

Features

- Proven design with high reliability, MTBF over 2500 hours
- Data transmission from depths of 14,000+ feet (4200+ meters) in favorable conditions
- Real time annular pressure, drill collar internal pressure, rotation sensing and gamma

Applications

- Low cost, reliable replacement to mud pulse systems
- Underbalanced drilling
- High speed drilling where fast data rates are required
- Low pressure formations or lost circulation situations

The Applied Physics Systems Model AP250 Electric Dipole Transmission System measures and transmits downhole data to the surface, enabling the directional drilling of a borehole. Data transmitted typically includes the inclination and azimuth angles of the borehole, the drilling system toolface (roll angle), and the tool temperature. The system can also be configured to transmit accelerometer and magnetometer sensor values, which can then be used to calculate the borehole angles.

Figure 1 shows the downhole parts of the electric dipole transmission system. At the top of the system, a nonmagnetic drill collar with an electrically insulated gap sub is used. To generate electromagnetic signals that propagate to the surface, a low frequency phase modulated signal is applied across the insulating gap. An upper electrode and the bolt in dipole head are used to apply the signal across the gap.

The gap sub signal is generated by the power driver electronics unit mounted in a pressure barrel just below the dipole head. Typically, two 29 V, 29 amp-hour batteries encased in pressure barrels are used to power the electric dipole system, although use of three or more batteries is possible for situations where high power output for a long period is required.

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.

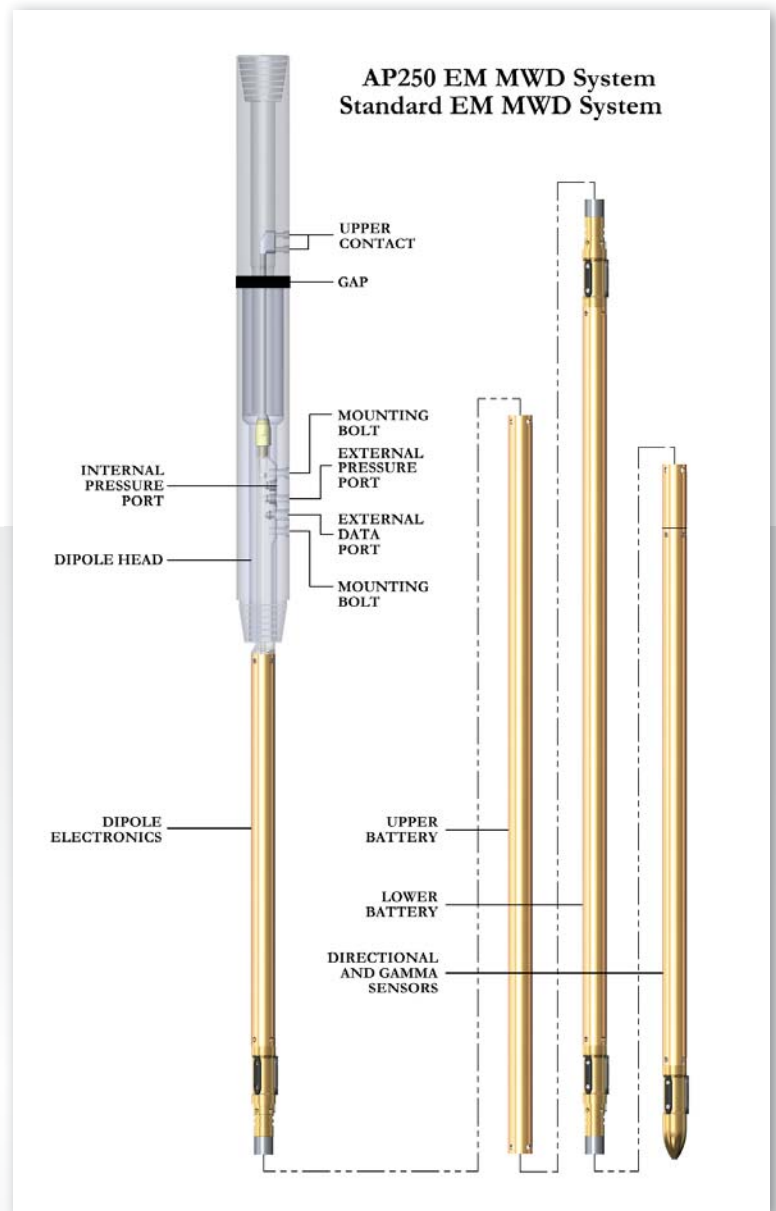


Figure 1. Model AP250 System Downhole Components

The Electric Dipole Transmission System is typically approximately 222 inches long and uses 1.875" diameter pressure barrels for system electronics and batteries. The same basic system can be used with 4.75", 6.5", 8" and 9" drill collar sizes. Mounting spacers enable the use of drill collar sizes greater than 4.75". To stabilize the tool string in the drill collars, rubber finned centralizers are used to connect the various system pressure barrels.

Model AP250

Electric Dipole Transmission System



Applied Physics
Systems

SPECIFICATIONS	
DOWNHOLE SYSTEM	
Frequencies	2 Hz to 10 Hz (user selectable)
Baud Rate	The baud rate is one half of the transmission frequency. A transmission frequency of 9 Hz has a baud rate of 4.5.
Power	Batteries typically consist of 2 DD stacks of 8 moderate rate cells each, producing 29 V at a 29 ampere-hour capacity. Battery life: <ul style="list-style-type: none">- At 10 Watts power level, battery life is 80 hours.- At 20 Watts power level, battery life is 40 hours.- At 40 Watts (maximum power), battery life is 20 hours.
Gap Sub Sizes	4.75" OD x 67.375" L 3.50" IF pin at bottom, box at top 6.5" x 72.0" L
Tool String Approximate Length (2 batteries)	222"
Sensors	Directional Sensor: Model 750 Gamma Sensor: Model 751
Vibration Damage Threshold (Data is based on the averaged vibration data from the Model 751 Gamma Sensor as reported in the AP250 Dipole Log.)	Below 8 gees, damage is unlikely. Between 8 to 12 gees, damage is possible. Over 12 gees, damage is likely.
Dipole Head Annular and Bore Pressure Sensors	0 to 5000 PSI Tolerance: $\pm 2\%$ Units: PSI, bar, kPa (user selectable in Detect MWD software)
UPHOLE SYSTEM	
Model 560 Preamplifier/Filter System	
Preamp Gain Selectable	0 to 42
Amplifier Gain Selectable	0 to 96
Power	115 V @ 1 A 220 V @ 0.5 A
Size	19" W x 3.5" H x 13" D (rack mountable)
Model 574 Downlink System	
Main Power	115 V @ 10 A 220 V @ 2.5 A
Size	16" W x 7.5" H x 12" D

The downhole system includes an MWD laptop with a 16-bit A/D installed and a Model 555 Rig Floor Display Module. An RS-232 port is required on the computer for the Rig Floor Display.

Specifications are subject to change without notice.