Model Series 8920 and 8930

GeoNet Network Data Loggers

Instruction Manual



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1. INTRODUCTION

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

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

Sensor data is collected and transferred via a cellular or Wi-Fi network to a secure cloud-based storage platform where it can be accessed through the GEOKON OpenAPI. Data visualization software, such as 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 data loggers, change settings, configure sensor channels, and view current data logger status. The API Portal can be found at api.geokon.com and the GEOKON Agent program can be downloaded at geokon.com/Software.

Model 8960 Digital Vibrating Wire interfaces can be connected to GeoNet Multi-Channel, Addressable, and Digital High Power Data Loggers to expand the capacity of the data 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 (DHP enclosures are IP 68 rated to 1.5 m, or 5 feet) 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	Data 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, RS-485		
8920-LTM-DHP-CBL	Digital High Power, RS-485		
8920-LTM-TLT-NAP	Tilt		Not Applicable

TABLE 1: *List of Model 8920 Data Loggers*

1.2 8930 MODEL LIST

Model Number	Data 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 Data Loggers*

1.3 INCLUDED ACCESSORIES

GeoNet Product Line	Part Number	Description	Quantity
Digital High Power (DHP) Models	ELC-824	Antenna	1
All Other Models	CHG-11	GeoNet Charger Kit, including: AC-DC power supply with barrel jack and multi-country AC adapter kit.	1
	COM-169	USB 2.0 A Male to C Male Cable	1
	ELC-824	Antenna	1
	TLS-111	#3 Phillips Head Screwdriver	1
	TLS-112	3/32" Flat Head Screwdriver	1

TABLE 3: *List of Included Accessories by GeoNet Product Line*

1.4 ADDITIONAL ACCESSORIES (NOT INCLUDED)

Accessory Application	Part Number	Description
12 Volt Battery Conversion	8020-7-1	Solar Panel, 20-watt, regulated. For use with a 12V battery (customer supplied). Includes side-of-pole mounts, charge controller, and 4.5 m (15') interconnect cable with battery clips.
	8800-7B or -7BV	External 12V battery conversion cable, 3 m (10') length. Varied cable lengths are available (-7BV model).
Other	8900-SOL-10W-BRJ	10 Watt solar panel. For use with all models except digital high power (DHP).
	8900-SOL-10W-USB	10 Watt solar panel. For use with digital high power models (DHP).
	KIT-GEONET-C-T20, including: COM-169 TLS-112 TLS-641	**Accessory Kit for Digital High Power (DHP) Models, including:** USB 2.0 A Male to C Male Cable 3/32" Flat Head Screwdriver T20 Torx Key
	KIT-GEONET (For Legacy Products), including: COM-166 TLS-111 TLS-112	**Accessory Kit for Legacy Products, including:** Mini USB to STD A Cable #3 Phillips Head Screwdriver 3/32" Flat Head Screwdriver

TABLE 4: *Additional Accessories (Not Included)*

2. MODELS

2.1 VIBRATING WIRE (VW) DATA LOGGERS

The Vibrating Wire Data 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 DATA LOGGER

Single-channel data loggers will read one GEOKON vibrating wire gauge and integral thermistor.



FIGURE 1: *Single-Channel Data Logger, 8920 Shown*

2.1.2 FOUR-CHANNEL VIBRATING WIRE DATA LOGGER

Four-channel data loggers will read up to four GEOKON vibrating wire gauges and integral thermistors.



FIGURE 2: *Four-Channel Data Logger, 8920 Shown*

A four-channel data logger can be configured as follows:

Maximum Number of Gauges	Maximum Number of Load Cells
Four	One 3-gauge **or** one 4-gauge load cell *Refer to Appendix I for load cell wiring tables*

TABLE 5: *Four-Channel Data Logger Gauge/Load Limits*

2.1.3 EIGHT-CHANNEL VIBRATING WIRE DATA LOGGER

Eight-channel data loggers will read up to eight GEOKON vibrating wire gauges and integral thermistors.



FIGURE 3: *Eight-Channel Data Logger, 8920 Shown*

An eight-channel data logger can be configured as follows:

Maximum Number of Gauges	Maximum Number of Load Cells
Eight	One 3-gauge **and** one 4-gauge load cell Two 3-gauge **or** two 4-gauge load cells One 6-gauge load cell *Refer to Appendix I for load cell wiring tables*

TABLE 6: *Eight-Channel Data Logger Gauge/Load Limits*

2.2 DIGITAL (RS-485) DATA LOGGERS

Digital RS-485 data loggers are compatible with GEOKON Digital Addressable MEMS products. Sensor cables are connected through a cable gland.

2.2.1 ADDRESSABLE DATA LOGGER

Addressable data loggers are compatible with GEOKON Digital Addressable MEMS products and are capable of reading up to 64 GEOKON MEMS sensors.



FIGURE 4: *Addressable Data Logger, 8920 Shown*

2.2.2 DIGITAL HIGH POWER (DHP) DATA LOGGER

Digital High Power (DHP) data loggers are compatible with GEOKON Digital Addressable MEMS products. Data loggers are capable of reading up to 250 GEOKON MEMS, or up to 500 GEOKON 6140 sensors. With custom firmware, they are also capable of reading non-GEOKON sensors that utilize RS-485 MODBUS communication protocol. DHP data loggers are equipped with a rechargeable battery and must be connected to a solar panel or other external power supply.



FIGURE 5: *Digital High Power Data Logger*

2.3 TILT DATA LOGGER

Tilt data loggers contain an integrated tiltmeter sensor. The two axes of the tiltmeter have a range of ±90° (the calibrated range is ±30°), based on a starting position of 0° (antenna pointing up).

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



FIGURE 6: *Tilt Data Logger, 8920 Shown*

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

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

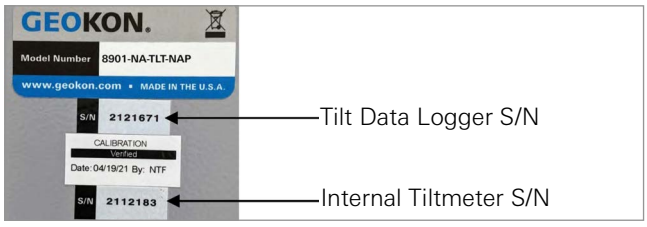


FIGURE 7: *Tilt Data Loggers Serial Number Placement*

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

3.2 MOUNT THE DATA LOGGER

GeoNet mounting bracket are 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. 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. All GeoNet devices can be grounded by connecting a suitable earth ground to the mounting bracket. Some GeoNet devices can also be grounded via the copper ground lug on the bottom of the enclosure.

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 mounting bracket or the copper grounding lug on the exterior of the device 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.

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 / OPEN THE COVER

3.5.1 DIGITAL HIGH POWER DATA LOGGER

Open the covers of all devices in the network by wedging open the latch on the right-hand side. (If needed, use a flathead screwdriver for leverage.) Unscrew the two Torx screws beneath the latch with the provided Torx key. Open the cover.

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



FIGURE 8: *Open the Cover of a DHP Data Logger*

3.5.2 ALL OTHER DATA LOGGERS (NOT DHP)

Unscrew the four cap screws on the enclosure. Remove the cover.

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

3.6 CONNECT THE SENSORS

Note: Multi-channel, Addressable, and Digital High Power data loggers will stop trying to read an empty channel after two attempts. The data 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 data loggers in order from left to right and wired into the VW terminal blocks in sequence, starting with channel one.

To connect a sensor:

1. Loosen the nut on the cable fitting and remove the plastic dowel.
2. Slide the sensor 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 Data Logger		
Position	**Color**	**Description**
VW+	RED	Vibrating Wire+
VW-	BLACK	Vibrating Wire-
TH+	WHITE	Thermistor+
TH-	GREEN	Thermistor-
SHD	BARE	Analog Ground (Shield)

TABLE 7: *Vibrating Wire Data Logger Wiring*

Addressable and Digital High Power (RS-485) Data Loggers		
Position	**Color**	**Description**
485+	WHITE	RS-485 Data+
485-	GREEN	RS-485 Data-
12V / VBUS	RED	12 Volt Bus
GND	BLACK	Bus Ground
SHD / EGND	BARE	Analog Ground (Shield)

TABLE 8: *Addressable and Digital High Power (RS-485) Data Logger Wiring*

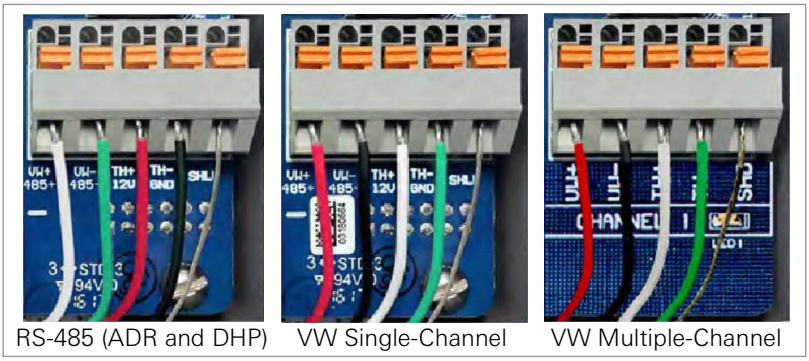


FIGURE 9: *Terminal Connections*

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 data logger (female).
3. Push the connector into place and then twist the outer ring of the male connector until it locks.

3.7 EXPANDING DATA LOGGER CAPACITY (OPTIONAL)

Model 8960 Digital Vibrating Wire Interfaces can be connected to GeoNet Multi-Channel, Addressable, and Digital High Power Data Loggers to expand the capacity of the data logger. Multiple VW 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 Instruction Manual (geokon.com/8960-Series) for information on how to connect a data 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 data logger has been powered on.

3.8 POWER THE DATA LOGGER

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

Move the battery switch to the ON position for DHP data loggers (Figure 10), or to the INT BATTERY position for all other data loggers unless used with an external battery/mains power in Sub Polar conditions (Figure 11) according to Table 10. (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.

Note: The LEDs are located on the battery board for DHP data loggers. See Table 9 for the various LED indications.

Green LED	Blue LED	Charge State
Off	Off	No Power
On	On	Bulk
Off	On	Absorption
On	Off	Float (Fully Charged)

TABLE 9: *Digital High Power Data Logger Battery Board LED Indicator Meaning*

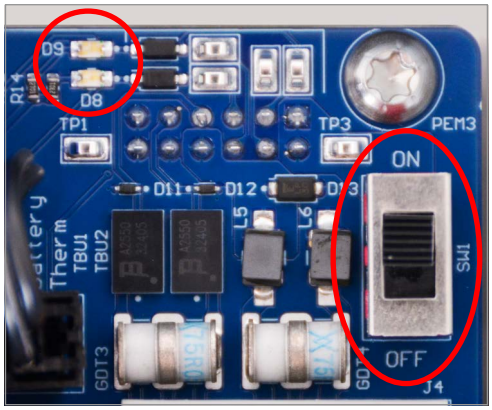


FIGURE 10: *Digital High Power Data Logger Battery Switch*

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

TABLE 10: *All Other Data Loggers (Not DHP) Battery Switch*

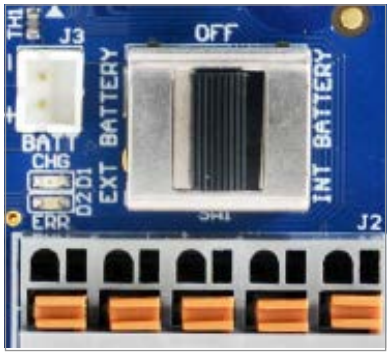


FIGURE 11: *All Other Data Loggers (Not DHP) Battery Switch*

3.9 VERIFY NETWORK CONNECTIVITY

The network status can be checked by pressing the status button on the side of the enclosure (for DHP data loggers, this is a small blue button located inside 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 data loggers will normally connect to the network within approximately five minutes. (GeoNet Cellular data loggers are compatible with all major networks except Verizon.) For Wi-Fi data loggers, follow the instructions in Section 12.

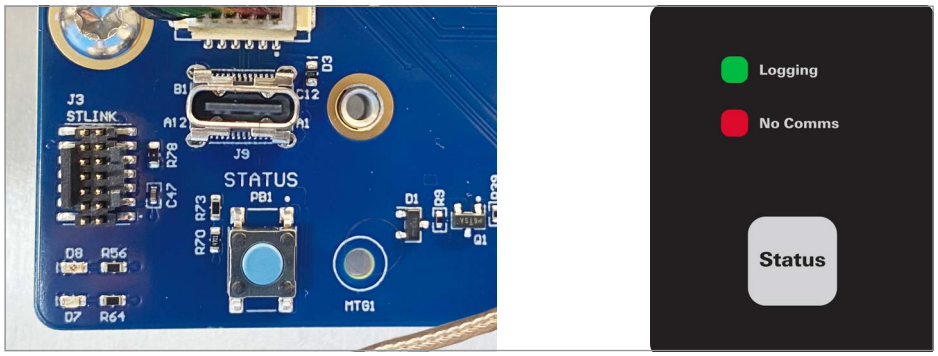


TABLE 10: *Status Button and LED Location, DHP Data Logger (Left) and All Other Data Loggers (Right)*

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

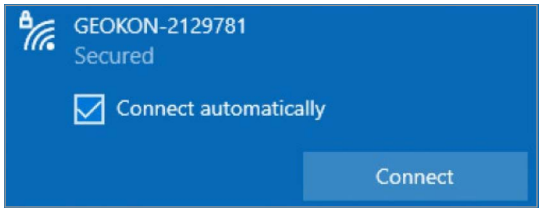
TABLE 11: *LED Indicator Meaning*

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

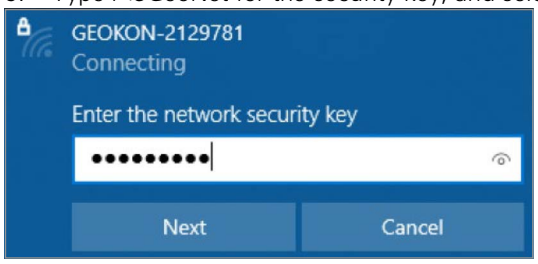
1. Turn on power to the 8930 GeoNet Wi-Fi data logger.
2. Open Wi-Fi settings in Windows.
3. Select Show available networks.



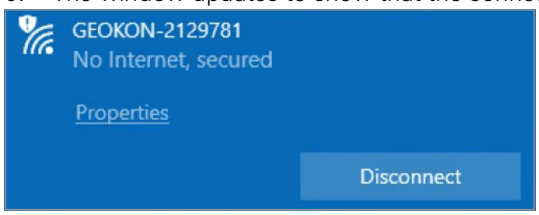
4. Select the network that starts with GEOKON, and then select the Connect button.



5. Type i<3GeoNet 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 Wi-Fi network, and then click Submit.



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



10. A message is shown when the connection is complete.
11. If desired, a static IP address can be set in the GEOKON API portal after commissioning the gateway using the Wi-Fi Configuration.

3.11 SEAL THE DATA LOGGER

3.11.1 DIGITAL HIGH POWER DATA LOGGER

1. Record the serial number of the data loggers and the attached sensors. For multiple-channel data 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. Make sure the cover gasket and the mating ridge on the enclosure are clean.
3. Close the cover and tighten the two Torx screws.
4. Push the latch firmly closed onto the cover.

Note: Make sure any unused openings are plugged with the provided dowel and the cable gland nut is tightened.

3.11.2 ALL OTHER DATA LOGGERS (NOT DHP)

1. Record the serial number of the data loggers and the attached sensors. For multiple-channel data 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. Make sure the cover gasket and the mating ridge on the enclosure are clean and that the gasket is properly seated inside the groove.

3. Place the cover on the unit, making sure the orientation is correct.
4. Tighten the cover screws a little at a time, working in a diagonal pattern.
5. Check that the cover has closed tightly and evenly.

Note: Make sure any unused openings are plugged with the provided dowel and the cable gland nut is tightened.

3.12 COMMISSION (ACTIVATE) THE DATA LOGGER

Network data loggers are commissioned (activated) using the GEOKON API portal: api.geokon.com.

4. MAINTENANCE

4.1 WEATHER PROOFING

Most GeoNet devices are designed to be splash proof and rain proof but **are not submersible**. DHP enclosures are IP 68 rated to 1.5 m, or 5 feet. 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.

Despite these precautions, the data loggers may encounter leakage along the cable if the cable is cut, or if the unit is installed in an especially humid environment.

APPENDIX A. TROUBLESHOOTING

Listed below are a few commonly experienced problems and remedial action. Visit 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 data 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 data 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 data 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 (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 B. SOLAR PANEL KIT

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



FIGURE 13: *Solar Panel for DHP Data Loggers (8900-SOL-10W-USB) and All Other Data Loggers (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 14: *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.

1. Select a location for the solar panel.
2. Assemble and adjust the mounting bracket to the proper angle.
3. Install the mounting bracket onto the mounting surface or pole.
4. Secure the solar panel to the mounting bracket.
5. Turn on the data logger and connect the power cable.

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.

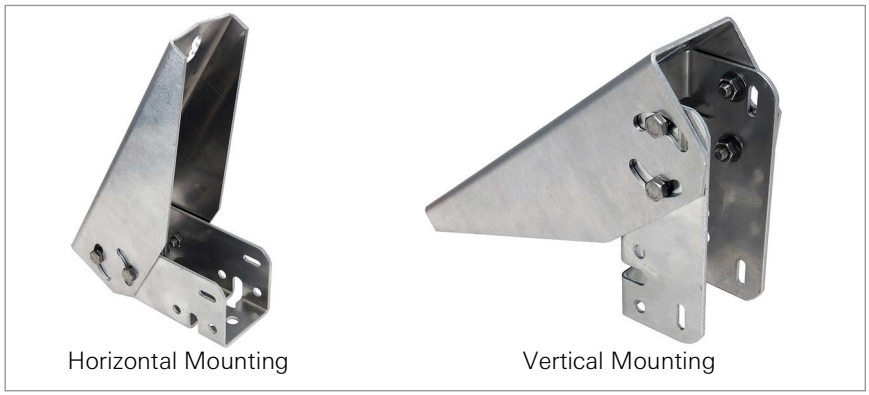


FIGURE 15: *Mounting Options*

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.

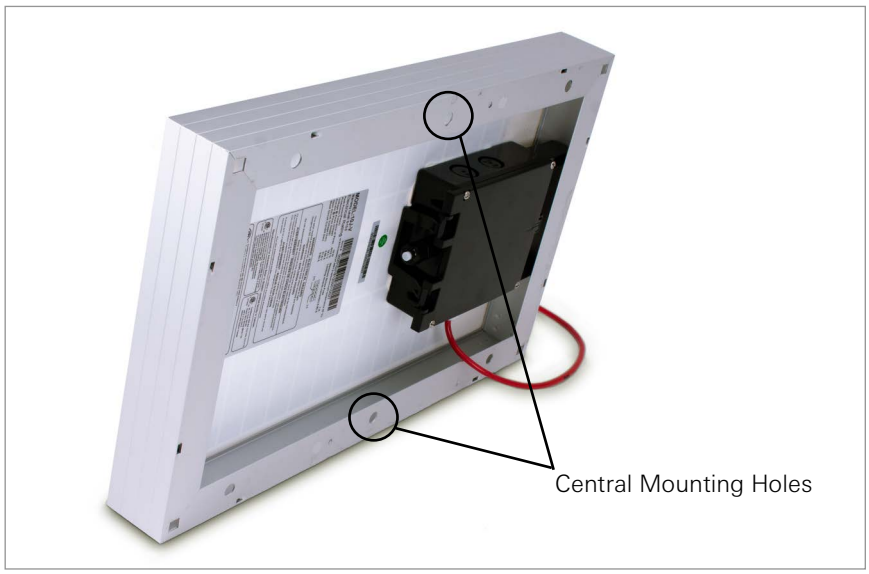


FIGURE 16: *Centrally Located Mounting Holes*

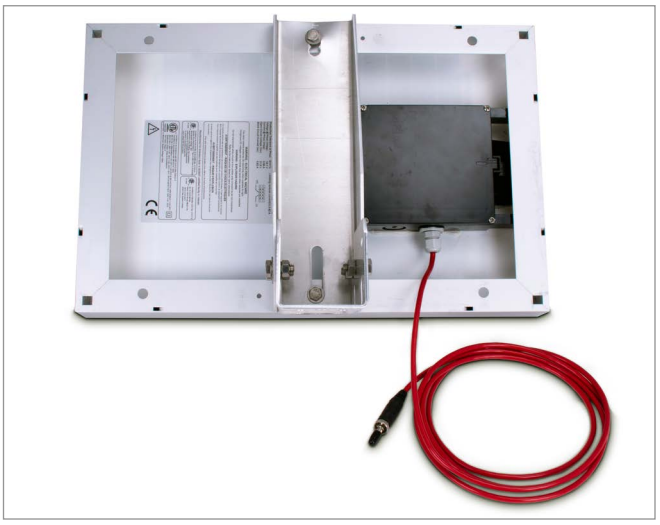


FIGURE 17: *Mounting Brackets Fastened Centrally*

B.5 CONNECT THE POWER CABLE

B.5.1 BATTERY SWITCH

Before connecting the power cable, be sure you have set the battery switch in the ON position for DHP data loggers, or as indicated in Table 12 for all other data loggers.

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

TABLE 12: *All Other Data Loggers (Not DHP) Battery Switch*

B.5.2 MAKING THE CONNECTION

Remove the plastic cap from the cable connector, then attach it to the EXT BATTERY plug on the data logger (USB-C plug for DHP data loggers). Tighten the retaining ring on the plug, for strain relief.

Note: All GeoNet Data Loggers have a USB port. However, only the DHP data loggers can be charged via USB.

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

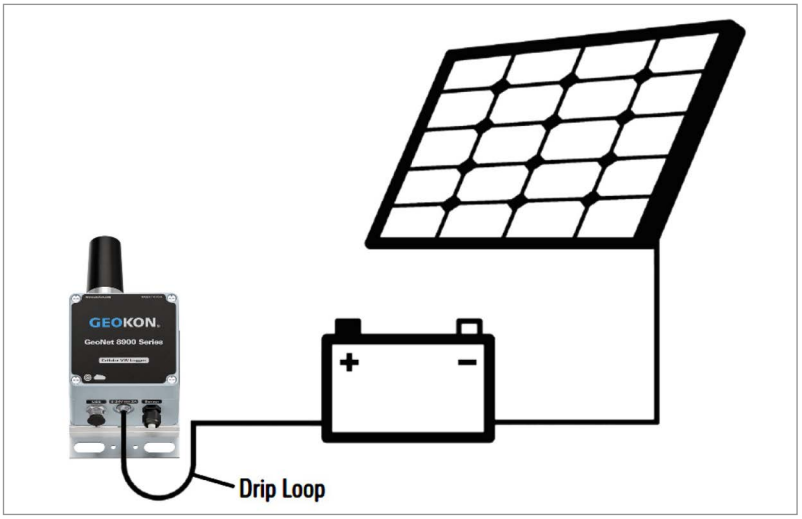


FIGURE 18: *Solar Panel with External Battery*

APPENDIX C. SPECIFICATIONS

C.1 VIBRATING WIRE DATA 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	10-1440 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 Material	Die-cast aluminum
Enclosure Dimensions	See Appendix E

TABLE 13: *Vibrating Wire Data Logger Specifications*

C.2 DIGITAL DATA LOGGER (ADDRESSABLE AND DIGITAL HIGH POWER) SPECIFICATIONS

Data Memory	32 MB
Storage Capacity	Varies by sensor sting connected
MEMS Sensor Limits	ADR: 64 Sensors (90 sensors, with the sensor string powered via external 12 V power supply) DHP: 250 sensors
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: 24 hours
Data Transmission Interval	Min: 10 minutes; Max: 24 hours
Power Supply	Mains power or solar
Operating Temperature	-40 °C to +85 °C (range varies by power source)
Enclosure Material	ADR: Die-cast aluminum DHP: Die-cast aluminum, IP 68 rated to 1.5 m (5 feet)
Enclosure Dimensions	See Appendix E

TABLE 14: *Digital Data Logger (Addressable and Digital High Power) Specifications*

C.3 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° angular range (±0.016 mm/m) ±0.0016° across ±15° angular range (±0.026 mm/m) ±0.0026° across ±30° angular 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 Material	Die-cast aluminum
Enclosure Dimensions	See Appendix E

TABLE 15: *Tilt Data Logger Specifications*

Note:

[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.

C.4 SUPPORTED CELLULAR FREQUENCIES

	Band	Frequency (MHZ)	Uplink (MHZ)	Downlink (MHZ)
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 16: *Supported Cellular Frequencies Specifications*

GeoNet Cellular Data 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 17: *Wi-fi Specifications*

APPENDIX D. CONNECTOR PINOUTS

D.1 VW DATA 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 18: *VW Data Logger, Cable Gland Connection*

D.2 VW DATA 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 19: *VW Data Logger, 10-Pin Bulkhead Connections*

D.3 ADDRESSABLE AND DIGITAL HIGH POWER (RS-485) DATA 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 20: *Addressable Data Logger, Cable Gland Connections*

APPENDIX E. UNIT DIMENSIONS

Note: Dimensions shown below are in inches.

E.1 SINGLE-CHANNEL (01C) AND ADDRESSABLE (ADR) MODELS

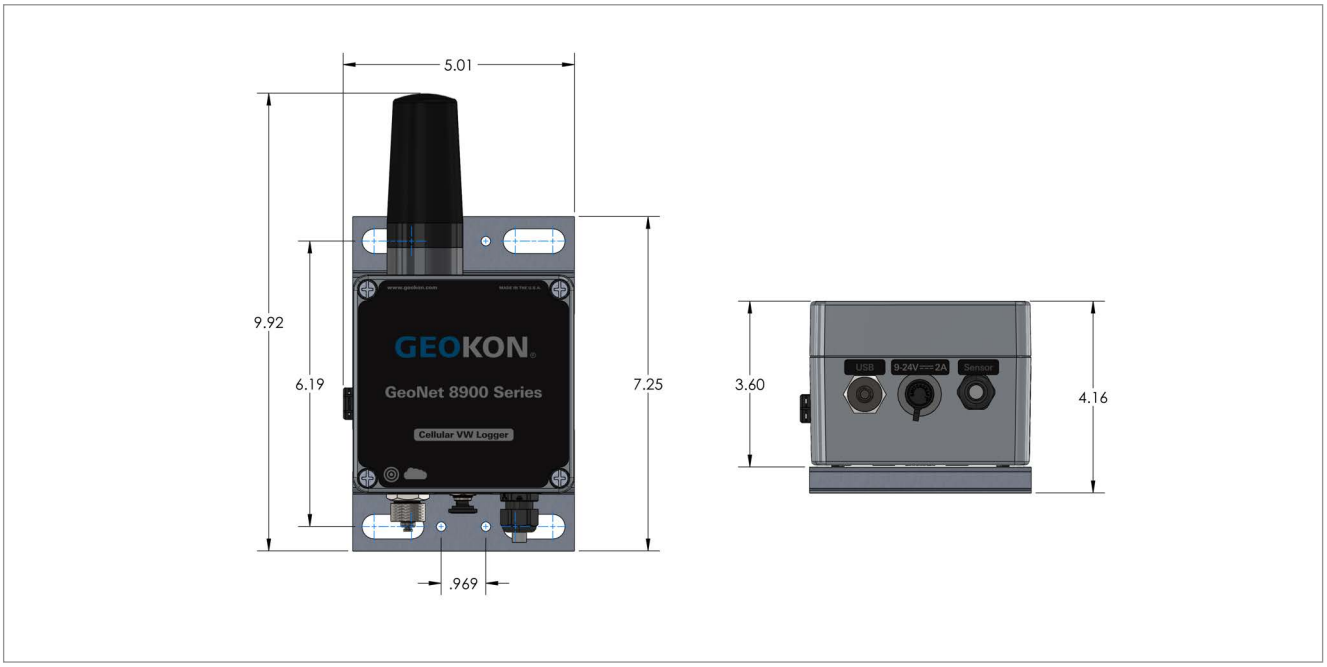


FIGURE 19: *Single-Channel (01C) and Addressable (ADR) Models*

E.2 FOUR-CHANNEL (04C) MODELS

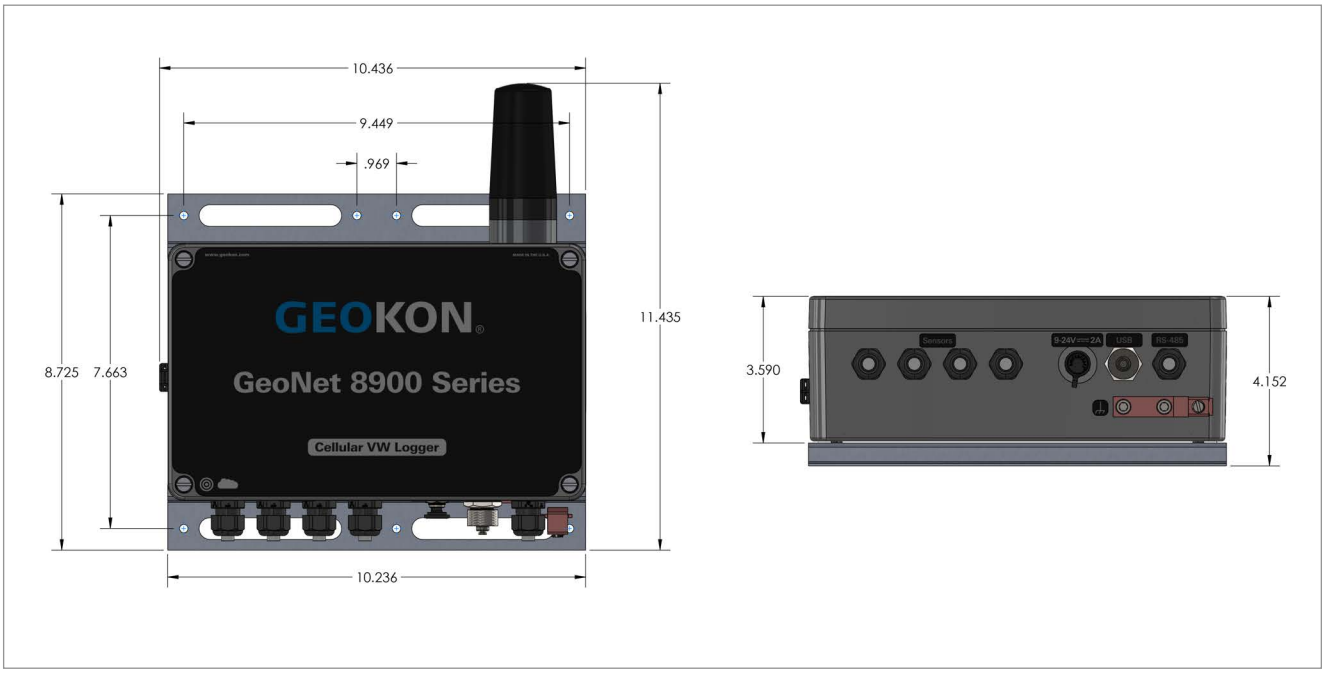


FIGURE 20: *Four-Channel (04C) Models*

E.3 EIGHT-CHANNEL (08C) MODELS

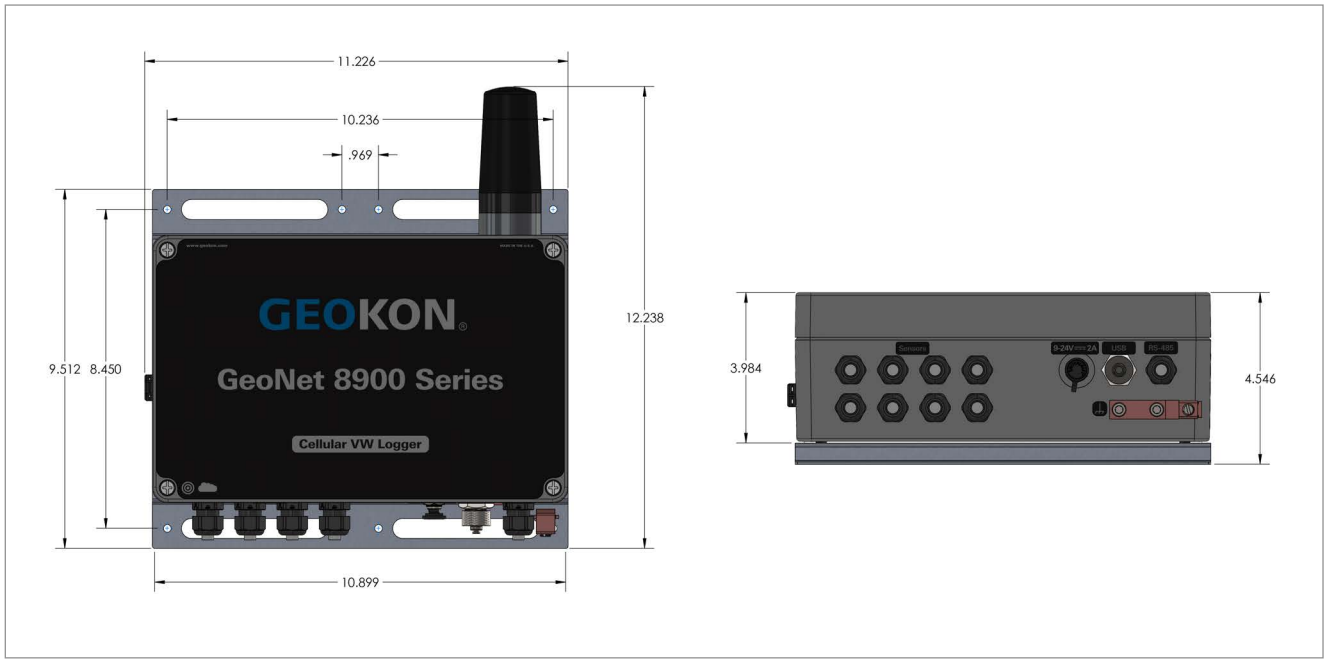


FIGURE 21: *Eight-Channel (08C) Models*

E.4 DIGITAL HIGH POWER (DHP) MODELS

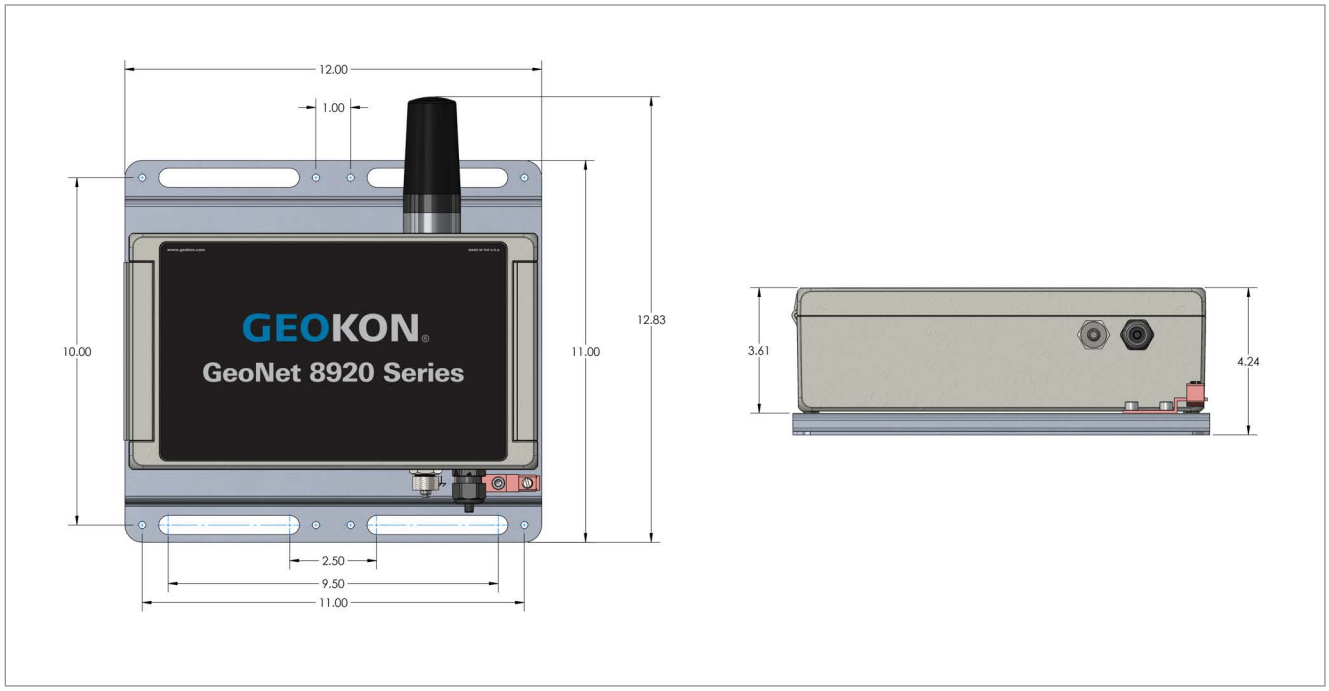


FIGURE 22: *Digital High Power (DHP) Models (Antenna Not Pictured)*

E.5 TILT (TLT) MODELS

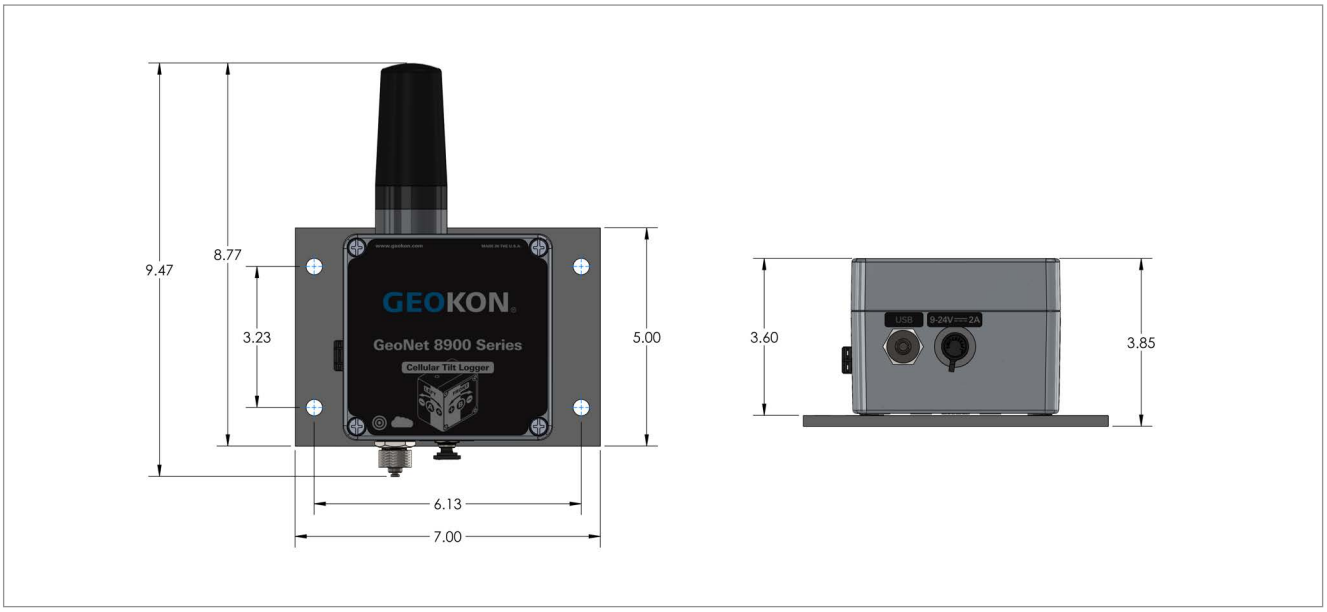


FIGURE 23: *Tilt (TLT) Models*

APPENDIX F. MOUNTING BRACKET DIMENSIONS

Note: Dimensions shown below are in inches.

F.1 SINGLE CHANNEL (01C) AND ADDRESSABLE (ADR) MODELS

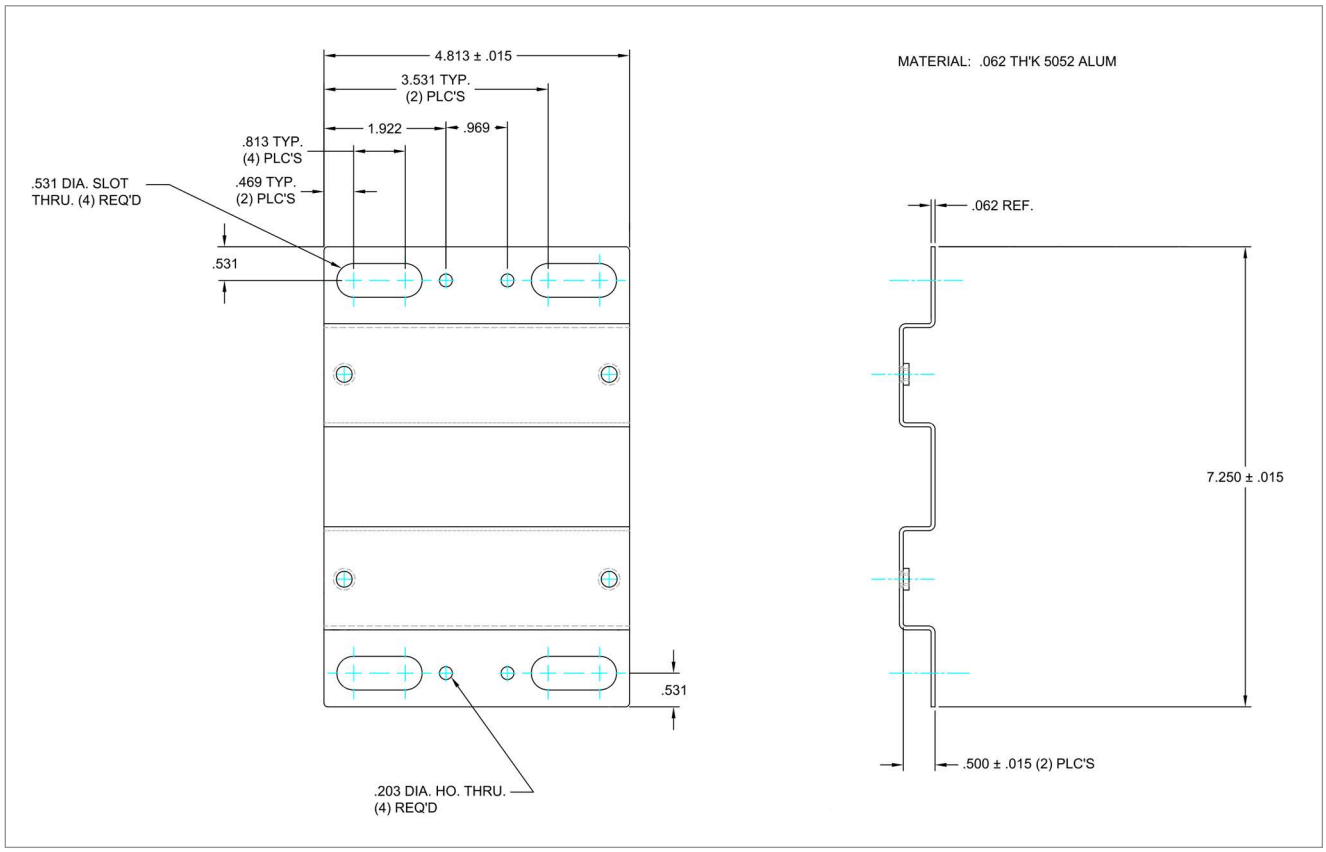


FIGURE 24: *Single-Channel (01C) and Addressable (ADR) Models*

F.2 FOUR-CHANNEL (04C) MODELS

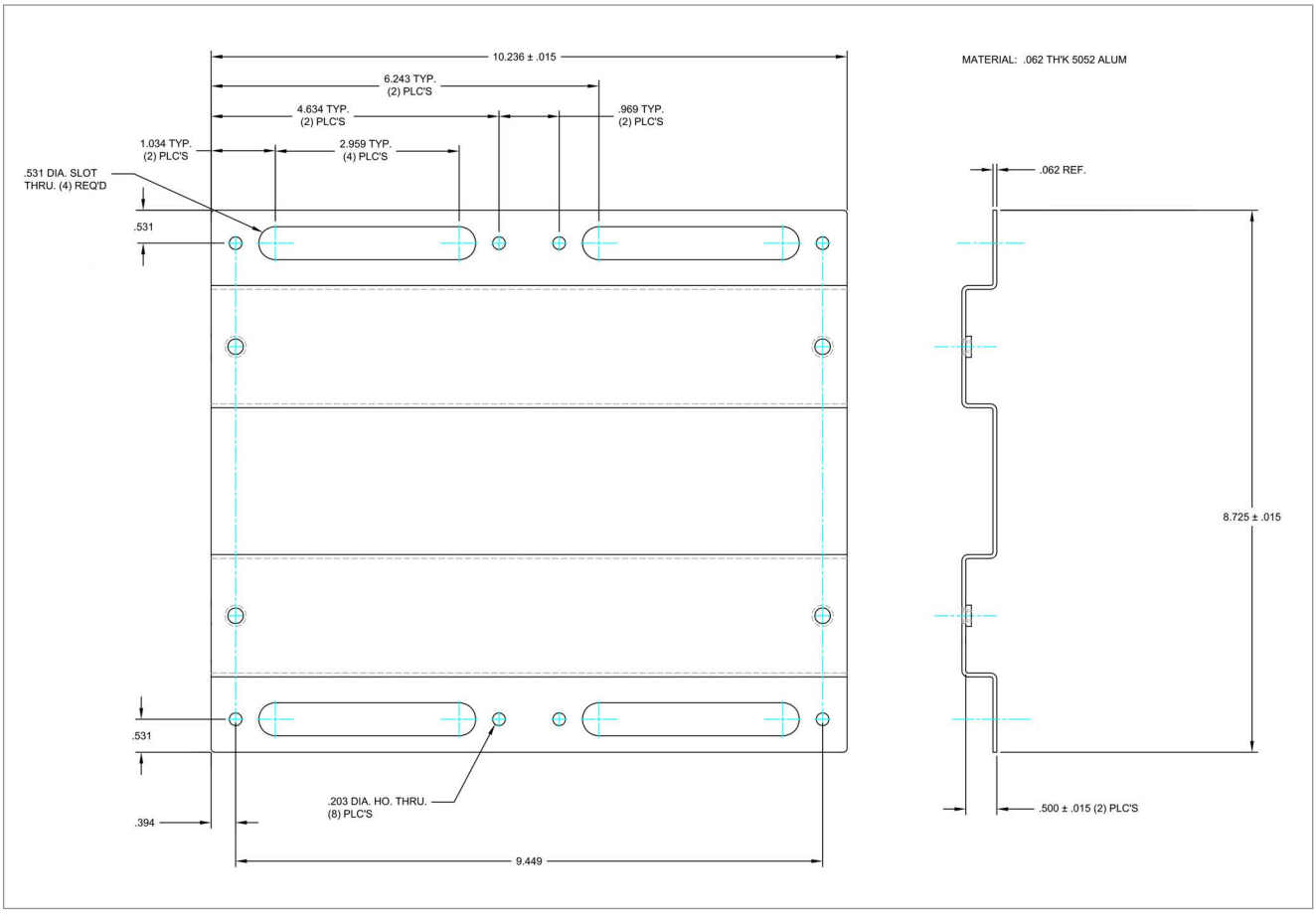


FIGURE 25: *Four-Channel (04C) Models*

F.3 EIGHT-CHANNEL (08C) MODELS

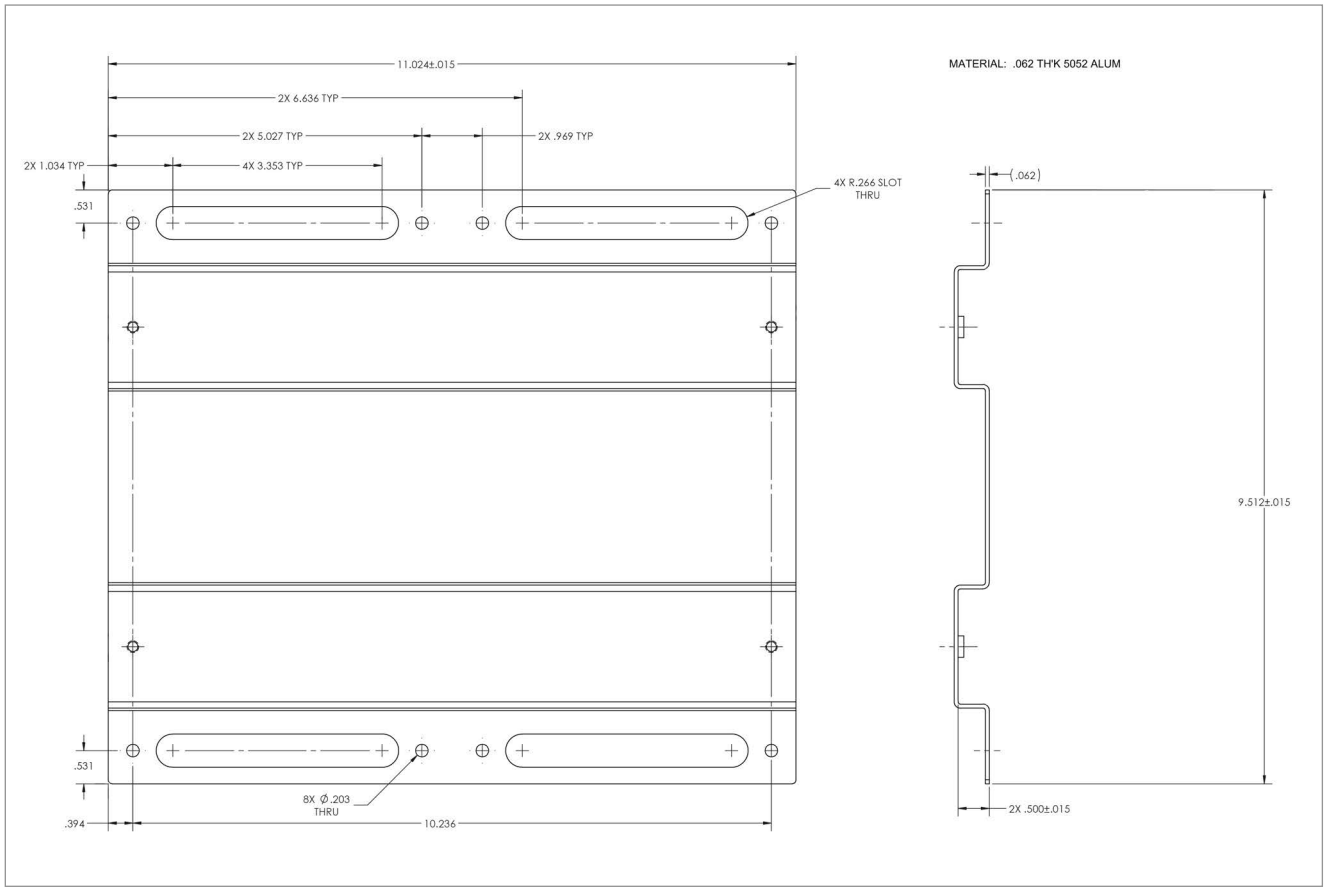


FIGURE 26: *Eight-Channel (08C) Models*

F.4 DIGITAL HIGH POWER (DHP) MODELS

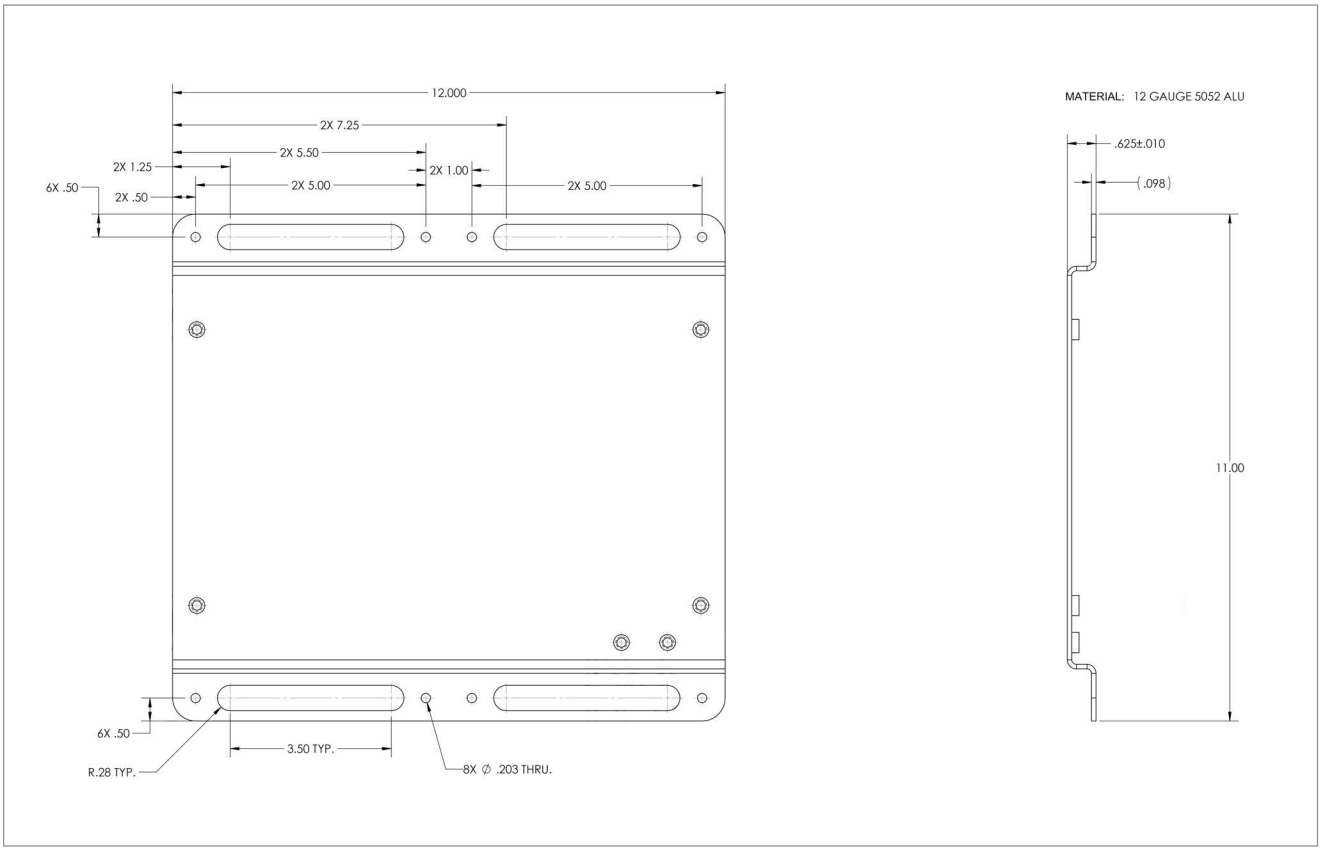


FIGURE 27: *Digital High Power (DHP) Models*

F.5 TILT (TLT) MODELS

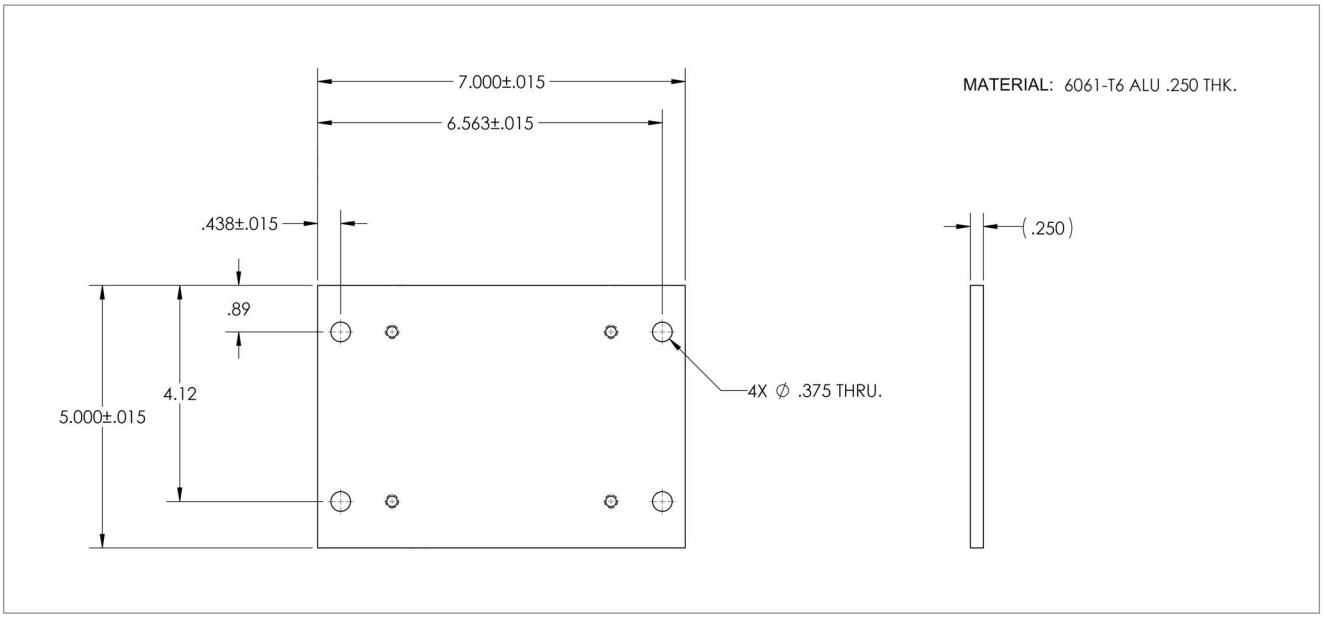


FIGURE 28: *Tilt (TLT) Models*

APPENDIX G. COMPONENTS (TYPICAL REPLACEMENT PARTS)

G.1 SINGLE-CHANNEL (01C) AND ADDRESSABLE (ADR) MODELS

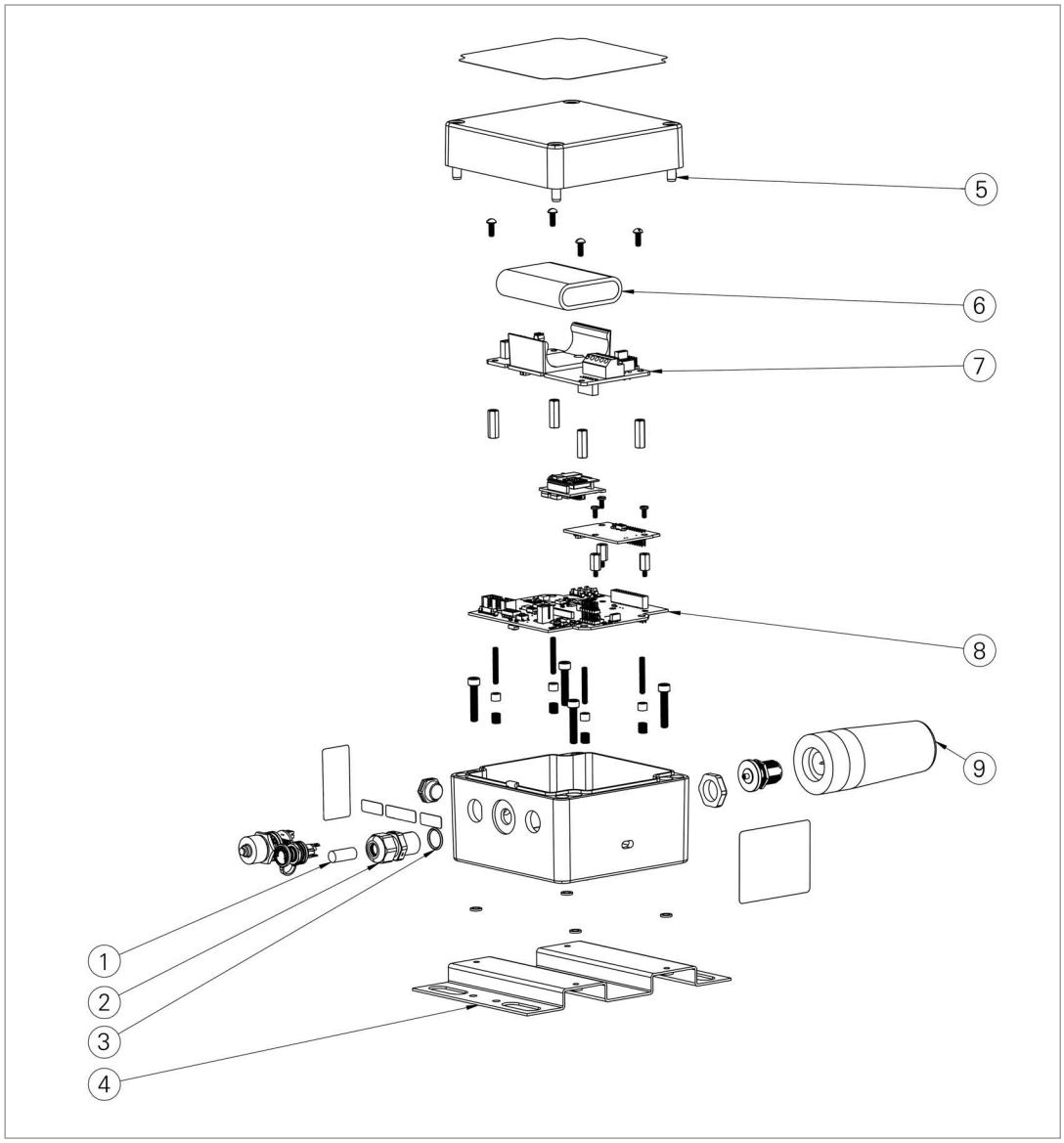


FIGURE 29: *Single-Channel (01C) and Addressable (ADR) Models*

Item No.	Part Number	Description
1	CON-A342	Dowel Pin
2	CON-A331	Cable Fitting
3	SEAL-09	Seal Ring for CON-A331
4	C8800-1	Mounting Bracket
5	HRD-A2009	M6 x 35 mm Allen Head Screw. When any replacements are required from the original screws, GEOKON recommends that all 4 screws are replaced.
6	BAT-207	Battery Pack
7	S-PCB-0292	Battery Holder PCBA
8	S-8900-NET	GeoNet PCBA
9	ELC-824	Antenna

TABLE 21: *Single-Channel (01C) and Addressable (ADR) Models Components Parts List*

G.2 FOUR-CHANNEL (04C) MODELS

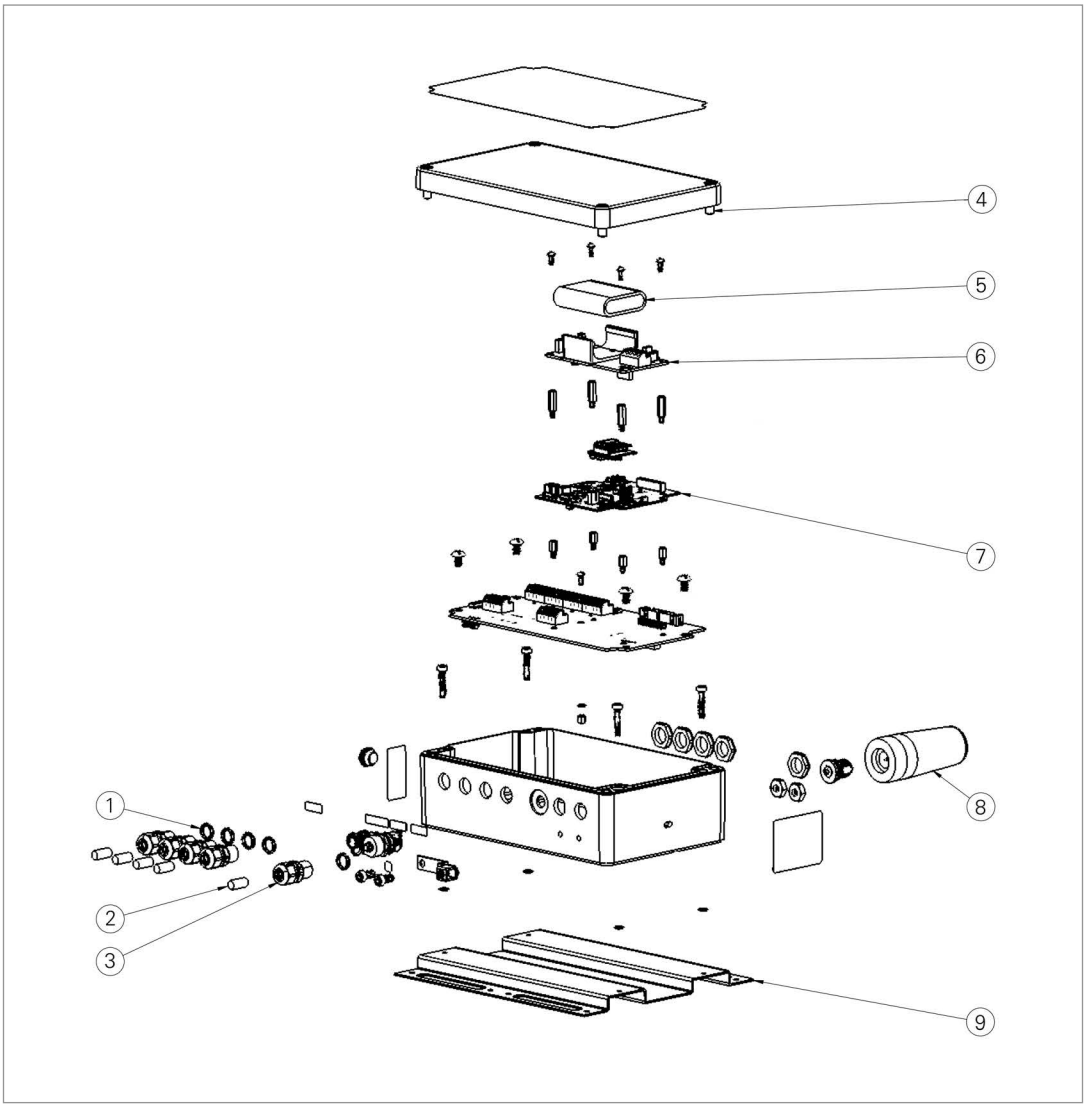


FIGURE 30: *Four-Channel (04C) Models*

Item No.	Part Number	Description
1	SEAL-09	Seal Ring for CON-A331
2	CON-A342	Dowel Pin
3	CON-A331	Cable Fitting
4	HRD-A2006	M6 x 25 mm Allen Head Screw. When any replacements are required from the original screws, GEOKON recommends that all 4 screws are replaced.
5	BAT-207	Battery Pack
6	S-PCB-0292	Battery Holder PCBA
7	S-8900-NET	GeoNet PCBA
8	ELC-824	Antenna
9	C8800-6	Mounting Bracket

TABLE 22: *Four-Channel (04C) Models Components Parts List*

G.3 EIGHT-CHANNEL (08C) MODELS

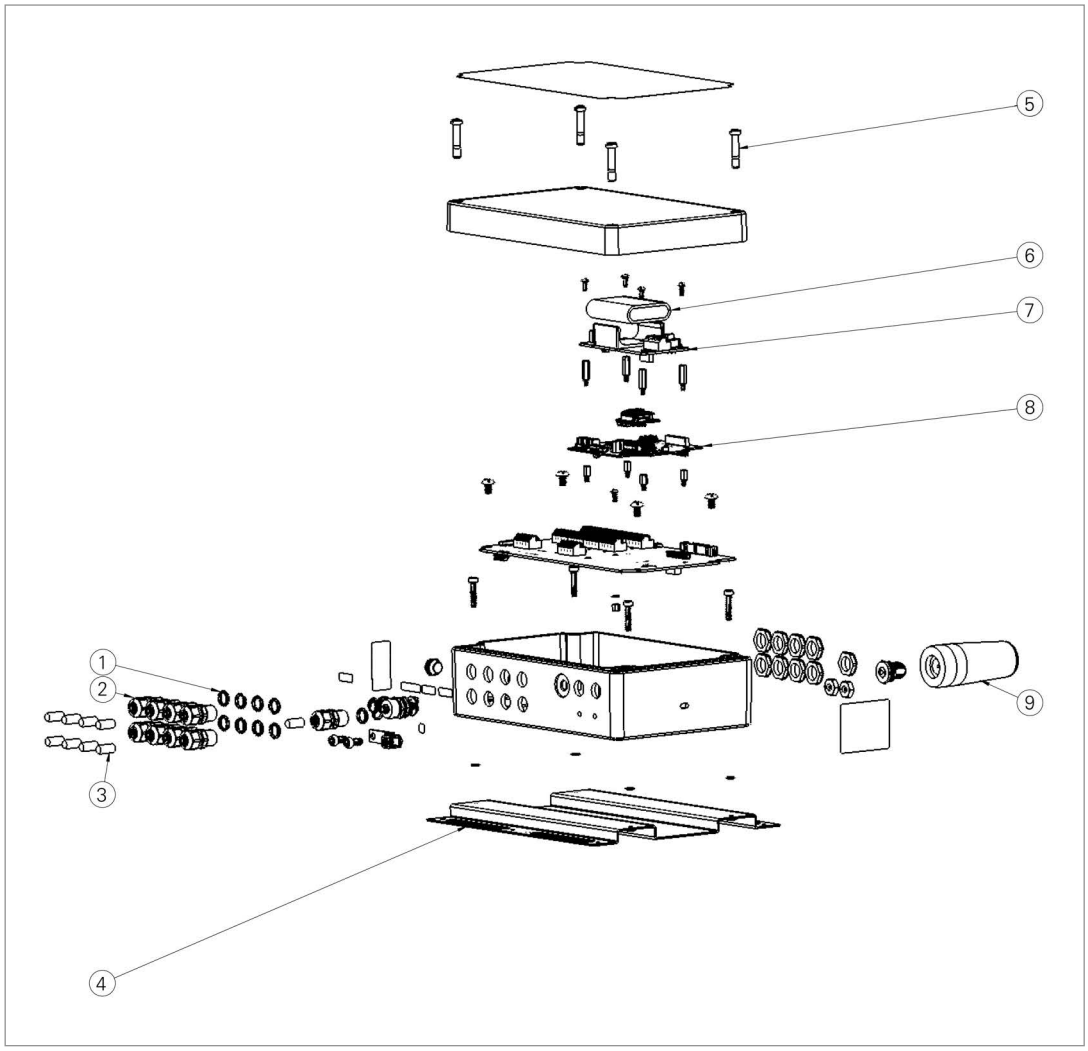


FIGURE 31: *Eight-Channel (08C) Models*

Item No.	Part Number	Description
1	SEAL-09	Seal Ring for CON-A331
2	CON-A331	Cable Fitting
3	CON-A342	Dowel Pin
4	C8900-1	Mounting Bracket
5	HRD-A2009	M6 x 35 mm Allen Head Screw. When any replacements are required from the original screws, GEOKON recommends that all 4 screws are replaced.
6	BAT-207	Battery Pack
7	S-PCB-0292	Battery Holder PCBA
8	S-8900-NET	GeoNet PCBA
9	ELC-824	Antenna

TABLE 23: *Eight-Channel (08C) Models Components Parts List*

G.4 DIGITAL HIGH POWER (DHP) MODELS

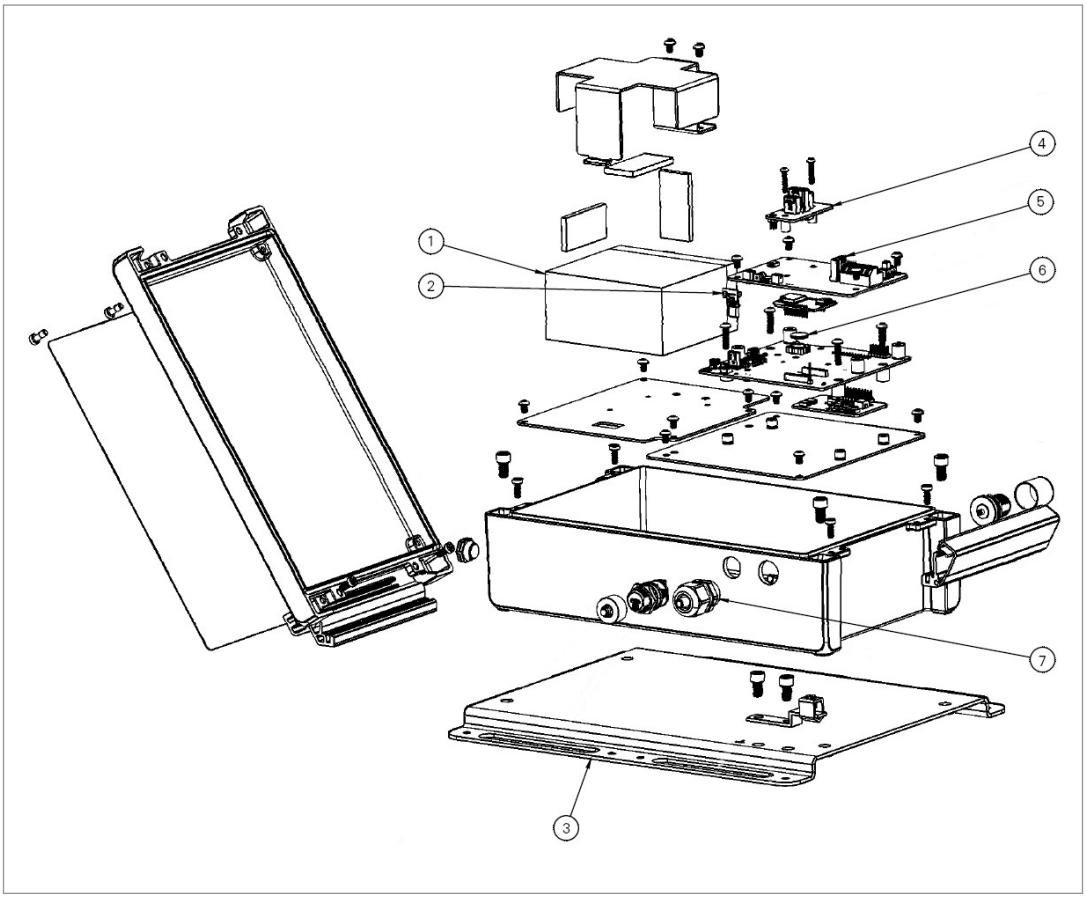


FIGURE 32: *Digital High Power (DHP) Models (Antenna Not Pictured)*

Item No.	Part Number	Description
1	BAT-209	Sealed Lead Acid Battery
2	S-8910-13	PicoBlade to USB-C Plug OVP
3	BOX-501-BRACKET	Mounting Bracket
4	S-8910-3-1	LoRa SLA OVP
5	N/A	Fuse, contact GEOKON for more information.
6	BAT-122	Lithium Coin Cell Battery
7	**CON-A443, including:** CON-A342 CON-A331 SEAL-09	**Assembled Cable Gland, including:** Dowel Pin Cable Fitting Seal Ring
8 (Not Pictured)	ELC-824	Antenna

TABLE 24: *Digital High Power (DHP) Models Components Parts List*

G.5 TILT (TLT) MODELS

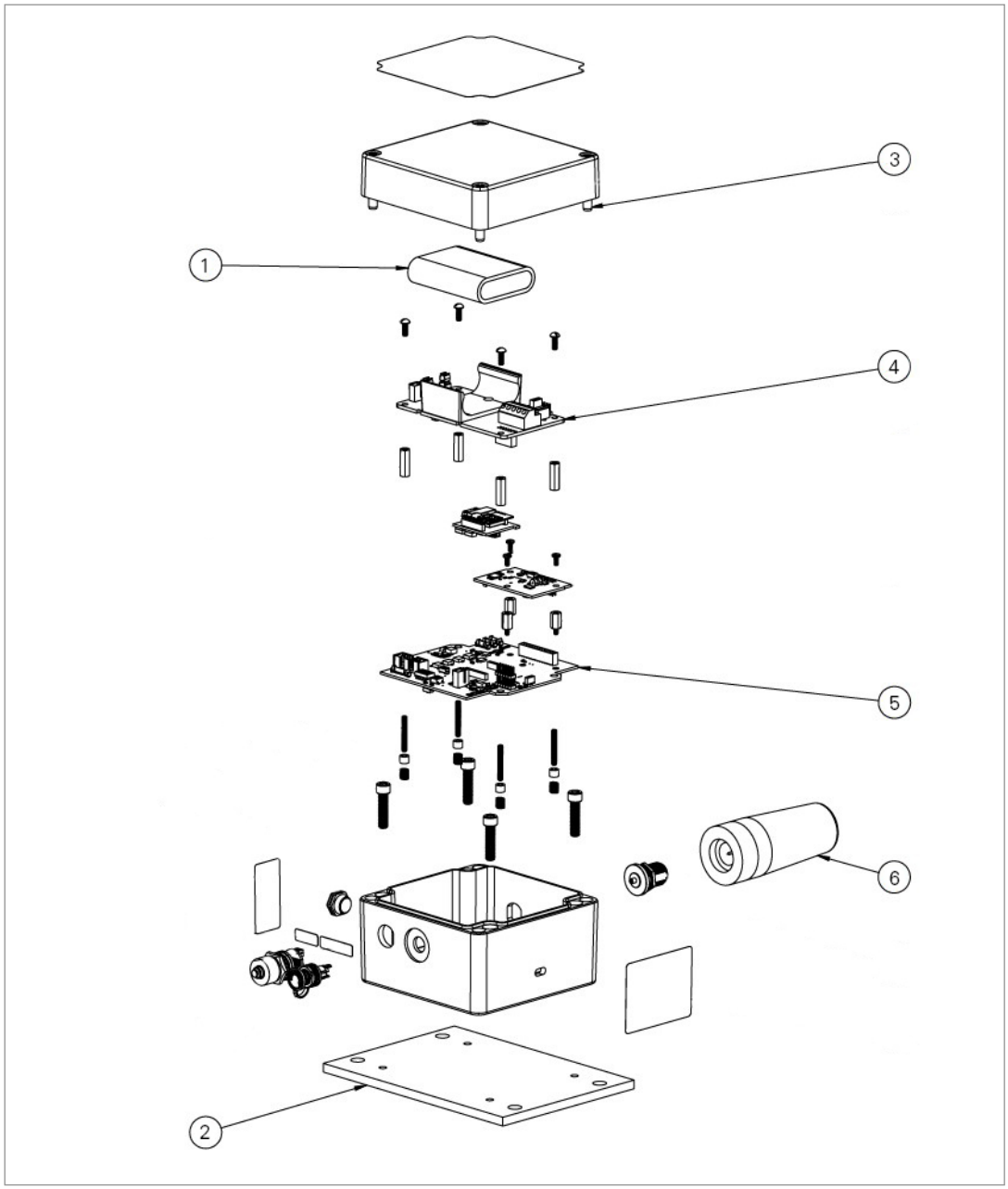


FIGURE 33: *Tilt (TLT) Models*

Item No.	Part Number	Description
1	BAT-207	Battery Pack
2	A8101-3	Mounting Bracket
3	HRD-A2009	M6 x 35 mm Allen Head Screw. When any replacements are required from the original screws, GEOKON recommends that all 4 screws are replaced.
4	S-PCB-0292	Battery Holder PCBA
5	S-8900-NET	GeoNet PCBA
6	ELC-824	Antenna

TABLE 25: *Tilt (TLT) Models Components Parts List*

APPENDIX H. FIRMWARE UPGRADE

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

Note: GeoNet Digital High Power Data Loggers allow for over-the-air (OTA) firmware upgrades.

Network data logger firmware upgrades are performed remotely through the GEOKON Gateway using the GEOKON API portal at api.geokon.com.

Alternatively, firmware upgrades can be performed on-site, using the instructions below:

1. Connect the COM-169 (USB 2.0 A Male to C Male Cable) to the USB-C connector on the bottom of enclosure and the USB port on the computer.

Note: Older Models may use a COM-166 (Mini USB to STD A Cable).



FIGURE 34: *USB Cable Connection (COM-166 Pictured)*

2. Download the "GeoNet Firmware Update Package" from geokon.com/Software.
3. Right click on the download file and choose "Extract All...".

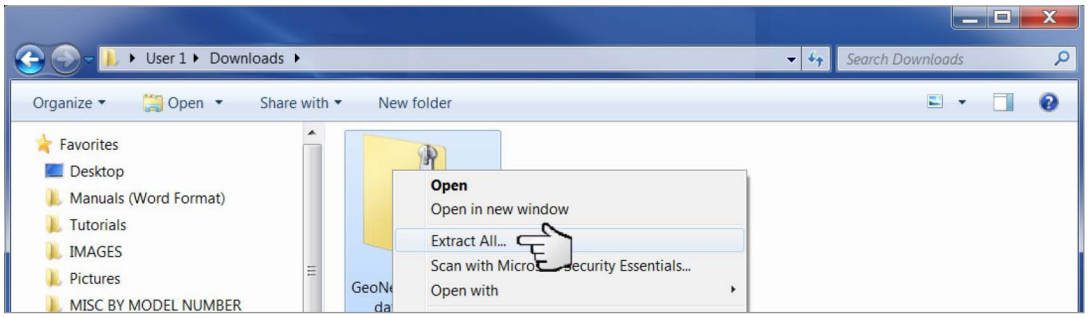


FIGURE 35: *Extract File*

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

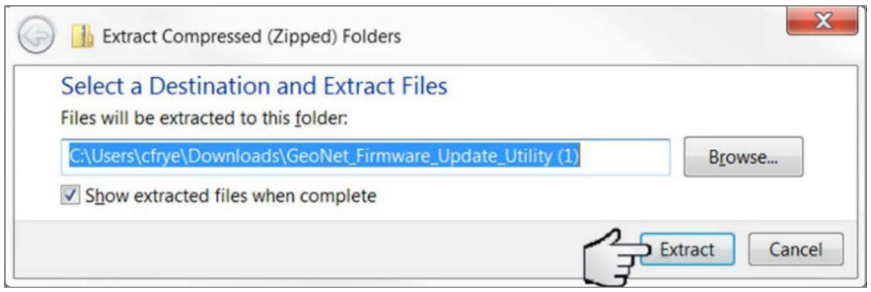


FIGURE 36: *Select Destination, then Click Extract*

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

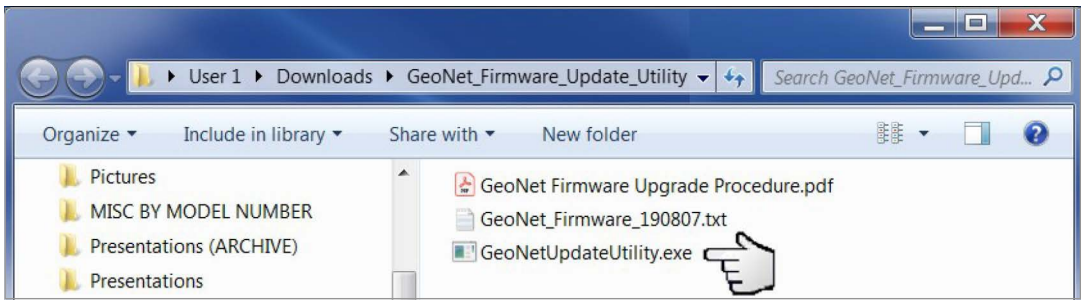


FIGURE 37: *Open the GeoNet Update Utility Application*

7. Click "Select File".

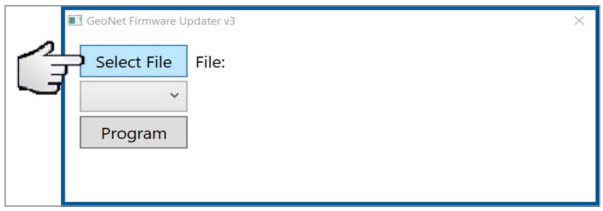


FIGURE 38: *Click on "Select File"*

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.)

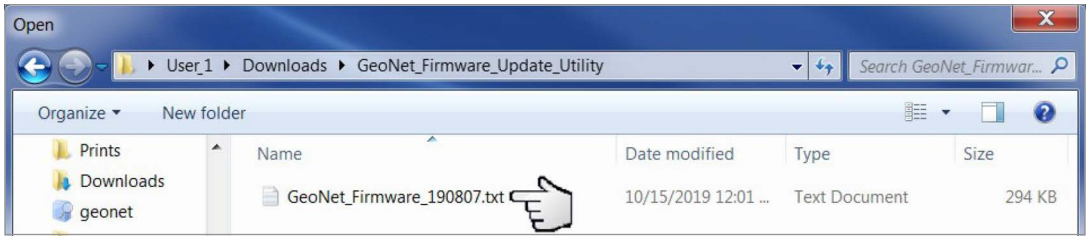


FIGURE 39: *Double Click on Firmware Text File*

9. Using the drop-down box below the "Select File" button, select the correct serial port for the COM-169 cable. To identify which serial port the unit is connected to, complete the following:
   a. Unplug the COM-169 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.

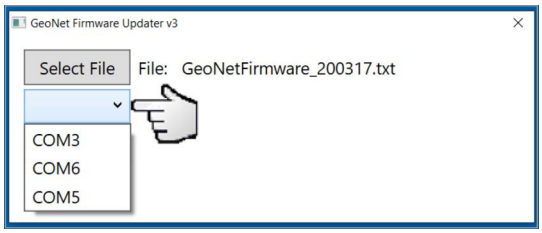


FIGURE 40: *Select COM Port*

10. Click "Program".

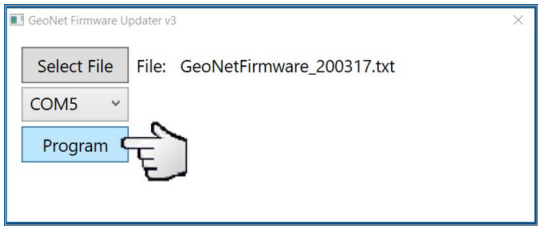


FIGURE 41: *Click on Program*

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.

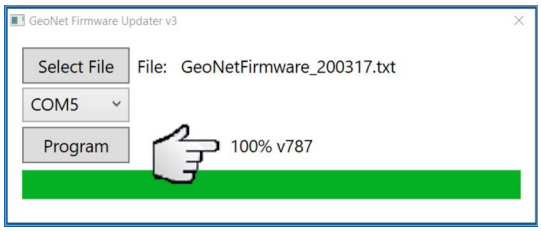


FIGURE 42: *Update Finished*

13. Repeat the above process with all the data loggers in the Network.

The firmware update is now complete.

APPENDIX I. VIBRATING WIRE LOAD CELL WIRING

I.1 WIRING SINGLE LOAD CELL

8CH Interface[1]	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[2]	Common	White's Black[3]	Green	Blue
Channel 1 TH +	Thermistor	Green[3]	Blue	Yellow
Channel 1 TH -	Thermistor	Green's Black	Blue's Black	Yellow's Black

TABLE 26: *Single Load Cell Wiring*

Note:

[1] Where second Load Cell is being included, retain relative channel position count up from channel 5.

[2] Common "VW-" between all channels associated with each VW Load Cell

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

I.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 27: *Load Cell Configuration Switch Settings*

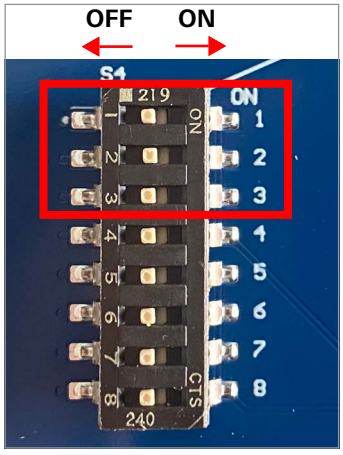


FIGURE 43: *Load Cell Configuration Switch*

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