

## Features

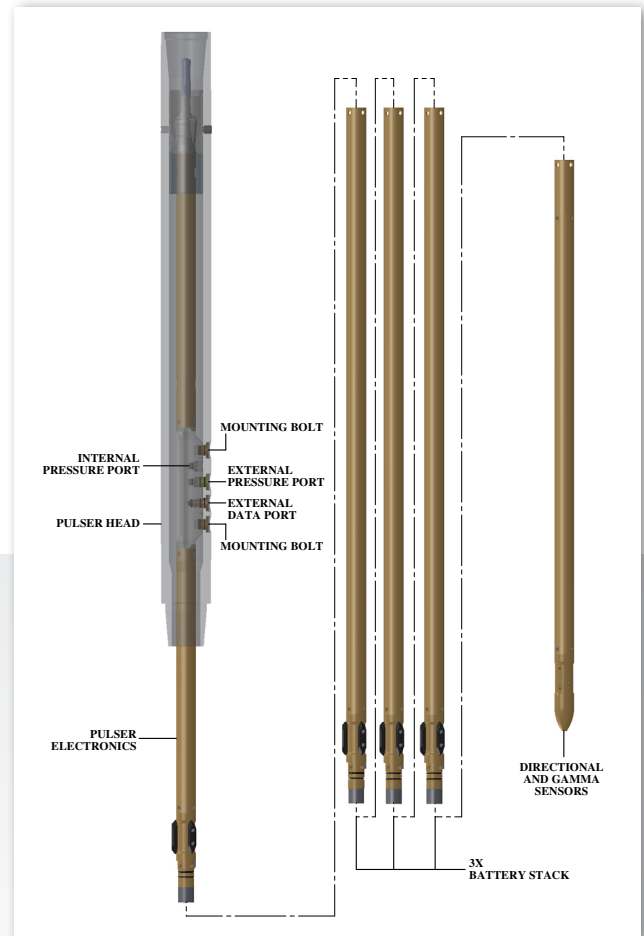
- High torque rotary design provides excellent performance in moderate or high LCM situations (Loss Circulation Material)
- Energy efficient design incorporates a brushless DC motor and intelligent electronics to lower power consumption
- Applied Physics proprietary encoding algorithm allows for transmission speeds approaching 1 baud
- Non-compensated (oil free) design for easy maintenance
- Non-retrievable design provides stable mounting and extra reliability in downhole environment
- Pulse Module available separately for seamless integration into AP-250 MWD System

The Model 400R MWD System is a mud pulse based Measurement While Drilling System that allows for the drilling of deviated boreholes and directional drilling. The system pairs our high accuracy directional sensor with our mud pulse telemetry system to provide directional drilling operators with highly reliable, real-time steering control. Additional sensors, such as gamma, inside and outside pressure, temperature and vibration are also provided to optimize functionality and rotation (RPM).

## Downhole System Components

**PULSER** — The pulser rotor/stator assembly is mounted into a wet sub through a flow sleeve. An appropriate flow sleeve is chosen to accommodate the fluid volume based on the drilling environment. The pulser rotor blades are driven by a powerful, high torque brushless DC motor that is capable of cutting through most types of Loss Circulation Material (LCM). The system is driven by an intelligent pulser electronics module located below the rotor/stator assembly.

**WET SUB** — The mounting head bolts into the wet sub and houses inside/outside pressure sensors for real-time pressure while drilling measurements (PWD). The head also contains the main system data port from which the tool can be programmed and a full run-time log can be downloaded.



**BATTERIES** — The power for the pulser and sensors is regulated using two or more 8 "DD" 29V, 29 Amp-hour batteries encased in pressure barrels. The use of three or more batteries is possible for situations where high power output for a long period is required.

**SENSORS** — The borehole angular orientation and drill string toolface are measured by a directional sensor mounted in a pressure barrel below the batteries. A gamma sensor is mounted directly below the system directional sensor.

The Rotary Pulser System is typically approximately 23' long and utilizes 1-7/8" diameter pressure barrels for system electronics and batteries. The same basic system can be used with 4-3/4", 6-1/2", 8" and 9" drill collar sizes. Mounting spacers enable the use of drill collar sizes greater than 4-3/4". To stabilize the tool string within the drill collars, bolt-on rubber finned centralizers connect the various system pressure barrels.

# Model AP-400R Rotary Pulse MWD System

Measures and transmits downhole data including accelerometer and magnetometer values



| SYSTEM SPECIFICATIONS      |   |
|----------------------------|---|
| Application Sizes          | 4.75 in., 6.50 in. and 8.0 in.<br>(120mm, 165mm and 203.2mm)                      |
| BHA Mount                  | Collar mounted (non-retrievable)  |
| Overall System Length      | 23 ft. (2 battery modules)  |
| Pulser Housing O.D.        | 1.875 in. (47.625mm)  |
| Data Transmission Type     | Positive Mud Pulse  |
| Operating Flow Rate        | 0.50-3.78m <sup>3</sup> /min (132-1000gpm) nominal                                |
| Shock Limit                | 1000g, 0.5msec  |
| Vibration Limit            | 20g RMS random 50-500Hz   |
| Operating Temperature      | -40°C to 150°C  |
| Hydrostatic Pressure (max) | 20,000 psi (137,895kPa)   |
| Operating Pulse Width      | Programmable  |
| Maximum Baud Rate          | 1 baud  |
| Power Requirements         | Lithium 28-30VDC  |
| Flow Switch                | Vibration   |
| Battery Consumption        | 200+ hours on single medium-rate battery<br>continuous pulsing 1 sec. pulse width |

Uphole Electronics Block Diagram

