

# MWD SOLUTIONS



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 Scientific Drilling

# SCIENTIFIC DRILLING

Scientific Drilling International is the largest independent service provider offering complete high-accuracy navigation and drilling solutions. Globally positioned to support a Oil & Gas, CBM/CGS, Geothermal, and Mining Industries, Scientific Drilling is committed to delivering a customer experience that makes it **Easy to Do Business**.



- + Directional Drilling
- + LWD Services
- + **MWD Services**
- + Magnetic Ranging
- + Drilling Motor Services
- + Wellbore Surveying
- + Survey Management
- + Rotary Steerable Services
- + Well Planning
- + Drilling Engineering
- + Cased Hole Services



# MWD SOLUTIONS

Scientific Drilling's innovative MWD technology provides a reliable, fit-for-purpose, and cost effective solution for the industry's wellbore placement challenges.



Our suite of MWD technologies provide a wide range of solutions to target your most complex operations.

We are proud to design and manufacture all components down to the sensor level, ensuring product integrity and performance. Our commitment to consistently deliver an unparalleled customer experience makes it **Easy** to do **Business**.

## MWD SYSTEMS

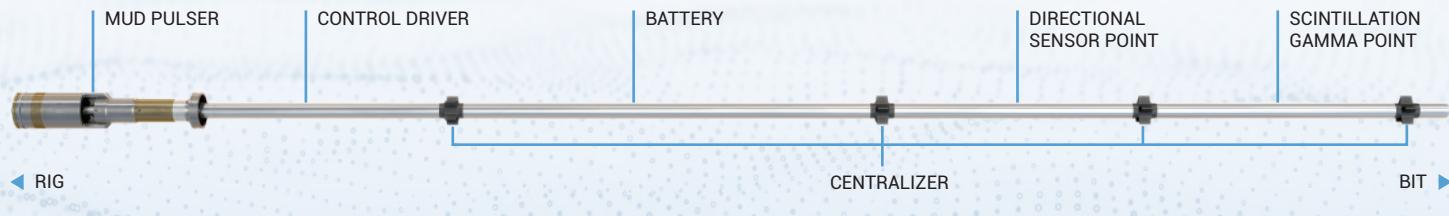
- + FALCON MP & EM  
Standard MWD System
- + FALCON X MP & EM  
High-speed ruggedized MWD System
- + FALCON X FIRE MP  
High-temperature Mud Pulse MWD system
- + Deep EM Receiver  
Wireline EM antenna

## gyroMWD

- + KEEPER gyroMWD  
Spinning mass gyroMWD
- + URSA gyroMWD  
High-angle Solid-state gyroMWD

Falcon is Scientific Drilling's legacy MWD system. Its trusted, industry-proven electronics and mechanical design are the foundation upon which all other SDI MWD, gyroMWD, LWD, and rotary steerable components built.

The Falcon MP's fully compensated and LCM tolerant pulsers deliver up to 3 bps speeds in a variety of sizes to address your BHA configuration needs.



### DELIVERING THE ULTIMATE VALUE

- + Supports BHA sizes 3.125" to 9.5"
- + Capable of 50-1500 GPM flow rates
- + Can achieve data rates up to 3 bps
- + Pressure rated to 30,000 psi
- + Bi-directional mud pulse telemetry
- + Industry standard

### TARGET APPLICATIONS

- + Unconventional resource plays
- + Directional/horizontal drilling
- + Relief well and re-entry
- + Magnetic ranging
- + Steam assisted gravity drainage (SAGD)

Scientific Drilling's Falcon EM MWD is the same industry-proven Falcon MWD system offering the advantage of very high data rates that are approximately four times faster than conventional MP MWD telemetry, up to 14 bps.

Paired with Scientific Drilling's downhole transceiver, EM signal is allowed to reach the surface without being affected by formation resistance above the target formation.



### DELIVERING THE ULTIMATE VALUE

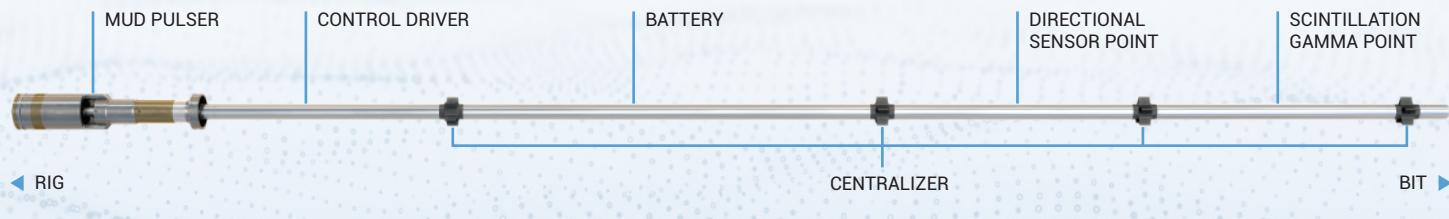
- + Supports BHA sizes 3.125" to 9.5"
- + Utilizes all drilling fluid types (air, mist, foam, mud)
- + Can achieve data rates up to 14 bps
- + Pressure rated to 30,000 psi
- + Bi-directional electromagnetic telemetry
- + Retrievable EM configuration available

### TARGET APPLICATIONS

- + Unconventional resource plays
- + Under-balanced drilling with aerated fluids
- + Geothermal
- + Relief well and re-entry
- + Magnetic ranging
- + Steam assisted gravity drainage (SAGD)

As the next evolution of the Falcon platform, Falcon X features faster telemetry speeds, dual-transducers, and advanced solid-state sensors; ensuring un-matched dependability, faster surveys, safer operations, precision wellbore placement, and deeper reach.

Falcon X MP system parameters are fully field-programmable, yielding predictable performance and delivering speeds up to 5 bps in the world's harshest drilling environments, including extreme LCM conditions.



### DELIVERING THE ULTIMATE VALUE

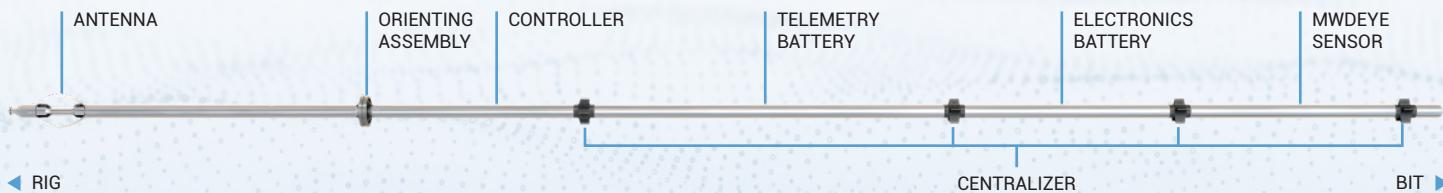
- + Supports BHA sizes 3.125" to 9.5"
- + Capable of 50-1500 GPM flow rates
- + Can achieve data rates up to 5 bps
- + Advanced solid-state sensors
- + Dual-transducer configuration
- + SDI's fastest mud pulse MWD system

### TARGET APPLICATIONS

- + Severe drilling environments
- + Geothermal drilling
- + Directional/horizontal drilling
- + Magnetic ranging
- + Enhanced gyroMWD drilling

Scientific Drilling's Falcon X EM offers the same durability, reliability, and precision as the Falcon X MP, but with even greater speed.

Falcon X EM is capable of improving drilling efficiency by transmitting surveys during pipe connections with telemetry speeds up to 14 bps, enabling greater ROP and providing increased data density for high-resolution reservoir analysis.



### DELIVERING THE ULTIMATE VALUE

- + Supports BHA sizes 3.125" to 9.5"
- + Utilizes all drilling fluid types (air, mist, foam, mud)
- + Can achieve data rates up to 14 bps
- + Advanced solid-state sensors
- + Extended battery configurations available
- + Retrievable EM configuration available

### TARGET APPLICATIONS

- + Severe drilling environments
- + Under-balanced drilling with aerated fluids
- + Geothermal
- + Relief well and re-entry
- + Magnetic ranging
- + Steam assisted gravity drainage (SAGD)
- + Enhanced gyroMWD drilling

Based on the Falcon X platform, Scientific Drilling's Falcon X Fire MP MWD is a high-temperature, high-speed, ruggedized Mud Pulse MWD system with a maximum temperature rating of up to 350°F (177°C).

Falcon X Fire MP system parameters are fully field-programmable, yielding predictable performance and delivering speeds up to 5 bps in the world's harshest drilling environments, including extreme LCM and high-temperature conditions.



### DELIVERING THE ULTIMATE VALUE

- + Supports BHA sizes 3.125" to 9.5"
- + Capable of 50-1500 GPM flow rates
- + Can achieve data rates up to 3 bps
- + Pressure rated to 30,000 psi
- + Bi-directional mud pulse telemetry
- + Industry standard

### TARGET APPLICATIONS

- + High-temperature environments
- + Geothermal drilling
- + Directional/horizontal drilling
- + Magnetic ranging
- + Steam assisted gravity drainage (SAGD)

# DEEP EM RECEIVER

WIRELINE ELECTROMAGNETIC ANTENNA

Deployed via wireline, Scientific Drilling's Deep EM Receiver detects and collects EM signal transmission in areas that are subject to electromagnetic resistance.

The Deep EM Receiver can be placed below EM absorbing formations to receive EM transmissions, significantly increasing usable depth for EM MWD systems.



## DELIVERING THE ULTIMATE VALUE

- + Dramatically increases depth for EM MWD systems
- + Allows EM operation in areas that block/absorb EM fields
- + High data rate sampling for improved log density
- + Reliably receives EM signal through resistive zones
- + Simplified deployment in existing wells
- + Depth adjustable for multiple zone use

Powered by Scientific Drilling's proven north-seeking spinning mass Keeper Gyro, the Keeper gyroMWD system delivers drilling confidence by enabling precision surveying even in the presence of magnetic interference.

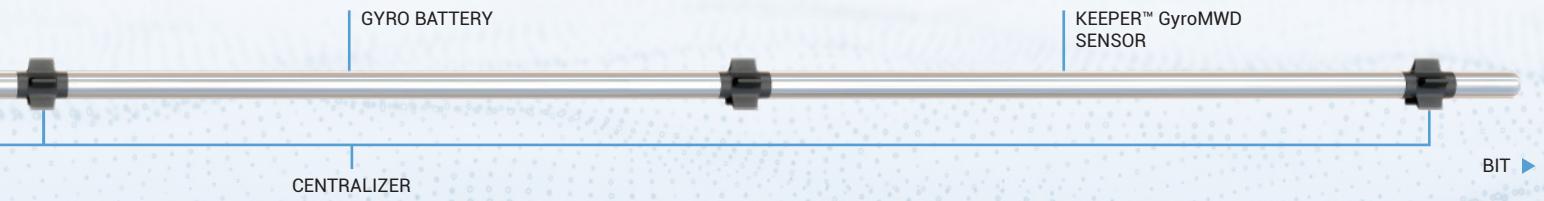
Available as an integrated module within our directional partner's MWD systems or utilizing SDI's proven telemetry, Keeper gyroMWD provides preventative measures for collision avoidance.



## DELIVERING THE ULTIMATE VALUE

- + Enables high-accuracy surveying in multi-well environments with real-time true gyro tool face
- + Provides seamless compatibility with existing MWD and RSS in top hole sections
- + Allows continuous gyro tool face while sliding
- + Enables operational efficiency through flexibility of BHA configurations
- + Reduces cost and time by eliminating the requirement for wireline orientation and survey check-shot runs

SDI's Keeper gyroMWD systems provide a robust and dependable while-drilling solution, adaptable to a multitude of drilling environments and backed by over twenty years of industry use and acceptance.

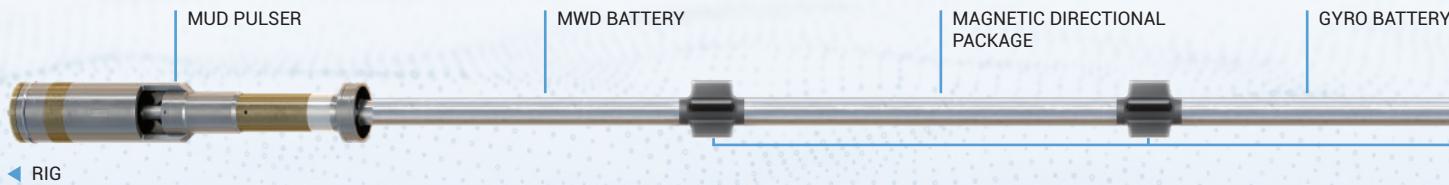


## TARGET APPLICATIONS

- + Collision avoidance
- + Close proximity drilling
- + Magnetic ranging
- + Gross error detection
- + Reduced error ellipse
- + Offshore and onshore drilling
- + Multi-well and pad drilling
- + Congested fields and platforms
- + Batch drilling
- + Riserless top hole drilling
- + Magnetic interference zones
- + Whipstock orientation & kickoff
- + In-fill drilling

URSA is Scientific Drilling's state of the art high-angle solid-state gyroMWD sensor. Built using SDI's proprietary solid-state gyro sensors, URSA gyroMWD redefines survey accuracy with an optimized system built on experience.

A robust and ruggedized system, named for its association with one of humanity's most historic navigational aids, URSA represents strength and resilience.



### DELIVERING THE ULTIMATE VALUE

- + Ruggedized sensor package and robust QA
- + Enables high-accuracy surveying in multi-well environments with real-time true gyro tool face
- + Provides seamless compatibility with existing MWD and RSS in top hole sections
- + Allows continuous gyro tool face while sliding
- + Enables operational efficiency through flexibility of BHA configurations
- + Reduces cost and time by eliminating the requirement for wireline orientation and survey check-shot runs

Available in a range of configurations as an integrated module within our directional partner's MWD systems or utilizing SDI telemetry, with service packages ranging from complete to ZeroPOB, URSA gyroMWD enables the ultimate flexibility in precision wellbore placement whilst delivering industry-leading angle capability.



## TARGET APPLICATIONS

+ Collision avoidance	+ Reduced error ellipse	+ Riserless top hole drilling
+ Close proximity drilling	+ Offshore and onshore drilling	+ Magnetic interference zones
+ Magnetic ranging	+ Multi-well and pad drilling	+ Whipstock orientation & kickoff
+ High-angle directional wells	+ Congested fields and platforms	+ Extreme environments
+ Gross error detection	+ Batch drilling	

# FLEXIBLE TOOL CONFIGURATIONS

## GAMMA RAY SOLUTIONS

- + **Sci-Gamma**  
API Natural Gamma Ray
- + **Sci-Gain**  
API Radial Gamma & Inclination
- + **Azi-Gain**  
Azimuthal Gamma & Inclination
- + **BitSub**  
At-bit AziGamma & Inclination
- + **Smart Motor**  
Mandrel Integrated BitSub

## RESISTIVITY SOLUTIONS

- + **Propagation Resistivity**  
Single Frequency - Dual Spacing  
Qualitative Measurement
- + **Wave Propagation - WPR**  
Dual Frequency - Dual Spacing  
Quantitative Measurement

## PRESSURE SOLUTIONS

- + **Pressure While Drilling**  
Annular and Pipe Pressure

## UNCONVENTIONAL LOGGING

- + **ULT**  
Spectral Azimuthal Gamma Ray  
Ultrasonic Imager  
Azimuthal Sonic  
Inclination & Vibration

## gyroMWD SOLUTIONS

- + **URSA Standalone gyroMWD**  
High-angle Solid-State gyroMWD
- + **Keeper Standalone gyroMWD**  
Spinning mass gyroMWD

## ROTARY STEERABLE SYSTEMS

- + **HALO RSS**  
High-performance Rotary Steerable System
- + **BabelFish**  
SLB Orbit & NeoSteer

Multiple RSS Integrations



Scientific Drilling

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