Other Applications

- Aerospace/aviation—has endured the rigors of space travel and provided acceleration, structural, and equipment performance measurements.

- Geotechnical—measures tilt, convergence, displacement, geographic position, strain, load, vibration, overburden, level, flow, creep, and force for slope stability, subsidence, seismicity studies, structural restoration, or site assessment applications.

- Mining—monitors mine ventilation, slope stability, convergence, and equipment performance.

- Machinery testing—provides temperature, pressure, RPM, velocity, power, acceleration, position, torque, and strain measurements.

- Laboratory—can serve as a monitoring device to record parameters over time and can also be used to regulate and control test conditions.

Our dataloggers measured the effects of gravity on a test structure aboard a NASA low-gravity flight. Photo credit: NASA.

General CR9000 & CR9000C Specifications

Electrical specifications are valid over a -25° to +50°C range unless otherwise specified; testing over -40° to +70°C available as an option, excluding batteries. Non-condensing environment is required. To maintain specifications, Campbell Scientific recommends recalibrating dataloggers every two years.

9031 CPU MODULE
PROCESSORS: Main CPU is 32-bit with on-chip floating point unit. Measurements, timing, and setup done by hardware task sequencer with DMA type transfer to CPU memory.
MEMORY: 2 MB Flash EEPROM, 2 MB Static RAM

9011 POWER SUPPLY MODULE
VOLTAGE: 9.6 to 18 Vdc
TYPICAL CURRENT DRAIN: 50 mA, supplied by the CR9000(C)
SIZE (excluding cable): 2.25” x 0.5” x 4.0” (5.7 x 1.3 x 10.2 cm)
CABLE LENGTH: Specified, in feet, by the user, 50 ft maximum length
WEIGHT: 2.5 lb (0.11 kg)

9041 A/D and AMPLIFIER MODULE
A/D Conversions: 16-bit, 100 kHz

PC9000(C) INTERFACES
PLA100
TYPICAL CURRENT DRAIN: 50 mA, supplied by the CR9000(C)
SIZE (excluding cable): 2.25” x 0.5” x 4.0” (5.7 x 1.3 x 10.2 cm)
CABLE LENGTH: Specified, in feet, by the user, 50 ft maximum length
WEIGHT: 2.5 lb (0.11 kg)

TL925
TYPICAL CURRENT DRAIN: 50 mA, supplied by the CR9000(C)
BAUD RATE: 300 bps to 115.2 kbps with auto baud detection.
SIZE: 2.1” x 1.0” x 6.8” (5.3 x 2.5 x 17.3 cm)
WEIGHT: 2.5 lb (0.11 kg)

TRANSIENT PROTECTION
All analog and digital inputs and outputs use gas discharge tubes and transient filters to protect against high-voltage transients. Digital I/Os also have over-voltage protection clamping.

9032 CPU MODULE
9011 POWER SUPPLY MODULE
9041 A/D and AMPLIFIER MODULE

PHYSICAL SPECIFICATIONS
Size
Lab Enclosure: 15.75”L x 9.75”W x 8”D (40 x 24.8 x 20.3 cm)
Fiberglass Enclosure: 18”L x 13.5”W x 9”D (45.7 x 34.3 x 22.9 cm)
CR9000C: 10”L x 11”W X 9”D (25.4 x 27.9 x 22.9 cm)

Weight
Lab Enclosure: 30 lbs including modules (13.6 kg)
Fiberglass Enclosure: 42 lbs including modules (19.1 kg)
CR9000C: 27 lbs including modules (12.3 kg)
Replacement Batteries: 6.4 lbs (2.9 kg)
Additional Modules: 1 lb each (0.5 kg)

WARRANTY
Three years against defects in materials and workmanship.

We recommend that you confirm system configuration and critical specifications with Campbell Scientific before purchase.
CR9000 & CR9000C I/O Module Specifications

CR9050(E) and CR9051E ANALOG INPUT MODULE with RTD

Input Channels per Module: 14 differential or 28 single-ended.

Range and Resolution:

<table>
<thead>
<tr>
<th>Input</th>
<th>Resolution (1 A/D count)</th>
<th>Input Noise (µV RMS)</th>
<th>Max Sample Rates (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>±5000</td>
<td>158.0</td>
<td>105</td>
<td>100</td>
</tr>
<tr>
<td>±1000</td>
<td>32.0</td>
<td>35</td>
<td>100</td>
</tr>
<tr>
<td>±200</td>
<td>6.3</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>±50</td>
<td>1.6</td>
<td>4</td>
<td>50</td>
</tr>
</tbody>
</table>

Note: Measurement averaging provides lower noise and better resolution.

Accuracy of Voltage Measurements:

Single-Ended & Differential:

±0.1% of reading + 4 A/D counts -25° to +50°C
±0.2% of reading + 4 A/D counts -40° to +70°C

Dual Differential:

(For two measurements with input polarity reversed)

±0.1% of reading + 1 A/D count -25° to +50°C
±0.2% of reading + 1 A/D count -40° to +70°C

Common Mode Range: ±50 V

DC Common Mode Rejection: >62 dB

Input Resistance: ±100 Kohms typical

DC Input Voltage Without Damage: ±150 V

DC Input Voltage Without Damage: ±150 V

MAXIMUM ACME VOLTAGE WITHOUT DAMAGE: ±50 V

MAXIMUM CURRENT DRAIN: 15 mA active

CR9050E ISOLATION MODULE

Input Channels per Module: 10 isolated, differential; each channel has its own isolation ground for shielded cable connection.

Range, Resolution, and Input Resistance:

<table>
<thead>
<tr>
<th>Input</th>
<th>Resolution</th>
<th>Input Noise (µV RMS)</th>
<th>Max Sample Rates (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>±2</td>
<td>±10</td>
<td>±2</td>
<td>10,000</td>
</tr>
<tr>
<td>±20</td>
<td>±100</td>
<td>±20</td>
<td>88.9</td>
</tr>
<tr>
<td>±60</td>
<td>±300</td>
<td>±60</td>
<td>269</td>
</tr>
</tbody>
</table>

Accuracy: ±0.02% of Full Scale Range over -40° to +70°C

MINIMUM SCAN TIME PER MODULE:

- VoltDiff: 1285 µs (778 samples per second) + integration time with input reversal (RevDiff=1)
- TCDiff (range parameter set to V2C): 2570 µs (389 samples per second) + integration time with input reversal (RevDiff=1)
- Maximum bounce time: 1 ms open without being counted

LOW LEVEL ACME MODE (8 channels)

Input hysteresis: 10 mV

Minimum pulse width: 500 ns

Maximum input frequency: 1 MHz

Thresholds: Pulse counted on transition from below 1.5 V to above 3.5 V

Minimum input voltage: ±20 V

Low Level ACME Mode: 25 mV RMS

Frequency Range:

25 mV to ±10,000

50 mV to ±20,000

Digital Inputs/Outputs

I/O Channels per Module: 16

Output Voltages (no load):

- High: ±5 V
- Low: ±2 V

Output Resistance: 100 kOhms

Input State:

- High: 3.5 to 5 V
- Low: -0.5 to 1.2 V

Input Resistance: 100 kOhms

Interval Measurement:

I/O Channels:

- Resolution is the scan rate
- Pulse Channels

Maximum interval: 1 minute

Resolution: ±40 ns

CR9090 PCMCIA and MEMORY MODULE

PCMCIA Card Interface: Accepts two Type I/II, or one Type III SRAM or ATA Flash Memory Cards.

Serial I/O: Allows serial communications with CSI peripherals at up to 115,200 bps.

Typical Current Drain: 300 mA active