User's Guide

BAS-o-matic Modbus RTU Option

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Modbus RTU Overview

Modbus RTU overview

NOTE: Support for decoding the Modbus RTU requires the U+4 hardware and works with ONLY 32 bit operating systems

MODBUS Serial Line protocol is a Master-Slave protocol. This protocol takes place at level 2 of the OSI model.
A master-slave type system has one node (the master node) that issues explicit commands to one of the "slave" nodes and processes responses. Slave nodes will not typically transmit data without a request from the master node, and do not communicate with other slaves.
At the physical level, MODBUS over Serial Line systems may use different physical interfaces (RS485, RS232). TIA/EIA-485 (RS485)
Two-Wire interface is the most common. As an add-on option, RS485 Four-Wire interface may also be implemented. A TIA/EIA-232-E (RS232) serial interface may also be used as an interface, when only short point to point communication is required. (see web references to Modbus "Physical Layer")
The following figure gives a general representation of MODBUS serial communication stack compared to the 7 layers of the OSI model.

Layer	ISO/OSI Model	
7	Application	MODBUS Application Protocol
6	Presentation	Empty
5	Session	Empty
4	Transport	Empty
3	Network	Empty
2	Data Link	MODBUS Serial Line Protocol
1	Physical	EIA/TIA-485 (or EIA/TIA-232)

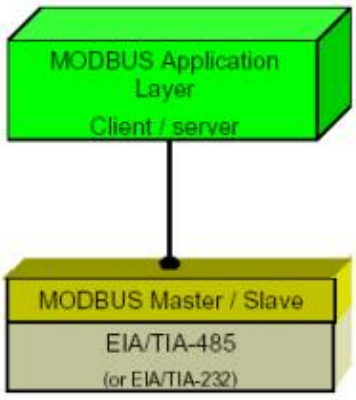

Figure : MODBUS Protocols and ISO/OSI Model

The MODBUS application layer messaging protocol, positioned at level 7 of the OSI model, provides client/server communication between devices connected on buses or networks. On a MODBUS serial line the client role is provided by the Master of the serial bus and the Slaves nodes act as servers.

U+4 Hardware Details

U+4 Hardware Details

Modbus RTU

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- USB to RS485 interface
- High speed co-processor handles time critical data and solves Windows real time response issues
- Both DB9 and screw terminals
- Professional electrical construction in a rugged metal housing
- Data and Power indication
- USB powered (no external power)

Power

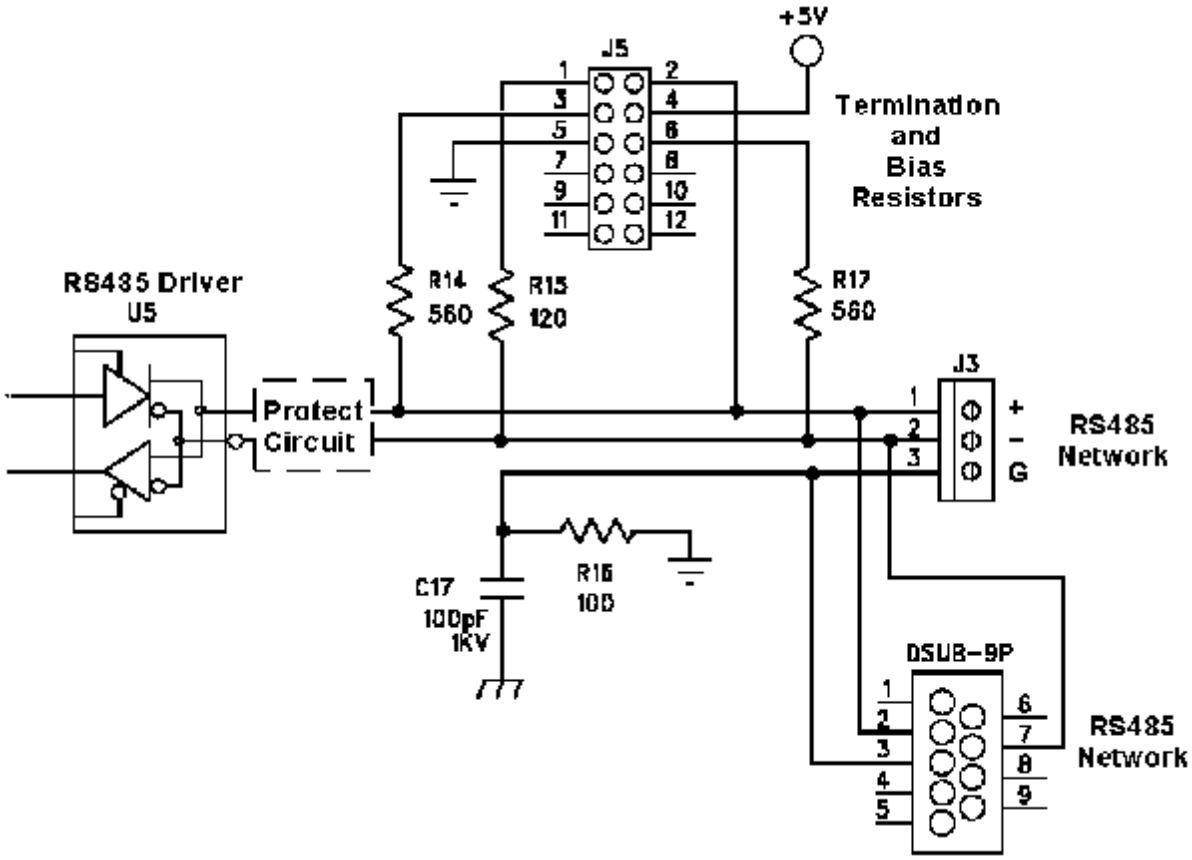
The U+4 is powered by the USB port and does not require a separate power supply. Proper power will be indicated by the Power LED indicator being on.

Data

The Data LED will indicate any read or write operation within the unit (activity on the network)

RS485 connection

The back panel of the U+4 has two connectors. The three conductor screw terminal allows connection of the RS485 network using industrial connectors, and the 9 pin D is merely in parallel as an alternative connection. Please refer to the following schematic:



Termination and Bias settings

Inside the U+4 unit is a header called J5 which lets you set termination or bias resistors into the network circuit. When jumpers are in positions 1-2, 3-4, 5-6 then these resistors are in the circuit. NOTE: These jumpers are not in the circuit when delivered from the factory and terminator and biasing are expected to be externally supplied.

U+4 Software Driver Setup

U+4 Software Driver Setup

QUICK HELP: To get your U+4 device working, you need to 1) install the software driver, 2) connect the device to your computers USB port, and 3) point Windows to the drivers location (default = C:\Program Files\Cimetrics\BAS-o-matic\Plugins\ModbusDriver)

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Windows XP

1) Driver Installation : The U+4 software driver is installed by the standard BAS-o-matic installation program. If you have doubts about this driver being installed, you can go to **Start | Control Panel | Network Connections** and see if you now have one more

"**Local Area Connection x**" (where x is one more than you normally have on your machine). NOTE: The U+4 hardware device must be connected for this to be displayed.

If you need to reinstall this driver,

a) Go to **Start | Control Panel | Add or Remove programs | BAS-o-matic | Change** to start this program again.
b) Select **Fieldbus interface | Modbus RTU driver** and start the load process again.

Windows Vista

1) Driver Installation : The U+4 software driver is installed by the standard BAS-o-matic installation program. If you have doubts about this driver being installed, you can go to **Start | Right click on Network | Properties | Manage Network Connections** and see if you now have one more "**Local Area Connection x**" (where x is one more than you normally have on your machine). NOTE: The U+4 hardware device must be connected for this to be displayed.

If you need to reinstall this driver,

a) Go to **Start | Control Panel | Programs and Features | right click on BAS-o-matic | Choose Change** to start this program again.
b) Select **Fieldbus interface | Modbus RTU driver** and start the load process again.

Windows 7

1) Driver Installation : The U+4 software driver is installed by the standard BAS-o-matic installation program. If you have doubts about this driver being installed, you can go to **Start | Control Panel |Network | Network and Sharing Center | Change Adapter Settings** and see if you now have one more "**Local Area Connection x**" (where x is one more than you normally have on your machine). NOTE: The U+4 hardware device must be connected for this to be displayed.

If you need to reinstall this driver,

a) Go to **Go to Start | Control Panel | Programs | Programs and Features | right click on BAS-o-matic | Choose Change** to start this program again.
b) Select **Fieldbus interface | Modbus RTU**

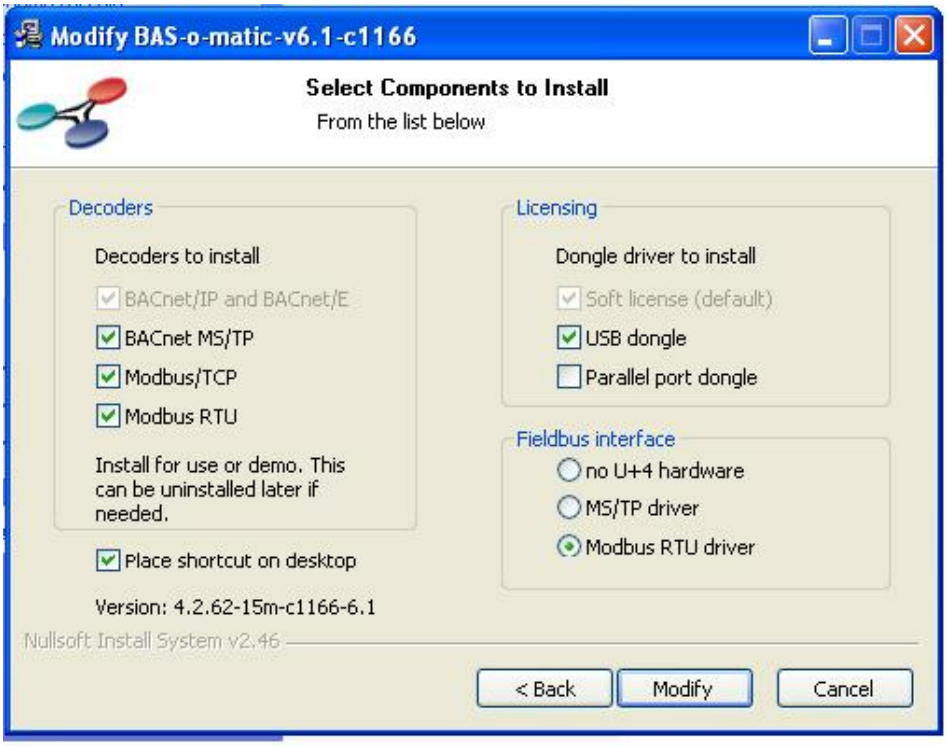
driver and start the load process again.

Windows 8

1) Driver Installation : The U+4 software driver is installed by the standard BAS-o-matic installation program. If you have doubts about this driver being installed, you can go to **Start | Right click on Network | Properties | Manage Network Connections** and see if you now have one more "**Local Area Connection x**" (where x is one more than you normally have on your machine). NOTE: The U+4 hardware device must be connected for this to be displayed.

If you need to reinstall this driver,

a) Go to **Start | Control Panel | Programs and Features | right click on BAS-o-matic | Choose Change** to start this program again.
b) Select **Fieldbus interface | Modbus RTU driver** and start the load process again.



2) **Connect the device -** Connect the U+4 to the USB port. Windows will display that a USB device has been found and will ask you to automatically or manually select a driver.

3) **Find the driver file for manual selection** - Select the location of the driver file (default = C:\Program Files\Cimetrics\BAS-o-matic\Plugins\ModbusDriver)

U+4 Driver Settings + Filters

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Changing Driver Settings

View device status under **Start | Control Panel | Network Connections**. To change settings, right click on the U+4 MODBUS Network Adapter connection and select **Properties**.

You can also change status in Settings menu. Under **Options** tab select Automation Protocols. Choose Modbus/RTU and click Configure.

On the Local Area Connection screen, right click, and select **Properties**.

If you have a Cimetrics BACstac: The BAS-o-matic program does NOT use the Cimetrics BACstac, but if you have this installed for another program, please unselect this protocol now.

Click on **Configure** |**advanced** then you can change the following option settings:

- **Baud rate:** All devices on the network must be set to the same baud rate. Modbus RTU baud rates are 76800, 38400, 19200, and 9600. Some manufacturers have implemented other baud rates, so the U+4 device can also be set to: 115200, 28800, 14400, 4800, and 2400).

- **Filter:** There are four modes:

  1) All - pass ALL Modbus RTU data to BAS-o-matic.
  2) Without CRC Errors - only pass Modbus RTU frames without CRC Errors

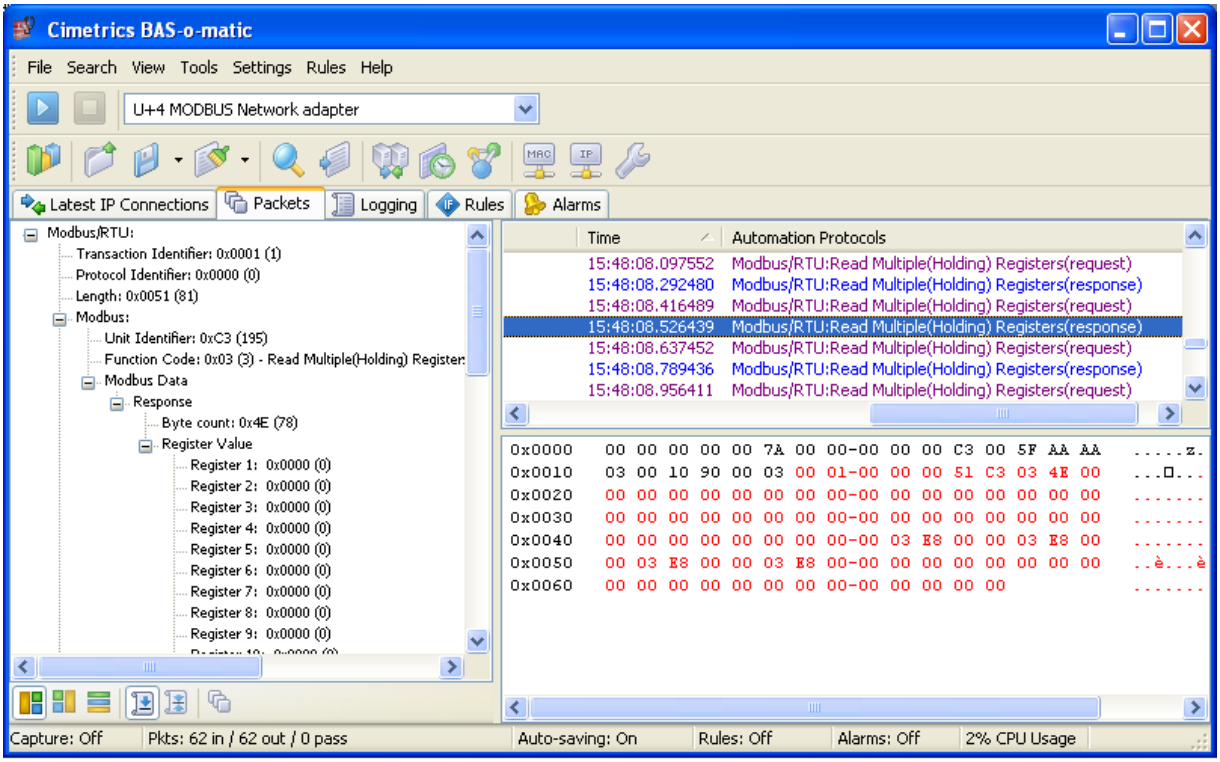
When you are finished, close the advanced drivers window.

If you have a Cimetrics BACstac: Reselect the BACstac protocol and a screen will pop up which says "BACstac has been started".

When finished, close all Control Panel windows and go back to using the BAS-o-matic program.

Example of Packet Decoding

Example of packet decoding



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More Information

More Information

More information

The main BAS-o-matic program contains more information concerning Cimetrics products and contact information for support and ordering.

Go back to the main program and select **HELP | Contents & Index**.

Links to Modbus Resources

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Here are some other resources where you can learn more about relevant issues.

NOTE: Check the main help file for Modbus for General Networking links.

Modbus Information

Wikipedia **-** Articles on Modbus, explanation of Modbus protocol along with the links to other resources.

Modbus Organization **-** The Modbus Organization is a group of independent users and suppliers of automation devices that seeks to drive the adoption of the Modbus communication protocol suite and the evolution to address architectures for distributed automation systems across multiple market segments.

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