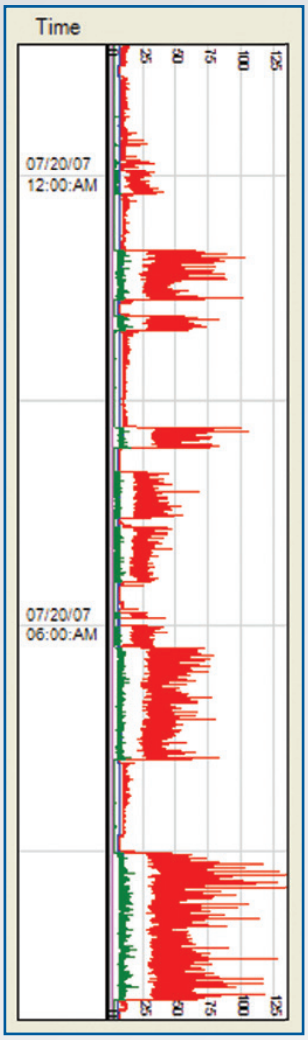
SureShot™ Vibration Memory Module (VMM™)

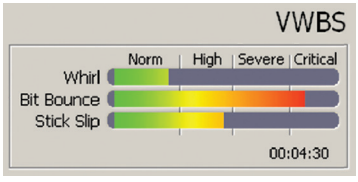
SureShot-VMM

APS's VMM™ is a software-enabled extension to our SureShot MWD tool that measures, analyzes, records and enables real time transmission of axial (bit bounce), lateral and torsional (stick-slip, chatter and whirl) vibrations and shocks. VMM allows users to assess the severity of downhole drilling to improve drilling efficiency and alert them to vibration conditions that could damage MWD and other downhole tools. The real time and memory data can be correlated to drilling events and equipment performance to improve drilling efficiency or prevent failures. The real time and memory data can also provide evidence for use in warranty claim resolution. Real time, memory and surface sensor data can be viewed with the SureShot VMM Viewer, plotted with APSPlot™ and exported in industry-standard formats (WITS and LAS).



Axial/Lateral Vibration vs. Time. Helps staff identify problem combinations of weight-on-bit, RPM and rock formation in post-run memory analysis.

Features	Advantages	Benefits
Software option in SureShot Control Center (SSCC™)	Vibration monitoring service can be easily added	Reduced operating cost and increased service flexibility
Configurable vibration level update times	Regular notification of vibration levels; increases awareness of downhole drilling conditions	Allows optimization of drilling parameters for ROP maximization
Real time vibration level alerts	Notify rig personnel of severe vibration conditions	Modify drilling parameters before damaging equipment
Real time and memory vibration data	Evaluation of vibration data and drilling parameters to optimize drilling efficiency	Improved drilling efficiency
Vibration data export via SSCC	Vibration data can be shared with other packages or transmitted to customer's office	Vibration can be easily integrated with other wellsite services and data can be transmitted quickly to decision makers



SSCC's Real Time Vibration Alert Window

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Product Specifications

Measurement	
Measurement Devices	Three ±120 *g* accelerometers, in APS MWD Controller Chassis 3-axis fluxgate magnetometer, in D&I Module
Data Sampling Rate	Accelerometers – 100 samples/s max. Magnetometers – 100 samples/s max.
Real Time Telemetry	Configurable at rig site
Vibration Memory Size	Up to 32 MB
Memory Recording	Average and peak data stored on configurable intervals; event-driven bursts of configurable lengths recorded when configurable thresholds are crossed
Data Recorded:	
Max. Lateral Vibration	0 to 169.7 *g*
RMS Lateral Vibration	0 to 169.7 *g*
Max. Axial Vibration	0 to 120 *g*
RMS Axial Vibration	0 to 120 *g*
Torsional Vibration	±314 rad/s (±18,000 deg/s)
Memory Dump	Connect to sonde at surface to program and dump memory

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

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