EZPanel Enhanced
EZText Enhanced
EZTouchPLC
EZTextPLC
EZMarquee
EZPLC & EZI/O
EZ Touchscreen CE Computer
EZCE Touchpanel
EZMonitor

336 pages of the most SENSIBLE Automation Products

Designed and built in USA by

AVG

EZPLC
Hardware Manual

Manual Part Number EZPLC-M
Revision A.1

EZ 123 BY AVG
EZ AS 1-2-3

EZAutomation

1-877-774-EASY (774-3279)
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WARNING!

Programmable control devices such as EZPLC are not fail-safe devices and as such must not be used for stand-alone protection in any application. Unless proper safeguards are used, unwanted start-ups could result in equipment damage or personal injury. The operator must be made aware of this hazard and appropriate precautions must be taken.

In addition, consideration must be given to the use of an emergency stop function that is independent of the EZPLC.

The diagrams and examples in this user manual are included for illustrative purposes only. The manufacturer cannot assume responsibility or liability for actual use based on the diagrams and examples.

Trademarks

This publication may contain references to products produced and/or offered by other companies. The product and company names may be trademarked and are the sole property of their respective owners. EZAutomation disclaims any proprietary interest in the marks and names of others.

Manual part number EZPLC-M

Designed and Built by AVG
4140 Utica Ridge Rd. • Bettendorf, IA 52722-1327

Marketed by EZAutomation
4140 Utica Ridge Road • Bettendorf, IA 52722-1327

Table of Contents

EU Information

EZPLC is manufactured in compliance with European Union (EU) Directives and carries the CE mark. EZPLC has been tested under CE Test Standard #EN55011, and is submitted for UL Certification.

Please Note: Products with CE marks perform their required functions safely and adhere to relevent standards as specified by EU directives provided they are used according to their intended purpose and that the instructions in this manual adhere to. The protection provided by the equipment may be impaired if this equipment is not used in accordance with this manual. Only replacement parts supplied by EZAutomation or its agents should be used.

Technical Support

Consult EZPLC Editor Programming Software Help or you may find answers to your questions in the operator interface section of our website @ www.EZAutomation.net. If you still need assitance, please call our technical support at 1-877-774-EASY or FAX us at 1-877-775-EASY.

SELV Circuits

All electrical circuits connected to the communications port receptacle are rated as Safety Extra Low Voltage (SELV).

Environmental Specifications

Operating Temperature:	-100 to +60 °C
Storage Temperature:	-20 to +70 °C
Operating Humidity:	10 - 95% R.H., noncondensing
Air Composition:	No corrosive gasses permitted

Preventative Maintenance and Cleaning

No special preventative maintenance is required.

1

Getting Started

In this chapter....

- Introduction
- Purpose of the Manual
  - Where to get HELP - Technical Support
- Organization of the Manual
- Quick and EZ System Overview
- EZPLC Part Numbering System
- Quick and EZ Start to Getting Familiar with EZPLC
- How to Design the Most Efficient EZPLC System

1.1 Introduction

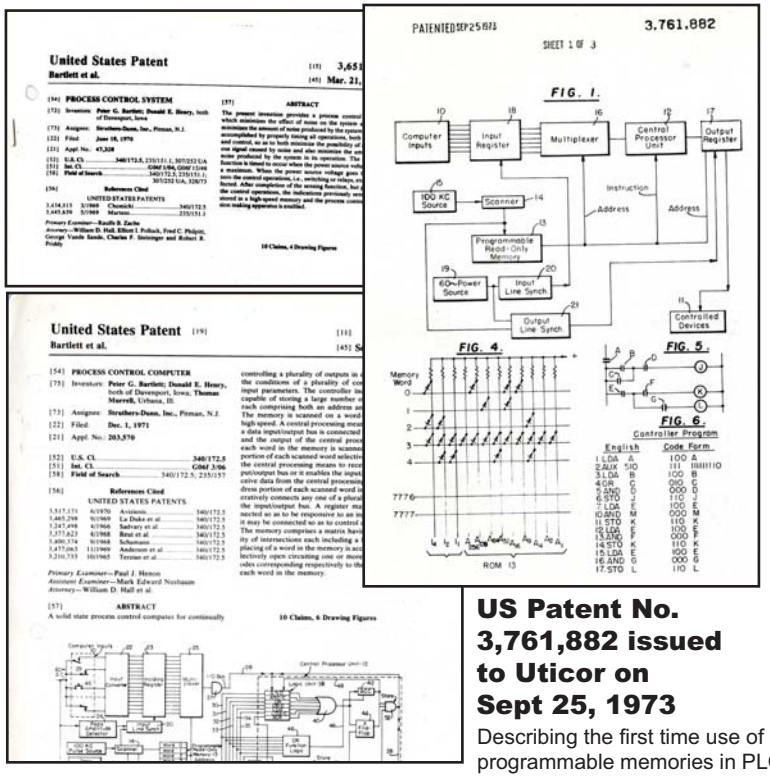
Welcome to EZAutomation's new programmable logic controller, the EZPLC.

EZAutomation is the newest addition to the AVG family, with a 37-year-old tradition of manufacturing more than 200 high value and most innovative automation products.

AVG, established in 1975, is an American group of companies comprised of Autotech, Uticor, and now EZAutomation. Since its inception, AVG has introduced more than 500 innovative new products, including PLS and PLCs. We have more than 20 patents in Automation products and 15 new patents are pending.

Uticor, formerly Struthers Dunn Systems division, has been at the forefront of PLCs, welding controls, message displays and operator interface technology since 1968. Uticor, in fact, was one of the early inventors of PLCs back in 1968. It held numerous patents on PLCs, then called Process Control Computers.

The EZPLC's innovation, flexibility, cost-effectiveness and precision, comes from Uticor's 37 years of PLC experience.



US Patent No. 3,761,882 issued to Uticor on Sept 25, 1973

Describing the first time use of programmable memories in PLCs.

1.2 Purpose of the Manual

This manual is presented with details and step-by-step information on Installation and Programming of a new EZPLC. It also covers the troubleshooting and maintenance of an existing setup, if present, and provides understanding on how to connect an EZPLC with other components in your control system.

This manual is a good reference guide for personnel who install EZPLCs as well as those who program them. If you understand programmable logic controllers in general, you can find all the information you need to start and maintain your system in this manual.

Where should I Start?
If you are already familiar with basic PLC concepts, you may choose to start with *Chapter 2, Hardware Installation*. New customers may find it more useful to get acquainted with the features of EZPLC first. The *Quick And EZ Start to get familiar with EZPLC* section of this chapter is also a good starting point, for both experienced and new users.

Where to get HELP - Technical Support
We make every effort to keep our manuals in line with the feedback from our customers. If you find it difficult to locate what you are looking for, check the resources listed below for the topic you are looking for.

- Table of Contents: A listing of contents per chapter, at the beginning of manual.
- Index: Index is an alphabetical listing of all key words located at the back of the manual.
- Key Topics for Each Chapter: At the beginning of each chapter

Although most of your questions will be answered within this manual, if you still need assistance, technical support is available at 1-877-774-EASY. Our voted best Tech Support Engineers are available Monday through Friday 6 A.M. to 12 midnight CST. You can also reach us at 1-563-650-8112 on the weekends for emergency tech support. We may not be able to provide you the level of support available during the week, but we would most likely be able to solve your emergency needs.

You can also visit our website for online resources and the latest product related information. Our web address is www.EZAutomation.net.

1.3 Organization of the Manual

The table below provides an overall description of the topics covered within this manual.

Chapter	Description
	**Chapter 1: Getting Started** Introduction; Purpose of the Manual; Quick and EZ System Overview; EZPLC Part Numbering System; Quick and EZ Start to getting familiar with EZPLC; How to design the most efficient EZPLC system.
	**Chapter 2: Installation** Safety Considerations; Installation considerations; EZPLC Environmental and Power Specifications; Electrical considerations; Control Cabinet installation; Installing EZPLC Base; Base Mounting Dimensions; Power sources and Optical Isolation; EZIO Modules Positioning; EZIO Modules Installation Overview.
	**Chapter 3: Wiring** EZPLC Models and Specifications; CPU Overview; CPU Hardware; PLC Operation Modes; CPU Status indicators; Communication Ports; Battery backup; CPU Operation; I/O Response time; Scan time considerations; Memory map.
	**Chapter 4: Maintenance and Troubleshooting**

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1.4 EZPLC System Overview

DC Input 10-28 VDC
8 pt sink/source
8 pt High Speed

DC Output 10-28 VDC
8 pt sink or source, 0.5A

DC Combo 10-28 VDC
4 pt IN, 4 pt sink OUT
4 pt IN, 4 pt source OUT
4 pt IN, 4 pt High Speed IN

AC Input
8 pt 70-132 VAC

AC Output
8 pt 70-132 VAC
Not in M2 slot

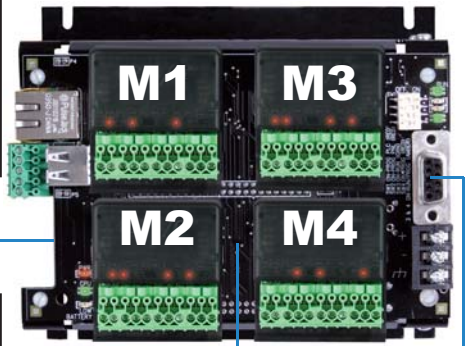
AC Combo 70-132 VAC
4 pt IN, 4 pt OUT
*Not in M2

Analog Input, 12 bit
8 channel IN, voltage
8 channel IN, current
M1 to M10

Analog Combo, 12 bit
4 ch. IN, 4 ch. OUT
0-5 VDC or 0-10 VDC
0-20 mA or 4-20 mA
M1 to M4 only

CPUs
Mounted underneath base
1. Standard w/ 2 serial ports
2. Enhanced w/ 2 serial ports and Ethernet

40MHz, 8192 Registers
64KB memory, 3ms scantime for 1K



Relay Output
4 pt OUT, 5-180 VDC or 20-132 VAC, 1A
*Not in M2

Relay Combo
4 pt IN, 70-132 VAC
4 pt OUT, 5-180 VDC or 20-132 VAC
4 pt IN, sink/source
4 pt OUT, 5-180 VDC or 20-132 VAC *Not in M2

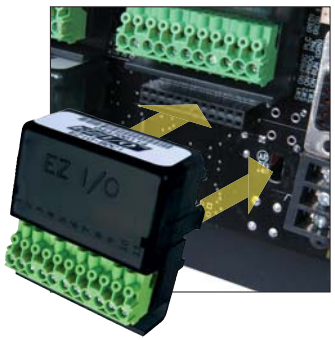
Communication Cards
Plugged onto the back of the base
1. DeviceNet
2. Profibus

Bases
4 slots - 32 I/O, 110VAC, 24VDC
6 slots - 48 I/O, 110VAC, 24VDC
8 slots - 64 I/O, 110VAC, 24VDC
12 slots - 96 I/O, 110VAC, 24VDC

* Plug-in 2x2x1 I/O modules with Removable Terminal Block and LED indicator in each I/O

Specialty
4 ch. Thermocouple IN
High speed counter with 1 or 2 encoders

AC/DC Combo
4 pt OUT, 10-28 VDC source, 4 pt OUT, 70-132 VAC *Not in M2
4 pt IN, 70-132 VAC, 4 pt OUT, 10-28 VDC source
4 pt IN, 10-28 VDC sink/source, 4 pt OUT, 70-132 VAC *Not in M2



Inserting an EZI/O Module


Programming EZPLC Editor

1.5 Quick and EZ System Overview

The EZPLC family is the most innovative PLC in its class. These micro modular PLCs are smaller in size, but they are packed with high controlling power only found in high-end PLCs.

EZPLC Base

The EZPLC bases are available in four models for 4, 6, 8 or 12 slots and are capable of flexibly incorporating 32, 48, 64 or 96 I/O points respectively. Every EZPLC model is available for either 24 VDC or 110 VAC power input. Every EZPLC has a built-in RS232 port (programming and HMI), RS-422 port (ASCII communications), CPU with or without Ethernet (what we call our card engine), and slots for I/O modules. Optional communication cards for DeviceNet Slave and Profibus Slave can be utilized with every model as well (field installable).

CPU (Card Engine)

There are two types of CPUs. The Standard CPU has two integrated Serial Communication ports; while the Enhanced model comes with additional Ethernet connectivity. The CPU is located underneath the Base. Both types of CPUs have 64KB of total program memory and a rich yet concise instruction set including drum sequencer, 32-bit floating-point calculations, ASCII In/Out and Data conversions. Scan time for 1K instructions is approximately 3 ms including all overhead.

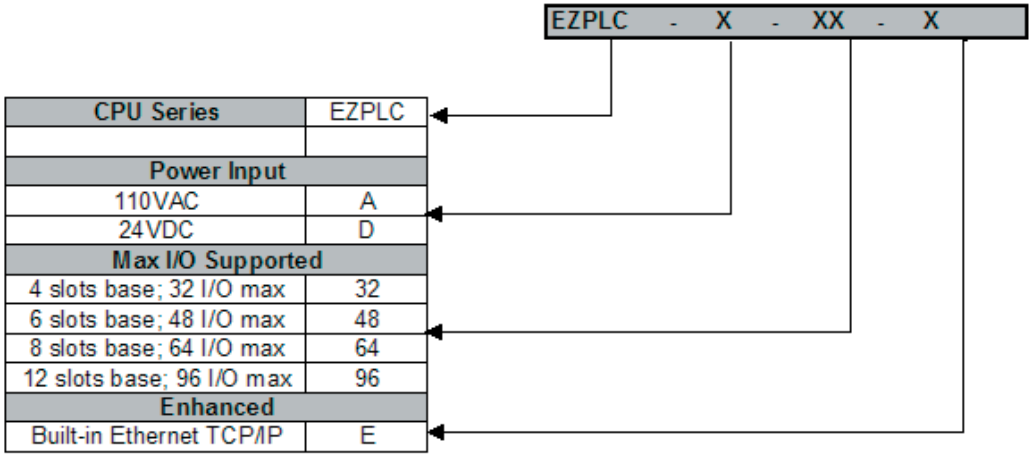
I/O Configuration

The EZPLCs can support a maximum of 32, 48, 64 or 96 I/O points on it's 4, 6, 8 or 12 slot bases respectively.

I/O Modules

All EZPLCs utilize plug-in EZIO modules for its IO requirements. EZIO modules are not included with EZPLC bases and need to be purchased separately. All the bases in EZPLC series can be equipped with any EZIO module with only minor restrictions on the type of EZIO modules that can be used in some of the I/O slots. EZIO modules are available for DC, AC, Analog, Thermocouple, High speed counter and Relay type IO requirements. As you can see from the I/O tables on the preceding page, there are a number of Mix-n-Match I/O Modules. The patent pending Mix-n-Match capability of EZIO makes it extremely flexible to configure the I/O or EZPLC.

1.6 EZPLC Part Numbering System



CPU Series	EZPLC
Power Input	
110VAC	A
24VDC	D
Max I/O Supported	
4 slots base; 32 I/O max	32
6 slots base; 48 I/O max	48
8 slots base; 64 I/O max	64
12 slots base; 96 I/O max	96
Enhanced	
Built-in Ethernet TCP/IP	E

EZIO Part Numbering System:

EZIO modules use a very easy and self-explanatory part numbering system. Let's take a few examples to get you familiarized with the conventions used in part numbering:

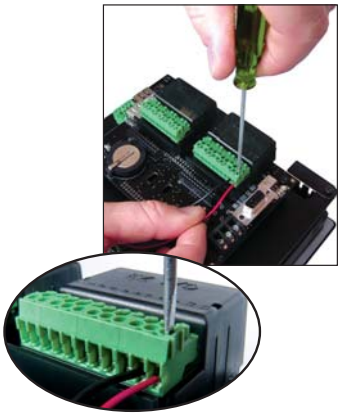
Discrete Modules:

- •EZIO-8DCI — EZIO module with 8 DC inputs.
- •EZIO-4DCI4DCOP — EZIO Module with 4 DC inputs and 4 DC type outputs P specifies PNP Sourcing Type output (N specifies NPN Sinking type output).
- •EZIO-4ACI4ACO — EZIO module with 4 Analog inputs and 4 Analog outputs V specifies voltage (C specifies Current type).

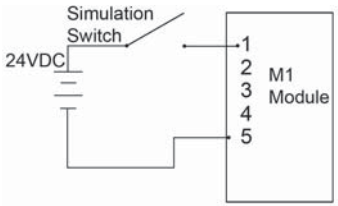
Analog Modules:

- •EZIO-4ANI4ANOV — EZIO module with 4 Analog inputs and 4 Analog outputs V specifies voltage type (C specifies Current type).

Similarly, all EZIO modules have intuitive and easy to remember part numbers. For a complete list of all the EZIO module's part numbers and description, refer to Chapter 3.



NOTE: If you purchased an AC Power Base, everything else remains the same except for the use of 120 VAC in place of 24 VDC.



1.7 Quick and EZ Start to Get Familiar with EZPLC

In this section we present a quick example of how you can setup your EZPLC. You will see how EZ it is to setup an EZPLC, even if you are new to PLCs. This example is not intended to explain specific details needed to start-up your system. Rather, it provides a quick guide to give a broad picture of what is needed to power-up your EZPLC system.

Step 1 Check all System Components

It is always recommended to make sure you have all the right parts to build your system. This is what you will need to get started:

- EZPLC Base (e.g. EZPLC-D-32)
- Discrete AC or DC EZIO modules* (e.g. EZIO-8DCI and EZIO-8DCOP
- RS-232C Programming cable (P/N EZP-PGMCBL)*
- Screwdriver for I/O Module wiring (P/N EZIO-SCDRV)* (You can also use your own 2.5mm blade screwdriver)
- EZPLC Editor Programming Software (P/N EZPLC-EDIT)*
- 24 VDC/120 VAC Momentary NO switch**
- 24VDC Power Supply assuming you have a DC Power EZPLC

* *These items have to be purchased separately from EZAutomation.*

** *EZAutomation does not sell this item.*

You will also need a PC for programming EZPLC. It can be any IBM or Compatible PC (486 or better) with a mouse and a separate serial port, a CD-ROM Drive, and a Windows operating system (Standard Windows 95/98/NT4.0/2000/XP) installed on it.

Step 2 Install I/O Modules

Insert EZIO module(s) into the base. Refer to the following I/O positioning diagram.

EZIO-8DCI should be mounted at position M1 and EZIO-8DCOP at M3. EZIO modules have a snap-on design to facilitate easy installation and removal from the base slots. The I/O modules have two clips and a Molex connector, which snap into the EZPLC Base.

- Hold the module in the thumb and index finger so that your fingertips are on the clips (see image to the left)
- Snap the module onto the board so that clips are placed on the open slots
- Make sure that the Molex connector is aligned to the female counterpart on the base
- Push the module gently from the top to insert it completely until you hear a clicking sound

Step 3 Add I/O Simulation

Wire the Momentary switch as per the diagram and add an output module.

Step 4 Connect Power

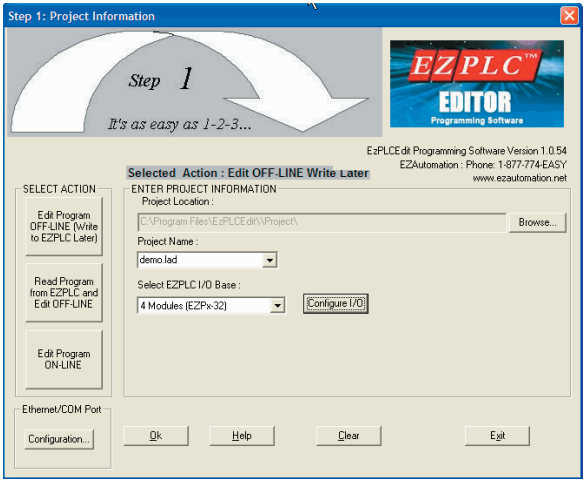
Connect the power input wires into the EZPLC's power terminals. Do not apply power at this time.

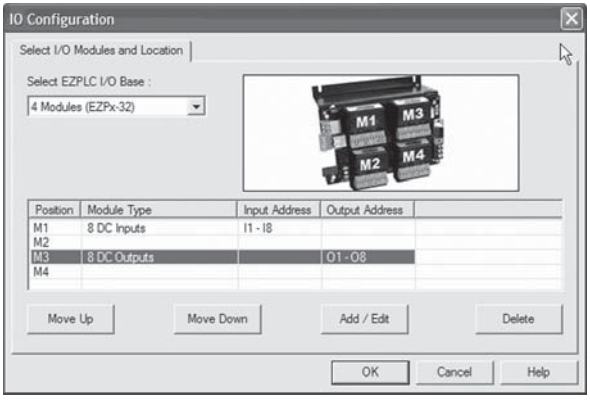
Step 5 Install software on your PC
Load the CD included with the purchase of software (P/N EZPLC-EDIT) into your computer's CD-ROM drive and follow the on-screen instructions. The software will install itself.

Step 6 Connect EZPLC to your PC
Connect your PC's serial port to EZPLC's RS232 port using the programming cable (P/N EZP-PGMCBL). Mode DIP switch SW1 enables or disables the RS232 port on the PLC. Thus, SW1 must be in the ON position in order to program the EZPLC. SW2 must be OFF. SW3 and SW4 should be ON.

Step 7 Switch ON the Power
Apply power to the system and ensure the PWR indicator LED on the EZPLC base is ON. If not, remove power from the system and check all wiring.

Step 8 Enter Program





1. Open the EZPLC Editor Software and click on the **Edit Program Off-Line (Write to EZPLC Later)** button.

2. Type the project name 'demo' in the Project Name field (as shown in the image on the left). The EZPLC projects are saved as **.lad** files in the PC.

3. Select the appropriate EZPLC I/O Base e.g. '4 Modules (EZPx-32).

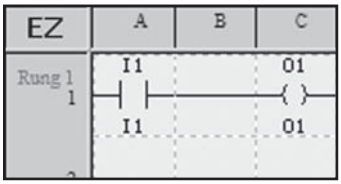
4. Click on the **Configure I/O** button and select the appropriate position for your EZIO modules (e.g. '8 DC Inputs' for M1 and I1-I8 for its address and '8DC Outputs' for M3 position and O1-O8 for its address).

5. Enter following sample ladder program into the EZPLC Editor.

   a. Select "Relay/Boolean" type instruction set in the instruction toolbar (located on the right side of the EZPLC Editor programming screen.

   b. Click on "NO Contact" and then click on the main ladder logic programming window to place it as shown on the following page.

   c. Once placed on the ladder logic programming window, double-click on the icon and enter the tag name/ address as "I1".



d. Similarly, click on “NO Coil” and place the instruction in the ladder logic programming window. Select the tag name/address as “O1”.

e. Click on shortcut  to wire “NO Contact” and “NO Coil” as shown.

6. Transfer the program to the EZPLC by pressing the **Control + T** keys on your PC.

Step 9 Test the Program
When you press the NO momentary switch, the LED on Input Module M1 input #1 and on the output module M3 output #1 will turn ON. When you release the switch, both LEDs will turn off.

Congratulations!
You have successfully written and tested your first program in EZPLC.

1.8 How to Design the Most Efficient EZPLC System

When designing your control system, keep the following recommendations in mind to design the most efficient and powerful EZPLC system:

1. Take Advantage of our Mix-n-Match EZI/O
One key advantage of using EZPLC is its extremely flexible EZIO. In order to take full advantage of this feature, first figure out the requirements for your control system. Figure out your most commonly used and most cost effective switches, solenoids, and sensors, etc. Once you have a good idea of all of these devices that you are going to use, then pick EZIO to match your configuration instead of trying to match your configuration to the available IO as you would do with most other PLCs. There is practically no configuration of IO that EZPLC cannot handle. EZIO is available in efficient blocks of 8 points with AC/DC combo modules, AC/DC with Relay, Analog combo and many more to match any configuration.

2. Fast Scan Time
Need fast response time for your control system? EZPLC has a fast scan time, an average of 3ms for 1K Boolean instructions and all other associated overhead. Even if your control system’s scan time spreads out to 5-6 ms based on the logic used, you can take advantage of our FAST interrupt inputs and subroutines. Use these inputs to match the precision of multi-thousand dollar PLCs.

3. No Power Budgeting
With EZPLC, you will have the absolute peace of mind when picking EZIO modules for your control system. EZPLCs do NOT require any power budgeting whatsoever. You can practically pick out any EZIO module in any combination without having to worry about power budgeting.

4. Rich Instruction Set and Patent Pending Free Flow Logic

Before you start designing your control system, just take a couple of moments to understand EZPLC's rich yet concise instruction set. It has features like Drum, data conversion, and marquee instructions to save you extensive programming. A Relay Ladder Logic program (RLL) designed in another PLC might require 100 rungs where EZPLC can perform the same functionality by utilizing subroutines and using our patent-pending Free Flow Logic in just a couple of rungs.

5. 64KB Memory

Regardless of the size of the EZPLC you purchased, all models have an abundant 64KB of total memory available. With this amount of available memory, you can now design practically any size of RLL program without ever having to worry about memory shortage. You can create large databases, huge recipes, and data acquisition with this amount of memory in your PLC.

6. 8192 Registers and Variables

There is no shortage of the numbers of variables (tags) and registers in the EZPLC. Therefore, you do not have to worry about running out of registers and accordingly plan your design.

2

Installation

In This Chapter....

2.1 Safety Considerations

Please follow all applicable local and national codes to ensure maximum safety of the equipment and personnel. The installation and operational environment must be maintained per the latest revision of these codes. You are responsible to determine the codes to be followed, and to verify the compliance of equipment, installation, and operation with the latest revision of these codes.

Plan for Safety

It is an absolute must to follow all applicable sections of:

- The National Fire Code
- The National Electrical Code (NEC)
- The National Electrical Manufacturer's Association (NEMA) codes.

Local regulatory and government offices usually provide excellent help to determine which codes and standards are necessary for safe installation and operation.

Safety Techniques

Safety is the most important element of a proper system installation. Adhering to these safety considerations ensures the safety of yourself and others, as well as the condition of your equipment. We recommend reviewing the following safety considerations:

1) *Disconnecting Main Power*
   The main power switch should be easily accessible to the operators and maintenance personnel. It is important to make sure that all other sources of power including pneumatic and hydraulic are de-energized before starting the work on a machine or process controlled by a PLC.

2) *Safety Circuits*
   Most of the machines are installed with safety circuits, like Limit switches, Emergency stop push buttons, and Interlocks. These circuits should always be hard-wired directly to the PLC. These devices must be wired in series so that when any one device opens, the PLC is automatically de-energized. This removes power to the machine. These circuits should not be altered in any case, since serious injury or machine damage could result.

3) *Fail-Safe Operation*
   Our products are not fault-tolerant and are not designed or intended for use as on-line control equipment in hazardous environments requiring fail-safe performance, such as in operation of nuclear facilities, aircraft navigation or communication systems, air traffic control, direct life-support machines, weapons systems, clutch control systems on presses, in which the failure of the product could lead directly to death, personal injury or severe physical or environmental damage. External fail safe and/or redundant components are required to make your control system Fail-safe.

2.2 Installation Considerations

EZAutomation products have been designed and tested for operation in the most demanding industrial environments. Modern solid-state industrial controls are complex electronic equipment that operate at low levels of voltage and current, coexisting with components that operate at much higher levels of power. The difference in operating power characteristics between the high and low power control devices creates the possibility of unwanted signals being generated causing interference. The interference, which is a by-product of electrical noise, is not present at all times. However, it appears at random and during brief periods of time it can cause disruptions and errors in the operation of a control system.

Enhancement of a system's noise level immunity, and its tolerance to other environmental hazards can be accomplished by following proper system installation guidelines. The recommendations are of a general nature and constitute good industrial installation practice.

General Environmental Installation Considerations

Avoid installing EZPLC in areas where the following conditions may exist:

- Environmental temperatures above or below those specified by the EZPLC
- Prolonged exposure to humidity and liquids which may be sprayed or splashed on the equipment
- Dusty environments where airborne particles may accumulate on equipment causing reduction of heat dissipation, and reduction in effective electrical spacing between components
- Areas of excessive vibration
- Areas of high-radiated electrical noise, such as near fields of transmitting antennas and areas in close proximity of arc welding stations

Environmental Specifications

The following table lists the environmental specifications that generally apply to the EZPLC Bases and EZIO modules. Please refer to the appropriate I/O module specifications in the EZIO User Manual (P/N EZIO-M).

Parameter	Ratings
Operating Temperature	-10 to 60 °C
Storage Temperature	-20 to 70 °C
Humidity	10 to 95% Relative Humidity, Non-condensing
Vibration Resistance	5 to 55 Hz, 2g for 2 Hours in X, Y, and Z Axes
Shock Resistance	10g for under 12 ms in X, Y, and Z Axes
Electrical Noise	NEMA ICS 2-230 Showering Arc, ANSI C37.90a SWC, Level C Chattering Test
Atmospheric Conditions	Non-corrosive gases

Agency Approvals

Your application may require Agency approval*. EZPLC's agency approvals are:

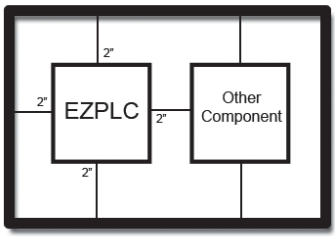
- UL (Underwriter's Laboratories, Inc)*
- CUL (Canadian Underwriter's Laboratories, Inc)*
- CE (EU Certification)*
- Approvals in process. Check our website www.EZAutomation.net for the latest information.

Physical Layout of EZPLC In Control Cabinets

When possible, cabinets housing electronic equipment should be designed with provisions for natural or forced ventilation to facilitate heat dissipation. Observe the following rules for cabinet installation:

- Heat generating equipment (power supplies and other heat inducing components) should be installed toward the top of the cabinet. The lower space in the cabinet is cooler than the top area.
- Install heat-sensitive components in the lower section.
- Provide enough space between components to allow a free flow of air for better heat dissipation.
- Provide the maximum possible physical separation between solid state and electromechanical controls. If possible, the electromechanical controls (motors, starters, solenoids, etc.) should be housed separately or at the farthest point when enclosed within the cabinet.

CONTROL CABINET



Also 2" from door or cover of the cabinet

We recommend that the EZPLC has a minimum clear space of 2" on all sides.

2.3 Electrical Considerations

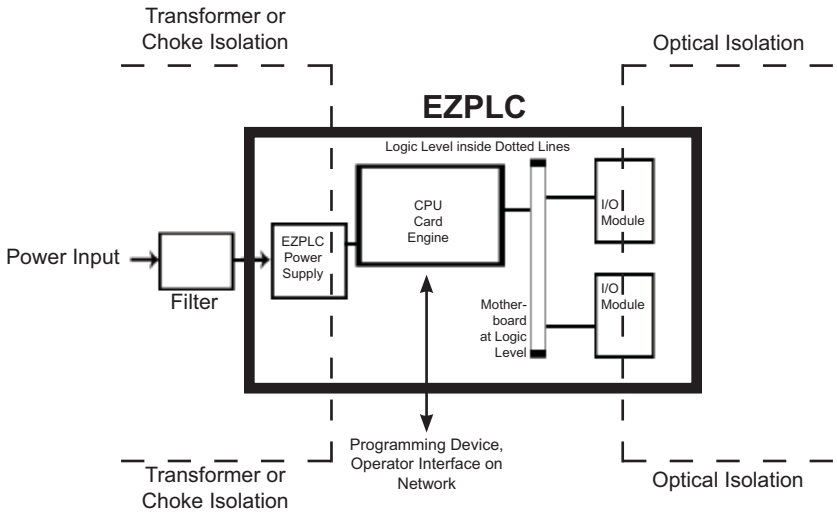
Understanding Electrical Noise, Optical Isolation, and Shielding of Cables

This section will provide you with a very basic understanding of Electrical Noise and how to keep it away from CPUs.

1. **Source of Electrical Noise**
   Industrial plants that have a number of generators of electrical noise are sometimes also referred to as Radio Frequency Interference or RFI. Anytime an inductive load like a motor, motor starter, or solenoid is turned off, it generates a burst of excess energy that has to flow back to ground, just like electrical energy from a lightening storm has to flow back to Earth. Other sources are RF Welders or Radio Transmitters. RFI is short bursts of electrical energy at very high frequencies.

2. **Effect of RFI on Electronic Automation Equipment**
   Electronic controls use faster and faster CPUs today. These CPUs are also operating at 2.5V to 5VDC logic level power supply. RFI, if allowed to enter the CPU inside, is a killer of logic. A CPU under this environment loses its brain and behaves erratically. A smart industrial-grade CPU like the EZPLC's Card Engine, when faced with RFI, halts its operation instead of giving false outputs.

3. How to Keep RFI Isolated from CPUs

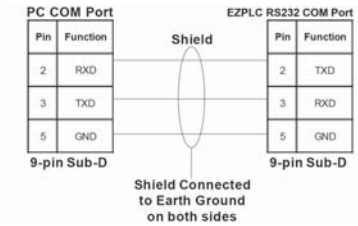


Cabinets

Equipment cabinets usually incorporate one or two doors and/or hinged cabinet panels. In addition, sub-panels may be utilized on those electronic controls and electromechanical items that are mounted.

The goal here is to create a medium for mounting the equipment and ensure grounding of the control's chassis to it. Relying on door hinges and swinging panels for a good metallic bond between hinged parts and the main body of the cabinet does not insure adequate grounding. That is why the use of ground straps is recommended.

RS232 Wiring Diagram

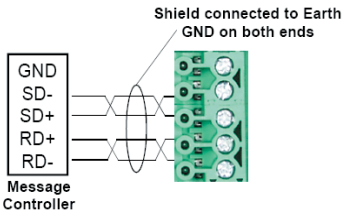


RFI enters electronic controls in two ways:

- Radiated RFI
- Conducted RFI

For most practical purposes, electronic devices, unless sitting right next to a powerful RFI transmitter, will not be affected by noise because air space severely attenuates such interference. On the other hand, conducted RFI travels over conductive surfaces such as power supply wires, electrical wiring of field devices, and worst of all; improper ground planes.

RS422/485 Wiring Diagram



It is a common practice with PLCs to isolate the sensitive CPU of the PLC from RFI by providing Transformer or Choke Isolation on the Power Supply and optical isolation at the I/O side. EZPLC isolates the conducted RFI by both means, transformer/choke isolation as well as optical isolation for I/O modules.

4. Cabling, Shielding, and Grounding

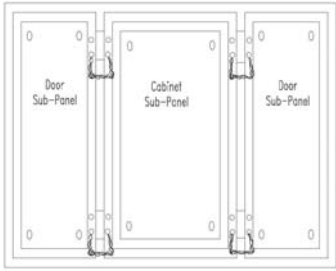
It is vital for the reliable operation of any electronic device to have any of its metallic surface well grounded to Earth. This not only provides for safe operation, it also will drain out any conducted RFI to Earth, away from the CPU's signal ground. Obviously, the metal cabinet

housing the EZPLC should also be well grounded. The following section will detail these procedures.

Power cables, I/O cables or wiring and communication cables should all be separate so that they do not couple the conducted RFI on any of these wires/cables. Communication cables such as Ethernet, DeviceNet and Profibus cables have their own standards for noise isolation which must be followed. Another path for RFI into the EZPLC is through its RS232 and RS422/485 ports. The cables to these ports must be shielded properly as shown in the following diagrams.

Cabinet Grounding

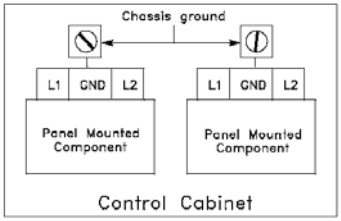
Equipment cabinets usually incorporate one or two doors and/or hinged cabinet panels. In addition, sub-panels may be utilized on those electronic controls and electromechanical items that are mounted.



Cabinet Door Grounding Straps

The goal is to create a medium for mounting the equipment and ensure grounding of the control's chassis to it. Relying on door hinges and swinging panels for a good metallic bond between hinged parts and the main body of the cabinet does not insure adequate grounding. That is why the use of ground straps is recommended.

The equipment enclosures are generally either painted or anodized. It is imperative that the equipment chassis are grounded. Not only is this good safety practice, but it also helps noise immunity problems. Mounting of painted or anodized enclosures to like surfaces does not insure good metallic contact between the equipment chassis and cabinet.

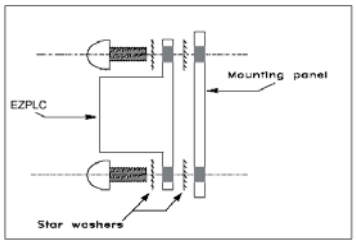


Cabinet Chassis Grounding

The use of star washers when mounting the EZPLC, or other components, provides sufficient grounding on the panel.

Cabinet Wiring

The wiring of the EZPLC to the "field" outside the cabinet must be by design. The wiring cannot be random in order to get the various points of the cabinet and the "field" electrically connected.



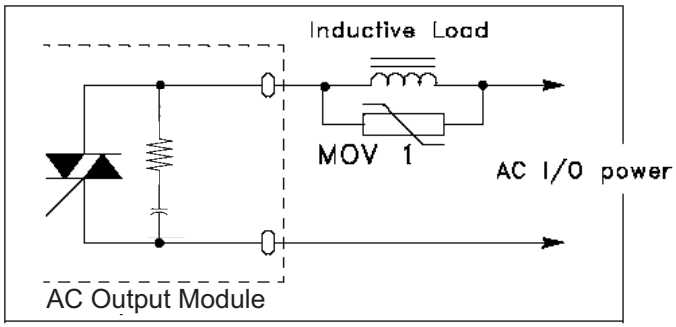
Star washers for proper grounding

Some general rules that apply in most situations:

- Provide a separate power source to electronic controls and keep this power buss away from any I/O power.
- The cabinet should be wired with a safety ground (the main safety ground wire gauge is determined by the cabinet's total current consumption) and in accordance with all electrical code requirements.
- Once the cabinet doors, stationary sub-panels and swing-out sub-panels have been "strapped" to the main cabinet, it is not necessary to run safety ground wires from the equipment chassis terminals to the main safety ground connection.
- The safety ground terminal of each component can, and should be, connected with the shortest wire possible, to the cabinet or sub-panel frame.
- Plan the wiring routing. Keep all switched power in separate ducts and if there is AC and DC power being switched, keep the wiring of each branch separate from all wires and cables carrying low level signals.
- Keep all three phase power outside of the cabinet, but if it becomes necessary, keep the runs as short as possible and maintain the maximum possible distance between the three phase buss and all other wiring.

AC/DC Transient Protection

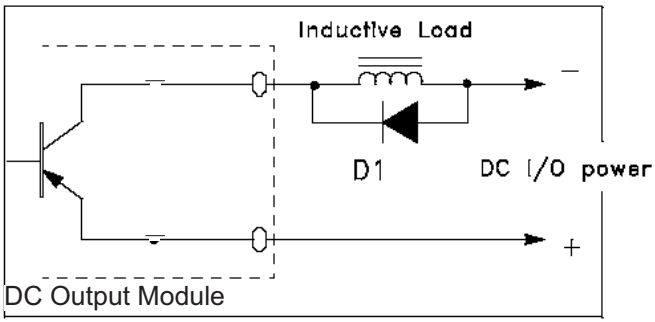
Recommended AC Inductive Transient Protection



CAUTION! *MOV should be 2 times the load voltage and have sufficient energy rating corresponding to the load.*

CAUTION! *D1 should have at least 100 PIV and 3 Amp current capacity.*

Recommended DC Sinking Transient Protection



CAUTION! *EZPLC's DC outputs have a built-in flyback diode to absorb an inductive kick. For this Diode to work effectively, the 24VDC power source powering the inductive load must be connected to the EZIO module. Use these recommended external suppressors for improved safety.*

- Primary power leads to the control equipment (Base power terminals) should be made with a two wire twisted cable with approximately 12 turns per foot. The length of these cables should be kept to a minimum and to the greatest extent possible such cable runs should be kept separate from other wiring.
- In the case of AC powered equipment, the primary power should be provided separately from the power source used for I/O control.

AC Line Noise

The AC power available in house outlets and at sub-stations powering industrial and commercial applications is generally generated at a power station miles away from the point of usage.

The power is "noise" free at the time it is being generated, and meets all specifications for amplitude, frequency, harmonic distortion and others.

However, the same specifications cannot be guaranteed at the point of usage, due to the disruptive factors associated with the transmission from generator to consumer.

While the generated power output starts its journey “clean,” and free of noise, it is “polluted” by radio and TV frequencies, spikes from reactive kickbacks due to switching heavy inductive and capacitive loads in transmission lines, and from other interference.

As a result, critical and sophisticated electronic controls may malfunction; false triggering, user program loss and/or modification may occur and even catastrophic failure.

In view of the problems associated with AC power, it is strongly recommended the source, transmission and final end use be given stringent consideration before any commitment to supply the system is given. Some typical problems in power line usage are:

- Blackouts: This is the total loss of power. Generally, they are easy to detect and if a situation arises where they cannot be tolerated then an un-interrupted power supply (UPS) should be used.

- Brownouts: This occurs when there is a reduction in line voltage amplitude. If this reduction falls within operating limits, no adverse effects will be experienced. However, if they are frequent and severe, a UPS system should be considered.

- Voltage Fluctuations: These are amplitude variations (rapid or slow) and can occur above or below the specified limits. Over-voltage conditions may damage equipment if the duration of the voltage condition is lengthy. It may cause disruptions, data loss, and production down-time.

- Noise Spikes: Noise spikes and other unwanted signals superimposed on the AC line voltage waveform are the most common problems associated with the distribution of the power from its grid system. The amplitude of these signals can be from several hundred to a few thousand volts and the pulse width from about one to 200 microseconds. Because of their short duration and random occurrences, these harmful signals are difficult to detect.

Dealing with AC Line Noise

The best option to effectively eliminate or greatly reduce voltage fluctuations, spikes and line noise is through the use of isolation, constant voltage or power line conditioner transformer.
Isolation transformers are passive devices that do not have DC paths between the circuits they isolate. The transformer provides attenuation to spikes and common mode noise, but has virtually no effect on transverse mode noise and does not provide protection for voltage fluctuations.

Constant voltage transformers are static Ferro-resonant transformers that can accept fluctuating AC voltage input (within a specified range)

and maintain a constant voltage output. The transformers provide good attenuation to transverse mode type noise, however, are ineffective for attenuation of common mode type signals.

Power line conditioning transformers provide good line regulation and are effective in providing attenuation to both common and transverse mode types of noise.

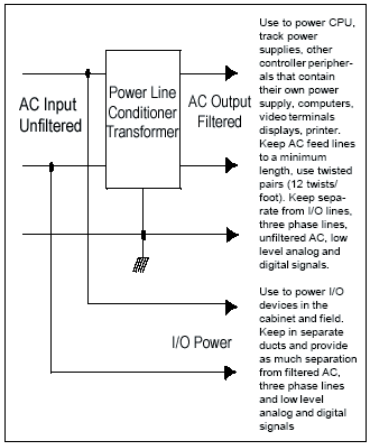
All of the mentioned transformer types are available by various manufacturers and they come in different varieties of operating voltages, power ratings, and frequencies.

Power connection

CAUTION! *Do not apply AC power to DC models. Do not apply 220VAC to AC models.*

CAUTION! *Keep the signal GND for CPU Power and I/O Power isolated.*

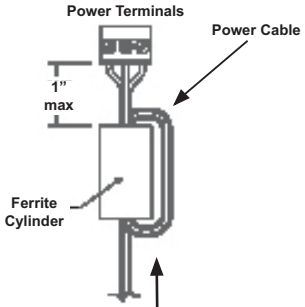
NOTE: *Industrial Power Supplies today are relatively inexpensive. Any good industrial DC Power Source has an EMI filter built-in. An I/O DC Power Supply does not have to be that well regulated on the other hand.*

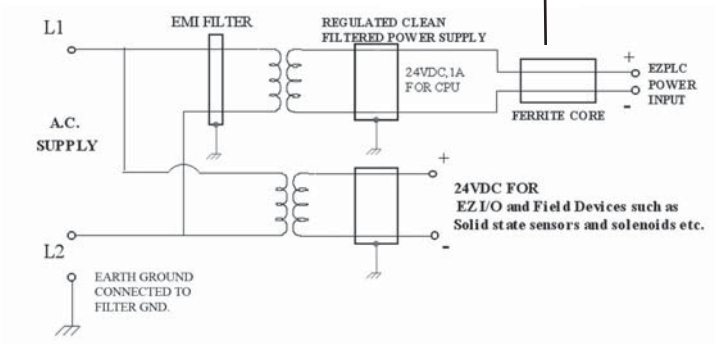


AC Power Distribution

DC Powered EZPLC System

If you are using 24VDC for DC Power for the EZPLC, we recommend that the power for the CPU (Card Engine) be a separate Power Supply and the power source for DC Loads be a DC Load supply.



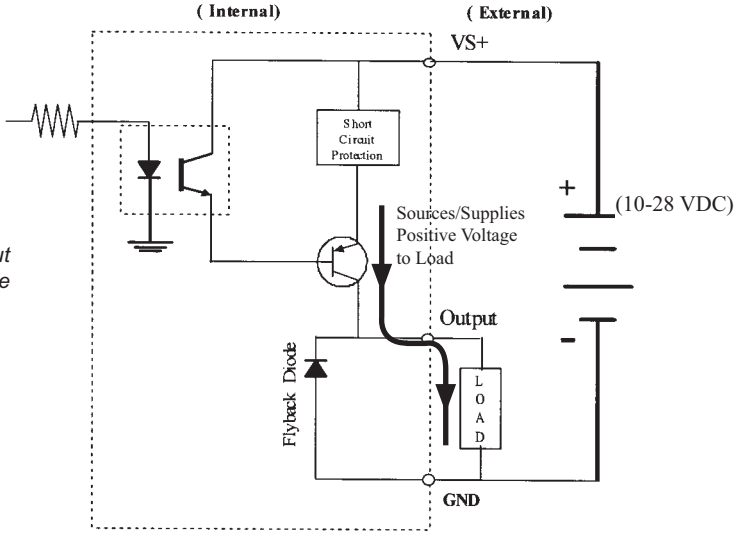


2.4 Sourcing (P type) and Sinking (N type) I/O

You will come across these two terms quite often in the world of automation controls. This section will give you a short explanation and a simple way to remember the terminology.

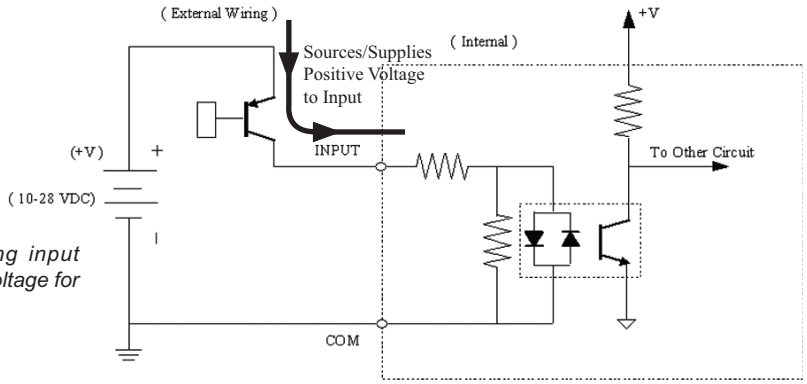
Source (P type)	Sources Voltage to the receiver
Source (N type)	Sinks current through the load into GND

NOTE: *A sourcing output sources/supplies positive voltage to a load.*

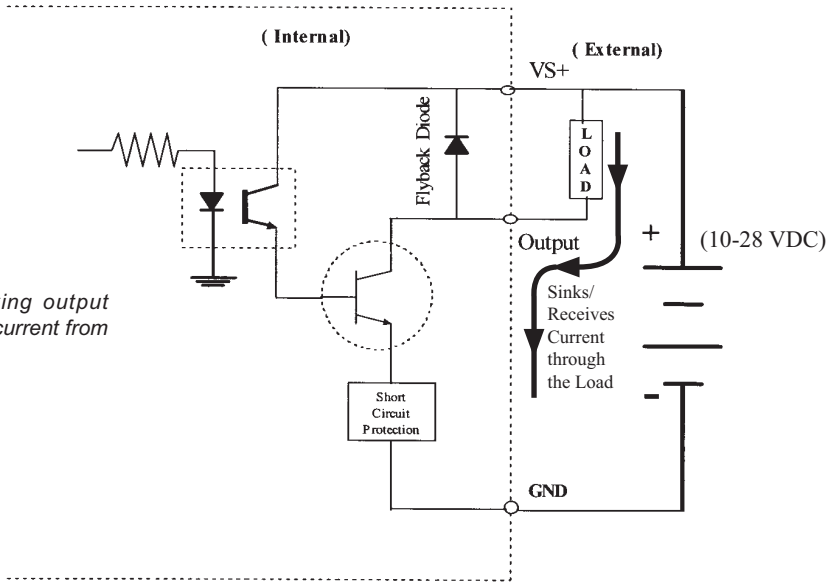


DC OUTPUT [SOURCE]

NOTE: *A sourcing input expects positive voltage for it to activate.*

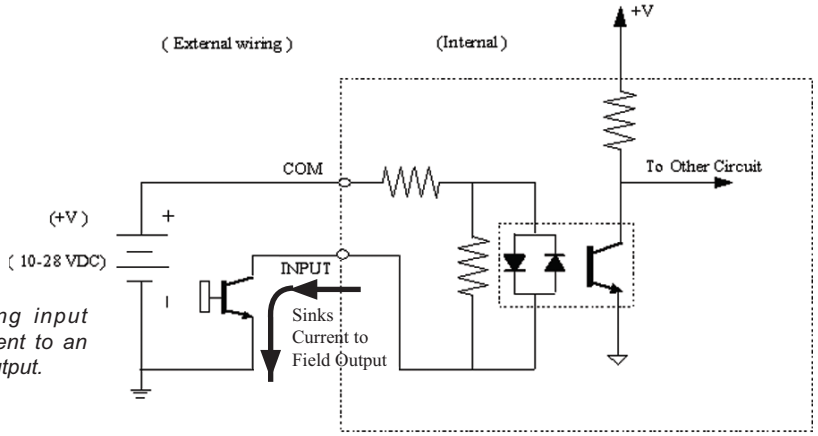


DC INPUT (SOURCE)



DC OUTPUT [SINK]

NOTE: *A sinking output sinks/receives current from a load.*



DC INPUT (SINK)

NOTE: *A sinking input sends/sinks current to an external switch/output.*

2.5 EZPLC Mounting

Mounting Dimensions

You need to know the dimensions of the EZPLC before mounting. The diagrams on the following pages provide exact Base dimensions. The dimensions here represent the EZPLC bases with I/O modules installed on them. However, it should be noted that EZPLC offers flexibility to design your system based on your specific I/O requirements. So EZIO modules have to be purchased separately. EZIO has a snap-on design so that the I/O modules can be installed on the Base easily.

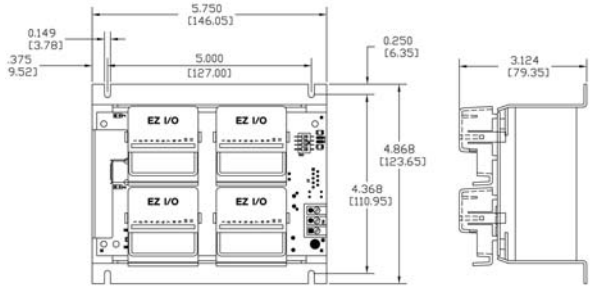
There is no limitation on I/O module location, except:

1. The bottom left module cannot be AC Output or Relay module.
2. Analog input and output combination module can be configured only in the first 4 slots.
3. All Analog or Specialty modules can be configured only in the first 10 slots.

Use 4/6 screws with STAR washers to secure the unit to the mounting surface. Dimensions are provided in inches and millimeters, mm appear in brackets [ ].

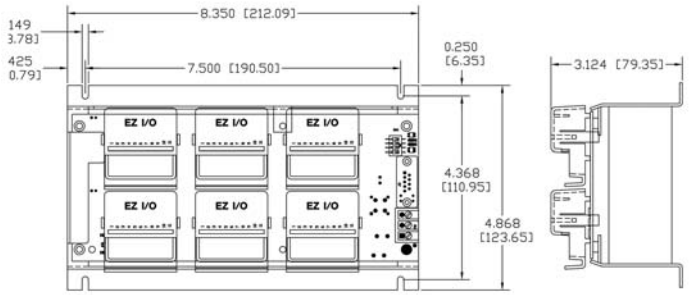
EZPLC With 4 Slots per base, 32 I/O Max

Models:
EZPLC-A-32
EZPLC-A-32-E
EZPLC-D-32
EZPLC-D-32-E



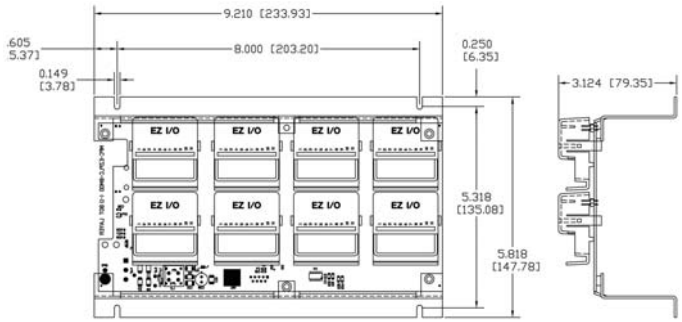
EZPLC with 6 Slots per base, 48 I/O Max

Models:
EZPLC-A-48
EZPLC-A-48-E
EZPLC-D-48
EZPLC-D-48-E



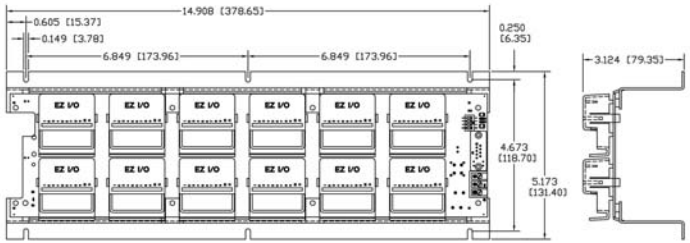
EZPLC with 8 Slots per base, 64 I/O Max

Models:
EZPLC-A-64
EZPLC-A-64-E
EZPLC-D-64
EZPLC-D-64-E



EZPLC with 12 Slots per base, 96 I/O Max

Models:
EZPLC-A-96
EZPLC-A-96-E
EZPLC-D-96
EZPLC-D-96-E



2.6 EZIO Modules Positioning

Slots Numbering System

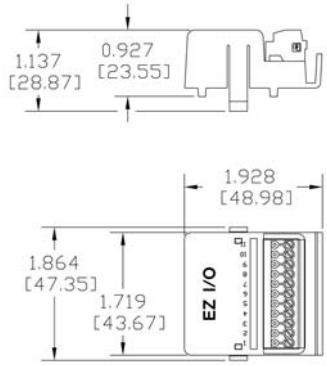
As discussed earlier there are 4 bases you can choose from: 4 slots, 6 slots, 8 slots and 12 slots, that can support up to a maximum of 32, 48, 64 and 96 I/O points respectively. Use the following conventions to identify the slot numbers on the bases.

CAUTION! *The M2 slot cannot be used for any AC or Relay output module. Also, modules with both Analog inputs and outputs can be used only on slots M1 through M4 and Analog and Counter modules in general must be used from M1 through M10.*

You can configure the positioning of the I/O modules on the Base by clicking on the Configure I/O button. The picture above shows the I/O module positioning convention employed in EZPLC. Following are the guidelines/ recommendations for installing I/O modules on an EZPLC base. We have shown and described the 12-slots (capable of 96 I/O points MAX) base here; however the module numbering convention as well as the positioning guidelines remain the same for smaller bases.

Module Positioning Restrictions

EZ I/O Modules		Recommendations for Positioning of Modules
DC Modules		
EZIO-8DCI	8 point DC Inputs (sink/source)	Any Slot
EZIO-8DCOP	8 point DC (source) Outputs	
EZIO-8DCON	8 point DC (sink) Outputs	
EZIO-8HSDCI	8 point High Speed DC Inputs (sink/source)	
EZIO-4DCI4DCON	4 point DC (sink/source) Inputs; 4 point DC (sink) outputs	
EZIO-4DCI4DCIF	4 point DC (sink/source) Inputs; 4 point High Speed DC (sink/source) Inputs	
EZIO-4DCI4DCOP	4 point DC (Sink/Source) Inputs; 4 point DC (source) outputs	
AC Modules		
EZIO-8ACI	8 point AC Inputs	Any Slot
EZIO-8ACO	8 point AC Outputs	Any Slot Between M1 and M10
EZIO-4ACI4ACO	4 point AC Inputs; 4 point AC Outputs	Any Slot
AC/DC Combo Modules		
EZIO-4DCOP4ACO	4 point DC (source) Outputs; 4 point AC outputs	Any Slot Except M2
EZIO-4ACI4DCOP	4 point AC Inputs; 4 point DC (source) outputs	Any Slot
EZIO-4DCI4ACO	4 point DC (sink/source) Inputs; 4 point AC Outputs	Any Slot Except M2
Analog Modules		
EZIO-8ANIV	8 channel Analog Input module (Voltage)	Any Slot Between M1 and M10
EZIO-8ANIC	8 channel Analog Input module (Current)	
EZIO-4ANI4ANOV	4 Channel Analog Inputs; 4 Channel Analog Outputs	Any Slot Between M1 and M4
EZIO-4ANI4ANOC	4 Channel Analog Inputs; 4 Channel Analog Outputs	
Relay Modules		
EZIO-4IORLO	4 point Relay Outputs	Any Slot Between M1 and M10
EZIO-4ACI4RLO	4 point AC Inputs; 4 point Relay Outputs	
EZIO-4DCOP4RLO	4 point DC (sink/source) Outputs; 4 point Relay Outputs	
Specialty Modules		
EZIO-4THI	4 Channel thermocouple input module	Any Slot
EZIO-4HSCM1	High Speed 24-Bit Counter module	Any Slot Between M1 and M10; 3 Modules Max per Base
EZIO-4HSCM2	High Speed 24-Bit Counter module	



EZIO Module Dimensions

2.7 EZIO Mounting and Wiring

EZIO Installation Overview

EZIO modules are designed with one thing in mind - modularity! Any base of EZPLC can be fitted with each and every EZIO module. All EZ Family PLCs are designed to handle any combination of EZIO modules without any need for power budgeting. Most EZIO modules consume only 20-40 mA current at 3.3V.

Mounting I/O Modules

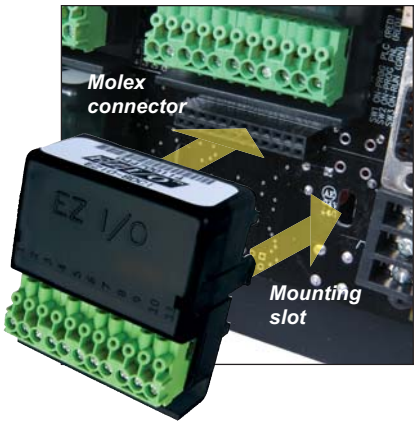
EZIO modules have a snap-on design to facilitate easy installation and removal from the base slots. The I/O modules have two clips and a Molex connector, which snap into EZPLC Base.

STEP 1

STEP 1 - Hold the module in the thumb and index finger so that your fingertips are on the clips.

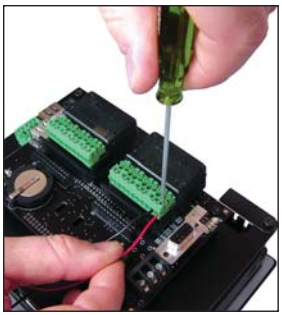
STEP 2 - Snap the module on the board so that clips are placed on the open mounting slots. Make sure that the Molex connector is aligned to the female counterpart on the base. Push the module gently from the top to insert it completely until you hear a clicking sound.

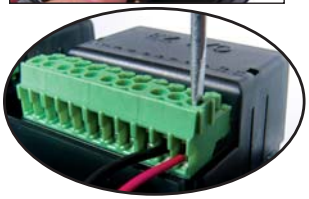
STEP 2



Wiring EZIO Modules

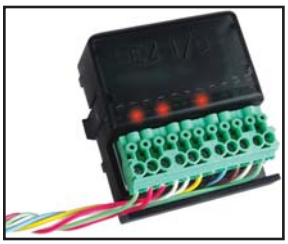
As shown in the picture, simply insert the wire and screw to tighten. You can wire up to ONE 14 AWG wire, TWO 18 AWG wires, or FOUR 22 AWG wires in every terminal. You will need a 2.5mm blade screwdriver (P/N EZIO-SCDRV) to work with the EZIO terminal blocks and wiring.

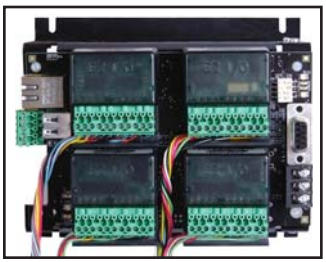




Routing EZIO Wiring

EZIO modules have wiring trays for proper routing of field wires.





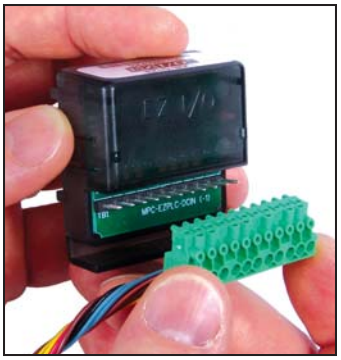
Number of Wires Allowed in Each Terminal	
1	14 AWG
2	18 AWG
4	22 AWG

Wiring Capabilities

UL rated at 300 volts, 10 amps 14 AWG

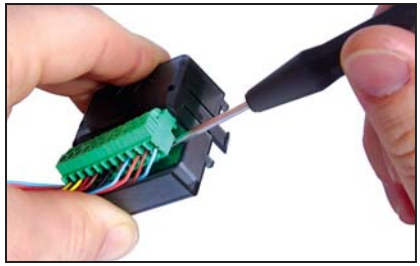
Discrete I/O Module Status Indicators

The discrete I/O modules have LED status indicators to provide visual indication of the input points activity.



Removable Terminal Blocks

EZIO eliminates the need for rewiring your terminal block anytime you need to swap a module. Since these modules are built to withstand industrial environments, terminal blocks fit very snugly on the module. Slip the edge of the screwdriver under the terminal block and lift to pop it off.



Removing I/O Modules

- Hold the module in the thumb and index finger so that your fingertips are on the clips.
- Apply inward pressure on the two clips with your fingers to release the module from the mounting slots on the base.
- Pull the module out.

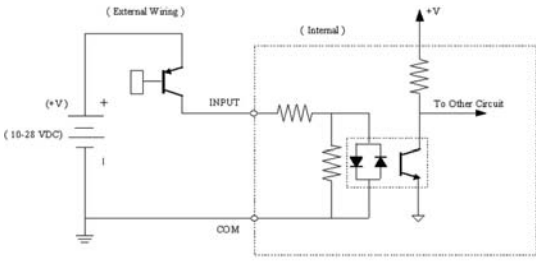
2.8 EZI/O Modules

EZIO-8DCI

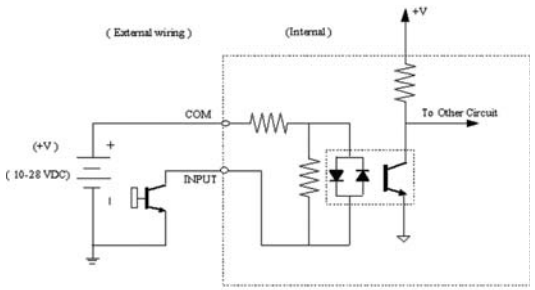
8 pt. 24VDC Input Module

Module Specifications	
Number of Inputs	8 (sink/source)
Input Voltage Range	10-28 VDC
Peak Voltage	40 VDC
Input Current	1.92 mA @ 12 VDC 4.0 mA @ 24 VDC
Maximum Input Current	5 mA @ 28 VDC
Input Impedance	5.6k @ 10-28 VDC
ON Voltage Level	> 10 VDC
OFF Voltage Level	< 2 VDC
Min. ON Current	1.5 mA
Min. OFF Current	0.2 mA
OFF to ON Response	2-4 ms, typical 3 ms
ON to OFF Response	2-4 ms, typical 3 ms
Status Indicators	Red LED for each input
Commons	2 points
Fuse	No Fuse
Base Power Required (3.3V)	Typical 15mA (all inputs on)
Optical Isolation	2500 Volt
Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

Pinout Information	
Pin No.	EZIO-8DCI
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	COM
6	Input(5)
7	Input(6)
8	Input(7)
9	Input(8)
10	COM
11	Not Connected



DC INPUT (SOURCE)



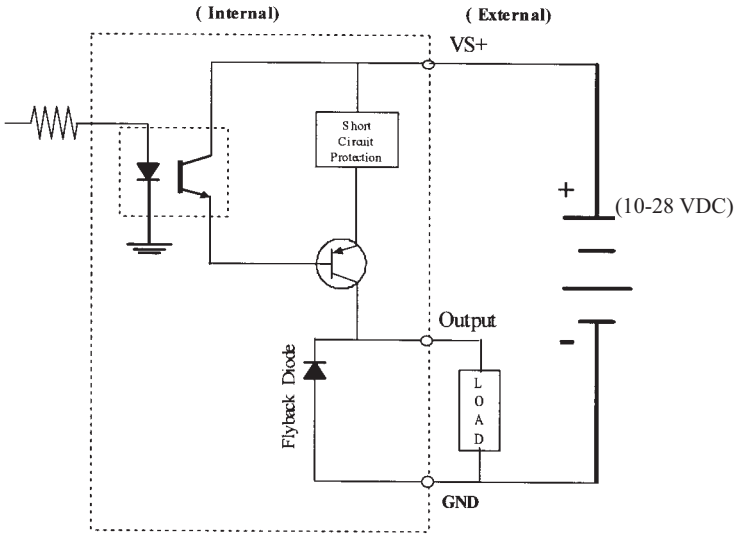
DC INPUT (SINK)

EZIO-8DCOP

8 pt. 24VDC Output Module (Source)

Module Specifications	
Number of Outputs	8 sourcing
Peak Voltage	50.0 VDC
Maximum Steady State Output Current	0.5A per output, 1.0A max per module @ 50°C
Maximum Leakage Current	100µA @ 50 VDC @ 50°C
ON Voltage Drop	2 VDC @ 0.5A
Maximum Inrush Current	0.8A for 10ms
OFF to ON Response	< 2µs
ON to OFF Response	<10µs
Status Indicators	Red LED for each output
+V Terminals & Commons	One V+, 2 Common
Short Circuit Protection	1 Amp per module, turns off outputs upon short circuit detection
Base Power Required (3.3V)	40mA, all outputs on
Optical Isolation	2500 Volt
Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

Pinout Information	
Pin No.	EZIO-8DCOP
1	Output(1)
2	Output(2)
3	Output(3)
4	Output(4)
5	GND
6	Output(5)
7	Output(6)
8	Output(7)
9	Output(8)
10	GND
11	Customer_Supply(+VS)



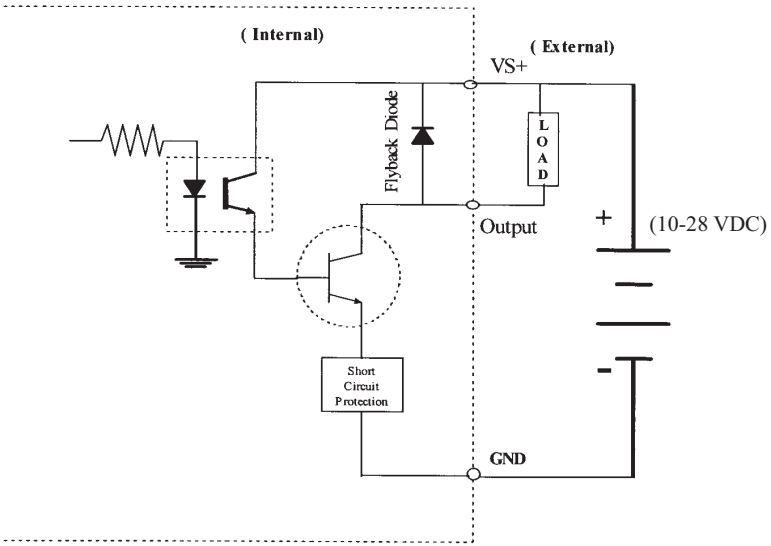
DC OUTPUT [SOURCE]

EZIO-8DCON

8 pt. 24VDC Output Sinking Module

Module Specifications	
Number of Outputs	8 sinking
Peak Voltage	50.0 VDC
Maximum Steady State Output Current	0.5A per output, 1.4A max per module @ 50°C
Maximum Leakage Current	100µA @ 50 VDC @ 50°C
ON Voltage Drop	1.3 VDC @ 0.5A
Maximum Inrush Current	1.0A for 10ms
OFF to ON Response	< 2µs
ON to OFF Response	<10µs
Status Indicators	Red LED for each output
+V Terminals & Commons	One V^+, 2 Common
Short Circuit Protection	1.4 Amp per module, turns off outputs upon short circuit detection
Base Power Required (3.3V)	40mA, all outputs on
Optical Isolation	2500 Volt
Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

Pinout Information	
Pin No.	EZIO-8DCON
1	Output(1)
2	Output(2)
3	Output(3)
4	Output(4)
5	GND
6	Output(5)
7	Output(6)
8	Output(7)
9	Output(8)
10	GND
11	Customer_Supply(+VS)



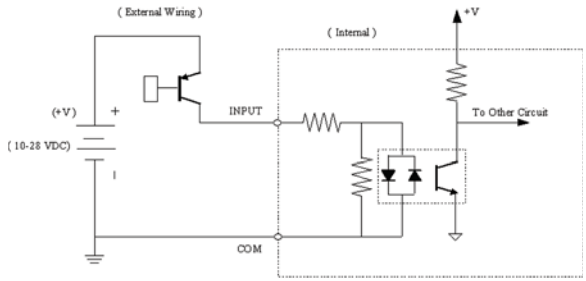
DC OUTPUT [SINK]

EZIO-8HSDCI

8 pt. 24VDC High Speed Input Module

Module Specifications	
Number of Inputs	8 (sink/source)
Input Voltage Range	10-28 VDC
Peak Voltage	40 VDC
Input Current	1.92 mA @ 12 VDC 4.0 mA @ 24 VDC
Maximum Input Current	5 mA @ 28 VDC
Input Impedance	5.6k @ 10-28 VDC
ON Voltage Level	> 10 VDC
OFF Voltage Level	< 2 VDC
Min. ON Current	1.5 mA
Min. OFF Current	0.2 mA
OFF to ON Response	0.2-0.4 ms, typical 0.3 ms
ON to OFF Response	0.2-0.4 ms, typical 0.3 ms
Status Indicators	Red LED for each output
Commons	2 points
Fuse	No Fuse
Base Power Required (3.3V)	Typical 15 mA (all inputs on)
Optical Isolation	2500 Volt
Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

Pinout Information	
Pin No.	EZIO-8HSDCI
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	COM
6	Input(5)
7	Input(6)
8	Input(7)
9	Input(8)
10	COM
11	Not Connected



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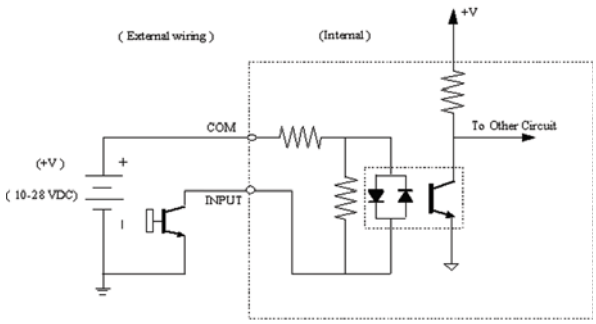


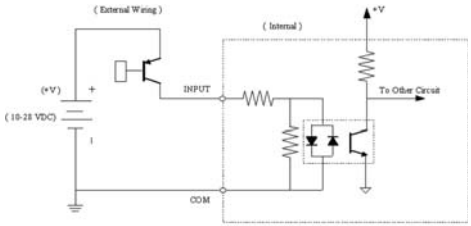
DC INPUT (SINK)

EZIO-4DCI4DCON

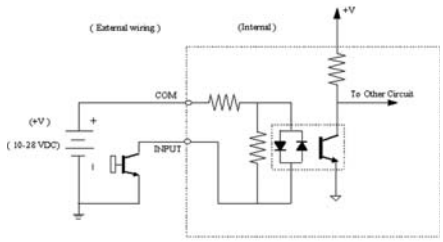
8 pt. 24VDC Output Sinking Module

	Module Specifications	
DC Power Supply Specs	Voltage Range	
DC Input Specs	Number of Inputs	4 (sink/source)
	Input Voltage Range	10-28 VDC
	Peak Voltage	40 VDC
	Input Current	1.92 mA @ 12 VDC 4.0 mA @ 24 VDC
	Maximum Input Current	5 mA @ 28 VDC
	Input Impedance	5.6k @ 10-28 VDC
	ON Voltage Level	> 10 VDC
	OFF Voltage Level	< 2 VDC
	Min. ON Current	1.5 mA
	Min. OFF Current	0.2 mA
	OFF to ON Response	2-4 ms, typical 3 ms
	ON to OFF Response	2-4 ms, typical 3 ms
	Status Indicators	Red LED for each output
	Commons	1 point
	Fuse	No Fuse
	Base Power Required (3.3V)	Typical 7.5 mA (all inputs on)
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
DC Output Specs	Number of Outputs	4 (sourcing)
	Peak Voltage	50.0 VDC
	Maximum Steady State Output Current	0.5A per output, 1.0A max per module @ 50°C
	Maximum Leakage Current	100µA @ 50 VDC @ 50°C
	ON Voltage Drop	2 VDC @ 0.5A
	Maximum Inrush Current	0.8A for 10ms
	OFF to ON Response	< 2µs
	ON to OFF Response	<10µs
	Status Indicators	Red LED for each output
	+V Terminals & Commons	One V+, 1 Common
	Short Circuit Protection	1 Amp per module, turns off outputs upon short circuit detection
	Base Power Required (3.3V)	20mA, all outputs on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

Pinout Information	
Pin No.	EZIO-4DCI4DCON
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	COM
6	Output(1)
7	Output(2)
8	Output(3)
9	Output(4)
10	GND
11	Customer_Supply(+VS)

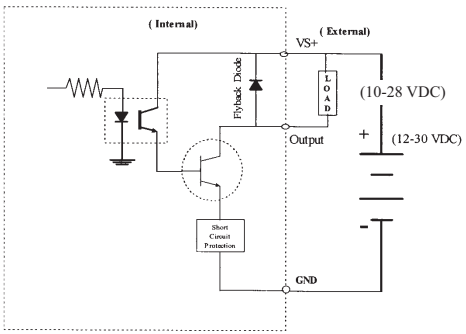


DC INPUT (SOURCE)



DC INPUT (SINK)

Output Wiring

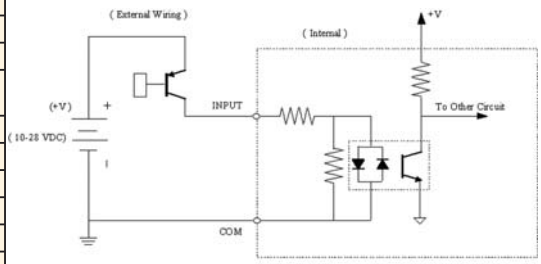


EZIO-4DCI4DCIF

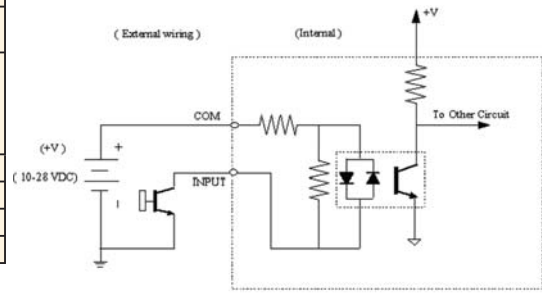
4 pt. 24VDC In/4 pt. 24VDC Fast Input Module with Interrupt

	Module Specifications	
DC Power Supply Specs	Voltage Range	
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
DC Input Specs (Standard)	Number of Inputs	4 (sink/source)
	Input Voltage Range	10-28 VDC
	Peak Voltage	40 VDC
	Input Current	1.92 mA @ 12 VDC 4.0 mA @ 24 VDC
	Maximum Input Current	5 mA @ 28 VDC
	Input Impedance	5.6k @ 10-28 VDC
	ON Voltage Level	> 10 VDC
	OFF Voltage Level	< 2 VDC
	Min. ON Current	1.5 mA
	Min. OFF Current	0.2 mA
	OFF to ON Response	2-4 ms, typical 3 ms
	ON to OFF Response	2-4 ms, typical 3 ms
	Status Indicators	Red LED for each output
	Commons	1 point
	Base Power Required (3.3V)	Typical 3.5 mA (all inputs on)
DC Input Specs (Fast)	Number of Inputs	4 (sink/source)
	Input Voltage Range	10-28 VDC
	Peak Voltage	40 VDC
	Input Current	1.92 mA @ 12 VDC 4.0 mA @ 24 VDC
	Maximum Input Current	5 mA @ 28 VDC
	Input Impedance	5.6k @ 10-28 VDC
	ON Voltage Level	> 10 VDC
	OFF Voltage Level	< 2 VDC
	Min. ON Current	1.5 mA
	Min. OFF Current	0.2 mA
	OFF to ON Response	0.2-0.4 ms, typical 0.3 ms For Inputs 5,6 and 7
	ON to OFF Response	0.2-0.4 ms, typical 0.3 ms For Inputs 5,6 and 7
	Interrupt	Low pass filter of 20µs, 60µs typical response time from input interrupt, 1 rung of processing and output activation, For Input # 8
	Status Indicators	Red LED for each output
	Commons	1 point
	Fuse	No Fuse
	Base Power Required (3.3V)	Typical 3.5 mA (all inputs on)

Pinout Information	
Pin No.	EZIO-4DCI4DCIF
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	GND
6	Fast Input(5)
7	Fast Input(6)
8	Fast Input(7)
9	Fast Input(8) - Interrupt
10	GND
11	Not Connected



DC INPUT (SOURCE)



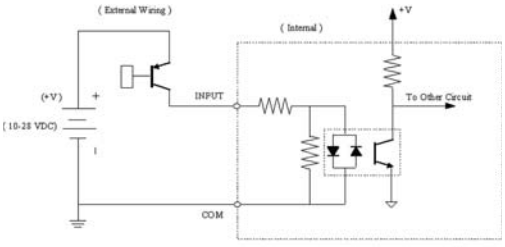
DC INPUT (SINK)

EZIO-4DCI4DCON

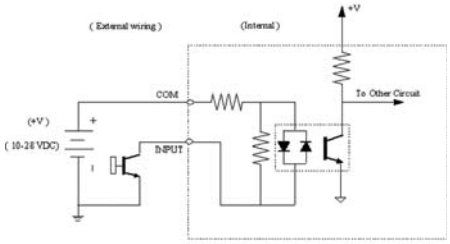
4 pt. 24VDC In/4 pt. 24VDC Out Module (Source)

	Module Specifications	
DC Power Supply Specs	Voltage Range	
DC Input Specs	Number of Inputs	4 (sink/source)
	Input Voltage Range	10-28 VDC
	Peak Voltage	40 VDC
	Input Current	1.92 mA @ 12 VDC 4.0 mA @ 24 VDC
	Maximum Input Current	5 mA @ 28 VDC
	Input Impedance	5.6k @ 10-28 VDC
	ON Voltage Level	> 10 VDC
	OFF Voltage Level	< 2 VDC
	Min. ON Current	1.5 mA
	Min. OFF Current	0.2 mA
	OFF to ON Response	2-4 ms, typical 3 ms
	ON to OFF Response	2-4 ms, typical 3 ms
	Status Indicators	Red LED for each output
	Commons	1 point
	Fuse	No Fuse
	Base Power Required (3.3V)	Typical 8 mA (all inputs on)
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
DC Output Specs	Number of Outputs	4 sinking
	Peak Voltage	50.0 VDC
	Maximum Steady State Output Current	0.5A per output, 1.4A max per module @ 50°C
	Maximum Leakage Current	100µA @ 50 VDC @ 50°C
	ON Voltage Drop	1.5 VDC @ 0.5A
	Maximum Inrush Current	1.0A for 10ms
	OFF to ON Response	< 2µs
	ON to OFF Response	<10µs
	Status Indicators	Red LED for each output
	+V Terminals & Commons	One V+, 1 Common
	Short Circuit Protection	1.4 Amp per module, turns off outputs upon short circuit detection
	Base Power Required (3.3V)	20mA, all outputs on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

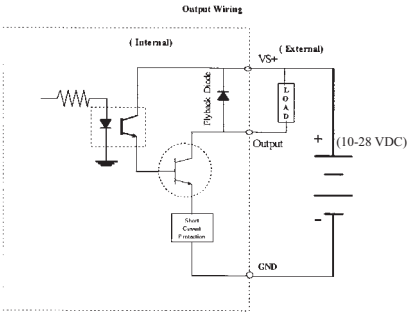
Pinout Information	
Pin No.	EZIO-4DCI4DCOP
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	GND
6	Output(1)
7	Output(2)
8	Output(3)
9	Output(4)
10	GND
11	Customer_Supply(+VS)



DC INPUT (SOURCE)



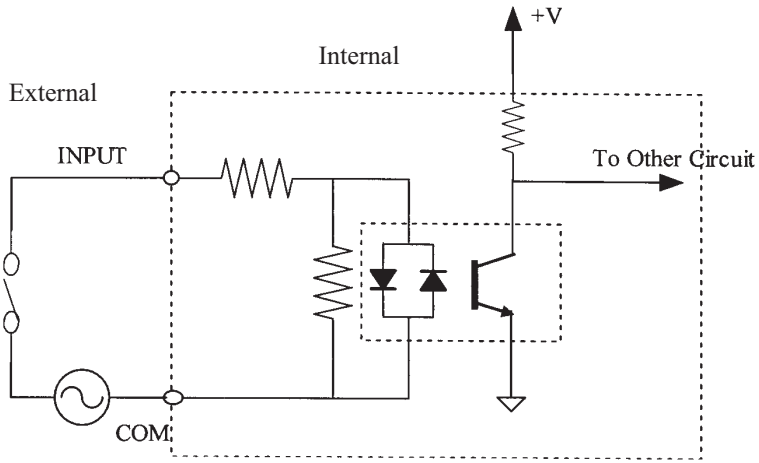
DC INPUT (SINK)



EZIO-8ACI
8 pt. 110VAC Input Module

Module Specifications	
Number of Inputs	8
Input Voltage Range	70-132 VAC
AC Frequency	47-63 Hz
Peak Voltage	180 Volt
Input Current	0.5mA @ 110 VAC
Maximum Input Current	0.6mA @ 132 VAC
Input Impedance	200K
ON Voltage Level	70 VAC
OFF Voltage Level	40 VAC
OFF to ON Response	< 10ms
ON to OFF Response	< 10ms
Status Indicators	Red LED for each input
Commons	2 Commons
Fuse	No fuse
Base Power Required (3.3V)	20mA for all 8 on
Optical Isolation	2500 Volt
Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

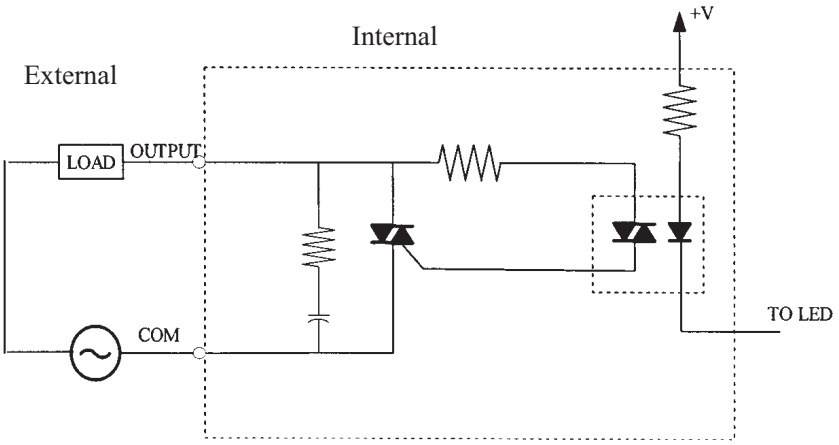
Pinout Information	
Pin No.	EZIO-8ACI
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	AC_Common
6	Input(5)
7	Input(6)
8	Input(7)
9	Input(8)
10	AC_Common
11	Not Connected



EZIO-8ACO
8 pt. 110VAC Output Module

Module Specifications	
Number of Output Points	8
Number of Commons	2
Output Voltage Range	20-132 VAC
Peak Voltage	180 Volt
ON Voltage Drop	1.2 V @ 1A
Maximum Current	1.2 A @ 25°C, 0.8A @ 50°C for each output
Maximum Leakage Current	1mA @ 132 VAC
Maximum Inrush Current	38Amps for 16.6ms
Minimum Load	15mA
OFF to ON Response	max 1/2 cycle
ON to OFF Response	max 1/2 cycle
Fuse	No fuse
Base Power Required (3.3V)	70mA for all 8 on
Optical Isolation	2500 Volt
Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

Pinout Information	
Pin No.	EZIO-8ACO
1	Output(1)
2	Output(2)
3	Output(3)
4	Output(4)
5	AC_Common
6	Output(5)
7	Output(6)
8	Output(7)
9	Output(8)
10	AC_Common
11	Not Connected

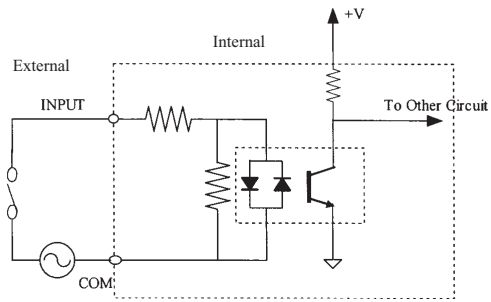


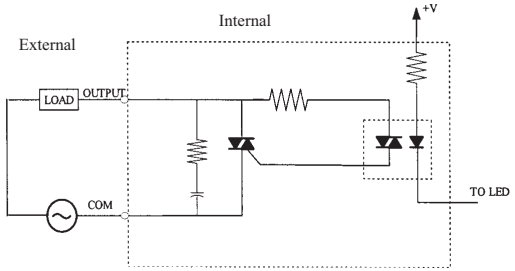
EZIO-4ACI4ACO

4 pt. 110VAC In, 4 pt. 110VAC Out Module

Module Specifications		
AC Power Supply Specs	Voltage Range	
AC Input Specs	Number of Inputs	4
	Input Voltage Range	70-132 VAC
	AC Frequency	47-63 Hz
	Peak Voltage	180 Volt
	Input Current	0.5mA @ 110 VAC
	Maximum Input Current	0.6mA @ 132 VAC
	Input Impedance	200K
	ON Voltage Level	70 VAC
	OFF Voltage Level	40 VAC
	OFF to ON Response	< 10ms
	ON to OFF Response	< 10ms
	Status Indicators	Red LED for each input
	Commons	1 Common
	Fuse	No fuse
	Base Power Required (3.3V)	10mA for all 4 on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
AC Output Specs	Number of Output Points	4
	Number of Commons	1
	Output Voltage Range	20-132 VAC
	Peak Voltage	180 Volt
	ON Voltage Drop	1.2 V @ 1A
	Maximum Current	1.2 A @ 25°C, 0.8A @ 50°C for each output
	Maximum Leakage Current	1mA @ 132 VAC
	Maximum Inrush Current	38Amps for 16.6ms
	Minimum Load	15mA
	OFF to ON Response	max 1/2 cycle
	ON to OFF Response	max 1/2 cycle
	Fuse	No fuse
	Base Power Required (3.3V)	35mA for all 4 on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

Pinout Information	
Pin No.	EZIO-4ACI4ACO
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	AC_Common
6	Output(1)
7	Output(2)
8	Output(3)
9	Output(4)
10	AC_Common
11	Not Connected



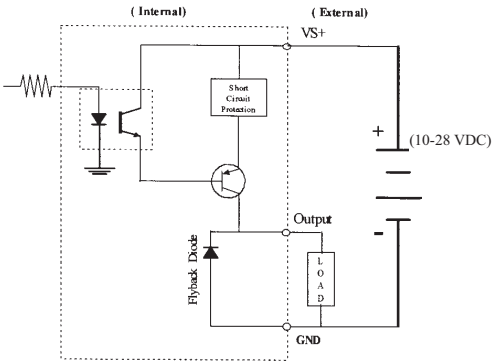


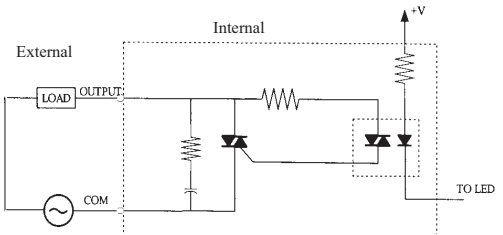
EZIO-4DCOP4ACO

4 pt. 24VDC Out (Source), 4 pt. 110AC Out Module

	Module Specifications	
AC/DC Power Supply Specs	*Voltage Range*	
DC Output Specs	*Number of Outputs*	4 (sourcing)
	Peak Voltage	50.0 VDC
	Maximum Steady State Output Current	0.5A per output, 1.0A max per module @ 50°C
	Maximum Leakage Current	100µA @ 50 VDC @ 50°C
	ON Voltage Drop	2 VDC @ 0.5A
	Maximum Inrush Current	0.8A for 10ms
	OFF to ON Response	< 2µs
	ON to OFF Response	<10µs
	Status Indicators	Red LED for each output
	+V Terminals & Commons	One V+, 1 Common
	Short Circuit Protection	1 Amp per module, turns off outputs upon short circuit detection
	Base Power Required (3.3V)	20mA, for all 4 on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
AC Output Specs	*Number of Output Points*	4
	Number of Commons	1
	Output Voltage Range	20-132 VAC
	Peak Voltage	180 Volt
	ON Voltage Drop	1.2 V @ 1A
	Maximum Current	1.2 A @ 25°C, 0.8A @ 50°C for each output
	Maximum Leakage Current	1mA @ 132 VAC
	Maximum Inrush Current	38Amps for 16.6ms
	Minimum Load	15mA
	OFF to ON Response	max 1/2 cycle
	ON to OFF Response	max 1/2 cycle
	Fuse	No fuse
	Base Power Required (3.3V)	35mA for all 4 on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

Pinout Information	
Pin No.	EZIO-4DCOP4ACO
1	AC Output(1)
2	AC Output(2)
3	AC Output(3)
4	AC Output(4)
5	AC_Common
6	DC Output(5)
7	DC Output(6)
8	DC Output(7)
9	DC Output(8)
10	GND
11	Customer_Supply(+VS)



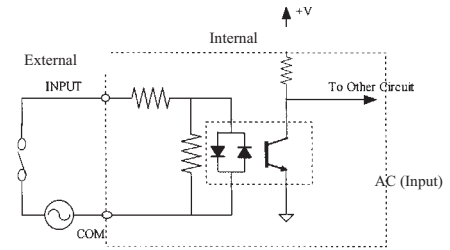


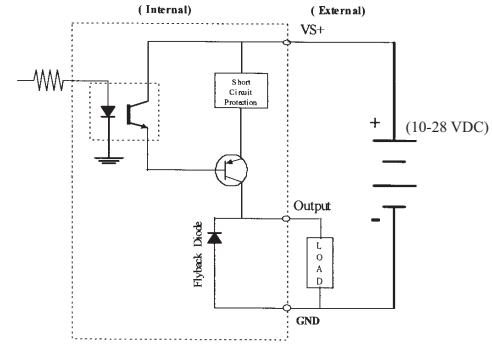
EZIO-4ACI4DCOP

4 pt. 110VAC In/4 pt. 24VDC Out Module (Source)

	Module Specifications	
AC/DC Power Supply Specs	Voltage Range	
AC Input Specs	Number of Inputs	4
	Input Voltage Range	70-132 VAC
	AC Frequency	47-63 Hz
	Peak Voltage	180 Volt
	Input Current	0.5mA @ 110 VAC
	Maximum Input Current	0.6mA @ 132 VAC
	Input Impedance	200K
	ON Voltage Level	70 VAC
	OFF Voltage Level	40 VAC
	OFF to ON Response	< 10ms
	ON to OFF Response	< 10ms
	Status Indicators	Red LED for each input
	Commons	1 Common
	Fuse	No fuse
	Base Power Required (3.3V)	10mA for all 4 on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
DC Output Specs	Number of Outputs	4 (sourcing)
	Peak Voltage	50.0 VDC
	Maximum Steady State Output Current	0.5A per output, 1.0A max per module @ 50°C
	Maximum Leakage Current	100µA @ 50 VDC @ 50°C
	ON Voltage Drop	2 VDC @ 0.5A
	Maximum Inrush Current	0.8A for 10ms
	OFF to ON Response	< 2µs
	ON to OFF Response	<10µs
	Status Indicators	Red LED for each output
	+V Terminals & Commons	One V+, 1 Common
	Short Circuit Protection	1 Amp per module, turns off outputs upon short circuit detection
	Base Power Required (3.3V)	24mA, for all 4 on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

Pinout Information	
Pin No.	EZIO-4ACI4DCOP
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	AC_Common
6	Output(1)
7	Output(2)
8	Output(3)
9	Output(4)
10	GND
11	Customer_Supply(+VS)





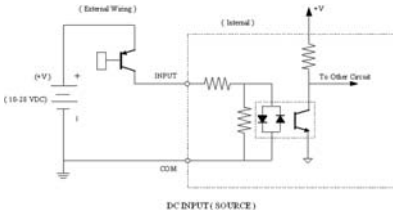
DC Output (Source)

EZIO-4DCI4ACO

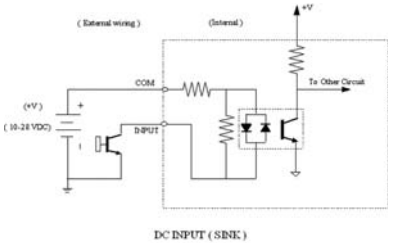
4 pt. 24VDC In/4 pt. 110VAC Out Module

	Module Specifications	
AC/DC Power Supply Specs	Voltage Range	
DC Input Specs	Number of Inputs	4 (sink/source)
	Input Voltage Range	10-28 VDC
	Peak Voltage	40 VDC
	Input Current	1.92 mA @ 12 VDC 4.0 mA @ 24 VDC
	Maximum Input Current	5 mA @ 28 VDC
	Input Impedance	5.6k @ 10-28 VDC
	ON Voltage Level	> 10 VDC
	OFF Voltage Level	< 2 VDC
	Min. ON Current	1.5 mA
	Min. OFF Current	0.2 mA
	OFF to ON Response	2-4 ms, typical 3 ms
	ON to OFF Response	2-4 ms, typical 3 ms
	Status Indicators	Red LED for each output
	Commons	1 point
	Fuse	No Fuse
	Base Power Required (3.3V)	Typical 7.5 mA (all inputs on)
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
AC Output Specs	Number of Output Points	4
	Number of Commons	1
	Output Voltage Range	20-132 VAC
	Peak Voltage	180 Volt
	ON Voltage Drop	1.2 V @ 1A
	Maximum Current	1.2 A @ 25°C, 0.8A @ 50°C for each output
	Maximum Leakage Current	1mA @ 132 VAC
	Maximum Inrush Current	38Amps for 16.6ms
	Minimum Load	15mA
	OFF to ON Response	max 1/2 cycle
	ON to OFF Response	max 1/2 cycle
	Fuse	No fuse
	Base Power Required (3.3V)	35mA for all 4 on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG

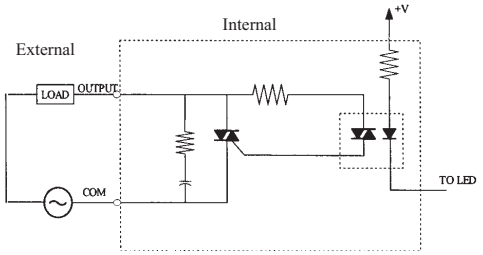
Pinout Information	
Pin No.	EZIO-4DCI4ACO
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	GND
6	Output(1)
7	Output(2)
8	Output(3)
9	Output(4)
10	AC_Common
11	Not Connected



DC INPUT (SOURCE)



DC INPUT (SINK)

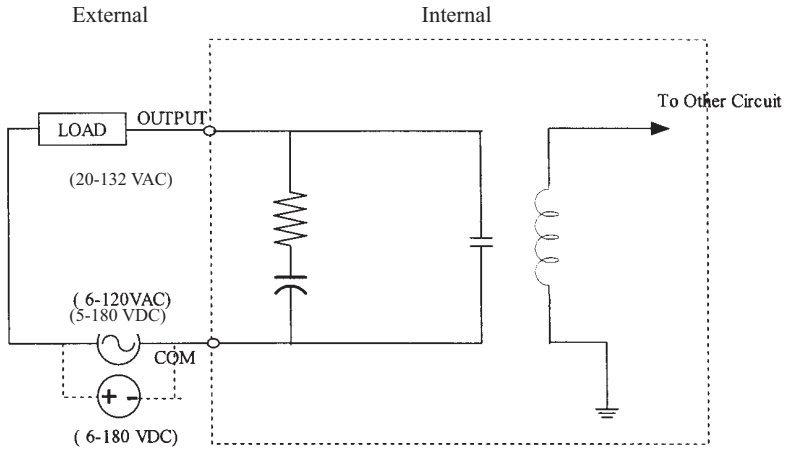


EZIO-4RLO

4 pt. Relay Out Module w/built-in Electromagnetic shield

Module Specifications	
Number of Outputs	4
Output Voltage Range	5-180 VDC or 20-132 VAC
Output Type	Relay 1 Form A (SPST)
Output Terminals Consumed	8
Peak Voltage	180 VDC/200 VAC
AC Frequency	47-63 Hz
Maximum Current (resist.)	1A/point
Maximum Leakage Current	0.5mA @ 130 VAC @ 60Hz
Maximum Switching Current	0.5A
Electromagnetic Shield	2 pF between contact and shield
Dielectric Strength	250V between contacts, 1500V between contacts and shield
OFF to ON Response	≤1ms (typical)
ON to OFF Response	≤1ms (typical)
Status Indicators	Red LEDs
Contacts	4 isolated
Base Power Required (3.3V)	50mA

Pinout Information	
Pin No.	EZIO-4RLO
1	Output(1)_Normally open
2	Output(1)_COM
3	Output(2)_Normally open
4	Output(2)_COM
5	Not Connected
6	Not Connected
7	Output(3)_Normally open
8	Output(3)_COM
9	Not Connected
10	Output(4)_Normally open
11	Output(4)_COM

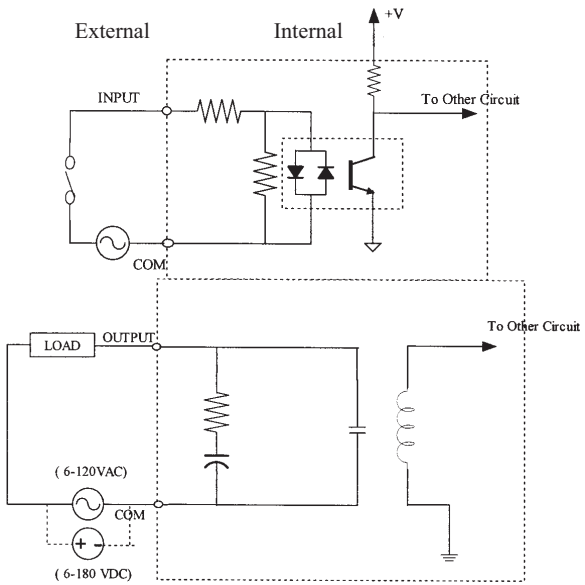


EZIO-4ACI4RLO

4 pt. 110 AC In/4 pt. Relay Out Module w/built-in Electromagnetic shield

	Module Specifications	
AC Input Specs	Number of Inputs	4
	Input Voltage Range	70-132 VAC
	AC Frequency	47-63 Hz
	Peak Voltage	180 Volt
	Input Current	0.5mA @ 110 VAC
	Maximum Input Current	0.6mA @ 132 VAC
	Input Impedance	200K
	ON Voltage Level	70 VAC
	OFF Voltage Level	40 VAC
	OFF to ON Response	< 10ms
	ON to OFF Response	< 10ms
	Status Indicators	Red LED for each input
	Commons	1 Common
	Fuse	No fuse
	Base Power Required (3.3V)	10mA for all 4 on
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
Relay Output Specs	Number of Outputs	4
	Output Voltage Range	5-180 VDC or 20-132 VAC
	Output Type	Relay 1 Form A (SPST)
	Output Terminals Consumed	5
	Peak Voltage	180 VDC/200 VAC
	AC Frequency	47-63 Hz
	Maximum Current (resist.)	1A/point
	Maximum Leakage Current	0.5mA @ 130 VAC @ 60Hz
	ON Voltage Drop	1.5 V @ 1 Amp
	Maximum Switching Current	0.5A
	Electromagnetic Shield	2 pF between contact and shield
	Dielectric Strength	250V between contacts, 1500V between contacts and shield
	OFF to ON Response	≤1ms (typical)
	ON to OFF Response	≤1ms (typical)
	Status Indicators	Red LEDs
	Commons	1
	Base Power Required (3.3V)	25mA

Pinout Information	
Pin No.	EZIO-4ACI4RLO
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	Customer_COM (GND)
6	Output(1)
7	Output(2)
8	Output(3)
9	Output(4)
10	Customer_COM (GND)
11	Not Connected

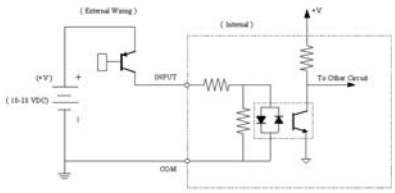


EZIO-4DCIP4RLO

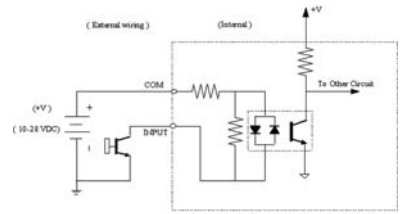
4 pt. 24VDC In/4 pt. Relay Out Module w/built-in Electromagnetic shield

	Module Specifications	
DC Input Specs	Number of Inputs	4 (sink/source)
	Input Voltage Range	10-28 VDC
	Peak Voltage	40 VDC
	Input Current	1.92 mA @ 12 VDC 4.0 mA @ 24 VDC
	Maximum Input Current	5 mA @ 28 VDC
	Input Impedance	5.6k @ 10-28 VDC
	ON Voltage Level	> 10 VDC
	OFF Voltage Level	< 2 VDC
	Min. ON Current	1.5 mA
	Min. OFF Current	0.2 mA
	OFF to ON Response	2-4 ms, typical 3 ms
	ON to OFF Response	2-4 ms, typical 3 ms
	Status Indicators	Red LED for each output
	Commons	2 points
	Fuse	No Fuse
	Base Power Required (3.3V)	Typical 7.5mA (all inputs on)
	Optical Isolation	2500 Volt
	Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
Relay Output Specs	Number of Outputs	4
	Output Voltage Range	5-180 VDC or 20-132 VAC
	Output Type	Relay 1 Form A (SPST)
	Output Terminals Consumed	5
	Peak Voltage	180 VDC/200 VAC
	AC Frequency	47-63 Hz
	Maximum Current (resist.)	1A/point
	Maximum Leakage Current	0.5mA @ 130 VAC @ 60Hz
	ON Voltage Drop	1.5 V @ 1 Amp
	Maximum Switching Current	0.5A
	Electromagnetic Shield	2 pF between contact and shield
	Dielectric Strength	250V between contacts, 1500V between contacts and shield
	OFF to ON Response	≤1ms (typical)
	ON to OFF Response	≤1ms (typical)
	Status Indicators	Red LEDs
	Commons	1
	Base Power Required (3.3V)	25mA

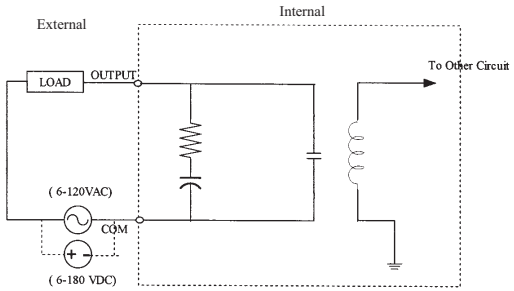
Pinout Information	
Pin No.	EZIO-4DCIP4RLO
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	Customer_COM (GND)
6	Output(1)
7	Output(2)
8	Output(3)
9	Output(4)
10	Customer_COM (GND)
11	Not Connected



DC INPUT (SOURCE)



DC INPUT (SINK)

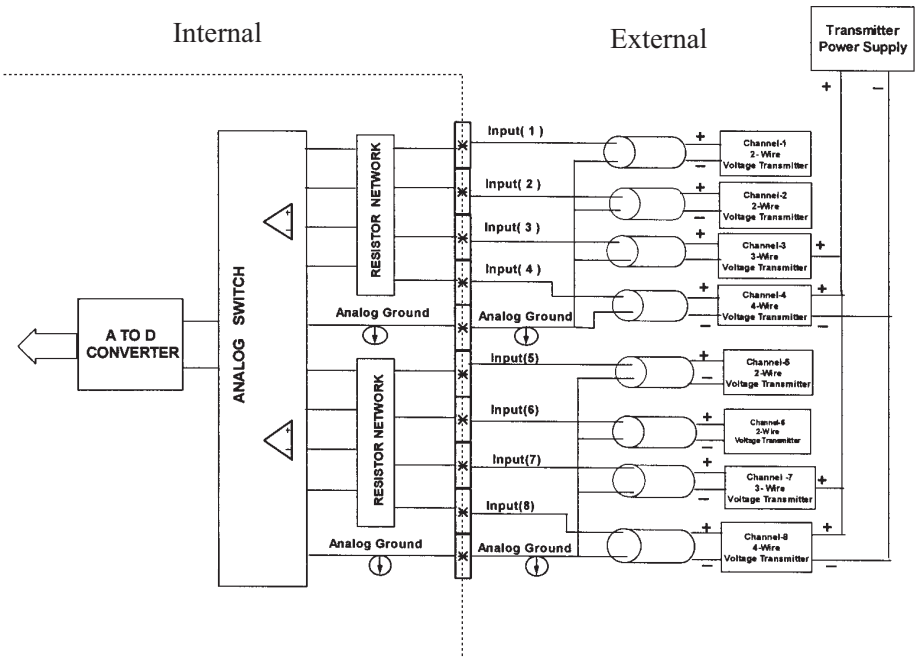


EZIO-8ANIV

8 pt. Analog In Module (Voltage)

Module Specifications	
Number of Channels	8 single ended
Input Range	0-5, 0-10V DIP switch selectable
Resolution	12 bit (4 in 4 or 6)
Step Response	200µs to 95% of FS
Crosstalk	1/2 count max, -80db
Input Impedance	>20KΩ
Absolute Max Ratings	± 15V
Converter Type	successive approximation
Linearity Error (end to end)	± 2 count
Input Stability	± 2 count
Gain Error	± 2 counts
Offset Calibration Error	± 5 counts
Max Inaccuracy	± 0.2% at 25°C, ± 0.4% at 0-60°C
Accuracy vs. Temperature	± 50 ppm/°C typical

Pinout Information	
Pin No.	EZIO-8ANIV
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	Customer_COM (Analog GND)
6	Input(5)
7	Input(6)
8	Input(7)
9	Input(8)
10	Customer_COM (Analog GND)
11	Not Connected

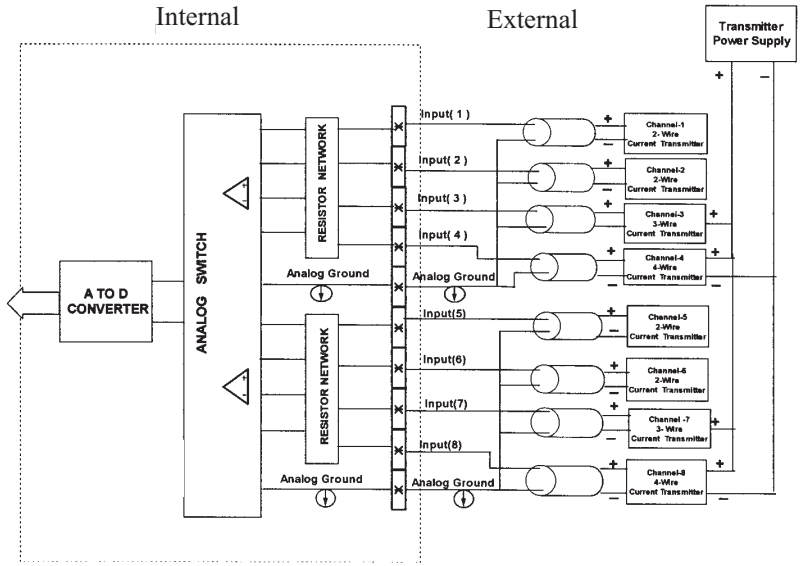


EZIO-8ANIC

8 pt. Analog In Module (Current)

Module Specifications	
Number of Channels	8 Single Ended
Input Range	0-20mA or 4-10 mA DIP switch selectable
Resolution	12 bit (1 in 4 or 6)
Step Response	200µs for 95% FS
Crosstalk	1/2 count max, -80db
Input Impedance	62.5Ω ± 0.1%
Absolute Max Ratings	-30mA to 30mA
Converter Type	Successive Approximation
Linearity Error (end to end)	± 2 counts
Input Stability	± 1 count
Full-scale Calibration Error	± 10 counts @ 20mA
Offset Calibration Error	± 5 counts
Max Inaccuracy	± 0.3% @ 25°C, ± 0.6% @ 60°C
Accuracy vs. Temperature	± 50 ppm/°C typical
Recommended Fuse	.032 Amp, series 217 fast acting

Pinout Information	
Pin No.	EZIO-8ANIC
1	Input(1)
2	Input(2)
3	Input(3)
4	Input(4)
5	Customer_COM (Analog GND)
6	Input(5)
7	Input(6)
8	Input(7)
9	Input(8)
10	Customer_COM (Analog GND)
11	Not Connected

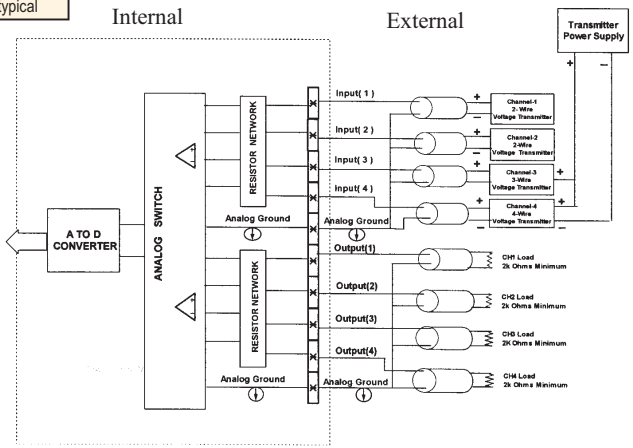


EZIO-4ANI4ANOV

4 pt. Analog In/4 pt. Analog Out Module (Voltage)

	Module Specifications	
Analog Voltage Input Specs	Number of Channels	4 single ended
	Input Range	0-5, 0-10V DIP switch selectable
	Resolution	12 bit (4 in 4 or 6)
	Step Response	200µs to 95% of FS
	Crosstalk	1/2 count max, -80db
	Input Impedance	>20KΩ
	Absolute Max Ratings	± 15V
	Converter Type	successive approximation
	Linearity Error (end to end)	± 2 count
	Input Stability	± 2 count
	Gain Error	± 2 counts
	Offset Calibration Error	± 5 counts
	Max Inaccuracy	± 0.2% at 25°C, ± 0.4% at 0-60°C
	Accuracy vs. Temperature	± 50 ppm/°C typical
Analog Voltage Output Specs	Number of Channels	4 single ended (1 common)
	Output Range	0-5 VDC, 0-10 VDC (DIP switch selectable)
	Resolution	12 bits (1 in 4096)
	Conversion Setting Time	100 µs for FS
	Crosstalk	1/2 count max, -80db
	Peak Output Voltage	± 18 VDC
	Offset Error	± 0.15% of range
	Gain Error	± 0.3% of range
	Linearity Error (end to end)	± 1 count
	Output Stability	± 2 counts
	Load Impedance	2k Ω min.
	Load Capacitance	.01 microF max
	Accuracy vs. Temperature	± 50 ppm/C typical

Pinout Information	
Pin No.	EZIO-4ANI4ANOV
1	Output(1)
2	Output(2)
3	Output(3)
4	Output(4)
5	Customer_COM (Analog GND)
6	Input(1)
7	Input(2)
8	Input(3)
9	Input(4)
10	Customer_COM (Analog GND)
11	Not Connected

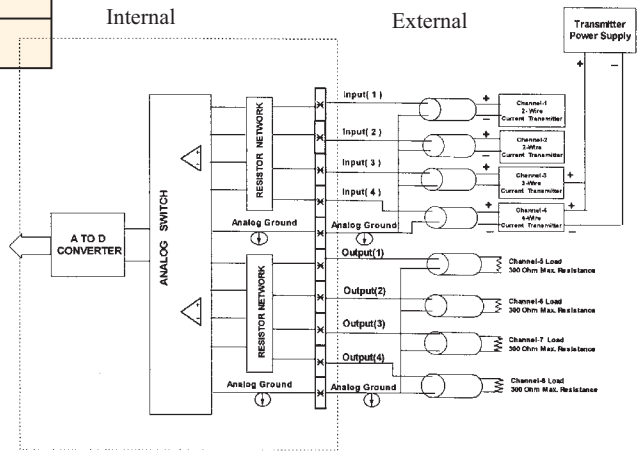


EZIO-4ANI4ANOC

4 pt. Analog In/4 pt. Analog Out Module (Current)

	Module Specifications	
AC Input Specs	Number of Channels	4 Single Ended
	Input Range	0-20mA or 4-10 mA DIP switch selectable
	Resolution	12 bit (1 in 4 or 6)
	Step Response	1ms for 95% FS
	Crosstalk	1/2 count max, -80db
	Input Impedance	62.5Ω ± 0.1%
	Absolute Max Ratings	-30mA to 30mA
	Converter Type	Successive Approximation
	Linearity Error (end to end)	± 2 counts
	Input Stability	± 1 count
	Full-scale Calibration Error	± 10 counts @ 20mA
	Offset Calibration Error	± 5 counts
	Max Inaccuracy	± 0.3% @ 25°C, ± 0.6% @ 60°C
	Accuracy vs. Temperature	± 50 ppm/°C typical
	Recommended Fuse	.032 Amp, series 217 fast acting
AC Output Specs	Number of Channels	4 single ended
	Output Range	0-20mA, 4-20mA (DIP switch selectable)
	Output Type	Current Sourcing
	Resolution	12 bit (1 in 4 or 6)
	Max. Loop Voltage	30 VDC
	Load/loop Power Supply	0-300Ω/18-30 VDC
	Linearity Error (end to end)	± 2 counts
	Conversion Setting Time	100µs for FS
	Full-scale Calibration Error	± 12 counts
	Offset Calibration Error	± 6 counts
	Max. Full-scale Inaccuracy (all errors included)	± 0.3%

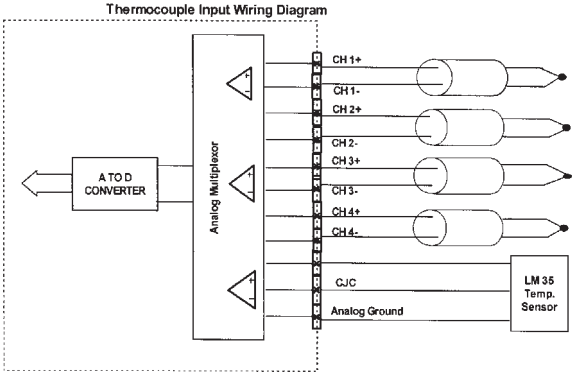
Pinout Information	
Pin No.	EZIO-4ANI4ANOC
1	Output(1)
2	Output(2)
3	Output(3)
4	Output(4)
5	Customer_COM (Analog GND)
6	Input(1)
7	Input(2)
8	Input(3)
9	Input(4)
10	Customer_COM (Analog GND)
11	Not Connected



EZIO-4THI
Thermocouple Input Module

Module Specifications	
Number of Channels	4, differential
Common Mode Range	-1.5 VDC to +4.0 VDC
Common Mode Rejection	100dB min. @ VDC 50/60Hz
Input Impedance	5MΩ
Absolute Maximum Ratings	Fault-protected inputs to ±50 VDC
Accuracy vs. Temperature	± 15ppm/°C max. 0-1.25V ±35 ppm/°C max. (including max. offset change)
PLC Update Rate	4 channels per scan
Base Power Required	10mA @ 3.3 VDC supplied by base
Operating Temperature	32° to 140°F (0° to 60°C)
Storage Temperature	-4° to 158°F (-20° to 70°C)
Relative Humidity	5 to 95% (non-condensing)
Environmental Air	No corrosive gases permitted
Vibration	MIL STD 810C 514.2
Shock	MIL STD 810C 516.2
Noise Immunity	NEMA ICS3-304
Replacement Terminal Block	EZIO-TERM11CJC (comes with CJC)

Thermocouple Input Wiring Diagram



Pinout Information	
Pin No.	4 Thermocouple Input
1	CHAN1 + (Input)
2	CHAN1 - (Input)
3	CHAN2 + (Input)
4	CHAN2 - (Input)
5	CHAN3 + (Input)
6	CHAN3 - (Input)
7	CHAN4 + (Input)
8	CHAN4 - (Input)
9	+ 5 VDC
10	Vout (Temp. Sensor)
11	Analog GND

Thermocouple Specifications			
Input Ranges		**Range in C**	**Range in F**
	Type J	-190 to 760°C	-310 to 1400°F
	Type K	-150 to 1372°C	-238 to 2502°F
	Type S	65 to 1768°C	149 to 3214°F
	Type T	-230 to 400°C	-382 to 752°F
Display Resolution	± 0.1°C or ± 0.1°F		
Cold Junction Compensation	Automatic		
Conversion Time	1ms per channel		
Warm-Up Time	30 minutes typically ± 1°C repeatability		
Linearity Error (End to End)	± 1°C max. ± 0.5°C typical		
Maximum Inaccuracy	± 3°C (excluding thermocouple error)		

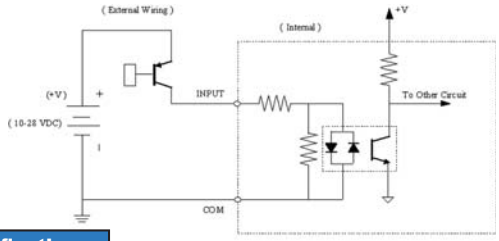
High Speed Counter Modules with PLS Outputs

General Specifications	
Optical Isolation	2500 Volt
Wires	1 of 14 AWG, 2 of 18 AWG, 4 of 22 AWG
Operating Environment	0-60°C, Humidity non-condensing 5-95%

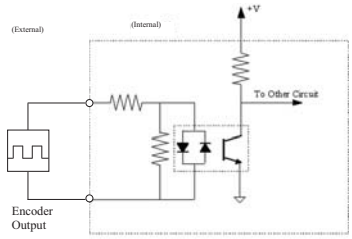
Module Specifications		
Feature	*EZIO-HSCM1*	*EZIO-HSCM2*
Module Type	Intelligent High Speed Dual Counter Module	Intelligent High Speed Single Counter Module
Maximum Input Frequency	60KHz after 1X, 2X or 4X Multiplication	100KHz after 1X, 2X or 4X Multiplication
Minimum Pulse Width	5 µs	
Resource Options	1X, 2X, or 4X Quadrature, Up or Down Counter, Reset	
Counter Range	16 million (24 bits)	
Preset Modes	1. This mode will preset the counter to the preset value while preset is held high. While the preset signal is high, no new count signals will be counted. 2. This mode will create an interrupt on the rising edge of the reset signal to set the counter to the preset value. 3. This mode will create an interrupt on the falling edge of the preset signal to set the counter to the preset value. 4. This mode will create a preset pulse every time that there is a rising edge of signal A and the preset signal is high.	
Reset Modes/Input	None	Same as Preset except the reset input sets the counter value to zero
Inhibit Input	None	Inhibits the counter from counting when high

1 Counter Pin Out	
Pin No.	EZIO-HSCM1
1	Quad A encoder 1
2	Quad B encoder 1
3	Inhibit
4	Reset
5	Common
6	Preset
7	Counter 1 Output 1
8	Counter 1 Output 2
9	Counter 2 Output 1
10	Counter 2 Output 2
11	Vs+

2 Counter Pin Out	
Pin No.	EZIO-HSCM1
1	Quad A encoder 1
2	Quad B encoder 1
3	Quad A encoder 2
4	Quad B encoder 2
5	Common
6	Preset
7	Counter 1 Output 1
8	Counter 1 Output 2
9	Counter 2 Output 1
10	Counter 2 Output 2
11	Vs+



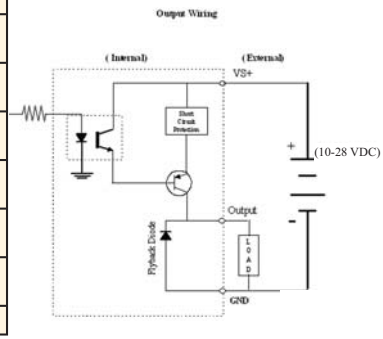
DC INPUT (Source) for Control Signals



DC INPUT (Source) for Control Signals

PLS Output Specifications		
Feature	*EZIO-HSCM1*	*EZIO-HSCM2*
Number of Outputs	2 Source outputs for each counter	4 Source outputs
Response Time	100µs	
PLS Setpoints	1 on/off pair for each output	
Peak Voltage	50.0 VDC	
Maximum Steady State Output Current	0.5A per output, 1.0A max per module @ 50°C	
Maximum Leakage Current	100µA @ 50 VDC @ 50°C	
ON Voltage Drop	2 VDC @ 0.5A	
Maximum Inrush Current	0.8A for 10ms	
OFF to ON Response	< 2µs	
ON to OFF Response	<10µs	
Status Indicators	Red LED for each output	
+V Terminals & Commons	One V+, 1 Common	
Short Circuit Protection	1 Amp per module, turns off outputs upon short circuit detection	
Optical Isolation	2500 Volt	

Counter Input Specifications		
Feature	*EZIO-HSCM1*	*EZIO-HSCM2*
Number of Inputs	5	
Input Voltage Range	10-28 VDC	
Peak Voltage	40 VDC	
Input Current	5.0 mA @ 12 VDC 8.0 mA @ 24 VDC	
Maximum Input Current	10 mA @ 28 VDC	
Input Impedance	2.2KΩ min. @ 10-28 VDC	
ON Voltage Level	> 10 VDC	
OFF Voltage Level	< 2 VDC	
Min. ON Current	5 mA	
Min. OFF Current	0.2 mA	
OFF to ON Response	< 2µs	
ON to OFF Response	< 3µs	
Status Indicators	Red LED for each input	
Commons	1 point	



3

Specifications, CPU Operation, PLC Modes and Memory Map

In this chapter....

3.1 EZPLC Models and EZIO Modules

Part Number	Description
EZPLC-A-32	4-slot EZPLC AC Powered; 32 I/O Max
EZPLC-A-32-E	4-slot EZPLC AC Powered; 32 I/O Max; with built-in Ethernet
EZPLC-D-32	4-slot EZPLC AC Powered; 32 I/O Max
EZPLC-D-32-E	4-slot EZPLC AC Powered; 32 I/O Max; with built-in Ethernet
EZPLC-A-48	6-slot EZPLC AC Powered; 48 I/O Max
EZPLC-A-48-E	6-slot EZPLC AC Powered; 48 I/O Max; with built-in Ethernet
EZPLC-D-48	6-slot EZPLC AC Powered; 48 I/O Max
EZPLC-D-48-E	6-slot EZPLC AC Powered; 48 I/O Max; with built-in Ethernet
EZPLC-A-64	8-slot EZPLC AC Powered; 64 I/O Max
EZPLC-A-64-E	8-slot EZPLC AC Powered; 64 I/O Max; with built-in Ethernet
EZPLC-D-64	8-slot EZPLC AC Powered; 64 I/O Max
EZPLC-D-64-E	8-slot EZPLC AC Powered; 64 I/O Max; with built-in Ethernet
EZPLC-A-96	12-slot EZPLC AC Powered; 96 I/O Max
EZPLC-A-96-E	12-slot EZPLC AC Powered; 96 I/O Max; with built-in Ethernet
EZPLC-D-96	12-slot EZPLC AC Powered; 96 I/O Max
EZPLC-D-96-E	12-slot EZPLC AC Powered; 96 I/O Max; with built-in Ethernet

EZ I/O Modules	
DC Modules	
EZIO-8DCI	8 point DC Inputs (sink/source)
EZIO-8DCOP	8 point DC (source) Outputs
EZIO-8DCON	8 point DC (sink) Outputs
EZIO-8HSDCI	8 point High Speed DC Inputs (sink/source)
EZIO-4DCI4DCON	4 point DC (sink/source) Inputs; 4 point DC (sink) outputs
EZIO-4DCI4DCIF	4 point DC (sink/source) Inputs; 4 point High Speed DC (sink/source) Inputs
EZIO-4DCI4DCOP	4 point DC (Sink/Source) Inputs; 4 point DC (source) outputs
AC Modules	
EZIO-8ACI	8 point AC Inputs
EZIO-8ACO	8 point AC Outputs
EZIO-4ACI4ACO	4 point AC Inputs; 4 point AC Outputs
AC/DC Combo Modules	
EZIO-4DCOP4ACO	4 point DC (source) Outputs; 4 point AC outputs
EZIO-4ACI4DCOP	4 point AC Inputs; 4 point DC (source) outputs
EZIO-4DCI4ACO	4 point DC (sink/source) Inputs; 4 point AC Outputs
Analog Modules	
EZIO-8ANIV	8 channel Analog Input module (Voltage)
EZIO-8ANIC	8 channel Analog Input module (Current)
EZIO-4ANI4ANOV	4 Channel Analog Inputs; 4 Channel Analog Outputs
EZIO-4ANI4ANOC	4 Channel Analog Inputs; 4 Channel Analog Outputs
Relay Modules	
EZIO-4IORLO	4 point Relay Outputs
EZIO-4ACI4RLO	4 point AC Inputs; 4 point Relay Outputs
EZIO-4DCOP4RLO	4 point DC (sink/source) Outputs; 4 point Relay Outputs
Specialty Modules	
EZIO-4THI	4 Channel thermocouple input module
EZIO-4HSCM1	High Speed 24-Bit Counter module
EZIO-4HSCM2	High Speed 24-Bit Counter module

3.2 EZPLC Accessories

Part Number	Description
EZPLC-EDIT	EZPLC Programming Software
EZPLC-M	Hardware User Manual for EZPLC CPU and Base
EZIO-M	Hardware User Manual for EZI/O Modules
EZPLC-CM	Hardware User Manual for DeviceNet, Profibus and Ethernet options
EZPLC-BAT	EZPLC Replacement Battery
EZP-PGMCBL	Programming Cable
EZIO-DUMMY	Dummy Module for Open Slots
EZIO-TERM11	11 Pin Removable 3.5mm Phoenix Terminal Block
EZPLC-TERM5	5 Pin Removable 3.5mm Phoenix Terminal Block
EZPLC-DN-TERM5	DeviceNet 5 Pin Field Terminal Block

3.3 EZPLC Specifications

EZPLC Specifications								
Part Number	EZPLC-A-32 - Standard EZPLC-A-32E - Ethernet EZPLC-D-32 - Standard EZPLC-D-32E - Ethernet		EZPLC-A-48 - Standard EZPLC-A-48E - Ethernet EZPLC-D-48 - Standard EZPLC-D-48E - Ethernet		EZPLC-A-64 - Standard EZPLC-A-64E - Ethernet EZPLC-D-64 - Standard EZPLC-D-64E - Ethernet		EZPLC-A-96 - Standard EZPLC-A-96E - Ethernet EZPLC-D-96 - Standard EZPLC-D-96E - Ethernet	
								
Specifications	**EZPLC models with "E" suffix are built with 10/100 Base-T Ethernet with a standard RJ45 connector**							
	4 Slot EZPLC AC Powered	4 Slot EZPLC DC Powered	6 Slot EZPLC AC Powered	6 Slot EZPLC DC Powered	8 Slot EZPLC AC Powered	8 Slot EZPLC DC Powered	12 Slot EZPLC AC Powered	12 Slot EZPLC DC Powered
Input Voltage Range	110 VAC (95-125VAC)	24VDC (20-28VDC)	110 VAC (95-125VAC)	24VDC (20-28VDC)	110 VAC (95-125VAC)	24VDC (20-28VDC)	110 VAC (95-125VAC)	24VDC (20-28VDC)
Maximum I/O Capacity	4 Slot Base (32I/O Max)		6 Slot Base (48I/O Max)		8 Slot Base (64I/O Max)		12 Slot Base (96I/O Max)	
Power Supply Capacity	3.3V @ 1 Amp							
CPU & Support Electronics Power	300mA							
I/O Module Power (typical)	25mA							
DeviceNet/Profibus Interface Power	DeviceNet 50mA Profibus 100mA							
Maximum Power Consumption	10 watts		11 watts		12 watts		15 watts	
CPU Processor	32 Bit, 40 MHz RISC Processor							
Total Memory Available	64 KB (Ladder)							
Total Number of Registers	8192 16Bit							
Typical Scan Time	3ms (1K Boolean)							
Real Time Clock/ Calendar	Built-in							
Built-In Battery Backup	Yes, Lithium coin cell battery with 5 year life expectancy, with a low battery indicator							
LED Indicators	Input Power, CPU Status (Run, Program & Run/Program) , Low Battery and RS232 Programming Port active indicators							
I/O Supported	EZI/O Snap-in modules with status LEDs and Removable Terminal Block DC / AC / Analog / Relay / Thermocouple / High Speed Counter / DeviceNet / Profibus							
Operating Temperature	-10C to 60C							
Storage Temperature	-20C to 70C							
Humidity	10-95% Non-Condensing							
Electrical Noise	Nema ICS 2-230 Showering arc; ANSI C37.90a SWC; Level C Chattering Relay Test (pending)							
Agency Approval	UL, CUL, CE (pending)							
Withstand Voltage	1000VDC (1 minute) between power supply input terminal and protective ground)							
Insulation Resistance	Over 20M Ohm between power supply input and terminal and protective ground							
Vibration	5 to 55Hz 2G's for 2 hours in X,Y,and Z axis							
Shock	10G for under 12ms in the X,Y, and Z axis							
Protocols Supported	ASCII In/Out on RS422/485 port; EZ Protocol on Ethernet and RS232 port DeviceNet Slave option card (EZPLC-DeviceNet), and Profibus Slave option card (EZPLC-Profibus)							
Communication Ports	**Standard Model:** Port 1: RS232 (Programming and HMI Port Only with EZ Protocol) Port 2: RS422 (1.2K, 2.4K, 4.8K, 9.6K, 19.2K, and 38.4K Baud Rates supported) ASCII In/Out							
	Ethernet Model: Port 1: RS232 (Programming and HMI Port Only with EZ Protocol) Port 2: RS422 (1.2K, 2.4K, 4.8K, 9.6K, 19.2K, and 38.4K Baud Rates supported) ASCII In/Out Port 3: Ethernet TCP/IP with EZ Protocol for programming or interface to an HMI							
External Dimensions	5.75" x 4.868" x 3.124" (146.05 x 123.65 x 79.356mm)		8.35" x 4.868" x 3.124" (212.09 x 123.65 x 79.356mm)		9.21" x 5.818" x 3.124" (233.93 x 147.78 x 79.356mm)		14.908" x 5.173" x 3.124" (378.65 x 131.4 x 79.356mm)	

3.4 CPU Overview

All EZPLC models have the CPU built-in and do not require any additional plug-in processors. The CPU is one of the most crucial and important components of the EZPLC. Almost all PLC operations are carried out in the CPU so it is very important to understand its capabilities. This section will provide you with all the information regarding the EZPLC CPU and its communication specifications.

The EZPLC is offered in two different types of CPUs. The Standard EZPLC has two integrated serial communication ports while the Enhanced model has an additional port for Ethernet connectivity. The EZPLC CPU offers very robust processing power with a rich instruction set. Refer to Section 5 for the complete set of the 55 most widely used instructions. Common features to all CPU configurations include:

- Both CPUs support all 55 instructions, including data conversion, 2 types of drum sequencer, ASCII In/Out communications.
- 64 KB of total program memory with 8192 total registers
- Fast scan time (3 ms of scan time for 1k Boolean instructions)
- Two integrated serial communication ports (Port 1: RS232; Port 2: RS422/485)
- Enhanced model with Ethernet communication port
- Optional communication interface cards for DeviceNet Slave and Profibus Slave.
- The CPU is a 32 bit 40 MHz Motorola ColdFire processor.

3.5 CPU Operation Modes

The Mode DIP Switches on an EZPLC are used to switch between Program and Run modes. Use the following table as a guide to different modes.

NOTE: As a stand alone PLC (as against embedded PLC) the EZPLC needs to have SW1 set at 1 (ON) and SW2 set at 0 (OFF) In this mode, its RS232 can be used for either programming the EZPLC or connecting it to an external HMI like EZPanel or EZText. SW1 and SW2 also provide an extra level of safety for EZPLC Programs. If these switches are set to be both on or off, the CPU is totally disconnected from the RS232 Programming port.

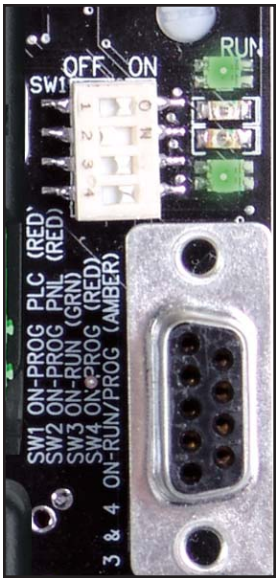
RS232 Programming/Communication Port Enable Switch Setup

SW1	SW2	PLC LED	Panel LED	RUN LED	Connection
0	0	Off	Off	On	Port disconnected
1	0	On	Off	Off	RS232 to PLC
0	1	Off	On	Off	RS232 to HMI*
1	1	On	On	Off	Port disconnected

Switches SW1 and SW2 control the connectivity of the RS232 communication/programming port on the EZPLC base to its CPU. Switch SW1 must be ON and SW2 must be OFF in order to be able to program the PLC from a computer.

*SW2 is provided for a special case when EZPLC is embedded in our EZPanel or EZText Enhanced.

Once a connection is established between the PLC and computer thru SW1, switches SW3 & SW4 help the user switch between RUN/PROGRAM modes of the PLC.



NOTE: Shown for 4 and 6 slots, 8 and 12 slot bases have the same orientation except that the switches and LEDs are at the bottom of the motherboard.

PLC Run/Program Switch Setup

SW3	SW4	Tricolor LED	Operation/Mode
0	0	Off	No Operation
1	0	Green	Run
0	1	Red	Program
1	1	Amber	Run/Program

The Program mode disables all I/O and you can modify the logic program in PLC. Run mode enables all I/O. You can view/monitor the logic program in this mode but you can't modify it. Run/Program mode enables you to make modifications ONLINE with enabled I/O.

CPU Status Indicator LEDs

EZPLC has 3 Status indicator LEDs. They have specific functions that can help you in programming and troubleshooting of an EZPLC. These LEDs provide visual indication of CPU status. The table below lists various states of these indicators.

Indicator	Status	Description
PWR	On/Off	Power connection On/Off
CPU	On/Off	CPU functioning On/Off
Low Battery	On/Off	Backup Battery Voltage Low/OK

CAUTION! *CPU LED will be off if there is no valid Ladder program in the PLC.*

Red Power LED indicates that the EZPLC has power. Green CPU LED indicates that the CPU is executing a valid program. Red Low Battery LED will momentarily turn on at Power ON and then stay off if the battery is good. If the battery is low, this LED will turn on.

Communications

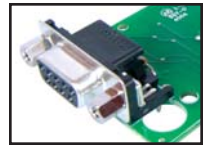
Both EZPLC CPU models (standard and enhanced) have 2 built-in serial ports. Port 1 is RS232 that can be used for programming and connecting to HMI. Port 2 is an RS-422/485 port that can be used for networking with marquees, barcode printers, scanners and other ASCII type devices.

Enhanced EZPLC CPU model comes with a built-in Ethernet communication interface (RJ45) along with serial ports. Optional communication interfaces (field installable) for DeviceNet and Profibus can be installed in every EZPLC. (DeviceNet and Profibus communication interfaces are sold separately P/N: EZPLC-DEVICENET and EZPLC-PROFIBUS).

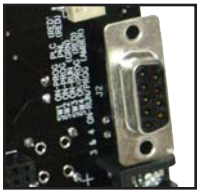
These option cards are mounted on the back side of the EZPLC motherboard, right next to the CPU card engine.


Ethernet


DeviceNet


Profibus

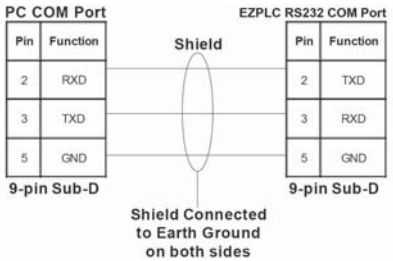
Serial Port 1 Specification



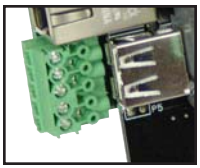
Use port 1 for programming the EZPLC. This RS232 port can also be used to connect to an operator interface (like EZPanel Enhanced or EZText Enhanced). You will need to use an appropriate RS-232C cable for programming from a PC. (P/N EZP-CBL for communication with EZPanel Enhanced or EZText Enhanced ONLY) This port is located on the 9-pin D-shell connector and supports EZ Protocol for communicating with an operator interface.

CAUTION! *Keep the signal reference GND wire well protected from external noise by using shielded cable.*

RS232 Wiring Diagram



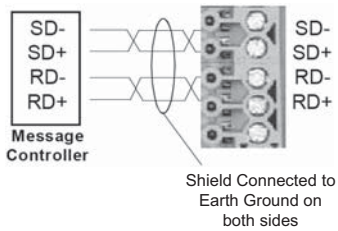
Serial Port 2 Specification

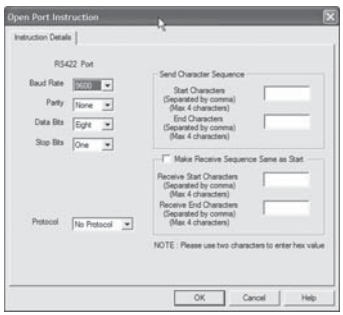


Use Port 2 to network AC drives or any other compatible device with multi-drop capability over RS-422/485. This port has the same communication capabilities of many larger PLCs in a serial port. This port is located on the removable Phoenix terminal block. Port 2 supports up to 38.4k baud rate and has ASCII In/Out capability.

CAUTION! *Do not connect the GND terminal of this port to any external drive. Please leave it unconnected right at the port terminal.*

RS422/485 Wiring Diagram





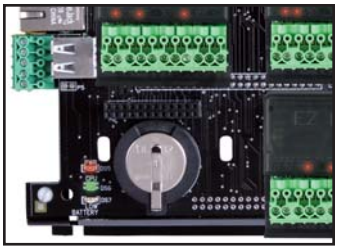
The RS422/485 port can be accessed from the ladder logic program using Communication Instructions. See EZPLC Software Manual for information on how to configure a port to communicate with an ASCII device.

You will need to specify network properties such as Baud Rate (1200 to 38400), Parity value (None, Odd or Even), Data Bits (7 or 8), Stop Bits (1 or 2) and a Protocol.

3.6 Battery Backup

The EZPLC has a built-in 3V Lithium ion cell battery to maintain the system RAM retain its data when the EZPLC system is without external power. Typical CPU battery life is 5 years, inclusive of PLC runtime and normal shutdown periods. A Low Battery LED indicator gives a low battery voltage warning.

To replace the 3V Lithium cell battery, perform the following steps:



3V Lithium Cell Battery under module M2

1. Remove the M2 EZI/O module to access the battery.
2. Connect the EZPLC with a programming computer using an RS-232C cable.
3. Open the EZPLC Editor software and Save the program on your computer's hard disk.
4. Disconnect Power source.
5. Simply remove the old battery from the slot.
6. Gently insert a new battery (P/N EZPLC-BAT) into its place, with the Positive (+) side upwards.
7. Power up the system and reload the program from the computer.

***NOTE:** *You can replace a battery without removing the main power to the EZPLC. However, it is always recommended to switch off the main power.*

3.7 CPU Operation Sequence

A good understanding of EZPLC's CPU operating sequence will help you achieve the proper control for your equipment or process.

The flow chart on the next page shows the main tasks how the CPU controls all aspects of system operation.

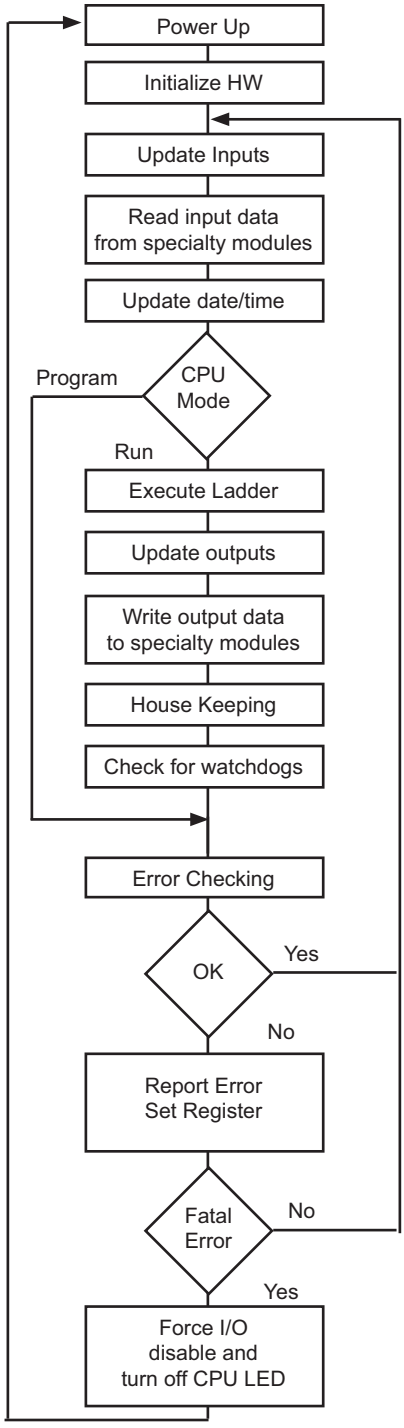
Power-up Initialization

At power-up, the CPU initializes the internal electronic hardware. It also checks if all the memories are intact and the system bus is operational. It sets up all the communication registers. It checks the status of the back up battery. If all registers are go, the CPU begins its cyclic scan activity as described below.

Read Inputs

The CPU reads the status of all inputs, and stores them in an image table. IMAGE TABLE is EZPLC's internal storage location where it stores all the values of inputs/outputs for ONE scan while it is executing ladder logic. CPU uses this image table data when it solves the application logic program.

After the CPU has read all the inputs from input modules, it reads any input point data from the Specialty modules like High Speed Counters.



Execute Logic Program

This segment is also called Ladder Scan. The CPU evaluates and executes each instruction in the logic program during the ladder scan cycle. The rungs of a ladder program are made with instructions that define the relationship between system inputs and outputs. The CPU starts scanning the first rung of the ladder program, solving the instructions from left to right. It continues, rung by rung, until it solves the last rung in the Main logic. At this point, a new image table for the outputs is updated.

Write Outputs

After the CPU has solved the entire logic program, it updates the output image table. The contents of this output image table are written to the corresponding output points in I/O Modules. After the CPU has updated all discrete outputs in the base, it scans for the specialty modules. The output point information is sent to the specialty I/O like counters.

Immediate Inputs/Outputs

There is a possibility that an input changes after the CPU has read the inputs. If you have an application that cannot wait until the CPU returns for the next input scan, you can use **Immediate Instructions.** These instructions do not use the status of the input from the image table to solve the application program. The Immediate instructions immediately read the input status directly from I/O modules and update the Input table with appropriate status of input module read. Similarly, Immediate Output instructions do not wait for the CPU to complete the ladder scan. Immediate outputs are directly written to the image table and Outputs are updated accordingly.

Subroutines

The CPU executes subroutines when called for in the ladder program. These subroutines are useful in performing the same logic operation time and time again just upon one call so you do not have to repeat the rung logic over and over again. Subroutines are also useful in executing a logical function, for example check limits, upon receiving an external interrupt from an EZI/O module.

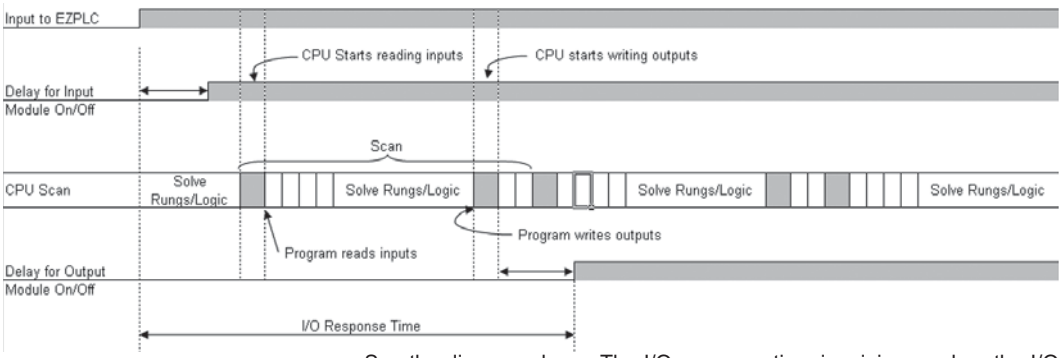
3.8 I/O Response Time

I/O response time is typically defined as the time required for the control system to note a change in an input point and update a corresponding output point.

In a majority of the applications, the processor of a PLC responds practically instantaneously to this task. There are some applications that require extremely fast I/O scan times. The following four factors affect the I/O response time of a CPU:

1. The point in the scan period when the field input changes its state.
2. Delay time for Input module to change state.
3. CPU scan time.
4. Delay time for Output module to change state.

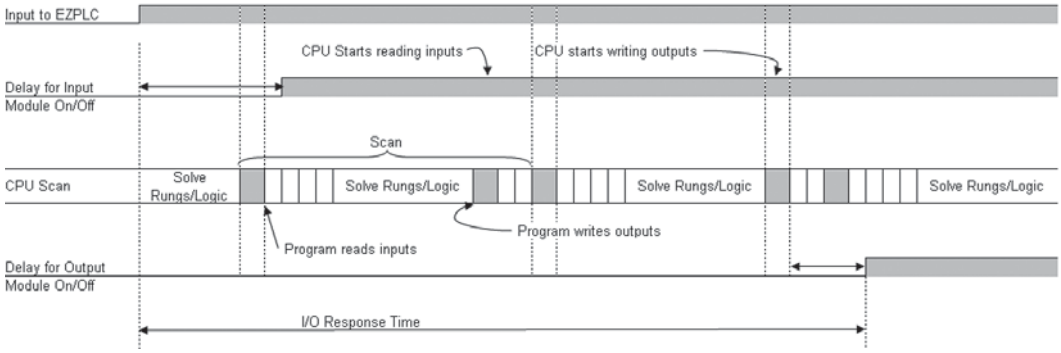
Normal I/O Response Time



See the diagram above. The I/O response time is minimum when the I/O module gets the input change before the Read Inputs portion of the Ladder execution scan cycle. In this case the input status is read, the logic program is solved, and the corresponding output point gets updated.

The total I/O response time is calculated as: *I/O Response = Delay in Input module + CPU Scan Time + Delay in Output module*

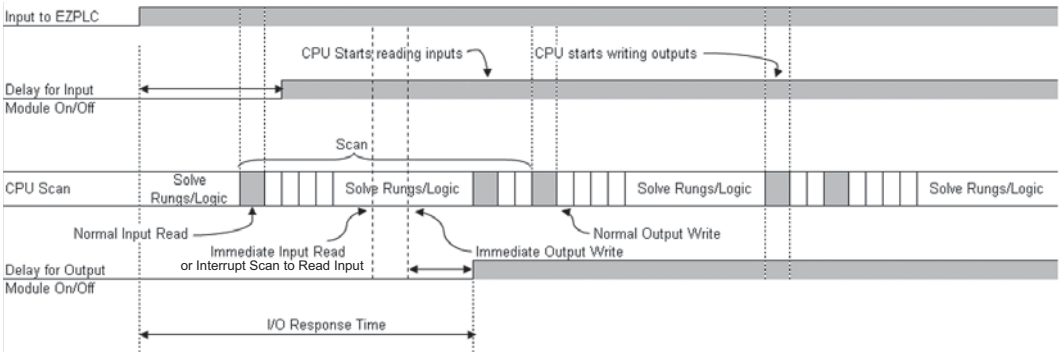
Maximum I/O Response Time



The I/O response time is maximum when the I/O module notes an input change after the Read Inputs portion of the Ladder execution scan cycle. In this case the input status gets noted only in the following Input scan. The diagram shows an example of I/O response timing for this condition.

The total I/O response time is calculated as: *I/O Response = Delay in Input module + 2 times the CPU Scan Time + delay in output module.*

How to get the best I/O Response time



Using Interrupt subroutines and Immediate I/O instructions is the best way to optimize the I/O Response time of your EZPLC system. The immediate instructions update the I/O points during the ladder logic program execution. See the EZPLC Software Manual for detailed description of Immediate instructions. The diagram shows how immediate input and output instructions affect the I/O response timing.

The total I/O response time is simply calculated as: *I/O Response = Delay in Input module + Instruction Execution Time + Delay in Output module + Instruction Execution Time = Immediate Input Instruction Execution + Immediate Output Instruction + Time for Execution of all Instructions in-between*

The total I/O response time for an external interrupt and a subroutine is calculated as: *Delay in Input Module + execution of subroutine + delay in output module. As an example, upon an interrupt you can read the status of an input bit, perform a logical operation on it based upon the value of some other registers, and turn on an output in less than 50µs.*

3.9 CPU Scan Time Considerations

The scan time includes all the tasks that are performed by the operating system in a cyclic manner. As discussed previously, each scan cycle is made up of several segments. Each of these segments takes a certain amount of time to execute. Among all the segments, the amount of time it takes to execute the application program is the only one that has maximum influence on total scan time. This also happens to be the one segment you can control as a user. If your application needs a smaller scan time, then you should try to choose instructions with as fast execution time as possible. This is because different instructions take different amounts of time to execute. Your choice of I/O modules and system configuration can also affect the scan time.

If you need to check the scan time, the SR7 register holds the value of the last CPU scan time. You can display this data value from the logic program.

3.10 Memory Map

A PLC system handles many numbers representing different types of information regarding the process. These process/machine parameters may be anything from status of the input or output devices, timers/counters, or other data values. Before you start programming the EZPLC, it would be helpful if you took a moment to familiarize yourself with how the system represents and stores the various types of data. Each PLC manufacturer has their own conventions for this in their PLCs.

Here we discuss various memory types used in the EZPLCs. These memory types can be used to store a variety of information and can be used inside various RLL instructions. See a description of each of the memory types below.

Discrete Memory Type

A Discrete memory type is one bit that can be either a 1 or a 0 (On or Off). Discrete memory area is used for inputs, outputs, control relays, and timer/counter bits.

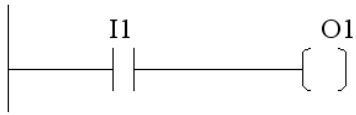
WORD Memory Type

A Word memory type is a 16-bit location that is normally used to store and manipulate numeric or ASCII data. A word memory location is also called a Register.

Mapping Conventions Used

Discrete Inputs

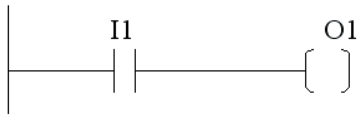
Discrete Inputs are denoted using an "I" pre-fix (e.g. I1, I4, etc…). The maximum number of Inputs available is 1 through 128. Discrete inputs are Read only type.



Note: *All the discrete type EZIO modules are mapped to Discrete Inputs. In this example, the Output bit O1 will be turned on when input I1 allows power through the rung.*

Discrete Outputs

Discrete Outputs are denoted using an "O" pre-fix (e.g. O1, O4, etc…). The maximum number of Outputs available is 1 through 128. Discrete Outputs are Read-Write type.



Note: *All the Discrete type EZIO Output modules are mapped to Discrete Outputs.*

Input Register (Word)

Input Registers are denoted using an “IR” pre-fix (e.g. IR1, IR4, etc…). These are 16-bit Word data types (registers). The maximum number of Input Registers available is 1 through 64. You can only Read from an IR register.

Note: *All the EZIO Analog Input, Thermocouple, and High Speed Counter modules are mapped to Input Registers.*

Output Register (Word)

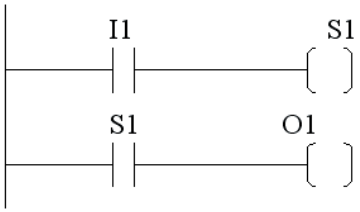
Output Words are denoted using an “OR” pre-fix (e.g. OR1, OR4, etc…). These are 16-bit Word data types (registers). The maximum number of Output Registers available is 1 through 64. OR are Read-Write type of Word registers.

Note: *All the EZIO Analog outputs, are mapped to Output Registers.*

Discrete Internals (Discrete)

Discrete Internals are denoted using “S” pre-fix (e.g. S1, S4, etc…). There are 1024 Discrete Internals available in the EZPLC. Discrete Internals are read-write type.

Discrete internal bits are mainly used to control the user logic program. They do not represent a real physical device, like switch, output coil etc. They are only internal to the CPU. You cannot program discrete internals as discrete inputs or discrete outputs for EZIO modules.



In this example, memory location S1 will be powered when input I1 turns on; you can then use a discrete internal as an input in another rung.

Register Internals (Word)

Internal Registers are denoted using an "R" pre-fix (e.g. R1, R4, etc…). These are 16-bit Word data types (registers). There are 8192 Internal Registers available in the EZPLC. R are Read-Write type of data registers.

System Discretes (Discrete)

System Discretes are denoted using an "SD" pre-fix (e.g. SD1, SD4, etc…). There are 16 System Discretes available in the EZPLC. System Discretes are Read-Write type.

SDs are Read-Write discrete memory locations with pre-assigned functionality. There are many different types of system discretes. They help in logic program development, or provide system operating status information, etc.

System Registers (Word)

System Registers are denoted using an "SR" pre-fix (e.g. SR1, SR4, etc…). These are 16-bit Word data types (registers). There are 20 System Registers available in the EZPLC. System registers are Read-Write type data points.

Index and Value Registers (Word)

The Index Register data type is represented by an "XR" pre-fix (e.g. XR1, XR2 etc…). There are 4 XR memory locations available in EZPLC 1 through 4. "XR" is a Read-Write data type and it is mainly used to point to the correct address of "R" registers. The pointed-to "R" registers data value is stored in "#R" registers.

Value Register data type is represented by a "#R" pre-fix (e.g. #R1, #R2 etc…). There are 4 #R memory locations available in EZPLC 1 through 4. "#R" is a Read-Write data type and it is mainly used to read/write value of "R" registers as pointed out by "XR" registers.

Both XR and #R registers are used in conjunction with each other and provide a convenient way of addressing R registers.

Example:

Let's assume data values

R59=9874, R8000=32

If XR1=59
Then #R1=9874 (the actual data value of R59)

If XR2=8000
Then #R2=32 (the actual data value of R8000)

XR contains the address of the operand (or specifies a register that contains the effective address), #R is used to read or write the actual operand. Indirect addressing is often combined with pre- or post-increment (or decrement) addressing. This allows the address of the operand to be increased or decreased by the specified number either before or after using it. Proper usage of XR variables often saves a lot of programming.

EZAUTOMATION EZPLC

MAP STRING
TAAAAA
T - TYPE
AAAAA - ADDRESS of memory type in DECIMAL

MEMORY TYPE	ADDRESS RANGE	I/O_TYPE	VALUE_TYPE	MAP STRING EXAMPLES
I - Discrete inputs	1 -128	READ_ONLY	DISCRETE	I4
O - Discrete ouputs	1 - 128	READ_WRITE	DISCRETE	O5
S - Discrete internals	1 - 1024	READ_WRITE	DISCRETE	S3
IR - Input Register	1 - 64	READ_ONLY	WORD	IR3
OR - Output Register	1 - 64	READ_WRITE	WORD	OR2
R Register internals	1 - 8192	READ_WRITE	WORD	R123
SR - System registers	1 - 20	READ_WRITE	WORD	SR6
SD - System Discretes	1 - 16	READ_WRITE	DISCRETE	SD1
XR - Index Registers	1 - 4	READ_WRITE	WORD	XR2
#R - Value Registers	1 - 4	READ_WRITE	WORD	#R2

1. WORD VALUE_TYPE = All word VALUE_TYPES

If the IO_TYPE is READ_WRITE, the entire word will be written with the latest values for all other bits in that word

Note: Does not support access to bit of word (ex: R100/0, R100/5, R100/15, etc...).

Memory Type Descriptions		
I - Discrete Inputs	Input	Inputs are denoted using an I. Depending on your EZPLC base, the maximum number of inputs is 128. Inputs are used as a real world interface to a physical Input Device. Inputs are single bits.
O - Discrete Outputs	Output	Outputs are denoted using an O. Depending on your EZPLC base, the maximum number of outputs is 128. Outputs are used as a real world interface to a physical Output Device. Outputs are single bits.
S - Discrete internals	Discrete Bit	Discrete Internals are denoted using an S. There are 1024 Discrete Internals available on the EZPLC. Discrete Internals are used in Boolean instructions such as the Normally Open Contacts and Normally Closed contacts. Discrete Internals use bits that are internal to the EZPLC.
IR - Input Register	Input Register (16bit)	Input Registers are denoted using an IR. There are 64 Input Registers available on the EZPLC. Input Registers are used as a real world interface to a physical Input Device. Input Registers are 16 bit.
OR - Output Register	Output Regiister (16bit)	Output Registers are denoted using an OR. There are 64 Output Registers available on the EZPLC. Output Registers are used as a real world interface to a physical Output Device. Output Registers are 16 bit.
R Register internals	Data Register (16bit)	Internal Registers are denoted using an R. There are 8192 Internal Registers available on the EZPLC. Internal Registers are 16 bit.
SR - System registers	System Register (16bit)	System Registers hold various information about the EZPLC. The user may reference these registers to display that information.
SD - System Discretes	System Discrete	System Discretes provide various functions such as a first scan pulse, 100 msec pulse, 1 second pulse, and whether or not the PLC is in RUN mode or STOP mode.
XR - Index Registers		Need Description
#R - Value Registers		Need Description

4

Maintenance and Troubleshooting

In This Chapter....

- Hardware Maintenance for PLC
- PLC System Troubleshooting
  - PLC Operation
  - PLC Communication

4.1 Hardware Maintenance

Routine maintenance checks should be performed on the EZPLC to avoid any risk of hardware problems. EZPLC is designed to be a very rugged controller so that just a few checks periodically will help keep it up and running.

The key points to be checked include:

- Ambient operating conditions
- CPU battery

Maintaining the Ambient Operating Conditions

Keeping the EZPLC's environment within specified operating conditions is the best method to minimize the maintenance.

1. Always ensure that ambient temperature inside the cabinet is within EZPLC's temperature ratings.
2. Employ cooling methods like a blower fan to reduce 'hot spots' around the EZPLC, if any other equipment inside or outside of the cabinet is producing heat.
3. Periodically inspect and clean if there are any air filters on the cabinet. Ensure that the EZPLC is free from dust, humidity and corrosive gasses.

CPU Backup Battery

It is important that you check the Low Battery LED Indicator periodically. If the 3V Lithium cell battery needs to be replaced, perform the following steps:

1. Connect the EZPLC with a programming computer using an RS-232C cable.
2. Open the EZPLC Editor software and Save the program on your computer's hard disk.
3. Disconnect the Power source.
4. Simply remove the old battery from the slot.
5. Gently insert a new battery (P/N EZPLC-BAT) into its place, with the Positive (+) side upwards.
6. Power-up the system and reload the program from your computer.

***NOTE:** *You can replace a battery without removing the main power to the EZPLC, however it is always recommended to switch off the main power.*

Error Checking

The EZPLC system performs a standard diagnostic routine during each CPU scan. This is called the error-checking step. The primary task of this step is to identify various types of CPU and I/O failures. We classify these errors/failures broadly into two categories: Fatal and Non-fatal

Fatal Errors

These errors are the ones that lead to the system failure. During the CPU scan if a fatal error is detected, PLC is automatically switched out of Run mode and all I/O points are disabled. Some instances of fatal errors include: Wrong parity value, Wrong I/O configuration, Programming errors, etc. EZPLC will not go into Run mode from Program if it detects a fatal error.

Non-Fatal Errors

These errors just need your attention and are not detrimental to PLC operation. Unlike fatal errors, the PLC will continue in Run mode despite an occurrence of non-fatal errors. When you identify such errors, you can proceed with an orderly shutdown, switch the PLC into Program mode and take the required corrective action. Some examples of non-fatal errors are – Low backup battery voltage, minor programming errors, I/O module error, etc.

4.2 System Troubleshooting

Problem		Possible Cause	Suggested Action
Operation	None of the LEDs on EZPLC are On.	Disconnected or faulty power source	Check and repair power source.
	PWR LED on EZPLC is Off.		Check the wiring for loose contacts and secure if found any.
			For 24 VDC powered EZPLC, make sure that proper polarity is observed.
		Input power level is outside of EZPLC's power rating specifications	Ensure that the power being presented to the EZPLC terminals is within specified range
	CPU LED is Off.	Incorrect power supply to the EZPLC	Ensure correct power supply per specifications
		Error in the logic program	Check your logic program.
			Pay special attention to Program Control Instructions and make sure you have used Next or Return statements at the end of Jump and Subroutine Instructions
		Electrical noise	Follow instructions to avoid electrical noise in Chapter 3.
			Consider installing an Isolation transformer if you think the noise is making it's way through the Power source
			Check to ensure that RS232 signal GND is not connected to Earth ground, and the shield is connected to Earth ground on both sides
			Check to ensure that RS422/485 port signal GND point is not connected
		Improper grounding	Most noise problems occur due to improper grounding. Follow the instructions in Chapter 3 for grounding guidelines.
		CPU Hardware failure	Power cycle the EZPLC once to see if an intermittent high frequency noise has caused the failure.
			If yes, take proper steps (e.g. grounding, noise filters) to reduce the noise.
			If problem persists, call EZ Automation for assistance.

Problem		Possible Cause	Suggested Action
Operation	Low Batt LED is On.	Low battery voltage	Follow instructions in the Maintenance section of this chapter to replace the Lithium coin cell battery
	LEDs on one or more I/O modules are Off.	Incorrect power supply to the EZ I/O module	Ensure correct power supply per specifications
		Improper installation of module	Check the connectors for loose contacts and secure if found any.
			Make sure to mount the EZ I/O module properly on the base
			Make sure to connect the Terminal block properly on the EZ I/O module
	On-Line programming does not work.	Disconnected or loose wiring	Check the wiring for loose contacts and secure if found any.
		Wrong position of Mode DIP switches	Check if the Tricolor LED near dipswitches is Green or Amber
			Switch SW3 must be in ON (1) position.
Communication	No communication with EZPLC	Disconnected or loose cable	Ensure you are using a correct communication cable.
			Check the wiring for loose contacts and secure if found any.
			Check if the cable has any broken wires
			Replace/repair wiring if not proper
	No communication with the programming computer (RS232 Port error)	Wrong/broken cable	Make sure you are using a correct communication cable. (RS-232C)
			Check the pins and wiring on the cable
		Wrong position of Mode DIP switches	Make sure if the Run LED near dipswitches is Off and PLC LED is On
			Switch SW1 must be in ON (1) position.
			Check if the Tricolor LED near dipswitches is Green or Amber
			Switch SW3 must be in ON (1) position.
		Wrong Comm Port Settings	Check and correct the comm port attributes
			Open the EZPLC Editor and click on the Configuration button
			Enter/correct parameters like Unit number, Group number and Comm Port name

Problem		Possible Cause	Suggested Action
Communi-cation		Wrong Comm Port Assign-ment on the Computer	Check if correct Serial Port (Com1 or Com2) of the computer is selected
	No communication with the ASCII device on RS422/485 network	Wrong/broken/loose cable	Check and correct the wiring to send/receive pins on the RS422 port
			Ensure right alignment of the Phoenix terminal block on which this port is located
		Wrong Comm Port Settings	Check and correct the comm port attributes
			Open the EZPLC logic program and look for the OpenPort Instruction.
			Check/correct parameters like Baud rate, Parity, Data/Stop Bits and protocol
		Mismatching comm settings of connected device	Check if the connected device is sending correct data
			Check/correct parameters like Baud rate, Parity, Data/Stop Bits and protocol on the connected device
			Most communication problems occur due to improper grounding. Follow the instructions in Chapter 3 for grounding of both devices.
	No communication with the Device Level Network	Network option board not installed correctly	Check that the Option board is inserted properly in the slot
		Wrong Settings - DeviceNet	Check if the Network type selected is DeviceNet
			Open the Setup -> Device Network menu of EZPLC Editor
			Check/Correct the network properties like MAC Id, Baud rate etc
		Wrong Settings - Profibus	Open the Setup -> Device Network menu of EZPLC Editor
			Check if the Network type selected is Profibus
			Check/Correct the network properties such as Node address
	No communication with the Ethernet network	Wrong Comm Port Settings	Open the EZPLC Editor and click on the Ethernet/Configuration button
			Enter/correct parameters like Unit number, Group number and Comm Port name
			Open the Setup -> Ethernet menu of EZPLC Editor
			Check/Correct the network properties such as IP address, Subnet Mask etc

Still Need HELP?

Technical Support

Most of the frequently encountered problems regarding EZPLC operation are answered in the sections above. However, if you still need answers to your questions, please call our technical support at 1-877-774-EASY.

Warranty Repairs

If your EZPLC is under warranty, contact us at 1-877-774-EASY

Out of Warranty Services

If your EZPLC is out of warranty, contact EZ Automation at 1-877-774-EASY for an evaluation of repair costs. You can then decide whether it is more economical to proceed with the repairs or to upgrade your system with a new EZPLC.

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