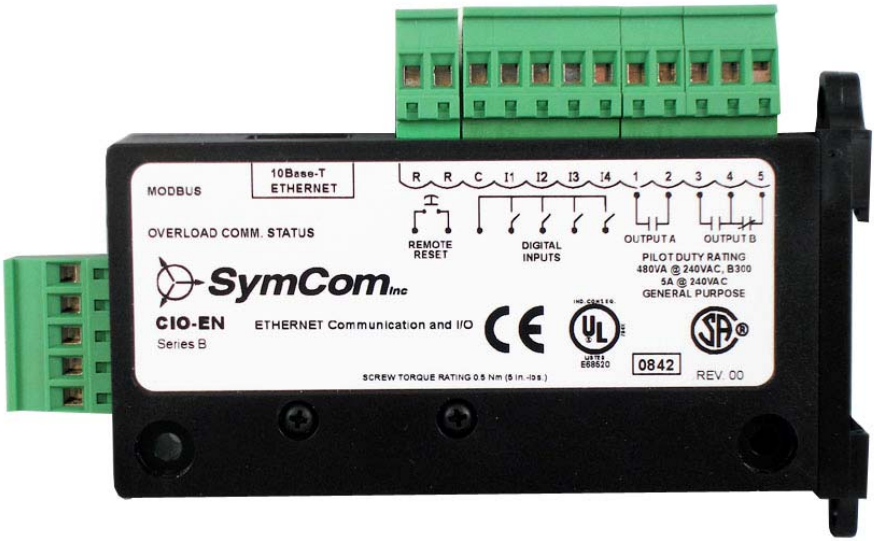
MODEL CIO-EN
MODBUS/TCP, MODBUS/RTU I/O MODULE



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DANGER!

HAZARDOUS VOLTAGES MAY BE PRESENT DURING INSTALLATION.
Electrical shock can cause death or serious injury.
Installation should be done by qualified personnel following all national, state and local electrical codes.

BE SURE POWER IS DISCONNECTED PRIOR TO INSTALLATION!
FOLLOW NATIONAL, STATE AND LOCAL CODES.
READ THESE INSTRUCTIONS ENTIRELY BEFORE INSTALLATION.

The CIO-EN Module is a convenient and cost-effective Modbus/TCP and Modbus/RTU interface capable of providing discrete control and monitoring of an overload relay over a Modbus network. The CIO-EN is designed to provide the following benefits in both new and existing installations:

- reduced field wiring
- greater operator efficiency
- ease in system startup and commissioning

The CIO-EN Modbus I/O Module provides four (4) inputs and two (2) AC/DC rated relay outputs. It can be DIN rail mounted or mounted directly to a back panel. The CIO-EN's compact size, ease of wiring, and Modbus communications capability makes the use of traditional discrete devices on Modbus cost-effective and simple. The CIO-EN Module is compatible with SymCom's Model 777-P and 777-P1 overload relays. It simply connects to the side of the 777-P/P1 and in addition to the extended I/O functions, permits remote monitoring and control of the 777-P/P1 over a Modbus network. An additional remote reset input is available on the CIO-EN to reset a connected 777-P/P1.

CONNECTIONS

1. Mount the CIO-EN in a convenient location in a properly rated enclosure. The module can be mounted to a back panel using screws or can be snapped onto a DIN rail.
2. For Modbus/RTU networks, connect the three Modbus wires (A, B, Shield) to the 5-pin connector on the front of the CIO-EN module. 24 VDC should be connected to V+ and V-.
3. For Ethernet, connect an Ethernet cable to the Ethernet jack on the top of the CIO-EN module.
4. **NOTE: CIO-EN Connections are dry contact inputs only.**

   CIO-EN Inputs (refer to Figure 1):

   Connect one side of each input contact to C and connect the other side to I1, I2, I3, or I4.
5. The MODBUS MODULE NETWORK STATUS LED indicates communication between the CIO-EN and a Modbus master. The OVERLOAD COMM. STATUS LED indicates communication between the 777-P/P1 overload.
6. The yellow LED on the Ethernet jack indicates the link between the CIO-EN and a computer/LAN network. The green LED on the Ethernet jack indicates network activity between the CIO-EN and a computer/LAN network.
7. OUTPUT A, OUTPUT B and the REMOTE RESET connections are made on the top green connector of the CIO-EN Module.

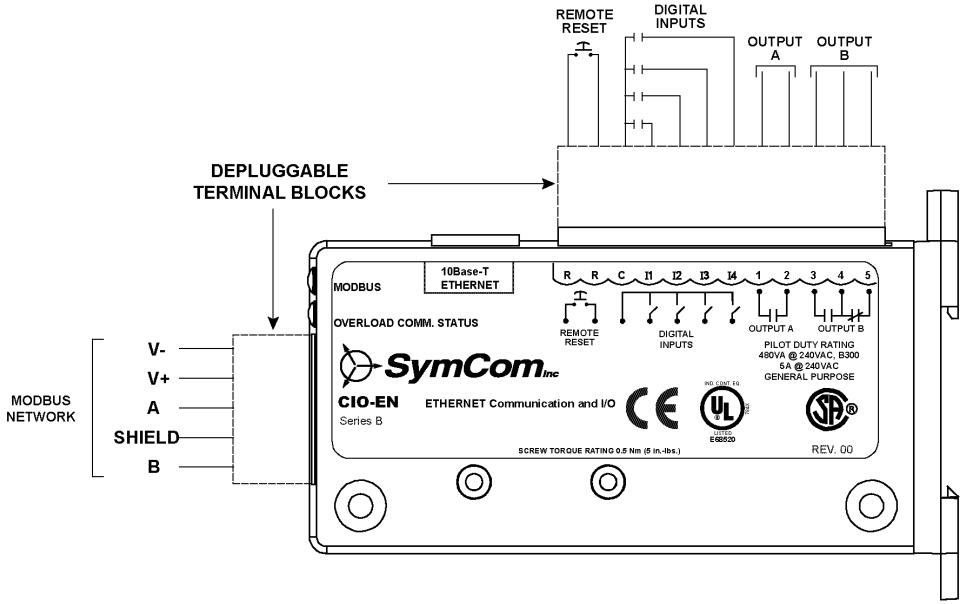

FIGURE 1: Typical Wiring Diagram (CIO-EN)

TABLE 1: CIO-EN Terminals

Terminal Designations	Function
V-	Ground Connection
V+	24 VDC Power Connection
A	RS-485 A Connection
SHIELD	Shield Connection
B	RS-485 B Connection
R	Remote Reset Switch
R	Remote Reset Switch
C	Input Common
I1	Input 1
I2	Input 2
I3	Input 3
I4	Input 4
1	Output A terminal 1
2	Output A terminal 2
3	Output B normally open
4	Output B common
5	Output B normally closed

DIAGNOSTIC INDICATOR LIGHTS (CIO-EN)

The unit is energized when 24 VDC is applied between V+ and V- on the 5-pin connector on the front of the CIO-EN module. The MODBUS MODULE NETWORK STATUS (MNS) LED and OVERLOAD COMM. (OLC) STATUS LED will flash until communication is established. The MNS LED indicates the state of an upstream Modbus connection to the module. The OLC LED indicates the state of the overload connection to the module. For a complete description of the indicator LED's see tables 2 and 3 below:

TABLE 2: MNS LED State Table

For this state:	LED is:	To indicate:
Not Powered	Off	The CIO-EN is not powered.
Upstream Modbus/RTU Comm. Operational	Green	The CIO-EN is communicating with an upstream Modbus/RTU device and the CIO-EN is powered.
Upstream Modbus/RTU Comm. NOT Operational	Flashing Green	The CIO-EN is powered but upstream communications are not established.

TABLE 3: OLC LED State Table

For this state	LED is:	To Indicate:
Not Powered	Off	The CIO-EN is not powered.
Overload Comm. Operational	Green	The CIO-EN is communicating with an overload device and the CIO-EN is powered.
Overload Comm. NOT Operational	Flashing Green	The CIO-EN is powered but overload communications are not established.

Note: When there is insufficient power, the CIO-EN will signal this by slowly flashing both LED's.

The CIO-EN Ethernet jack on top of the unit contains LED's to represent communication and activity over the network. Tables 4 and 5 describe the LED functions.

TABLE 4: Yellow Ethernet LED

For this state:	LED is:	To indicate:
No Link	Off	The CIO-EN is not connected to an Ethernet network.
Active Link	Solid Yellow	The CIO-EN is connected to an Ethernet network.

TABLE 5: Green Ethernet LED

For this state	LED is:	To Indicate:
No Network Activity	Off	The CIO-EN is not transmitting or receiving any data over Ethernet.
Network is Actively Operational	Green	The CIO-EN is transmitting or receiving data over Ethernet.

REMOTE RESET

The R terminals can be connected to a normally open pushbutton to remotely reset a connected 777-P/P1 overload.

MODBUS/RTU CONFIGURATION

Flexible Modbus/RTU addressing is enabled by default on the CIO-EN. This means that when the CIO-EN is connected and communicating to a 777-P/P1 overload relay, the CIO will automatically assume and keep the Modbus address of the overload. If the CIO-EN is used as a standalone device, its Modbus address is defaulted to 1.

MODBUS/RTU COMMUNICATIONS

The CIO-EN Module provides the ability to communicate with both an upstream device (Modbus/RTU master) and a 777-P/P1 (Modbus slave). In order to communicate with the CIO-EN via an upstream device such as a PLC, DCS, SCADA system or PC, an RS-485 network must exist between the upstream device and the CIO-EN. The upstream device must be connected to the CIO-EN using an 18-24 AWG shielded, twisted-pair cable connected to A, B, and Shield of the 5-pin connector on the front of the CIO-EN module. The CIO-EN can be programmed as device address 01-99 and can communicate at baud rates of 9600, 19200, 38400, and 57600. The default communications settings for the CIO-EN are:

- Baud Rate: 19200
- Parity: Even
- Modbus Address: Flexible when attached to overload; 1 when standalone

The CIO-EN simply connects to the side of a 777-P/P1 via the 9-pin D-SUB connector located on the side of the CIO-EN.

Note: Do not plug a modem or any other PC compatible device directly into the 9-pin D-SUB connector on the CIO-EN.

Terminating Resistors

The RS-485 network may require terminating resistors if the length between the CIO-EN and an upstream device exceeds 100 feet or if the twisted pair cable is in a noisy environment. When terminating resistors are required, 120Ω terminating resistors should be connected at both the CIO-EN (across A and B) and also at the upstream device (also across A and B). SymCom recommends that terminating resistors be used in all circumstances to optimize RS-485 signals.

Existing Network Installations

The CIO-EN can be added to a Model 777-P/P1 overload in an existing network. Flexible addressing is enabled by default; therefore, the CIO-EN will automatically assume the address of the 777-P/P1 upon being plugged into the overload.

Equipment Setup

1. Connect the CIO-EN to the Modbus network using the communication terminals on the front of the unit.
2. Check that the 24VDC power supply disconnect switch is ON and that 24VDC is present on the network cable (V+ and V- at any location).
3. Plug the 24VDC power supply into the correct terminals on the CIO-EN.
4. Connect the CIO-EN to the overload using the serial port on the side of the overload.
5. Power the overload.

Modbus/RTU Network Solutions Setup

1. Open Solutions
2. Click **Modbus/RTU** in the Select Network Connection Type box.
3. Ensure the network communication settings are correct, and the device connections are correct.

4. Right click the network window and select **Auto Detect for Units.** All units on the network will be automatically detected and should appear on the screen—click on a unit to view its properties.

   NOTE: If the unit does not appear on the screen, recheck the device connections and network communication settings. Reattempt to Auto Detect for Units.

ETHERNET CONFIGURATION

The default IP address for the CIO-EN is 192.168.50.1. However, flexible IP addressing is enabled by default on the CIO-EN. This means that when the CIO-EN is connected and communicating to a 777-P/P1 overload relay, the CIO-EN will automatically assume and keep the Modbus address of the overload as the last octet in its IP address. For example, if the CIO-EN is connected to a 777-P1 with a Modbus address of 29, the IP address will automatically become 192.168.50.29. Please note that the first three octets of the IP address (192.168.50) are not affected by flexible IP addressing.

ETHERNET COMMUNICATIONS

The CIO-EN Module is 10Base-T Ethernet compatible, meaning it is capable of transmitting data at a maximum rate of 10 Megabits/second. TCP/IP Protocols supported by the CIO-EN include:

- Modbus/TCP
- HTTP for an embedded webpage
- FTP for data logging
- ICMP (ping)
- DHCP for automatic IP assignment

The default Ethernet communications settings for the CIO-EN are:

- IP Address: 192.168.50.1 as standalone; 192.168.50.FLEX where FLEX = 777-P/P1 Modbus Address
- Subnet Mask: 255.255.0.0
- Gateway: 192.168.50.1
- DHCP: Disabled

Changing the Ethernet Configuration Settings

The Ethernet configuration settings can be changed at any time through the CIO-EN's embedded webpage (Figure 2). To access this webpage, simply type the IP address of the CIO-EN in the address bar of an Internet browser (i.e. http://192.168.50.1/) and click on *Configure*. The CIO-EN will ask for a user name and password.

The user name is: *admin*
The password is: *symcom*

Once the settings have been changed and saved, communications with the CIO-EN may be lost for a short period of time.

Ethernet configuration settings can also be easily changed using SymCom's Solutions Software.

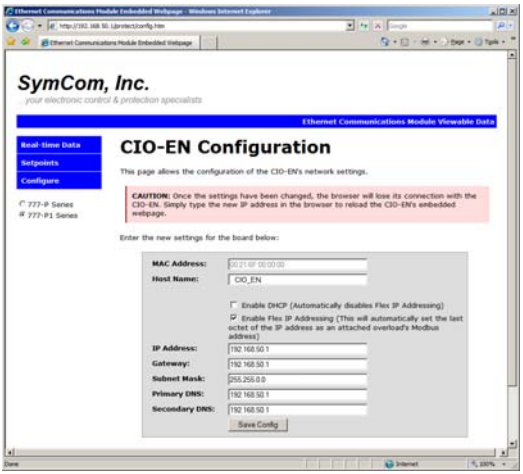

Figure 2 - CIO-EN Embedded Webpage

Modbus/TCP Network Solutions Setup

1. Open Solutions
2. Click **Modbus/TCP** in the Select Network Connection Type box.
3. Ensure the Ethernet network communication settings are correct, and the device connections are correct.
4. Right click the network window and select **Auto Detect for Units.** All units on the network will be automatically detected and should appear on the screen—click on a unit to view its properties.

   NOTE: If the unit does not appear on the screen, recheck the device connections and network communication settings. Reattempt to Auto Detect for Units.

PHYSICAL DIMENSIONS (CIO-EN)

All dimensions are in inches.

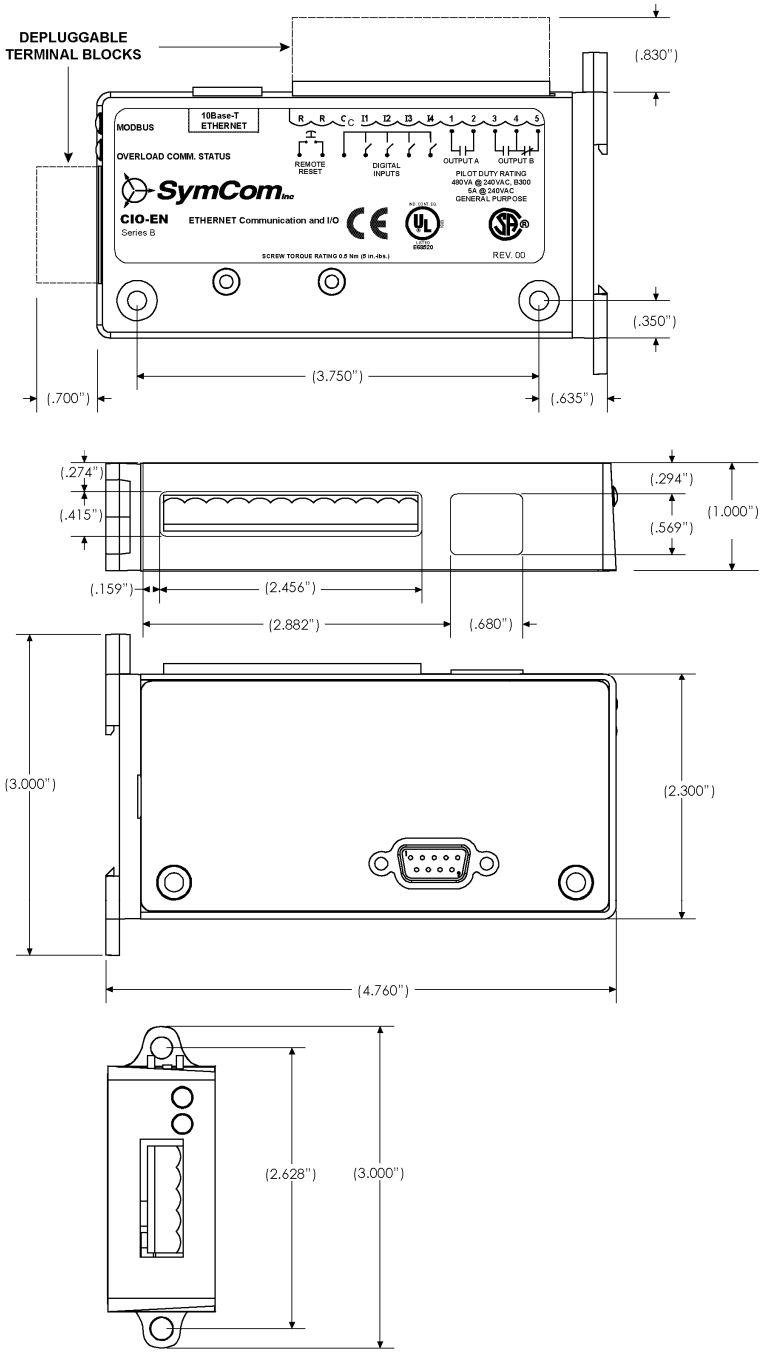

FIGURE 3: Physical Dimensions (CIO-EN)

TABLE 6: CIO-EN SPECIFICATIONS	
Ethernet Controller	
Compatibility	IEEE 802.3
Capability	10Base-T
Output Relay Contact Rating – SPDT (1), SPST (1)	
Pilot Duty	480VA @ 240VAC, B300
General Purpose	5A @ 240VAC
Inputs (4) – General Purpose	
Voltage Range	12–24VDC
Current	2mA (typical)
Remote Reset (for use with optional 777-P/P1 overload)	Normally open pushbutton rated 24VDC, 10mA (min.)
Power Requirements	
Voltage	24VDC (+/- 10%)
Current	95mA (max.) 70mA (typical)
Power	2.28 Watts (max.) 1.7 Watts (typical)
Weight	14 oz.
Enclosure	Polycarbonate
Terminal (depluggable terminal block)	
Torque	3 in.-lbs. (max.)
Wire AWG	12-20 AWG
Safety Marks	
UL	UL508 (File #E68520)
CSA	C 22.2
Standards Passed	
Electrostatic Discharge (ESD)	IEC 1000-4-2, Level 3, 6kV contact, 8kV air
Radio Frequency Immunity, Radiated	150 MHz, 10V/m
Fast Transient Burst	IEC 1000-4-4, Level 3, 4kV input power
Hi-Potential Test	Meets UL508 (2 x rated V +1000V for 1 minute)
Surge	Input Power – IEC 1000-4-5, Level 1 Inputs/Data Lines – IEC 1000-4-5, Level 2
Environmental	
Temperature Range	Ambient Operating: -20° to 70°C (-4° to 158°F) Ambient Storage: -40° to 80°C (-40° to 176°F)
Class of Protection	IP20, NEMA 1 (Finger Safe)
Relative Humidity	10-95%, non-condensing per IEC 68-2-3