

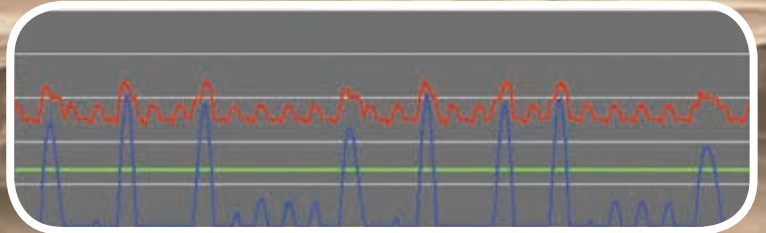
KEYDRILL MICROPROCESSOR UNIT (MPU)



MPU

Overview:

KeyDrill's Microprocessor Unit (MPU) module is a drop-in replacement for the current Tensor-Compatible MPU board. The MPU provides all the traditional functions, but adds useful features such as shock/vibration levels and RPM data for downhole monitoring. The RPM downlink feature provides a more reliable and flexible option to the traditional pressure downlink method, which is also included. All types of information can be recorded on the 16MB's of onboard flash memory, including survey, toolface, temperature, shock/vibration, RPM and gamma. Realtime rotation detection and rotation sequences can maximize the transfer speed of some desired data. KeyDrill's MPU also provides raw data (Ax, Ay, Az and Mx, My and Mz) to 6 decimals for more accurate survey data calculation and sleep modes for optimal battery efficiency.



Specifications:

Input Voltage:..... 5 Volts

Dimension: 7-9/16"L x 1-1/4"W x 5/8"H

Shock: 1000 G, 0.5 mSec, half sine all axes

Vibration: 5-30 Hz, 1 inch double amplitude,
30-1000 Hz, 20 G all axes

Operating Temperature: -40° to 175°C

Rotation Flag (RotF) and Rotation Sequence (RSq)

KeyDrill's MPU module has a rotation flag and rotation sequences which allow transfer of the different sequences of data in slide mode and in rotation mode. In Slide Mode (RotF==False), drillers need more toolface data in TSq and MWD tools can be set to transmit more toolface data to meet the customers' requirements. In rotation mode (RotF==True), drillers need more gamma or resistivity data. The MWD tool will automatically switch to transmit rotation sequences (RSq) that include more Gamma or Vibration/Shock data.

Real-Time Rotation Detection (RTRD)

RTRD can detect the real-time rotation status and automatically switches the sequence between TSq and RSq, based on the status without need for "RotF". Data is delivered in real-time to increase the rate of penetration.

Rotation and Sliding Mode Inclination (RInc)

RInc shows the real-time inclination information of the MWD tool while drilling (Rotating or Sliding). KeyDrill's new technology can improve the RInc measurement reliability and accuracy although strong shock and vibration can still affect its measurement accuracy. The information provided allows for monitoring of the well trajectory for verification that drilling is proceeding according to the well plan.

Sleep Mode

There are two sleep modes available, Tool Sleep Mode (TSM) and Data Sleep Mode (DSM), which allow the MPU to turn off the pulser, saving power during transportation or other stages. TSM allows the customer to assemble their MWD tools in the shop without worrying about battery usage during transport. It will turn on the tool whenever the tool's inclination becomes less than 30° or its RPM is greater than the rotation high threshold. DSM can be achieved by using zero parameters in its data sequence (TSq or RSq). Our real-time rotation detection feature enables the tool to wake up when the tool starts or stops rotation.

Faster Raw Data Transform Format

The MPU supports a faster raw data scaled transform format in addition to the float point format. This raw data format in 12-bits can achieve the same resolution as 16-bit float point. Using the raw data scaled format can save as much as 25% of raw data transfer time.

36 Generic Variables

The MPU is an open system and supports 36 generic variables (GV0~9, GVA~Z) allowing for more sensors to be attached to our MWD tools.

ReSync Control (ReSy)

The Resync function in MPU resends sync pulses and sequence headers whenever a new sequence begins. It provides special value for drilling in lost circulation and underbalanced drilling conditions.

Rotation Downlink

Rotation downlink capability has been added, using the same command format as the pressure downlink for ease of implementation. The hard connection between the drill pipe and the MWD tool makes the rotational downlink much more accurate and reliable than pressure downlinking.

Rotation Simulation Mode (SimM)

The Surface Rotation Simulation function in MPU simulates tool rotation and makes testing the tool on the surface more convenient. The simulation includes Rotation flag simulation and rotation speed (RPM) simulation. The range of RPM simulation is 0-200.