Model 8920/8930

GeoNet Network Loggers and Data Hosting System

Instruction Manual

Wi-Fi Addressable Logger

GeoNet 8930 Series

Secure Wi-Fi® Connection

GEOKON® Server + OpenAPI

Wi-Fi Tilt Logger

GeoNet 8930 Series

GEOKON® GeoNet 8930 Series Wi-Fi VW Logger (8-Channel)

Secure data access via Vista Data Vision or GEOKON AGENT Software

GEOKON®

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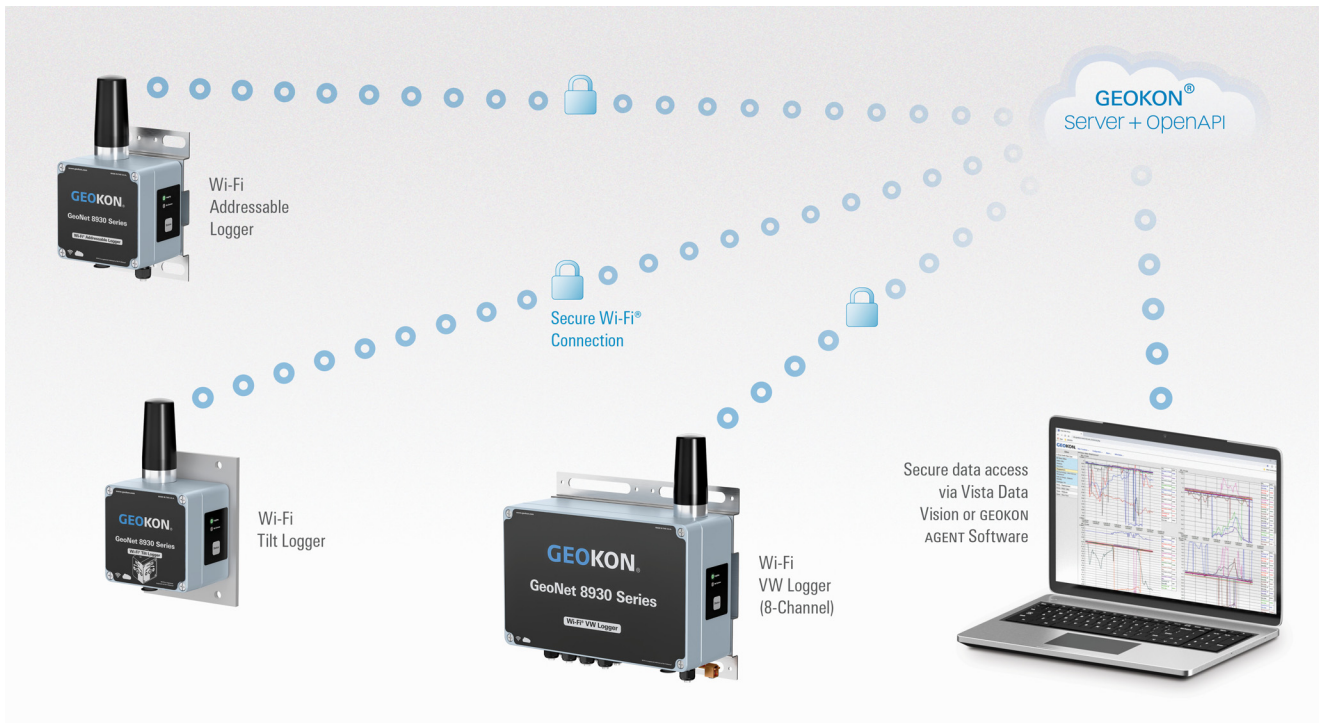
WARRANTY STATEMENT

GEOKON warrants its products to be free of defects in materials and work-manship, under normal use and service for a period of 13 months from date of purchase. If the unit should malfunction, it must be returned to the factory for evaluation, freight prepaid. Upon examination by GEOKON, if the unit is found to be defective, it will be repaired or replaced at no charge. However, the WARRANTY IS VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion or current, heat, moisture or vibration, improper specification, misapplication, misuse or other operating conditions outside of GEOKON's control. Components that wear or are damaged by misuse are not warranted. This includes fuses and batteries.

GEOKON manufactures scientific instruments whose misuse is potentially dangerous. The instruments are intended to be installed and used only by qualified personnel. There are no warranties except as stated herein. There are no other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and of fitness for a particular purpose. GEOKON is not responsible for any damages or losses caused to other equipment, whether direct, indirect, incidental, special or consequential which the purchaser may experience as a result of the installation or use of the product. The buyer's sole remedy for any breach of this agreement by GEOKON or any breach of any warranty by GEOKON shall not exceed the purchase price paid by the purchaser to GEOKON for the unit or units, or equipment directly affected by such breach. Under no circumstances will GEOKON reimburse the claimant for loss incurred in removing and/or reinstalling equipment.

Every precaution for accuracy has been taken in the preparation of manuals and/or software, however, GEOKON neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages or losses that result from the use of the products in accordance with the information contained in the manual or software.

- ■ Product Modifications:

  Modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment

- ■ RF Exposure Compliance:

  This equipment complies with FCC radio frequency radiation exposure rules and limits set forth for an uncontrolled environment, when installed and operated with a minimum distance of 20 cm between its radiating structures (antenna) and the body of nearby persons and when not operated simultaneously with other nearby radio transmitters

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1. INTRODUCTION

GEOKON Model 8920 and 8930 Series Loggers offer a high-value data collection option for all GEOKON Vibrating Wire (VW) instruments and digital sensor (MEMS IPI and VW) strings. Each logger is ready to be installed from the factory and acquires data in minutes.

Sensor data is collected and transferred by the network to a secure cloud-based storage platform where it can be accessed through the GEOKON open API. Data visualization software, such as Vista Data Vision, or the free GEOKON Agent program can be used with the open API for data viewing and reporting. Commissioning, billing, and configuration are accomplished using the GEOKON API Portal. The portal allows users to activate loggers, change settings, configure sensor channels, and view current logger status. The API Portal can be found at https://api.geokon.com and the GEOKON Agent program can be downloaded at https://www.geokon.com/software.

FEATURES:

■ Automated data connection to servers

■ Automated calculation of engineering units using the Web API integration with the GEOKON database with VDV or third-party software

■ USB connector for firmware updates, diagnostics, and more

1.1 MODEL NUMBERS

Example Part Number: 8920-LTM-01C-CBL

MODEL:
8920: Cellular
8930: Wi-Fi
CELLULAR NETWORK (Omit for 8930 Models):
LTM: LTE-M
03G: 3G
LOGGER TYPE:
01C: Vibrating Wire
04C: 4-Channel Vibrating Wire
08C: 8-Channel Vibrating Wire
ADR: Addressable
TLT: Tilt
SENSOR CONNECTION:
CBL: Cable Gland
NAP: Not Applicable

1.2 8920 MODEL LIST

8920-LTM-01C-CBL	Single-Channel Logger, LTE-M, Cable Gland
8920-LTM-04C-CBL	Four-Channel Logger, LTE-M, Cable Gland
8920-LTM-08C-CBL	Eight-Channel Logger, LTE-M, Cable Gland
8920-LMT-ADR-CBL	Addressable Logger, LTE-M, Cable Gland
8920-LTM-TLT-NAP	Tilt Logger, LTE-M, Not Applicable
8920-03G-01C-CBL	Single-Channel Logger, 3G, Cable Gland
8920-03G-04C-CBL	Four-Channel Logger, 3G, Cable Gland
8920-03G-08C-CBL	Eight-Channel Logger, 3G, Cable Gland
8920-03G-ADR-CBL	Addressable Logger, 3G, Cable Gland
8920-03G-TLT-NAP	Tilt Logger, 3G, Not Applicable

TABLE 1: *GeoNet 8920 Series Model List*

1.3 8930 MODEL LIST

8930-01C-CBL	Single-Channel WIFI Logger
8930-04C-CBL	Four-Channel WIFI Logger
8930-08C-CBL	Eight-Channel WIFI Logger
8930-ADR-CBL	Addressable WIFI Logger
8930-TLT-NAP	Tilt WIFI Logger

TABLE 2: *GeoNet 8930 Series Model List*

2. COMPONENTS

2.1 VIBRATING WIRE (VW) LOGGERS

Model 8920 and 8930 series Loggers read up to eight GEOKON VW gauges, two GEOKON VW load cells, or a combination using cables with stripped conductor wires. (Capacity varies by model.)

Note: 8930 models not shown

2.1.1 SINGLE-CHANNEL LOGGER (8920-XX-01C-CBL)

FIGURE 1: Single-Channel Logger (8920-XX-01C-CBL)

2.1.2 FOUR-CHANNEL LOGGER (8920-XX-04C-CBL)

FIGURE 2: Four-Channel Logger (8920-XX-04C-CBL)

Four-channel logger configurations:

Model	Maximum Number of Gauges	Maximum Number of Load Cells
8920-XX-04C-CBL	Four	One 3-gauge **or** one 4-gauge load cell

TABLE 3: Four-Channel Logger Gauge/Load Limits

2.1.3 EIGHT-CHANNEL LOGGER (8920-XX-08C-CBL)

FIGURE 3: *Eight-Channel Logger (8920-XX-08C-CBL)*

Eight-channel logger configurations:

Model	Maximum Number of Gauges	Maximum Number of Load Cells
8920-XX-08C-CBL	Eight	One 3-gauge **and** one 4-gauge load cell Two 3-gauge **or** two 4-gauge load cells One 6-gauge load cell

TABLE 4: *Eight-Channel Logger Gauge/Load Limits*

2.2 ADDRESSABLE LOGGER (8920-XX-ADR-CBL)

The addressable logger is compatible with Model 6180 Vertical In-Place Inclinometer, Model 3810 Addressable Thermistor Strings, and Model 8960 Vibrating Wire interface.

FIGURE 4: *Addressable Logger (8920-XX-ADR-CBL)*

2.3 TILT LOGGER (8920-XX-ADR-CBL)

Tiltmeters are designed for permanent long-term monitoring of changes in tilt of structures such as dams, embankments, foundation walls, retaining walls, and buildings.

GEOKON biaxial tiltmeter loggers contain an integrated tiltmeter sensor, and communicate with the gateway in the same way as other loggers.

The two axes of the tiltmeter have a calibrated range of ±30°, based on a starting position of 0° (antenna pointing up).

FIGURE 5: *Tilt Logger (8920-XX-TLT-NAP)*

2.4 ADDITIONAL INFORMATION

Model 8920 and 8930 loggers are protected from environmental contaminants by a rugged IP66 die cast aluminum enclosure. An earth ground terminal is provided on the exterior of the enclosure to protect against lightning and other large, transient voltages.

2.5 ANTENNA

Loggers are shipped with an omni-directional antenna. For other antenna options, please contact GEOKON technical support.

3. INSTALLATION

GEOKON recommends a component mounting height of at least two meters. Mounting a component lower than two meters may compromise performance; as a rule, higher is usually better.

Install the logger using the following steps:

1. Mount the logger. The attached mounting bracket is designed to be used with U-bolts, hose clamps, screws, etc. Mount all devices vertically, with the antenna pointing up.

2. Attach the antenna.

3. Attach a ground wire to the logger. See Section 7.

4. Connect the power supply (solar or mains adapter). See Appendix C.

5. Connect the sensors to the logger. Be sure to record which sensor serial number is connected to which channel. See Section 3.3.

6. Turn on the power by moving the switch to the correct position.

7. Check the logger status. See Section 3.4.

8. Insert desiccant into the logger.

9. Install the lid securely.

3.1 LOGGER BATTERY SWITCH

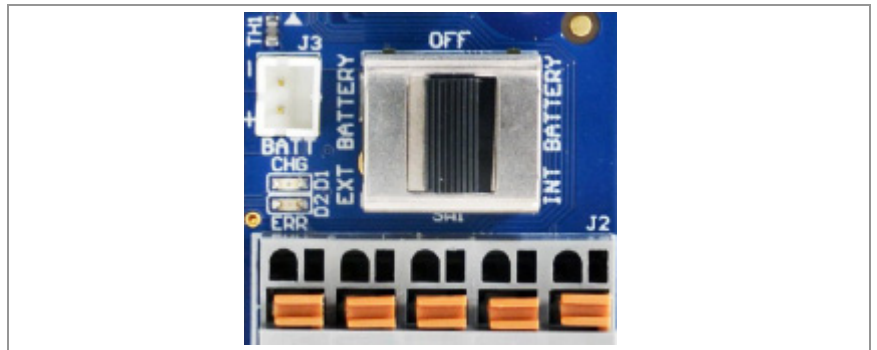| Power Source	Geographic Zone	
	Sub Polar	Temperate
Mains or solar with external battery	EXT BATTERY	INT BATTERY
Solar without external battery	N/A	

TABLE 6: Battery Switch

FIGURE 7: Battery Switch

3.2 GROUND THE LOGGERS

Install a grounding rod and cable, or other suitable ground, at a location near each device. Multi-channel loggers come equipped with a copper grounding lug to which you can connect the grounding cable. Other types of loggers ground using the mounting bracket.

3.3 CONNECT THE SENSORS TO THE LOGGERS

3.3.1 MAKING CABLE GLAND CONNECTIONS

To connect a device using a cable gland connection:

1. Loosen the nut on the cable fitting and remove the white plastic dowel.

2. Slide the transducer cable through the cable gland nut and fitting.

3. Wire each conductor into the terminal block by pressing down on an orange tab, inserting the bare end of the conductor into the terminal blocks, and then releasing the tab. Refer to the tables below for wiring information. *To prevent a short circuit, do not allow bare leads to touch each other during or after wiring*.

4. Pull gently on each conductor to make sure it is secure.

5. Tighten the cable gland nut until it firmly grips the outer jacket of the cable. The cable gland nut must be properly tightened to prevent water entry. *Do not over-tighten, because this might strip the plastic threads*.

6. Pull gently on the gauge cable to make sure it is held in place by the cable gland.

7. Repeat these steps for each gauge cable connection.

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Single/Multiple-Channel VW Loggers		
Position	**Color**	**Description**
VW+	RED	Vibrating Wire+
VW-	BLACK	Vibrating Wire-
TH+	WHITE	Thermistor+
TH-	GREEN	Thermistor-
SHD	BARE	Analog Ground (shield)

Addressable Loggers		
Position	**Color**	**Description**
485+	WHITE	RS-485 Data+
485-	GREEN	RS-485 Data-
12 V	RED	12 V Bus
GND	BLACK	Bus Ground
SHD	BARE	Analog Ground (shield)

***TABLE 8:** Logger wiring information*

3.3.2 RECORD LOGGER AND SENSOR SERIAL NUMBERS

■ Record the serial numbers of both the loggers and of the attached sensors.

■ Also record the channel to which each sensor has been connected.

The serial numbers are needed to correlate channels to sensors when commissioning the logger.

3.3.3 SEAL THE LOGGERS

1. Place the supplied desiccant packs inside the enclosure.

2. Make sure the cover gasket and the mating ridge on the enclosure are clean and that the gasket is properly seated inside the groove on the cover. Place the cover on the unit.

3. Tighten the cover screws slowly. If using an electric screwdriver, **Do not** fully tighten the screws. Instead, do the final tightening by hand. Work in a diagonal pattern.

3.4 STATUS BUTTON FUNCTIONALITY

All GeoNet devices have red and green LED indicators to display their status. Press the Status button, and the LEDs briefly display the logger status.

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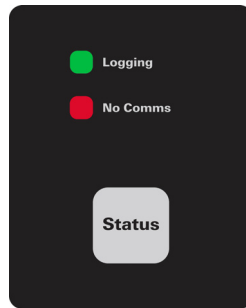
Logging LED	Comms LED	Indication
Green		Logging, good communications
Green	Red	Logging, no communications
	Red	Not logging, no communications

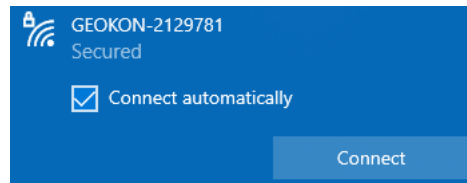## 3.5 CONNECT THE 8930 LOGGER TO A WIFI NETWORK

1. Turn on power to the 8930 GeoNet WiFi Logger.
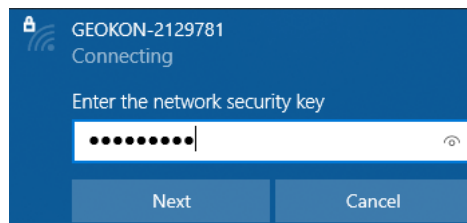
2. Select **Wi-Fi settings** in Windows.
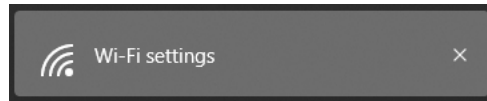
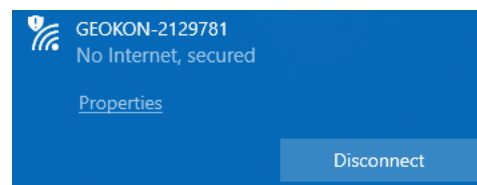3. Select **Show available networks**.

4. Select the network that starts with **GEOKON**, and then select the **Connect** button.

5. Type **i<3GeoNet** for the security key, and select the **Next** button.

The window updates to show that the connection was made.

6. Open a web browser such as Google Chrome, and enter **18.0.1.2** in the window, and then select the Enter key.

7. Enter the name of your network, and then select the **Submit** button.

8. Enter your network password, and then select the **Submit** button.

The following message is shown when the connection is complete.

3.5.1 SETTING A STATIC IP ADDRESS

A static IP address can be set in the portal under Wi-Fi Configuration.

3.6 LOGGER COMMISSIONING

Loggers are commissioned on the GEOKON API portal: https://api.geokon.com

A tutorial on using the API portal is available at: https://www.geokon.com/8900-Tutorials#API

4. MAINTENANCE

All GeoNet devices are designed to operate in field environments with minimal upkeep. To ensure maximum reliability and functionality, follow the basic maintenance procedures shown here.

4.1 PREVENTING WATER FROM ENTERING THE ENCLOSURES

GeoNet devices are designed to be splash proof and rain proof, but are not submersible.

⚠️ **GeoNet devices MUST be mounted vertically**

These units are sealed by a gasket preventing water entry, as long as the screws that hold the lid in place are properly tightened and the gasket inside the lid is properly aligned. It is also very important to ensure that all the cable fittings are securely tightened. Models that feature a 10-pin connector are equipped with a watertight cap, which must be installed when the connector is not in use.

Despite these precautions, the loggers may encounter leakage along the cable if the cable is cut, or if the unit is installed in an especially humid environment. In this type of environment, GEOKON recommends that the internal desiccant packs be replaced at intervals to prevent condensation from corroding or shorting out the internal electronics.

4.2 LIGHTNING PROTECTION

Each vibrating wire (VW) channel is protected by a 230V gas discharge tube, followed by a high-speed surge protector and a transient voltage suppression diode. Each thermistor (TH) channel is protected by a 230V gas discharge tube, followed by an inductor (lower resistance than high-speed surge protectors) and a transient voltage suppression diode.

For these components to safely divert lightning energy to ground, a solid electrical connection to earth ground is required. A copper grounding rod at least six feet in length should be driven into the soil to a minimum depth of three feet, as close to the device as possible. Alternatively, any other suitable earth ground attachment may be used. Connect the grounding rod to the copper grounding lug on the exterior of the device (if equipped) with a 12 AWG or larger wire. This will provide a path from the device to earth ground in the event of a lightning strike.

APPENDIX A.   SPECIFICATIONS

A.1 VW LOGGER SPECIFICATIONS
   (ALL 8920 and 8930 MODELS)

Data Memory	32 MB
Storage Capacity	Varies by model. Circular buffer.
Scan Interval	10-1440 Minutes
Power Supply	Mains power or solar
Operating Temperature	-40 °C to +85 °C
Dimensions (L × W × H)	Single-channel, addressable, tilt – 120 × 122 × 91 mm Four channel – 160 × 260 × 91 mm Eight channel– 180 × 280 × 101 mm

TABLE 10: *VW Logger Specifications*

A.2 VW LOGGER SPECIFICATIONS
   (MODELS ENDING IN 01C, 04C, 08C)

Trueness	0.082 Hz
Frequency Precision[1]	±0.146 Hz
Frequency Resolution	±0.002 Hz
Thermistor Accuracy	1% (0.5° C Thermistor point match)
Thermistor Resolution	0.032° C
VW Frequency Range	400-5000 Hz

TABLE 11: *VW Logger Specifications*

A.3 TILT LOGGER SPECIFICATIONS
   (MODELS ENDING IN TLT-NAP)

Precision[1,2]	±0.0075° (±0.13 mm/m)
Nonlinearity	±0.005° across ±30° range (±0.09 mm/m)
Temperature-Dependant Uncertainty	±0.019°/°C (±0.33 mm/m °C)
Resolution[2]	±0.00025° (±0.004 mm/m)
Range	±30°

TABLE 12: *Tilt Logger Specifications*

[1]Includes random walk (changes between consecutive readings that have no discernible cause) and seismic noise during testing.

[2]99% confidence interval (99 out of 100 individual readings fall within this tolerance.)

APPENDIX B.   TROUBLESHOOTING

The Troubleshooting GeoNet Networks, Agent Software Tutorial, and the GeoNet Troubleshooting Guide cover these topics, all of which are available at GEOKON's website https://www.geokon.com. Contact GEOKON if additional assistance is needed.

SYMPTOM: DATA PRESENT (E.G., BATTERY/SIGNAL STRENGTH) BUT NO VW GAUGE DATA AVAILABLE

☐ Verify that the gauge leads are wired correctly inside the logger. Refer to Section 3.3.1 and the gauge manual for wiring information.

☐ Check the gauge for proper operation with an independent readout, such as a GK-404, GK-405, or GK-406.

SYMPTOM: VW GAUGE READING IS UNSTABLE

☐ Move any sources of electrical noise away from the transducer cable, such as generators, motors, arc welding equipment, high voltage lines, etc.

SYMPTOM: THERMISTOR DISPLAY SHOWS -273.15 DEGREES C°

☐ This symptom indicates an open circuit to the thermistor leads. Verify a proper connection inside the logger. For wiring information, refer to Section 3.3.1 or the gauge manual.

☐ Check the thermistor for proper operation by using an ohmmeter to measure the resistance between the thermistor leads. Resistance should be between 10KΩ and 2.4KΩ when the ambient temperature is between 0 and +30 °C. Very high or infinite resistance may indicate cable damage, very low resistance may indicate a short between conductors.

SYMPTOM: NO LIGHTS WHEN PRESSED

☐ Make sure that a power source is connected to the logger.

☐ Make sure the power switch is not in the center (OFF) position

☐ Malfunction

SYMPTOM: GREEN LIGHT FLASHING ONCE PER SECOND

Bootloader is activated, complete the following:

1. Check whether any channel switches are in the ON position.

2. If channel switches were set to ON, set them to the OFF position and then press the blue reset button.

3. If the light is still flashing, a firmware update was interrupted. Update the firmware to the latest version. Firmware can be downloaded at https://www.geokon.com/Software (Instructions are included with the download)

SYMPTOM: GREEN AND RED LIGHT ALTERNATING

☐ Device malfunction, contact GEOKON

SYMPTOM: RED LIGHT

☐ Make sure the antenna is not obstructed

☐ Raise or otherwise elevate the mounting location

☐ Make sure the unit is activated in the API portal

APPENDIX C.   SOLAR PANEL KIT

The GEOKON Solar Panel Kit enables you to power a Logger in an area that has no access to mains / domestic power.

FIGURE 9: *Solar Panel 8900-SOL-10W-BRJ*

Inside the kit box are the following:

■   One envelope containing technical documents and instructions.

■   One mounting bracket.

■   One solar panel complete with power regulation circuitry and power cable.

FIGURE 10: *Solar Panel Kit Box Contents*

INSTALLATION OVERVIEW

The general installation steps are as follows:

1.   Select a location for the solar panel.

2.   Assemble and adjust the mounting bracket to the proper angle.

3.   Install the mounting bracket.

4.   Secure the solar panel to the mounting bracket.

5.   Connect the power cable to the Logger.

C.1 SELECT A LOCATION

Choose a location for the solar panel that is clear of obstructions and anything that might cast a shadow on the panel.

C.2 ASSEMBLE THE MOUNTING BRACKET

When assembling the two sections of the mounting bracket, be sure to set the sections to the desired angle before tightening the nuts. The angle of the mounting bracket will dictate the angle of the solar panel.

■ Ensure the angle is at least 10 degrees, to aid in water control.

■ In general, choose the best angle for the latitude of your location.

■ Mounting on a horizontal surface will require a reverse configuration of the two sections compared to mounting vertically. See the figure below.

Horizontal Mounting   Vertical Mounting
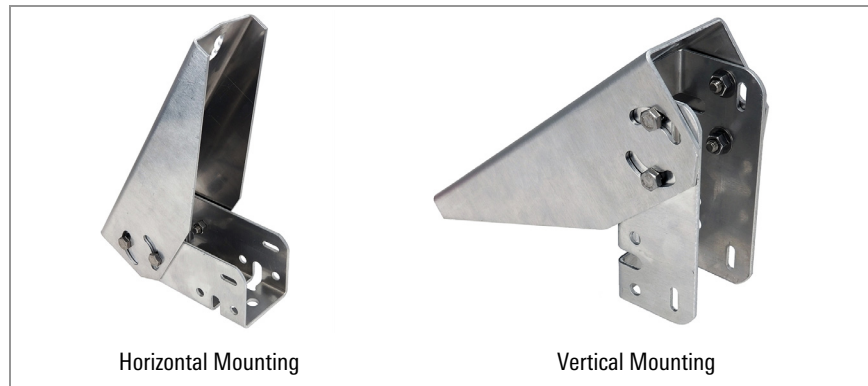
FIGURE 11: Mounting Options

C.3 INSTALL THE MOUNTING BRACKET

Mount the bracket on a flat surface (roof, wall, etc.) using locally-supplied bolts or lag screws. If mounting to a pole, use locally-supplied U-bolts and retaining clamps.

C.4 SECURE THE SOLAR PANEL TO THE MOUNTING BRACKET

Use the included nuts and screws to secure the solar panel to the mounting bracket. Use the centrally-located holes provided for this purpose on the back of the solar panel.

Note: Be sure to mount the solar panel with the cable coming out the bottom of the panel, as shown below.

Central Mounting Holes
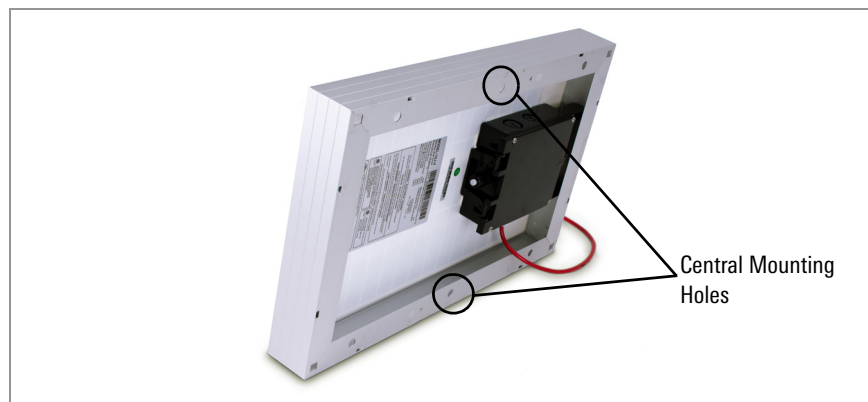
FIGURE 12: Centrally-Located Mounting Holes
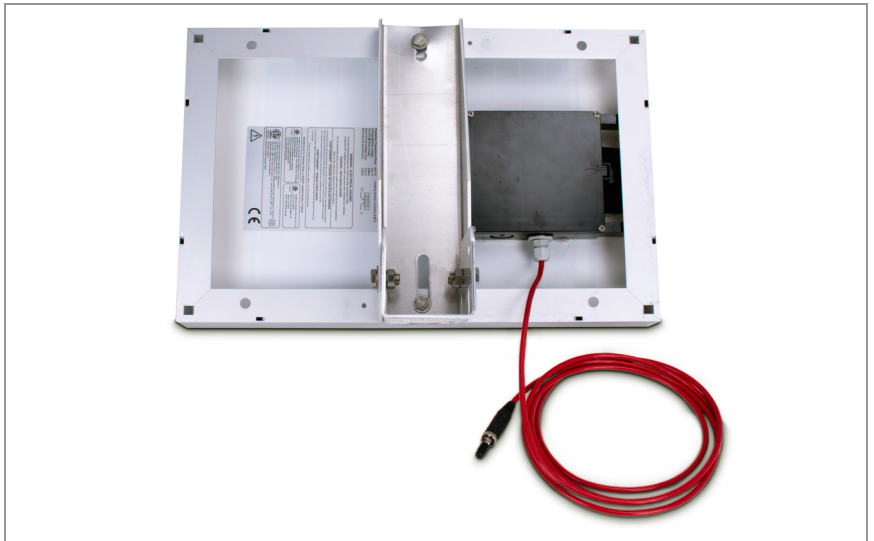
FIGURE 13: *Mounting Bracket Fastened Centrally*

C.5   CONNECT THE POWER CABLE

C.5.1 BATTERY SWITCH
Before connecting the power cable, be sure you have set the battery switch appropriately.

■   When not using an external battery, set the battery switch inside the Logger to the INT BATTERY setting.

■   When using an external battery between the solar panel and the Logger, set the battery switch inside the Logger to the EXT BATTERY setting.
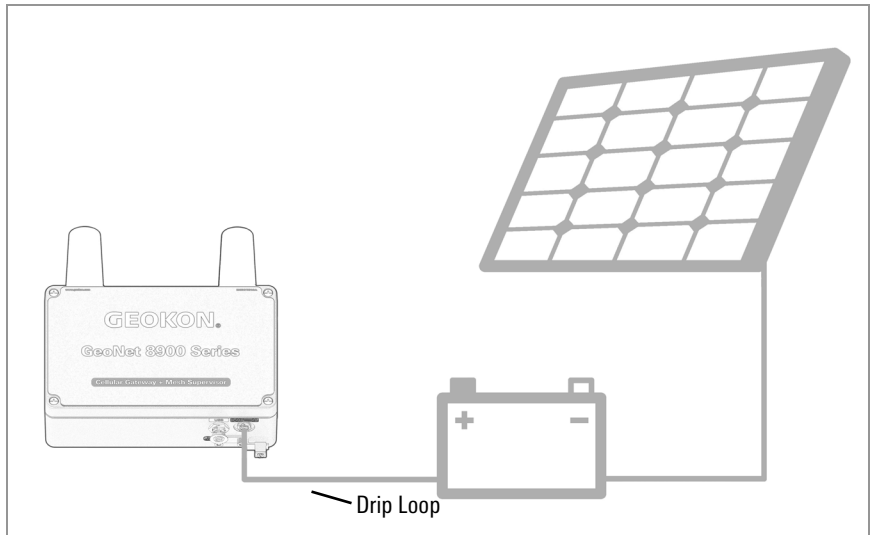
FIGURE 14: *Solar Panel with External Battery*

C.5.2 MAKING THE CONNECTION
Remove the plastic cap from the cable connector, then attach it to the EXT BATTERY plug on the Logger. Tighten the retaining ring on the EXT BATTERY plug, for strain relief.

Note: Be sure to implement a drip loop, as indicated in the previous figure, to prevent water ingress through the power connector.