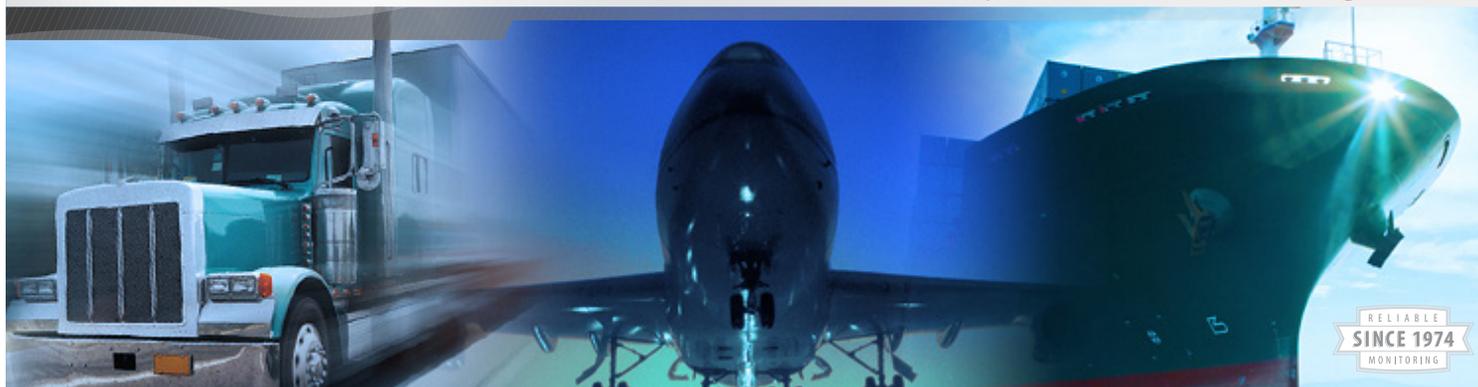




# Transportation

Infrastructure, public information and warning, vehicles



RELIABLE  
SINCE 1974  
MONITORING

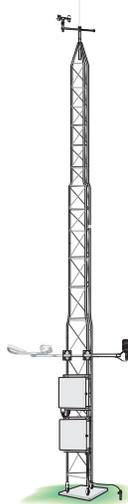
Campbell Scientific data acquisition systems provide reliable and flexible solutions for many applications within the transportation industry. Our capabilities range from monitoring the state of transported goods, to monitoring transportation infrastructure and the vehicle itself, to providing real-time information to warn or inform the public. The compact size, rugged design, and reliability of our systems make them ideal for transportation applications where they may be exposed to harsh conditions such as extreme temperatures or vibration. Low-power consumption, battery power, and wireless data transfer also optimize their use. Systems can be configured to monitor almost any combination of parameters.

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## MAJOR SYSTEM

### ESS | Environmental Sensor Station

Typically includes tower, RPU, road sensors, meteorological sensors, camera, and remote communication hardware



Measurements	Datalogger	Communications Supported	Benefits
wind speed & direction air & road temperature relative humidity road surface visibility precipitation	CR6 CR3000 CR1000X	cellular DNP3 email fiber optic field display FTP Modbus NTCIP radio satellite serial TCP/IP Wi-Fi	<ul style="list-style-type: none"> <li>• Customer-owned data</li> <li>• Flexibility</li> <li>• NTCIP compliant</li> <li>• Web-based software</li> <li>• Nonproprietary/open architecture</li> <li>• Low cost</li> <li>• Proven reliability in harsh weather conditions</li> </ul>

## Transporting Goods

Our systems provide a continuous record of the state of transported goods by monitoring temperature, relative humidity, vibration, or other parameters essential to the well-being of the cargo. Whether transport takes place in a semi-trailer, airplane, train, or cargo ship, our systems provide a continuous time-stamped record of events. GPS data can also be synchronized with other measured parameters, providing location information.

Our measurement systems operate reliably under high levels of vibration, high altitudes, high speeds, and in extreme temperatures, such as refrigerated units. Systems are battery-powered, eliminating the need for external power sources. Depending on configuration, they can operate for months at a time without battery recharge or replacement. Data can be recorded on-board for later analysis or transmitted continuously to a base station during transport.

More info: 435.227.9120

[campbellsci.com/transportation-systems](http://campbellsci.com/transportation-systems)



## Transportation Infrastructure



In Del Mar, California, a tractor-mounted trencher installed coaxial cable for monitoring slope stability using our TDR system.

Stand-alone monitoring of transportation infrastructure can provide data for research, maintenance, and public safety. Vibration, stress, temperature, and other parameters can be monitored on roads, runways, railroad tracks, bridges, and overpasses. Slope stability and subsidence can be monitored in unstable areas around infrastructure.

Our systems are used for pavement studies to monitor different construction materials and techniques and the effects of traffic and weather over time. Weather stations provide data on icing conditions, excessive wind speeds, fog, and avalanche forecasting. Measurement stations provide continuous, around-the-clock monitoring and can provide real-time information via many different communications options.

## Public Information and Warning

In situations where public safety may be compromised (such as high winds, fog, ice, flooding, landslides, or avalanche potential) our systems can interface to electronic signs and signals to provide public warning and information systems. These systems feature quick response to measured conditions—without the need for human intervention. Data can also be telemetered to a base station computer, alerting public officials of conditions.

These types of systems are also useful for traffic management; traffic can be diverted or redirected based on congestion or road conditions ahead. This can help minimize congestion and serve commuters by indicating routes around problems. In ports, crane operators and incoming and outgoing ships can receive real-time wind speed and direction data. Ferries and ships can be instrumented with GPS equipment and weather stations, providing scheduling and safety information.



This ALERT site in Douglas County, Colorado includes a camera to monitor stream and road conditions, and a road-temperature sensor to aid the Public Works department with winter maintenance.

## Transport Vehicles

Our systems can also monitor the transport vehicle itself. Average speed, fuel efficiency, stops, event counting, shock, vibration and many other parameters provide information for vehicle maintenance scheduling and operation efficiency. Research vehicles can

be instrumented to improve design and operation. In many cases, our measurement systems can monitor parameters affecting both the cargo and the transport vehicle.

## Instrumentation

Our measurement systems are based around a programmable datalogger that measures the sensors, then processes or stores the data. Measurement types, scan rates, and recording intervals are all programmable. Onboard processing instruction sets contain programmed algorithms that process measurements and output results



in the desired units of measure. Our dataloggers can also control external devices, such as valves and samplers. Most sensors, even those made by other manufacturers, interface directly to our dataloggers.

Multiple communications options for data retrieval are available and can be mixed within the same network. Telecommunications options include telephone (landline, voice-synthesized, cellular), Ethernet, Wi-Fi, radio, satellite, multidrop, and short-haul. On-site options include CompactFlash cards, MicroSD cards, Android or iOS devices, and laptop computer.

