

Technote 06 - Modbus Debugging

Tips for solving Modbus device problems with the AcquiSuite

These are some basic techniques for solving Modbus communications problems using the AcquiSuite and any number of Modbus devices, ideally as you bench-test the equipment before deploying to the installation.

General

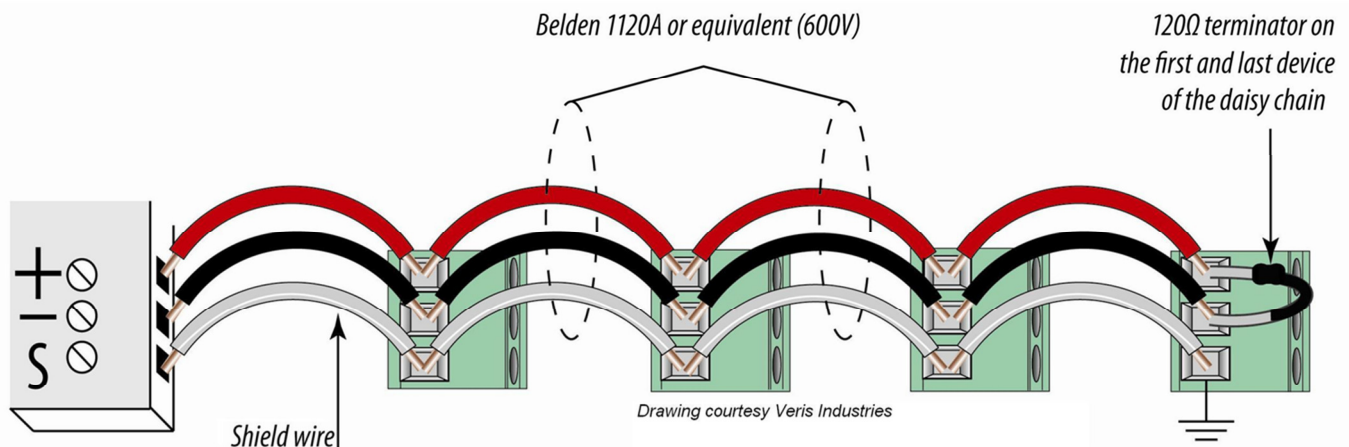
The AcquiSuite can communicate with 32 Modbus devices on a RS-485 wire loop in a daisy-chain configuration. The default communications baud rate (speed) is 9600. Confirm the RS-485 baud rate in the Modbus/Setup section of the AcquiSuite configuration web page. Another Technote discusses timing.

Because 2-wire RS-485/Modbus is a shared line, half duplex system, a wiring fault may cause all devices to stop working. In addition, each device must have a unique address. If multiple devices are configured with the same address, all such devices will fail to respond. Ensure that each device has a unique address. This also includes any devices connected through Modbus TCP.

To troubleshoot a Modbus problem with an AcquiSuite, you should ensure that the AcquiSuite is running the latest firmware, and then take the following steps.

View the Modbus Device List on the AcquiSuite

The Modbus device list on the AcquiSuite will report a list of all discovered Modbus devices. On the A8812 AcquiSuite, one of these devices is number 250, which reads the internal pulse and analog inputs on the AcquiSuite itself. Confirm that device 250 is present and working. Click on the device number 250 and verify the point details page does not report any errors.



If there are errors accessing device 250, most likely an RS-485 wiring problem is preventing any attached device from working. Disconnect the RS-485 line from the RS-485 terminals on the AcquiSuite. This will help rule out any wiring problems. Try device 250 again. If device 250 responds, the problem is likely a wiring problem with the RS-485 line. If device 250 still fails with no external RS-485 connections present, there may be a problem with the AcquiSuite.

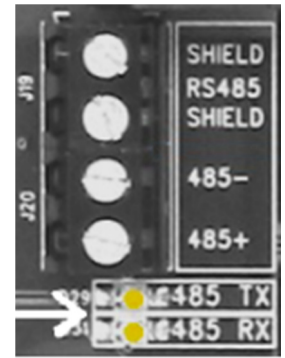
Verify the RS-485 Modbus LEDs on the AcquiSuite

During normal operation, the TX RS-485 LED should blink several times per second, and the RX RS-485 LED should be off most of the time, but may blink when specific devices are queried. The LED placement for an AcquiSuite EMB is shown to the left, and an AcquiSuite is shown to the right.



AcquiSuite EMB A8810 RS-485 LEDs

If the RX RS-485 LED is on solid, or the TX RS-485 LED never blinks, the wiring is likely incorrect. Disconnect the RS-485 wires from the AcquiSuite and then confirm that the LEDs behave normally.



A8812 LEDs

Some common wiring problems:

- there is a short between the RS-485 wires (such as RS-485+ or RS-485- and the RS-485 shield)
- there is a short between the RS-485 wires + and RS-485 shield due to wire debris on the contacts
- the RS-485 wires are crossed: the RS-485(+) wire is connected to the RS-485(-) connection point, and the RS-485(-) wire is connected to the RS-485(+) connection point. See the previous drawing.

In any case, device 250 (the AcquiSuite A8812 "internal IO" device) will not operate on the AcquiSuite A8812 while this problem persists. If device 250 is not working on the AcquiSuite A8812, try disconnecting the RS-485 wires from the AcquiSuite A8812. Be sure that the AcquiSuite has the latest firmware. If these adjustments do not correct the problem, contact technical support.

Check wiring issues

If the AcquiSuite is functioning and device 250 is working, you can troubleshoot external Modbus devices by connecting them one at a time. Attach only one Modbus device to the AcquiSuite, possibly using temporary wiring. This will eliminate a large number of possible wiring problems and allow you to focus on only one length of cable, and one Modbus device.

Once the first device is working, attach one additional device. Again, confirm the new device appears in the device list on the AcquiSuite. It is important to stop and check the device list after each new device is attached. The device detection feature in the AcquiSuite may take 3 to 5 minutes to discover the new device, so it is best to be patient. Rebooting the AcquiSuite will not speed up the device probe feature.

Note: add one new Modbus device at a time (and wait until the AcquiSuite acquires it) until all the Modbus devices are attached.

Finally, additional termination resistors may be required, as shown in the previous drawing. The AcquiSuite already has built-in termination resistors. For other devices, refer to the manufacturer for more information.

The remainder of the document contains details for specific Modbus devices.

Notes for the Veris H8328 MCM*:

First, confirm the MCM dipswitch setting. MCM dipswitch settings should be:

- position 1: any. (6 or 8 meter configuration)
- position 2: OFF: 2 wire
- position 3: OFF: baud 9600
- position 4: ON: baud 9600
- position 5: OFF: parity (E)
- position 6: OFF: parity disabled.

Verify the RS-485 wire is daisy-chained from the MCMs to the AcquiSuite. The 3 wire connection should attach to the MCM using the following connections:

- MCM "TX+RX+" terminal to the AcquiSuite RS-485+ terminal.
- MCM "TX-RX-" terminal to the AcquiSuite RS-485- terminal.
- MCM "SHLD" terminal to the AcquiSuite shield terminal.
- MCM "TX+" terminal is not connected.
- MCM "TX-" terminal is not connected.

You should see the H8238 Alive LED blinking every second, and the H8238 RX LED blink 2-3 times per second. If the RX LED is not blinking, then there is an RS-485 wiring issue between the AcquiSuite and the H8238.

After any changes are made, wait 5 minutes, and then select the "Modbus status" from the LCD menu, and check if more devices are listed. You must wait 5 minutes to allow the AcquiSuite to scan and detect the new devices.

Notes for the Veris H663 and H704 BCM*:

Verify the RS-485 wire is daisy-chained from the BCMs to the AcquiSuite. The 3 wire connection should attach to the BCM using the following connections:

- BCM "TX+RX+" terminal to the AcquiSuite RS-485+ terminal.
- BCM "TX-RX-" terminal to the AcquiSuite RS-485- terminal.
- BCM "SHLD" terminal to the AcquiSuite shield terminal.
- BCM "TX+" terminal is not connected.
- BCM "TX-" terminal is not connected.

Next, verify the switch settings on the BCM:

- position 1: OFF (not used)
- position 2: ON: 2 wire
- position 3: OFF: baud 9600
- position 4: ON: baud 9600
- position 5: OFF: parity disabled.
- position 6: OFF: parity disabled.
- Position 7: OFF: (not used)
- Position 8: OFF: (not used)

Verify the BCM has a unique address set for each BCM. ie, number them 1,2,3 in order. It is important that no two devices have the same address. This includes any non-BCM devices in the system.

After any changes are made, wait 5 minutes, and then select the "Modbus status" from the LCD menu, and check if more devices are listed. You must wait 5 minutes to allow the AcquiSuite to scan and detect the new devices.

** Refer to manufacturer's documentation for details.*