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RACO®
REMOTE ALARMS AND CONTROLS
Catalyst®

Rockwell Automation
Encompass™ Product Partner
Americas

TECH NOTES-101

Integrating RACO® Catalyst® and Allen-Bradley® MicroLogix™ via Modbus over RS485

This technical note explains how to interface the RACO Catalyst system with many of the Allen-Bradley MicroLogix family of PLCs. This allows the Catalyst to perform its alarm notifications and data logging functions using the existing wiring to Allen-Bradley MicroLogix as inputs via data communications.

RS485 networks are preferred over RS232 when required to communicate multiple slaves (i.e. PLCs). They also have a greater immunity to noise, thus allowing for significantly longer cable length and faster communication speed. The following components are required:

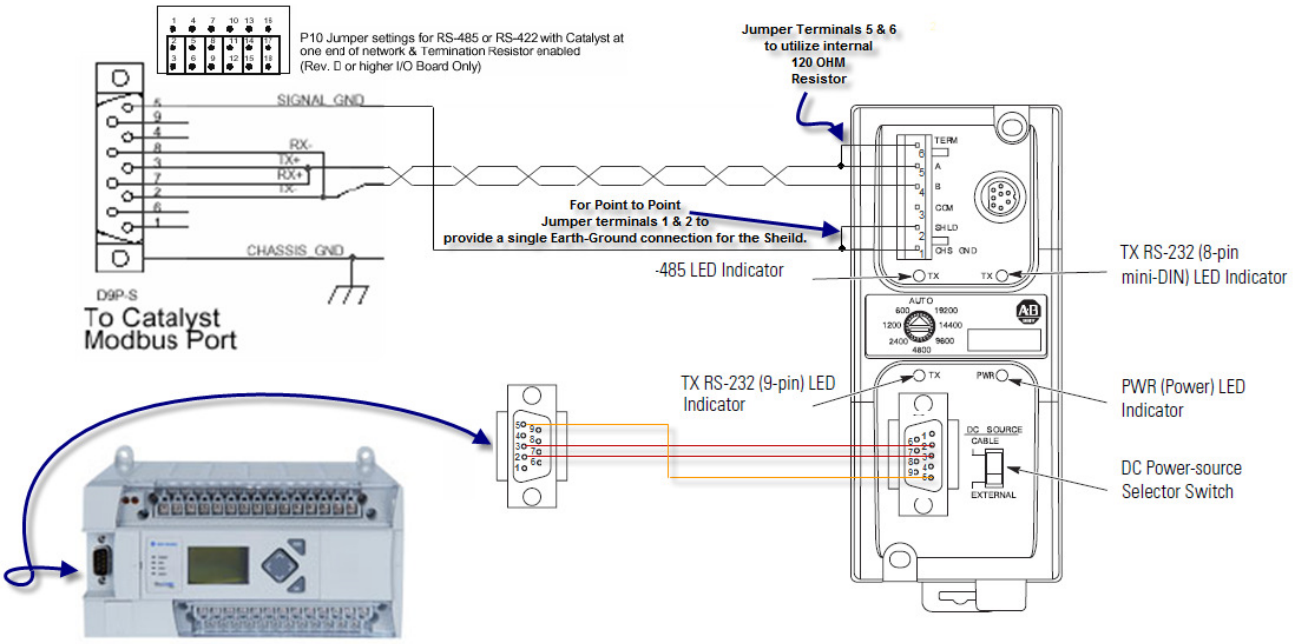
RACO-supplied components:
Catalyst (C10-S-020-1450, C10-1-020-1450, C10-2-020-1450 models)
Alarmware Software version 1.87
707CAT-PC15 Cable (Qty-2)

Allen-Bradley-supplied components:
MicroLogix PLC as listed in the table below
1761-NET-AIC
RSLogix™ 500 software version 8.10.00
1761-CBL Cable

The table below lists the MicroLogix PLCs containing a native *Modbus RTU Slave* driver.

Modbus RTU Slave Driver is available within the following MicroLogix^{M} PLCs	
Model #	Series #
1100	A & B
1200	A & B & C
1400	A
1500 LSP	B & C
1500 LRP	B & C

Connecting Catalyst to MicroLogix PLC through an AIC Module



When setting up Modbus RTU Master / Slave over an RS485 network, provide a three-wire cable (twisted pair) to connect back to the Allen-Bradley Advanced Interface Converter. (1761-NET-AIC)

External +24 vdc power is recommended and either a Simple NULL Modem cable (as illustrated) or use the Allen-Bradley 1761-CBL cable to plug to the round 8-pin mini DIN receptacle, to connect between the PLC and AIC unit. Configure as per the illustration above.

Ensure the P10 Jumpers are set for RS-485 on Catalyst main board.

Communication Setup for the Allen-Bradley MicroLogix

In addition to cabling and interface setup, parametric changes are required within RSLogix 500 and Alarmware® to synchronize the Modbus Drivers.

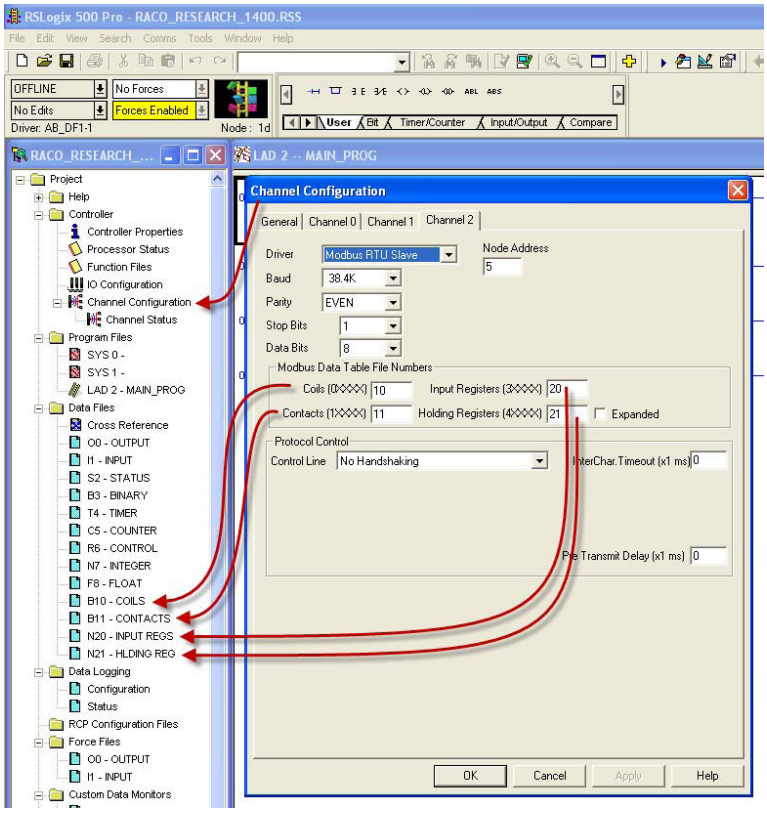
When configuring communications for the Allen-Bradley, a communication cable and either the RSLogix 500 or RSLogix Micro software is required.

STEP #1 — Connect your MicroLogix to your PC using the required 1761-CBL cable
This cable connects to Channel 0 in the MicroLogix, where the DF1 Full Duplex driver by default is ready to communicate to your RSLogix 500 software.

STEP #2 — Launch RSLogix™ 500 Software

STEP #3 — Set Communications Driver to Modbus RTU Slave
Open the Channel Configuration form and select an available channel other than Channel 0, where possible.

Caution: It is not recommended to configure communications to Modbus should your PLC have only a single communications port, as Channel 0 should remain available to RSLogix 500 software for program upload / download and monitoring.



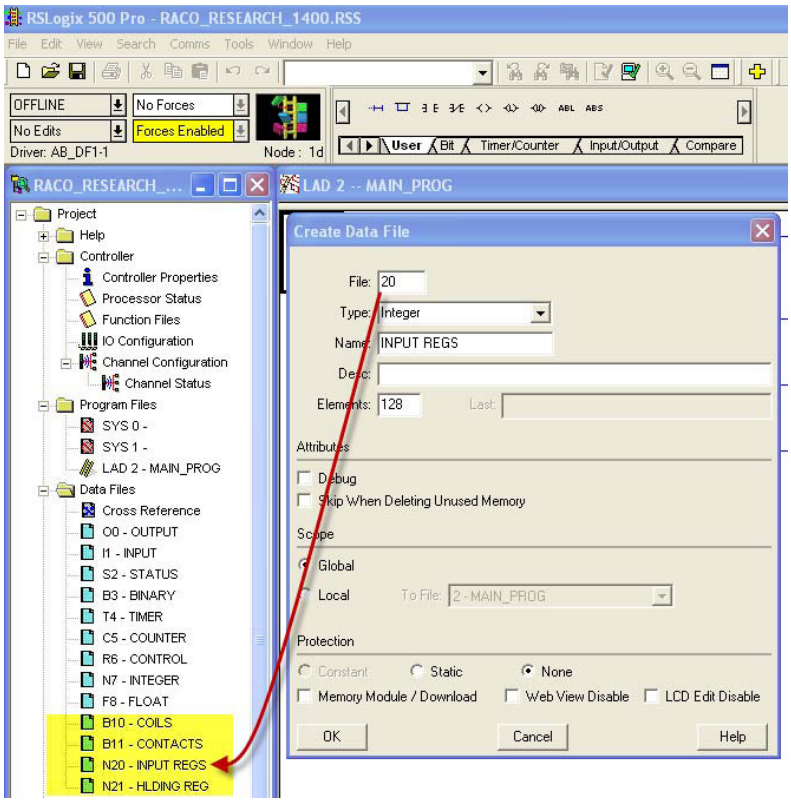
As shown at left, the Channel Configuration form has four tabs: General, Channel 0, Channel 1 and Channel 2. Since we will reserve Channel 0 for RSLogix 500 software, we will select the Channel 2 tab. (Select Channel 1 if Channel 2 does not exist.) Once the Driver field is clicked, a drop-down menu of driver choices will be visible. Select Modbus RTU Slave, as shown.

Next, select a unique Node Address. Catalyst default is 1, so anything other than 1, up to 256, is acceptable. Both the Baud rate and parity should match with the Catalyst.

RACO recommends the following:

- Baud rate = 19,200
- Parity = EVEN
- Stop Bits = 1
- Data Bits = 8
- Control Line = No Handshaking

STEP #3 — Select PLC Data Files



Available file numbers are 3, 7 and 9–255. When selecting the data files, ensure that they exist. If the files do exist, ensure the elements within the file exist, and are not being utilized elsewhere in your program.

In the example at left, new data files were created and named exclusively for Modbus communications (highlighted in yellow).

Once a file number has been assigned, select the data type. Type the name you wish to call the file in the name field. Our name follows the assignment as per Modbus. (See Table #1.)

MicroLogix only allows Binary or Integer type data files to be linked to the Modbus convention. Floating point files are not currently accepted. (i.e. 5xxxx)

In our example, 128 elements were selected. In the case of both “Coil number” and “Contact number,” where address is only a single bit, this translates to 2,048 available addresses (i.e. 128 * 16 bits).

In the case of “Input Register number,” 128-16 bit integer addresses were available.

In the case of “Output Register number,” 128-16 bit integer addresses are available.

Note: Although we have assigned data tables 128 words in length, we are bound to the number of channels on the Catalyst end. Please refer to model numbers listed above to select a unit with the desired number of channels to suit your application.

Upon completion of your data file assignment you are ready, at the Allen-Bradley end, to communicate.

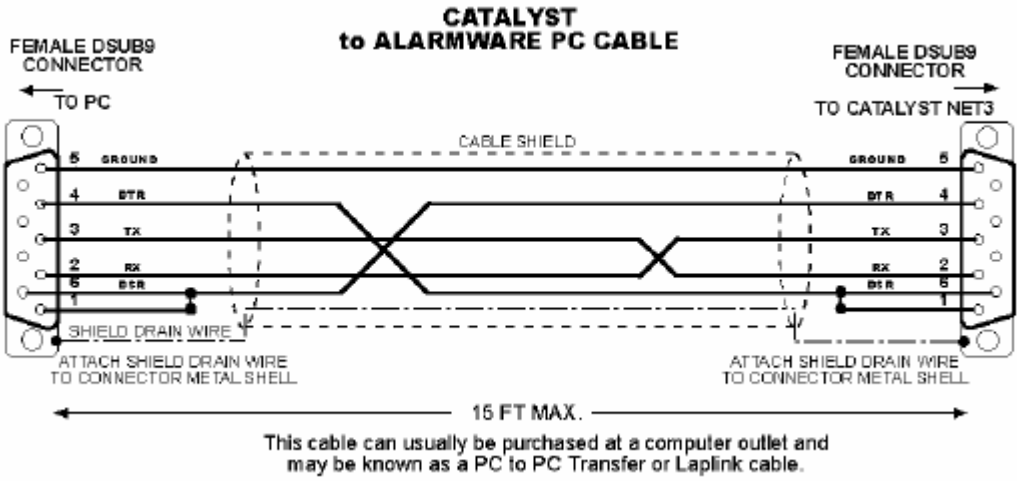
Communication Setup for the RACO Catalyst

STEP #1 — Launch Alarmware for Catalyst 1.87
Alarmware for Catalyst version 1.87 software.

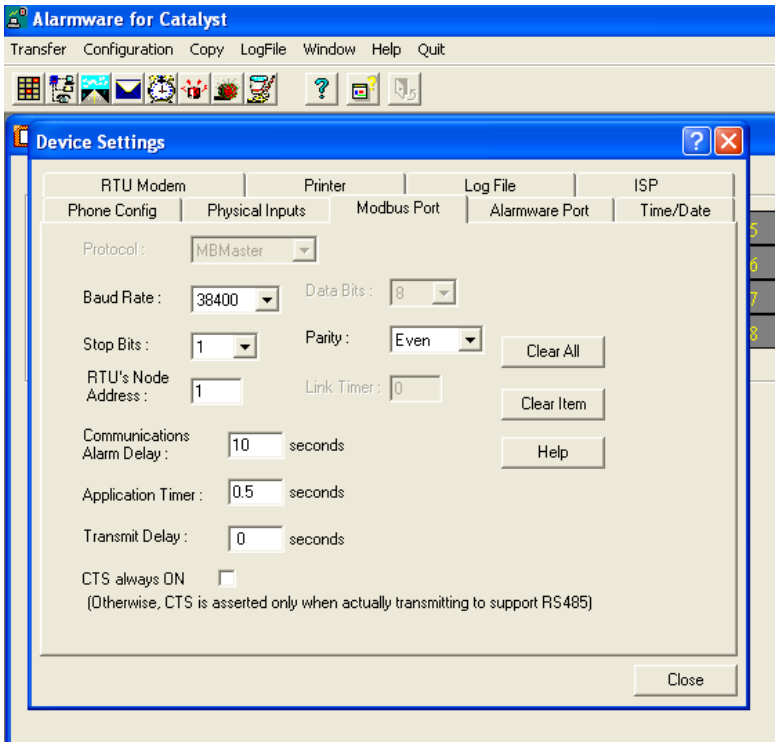
STEP #2 — Connect Catalyst to PC
The Catalyst to Alarmware PC cable is required. (See below for pin-out.)

The Alarmware and cable are normally supplied with a new Catalyst. RACO cable part number 707CAT-PC15 (15-foot length).

Once connected to the Catalyst via Alarmware, we are ready to configure the necessary parameters for communication.



STEP #3 — Modify Device Settings in Alarmware



Open Alarmware and go to “Devices” via “Configuration.”

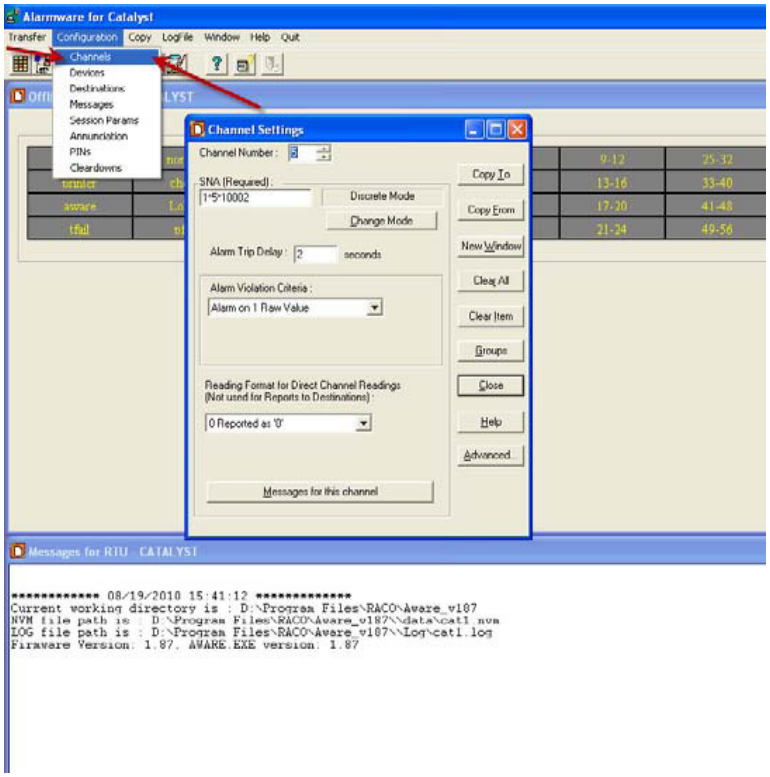
Once open, click the “Modbus Port” tab. Configure the Modbus parameters beginning with the Baud Rate. Select the speed best suited for your application.

In this case, we have chosen the fastest available at 38.4K baud. The default Stop bits is 1 and Parity should be “Even.”

Next, select a Node address. Default is 1.

Do not check the “CTS always ON” box, as we do not require handshaking in this setup.

STEP #4 — Modify Channel Settings in Alarmware



Finally, we will configure the Channel settings. As illustrated on left, first select “Configuration” then select “Channels.”

Up to 256 remote channels are available (i.e. 1–256), depending on the Catalyst model you choose.

For the purpose of illustration, we have selected Channel Number 5. Next, we need to choose a mode (i.e. either Discrete or Analog). This is done via SNA.

Enter the SNA as described below and then follow procedure to complete the Channel settings.

TABLE #1

Register Address	Description	Size/Limitation	Catalyst SNA
0xxxx	Coil number xxxx	1-bit	1*node*0xxxx
1xxxx	Input number xxxx	1-bit	1*node*1xxxx
3xxxx	Input register number xxxx	16-bit	1*node*3xxxx
4xxxx	Output register number xxxx	16-bit	1*node*4xxxx
5xxxx	Floating point register	32-bit	1*node*5xxxx
Note: The 5x and 4x references share the same data space. That is, an address of the form 5nnnn takes the 32 bits beginning at location 4nnnn and extending through 4nnnn + 1. These 32 bits are then interpreted as IEEE floating point number.			

Important: Catalyst Modbus SNA addresses begin with the number 1

Table #1 illustrates the Modbus data file convention within the Catalyst and the link to PLC via SNA (Source Net Address).

Important:
Although Holding Registers are not currently applicable to MicroLogix, it should be noted that Output Register (4xxxx) and Holding Register (5xxxx) data types use the same data area at the Catalyst 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 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, 2nd address point 30003, 3rd address point 30005, etc.

Constructing the SNA (Source Network Address)

The SNA is comprised of Net / Node / Address.

Net: This is either a 0 or 1.
- 0 when using local physical I/O
- 1 when using remote PLC I/O

Node: This is the node address of the PLC we wish to communicate.
(In this tech note we have configured our MicroLogix to have a Node address of 5.)
Address: Points to the Modbus address mapped to the PLC (i.e. remote device).

The following two examples construct the SNA for both a discrete and analog PLC point as per file assignment illustrated in this Tech Note.

Example #1
To configure a channel to communicate to B10:0/0, set the SNA as follows: 1*5*10001

Example #2
To configure a channel to communicate to N21:0, set the SNA as follows: 1*5*40001

Once channels are configured, they are ready to be assigned to your project, typically linked to Alarms and Messages.

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