

Installing GeoNet Wireless Data Hosting Systems



Topics Covered in this Tutorial

- Initial Setup
- Power Up
- Device Mounting & Network Considerations
- Connecting Sensors to Nodes

Important Terms

- **Network**

- ▶ A collection of GeoNet devices communicating via radio signals
- ▶ Minimum requirements for a working network: 1 *"Node"*, 1 *"Supervisor" or "Cellular Gateway"*, a PC running *"Agent software"*

- **Node**

- ▶ Collects data from external sensors (piezometers, strain gauges, etc.) and internal sensors (battery, signal strength, etc.)
- ▶ Forwards collected data to the Supervisor / Cellular Gateway
- ▶ Relays data from other Nodes to the Supervisor/Gateway as necessary

- **Supervisor / Cellular Gateway**

- ▶ Controls the network (sets time, changes modes, etc.)
- ▶ Central collection point for all data obtained by the network
- ▶ Contains internal sensors for battery, signal strength, etc.

Important Terms (Continued)

- **Agent software**

- ▶ Used for network configuration and data collection
- ▶ Data can be viewed as a chart or exported for use in other data management applications
- ▶ Visit GEEKON.com/software to download

- **LED indicators**

- ▶ Red and green LEDs that indicate the status of the device
- ▶ A key printed below the indicators explains the various light codes

- **Status Button**

- ▶ Press to have the LED indicators display the device status
- ▶ Used to activate or restart *"Deployment Mode"* on the Supervisor / Cellular Gateway

Important Terms (Continued)

- **Deployment Mode**

- ▶ Must be used when making changes to a network (adding Nodes, changing batteries, resetting a device, etc.)
- ▶ Indicated by the LEDs on the Supervisor / Cellular Gateway flashing every 10-15 seconds
- ▶ Automatically activated when the Supervisor / Cellular Gateway is powered
- ▶ Active for 60 minutes by default (Can be changed using Agent software)
- ▶ Can be reactivated/reset by pressing the status button on the Supervisor / Cellular Gateway (May take up to 6 minutes to take effect)

Items Required for Installation

- **GEOKON Provided**

- ▶ #3 Philips head screwdriver
- ▶ Small flat head screwdriver
- ▶ Antenna for each device
- ▶ Two D-cell batteries for each device (Not required for Cellular Gateways)
- ▶ Desiccant packs
- ▶ Mini USB to standard USB cable (Required for USB Supervisors)
- ▶ USB to RS-232 adaptor (Required for RS-232 Supervisors)

Items Required for Installation

- **Customer Provided**

- ▶ Mounting hardware
(screws, U-bolts, hose clamps, etc.)
- ▶ Materials to create a suitable earth ground
(A 6-foot copper rod and 12 AWG or larger copper wire are recommended; these items can be purchased from GEOKON)
- ▶ Portable PC with Agent software installed
(Required on-site when using a Supervisor to control network)

Getting Started

For ease of setup GEOKON recommends the following:

- Perform the installation in the designated order
(Skipping steps or performing them out of order could complicate the installation of the network)
- All network components should be in close proximity to one another during the initial setup
- Make sure all components have joined the network before moving them to their final locations

Initial Setup




Attach the Antennae

Complete the following for all devices in the network:

1. Remove the cap from the antenna mount
2. Position the antenna on the mount
3. Thread the antenna onto the mount by rotating it clockwise until finger tight



 Do not cross thread the antenna. Cellular Gateway Supervisor antennae have an O-ring which must be flush with the enclosure

Remove the Covers


Complete the following for all devices in the network:

1. Using a Phillips head screwdriver, loosen the cover screws by turning them counterclockwise
2. Remove the cover



Setting Channels

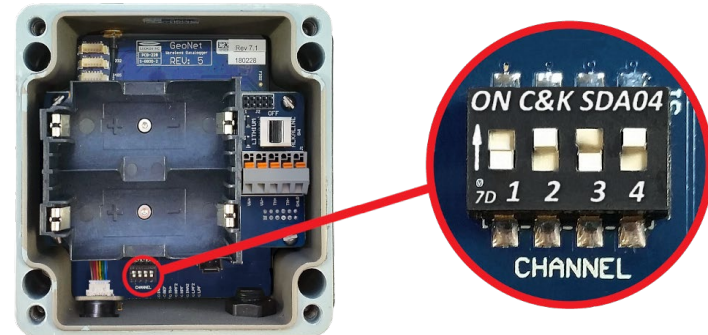
- All GeoNet devices are set to operate on the same channel at the factory

 *Channels only need to be set if multiple networks will be operating within radio range of one another*

- Networks within radio range of one another must be set to different channels
- Up to 12 networks can operate in the same area, by utilizing a different channel for each network

Setting Channels (Continued)

- To set the channel, move the channel dipswitches to one of the 12 valid settings shown
- GeoNet Devices will only communicate with others that have been set to the same channel, therefore, ALL DEVICES in a network must be set to the same channel



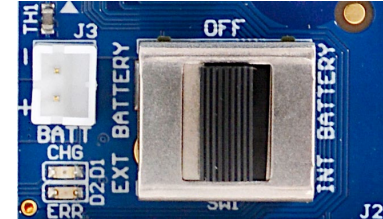
Modbus Address and Channel	1	2	3	4
1	OFF	OFF	OFF	OFF
2	ON	OFF	OFF	OFF
3	OFF	ON	OFF	OFF
4	ON	ON	OFF	OFF
5	OFF	OFF	ON	OFF
6	ON	OFF	ON	OFF
7	OFF	ON	ON	OFF
8	ON	ON	ON	OFF
9	OFF	OFF	OFF	ON
10	ON	OFF	OFF	ON
11	OFF	ON	OFF	ON
12	ON	ON	OFF	ON

Power Up



Powering a Cellular Gateway

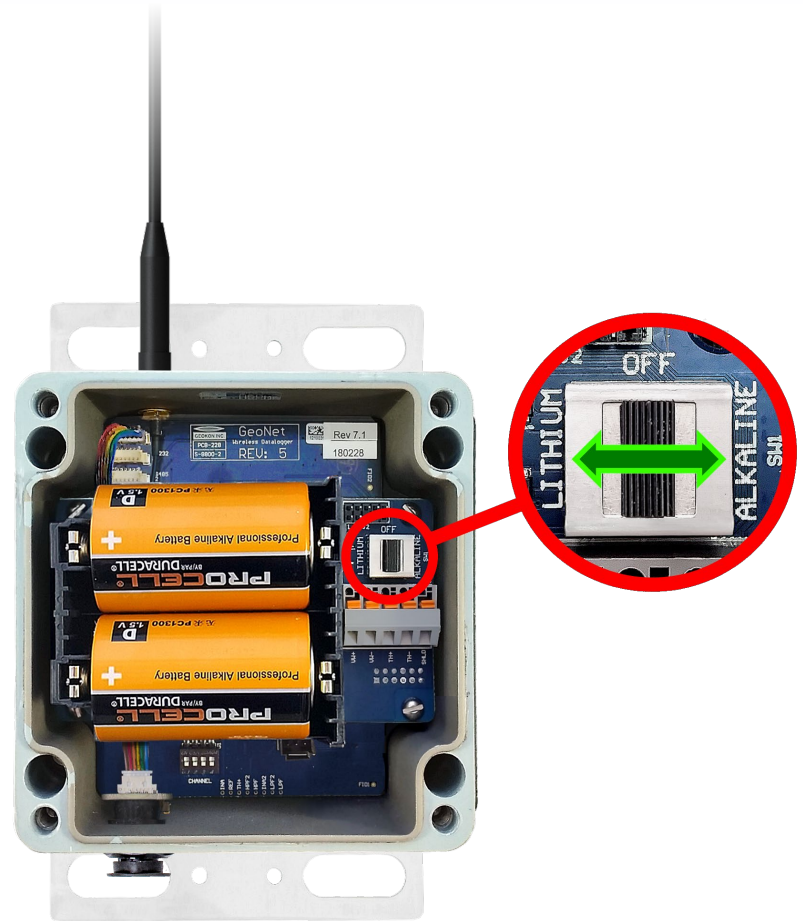
1. Plug the AC adaptor, or other external power source, into the 9-24V DC power jack (Cellular Gateways must have an external power source)
2. Move the power switch to the correct position based on the table below



Power Source	Geographical Zone	
	Temperate	Sub Polar
Mains / Solar with External Battery	INT BATTERY	EXT BATTERY
Solar, NO External Battery		N/A

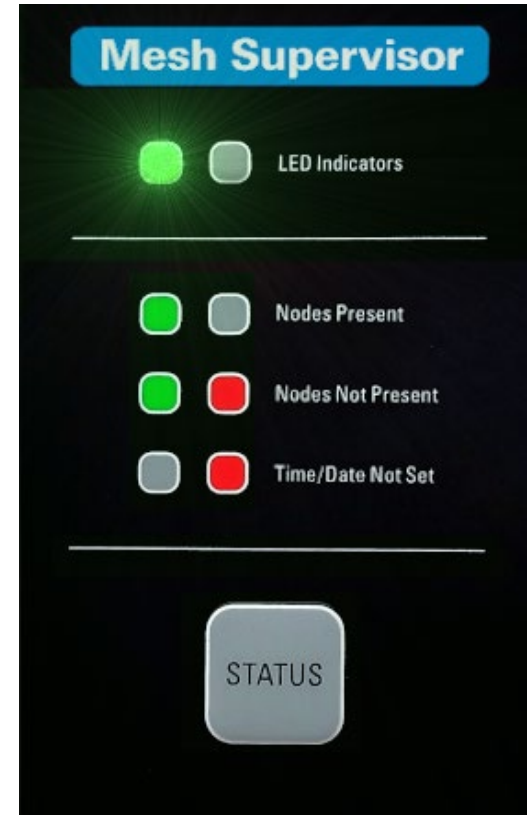
Powering a Supervisor without Cellular Capability

1. Align the positive (+) side of the D cell batteries with the left side of the battery holder
2. Push the batteries straight down into the holder
3. Move the battery selector switch to "ALKALINE" or "LITHIUM" depending on the type of batteries installed



Supervisors & Cellular Gateways

- On power up, the green LED on the side of the enclosure will flash twice (May take several seconds to occur)
- The LEDs will not flash again until at least one Node has joined the network, or the status button is pressed



Close the Supervisor / Cell Gateway

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
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



Setting the Network Time

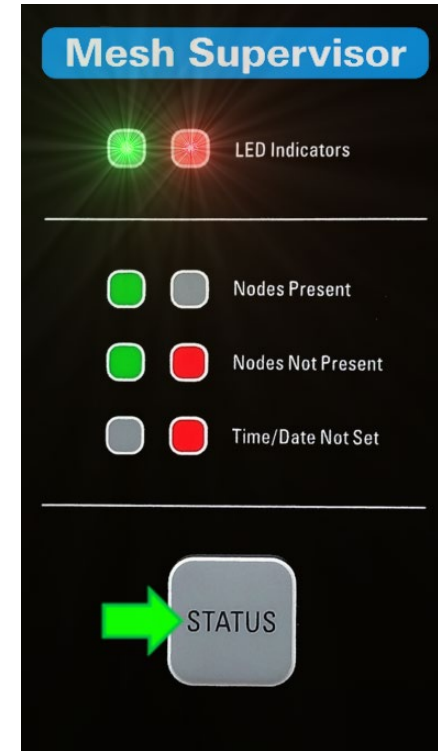
(Not Necessary for Cellular Gateways)

- Data will not be collected until the network time has been set using Agent software
1. Connect the Supervisor to a computer using the factory supplied USB cable (and RS-232 adaptor if required)
 2. Use Agent software to set the network time
(For more information, refer to the [Agent instruction manual](#))



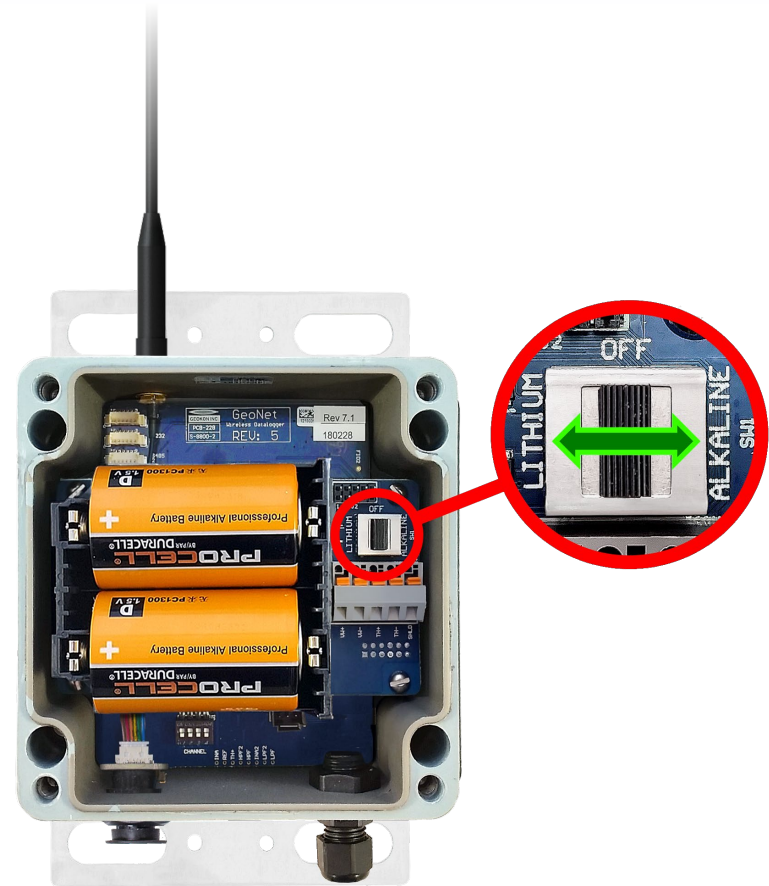
Verify Network Time is Set and Record the Serial Number

1. Verify the network time is set by pressing the status button and observing a green and red flash on the LED indicators
2. If only the red LED flashes:
 - ▶ Cellular Gateways:
Wait several minutes then try again
 - ▶ Supervisors without cellular capability :
Set the network time in Agent as previously described
3. Record the serial number of the Supervisor / Cellular Gateway
(Required to commission Cellular Gateways and used to differentiate networks in Agent)



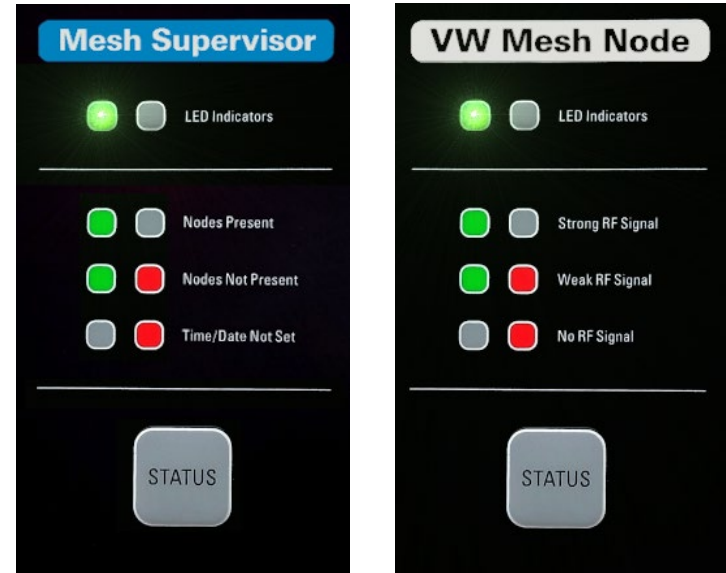
Powering a Node

- Nodes should be powered up in close proximity to the Supervisor
1. Align the positive (+) side of the D cell batteries with the left side of the battery holder
 2. Push the batteries straight down into the holder
 3. Move the battery switch to "ALKALINE" or "LITHIUM" depending on the type of batteries installed



Powering a Node (Continued)

3. The green LED on the Node will flash twice (may take several seconds to occur)
4. The Node will join the network in approximately 30 seconds (Can take longer if the Supervisor / Gateway is not in Deployment mode)
5. LEDs on the Supervisor / Gateway and Node will flash in unison
6. Verify that LEDs are flashing *green only* before continuing



Adding More Nodes

- Each time a new Node joins the network, the 60-minute Deployment Mode timer will reset
- The amount of time Deployment Mode is active can be changed using Agent software
- Deployment Mode can be reactivated/reset by pressing the status button on the Supervisor / Cellular Gateway (May take up to 6 minutes to take effect)



Adding More Nodes (Continued)

- If a Node does not join the Network within 30 seconds of power up, it is out of range, on the wrong channel, or the Supervisor / Cellular Gateway has left Deployment Mode
- Move Nodes to their final location *after* they have joined the network (Expedites installation)



Device Mounting & Network Considerations



Device Mounting

- GeoNet Devices can be mounted using bolts (A), screws (B), hose clamps (C), U-bolts (D), etc. (Mounting hardware not included)
- Always mount GeoNet devices vertically, with the antenna pointing up
- The space around the antenna should be free of obstructions
- A minimum mounting height of two meters (six-feet) is recommended



Tiltmeter Orientation

- The direction of tilt for the A and B axes is shown on the cover of the unit
- The two axes of the tiltmeter have a calibrated range of $\pm 30^\circ$, based on a starting position of 0° (antenna pointing up)



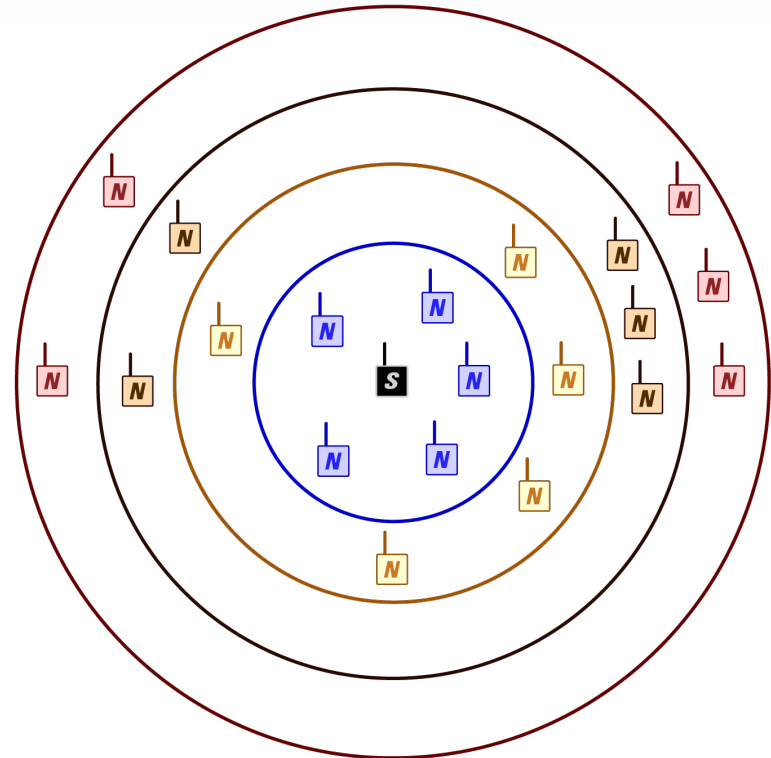
Device Grounding

- GeoNet Devices should be properly grounded to protect against lightning and other large transient voltages
- All GeoNet devices can be grounded by connecting a suitable earth ground to the mounting bracket (**A**)
- Cellular Gateways and Multi-Channel Nodes can also be grounded via the copper ground lug on the bottom of the enclosure (**B**)



Network Considerations

- Start with Nodes closest to the Supervisor / Cellular Gateway and work outwards
- Place the Supervisor / Cellular Gateway in the center of the network wherever possible



Key:

Sup./Gateway



Preferred Order of Installation



First



Second



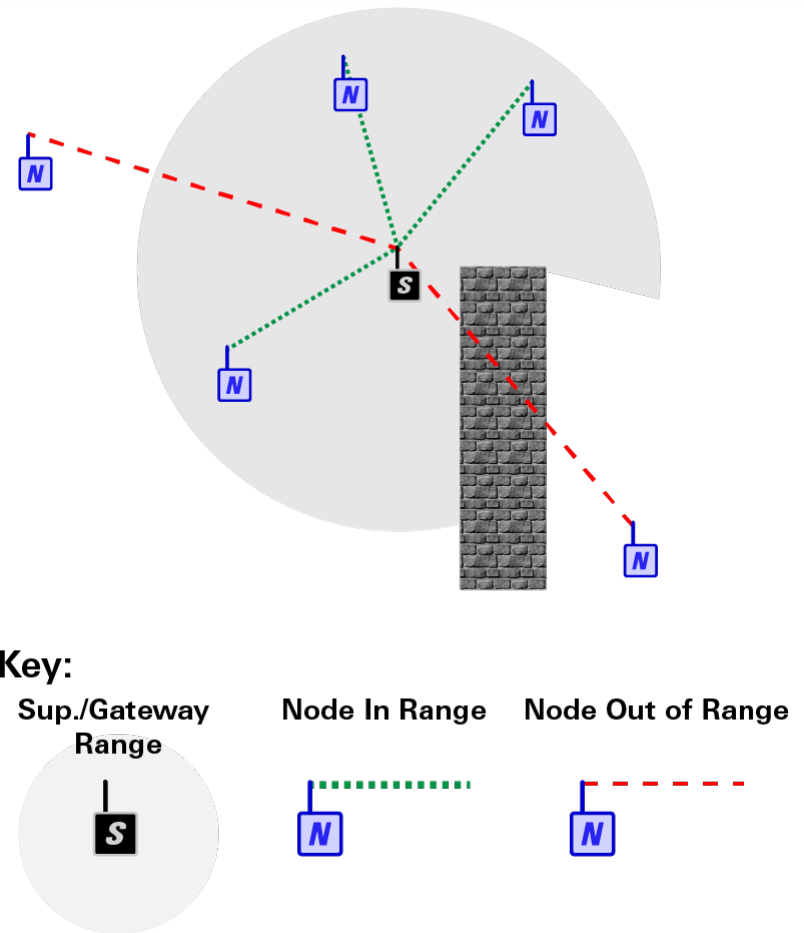
Third



Fourth

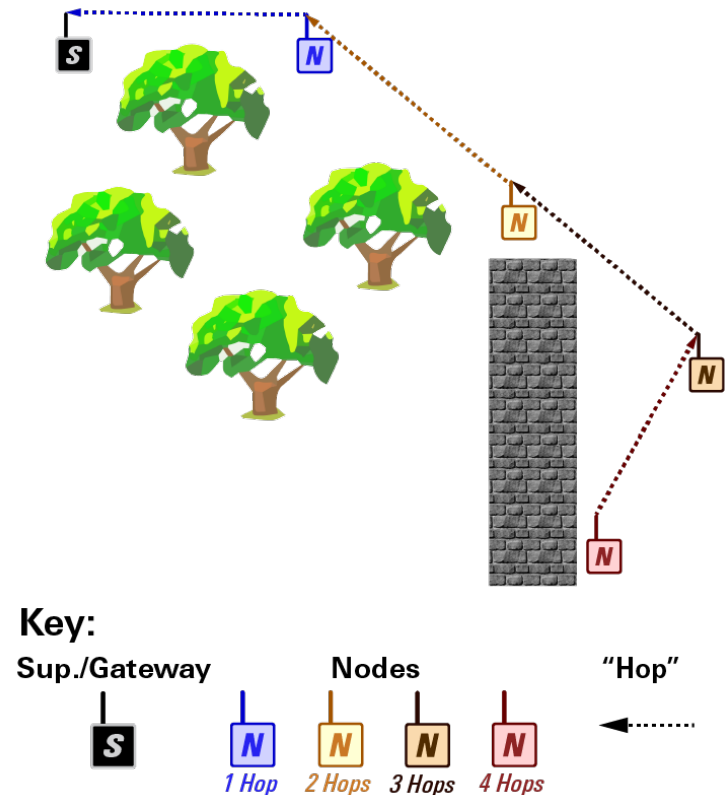
Network Considerations (Continued)

- GeoNet devices can only communicate with other devices that are within range of their radio signal
- Radio ranges vary by model and can be affected by the radio environment and obstructions
- See the [GeoNet instruction manual](#) for complete radio specifications



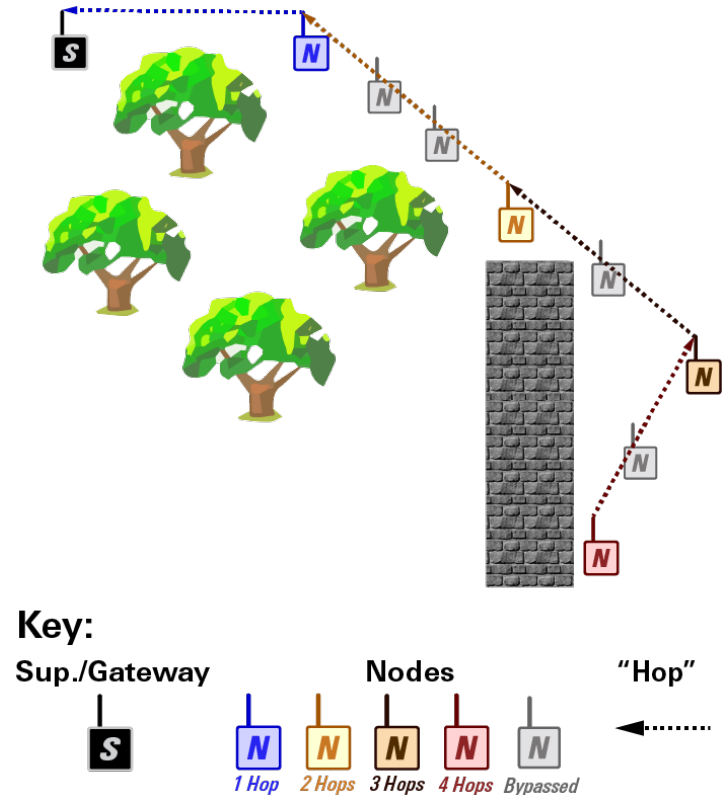
Network Considerations (Continued)

- Nodes can communicate with the Supervisor / Cellular Gateway over greater distances, and work around obstacles, by using other Nodes as repeaters
- Data is automatically relayed between Nodes as needed
- Each transmission from Node to Node, or from Node to Supervisor / Gateway is known as a “Hop”
- Up to four “Hops” can be made between the Node collecting data and the Supervisor / Gateway



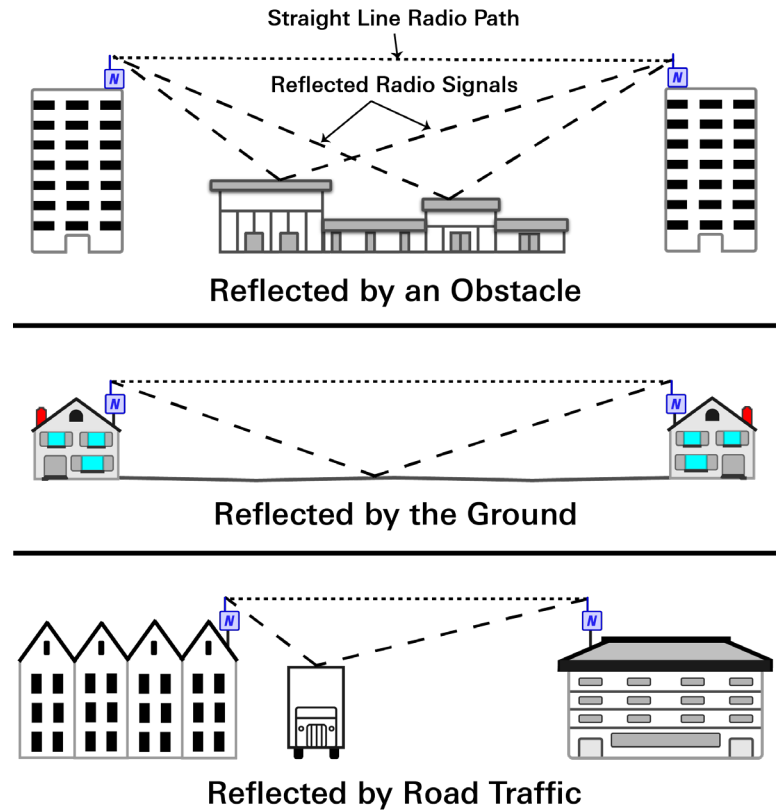
Network Considerations (Continued)

- GeoNet automatically minimizes the number of Hops from each Node to the Supervisor / Cellular Gateway
- Accomplished by analyzing the network and finding the shortest route to the Supervisor / Cellular Gateway (least number of Hops)



Network Considerations (Continued)

- Obstructions between, around, or near GeoNet devices can cause reflections of the radio signal
- Reflected radio signals can cause GeoNet devices to malfunction
- For optimum performance, create as much space as possible between the straight-line radio path and any obstructions (especially metallic objects)

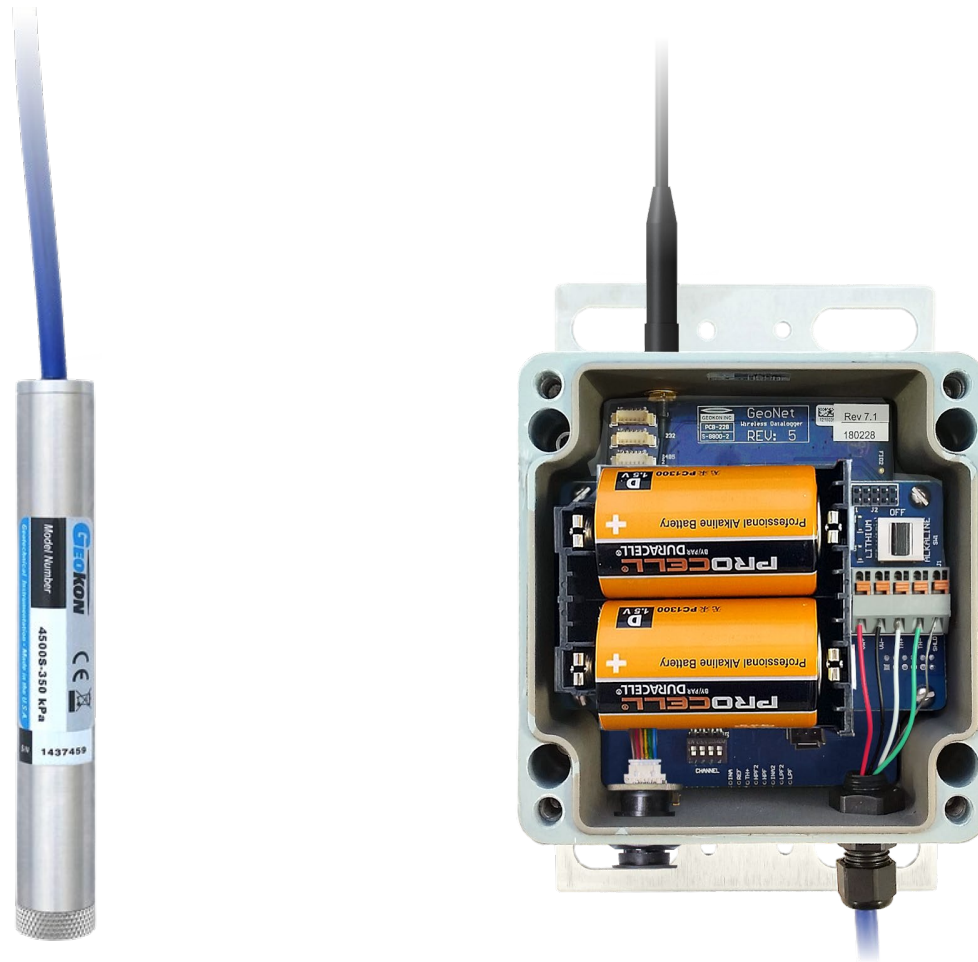


Device Mounting (Continued)

- Common mounting mistakes include:
 - ▶ Not enough clear space around the antenna
 - ▶ Mounting devices horizontally
 - ▶ Metallic objects nearby
- The photos to the right show examples of improper device mounting



Connecting Sensors to Nodes



Connecting Sensors to Nodes

- Depending on the model of the Node, sensors are connected by either a bulkhead connector (**A**) or bare leads (**B**)



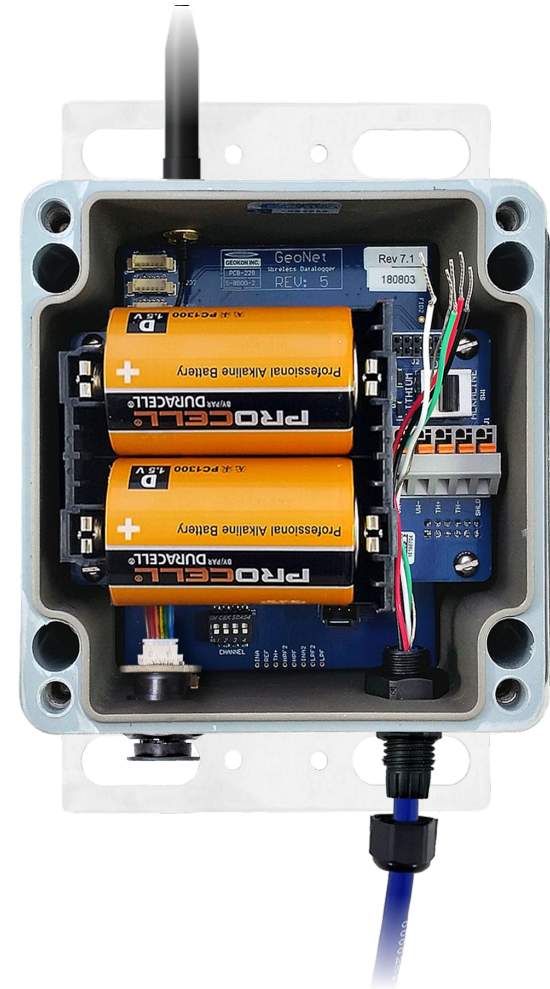
Connecting Sensors to Nodes: Bulkhead Connectors

1. Remove the cap from the bulkhead connector on the Node
2. Align the internal grooves of the sensor and Node connectors and then push them together
3. Twist the outer ring of sensor connector clockwise until it locks into place



Connecting Sensors to Nodes: Bare Leads

1. Loosen the cable gland nut and remove white plastic dowel
2. Slide the cable of the sensor through the cable gland (and gland nut) and into the Node



Connecting Sensors to Nodes: Bare Leads (Continued)

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 block, and then releasing the tab

Conductors are wired as follows:

Vibrating Wire Sensors

RED = VW+
BLACK = VW-
WHITE = TH+
GREEN = TH-
BARE = SHLD

Addressable (RS-485) Sensors


WHITE = 485+
GREEN = 485-
RED = 12V
BLACK = GND
BARE = SHLD



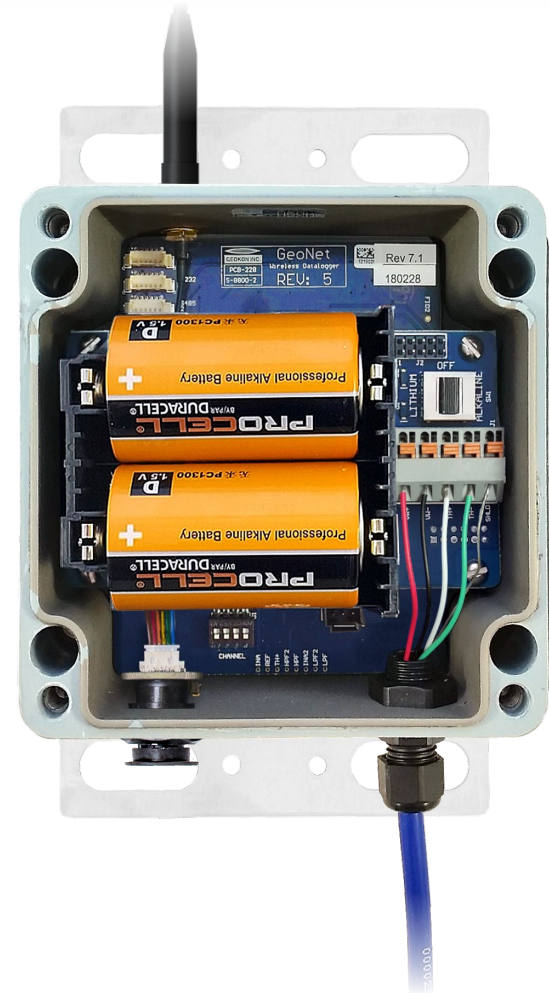
To prevent possible short circuits, do not allow bare leads to touch each other during or after wiring; trim long leads if necessary

Connecting Sensors to Nodes: Bare Leads (Continued)

4. Gently pull on each conductor to make sure it is secure
5. Tighten the nut onto the cable gland until the gland firmly grips the outer jacket of the cable

 The cable gland must be properly tightened to prevent water entry (Do not over-tighten, which may strip the plastic threads)

6. Gently pull on the sensor cable to make sure it is held in place by the cable gland



Notes Concerning Multi-Channel and Addressable Nodes

- On Multi-Channel Nodes, sensor cables should be inserted into the cable glands in order from left to right and wired in sequence, starting with Channel 1
- Do not wire sensors into the terminal blocks marked “485_IN” and “485_OUT” on a Multi-channel Node
- Multi-Channel and Addressable Nodes stop trying to read empty channels after two attempts; additional attempts occur at the top of every hour (Reset the Node to initiate an immediate retry)

Close the Node and Record Serial Numbers

1. Insert the supplied desiccant packs into the enclosure
2. Install the cover as previously explained
3. Record the serial number of the Node and the attached sensor (For Multi-channel Nodes, note the channel each sensor has been wired into)



Cellular Gateway Commissioning

- Complete the installation *before* commissioning the Logger
- Loggers are commissioned using 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>

For more information...

- Consult the GeoNet and Agent instruction manuals
- Instruction manuals are available for download at:
www.geokon.com/Manuals
- Please visit <https://www.geokon.com/Tutorials> for more tutorials