SunSpec Alliance Interoperability Specification

Environmental Models

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ABSTRACT

This document describes the Environmental devices models of the SunSpec Alliance interoperability specification

Introduction

This SunSpec Alliance Interoperability Specification describes the data models and MODBUS register mappings for environmental stations used in Renewable Energy systems.

Six device types are defined in the Environmental blocks. These devices can be chained together per the Common Model to create a specific implementation. Some of the models allow for a variable number of units to be incorporated in a single block. This built in flexibility removes any fixed constraint on the number and types of devices that can be incorporated with minimal overhead.

Environmental Device Blocks

The following data elements are provided to describe meters.

- **C_SunSpec_DID –** A well-known value that uniquely identifies this block as an environmental block.
- **C_SunSpec_Length –** The length of the environmental block in registers.
- **E_BaseMet_xxxx – Environmental Base Meteorological Data.**
- **E_Irradiance_xxxx – Environmental Solar Irradiance Data.**
- **E_BOM_Temp_xxxx – Environmental Back of Module Temperature Data .**
- **E_Inclinometer_xxxx – Environmental Inclinometer Data.**
- **E_GPS_xxxx – Environmental GPS Data.**
- **E_PanelRef_xxxx – Environmental Panel Reference Data.**

MODBUS Register Mappings

Base Meteorological Model - MODBUS Mapping

This map supports basic meteorological data in a single map.

Start	End	#	R/W	Name	Type	Units	Scale Factor	Contents	Description
1	1	1	R	C_SunSpec_DID	Uint16	N/A	0	301	Well-known value. Uniquely identifies this as a SunSpec Base Meteorlogical Model
2	2	1	R	C_Sunspec_Length	uint16	N/A	0	22	Length of model block, number of sensors = 11
3	4	2	R	E_BaseMet_Air Temperature	int32	°C	0	Measured	Ambient Air Temperatute
5	6	2	R	E_BaseMet_Relative Humidity	int32	%	0	Measured	Relative Humidity

7	8	2	R	E_BaseMet_Barometric Pressure	int32	HPa	0	Measured	Barometric Pressure
9	10	2	R	E_BaseMet_Wind Speed	int32	m/s	0	Measured	Wind Speed
11	12	2	R	E_BaseMet_Wind Direction	int32	Degrees	0	Measured	Wind Direction
13	14	2	R	E_BaseMet_Rain	int32	Inches	0	Measured	Incremental Rainfall since last poll
15	16	2	R	E_BaseMet_Snow	int32	Inches	0	Measured	Incremental Snowfall since last poll
17	18	2	R	E_BaseMet_PPT Type	int32	N/A	0	Measured	Precipitation Type (WMO 4680 SYNOP code reference)
19	20	2	R	E_BaseMet_Electric Field	int32	V/m	0	Measured	Electric Field
21	22	2	R	E_BaseMet_Surface Wetness	int32	kOhms	0	Measured	Surface Wetness
23	24	2	R	E_BaseMet_Soil Moisture	int32	%	0	Measured	Soil Moisture

Irradiance Model - MODBUS Mapping

This map supports a complete set of irradiance data in a single map. Multiple number of sensors and sensor types are accommodated by adjusting the length.

Start	End	#	R/W	Name	Type	Units	Scale Factor	Contents	Description
1	1	1	R	C_Sunspec_DID	unit16	N/A	N/A	302	Well-known value. Uniquely identifies this as a SunSpec Irradiance Model
2	2	1	R	C_Sunspec_Length	uint16	N/A	N/A	5	Variable length model block = (5*n), where n = number of sensors blocks
3	3	1	R	E_Irradiance_Global_Horizontal_1	uint16	W/m^2	0	Measured	Global Horizontal Irradiance
4	4	1	R	E_Irradiance_Plane-of-Array_1	uint16	W/m^2	0	Measured	Plane-of-Array Irradiance
5	5	1	R	E_Irradiance_Diffuse_1	uint16	W/m^2	0	Measured	Diffuse Irradiance
6	6	1	R	E_Irradiance_Direct_1	uint16	W/m^2	0	Measured	Direct Irradiance
7	7	1	R	E_Irradiance_Other_1	uint16	W/m^2	0	Measured	Some other type Irradiance

Back of Module Temperature Model - MODBUS Mapping

This map supports a complete set of back of module temperature data in a single map. A multiple number of sensors are accommodated by adjusting the length.

Start	End	#	R/W	Name	Type	Units	Scale Factor	Contents	Description
1	1	1	R	C_SunSpec_DID	uint32	N/A	N/A	303	Well-known value. Uniquely identifies this as a SunSpec Back of Module Temperature Model
2	2	1	R	C_Sunspec_Length	uint16	N/A	N/A	2	Variable length model block = (2*n), where n = number of sensors
3	4	2	R	E_BOM_Temp_1	int32	°C	0	Measured	Back of module temperature

Inclinometer Model - MODBUS Mapping

This map supports a complete set of inclinometer data in a single map. A multiple number of sensors are accommodated by adjusting the length.

Start	End	#	R/W	Name	Type	Units	Scale Factor	Contents	Description
1	1	1	R	C_SunSpec_DID	uint32	N/A	N/A	304	Well-known value. Uniquely identifies this as a SunSpec Inclinometer model
2	2	1	R	C_Sunspec_Length	uint16	N/A	N/A	6	Variable length model block = (6*n), where n = number of inclinometers
3	4	2	R	E_Inclinometer Ux_1	int32	Degrees	-2	Measured	X Axis tilt
5	6	2	R	E_Inclinometer Uy_1	int32	Degrees	-2	Measured	Y Axis tilt
7	8	2	R	E_Inclinometer Uz_1	int32	Degrees	-2	Measured	Z Axis tilt

Location Model - MODBUS Mapping

This map supports a complete set of GPS location data in a single map.

Start	End	#	R/W	Name	Type	Units	Scale Factor	Contents	Description
1	1	1	R	C_SunSpec_DID	uint32	N/A	N/A	305	Well-known value. Uniquely identifies this as a SunSpec Location Model
2	2	1	R	C_Sunspec_Length	uint16	N/A	N/A	41	Length of model block = 41 registers
3	7	5	R	E_GPS_UTC Time	String	hhmmss.sss	N/A	Measured	UTC 24 hour time of day to milliseconds
8	11	4	R	E_GPS_UTC Date	String	DDMMYYYY	N/A	Measured	UTC Date
12	16	5	R	E_GPS_Latitude	int32	Degrees	-7	Measured	Latitude in degrees plus/minus with 7 digits of accuracy
17	21	5	R	E_GPS_Longitude	int32	Degrees	-7	Measured	Longitude in degrees plus/minus with 7 digits of accuracy
22	23	2	R	E_GPS_Altitude	int32	Meters	0	Measured	Altitude above or below mean sea level
24	43	20	R	E_GPS_Location	String	Text	N/A	Free Form	Descriptive text for this location for display purposes

Reference Point Model - MODBUS Mapping

This map supports a complete set of Reference Point data in a single map. A Reference Point could be an Array, a SubArray, a String, a Module, or a ReferenceCell. A multiple number of sensors are accommodated by adjusting the length.

Start	End	#	R/W	Name	Type	Units	Scale Factor	Contents	Description
1	1	1	R	C_SunSpec_DID	uint32	N/A	N/A	306	Well-known value. Uniquely identifies this as a SunSpec

									Reference Point Model
2	2	1	R	C_Sunspec_Length	uint16	N/A	N/A	7	Variable length model block = (7*n), where n = number of blocks
3	4	2	R	E_RefPoint_Current	int32	Amps	-2	Measured	Current
5	6	2	R	E_RefPoint_Voltage	int32	Volts	-2	Measured	Voltage
7	8	2	R	E_RefPoint_Temperature	int32	°C	0	Measured	Temperature
9	9	1	R	E_RefPoint_Irradiance	uint16	W/m^2	0	Measured	Irradiance