PROTOS X CONFIGURATION

CHAPTER
4

In This Chapter...
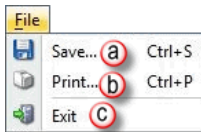
Protos X Software Configuration Tool (PG-CFGSW)

The PX-CFGSW software configuration tool is used to identify the Modbus addressing, Modbus function codes, and change some of the bus coupler settings. The software tool is a free download from our website or it can be purchased separately on a USB thumb drive.
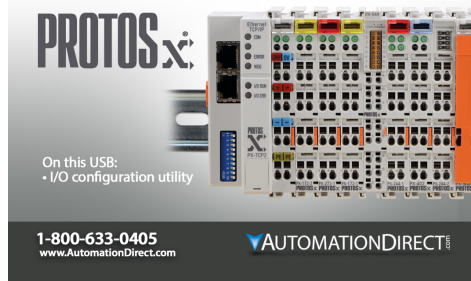
The Protos X configuration software is a very simple tool to easily manage connections to the Protos X hardware. When the software opens, the Main Screen will have everything you need. The Main Screen graphic below provides a quick overview of the features included with the Protos X configuration software.


a. Displays the **Slot** where the **Terminal** is physically located in the discovered hardware.

b. Displays the **Part Number** for the detected **Terminal**.

c. Displays the **Terminal's Short Description** including the I/O or channel and voltage/current range.

d. Displays the **Terminal's Long Description** with more details.

e. Displays the **Modbus Address** for the bit and the word level.
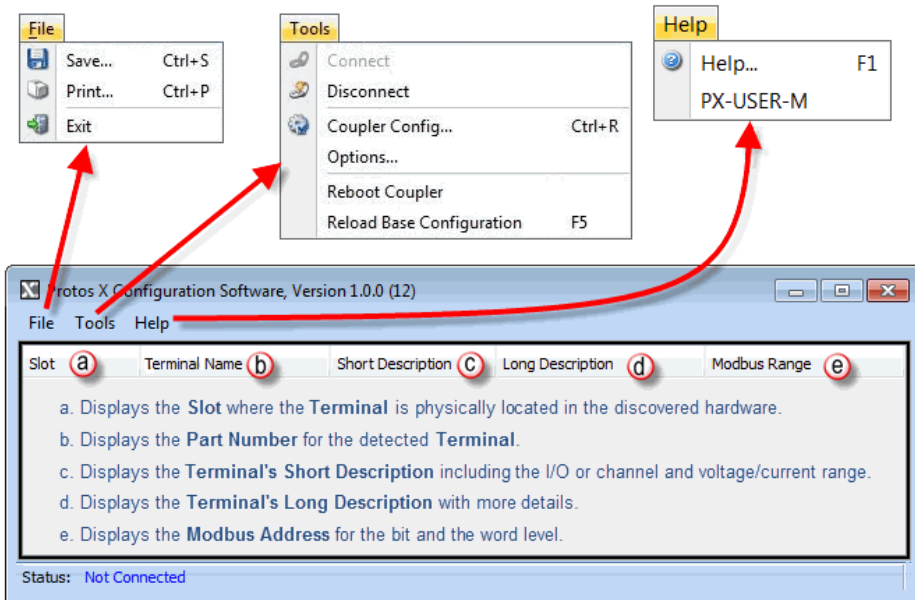
File Menu

a. **Save...** This selection or Ctrl+S, Saves a ".csv" (comma separated value) file containing information downloaded from the Bus Coupler. The file is Saved to a directory chosen by the user. This read only file containing Terminal and Addressing information can be viewed when opened using MS Excel®. This file cannot be used to load configuration data to a Bus Coupler.

b. **Print...** Selecting Print or **Ctrl +P**, prints the screen as it is viewed. Therefore, if all the Terminals are expanded, the Printout will include all the Terminals with the expanded view. If only one Terminal is expanded, the Printout will only include the expanded view for that Terminal.

c. **Exit** Choosing this selection Exits/Closes the Protos X configuration software.

Tools Menu
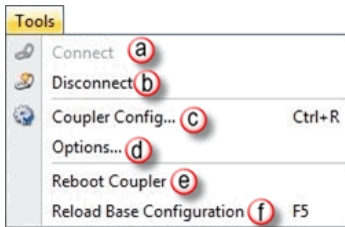
a. **Connect:** When the PX-USB-232 is connected to a Bus Coupler it is detected and the selection will become active. An inactive selection will look faded as seen in the Connection selection on the graphic above. When active, click on Connect to make a connection with the Bus Coupler.

b. **Disconnect:** Click to Disconnect the Configuration Software from the Bus Coupler. The Configuration Software does not send/receive continual messages to/from the Bus Couplers. If a cable has been removed or communications has been interrupted, you may have to reconnect to the Bus Coupler.

c. **Coupler Config...:** This selection opens the Coupler Configuration window. The Coupler Configuration dialog will vary depending on the Bus Coupler you are connected to (Serial or Ethernet.)

Note: The rotary switches on the PX-MOD should be set to " 00 " for the Configuration Tool to connect.

1. Ethernet Connection (See boxes on following page): If connected to the Ethernet Bus Coupler, the configuration window will allow you to view the MAC ID, change the Host Name, choose whether to manually assign an IP Address or choose the BootP or the DHCP option for IP Address assignment. If you choose to manually assign the IP Address, you can enter the IP Address, Subnet Mask, and the Gateway, if your network has one. The first three octets of the IP Address will be assigned through the configuration software. The last octet must be set by the DIP switches on the Bus Coupler. The configuration software will display how the DIP switches should be set based on the Address that is entered into the address field. See the following DIP switch configuration example.

Tools Menu, (cont'd)

1

2
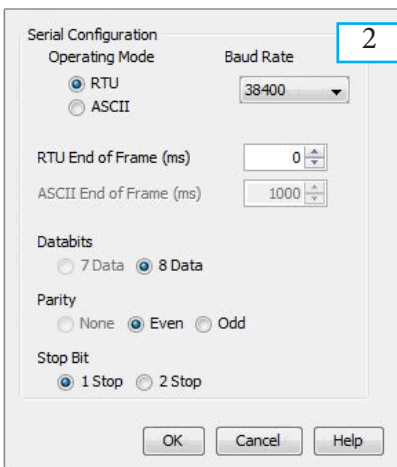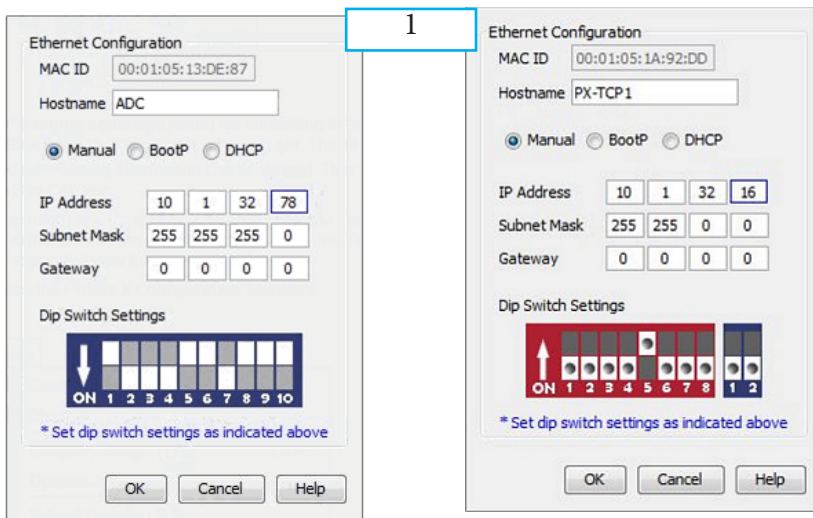
2. Serial Connection: If connected to the Serial Bus Coupler, the configuration window shown at left will allow you to select the operating mode (Modbus RTU or Modbus ASCII), baud rate, end of frame time (in milliseconds), data bits, parity, and stop bits (see box below). These settings should reflect the COM Port settings of the master device.
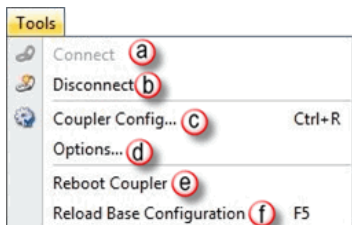
d. **Options**...: This selection opens the Options setup window. This dialog box is used for selecting the COM Port type and connecting to the Bus Coupler. The port settings are configured in the Coupler Configuration window and cannot be changed in this dialog.

Tools Menu, (cont'd)
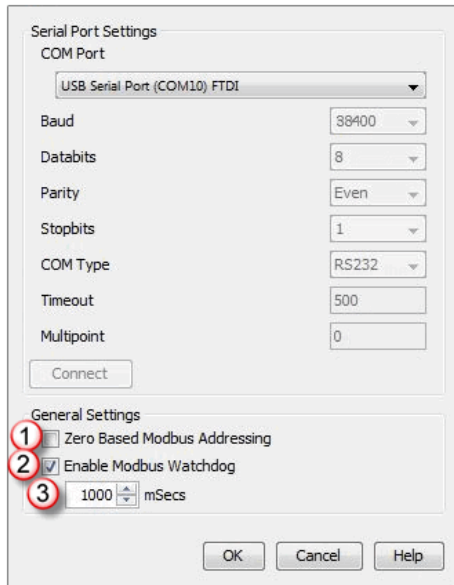
The General Settings portion of this window can be edited as follows:

1. Zero Based Modbus Addressing: You can choose to enable the Zero Based Modbus Addressing by clicking the checkbox. This will start the Modbus addresses at "0", or if not chosen they will start at "1".

2. Enable Modbus Watchdog: This option is checked by default. Click the checkbox to disable the Modbus Watchdog if needed. Setting this option will cause the Bus Coupler to fault after a set time period (in milliseconds), if there has been no Modbus communications. If Enable Modbus Watchdog is not checked and communications is lost, the Protos X outputs will remain in their last state.

3. Modify the Modbus Watchdog timeout period in milliseconds. Choose a value between 0–65535.

e. Reboot Coupler: Click on this selection to send a reboot command to the Bus Coupler so you can reset it without power cycling.

f. Reload Base Configuration: Click on this selection to reload the base configuration. This forces the Bus Coupler to read the configuration of the terminals within the assembly and reload the configuration based on the reading.

Help Menu
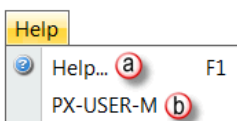
a.   **Help...** This selection opens the Help File.

b.   **PX-USER-M** Opens the User Manual.

Understanding the Protos X Configuration Software Tool

Once the Bus Coupler has been discovered by the software, all the information you need to identify the Modbus addresses of the I/O terminals will be displayed on the Main Screen of the Protos X Configuration Software. The Main Screen should look similar to the graphic below: Each column function is described in the following text.

a. Slot: Shows the physical location of the terminal in the discovered hardware. Slots are incremented from left to right.

b. Terminal Name: Displays the terminal part number.

c. Short Description: Displays a short description of the terminal including I/O or channel count and voltage/current range.

d. Long Description: Displays a more detailed and complete description of the terminal.

e. Modbus Range: Displays the Modbus address for the bit and word level.

Each terminal can be expanded to show the Modbus information in more detail.

a. **Expand (+) / Minimize (-)Symbol:** Use the (+) symbol to expand the terminal tree. When expanded, use the (-) symbol to collapse the terminal tree.

b. **Point:** Shows the points for this terminal.

c. **Short Description:** Shows the short description of the terminal type.

d. **Modbus Address:** Displays the Modbus addresses for each specific terminal by bit and word level.

e. **Modbus Access:** Shows the corresponding Modbus function codes that can be used to read from or write to the terminal.

Using the Configuration Software

These steps assume that the Protos X Configuration Software has been installed. To ensure proper operation of the configuration software once it has been installed, follow these steps:

1. Confirm that the PX-USB-232 configuration cable is properly connected to the USB port of your PC and the other end is properly connected to the Bus Coupler port.

2. Confirm that the Protos X Bus Coupler is powered up.

3. If properly connected, the green LEDs on the Bus Coupler and the cable will be illuminated. These LEDs indicate when there is power on the USB port and that the Bus Coupler the cable is plugged into is powered up.

NOTE: Some RS-485 devices on the PX-MOD 9-pin D-sub port may prevent comm to the programming port.
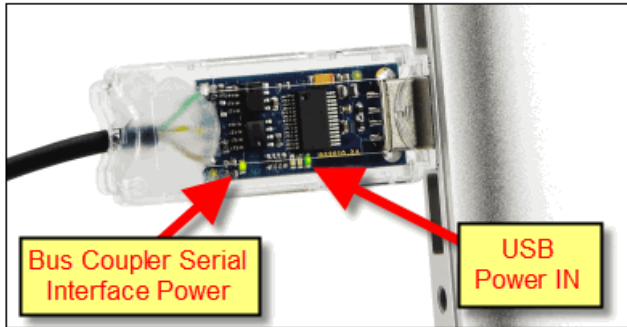
If the configuration software is not running, click the program icon (shown below) on your desktop to open the Software.
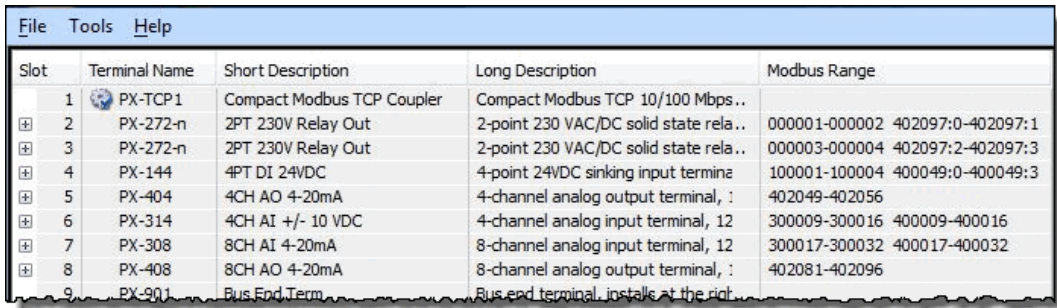
4. Once the configuration software opens, go to the Tools menu and select Connect from the drop down menu.
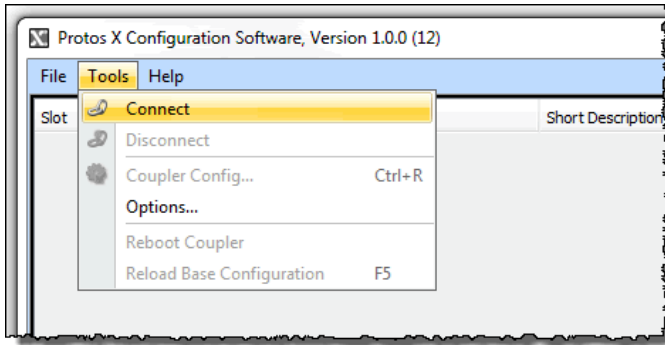
5. Once Connect is selected, the software should discover the Bus Coupler, read the I/O configuration and populate the Main Screen with information. It should look similar to the graphic shown below.

Slot	Terminal Name	Short Description	Long Description	Modbus Range
1	PX-TCP1	Compact Modbus TCP Coupler	Compact Modbus TCP 10/100 Mbps..	
2	PX-272-n	2PT 230V Relay Out	2-point 230 VAC/DC solid state rela..	000001-000002 402097:0-402097:1
3	PX-272-n	2PT 230V Relay Out	2-point 230 VAC/DC solid state rela..	000003-000004 402097:2-402097:3
4	PX-144	4PT DI 24VDC	4-point 24VDC sinking input termina	100001-100004 400049:0-400049:3
5	PX-404	4CH AO 4-20mA	4-channel analog output terminal, :	402049-402056
6	PX-314	4CH AI +/- 10 VDC	4-channel analog input terminal, 12	300009-300016 400009-400016
7	PX-308	8CH AI 4-20mA	8-channel analog input terminal, 12	300017-300032 400017-400032
8	PX-408	8CH AO 4-20mA	8-channel analog output terminal, :	402081-402096
9	PX-901	Bus End Term	Bus end terminal, installs at the righ	

Protos X Discrete and Analog I/O Mapping

Once the PX-CFGSW has been used to identify the Modbus addressing for the Protos X terminals in your assembly, you are ready to start reading and writing data from your Modbus controller to the Protos X Bus Coupler. Following is a description of the register mapping for the terminal I/O.

Discrete I/O

Discrete I/O can be read from or written to by using a bit level Modbus function code or a word level Modbus function code. In the following example for a relay output terminal (shown on top) you could use the function codes 1 (read coil status), 5 (force a single coil), or 15 (force multiple coils) to access the data of the relay output terminal at the bit level. You could also access the relay output at the word level by using the Modbus function code 3 (read holding register).

For the input terminal in the example below, Modbus function code 2 (read input status) can be used to read the input points at the bit level. At the word level, Modbus function code 4 (read input register) or Modbus function code 3 (read holding register) can be used.

Analog I/O

Analog terminals will always use word level Modbus read/write commands. Analog input terminals also have a Status register (1 byte) and a Data register (2 bytes). Analog output terminals have a Control register (1 byte) and a Data register (2 bytes). At this time, the Control Byte will not be used for the output terminals. The upper bytes of the Status and Control registers are not used but are consumed by the Coupler to make sure all registers are word aligned so data does not start in the middle of a word. In the following example, the analog output terminal registers will start at register 402049.

	3	PX-272-n	2PT 230V Relay Out		2-point 230 VAC/DC solid state relay output terminal,		000001-000002 402057:0-402057:1
Point				Short Description	Modbus Address	Modbus Access	
			1	2PT 230V Relay Out	000001	discrete output, function 1, 5 or 15	
			2	2PT 230V Relay Out	000002	discrete output, function 1, 5 or 15	
			1	2PT 230V Relay Out	402057:0	Packed output bits, function 3	
			2	2PT 230V Relay Out	402057:1	Packed output bits, function 3	
	4	PX-144	4PT DI 24VDC		4-point 24VDC sinking input terminal,		100001-100004 400009:0-400009:3
Point				Short Description	Modbus Address	Modbus Access	
			1	4PT DI 24VDC	100001	discrete input, function 2	
			2	4PT DI 24VDC	100002	discrete input, function 2	
			3	4PT DI 24VDC	100003	discrete input, function 2	
			4	4PT DI 24VDC	100004	discrete input, function 2	
			1	4PT DI 24VDC	300009:0	Packed Input bits, function 4	
			2	4PT DI 24VDC	300009:1	Packed Input bits, function 4	
			3	4PT DI 24VDC	300009:2	Packed Input bits, function 4	
			4	4PT DI 24VDC	300009:3	Packed Input bits, function 4	
			1	4PT DI 24VDC	400009:0	Packed Input bits, function 3	
			2	4PT DI 24VDC	400009:1	Packed Input bits, function 3	
			3	4PT DI 24VDC	400009:2	Packed Input bits, function 3	
			4	4PT DI 24VDC	400009:3	Packed Input bits, function 3	

Since the Control register will not be used, the output data can be written to the Data register using Modbus function code 6 (preset single register) or 16 (preset multiple registers).

2	PX-402	2CH AO 4-20mA		2-channel analog output terminal,		402049-402052
Point		Short Description	Modbus Address	Modbus Access		
		1 2CH AO 4-20mA	402049	Control, function 6 or 16		
		1 2CH AO 4-20mA	402050	Data, function 6 or 16		
		2 2CH AO 4-20mA	402051	Control, function 6 or 16		
		2 2CH AO 4-20mA	402052	Data, function 6 or 16		

The analog input terminals will have a Status register associated with each input channel. The Status register can be used to determine if there is an input fault and if it is an over-range or under-range error (see status word bit map below). The Modbus function code 4 (read input register) or 3 (read holding register) can be used to get data stored in the Status and Data words of the analog output terminal.

The PX-MOD will not have Status or Control registers associated with each channel's Data word. Analog Input and Output terminals will only consume two bytes (one word) per channel. PX-TCP1 and PX-TCP2 Analog Input and Output terminals will consume 8 bytes (4 words) per channel.

5	PX-332-n	2CH THM In		2-channel thermocouple input terminal,		300005-300008 400005-400008
Point		Short Description	Modbus Address	Modbus Access		
		1 2CH THM In	300005	Status, function 4		
		1 2CH THM In	300006	Data, function 4		
		2 2CH THM In	300007	Status, function 4		
		2 2CH THM In	300008	Data, function 4		
		1 2CH THM In	400005	Status, function 3		
		1 2CH THM In	400006	Data, function 3		
		2 2CH THM In	400007	Status, function 3		
		2 2CH THM In	400008	Data, function 3		

Analog Input Terminal Status Register Bit Mapping

To access the status bits use Modbus function code 4 (read input register) or 3 (read holding register) and use bit of word addressing or unpack bits from the word level to access the individual bits.

Bit		30005:6					30005:1	30005:0
Name		Error					Over range	Under range

Within these word locations, the individual bits represent specific information about the analog signal.

Analog Terminals

PX - 302
PX - 304
PX - 308

MSB   LSB

15 14 13 12 11 10 9 8 7 6 5 4 3   2 1 0

12 Bits (Bits 3 – 14) 0 – 4095

For inputs: The LSB will change but are not significant for analog calculations in the module.

PX - 402
PX - 404
PX - 408

MSB   LSB

15 14 13 12 11 10 9 8 7 6 5 4 3   2 1 0

12 Bits (Bits 3 – 14) 0 – 4095

For outputs: Changing the state of the LSB will not change the output value.

= Data format resolution

Analog Terminals

PX - 312
PX - 314
PX - 318

MSB   LSB

15 14 13 12 11 10 9 8 7 6 5 4   3 2 1 0

Bit 15 is +/-   Bits 4 – 14 = 0 – 2047

For inputs: The LSB will change but are not significant for analog calculations in the module.

PX - 412
PX - 414
PX - 418

MSB   LSB

15 14 13 12 11 10 9 8 7 6 5 4   3 2 1 0

Bit 15 is +/-   Bits 4 – 14 = 0 – 2047

For outputs: Changing the state of the LSB will not change the output value.

= Data format: 11 bit plus Sign bit