



Global perspective. Independent thinking.



TRIPLE & QUAD
COMBO LWD

The image shows a close-up of a Triple & Quad Combo LWD tool joint installed in a wellbore. The tool joint is a long, thin, metallic rod that has been drilled into the rock. The rock is dark brown and has a rough, fractured texture. A circular highlight is drawn around the tool joint, emphasizing its position in the wellbore.

- 
- iPCD™ » Triple Combo
 - Sonic » Quad Combo
- The image shows a close-up of the Triple & Quad Combo LWD tool joint. The tool joint is a long, thin, metallic rod with a complex, multi-segmented design. It is shown in a curved position, highlighting its flexibility. The background is a light gray gradient.



Global perspective. Independent thinking.

Advanced LWD Systems

APS Technology has developed a new suite of Logging While Drilling (LWD) tools to complement our highly reliable Wave Propagation Resistivity (WPR™) tool, which was introduced in 2009. Like the WPR, these new integrated neutron Porosity, acoustic Caliper and azimuthal litho-Density (iPCD™) and Sonic tools operate seamlessly with the APS SureShot™ MWD platform. The introduction of these new porosity sensors allows APS's customers, independent service companies and vertically integrated oil companies to provide higher-level "Triple Combo" or "Quad Combo" LWD services.

APS's advanced systems are powered by a turbine alternator in configurable combination with batteries to accommodate both LWD and Logging While Tripping (LWT). All LWD sensor subs can be used at typical flow rates (maximum 1,200 gpm or 76 l/sec) and to 347°F (175°C).



iPCD sensor subs are available in 4.75 in. (121mm), 6.75 in. (171mm) and 8.00 in. (203mm) O.D.

iPCD™ for Triple Combo LWD

The APS iPCD provides real-time bulk density ($\Delta\rho$) and neutron porosity (Φ_n) data to characterize formation porosity and lithology while drilling. All nuclear measurements are borehole compensated using the standoff data provided by a novel acoustic caliper.

- > Density sensor provides user-configurable formation imaging data with 4 or more sectors in real time and 24 sectors from memory.
- > High-resolution images allow for structural/stratigraphic dip analysis.
- > Photoelectric factor (Pe) data is stored in memory.
- > All measurements include quality factors and standard log data.
- > An array of rugged acoustic transducers provides a borehole shape/diameter log, permitting borehole breakout analysis.
- > One set of transducers is aligned with the density neutron detectors for accurate real-time standoff measurement.

Radiation safety is of paramount importance with these types of tools. APS has made safety a priority, from tool design and international source licensing requirements to safety equipment and emergency procedures. Sources are doubly encapsulated with an industry-standard permanent mounting design featuring redundant mounting and retention schemes.

APS m-Con System

All APS LWD sensor subs connect via a modular connector (m-Con) system. This allows for quick, safe and reliable electrical and mechanical connection of LWD sensor subs, providing maximum flexibility for placement within the BHA.

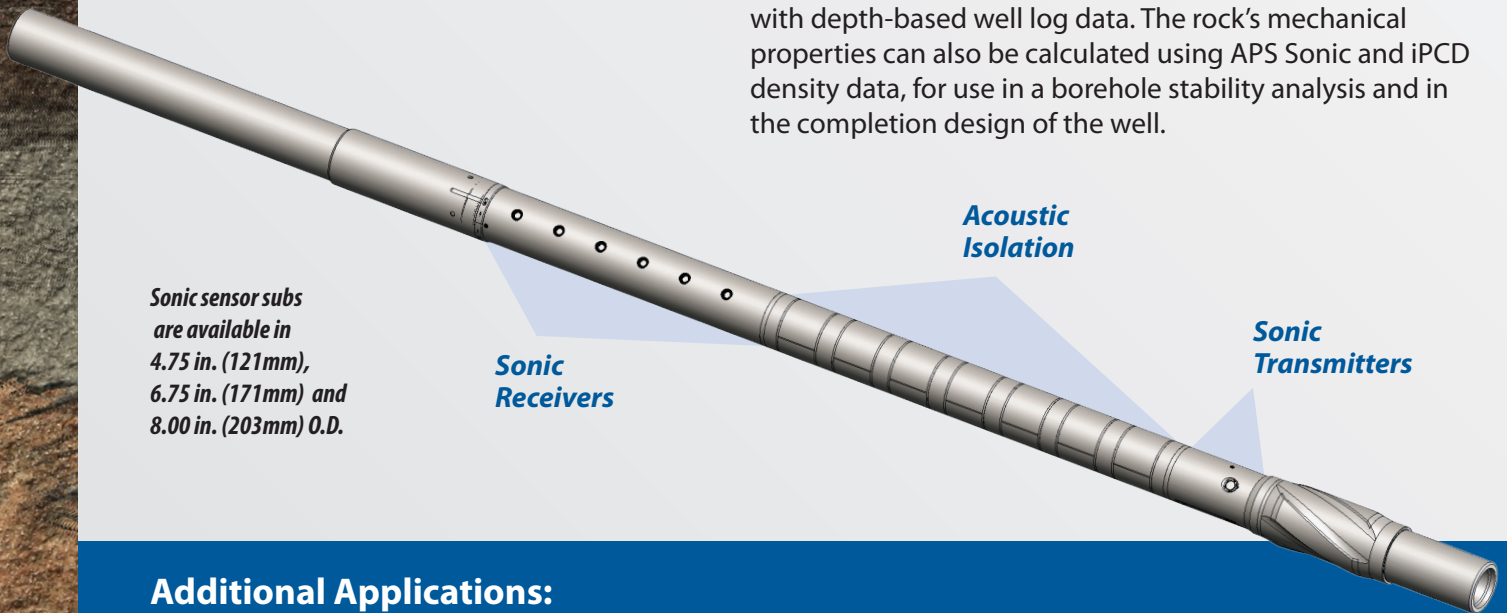


Sonic Sensor for Quad Combo LWD

The APS Sonic sensor is a full waveform sonic device that adds Δt (delta T) measurements to the Triple Combo LWD system. This sensor provides faster-than-fluid compressional wave (Δt_c) and shear wave (Δt_s) velocity data. In conjunction with APS WPR resistivity and iPCD sensors, the Sonic sensor enables operators to dispense with costly wireline logging operations and develop "insurance" formation evaluation logs during the drilling process.

- > Sonic can be run in real-time MWD mode or standalone recorded data mode.
- > Measurements provide data for a number of applications that are useful for several of the disciplines found on most asset teams.

Geophysicists can use APS Sonic sensor data to minimize uncertainty by tying time-based seismic data directly in with depth-based well log data. The rock's mechanical properties can also be calculated using APS Sonic and iPCD density data, for use in a borehole stability analysis and in the completion design of the well.



Additional Applications:

- > Provide an additional correlation log and a non-nuclear porosity device to use in the hydrocarbon saturation calculation.
- > Establish fluid type and distinguish gas and oil contacts within a reservoir.
- > Provide telemetered Δt compressional data for real-time pore pressure evaluation and mud weight / casing point selection optimization during the well construction process. This is an invaluable tool for establishing a safe and effective drilling operation.
- > As a digital full waveform sensor, Sonic can acquire data to identify natural fractures in the formation.
- > Waveforms can also be used in cased holes to identify the top of a cement location behind casing and help confirm a good cement job.



Global perspective. Independent thinking.

HEADQUARTERS

WALLINGFORD, CT USA

7 Laser Lane
Wallingford, CT 06492 USA
Phone: +1 860.613.4450
Fax: +1 203.284.7428
contact@aps-tech.com

HOUSTON, TX USA

15415 International Plaza Dr., Suite #150
Houston, TX 77032 USA
Phone: +1 281.847.3700

CALGARY, AB CANADA

APS Oilfield Services Canada, Inc.
Office Location: 120 8th Avenue SE, 4th floor, Calgary, AB T2G 0K6, Canada
Mailing Address: 731 1st Street SE, Calgary, AB T2G 2G9, Canada
Direct: 403.455.7004
Cell: 435.513.2933

DUBAI, UAE

B43, Oilfield Supply Center
Jebel Ali, Dubai, UAE
Phone: +971.4.883.7231
Fax: +971.4.883.7234

CHENGDU, CHINA

Guanghan APS Technology, Ltd.
Section 2, Fuzhou Road
Guanghan City, Sichuan, P.R. China 618300
Phone: +86.838.5103.658
Fax: +86.838.5517.099

KORLA, CHINA

No. 141 West Side, South of Shihua Road
Xincheng District
Korla City
Bayinguoleng, Xinjiang Uygur Autonomous Region
P.R. China 841000
Phone: +86.996.8792.358

MOSCOW, RUSSIA

Official Distributor: GeoTrend Corporation
10, Starokonushenny Lane, 2nd Floor
Moscow 119002, Russia
Phone: +7 (495) 789.2517
Fax: +7 (495) 789.2519
info@geo-trend.com

NIZHNEVARTOVSK, RUSSIA

Official Distributor: GeoTrend Corporation
Str. Kuzovatkina, 5, Building 3
Nizhnevartovsk 628605, Russia
Phone: +7 (3466) 311.512
Fax: +7 (3466) 67.02.35