

Out of the Box: MicroLogix 1100 Setup for Modbus RTU with Universal Expansion Modules and Serial Base

Applies To

Rockwell Automation, Allen Bradley:

- MicroLogix 1100

FreeWave Technologies:

- IOE-X-4422PC
- IOE-X-4422P

Summary

This application note describes how to configure Allen Bradley MicroLogix 1100 programmable logic controllers (PLC) for the very first time and establish communications with Modbus RTU to FreeWave Technologies' Serial Base with Expansion Modules. A MicroLogix 1100 is used as an example in this document; settings are common to all Allen Bradley PLC's with Modbus RTU.

The configuration software used in these instructions, RSLogix Micro English, is a free software package provided by Rockwell Automation. RSLogix works with MicroLogix 1000 and 1100 PLC's only. If your application involves other Allen Bradley PLC's you must use the appropriate RSLogix software program.

Download and Save Necessary Files

Tool Suite is FreeWave's radio and I/O device configuration software. Download the Tool Suite installation package and save it somewhere easy to find.

- Available at http://www.freewave.com/phpscript/FreeWaveToolSuite_download3.php

Ladder logic files contain the instructions for the PLC to execute. Download FreeWave's sample ladder logic file for Modbus and save it somewhere easy to find.

- Available at <http://www.freewave.com/files/FreeWave-Ladder-Sample-Modbus-Read.zip>

RSLogix allows users to create and download ladder logic files for Rockwell PLCs. RSLinx allows users to connect, communicate and configured Rockwell PLCs. Download Rockwell's software installation package for both programs and save it somewhere easy to find.

- Available at http://files.rockwellautomation.com/Public/RSLogixMicroLite_Linx.zip

Install Tool Suite, RSLinx and RSLogix

Follow these steps to install Tool Suite:

1. Open FreeWave's software installation package, "ToolSuiteWebInstall.exe"
 - i. Use default settings for quick installation

Follow these steps to install RSLogix.

1. Open Rockwell's software installation package, "RSLogixMicroLite_Linx.zip"
2. Open the "RSLogix_En" directory
3. Run "setup.exe"
 - i. Use default settings for quick installation

Follow these steps to install RSLinx:

1. Open Rockwell's software installation package, "RSLogixMicroLite_Linx.zip"
2. Run "autorun.exe"
3. Click "Optional Steps" from the splash page

Out of the Box: MicroLogix 1100 Setup for Modbus RTU with Universal Expansion Modules and Serial Base

4. Click "Install RSLinx Classic Lite"
 - i. Use default settings for quick installation

Configure the Serial Base and Expansion Modules (Tool Suite)

Up to 15 Expansion Modules can be stacked on a Serial Base. The following steps provide an overview of the configuration procedure for the Serial Base with stacked Expansion Modules:

1. Stack as many Expansion Modules (IOE-X-4422P) on the Serial Base (IOE-X-4422PC) as necessary for the application.
2. Connect the expansion stack to a computer with the data cable provided.
3. Power the expansion stack with a power supply within the specific voltage range.
4. Run Tool Suite
5. Click "Configuration" to open the application
6. Press and hold the button on the data cable until the "P" light flashes green.
7. Change the following settings in the Serial Base:
 - i. Stack Settings:
 - i. Serial Protocol: RS-232
 - ii. Port Speed: 19,200
 - iii. Parity: None
 - iv. Stop Bits: 1 bit
 - v. Modbus ID: 2
8. Press the write "All" button for settings on the Serial Base to take effect.

Power the PLC

Power the PLC with the appropriate power supply. Consult the PLC's manual to determine whether it requires 12Vdc, 24Vdc, or 110Vac.

Connect to the PLC's Serial Port (RSLinx)

The MicroLogix 1100 comes from the factory setup by default with DF1 as the default configuration interface on the serial port. Follow these steps to communicate with the device.

1. Connect one end of the 1761-CBL-PM02 cable to the PLC
2. Connect the other end of the PM02 cable to a serial port on the computer/laptop
3. Open RSLinx
4. Click the "Communications" tab and select "Configure Drivers"
5. Configure the serial port driver:
 - i. In the "Available Drivers" window, select "RS-232 DF1 Devices" and then click on the "Add New..." button
 - ii. Enter a new name for the driver or leave as "AB-DF1-1" and click "OK."
 - iii. Select the communication settings:
 - i. Com Port: select the physical port to which the PLC is connected
 - ii. Device Type: SLC-CH0/Micro/PanelView
 - iii. Baud Rate: 19,200
 - iv. Parity: None
 - v. Stop Bits: 1
 - vi. Error Checking: CRC
 - vii. Protocol: Full Duplex
 - iv. Select "OK"
6. Open RSWho:
 - i. Click the "Communications" tab and select "RSWho"
7. In the left window, click on the DF1 driver

Out of the Box: MicroLogix 1100 Setup for Modbus RTU with Universal Expansion Modules and Serial Base

8. The MicroLogix should show up in the right window box

Configure the PLC's Ethernet Port (RSLogix)

When the application is running, the serial port of the PLC will be running as a Modbus RTU Master port. In order to maintain a connection to the PLC you will need to establish an Ethernet connection to the PLC. To do this first connect via DF1 to configure the channel 1 (Ethernet) port. To do this:

1. Open RSLogix Micro English
2. Connect to the PLC in RSLogix:
 - i. Click on the "Comm" button (middle top of the screen) and select "Who Active Go Online"
 - ii. A Communications box will open
 - i. In the left column select the DF1 driver
 - ii. In the right window, select the PLC and click "OK"
 - iii. A window might appear with several option buttons on the right, select "Create New File"
 - iv. The controller's file will be uploaded and you should be online with the controller
3. Configure the PLC's Ethernet port:
 - i. Once online with the controller, in the left column, under the controller tab, double click "Channel configuration" to open
 - ii. Choose the "Channel 1" tab.
 - i. Uncheck "BootP Enable"
 - ii. Set the IP address to 192.168.1.5 and the subnet mask to 255.255.255.0
 - iii. Click the "OK" button and "Apply" from the dialog box that appears

Configure the Computer/Laptop's Ethernet Port

If the computer you are using is already connected to an Ethernet network, physically disconnect the computer from the network to prevent IP address conflicts. Be sure to use a physical LAN connection instead of a wireless one.

Follow these steps to configure the computer/laptop settings for communications with the PLC:

1. Click the Windows "Start" button.
2. Right-click "My Network Places" and select "Properties"
3. In the new window that opens, right-click "Local Area Connection" and select "Properties"
 - i. Select the entry for "Internet Protocol (TCP/IP)" and click the "Properties" button
 - i. Select "Use the following IP address:" and enter the following information
 1. IP Address: 192.168.1.1
 2. Subnet mask: 255.255.255.0
 - ii. Click "OK" to close the Internet Protocol Properties window
 - ii. Click "OK" to close the Local Area Connection Properties window
 - iii. At this point the computer will no longer be connected to the internet.

Connect to the PLC's Ethernet Port (RSLinx)

Programming the controller will occur through the Ethernet port now that it is configured.

1. Connect one end of a network cable to the PLC
2. Connect the other end of the network cable to the computer/laptop
3. Open RSLinx
4. Click the "Communications" tab and select "Configure Drivers"
5. Configure the Ethernet port driver:
 - i. In the "Available Drivers" window, select "Ethernet devices" and then click on the "Add New..." button
 - ii. Enter a new name for the driver or leave as "AB-ETH-1" and click "OK."

Out of the Box: MicroLogix 1100 Setup for Modbus RTU with Universal Expansion Modules and Serial Base

- iii. In the "Station Mapping" window, in the "Host Name" window, type 192.168.1.5
- iv. Click "OK"
6. Open RSWho:
 - i. Click the "Communications" tab and select "RSWho"
7. In the left window, click on the Ethernet driver
 - i. The MicroLogix should appear in the right window box
8. It may be necessary to cycle power on the PLC for the Ethernet settings to take effect.

Load the Sample Ladder File (RSLogix)

Follow these steps to load the sample ladder logic file. The sample logic file reads the input read-only coil at address 2 from the device at Modbus ID 2.

1. Connect to the PLC's Ethernet port with RSLogix:
 - i. Click on the "Comm" button (middle top of the screen) and select "Who Active Go Online"
 - ii. A Communications box will open
 - i. In the left column select the Ethernet driver
 - ii. In the right window, select the PLC and click "OK"
 - iii. Several windows may appear once the PLC is connected:
 - i. Click "No" when asked if you want to save changes
 - ii. Select "Create New File" when asked what to do with PLC configuration
 - iv. The controller's file will be uploaded and you should be online with the controller
2. Open the sample ladder logic file:
 - i. From the "File" button, select "Open" and open the sample configuration file.
 - ii. You will be prompted to confirm that you want to close the existing program. Select "Yes" You will then be asked if you want to save the current file. Select "No."
 - iii. The sample ladder logic file will open.
3. Program the PLC
 - i. In the upper left of the screen, there is a pull down box that should read "OFFLINE". Click on the pull down box and select "download".
 - ii. You will be asked if you want to proceed, select "Yes."
 - iii. The program will load and a warning box may appear saying "COMMUNICATIONS CONFIGURATION IS DIFFERENT" with "Apply" and "Don't Apply" buttons. Select "Apply".
 - iv. From the same pull down box, now select "Go Online".
 - v. That box should now read "REMOTE PROG".
 - vi. Click on the pull down box and then "Run".
 - i. The PLC should now be running the logic
4. Connect the PLC to the Serial Base and Expansion Modules
 - i. Connect the female DB9 connector on the PM02 cable to the male connector on the ASC3610CP data cable.
 - ii. Connect the 10-pin data connector on the ASC3610CP data cable to the top module in the Expansion stack.
 - iii. Connect the power supply to the barrel connector on the ASC3610CP data cable.

Confirm Communications Between PLC and Serial Base

The PLC should communicate with the Serial Base.

If "FreeWave" is not displayed on the LCD screen:

1. Press the "Escape" button to get to the menu screen
2. Press the down arrow until "User Displ" is selected

Out of the Box: MicroLogix 1100 Setup for Modbus RTU with Universal Expansion Modules and Serial Base

3. Press "OK"
 - i. You should now see the text "FreeWave" and a counter that displays "+00000"

If there is no communication between the PLC and Serial Base:

1. Press the up arrow once
 - i. Upon incrementing the counter to "+0001" communication will begin

If there is no communication between the PLC and Serial Base, double check all connections and that devices are powered.