Modbus® Vibrating Wire Interface

Applications

The Model 8960-01C Interface enables vibrating wire sensors to send data to equipment that is normally incapable of reading such sensors, including…

- **Field PCs**
- **Desktop PCs**
- **PLCs**

Model 8960-01C Vibrating Wire Interface, shown as connected to the Model 4500S Standard Piezometer.

Operating Principle

Vibrating wire sensors are well known for their long-term stability. The advantage of vibrating wire sensors over more conventional types lies mainly in the sensor output, which is a frequency rather than a voltage, and which can be transmitted over long (> 2000 m) cables without appreciable degradation of the signal caused by variations in cable resistance, which can arise from water penetration, temperature fluctuations, contact resistance or leakage to ground. This factor, coupled with the elegance and ruggedness of **GEOKON®** designs results in sensors which exhibit excellent long-term stability and which are ideally suited for long-term measurements in adverse environments.

The Model 8960-01C Vibrating Wire Interface expands upon the abovementioned features by incorporating state of the art signal conditioning and digital addressing to enables vibrating wire sensors to send data to equipment that normally would be incapable of interfacing with a VW sensor.

When fitted with the Model 8960-01C Interface, the VW sensor is queried via industry standard **Modbus** Remote Terminal Unit (RTU) protocol over a simple half-duplex RS-485 connection. The VW sensor is excited and measured by the interface, and the digitized measurement is then sent back to the **Modbus** RTU over the RS-485 bus.

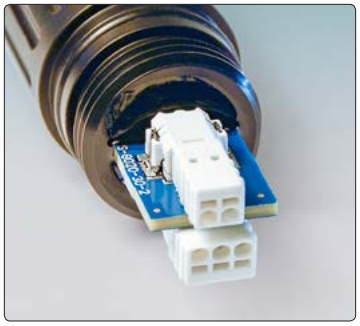
It will automatically detect any resonant frequency between 400 and 5,000 Hz. There are no settings for sensor type. The maximum time between sending a trigger and data availability is approximately 370 milliseconds.

Communications & Control

The **GEOKON** Model 8960-01C uses the industry standard **Modbus** Remote Terminal Unit (RTU) protocol to communicate. As the name suggests, **Modbus** was designed to work on what is known as a bused network, meaning that every device receives every message which passes across the network. The **Modbus** standard does not specify a physical layer (connection type), but it will work with any interface that can communicate asynchronously with multiple devices (e.g., RS-485, RS-422, optical, radio, etc.). The Model 8960-01C uses the RS-485 electrical interface because of its prevalence, simplicity, and success as a robust, industrial physical layer.

The **Modbus** RTU protocol uses packets (messages made up of multiple sections) to communicate and transfer data between devices on the network.

Modbus tables (maps) define the memory locations within each 8960-01C interface and what information they contain.



● *Close-up showing Connector Assembly.*

● *Model 8020-38 Addressable Bus Converter.*

GEOKON makes the Model 8020-38 Addressable Bus Converter for connecting addressable sensor strings to personal computers, readouts, data loggers, and programmable logic controllers. The converter acts as a bridge using the TTL or USB protocols between readers and the **GEOKON** RS-485-enabled sensor strings. (Please see the **GEOKON** Model 8020-38 Addressable Bus Converter data sheet.)

Campbell Scientific's CR1000, CR800 and CR6 dataloggers can easily read the Model 8960-01C Interface.

Summary

The **GEOKON** Model 8960-01C Interface efficiently allows vibrating wire sensors to use the **Modbus** communication protocol to transmit data over serial lines between electronic devices.

More information about **Modbus** can be found at the following website: http://www.modbus.org/specs.php

TTL to RS-485 Wiring Chart

String Cable Conductor Color	TTL to RS-485 Converter	Description
Red	12 V (OUT)	Thermistor String Power
White	485+	RS-485+ Communication
Green	485–	RS-485– Communication
Black	GND	Ground
Shield	GND	Analog Ground

USB to RS-485 Wiring Chart

String Cable Conductor Color	USB to RS-485 Converter	Description
Red	+5 V	5 volt power to the string
White	485+	RS-485+ Communication
Green	485–	RS-485– Communication
Black	GND	Ground
Shield	GND	Analog Ground

Technical Specifications

Power Supply	5 VDC to 15 VDC (12 V nominal)
Current Per Sensor	1.2 mA (idle)
Maximum Current	35 mA (180Ω VW Coil), 57 mA (50Ω VW Coil)
Interface	RS-485, Half-duplex (two-wire differential)
Protocol	**Modbus** RTU
Baud Rate	115,200 bits/second
Frequency Range	400 Hz to 5,000 Hz
Frequency Trueness	0.082 Hz
Frequency Precision	0.146 Hz (99% Confidence Interval)
Frequency Resolution	> 0.002 Hz
Frequency Measurement Duration	< 370 ms
Thermistor Range	–20 °C to +80 °C
Thermistor Accuracy	±1% (25 °C thermistor point match)
Temperature Resolution	10-bit, non-linear, 0.6 °C (worst case at –40 °C)
Cable	4 conductor, 2 twisted pairs, 6.35 mm (±0.25 mm) diameter
Operating Temperature	–40 °C to +80 °C
L × Ø (Housing)	100 × 25 mm

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