GEONET WIRELESS MESH DATA ACQUISITION SYSTEM

GEOKON®

MODEL 8800, 8900 SERIES



The GeoNet Wireless Mesh Data Acquisition System: a typical network configuration of Data Loggers, a Cellular Gateway and Cloud integration with secure data access

APPLICATIONS

Typical applications include:

- Groundwater monitoring
- Tailings dams
- Mining/slope stability
- Structural monitoring of buildings, bridges, excavations and tunnels
- Historical structures

INTRODUCTION

The GeoNet Wireless Mesh Data Acquisition system consists of a Gateway and subordinate Wireless Mesh Data Loggers that transmit data collected from the connected sensors.

The Gateway controls the network and is the aggregator of all the data collected by the system. Cellular and Wi-Fi gateways transfer the collected data to the GEOKON Cloud data storage platform, where it is securely stored and can be viewed in GEOKON Agent Software or exported to a third-party software platform through the Open API. A Local Gateway is also available for applications where the data is to remain local or a third-party modem or ethernet connection is desired.

The system is compatible with most manufacturers' Vibrating Wire instruments and GEOKON addressable sensor strings (MEMS, VW, and thermistor). Sensor cables are connected through cable glands or 10-pin bulkhead connectors.
Tilt Data Loggers, which combine the functionality of a biaxial tiltmeter and a GeoNet Data Logger, are also available.

Rechargeable versions of the data loggers, with lithium ion batteries, are available for use with solar panels.

Model 8960 Digital Vibrating Wire interfaces can be connected to GeoNet Multi-Channel and Addressable Data Loggers to expand the capacity of the data logger. Multiple interfaces can be used to bus the data to a single data logger. The bus limit is 32 units or 64 Channels. Refer to the Model 8960 data sheet for more information.

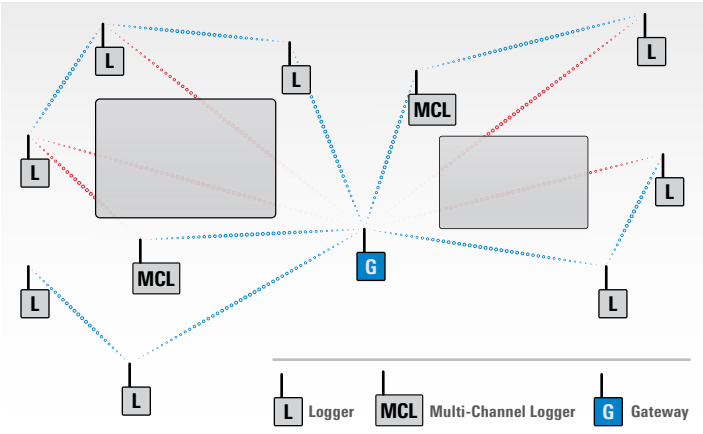
COMMUNICATIONS

The GeoNet Mesh network operates as a self-healing network which will reconfigure itself to accommodate disturbances to the physical environment or changes to the network configuration. The system topology can take advantage of mesh, star, or cluster tree configurations to optimize the data path from the data loggers to the gateway.

The data loggers wake from sleep to collect and/or transmit data to the gateway and then return to sleep when finished to conserve battery life. Data loggers that get separated from the network will continue to collect and store data autonomously until network connectivity is re-established at which time the data will be transmitted to the gateway. Each data logger retains a copy of its data after transmission to the gateway.

Configuration of the network and collection and transmission of data is accomplished by using the GEOKON API (api.geokon.com) when using a cellular or Wi-Fi gateway or by using Agent Software for a local gateway.

Up to 12 networks can exist within radio range of one another by setting each to a different operating channel.



Mesh Topology

NETWORK SPECIFICATIONS

Topology	Star/Mesh/Cluster Tree (Auto)
Radio Technology	FHSS
Radio Frequency, ISM Band	902–928 MHz (North America) 915–928 MHz (Australia, Chile, Peru) 863–870 MHz (Europe) 902–906, 915–928 MHz (Brazil)
Channels	12
Range[1]	8900 (North America, Brazil): Up to 60 km (15 km × 4 hops) 8900 (Europe): Up to 22 km (5.5 km × 4 hops) 8800 (All): Up to 26 km (6.5 km × 4 hops)
Transmit Power	8900 (North America, Brazil): 1 W 8900 (Europe): 20 mW 8800 (All): 250 mW
Receiver Sensitivity	8900: –106 dBm 8800: –101 dBm
Antenna (Half-Wave Dipole)	2.1 dBi (North America, Brazil) 1.6 dBi (Europe)

[1]Outdoor, clear line-of-Sight, maximum 4 hops.

GATEWAY SPECIFICATIONS

Data Memory	32 MB
Storage Capacity	> 1.04 M Arrays
Direct Connection Type	USB, RS-232
Communication Speed	115.2 kBits/second
Communication Parameters	8, N, 1 (data bits, parity, stop bits)
Data Transmission Interval	Min: 10 minutes; Max: 1 day
USB Driver	FTDI
Power Supply	Cellular/Wi-Fi Gateway: 3.7V 6,600 mAh Internal Lithium Battery Pack, or 9-24V External Local Gateway: D Cell, Alkaline or Lithium (2×), or 12V External
Battery Life	Please contact GEOKON
Operating Temperature [1]	–40° C to +85° C (range varies by power source)
Enclosure	Die-cast aluminum 160 × 260 × 91 mm (Cellular/Wi-Fi Gateway) 120 × 122 × 91 mm (Local Gateway)

[1] Internal lithium battery will not charge below 0° C

ADDRESSABLE DATA LOGGER SPECIFICATIONS

Data memory	32 MB
Storage Capacity	Varies by sensor sting connected
MEMS Sensors Limits per Power Supply	D cell batteries: 32 External Lead Acid Battery: 62
Communication Protocol	RS-485 Modbus
Thermistor Accuracy	1% (0.5° C thermistor point match)
Thermistor Resolution	0.032° C
Scan Interval	Min: 10 minutes; Max: 1 day
Power Supply	2x D cell, Alkaline or Lithium, 12V Auxiliary
Operating Temperature	–40° C to +85° C (range varies by power source)
Battery Life	Refer to Battery Life section
Enclosure	Die-cast aluminum 120 × 122 × 91 mm

WI-FI SPECIFICATIONS

Protocol	IEEE 802.11 b/g/n IEEE 802.11 d
Band Support	Station Mode: 2.4 GHz, Channel 1–13 Access Point Mode: 2.4 GHz, Channel 1–11

VIBRATING WIRE DATA LOGGER SPECIFICATIONS

Data memory	32 MB
Storage Capacity	Varies by model
Trueness	0.082 Hz
Frequency Precision	±0.146 Hz (99% CI)
Frequency Resolution	±0.002 Hz
Thermistor Accuracy	1% (0.5° C thermistor point match)
Thermistor Resolution	0.032° C
Scan Interval	Min: 10 minutes; Max: 1 day
Power Supply	2x D cell, Alkaline or Lithium, 12V Auxiliary CHG models: 3.7V 6,600 mAh Internal Lithium Battery Pack
Operating Temperature	–40° C to +85° C (range varies by power source)
VW Frequency Range	400–6500 Hz
Battery Life	Refer to Battery Life section
Enclosure	Die-cast aluminum 120 × 122 × 91 mm (single-channel) 160 × 260 × 91 mm (four-channel) 180 × 280 × 101 mm (eight-channel)

TILT DATA LOGGER SPECIFICATIONS

Range[1]	±90°
Resolution[2]	0.00025° (0.004 mm/m)
Precision[3]	±0.0075° (±0.13 mm/m)
Nonlinearity	±0.005° across ±30° range (±0.09 mm/m)
Temperature Dependent Uncertainty	±0.001° across ±5° range (±0.016 mm/m) ±0.0016° across ±15° range (±0.026 mm/m) ±0.0026° across ±30° range (±0.042 mm/m)
Axis	2
Data Memory	32 MB
Storage Capacity	500,000 readings
Thermistor Accuracy	1% (0.5° C thermistor point match)
Thermistor Resolution	0.032° C
Scan Interval	Min: 10 minutes; Max: 1 day
Power Supply	2x D cell, Alkaline or Lithium, 12V Auxiliary
Operating Temperature	–40° C to +65° C (range varies by power source)
Battery Life	Refer to Battery Life section
Enclosure	Die-cast aluminum 120 × 122 × 91 mm

[1] Calibrated Range: ±30°
[2] 99% confidence interval (i.e. 99 out of 100 individual readings fall within this tolerance).
[3] Includes random walk (changes between consecutive readings that have no discernible cause) and seismic noise during testing.

BATTERY LIFE

Battery life is affected by the quantity and physical configuration of the data loggers, along with weather conditions and the radio environment (as related to retries).

Data Loggers that are the only communication link between other data loggers and the gateway will have a shorter battery life than those that have no routing responsibility.

ORDERING INFORMATION

Example Part Number for a Data Logger: 8901-NA-01C-CBL-CHG

MODEL/REGION:
8901-NA: North America
8901-BZ: Brazil
8903-EU: Europe
8800-AU: Australia
8800-CL: Chile
8800-PE: Peru

DATA LOGGER TYPE:
01C: Single-Channel VW
ADR: Addressable
04C: Four-Channel VW
08C: Eight-Channel VW
TLT: Tilt

SENSOR CONNECTION:
CBL: Cable Gland
10P: 10-Pin
NAP: No Access Point

BATTERY TYPE:
CHG: Optional Rechargeable Battery

Example Part Number for a Gateway: 8901-NA-LTM-USB

MODEL/REGION:
8901-NA: North America
8901-BZ: Brazil
8903-EU: Europe
8800-AU: Australia
8800-CL: Chile
8800-PE: Peru

GATEWAY TYPE:
LTM: Cellular (for LTE-M networks)
WFI: Wi-Fi
SUP: Local

PC CONNECTION:
USB: USB cable
232: RS-232 cable

Note: Not all models available in all areas

ACCESSORIES

8900-SOL-10W-BRJ: GeoNet Series Solar Panel, 10W, unregulated. For use with GeoNet Cellular and Wi-Fi Gateways.
BAT-111: Alkaline D size battery
BAT-202: Lithium D size battery, 17 Ah
CHG-11: AC Charger for Cellular and Wi-Fi Gateways.
COM-169: USB 2.0 A Male to C Male Cable
COM-108: Patch Cord for RS-232 Local Gateways.
8001-7: USB to RS-232 Converter
SUP-514: Desiccant pack, 10 grams
8800-7: External 12V battery conversion cable, 3 m length, bare leads. For use with GeoNet Mesh Data Loggers and Local Gateways.
8800-7V: As above, customer-specified cable length.
8800-7B: External 12V battery conversion cable, 3 m length, barrel jack connector. For use with GeoNet Cellular and Wi-Fi Gateways.
8800-7BV: As above, customer-specified cable length.
8020-7-1: Solar Panel, 20W, regulated. For use with 12V battery. Includes side-of-pole mounts, charge controller, and 4.5 m interconnect cable with battery clips.
8800-2-4A: Cellular modem module for GeoNet Local Gateways. (For customer supplied modems.)
8800-2-4B: Ethernet module for GeoNet Local Gateways
8020-7-2: Solar Panel, 20W, regulated. For use with Model 8800-2-4 Cellular/ Ethernet modules.

AVAILABLE MODELS



Single-Channel VW Data Logger
Four-Channel VW Data Logger
Eight-Channel VW Data Logger
Addressable Data Logger
Tilt Data Logger
Local Gateway
Cellular Gateway

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GEOKON
48 Spencer Street
Lebanon, NH 03766 • USA

www.geokon.com
e: teamsales@geokon.com
p: +1 · 603 · 448 · 1562

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