

Technical Note – SunSpec Logging in SolarEdge Inverters

SolarEdge inverters support reading inverter-level monitoring data directly from the inverter to a local non-SolarEdge device, by implementing the SunSpec open protocol for interoperability between devices in renewable energy systems. This option can be used alongside the connection to the SolarEdge monitoring server. This document describes the connection method and the protocol and configurations needed to implement this feature.

Purpose of Connection

Direct connection is useful when no network connection is available, when extensive custom data processing is required or when authorities require direct access to monitoring data. In many cases it is possible – and recommended – to employ the direct connection **alongside** a SolarEdge monitoring portal connection. Connection to the SolarEdge monitoring portal enables all the monitoring benefits, primarily:

1. Proactive installer maintenance and real time troubleshooting by SolarEdge support, possible with the physical mapping available only in the SolarEdge monitoring portal.
2. Module-level monitoring

SunSpec-Supported Inverters

All single phase inverters with CPU version 2.105 and above, and all three phase inverters with CPU version 2.150 and above, are SunSpec-supported.

1. The firmware version may be seen on the LCD of the inverter by pressing the LCD button several times until the *Software Version* display shows the following screen:

```
I D      :   0 0 0 0 0 0 0 F
D S P 1 / 2 : 1 . 0 2 1 0 / 1 . 0 0 5
C P U    :   0 0 0 2 . 0 1 0 5
C o u n t r y : G B R
```

2. If needed, contact SolarEdge support to update inverters with earlier versions.

Physical Connection

The SunSpec connection is done using an RS485 connector with a standard twisted pair cable. The SunSpec transmission mode in SolarEdge inverters is set to RTU (binary).

The COM port properties are: 115200 bps, 8 data bits, no parity, 1 stop bit, no flow control.

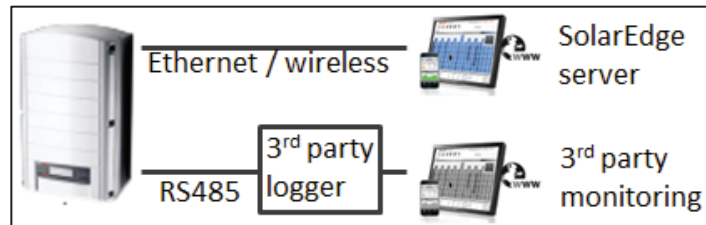
The RS485 bus can be configured to support *either* SunSpec connection to a 3rd party logger *or* Master-Slave connection between SolarEdge inverters. Therefore a Slave inverter cannot communicate simultaneously with a Master inverter and with a SunSpec logger via RS485.

Use Cases

Single inverter installation

Use the RS485 bus for SunSpec logging.

Connection to the SolarEdge monitoring server can be done via an Ethernet cable or with any of the optional wireless connection options.



Multiple inverter installation – without connection to SolarEdge monitoring server

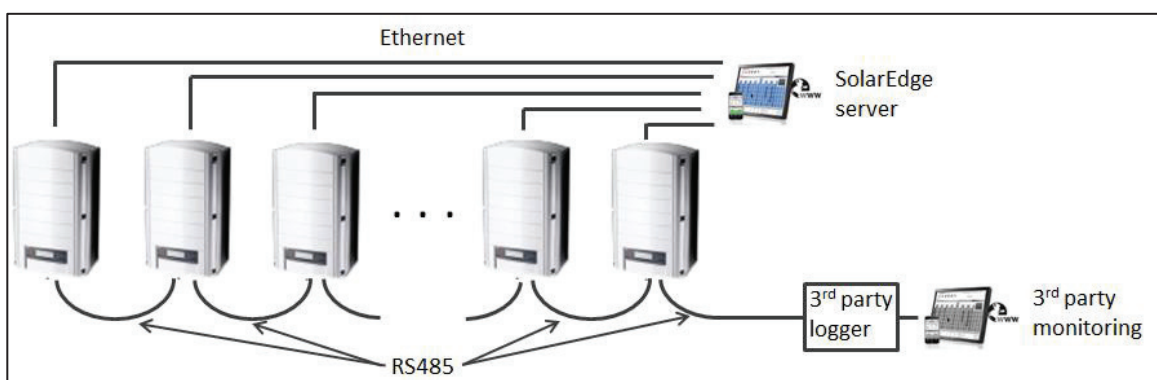
Use the RS485 bus for SunSpec logging. Every inverter connected to the RS485 bus should be configured to a different MODBUS channel.



Multiple inverter installation – with connection to SolarEdge monitoring server

Use the RS485 bus for SunSpec logging. Every inverter connected to the RS485 bus should be configured to a different MODBUS channel

Connect each inverter to the SolarEdge monitoring portal via Ethernet cables.



Register Mapping

The SolarEdge inverter mapping is based on the **SunSpec Alliance Interoperability Specification – Inverter Models v1.0**. Consult the **SunSpec Alliance Interoperability Specification – Common Elements** for a detailed description of the protocol.

Mapping can be downloaded from the SunSpec Alliance web page: <http://www.sunspec.org/>. SolarEdge inverters support device ID (DID) 101, 102¹ & 103 register mapping.

Common Model MODBUS Register Mappings

1. Base Register Common Block is set to 40001 (Modbus PLC address [base 1]) or 40000 (Modbus Protocol Address [base 0]).
2. All parameters are defined as in the SunSpec Common Block definition, aside for the C_Options register which is set to NOT_IMPLEMENTED.
3. C_Manufacturer is set to SolarEdge.
4. C_Model is set to the appropriate inverter model, e.g. SE5000.
5. C_Version contains the CPU software version with leading zeros, e.g. 0002.0111.
6. C_SerialNumber contains the inverter serial number.
7. C_DeviceAddress is the device Modbus ID (default: 1), and may be changed using the inverter menu (see below in Inverter Configuration section).

Address	Size	Name	Type	Description
40001	2	C_SunSpec_ID	uint32	Value = "SunS" (0x53756e53). Uniquely identifies this as a SunSpec Modbus Map
40003	1	C_SunSpec_DID	uint16	Value = 0x0001. Uniquely identifies this as a SunSpec Common Model Block
40004	1	C_SunSpec_Length	uint16	65 = Length of block in 16-bit registers
40005	16	C_Manufacturer	String(32)	Value Registered with SunSpec = "SolarEdge "
40021	16	C_Model	String(32)	SolarEdge Specific Value
40045	8	C_Version	String(16)	SolarEdge Specific Value
40053	16	C_SerialNumber	String(32)	SolarEdge Unique Value
40069	1	C_DeviceAddress	uint16	Modbus Unit ID

Inverter Device Status Values

The following I_Status_ xxxx values are supported:

I_STATUS_OFF	1	Off
I_STATUS_SLEEPING	2	Sleeping (auto-shutdown) – Night mode
I_STATUS_MPPT	4	inverter is ON and producing power

Inverter Model MODBUS Register Mappings

1. The table below shows which MODBUS register values are supported.
2. Unsupported values are indicated by the NOT_IMPLEMENTED value.
Base Register Device Specific Block is set to 40070 (Modbus PLC address [base 1]) or 40069 (Modbus Protocol Address [base 0]).

Address	size	Name	Type	Units	Description
40070	1	C_SunSpec_DID	uint16		101 = single phase 102 = split phase ¹ 103 = three phase
40071	1	C_SunSpec_Length	uint16	Registers	50 = Length of model block
40072	1	I_AC_Current	uint16	Amps	AC Total Current value
40073	1	I_AC_CurrentA	uint16	Amps	AC Phase A Current value
40074	1	I_AC_CurrentB	uint16	Amps	AC Phase B Current value
40075	1	I_AC_CurrentC	uint16	Amps	AC Phase C Current value
40076	1	I_AC_Current_SF	int16		AC Current scale factor
40077	1	I_AC_VoltageAB	uint16	Volts	AC Voltage Phase AB value
40078	1	I_AC_VoltageBC	uint16	Volts	AC Voltage Phase BC value
40079	1	I_AC_VoltageCA	uint16	Volts	AC Voltage Phase CA value
40080	1	I_AC_VoltageAN ¹	uint16	Volts	AC Voltage Phase A to N value
40081	1	I_AC_VoltageBN ¹	uint16	Volts	AC Voltage Phase B to N value
40082	1	I_AC_VoltageCN ¹	uint16	Volts	AC Voltage Phase C to N value
40083	1	I_AC_Voltage_SF	int16		AC Voltage scale factor
40084	1	I_AC_Power	int16	Watts	AC Power value
40085	1	I_AC_Power_SF	int16		AC Power scale factor
40086	1	I_AC_Frequency	uint16	Hertz	AC Frequency value
40087	1	I_AC_Frequency_SF	int16		Scale factor
40088	1	I_AC_VA	int16	VA	Apparent Power
40089	1	I_AC_VA_SF	int16		Scale factor
40090	1	I_AC_VAR	int16	VAR	Reactive Power
40091	1	I_AC_VAR_SF	int16		Scale factor
40092	1	I_AC_PF	int16	%	Power Factor ²
40093	1	I_AC_PF_SF	int16		Scale factor
40094	2	I_AC_Energy_WH	acc32	WattHours	AC Lifetime Energy production
40096	1	I_AC_Energy_WH_SF	uint16		Scale factor
40097	1	I_DC_Current	uint16	Amps	DC Current value
40098	1	I_DC_Current_SF	int16		Scale factor
40099	1	I_DC_Voltage	uint16	Volts	DC Voltage value
40100	1	I_DC_Voltage_SF	int16		Scale factor
40101	1	I_DC_Power	int16	Watts	DC Power value
40102	1	I_DC_Power_SF	int16		Scale factor
40104	1	I_Temp_Sink	int16	Degrees C	Heat Sink Temperature
40107	1	I_Temp_SF	int16		Scale factor
40108	1	I_Status	uint16		Operating State
40109	1	I_Status_Vendor	uint16		Vendor Defined Operating State and error codes

Supported MODBUS Register Mappings

¹ Supported only in split-phase configurations (Japanese grid and 240V grid in North America)² Supported only for three phase inverters

Inverter Configuration

Short press the LCD button to scroll through the informative screens. Find the ID status window and check the CPU firmware version. The correct configuration sequence depends on the CPU version.

```
ID      :  # # # # # # # # # # # #
DSP 1 / 2 : 1 . 0 2 1 0 / 1 . 0 0 3 4
CPU    : 0 0 0 2 . 0 2 5 0
Country : U S A
```

To reach the main setup menu, follow the instructions in “SolarEdge Installation Guide – Configuring the Inverter Using the LCD Panel and User Buttons”.

To configure the inverter as a SunSpec device, for FW version earlier than 2.250, apply the following steps:

1. Under **Communication** select **Bus** submenu and set it to **None**.
2. Under **Communication** select **Modbus Conf**.

```
S e r v e r < L A N >
B u s < N O N E >
L A N   C o n f
R S 4 8 5   C o n f < S >
Z I G B E E   C o n f < S >
R S 2 3 2   C o n f
*   M o d b u s   C o n f
```

3. Under **Modbus Conf** select **Modbus Set** and choose **Enable**.
4. Return to **Modbus Conf**, select **Set Protocol Type** and choose **Serial**.
5. Return to **Modbus Conf**, select **Set Device ID** and enter the desired MODBUS address. This will set the register C_DeviceAddress.
6. Return to **Modbus Conf**, select **Set Channel** and select **RS485**. The LCD will say **Resetting** and will turn off. This completes the configuration.
7. To clear SunSpec energy counters select **Factory Reset** under **Modbus Conf** and choose **YES**.

To configure the inverter as a SunSpec device, for FW version 2.250 and above, apply the following steps:

1. Under **Communication** select **Server** and set it to the desired server connection
2. Under **Communication** select **RS485-1 Conf**
3. Under **RS485-1 Conf** select **Device Type** and set it to **Non-SE Logger**
4. Under **RS485-1 Conf** select **Protocol** and set it to **SunSpec**
5. Under **RS485-1 Conf** select **Device ID** and enter the desired MODBUS address (unique value 1...247). This will set the register C_DeviceAddress.

Appendix A – Example of Supported Modbus Request

In order to prevent confusion in the implementation of Modbus request procedure, SolarEdge implemented two methods:

1. Modbus request with explicit register addressing - supported by all communication board CPU versions
2. Modbus request without explicit addressing – supported by communication board CPU version 2.478 and above

Here is an example:

1. Modbus request with explicit register addressing [supported by all communication board CPU versions]:
Tx: 01 03 9C 40 00 7A EB AD – Read 122 holding registers starting at address 40001.
Rx: 01 03 F4 53 75 ... [Registers data] ... FF FF 12 1B
2. Modbus request without explicit addressing (register offset only) [communication board CPU version 2.478 and above]:
Tx: 01 03 00 00 00 7A C4 29 – Read 122 holding registers starting at offset 0.
Rx: 01 03 F4 53 75 6E 53 ... [Registers data] ... FF FF AE DB