

## HRAI™ High Resolution Array Induction Tool

The HRAI™ high resolution array induction tool represents a significant engineering advance over the HRI™ high resolution induction tool. The HRAI tool leverages the proven features of the HRI tool “three-coil” receiver configuration while providing induction measurements with six radial focal depths. The sonde is a symmetrical design, with five upper and five lower receivers positioned around a center-mounted transmitter. Raw conductivity data is collected at two frequencies, 8 and 32 kHz, and the receiver antennas are spaced from 17 to 78 in.

A new speed correction algorithm implemented in the logging software enhances the accuracy of HRAI tool coil array data even during large overpulls in sticky boreholes. Long transmitter-receiver spacing and optimized array processing help to significantly reduce the effects of washouts, rugosity, and tool eccentricity.

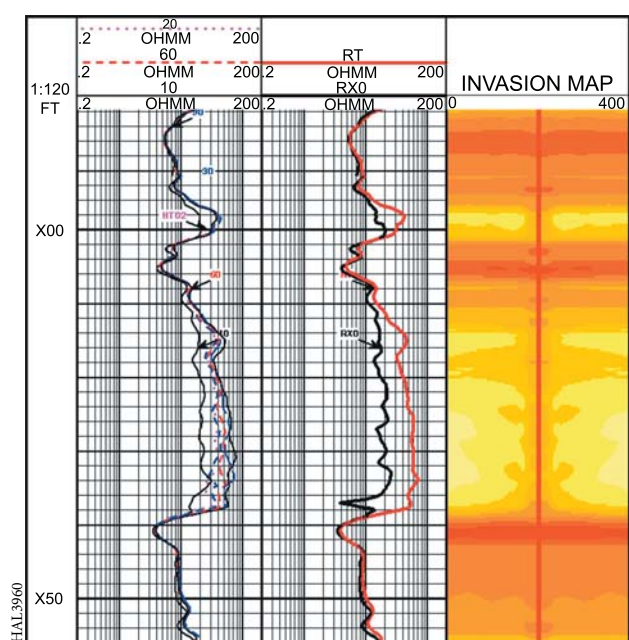
### Applications

- Accurate measures of formation resistivity at varying depths of investigation for enhanced estimates of  $R_t$ ,  $R_{xo}$ , and  $D_i$
- Quantitative assessment of  $S_w$ ,  $S_{xo}$ , and moveable water volumes
- Qualitative assessment of permeability and rock quality
- Array induction measurements are available in formations with resistivities from 0.2 to 2,000 ohm-m and in water, air, or oil-filled boreholes
- Analysis of finely-bedded formations

### Features

- Real-time 2D software focusing achieves an optimum balance of vertical resolution, radial focusing, and symmetry of response
- Resolution-matched radial curves are computed with radial focal depths of 10, 20, 30, 60, 90 and 120 in.

- Each resistivity comes with a 1-ft, 2-ft, and 4-ft vertical resolution
- Real-time  $R_t$ ,  $R_{xo}$ , and  $D_i$  curves and an invasion “map” are available
- Real-time borehole corrections facilitated by a sonde-mounted mud resistivity sensor
- Advanced “speed correction” algorithm for correcting array data for over-pulls in sticky boreholes
- Vertical resolution-matched elemental measurements
- High logging speeds up to 6,000 ft/hour are possible



Real-time answer products of HRAI™ tool: an invasion map in Track 4,  $R_t$  and  $R_{xo}$  in Track 3, and Track 2 shows the 2-ft resolution radial resistivity curves.

## HRAI™ High Resolution Array Induction Tool Specifications

Description	Logging Speed ft/hr (m)	Length ft (m)	Minimum Borehole Diameter in. (cm)	Operating Pressure psi (bar)	Operating Temperature °F (°C)	Weight lb (kg)
LOGIQ	6,000 (1830)	25.43 (7.75)	4.5 (11.43)	20,000 (1400)	350 (177)	400 (181)
DIT	6,000 (1830)	35 (10.67)	4.5 (11.43)	20,000 (1400)	300 (150)	586 (266.5)