Breakthrough Technology for Openhole Logging
Power, Performance, Usability and Efficiency

THE LOGIQ® PLATFORM

The LOGIQ® surface system and its family of downhole sensors are revolutionary in their design and represent significant departures from earlier generations of logging equipment.

Halliburton’s premium downhole tools incorporate the latest digital capabilities in their sensor, mechanical and electrical architectures, rendering toolstrings that are significantly shorter and lighter without penalty in temperature or pressure ratings. The PC-based surface system brings new capabilities and ergonomics to wellsite workstations where customers can instantly appreciate the LOGIQ platform for its unmatched levels of power, performance, usability and efficiency.
LENGTH AND WEIGHT
Compared to the previous-generation quad combo, the LOGIQ downhole toolstring is about half the length and about two thirds the weight. The smaller dimensions make the equipment far safer to handle, and they contribute not only to faster rig up and rig down times, but also to the elimination of excessive rig time needed to drill long “rathole” sections.

PREMIUM SERVICE SPECIFICATIONS
Unlike other toolstrings touted for being shorter and lighter, LOGIQ tools can handle a full range of downhole challenges. All LOGIQ tools are rigorously qualified to 350°F (177°C) and 20,000 psi (138 MPa), thus preserving operational flexibility for the customer.

DOWNHOLE COMMUNICATION
The LOGIQ system utilizes an Ethernet communication protocol that produces a five-fold increase in data capacity between downhole tools and the surface system. Benefits of the new protocol include faster logging speeds, the ability to combine current-generation high data rate tools, and the provision for future, even higher data rate tools.

FLEXIBLE
While the LOGIQ platform offers all new primary sensors, there are circumstances where customers may want to run previous-generation downhole logging tools. The LOGIQ system easily accommodates these older tools, including and encompassing any of the openhole logging tools in the Halliburton fleet. Tools may be used in virtually any combination and in virtually any order on the toolstring.

FIELD MAINTENANCE AND JOB-READY STATUS
The LOGIQ system was developed with a keen eye towards fast, efficient field maintenance of all downhole and surface equipment. Parts commonality, an advanced supply and support chain, and superior mechanical and electrical engineering contribute to maximum field worthiness and job-ready status for the customer. This subtle but critical aspect of operational efficiency can be especially important when advance job notice is impossible for the customer.

LESS “RATHOLE” REQUIREMENT
Every operator hates drilling ratholes, that portion of extra drilled footage required to convey older-generation toolstring combinations as close as possible to the bottom of the hole. The time, cost and risk of this extra drilling can be significant. The current alternative—making multiple trips with uncombined logging tools, may only poorly address this issue.

The shorter LOGIQ platform tools offer a solution to the problem. For most common toolstring combinations, the LOGIQ tools are approximately half the length of the previous generation of tools. Not only does this save the operator the risk and time of drilling long rathole sections, but it also reduces the risk of differential sticking while logging.
LOGIQ Platform
Advantages and Features

LOGIQ toolstrings are about half the length and two-thirds the weight of previous-generation tools. As such, they are easier and safer to handle, resulting in faster rig up and rig down times. In addition, shorter toolstrings reduce the need for costly rathole drilling. Regardless of the scale of the drilling operation, savings quickly add up when total logging operating times are significantly reduced.

The LOGIQ platform features a surface system that incorporates the latest thinking in system architecture, instrumentation, and software to enhance all critical aspects of wellsite service delivery.

DATA INTEGRITY, QC ASSURANCE
Advanced color graphics, real-time diagnostics, and secure communications are integrated to give both local and remote users a seamless interface to the logging operation and unparalleled assurance of data quality and instrument integrity.

FULL RANGE OF WELLSITE SERVICES
The LOGIQ surface system supports the entire arsenal of conventional openhole logging and perforating services, including most previous-generation downhole services. In addition, the LOGIQ system supports the full range of high-power applications including formation testing and rotary coring services.

POWERFUL DATA ACQUISITION
A powerful, PC-based data acquisition system is able to extract full benefit of even the highest data rate or processing-intensive services. The Ethernet-based telemetry system offers a five-fold improvement in data rate over the existing system and brings uplink bandwidth to 1 Mb/sec. This relieves any constraint in combining data-intensive tool combinations and permits the fastest possible logging speeds.

A detailed account of benefits and capabilities of sensors utilized within the LOGIQ platform follows.

When your success depends on measurement precision and performance reliability, you can depend on Halliburton Wireline and Perforating Services.
**LOGIQ® ACR™**
(Array-Compensated True Resistivity Tool)
- Advanced asymmetric array induction
- Real-time radial curves computed with depths of investigation at 10, 20, 30, 60 and 90 in. and with vertical resolutions of 1, 2 or 4 ft
- Utilizes 2D software focusing and proprietary borehole and thermal correction schemes for greatly improved accuracy and tolerance for poor logging conditions (such as washed-out and/or large holes, centered/eccentered tool position, salty muds and/or high resistivities)
- Improved sensitivity to the near-wellbore resistivity offers improved definition—even of shallow mud filtrate invasion. This results in higher-fidelity Rt-Rxo-Di computations and an improved (qualitative) indicator of rock quality

**LOGIQ B-SAT**
(Borehole Compensated Sonic Array Tool)
- Monopole sonic logging is available on the LOGIQ platform in two configurations
- When dictated by logging conditions or customer preferences, the B-SAT tool is available. It features a symmetrical, two-transmitter design
- In either tool configuration, full waveforms are acquired with 16 usec sampling and 2 msec listening times. The center frequency is 16 kHz. The tool features piezoelectric transmitter and receiver elements
- Real-time semblance processing provides robust real-time Δt measurements and improved log quality diagnostics
- Conventional cement bond logging is available with the B-SAT tool, utilizing the 3-ft and 5-ft receivers. Attenuation measurements are available with the B-SAT tool
LOGIQ CT
(Caliper Tool)

- Six high-sensitivity stylus-like independent arms yield high-resolution data on borehole defects, washouts and borehole shape with 0.1 in. accuracy and repeatability
- Provides an important new diagnostic for general log quality and improved means to assess degree and orientation of borehole breakout and the near-wellbore stress field
- Identifies small drilling-induced defects that permit operators to fine-tune drilling practices and make confident decisions on completion tactics and drilling muds

LOGIQ® SDL™/DSN™
(Spectral Density Log and Dual-Spaced Neutron)

The LOGIQ platform brings two normally separate services into a single, compact physical configuration. This was achieved by integrating the two, normally separate SDL and DSN instrument sections into one and resulted in a 10-foot savings in tool length.

LOGIQ Spectral Density Log
The SDL tool provides precise measurements of formation bulk density and photoelectric absorption index (Pe). Active gain stabilization of two NaI scintillation detectors, optimized pad geometry and robust tool characterization help ensure accurate measurements over a wide range of borehole conditions, mud types and weights, and toolstring configurations.

The SDL tool accommodates a conventional Microlog on the integrated caliper arm. The strong, 1.5 Ci Cesium source provides high count rates at the detectors for faster logging speeds and improved statistical precision. The SDL tool can operate in holes ranging from 6 to 20 inches in diameter.

LOGIQ Dual-Spaced Neutron
The Dual-Spaced Neutron tool delivers porosity measurements in openhole with excellent accuracy and repeatability. The DSN tool consists of two He3 thermal neutron detectors and a strong, 15 Ci AmBe source for the highest possible count rates. This affords superior repeatability, deep depth of investigation, and the fastest possible logging speeds. Like the SDL tool, the DSN tool has been exhaustively characterized and includes real-time corrections for the full range of formation and wellbore conditions.

The combined measurements from the LOGIQ SDL/DSN tools provide robust determinations of total and effective formation porosity, lithology, fluid properties and formation mineral composition. A proprietary new thin bed processing algorithm—Omega Processing—affords high vertical-resolution measurements with far less statistical deviation than is observed with earlier or competitive enhanced-resolution processing techniques and with faster logging speeds. In combination with resistivity logs, the LOGIQ SDL/DSN tools provide accurate assessments of formation water saturations (Sw).
Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.