

AUTOMATIC WEATHER STATION (AWS)



MONITOR-1

EASY-TO-USE, AFFORDABLE DATALOGGER



- ▶ Weather Station Applications
- ▶ SDI-12, Analog, Digital Inputs
- ▶ SD Card for Set Up & Download
- ▶ Full Access Through Front Panel
- ▶ Command Line Interface & MODBUS
- ▶ Modem/Radio Ready for Full Remote Access



DESCRIPTION

The Monitor, Sutron's easy-to-use and affordable datalogger, is designed to measure common hydrologic and meteorological sensors and log the data in its flash memory. The general purpose Monitor supports up to 16 measurements with its analog, digital, and SDI-12 sensor interfaces. The built-in display/keypad makes it simple to set the station up and perform routine maintenance. Monitor includes an SD memory slot for downloading data or setups. Monitors can be used stand-alone or can be connected to wireless modems for integration into an automatic data collection system.

SPECIAL FEATURES

- Set up 16 independent measurements
- EQUATION PROCESSING!
- Full featured command line interface (RS-232)
- SD Card can download data & read/write set-ups.
- View data & set-up entirely from front panel
- Advanced Averaging
- Operates standalone or connected to wireless modem

INPUTS

Supports the following input types:

- Two 0-5 V Analog Inputs
- Three 0 to (+/-)39 mV Differential Analog Input (for bridge-type pressure sensors)
- One 4-20 mA input
- One digital input for tipping bucket
- A 2nd digital input for frequency counter
- One SDI-12 port (supports up to 16 SDI-12 sensors)

SENSOR COMPATIBILITY EXAMPLES

AIR TEMPERATURE/ RELATIVE HUMIDITY	Including non-linear analog sensors that require equation processing
PRECIPITATION	Using tipping bucket
ANEMOMETER	RM Young or Gill Ultrasonic via analog, frequency, or SDI-12
STAGE	Via Sutron SDI-12 Shaft Encoder or Bubbler
OTHER SENSORS	Barometric Pressure, Solar Radiation, etc. Accepts majority of hydro-met sensors (up to 16 measurements) irrespective of manufacturer

SPECIFICATIONS

CLOCK	Internal real-time clock w/battery backup (5-year coin cell) ± 2 minutes a month (0 to +50C).
LOG CAPACITY	>250,000 Readings Flash Memory
TEMPERATURE	-40 to +60 °C (LCD operates -10° C)
DATA CONNECTION	RS232 DB9 (female) connect PC/PDA/modem/radio +5V or +12V on pin 9 (71 mA at +5V)
POWER CONSUMPTION	<1mA to <1.5mA @ 12 VDC quiescent <20 mA @ 12 VDC active
DIMENSIONS	6.5" x 6.5" x 4.5" NEMA-4 enclosure

ANALOG INPUT SPECIFICATIONS

	NUMBER OF BITS - 24	
	SINGLE ENDED	DIFFERENTIAL
Full Scale	0 to 5 Volts	+/- 0.0390625 V
Resolution	0.298 uV	4.657 nV
Noise (p/p) @25C	6.5 uV (p/p)	1.6 uV (p/p)
Noise (rms) @25 C	3.4 uV RMS	0.38 uV
Accuracy @25C	0.02%	<.01%
Input Impedance	>2M Ohm	>3M Ohm
	4-20mA INPUT	
Full Scale	20ma	
Resolution	<1nA	
Accuracy @25C	.02%	
24 Volt Current Loop Pwr	24 Volt +/- 5%	
24 Volt	Short Protected	
Resistor	100 Ohm built-in	

Specifications subject to change without notice

MONITOR-4

EASY-TO-USE, AFFORDABLE INSIDE ENCLOSURE



MONITOR-4

All the features of Monitor-1 Datalogger including SDI-12, Analog, Digital, MODBUS, mounting for radio/modem, SD Card Slot ready to deploy plus it's HOUSED IN FIBERGLASS ENCLOSURE WITH 7 AH BATTERY & SOLAR REGULATOR INCLUDED.

NEMA-4X FIBERGLASS ENCLOSURE

with raised twist latch & stress relieving glands

Height (In.): 14.0

Width (In.): 12.0

Depth (In.): 6.0

Standard Weight (Lbs.): 12.0

- Material: Cover/Base - Ultraguard® Fiberglass reinforced polyester (Color RAL 7035). Construction meets NEMA/EEMAC Type 1, 2, 3, 4, 4X, 12 and 13. UPC: 085339914518
- UL® 508 listed; Type 1, 2, 3, 3R, 4, 4X, 12, and 13
- CSA-C22 No. 14; Type 1, 2, 3, 3R, 4, 4X, 12, and 13
- IEC60529 Type IP66
- Compliant with RoHS (Restriction of Hazardous Substances)



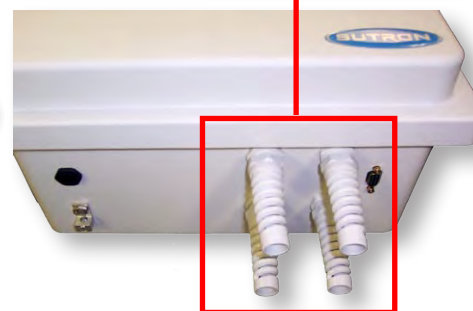
SOLAR REGULATOR

Input Voltage	12 to 20 VDC
Output Voltage	13.7 VDC
Output Current Limit	3 Amps
Operating Temp Range	-40 F to 140 F (-40 C - 60 C)
Max/Min Wire Size	12AWG / 24 AWG
Size	1.5" x 1.5" x 3"



7 AH BATTERY

- Rechargeable sealed lead-acid batteries
- Maintenance-free
- Overcharge protection
- Leak-proof
- Easy handling
- No special shipping container required
- Long service life
- Trouble-free, safe operation in any position.
- No need to add electrolyte, as gasses generated during overcharge are recombined in a unique "Oxygen Cycle"
- High-impact resistant case made of non-conductive ABS plastic with superior resistance to shock, vibration, chemicals and heat



SOLAR PANEL OPTIONS*

- 5100-0400-1 Solar Panel, 10 Watt Unregulated with 10 ft. Cable
- 5100-0410-1 Solar Panel, 20 Watt Unregulated

*Solar panels are sold separately.



MEASUREMENTS

WIND SPEED & WIND DIRECTION

Sutron's Met-Set uses a three cup anemometer, for accuracy, sensitivity, and durability. The cups are connected to a shaft, which turns a sensing element that converts the rotation into a series of electronic pulses. The basic operation is based on the proven 014 Wind Speed Sensor.

A lightweight vane tail provides the motive power for the wind direction portion of the sensor. As the vane tail moves it turns a shaft on a pair of bearings. That shaft turns a sensing element that converts the rotation into analog voltage.

- ▶ Wind Speed Range 0 – 50 m/sec
- ▶ Wind Speed Resolution 0.1 m/sec
- ▶ Wind Speed Accuracy $\pm 2\%$
- ▶ Wind Direction Range 0 – 360°
- ▶ Wind Direction Resolution 1°
- ▶ Wind Direction Accuracy $\pm 5^\circ$
- ▶ Threshold, both Speed & Direction 1 m/sec

TEMPERATURE & HUMIDITY

Both Temperature and Humidity are built into the temperature shield at the bottom of the sensor. The integral shield limits errors due to solar radiation. The RH sensor is a capacitive element enclosed in a protective membrane.

- ▶ Temperature Range -40°C to +60°C
- ▶ Temperature Resolution 0.1°C
- ▶ Temperature Accuracy $\pm 0.5^\circ\text{C}$
- ▶ Relative Humidity Range 0-100%
- ▶ Relative Humidity Resolution 1%
- ▶ Relative Humidity Accuracy $\pm 4\%$

BAROMETRIC PRESSURE

A solid state pressure sensor built into the sensor electronics provides accurate measurement of barometric pressure changes over a wide range. Electronic temperature compensation is included for highest accuracy over the operating temperature of the sensor.

- ▶ Measurement Range 500 – 1100 mbars
- ▶ Measurement Resolution 0.1 mbar
- ▶ Measurement Accuracy ± 2 mbars



MET-SET

5600-MOMP-1



EASY INSTALLATION

SITING

- ▶ Find suitable location within cable length of recording electronics / display.
- ▶ Locate true north.

MOUNTING

- ▶ Use quick mount u-bolts to install on vertical or horizontal mast, pole or pipe.
- ▶ Tighten nuts, keeping sensor level.

DIRECTION ALIGNMENT

- ▶ Install alignment shoulder screw into wind direction vane hub.
- ▶ Align sensor so wind direction counterweight is to the South, vane tail is to true North

CHECK OPERATION

- ▶ Check that the vane and cups rotate freely.



SIMPLE SERIAL CONNECTIONS

RS-232 CONFIGURATION

- ▶ 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control

SDI-12 CONFIGURATION

- ▶ Default address 0
- ▶ Conforms to SDI-12 V1.3

OUTPUT STRING FORMAT:

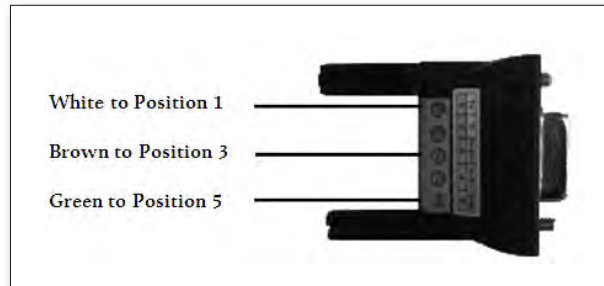
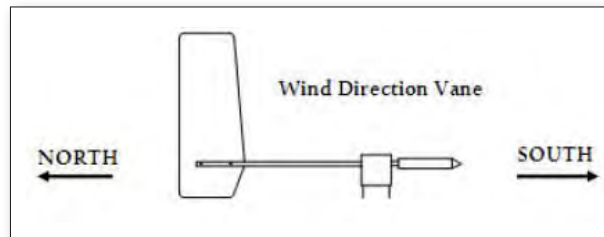
- ▶ SSS.S, DDD, +TTT.T, HHH, PPP.P, RRR.RR, XXXX, VV.VV, *CCCC<CR><LF>
- ▶ SSS.S = Wind Speed
- ▶ DDD = Wind Direction
- ▶ +TTT.T = Temperature
- ▶ HHH = Relative Humidity
- ▶ PPP.P = Barometric Pressure
- ▶ RRR.RR = Rain (Optional)
- ▶ XXXX = Solar (Future Option)
- ▶ VV.VV = Battery Voltage
- ▶ *CCCC = Message Checksum

CONNECTIONS

- ▶ Run cable to recorder or computer
- ▶ Connect using included screw-terminal DB-9 adaptor or solder DB-9 or DB-25.

WIRING

- ▶ RED +9 TO +17 VOLTS DC @ 4mA
- ▶ BLK POWER COMMON
- ▶ WHT RS-232 TX
- ▶ BRN RS-232 RX
- ▶ GRN RS-232 / SDI-12 COMMON
- ▶ BLU SDI-12
- ▶ WHT/BRN SHIELD (must be grounded for transient protection to function)



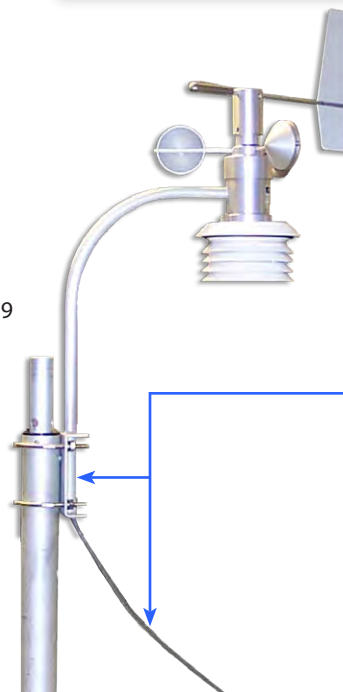
ORDERING

5600-MOMP-1 3 meteorological sensors (*wind direction, wind speed, air temperature, relative humidity & barometric pressure*) integrated into 1 instrument for use in a variety of met applications when connected to data collection platforms (dcp).

Includes mounting plate, u-bolts, 50 foot cable

The Met Set platform comes **standard with serial RS-232 & SDI-12 outputs.**

RS-485 & RS-422 are available upon request.



SILICON PYRANOMETER

5600-0600



DESIGNED FOR FIELD MEASUREMENTS IN SOLAR, METEOROLOGICAL, FORESTRY, AGRICULTURAL & HYDROLOGICAL STUDIES

FEATURES

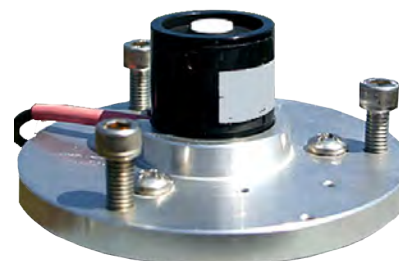
- ▶ Used extensively in solar energy studies for site evaluations and monitoring, passive system analysis, irrigation scheduling and other environmental studies.
- ▶ Patterned after the work of Kerr, Thurtell and Tanner,
- ▶ Features a silicon photovoltaic detector mounted in a fully cosine-corrected miniature head
- ▶ Can be mounted in any plane without affecting performance
- ▶ In clear unobstructed daylight conditions compares favorably with first class thermopile type pyranometers, but is priced at a fraction of the cost
- ▶ Spectral response does not cover full range of solar spectrum (error induced - $<\pm 5\%$ - under most conditions of natural daylight)
- ▶ Includes a millivolt adapter to provide voltage output
- ▶ Includes anodized aluminum base with stainless steel leveling screws and a weatherproof spirit level

ORDERING

Part #	Description
5600-0600-1	Pyranometer, Silicon, with leveling bracket

Accessories

6661-1098-1	Mounting Kit, Pyranometer
8111-1073-1	Amplifier with voltage & frequency outputs



SPECIFICATIONS

Specifications subject to change without notice

Range	400 to 1100 nm
Accuracy	Calibrated against an Eppley Precision Spectral Pyranometer (PSP) under natural daylight conditions. Absolute error under these conditions is $\pm 5\%$ maximum, typically $\pm 3\%$.
Sensitivity	Typically 10 μV per 1000 W/m^2
Linearity	Maximum deviation of 1% up to 3000 W/m^2
Stability	$< \pm 2\%$ change over one-year period
Response Time	10 μs
Temperature Dependence	$\pm 0.15\%$ per $^{\circ}\text{C}$ maximum
Cosine Correction	Cosine corrected up to 80° angle of incidence
Azimuth	$< \pm 1\%$ error over 360° at 45° elevation
Tilt	No error induced from orientation
Operating Temperature	-40°C to $+65^{\circ}\text{C}$ (-40°F to $+149^{\circ}\text{F}$)
Relative Humidity	0% to 100% RH
Detector	High stability silicon photovoltaic detector (blue enhanced)
Sensor Housing	Weatherproof anodized aluminum case with acrylic diffuser & stainless steel hardware
Size	7.6 cm Dia x 3.6 cm H (3 in. x 1.4 in.)
Weight	123 g (4.4 oz)
Cable Length	3m (10ft) standard

TIPPING BUCKET RAIN GAUGE

5600-0525 (-5, -2, & -6)



Standard Precision Instrument
for Measurement of Rainfall
Accumulation &/or Rate

- Rain enters gauge through an eight inch orifice, protected by distortion preventing aluminum ring
- Collected water passes through debris-filtering screen and is funneled into one of two tipping buckets inside the gauge.
- When a given amount of water collects, bucket tips (amount determined by calibration).
- Tipping causes magnet to pass over proximity switch, closing it momentarily.
- Second bucket positions under funnel for filling.
- After rain is measured, it exits through drain tubes with screen covered holes in the base of the gauge.
- Designed for many years of accurate, trouble-free operation
- Stainless steel outer housing
- Built in level indicator and pre-drilled feet



APPLICATIONS

- Meteorological Station
- Stormwater Management

SPECIFICATIONS

MECHANICAL	
Orifice Size	7.87 in. (20 cm) Diameter
Dimensions	8.25 in. (20.95 cm) Dia x 19 in. (48.25 cm) H
Weight	6.4 lbs (2.9Kg)
Switch	Rugged Magnetic Proximity Switch
OPERATIONAL	
Output	0.1 second switch closure
Accuracy	±0.5% at 1.25 in./hr (3.175 cm/hr.) ±2% at 5 in./hr (12.7 cm/hr)
PART #	SENSITIVITY/RESOLUTION
5600-0525-2	0.2mm
5600-0525-5	0.5mm
5600-0525-6	0.01 inch

ORDERING

5600-0525-2	Rain Gauge, Stainless Steel Outer Housing, Tipping Bucket 0.2mm/tip (includes 50ft/15m cable)
5600-0525-5	Rain Gauge, Stainless Steel Outer Housing, Tipping Bucket 0.5mm/tip (includes 50ft/15m cable)
5600-0525-6	Rain Gauge, Stainless Steel Outer Housing, Tipping Bucket 0.01 inch/tip (includes 50ft/15m cable)
ACCESSORIES	
6661-1137-1	Drain Kit, Tipping Bucket
6211-1024-1	Mounting Kit, Tipping Bucket to Tower
WindScreen	Improves Precipitation "Catch" by diminishing updrafts



Specifications subject to change without notice

AWS Power Budget - (Monitor-MetPack)

Average Current Load

Item	Current (mA)	Active Time (secs)	% Active	Ave. Current (mA)	NOTES
Monitor	20	86400	100.00	2.00E+01	Average Current (Active and Stand by)
MetPack	4	86400	100.00	4.00E+00	Transmitting 15sec/Hr
				2.40E+01	Total Average Current (mA)

Power Consumption

Power = Total Average Current Times 12 Volts
 Energy Used Daily = Total Average Power Times 24 Hours
 Amp Hours Used Daily = Total Average Current Times 24 Hours

0.29 Total Average Power (@ 12 V) Watts
 6.91 Total Daily Power Load (Wh)
 0.58 Total Daily Ah Usage

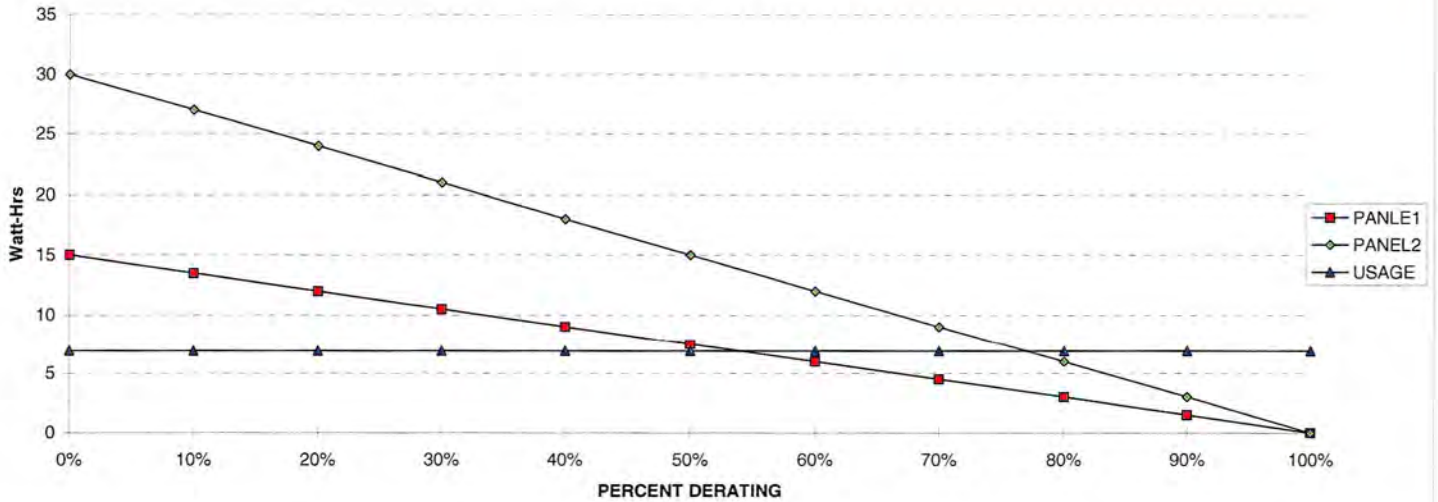
Solar Power Capacity

	PANEL1	PANEL2
Panel Wattage	5 Watts	10 Watts
Ave. Hrs Full Sun	3 Hrs	3 Hrs
Generating Capacity	15 Wh	30 Wh
Charging Capacity in Wh (Generating Capacity - Usage)	8 Wh	23 Wh
Charging Capacity in Ah (Generating Capacity - Usage)	1 Ah	2 Ah

Reserve Battery Capacity

	BATTERY1		BATTERY2	
Battery Capacity	24 Ah		7 Ah	
Daily Ah Usage	0.58 Ah/Day	Total Daily Ah Usage	0.58 Ah	Total Daily Ah Usage
Capacity in Days(CiD)	42 Days	Capacity divided by Usage	12 Days	Capacity divided by Usage
CiD 50% backup	21 Days	50% Capacity divided by Usage	6 Days	50% Capacity divided by Usage

SOLAR PANEL CHARGING CAPACITY



BATTERY CAPACITY DERATING CHART

