

www.campbellsci.com/permafrost

Permafrost

System Benefits

1. Stations are customized by choosing from a variety of dataloggers, sensors, and communication options.
2. Battery/solar power charging system allows for long-term, stand-alone operation.
3. Most commercially available sensors can be measured by our dataloggers.
4. Stations can perform unattended control based on time or measured parameters.
5. Stations are research-grade, yet cost-effective.
6. Communication options include satellite (Argos, GOES, and others), phone, cellular phone, and radio.
7. Networks are easily expandable: add new sites or add sensors to existing sites.
8. Stations can do double duty – monitor permafrost below ground, meteorological conditions above ground.
9. Dataloggers provide statistical and mathematical processing for on-site data reduction.
10. Equipment versatility provides for cold climate structural, building, bridge, and road monitoring.



The southern edge of Devon Island Ice Cap in Nunavut, Canada.

From single research stations to large networks, Campbell Scientific monitoring systems are commonly used worldwide in permafrost research. Our systems are widely deployed in both high latitude and high altitude applications, facing the coldest and harshest conditions. Our flexible equipment is used for cold climate structural research, and have measured permafrost, hydrological, and meteorological conditions in the Arctic, sub-Arctic, Antarctic, and on the world's great mountain peaks.

Long-term, unattended station operation is achieved with low-power use, batteries and solar panels, wireless data retrieval, and large on-board data storage capacity. For example, stations installed in the summer have the capability to monitor conditions while "overwintering." For all this capability, our dataloggers can be quite small, making them easily transportable in a backpack.

Dataloggers

Our monitoring stations are based around a programmable datalogger (typically a CR1000 or CR3000) that measures the sensors, then stores and transmits the data. We designed our dataloggers to provide a high level of station customization. They have programmable execution intervals, operating temperature ranges down to -55° C, onboard instructions for

commonly used sensors, and adequate input channels to accommodate many different sensor configurations.

If needed, channel capacity can be expanded using multiplexers, including a model designed specifically for thermocouples. Our dataloggers interface directly to most sensors, eliminating external signal conditioning. Powerful on-board instruction sets allow unattended control decisions based on time or conditional events. For example, peripherals such as heaters or specialized sensors can be actuated based on temperature, wind speed, solar radiation, or some other measured parameter or event. These instruction sets contain programmed algorithms that process measurements and output results in the desired units of measure. Wind vector, wet bulb, histogram, and sample on maxima or minima are all standard to the datalogger instruction sets.

Measurement processing and data storage are programmable, but measurements are typically processed and stored at hourly and daily intervals (e.g., maxima, minima, averages). True averages can be calculated and stored by the dataloggers. Conditional outputs can also be processed and stored. For example, data can be stored at faster intervals based on events such as increased wind speeds or subnormal temperatures.

Sensors

Almost any sensor can be measured by our dataloggers, allowing stations to be customized for each site. Typical sensors used with our stations include, but are not limited to: relative humidity, solar radiation, wind speed and direction, temperature (air, water, and soil), precipitation, snow depth, barometric pressure, soil moisture, and water quality, as well as strain gages, accelerometers, pressure transducers, GPS receivers, linear potentiometers, Time Domain Reflectometry, and many more.

Data Retrieval

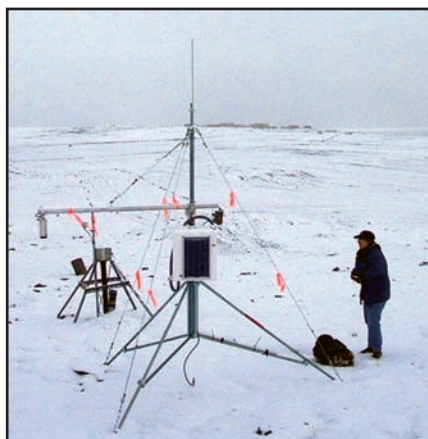
We offer multiple communication options for data retrieval, allowing stations to meet exact needs. Telecommunication options include radio frequency, satellite (Argos, GOES, telephone (landline, voice-synthesized, cellular), short-haul, and multi-drop. On-site options include storage module, laptop computer, and datalogger keyboard/display. Robust error-checking and low-power use ensure your data arrives uncorrupted and as scheduled. We can even help you post your data to the Internet.

Software

Our Windows-based software simplifies datalogger programming, data retrieval, and report generation. The datalogger program can be modified at any time to accommodate different sensor configurations or new data processing requirements.



Greely Fjord, on Ellesmere Island, Nunavut, Canada.



Sharon Smith inspects a monitoring station in Alert, Nunavut, Canada.



Datalogger captures informative building data at the Cold Climate Housing Research Center in Fairbanks, Alaska, USA.



CR1000 provides an extended temperature testing range down to -55° C.