

(((Echometer)))

Models: H, M and Well Analyser (TWM)

Model H

Model H is a stand-alone, battery powered microprocessor controlled digital acoustic signal processor, recorder and display unit.

Interpretation of Reflections - The Model H permits better interpretation of reflections from down hole anomalies through the application of digital filtering and processing that improve the ability of the operator to distinguish down hole obstructions from enlargements. The response from the liquid level (or a reduction in annulus area) is opposite to the response from an enlargement such as a hole in the casing or perforations.

Convenience Features - The Model H has been designed to facilitate and speed up acquisition of data by minimising the number of steps to obtain a liquid level depth measurement. This is achieved by setting up the program for the "Quick Shot" mode so that once the instrument is powered up, it takes only three "clicks" to display the signal analysis screen.



The user can manage the data acquisition and control the flow of the program from the Main Menu. Wells can be organised in logical groups to facilitate access to the well files and specific acoustic shots.

Using the Model H Laptop Manager software is a more efficient tool for entry of well data and management of the acoustic records.

Before acquisition of the record, the software monitors the background acoustic noise in the well and displays a colour bar indicating the acoustic signal level, and warns the user to increase the pressure differential between the chamber and the wellbore when the noise exceeds the pre-set threshold level.

Filter Operation - Fluid level instruments are designed to include various filters, which can be used to accent signals that correspond to these frequency ranges. Selecting the proper digital filter will result in more accurate determination of the number of tubing collar reflections from the surface to the liquid level. The Model H records the signal with the highest possible resolution and frequency content so that signal analysis and interpretation is optimised using digital signal processing techniques.

Model H Features -

- Advanced acoustic liquid level depth instrument
- Digital signal acquisition, processor and display unit
- Software that can be installed on a laptop for data storage and analysis
- Enhanced interpretation of acoustic data
- New anomaly marker analysis for gas and gas lift wells
- Certified for use in hazardous environments
- Interpretation of reflections
- Filter Operation
- Minimal number of steps to obtain a liquid level depth measurement
- User manages the data acquisition and controls the flow of the program

Model H Specification -

- Weatherproof
- Dustproof plastic housing
- 280mm x 255mm x 127mm
- Panel incorporates both soft-keys and navigational 5-button star input keypad
- Self-contained rechargeable battery
- Battery rated at 9 Amp-Hour
- Current drain is 0.825 Amps operating and 0.325 Amps standby
- Battery operating ON-time is approximately 10.9 hours
- Weight – 5kg

Model H Acquisition Options

The Model H user has two options to acquire data:

- 1) Quick Shot Mode - Once the instrument is powered up, it takes only three "clicks" to display the signal acquisition screen.
- 2) Named Well Mode - The user may specify a pre-entered well file name where the acquired data is stored.

Model H Analysis Options

Deep Well Analysis - Through Automatic Analysis of the fluid level records in a deep well, the software analyses the record to identify the most likely signals that could correspond to the echo from the liquid level and highlights the most probably signal with a vertical dashed indicator within the dark band. This signal is also displayed with an expanded time scale (from 14.5 to 15.5 seconds) in the window at the lower right.

The time scale is converted to a distance scale using the average acoustic velocity computed from a count of the collar echoes from time zero to the time indicated by the vertical dashed line labelled "C". This line indicates the point in the record where the amplitude of the collar echoes is equal to the amplitude of the background noise.

Gas Lift Well Analysis - When an acoustic record is acquired in a gas lift well, the program will perform the automatic analysis using the collar count procedure to determine the liquid level.

Anomaly Marker Method - The purpose of this method is to accurately calculate the distance to the liquid level echo using the known distance to one or more specific echoes that are generated by wellbore changes in diameter (hereafter defined as "anomalies") that exist in the wellbore at known distances from the wellhead. This method accounts for the variation of acoustic velocity that is commonly observed in most wellbores due to the variation of temperature, pressure and gas composition as a function of depth.

Model M

The Model M is a portable dual-channel strip chart recorder that uses acoustics to obtain the distance to the liquid level in the casing annulus of a well. It comes with a microprocessor controlled dual channel amplifier/recorder and a gun/microphone wellhead attachment.



Model M Features -

- Stand-alone acquisition instrument. Strip chart recorder.
- Acoustic trace prints out on strip chart paper
- Dual channel recorder
- Automatic gain setting and control
- Strip chart recorder. Acoustic trace print out
- One second timer with date stamp
- Software
- Built-in self-test
- Operates from self-contained 12V rechargeable lead-cell battery or 12V external outlet
- Does not have a fluid level instrument, dynamometer measurement capabilities, power and current measurement capabilities
- Produces a paper strip chart and does not have any data storage capabilities
- Does not have a print function.

Model M Specifications -

- Compact Plastic Case
- 1.5m Microphone to Amplifier Cable
- 110/220 VAC Automatic Battery Charger
- 12 VDC Automobile Cigarette Lighter Power Cord
- 11 Point Dividers
- 10 Rolls of Paper
- 200 PSI Gauge with Quick Connector
- Set of O-Rings / Miscellaneous Parts
- Comprehensive Operating Manual
- 5 lb. CO₂ or N₂ cylinder. Other options are available on request
- Hose and Filler Connector Supplied for CO₂ and N₂ Cylinders
- Physical size 280mm x 255mm x 127mm

The gas gun generates an acoustic pulse which travels through the wellbore gas. The pulse reflects from tubing collars and the liquid level. The microphone converts the acoustic reflections into an electrical signal. The amplifier/recorder simultaneously processes and filters the signal through two channels and records two traces on the paper strip chart. One channel accents collars, and the other channel accents the liquid level. The operator counts the number of collar reflections to the liquid level and multiplies by the average length of the tubing joints to determine the distance to the liquid level. Acoustic velocity can also be used in cases where counting tubing collars is not available. Labelled timing marks simplify the task of determining time to the liquid level reflection.

Well Analyser

Compact, rugged, and designed for use in hot or cold, humid or dry climates, The Well Analyser is a computerised instrument for acquiring liquid level data, acoustic pressure transient data, dynamometer data, and motor power / current data.



Well Analyser Features -

- Notebook computer, software, analogue to digital converters, and sensors
- Dynamometer Testing
- Motor Power/Current Testing
- Pressure Transient Testing
- Total Well Management Software (TWM)
- Acoustic Liquid Level Test and BHP Calculation
- The well analyser is able to take pressure readings along with the liquid level data for additional pressure calculations
- The Well Analyser is able to perform dynamometer measurements and analysis
- The Well Analyser is able to record and perform power and current measurement and analysis
- The data can be analysed and saved to external sources or emailed
- The Total Well Management (TWM) Software has report printing options

Well Analyser Specifications -

- Sigma-Delta Analogue to Digital Converters
- Precision Sensors
- Shielded Cables
- Windows Software
- Weights 35 kg
- Physical size 500mm x 380mm x 150mm
- Shipped in 2 packages, 500mm x 500mm x 500mm each

The Well Analyser is an integrated artificial lift data acquisition and diagnostic system that allows an operator to maximise oil and gas production and minimise operating expense. Well productivity, reservoir pressure, overall efficiency, equipment loading and well performance are derived from the combination of measurements of surface pressure, acoustic liquid level, dynamometer, power and pressure transient response. This portable system is based on a precision analogue to digital converter controlled by a notebook computer with Windows-based application. The Well Analyser acquires, stores, processes, displays and manages the data at the well site to give an immediate analysis of the well's operating condition.

Well Analyser vs Model M: Advantages and Disadvantages

The computerised Well Analyser is capable of obtaining a complete well analysis with minimal time and effort on the part of the operator, however, the operator must be familiar with the computer and software operations.

The Model M strip chart instrument is simpler to operate but cannot perform dynamometer measurements, motor power-current analysis and unattended pressure transient data acquisition and analysis and thereby delivers a less complete view of a well's operation.