

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

Modicon 311/411 Micro PLC Hardware User Manual

GI-MICR-341, Version 3.0

043502910

Contents

General Hardware Characteristics 3
Hardware Characteristics 3
PLC Operating Modes 3
Memory Resources 3
Memory Backup Options 4
General Hardware Overview 5
The I/O Terminal Blocks 5
The J1 and J2 Screws 6
Wiring External Power 6
PLC Status Display 8
Comm Ports 8
Base Unit Specifications 10
Electrical 10
Environmental 11
Optional Hardware Part Numbers 13
Fixed I/O Specifications 14
CPU31100 Field Wiring (under 115/230 VAC Power) 14
115 VAC Inputs 26
230 VAC Inputs 27
24 VDC Inputs 28
User-selectable High-speed Counter/interrupt Inputs 31
Dedicated High-speed Interrupt Inputs 33
Relay Outputs 34
Triac Outputs 36
24 VDC (FET) Outputs 38
Installation Guidelines 40
Mounting Options 40
Installing the Optional Battery or Battery Capacitor 44
Serial I/O Expansion Link 45
Terminating the Link 46
Connecting the PLC to a Programming Panel 47
RS-232 Cables 47

General Hardware Characteristics

Hardware Characteristics

All Model 311 and 411 Micro PLCs are equipped with:

- On-board CPU, memory, fixed I/O circuitry, and power supply
- 8 MHz CPU speed for handling I/O throughput
- An RS-232 port for communication with a programming device and with an ASCII input or display device
- An RS-485 port for serial I/O expansion with other Modicon Micro PLCs

Standard only on the Model 411 Micro PLCs is a set of 24 VDC high-speed inputs that can be configured to operate as a dedicated hardware interrupt and a user-configurable counter/timer/interrupt input.

On-board the 110CPU31100 and 110CPU41100 PLCs is a 24 V power supply that provides 150 mA. This supply is suitable for driving the hardware interrupts on the 110CPU41100 or the 24 VDC I/O points on either unit when it is used in an AC environment.

PLC Operating Modes

The 311 and 411 PLCs can operate in any one of three modes:

- As a *single* PLC—i.e., a stand-alone programmable control system
- As a *parent* PLC on an I/O expansion link—with the ability to access the fixed I/O resources of the PLC(s) in child operating mode on the link
- As a *child* PLC whose fixed I/O resources can be put under the control of the parent on an expansion link

Memory Resources

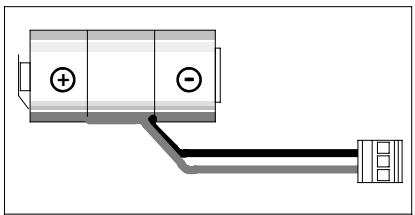
- 32 kbytes of RAM
- 1024 words available for program memory
- 512 words of data memory

Customer Part Number	Power Supply	Fixed I/O Resources
110CPU31100 110CPU41100	115/230 VAC	16 (24 VDC) in 12 relay out
110CPU31101 110CPU41101	115 VAC	16 (115 VAC) in 8 triac out 4 relay out
110CPU31102 110CPU41102	230 VAC	16 (230 VAC) in 8 triac out 4 relay out
110CPU31103 110CPU41103	24 VDC	16 (24 VDC) in 12 (24 VDC) FET out

Memory Backup Options

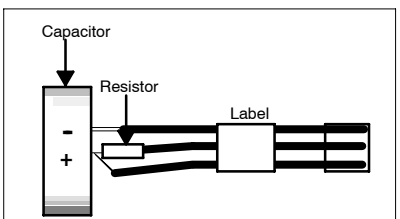
User memory—for the system configuration and application program—can be backed up in three ways:

- Using an optional (110XCP98000) lithium battery assembly



110XCP98000 Lithium Battery Assembly

- Using an optional (110XCP99000) battery capacitor assembly



110XCP99000 Battery Capacitor Assembly

- Writing the information to a reserved area in the PLC's Flash RAM

The optional lithium battery or battery capacitor will automatically back up the current user memory in the event of a power shutdown. The battery can safely back up the data for one year. The battery capacitor can back up a typical user logic program for 72 hours.

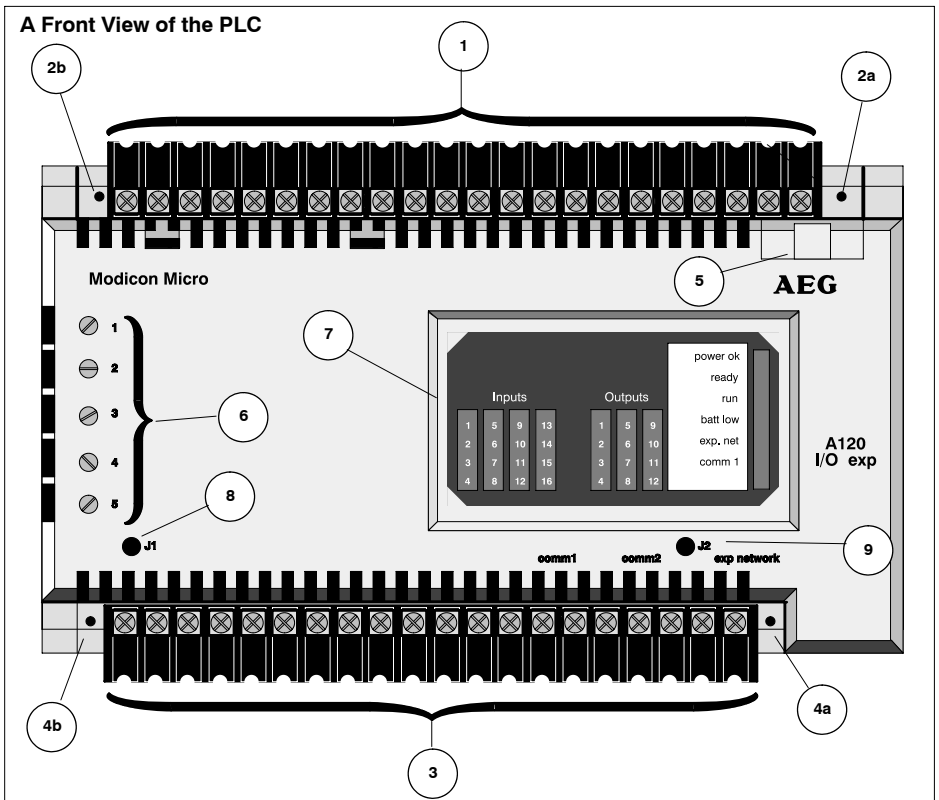
☞ **Note** The 110XCP990000 battery capacitor must be charged in a powered-up PLC for at least 24 hours to assure full memory backup.

The ability to back up user memory by writing it to Flash RAM is a standard feature of all Micro PLCs. Memory backed up in Flash remains completely nonvolatile over time.

If you are using Flash RAM backup, save the changes you make in your program and/or system configuration at the end of each edit session. The **Save to Flash** command is issued from your panel software.

Whenever PLC power is lost and then restored, the system firmware first attempts to restore any battery-backed memory. If there is no battery-backed memory, then it will restore any configuration and/or programming information stored in Flash—remember that information in Flash is only as current as the last time you issued a **Save to Flash** command. If there is no user memory saved in Flash, the firmware will assign the PLC a set of default configuration parameters and no logic program will exist.

General Hardware Overview



1. Terminal block for fixed discrete and hardwired inputs
2a/b. Captive screws for the input terminal block
3. Terminal block for fixed discrete outputs
4a/b. Captive screws for the output terminal block
5. Battery cover
6. Five terminal screws for external power connection
7. PLC status display with LED indicators
8. **J1** screw for signal ground-to-chassis ground
9. **J2** screw foe 120 Ω termination of the PLC

The I/O Terminal Blocks

The terminal block at the top of the PLC provides screw terminal connections for the 16 fixed discrete inputs and, in the case of the Model 411 PLCs, the high-speed interrupt and counter/timer/interrupt inputs. The terminal block at the bottom of the PLC provides screw terminal connections for the fixed discrete outputs (groups of relay, triac, and/or FET outputs).

To make field wiring easier, terminal blocks can be removed from the PLC base. To remove a terminal block, loosen the two captive screws on the left and right of the block with a slotted screwdriver until they spring free of their mating pieces in the unit base. Then use the screwdriver to pop the block out of the PLC base.

Use a Philips #2 screwdriver to make the field wire connections to the terminal screws, then push the terminal blocks back on the PLC base.

The J1 and J2 Screws

Two factory-set screws are installed on the front of the unit. The **J1** screw is located below the power connectors on the left front of the unit, and the **J2** screw is located below the PLC status display on the right front of the unit.

The position of the **J1** screw in the PLC housing determines whether there is conventional signal ground-to-chassis grounding or grounding at different potentials for non-grounded applications.

When **J1** is fully tightened—i.e., in its factory-set position—both signal ground and chassis ground in the PLC are tied together and to the input power terminal block ground screw. This is the preferred method of grounding for all single, parent, or child PLCs whenever solid earth ground is available.

When the **J1** is loosened (counterclockwise), it disconnects earth ground from signal ground. The PLC can now be connected as part of a non-grounded or single-point ground system. In a single-point ground system, only one PLC needs to be tied to chassis ground (**J1** screw tightened); all other PLCs in the system can be referenced to this single point over the I/O expansion link (their **J1** screws loosened). The expansion link must always be attached to prevent communication errors in the ungrounded PLCs.

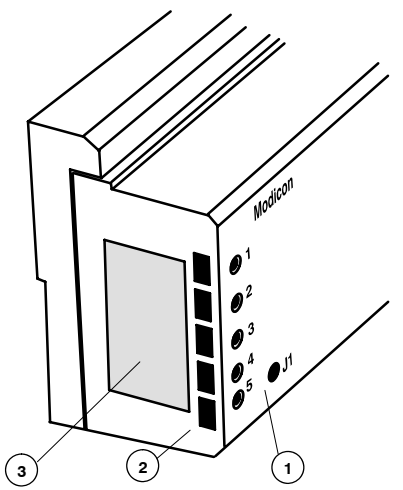
Caution Before you power up your system, make sure that all the PLCs are at the same earth ground potential to reduce communication errors, ground loop lockups, and damage to the PLCs or other attached devices.

The **J2** screw provides 120 Ω termination for the PLC when it is tightened—**J2** is shipped from the factory in a tightened position. When the PLC is operating in *single* mode or when it is a *parent* or *child* at the head or tail end of an I/O expansion link, the **J2** screw must remain tightened. When the PLC resides in a non-terminating location on an I/O expansion link, the **J2** screw must be loosened by one turn.

Wiring External Power

External connections to the power supply are made at the five terminal screws located on the left front of the PLC. The wires from the external source are fed to the appropriate screws through slots along the left side of the PLC, as shown in the following illustration.

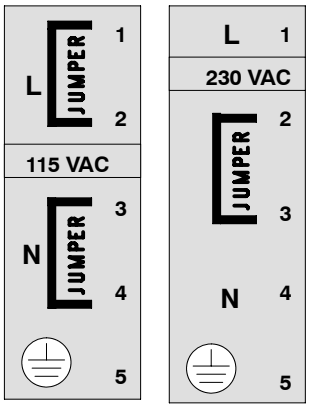
A Left Front Isoview of the PLC



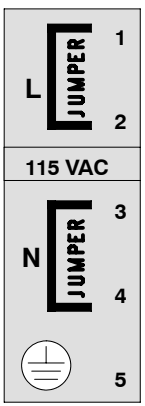
1. Five terminal screws for external power wiring
2. Side slots for leading wires from the power source to the terminal screws
3. Label indicating power wiring scheme

The label affixed to the side of the PLC indicates the power wiring scheme.

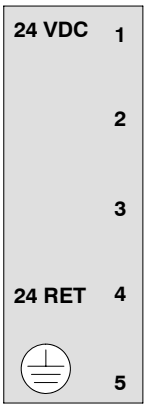
- Model 11031100 and 11041100 PLCs can be wired to use either a 115 VAC or 230 VAC external power source:



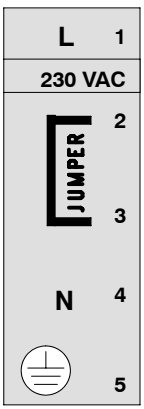
- Model 11031101 and 11041101 PLCs use a 115 VAC external power source:



- Model 11031103 and 11041103 PLCs use a 24 VDC external power source:



- Models 11031102 and 11041102 use a 230 VAC external power source:



The labels for the power source terminal connections are in red lettering.

☞ **Note** Add a wire loop between the pins labeled **JUMPER**.

PLC Status Display

The display panel on the front of the Model 311 and 411 Micro PLCs uses light-emitting diodes (LEDs) to indicate the health and status of the unit's CPU, battery, communication ports, and fixed I/O points. The column of LEDs on the right side of the unit indicates PLC status:

PLC Status LEDs	
LED	**Function**
power ok	A green LED turned ON when internal power is OK
ready	An amber LED that is ON when the PLC has passed its power-up diagnostics, and remains ON as long as the PLC is healthy
run	A green LED that is ON when the PLC has started and is solving logic and that flashes when the PLC has power but cannot find a valid configuration/ operating mode
battery low	A red LED that goes ON when the internal battery needs to be replaced (Replacement should be within 14 days of the initial LED indication.) This LED also goes ON if a problem is detected in the optional battery capacitor or if the capacitor is not fully charged.
I/O exp. link	A green LED that goes ON steadily when valid communications occur on the I/O expansion link, and flashes when errors occur on the link. similar **exp link** indications occur in both PLCs involved in the communication
comm 1	A green LED that flashes when communi-- cations occur on the RS-232 port

The array of LEDs on the left side of the display indicates the status of the fixed discrete I/O points on the PLC.

Each fixed input and output lights a number (1 ... 16 for inputs, 1 ... 12 for outputs) with a red (logic side) LED when the associated discrete point is ON.

To reference the physical I/O point to an LED number in the display, refer to the field wiring diagrams presented in this book.

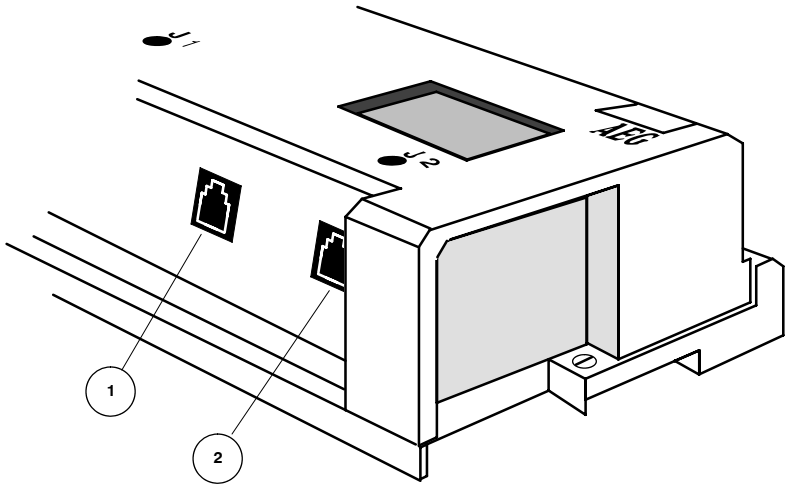
If the **run** LED on the right is flashing in conjunction with any of the input LEDs, a crash error has been detected. The pattern of the input LED flashes indicates the nature of the error. The person programming the PLC can refer to the ***Modicon Micro Ladder Logic Manual*** (GM-MICR-LDR) for a description of system crash codes.

Comm Ports

An RS-232 (**comm 1**) port and an RS-485 (**I/O exp link**) port are located on the bottom of each unit. The RS-232 port uses eight-position RJ45 (phone jack-type) connectors. The RS-485 port uses a six-position RJ11 (phone jack-type) connector.

The comm ports are multi-functional, and under the control of the system firmware, Their capabilities are described in the ***Modicon Micro Ladder Logic Manual*** (GM-MICR-LDR) and your panel software documentation.

Bottom Isoview of the PLC



1. **comm 1** (RJ45) port 2. **I/O exp link** (RJ11) port

Base Unit Specifications

Electrical

Input voltages	
120 VAC input	96 ... 132 V RMS, 47 ... 63 Hz
230 VAC input	192 ... 264 V RMS, 47 ... 63 Hz
24 VDC input	19.2 ... 30.0 VDC
Output voltage	
24 VDC output	20.5 ... 29.0 VDC @ .15 A maximum
Output ripple and noise	
24 VDC output	2.5 V peak-to-peak @ 100/120 Hz maximum
Electrical immunity	
ESD	IEC 801-2, level 3
Radiated EMI	IEC 801-3, level 3
Fast transient	IEC 801-4, level 2
Surge transient	IEC 801-5, level 3
Input power interrupt	
AC inputs	$\leq$ 0.5 period with no affect
DC inputs	$\leq$ 1 ms with no affect
Ring wave	IEEE-STD 472 (1974) IEC-255-4, level 3
Isolation voltages	
AC in to system ground	1780 V RMS, 1 min
AC in to chassis ground	1780 V RMS, 1 min
DC in to system ground	500 V RMS, 1 min
DC in to chassis ground	500 V RMS, 1 min

Input Power Specifications
(Values in Amps)

Part Number	I/O and CPU Description	Base Unit 6 or less Outputs ON	Base Unit More than 6 Outputs ON	Add if Hand-Held is Used	Add if PAB is Used
110CPU31100	DC Relay CPU 115/230V	.30	.50	.05	N/A
110CPU41100	DC Relay CPU 115/230V	.30	.50	.05	N/A
110CPU31103	DC/DC FET CPU 24V	.25	.27	.05	N/A
110CPU41103	DC/DC FET CPU 24V	.25	.27	.05	N/A

Input Power Specifications (continued)
(Values in VA)

Part Number	I/O and CPU Description	Base Unit 6 or less Outputs ON	Base Unit More than 6 Outputs ON	Add if Hand-Held is Used	Add if PAB is Used
110CPU31101	115VAC/Triac CPU 115V	21.0	23.1	2.1	N/A
110CPU41101	115VAC/Triac CPU 115V	21.0	23.1	2.1	N/A
110CPU31102	230VAC/Triac CPU 230V	21.0	23.1	2.1	N/A
110CPU41102	230VAC/Triac CPU 230V	21.0	23.1	2.1	N/A

Input voltage fuses
AC inputs $^1/_4$ A SB in each AC input line
DC inputs 1.6 A SB in series with the input circuit

Power for external devices +5 VDC @ 150 mA continuous (maximum)

Environmental

Operating Temperature 0 ... 60 degrees C

Storage Temperature –40 ... +85 degrees C

Relative Humidity 95% noncondensing

Altitude 3800 m (15,000 ft)

Shock 30 g for 11 ms, 3 pulses/axis for up to 18 pulses

Vibration 10 ... 62 Hz @ .075 mm displacement amplitude,
62 ... 500 Hz @ 1 g
Duration: 23 min @ 2 sweeps/axis on 3 mutually orthoganal axes at a rate of 1 octave/min

Chemical Environmental Enclosures are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions

Dimensions
Height: (including I/O terminal blocks): 158.75 mm (6.25 in)
Width: 254 mm (10 in)
Depth: 76 mm (3 in)

Weight	1.45 kg (3.2 lb)

Agency Approvals

All models are F.M. Class I, Div. 2 approved, and are designed to meet VDE 0160 standards

The following models are UL 508 Listed for industrial control equipment and CSA 142 Certified for process control equipment:

110CPU31100
110CPU31101
110CPU31102
110CPU41100
110CPU41101
110CPU41102

The 110CPU31103 and 110CPU41103 have UL and CSA pending.

Optional Hardware Part Numbers

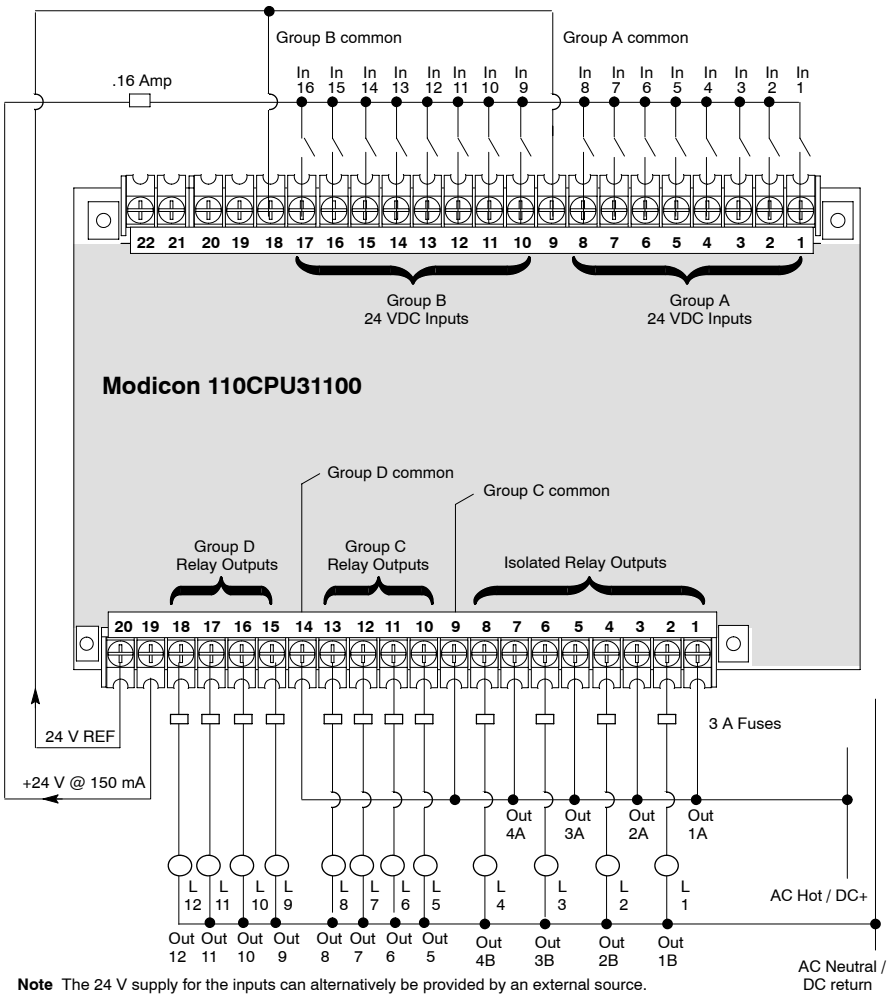
RS-232 communication cable assemblies (with RJ45 connectors on both ends)	
1 m (3 ft)	110XCA28201
3 m (10 ft)	110XCA28202
6 m (20 ft)	110XCA28203
RS-485 I/O expansion link cable assemblies (with RJ11 connectors on both ends)	
61 cm (2 ft)	110XCA17101
3 m (10 ft)	110XCA17102
6 m (20 ft)	110XCA17103
1000 ft reels of flat cable	
Eight-position (for RS-232)	490NAA00010
Six-position (for RS-485)	490NAA00020
RJ45 connectors (20/box)	490NAD00010
RJ11 connectors (20/box)	490NAD00020
RJ type connector tool	490NAB00010
RJ11 die set	490NAB00011
RJ45 die set	490NAB00012
RJ11 Y-connector	110XCA10100
RJ45 adapter connections	
9-pin	
Premade for PC-ATs	110XCA20300
Wire-it-yourself (male)	110XCA20301
Wire-it-yourself (female)	110XCA20302
25-pin	
Premade for PC-XTs	110XCA20400
Wire-it-yourself (male)	110XCA20401
Wire-it-yourself (female)	110XCA20402
Lithium battery assembly	110XCP98000
Battery capacitor assembly	110XCP99000
Spare I/O terminal strips and covers	
Input (22-pin)	110XTS00122
Output (20-pin)	110XTS00120

Fixed I/O Specifications

CPU31100 Field Wiring (under 115/230 VAC Power)

Fixed I/O Topology		
I/O Type	**Number of I/O Points**	**Number of Groups**
24 VDC inputs	16	2 groups of 8
Relay outputs	12	2 groups of 4 and 4 individually isolated

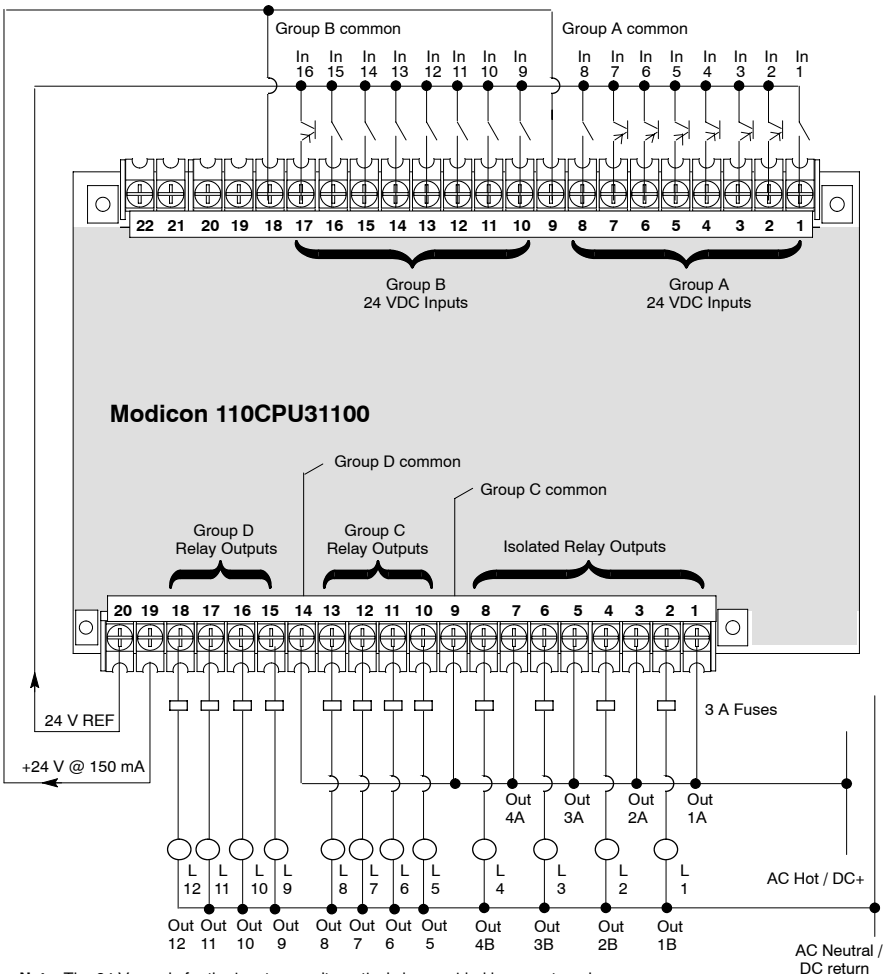
with Source-configured 24 VDC Inputs



Note The 24 V supply for the inputs can alternatively be provided by an external source.

Note Fast-blow fuses are recommended for input and output protection.

with Sink-configured Inputs



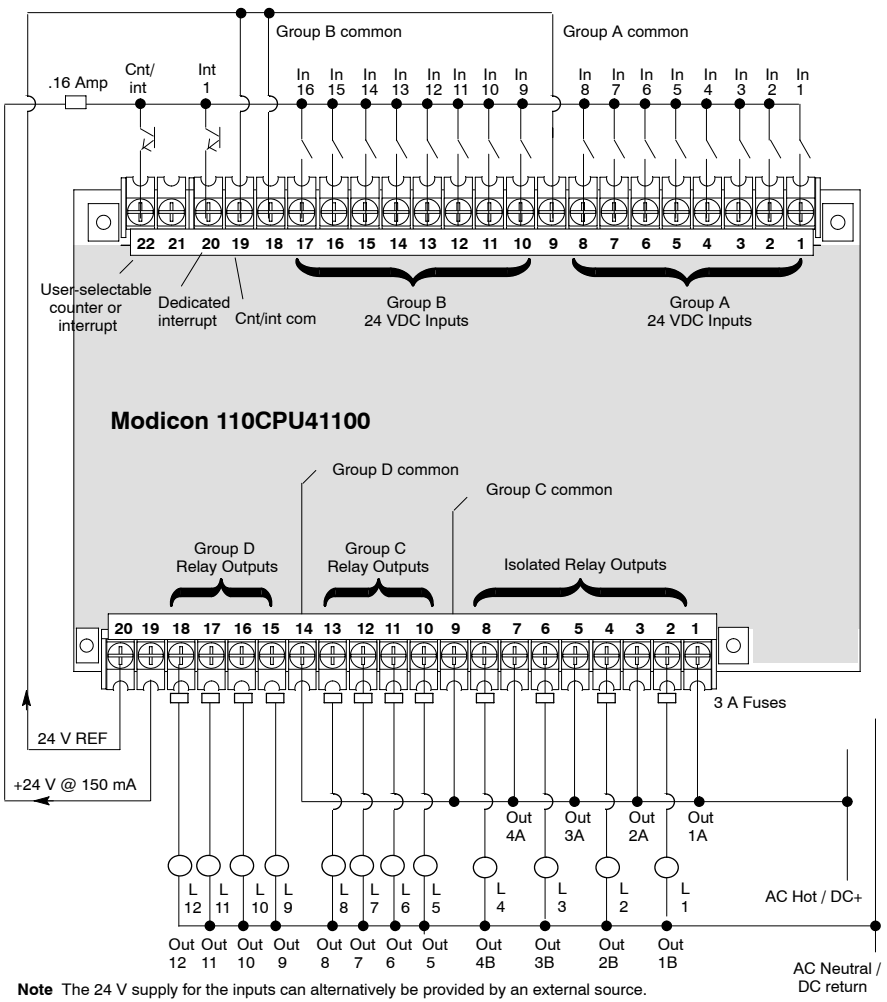
Note The 24 V supply for the inputs can alternatively be provided by an external source.

Note Fast-blow fuses are recommended for input and output protection.

CPU41100 Field Wiring (under 115/230 VAC Power)

Fixed I/O Topology		
I/O Type	**Number of I/O Points**	**Number of Groups**
24 VDC inputs	16	2 groups of 8
24 VDC user-selectable counter/interrupt	1	1 group of 2
24 VDC dedicated high-speed interrupts	1	
Relay outputs	12	2 groups of 4 4 individually isolated

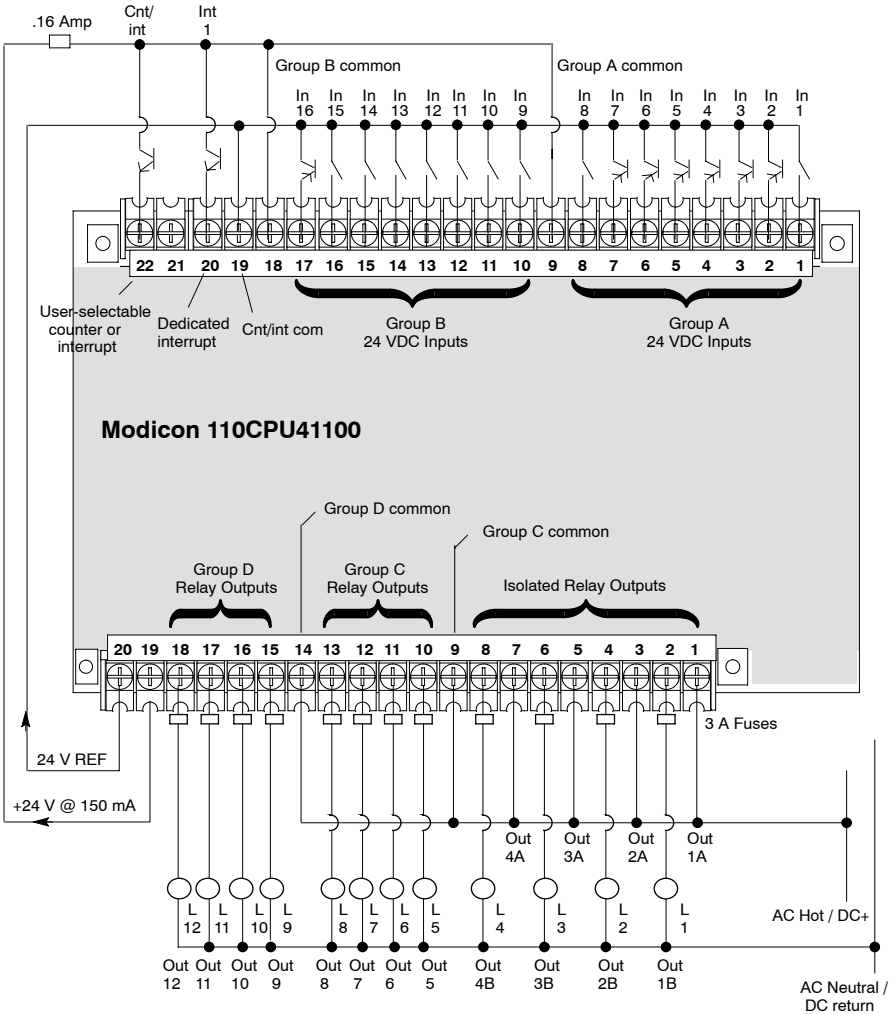
with Source-configured 24 VDC Inputs



Note The 24 V supply for the inputs can alternatively be provided by an external source.

Note Fast-blow fuses are recommended for input and output protection.

with Sink-configured 24 VDC Inputs

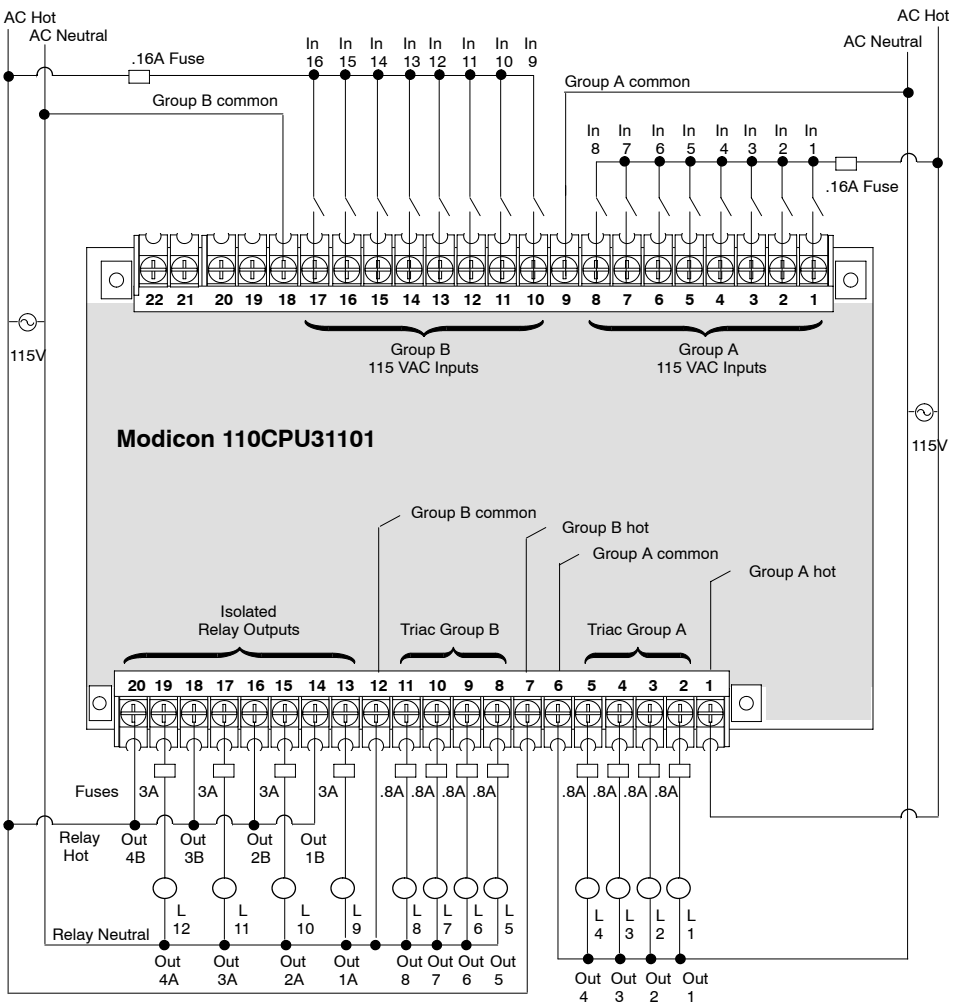


Note The 24 V supply for the inputs can alternatively be provided by an external source.

Note Fast-blow fuses are recommended for input and output protection.

CPU31101 Field Wiring (under 115 VAC power)

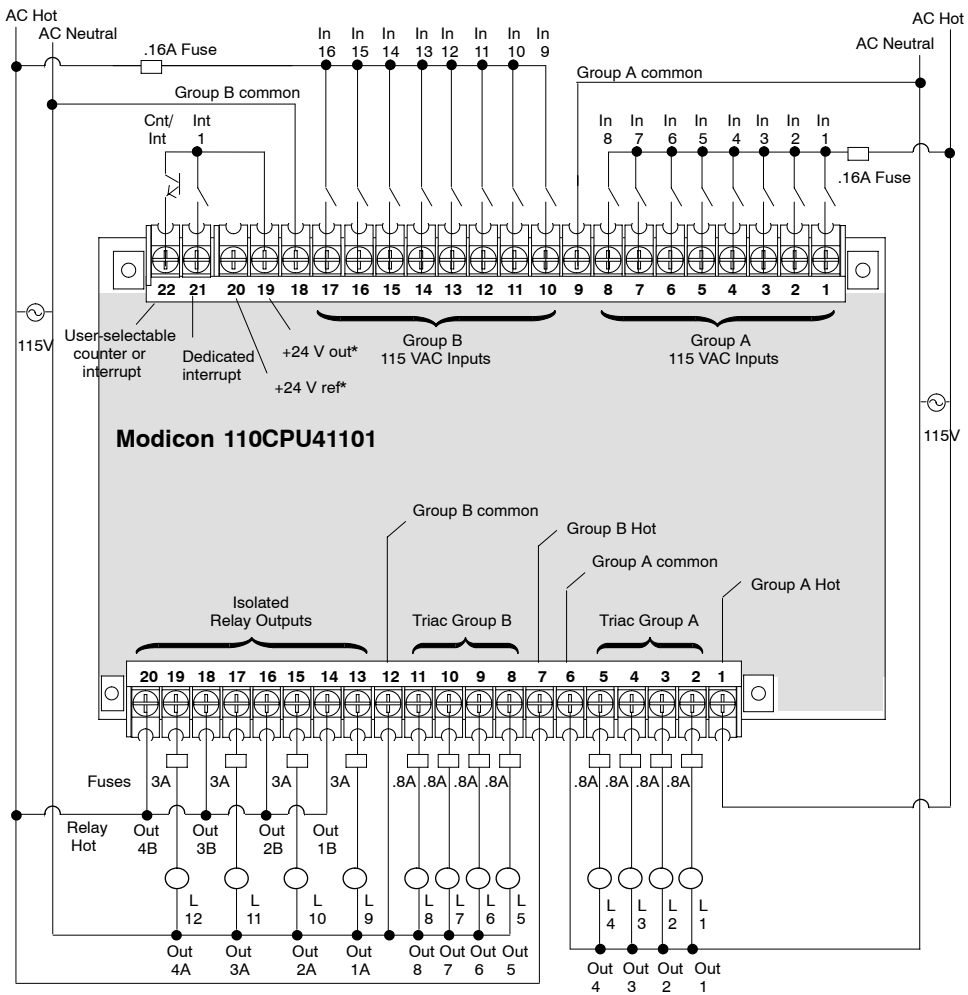
Fixed I/O Topology		
I/O Type	**Number of I/O Points**	**Number of Groups**
115 VAC inputs	16	2 groups of 8
Triac outputs	8	2 groups of 4
Relay outputs	4	individually isolated



Note Fast-blow fuses are recommended for input and output protection.

CPU41101 Field Wiring (under 115 VAC power)

Fixed I/O Topology		
I/O Type	**Number of I/O Points**	**Number of Groups**
115 VAC inputs	16	2 groups of 8
24 VDC user-selectable counter/interrupt	1	1 group of 2
24 VDC dedicated high-speed interrupts	1	
Triac outputs	8	2 groups of 4
Relay outputs	4	individually isolated

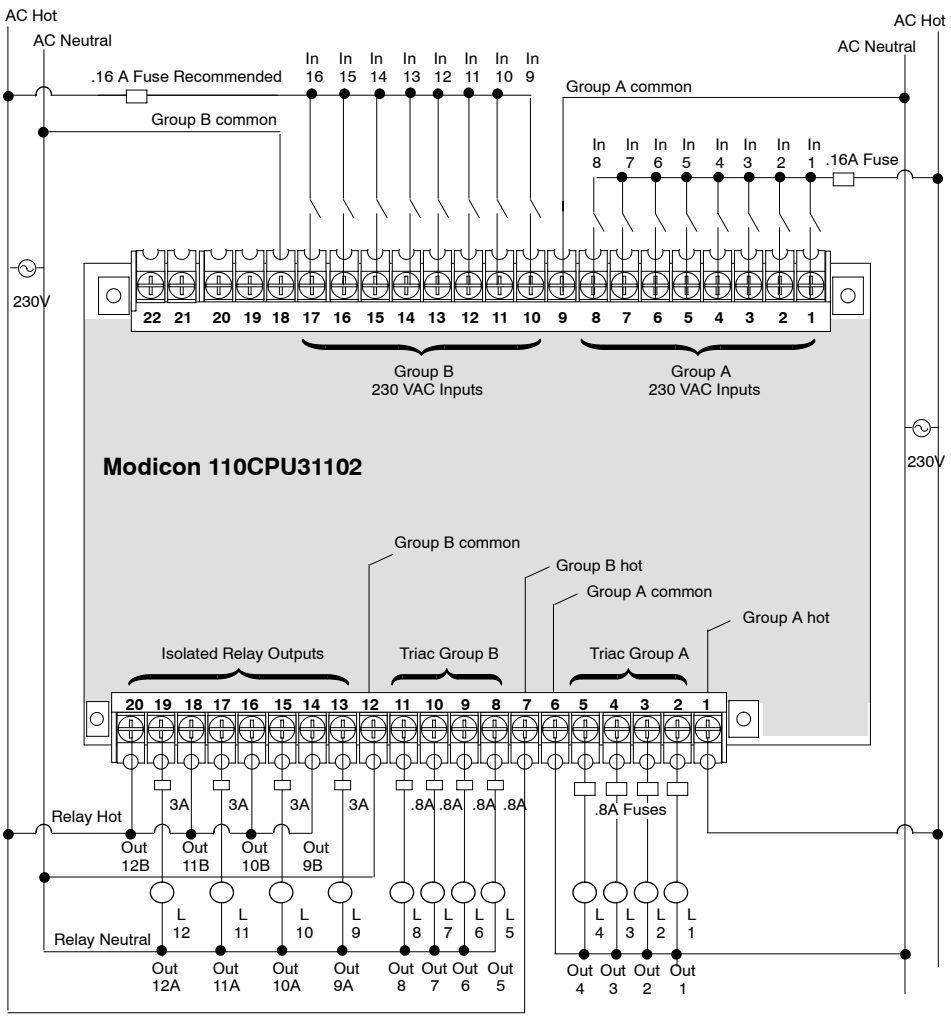


* The 24 V power supply from pins 19 and 20 in the top block provide up to 150 mA at 24 V.

Note Fast-blow fuses are recommended for input and output protection.

CPU31102 Field Wiring (under 230 VAC power)

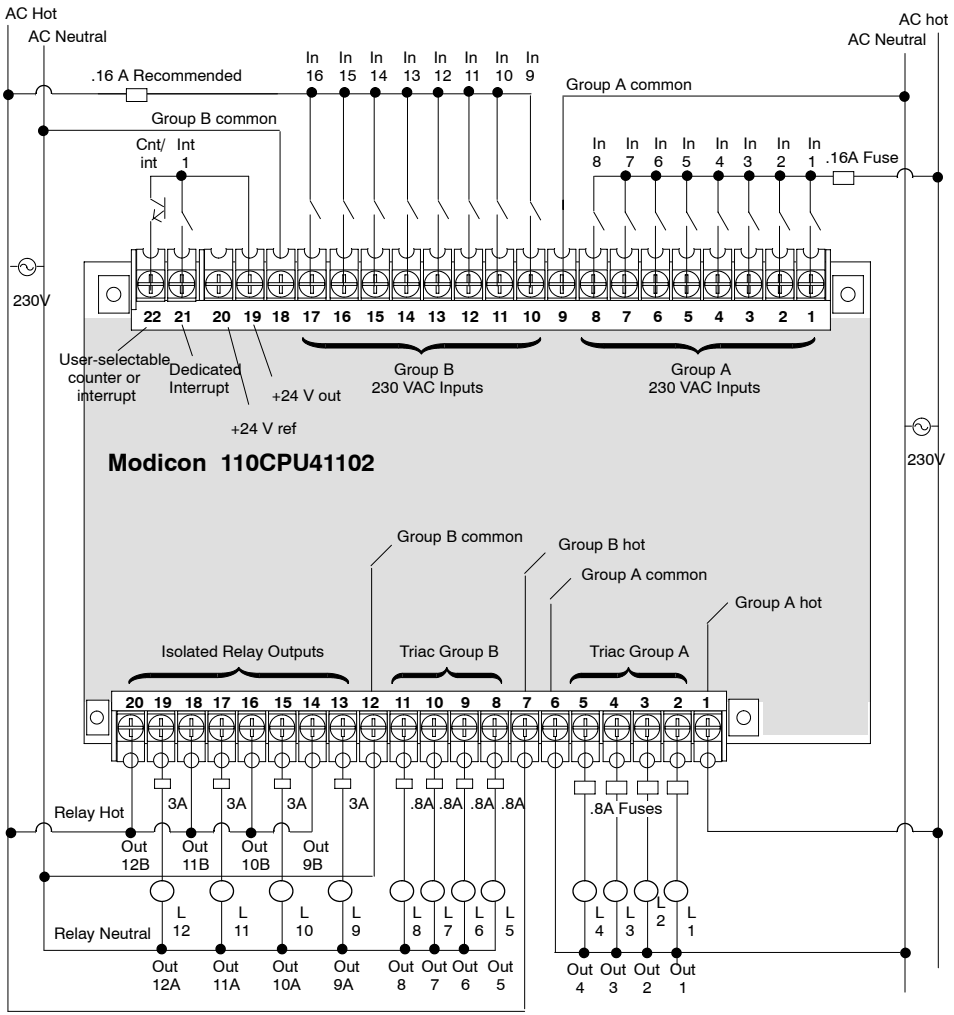
Fixed I/O Topology		
I/O Type	**Number of I/O Points**	**Number of Groups**
230 VAC inputs	16	2 groups of 8
Triac outputs	8	2 groups of 4
Relay outputs	4	individually isolated



Note: Fast-blow fuses are recommended for input and output protection.

CPU41102 Field Wiring (under 230 VAC power)

Fixed I/O Topology		
I/O Type	**Number of I/O Points**	**Number of Groups**
230 VAC inputs	16	2 groups of 8
24 VDC user-selectable counter/interrupt	1	1 group of 2
24 VDC dedicated high-speed interrupts	1	
Triac outputs	8	2 groups of 4
Relay outputs	4	individually isolated

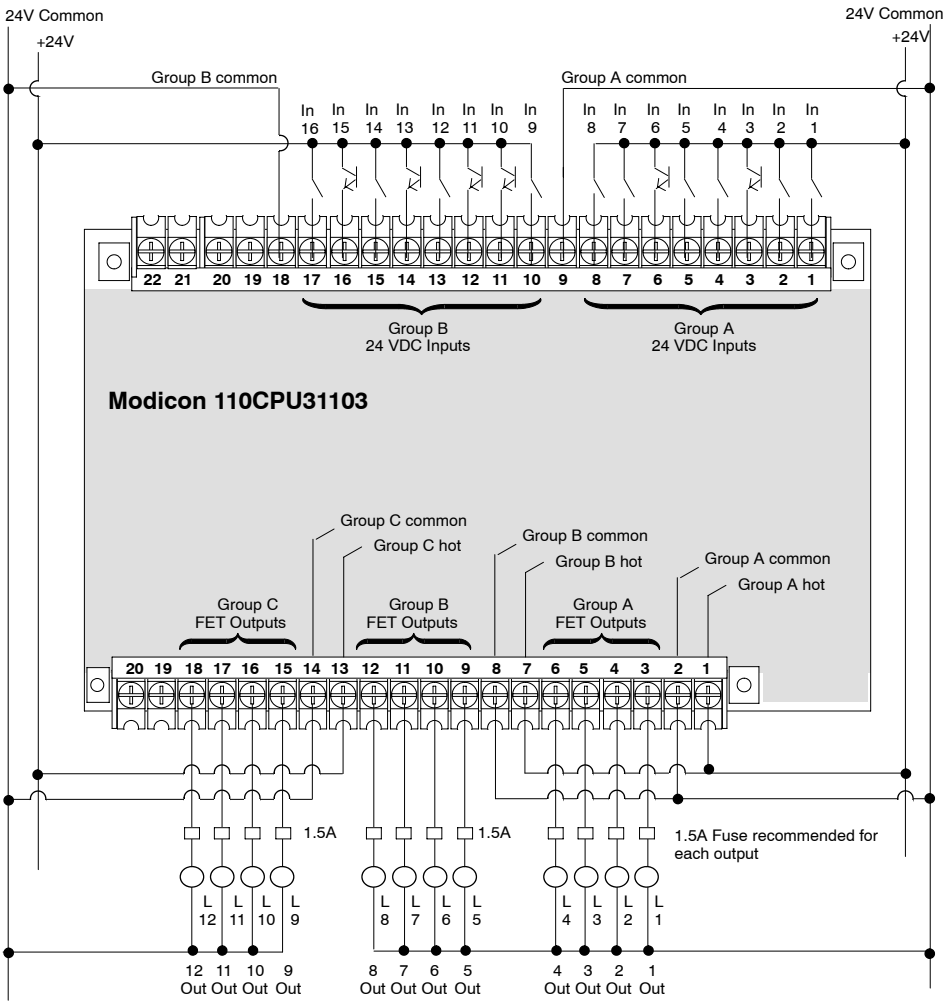


Note: Fast-blow fuses are recommended for input and output protection

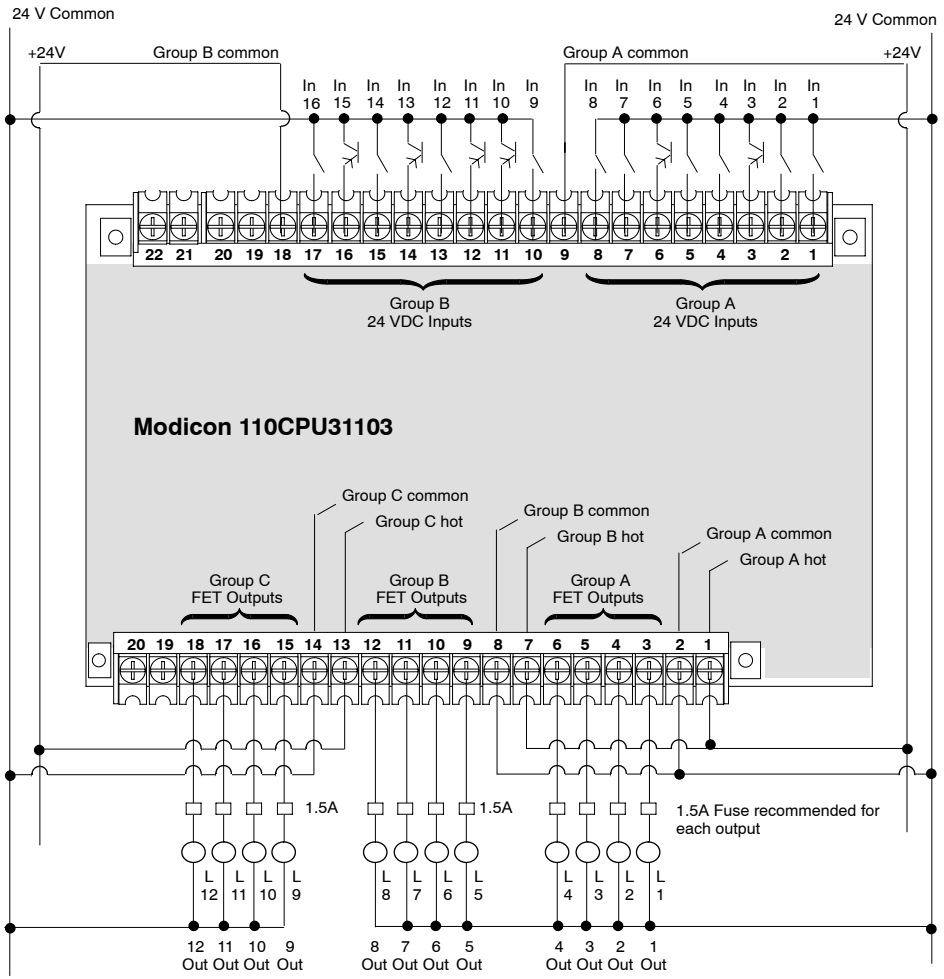
CPU31103 Field Wiring (under 24 VDC power)

Fixed I/O Topology		
I/O Type	**Number of I/O Points**	**Number of Groups**
24 VDC inputs	16	2 groups of 8
24 VDC (FET) outputs	12	3 groups of 4

with Source-configured 24 VDC Inputs



with Sink-configured 24 VDC Inputs



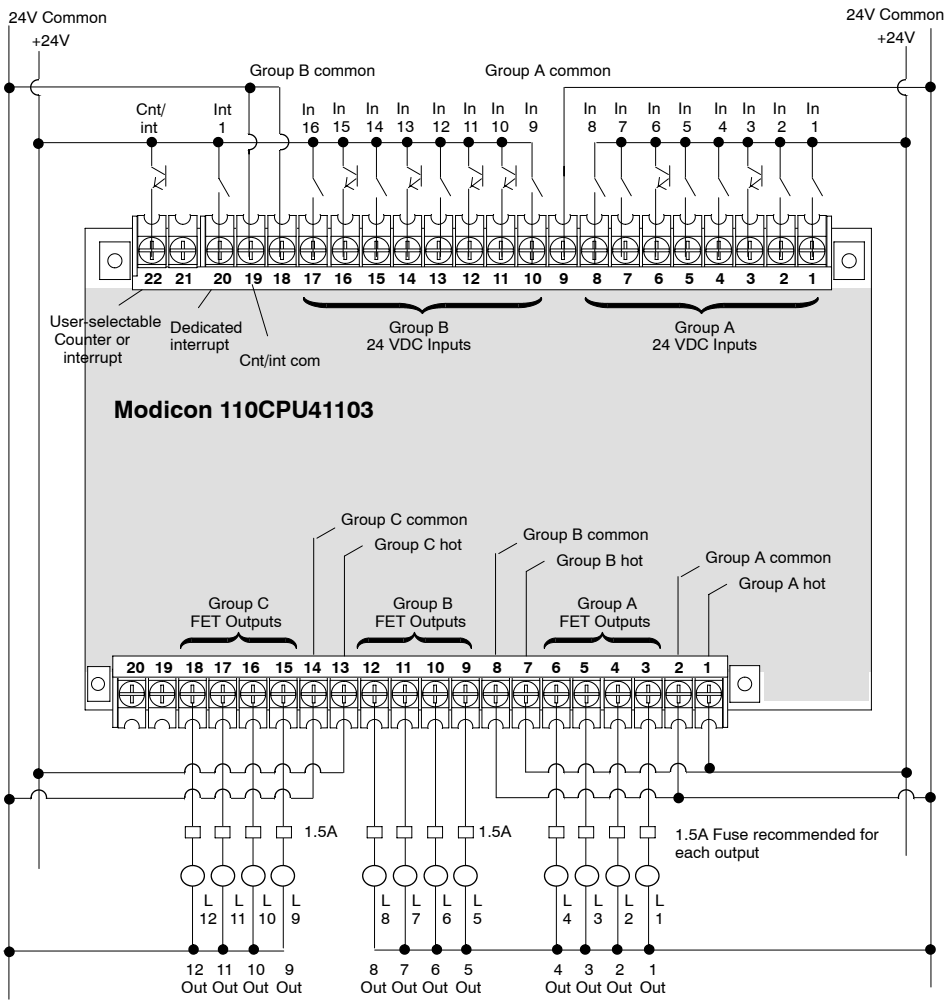


Note To reduce the risk that electrical noise from field I/O devices will effect Micro operation, we recommend that a separate 24 VDC power source be used for the field I/O. A dual power-source configuration can also be beneficial in preventing a failure in a single field device from shutting down power to the PLC.

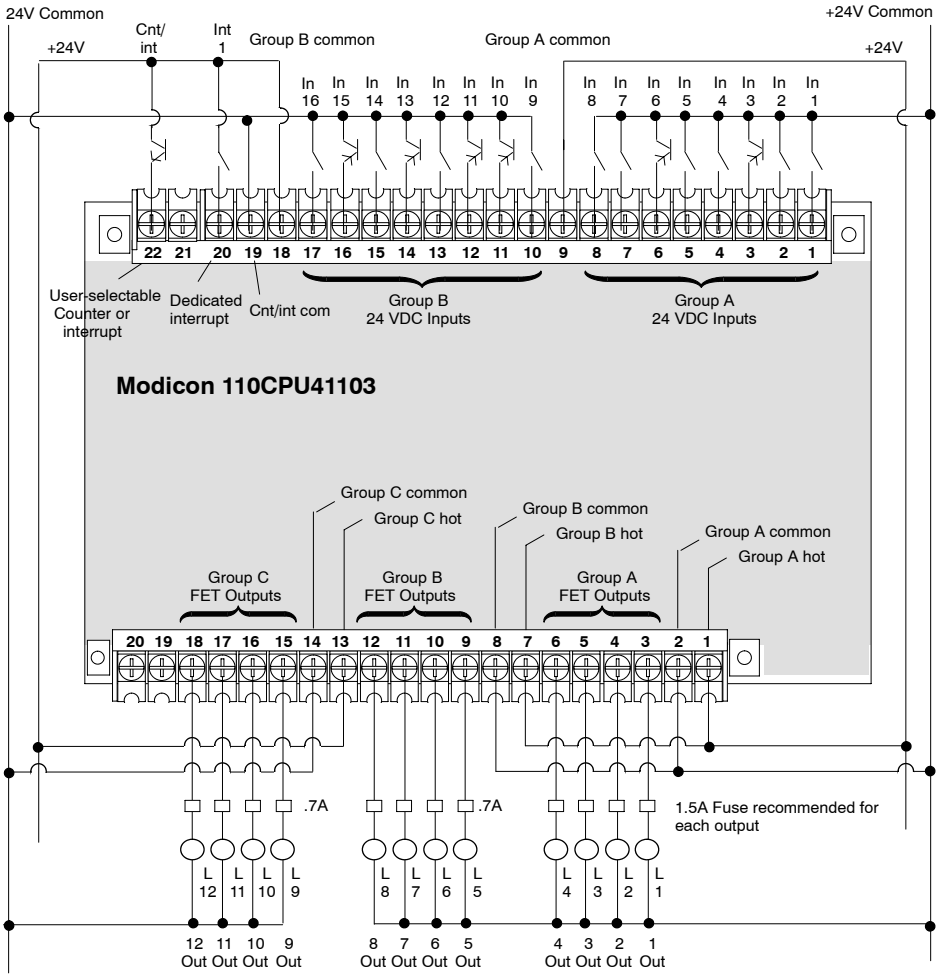
CPU41103 Field Wiring (under 24 VDC Power)

Fixed I/O Topology		
I/O Type	**Number of I/O Points**	**Number of Groups**
24 VDC inputs	16	2 groups of 8
24 VDC user-selectable counter/interrupt	1	1 group of 2
24 VDC dedicated high-speed interrupts	1	
24 VDC (FET) outputs	12	3 groups of 4

with Source-configured 24 VDC Inputs



with Sink-configured 24 VDC Inputs





Note To reduce the risk that electrical noise from field I/O devices will effect Micro operation, we recommend that a separate 24 VDC power source be used for the field I/O. A dual power-source configuration can also be beneficial in preventing a failure in a single field device from shutting down power to the PLC.

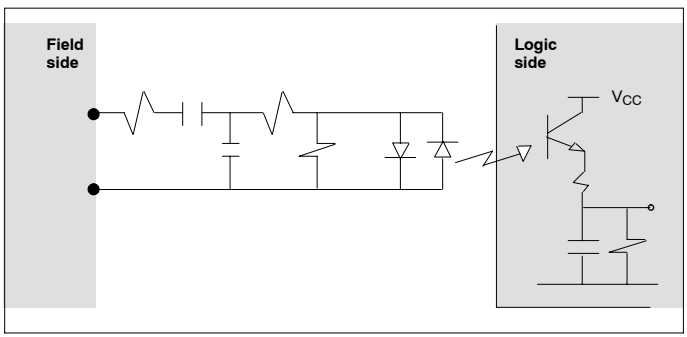
115 VAC Inputs

Electrical Characteristics

ON level	79 ... 132 VAC with a maximum source impedance of 6.2 kΩ @ 60 Hz
ON current @ 120 VAC	10 mA
OFF level	0 ... 20 VAC
Maximum OFF state input current	1.7 mA @ 20 V
Minimum ON state input current	6.5 mA @ 79 V
Input impedance	12 kΩ @ 60 Hz

Circuit Characteristics

Simplified schematic



Isolation	
Method	Opto-coupler
Channel-to-bus	1780 VAC, 2 kV DC
Group-to-group	1780 VAC, 2 kV DC
Addressing	16 discrete bits in 1 register in
Maximum wire length	100 m
Wire size	20 AWG
Response time	
ON→OFF	25 ... 30 ms
OFF→ON	25 ... 30 ms

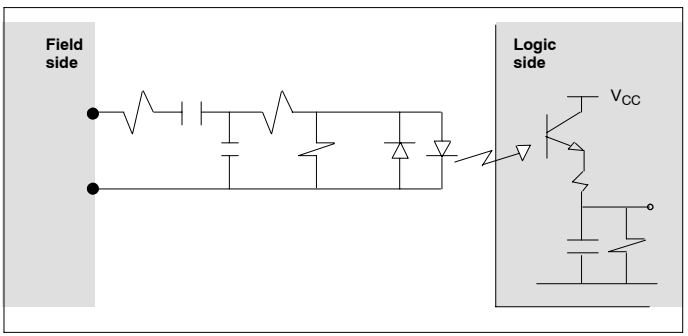
230 VAC Inputs

Electrical Characteristics

ON level	164 ... 253 VAC with a maximum source impedance of 16 kΩ
OFF level	0 ... 40 VAC
ON state input	7 mA @ 230 VAC, 50 Hz
OFF current	1.2 mA maximum @ 40 VAC
Maximum OFF state current	1.2 mA @ 40 VAC
Minimum ON state current	5.0 mA @ 164 VAC
Input impedance	33 kΩ @ 50 Hz

Circuit Characteristics

Simplified schematic



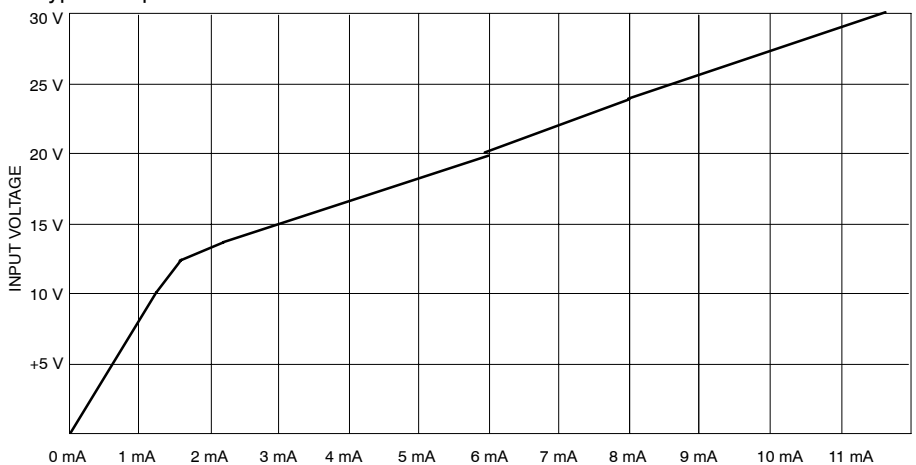
Isolation	
Method	Opto-coupler
Channel-to-bus	1780 VAC, 2500 VDC
Group-to-group	1780 VAC, 2500 VDC
Maximum wire length	100 m
Wire size	14 AWG
Response time	
ON→OFF	25 ... 30 ms
OFF→ON	25 ... 30 ms

24 VDC Inputs

Electrical Characteristics for Source (True High) Inputs

ON level	15 ... 30 VDC, source impedance < 1.5 kΩ
OFF level	0 ... 5 VDC
Minimum ON state input current	3.4 mA @ 15 VDC
Maximum OFF current	.6 mA @ 5 V
Maximum input impedance	7.8 kΩ when OFF 3.0 kΩ when ON @ 24 VDC input

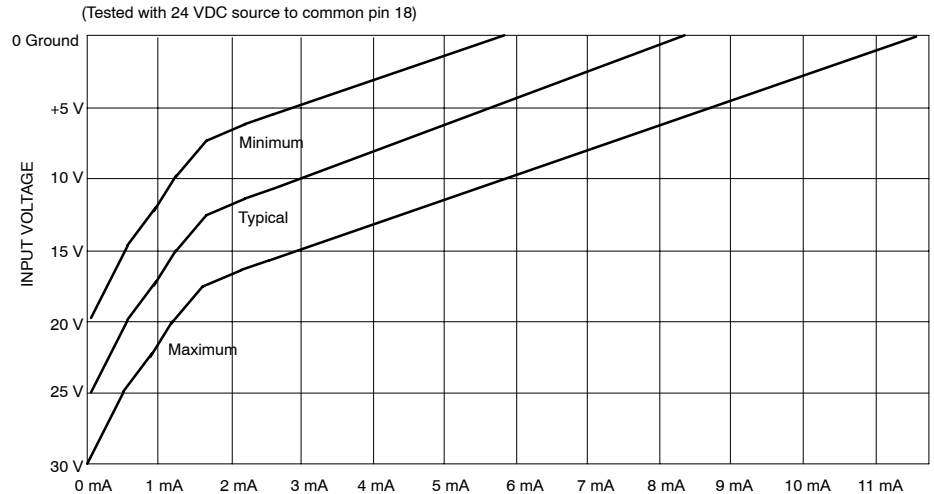
Typical impedance curve



Electrical Characteristics for Sink (True Low) Inputs

ON level	Source ground to (source voltage – 15 V)
OFF level	Source voltage to (source voltage – 5 V)
Minimum ON state input current	3.4 mA with 20 ... 30 V source
Maximum OFF current	.7 mA with 20 ... 30 V source
Maximum input voltage	30 VDC
Maximum input impedance	7.8 kΩ when OFF 3.0 kΩ when ON @ 24 VDC

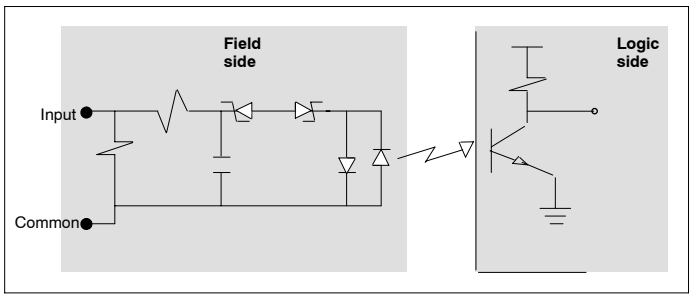
Typical impedance curve



☞ **Note** We recommend the use of three-wire proximity switches on these inputs.

Circuit Characteristics

Simplified schematic



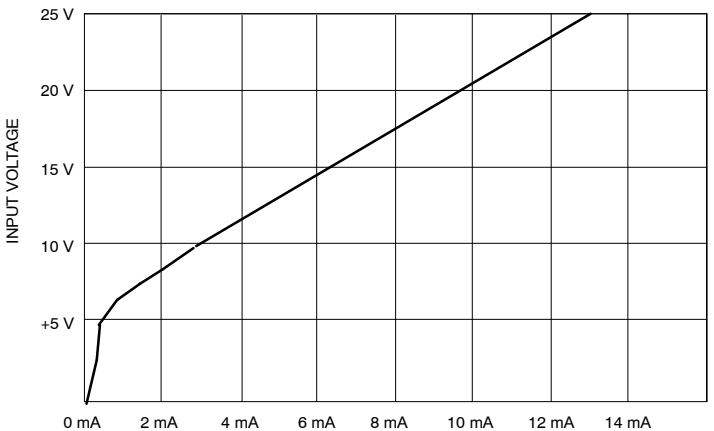
Isolation	
Method	Opto-coupler
Channel-to-bus	1780 VAC, 2500 VDC
Group-to-group	1780 VAC, 2500 VDC
Response time	
ON→OFF	2 ms
OFF→ON	2 ms
Maximum wire length	100 m
Wire size	14 AWG

User-selectable High-speed Counter/interrupt Inputs

Electrical Characteristics

ON level	15 ... 30 VDC
OFF level	0 ... 5 VDC
Minimum ON state input	6 mA @ 15 VDC
Maximum OFF current	0.3 mA @ 5 V
Input impedance	15.8 kΩ when OFF 1.95 kΩ when ON @ 24 VDC
Current draw	12.3 mA @ 24 VDC

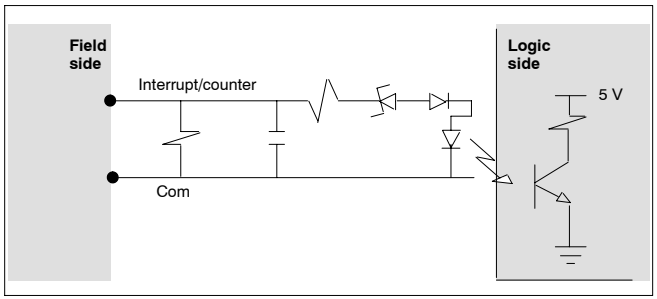
Typical impedance curve



☞ **Note** We recommend the use of three-wire proximity switches on these inputs.

Circuit Characteristics

Simplified schematic



Isolation	
Method	Opto-coupler
Channel-to-bus	500 VDC
Group-to-group	500 VDC
Addressing	1 register in
Maximum cable length	50 m
Response time	
OFF→ON	10 ... 20 μs
ON→OFF	10 ... 20 μs
Required cable type	Shielded twisted pair, for noise immunity
Wire size	20 AWG
Up-counter positive edge trigger	
Maximum counter rate	5 kHz
Pulse duration	> 100 μs
Interrupt voltage level	To assure reliable system operation, interrupt voltage must be brought from OFF to ON and maintained ON for 350 μs minimum—any pulse duration < 20 μs is filtered

Dedicated High-speed Interrupt Inputs

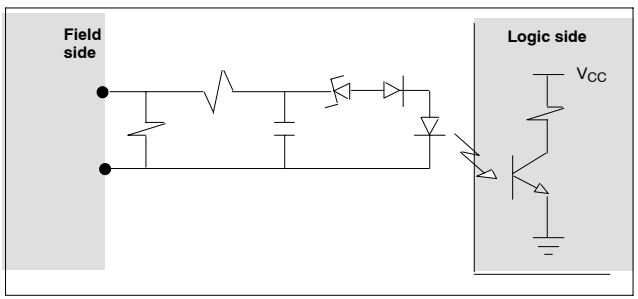
Electrical Characteristics

ON level	15 ... 30 VDC
OFF level	0 ... 5 VDC
Minimum ON state input	6 mA @ 15 VDC
Maximum OFF current	0.3 mA @ 5 V
Maximum input impedance	15.8 kΩ when OFF 1.95 kΩ when ON @ 24 VDC
Current draw	12.3 mA @ 24 VDC

☞ **Note** We recommend the use of three-wire proximity switches on these inputs.

Circuit Characteristics

Simplified schematic



Isolation	
Method	Opto-coupler
Channel-to-bus	500 VDC
Maximum cable length	50 m
Required cable type	Shielded twisted pair, for noise immunity
Wire size	20 AWG
Interrupt voltage level	To assure reliable system operation, interrupt voltage must be brought from OFF to ON and maintained ON for 350 μs minimum—any pulse duration < 50 μs is filtered

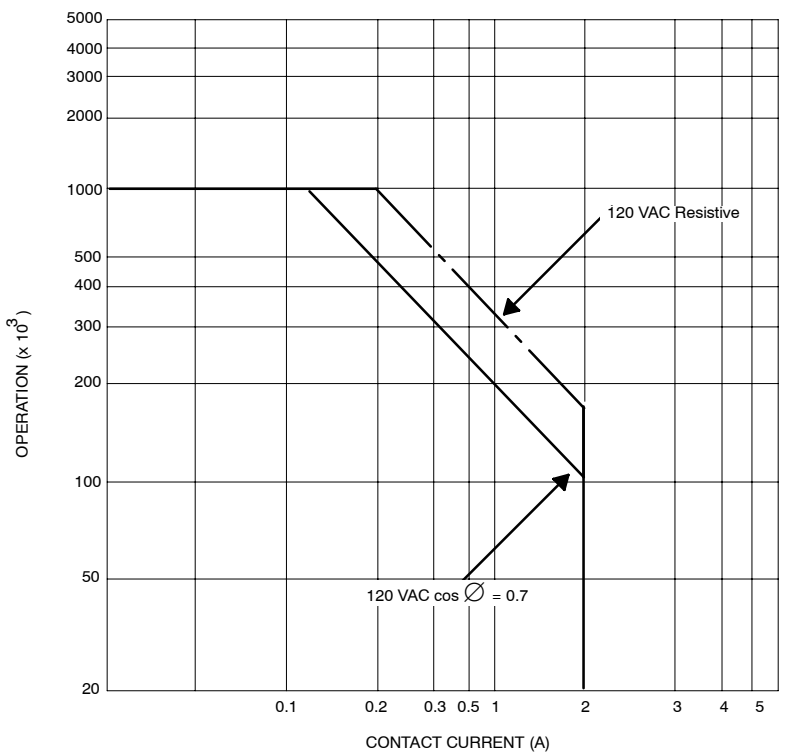
Relay Outputs

Electrical Characteristics

Working voltage range (for all Micro types)	24 ... 30 VDC 24 ... 250 VAC
Maximum load current	2 A/channel
Surge current	20 A for 1 cycle
VA rating	500 VA (switching)
Minimum load current	20 mA
Maximum switching rate	5 Hz
Required external fuse size	User-installed 3 A fuse—e.g. Bussman GMA-V-3.0—in the field wiring between the output terminal screw and the load

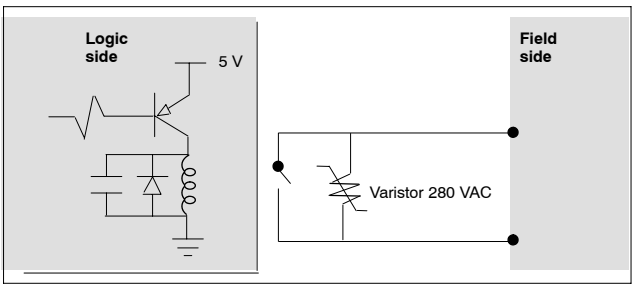
Caution Internal overload protection is not provided for these outputs — external fusing is required.

Derating curve



Circuit Characteristics

Simplified schematic



Isolation	
Channel-to-bus	1780 VAC, 2500 VDC
Group-to-group	1780 VAC, 2500 VDC
Mechanical operating cycles	20,000,000
Surge withstand capability	4 kV
Response times	
ON→OFF	10 ms
OFF→ON	10 ms
Maximum wire length	100 m
Wire size	
One wire	14 AWG
Two wires	20 AWG

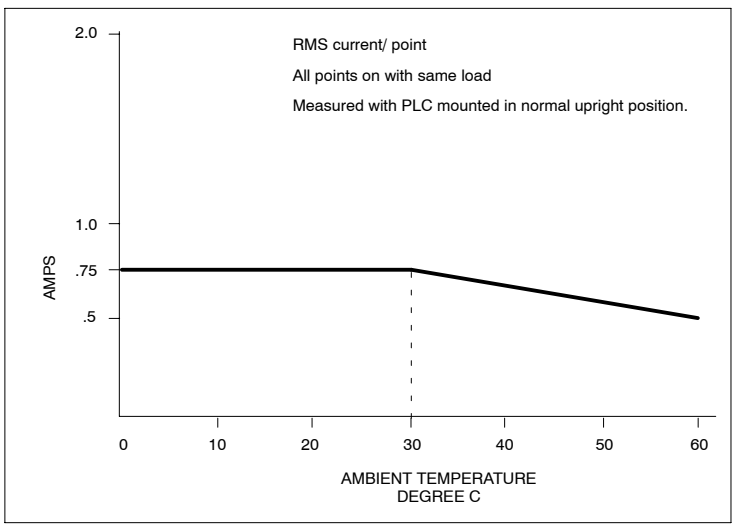
Triac Outputs

Electrical Characteristics

Working voltage	
Continuous range	24 ... 132 VAC for the -01 Models 24 ... 250 VAC for the -02 Models
Maximum	500 VAC for 1 cycle
Frequency of operation	47 ... 63 Hz
Maximum load current	0.5 A/channel
Surge current	5 A for 1 cycle
Minimum load current	50 mA
Maximum OFF state leakage current	1.5 mA
ON state voltage drop	1.5 V
Maximum switching rate	20 Hz
Static DV/DT	300 V/μs
Required external fuse size	User-installed 0.8 A fuse—e.g., Bussman GMA-V-.8—in the field wiring between the output terminal screw and the load

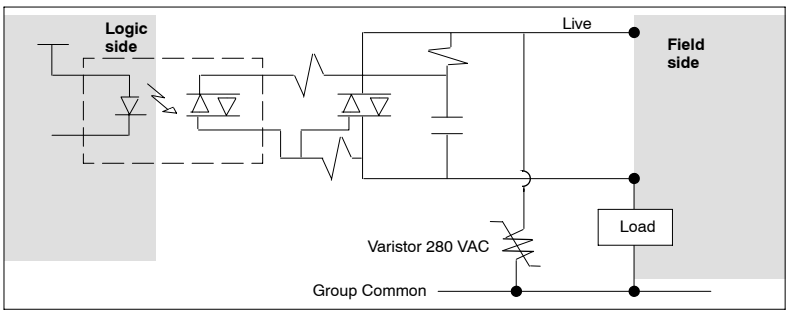
Caution **Internal overload protection is not provided for these outputs—external fusing is required.**

Derating curve



Circuit Characteristics

Simplified schematic



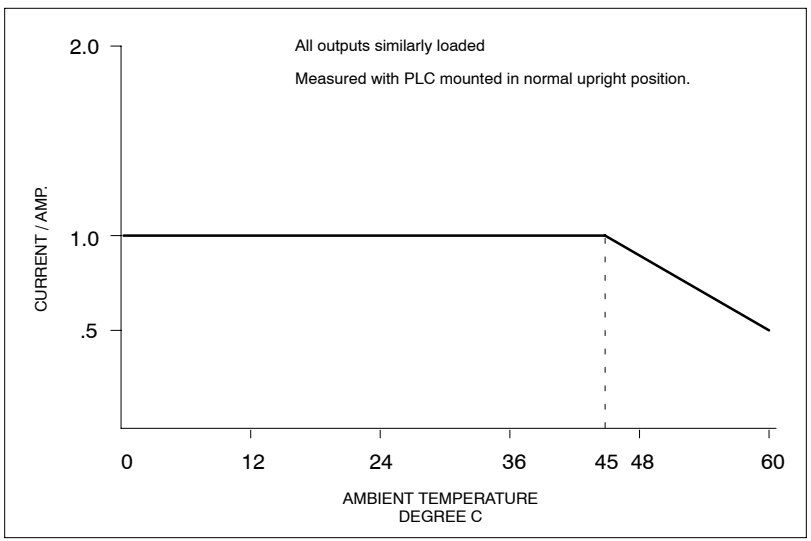
Isolation	
Method	Opto-coupler
Channel-to-bus	1780 VAC, 2500 VDC
Group-to-group	1780 VAC, 2500 VDC
Response times	
ON→OFF	8 ms
OFF→ON	8 ms
Maximum wire length	100 m
Wire size	
One wire	14 AWG
Two wires	20 AWG

24 VDC (FET) Outputs

Electrical Characteristics

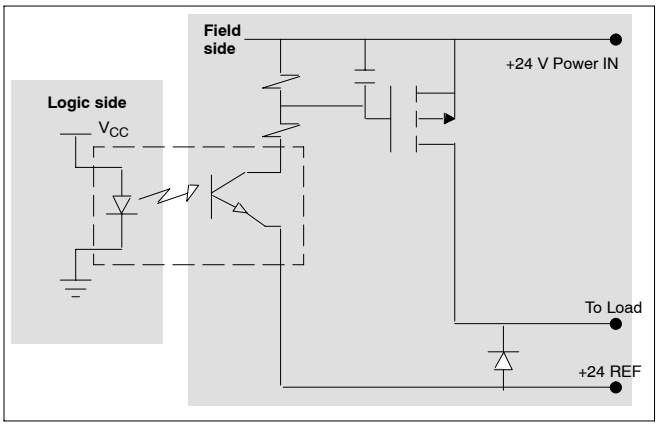
Working voltage range	20 ... 30 VDC
Continuous	32 V for 10 s
Maximum	56 V for 1.5 ms
ON current (@ 60 degrees C)	0.5 A / channel 2 A / group 6 A total
Surge current	5 A for .5 ms @ 6 pulses / min
Minimum load current	10 mA
Maximum OFF leakage current	1 mA @ 30 V
ON state voltage drop	.4 V @ .5 A
Maximum switching rate	4 Hz inductive
Recommended external fuse size	User-installed 1.5 A fuse—e.g., Bussman GMA-V-1.5—in the field wiring between the output terminal screw and the load. **Note** Internal overload protection is not provided for these outputs, and external fusing is strongly recommended.

Derating curve



Circuit Characteristics

Simplified schematic



Isolation	
Channel-to-bus	1780 VAC, 2500 VDC
Group-to-group	500 VAC
Response times	
ON→OFF	1 ms
OFF→ON	1 ms
Maximum wire length	100 m
Wire size	14 AWG

Installation Guidelines

The Model 311 and 411 Micro PLCs offer a straightforward plug-and-play installation capability.

Mounting Options

A PLC may be mounted:

- In a NEMA cabinet
- On a wall
- On an EIA rack
- On DIN rail

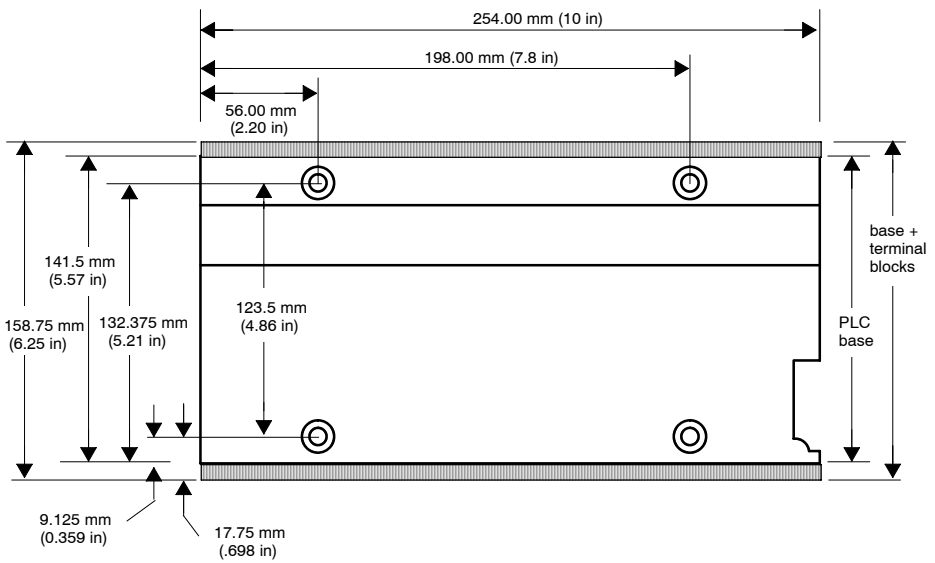
Securing a Unit to a Flat Surface

The PLC housing contains four through-holes—two at the top and two at the bottom—to secure the unit to a flat surface such as a $^1/_4$ in metal plate in a NEMA cabinet.

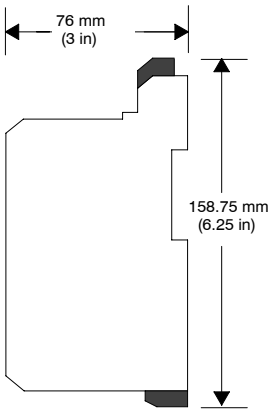
To access these through-holes, remove the I/O terminal blocks at the top and bottom of the unit. The through-hole locations are shown in the dimension drawing below.

The four holes are counter-bored in the housing so that the securing screws will not touch the terminal blocks when they are re-inserted onto the unit.

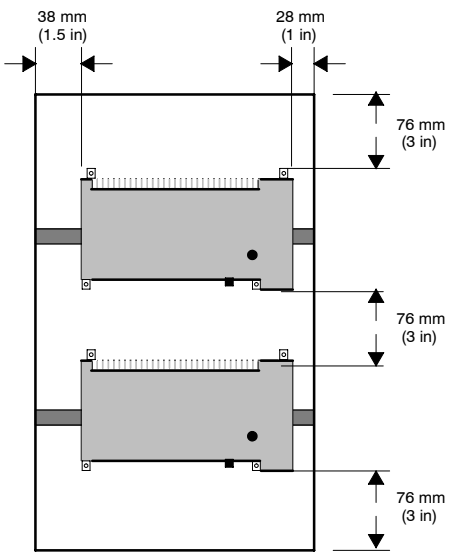
Use M5 screws. The type and length of the screw depends on the kind of surface on which the units are being mounted—e.g., a machine screw with a minimum length of $^5/_8$ in should be used to mount to a $^1/_4$ in plate.



Unit Dimensions

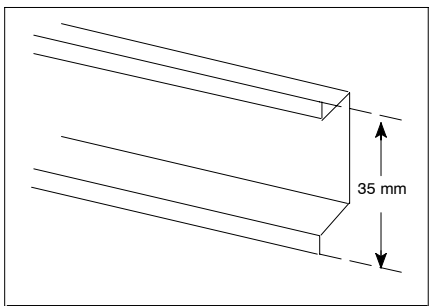


Recommended Minimum Mounting Clearances



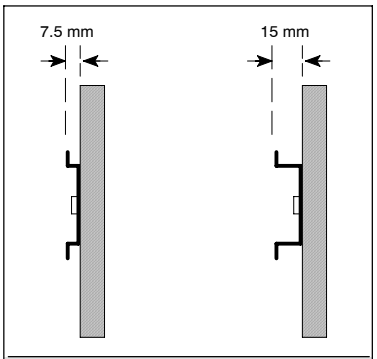
Mounting Units on DIN Rail

The PLC can be mounted on a DIN EN 50 022 carrier rail. The DIN rail can be attached to a flat mounting surface or hung on an EIA rack or in a NEMA cabinet.



DIN EN 50 022 Carrier Rail

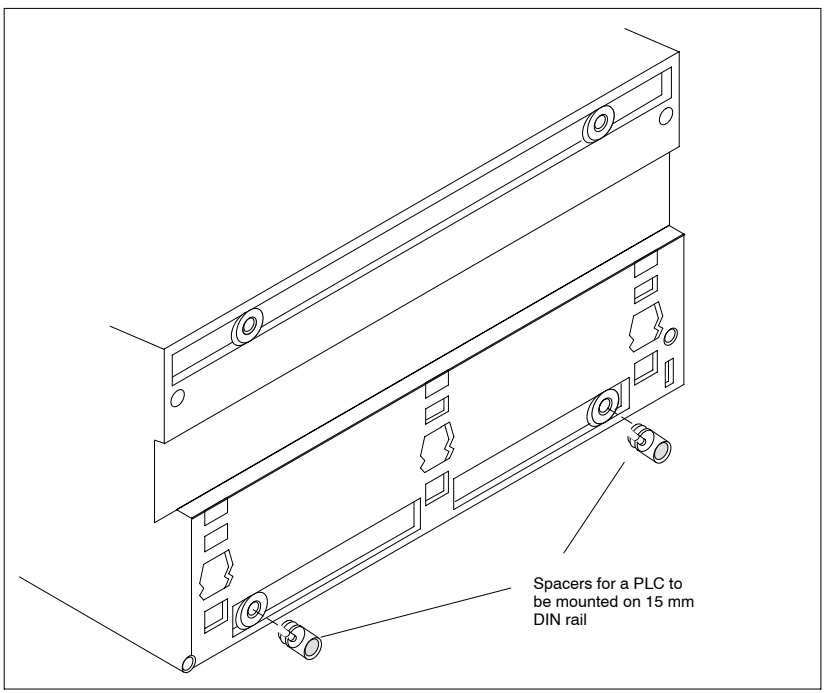
DIN rail may have either 7.5 mm or 15 mm clearance from the mounting surface.



Mounted DIN Rail Profiles

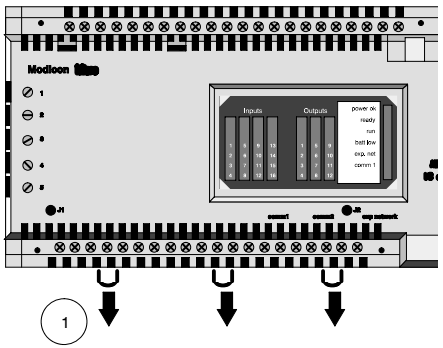
If the PLC is mounted on 15 mm DIN rail, the two spacers shipped with the PLC should be placed on the the lower back of the PLC, as shown below. The spacers keep the unit flush against a flat mounting surface and provide vibration protection.

A DIN rail must be at least 255 mm (10.04 in) long to support a single PLC.

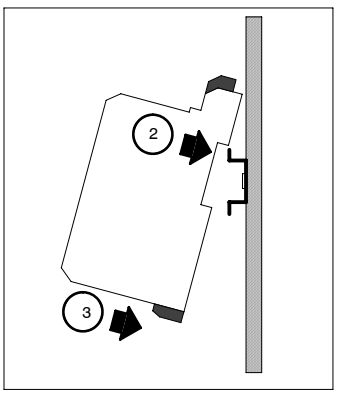


Installing a PLC on DIN Rail

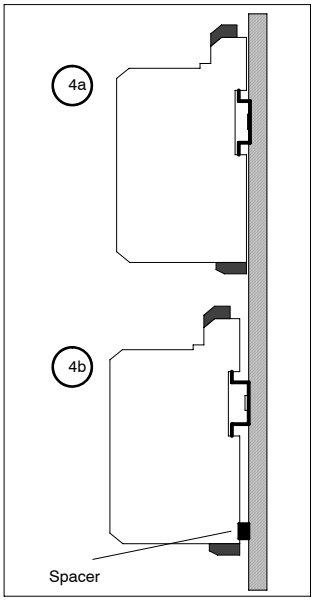
Step 1 Remove the output terminal block on the bottom of the PLC to gain access to the three clips shown in (1). Pull the clips down before placing the unit on the DIN rail.



Step 2 Place the clip on the top of the PLC housing over the top of the DIN rail and drop the unit into place.

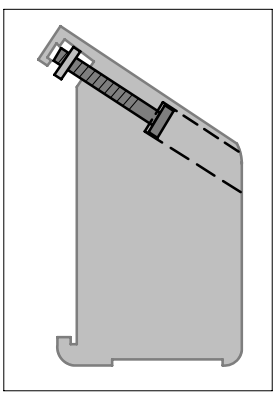


Step 3 If the DIN rail is on a wall or a plate, the unit will fall flush against the surface (see 4a). If you are using a 15 mm DIN rail, insert the two spacers on the lower backside of the unit (see 4b).



Step 4 Push the three clips on the bottom of the unit up to lock the unit onto the DIN rail, then snap the output terminal block back into place.

Step 5 To keep the Micro PLC assembly from sliding on the DIN rail, we recommend that you place a DIN rail end clamp such as the one shown below on both sides of the unit assembly.



End clamps such as the one above can be ordered from your DIN rail supplier.

Installing the Optional Battery or Battery Capacitor

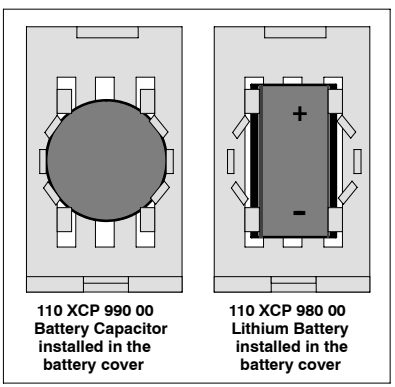
Memory backup may be provided by either a lithium battery assembly (110XCP98 00) or a battery capacitor assembly (110XCP99000).

Both assemblies include wire leads and a 3-position feed-thru receptacle connector. They may be ordered as options from Modicon or from your local distributor.

Installing a Battery or Battery Capacitor Assembly

Step 1 With a slotted screwdriver, remove the battery cover from the Micro PLC. This cover is located on the top right corner of the unit above the LED panel.

Step 2 The under side of the cover has a finger pattern that will grab either the lithium battery or the capacitor. Snap the desired component into the cover:



110 XCP 990 00 Battery Capacitor installed in the battery cover

110 XCP 980 00 Lithium Battery installed in the battery cover

Step 3 Connect the 3-position receptacle connector on the assembly to the three pins on the printed circuit board on the PLC beneath the battery cover. The receptacle is keyed so that only the correct connections can be made with the pins.

Step 4 Place the cover back on the PLC unit. The memory back–up assembly is now installed and available.

Serial I/O Expansion Link

Up to five PLCs can be interconnected on a serial I/O expansion link. The link contains one *parent* PLC and from one ... four *child* PLCs.

I/O Expansion Link Characteristics	
Number of PLCs	2 ... 5
Physical comm port	RS-485
Cable type	Six-position line long body
Connector type on the cableboth ends	RJ11 male on
Termination	120 Ω
Data rate on the link	125 kbyte (+)
Encoding scheme	NRZ
Length of link500 m (1500 ft) maximum 6 m (20 ft) minimum	

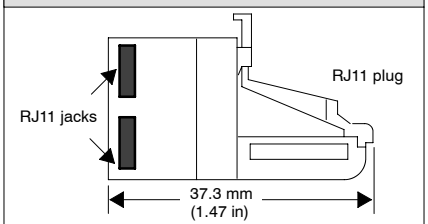
The PLCs are connected to each other on the link via their RS-485 ports. Connections are point-to-point.

Standard six-position, foil-shielded, flat telephone cables with male RJ11 connectors on each end are used to connect the units. Three premade cable assemblies are available:

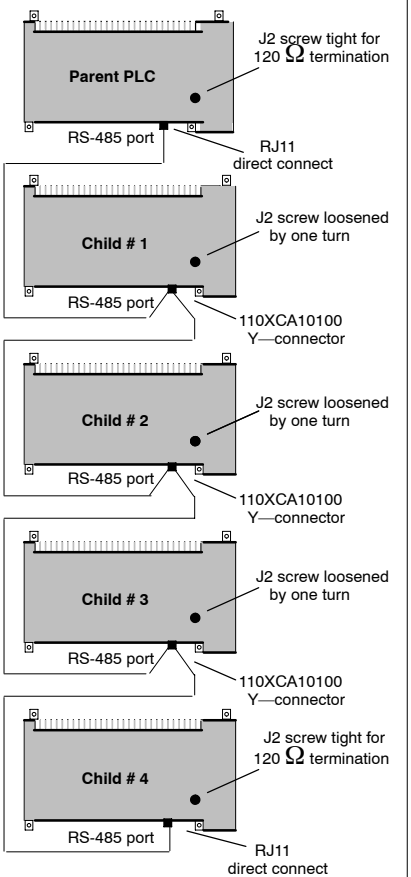
I/O Expansion Link Cables	
Length	**Part Number**
61 cm (24 in)	110XCA17101
3 m (10 ft)	110XCA17102
6 m (20 ft)	110XCA17103

The RJ11 cable plugs directly into the RS-485 ports on the two units at the head and tail ends of the link. All the other units on the link use a (110XCA10100) RJ11 Y-connector.

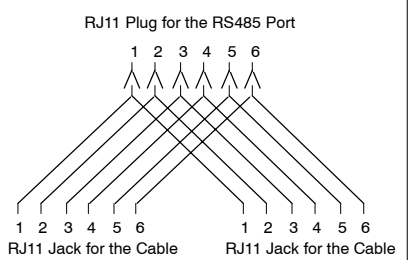
The 110 XCA 101 00 Y-connector



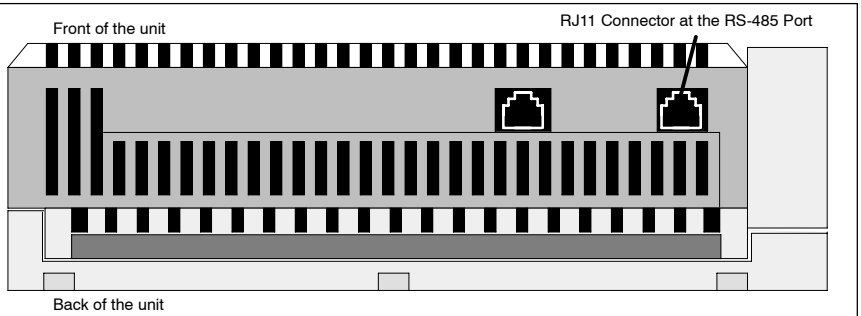
An I/O Expansion Link



110XCA10100 Y-connector Pinouts



Pin 1 = chassis ground
Pin 2 = TXHi
Pin 3 = TXLo



RS-485 Port Location on the Bottom of a 311/411 PLC

Serial I/O expansion establishes a parent-child relationship between the units on the link. One Micro PLC acts as the parent—its I/O processor can access the fixed I/O resources of all the child PLCs on the link, and its CPU can perform all the logic-solving activities for the fixed I/O resources on the link.

Each child PLC on the link must have a unique numerical address in the range 1 ... 4.

☞ **Note** It is your responsibility as a programmer to make sure that each child has been uniquely addressed when the system is I/O mapped (see ***Modicon Micro Ladder Logic Manual***, GM-MICR-LDR, and your panel software documentation for more details). We recommend that you set the child PLCs to RUN mode or power them up before the parent.

Individual child PLCs can be disconnected from the I/O expansion link without disrupting communications between the parent and other child PLCs as long as the disconnection does not break the cable link to the other child PLCs.

⚠ **Caution When a child PLC acts as an intelligent unit on an I/O expansion link—i.e., when the child uses some or all of its fixed I/O resources instead of giving them to the parent—servicing of the hardware interrupts by the child can disrupt predictable logic solving in the parent.**

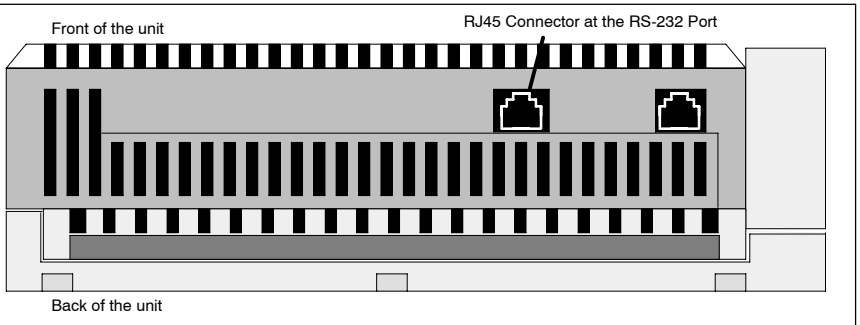
Terminating the Link

120 Ω termination is provided by tightening the screw labelled **J2** on the front right of the PLC below the LED status display. Units are factory-delivered with the **J2** screw tightened.

The two units on the head and tail ends of an I/O expansion link require termination—i.e., the **J2** screws must be tightened. All other units on the link are not terminated—i.e., their **J2** screw must be loosened by one turn.

Connecting the PLC to a Programming Panel

A programming panel—for example, the 520VPU19200 Hand-held Programmer (HHP) or a personal computer running Modsoft programming software—can be connected to the PLC at its RS-232 port, **comm 1**.



RS-232 Port Locations on the Bottom of a 311/411 PLC

RS-232 Cables

Standard eight-position, foil-shielded, flat telephone cables with male RJ45 connectors on each end are used to connect the units. Three premade cable assemblies are available:

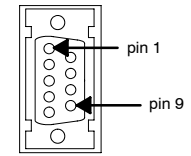
RS-232 Communications Cables	
Length	**Part Number**
1 m (3 ft)	110XCA28201
3 m (10 ft)	110XCA28202
6 m (20 ft)	110XCA28203

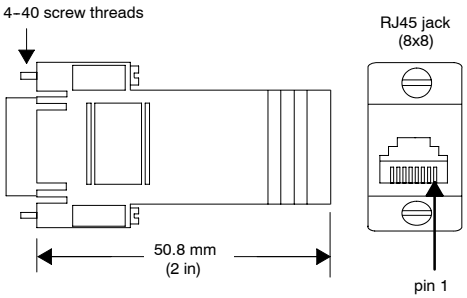
RS-232 Cable Connectors

Two female D-shell adapters are available from Modicon for PLC-to-computer connections—a (110XCA20300) 9-pin adapter for PC-AT type computers and a (110XCA20400) 25-pin adapter for PC-XT type computers.

These adapters come equipped with an RJ45 jack that allows them to clip directly onto a cable assembly. Details are shown on the following page.

110XCA20300
9-pin Female Adapter



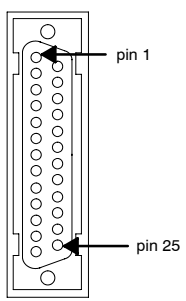


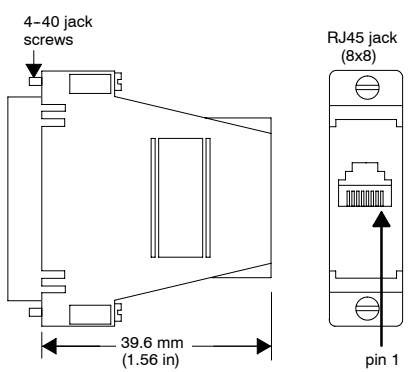
Micro ↔ PC-AT Pinouts

RJ45 Connector		9-pin D-shell	
	1*	1	DCD
TXD	3	2	RXD
RXD	4	3	TXD
DSR	2	4	DTR
GND	5	5	GND
		6	DSR
CTS	7	7	RTS
RTS	6	8	CTS
		9	RI
chassis ground	8	case of the connector	

*** CAUTION: Pin 1 receives 5 V from the Micro**

110XCA20400
25-pin Female Adapter





Micro ↔ PC-XT Pinouts

RJ45 Connector		25-pin D-shell	
	1*	1	
RXD	4	2	TXD
TXD	3	3	RXD
CTS	7	4	RTS
RTS	6	5	CTS
		6	DSR
GND	5	7	GND
		8	DCD
DSR	2	20	DTR
chassis ground	8	1	chassis ground

*** CAUTION: Pin 1 receives 5 V from the Micro**

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP