

AcquiSuite SMA Inverter Module

Michael Hewitt

Custom Module

Communicating with SMA-over-RS485 requires that the Obvius Data Acquisition Server (DAS) has a custom firmware module. Prior to installing the module, ensure that the DAS firmware version is the latest release, such as release v02.12.0613. This is available on the [Firmware Version](#) page, and includes a kernel which must also be installed. Use the [Firmware Version](#) page to upgrade and verify the required versions. When done, the [Check for Updates](#) button should indicate that the system is up-to-date. If not, upgrade the firmware items which are not current before proceeding.

Firmware Version

Current firmware installed:

AcquiSuite Firmware version	v02.12.0613
usr apps version	v02.12.0613
root filesystem version	v02.12.0613
Linux kernel version	Linux 2.6.28.10-r1.92--ge055112

AcquiSuite Modules installed:

Vendor & Module Name:	Version:	Status:	Action (at next boot):
Obvius, LLC — Sma Inverter Process [Obvius_SmaInverter.asmodule.cramfs]	v0.12.0306	Enabled, Loaded	Enable <input type="button" value="Apply"/> <input type="button" value="Cancel"/>

Once the firmware has been fully updated, use the [Show Optional Modules](#) feature to install the custom SMA firmware module. Also use the [Firmware Version](#) page to confirm the presence and version of the installed module and [Enable](#) it. Contact Obvius for information on the latest versions.

Modbus Devices via USB Communications

The SMA inverters communicate with the DAS using a special USB adapter available from Obvius, **A89-USB485**. Contact Obvius Sales for current pricing and availability. Through its USB port using that adapter and the additional firmware module noted above, the AcquiSuite EMB A8810, AcquiLite EMB A7810, and AcquiSuite A8812 communicate with SMA inverters. To verify the USB process connectivity, view the [USB Devices](#) page, under [System](#).



Port	Device Name	Vendor	S/N	Vers.	Max Power	Vendor ID	Product ID
usb1	AcquiSuite root hub	Obvius	ep93xx	1.10	0mA	1d6b	0001
ttyUSB0 (in use by 511)	USB-RS485 Cable	FTDI	FTT5G3AX	2.00	300mA	0403	6001
ttyS0	A8812 daughtercard						

OBVIUS
 3300 NW 211th Terrace, Hillsboro, OR 97124
 Ph: +1-503-601-2099 Fax: +1-503-601-6878
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Current time: Tuesday, July 05 2011 14:05:55 PDT

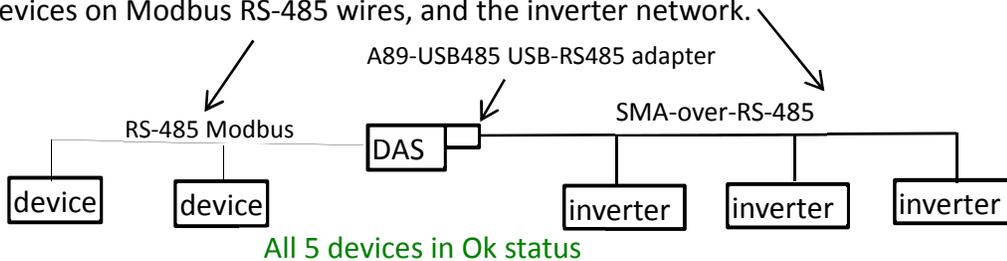
Currently the DAS supports one USB port, dedicated to one function, such as the SMA adapter.

While communicating with the SMA gateway, the DAS continues to communicate with traditional Modbus/TCP and Modbus RS-485 devices using the normal established methods.

Typical Modbus RS-485 considerations include baud rate and termination resistors (see Tech Notes TN06 and TN27). Additionally note that the inverter communications and hardware can be independently verified using software and instructions supplied by SMA.

It's all about the USB

The SMA inverters communicate with the DAS over a USB serial connection, which is independent of the RS-485 Modbus connection point (screw terminals) of the DAS. Each inverter needs to be on to communicate. The whole system works best when all inverters are connected, powered, and functioning. This illustration shows the two distinct communication methods: other typical meter devices on Modbus RS-485 wires, and the inverter network.



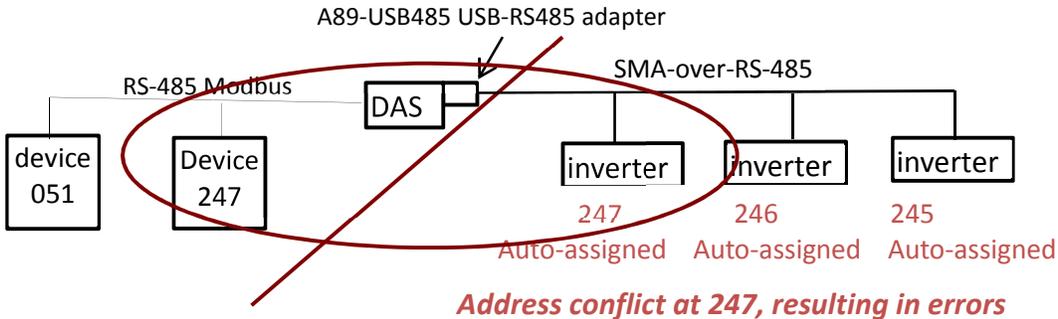
If the adapter is not functional, the configurations in the DAS cannot access the inverters.

Inverters and Modbus Addresses

The SMA inverters are automatically discovered by the DAS, and unlike typical Modbus devices do *not* need initial unique addresses. Typically the inverters each begin as Node 1. Using the AcquiSuite SMA Inverter module, the DAS automatically assigns Node numbers and Modbus addresses to the inverters as it discovers them. It assigns Modbus address 247 for the first Node, Modbus address 246 for the second Node, Modbus address 245 for the third, and so on. Node numbers have little operational significance, but the Modbus address and serial number of an inverter uniquely identify it on the DAS and log files. Once acquired and named, the associations persist across a power cycle of the inverter(s) or DAS.

Important Note about Modbus addresses

Because of the automatic assignment of Modbus addresses, avoid configuring other devices to the Modbus addresses in the range required to identify the SMA inverters.



As always, when the DAS acquires a new Modbus device, it appears on the Modbus Device List in the Unconfigured state. When it does, label it with some name that makes the device easier for you to identify, such as *Inverter A* or *SB 4000*. To do this, when the new device appears on the Device List, select [Rename all devices](#), and then type in a name for the new device in the box that appears on that line. Save the names, and the device should then be *Ok*.

Device	Status	Name and Purpose	Type	Comms	Firmware	Serial Number
001	Ok	Solar Meter	Elkor Watts On	9600n81	4.70	00059246
244	Ok	D SB 4000	SMA,WR40U08,244		272.272	2000940727
245	Ok	C SB 4000	SMA,WR40U08,245		272.272	2000940752
246	Ok	B SB 4000	SMA,WR40U08,246		272.272	2000940730
247	Ok	A SB 3000	SMA,WR30U08,247		272.272	2001597510

[Add](#) [Troubleshoot](#) [Rename all devices](#) [List all supported devices](#) Show: [\[none\]](#) [\[setup\]](#) [\[devinfo\]](#) [\[stats\]](#) [XML](#)

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 3300 NW 211th Terrace, Hillsboro, OR 97124
 Ph: +1-503-601-2099 Fax: +1-503-601-6878
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Current time: Tuesday, July 05 2011 18:44:51 EDT

As with any typical device logged by the DAS, each inverter can be viewed and configured from the Device List page, under Modbus. This includes inverter-specific status, communications statistics, device information, and Advanced pages.

Diagnostics

The Gateway Status page includes many diagnostics indicators, such as uptime and a quick summary, as well as much finer details on the current communications conditions. Additionally, the page contains the [View SMA Debug Messages](#) button, which is a link to other much more detailed diagnostics. The inverters produce many diagnostic messages all the time, which appear in the log. Refer to the SMA documentation for information on the significance and meanings of the messages, such as disturbance or warning numbers. The SMA Gateway Status page shows the communications status, current SMA Operational State, and many other useful diagnostics.



SMA Gateway Status



Gateway status: ✔ Gateway Connected

Gateway uptime: 3 hrs, 15 min, 0 sec

Gateway version: v0.12.0306

USB serial adapter: USB-RS485 Cable, vers= 2.00, S/N=FTT6Y0C2, VID=0403, PID=6001

SMA Baud Rate: 1200 bps

Force Probe Search

SMA Nodes: 1 (Up to 32 Maximum Nodes)

ReStart Gateway

Modbus/TCP status: 3 active connections (including gateway)

Modbus/TCP port: 504

Gateway accessible from: Allow Modbus TCP access from any IP address ([change Modbus/TCP access](#))

SMA Operational State: netGetDataState

	Totals
Packets transmitted:	14192
Sync Packets transmitted:	4690
Packets received, OK:	9270
Packets received, Bad:	0
Checksum errors:	29
Data query timeouts:	101
Most recent data query timeouts:	0
Packets received - other destination:	0
Response Packets too large:	0
Channel Info Sequence:	1
Current Packet #:	0
Node Address / Serial # / Index:	247 / 2001625460 / 0
Port Status:	waiting for data packet: 1
Spoilt Pkt Count:	0
Out of Order Channel Pkt Count:	1
Out of Order Data Pkt Count:	0
Dwell Time:	2000
# of Channel Configured Nodes / # of Non-Reporting Nodes:	1 / 0
Cycle Refresh Time Total (milliseconds):	2679

SMA debug information: Errors & Summary Only (default)

View SMA Debug Messages

Apply Cancel

XML



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The status of all the inverters (by node) can be viewed by clicking on the Inverters Status link.

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Sma Inverters Status and Power Generation

Instantaneous Power Generation per Node (kW) — updated every ~5 seconds

#1-25	W	#26-32	W
Node 1:	77.0	Node 17:	--
Node 2:	75.0	Node 18:	--
Node 3:	608.0	Node 19:	--
Node 4:	384.0	Node 20:	--
Node 5:	--	Node 21:	--



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NOTE: Inverters drawing power from solar arrays will go into error conditions overnight unless they have supplemental power sources when the arrays cease generating any power. These expected error conditions will appear in log files, messages and pages listing inverter conditions.

Inverter Startup

Note that inverters have startup times measured in minutes, and communicate over low (slow) baud rates. So despite the efficiency and fast processing speed of the DAS, it takes nearly 2 minutes to acquire each individual inverter. So a network of 7 acquires in about 15 minutes. The best time to introduce new SMA inverters is when the DAS boots. Typical installations work best if all the inverters are fully on before booting the DAS. If the DAS seems to have trouble acquiring inverters and the gateway is Ok but shows many transmitted packets without replies, try restarting the gateway / rebooting the DAS, then allow some time for it to acquire.

More Information

Each of the SMA pages, like the Gateway Status page on the DAS has a  Help link, and the related page has a large amount of information related to configuration and status of the communications and inverter devices. This specific and useful data even includes guidelines and recommended actions in case of error conditions.

Further real-time diagnostics are also available on the Gateway Status page. For example, the SMA Operational State changes to show the current status of the gateway, such as:

- When determining the condition of the SMA-over-RS485 communications...

SMA Operational State: [netTerminalChannelInfoState](#)

- ... reading information from inverters...

SMA Operational State: [netGetDataState](#)

- ...or synchronizing the time across the inverters.

SMA Operational State: [netSyncOnlineState](#)

Numbered identification of inverters varies by context. Modbus address 247 will be Node Address 0, and appear as Node 1 on the Inverter Status page. Modbus address 246 will be Node Address 1, Node 2; Modbus address 245 will be Node Address 2, Node 3; and so on. Note inverter serial numbers.

Supported Inverters

Please contact Obvius Sales to confirm the support of a particular SMA inverter. For example, the SMA SunnyBoy series is supported using the Obvius SMA Inverter Module. Typically the part number also needs a "US" suffix - sold in the United States.

