

## LOGIQ® Dual-Spaced Neutron (DSN II™) Tool

The LOGIQ® Dual-Spaced Neutron (DSN II™) tool is a thermal-neutron tool designed to measure formation porosity from neutron-nuclei interactions. Neutron-porosity logs provide total fluid information for use with resistivity logs and/or pulsed neutron logs in determining formation water saturation. They can be combined with density logs to provide an indication of formation gas saturation, and also with density and/or sonic logs to provide indications of formation lithology. In open holes, the LOGIQ DSN II tool is usually combined with the Spectral Density Logging Tool (SDLT™).

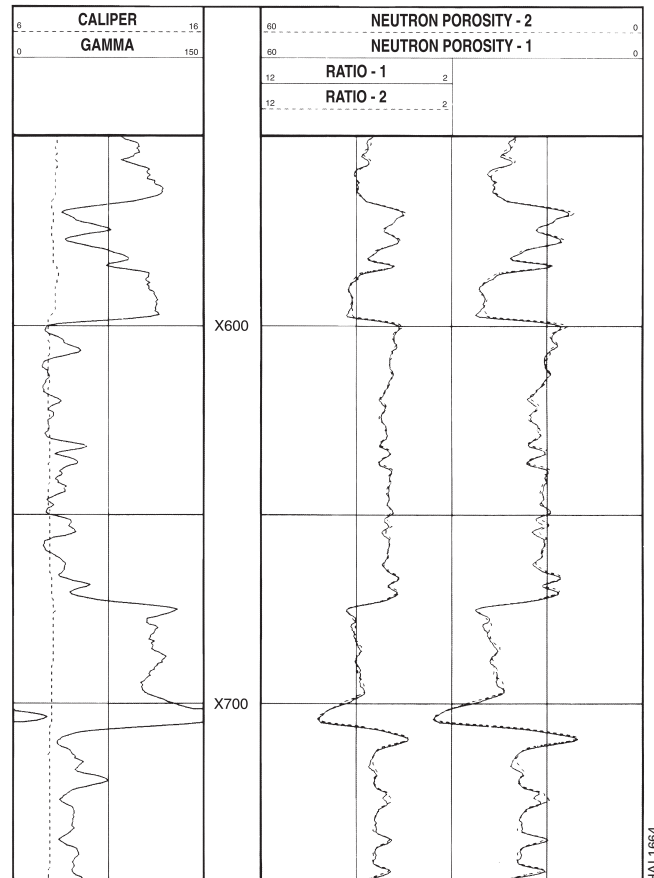
The LOGIQ DSN II tool consists of an instrument section housing the electronics, two helium ( $\text{He}^3$ ) detectors, and a source sub housing an americium-beryllium source, which generates fast neutrons that penetrate the formation at an initial energy of 4.6 MeV. Thermal-neutron tools are not as limited by the spacing and depth of investigation problems associated with epithermal-neutron tools. Since thermal neutrons are detected, count rates are much higher than for epithermal neutrons. However, thermal neutron detectors are more sensitive to lithology and are affected by borehole and formation salinity. The dual detector method is used to compensate for these environmental effects. LOGIQ DSN II tool applications include:

- Gas Detection
- Porosity
- Lithology

### Benefits

The LOGIQ DSN II service delivers porosity measurements with greater accuracy and repeatability than any other neutron-porosity service. Designed for use in fluid-filled open or cased holes, this service provides:

- **Superior accuracy.** More consistent measurements over the entire porosity range, even in cased holes.
- **Repeatable results.** Optimized detector spacing, advanced calibration methods, and greater counting rates contribute to the service's outstanding precision.



*In this LOGIQ® DSN II™ log example, the subject well was logged twice. The resulting near/far ratio curves and the calculated porosity curves are overlaid to illustrate the high repeatability of DSN II tool porosity measurements.*

- **Faster log runs.** The optimized design helps save rig time by allowing logs to be run at faster cable speeds.
- **Improved thin-bed evaluation.** Clearer delineation of thin-bed formations with enhanced vertical resolution (EVR) available in real-time or in post-processing.
- **Increased reservoir understanding.** A combination of logging tools can be run to identify lithology, reveal gas zones, and calculate shale volumes.

## Features

The LOGIQ DSN II tool detector array contains two helium proportional counters, and can be combined with most LOGIQ tools.

LOGIQ® Dual-Spaced Neutron (DSN II™) Tool Specifications							
Make Up Length	Diameter		Maximum Pressure		Maximum Temperature	Weight	
	Standard	DeepSuite™	Standard	DeepSuite™		Standard	DeepSuite™
10.54 ft. (3.21 m)	3.63 in. (92.20 mm)	4.44 in. (112.78 mm)	20,000 psi (137.89 MPa)	35,000 psi (241.3 MPa)	350 °F (176.67 °C)	196 lb (88.90 kg)	368.00 lb (166.92 kg)