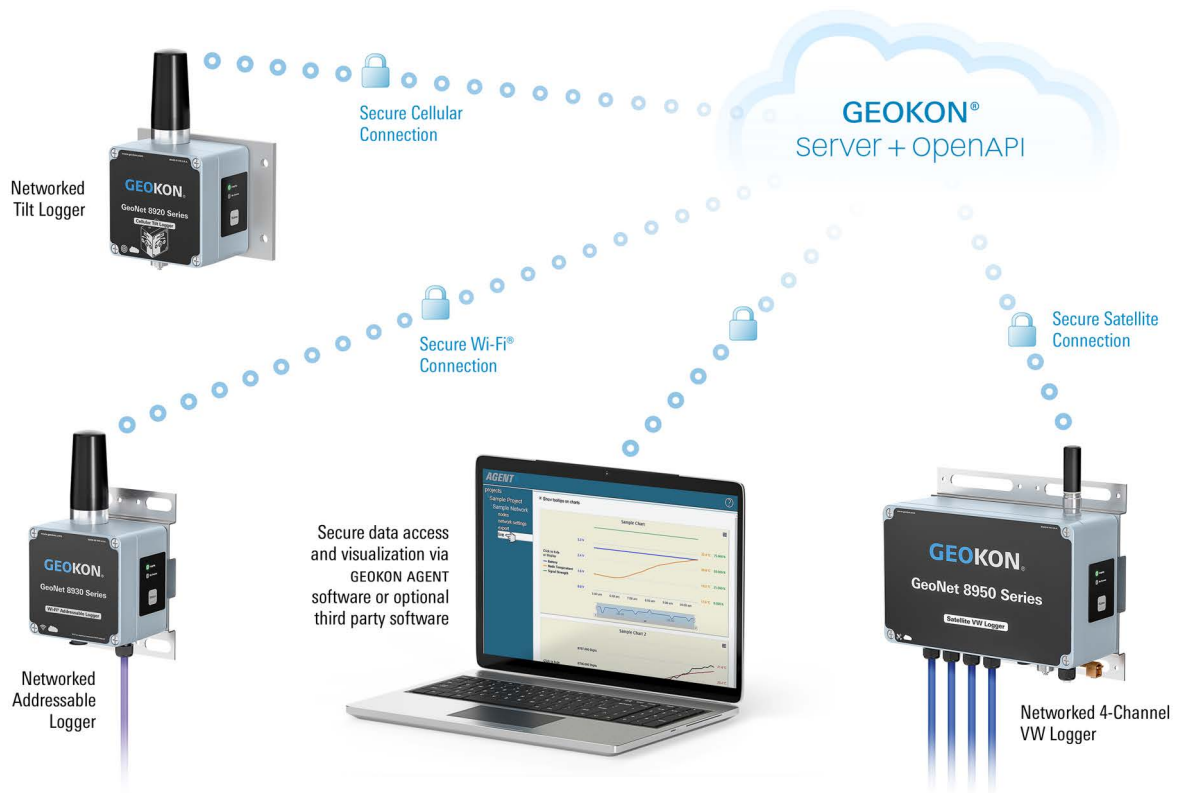


# Model Series 8920, 8930, 8950 GeoNet Network Loggers Instruction Manual





## **WARRANTY STATEMENT**

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GEOKON warrants its products to be free of defects in materials and workmanship, 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.

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# 1. INTRODUCTION

GEOKON Model 8920, 8930, and 8950 Series Loggers offer a high-value, networked data collection option for all GEOKON vibrating wire instruments and digital sensor (MEMS IPI and VW) strings. Each logger comes from the factory ready for deployment and may commence with data acquisition in minutes.

Tilt loggers are also available and combine the functionality of a biaxial tiltmeter and a Network Logger.

Sensor data is collected and transferred via a cellular, Wi-Fi, or satellite network to a secure cloud-based storage platform where it can be accessed through the GEOKON OpenAPI. Industry leading data visualization software, such as Vista Data Vision, or the free GEOKON Agent program can be used with the OpenAPI for data viewing and reporting. Commissioning, billing and configuration are accomplished via the easy-to-use 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 [api.geokon.com](https://api.geokon.com) and the GEOKON Agent program can be downloaded at [geokon.com/Software](https://geokon.com/Software).

Model 8960 Digital Vibrating Wire interfaces can be connected to GeoNet Multi-Channel and Addressable Loggers to expand the capacity of the logger. See Section 3.7.

## FEATURES:

- Automated data connection to servers
- Automated calculation of engineering units via Web API integration with the GEOKON database
- Rugged, die-cast aluminum enclosure with a pressure compensation vent to prevent condensation buildup in humid climates.
- USB connector for firmware updates, diagnostics, and more

## 1.1 8920 MODEL LIST

Model Number	Logger Type	Cellular Network	Sensor Cable Entry
8920-LTM-01C-CBL	Single-Channel Vibrating Wire	LTE-M	Cable Gland
8920-LTM-04C-CBL	Four-Channel Vibrating Wire		
8920-LTM-08C-CBL	Eight-Channel Vibrating Wire		
8920-LTM-ADR-CBL	Addressable		
8920-LTM-DHP-CBL	Digital High Power		
8920-LTM-TLT-NAP	Tilt		Not Applicable
8920-03G-01C-CBL	Single-Channel Vibrating Wire	3G	Cable Gland
8920-03G-04C-CBL	Four-Channel Vibrating Wire		
8920-03G-08C-CBL	Eight-Channel Vibrating Wire		
8920-03G-ADR-CBL	Addressable		
8920-03G-TLT-NAP	Tilt		Not Applicable

**TABLE 1:** List of Model 8920 Loggers



OpenAPI Portal



Software Resources

## 1.2 8930 MODEL LIST

Model Number	Logger Type	Network	Sensor Cable Entry
8930-01C-CBL	Single-Channel Vibrating Wire	Wi-Fi	Cable Gland
8930-04C-CBL	Four-Channel Vibrating Wire		
8930-08C-CBL	Eight-Channel Vibrating Wire		
8930-ADR-CBL	Addressable		
8930-TLT-NAP	Tilt		Not Applicable

**TABLE 2:** List of Model 8930 Loggers

## 1.3 8950 MODEL LIST

Model Number	Logger Type	Network	Sensor Cable Entry
8950-01C-CBL	Single-Channel Vibrating Wire	Satellite	Cable Gland
8950-04C-CBL	Four-Channel Vibrating Wire		
8950-08C-CBL	Eight-Channel Vibrating Wire		
8950-ADR-CBL	Addressable		
8950-TLT-NAP	Tilt		Not Applicable

**TABLE 3:** List of Model 8950 Loggers



## 2. COMPONENTS

### 2.1 VIBRATING WIRE (VW) LOGGERS

The Vibrating Wire Logger series read the quantity of gauges outlined below. Sensor cables are connected through a cable gland or a 10-pin bulkhead connector, depending on model.

#### 2.1.1 SINGLE-CHANNEL VIBRATING WIRE LOGGER

Single-channel loggers will read one GEOKON vibrating wire gauge.



**FIGURE 1:** Single-Channel Loggers: 8920 (Left), 8950 (Right), 8930 Not Shown

#### 2.1.2 FOUR-CHANNEL VIBRATING WIRE LOGGER

Four-channel loggers will read up to four GEOKON vibrating wire gauges.



**FIGURE 2:** Four-Channel Loggers: 8920 (Left), 8950 (Right), 8930 Not Shown

A four-channel logger can be configured as follows:

Maximum Number of Gauges	Maximum Number of Load Cells
Four	One 3-gauge <b>or</b> one 4-gauge load cell <i>Refer to Appendix H for load cell wiring tables</i>

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

2.1.3 EIGHT-CHANNEL VIBRATING WIRE LOGGER

Eight-channel loggers will read up to eight GEOKON vibrating wire gauges.



FIGURE 3: Eight-Channel Loggers: 8920 (Left), 8950 (Right), 8930 Not Shown

An eight-channel logger can be configured as follows:

Maximum Number of Gauges	Maximum Number of Load Cells
Eight	One 3-gauge <b>and</b> one 4-gauge load cell
	Two 3-gauge <b>or</b> two 4-gauge load cells
	One 6-gauge load cell
	Refer to Appendix H for load cell wiring tables

TABLE 5: Eight-Channel Logger Gauge/Load Limits

2.2 ADDRESSABLE (RS-485) LOGGER

Addressable loggers are compatible with GEOKON Digital Addressable MEMS products. Sensor cables are connected through a cable gland.



FIGURE 4: Addressable Loggers: 8920 (Left), 8950 (Right), 8930 Not Shown

## 2.3 TILT LOGGER

Tilt loggers contain an integrated tiltmeter sensor. The two axes of the tiltmeter have a range of  $\pm 90^\circ$  (the calibrated range is  $\pm 30^\circ$ ), based on a starting position of  $0^\circ$  (antenna pointing up).

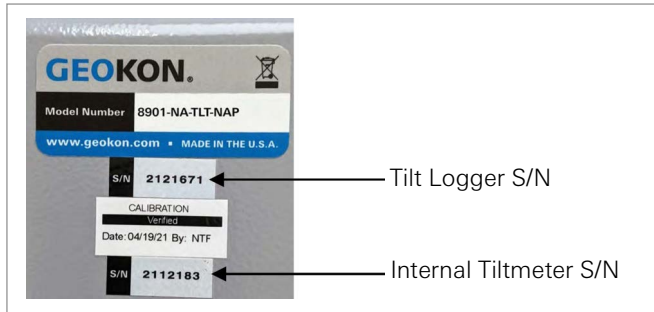
**Note:** Tilt loggers do not possess sensor-reading functionality; external sensors cannot be connected.



**FIGURE 5:** Tilt Loggers: 8920 (Left), 8950 (Right), 8930 Not Shown

Tilt loggers have two serial numbers, the tilt logger serial number is the upper number, and serial number for the internal tiltmeter is the lower number. See the figure below.

**Note:** Tilt logger serial numbers greater than 2047508 provide calibrated output and do not require post processing.



**FIGURE 6:** Tilt Loggers Serial Number Placement

## 2.4 ACCESSORIES

GeoNet Network Loggers are shipped with the following accessories:

- AC Charger
- Four desiccant packs
- One Phillips head screwdriver
- One flat head screwdriver
- USB 2.0 A Male to C Male Cable

## 3. INSTALLATION

---

### 3.1 INSTALLATION OVERVIEW

A general overview of the installation is shown in the steps below. Each step is described in detail in the sections that follow.

1. Mount the logger
2. Connect an earth ground
3. Install the antenna
4. Remove the cover
5. Connect the sensors
6. Expanding logger capacity (optional)
7. Power the logger
8. Verify network connectivity
9. Connect to a Wi-Fi network (8930 loggers only)
10. Seal the logger
11. Commission (activate) the logger

### 3.2 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. GEOKON recommends a mounting height of at least two meters. Lower than two meters may compromise performance. As a rule, higher is usually better.

### 3.3 CONNECT AN EARTH GROUND

Properly grounding GeoNet devices will lessen the chance of them being damaged from nearby lightning strikes or other large transient voltages.

All loggers can be grounded by connecting a suitable earth ground to the mounting bracket. Multi-Channel loggers can also be grounded via the copper ground lug on the bottom of the enclosure. See Section 4.2 for more information.

A 6-foot copper grounding rod and 12 AWG or larger copper wire is recommended; both of which can be purchased from GEOKON.

### 3.4 INSTALL THE ANTENNA

Remove the rubber cap from the antenna mount and install the antenna by turning it clockwise.

**Important! Do not cross thread the antenna. The O-ring on the bottom of the antenna must be flush with the enclosure.**

### 3.5 REMOVE THE COVER

Remove the cover by unscrewing the four cap screws on the enclosure.

**Important! Ensure that no dirt, water, or other contaminants enter the enclosure.**

### 3.6 CONNECT THE SENSORS

**Note:** Multi-channel and Addressable loggers will stop trying to read an empty channel after two attempts. The logger will read all channels at the top of every hour and will resume sampling when it detects a sensor.

### 3.6.1 CABLE GLAND CONNECTIONS

For ease of wiring, sensor cables should be inserted into the cable glands on Multi-channel loggers in order from left to right and wired into the VW terminal blocks in sequence, starting with channel one.

To connect a sensor 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. Connect the cable leads to the terminal block by holding down an orange tab, inserting the lead, and then releasing the tab. The wiring order is shown in the tables and figures below.

**Important! To prevent a short circuit, do not allow the cable leads to touch each other during or after wiring.**

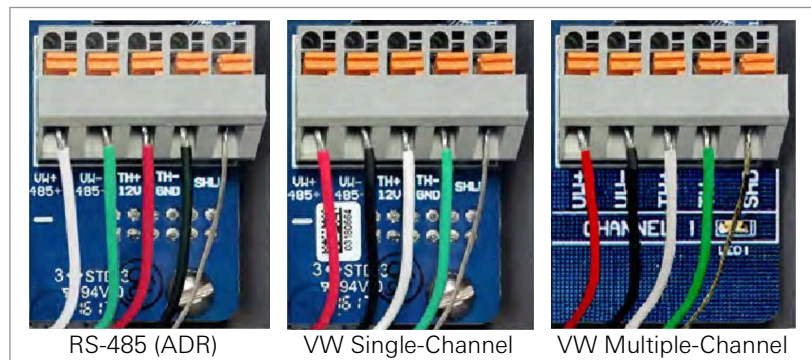
4. Pull gently on each conductor to ensure it is secure.
5. Tighten the cable gland nut until it firmly grips the outer jacket of the cable. The cable gland nut must be properly tightened to prevent water entry. Do not overtighten, as this might strip the plastic threads.
6. Pull gently on the gauge cable to ensure it is held in place by the cable gland.
7. Repeat these steps for each gauge cable to be connected.

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

**TABLE 6:** Vibrating Wire Logger Wiring

Addressable (RS-485) Logger		
Position	Color	Description
485+	WHITE	RS-485 Data+
485-	GREEN	RS-485 Data-
12V	RED	12 Volt Bus
GND	BLACK	Bus Ground
SHD	BARE	Analog Ground (Shield)

**TABLE 7:** Addressable (RS-485) Logger Wiring



**FIGURE 7:** Terminal Connections

### 3.6.2 10-PIN CONNECTIONS

To connect a device using a 10-pin connection:

1. Remove the cover from the 10-pin connector.
2. Align the grooves on the sensor connector (male), with the connector on the logger (female).
3. Push the connector into place and then twist the outer ring of the male connector until it locks.

### 3.7 EXPANDING LOGGER CAPACITY (OPTIONAL)

Model 8960 Digital Vibrating Wire interfaces can be connected to GeoNet Multi-Channel and Addressable loggers to expand the capacity of the logger. Multiple VW interfaces can be daisy-chained together to bus the data to a single logger. The bus limit is 32 units or 64 Channels.

Refer to the [Model 8960 Instruction Manual](#) for information on how to connect a logger to an interface, how to address the interfaces, and other applicable steps. To get immediate software recognition the interfaces must be connected before the logger has been powered on.



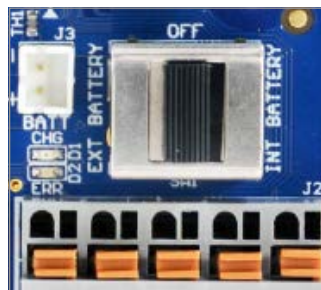
### 3.8 POWER THE LOGGER

Connect the AC adaptor, solar panel, or other external power source. (Though equipped with an internal battery, loggers must have an external power source.)

Move the battery switch (shown in Figure 8) to the EXT BATTERY or INT BATTERY position, according to the table below. (The battery switch is located on the battery board inside the enclosure.) The green LED on the right side of the box will flash twice, indicating the unit has power.

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

**TABLE 8:** Battery Switch



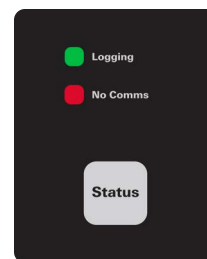
**FIGURE 8:** Battery Switch

### 3.9 VERIFY NETWORK CONNECTIVITY

The network status can be checked by pressing the status button on the side of the enclosure. When pressed, the Status button triggers the appropriate LED indicators to briefly illuminate. The table below shows the meaning of the various LED indications.

Cellular loggers will normally connect to the network within approximately five minutes. (GeoNet Cellular loggers are compatible with all major networks except Verizon.) Satellite loggers may take up to 20 minutes to connect. For Wi-Fi loggers, follow the instructions in Section 3.10.

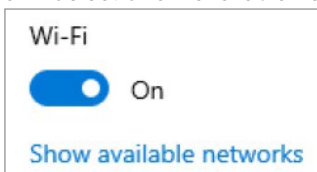
Logging LED	Comms LED	Indication
Green		Logging, good communications
Green	Red	Logging, no communications
	Red	Not Logging, no communications



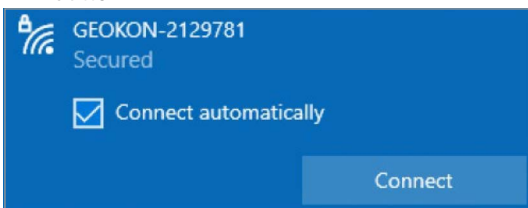
**TABLE 9:** Wires Trimmed to Two Inches

### 3.10 CONNECT TO A WI-FI NETWORK (8930 LOGGERS ONLY)

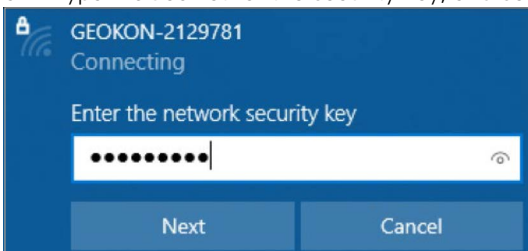
1. Turn on power to the 8930 GeoNet Wi-Fi logger.
2. Open Wi-Fi settings in Windows.
3. Select Show available networks.



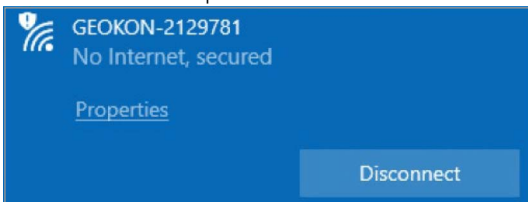
4. Select the network that starts with GEOKON, and then select the Connect button.



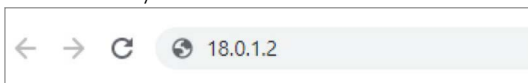
5. Type i3GeoNet for the security key, and select the Next button.



6. The window updates to show that the connection was made.



7. Open a web browser and enter 18.0.1.2 in the window, and then press the Enter key.



8. Enter the name of your network, and then click Submit.

Please select or enter a network name:

9. Enter your network password, and then click Submit.

Network:	<input type="text" value="Geokon"/>
Password:	<input type="password" value="....."/>
<input type="button" value="Submit"/>	

10. A message is shown when the connection is complete.
11. If desired, a static IP address can be set in the portal under Wi-Fi Configuration.

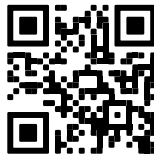
### 3.11 SEAL THE LOGGER

1. Record the serial number of the loggers and the attached sensors. For multiple-channel loggers, also record the channel to which each sensor has been connected. (The serial numbers are used for identification purposes in the API portal and Agent software.)
2. Insert the desiccants into the enclosure.
3. Make sure the cover gasket and the mating ridge on the enclosure are clean and that the gasket is properly seated inside the groove.
4. Place the cover on the unit, making sure the orientation is correct.
5. Tighten the cover screws a little at a time, working in a diagonal pattern.
6. Check that the cover has closed tightly and evenly.

**Note:** Make sure any unused openings are plugged and tightened.

### 3.12 COMMISSION (ACTIVATE) THE LOGGER

Network loggers are commissioned (activated) using the GEOKON API portal: [api.geokon.com](https://api.geokon.com).



OpenAPI Portal



## 4. MAINTENANCE

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### 4.1 WEATHER PROOFING

GeoNet devices are designed to be splash proof and rain proof but **are not submersible**. The enclosures are sealed by a gasket. The gasket will only prevent water entry if the screws that hold the lid in place are properly tightened, and the gasket is properly aligned inside the lid.

Always mount the devices so that the cable entries are on the bottom. Ensure the cable gland fittings are securely tightened and that the white plastic dowels provided are used to plug cable entries which are not in use. For models that feature a 10-pin connector, the watertight cap must be installed when the connector is not in use.

It is important to periodically check the desiccant packs inside the devices and change them out as necessary with fresh ones.

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 frequent 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.



Technical Support

## APPENDIX A. TROUBLESHOOTING

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Listed below are a few commonly experienced problems and remedial action. Visit [geokon.com/Technical-Support](https://geokon.com/Technical-Support) for additional troubleshooting help.

### ***SYMPTOM: UNIT WILL NOT RESPOND TO COMMUNICATIONS***

- ☐ Wrong connection type, or incorrect address specified in Agent software.
- ☐ The batteries may be improperly installed. Check their placement.
- ☐ The batteries inside the unit may be dead. Replace the batteries.

### ***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. (See Section 3.6.1).
- ☐ Check the gauge for proper operation with an independent readout, such as a GK-404 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 indicates an open circuit to thermistor leads. Verify that the thermistor leads are properly connected inside the logger. (See Section 3.6.1).
- ☐ Check the thermistor for proper operation with an independent readout, such as a GK-404 or GK-406.

### ***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
- ☐ Device malfunction, contact GEOKON

### ***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 [geokon.com/Software](https://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



Software Resources

## APPENDIX B. SOLAR PANEL KIT

---

The GEOKON Solar Panel Kit enables you to power a GeoNet 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

Install the solar panel by following the steps listed below. Each step is described in detail in the sections that follow.

Select a location for the solar panel.

1. Assemble and adjust the mounting bracket to the proper angle.
2. Install the mounting bracket.
3. Secure the solar panel to the mounting bracket.
4. Connect the power cable to the logger.

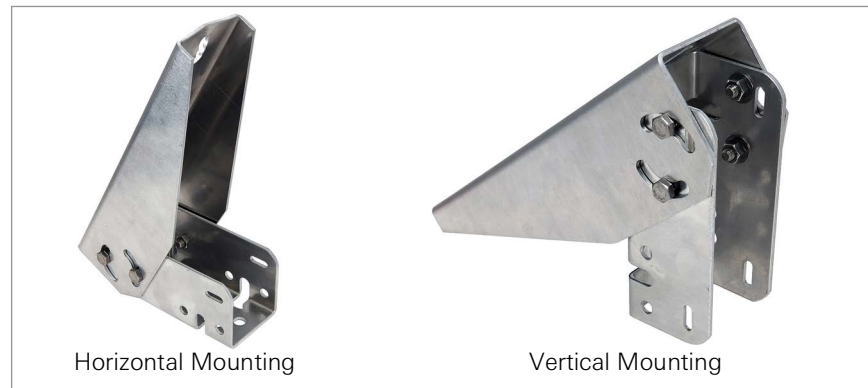
### B.1 SELECT A LOCATION

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

## B.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, as shown below.



**FIGURE 11:** *Mounting Options*

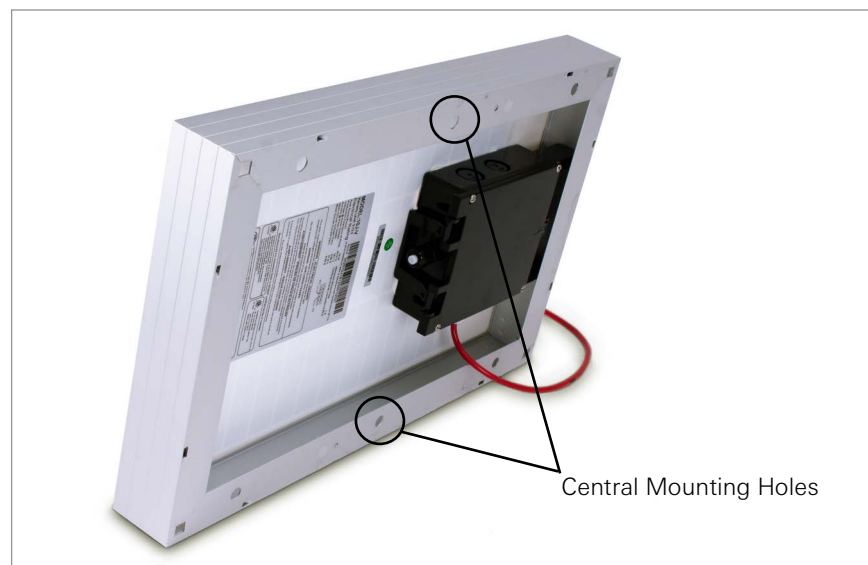
## B.3 INSTALL THE MOUNTING BRACKET

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.

## B.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.



**FIGURE 12:** *Centrally Located Mounting Holes*



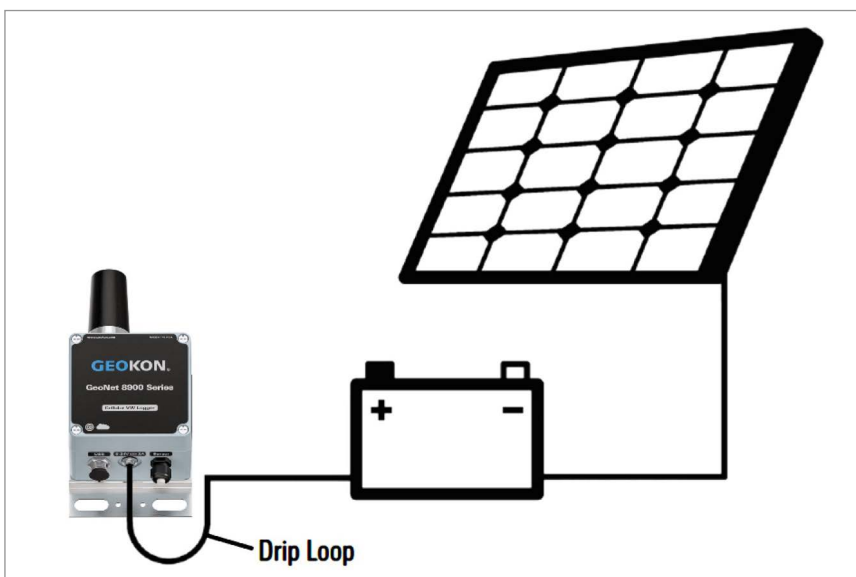
**FIGURE 13:** Mounting Brackets Fastened Centrally

## **B.5 CONNECT THE POWER CABLE**

### **B.5.1 BATTERY SWITCH**

Before connecting the power cable, be sure you have set the battery switch appropriately, as indicated in Section 3.8.

- 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

### **B.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.

## APPENDIX C. SPECIFICATIONS

### C.1 VIBRATING WIRE LOGGER SPECIFICATIONS

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	10-1440 Minutes
Data Transmission Interval	8920, 8930: 10-1440 minutes 8950: 120 minutes
Power Supply	Mains power or solar
Operating Temperature	-40 °C to +85 °C (range varies by power source)
VW Frequency Range	400-6,500 Hz
Enclosure	Die-cast aluminum 120 × 122 × 91 mm (single-channel) 160 × 260 × 91 mm (four-channel) 180 × 280 × 101 mm (eight-channel)

**TABLE 10:** *Vibrating Wire Logger Specifications*

### C.2 ADDRESSABLE (RS-485) LOGGER SPECIFICATIONS

Data Memory	32 MB
Storage Capacity	Varies by sensor sting connected
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	Mains power or solar
Operating Temperature	-40 °C to +85 °C (range varies by power source)
Enclosure	Die-cast aluminum 120 × 122 × 91 mm

**TABLE 11:** *Addressable (RS-485) Logger Specifications*

### C.3 TILT LOGGER SPECIFICATIONS

Range <sup>1</sup>	±90°
Resolution <sup>2</sup>	±0.00025° (±0.004 mm/m)
Precision <sup>3</sup>	±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	Mains power or solar
Operating Temperature	-40 °C to +65 °C (range varies by power source)
Enclosure	Die-cast aluminum 120 × 122 × 91 mm

**TABLE 12:** Tilt Logger Specifications

**Note:**

<sup>1</sup> Calibrated Range: ±30°

<sup>2</sup> 99% confidence interval (i.e., 99 out of 100 individual readings fall within this tolerance).

<sup>3</sup> Includes random walk (changes between consecutive readings that have no discernible cause) and seismic noise during testing.

### C.4 SUPPORTED CELLULAR FREQUENCIES

	Band	Frequency (MHZ)	Uplink (MHZ)	Downlink (MHZ)
03G	5	850	824-849	869-894
	2	1900	1850-1910	1930-1990
LTM	2	1900	1850-1910	1930-1990
	4	1700	1710-1755	2110-2155
	8	900	880-915	925-960
	28	700	703-748	758-803

**TABLE 13:** Supported Cellular Frequencies Specifications

GeoNet Cellular Loggers are compatible with all major networks except Verizon

### C.5 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

**TABLE 14:** Wi-fi Specifications

## APPENDIX D. CONNECTOR PINOUTS

### D.1 VW LOGGERS WITH CABLE GLAND CONNECTION

Terminal Strip Position	Description	Cable Wire Color
VW+	Vibrating Wire+	RED
VW-	Vibrating Wire-	BLACK
TH+	Thermistor+	WHITE
TH-	Thermistor-	GREEN
S	Analog Ground (Shield)	BARE WIRE

TABLE 15: VW Logger, Cable Gland Connection

### D.2 VW LOGGERS WITH 10-PIN BULKHEAD CONNECTION

10-Pin Bulkhead	Internal Wire Color	Description	Cable Wire Color
A	Brown	Vibrating Wire+	RED
B	Red	Vibrating Wire-	BLACK
C	Orange	Thermistor+	WHITE
D	Yellow	Thermistor-	GREEN
E	Green	Analog Ground (Shield)	BARE WIRE
F	Blue	+VCC Supply	N/A
G	Violet	Digital Ground	N/A
H	Grey	Mux Reset	N/A
J	White	Mux Clock	N/A
K	Black	Digital Ground	N/A

TABLE 16: VW Logger, 10-Pin Bulkhead Connections

### D.3 ADDRESSABLE (RS-485) LOGGERS

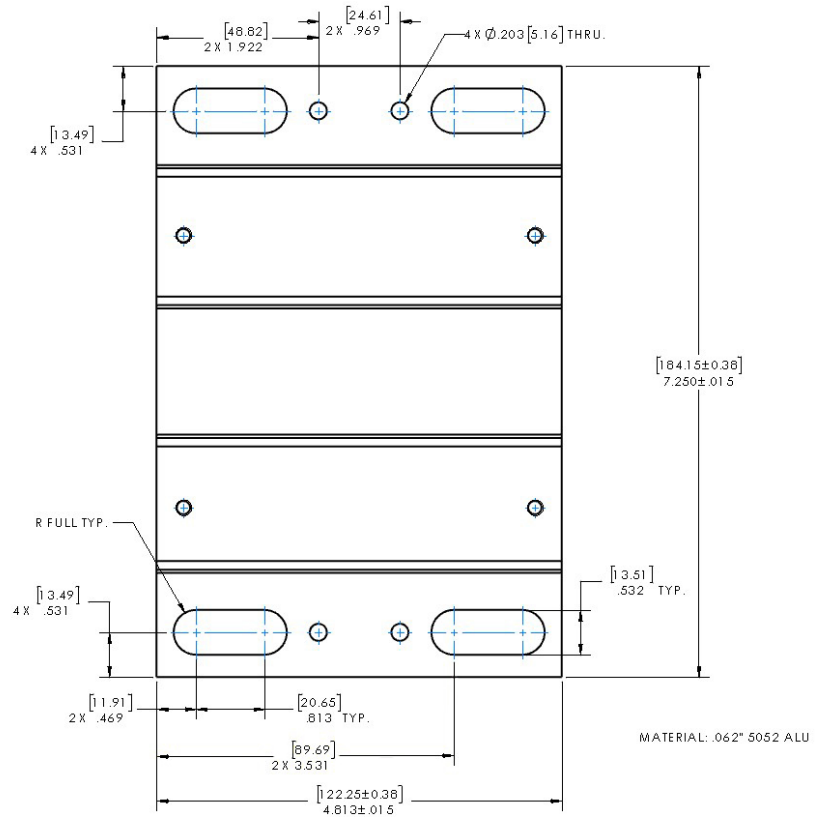
Terminal Strip Position	Description	Cable Wire Color
485+	RS-485 Data+	WHITE
485-	RS-485 Data-	GREEN
12V	12 Volt Bus	RED
GND	Bus Ground	BLACK
S	Analog Ground (Shield)	BARE WIRE

TABLE 17: Addressable Logger, Cable Gland Connections

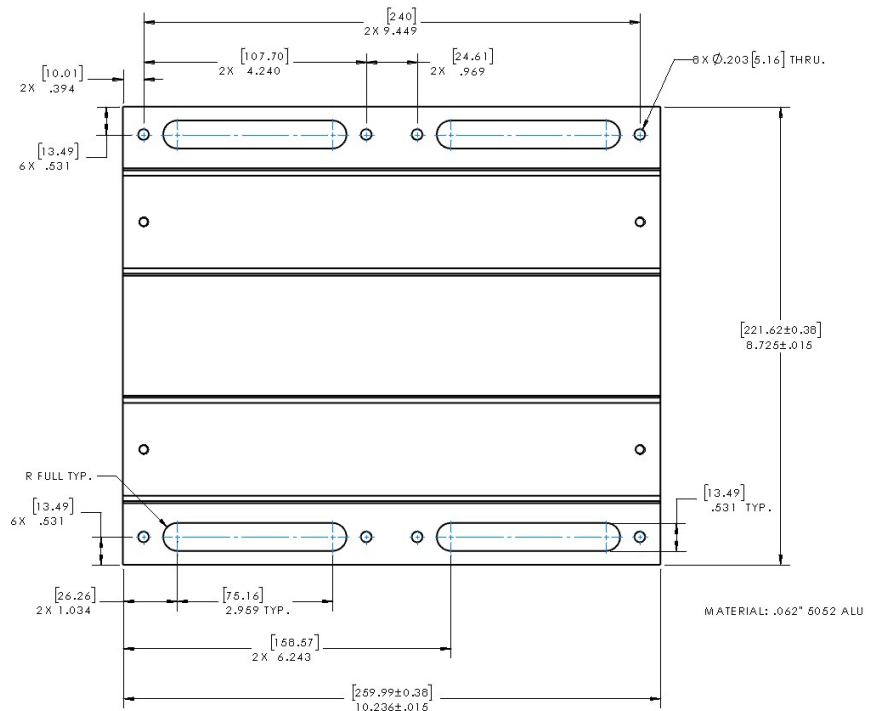


## APPENDIX E. MOUNTING BRACKET DIMENSIONS

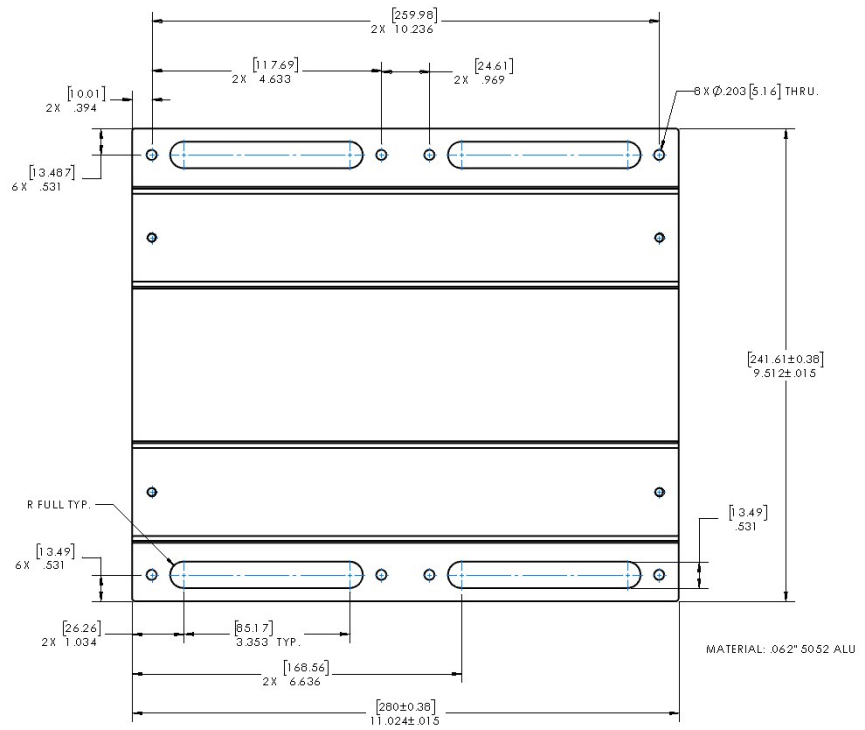
### E.1 ALL SINGLE CHANNEL AND ADDRESSABLE LOGGERS



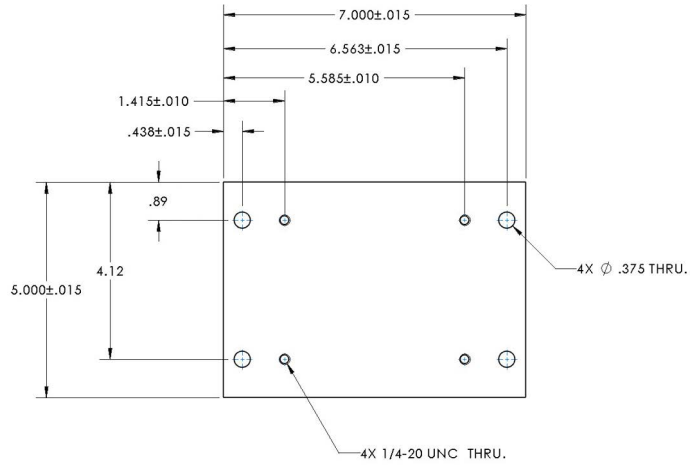
### E.2 ALL FOUR-CHANNEL LOGGERS



### E.3 ALL EIGHT CHANNEL LOGGERS



### E.4 ALL TILT LOGGERS



## APPENDIX F. FIRMWARE UPGRADE

**Warning!** Performing a firmware update on a logger will reset the logger memory. **Retrieve all data from the logger prior to performing a firmware update.**

1. Connect the COM-166 (Mini USB to STD A cable) to the “USB” connector on the bottom of enclosure.

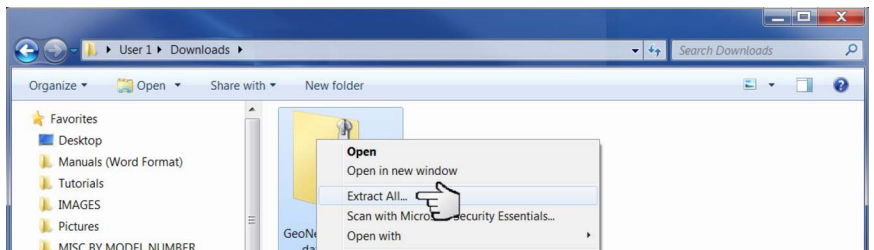


**FIGURE 15:** USB Cable Connection



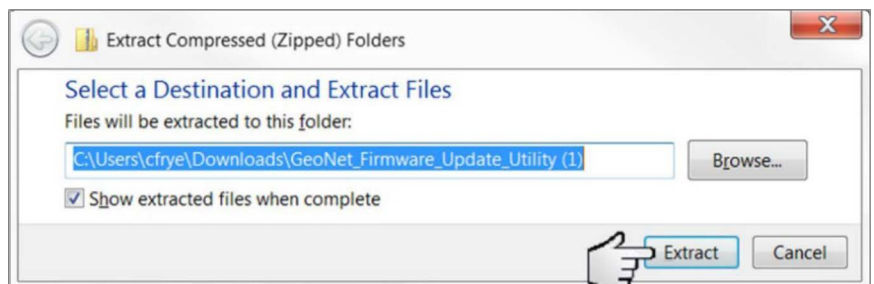
Software Resources

2. Download the “GeoNet Firmware Update Package” from [geokon.com/Software](http://geokon.com/Software).
3. Right click on the download file and choose “Extract All...”.



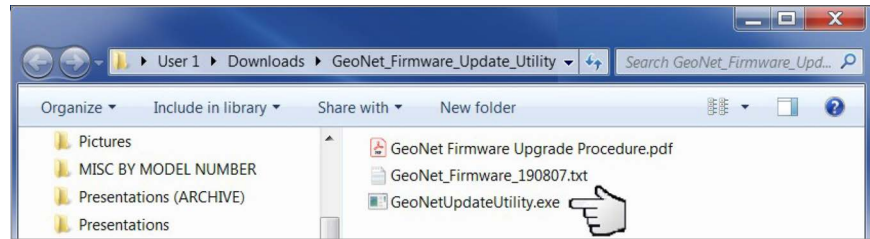
**FIGURE 16:** Extract File

4. When prompted click “Extract All”.
5. Select a destination for the files and then click “Extract”.



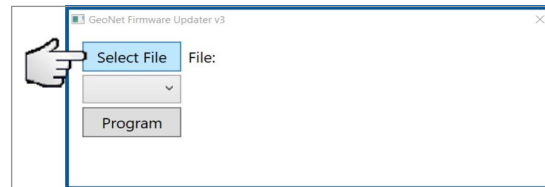
**FIGURE 17:** Select Destination, then Click Extract

6. Open “GeoNetUpdateUtility.exe” file. (If a security warning appears, click “Run”).



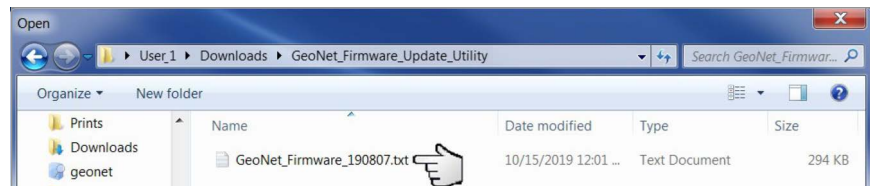
**FIGURE 18:** Open the GeoNet Update Utility Application

7. Click “Select File”.



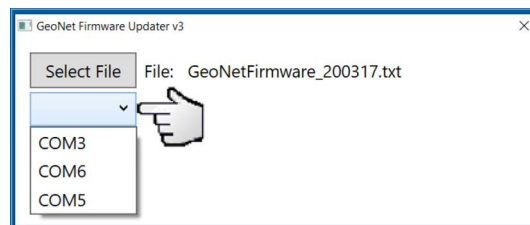
**FIGURE 19:** Click on “Select File”

8. Double click on the .txt firmware file. (Firmware files are named in the following format: “GeoNet\_Firmware\_YYMMDD.txt”, where YY is the last two digits of the year, MM is the month, and DD is the day of the month.)



**FIGURE 20:** Double Click on Firmware Text File

9. Using the drop-down box below the “Select File” button, select the correct serial port for the 8001-7 or COM-166 cable. To identify which serial port the unit is connected to, complete the following:
  - a. Unplug the 8001-7 or COM-166 cable from the PC.
  - b. Go to the “Control Panel” then open “Device Manager”.
  - c. Click on the triangle to the left of “Ports (COM & LPT)” to expand the list.
  - d. Plug the cable back into the computer and the port will appear in the list.



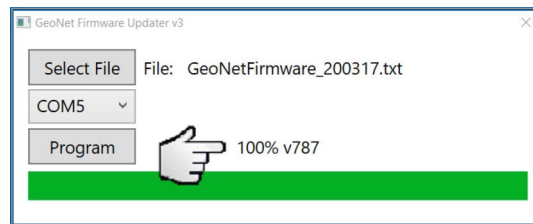
**FIGURE 21:** Select COM Port

10. Click “Program”.



**FIGURE 22:** Click on Program

11. A progress bar will appear. The update process will normally take one to two minutes.
12. Once the update has finished, operation will return to normal.



**FIGURE 23:** Update Finished

13. Repeat the above process with all the loggers in the Network.
- The firmware update is now complete.

## APPENDIX G. FIRMWARE VERSION CHANGE SUMMARY

Version	Date/File	Description
798	221025	Fixes all UTC and day 1 time issues.
797	220826	No user enhancements. <b>Known Issues:</b> UTC day 1 network propagation may require 24 hours.
796	220728	No user enhancements. <b>Known Issues:</b> Does not allow Cellular Loggers to start without UTC offset configured.
795	220722	No user enhancements.
789	11-11-2020 / 201104	Handles unexpected radio resets. Prioritizes acquisition over radio function when battery is low. ADR models recognize new product types: 6180 and 8960 <b>Known Issues:</b> Local time may be misrepresented by Gateways in regions with positive universal time coordinates. Zeros can occur in digital sensor data.
790	01-05-2021 / 201229	Recognizes 3810B temperature sensors.
792	06-22-2021 / 210614	No user enhancements. <b>Known Issues:</b> Loggers become unresponsive to com port in airplane mode. UTC offset contention between server and Gateway.
793	07-21-2021 / 210721	All Loggers take a sample within 1 minute of status button press. Fixes UTC offset contention. Airplane mode bug fix, Loggers become unresponsive to local coms.
788	200410	Revised bootstrap loader (BSL) provides firmware updates via external USB. Internal "CHANNEL" DIP switches don't need to be changed when using new software utility to upload new firmware images. Make USB the default port. Recognize models 6150F, 6150G, etc., as MEMS.
787	200311	Corrected Leap Day bug that prevented Loggers from relaying data to Sensemetrics THREADs after joining.
786	191023	Update Gateway signal strength regularly.
784	190807	Provisions GeoNet for "airplane mode", silencing radio for Logger-only operation.
783	190502	Corrected fault that prevented sensemetrics threads from reading MUX boards.
782	190311	Fixes intermittent addressable discovery of drop 1 USB lock up corrected.
779	190125	Log data from Addressable Temperature Sensors (3810A) and Addressable Vibrating Wire Readers (8020-30). Simplified keypad operation. Corrected defects that impeded prompt radio network connections. Augmented power control and battery monitoring.
	181025 through 180228	Single Channel: VW is never disabled. MUX: VW channel disabled after 10 failed reads. MEMS: MEMS drops disabled after 10 failed reads.
	180213 through 170818	Single Channel: VW is never disabled. MUX: VW channel disabled after 10 failed reads.
	Prior to 170818	Single Channel: VW is disabled after 5 failed reads. MUX: VW is disabled after 5 failed reads

## APPENDIX H. VIBRATING WIRE LOAD CELL WIRING

### H.1 WIRING SINGLE LOAD CELL

8CH Interface <sup>1</sup>	Function	3-Gauge Load Cell Violet Cable	4-Gauge Load Cell Violet Cable	6 Gauge Load Cell Orange Cable
Channel 1 VW+	Gauge #1	Red	Red	Red
Channel 2 VW+	Gauge #2	Red's Black	Red's Black	Red's Black
Channel 3 VW+	Gauge #3	White	White	White
Channel 4 VW+	Gauge #4	NC	White's Black	White's Black
Channel 5 VW+	Gauge #5	NC	NC	Green
Channel 6 VW+	Gauge #6	NC	NC	Green's Black
Channel 1 SHD	Shield	All Shields	All Shields	All Shields
VW- Channels <sup>2</sup>	Common	White's Black <sup>3</sup>	Green	Blue
Channel 1 TH +	Thermistor	Green <sup>3</sup>	Blue	Yellow
Channel 1 TH -	Thermistor	Green's Black	Blue's Black	Yellow's Black

**TABLE 18:** Single Load Cell Wiring

**Note:**

<sup>1</sup> Where second Load Cell is being included, retain relative channel position count up from channel 5.

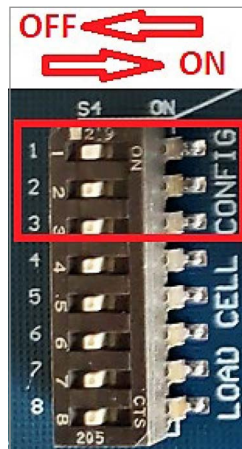
<sup>2</sup> Common "VW-" between all channels associated with each VW Load Cell

<sup>3</sup> White's black and Green wires are switched on GEOKON three-gauge VW load cells prior to serial number 3313.

### H.2 LOAD CELL CONFIGURATION SWITCH SETTINGS

POS 1	POS 2	POS 3	Configuration
OFF	OFF	OFF	Std. No Load Cell
ON	OFF	OFF	One 3-Gauge Load Cell
OFF	ON	OFF	One 4-Gauge Load Cell
ON	ON	OFF	Two 3-Gauge Load Cells, second starting at channel 5
OFF	OFF	ON	Two 4-Gauge Load Cells, second starting at channel 5
ON	OFF	ON	One 3-Gauge Load Cell & One 4-Gauge Load Cell starting at channel 5
OFF	ON	ON	One 4-Gauge Load Cell & One 3-Gauge Load Cell starting at channel 5
ON	ON	ON	One 6-Gauge Load Cell

**TABLE 19:** Load Cell Configuration Switch Settings



**FIGURE 24:** Load Cell Configuration Switch



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