

Central Alaska Network Climate Monitoring Equipment

This document includes a description of the equipment, vendors, model numbers and 2004 costs of a representative CAKN climate station. This information was derived from Sousanes (2004).

Campbell Scientific, Incorporated (CSI) research-grade meteorological instrumentation is being used for CAKN climate stations. Although the equipment is purchased through this vendor the sensor array is not limited to this manufacturer. For example, an R. M. Young Wind Monitor is used to measure wind speed and direction, but the instrument is sold through CSI for compatibility with their data logger. Equipment was purchased in FY2002, assembled and then operated in an accessible location for trouble-shooting and assessment purposes. During FY2003, two stations were also tested in field locations. The stations were specifically designed for remote, high latitude and extreme cold conditions. The main objective of these stations is to collect climate data for the next 50 – 100 years.

Table 1 lists the initial equipment procurement for a single climate station for the Central Alaska Network from Campbell Scientific, Inc. (<http://www.campbellsci.com/home.html>) and Table 2 lists the power system requirements and 2004 costs. A typical station is also shown (Figure 1). Sensor specifications are also listed.

Table 1. CAKN Climate Station Equipment

Description	Campbell Sci. Item #	2004 Pricing
10' tripod tower CM10w/grounding kit	CM10	345.00
CM10 guy Kit		90.00
CR-10X Datalogger	CR10X	1250.00
Extended Temperature testing for CR10X	XT CR10X	125.00
Datalogger Support Software	LoggerNet	395.00
GOES DCP Platform w/ SATHDR GOES transmitter, CH12R power regulator, battery cables, 16"x18" enclosure, 10 Watt solar panel, GPS antenna, GOES Antenna w/coax cable	DCP 100	3575.00
Keyboard/Display	XT-CR10K	280.00
Vaisala HMP45C temperature and Relative Humidity probe/w10' cable	HMP45C – L10	555.00
RM Young 12-plate Gill Radiation Shield for	41002	173.00
RM Young 05103 Wind Monitor/w15' cable	05103-L15	885.00

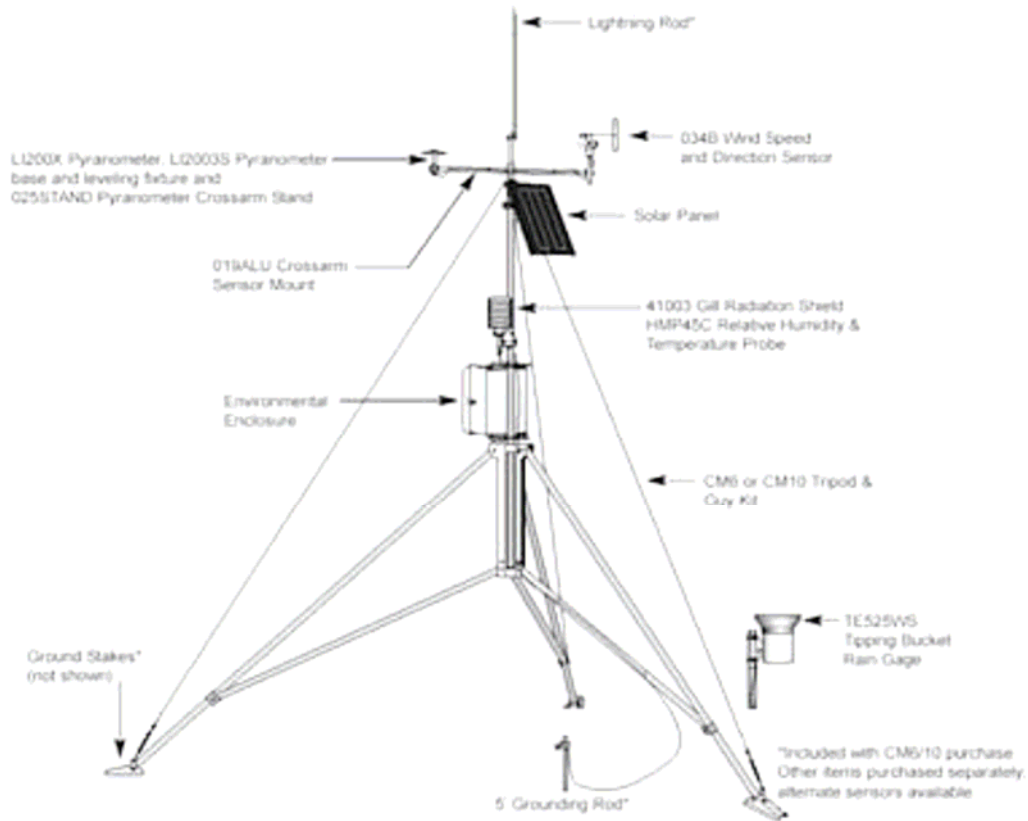
Texas Electronics 8" Tipping Bucket Rain Gage w/25' cable	TE525WS-L25	370.00
Li-Cor Silicon Pyranometer w/11' cable	LI200X-L11	295.00
CSI Soil Temperature Probe (3) w/25' cable	107-L25	230.00
Aluminum Crossarm Sensor Mount	019ALU	75.00
LiCor base and Leveling Fixture for LI200X	LI2003S	58.00
CSC Ultrasonic Distance Sensor (Snow Depth) w/15' cable	SR50-L15	945.00
	Sub-Total	9646.00

Table 2. CAKN Climate Station Power System

PVX 1040T Concorde Battery (2)	320.00
MSX-64 Watt Solar Panel	256.00
Battery Box	215.00
Sub-Total	791.00
Total for Climate Station	\$10,437.00*

*This cost does not reflect miscellaneous mounting hardware and tools required for installation.

Figure 1 A typical Campbell Scientific climate station.



Specifications for Sensors and Equipment Used on CAKN Climate Stations

These specifications are for the Campbell Scientific, Inc. instrumentation. It also provides the guidelines for sampling frequency, measurement and processing intervals, and sensor placement above ground level.

Datalogger

Model CR10X

Extended temperature Range: -55° to $+85^{\circ}$ C

2 Mbytes additional memory

Program execution rate: Up to 64 Hz

Number of Channels: 6 differential inputs, 2 pulse counters, 3 excitation, and 8 control ports

Power requirements: 9.6 – 16 volts

Current drain: 1 mA quiescent, 13 mA processing, 46 mA analog measurement

Data Storage: 62,000 data points

Air Temperature and Relative Humidity

Model HMP45C

Sensors: Temperature 1000 Ω PRT

Relative humidity - HUMICAP® H-Chip

Relative Humidity range: 0.8 to 100% RH, non-condensing

Relative Humidity accuracy: $\pm 2\%$ RH (0-90%)

$\pm 3\%$ RH (90-100%)

Temperature Range: -39.2° to $+60^{\circ}\text{C}$

Soil temperatures**Model 107B soil temperature probe**

Sensor: Thermistor

Range: -35° to 50°C

Accuracy: typically $\pm 0.2^{\circ}\text{C}$

Solar Radiation**Model LI2100X silicon pyranometer**

Sensor: Silicon photocell

Sensitivity: 0.2 kW m⁻² mV⁻¹

Requirements: LI2003S base and leveling fixture

Wind Speed and Direction**Model 5103 Wind Monitor**

Sensors: Propeller vane

Temperature range: -50° to $+50^{\circ}\text{C}$

Wind Sped Range: 0 to 134 mph, gust survival 220 mph

Wind Speed threshold: 2.2 mph

Wind Speed distant constant: (63% recovery): 8.9 ft.

Wind direction delay distance (50% recovery): 4.3 ft

Vane range: 360° mechanical, 355° electrical

Vane threshold: 2.0 mph @ 10° displacement, 2.9 mph @ 5° displacement

Precipitation**Model TE525WS Tipping Bucket Rain Gauge**

Sensor: magnetic switch

Orifice: 8" diameter

Sensitivity: 0.01"/tip

Snow Depth**Model SR50 ultrasonic distance sensor**

Power requirements: 9 to 16 VDC

Power consumption: 2mA (quiescent), 250mA (measurement peak)

Measurement range: 0.5 to 1.0

Accuracy: ± 1 cm or 0.4% of distance to target w/external temperature compensation

resolution: 0.1mm

Beam acceptance angle: approximately 22°

Communication

SAT HDR GOES transmitter

On-Board memory: Non-volatile flash for setup parameters. 16Kbytes for self-timed data

Power requirements: 9.6 to 16 VDC, 1 mA quiescent, 350 mA during GPS fix and less than 4 Amps during transmission.

Transmit power: 7.9 watts for 100 and 300 bps, 15.9 watts for 1200 bps

Temperature Rating: -40° to 50°C