DATA SHEET

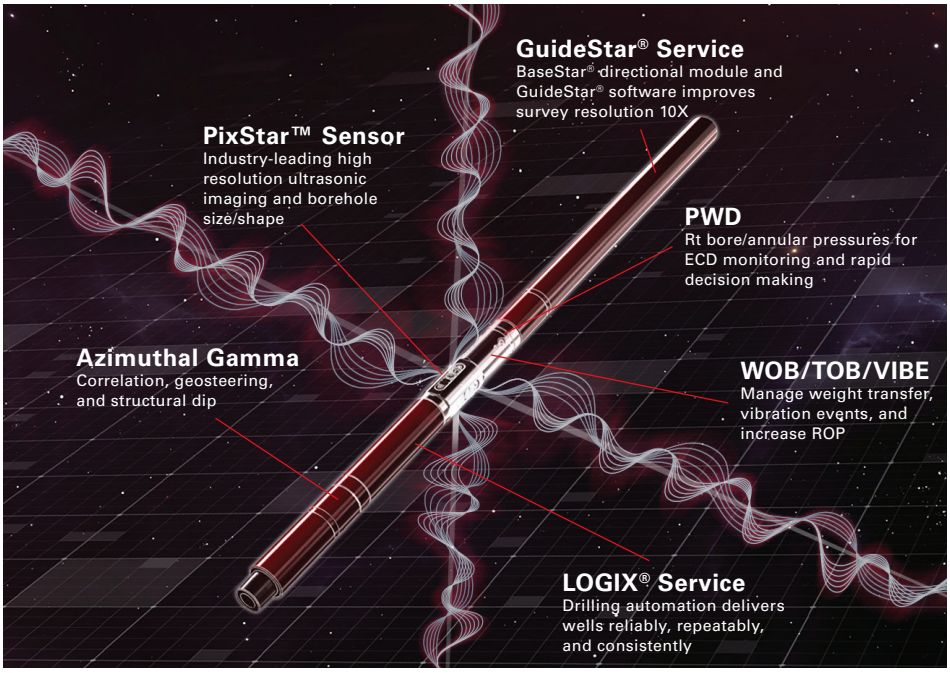
HALLIBURTON

Well placement and drilling optimization measurements

ISTAR® DRILLING AND LOGGING PLATFORM

BaseStar® Service

Delivering critical real-time measurements for well placement, drilling optimization, and borehole quality



FEATURES

- Compact collar design moves measurements closer to the bit
- Comprehensive drilling dynamics from WOB, TOB, pressure, and vibration measurements
- Ultrasonic high-resolution radius and amplitude imaging
- PixStar™ sensor with 0.1" spot resolution and eccentricity correction
- Definitive pumps-off surveys, continuous inclination, and azimuth measurements
- High detector sensitivity for precise gamma-ray measurements and clear borehole images

BENEFITS

- Improve accuracy of geometric well placement and understanding of borehole tortuosity
- Monitor hole cleaning and wellbore stability, and maintain wellbore pressure
- Measure and evaluate borehole size and shape in real time
- Reduce unexpected fracture or collapse by identifying borehole degradation
- Acquire correlation, geosteering, and structural dip measurements
- Identify geological features with high-resolution images to optimize frac and completions
- Maximize ROP in ER wells by managing real-time torque/weight transfer
- Eliminate risk from wireline runs in high-angle, unstable wells

Overview

Operators need to fully understand the bottom hole assembly (BHA) position and dynamics to optimize drilling performance and well placement. They also need high-quality images to characterize borehole features and assess its size and shape. The BaseStar® service from Halliburton is an integrated logging-while-drilling (LWD) and measurement-while-drilling (MWD) service that delivers the information to understand drillstring dynamics, manage wellbore trajectory, and safely deliver wells on target and on time. The service enhances reservoir understanding of fractures, faults, and lithological features in oil- and water-based mud systems. The compact footprint of this complete package moves critical measurements closer to the bit, reduces the length of pilot holes, and drives quicker decisions. The BaseStar® service is fully web-enabled to control drilling from anywhere through a browser window; enables ROC.

Continuous data, precise positioning

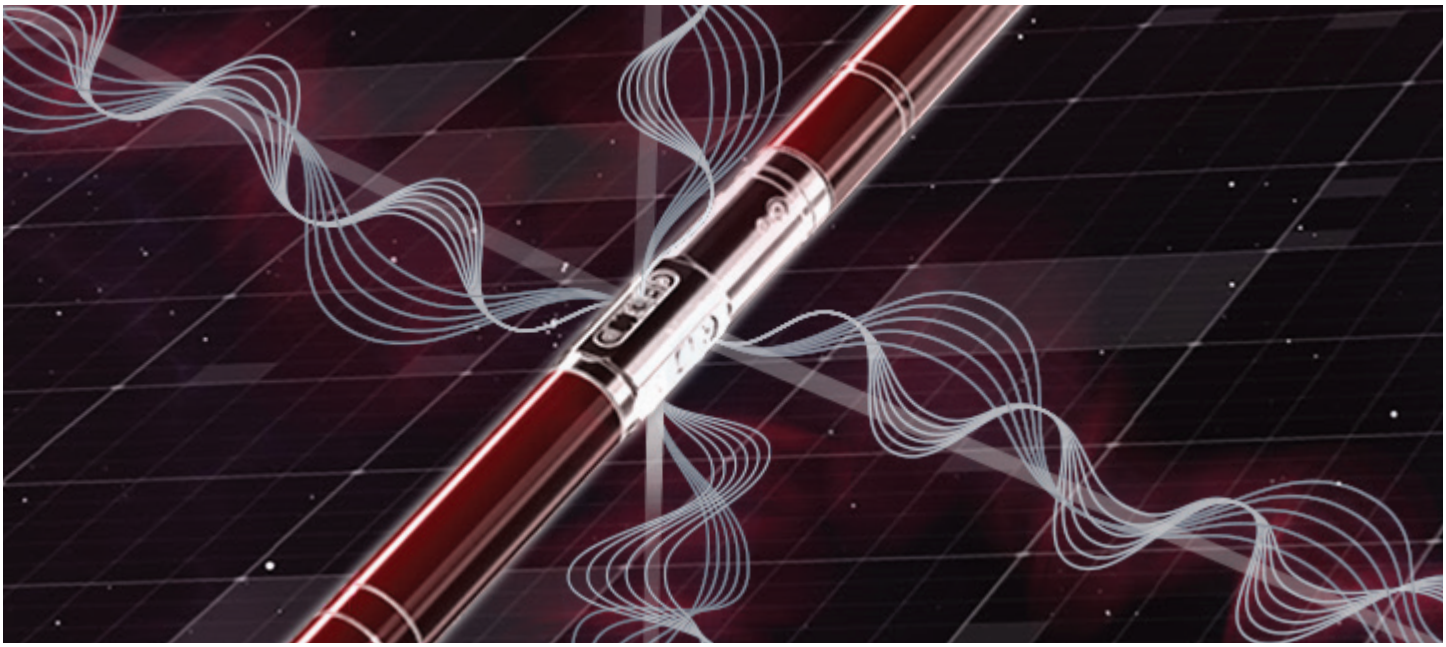
The BaseStar® service takes pumps-off static surveys for reduced well time and accurate geometric wellbore positioning. High-frequency, continuous inclination and azimuth measurements enable automation through the LOGIX® autonomous drilling platform to adapt to downhole uncertainty and accurately place the well. The BaseStar® service provides high-resolution gamma-ray logs for correlation between wells, along with gamma-ray borehole images to further reduce the geological uncertainty of the reservoir in real time and enhance well placement. Directional data from the BaseStar® service supports the GuideStar® continuous definitive survey measurements service, which can increase the accuracy of the survey measurements by correcting for localized environmental influences. These methods help reduce inherent uncertainties when calculating the wellbore trajectory and increase the accuracy of the wellbore position.

Reduced well time

Downhole torque, weight, and vibration measurements drive real-time decision-making to improve drilling efficiency and optimize the rate of penetration. Real-time bore and annular pressure measurements allow monitoring of equivalent circulating density and rapid decisions to modify drilling and drilling-fluid parameters or operating procedures to improve hole-cleaning efficiency. This comprehensive sensor package allows operators to mitigate risks such as pack-offs and tool damage, monitor and efficiently transfer weight and torque along the drillstring, minimize wasted energy transfer, and manage drilling dysfunction, which minimizes non-productive time and reduces well time.

Improve wellbore stability

Real-time hole shape and annular-pressure measurements allow ongoing evaluation of wellbore stability and effective control of the mud program to protect formation integrity and mitigate hole problems. In pumps-off mode, the service measures the minimum, maximum, and average pressures during non-circulating periods and transmits the results to the surface when circulation resumes. These measurements help avoid lost circulation and detect flow or kicks immediately. The BaseStar® service also reduces the risk of problems caused by unexpected fracture or collapse. On extended-reach wells, real-time information helps to maintain wellbore pressures within safe operating limits.



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Well placement and drilling optimization measurements

ISTAR® DRILLING AND LOGGING PLATFORM

PixStar™ high-resolution ultrasonic imaging service

Provides greater wellbore coverage to enhance reservoir understanding

FEATURES

- Four high-resolution transducers each provide redundancy and wireline-quality, motion-tolerant images
- Simultaneous transducer firings provide caliper measurements when non-rotating or pulling out of hole
- Motion-based image corrections remove unwanted artifacts resulting from eccentricity or lateral tool motions
- Can be run in real time or in recorded memory

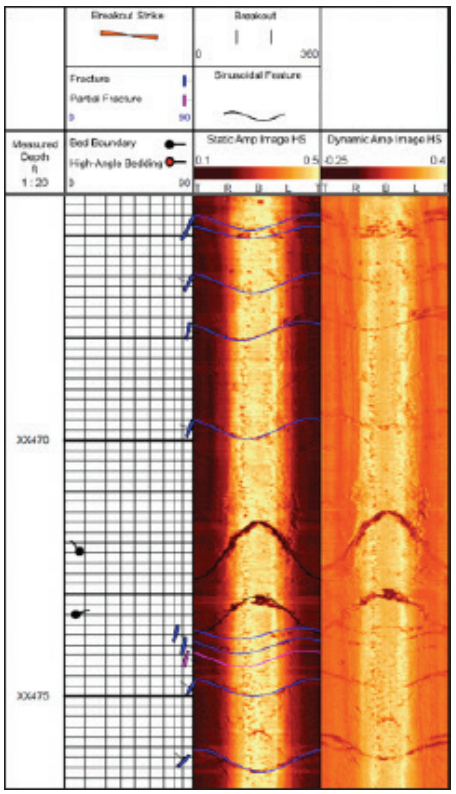
BENEFITS

- Real-time acoustic amplitude images enable geosteering
- Optimized high-resolution images based on hole size and ROP/RPM parameters
- Borehole size and shape analysis determines accurate cement volumes and improves wellbore stability

Overview

When drilling in oil-based mud, operators often lack high-quality images to make informed decisions about their fracturing and completion programs. The PixStar™ high-resolution ultrasonic imaging service from Halliburton is a logging-while-drilling (LWD) service that assesses borehole sizes and shapes in real time, and provides high-resolution acoustic amplitude images in oil- and water-based mud. The service enhances reservoir understanding of fractures, faults, and lithological features to help operators gain greater wellbore coverage and maximize their asset value.

The PixStar™ service uses four piezoelectric ultrasonic transducers placed at 90-degree-angle increments around the circumference of the tool, which operate in pulse-echo mode. All four transducers are excited simultaneously, generating 2,000 pulses per second. This rapid firing rate generates high-resolution amplitude and travel time images, even at high logging speeds, enabling detailed reservoir evaluation.



High-resolution (540-sector) static and dynamic acoustic amplitude images from the PixStar™ service

Identify fractures, plan frac program

By accurately identifying and interpreting fractures, operators have the information they need to plan and optimize their hydraulic fracture and completion programs. The PixStar™ service uses reflection amplitude images of the borehole surface to identify acoustic impedance changes associated with structural features (bedding, fractures, faults) and sedimentological features (vugs, clasts, bioturbation). By knowing the location of the natural fracture networks and clusters, operators can plan their fracture programs, maximizing production efficiency.

Improve wellbore stability, minimize risk

Travel time measurements enable the derivation of borehole size and shape, and the orientation of borehole breakout, thus helping to identify wellbore stability issues. Understanding the stress distribution enables optimization of drilling parameters and mud weight, and provides input to the geomechanical model. This helps prevent wellbore washout or breakout and formation damage, and minimize risk.

Place packers accurately, optimize completions

Borehole size and shape analysis is used to calculate total cement volume, enabling safe and efficient cement operations, and helping operators improve packer placement and optimize completion design.

BaseStar® service technical specifications

MECHANICAL SPECIFICATIONS	4.75 INCH	6.75 INCH	8.00 INCH	9.50 INCH
Nominal Tool OD	4.75 in. (121 mm)	6.75 in. (171 mm)	8.00 in. (203 mm)	9.50 in. (241 mm)
Maximum Body OD	5.25 in. (133 mm)	7.125 in. (181 mm)	9.00 in. (229 mm)	10.6 in. (269 mm)
Hole Size Range	5.875 to 6.75 in. (149 to 171 mm)	7.875 to 9.875 in. (200 to 251 mm)	10.50 to 14.75 in. (267 to 375 mm)	12.25 in. to 26.00 in. (311 mm to 660 mm)
Collar ID*	1.25 in. (32 mm)	1.82 in. (46 mm)	2.37 in. (60 mm)	2.625 in. (66.7 mm)
Length	13.40 ft (4.08 m)		13.88 ft (4.23 m)	14.51 ft (4.42 m)
Weight	735 lbm (333 kg)	1227 lbm (557 kg)	1822 lbs (827 kg)	2,757 lbf (1,251 kg)
Connections	HAL40 (box up x pin down)	HAL50 (box up x pin down)	HAL56 (box up x pin down)	HAL70 (box up x pin down)
Make-Up Torque	14,000 ft-lbf (1900 daN-m)	35,000 ft-lbf (4750 daN-m)	50,000 ft-lbf (6780 daN-m)	85,000 ft-lbf (11,520 daN.m)
Maximum Dog Leg Severity - Rotating	14°/100 ft (14°/30 m)	10°/100 ft (10°/30 m)	8°/100 ft (8°/30 m)	5.5°/100 ft (5.5°/30 m)
Maximum Dog Leg Severity - Sliding	30°/100 ft (30°/30 m)	21°/100 ft (21°/30 m)	14°/100 ft (14°/30 m)	14°/100 ft (14°/30 m)
Maximum Drilling or Operating Rotary Torque	12,000 ft-lbf (1630 daN-m)	35,000 ft-lbf (4750 daN-m)	50,000 ft-lbf (6780 daN-m)	85,000 ft-lbf (11,520 daN.m)

* Effective collar ID for hydraulics calculations.

BaseStar® service technical specifications continued

OPERATING LIMITS SPECIFICATIONS	4.75 INCH	6.75 INCH	8.00 INCH	9.50 INCH
Temperature Range	32 to 302˚F (0 to 150˚C)			
Maximum Pressure	25,000 psi (172 MPa)			
Maximum Mass Flow Rate	5,000 lbm/min (2270 kg/min)	10,000 lbm/min (4540 kg/min)	20,000 lbm/min (9070 kg/min)	20,000 lbs/min (9,080 kg/min)
Maximum Sand Content	2%			
Maximum Rotary Speed	400 rpm			
Maximum WOB	25,000 lbf (11 000 daN)	65,000 lbf (29 000 daN)	85,000 lbf (38 000 daN)	100,000 lbf (44,500 daN)
Vibration	Refer to Sperry Drilling Downhole Tools Technical Specifications. (Available on request.)			

WOB SPECIFICATIONS	4.75 INCH	6.75 INCH	8.00 INCH	9.50 INCH
Weight Operating Range	30,000 lbf (13 300 daN)	65,000 lbf (29 000 daN)	85,000 lbf (38,000 daN)	100,000 lbf (44,500 daN)
Weight Resolution	1,000 lbf			
Measure Point from Bottom of Tool	5.70 ft (1.74 m)		6.12 ft (1.87 m)	6.58 ft (2.01 m)

TOB SPECIFICATIONS	4.75 INCH	6.75 INCH	8.00 INCH	9.50 INCH
Torque Operating Range	10,000 lbf-ft (1360 daN-m)	35,000 lbf-ft (4750 daN-m)	50,000 lbf-ft (6780 daN-m)	85,000 lbf-ft (11,520 daN.m)
Torque Resolution	200 lbf·ft (27 daN·m)			
Measure Point from Bottom of Tool	5.70 ft (1.74 m)		6.12 ft (1.87 m)	6.58 ft (2.01 m)

PRESSURE WHILE DRILLING SPECIFICATIONS	4.75 INCH	6.75 INCH	8.00 INCH	9.50 INCH
Detector Type	Quartzdyne Transducer			
Measurement Range	0 to 30,000 psi (0 to 206.8 MPa)			
Measurement Accuracy	0.1% at Full Scale			
Measure Point from Bottom of Tool	8.03 ft (2.45 m)		8.51 ft (2.59 m)	8.92 ft (2.72m)

VIBRATION SPECIFICATIONS	4.75 INCH	6.75 INCH	8.00 INCH	9.50 INCH
Peak Accelerations	0-105 g (3 axis)			
Average Accelerations	0-25 g (3 axis)			
Burst Data Sampling Rate	1,000 Hz			
Rotary Speed	±0-500 rpm			
Measure Point from Bottom of Tool	9.13 ft (2.78 m)		9.61 ft (2.93 m)	10.03 ft (3.06 m)

BaseStar® service technical specifications continued

DIRECTIONAL SPECIFICATIONS	4.75 INCH	6.75 INCH	8.00 INCH	9.50 INCH
Azimuth Accuracy	±1°			
Inclination Accuracy	±0.1°			
Toolface Resolution	±2.8°			±1°
Measure Point from Bottom of Tool	10.28 ft (3.13 m)		10.76 ft (3.28 m)	11.39 ft (3.47 m)

ULTRASONIC IMAGING SPECIFICATIONS	4.75 INCH	6.75 INCH	8.00 INCH	9.50 INCH
Ultrasonic Transducer Type	Piezoelectric (x4)			
Spot Resolution	0.1 in. (2.54 mm)			0.2 in. (5.08 mm)
Individual Transducer Firing Rate	500 Hz			
Real-Time Amplitude Images	4, 8, 16, 32, or 64 Sectors			
Real-Time Caliper Images	4, 8, or 16 Sectors			
High-Resolution Caliper and Amplitude Images**	16, 32, 64, 128, 180, 256, 360, 540, 720, 900, 1080, 1440, or 1980 Sectors			
Mud Types	Oil-Based and Water-Based Mud			

** Optimal number of sectors depends on the RPM.

GAMMA RAY SPECIFICATIONS	4.75 INCH	6.75 INCH	8.00 INCH	9.50 INCH
Detector Type	Scintillation Crystal (x2)			
Measurement Range	0 to 1000 API			
Measurement Precision†	±1.8 API @ 100 API	±2.4 API @ 100 API	±2.8 API @ 100 API	±3 API @ 100 API
Real-Time Gamma Image	4 or 16 (compressed) sectors			
Recorded Gamma Image	16 sectors			
Measure Point from Bottom of Tool	2.69 ft (0.82 m)		2.99 ft (0.91 m)	5.06 ft (1.54 m)

† Specifications are for a 30-second interval.

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com