

Evapotranspiration Monitoring Stations

Models ET101 and ET106

The ET101 and ET106 are pre-configured stations that calculate potential evapotranspiration (ET_0) using a turf grass reference. The ET101 measures a reduced set of meteorological sensors (solar radiation and air temperature only); the ET106 measures a standard set of meteorologic sensors. Both stations consist of electronics housed in an environmental enclosure, a 2- or 3-meter aluminum mounting pole, and sensors. Sealed circular connectors are provided for sensor hookup, simplifying station installation.

Eight alkaline D-cells or a 7 Ahr sealed rechargeable battery powers the stations. The rechargeable battery can be float charged with AC power or an MSX10 10-Watt solar panel.

The enclosure includes electronics for measuring sensors, processing and storing data, and communicating with a central computer. Data can be telemetered via phone (including cellular and voice synthesized) or short-haul modems.

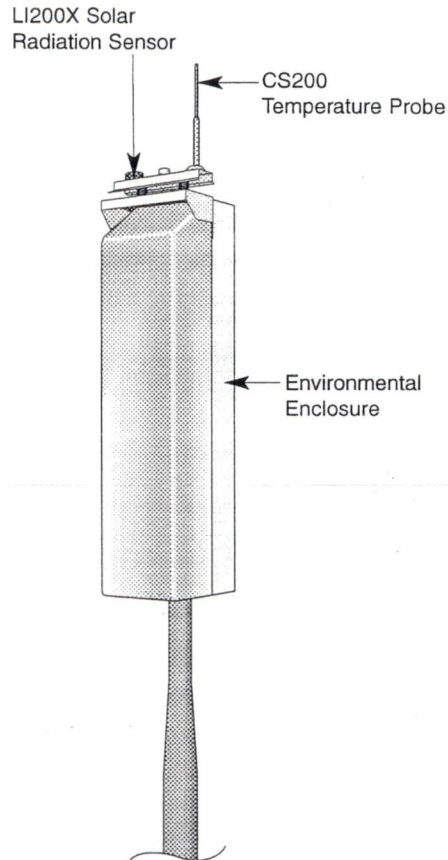
Features

- Simple to install
- Low maintenance
- Water-tight enclosure with internal humidity detection
- Low power consumption
- Slim, vertical profile

ET101 Reduced Set ET_0 Station

The ET101 uses a modified Penman-Monteith equation to calculate ET_0 from measurements of solar radiation and air temperature. This eases installation, minimizes maintenance, and reduces cost. Saturation vapor pressure is calculated from the previous day's minimum temperature. The user inputs an average value for wind speed (typically 2 meters per second).

For sites surrounded by well-watered, vegetated surfaces, the weekly ET_0 average of the ET101 agrees reasonably well with the ET106's weekly average; accuracy improves over longer averaging periods (see charts and table on following page). The ET106 is recommended over the ET101 for arid locations and applications that require daily ET_0 averages. The ET101 can be upgraded to an ET106, adding measurements of wind speed and direction, rainfall, and relative humidity.



The "no-moving-parts" ET101 decreases maintenance requirements.



CAMPBELL SCIENTIFIC, INC.

815 W. 1800 N. • Logan, Utah 84321-1784 • (435) 753-2342 • FAX (435) 750-9540 • www.campbellsci.com

ET106 ETo Station

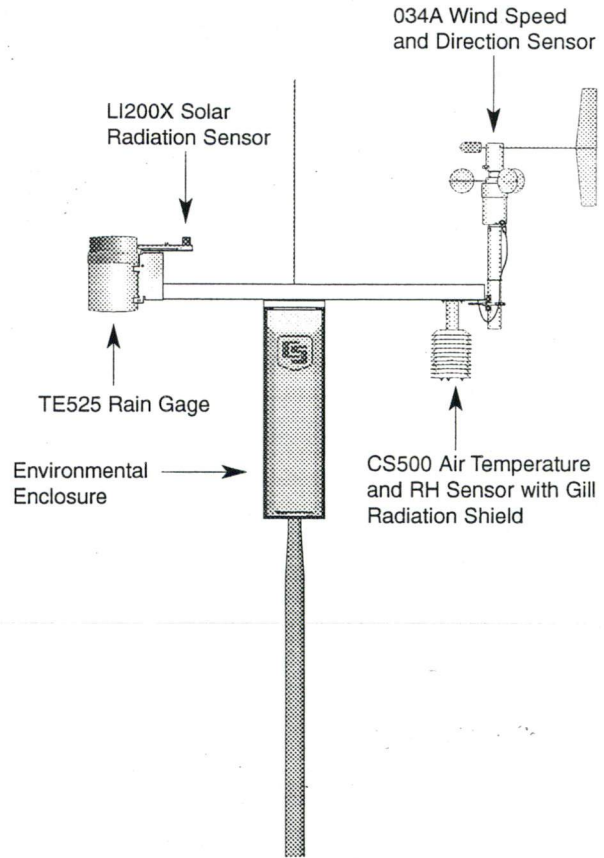
This station is equipped with a standard set of meteorologic sensors and uses the Penman-Monteith equation to calculate ETo. The ET106 measures:

- Air Temperature
- Relative Humidity
- Solar Radiation
- Rainfall
- Wind Speed
- Wind Direction

By measuring relative humidity and wind speed throughout the day, accuracy of the ETo calculation is improved, especially over shorter time intervals (i.e., 24 hour periods).

The ET106 accommodates the following additional sensors:

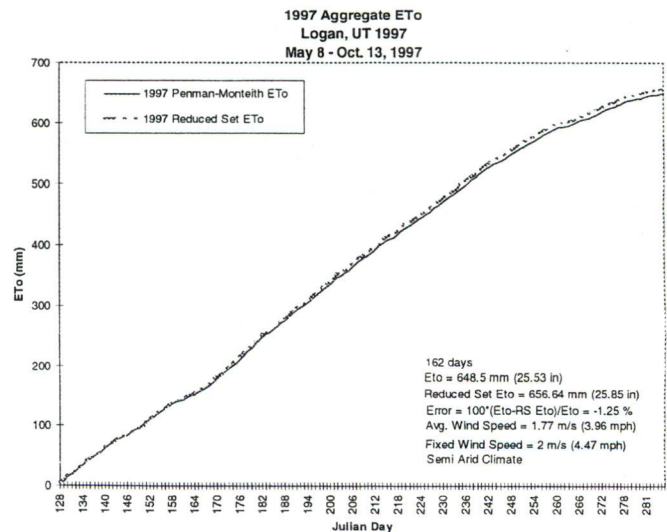
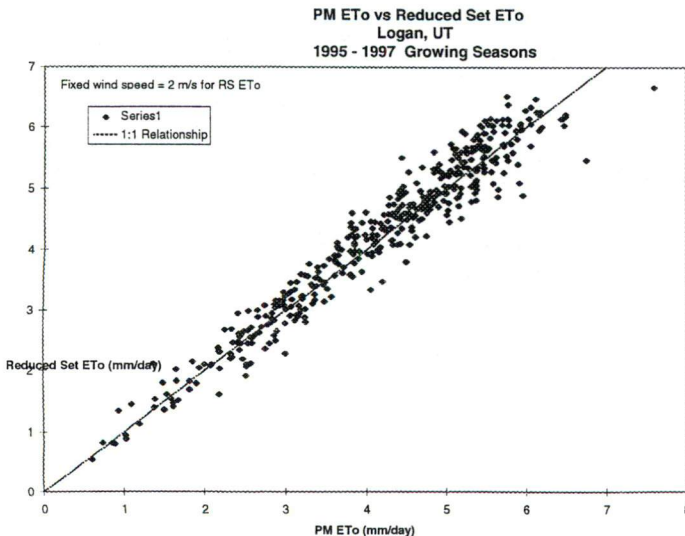
- 107-LC Soil Temperature Probe
- CS615-LC Soil Water Content Reflectometer
- 257-LC Soil Moisture Block
- SR50-LC Snow Depth Sensor
- 237-LC Leaf Wetness Grid



The ET106 includes a standard set of meteorological sensors.

ETo Comparison Table and Graphs

Location	Test Dates	# Days	ET106 ETo		ET101 Reduced Set ETo		%Diff	Avg Daily Difference	
			(mm)	(in)	(mm)	(in)		RS ETo-ET	
Bethel Mill, NJ, USA	04/11 - 10/27, 96	199	680.3	26.78	689.9	27.16	1.41	0.05	
Chico, CA, USA	01/01 - 12/31, 96	365	1275.0	50.20	1352.0	53.23	6.04	0.21	
Edmonton, AB, CA.	07/14 - 10/13, 95	91	230.0	9.06	229.0	9.02	-0.43	-0.01	
Juniper, ID, USA	06/28 - 10/13, 95	108	552.2	21.74	527.7	20.78	-4.95	-0.25	
Las Cruces, NM, USA (Ley)	04/06 - 10/31, 96	208	1197.0	47.13	1099.0	43.27	-8.19	-0.47	
Las Cruces, NM, USA (NWS)	04/06 - 10/31, 96	208	1179.0	46.42	1031.0	40.59	-12.55	-0.72	
Lexington, NE, USA	05/05 - 10/08, 95	156	584.8	23.02	598.0	23.54	2.26	0.08	
Logan, UT, USA	05/08 - 10/13, 97	158	641.2	25.24	649.7	25.58	1.33	0.05	
Mead, NE, USA	05/06 - 10/12, 95	159	611.7	24.08	608.7	23.96	-0.49	-0.02	
Scottsbluff, NE, USA	05/11 - 09/25, 95	137	542.9	21.34	531.6	20.90	-2.08	-0.08	



Specifications - Sensors

CS200 Air Temperature Sensor (ET101 only)

Sensor: Thermistor (radiation shield NOT required)

Error: $\pm 2^{\circ}\text{C}$ given a wind speed under 2 m s^{-1} over a 0 to 60°C temperature range

$\pm 1.25^{\circ}\text{C}$ given a wind speed above 2 m s^{-1} over a 0 to 60° temperature range

LI200X-LC5 Solar Radiation Sensor (ET101 & ET106)

Sensor: Silicon photocell

Accuracy: Absolute error in natural daylight is $\pm 5\%$ maximum; $\pm 3\%$ typical

CS500-LC5 Air Temperature and Relative Humidity Probe (ET106 only)

Operating Range: -25 to $+50^{\circ}\text{C}$, 0 to 100% RH

Temperature Sensor: Platinum Resistance Thermometer

Operational Accuracy: $\pm 1.5^{\circ}\text{C}$ at zero wind speed*

Relative Humidity Sensor: Vaisala's INTERCAP capacitive chip
(requires 41301 6-plate Radiation Shield)

RH Accuracy: $\pm 3\%$ for 10 to 90% range, $\pm 6\%$ for 90 to 100% range

TE525-LC5 Tipping Bucket Rain Gage (ET106 only)

Sensor: Magnetic reed switch

Orifice: 6.0 " diameter

Sensitivity: 1 tip per 0.01 " (0.25 mm)

Accuracy: $\pm 1\%$ accuracy @ 2 " per hr (50.8 mm per hr) or less

034A-LC6 Wind Speed and Direction Sensor (ET106 only)

Sensor: Cup anemometer

Range: 0 to 49.5 m s^{-1} (0 to 110 mph)

Threshold: 0.4 m s^{-1} (0.9 mph)

Sensor: Vane

Range: 360° mechanical, 356° electrical

Threshold: 0.4 m s^{-1} (0.9 mph) @ $\pm 4^{\circ}$ displacement

Damping Ratio: 0.25

* Includes radiation error.

Sensor manufacturers are: LI-200X, LICOR, Inc. Lincoln, NE
CS500, Vaisala, Inc., Woburn, MA
TE525, Texas Electronics Inc., Dallas, TX
034A, Met One Inc., Grants Pass, OR

Specifications - Electronics

Measurement and Control Electronics (ET101 & ET106)

Temperature Range: -25° to +50°C

Accuracy of Voltage Measurement: $\pm 0.05\%$ of Full Scale Range (0° to +40°C)
 $\pm 0.1\%$ of Full Scale Range (-25° to +50°C)

Data Values Stored: 62,000

Power Supply Requirements: 9.6 to 16 VDC

Typical Current Drain: <1 mA (quiescent)

*For additional information, contact our environmental group by
phone at (435) 750-9691 or e-mail enviro@campbellsci.com*



CAMPBELL SCIENTIFIC, INC.

815 W. 1800 N. • Logan, Utah 84321-1784 • (435) 753-2342 • FAX (435) 750-9540
Offices also located in: Australia • Canada • England • France • South Africa

Copyright © 1997, 1998
Campbell Scientific, Inc.
Printed November 1998