

Model 1151

Natural Gamma Vibration Sensor



Datasheet



Features

- Digital Interface
- High Sensitivity Crystal
- Photomultiplier Tube Design
- Two Gamma Outputs
 - API calibrated count pulse output
 - Q-Bus Output via GV0 (General Variable Zero)
- Extensive Vibration Statistics output
- Available via GV0 – 7

Applications

- Evaluate downhole strata, in drilling and logging applications
- Evaluate downhole vibration and shock magnitudes.
- Function in high shock and vibration environments

Description

The Model 1151 Natural Gamma Sensor is designed to measure the background gamma radiation occurring in well bores. This sensor is used to detect the presence of porous petroleum reservoirs (e.g., sands and lime stones), which are generally less radioactive than non-porous strata (e.g., shales).

The 1151 Natural Gamma Vibration Sensor can be used as either a stand-alone system or together with the Model 1150 Directional Sensor. To achieve high gamma sensitivity, a 1-inch diameter by 5.75-inch long scintillation crystal is used to detect gamma rays. Two gamma outputs are present in the Model 1151: 1) TTL Level negative going count pulse, and 2) Q-bus output (counts per second) via the use of general variable (GV0). The count output is generated by the system microprocessor, enabling this output to be API calibrated.

One advantage of using the Q-bus to collect gamma data is that it avoids using the gamma count pulse channel, which is sometimes subject to noise (e.g., from the pulse line in Tensor MWD Systems), resulting in high erroneous count rates. The 1151 vibration data is collected at 200 samples/second over 20 seconds (total of 4000 samples) and is analyzed to produce the following Q-bus data using general variables GV0 – GV7:

- GV0: Gamma
- GV2 and GV5: Axial and transverse highest bin number (1 – 5) with greater than 5% of counts
- GV3 and GV6: Axial and transverse maximum vibration measurement during the sampling period
- GV7: Temp °C

The 1151 Sensor also has a digital serial com interface (TTL level) that can be used to retrieve gamma and vibration data. This interface can be configured to respond to external commands requesting data or can be configured to auto send data. Both binary and ASCII data transfer protocols can be used to retrieve data from the digital serial interface.

Model 1151 Specifications

Scintillation Crystal
1" dia. X 5.75" long mounted in Stainless Steel Case
Photomultiplier Tube
Hamamatsu Model R1288
Sensitivity (in a 1 7/8" Beryllium Copper pressure barrel)
1 Count per API (user calibratable)
Accuracy
± 5%
Thin Bed Resolution (8" hole diameter)
6" (236 mm)
Temperature Range
Operating: 0 to 150°C, Storage: -25° to +160°C
Power
+15V @ 40mA, +30V @ 20mA
Physical
Size: 1.375" dia x 15.5" long, Weight: 1.5 lbs
Shock
1000 G 1ms half sine wave
Vibration (random)
10 G rms, 50-250Hz
Count Interface
Pulse ~1 microsecond long at gamma count — TTL 5V to 0V
Digital Interface
Logic Level: TTL / CMOS, Baud Rate: User Programmable, up to 9600 Baud Protocol: User Selectable, ASCII or Binary
Connectors
Main Connector: MDM15PH003P (ITT Cannon) or Kentec 10 pin Mating Connector: MDM15SH003L (ITT Cannon) or Kentec 10 pin

1. Additional Information

The Model 1151 Tensor Gamma Module & Vibration Module are drop in sensors that can be added to the current Tensor MWD tool, enabling the transmission of real time shock and vibration data. The Model 1151 Gamma & Vibration Module incorporates its own microprocessor, and since it is a smart sensor, it communicates directly with the processor in the Directional Module. The GE Tensor Directional Module will need the GVD8 variable enabled in the system memory. This will allow the system to record the data in the DM Memory for a higher resolution table of all gamma & vibration data.

Model 1151 QBus Parameters (Node 29 on Qtalk)

G#	List of all parameters	
Ga	Axial Threshold (APS Lab Use Only)	3
Gf	Firmware version	1.8c
Gg	Gamma Acquisition Period	20
Gp	Vibration Acquisition Period	20
Gs	Gamma Scaling	0.05
Gt	Transverse Threshold (APS Lab Use Only)	8
Gx	Total updates time (1 second increments)	17
Gz	QBUS Quiet Mode 1=off 0=on	

Read Example- G#?
Write Example- Ga=3

Model 1151 QBus Tx Values

GV0	Gamma
GV1	NA
GV2	Axial Vibration Severity
GV3	Axial Max for Acquisition Period
GV4	NA
GV5	Transverse Vibration Severity
GV6	Transverse Max for Acquisition Period
GV7	Gamma Temp C

About the Measurements

Lookup Table — The Model 1151 QBus Gamma utilizes a lookup table to record and calculate all of the shock and vibration data. The tool records shock and vibration at a rate of 200 samples/second. The default recording period is 20 seconds (4000 samples).

Vibration Severity — Allows the operator to transmit a compressed 3 bit variable that indicated the level on vibration the tool is seeing down hole. The scale is 1 to 5 (1 being no vibration, 5 being extreme vibration). Normal drilling will be 2's with an occasional 3.

Max Vibration — The firmware monitors the lookup table and transmits the highest measurement recorded during the acquisition period. The processor then transmits a number from 0 to 50 G's.

Bits to Transmit		Format		Real Time Resolution	
GV0	0-255 CPS	GV0:u8	Gamma	1 CPS Resolution	
GV0	0-255 CPS	GV0:u9.-1	Gamma	.5 CPS Resolution	
GV0	0-255 CPS	GV0:u10.-2	Gamma	.25 CPS Resolution	
GV0	0-511 CPS	GV0:u9	Gamma	1 CPS Resolution	
GV0	0-511 CPS	GV0:u10.-1	Gamma	.5 CPS Resolution	
GV0	0-1023 CPS	GV0:u10	Gamma	1 CPS Resolution	
GV0	0-1023 CPS	GV0:u11.-1	Gamma	.5 CPS Resolution	
GV2	1-5	GV2:u3	Axial Vibe Severity		
GV3	0-50G's	GV3:u6	Axial Max Vibe	.78 Count Resolution	
GV3	0-50G's	GV3:u4.2	Axial Max Vibe	3.13 Count Resolution	
GV5	1-5	GV5:u3	Lateral Vibe Severity		
GV6	0-50G's	GV6:u6	Lateral Max Vibe	.78 Count Resolution	
GV6	0-50G's	GV6:u4.2	Lateral Max Vibe	3.13 Count Resolution	
GV7	0-150 Degrees C	GV7:u8	Temp		

Toolface Logging Sequence Example

3{aTFA:6:P;Gama:9} GV2:u3 aTFA:6:P GV5:u3 Gama:9 Bat2 aTFA:6:P BatV:8:P 3{aTFA:6:P;Gama:9} Temp:8:P GV2:u3 aTFA:6:P GV5:u3 aTFA:6:P Gama:9