

# Vehicle Testing

[www.campbellsci.com/vehicle-testing](http://www.campbellsci.com/vehicle-testing)

## Benefits of Our Systems

1. Rugged design allows systems to withstand vibration, shock, and temperature extremes.
2. Nearly every commercially available sensor can be used in our systems.
3. Systems are calibrated against NIST standards.
4. Internal preset gain ranges eliminate the need for costly external signal conditioning while allowing excellent measurement resolution.
5. Onboard statistical and mathematical capabilities provide data reduction on-site.
6. Multiple systems are available with varying channel counts, sampling rates, and physical sizes.
7. Multiplexers and other peripherals are available for expanding systems.
8. Communications options include direct wire to PC or laptop and many wireless possibilities.
9. Systems are durable—many are still in use after 15 years.



CR9000X



*Our systems are compact, allowing them to fit in a variety of locations during testing, such as the back of a seat. A dashboard-mounted heads-up display provides test results in real time.*

Campbell Scientific's data acquisition systems are used by vehicle manufacturers worldwide. Our systems feature: (1) portability—take them anywhere you need measurements, (2) reliability—get accurate, consistent data, even in extreme environments, and (3) versatility—configure a system that meets your exact needs. From scorching summers to frigid winters, wind tunnels to abusive test tracks, our data acquisition systems provide accurate, timely, and reliable data.

## Portability

Designed for portable and remote applications, our dataloggers do not require AC power or computers. With their self-contained power supplies, they can be used anywhere. Their compact sizes allow them to fit in small spaces, such as trunks, engines, or passenger compartments during testing. Rugged construction and wide operating temperature ranges allow them to be used for cold temperature, hot temperature, high altitude, off-highway, and cross-country performance tests. Data can be displayed real-time during testing, stored for later retrieval, or transmitted to a base station.

## Reliability

Our systems have proven to be reliable, not only under normal conditions, but also under a wide range of temperature, vibration, and shock. For example, our systems have collected data during cold weather testing in Michigan and Canadian winters, summer testing in Arizona deserts, altitude testing on Pike's Peak, cross-country endurance testing just about everywhere else, and structural analysis monitoring for an experiment on the Space Shuttle Endeavor (STS-69).

## Versatility

The versatility of our data acquisition systems allows them to be customized for each application. We offer a range of dataloggers from the most basic system with just a few channels, to expandable systems that measure hundreds of channels.

Because our dataloggers are compatible with almost every commercially available sensor, our systems give you the freedom to use the sensors that best meet your application. Most sensors connect directly to our dataloggers, eliminating costly external signal conditioning. Channel types include analog (single-ended and differential), pulse count, switched excitation, continuous analog output, anti-aliasing filter, and digital I/O. Typical sensors used with our systems include: thermocouples, pressure transducers, pulse pickups, flow transducers, potentiometers, strain gages, load cells, digital switches, accelerometers, LVDTs, and tilt sensors. Our configurable model, the CR9000X, allow you to choose modules with the channel types that best fit your application. The number and type of channels on most of our dataloggers are expandable using multiplexers and other measurement peripherals.



*Our systems are used for testing passenger vehicles, farm and construction equipment, trains, buses, and other vehicle types.*

Scan rates can be programmed from every few hours to 100,000 times per second, depending on the datalogger model. Measurement types, processing algorithms, and recording intervals are also programmable. Our systems can also store data transmitted from the vehicle's on-board computer via Canbus, allowing time-synchronized storage of vehicle computer data with the datalogger's independently measured data. Onboard instruction sets contain programmed algorithms that process measurements and output results in the desired units of measure. For example, data can be displayed as rainflow or level crossing histograms. These rainflow and level crossing algorithms allow processing for extended periods of time, not just a limited number of cycles. Our instruction sets also allow unattended measurement and control decisions based on time or conditional events.

Communications interfaces for retrieving, storing, and displaying data include direct connection to a PC or laptop, PC cards, storage modules, and a datalogger keyboard/display. A heads-up-display is also available for data display when driving a vehicle. Telecommunication options include short-haul, telephone (landline, voice-synthesized, and cellular), radio frequency, multidrop, and satellite.

Our systems are competitively priced, especially when considering that (1) they have long lives, (2) most sensor types can be measured on the same system, (3) external signal conditioning is usually not required, and (4) our free technical support lasts as long as you own the system.

## Testing Possibilities

Our data acquisition systems have been instrumental in testing the following:

### General Vehicle Testing

- Chassis monitoring
- Road noise
- Vehicle speed
- Steering
- Air bag
- Distance traveled
- Humidity
- Hot and cold soaks
- Wind tunnel
- Altitude
- Geographic location

### Fuel Systems

- Line pressure
- Tank pressure
- Temperature
- Flow

### Climate Control

- Ambient air temperature
- Supply air temperature
- Solar radiation
- Fan speed
- Interior temperature
- Time to comfort
- AC on and off
- Refrigerant pressures

### Suspension

- Strut pressure
- Spring force
- Travel
- Mounting point stress
- Deflection

### Brake Testing

- Line pressure
- Pedal pressure/travel
- ABS
- Line/pad temperature

### Engine Monitoring

- Oil pressure
- Oil temperature
- Water pressure
- Water temperature
- Fuel injector timing
- Crank position
- RPM
- Noise level
- Heat detection
- Catalytic converter
- Cooling fan speed
- Manifold pressure
- Manifold temperature
- Exhaust gas temperature

