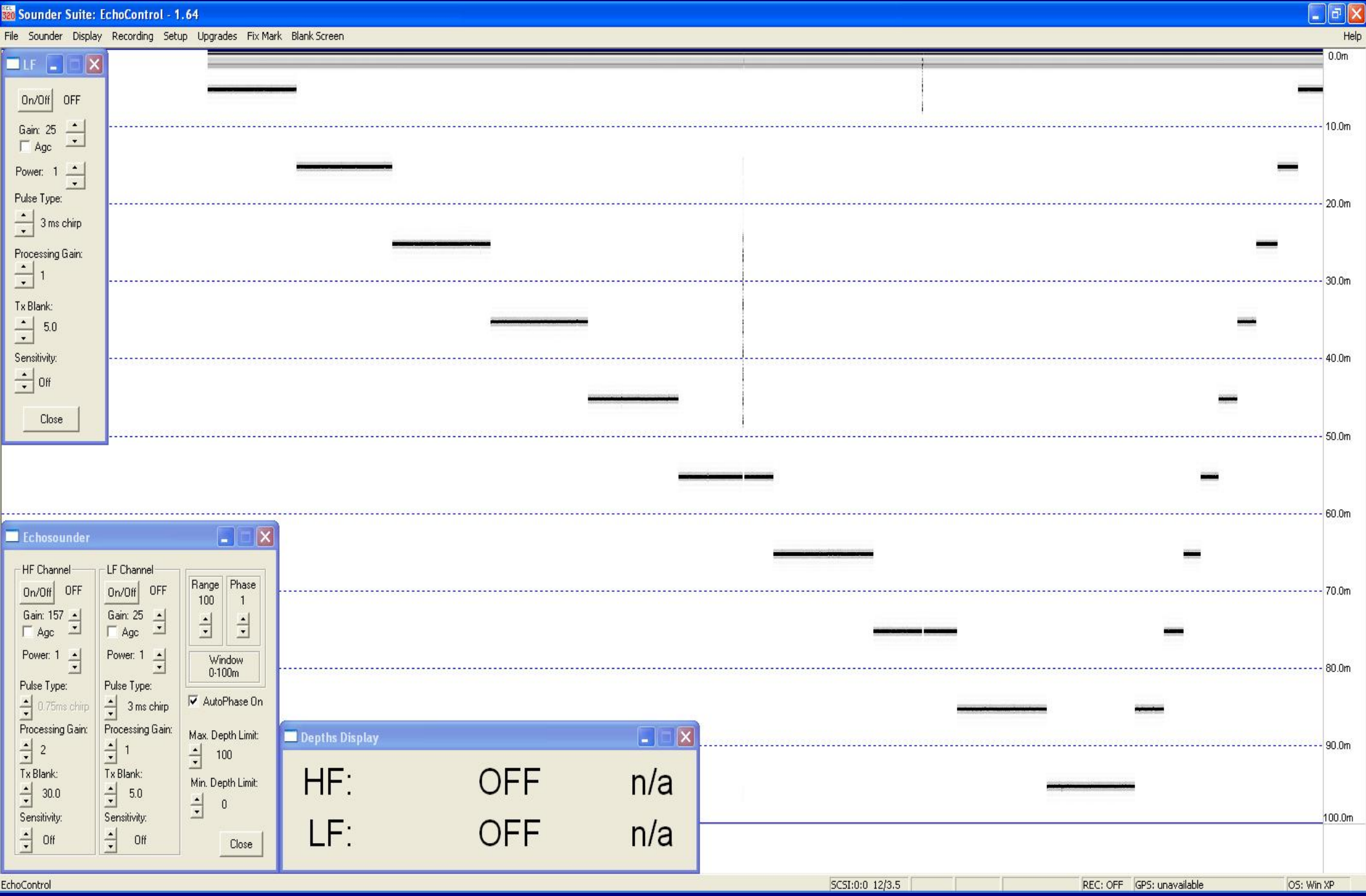


GUI Screen presenting Transducer Test Mode (Active Interface)

Knudsen D229-0485 Sonar Simulator



GUI Screen presenting Simulator Mode (Active Interface)



Echogram produced with the Knudsen unit displaying simulated bottom return

Knudsen D229-0485 Sonar Simulator

Advantages of the unit:

- Native to Knudsen hardware
- Works on computers already running a 3260 unit
- Simple graphical interface for ease of use
- Many test parameters can be varied
- Firmware can be upgraded
- BNC out can connect to an oscilloscope while testing
- Built for field use
- Can be leased from manufacturer

Knudsen D229-0485 Sonar Simulator

Disadvantages of the unit:

- Must run on Win 7 or newer OS
  - Not compatible with computer that runs a 320 B/R
- Needs interface cables and mains power
- Cannot save test results