

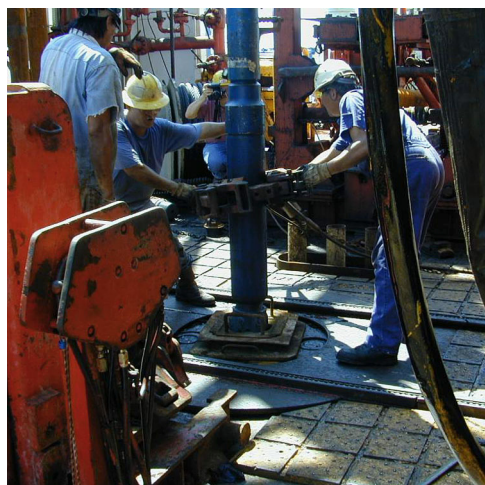
Logging-While-Drilling Resistivity-at-the-Bit Tool

Description

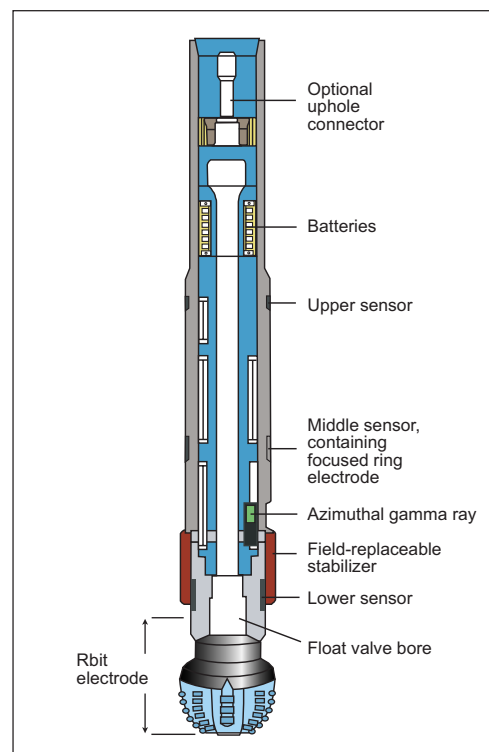
The Resistivity-at-the-Bit tool (LWD-RAB) makes azimuthal resistivity and gamma ray measurements while drilling. Using an azimuthal positioning system, measurements are acquired around the borehole to create a high resolution, 360-degree resistivity image of the drilled hole. The RAB tool may be connected directly behind the bit or further back in the bottom hole assembly. It may be run with other LWD tools such as the ADN, ISONIC or NMR. Typically, the RAB data are stored in memory within the tool and retrieved at the end of the bit run. As an option, the data may be transmitted to a surface acquisition system if a Measurement-While-Drilling (MWD) power pulse tool is run in conjunction with the RAB.

Applications

- ◆ Detection of resistivity heterogeneity via azimuthal resistivity images
- ◆ Lithology estimation
- ◆ Instantaneous detection of casing and coring points
- ◆ Accurate resistivity when mud is salty or formation resistivity is high
- ◆ Detection of early invasion of borehole fluids into the formation



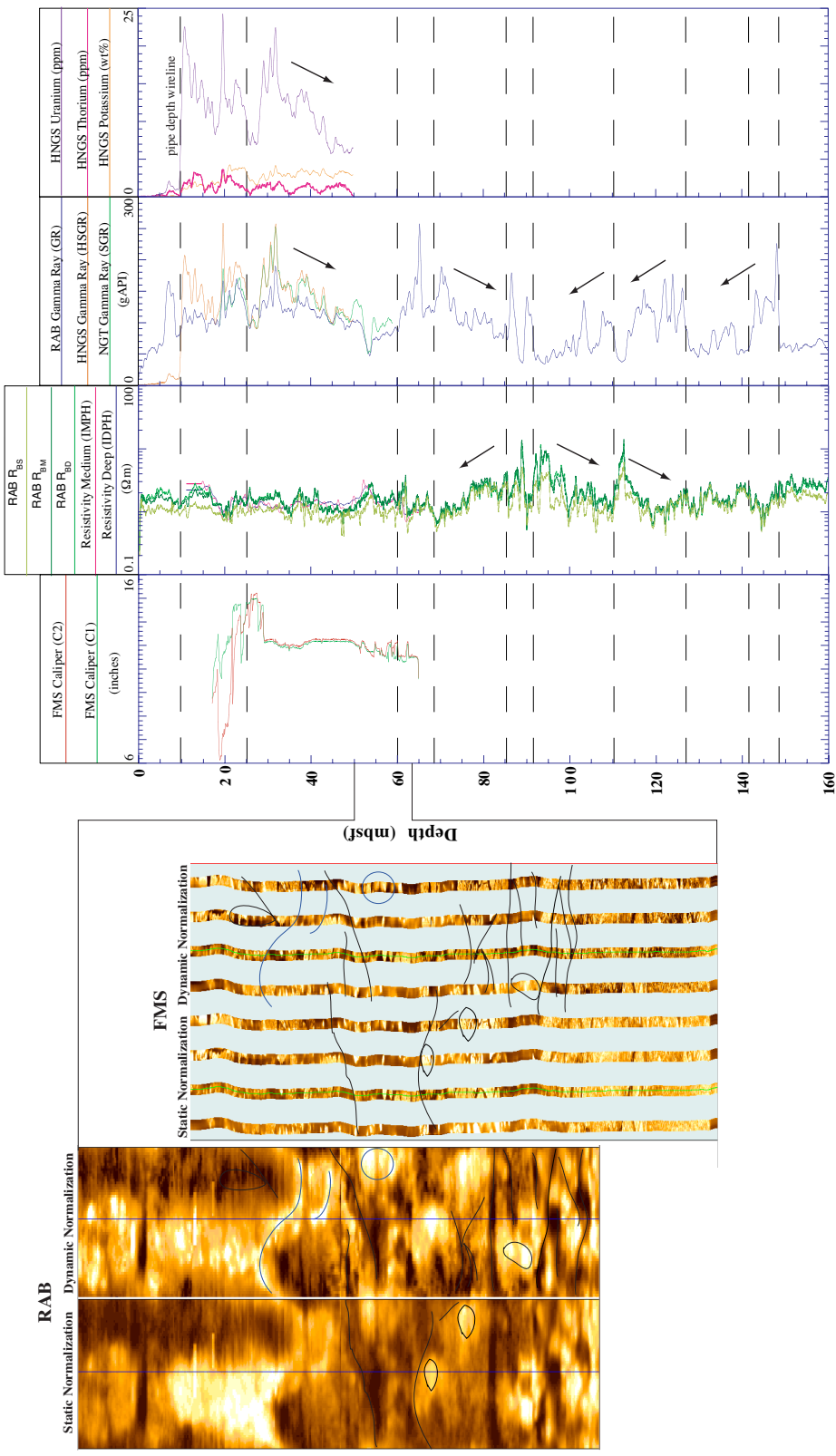
Assembly of the RAB tool aboard the JOIDES Resolution.



Schematic illustration of the Resistivity-at-the-Bit tool (LWD-RAB).

Specifications

Tool weight:	1200 lbm		
Tool length:	10.1 ft (3.08m)		
Temperature range:	-13° to 300° F (-25° to 150° C)		
Drill collar nominal outside diameter:	6.75 in.		
Drill collar max. outside diameter (azimuthal):	8.125 in.		
Power:	Lithium battery pack (200+ hrs)		
Recommended maximum torque:	16,000 ft-lbf		
Resistivity measurement accuracy:			
	<i>Range</i>	<i>Bit & focused electrode</i>	<i>Azimuthal</i>
	0.2 - 1	+/- 20%	+/- 20%
	2 - 1000	+/- 5%	+/- 5%
	1000 - 2000	+/- 10%	+/- 20%
	2000 - 20,000	+/- 20%	---
Gamma ray specifications:			
Range:	0 - 250 API units		
One sigma statistical repeatability:	< 3% at 100 ft/hr		
(10-API formation, 3-level averaging)	< 2% at 50 ft/hr		
Maximum flow rate:	800 gal/min		
Maximum operating pressure:	18,000 psi		
Maximum weight on bit:	F = 74,000,000/L ² lbf (where L is distance between stabilizers in feet)		
Maximum jarring load:	330,000 lbf		



A comparison between Logging-While-Drilling Resistivity-at-the-Bit (RAB) and wireline log data. The measurements provide electrical images of the borehole wall (left side) and log curves of electrical resistivity and natural radioactivity (right side). The LWD data (images, deep-, medium-, and shallow-burton resistivity curves, and gamma ray profile) show fracture patterns, alteration trends (denoted by arrows), and high gamma ray values that may be indicative of hydrothermal fluid flow along fractures. (Figure courtesy of the ODP Leg 193 shipboard party.)