Technical Information & Data Reference

PR2 LWD PROPAGATION RESISTIVITY - LWD

PR2 LWD PROPAGATION RESISTIVITY

Real-time formation evaluation

The PR2 provides resistivity measurements when formation evaluation is required in real time. Typically 1-2 resistivity measurements are telemetered to the surface with gamma ray data to provide identification of the subsurface strata. Additional resistivity and gamma ray measurements are stored in tool memory and added to the real-time log after drilling to provide a complete high-resolution profile of formation properties.

Multiple depths of investigation

The PR2 measures formation resistivities at multiple depths of investigation using two receiver antennas located in the middle of a balanced array of four transmitter antennas operating at two frequencies. The antenna arrangement provides compensation for both borehole irregularities and electronics drift. This technology is capable of measuring formation resistivities up 3000ohmm using phase-difference measurements.

Combinable with existing MWD components

The PR2 was designed to add resistivity measurements to existing 3rd-party MWD directional / gamma systems, including both top-mount & bottom- mount mud pulsers. The PR2 propagation resistivity measurements are also compatible with electromagnetic telemetry. Typically no additional investment is required to upgrade existing surface decoding, depth tracking or log plotting capabilities.

Applications

- Formation evaluation while drilling in all well trajectories
- Geosteering
- Invasion profiling / permeability indication
- Reserve calculations
- Optimized completion design
- Managed pressure drilling / equivalent circulating density monitoring

Features

- 8 compensated multi-depth resistivities
- Optional bore & annular pressure
- Compatible with all drilling fluids
- Low power for long battery life, reduced operating cost
- Rated to 175C, 20,000psi

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Measurement Specifications

Resistivity

Spacing / Frequency	22"/ 400KHz	40" / 400KHz	22" / 2MHz	40" / 2MHz
Measurement Range				
Phase Difference	0.1 - 400 ohmm		0.1 - 3000 ohmm	
Attenuation	0.1 - 10 ohmm		0.1 - 50 ohmm	
Accuracy				
Phase Difference	Below 10ohmm: +/- 2% Above 10ohmm: +/- 2mmho/m		Below 60ohmm: +/- 2% Above 60ohmm: +/-0.3mmho/m	
Attenuation	Below 3ohmm: +/- 5% Above 3ohmm: +/- 18mmho/m	Below 3ohmm: +/- 3% Above 3ohmm: +/- 10mmho/m	Below 15ohmm: +/- 5% Above 15ohmm: +/- 4mmho/m	Below 15ohmm: +/- 3% Above 15ohmm: +/- 2mmho/m

Bore & Annular Pressure (optional)

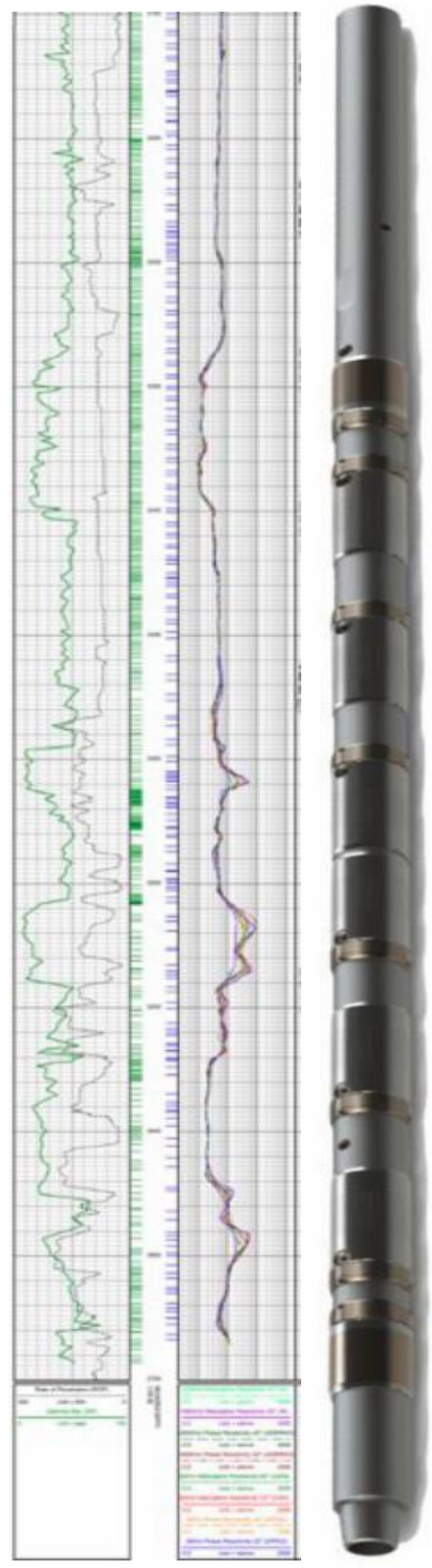
Range	0 - 20,000 psi
Accuracy	+/- 0.5% Full Scale standard / +/- 0.1% Full Scale optional
Resolution	0.1 psi

General Specifications

Input Voltage	18 - 36V from Lithium Batteries or Alternator
Input Power	~5W (typical)
Battery Life	8 - DD cells (28V, single pack) : 130 hours 10 - DD cells (36V, single pack) : 160 hours
Data Memory	64Mbytes (>200 hours)
Operating Temp. Range	0 - 175 deg. C

Mechanical Specifications

Maximum pressure		20,000 psi	
Nominal dia.	4.75"	6.75"	8.25"
Maximum dia.	5.25"	7.25"	8.75"
Nominal length	176"	176"	TBD
Maximum flow rate	350 USGPM	750 USGPM	1200 USGPM
Dogleg Severity			
Rotary mode	12.5°/100 ft.	8°/100 ft.	7°/100 ft.
Sliding mode	25°/100 ft.	16°/100 ft.	14°/100 ft.
Connections Top - box Bottom - pin	NC-38 (3.5" IF)	NC-50 (4.5" IF)	6 5/8"



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