CAMPBELL® SCIENTIFIC
WHEN MEASUREMENTS MATTER

Weather & Climate

Automated weather stations & other meteorological instruments

Research-Grade Meteorological Instruments

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Research-Grade Meteorological Instruments

Since 1974, Campbell Scientific has provided automated weather stations and other measurement systems for thousands of applications around the world—in every climate.

Through this experience, our measurement systems have established a solid reputation for their reliability and longevity in the field, excellent measurement quality, and the flexibility to dial in on exact needs. At the same time, our customer support is unmatched in the industry.

We have the products and experience to help make your project successful. Please let us know if we can answer any questions.

For an introduction to mesonets, their value, and how they work, visit:
www.campbellsci.com/mesonets

MESONET ESSENTIALS

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

Weather and Climate

Automated Weather Stations (AWS) and Meteorologic Instruments

From single research weather stations to mesoscale weather networks (mesonets), Campbell Scientific AWSs have become the worldwide standard for climate and boundary-layer meteorology. They are integral parts of forecasting and monitoring systems world wide. Accurate measurements, low power requirements, and proven reliability in extreme weather conditions make our weather stations ideal for all types of meteorological and climatological monitoring anywhere on earth.

MAJOR SYSTEMS

		Measurements	*Datalogger*	*Power*	*Communications*
WxPRO | Entry-Level, Research-Grade Weather Station For budget-conscious researchers		wind speed, wind direction, air temperature, precipitation, relative humidity, barometric pressure, solar radiation, soil water content	CR300, CR310	BP7 12 Vdc, 7 Ah battery recharged with 10 W solar panel	Wi-Fi, Ethernet
MetPRO | Research-Grade Meteorological Station Reliable Weather Monitoring		wind speed, wind direction, air temperature, precipitation, relative humidity, barometric pressure, solar radiation, soil water content	CR6	BP12 12 Vdc, 12 Ah battery recharged with 20 W solar panel	Wi-Fi, radio
MesoPRO | Research-Grade Mesonet Station Reliable Weather Monitoring		wind speed (2 heights), wind direction (2 heights), air temperature, precipitation, relative humidity, barometric pressure, solar radiation, soil water content	CR6	BP84 12 Vdc, 84 Ah battery recharged with 50 W solar panel	cellular, Wi-Fi, radio

CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

WxPRO

Entry-level research-grade weather station

Full-Featured Weather Station

For Budget-Conscious Researchers

Measurements

- *Wind speed*
- *Wind direction*
- *Air temperature*
- *Relative humidity*
- *Barometric pressure*
- *Precipitation*
- *Solar radiation*

Overview

The WxPRO™ is an entry-level, research-grade weather station, designed for a wide-variety of environmental applications. This portable tripod station is suitable for both long-term and temporary deployments.

Designed for the budget-conscious researcher, this system is a lower-cost offering than the MetPRO™ while maintaining the quality instrumentation you'd expect from a Campbell Scientific solution. This system implements research-grade sensors, which are needed for defensible data in environmental research. The WxPRO's meteorological measurements can be used to calculate evapotranspiration, growing-degree days, wind chill, dew point, and other weather-related parameters.

Benefits and Features

- Full-featured weather station for the budget-conscious researcher
- Obtain defensible data with high-accuracy instruments
- Deploy system remotely for unattended long-term monitoring
- Low-power design
- Connect remotely with many communication options
- Customize system for specific application needs

Components

1. CR300-WIFI Measurement and Control Datalogger with integrated Wi-Fi modem
2. BP7 7 Ah Battery and Mount
3. SP10 10 W Solar Panel
4. 03002 RM Young Wind Sentry with 17953 Nu-Rail Fitting
5. CM204 4 ft Crossarm
6. TE525 Tipping Bucket with user-supplied mounting post or pipe
7. CS215 Temperature and Relative Humidity Probe and RAD06 6-Plate Radiation Shield
8. CS300 Solar Radiation Sensor with 18356 Leveling Base and CM225 Solar Radiation Mount
9. ENC10/12 Enclosure, 10-inch-by-12-inch
10. CS100 Barometric Pressure Sensor
11. CM106B 6 ft Tripod

Some system sensors and components may not be available in all parts of the world. Contact your regional Campbell Scientific representative for details.

Customizations

You can order the WxPRO™ with the parts shown above or as a complete pre-wired, pre-programmed, pre-configured system.

This system is also fully-customizable. You can add sensors, measurement peripherals or communications devices to meet the needs of your specific application. Contact a Campbell Scientific sales engineer to design your custom solution.

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

MetPRO

Research-grade meteorological station

Reliable Weather Monitoring

Research-Grade Weather Station

Standard Measurements

- *Wind speed*
- *Wind direction*
- *Air temperature*
- *Relative humidity*
- *Barometric pressure*
- *Precipitation*
- *Solar radiation*
- *Soil water content*

Overview

The MetPRO™ is a highly accurate, durable, research-grade meteorological monitoring station, designed for a wide-variety of demanding environmental applications. This portable tripod station is suitable for both long-term and temporary deployments on flat or uneven terrain.

This system includes high quality sensors, which are needed for defensible data in environmental research as well as critical operations dependent on continual weather monitoring. The MetPRO's meteorological measurements can be used to calculate evapotranspiration, growing-degree days, wind chill, dew point, and other weather-related parameters.

Benefits and Features

- Obtain defensible data with high-accuracy instruments
- Deploy system remotely for unattended long-term monitoring
- Low-power design—operates on a battery recharged by a solar panel
- Reduce maintenance overhead with durable system components
- Connect remotely with IP-based modem communication
- Customize system for specific application needs

Components

1. CR6-WIFI Measurement and Control Datalogger with integrated Wi-Fi modem
2. BP12 12 Ah Battery and Mount
3. SP20 20 W Solar Panel
4. 05103 RM Young Wind Monitor with 17953 Nu-Rail Fitting
5. CM204 4 ft Crossarm
6. TE525WS Tipping Bucket with CM270 mounting kit and CM300-PJ Pedestal Mount
7. 260-953 Alter-type Rain-Gage Wind Screen
8. EE181 Temperature and Relative Humidity Probe and RAD10E 10-Plate Radiation Shield
9. CS655 Soil Water Content Reflectometer
10. CS320 Solar Radiation Sensor with 18356 Leveling Base and CM225 Solar Radiation Mount
11. ENC12/14 Enclosure, 12 inch by 14 inch
12. CM106B 6 ft Tripod
13. CS100 Barometric Pressure Sensor

Some system sensors and components may not be available in all parts of the world. Contact your regional Campbell Scientific representative for details.

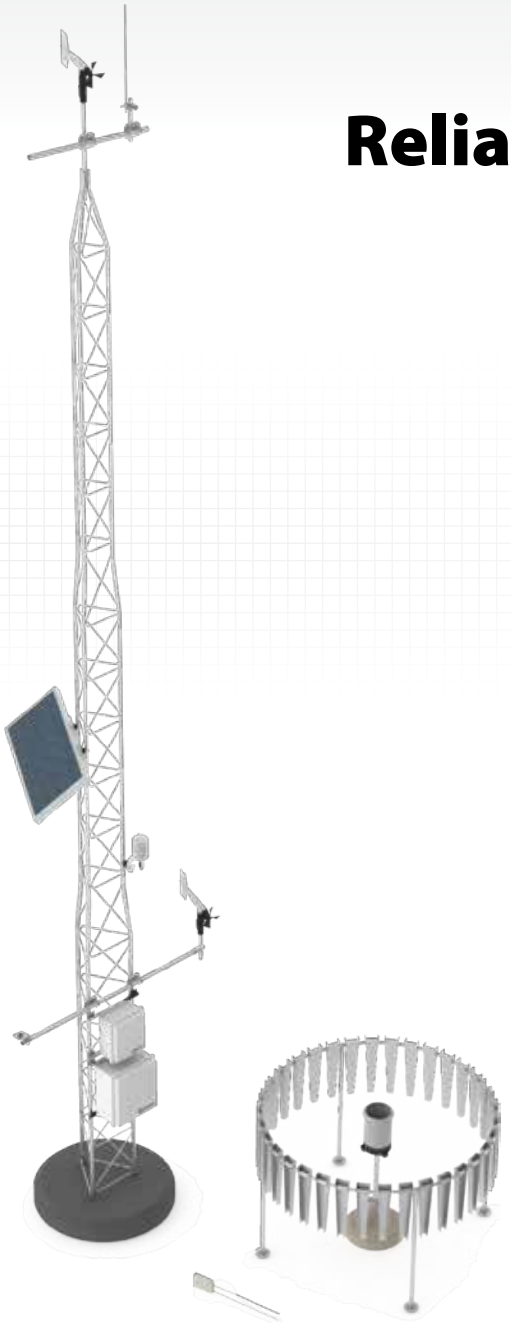
Customizations

You can order the MetPRO™ with the parts shown above or as a complete pre-wired, pre-programmed, pre-configured system. This system is also fully-customizable. You can add sensors, measurement peripherals or communications devices to meet the needs of your specific application. Contact a Campbell Scientific sales engineer to design your custom solution.

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

MesoPRO

Research-grade mesonet station



Reliable Weather Monitoring

Research-Grade Mesonet Station

Standard Measurements

- Wind speed (2 m and 10 m)
- Wind direction (2 m and 10 m)
- Air temperature (2 m)
- Relative humidity (2 m)
- Barometric pressure
- Precipitation
- Solar radiation
- Soil water content

Overview

The MesoPRO™ is a highly accurate, durable, research-grade meteorological monitoring station, designed for a wide-variety of demanding environmental applications. This 10-meter tower station is suitable for long-term installations common in large networks like mesonets. Remote monitoring and data collection is implemented via an industrial 4G LTE cellular network modem.

This system implements field-proven sensors that provide accurate measurements required for the data products needed by mesonet stakeholders. The sensors are selected for an optimal balance between accuracy, durability, and performance to get the best data, while reducing maintenance and operational overhead. The MesoPRO's meteorological measurements can be used to calculate evapotranspiration, growing-degree days, wind chill, dew point, and other weather-related parameters.

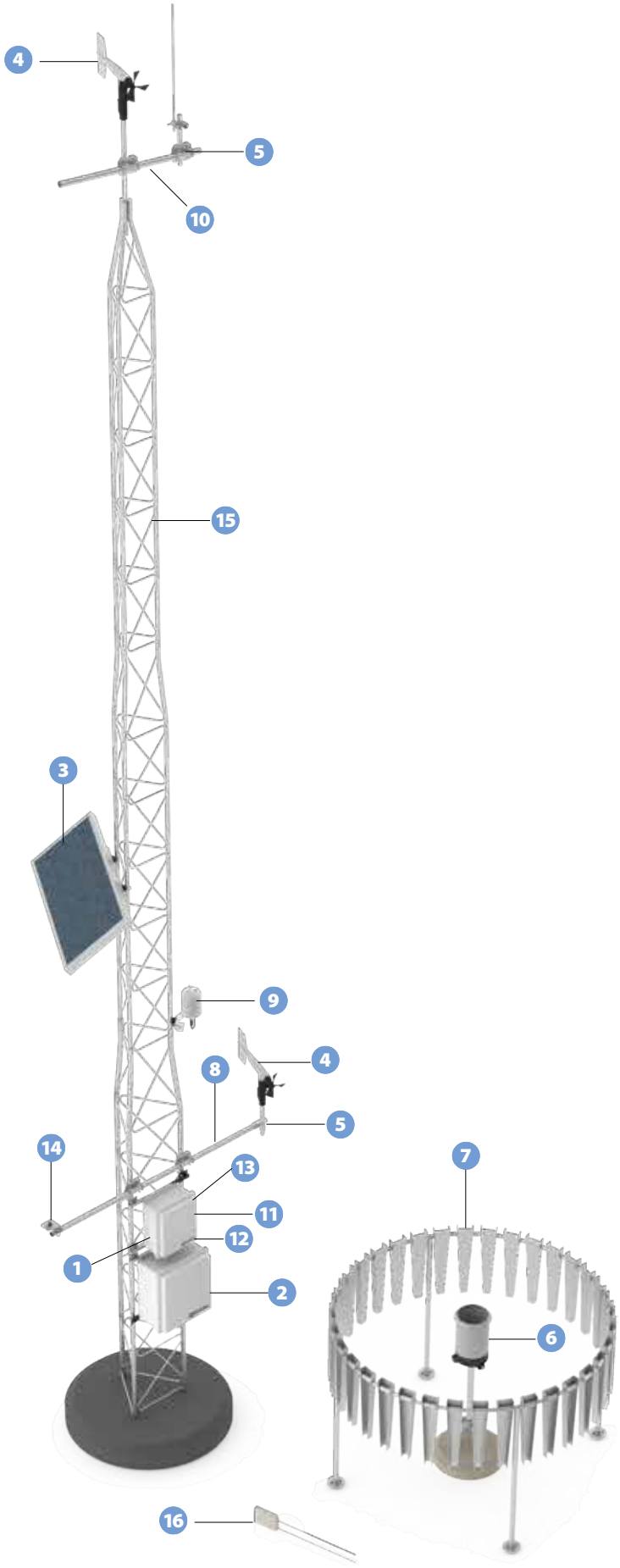
Benefits and Features

- Obtain defensible data with high-accuracy instruments
- Deploy system remotely for unattended long-term monitoring
- Low-power design
- Reduce maintenance overhead with durable system components
- Adapt to diverse or changing measurement needs with a tower-based solution
- Connect remotely with 4G LTE cellular network— two-way satellite Internet and many other communications options supported
- Customize system for specific application needs

Components

1. CR1000X Measurement and Control Datalogger
2. PS84-SC-SR-TM Rechargeable Power Supply
3. SP50 50 W Solar Panel
4. 05108 RM Young Wind Monitor
5. 17953 Nu-Rail Fitting
6. TB4 Tipping Bucket with CM300 Pedestal Mount
7. 260-953 Alter-type Rain-Gage Wind Screen
8. CM206 6 ft crossarm
9. EE181 Temperature and Relative Humidity Probe and RAD10E 10-Plate Radiation Shield
10. CM204 4 ft Crossarm
11. CS100 Barometric Pressure Sensor
12. RV50 Cellular Modem and mounting bracket
13. ENC12/14 Enclosure, 12 inch by 14 inch
14. CS320 Solar Radiation Sensor with 18356 Leveling Base and CM225 Solar Radiation Mount
15. UT30 Tower 30 ft Tower with guy kit, grounding kit, and base
16. CS655 Soil Water Content Reflectometers (quantity 3)

Some system sensors and components may not be available in all parts of the world. Contact your regional Campbell Scientific representative for details.



Customizations

You can order the MesoPRO™ with the parts shown above or as a complete pre-wired, pre-programmed, pre-configured system.

This system is also fully-customizable. You can add sensors, measurement peripherals, and communications devices to meet the needs of your specific application. Contact a Campbell Scientific sales engineer to design your custom solution.

CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

Dataloggers

Also known as Data Loggers, Data Recorders, and RTUs

Rugged, reliable, and ready for any application

RELIABLE SINCE 1974 MONITORING

Dataloggers are the heart of a data acquisition system. They measure sensors at a specific scan rate, process data, store the data, and initiate telecommunications. Our dataloggers also have control capabilities allowing them to respond to specific site conditions by opening flood gates, turning fans off/on, etc. All our dataloggers share similar measurement and programming capabilities. Selection of the appropriate datalogger depends mainly on the type, number, precision, and speed of measurements required.

MAJOR SPECIFICATIONS

	Channels	Input Voltage Range	Analog Voltage Resolution	A/D Bits
CR6* | Innovative Vibrating Wire Powerfully versatile multi-tool for data acquisition; onboard vibrating-wire measurement  **The number of measurements listed in the Channels column assumes all of the U and/or C channels are configured for that type of measurement.*	12 universal (U) and 4 control (C) terminals are programmable to measure up to: • 12 SE analog inputs • 6 DF analog inputs • 16 pulses • 12 voltage switched excitation • 12 current switched excitation • 2 RS-232 • 2 RS-485 • 16 I/Os, • 8 SDI-12	±5000 mV	to 0.08 µV	24
CR800 & CR850 | Smaller, Simpler Research-grade power for smaller installations 	Analog: 6 SE or 3 DF Pulse: 2 Switched Excitation: 2 voltage Digital: 4 I/O or 2 RS-232	±5000 mV	to 0.33 µV	13
CR1000X | Rugged Versatility Multipurpose Monitoring and Control 	Analog Voltage: 16 SE or 8 DF Analog Current 4 - 20 mA: 2 Pulse: 2 Switched Excitation: 4 voltage Digital: 8 I/O or 4 RS-232	±5000 mV	to 0.02 µV	24
CR300 & CR310 | Capable, compact, low cost, high performing Small applications requiring long-term, monitoring and control 	Analog Voltage: 6 SE or 3 DF Analog Current 4 - 20 mA: 2 Pulse: 2 Switched Excitation: 2 voltage Digital: 2 I/O	-100 to 2500 mV	to 0.23 µV	24
CR3000 | Fast, Compact Supports complex installations, built-in keyboard and display 	Analog: 28 SE or 14 DF Pulse: 4 Switched Excitation: 4 voltage 3 current Digital: 3 SDM, 8 I/O, or 4 RS-232 Continuous Analog Output: 2	±5000 mV	to 0.33 µV	16

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

Wind Speed and Wind Direction

Wind vanes and cup, propeller, sonic anemometers, or Lidar

Rugged, Reliable, and Ready for any Application

RELIABLE SINCE 1974 MONITORING

Campbell Scientific offers a selection of quality wind sensors. Our wind sensors are used in research, air quality, and general purpose meteorological applications. Most of the wind sensors available directly from Campbell Scientific are modified slightly from the manufacturer's stock items for use with our dataloggers.

MAJOR SPECIFICATIONS

	Sensor	Range	Accuracy	Application
03002 | Wind Sentry Set 	3-cup anemometer and vane	Wind Speed 0 to 50 m/s (112 mph) Direction 0 to 360° (mechanical) 0 to 352°, 8° open (electrical)	Wind Speed ±0.5 m/s (1.1 mph) Direction ±5°	General
034B | Wind Set 	3-cup anemometer and vane	Wind Speed 0 to 50 m/s (110 mph) Direction 0 to 360° (mechanical) 0 to 356°, 4° open (electrical)	Wind Speed < 10.1 m/s (22.7 mph): ±0.11 m/s (0.25 mph) >10.1 m/s (22.7 mph): ±1.1% of true Direction ±4°	General
05103 | Wind Monitor 	helicoid-shaped, 4-blade propeller and fuselage-shaped sensor body	Wind Speed 0 to 100 m/s (0 to 224 mph) Direction 0 to 360°(mechanical) 0 to 355°, 5° open (electrical)	Wind Speed ±0.3 m/s (0.6 mph) or 1% of reading Direction ±3°	Harsh
05108 | Heavy-Duty Wind Monitor 	helicoid-shaped, 4-blade propeller and fuselage-shaped sensor body	Wind Speed 0 to 100 m/s (0 to 224 mph) Direction 0 to 360°(mechanical) 0 to 355°, 5° open (electrical)	Wind Speed ±0.3 m/s (0.6 mph) or 1% of reading Direction ±3°	Marine/Extreme
05108-45 | Alpine Wind Monitor-HD 	helicoid-shaped, 4-blade propeller and fuselage-shaped sensor body	Wind Speed 0 to 100 m/s (0 to 224 mph) Direction 0 to 360° (mechanical) 0 to 355°, 5° open (electrical)	Wind Speed ±0.3 m/s (0.6 mph) or 1% of reading Direction ±5°	Alpine/Extreme

	Sensor	Range	Accuracy	Application
05305 | Wind Monitor-AQ 	helicoid-shaped, 4-blade propeller and fuselage-shaped sensor body	Wind Speed 0 to 50 m/s (0 to 112 mph) Direction 0 to 360° (mechanical 0 to 355°, 5° open (electrical)	Wind Speed ±0.2 m/s (0.4 mph) or 1% of reading Direction ±3°	General/ Air Quality
WINDSONIC1 | 2-D Sonic Wind Sensor, RS-232 Version 	2-dimensional ultrasonic anemometer	Wind Speed 0 to 60 m/s (0 to 134 mph) Direction 0° to 360°	Wind Speed ±2% of reading Direction ±3°	General/ Extreme
WINDSONIC4 | 2-D Sonic Wind Sensors, SDI-12 Version 	2- dimensional ultrasonic anemometer	Wind Speed 0 to 60 m/s (0 to 134 mph) Direction 0° to 360°	Wind Speed ±2% of reading Direction ±3°	General/ Extreme
ZX300 | Remote Sensing Wind Measurement Lidar 	continuous-wave (CW) lidar	<1 m/s to 70 m/s (0 to 157 mph)	Wind Speed < 0.5% (as measured against a calibrated moving target) Direction <5°	General

Environment Field Descriptions

- **General:** Rain with light snow. Little or no riming or blowing sand. No salt spray.
- **Harsh:** Rain with light snow. Little or no riming. Some blowing sand. No salt spray.
- **Alpine:** Rain, snow, ice, and riming. No salt spray.
- **Marine:** Heavy rains. Light snow. Constant humidity. Salt spray. Little or no ice or blowing sand.
- **Extreme:** Blowing Sand. Very little maintenance required. Will handle salt spray.
- **Air Quality:** Designed to meet specific government standards for air quality applications.

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

Barometric Pressure Sensors

Resonant silicon technology, silicon capacitance

Rugged, Reliable, and Ready for any Application

RELIABLE SINCE 1974 MONITORING

Barometric pressure sensors measure fluctuations in the pressure exerted by the atmosphere. The sensors require protection from condensing humidity, precipitation, and water ingress and are typically housed with the datalogger inside an environmental enclosure. If the enclosure is airtight, the sensor's pressure port must be vented to the atmosphere.

MAJOR SPECIFICATIONS

	Measurement Range	Elevation	Temperature Range	Accuracy	Current Consumption
CS100 | Standard Barometer Resides inside weather-proof enclosure 	600 to 1100 mb*	~ 2000 ft below sea level (as in a mine) to 12,000 feet above sea level	-40° to 60°C	±0.5 mb @ +20°C; ±1.0 mb @ 0° to 40°C; ±1.5 mb @ -20° to +50°C; ±2.0 mb @ -40° to +60°C	< 3 mA (active); < 1 µA (sleep mode)
CS106 | Wider Pressure Range Resides inside weather-proof enclosure 	500 to 1100 mb	~ 2000 ft below sea level (as in a mine) to 15,000 feet above sea level	-40° to 60°C	±0.3 mb @ +20°C; ±0.6 mb @ 0° to 40°C; ±1.0 mb @ -20° to +45°C; ±1.5 mb @ -40° to +60°C	< 4 mA (active); < 1 µA (sleep mode)
092 | Includes Weather-proof Enclosure Commonly used with the WMS100 for wind-farm power performance measurements 	600 to 1100 mb	~ 2000 ft below sea level (as in a mine) to 12,000 feet above sea level	-40° to 55°C	±0.35 mb @ +20°C; ±1.0 mb @ -40° to +55°C	10 mA, typical

*The CS100 is available in special ranges of 500 to 1100 and 800 to 1110; contact Campbell Scientific for more information.

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

Precipitation

Rain gages and heated rain gages

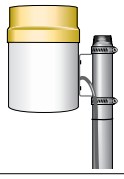
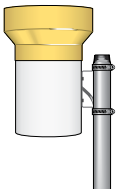
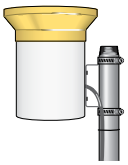
Rugged, Reliable, and Ready for any Application

RELIABLE SINCE 1974 MONITORING

Campbell Scientific offers several types of precipitation measuring devices: tipping bucket rain gage, siphoning tipping bucket rain gage, heated rain gage, and a snowfall adapter.

Sensor selection can be determined by precipitation type (rain or snow), orifice diameter, measurement range, and accuracy.

MAJOR SPECIFICATIONS

	Sensor Type	Orifice Diameter	Resolution	Accuracy	Operating Temperature
TE525 | Rain Gage Widely used in environmental monitoring applications 	Tipping bucket with magnetic reed switch	15.4 cm (6.06 in)	Rainfall per tip 0.01 in (0.254 mm) Volume per tip 4.73 ml/tip (0.16 fl. oz/tip)	1.0% up to 2 in/hour (50 mm/hr)	0° to +50°C
TE525WS | Rain Gage 8-in orifice meets the National Weather Service recommendations. Compatible with the CS705 snowfall adapter. 	Tipping bucket with magnetic reed switch	20.3 cm (8 in)	Rainfall per tip 0.01 in (0.254 mm) Volume per tip 8.24 ml/tip (0.28 fl. oz/tip)	1.0% up to 2 in/hour (50 mm/hr)	0° to +50°C
TE525MM | Rain Gage Monitors rainfall in metric rather than US units 	Tipping bucket with magnetic reed switch	24.5 cm (9.66 in)	Rainfall per tip 0.1 mm (0.004 in) Volume per tip 4.73 ml/tip (0.16 fl. oz/tip)	1.0% up to 2 in/hour (50 mm/hr)	0° to +50°C
CS700 | High-End Rain Gage with Siphon Rugged, accurate, and ideal for high-intensity precipitation 	Tipping bucket with siphon and dual reed switch	20 cm (7.9 in)	Rainfall per tip 0.01 in (0.254 mm)	±2% @ < 250 mm/hr (9.8 in/ hr); ±3% @ 250 to 500 mm/hr (9.8 to 19.7 in/hr) Maximum rate per hour 700 mm/hr (27.6 in/hr)	0° to 70°C
TB4 | High-End Rain Gage with Siphon Accurate and Ideal for high-intensity precipitation 	Tipping bucket with siphon and dual reed switch	20 cm (7.9 in)	Rainfall per tip 0.01 in (0.254 mm)	±2% @ < 250 mm/hr (9.8 in/ hr); ±3% @ 250 to 500 mm/hr (9.8 to 19.7 in/hr) Maximum rate per hour 700 mm/hr (27.6 in/hr)	0° to 70°C
TB4MM | High-End Rain Gage with Siphon Monitors rainfall in metric rather than US units 	Tipping bucket with siphon and dual reed switch	20 cm (7.9 in)	Rainfall per tip 0.2 mm (0.008 in)	±2% @ < 250 mm/hr (9.8 in/ hr); ±3% @ 250 to 500 mm/hr (9.8 to 19.7 in/hr) Maximum rate per hour 700 mm/hr (27.6 in/hr)	0° to 70°C

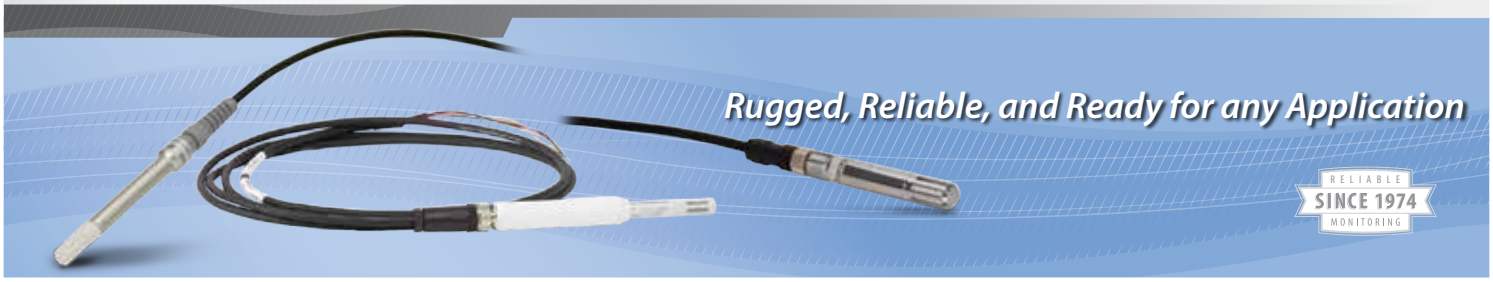
		Sensor Type	Orifice Diameter	Resolution	Accuracy	Operating Temperature
52202 | Electrically Heated Rain and Snow Gage 200 cm^2 catchment area and 0.1 mm measurement resolution meet WMO recommendations		Tipping bucket with magnetic reed switch	16 cm (6.3 in)	Rainfall per tip 0.1 mm (0.004 in)	2% for up to 25 mm/hr (1 in/hr); 3% for up to 50 mm/hr (2 in/hr)	-20° to +50°C
CS700H | High-End Electrically Heated Rain and Snow Gage Rugged, accurate, and ideal for high-intensity precipitation, even in freezing conditions		Tipping bucket with siphon and dual reed switch	20 cm (7.9 in)	Rainfall per tip 0.01 in (0.254 mm)	±2% @ < 250 mm/hr (9.8 in/hr); ±3% @ 250 to 500 mm/hr (9.8 to 19.7 in/hr) Maximum rate per hour 700 mm/hr (27.6 in/hr)	-40° to 70°C

COMPONENT CATEGORY

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

Air Temperature and Relative Humidity

Typically capacitive RH chips and PRTs



Air temperature and relative humidity probes typically consist of two separate sensors packaged in the same housing. Often relative humidity is measured with a capacitive RH chip, while air temperature is measured by a PRT. The HMP155A, EE181, or CS215 is recommended in humid areas or applications in which accurate measurements of RH (especially above the 90% RH level) are important. Solar radiation shields are required for most applications where the probes are exposed to sunlight.

MAJOR SPECIFICATIONS

		Sensor	Measurement Range	Accuracy	Field Replacable Chip or Recalibrate
HygroVUE™10 | Simple to Use, Easy to Maintain Combined, precalibrated digital RH & temp element		SHT35 modified by Campbell Scientific	Relative Humidity 0 to 100% RH Temperature -40° to +70°C	Relative Humidity ±1.5% (0 to 80% RH range) ±2% (80 to 100% RH range) Temperature ±0.2°C (-40 to +70°C range) ±0.1°C (-20 to +60°C range)	field-replaceable chip
EE181 | Accurate and Rugged Coating on RH element protects it from contaminants		Relative Humidity E+E Electronik HC101 Temperature PT100 RTD	Relative Humidity 0 to 100% RH Temperature -40° to +60°C	Relative Humidity ± (1.5 + 1.5%*mV) % RH (-40° to +60°C) Temperature ±0.2°C to ±0.5°C depending on temperature	recalibrate
CS215 | SDI-12 Output Competitively priced, general purpose temperature and RH sensor		Sensirion SHT75	Relative Humidity 0 to 100% RH Temperature -40° to +70°C	Relative Humidity (at 25°C) ±2% to ±4%, depending on RH Temperature ±0.3°C at 25°C; ±0.4°C (+5° to +40°C); ±0.9°C (-40° to +70°C)	field-replaceable chip

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WHEN MEASUREMENTS MATTER

Solar Radiation

Quantum sensors, pyranometers, net radiometers, and pyrheliometers

Campbell Scientific offers pyranometers, net radiometers, and quantum sensors, all designed to measure various aspects of the energy imparted by the sun on the Earth's surface.

A leveling fixture fitted with a bubble level may be required to accurately install solar radiation sensors.

MAJOR SPECIFICATIONS

		Sensor	Measurement Description	Spectral Range	Sensitivity	Operating Temperature
CS320 | Digital Thermopile Pyranometer For measurement of global solar radiation under changing weather conditions		Thermopile detector, acrylic diffuser, heater, and signal processing circuitry mounted in an aluminum housing	Measures broadspectrum shortwave radiation	385 to 2105 nm	digital output	–50° to +50°C
CS301 | Silicon Pyranometer Accurate, dependable, and ideal for long-term deployment in harsh conditions		Silicon photovoltaic detector mounted in a cosine-corrected head	Measures sun plus sky radiation	360 to 1120 nm	0.2 mV/W/m^2	–40° to +70°C
CS310 | Quantum Sensor Accurate and versatile		Blue-enhanced silicon photodiode and custom optical filters	Measures Photosynthetic Photon Flux Density (PPFD), in both natural and artificial light	389 to 692 nm ±5 nm	0.01 mV per µmole m^{-2} s^{-1}	–40° to +70°C
SP230SS | Heated All-Season Pyranometer Heater prevents snow, frost, and dew accumulation		Silicon photovoltaic detector mounted in a cosine-corrected head	Measures sun plus sky radiation	360 to 1120 nm	5 mV/W/m^2	–40° to +70°C
SR20-T2 | ISO Secondary-Standard Pyranometer Double glass dome and high-quality detector		High-quality blackened thermopile protected by two glass domes	Monitors solar radiation for the full solar spectrum range	285 to 3000 nm	7 to 5 µV/W/m^2	–40° to +80°C
SR30 | ISO Secondary-Standard Digital Pyranometer RS-485 Modbus communications and integrated heating and ventilation		High-quality blackened thermopile protected by two glass domes with integrated heater and ventilation	Monitors solar radiation for the full solar spectrum range	285 to 3000 nm	digital output	–40° to +80°C

		Sensor	Measurement Description	Spectral Range	Sensitivity	Operating Temperature
MS-80 | ISO Secondary-Standard Pyranometer Single dome, isolated thermopile detector, quartz diffusor		Internal desiccation, single dome, isolated thermopile detector, quartz diffusor	Monitors solar radiation for the full solar spectrum range	285 to 3000 nm	~10 µV/W/m²	–40° to +80°C
MS80M | ISO Secondary-Standard Digital Pyranometer Single dome, isolated thermopile detector, quartz diffusor with RS-485 Modbus communication		Internal desiccation, single dome, isolated thermopile detector, quartz diffusor	Monitors solar radiation for the full solar spectrum range	285 to 3000 nm	digital output	–40° to +80°C
CMP10 | ISO Secondary-Standard Pyranometer Double glass dome and high-quality detector		High-quality blackened thermopile protected by two glass domes	Monitors solar radiation for the full solar spectrum range	285 to 2800 nm	7 to 14 µV/W/m²	–40° to +80°C
LP02 | ISO Second-Class Pyranometer High quality device with protective dome		Blackened thermopile protected by a dome	Monitors solar radiation for the full solar spectrum range	285 to 3000 nm	15 µV/W/m²	–40° to +80°C
SR11 | ISO First-Class Pyranometer Double glass dome		High-quality blackened thermopile protected by two glass domes	Monitors solar radiation for the full solar spectrum range	285 to 3000 nm	15 µV/W/m² nominal	–40° to +80°C
SR20-D2 | ISO Secondary-Standard Digital Pyranometer Double glass dome and internal 10 k thermistor for optimized measurements		High-quality blackened thermopile protected by two glass domes	Monitors solar radiation for the full solar spectrum range	285 to 3000 nm	digital output	–40° to +80°C
CMP3 | ISO Second-Class Pyranometer Protective glass dome and solar shield		Blackened thermopile protected by a dome	Monitors solar radiation for the full solar spectrum range	300 to 2800 nm	5 to 20 µV/W/m²	–40° to +80°C
CMP6 | ISO First-Class Pyranometer Double glass dome and increased thermal mass improve performance		High-quality blackened thermopile protected by two glass domes	Monitors solar radiation for the full solar spectrum range	285 to 2800 nm	5 to 20 µV/W/m²	–40° to +80°C
CMP11 | ISO Secondary-Standard Pyranometer Double glass dome and high-quality detector		High-quality blackened thermopile protected by two glass domes	Monitors solar radiation for the full solar spectrum range	285 to 2800 nm	7 to 14 µV/W/m²	–40° to +80°C

CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

Soil Volumetric Water Content

Time-domain methods for unattended or portable measurements

Rugged, Reliable, and Ready for any Application

RELIABLE SINCE 1974 MONITORING

Soil water content indicates how much water is present in the soil. It can be used to estimate the amount of stored water in a profile or how much irrigation is required to reach a desired amount of water.

Soil volumetric water content sensors provide a tool to measure the water content using hand-held sensors, or installing the water content sensors into the soil for long-term measurements.

MAJOR SPECIFICATIONS

		Measurements	*Water Content Accuracy*	*Current Drain*
SoilVUE 10 | TDR Soil Moisture Profile Sensor Economical, easy-to-install, excellent soil contact		soil volumetric water content (VWC), permittivity, electrical conductivity (EC), temperature at six depths over 0.5 m or nine depths over 1.0 m using one sensor	±1.5% typical with most soils Soils with high organic matter (>12% soil organic carbon) or high clay content (> 45% clay) may need a soil-specific calibration due to the dispersive nature of these materials.	Active: ~64 mA @ 12 Vdc Quiescent: ~1.5 mA @ 12 Vdc
CS655 | Reflectometer with 12-cm Rods Innovative and more accurate in soils with high bulk EC without site-specific calibration		soil EC, relative dielectric permittivity, VWC, temperature	±3% VWC typical in mineral soils, where solution EC ±10 dS/m	Active (3 ms): 45 mA typical @ 12 Vdc (80 mA @ 6 Vdc, 35 mA @ 18 Vdc) Quiescent: 135 µA typical @ 12 Vdc
CS650 | Reflectometer with 30-cm Rods Innovative and more accurate in soils with high bulk EC without site-specific calibration		soil EC, relative dielectric permittivity, VWC, temperature	±3% VWC typical in mineral soils, where solution EC ≤3 dS/m	Active (3 ms): 45 mA typical @ 12 Vdc (80 mA @ 6 Vdc, 35 mA @ 18 Vdc) Quiescent: 135 µA typical @ 12 Vdc
CS616 | Reflectometer with 30-cm Rods High accuracy and precision; designed for long-term monitoring		VWC of porous media (such as soil)	±2.5% VWC using standard calibration with bulk EC of ≤0.5 dS m^{-1}, bulk density of ≤1.55 g cm^{-3}, and measurement range of 0% to 50% VWC	65 mA @ 12 Vdc (when enabled) 45 µA (quiescent typical)

CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

Enhanced Climate Monitoring

Campbell Scientific dataloggers at heart of networked weather stations in California

Point Reyes weather station

Case Study Summary

Application:
WRCC networks in California

Location:
California, USA

Contracting Agencies:
National Oceanic and Atmospheric Administration (NOAA), California Dept. of Water Resources, California Climate Change Center at Scripps

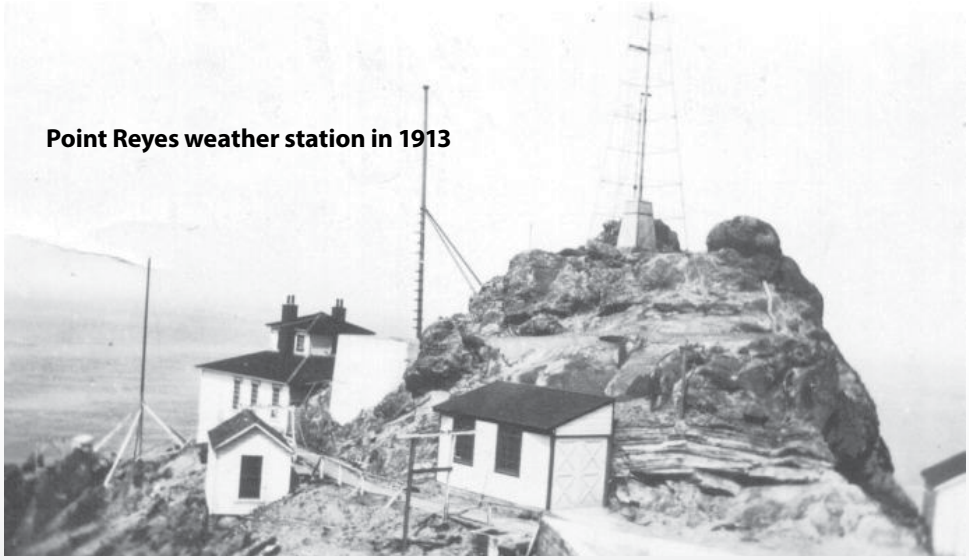
Products Used:
CR1000

Contributors:
David Simeral, Desert Research Institute, Western Regional Climate Center (WRCC/DRI)

Measured Parameters:
Wind Speed, Wind Direction, Temperature, Relative Humidity, Precipitation, Solar Radiation, Snow Depth, Soil Temperature

Climate and its variations are estimated to have an effect of 10-20 percent of the trillion-dollar economy of the state of California. Changes in climate appear to be under way in the far West, and yet in years past there was no monitoring system in place specifically designed to detect and report on such changes as they unfold.

The Desert Research Institute's Western Regional Climate Center, sponsored by the state of California and the National Oceanic and Atmospheric Administration (NOAA), undertook a project to identify gaps in how the climate of California is monitored, provide improvements in knowledge of climate in the state, and disseminate this information for public, policy, and technical use. This effort began with an evaluation of existing sources of data, locations of stations, and quality and type of information. This stage also involved consultation with state and federal agencies and with the climate research community. Significant partners include the California Department of Water Resources and the California Climate Change Center at Scripps. In such a vast state with



Point Reyes weather station in 1913

so much climate diversity, the approach taken was to focus on selected clusters and transects, with special emphasis on regions with strong spatial gradients in climate and underobserved geographic settings. Mountains and coastlines received preference for new weather stations at the start.

A transect has been identified that extends from the central coast to the North Fork American River and east of the Sierra Crest, including the Point Reyes location pictured here. Strong preference was given to locations not expecting development or changes in site characteristics (such as vegetation and land use) for several decades, and thus stable land ownership. Another priority was suitably open exposure. All sites have live communication, and all data is posted to the Internet and freely available.

The weather stations are based on Campbell Scientific's CR1000, and typical measurements include temperature, precipitation, wind speed and direction, relative humidity, solar radiation, snow depth, and soil temperatures, from a tower usually 10 m in height. The project has been joined by many partners interested in fostering long-term climate observations in the state of California.