

## 3D MWD SYSTEM

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### DESCRIPTION

The state-of-the-art 3D System MWD combines industry standard measurements to provide an accurate, reliable, and cost effective solution to MWD and LWD. With multiple telemetry speeds coupled with the latest in digital signal processing for noise immunity. Data can be sent to surface fast and efficiently independently of drilling conditions.

The 3D MWD System is a platform that is able to support the most advanced technologies in the directional drilling industry. It serves as a foundation for Flashlight inclination and gamma at bit, Omega propagation resistivity, annular pressure while drilling and vibration monitoring while drilling tools.

The Patented fast pulse telemetry allows resilient detection beyond what is possible with M-ary encoding. The piston pulser and directional module are shorter and lighter for better resilience to shock and vibration than legacy tools.

### APPLICATIONS

- Vertical, Directional and Horizontal drilling.
- Coil Tubing Drilling.
- Auto survey feature allows for continuous survey while drilling.
- Unconventional Drilling.
- Coal bed methane/coal seam gas.
- Mining/degasification.

### SURFACE EQUIPMENT

- Wireless surface equipment option for easy setup.
- Touch screen display with depth input for standalone operations.

- Wired surface equipment for reliable connection.
- Software able to calculate minimum curvature surveys.

### FEATURES & BENEFITS

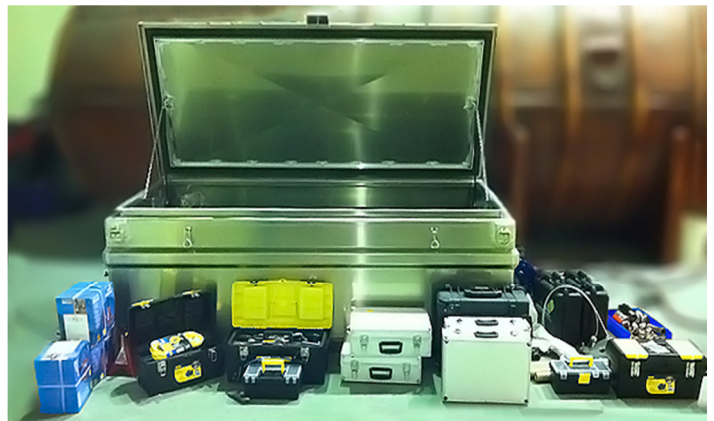
- Field Programmable.
- Operator configurable static and dynamic data.
- Programmable for extended battery life up to 400 circulating hours per battery pack.
- Fully retrievable. Reduce LIH exposure.
- Field replaceable fin centralizer cutter.
- Rotary Inclination.
- Rotary Sequences. Change sequences between sliding and rotary.
- Wits output and fully configurable to the data being run.

### TELEMETRY

The tool can be downlink able between fast pulse and M-ary.

M-ary Encoding is used for drilling deeper depths and longer battery life.

Fast Pulse produces a full wave pulse signal for superior detection over M-ary encoding schemes. Higher speed telemetry allows for higher log density and fast survey times.



### Environmental Specifications

Max Operating Pressure	20,000 psi
Max Operating Temperature	175°C (347°F)
Max Vibration G's	20g rms 5 - 1,000Hz
Max Shock	50 G's
Power Source	Lithium Battery Pack
Transmission	Full wave or Positive Pulse
Sand Content	0.5% by Volume
LCM ppg	50 ppg medium Nut plug

### D&I Measurement Specifications

Inclination Range	0.0° - 180°
Inclination Resolution	0.1°
Inclination Accuracy	±0.1°
Inclination Repeatability	±0.05°
Azimuth Range	0.0° - 360°
Azimuth Resolution	0.1°
Azimuth Accuracy	±0.5°
Azimuth Repeatability	±0.25°
Tool Face Range	0.0° - 360°
Tool Face Accuracy	±1°
Tool Face Repeatability	±1°
Magnetic Field Strength Range (Gauss)	0 - 2 Gauss
Magnetic Field Strength Resolution (Gauss)	0.001 Gauss
Magnetic Field Accuracy	±0.003 Gauss
G-total Range G's	0-2 G's
G-total Resolution	0.001 G's
G-total Accuracy G's	±0.0075 G's
Dip Angle Range	-90° to 90°
Dip Angle Resolution	0.1°
Dip Angle Accuracy	±0.3°
D&I Measurements Calibration Standard	Calibrated to 175°C

### Data Transmission Speeds (User Programmable)

Survey Times From pumps On (minutes)	1 min 54 sec. - 7 min.
Tool face Time (Seconds)	4.5 - 12 Seconds
Gamma Time (Seconds)	4.5 - 12 Seconds

### Mechanical Specifications

Collar Size O.D. Inches	3.5 to 9.5
Collar Size I.D. Inches	2.25 to 4.0
Probe O.D. Inches	1.875
Flow Ranges GPM	75-1400

### Surface Equipment

Rig Floor Display and Rig Sensors	Class 1, Div. 2
Surface Equipment Power	110V-220V AC
Surface Equipment Data Output options	Wits or Aramco WITSML
Surface Equipment Options	Wired or Wireless

### Gamma Sensor

Gamma Detector Type	Scintillation
Gamma Range	0 - 1024 API
Gamma Accuracy	1 cps
Gamma Calibration Standard	Calibrated to API standards