REMOTE ALARMS AND CONTROLS

Verbatim Gateway

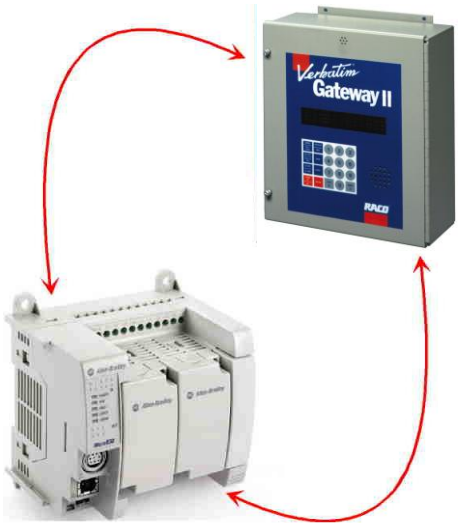
TECH NOTES-314

Integrating RACO® Verbatim® Gateway to Communicate with Micro800 PLC via Modbus RTU

This technical note details the step-by-step procedure to facilitate communications between RACO's Verbatim Gateway autodialer and Allen-Bradley's new Micro800™ PLC platform. With the exception of the Micro800 12-point models, all Micro800 controllers support the Modbus RTU over serial via the embedded non-isolated serial port. In addition, the 2080-SERIALISOL isolated serial port plug-in module also supports Modbus RTU, whereby both the Modbus RTU master and slave are supported. Given that the 48-point controllers can support up to five plug-in serial ports, including the embedded, up to six separate Modbus networks can operate within one PLC. This technical note will only illustrate communications via Modbus RTU protocol to the embedded non-isolated serial port.

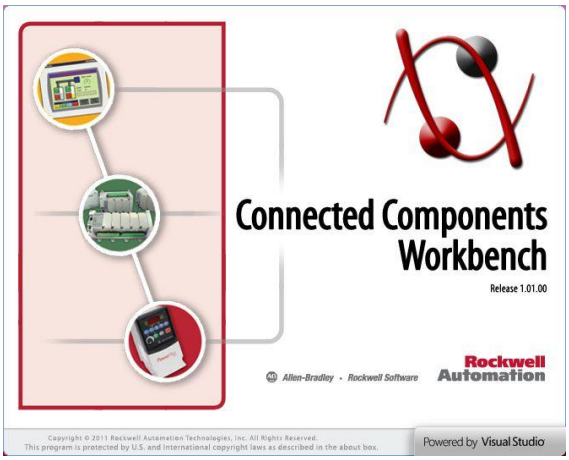
RACO-supplied components:
Verbatim Gateway (any model)
515VAB-ENI cable will provide the communications between the Micro800 and the Verbatim Gateway

Allen-Bradley-supplied components:
Micro800 PLC (with the exception of the Micro810 12-point models)
USB printer cable will provide the connection between personal computer and Micro800 PLC
Standard version of Connected Components Workbench™ software, available as a free download



Micro800 PLC Software Configuration

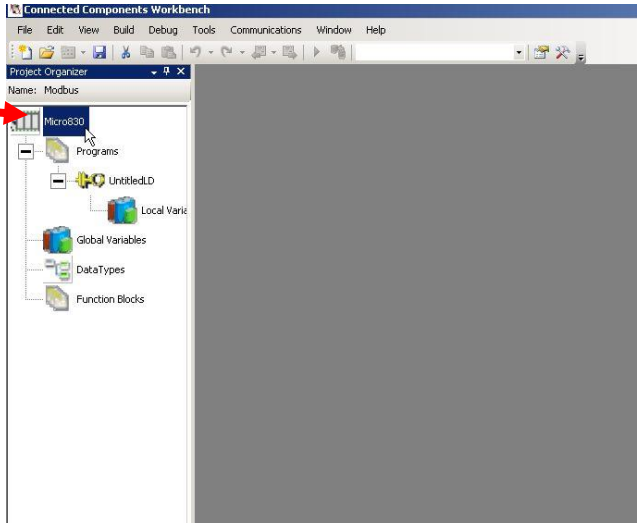
STEP #1 — Configure the Micro800 PLC. Obtain the Connected Components Workbench software, available as a free download from the Allen-Bradley website, http://ab.rockwellautomation.com/Programmable-Controllers/Connected-Components-Workbench-Software



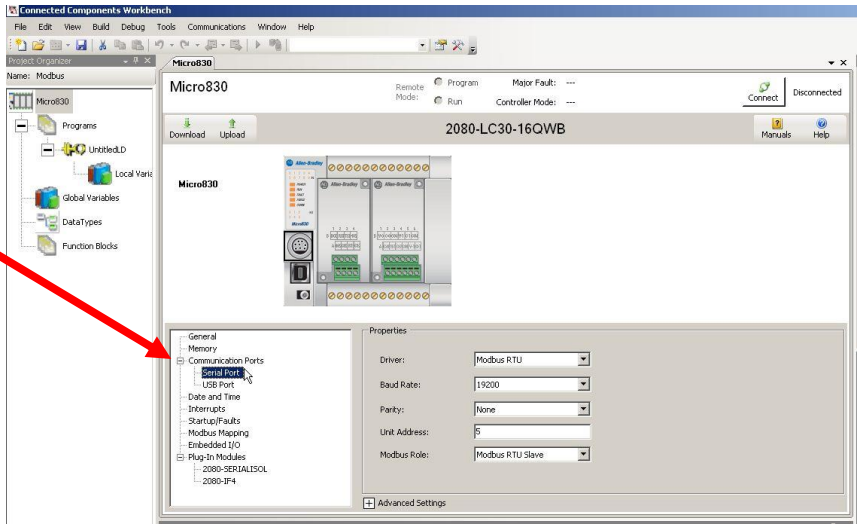
STEP #2 — Connect to the Embedded USB 2.0 (non-isolated) port with any standard USB printer cable.

STEP #3 — Launch the Connected Components Workbench software.

STEP #4 — Select your processor.



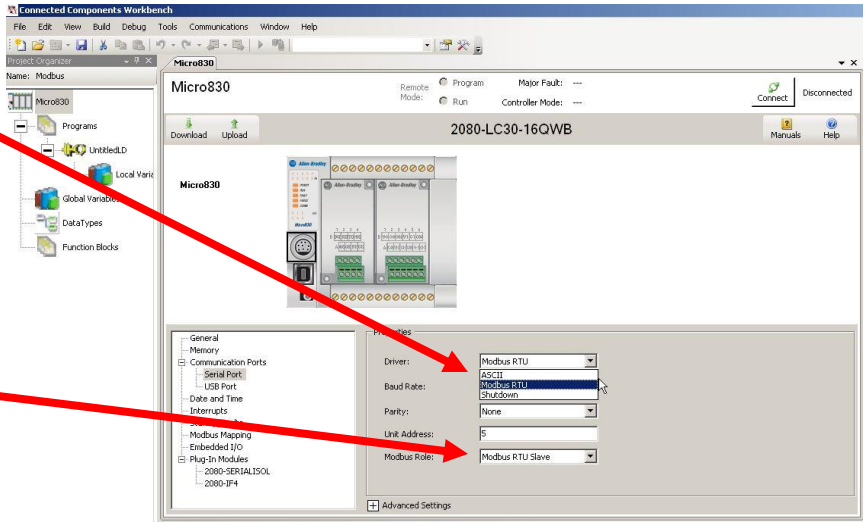
STEP #5 — On the Properties tree (bottom left), select Serial Port.



STEP #6 — Select Modbus RTU for Serial Port.

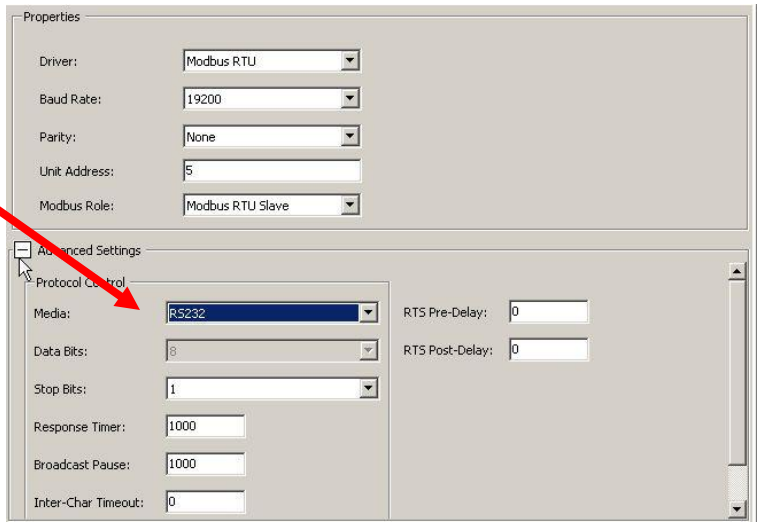
Complete the Properties form to suit your application. Remember, when configuring the Baud Rate and Parity, it must match that of the Verbatim Gateway.

The Verbatim Gateway will always be Modbus RTU Master, so select Modbus RTU Slave when configuring the PLC.



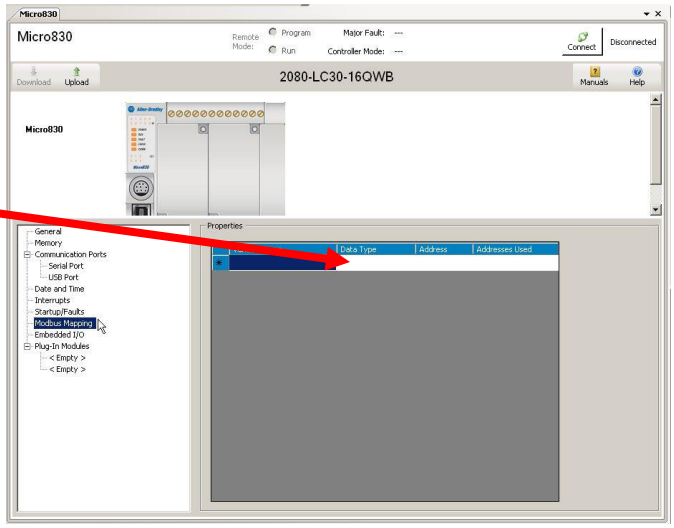
STEP #7 — Click the + icon to open the Advanced Settings form. Under the Protocol Control, the Media field should be RS232.

Set Stop Bits to 1.



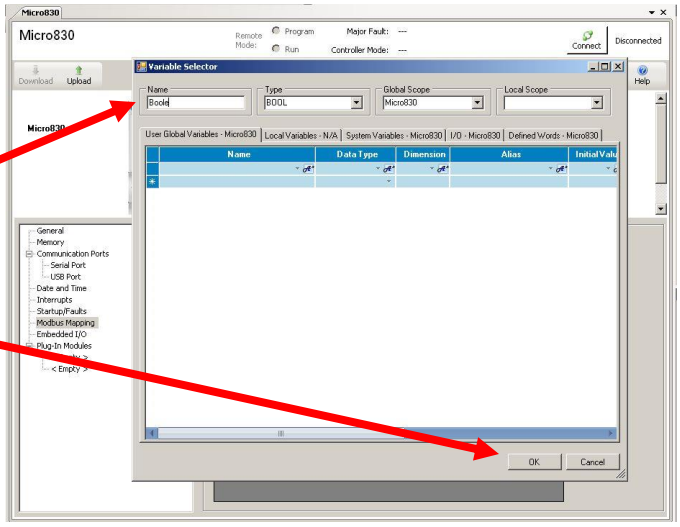
STEP #8 — We are now ready to configure Modbus Tags. To do so, select Modbus Mapping on the Properties tree.

Once selected, double-click in the blank field in the Properties form. This will launch the Variable Selector form.



STEP #9 — Under the User Global Variables — Micro800 tab, create a Boolean tag by entering the name and type into the top field, as shown.

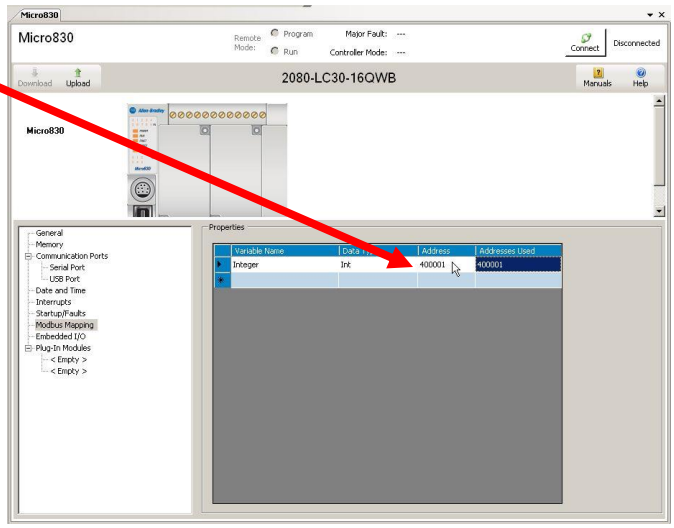
Once complete, click OK. This will close the form, revealing the Properties field behind.



STEP #10 — Under Address, type in your Modbus address.

Micro800 follows the six-digit addressing specified in the latest Modbus specification. Therefore, our first Boolean Output Coil address is 000001.

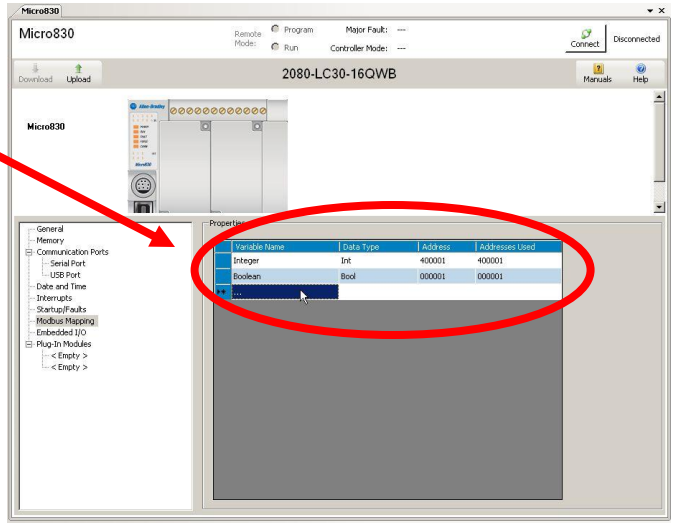
Repeat this procedure for all other tags required. When creating an Integer Tag, ensure you select INT under the Type field. Modbus Integer Output has the starting address location at 400001.



STEP #11 — Once complete, the Properties field will reveal some of the Tags you've configured.

Once all of your Tags have been configured, Build and Download the project.

We are now ready to configure the Verbatim Gateway.



Communication Setup for the RACO Verbatim Gateway

The following seven-step procedure will configure your Verbatim Gateway to link its Remote Channels (RC) to your Micro800™ PLC.

It is important to recognize the physical NET / PORT being used for communications to your PC. Connect to the NET ID (port) that supports Modbus RTU Master Protocol. Typically this is NET 2; however, the VCP card offers this protocol on NET 1.

STEP #1 — Protocol Driver (4906)
When setting the Protocol, Node Address and Communication parameters, it is good practice to include the NET ID (i.e., 4901, 4903, 4904, 4905 and 4906). Insert the NET ID immediately following the parameter number, as defined below.

Table #1

N	Protocol	Reference	Description	Nets
0	NONE		Device disabled	All nets
2	DH485	7.4.2	Allen-Bradley DH485 protocol	Net1 on V232 / 485 only
3	DF1	7.4.1	Allen-Bradley serial interface	**Net1 (on VDP only) Net2**
4				
5	MODBUSM	7.4.3	Modbus Master	**Net1 (on VDP only) Net2**
128	LDL	7.4.5	Local Data Logging May only be used on one device	**Net1 (on VDP only) Net2, 4**

As per Table #1, set the Protocol Driver to Modbus RTU Master / Slave on NET 2.
Key in the following: 4906 2 <point> 5 <enter>
To read the Protocol Driver for NET 2, key in the following: 4906 2 <enter>

STEP #2 — Node Address (4905)
Choose a unique Modbus RTU Master / Slave NODE address for the Verbatim Gateway. As illustrated above, we've already selected NODE 5 for the Micro800 PLC. NODE addresses can range from 1–256. For example, set the Verbatim Gateway NODE address to 2 by using code 4905.

To set the NODE address of NET 2, key in the following: 4905 2<point> <2> <enter>
To read the NODE address of NET 2, key in the following: 4905 2 <enter>

STEP #3 — Communication Parameters (4901, 4903, 4904)
Select the communication parameters. These must match with the driver settings you've configured via Connected Components Workbench software, for your Micro800 PLC.

RACO recommends the following communication settings:
BAUD rate = 19200 for 19200 on NET 2, key in the following: 4901 2<point> 19200 <enter>
Stop Bits = 1 for 1 on NET 2, key in the following: 4903 2 <point> <1> <enter>
Parity = NONE for NONE on NET 2, key in the following: 4904 2 <point> <0> <enter>
Parity Definition**:** 0 = No, 1 = ODD, 2 = EVEN, 3 = SPACE, 4 = MARK

Communication settings can be viewed by entering any one of the above four-digit codes followed by <enter>

DATA bits cannot be altered and remain at 8.

STEP #4 — Confirmations (4900, 4901, 4930, 4946)
Step #4 will validate all preceding steps.

To verify successful network communications on NET 2, key in the following: 4930 <point> 2 <enter>
To read the BAUD rate for NET 2, key in the following: 4901 2 <enter>
To verify communication settings reflect the above, at NET 2, key in the following: 4900 2<enter>
To verify active node addresses on NET 2, key in the following: 4946 2<enter>

STEP #5 — Set Defaults
This step simplifies Channel Configuration (i.e., Step 6).

By setting to Default, both the NET ID and NODE / STATION address, it is no longer necessary to reference them when setting Channel Configuration.

Set the following to DEFAULT.

1 NET ID, used to communicate via your Modbus RTU Master; in this example, 2.
2 NODE address of the target Modbus Slave Device; in this example, 5.

To change the NET ID to 2, key in the following: 4910 2 <enter>
To confirm the NET ID, key in the following: 4910 <enter>

To change the PLC NODE / STATION address to 5 of NET 2, key in the following: 4911 5 <enter>
To confirm PLC NODE / STATION address, key in the following: 4911 <enter>

STEP #6 Channel 1 & 2 Configuration (4501, 4502)
Table #2 (next page) illustrates the Modbus data file convention within the Verbatim Gateway. These addresses, or tags, map to the Modbus Slave Device as per the Modbus Table File numbers.

Table #2

Identifier	File Type	Example	
O	Output	O:1.0/0 O:017/10	(SLC500) (PLC5)
I	Input	I:0.1/0 I:013/07	(SLC500) (PLC5)
S	Status	S:2 S:2/0	(word) (bit)
B	Bit	B:0 B9:0/1	(word) (bit)
T	Timer	T4:0.2 T:0.0/1	(word) (bit)
C	Counter	C5:0.2 C10:0.0/1	(word) (bit)
R	Control	R6:2.1 R:2/15	(word) (bit)
N	Integer	N:1 N:1/0	(word) (bit)
F	Floating Point	F:2	(32-bit word)
NOTE: Cannot specify 16 or 1-bit points with F file type.			
D, G, M1, etc…	All other types	Not Supported	

Important:
It is important to note that Output Register (4xxxx) and Holding Register (5xxxx) data types use the same data area at the Verbatim Gateway end. The Holding Register (5xxxxx) uses two consecutive 16-bit addresses that are interpreted as a 32-bit floating point number (i.e., 5xxxx & 5xxxx+1). Not unlike the Holding Register, the Output Register (4xxxx) also reserves two consecutive 16-bit words; however the extended word is left blank. Similarly, when addressing the input register (3xxxx), allow for two consecutive 16-bit words, keeping in mind the extended word is reserved but not used. Hence, consecutive addressing of both Input and Output Registers will appear as follows. For example, first Input Register address point 30001, second address point 30003, third address point 30005, etc. Also, the Micro800 follows the six-digit addressing scheme as mentioned earlier, Table #2 shows a five-digit Modbus convention. Follow the five-digit format with the Verbatim Gateway, as this will sync to the Micro800 Modbus standard, as per the example below.

The two examples below illustrate the link via Modbus tagging convention (Table #2), to the Verbatim Gateway channels.

Example #1
To configure Channel 1 (coil) as per the OPC server settings illustrated above, key in the following:
4501 <point> 00001 <point> <enter>

To verify the current address entered, key in the following: 4501<point><enter>
To read address value, key in the following: 4001<point><enter>, this will read the actual PLC value assigned to Channel 1.

Example #2
To configure Channel 2 (integer) as per OPC server settings illustrated above, key in the following:
4502 <point> 40001 <point> <enter>

To verify the current address entered, key in the following: 4502<point><enter>
To read address value, key in the following: 4002<point><enter>, this will read the actual PLC value assigned to Channel 2.

Once channels are configured and successfully verified, they are ready to be assigned to your project, typically linked to Alarm Notifications, Data Logging and Messaging.

STEP #7 Assignment of Alarm Conditions
Having created and tested your remote channels, you are now ready to assign alarm conditions.

Channel #1, configured as Discrete, is either ON or OFF.
Should this channel be linked to a “Failsafe” point on the Micro800, (i.e., ON = NORMAL, OFF = ALARM), we would alarm when OFF. In this case, we would key in 45 01 2.

To alarm when ON (i.e., signal is HIGH), key in the following: 45 01 1
To alarm when OFF (i.e., signal is LOW), key in the following: 45 01 2
To read Alarm status for Channel 1, key in 4001 <enter>

Channel #2, configured as Analog, operates within the range from 0–65, 535.
Should this channel be linked to a pressure signal via Micro800, and the process requires that pressure remain within an acceptable level, otherwise ALARM (For example, BELOW 10,000 AND ABOVE 30,000.), we would key in the following:

To alarm when the analog signal falls below a value, for example 10,000, key in the following: 45 02 5 10000
To read the LOW set point alarm; key in the following: 45 02 5
To alarm when the analog signal rises above a value, for example 30,000, key in the following: 45 02 6 30000
To read the HIGH set point alarm; key in the following: 45 02 6

Now that you have proven the Verbatim Gateway will respond to alarm conditions, you can further test the application from your PC, via client a software simulator.

Verbatim Gateway 320VPLC-4C-32, monitors four internal digital inputs and up to 32 remote channels, supports DF1, Modbus connection via RS-232, 120VAC power source or 8-14 VDC @ 500mA Min.
Verbatim Gateway 321VPLC-4C-32AB, monitors four internal digital inputs and up to 32 remote channels, supports DF1, DH485, and Modbus connection via RS-232, 120VAC power source or 8-14 VDC @ 500mA Min.
Verbatim Gateway 320VPLC-4C-64, monitors four internal digital inputs and up to 64 remote channels, supports DF1, Modbus connection via RS-232, 120VAC power source or 8-14 VDC @ 500mA Min.
Verbatim Gateway 321VPLC-4C-64AB, monitors four internal digital inputs and up to 64 remote channels, supports DF1, DH485, and Modbus connection via RS-232, 120VAC power source or 8-14 VDC @ 500mA Min.
Verbatim Gateway 320VPLC-4C-96, monitors four internal digital inputs and up to 96 remote channels, supports DF1, Modbus connection via RS-232, 120VAC power source or 8-14 VDC @ 500mA Min.
Verbatim Gateway 321VPLC-4C-96AB, monitors four internal digital inputs and up to 96 remote channels, supports DF1, DH485, and Modbus connection via RS-232, 120VAC power source or 8-14 VDC @ 500mA Min.

For technical support from RACO call (510) 658 -6713.

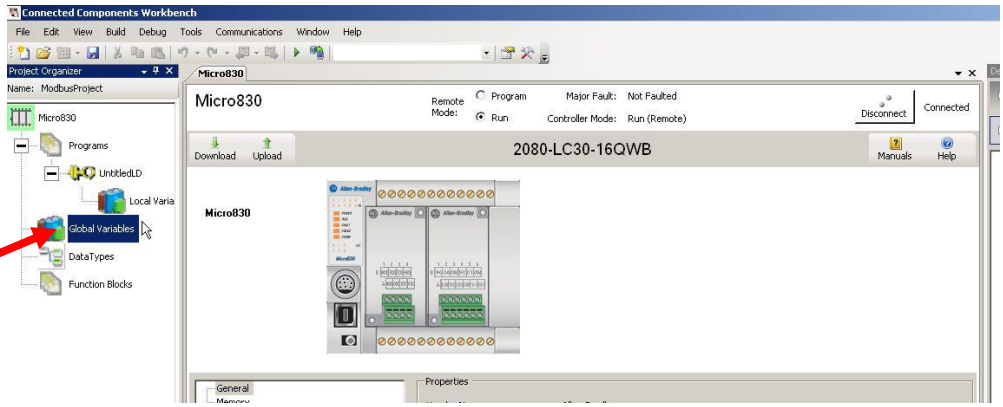
Debugging Global Variables via Connected Components Workbench

With the aid of the debugging tool, we can simulate actual process conditions. Debug mode gives us the capability to modify the Modbus Tag values live in runtime.

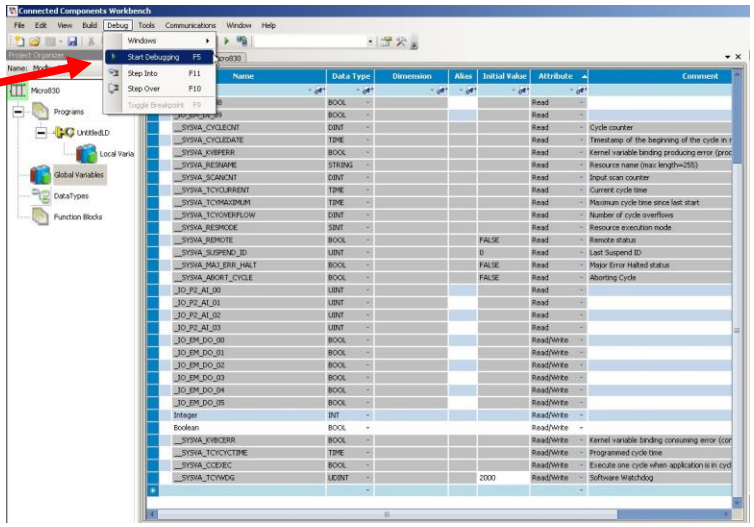
STEP #1 — Connect the Verbatim Gateway to your PLC via the 515VAB-ENI cable. The eight-pin mini DIN connector end will plug directly into the embedded non-isolated serial port of your Micro800™ PLC. The opposite end (RJ45) connects to the Verbatim Gateway.

STEP #2 — We must first be online with our project, in RUN mode and have executed a BUILD (i.e., compile) to be able to start debugging.

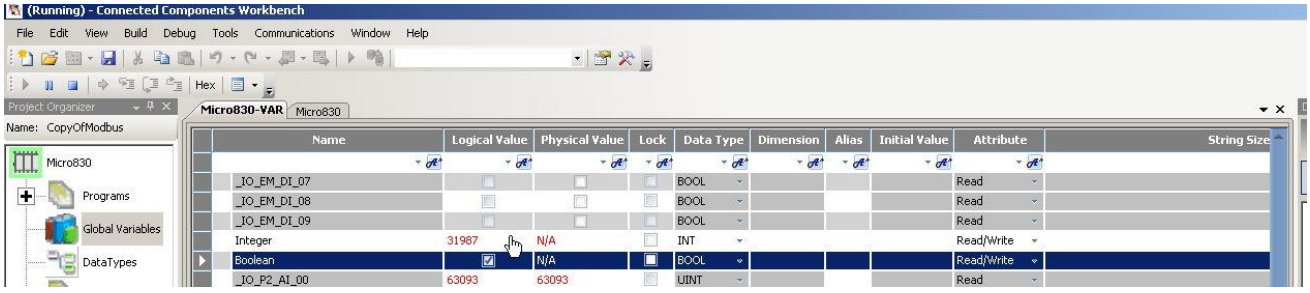
Double click the Global Variables Icon in the Project Organizer tree.

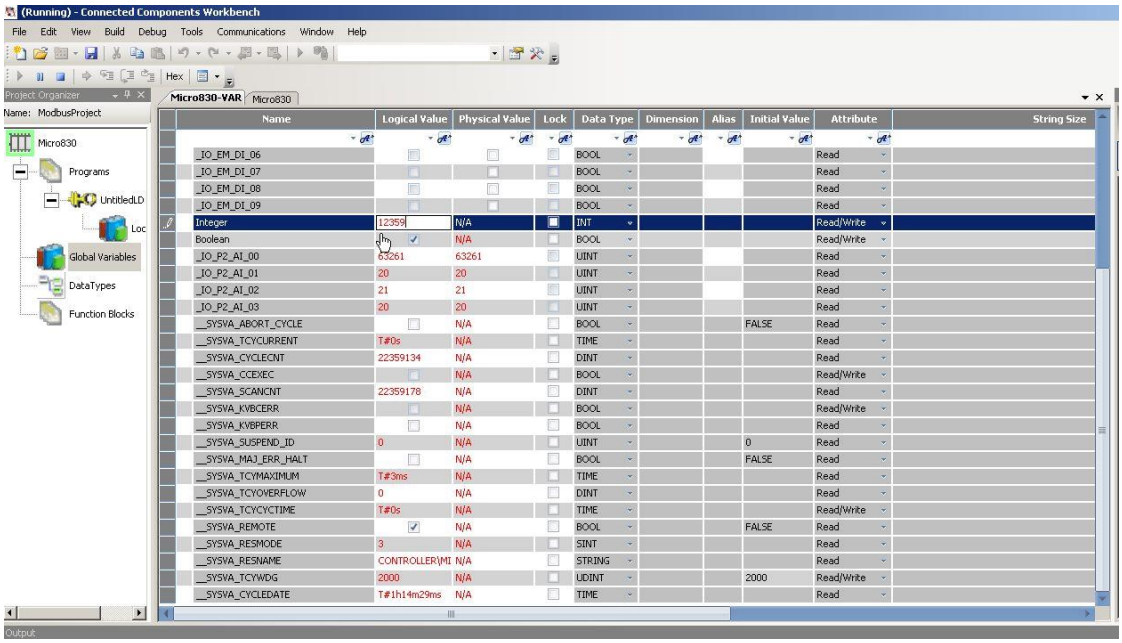


STEP #3 — Next, click Start Debugging.



STEP #4 — As you will find (below), both the current Integer and Boolean tag values are present. One can easily modify these values. Simply click edit for the Logical Value of the tag you wish to edit.





STEP #5 — At this point, you should be able to both READ and WRITE to your programmed tags.

Should your Verbatim Gateway be configured for call-outs, going online with your Micro800PLC via Connected Components Workbenchsoftware and “Debugging” Global Variables is an ideal means for simulating conditions that will trigger alarms or messages.

REMOTE ALARMS AND CONTROLS

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