Scientific Data Systems, Inc.

Warrior Cased Hole Well Logging System

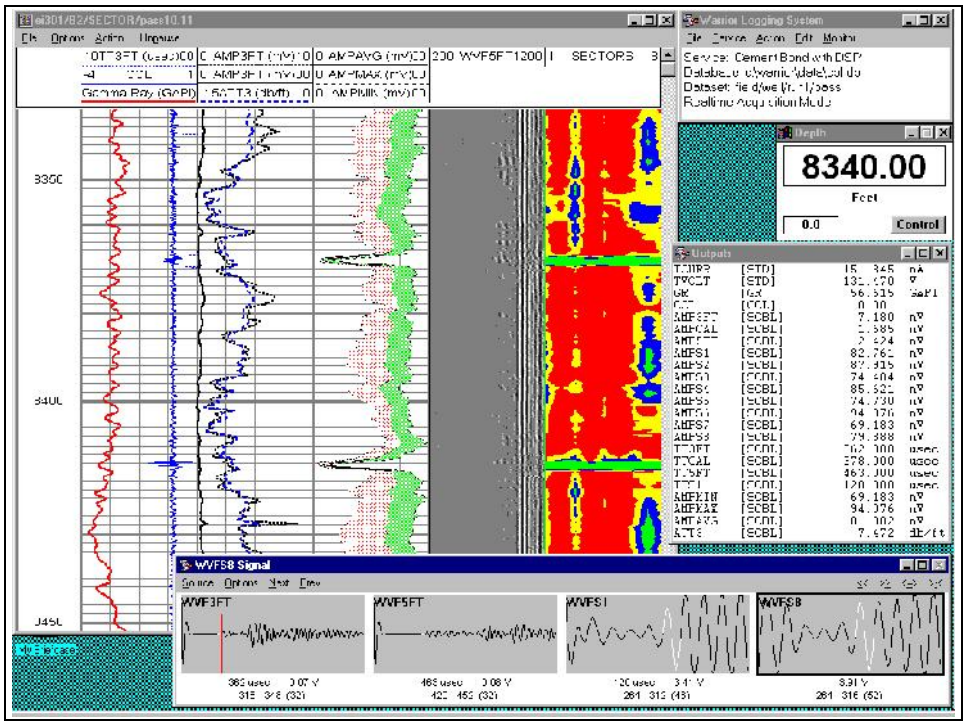
The **Warrior Well Logging System** employs advanced software and widely available hardware to provide a cost-effective solution to well logging requirements for open and cased hole applications in SRO, LWD and memory operations. Its main features include:

Wide Range of Down Hole Tool Support

Scientific Data Systems supports a the widest range of down hole tools from many manufacturers. Tools in current production and obsolete equipment is supported

Ease of Use with Graphical User Interface

The system is easy to use and the interface conforms to the popular MS Windows standard. Data monitoring is available in windows, which may be resized and repositioned as the user wishes. A typical user screen with scrolling log display and data monitors is shown below.



In the example shown at the left the operator is able to monitor the real time scrolling log, view any or all of the acoustic signals generated by a bond tool, and also monitor all the log outputs, including depth and line speed. Optionally raw sensor data may be displayed.

Multiple log plot windows may be opened for comparison of, for example, main and repeat log sections. Log plots may be paused and scrolled to any depth and annotations added, while data acquisition continues.

Depth correlation is achieved while logging, with the screen plot and system depth updated until correct depth is attained.

Log curve scales and other presentation parameters may be adjusted while logging and the screen plot redrawn until the desired output is obtained. The hardcopy plotter may be stopped and started at any time, presenting any interval with any desired presentation format.

Windows PC Computer

The system will run on almost any Windows computer. The tool interface connects to the computer through the industry standard Universal Serial Bus (USB). The performance of the systems may be upgraded easily, as more powerful CPUs and other components become available. Systems may be configured for rack mount, or notebook and other portable computers.

Tool Interface and Power Supply

A compact tool interface and power supply may be provided which is suitable for the most down hole tools. The latest Digital Signal Processing (DSP) technology is employed to minimize hardware complexity and maximize flexibility. The interface may be configured for open and / or cased hole services, and incorporates expansion slots for future developments and upgrades.

Plotter Support

Generation of the final log print with heading, annotated log sections, calibrations, tool string diagrams, etc., is easily achieved. The system supports most well log plotter types currently in use, including color and the generation of multiple copies using pre-folded paper. Two plotters may be driven concurrently and independently. The system also supports PDF and other file formats as plot output.

Typical Cased Hole Specification:

Software:

Mutli-tasking under MS Windows XP, Vista, Windows 7 and 8, 32/64 Bit
System services include:
- Calibrations
- Filtering
- Graphical Tool String Configuration
- Tool String Diagrams
- Real Time Data Monitors
- High Speed Multi-Well Log Database

Acquisition Modules include the following services:
- Cement Bond including:
  - Single and Dual Receiver Tools
  - Compensated Bond Tools
  - Sector and Radial Bond Tools
- Gamma Ray
- Gravel Pack
- Natural Spectral Gamma Ray
- Chlorine Tool
- Neutron
  - Single Detector (most types)
  - Dual Detector
  - Pulsed Neutron
- Collar Locator
- Tracer with Real Time Interpretation
- Multi-arm Calipers with Pipe Tally
- Multi-finger Caliper with Real Time Corrections
- Casing Inspection
- Temperature
- Noise
- Free Point
- Production Logging includes support for
  - Lee
  - CBG
  - Sondex
  - Flex Stack
  - Spartek
  - Guardian
  - Panex
  - Gearhart MUX / Sequential
  - Analog
  - Probe
  - Hotwell
  - Gowell
  - (among others)

User Defined Tools and Services
Recalculation (Relog) from raw data
Log Heading Editor
System Setup Control
- Depth Units
- Data Units
- User Interface Language
- Display Parameters

Graphical Log Format Editor
Well Sketch
Real Time XY Plot
Merge, Splice and TVD Correction
Directional Survey Calculation
Perforating Job Planner and Fire Control
Log Annotations and Curve Labeling
Log Presentation Editor
Plot to PDF, TIF
LAS ASCII Writer and Reader
LIS Read/Write
Data Transmission
Wired/Wireless Surface Sensor Integration

Hardware:

Typical Rack Mount Version:

Computer
- 3.0 GHz multi-core processor
- 8 GByte RAM
- 1 TByte Sata Hard Disk
- Dual Display PCIe Graphics
- USB
- DVD-RW (DAT optional)

SVGA 19 inch color rack mount LCD monitor
Rack mount 101 keyboard with mouse or trackball
Tool Interface and Power Supply
- Digital Signal Processor (DSP) 1.6 MSPS ADC
- Integrated USB2 Hub and Flash Drive
- 16 Channel, 16 bit ADC
- 6 Channel Counter/Timer
- Programmable Filter/Amplifier Boards
- Acoustic Filter
- 400vdc, 500ma Power Supply
  - Programmable
  - Constant Voltage/Current Modes
- External Power Supply Interface
- Depth Encoder and Line Tension Interface
- Surface Sensor Inputs

Plotter, includes support for
- Printrex
- iSys
- Neuralog
- Ferrotec
- HP DesignJet, PaintJet, DeskJet Color
- Epson Stylus
- Dot Matrix, and others
- Fax

Data/Fax Modem (optional)
Uninterruptible Power Supply (optional)
Cables and Hardware for 19 inch rack mounting
Wired and Wireless Surface Sensor Systems

Portable and Open Hole Configurations

Support is available for a wide variety of open hole tools for both oil field, water wells and other well log applications.
Various options for portable systems are also available, please contact SDS for details.

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