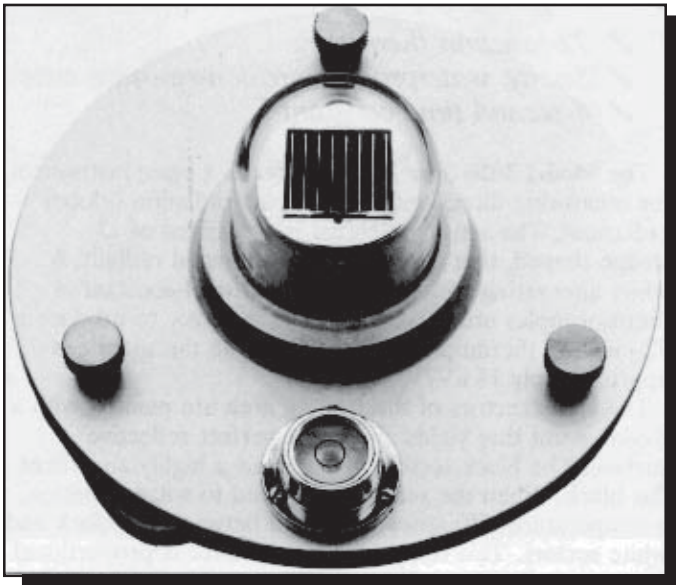


Silicon Cell Pyranometer Model 3120



User's
Manual

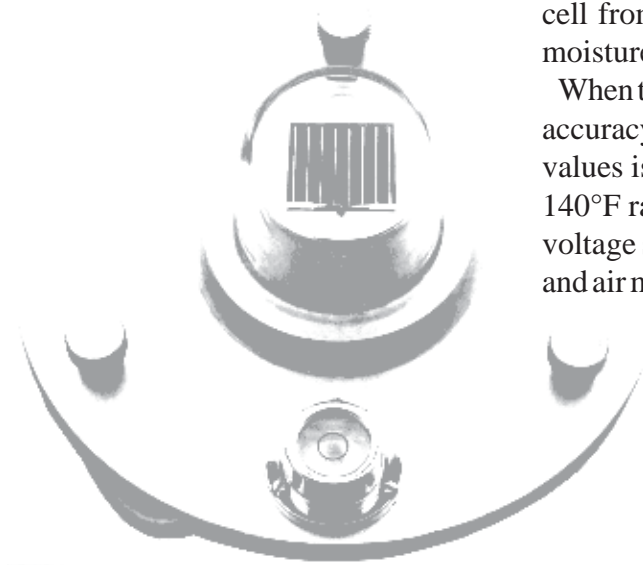


Introduction

The Model 3120 Silicon Cell Pyranometer is a compact, light-weight instrument widely used as a survey tool where continuous measurement of direct and reflected sky radiation is needed.

The Silicon Cell Pyranometer is designed to measure total sun and sky radiation over the spectrum of 0.25 to 1.15 microns. The transducer is a silicon wafer photovoltaic cell with an output of approximately 50 mV per gm cal. A pyrex glass dome protects the cell from wind and moisture. Desiccant is included to prevent moisture condensation inside the dome.

When the output of the sensor is integrated over a daily period, the accuracy of the value is within $\pm 3\%$. Accuracy of instantaneous values is $\pm 5\%$. Temperature compensation is provided for a 40-140°F range. A certificate of calibration showing sensor output voltage sensitivity is provided with the instrument. Cosine effect and air mass effect corrections are made during calibration.



Contents

Installation 1

Theory of Operation 2

Calibration 3

Maintenance 6

Warranty 7

Specifications 8

Parts Lists and Drawings 9

Installation

This instrument is thoroughly tested and fully calibrated at the factory and is ready for installation. Please refer to the return authorization card included in the packing box if damage has occurred. Also, notify All Weather Inc.

The selected site for installation should exhibit a terrain typical of the area under study. In the northern hemisphere, the sensor should be located south of any objects that might shadow it. The site should not receive the sun's reflection from other objects. The sensor should be mounted 1.5 meters above the surface level for data correlation.

Mount the instrument onto a flat surface with the bubble level positioned toward North in the northern hemisphere and toward South in the south-

ern hemisphere. Carefully level the instrument by centering the bubble within the black circle. After levelling has been completed, place a bolt through the base on the mounting surface and secure the instrument in place. Apply only light pressure on this securing bolt. Another convenient method of mounting the 3120 is provided by the All Weather Inc. Model 30318 Mast Adapter with boom assembly.

A two-conductor, 20 gauge twisted pair cable should be connected between the sensor and the signal conditioning module. The sensor may be located within several hundred feet of the signal conditioning module. Additional cable (T600502) may be added to extend the length provided with the sensor.

Theory of Operation

The pyranometer has a silicon cell wafer as a sensing element. The silicon photovoltaic cell converts light energy directly into electrical energy. The output voltage, essentially linear with light intensity, is approximately $.07 \text{ mV/ Wm}^2$. Since this is a light-sensitive instrument, as opposed to heat-sensitive, the output response is instantaneous.

The silicon cell is mounted on a platform fitted with a bubble level and covered with a polished pyrex glass hemisphere. The volume under the glass is sealed and kept dry by means of an enclosed desiccant.

Calibration

Initial calibration of this instrument has been performed at the factory using a secondary standard.

The accepted method of calibration consists of comparing the output voltage of this instrument to the output voltage of an instrument traceable to the National Bureau of Standards or an accepted radiation standard. Several data points are taken for both sensors and an operating curve and calibration factors determined.

An individual Certificate of Calibration is provided with each instrument indicating a calibration coefficient for that instrument. The sensor should be recalibrated at the end of each year of service. There

will be some gradual degradation of the calibration point over several years of usage. The change in calibration point value can occur more rapidly with constant use of the sensor. The solar insolation is determined by multiplying the millivolt output of the sensor by the coefficient provided on the Certificate of Calibration. The result will be in $\text{cal cm}^{-2} \text{min}^{-1}$ or in W/m^2 .

Due to the material characteristics of the silicon wafer, some sensors exhibit a positive offset while others exhibit a negative offset. Keep this in mind whenever slope and intercept calculations are made for the Model 3120.

CALIBRATION CERTIFICATE

Instrument SILICON CELL PYRANOMETER
 Model Number 3120 Serial Number _____

Range	Sensitivity mVDC/ W/m ²	Full-Scale Output mVDC at 1500W/m ²	Zero-Scale Output mVDC at 0W/m ²
	0-1500W/m ²		
	CALIBRATION COEFFICIENT		
	(millivolts x _____ + _____ = 1W/m ²)		

Cable T600502 Length _____ Shield: Yes No

Must be used in conjunction with:

Instrument Solar Radiation Module
 Model Number 1300 Serial Number _____
 Technician _____ Date _____

All Weather Inc.

CERTIFICATE OF CALIBRATION

Instrument: Silicon Cell Pyranometer

Date: _____

Model : 3120

Serial Number: _____

Calibration Conditions: Sunshine, clear air, no clouds.

Temperature Range: _____ to _____

Reference Standards: Thermopile type pyr heliometer and pyranometer.

Coefficients:

(millivolts x _____) + _____ = cal/cm²/min

(millivolts x _____) + _____ = watts/meter²

Conversion Factors:

Cal/cm² - min x 221.1 = Btu/ft²/hr¹

Cal/cm² x 3.687 = Btu/ft²

Cal/cm² - min x 1.000 = Langleys/min¹

Cal/cm² x 1.000 = Langleys

Cal/cm² x 1.162 = Milliwatt - hr/cm²

Cal/cm² x 11.62 = Watt - hr/meter²

Cal/cm² - min x 697.3 = Watt/meter²

Remarks:

Certified By: _____

RETAIN THIS CERTIFICATE. Our calibration data is discarded 18 months after the above date and duplicates will not be available thereafter.

Maintenance

The Model 3120 Silicon Cell Pyranometer is a precision instrument and, although maintenance is minimal, it must be performed regularly to ensure accurate data.

The glass dome is made of polished pyrex glass and should be kept clean at all times. Use a very soft, dampened cloth when cleaning its surface. Remove all dust, grime, and any streaks from the glass dome. Polish the dome with tissue paper as a final step.

The instrument is sealed at the factory with desiccant placed under the sensor to prevent moisture from condensing on the inside of the glass hemisphere. The seal and desiccant should last the life of the instrument. No provision is made for the replacement of the desiccant in the field. Should moisture appear on the inside of the glass dome, the instrument should be returned to the factory for repair.

Warranty

Unless specified otherwise, All Weather Inc. (the Company) warrants its products to be free from defects in material and workmanship under normal use and service for one year from date of shipment, subject to the following conditions:

- a. The obligation of the Company under this warranty is limited to repairing or replacing items or parts which have been returned to the Company and which upon examination are disclosed, to the Company's satisfaction, to have been defective in material or workmanship at time of manufacture.
- b. The claimant shall pay the cost of shipping any part or instrument to the Company. If the Company determines the part to be defective in material or workmanship, the Company shall prepay the cost of shipping the repaired instrument to the claimant. Under no circumstances will the Company reimburse claimant for cost incurred in removing and/or reinstalling replacement parts.
- c. This warranty shall not apply to any Company products which have been subjected to misuse, negligence, or accident.
- d. This warranty and the Company's obligation thereunder is in lieu of all other warranties, express or implied, including warranties of merchantability and fitness for a particular purpose, consequential damages, and all other obligations or liabilities.

No other person or organization is authorized to give any other warranty or to assume any additional obligation on the Company's behalf, unless made in writing and signed by an authorized officer of the Company.

Specifications

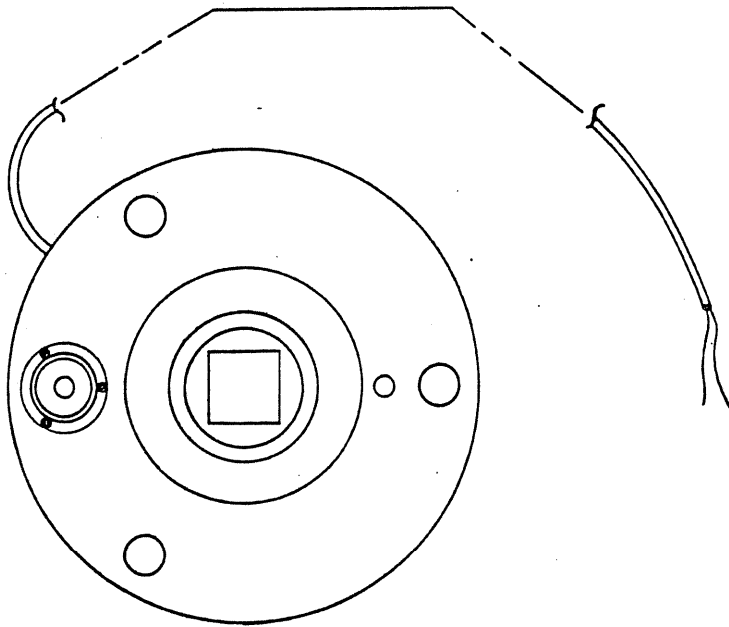
Transducer	Silicon photovoltaic cell
Spectral Response	0.25-1.15 microns
Range	0-1500 W/m ²
Sensitivity	~70 μ V/W/m ² (50 mV/ly/min)
Calibration	See enclosed data sheet
Impedance	1 ohm
Time Constant	<1 millisecond
Levelling	Threaded legs and level provided
Temperature Compensation	40-140° F (4-60° C)
Size	5" dia. x 4" H (125 mm x 100 mm)
Weight/Shipping	1 lb/1.5 lbs (0.5 kg/0.7 kg)

Parts Lists and Drawings

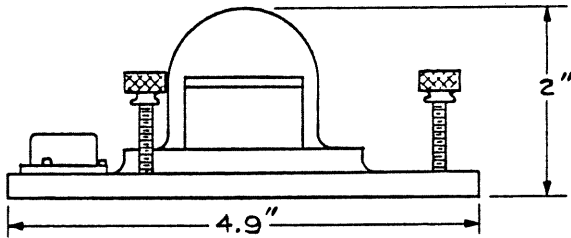
The following pages include a parts list and reference drawings to assist in installation and maintenance of this instrument.

Parts List

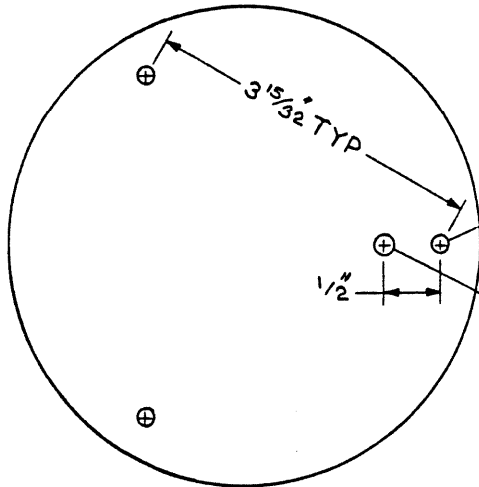
3120 SILICON CELL PYRANOMETER				
COMPONENT	QTY	UOM	DESCRIPTION	REF #
ECN			ENGR CHANGE NUMBER	4111
3120-001	1	EA	MANUAL	
T930160	1	EA	PYRANOMETER ASSEMBLY FOR 3120	
T930161	1	EA	LEVEL FOR 3120	
T930162	3	EA	LEVEL MOUNTING SCREW	
T930163	3	EA	LEVELING FOOT FOR 3120	
30318 MAST				
COMPONENT	QTY	UOM	DESCRIPTION	REF #
ASM	1	EA	ASSEMBLY DRAWING	30318-003
ECN			ENGR CHANGE NUMBER	3416
30318-001	1	EA	MANUAL	
M009072	3	EA	WASHER, NEOPRENE, 3/4 X 1/4	
M012058	4	EA	5/16 X 18 2 INCH LG HEX HD	4
T280018	3	EA	BUSHNG NYLON 3/8 SHANK #10 CLR	
T721211	3	EA	SCREW 10-32 X 2" CAD PL	
T722111	9	EA	NUT 10-32 HEX SS	
T722703	4	EA	NUT HEX 5/16, 18-8	7
T723023	6	EA	WASHER FLT NO.10 S.S.	
T723175	8	EA	WASHER FLAT 5/16 CAD	5
T723223	3	EA	WSHR.LK.INT TOOTH NO.10 S.S	
T723415	4	EA	WASHER LOCK SPLIT 5/16 SS	6
T724405	2	EA	U-BOLT 5/16 X1-1/2 ID X2-1/2 L GERWIN 320 or THOMPSON-DIGGS 21488-3	9
T800107	1	EA	MAST ADAPTER MOUNT	2
T800128	1	EA	ADAPTER,MOUNT 1"PIPE TO BOOM	3
T800259	2	EA	TOWER BRACKET	8
T800266	1	EA	BOOM 6FT FOR 85004	1



TOP VIEW



SIDE VIEW



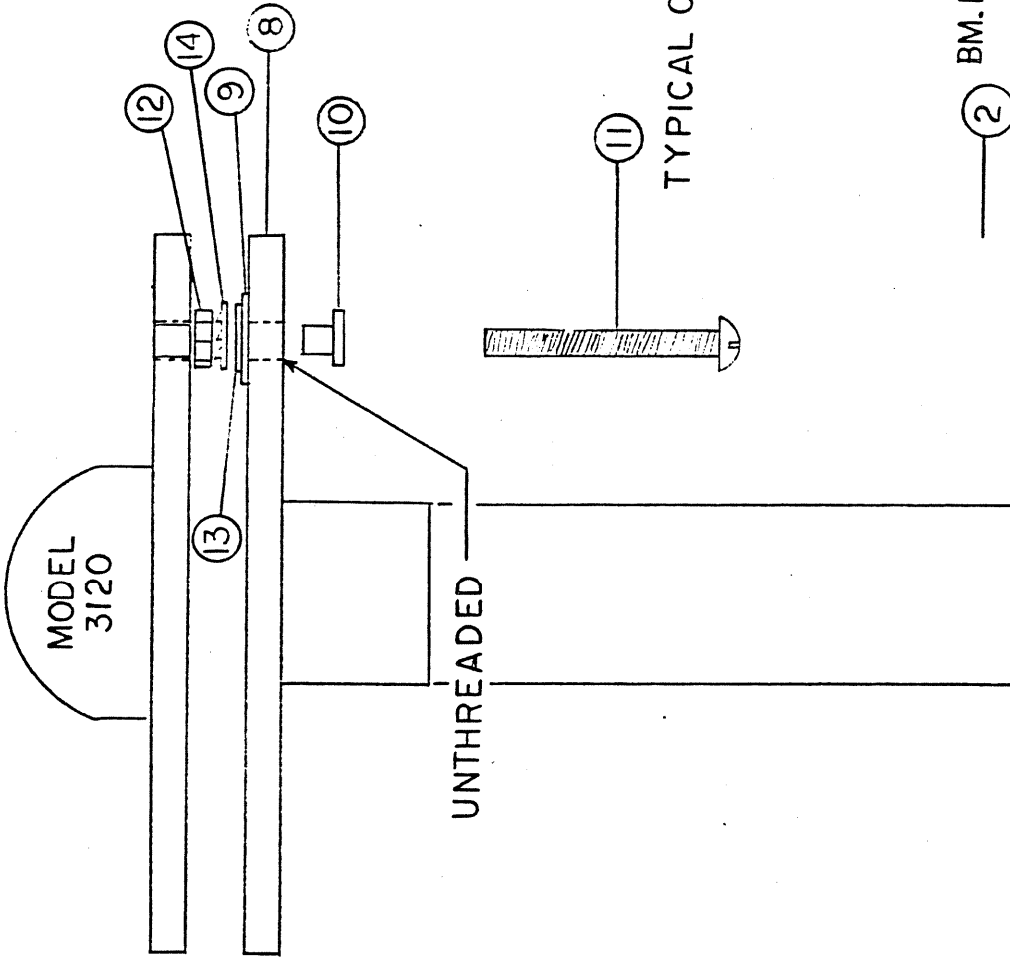
BOTTOM VIEW

LEVELING SCREW
LOCATIONS (3 EA)

SECURING BOLT
HOLE LOCATION,
3/16 DIA

ITEM	PART NO	SUFFIX	QTY.	UNIT	DESCRIPTION	REFERENCE NO
BILL OF MATERIALS						
WEATHERtronic 2777 Del Monte St. West Sacramento, CA 95691 Telephone (916) 371-2660					TITLE OUTLINE DRAWING SILICON CELL PYRANOMETER, 3120	
Δ AC CONNECTION ○ OPTIONAL STRIP ○ SOLDER ○ TERMINATION ▽ TEST POINT	Units preferred Dimensions: 0.000 0.001 0.010 0.100 1.000 As otherwise specified		NEXT ASBY REV DATE	FROM ASBY DATE REV DATE	RELEASE DATE 3-19-80 3120-05	
Units preferred All dimensions are in inches unless otherwise specified Dimensions in parentheses are for reference only Dimensions in () are for reference only Dimensions in () are for reference only Dimensions in () are for reference only					SCALE NONE J.G.	
DO NOT SCALE DR & REV LOG					1 1	

DWG. NO.
30310-015



TOLERANCES UNLESS OTHERWISE NOTED:
 XXX = ± .005 XX = ± .010 FRACTIONS = ± .02
 ANGLES ± 1/2° CONCENTRICITY = .003 TIR

MATL

FINISH

ENGR	DT
APPRO	DT

REV	ECN	DATED	QTY	NEXT	ASM
	2339	4-85			

WeatherMeasure
WEATHERtronics
 Division of QUALIMETRICS, Inc.

NOMENCLATURE
 ASSEMBLY, MAST ADAPTER 30310

MOD. USAGE 3120 SHEET 1 OF 1

BY (A) SCALE ∅
 DT 4-85 DWG. NO. 30310-015

A

BM. REF. NO. 2



All Weather Inc.
1165 National Drive
Sacramento, CA 95834
Fax: 916.928.1165
Phone: 916.928.1000
Toll Free: 800.824.5873
www.allweatherinc.com

3120-001
Revision E
July, 2008