

Well Integrity Logging & Evaluation Services

Cement Bond Evaluation • Casing Inspection • Leak Detection • 3D Casing Evaluation • Ultrasonic Casing & Cement Evaluation • Log Analysis



Safety – Quality – Efficiency



RADii™ Cement Bond Tool

Radial Cement Bond Evaluation

Product Information

The RADii™ Segmented Bond Tool accurately measures and maps the quality of cement behind casing.

Option to run as Stack Log in combination with Multi-Arm Caliper Tool or Electro-Magnetic Thickness Tool.

The service is available for slim-hole applications using the 1-11/16" and 2-3/4" RADii tools and for larger casing sizes using the high definition sixteen sector 3-1/2" RADii tool.

- ▶ **The RADii™ Segmented Cement Bond Tool uses a single ceramic transmitter, an eight or sixteen segment receiver at 3 ft. and a single receiver at 5 ft. spacing.**
- ▶ **The segmented receiver generates a cement map which enables identification of cement channelling, while the single receiver generates the traditional cement bond log (CBL) and a variable-density log (VDL).**
- ▶ **The ruggedized design of the RADii tool ensures consistently reliable and accurate operation in a wide range of environments.**
- ▶ **The oil-filled mandrels containing the transducers can be serviced individually, enabling significant time savings when the tool requires service.**
- ▶ **Ceramic transmitter and receivers enable the tool to withstand hostile high-temperature environments.**
- ▶ **Data from the receivers are digitized and stored in the tool's internal memory before being sequentially transmitted to surface. An internal controller transmits 8 signals from the RADii receiver, a composite signal representing the sum of the eight RADii signals, the 5 ft. receiver signal, and an internally generated calibration signal.**
- ▶ **A temperature log can be recorded while running in hole and used to provide additional cement quality information.**



ProMAC™ and RADii™ are trademarks of Probe Technologies



SPECIFICATIONS	1 ¹¹ / ₁₆ in. RADII	2 ³ / ₄ in. RADII	3 ¹ / ₂ in. RADII
Mechanical Specifications			
Outside diameter, in [cm]	1.688 [4.29]	2.750 [6.98]	3.500 [8.89]
Length, ft [m]	8.60 [2.62]	8.73 [2.66]	9.35 [2.82]
Weight, lb [kg]	41 [18.60]	93 [42.18]	175 [79.40]
Temperature rating, °F [°C]	350 / 475 [177 / 246]	350 / 475 [177 / 246]	350 [177]
Pressure rating, psi [MPa]	20,000 [137.90]	20,000 [137.90]	20,000 [137.90]
Casing range, in. [cm]	2.375 – 7.500 [6.03 – 19.05]	4.500 – 10.750 [11.43 – 27.3]	4.500 – 20.000 [11.43 – 50.80]
Measurement Specifications			
Output	Amplitude and TT: First arrival peak detection Variable density: Analog waveform from 5 ft receiver Cement map: 8 sector (1 11/16 in and 2 3/4 in), or 16 sector (3 1/2 in) options Secondary curves: Head voltage, internal temperature, external temperature (optional)		
Transmitted waveforms	1400 µsec for each receiver, 500 µsec for each sector		
Logging speed, ft/min [m/min]	Recommended: 30.0 [9.14], Maximum: 60.0 [18.28]		
Measurement range, µsec	200 - 1500		
Vertical resolution	3 ft E1 peak Amplitude, 5 ft Sonic Waveform		
Radial resolution, deg	8 sector (1 11/16 in and 2 3/4 in): 45.0; 16 sector (3 1/2 in): 22.5		
Precision, mV	< 1		
Hardware Characteristics			
Sensor type	18 kHz piezoelectric crystal (transmitter and receivers)		
Sensors	8-segment and 16-segment 3 ft receiver for amplitude and cement mapping 5 ft receiver for VDL		
Voltage, VDC	130	130	130
Current, mA	38	45	45

Specifications courtesy of Probe Technologies



ProMAC™ Multi-Arm Caliper Tool

Casing Inspection

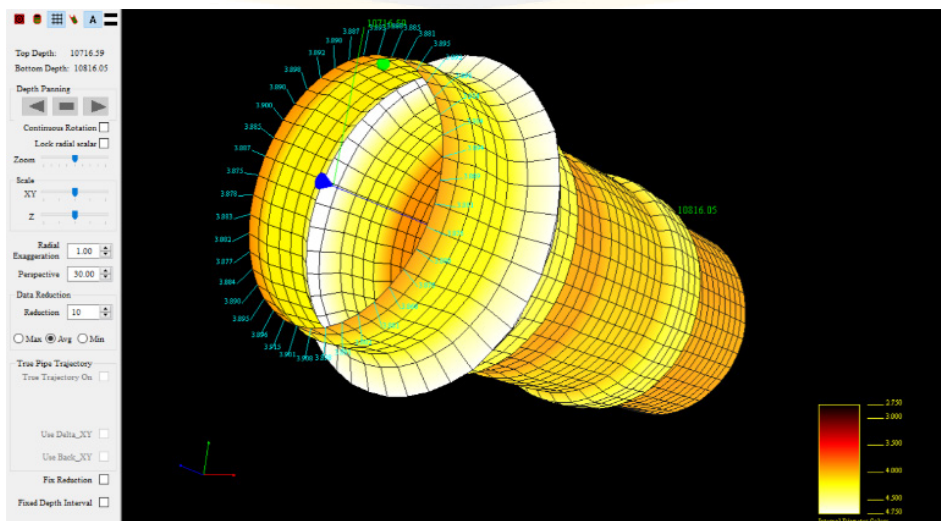
Product Information

ProMAC™ tools provide an accurate, detailed internal profile of tubing, casing and completion assemblies.

Option to run as Stack Log in combination with RADii™ Segmented Bond Tool or Electro-Magnetic Thickness Tool.

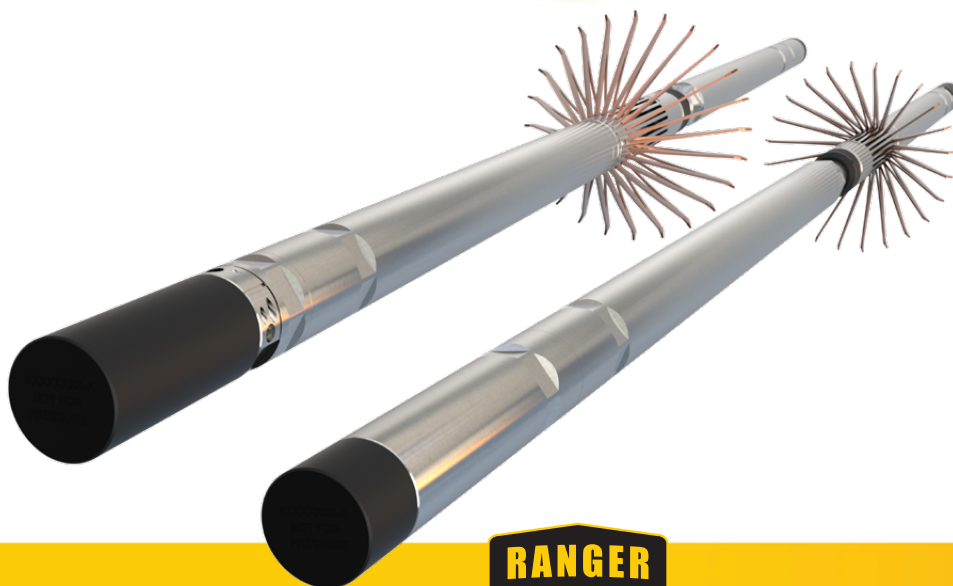
- **Assesses problems associated with corrosion, wear, restrictions, splits, holes, and mechanical deformation through the life of the well.**
- **Independent radial measurements provided by the caliper arms for a detailed image of the internal casing condition.**
- **Ranger provides multiple configurations including 24, 40 and 60-arm tools with an extended range of measurement.**
- **Precision machined calibration bowl ensures that each tool configuration delivers accurate and reliable data.**
- **Directional data is acquired simultaneously and can also be included in the log presentation.**
- **Real time plotting of downhole MAC data provides rapid interpretation of the data, a cross-section of the casing, and a 3-dimensional, color-enhanced visualization for tubulars ranging from 1¾ -in. to 14-in. internal diameter**
- **MIPSPro processing provides a joint-by-joint detailed analysis and clear 3D visualization that enhances the interpretation of caliper data. Potential problem sections can be identified and analyzed in detail.**

MIPSPro Processing & Interpretation



SPECIFICATIONS	MAC24	MAC40	MAC60
Mechanical Specifications			
Outside diameter, in [cm]	1.688 [42.9]	2.875 [7.30]	3.625 [9.21]
Length, ft [m]	4.57 [1.39]	5.42 [1.65]	7.57 [2.31]
Weight, lb [kg]	19 [8.5]	80 [36.3]	135 [61.2]
Temperature rating, °F [°C]	350 [177]	350 [177]	350 [177]
Pressure rating, psi [MPa]	15,000 [103.42]	15,000 [103.42]	15,000 [103.42]
Number of fingers	24	40	60
Casing Range, in [cm]	Standard fingers: 2.063 – 4.5 [5.24 – 11.43] Extended fingers: 2.063 – 7.0 [5.24 – 17.78]	Standard fingers: 3.0 – 7.0 [7.62 – 17.78] Extended fingers: 3.0 – 9.62 [7.62 – 24.43]	Standard fingers: 4.5 – 10.75 [11.4 – 27.3] Extended fingers: 6.0 – 13.375 [15.2 – 33.9]
Measurement Specifications			
Output	Primary: Internal casing dimensions, inclination Secondary: Head voltage, internal temperature		
Logging speed, ft /min [m/min]	Recommended: 30 [9.14], Maximum: 60 [18.28]		
Vertical resolution, in [mm] (at recommended logging speed)	0.6 [1.52] at 30 ft /min (0.3 [0.76] standalone)	0.6 [1.52] at 30 ft /min (0.3 [0.76] standalone)	0.6 [1.52] at 30 ft /min (0.3 [0.76] standalone)
Radial resolution, in [mm]	0.003 [0.076]	0.005 [0.13]	0.005 [0.127]
Radial accuracy, in [mm]	0.02 [0.5]	0.02 [0.5]	0.02 [0.5]
Electrical Specifications			
Sensor Type	DVRT	LVDT	LVDT
Voltage, VDC	120	120	120
Current, mA	25-30	25-30	30-35

Specifications courtesy of Probe Technologies



UltraView® Tool

Ultrasonic Casing and Cement Integrity

Product Information

High-resolution ultrasonic measurements detect casing and cement anomalies on a single trip with accurate analysis of cement, casing wear, casing thickness, corrosion, and fluid properties.

The service can be configured for large casing sizes over 7" up to 20" and for smaller casing sizes from 4 ½" to 7". The new short sonde service with multi-axis centralizers will provide reliable data in casing with high dogleg severity and can also be run in horizontal applications.

Applications

- ▶ Cement inspection with 360° coverage.
- ▶ Identifies channels in cement map as small as 5°.
- ▶ Locating internal and external casing defects.
- ▶ Monitoring internal wear and corrosion.
- ▶ Analyzing casing thickness.
- ▶ Evaluating cement.
- ▶ Producing high-resolution wellbore images.
- ▶ Analyzing foam and light cement.

Features

- ▶ Ultrasonic transducer in the rotating head.
- ▶ Patented mud chamber design.
- ▶ Two separate transducers: one dedicated to casing and cement inspection and another dedicated to fluid properties inspection.
- ▶ Measure-on-position DC motor that rotates the primary measurement head.

Benefits

- ▶ The UltraView tool generates acoustic resonance within the casing and measures cement acoustic impedance while minimizing sensitivity to the microannulus.
- ▶ Real-time fluid velocity, impedance, and density measurements eliminate the need to use data gathered during the down pass, which may not represent conditions while logging up.
- ▶ Accurate depiction of cement distribution around the casing
- ▶ High-resolution wellbore imaging provides detailed images of internal casing corrosion, wear loss, defects, and perforation patterns.
- ▶ High-resolution real-time thickness measurement.
- ▶ Deliverables include basic report, joint summary, burst pressure estimate, full detailed analysis.
- ▶ Combinable with standard cement bond tool and multi-arm caliper tool.



Standard Tool with Large Casing Centralizers

Short Tool with Small Casing Centralizers

UltraView and URSVision are trademarks of Weatherford International



SPECIFICATIONS

Measurement Specifications

Data	Acoustic impedance, fluid impedance, travel time, amplitude, casing ID, casing thickness
Logging speed	30 ft/min
Measurement range	Casing thickness: 0.200 to 0.800 in. (5 to 21 mm)*; Acoustic impedance: 0 to 10 Mrayl
Vertical resolution	Cement evaluation mode: 1.0 in. at 1800 ft/hr (540 m/hr) ; Image mode: 0.5 in. at 1,800 ft/hr (540 m/hr)
Thickness resolution	±0.002 in. (0.051 mm)
Acoustic impedance resolution	0.2 Mrayl
Accuracy	Internal radius ±1%; Acoustic impedance < 3.83 Mrayl ± 0.5 Mrayl; Thickness ±5%
Depth of investigation	Thickness of casing; casing-to-cement interface
Borehole fluids	WBM up to 14 lb/gal max mud weight; OBM up to 11.5 lb/gal max mud weight and 8.5% max solids

* The second harmonic is used for a thickness greater than 0.625 in. (15 mm).

Mechanical Specifications

Outer diameter*	3.38 in. (86.0 mm)
Length / Weight	18.66 ft (5.69 m) / 315.00 lb (142.90 kg)
Maximum temperature / pressure	350°F (177°C)** / 20,000 psi (138 MPa)**
Min / Max casing size	4.5 in. (11.43 cm) / 20.0 in. (50.8 cm)

** Temp/Press ratings are 175°F (80°C) / 5,000 psi (35 MPa) when logging casing > 14-in. and < 22-in. OD. Specifications courtesy of Weatherford International

Joint Table

JOINT NUMBER	TOP DEPTH	BOTTOM DEPTH	JOINT LENGTH	CASING OD	CASING WEIGHT	CASING GRADE	MAX WALL LOSS	OD/ ID	BURST PRESSURE	WORST DEFECT DEPTH	WORST DEFECT TYPE	JOINT CLASS
	(ft)	(ft)	(ft)	(in)	(lb/ft)		%		(psi)	(ft)		
1			24.426	7.000	26.30	J55	34.8	OD	3,688		SIP	2
2			32.456	7.000	26.30	J55						1
3			32.001	7.000	26.30	J55						1
4			27.381	7.000	26.30	J55	59.7	ID	2,280		GENA3	3
5			31.526	7.000	26.30	J55	31.5	OD	3,875		SIP	2
6			32.592	7.000	26.30	J55	21.7	OD	4,430		SIP	2
7			30.172	7.000	26.30	J55	67.6	OD	1,833		SIP	4
8			32.602	7.000	26.30	J55	45.7	OD	3,072		SIP	3
9			32.613	7.000	26.30	J55						1
10			32.588	7.000	26.30	J55	42.6	OD	3,247		SIP	3
11			31.749	7.000	26.30	J55	32.8	OD	3,802		SIP	2
12			31.616	7.000	26.30	J55	28.1	OD	4,067		SIP	2



Pressure-Temperature-Spinner Service

Pressure-Temperature-Spinner Service

Product Information

The PTS Service is used for applications involving leak detection and other anomalies in new and existing wells. The service can also provide a quick manual injection profile for each set of perforations on disposable saltwater and CO₂ injection wells.

The service is part of Ranger's Well Integrity services including multi-arm calipers, radial bond logs and ultrasonic services.

- ▶ **The Pressure/Temperature/Spinner tool configuration is effective in restricted bore holes and tubing as well as casing applications.**
- ▶ **The spinner is available in a number of sizes (1-3/8", 1-11/16", 2-1/8") to accommodate various applications from small diameter tubing larger casing sizes.**
- ▶ **Service Description**
 - ▶ The high-resolution Pressure/Temperature/Spinner (PTS) Service is used to measure pressure, temperature, and fluid velocity in a wellbore.
 - ▶ The tool transmits data from the transducer (pressure and internal temperature) serially to a telemetry tool, which transfers data to a surface acquisition system, or to a memory adapter, which stores data within internal memory.
 - ▶ Incorporates a quartz pressure sensor, temperature sensor, and bidirectional flow sensor.
 - ▶ Pressure sensor has built-in temperature compensation.
 - ▶ Bellows and buffer of silicone oil isolates sensors from wellbore fluids.
 - ▶ RTD resistor temperature sensor.
 - ▶ Flowrate sensor obtains rotational direction and speed from an attached spinner
 - ▶ PTS is compatible with both fullbore and continuous spinners.



SPECIFICATIONS

Mechanical Specifications

OD	1.375 in. (3.5 cm)
Length	27.2 in. (69 cm)
Weight	7.8 lb (3.5 kg)
Temperature Rating	350°F (177°C)
Temperature Resolution	0.018°F (0.01°C)
Temperature Accuracy	±1.6°F (±1°C)
Temperature Repeatability	0.36°F (0.2°C)
Pressure Rating	15,000 psi (103.5 MPa)
Pressure Resolution	0.02 psi (0.14 kPa)
Pressure Accuracy	±3.2 psi (±22 kPa) (equivalent to 0.02%)
Flow Resolution	0.083 rps
Flow Accuracy	±2%

1.375" MODEL

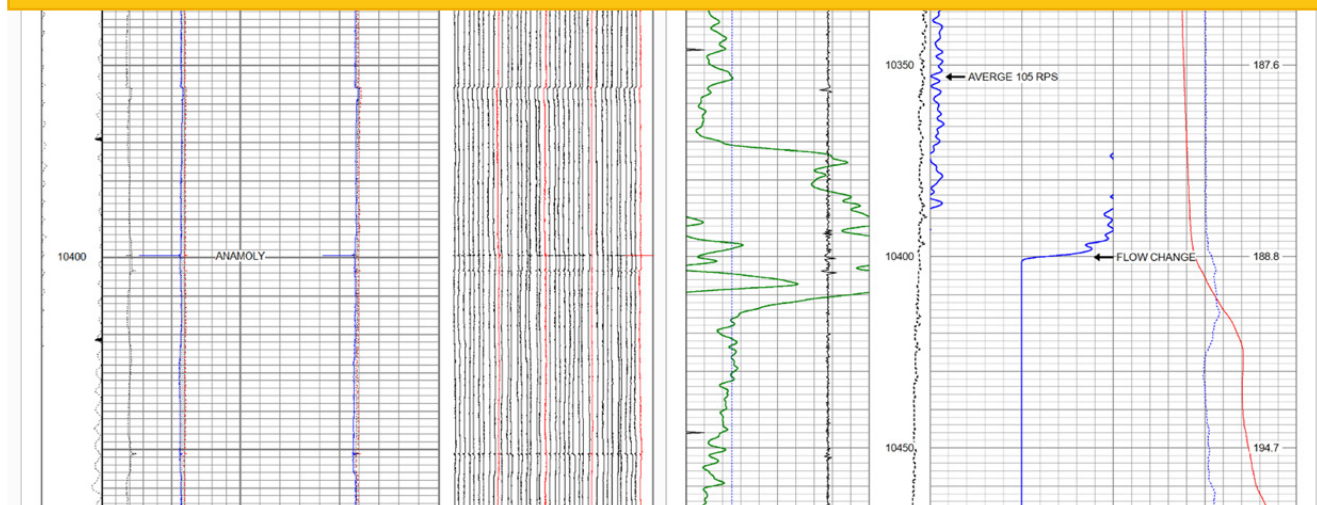
1.688" MODEL

2.125" MODEL

Spinner Section Measurements

OD	1.375 in (34.9 mm)	1.687 in (4.28 cm)	2.125 in (5.4 cm)
Length	8.7 in (22 cm)	9.1 in (23.5 cm)	9.5 in (23.5 cm)
Weight	2.2 lbs (1 kg)	2.4 lbs (1.1 kg)	2.8 lbs (1.3 kg)
Temp. Rating	350°F (177°C)		
Pressure Rating	15,000 psi (103.5 MPa)		
Threshold Velocity	3.28 ft/min (1 m/min)		
Spinner Response	0.037 rps/ft/min (0.12 rps/m/min)		

Leak Detection





WHY CHOOSE RANGER WIRELINE?

- Experienced & highly qualified team
- State-of-the-art equipment
- High performance culture
- Robust, behavior based QHSE management program
- Continuous improvement program
- Innovative technology development
- Technical solutions for today's complex wells

LOCATIONS

We have numerous locations in the USA

WILLISTON BASIN

- Williston, ND

DJ BASIN

- Brighton, CO

POWDER RIVER BASIN

- Casper, WY

PERMIAN BASIN

- Midland, TX
- Hobbs, NM

SOUTH TEXAS

- Pleasanton, TX

SAFETY

Safety is our top priority. Our entire organization is committed to ensuring that a proactive safety culture exists throughout the company.

QUALITY

At Ranger we are focused on providing the highest quality of service while protecting our employees and the environment in which they work. Ranger crews are dedicated and passionate about our business, with a track record of excellence and verified levels of competency.

EFFICIENCY

Ranger has streamlined our standard operating procedures to eliminate non-productive time for our customers. Our highly efficient and effective approach will contribute to optimizing your well results.

