

Dataloggers and Peripherals

Applications

The Model 8600 Series Dataloggers are ideally suited for remote, unattended monitoring of a variety of sensors in geotechnical, hydrologic, meteorologic and oceanographic fields. Applications include...

- Dam monitoring
- Tunnel and underground excavation monitoring
- Structural monitoring
- Water and stream levels
- Pump tests
- In-Place Inclinator readout
- Alarm actuation



• Model 8600-2 Datalogger.



• Model 8600-1 Datalogger (right) and the Model 8032 16 Channel Multiplexer (left).

Compatibility and Reliability

The Model 8600 Series Dataloggers are designed around the Campbell Scientific, Inc. (CSI) Model CR6 Measurement and Control System. Although primarily manufactured for use with vibrating wire sensors and thermistors, the Model 8600 Series can be configured, at **GEOKON**'s factory, to read MEMS sensors, Carlson type sensors, voltage type sensors, 4-20 ma sensors, and numerous other specialty sensor types.

The Model 8600-1 and 8600-2 Dataloggers are housed in a NEMA 4X fiberglass reinforced polyester enclosure, designed for use in harsh environments with wide temperature tolerance, resistance to moisture and humidity and protection against lightning damage.

Capacity and Memory

The Model 8600-1 has ports to connect up to 6 external multiplexers (Model 8032) and can read up to 96 vibrating wire sensors and 96 thermistors or, optionally, up to 256 two-wire sensors. The Model 8600-2 incorporates an integral Model 8032 Multiplexer for reading 16 vibrating wire sensors and 16 thermistors or up to 32 two-wire sensors. Where additional capacity is required it is possible to connect up to eight multiplexers, in a "daisy-chained" fashion, to each multiplexer input port on the datalogger

Standard memory storage capacity for the Model 8600 Series is 4 MB of battery-backed SRAM. Also included is a Micro SD card drive for extended memory requirements.

Communications and Control

The Model 8600 Series are designed for use with **Windows**® based computers with a USB port. Communication is accomplished by a direct connection with the datalogger, or via RS-485 or Ethernet interfaces. Additional communication methods are available, such as: Short Haul Modems, Landline Telephone Modems, Cellular Modems, Radio Modems, and Satellite.

The Model 8600 Series have 4 Control (C) ports that can be used for switch closure, pulse counting, high frequency and RS-232/RS-485/SDI-12/TTL communications

Power

The Model 8600 Series are powered by an internal 12 V, 7.0 Ah Gel Cell that is maintained by an external regulated, AC powered, waterproof (IP67) charger (supplied). Alternatively, a larger external battery, or a solar panel, can be connected to provide power to the system (please contact **GEOKON** for details).

Model 8032 | Multiplexer (MUX)

Applications

The Model 8032 Multiplexer expands the number of channels that can be read by the Model 8600 Series Dataloggers.



● Model 8032-25 Multiplexer, with manual switch option.



● Model 8032 Multiplexer (MUX).

Summary

The Model 8032 Multiplexer consists of an integral terminal board and multiplexer board, with mechanical relays, to allow switching of the gage connections in the Model 8600 Series Datalogger systems.

Two configurations are supported; 16 channels of 4 conductors or 32 channels of 2 conductors. Each channel is protected by an integrated lightning protection system to protect against lightning or EMI/RFI induced transients. Optional manual switches permit manual measurements using a portable readout in tandem with those taken automatically with the datalogger.

The Model 8032 is housed in a Nema 4X weather-proof enclosure, with appropriately sized cable entries, for use with the Model 8600-1. The Model 8600-2 incorporates the 8032 Multiplexer board within its own enclosure. The Model 8032 is a low-power device that can be located at a considerable distance from the datalogger. However, there are distance limits, under normal operating conditions, mostly due to the voltage drop in by the connecting cable over its length, which affects the control signals.

Model 8600-3 | Wireless Datalogger

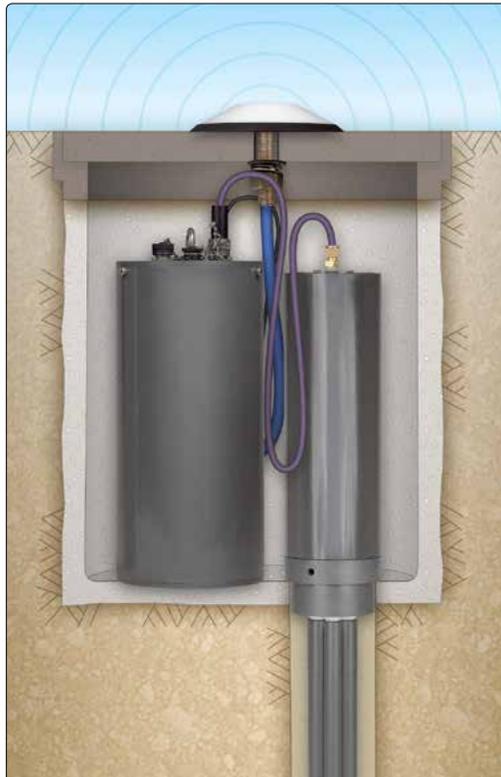
Applications

The Model 8600-3 is a wireless datalogger designed to transmit data from buried sensors installed in inaccessible locations. Applications include...

- Borehole Extensometers
- In-Place Inclinometers
- Multilevel Piezometers



● Model 8600-3 Datalogger and Model 1150 (A-3) Extensometer (right).



● Model 8600-3 Datalogger and Model 1150 (A-3) Extensometer in manhole, with manhole lid antenna.

Summary

The Model 8600-3 Datalogger is housed in a rugged, water-resistant PVC enclosure (stainless steel and fully waterproof enclosures are also available) together with a battery pack (for unattended operation) and an integral Spread Spectrum Radio (for wireless data transmission). It is configured to read either 6 channels of 4 conductor sensors or 12 channels of 2 conductor sensors, typically through a large multi-pair cable. The Model 8600-3 is typically installed in a recessed manhole, containing the instrumentation to be monitored together with a flush mounted manhole lid type antenna.

The integral Spread Spectrum Radio communicates to a local base station (or hub) where a transceiver routes the data to a PC or to a modem for onward transmission to a remote PC. Spread Spectrum Radios spread the normally narrow band information signal over a relatively wide range of frequencies thus allowing the communication to be more immune to noise and interference from RF sources such as pagers and cellular phones.

Model 8040 | Wireless Vibrating Wire Interface

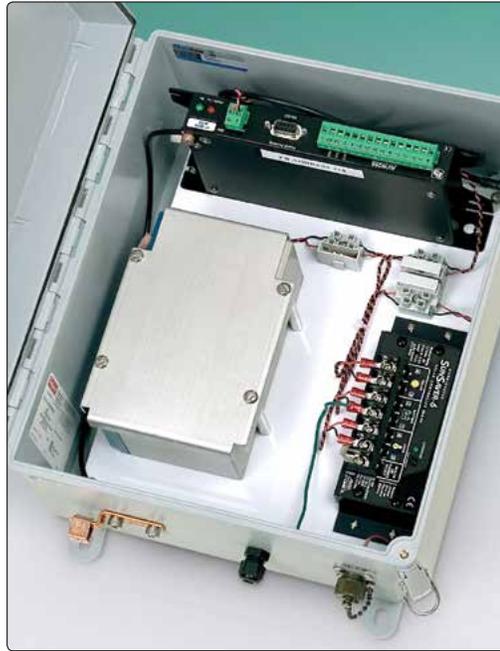
Applications

The Model 8040 is ideally suited for wireless data transmission with the Model 8600 Series Dataloggers. Applications include...

- Excavations
- Pump Tests
- Landfills
- Dams
- Structural monitoring



• Model 8040T configured to read a Model 4500 Vibrating Wire Piezometer.



• Model 8040 2-Channel Wireless Vibrating Wire Interface Module.

Summary

The 8040 Series Wireless Vibrating Wire Interface is designed to expand the data collection possibilities of the Model 8600 Series Dataloggers* and are particularly suitable where systems are deployed over wide areas eliminating the need for running lengthy cables and/or where construction activity may render the use of conventional hard-wired systems impractical.

Available for 2, 4, 16 or 32 sensors (VW plus thermistor), the 8040 Wireless Vibrating Wire Interface comprises Campbell Scientific's AWW206 (or AWW216) spectrum analyzer (with built-in 900 MHz radio transmitter: consult **GEOKON** for 2.4 GHz option), power supply, and antenna and, like the Model 8600 Series, is housed in a rugged NEMA 4X enclosure. The 2 and 4 channel versions are also available in enclosures which are designed for installations in manholes containing the instrumentation to be monitored (Model 8040T-2/4)

The power supply for the Model 8040 is generally provided by a 12 V lead acid battery, rechargeable by solar panels or AC mains, and by four 17 Ah lithium D cells in the 8040T. The Model 8040 commonly uses a whip antenna for data transmission, but high gain Yagi and Omnidirectional antennae are also available. The 8040T is typically supplied with a manhole lid antenna which allows for installations in roads, runways or other situations where a flush mounted system is required.

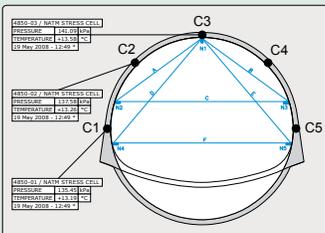
Wireless data transmission, from the Model 8040 to the Model 8600 Series Dataloggers* is capable over distances up to several miles and relies on Line-Of-Sight (LOS). Where LOS is restricted, or where signals are required to go around corners (as may be found in urban environments), Repeater Stations can be incorporated.

**Requires an optional radio base station (with requisite antenna) built into the Model 8600 Series Dataloggers.*

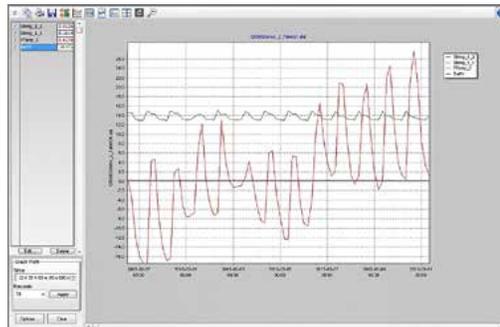
LoggerNet® and Vista Data Vision (VDV) Software

Applications

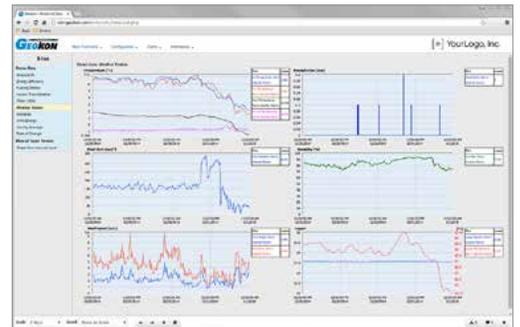
For programming, data retrieval and data visualization.



• VDV screen shot showing sensor locations and data on an engineering drawing.



• Typical graph as shown using LoggerNet.®



• Vista Data Vision data overview page (6 graphs per page).

Software

Windows® based **LoggerNet®** software provides the user with complete control over the datalogger by allowing the user to create the program which is executed by the datalogger. Vista Data Vision (VDV) software provides

a complete data management package for the previously collected data. VDV also provides the means for browsing, reporting and publishing data to the Internet

Technical Specifications

| Dataloggers | 8600-1 | 8600-2 | 8600-3 |
|------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Analog Inputs | 12 single-ended or 6 differential with ± 5000 mV, ± 1000 mV, ± 200 mV ranges 24 bit ADC | 12 single-ended or 6 differential with ± 5000 mV, ± 1000 mV, ± 200 mV ranges 24 bit ADC | 12 single-ended or 6 differential with ± 5000 mV, ± 1000 mV, ± 200 mV ranges 24 bit ADC |
| Analog Outputs | ± 2.5 V or ± 2.5 mA ranges 12 bit DAC | ± 2.5 V or ± 2.5 mA ranges 12 bit DAC | ± 2.5 V or ± 2.5 mA ranges 12 bit DAC |
| Accuracy | $\pm(0.04\%$ of reading + 2 microvolts), 0-40°C | $\pm(0.04\%$ of reading + 2 microvolts), 0-40°C | $\pm(0.04\%$ of reading + 2 microvolts), 0-40°C |
| Resolution | 50 nV (± 200 mV range, differential measurement, input reversal, 5 Hz f_{N1}) | 50 nV (± 200 mV range, differential measurement, input reversal, 5 Hz f_{N1}) | 50 nV (± 200 mV range, differential measurement, input reversal, 5 Hz f_{N1}) |
| Static Frequency-Analyzed Vibrating Wire | 12 V p-p 100-6000 Hz (Spectral analysis technique) | 12 V p-p 100-6000 Hz (Spectral analysis technique) | 12 V p-p 100-6000 Hz (Spectral analysis technique) |
| Accuracy | $\pm 0.013\%$ of reading | $\pm 0.013\%$ of reading | $\pm 0.013\%$ of reading |
| Resolution | 0.001 Hz RMS | 0.001 Hz RMS | 0.001 Hz RMS |
| Thermistor Accuracy | $\pm 0.25\%$ of reading | $\pm 0.25\%$ of reading | $\pm 0.25\%$ of reading |
| Temperature Range | -40° to +70°C | -40° to +70°C | -40° to +70°C |
| Battery | 12 V, 7 Ah Gel Cell | 12 V, 7 Ah Gel Cell | 4 x D-cell (Li 8.5 Ah) |
| L x W x H | 392 x 352 x 161 mm | 502 x 461 x 263 mm | Please consult GEOKON, INCORPORATED . |

| Multiplexer | 8032 | Wireless Multiplexer | 8040 |
|-----------------------|--------------------|----------------------|-------------------------------------------------------------|
| Switching Current | 1 A (max) | Input Range | 100-6500 Hz (vw); ± 2500 mV (th) |
| Contact Resistance | 0.1 ohm (max) | Resolution | 0.001 Hz RMS (vw); 0.001 ohm RMS (th) |
| Insulation Resistance | > 1 G ohm | Accuracy | $\pm 0.013\%$ of reading (vw); $\pm 0.25\%$ of reading (th) |
| Switch Life | > 200,000 cycles | Battery | 12 V, 7 Ah Gel Cell |
| Temperature Range | -40° to +60°C | Temperature Range | -25° to +50°C |
| L x W x H | 318 x 277 x 159 mm | L x W x H | Please consult GEOKON, INCORPORATED . |

| Radio Modem | 8600-3 | Radio Modem, Vibrating Wire Analyzer | 8040 |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operating Frequency | RF401A: 910 to 918 MHz; RF411A: 920 to 928 MHz; RF416: 2.45 to 2.46 GHz* | Operating Frequency | AVW206: 910 to 918 MHz; AVW211: 920 to 928 MHz; AVW216: 2.450 to 2.482 GHz* |
| Type | Frequency Hopping Spread Spectrum | Type | Frequency Hopping Spread Spectrum |
| I/O Data Rate | 38.4 K; 19.2 K; 9600, 4800 or 1200 bps | Baud Rates | 1200 bps to 38.4 kbps (selectable) |
| Tx Power Output | RF401A and RF411A: 100 mW nominal; RF416: 50 mW nominal | Tx Power Output | AVW206 and AVW211: 250 mW nominal; AVW216: 50 mW nominal |
| Power Requirements | 9 to 16 VDC | Power Requirements | 9.6 to 32 VDC |
| Average Current Drain | Standby: < 1 mA; RX: 24 mA (RF401A and RF411A); 36 mA (RF416); TX: < 75 mA (RF401A and RF411A); 75 mA (RF416) | Typical Current Drain (@ 12 VDC) | Quiescent, Radio Off: ~ 0.3 mA Radio Duty Cycling 1 s: ~ 3 mA Radio always on: ~ 26 mA Active RS-232 communication: ~ 6 mA Measurement: ~ 25 mA |
| Temperature Range | -25° to +50°C | Temperature Range (Standard) | -25° to +50°C |
| L x W x H | 111 x 69 x 27 mm (RF401A and RF411A); 114 x 70 x 29 mm (RF416) | L x W x H | 216 x 112 x 32 mm |

*Please consult **GEOKON, INCORPORATED** (not available in Europe).

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