



**CAMPBELL SCIENTIFIC, INC.**<sup>®</sup>  
WHEN MEASUREMENTS MATTER

**From:** Glenn Jarrell

**To:** State of West Virginia

**Date:** December 1, 2006

**Subject:** State of West Virginia Request for Quotation (RFQ#FOR1060)

Campbell Scientific Inc. (CSI) can provide the Fire Weather Stations and CSI can provide the Service, Support & Maintenance described in \*RFQ#FOR1060.

Attached you will find;

Page 1 of 6; Quote#57656 for a Fire Weather Station w/ GOES communication & a CM120 Tripod.

Page 2 of 6: Fire Weather brochure w/ Permanent & Portable Station options.

Page 3 of 6; Photo of modular equipment inside the Fire Weather Station enclosure

Page 4 of 6; CM120 Instrumentation Tripod Literature.

Page 5 of 6; Weather Station brochure showing Fire Weather Station tower mounting options.

Page 6 of 6; Quote for Fire Weather Station Service, Support & Maintenance.

**\*Note:** The State of West Virginia would need to contract w/ Campbell Scientific Inc to provide Fire Weather Station Service, Support & Maintenance for CSI Fire Weather Stations.

**Glenn Jarrell - Application Engineer**

**Campbell Scientific, Inc.**

**Phone: 435-750-1738 Fax: 435-750-9579**

**email: [gjarrell@campbellsci.com](mailto:gjarrell@campbellsci.com)**

RECEIVED

2006 DEC -6 A 9:37

PURCHASING DIVISION  
STATE OF WV

**GENERAL TERMS & CONDITIONS  
REQUEST FOR QUOTATION (RFQ) AND REQUEST FOR PROPOSAL (RFP)**

1. Awards will be made in the best interest of the State of West Virginia.
2. The State may accept or reject in part, or in whole, any bid.
3. All quotations are governed by the *West Virginia Code* and the *Legislative Rules* of the Purchasing Division.
4. Prior to any award, the apparent successful vendor must be properly registered with the Purchasing Division and have paid the required \$125.00 registration fee.
5. All services performed or goods delivered under State Purchase Orders/Contracts are to be continued for the term of the Purchase Order/Contract, contingent upon funds being appropriated by the Legislature or otherwise being made available. In the event funds are not appropriated or otherwise available for these services or goods, this Purchase Order/Contract becomes void and of no effect after June 30.
6. Payment may only be made after the delivery and acceptance of goods or services.
7. Interest may be paid for late payment in accordance with the *West Virginia Code*.
8. Vendor preference will be granted upon written request in accordance with the *West Virginia Code*.
9. The State of West Virginia is exempt from federal and state taxes and will not pay or reimburse such taxes.
10. The Director of Purchasing may cancel any Purchase Order/Contract upon 30 days written notice to the seller.
11. The laws of the State of West Virginia and the *Legislative Rules* of the Purchasing Division shall govern all rights and duties under the Contract, including without limitation the validity of this Purchase Order/Contract.
12. Any reference to automatic renewal is hereby deleted. The Contract may be renewed only upon mutual written agreement of the parties.
13. **BANKRUPTCY:** In the event the vendor/contractor files for bankruptcy protection, this contract is automatically null and void, and is terminated without further order.
14. **HIPAA Business Associate Addendum** - The West Virginia State Government HIPAA Business Associate Addendum (BAA), approved by the Attorney General, and available online at the Purchasing Division's web site (<http://www.state.wv.us/admin/purchase/vrc/hipaa.htm>) is hereby made part of the agreement. Provided that, the Agency meets the definition of a Covered Entity (45 CFR §160.103) and will be disclosing Protected Health Information (45 CFR §160.103) to the vendor.

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**INSTRUCTIONS TO BIDDERS**

1. Use the quotation forms provided by the Purchasing Division.
2. **SPECIFICATIONS:** Items offered must be in compliance with the specifications. Any deviation from the specifications must be clearly indicated by the bidder. Alternates offered by the bidder as **EQUAL** to the specifications must be clearly defined. A bidder offering an alternate should attach complete specifications and literature to the bid. The Purchasing Division may waive minor deviations to specifications.
3. Complete all sections of the quotation form.
4. Unit prices shall prevail in cases of discrepancy.
5. All quotations are considered F.O.B. destination unless alternate shipping terms are clearly identified in the quotation.
6. **BID SUBMISSION:** All quotations must be delivered by the bidder to the office listed below prior to the date and time of the bid opening. Failure of the bidder to deliver the quotations on time will result in bid disqualifications.

**SIGNED BID TO:**

Department of Administration  
Purchasing Division  
2019 Washington Street East  
Post Office Box 50130  
Charleston, WV 25305-0130



815 West 1800 North • Logan, Utah 84321-1784  
 Phone 435.753.2342 • Fax 435.750.9540  
 Fed. I.D. #87-0305157 • DUNS#06-798-0730

Quote Number	57656
Quote Date	12-01-06
Valid Through Date	01-30-07
Quoted By	Glenn Jarrell
Customer Number	50044
Est. Ship ARO	30 Days ARO
Page	1

## Domestic Sales Quotation

Q U O T E	CSI AE Marketing Campbell Scientific Inc Marketing Dept 815 W 1800 N Logan, UT 84321-1784 United States
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S H I P T O	CSI AE Marketing Campbell Scientific Inc Marketing Dept 815 W 1800 N Logan, UT 84321-1784
----------------------------	---

Contact:	Glenn Jarrell	Cust RFQ:	
Phone:	435-750-1738	Terms:	Net 30 Days
Fax:		Freight Terms:	
Email:	gjarrell@campbellsci.com	FOB:	LOGAN, UT

Li	Model	Part	Description	Qty	UM	Unit Price	Ext. Price
Freight & insurance charges will be added to total. If applicable, Sales/Use Tax will be added to the total for any orders "Shipped" to CA, FL, IN, & UT. Unit prices may be changed based on the quantity ordered.							
1	CM120	16702	Aluminum, 20ft Tripod w/ Grounding & Guy Kit	1	EA	1,035.00	1,035.00
2		18092	Guy Extension Anchor Kit for CM115 or CM120	1	EA	115.00	115.00
3		18806	Sub RAWs Enclosure Assembly	1	EA	2,650.00	2,650.00
4		19016	Tripod Mast Mounts for RAWs Enclosure	1	EA	65.00	65.00
5		18694	RAWs 24Ahr Power Supply Kit w/ charger/regulator & solar panel	1	EA	680.00	680.00
6		18692	RAWs Communication Package w/ GOES transmitter	1	EA	3,400.00	3,400.00
							Continued

This Quote is for Domestic purposes only.

Authorized Signature X

**Warranty Policy:** CSI warrants product manufactured by CSI to be free from defects in materials and workmanship under normal use and service for twelve (12) months from date of shipment unless specified otherwise, subject to the following conditions:  
 CSI's obligation under this warranty is limited to repairing or replacing (at CSI's option) products which have been returned prepaid to CSI. CSI will return warranted equipment by surface carrier prepaid. This warranty shall not apply to any CSI products which have been subjected to modification, misuse, neglect, accidents of nature, or shipping damage. Batteries are not warranted. Under no circumstances will CSI reimburse the claimant for costs incurred in removing and/or re-installing equipment. This warranty, and CSI's obligation thereunder, is in lieu of all other warranties of suitability and fitness for a particular purpose. CSI is not liable for consequential damages.



815 West 1800 North • Logan, Utah 84321-1784  
 Phone 435.753.2342 • Fax 435.750.9540  
 Fed. I.D. #87-0305157 • DUNS#06-798-0730

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## Domestic Sales Quotation

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SHIP TO	CSI AE Marketing Campbell Scientific Inc Marketing Dept 815 W 1800 N Logan, UT 84321-1784
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Contact:	Glenn Jarrell	Cust RFQ:	
Phone:	435-750-1738	Terms:	Net 30 Days
Fax:		Freight Terms:	
Email:	gjarrell@campbellsci.com	FOB:	LOGAN, UT

Li	Model	Part	Description	Qty	UM	Unit Price	Ext. Price
7	CS100-QD	18832	Setra 278 Barometer (600 - 1100 Hpa) for RAWS, 30inch Cable	1	EA	555.00	555.00
8		special	o34b-lq Met One Wind sensor w/ 25ft cable & connector	1	EA	643.75	643.75
9	CM220	17907	Right Angle Mounting Kit	1	EA	19.00	19.00
10		special	cs300-lq Apogee Pyranometer w/ 25ft cable & connector	1	EA	273.75	273.75
11		18356	CS300 Apogee Pyranometer Leveling Base	1	EA	37.00	37.00
12	CM225	17906	Solar Sensor Mounting Stand	1	EA	38.00	38.00
13	CM204	17904	Sensor Crossarm w/one CM210 Mounting Kit, 4ft	1	EA	70.00	70.00
						Continued	

This Quote is for Domestic purposes only.

Authorized Signature X

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Contact:	Glenn Jarrell	Cust RFQ:	
Phone:	435-750-1738	Terms:	Net 30 Days
Fax:		Freight Terms:	
Email:	gjarrell@campbellsci.com	FOB:	LOGAN, UT

Li	Model	Part	Description	Qty	UM	Unit Price	Ext. Price
14		special	hmp45c-lq Vaisala Temp & RH w/ 10ft cable & connector	1	EA	565.50	565.50
15	41003-5	5932	RM Young 10-Plate Gill Solar Radiation Shield for HMP45C	1	EA	180.00	180.00
16		special	te525ws-lq rain gage w/ 25ft cable & connector	1	EA	440.28	440.28
17		special	Customize RAWS program for User GOES assignment	1	EA	250.00	250.00
18	RESOURCECD	16478	Reference Material & Starter Software	1	EA	0.00	0.00
						SUBTOTAL	\$11,017.28
						TAX	\$699.60
						TOTAL	\$11,716.88

This Quote is for Domestic purposes only.

Authorized Signature X

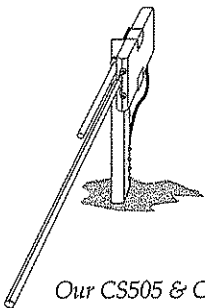
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# Fire Weather

[www.campbellsci.com/fire-weather](http://www.campbellsci.com/fire-weather)

## Benefits of Our Stations

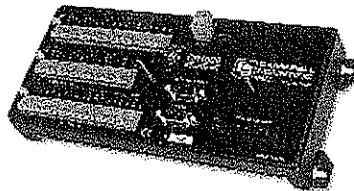
1. Sensors such as wind speed, wind direction, air temperature, relative humidity, solar radiation, fuel temperature, and fuel moisture, are commonly used in our systems.
2. Data transfer options include GOES satellite telemetry and the VSP3 Voice Radio Interface. The VSP3 allows you to call the station via a handheld radio and receive a verbal report. Phones, cellular phones, and RF may also be used.
3. Stations have proven reliability in harsh environments worldwide.
4. Fire weather stations can do double duty—ET calculation, hydrologic monitoring, avalanche forecasting, and more.
5. Stations provide on-board mathematical and statistical processing.
6. Stations are compatible with Remsoft's WeatherPro software.
7. Maintenance contracts are available.



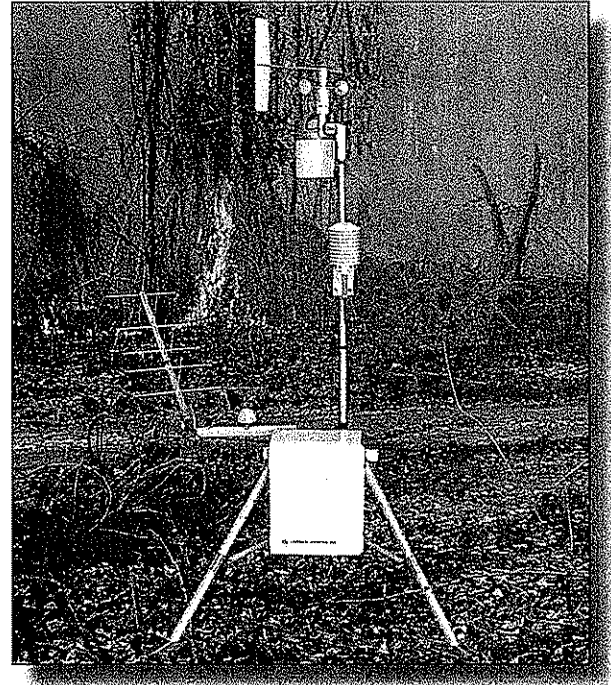
Our CS505 & CS205/107 provide automated fuel moisture and temperature measurements of a 10-hour fuel moisture dowel.

*Campbell Scientific's  
RAWS-F Fire Weather  
Quick Deployment Station  
(at right) provides accurate  
measurements in harsh envi-  
ronments. These stations  
can be set up in less than  
10 minutes—without tools.*

*See next page For  
"Custom Station" options*



*The versatility of our stations  
stems from the capabilities of  
our measurement system.*



**C**ampbell Scientific has manufactured thousands of automated weather stations. Our stations are known for their versatility and reliability, even in harsh environments—two features that make them ideal for fire weather monitoring. Several configurations are available, but all our fire weather stations monitor, record, and transmit meteorological data relevant to fire danger prediction.

Our fire weather stations are equipped with a suite of high quality meteorological sensors for monitoring wind speed and direction, precipitation, air temperature, and relative humidity. Sensors such as fuel moisture, fuel temperature, soil water content, soil temperature, solar radiation, and many others can also be measured.

Data can be transmitted over a variety of telemetry options including satellite transmitters, telephone, cellular phone, and radio. In the United States, GOES<sup>1</sup> satellite telemetered data can be collected via NIFC<sup>2</sup> and stored to WIMS<sup>3</sup> or collected directly from NESDIS<sup>4</sup> using Remsoft's WeatherPro and NESDIS module. NFDRS<sup>5</sup> indices are calculated using WIMS or WeatherPro.

Because our equipment can interface to many different sensor types and can measure large numbers of sensors, it can serve more than one purpose. For example, some of our equipment has monitored conditions near fire lines and been used for fire research during prescribed burns. Also, a suitably sited fire weather station could be used for avalanche forecasting in the winter. With the addition of a water depth sensor, a fire weather station could serve as a year-round hydrological monitoring station. Other combinations are possible.

1-Geostationary Operational Environmental Satellite  
2-National Interagency Fire Center.  
3-Weather Information Management System (database)

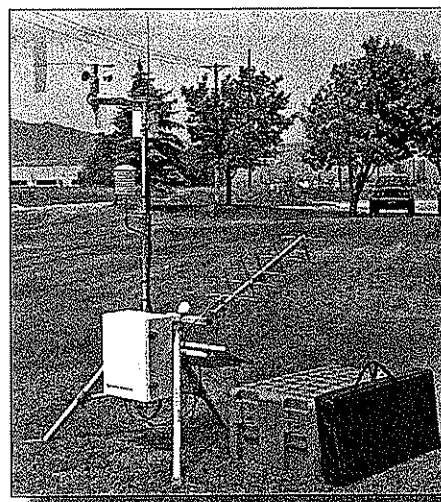
4-National Environmental Satellite, Data, and  
Information Service  
5-National Fire Danger Rating System

## Quick Deployment Station

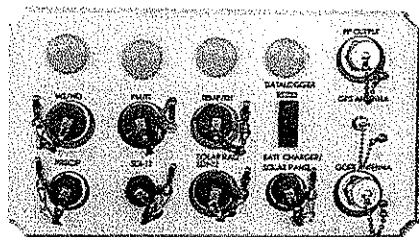
Our RAWS-F Fire Weather Quick Deployment Station is ideal for prescribed burns or other temporary installations. Customers can setup the station in as little as 10 minutes—without tools. Each RAWS-F station is pre-programmed to monitor wind speed and direction, air temperature and relative humidity, precipitation, barometric pressure, and solar radiation sensors. This program complies with the National Fire Danger Rating System (NFDRS) weather station standards.

A RAWS-F station consists of an aluminum environmental enclosure mounted to a 6 ft tripod. The enclosure houses and protects a CR1000 datalogger and a 12 V battery that is recharged via a solar panel or an AC transformer. To facilitate sensor connection, the outside of the enclosure has color-coded, keyed connectors. A wiring panel is also provided allowing the RAWS-F to measure additional sensors.

Communication options include our GOES satellite transmitter and the VSP3 Vosponder Voice Radio Interface. The Vosponder allows customers to call a RAWS-F station via a hand-held radio and receive verbal reports of real-time conditions. Our RAWS-F station is compatible with other communication equipment such as telephones, digital cellular transceivers, and RF.



The components of a RAWS-F station fit inside of two optional carrying cases for easily transporting the station to the site.



Our RAWS-F Quick Deployment Station has metal connector caps that are chained to a connector panel. The connectors are color-coded, keyed, and labeled—simplifying the attachment of sensors. Four additional connectors can be incorporated into the panel.

## Permanent Stations

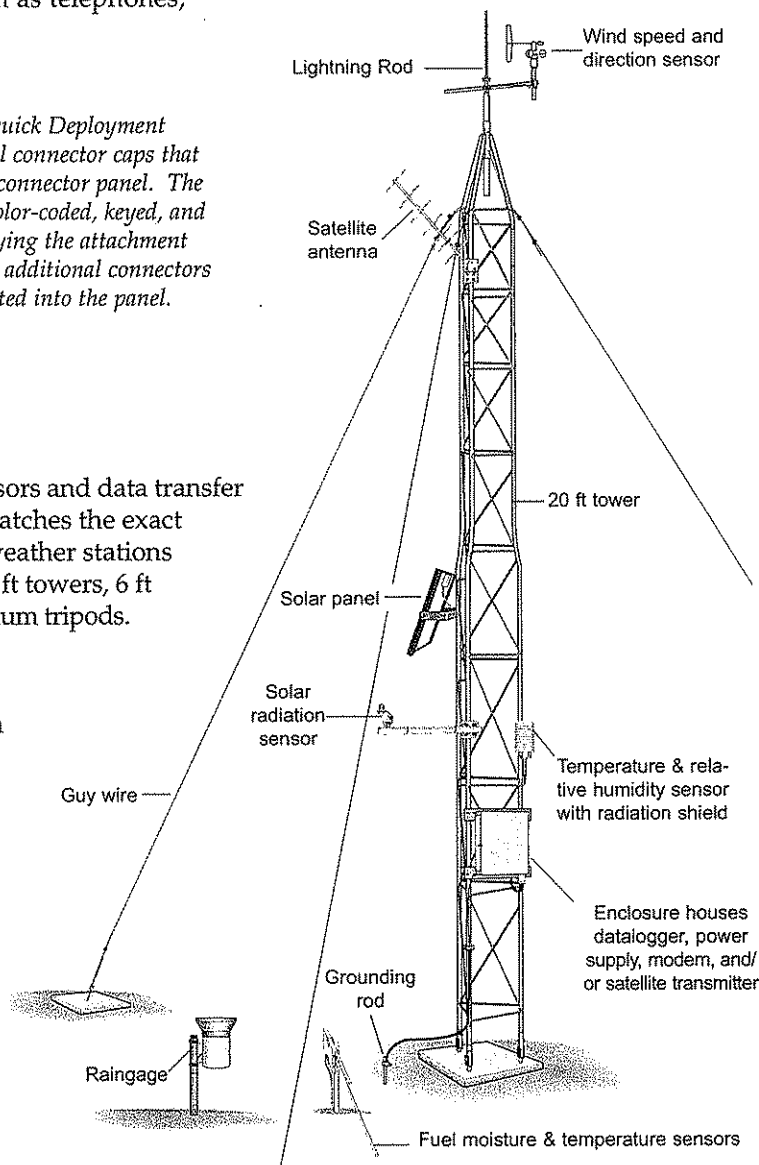
### Custom Stations

Campbell Scientific provides a wide selection of sensors and data transfer peripherals for configuring a custom station that matches the exact requirements of your application. Permanent fire weather stations typically use 20 ft towers. We also offer 10 ft and 30 ft towers, 6 ft and 10 ft steel tripods, and 10 ft, 15 ft, and 20 ft aluminum tripods.

### RAWS-H Data Collection Platform

Our RAWS-H contains a CR1000 datalogger with a Handar sensor connector panel. Customers can replace a Handar Data Collection Platform with our RAWS-H Data Collection Platform and continue to use their existing Handar sensors, enclosure, power supply, and tower.

Permanent stations (at right) can be configured by choosing from a variety of dataloggers, sensors, mounts, and communications options, ensuring an exact match for your application.



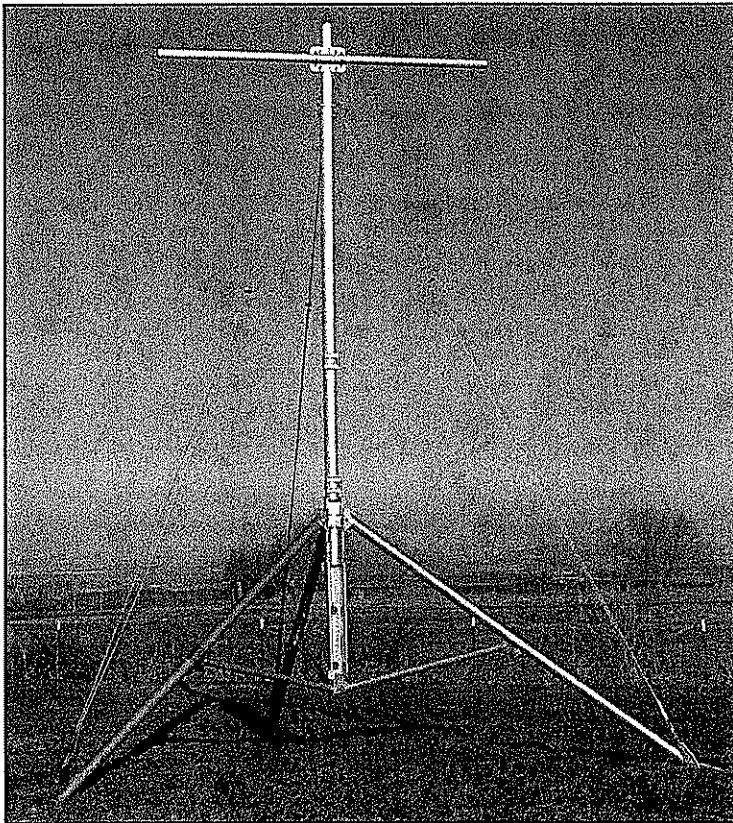
# Light-weight Instrumentation Tripods

## Models CM110, CM115, and CM120

The CM110, CM115, and CM120 tripods are corrosion-resistant, aluminum instrument mounts that support the attachment of sensors, mounts, solar panels, and environmental enclosures. The CM110 provides a maximum measurement height of 10 feet (3 m). The CM115 provides a 15 foot maximum measurement height and the CM120 a 20 foot maximum measurement height. The tripods are shipped with UV-resistant cable ties, and a grounding kit. The CM115 and CM120 also include a guy kit; the guy kit is optional for the CM110.

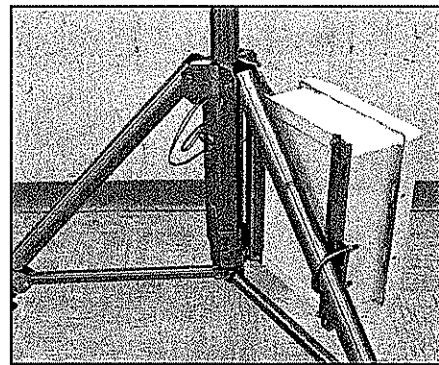
### Features

- Extendable and lockable tripod legs allow faster installation
- Pivoting mast enables easier access to the sensors and crossarm (i.e. hinged at base)
- Most joints are locked with pins that are simple to insert and remove
- Enclosures are easy to install without using U-bolts
- Measurement heights are adjusted using the three click heights or a clamp for more adjustment
- Individually adjustable legs allow installation over uneven terrain



At left is a guyed CM110 with a CM204 Crossarm. Sensors such as wind sets attach to the crossarm via the CM220 Right Angle Mounting Kit or a NU-RAIL fitting.

Our enclosures can be attached to either the mast or leg base (shown below). The ENC16/18 enclosure attaches to the tripod mast only.



The CM110, CM115, and CM120 are used as portable instrument mounts in a variety of applications. For meteorological applications, tripods augmented with mounts support the attachment of sensors such as wind sets, pyranometers, and temperature/relative humidity probes. Barometers, soil temperature and moisture probes, and rain gages are also used with tripod-based weather stations. For non-meteorological applications, tripods can provide a portable instrument mount for enclosures and a mounting point for antennas.



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## Ordering Information (see note 1)

### Tripods

- CM110 10 ft (3 m) light-weight tripod with grounding kit  
CM115 15 ft (5 m) light-weight tripod with grounding kit and guy kit  
CM120 20 ft (6 m) light-weight tripod with grounding kit and guy kit

### Accessories

- 17717 Carrying Tote Bag that holds one light-weight tripod  
17711 Guy Kit for the CM110 tripod  
17715 Tripod Extension Kit that increases the height of the tripod's mast by 5 ft (1.6 m); see notes 2 and 3.  
18092 Guy Extension Anchor Kit for a CM115 or CM120 tripod. The anchors allow the guy wires to be anchored at points further from the center point of the tripod thereby increasing tripod stability in higher wind speeds; see note 3.

## Specifications

	<u>CM110</u>	<u>CM115 (see note 4)</u>	<u>CM120 (see note 4)</u>
Height w/mast insert:	10' (3 m)	15.5' (4.7 m)	21.0' (6.4 m)
Shipping weight:	30 lbs (13.6 kg)	36 lbs (16.3 kg)	42 lbs (19 kg)
Base diameter w/legs extended:	10 ft (3 m)	10 ft (3 m)	10 ft (3 m)
Vertical load limit:	100 lb (45 kg)	100 lb (45 kg)	100 lb (45 kg)
Mast description:			
Number of pipe sections	1	2	3
Pipe length	5.5' (1.7 m)	5.5' (1.7 m)	5.5' (1.7 m)
Pipe length w/insert	6.5' (2.0 m)	6.5' (2.0 m)	6.5' (2.0 m)
OD	1.9" (4.8 cm)	1.9" (4.8 cm)	1.9" (4.8 cm)
Mounting hole in tripod foot:	0.75" diameter hole for user-supplied 0.5" J-bolts	0.75" diameter hole for user-supplied 0.5" J-bolts	0.75" diameter hole for user-supplied 0.5" J-bolts
Wind load recommendations:			
Sustained wind (mph)	75 (unguyed) 80 (guyed at feet)	56.25 (guyed at feet) 75 (guyed at 60°)	42.25 (guyed at feet) 65 (guyed at 60°)
Gust tolerance (mph)	95 (unguyed) 100 (guyed at feet)	71.25 (guyed at feet) 95 (guyed at 60°)	55.25 (guyed at feet) 85 (guyed at 60°)

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### Notes:

1. See the "Instrumentation Mounts" product literature for crossarm, solar radiation mounts, and radiation shield options.
2. For many applications, a UT20 or UT30 tower is preferable to using a CM120 tripod with an extension.
3. When the CM120 is used with the 17715 Tripod Extension Kit and the 18092 Guy Extension Anchor Kit, a longer guy cable may be required. Contact Campbell Scientific to acquire the longer cable.
4. Guy wire anchors must be able to hold at least 100 lbf (182 kgf).



**INTERMOUNTAIN ENVIRONMENTAL, INC.**  
 INSTRUMENTATION FOR RESEARCH AND RESOURCE MANAGEMENT  
 www.inmtn.com  
 601 W. 1700 S., Suite B, Logan, UT 84321-8247  
 PH: (435) 755-0774 FX: (435) 755-0794  
 Fed. I.D.# 87-0502649 DUNS# 80-936-8012

### QUOTATION

**Quote #** IEIQ6379  
**Date** 12/04/06  
**Account Rep.** Josh Hanks

**Quote To:**

Campbell Scientific, Inc.  
 Glenn Jarrell  
 815 W. 1800 N.  
 Logan, UT 84321-1784

**Ship To:**

**Terms:** UPON APPROVAL  
**FOB:** LGN,PPD & ADD  
**Ship Via:** UPS-Gnd

Fax: (435)752-3268  
 e-Mail: gjarrell@campbellsci.com

*Any questions concerning this quote please contact me at (800) 948-6236 x223 or through email at jhanks@inmtn.com.*

Model #	Description	Qty	Unit Price	Ext. Price
SERVICE PORTION QUOTE FOR RAW5 RFQ:				
SPC-OTH	Annual On-Site Maintenance (conforms to NWCG Standards as of May 2005) Includes: (per/station and per/year) - One annual site visit - Installation of recently calibrated sensors - System health check (power, sensor connections, mounts, etc..) - Provide calibration certificates - Unlimited phone and email support - Website for customer to review station status (maintenance and pictures) - 72 hour response to all system issues (including on-site needs) ** Does not include the cost to replace damaged sensors, communication equipment, power supplies or datalogging equipment) *** Does include technician time and travel expenses	1	\$4,500.00	\$4,500.00
			SubTotal	\$4,500.00
			Sales Tax	\$0.00
			* Est. Shipping, Handling & Insurance	\$0.00
			<b>Total</b>	<b>\$4,500.00</b>

We appreciate the opportunity to provide this quotation. Please feel free to contact us with any questions or comments.

Quoted PRICES are good for 30 days. Typical DELIVERY is 30-60 days. \* SHIPPING CHARGES are estimated, actual shipping charges will be F.O.B. Logan, UT, with freight and insurance prepaid and added to the invoice as a separate item unless noted otherwise. Items listed with a item code starting with SPC- are not returnable. Radios, Antennas, Cellular Phone Packages, and any sensors with non-standard cable lengths are not returnable. All products are covered by the manufacturers WARRANTY which is typically 12 months unless otherwise noted. All returned products are subject to a minimum 15% RESTOCKING FEE for products returned within 60 days, with original packaging (\$50 minimum). Accepted PAYMENT TERMS: Net 30 for approved Purchase Orders. Otherwise VISA, MasterCard, American Express, C.O.D., or Prepaid. A finance fee of 1.5% (18% annual) per month will be charge on past due accounts.



State of West Virginia  
 Department of Administration  
 Purchasing Division  
 2019 Washington Street East  
 Post Office Box 50130  
 Charleston, WV 25305-0130

# Request for Quotation

RFQ NUMBER  
**FOR1060**

PAGE  
**1**

ADDRESS CORRESPONDENCE TO ATTENTION OF:  
**BUYER 32**  
**304-558-0492**

VENDOR FOR

**CAMPBELL SCIENTIFIC INC.**  
**815 W 1800 N**  
**LOGAN, UTAH 84321-1784**

**RECEIVED**  
**NOV 27 2006**

SHIP TO

**DIVISION OF FORESTRY**  
**BUILDING 13**  
**4720 BRENDA LANE**  
**CHARLESTON, WV**  
**25312 558-2788**

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
11/16/2006				

BID OPENING DATE: **12/07/2006** BID OPENING TIME **01:30PM**


LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT
0001	2	EA		220-87		
<p align="center"><b>REQUEST FOR QUOTATION</b></p> <p>THE PURCHASING DIVISION IS SOLICITING BIDS FOR THE WEST VIRGINIA DIVISION OF FORESTRY TO PROVIDE TWO (2) FIRE WEATHER STATIONS.</p> <p>ATTACHMENTS:</p> <ol style="list-style-type: none"> <li>1. SPECIFICATIONS</li> <li>2. AFFIDAVIT</li> </ol> <p>DELIVERY: DELIVERY COSTS SHALL BE INCLUDED IN THE BID PRICE. UPON RECEIPT OF THE PURCHASE ORDER, THE SUCCESSFUL BIDDER SHALL HAVE SIXTY (60) DAYS TO DELIVER THE STATIONS TO:            WV DIVISION OF FORESTRY            4720 BRENDA LANE, BLDG. 13            CHARLESTON, WV 25312</p> <p align="center"><b>VENDOR PREFERENCE CERTIFICATE</b></p> <p>CERTIFICATION AND APPLICATION* IS HEREBY MADE FOR PREFERENCE IN ACCORDANCE WITH WEST VIRGINIA CODE, 5A-3-37 (DOES NOT APPLY TO CONSTRUCTION CONTRACTS).</p>						

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE
TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

The Fire Weather Monitoring equipment (RAWS stations) required by the State must meet the following requirements and specifications:

1. **Modular Design** – the weather station must be modular in design. That is to say, each component must be a separate entity, easily and quickly disconnected from the system, and replaced with a new or refurbished component. This must apply to the sensors, datalogger, GOES transmitter, power supply (battery, solar panel, and voltage regulator), and antenna. No component should ever require disassembly or exposure of internal circuitry in the field.
2. **Folding Mast System** – the supplied mast system must be telescopic, fast deploy, guy wires attached, duck-bill anchors and driving rod supplied, complete, and ready for installation. There *must* be two sections – one rigid, to which all components except the wind sensors and solar panel attach. The second—a 20' section—must be hinged at the base, and easily and quickly lowered to access the wind sensors for service and maintenance. 
3. **Datalogger: must have the following features**
  - **Memory storage capacity:** Must store approximately two years of weather data, based on hourly storage for a typical fire weather station configuration.
  - **No programming by user:** It must commence operating immediately upon power up. It must not require field-programming by the user (having been pre-programmed by the manufacturer, to the GOES NESID assignment provided by the user). It must also be programmable by the user, if required.
  - **Lightning protection on all connectors:** All datalogger input and output connections must be protected against lightning damage. Preferable method will be a 4 level system that includes internal gas-discharge lightning arrests.
  - **Connectorization:** The datalogger *must* be fully connectorized, using military type quick connect-disconnect connectors, color coded and labeled for simplicity of installation and service by non-technical people. The connectors *must* provide 100% protection against water seepage, even when the sensors are not connected to the datalogger ports.
  - **Datalogger unit to be a sealed system:** The datalogger *must* be waterproof – a sealed unit, such that the datalogger will float if dropped in water, and be impervious to water seepage.
  - **Datalogger clocking:** The datalogger must have minimally two clocks. A master high precision clock for data sampling and logger operational tasks, as well as a back up lower precision clock for holding current time when the logger is powered down, power off mode. The main clock must be reset periodically using the time signal from the GPS system, ensuring precise timing for GOES transmissions.
4. **Weather Station Sensors:** All required sensors—wind speed, wind direction, air temperature/relative humidity, precipitation, and solar radiation—must meet the specifications as outlined in the national ([http://www.fs.fed.us/raws/standards/NFDRS\\_final\\_revmay05.pdf](http://www.fs.fed.us/raws/standards/NFDRS_final_revmay05.pdf)) RAWS standards.
  - All sensors must read accurately even if main battery voltage falls below 8.5V
  - The tipping bucket rain gauge must be constructed of aluminum and stainless steel, and its signal cable sheathed with stainless steel braid, to protect it from damage.
  - The solar radiation sensor must communicate via the SDI-12 sensor protocol to provide simple installation, field swap out, and servicing. The State must be able to swap out the solar radiation sensor without having to reprogram the datalogger. The calibration information must be stored within the solar radiation sensor's on-board memory.
5. **GOES Transmitter:**
  - must support 100/300/1200 baud rate transmissions
  - use integrated GPS technology for clock synchronization
  - must be contained within a separate cast aluminum O-ring sealed module, easily and quickly replaced in the field.
  - Must be able to operate and maintain clock accuracy for up to 30days without a GPS clock synchronization.
6. **Power Supply:** The weather station must include a solar charged power supply, capable of powering the station throughout the year, anywhere within the State. It must be comprised of a 10 watt solar panel, voltage regulator

with thermistor to monitor main battery temperature, and a 100+ amp hour, starved-electrolyte battery, capable of operating the station for up to four months in the event of failure of the solar panel. 26AH batteries will not be accepted.

7. **Software:**

- Any utilities programs required to re-program the datalogger, and to see current conditions from the station's sensors, must be supplied at no extra cost.
- The fire weather station must be compatible with the fire management program, *Fire WeatherPlus 2000*.

8. **Manufacturer Service Support Capabilities:**

- **Maintenance, Troubleshooting, Repair Service:** The manufacturer of the equipment *must* maintain a repair depot capable of complete evaluation, troubleshooting, maintenance, and repairs of all supplied equipment.
- **Telephone Support:** The manufacturer *must* maintain a toll-free telephone support line, available from 9:00 AM to 5:00 PM, (MST). The support *must* include assistance with all aspects of the equipment from equipment set-up and troubleshooting, to software support.
- **BLM Depot Maintenance:** The manufacturer's equipment *must* be approved for maintenance contracts with the BLM RAWS maintenance depot in Boise, ID.
- **Maintenance Contracts:** The manufacturer *must* be willing to contract for an AOM (Annual Onsite Maintenance) maintenance contract for each station, for a period of five years, as follows:
  - The manufacturer of the fire weather station must agree to provide *on-site annual maintenance* for the weather stations. Their maintenance program must be designed specifically to ensure that the Fire Weather Station continues to operate at peak performance throughout the contract year, and conforms to the NWCG Weather Station Standards (May 2005 revision).
  - Under the terms of the contract, the weather station manufacturer must schedule a field technician to visit each of the State's RAWS stations once per contract year and perform annual maintenance in liaison with a local contact. This will include:
    - Replace sensors (in accordance with NWCG standards revision May 2005) and perform general RAWS maintenance.
    - Perform the latest firmware upgrades as required.
    - Change baud rate assignments as required
    - Conduct a detailed site survey of all station components and advise the State of potential issues, and anything else of note.
  - The State of West Virginia currently has a network of (11) FTS RAWS station, under AES field service contracts with FTS. The new stations must be completely compatible with the existing network stations, and serviceable by FTS field technicians when they are in the state maintaining the rest of the network.
  - The manufacturer of the fire weather stations must also provide unlimited telephone and technical support throughout the contract period (during business hours).
  - Should there be a station malfunction during fire season, the manufacturer must provide priority service, and have the nonfunctioning station back to full operation within 72 hours of breakdown notification.
  - Should there be a station malfunction outside fire season, the manufacturer must have the nonfunctioning station back to full operation within 10 days of breakdown notification.
  - After the field service has been carried out, all relevant information must be recorded in a Website available to the State, accessible via a user name and password. This must include all station details and recommendations as well as annual digital photographs of each station.

Campbell Scientific, Inc.

# Weather Stations

Options Available



**CAMPBELL SCIENTIFIC, INC.**

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# Weather Stations



Campbell Scientific weather stations have become the world-wide standard for meteorological and climatological monitoring. In use on every continent and virtually every country, our weather stations are known for their precision measurement capability, rugged construction, wide operating temperature range, and low power consumption. Campbell Scientific weather stations offer the flexibility to easily change sensor configurations, data processing, and data storage and retrieval options.

*The flexibility and long-term reliability of our weather stations have resulted in their widespread use in scientific, commercial, and industrial applications. This weather station in the North Dakota Agriculture Weather network provides data critical to the application of pesticides.*

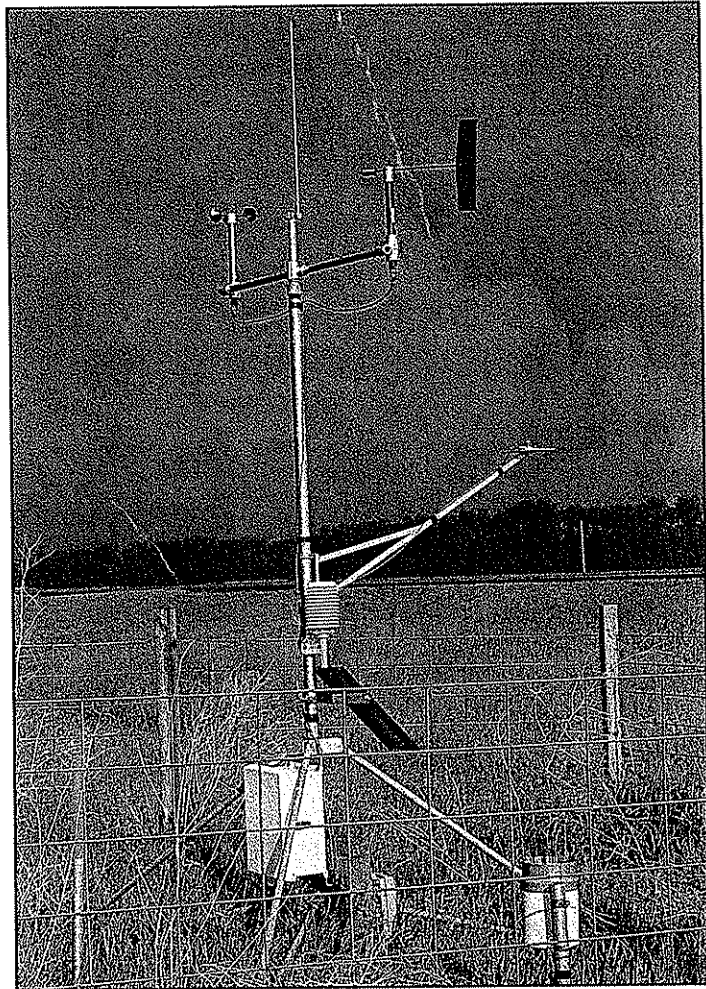
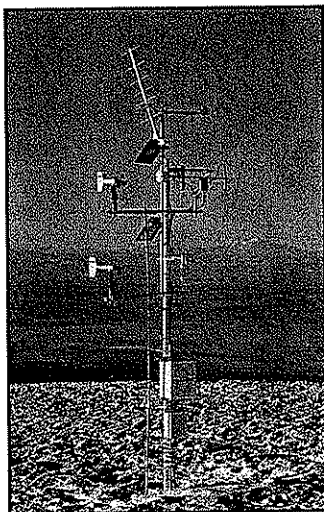


Photo Radu Carcoana, NDSU

## Tough Enough for the Extreme, Inexpensive Enough for the Routine



From frigid polar and alpine regions to the fiery Sahara, our stations have endured the elements for more than 25 years to provide accurate meteorological measurements. Most of our equipment has standard operating ranges of  $-25^{\circ}$  to  $+50^{\circ}\text{C}$ ; extended ranges are from  $-55^{\circ}$  to  $+85^{\circ}\text{C}$ . The heart of every Campbell Scientific weather station is the datalogger, and every datalogger we manufacture is calibrated and tested to ensure accurate, reliable performance.



Minimal power requirements allow use of alkaline or rechargeable batteries charged by solar panels or ac power. However, all this performance won't cost a fortune. Low overhead and lean manufacturing allow us to offer quality equipment at reasonable prices.

*(Above left) High atop Nevado Sajama in the Bolivian Andes, a Campbell Scientific weather station monitors conditions relevant to global warming. (Above right) Weather measurements on the Sphinx provide input for its preservation.*



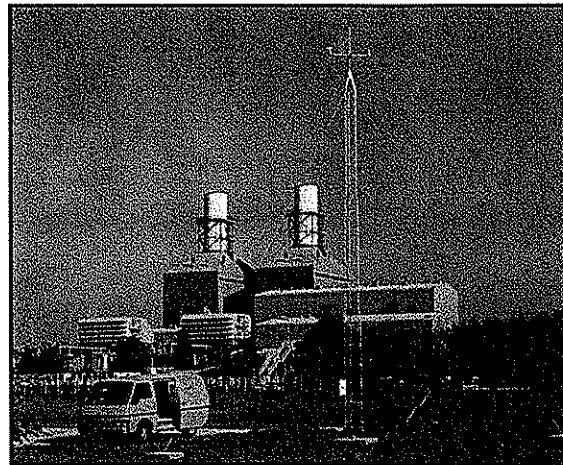
# Applications

## Meteorology

- **Individual Weather Stations** record site-specific conditions for meteorological research and routine weather measurement applications.
- **Weather Station Networks** provide regional and local real-time data for weather monitoring, forecasting, local warnings, and climatic modeling.
- **Air Quality and Diffusion Modeling** applications use the datalogger to monitor and control gas analyzers, particle samplers, and visibility sensors.

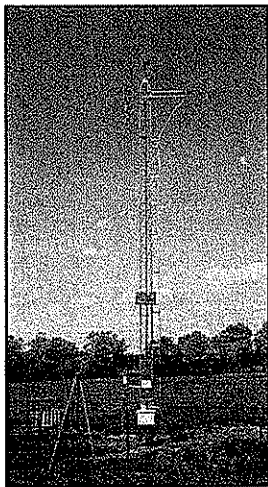
## Other Meteorological Applications

- **Ground Truth for Satellite Imagery**
- **Fire Weather Stations**



Phil Geary, Campbell Scientific Ltd.

*Campbell Scientific stations have become the standard used by the British Met Office.*

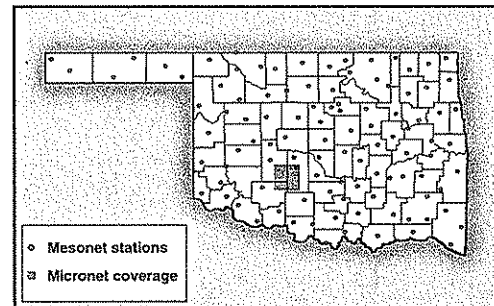


Dr. Ken Crawford, OCS

## The Mesonet: Oklahoma's Statewide Network

The Mesonet is composed of more than 115 Campbell Scientific weather stations that collect data for applications such as crop management, severe weather warnings, site-specific forecasts, and water resource management. Each station transmits data to the Oklahoma Climatological Survey (OCS) for processing and distribution to users via computer networks and bulletin boards, print and electronic media, and interactive public displays. The associated Micronet is an area of intensive study monitored by an additional 42 stations in the Little Washita Watershed.

*Every 15 minutes, the Oklahoma Law Enforcement Telemetry System (OLETS) collects data from each station via radio telemetry.*



## Agriculture

- **Crop Management Decisions** such as irrigation scheduling, integrated pest management, plant pathology, and frost prediction are based on data provided by our stations.
- **Evapotranspiration** can be calculated on-board using the FAO-56 Penman-Monteith equation, which is accepted by the Food and Agricultural Organization of the United Nations.

## Other Agricultural Applications

- **Erosion Studies**
- **Food Processing and Storage**

## Other Applications

- **Utilities/Energy/Wind Power**
- **Ecological/Biological/Microclimate Studies**
- **Historical Preservation**
- **Automotive Testing**
- **Hydrometeorological Stations**
- **Mining/Mineral Extraction/Earth Science**
- **Highway and Pavement Studies**
- **Alpine/Snow Science/Avalanche Control**
- **Geotechnical/Structural Engineering**
- **Sports Events (e.g., Olympic Games)**
- **Assessing Local Lightning Hazards and Thunderstorm Research**



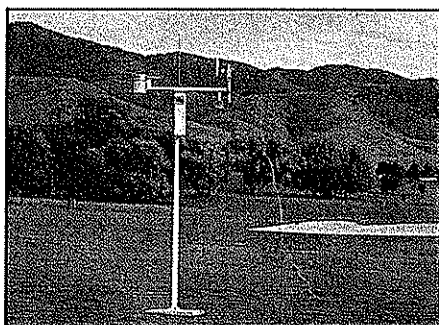
# Pre-Configured Weather Stations



Our pre-configured weather stations offer research-grade performance with ease-of-use for weather and climate monitoring. They feature a standard sensor assemblage and simplified installation.

## ET106 Weather/ETo Station

- Consists of measurement electronics, power supply, environmental enclosure, 2- or 3-meter aluminum pole, and a standard suite of sensors mounted to a crossarm
- Measures air temperature, solar radiation, relative humidity, rainfall, wind speed, and wind direction with the standard suite of sensors; optional soil temperature, soil water content, and snow depth sensors available
- Transmits data via short-haul, telephone, or voice-synthesized modems
- Configured with Visual Weather software (see page 7)



*The ET106 is an automated system designed for commercial agriculture, irrigation scheduling, and meteorological applications.*

## Quick Deploy Stations

Our RAWS-B and RAWS-F are ideal for prescribed burns and other temporary installations. These light weight, pre-configured stations can be setup in as little as 10 minutes. An aluminum environmental enclosure that houses a 12 V rechargeable battery and a CR1000 datalogger is mounted to a 6 ft tripod. The outside of the enclosure has color-coded, keyed connectors for attaching the sensors. Communication options include satellite transmitter, telephone, cellular phone, and radio.

### RAWS-B Basic Meteorological Station

This station is pre-programmed to measure the Vaisala™ Weather Transmitter and Apogee™ light sensor. The weather transmitter monitors wind speed and direction, precipitation, air temperature, relative humidity, and barometric pressure without movable parts. The light sensor monitors solar radiation.

### RAWS-F Fire Weather Meteorological Station

This station is pre-programmed to monitor individual wind speed and direction, precipitation, air temperature, relative humidity, barometric pressure, and solar radiation sensors. The measurement accuracy of the individual sensors is better than the measurement accuracy of the weather transmitter, which is used in the RAWS-B Basic Quick Deployment Station.

## RAWS-H Data Collection Platform

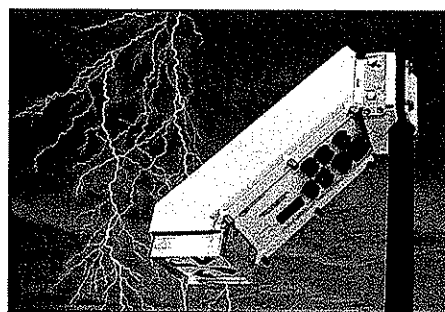
The RAWS-H contains a CR1000 datalogger with a Handar sensor connector panel. This allows you to replace a Handar Data Collection Platform with a RAWS-H and use the existing Handar sensors, enclosure, power supply, and tower.

## Other Pre-Configured Stations

The MetData1 provides an enclosure with connectors for attaching the sensors. Campbell Scientific also supplies stations to Toro®, RainBird®, and Hunter for automating turf grass irrigation; contact them for more information.

## Electric Field Meter

The CS110 can be used as an automated weather station. It measures the vertical component of the atmospheric electric field at the earth's surface. An embedded CR1000 datalogger, sealed connectors for attaching meteorological sensors, and three digital control ports for controlling external devices and/or triggering alarms are included. The datalogger measures the sensors, processes the measurements, stores the data in tables, and can initiate communications. Communication options compatible with the CR1000 include direct connect, Ethernet, phone modems (land-line and cellular), radios, short haul modems, satellite transmitters, and multidrop modems.



*The CS110's measurements are useful for assessing the local lightning hazard and for thunderstorm research.*

# Build-Your-Own Weather Stations

The flexibility of our products allows you to select only the components you need, in the quantity you need to customize your own weather station.

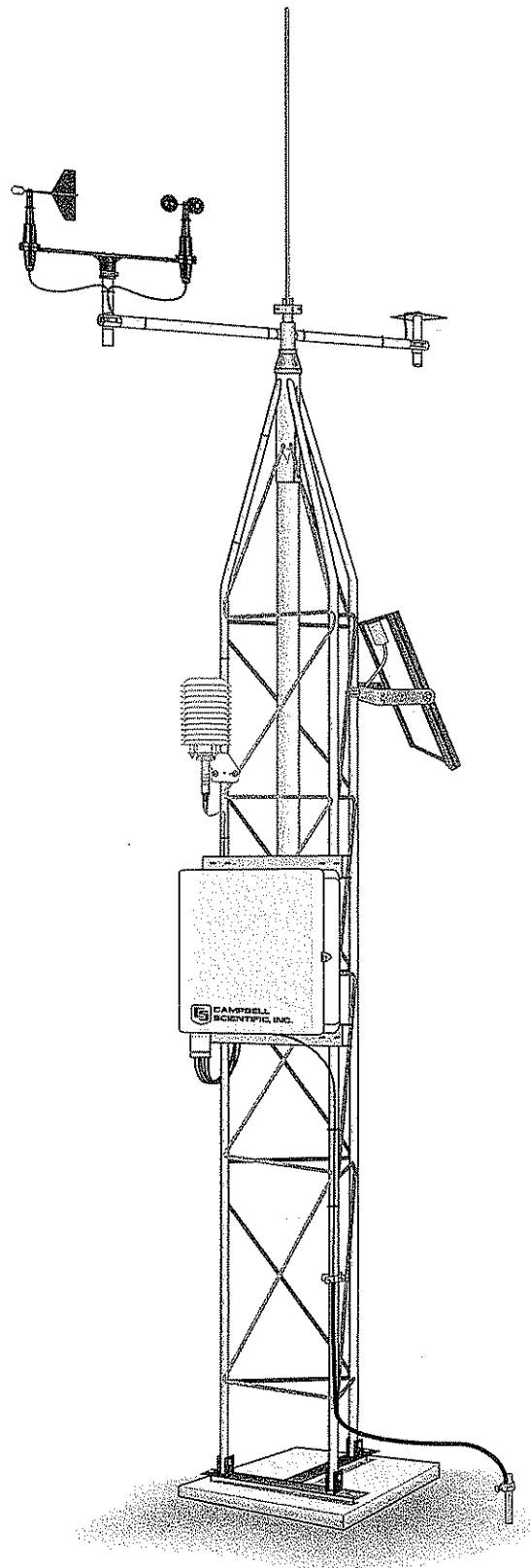
## Tripods and Towers

Our corrosion-resistant tripods and towers provide sturdy support for sensors, solar panels, and enclosures. We have steel tripods with 6- or 10-foot heights, aluminum tripods with 10-, 15-, or 20-foot heights, and towers with 10-, 20-, or 30-foot heights. Mounts for attaching wind sets, pyranometers, temperature and relative humidity sensors are available.

## Sensors

Campbell Scientific offers high quality sensors for measuring the parameters listed below. These sensors interface directly to our dataloggers. If measurement needs are specialized, our dataloggers' analog, pulse counter, and digital inputs are compatible with sensors offered by most manufacturers.

- **Wind Speed:** cup, propeller, or sonic anemometers.
- **Wind Direction:** vanes containing precision potentiometers or sonic anemometers. A single sensor assembly may measure wind speed and direction.
- **Solar Radiation:** silicon cell or thermopile pyranometers, quantum sensors, or net radiometers.
- **Temperature (air, water, soil):** thermistors, thermocouples, or RTDs.
- **Relative Humidity:** capacitive sensors that use integral signal conditioning. RH and air temperature sensors are typically housed in a single body.
- **Precipitation:** tipping bucket rain gages or weighing gages. A snowfall conversion adapter that uses antifreeze or a heated tipping bucket can measure the water content of snow.
- **Snow Depth:** ultrasonic distance sensors.
- **Barometric Pressure:** capacitance or strain gage pressure transducers.
- **Soil Moisture:** moisture blocks, analog output tensiometers, or reflectometers.
- **Fuel Moisture:** thermistor and reflectometer in a Forest Service-approved ponderosa pine dowel.



*Campbell Scientific weather stations can be customized using our standard product line to suit individual needs, employing a variety of towers, sensors, power supplies, and data retrieval products.*



## Dataloggers

Our weather stations are based around a programmable datalogger that measures sensors and stores data, in your choice of engineering units (e.g., wind speed in mph,  $m s^{-1}$ , knots). Sensor measurements are often processed and stored as hourly and daily arrays (e.g., maximums, minimums, averages). The datalogger also supports conditional outputs, such as rainfall intensity.

PC-based software is available for datalogger programming, data retrieval, and report generation. You can modify the program at any time to accommodate different sensor configurations or data processing requirements.

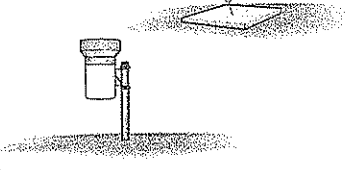
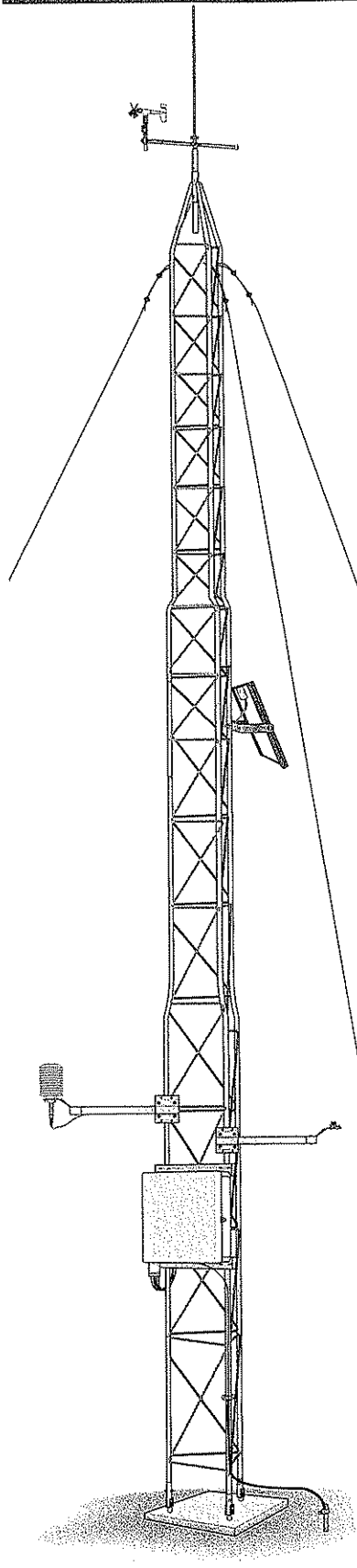
The datalogger has programmable execution intervals, on-board instructions for commonly used sensors, and adequate input channels to accommodate all standard sensor configurations. Use of measurement and control peripherals can expand the datalogger's capabilities.

## Power Supply

The power supply consists of either a set of alkaline batteries or a sealed-rechargeable battery; the rechargeable battery can be recharged via solar panel or ac power. Campbell Scientific offers a range of batteries, solar panels, and chargers to meet the needs of your specific application. Weather stations with high current drain peripherals (satellite, cellular phone) may require one of our larger capacity batteries.

## Enclosures

Environmental enclosures house the datalogger, power supply, data retrieval peripherals, and a barometer. The enclosures provide protection from dust, humidity, precipitation, sunlight, and environmental pollution. Our enclosures are UV-stabilized and reflect solar radiation. Enclosures can be customized for cable-entry openings or mounting brackets for our tripods or towers.



## Easy Set Up

Our weather station installation manuals provide step-by-step instructions with detailed illustrations. Station set-up time for most customers is a few hours.



*The UT30 tower places the wind speed and direction sensor at a 30 ft (10 m) measurement height that meets EPA requirements.*

## Data Retrieval Peripherals

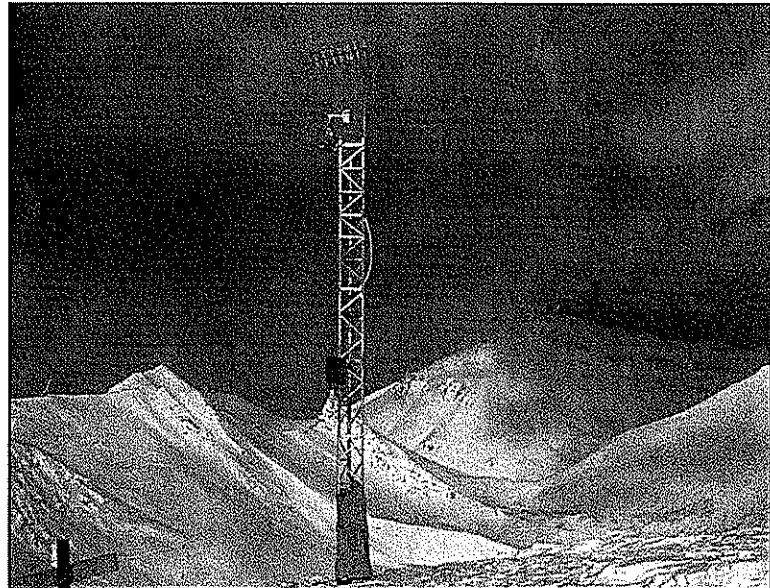
To determine the best option for your site, consider the accessibility of the site, availability of service (e.g., cellular phone or satellite coverage), quantity of data collected, and time between data downloads.

### On-site options:

- CompactFlash® cards
- Laptop Computer
- Datalogger keyboard display
- PDA Handhelds
- DataView Displays

### Telecommunication options:

- Short-Haul Modems
- Telephone (land line, digital cellular, and voice-synthesized)
- Ethernet
- Radio Frequency (RF) Transceivers (VHF narrowband, UHF narrowband, or spread spectrum)
- Multidrop Interface (coaxial cable)
- Satellite Transmitters (Argos and High Data Rate GOES)



Claude Labine, Campbell Scientific Canada

*Meteorological conditions are measured at Lake Louise, Alberta, Canada. The data are telemetered via phone-to-RF link to a base station.*

## Software

### Starter

Our starter software is available, at no charge, from [www.campbellsci.com/downloads](http://www.campbellsci.com/downloads) or from our Resource CD.

**Short Cut Program Builder** creates weather station programs that measure sensors and output data. It supports the meteorological sensors on our U.S. Price List, ET106, and MetData1.

**PC200W Starter Software** allows you to transfer the weather station program and collect data via a direct communications link (i.e., an optically isolated RS-232 interface or a similar device).

### Datalogger Support

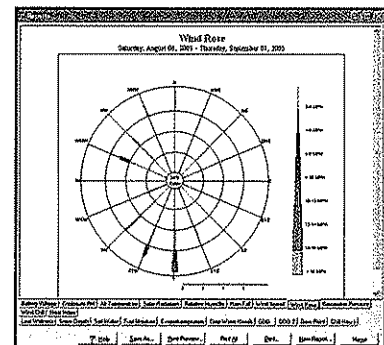
**PC400**, our mid-level software, provides advanced programming and telecommunications without introducing large network complexity. Scheduled data collection and combinations of communication options (e.g., phone-to-RF) are not supported.

**LoggerNet** is a full-featured software package based on a server application and several client applications. LoggerNet supports connection to a single datalogger and large datalogger networks. This software package supports scheduled data collection and combinations of communication options (e.g., phone-to-RF).

### Application Specific

**Visual Weather** is for customers who want reliable, real-time weather data and printed reports without worrying about technical details, such as programming, using client-server technology, or maintaining databases. It generates an ET106 or MetData1 program as sensors, scan interval, and communications path are selected. Short Cut is included for configuring custom weather stations.

*Using Visual Weather software, customers can create a wind rose report that displays the distribution of wind directions at multiple wind speeds.*



### Data Graphics & Analysis Software

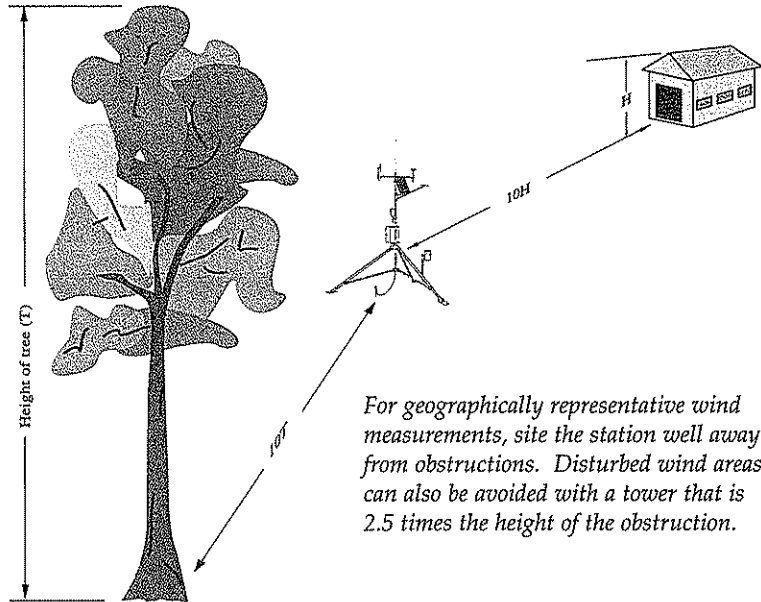
**RTDM** software displays data that is stored in data files and/or on a LoggerNet server. The data is displayed in graphical formats such as strip charts, dials and meters, and digital values.

# Site Selection and Sensor Placement

Wind, air temperature, and water vapor pressure measurements are affected by surface type and roughness, soil moisture, regional topography, and obstructions.

Sites selected for their applicability to a broader area should be free from obstructions such as buildings, trees, and steep slopes. Ten meter towers are often used to raise measurement heights above low-lying obstructions.

The following table lists the suggested measurement heights and exposure (distance to an obstruction) for each type of sensor.



	Measurement Height or Depth	Exposure Considerations
Wind	3 m ±0.1 m recommended (AASC) 2 m ±0.1 m, 10 m ±0.5 m, optional (AASC) 10 m (WMO & EPA)	No closer than ten times the obstruction's height.
Air Temperature & Relative Humidity	1.5 m ±1 m (AASC) 1.25-2.00 m (WMO) 2.00 m for temperature only (EPA) 2 m & 10 m for temperature difference (EPA)	The sensor must be housed in a ventilated radiation shield to protect the sensor from thermal radiation. The EPA recommends the sensor be no closer than four times the obstruction's height and at least 30 m from large paved areas.
Solar Radiation	Height should be consistent with the exposure standard (AASC, WMO, EPA). To facilitate leveling/cleaning, CSI recommends installing at a height of 3 m or less.	The sky should not be blocked by any surrounding object. However, objects ≤5° above the horizontal plane of the sensor are allowed.
Precipitation	1.0 m ±0.2 m (AASC) 30 cm minimum (WMO)	AASC & EPA suggest the sensor be no closer than four times the obstruction's height. The orifice of the gage must be in a horizontal plane, open to the sky, and above the level of in-splashing and snow accumulation.
Soil Temperature	10 cm ±1.0 cm (AASC) 5 cm, 10 cm, 20 cm, 50 cm, 100 cm (WMO)	Measurement site should be 1 m <sup>2</sup> and typical of the surface of interest. The ground surface should be level with respect to the immediate (10 m radius) area.

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Tanner, B.D. 1990. Automated weather stations, Remote Sensing Reviews 5, (1): 73-98.

We would like to discuss your weather station needs. Please contact us at one of our offices, or visit our web site at: [www.campbellsci.com](http://www.campbellsci.com)



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