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

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Designed and built in USA by
avg

EZTouchPLC
Hardware Manual
Manual Part Number EZP-TOUCHPLC-M
Revision A

2 Lines of 2", 20 Ch
1 Line of 4", 10 Ch

VFD DISPLAY
GREAT VIEWING ANGLE

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EZTouchPLC
Hardware Manual
Manual Part Number EZP-TOUCHPLC-M
Revision A

WARNING!

Programmable control devices such as EZTouchPLC 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 EZTouchPLC.

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 EZ-TOUCHPLC-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

CHAPTER 1 - GETTING STARTED

CHAPTER 2 - HARDWARE INSTALLATION

CHAPTER 3 - SPECIFICATIONS, OPERATION OF TWO CPUs, PLC MODES AND PLC MEMORY MAP

CHAPTER 4 - MAINTENANCE AND TROUBLESHOOTING

INDEX

EU Information

EZTouchPLC 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 EZTouchPLC 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
- EZTouchPLC Part Numbering System
- Quick and EZ Start to Getting Familiar with EZTouchPLC
- How to Design the Most Efficient EZTouchPLC System

1.1 Introduction

Welcome to EZAutomation's new Touch panel with a built-in programmable logic controller, the EZTouchPLC.

EZAutomation is the newest addition to the AVG family, with a 37-year-old tradition in 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 PLC, 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 EZTouchPLC's innovation, flexibility, cost-effectiveness and precision, comes from 37 years of PLC experience at Uticor.

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 a new EZTouchPLC. It also covers the troubleshooting and maintenance of an existing setup, if present, and provides understanding on how to connect an EZTouchPLC with other components in your control system.

This manual is a good reference guide for personnel who install EZTouchPLCs as well as those who program it. 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 the Chapter 2, Hardware Installation. New customers may find it more useful to get acquainted with the features of EZTouchPLC first. The "Quick And EZ Start to get familiar with EZTouchPLC" 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 these resources for the topic you are looking for :

- Table of Contents: A listing of contents per chapter, at the beginning of the manual

- Index: At the end of the manual, the Index is an alphabetical listing of all key words

- 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 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 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.

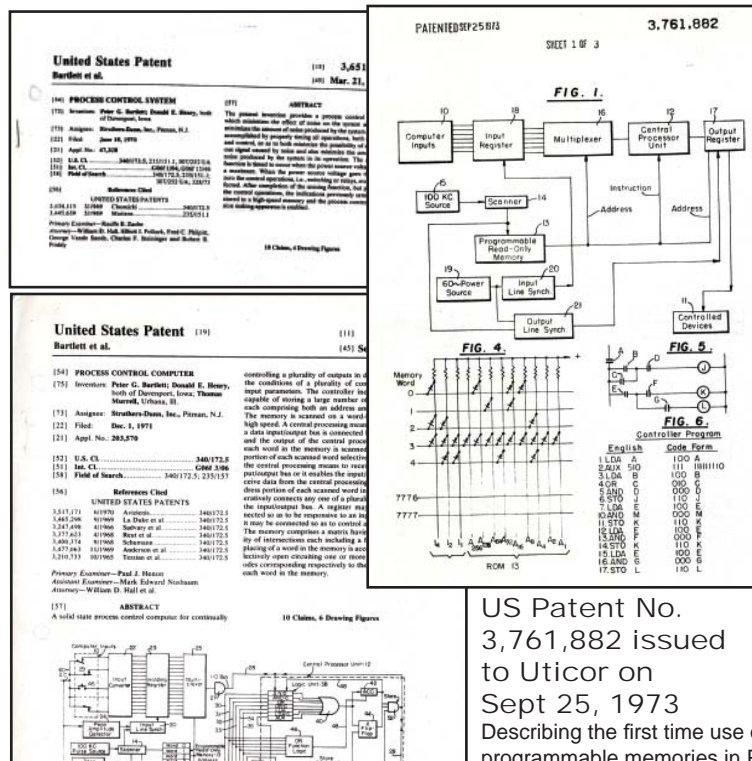| Chapter	Description
1	**Chapter 1: Getting Started** Introduction; Purpose of the Manual; Quick and EZ System Overview; EZTouchPLC Part Numbering System; Quick and EZ Start to getting familiar with EZTouchPLC; How to design the most efficient EZTouchPLC system.
2	**Chapter 2: Hardware and Installation** Safety Considerations; Installation considerations; EZTouchPLC Environmental and Power Specifications; Electrical considerations; Control Cabinet installation; Installing EZTouchPLC Base; Base Mounting Dimensions; Power sources and Optical Isolation; EZIO Modules Positioning; EZIO Modules Installation Overview.
3	**Chapter 3: Specifications, Operation of Two CPUs, PLC Modes, and PLC Memory Maps** EZTouchPLC 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.
4	**Chapter 4: Maintenance and Troubleshooting** Panel Side Maintenance and Troubleshooting; Installing Flash Cards; Lithium Battery Replacement; Gasket Replacement; RAM Upgrade; Flash Program Backup; Touchscreen/Chemical Compatibility; Panel Troubleshooting; Hardware Maintenance for PLC; PLC System Troubleshooting.

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1.4 EZTouchPLC System Overview

Touch Panels

6" White on Blue: 32 I/O PLC, 48 touch cell, slim bezel
6" Monochrome: 32 I/O PLC, 192 touch cell, slim bezel
6" STN Color: 32 I/O PLC, 192 touch cell, slim bezel
6" TFT Color: 32 I/O PLC, 192 touch cell, slim bezel
8" STN Color: 64 I/O PLC, 192 touch cell, slim bezel
8" TFT Color: 64 I/O PLC, 192 touch cell, slim bezel
10" TFT Color: 64 I/O PLC, 192 touch cell, slim bezel
15" TFT Color: 64 I/O PLC, 192 touch cell, slim bezel

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

DC Output 10-28 VDC
8 pt   sink/source

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

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
8 channel IN, voltage
8 channel IN, current
M1 to M10

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

Relay Output
4 pt OUT, 5-180 VDC
or 20-132 VAC
*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

CPUs

Mounted underneath base
1. Standard w/ 2 serial ports
2. Models E w/2 serial ports & Ethernet Comm. Port
3. Models D w/2 serial ports & DeviceNet slave Comm. Port
4. Models P w/2 serial ports & Profibus slave Comm. Port
40 MHz, 8192 Registers, 64 KB memory, 3 ms scan time

M1   M3
M2   M4
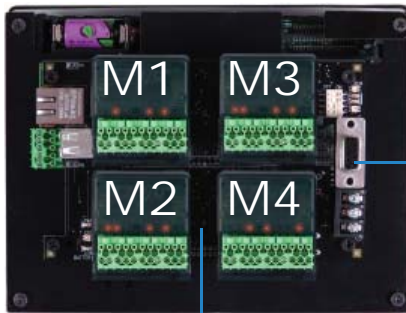
Bases
4 slots - 32 I/O, 24VDC
8 slots - 64 I/O, 24VDC

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
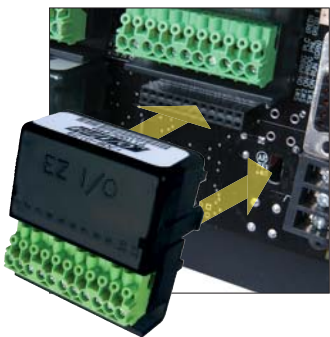
Inserting an EZI/O Module

Programming EZPanel and EZPLC Editors

1.5 Quick and EZ System Overview

EZTouchPLC is the most sensible combination of PLC and EZPanel HMI in one highly integrated package. It utilizes EZPLC's base and is thus capable of all the features present in our EZPLC and uses our 'Mix-n-Match' EZIO to deliver a truly modular integrated system.

EZPanel Operator Interface

The EZPanel Enhanced PLC Touch Panels are the most advanced operator panels in the industry, yet they're the EZest to use and program. They are available in 8 different display models, all using common CPU and flash firmware which is field-upgradable.

EZTouchPLC Base

The EZTouchPLC bases are available in four models for 4 or 8 slots and are capable of flexibly incorporating 32 or 64 I/O points respectively. Every EZTouchPLC has a built-in RS232 port for programming, RS-422 port (ASCII communications), CPU with or without Ethernet (what we call our card engine), and slots for I/O modules. The 6 inch models can have up to 32 I/O points whereas the 8, 10 and 15 inch models have 8 slots capable of 64 I/O points. Additionally, all these models can be purchased with either Ethernet, DeviceNet, or Profibus options for communications to the PLC.

CPU (Card Engine)

There are two types of CPUs. The Standard CPU has two integrated Serial Communication ports; while the Ethernet model comes with additional Ethernet connectivity. EZTouchPLC can also be purchased with Slave communication option cards for DeviceNet and Profibus networks. 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 EZTouchPLCs can support a maximum of 32 or 64 I/O points on it's 4 or 8 slot bases respectively.

I/O Modules

All EZTouchPLCs utilize plug-in EZIO modules for its IO requirements. EZIO modules are not included with EZTouchPLC bases and need to be purchased separately. All the bases in the EZTouchPLC 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 EZTouchPLC.

1.6 EZTouchPLC Part Numbers

6" White on Blue Models

Model Number	Description	Connectivity
EZP-S6W-RS-PLC	6" White on Blue, 32 I/O EZPLC Base	N/A
EZP-S6W-RS-PLC-E	6" White on Blue, 32 I/O EZPLC Base	EtherNet
EZP-S6W-RS-PLC-D	6" White on Blue, 32 I/O EZPLC Base	DeviceNet
EZP-S6W-RS-PLC-P	6" White on Blue, 32 I/O EZPLC Base	Profibus

6" Monochrome Slim Bezel Models

Model Number	Description	Connectivity
EZP-S6M-FS-PLC	6" STN Mono, 32 I/O EZPLC Base	N/A
EZP-S6M-FS-PLC-E	6" STN Mono, 32 I/O EZPLC Base	EtherNet
EZP-S6M-FS-PLC-D	6" STN Mono, 32 I/O EZPLC Base	DeviceNet
EZP-S6M-FS-PLC-P	6" STN Mono, 32 I/O EZPLC Base	Profibus

6" STN Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-S6C-FS-PLC	6" STN Color, 32 I/O EZPLC Base	N/A
EZP-S6C-FS-PLC-E	6" STN Color, 32 I/O EZPLC Base	EtherNet
EZP-S6C-FS-PLC-D	6" STN Color, 32 I/O EZPLC Base	DeviceNet
EZP-S6C-FS-PLC-P	6" STN Color, 32 I/O EZPLC Base	Profibus

6" TFT Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-T6C-FS-PLC	6" TFT Color, 32 I/O EZPLC Base	N/A
EZP-T6C-FS-PLC-E	6" TFT Color, 32 I/O EZPLC Base	EtherNet
EZP-T6C-FS-PLC-D	6" TFT Color, 32 I/O EZPLC Base	DeviceNet
EZP-T6C-FS-PLC-P	6" TFT Color, 32 I/O EZPLC Base	Profibus

8" STN Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-S8C-FS-PLC	8" STN Color, 32 I/O EZPLC Base	N/A
EZP-S8C-FS-PLC-E	8" STN Color, 32 I/O EZPLC Base	EtherNet
EZP-S8C-FS-PLC-D	8" STN Color, 32 I/O EZPLC Base	DeviceNet
EZP-S8C-FS-PLC-P	8" STN Color, 32 I/O EZPLC Base	Profibus

8" TFT Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-T8C-FS-PLC	8" TFT Color, 64 I/O EZPLC Base	N/A
EZP-T8C-FS-PLC-E	8" TFT Color, 64 I/O EZPLC Base	EtherNet
EZP-T8C-FS-PLC-D	8" TFT Color, 64 I/O EZPLC Base	DeviceNet
EZP-T8C-FS-PLC-P	8" TFT Color, 64 I/O EZPLC Base	Profibus

10" TFT Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-T10C-FS-PLC	10" TFT Color, 64 I/O EZPLC Base	N/A
EZP-T10C-FS-PLC-E	10" TFT Color, 64 I/O EZPLC Base	EtherNet
EZP-T10C-FS-PLC-D	10" TFT Color, 64 I/O EZPLC Base	DeviceNet
EZP-T10C-FS-PLC-P	10" TFT Color, 64 I/O EZPLC Base	Profibus

15" TFT Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-T15C-FS-PLC	15" TFT Color, 64 I/O EZPLC Base	N/A
EZP-T15C-FS-PLC-E	15" TFT Color, 64 I/O EZPLC Base	EtherNet
EZP-T15C-FS-PLC-D	15" TFT Color, 64 I/O EZPLC Base	DeviceNet
EZP-T15C-FS-PLC-P	15" TFT Color, 64 I/O EZPLC Base	Profibus

1.7 Quick and EZ Start to Get Familiar with EZTouchPLC

In this section we present a quick example of how you can setup your EZTouchPLC. You will see how EZ it is to setup an EZTouchPLC, 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 EZTouchPLC 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:
- An EZTouchPLC (e.g. EZP-S6M-FS-PLC)
- Discrete AC or DC EZIO modules*
  (e.g. EZIO-8DCOP)
- RS-232C Programming cable (P/N EZP-PGMCBL)*
- A Screwdriver for I/O Module wiring (P/N EZIO-SCDRV)*
  (You can also use your own 2.5mm blade screwdriver)
- EZTouchPLC Editor Programming Software
  (P/N EZTOUCHPLC-EDIT)*
- 24VDC Power Supply**

  * These items have to be purchased separately from
       EZAutomation.
  ** EZAutomation does not sell this item.

You will also need a PC for programming EZTouchPLC. 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 EZIO-8DCOP into the base in position M1. EZIO modules have 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.
- Hold the module between your 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 with 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 Connect Power
Connect the power input wires into the EZTouchPLC's power terminals. Do not apply power at this time.

Step 4 Install software on your PC
Load the CD included with the purchase of software (P/N EZP-TOUCHPLC-EDIT) into your computer's CD-ROM drive and follow the on-screen instructions. The software will install itself.

There are two separate software applications, EZPLC Editor and EZPanel Enhanced, which are required to program EZTouchPLC. Both of these applications are included with the EZTouchPLC programming CD (P/N EZP-TouchPLC-M). Also included is EZLaunch Pad to launch both of these software applications.

Step 5 Connect EZTouchPLC to your PC
Connect your PC's serial port to EZTouchPLC's RS232 port using the programming cable (P/N EZP-PGMCBL). SW1 must be ON and SW2 OFF in order to program the PLC section of the EZTouchPLC. SW3 and SW4 should be ON.

Step 6 Switch ON the Power
Apply power to the system and make sure the PWR indicator LED on the EZTouchPLC base is ON. If not, remove power from the system and check all wiring.

Step 7 Enter Program

1. Connect your PC's serial port to the RS232 port for PLC programming.

2. Ensure that the mode DIP Switch SW1 is ON and SW2 is OFF. SW3 and SW4 may be kept ON.

3. Open EZPLC Editor and click on the **Edit Program ON-LINE (Write to EZPLC Later)** button.
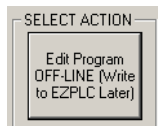
4. Type project name 'demo' in the Project Name field. The EZPLC projects are saved as .lad files in the PC.

5. Select an appropriate EZTouchPLC I/O Base e.g. '4 Modules.

6. Click on the **Configure I/O** button and select the appropriate position for your EZIO modules e.g. '8DC Outputs' for M1 and O1-O8 for its output address range.
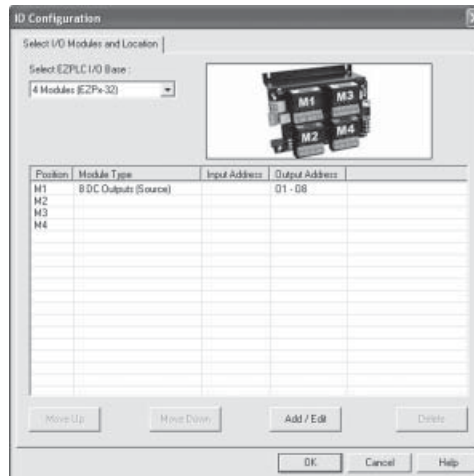
7. Enter the following sample ladder program into the EZPLC Editor.

   a. Select the "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 to the left.
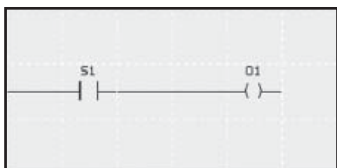
   c. Once placed on the ladder logic programming window, double-click on the icon and enter the tag name/address as "S1".

   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 to the left.

8. Transfer the PLC program to the EZTouchPLC by pressing the Control + T keys of your PC.

Step 8 Enter Panel Program
SW1 and SW2 on the PLC motherboard must be OFF.

a. Connect your computer's serial port to the panel's RS232 programming port using the programming cable (P/N EZP-PGMCBL).

b. Open the EZTouchPLC Editor Software and click on the EZPanel section. Click on the Edit Program Off-Line (Write to EZPanel Later) button. Name your Project (ie. ez project) and click OK. Select Panel Family to EZTouchPLC. Select Model. Click OK.
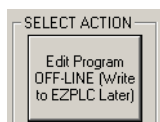
c. Create your Project. Click on Objects > Select Buttons. The screen below will appear. Enter **S1** for Tag Name. Change the object attributes as necessary. Click OK. It will bring up the Add New Tag Details screen.
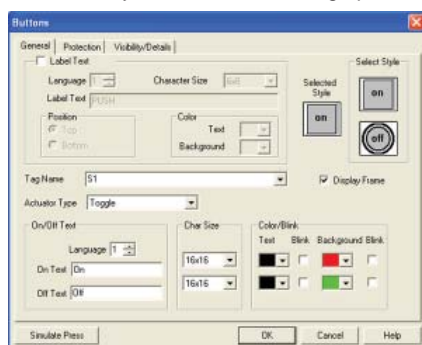
d. In the Field next to address string type in **S1**. Select data type as DISCRETE. Click OK.
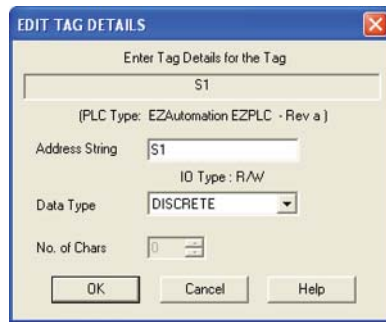
e. Click anywhere on the screen to place the Button object. Double click the object to open its object dialog box, and click simulate press to toggle between On and Off states.
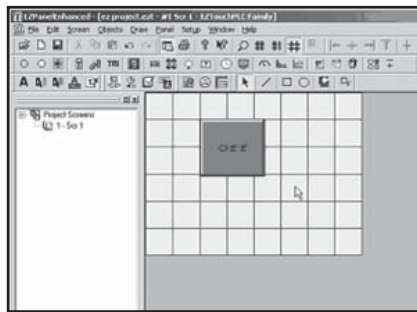
f. Similarly, we will create an Indicator Light Object. Enter O1 for Tag Name. Click OK. Enter **O1** as Tag Address and select data type as DISCRETE. Click OK. Place the object on the panel.
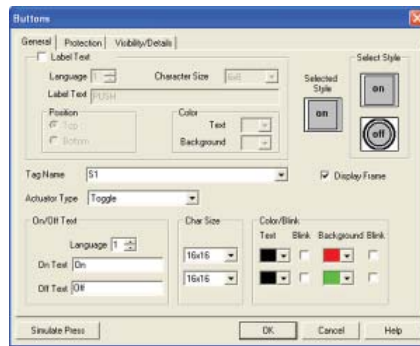
g. Click File > Transfer to Panel. This will transfer your program to the panel.

Step 9 Test the Program
MAKE SURE SW1 and SW2 are switched to OFF.
When you press the toggle button, output #1 on the output module M1
will turn ON. When you toggle the switch again, output will turn off.
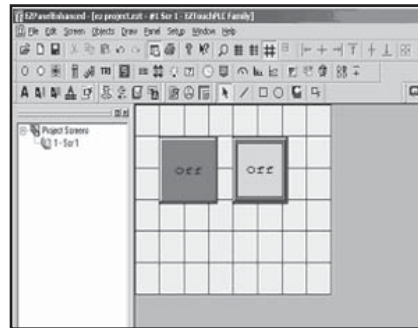
Congratulations
You have successfully written and tested your first program in
EZTouchPLC.

1.8 How to Design the Most Efficient EZTouchPLC System

When designing your control system, in addition to the obvious selection of the right choice of display for your HMI application, keep the following recommendations in mind to design the most efficient and powerful EZTouchPLC system:

1. **Take Advantage of our Mix-n-Match EZI/O**
   One key advantage of using EZTouchPLC is its extremely flexible EZIO. In order to take its full advantage, 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? EZTouchPLC 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 absolute peace of mind when picking EZIO modules for your control system. EZTouchPLCs 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 EZTouchPLC's rich yet concise instruction set. It has features like Drum sequencer, 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 EZTouchPLC 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 EZTouchPLC you purchased, all models have an abundant 64KB of total memory for its PLC. With this amount of available memory, you can 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 EZTouchPLC. Therefore, you do not have to worry about running out of registers and accordingly plan your design.

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2

Hardware 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 operates 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, if 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 EZTouchPLC in areas where the following conditions may exist:

- Environmental temperatures are above or below those specified by the EZTouchPLC.
- 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 EZTouchPLC Bases and EZIO modules. Please refer to the appropriate I/O module specifications in EZIO User Manual (P/N EZIO-M).

Parameter	Ratings
Operating Temperature	0 to 45 °C Worst case, depends on model
Storage Temperature	-20 to 60 °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*. EZTouchPLC'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 EZTouchPLC 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.

We recommend that the EZTouchPLC has a minimum clear space of 1" 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 have a number of generators of electrical noise or 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

Transformer or
Choke Isolation

Optical Isolation

EZTouchPLC

Logic Level inside Dotted Lines

CPU
Card
Engine

I/O
Module

Power Input →

PLC
Power
Supply

Filter

Mother-
board
at Logic
Level

I/O
Module

Programming Device,
Operator Interface on
Network

Transformer or
Choke Isolation

Optical Isolation
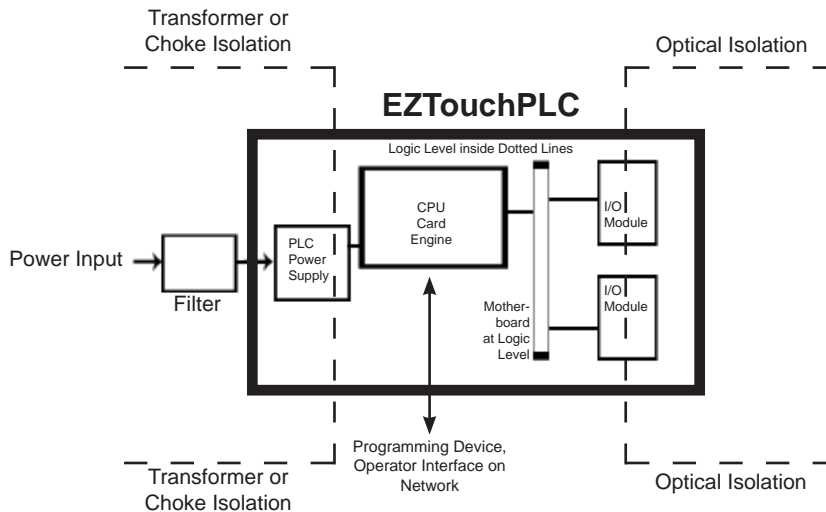
Cabinets

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.

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.

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 EZTouch-PLC should also be well grounded. The following section will detail these procedures.

RS232 Wiring Diagram

PC COM Port			EZPLC RS232 COM Port	
Pin	Function	**Shield**	Pin	Function
2	RXD		2	TXD
3	TXD		3	RXD
5	GND		5	GND
9-pin Sub-D			**9-pin Sub-D**	

Shield Connected to Earth Ground on both sides if you intend to keep this connection permanently on your machine instead of using it only for programming.

RS422/485 Wiring Diagram

Shield connected to Earth GND on both ends

GND
SD-
SD+
RD+
RD-

Message Controller
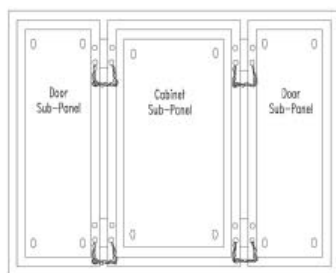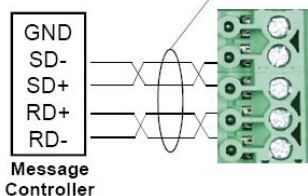
Cabinet Door Grounding Straps

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 EZTouchPLC is through its RS232 and RS422/485 ports. The cables to these ports must be shielded properly as shown in the diagrams shown to the left.

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.

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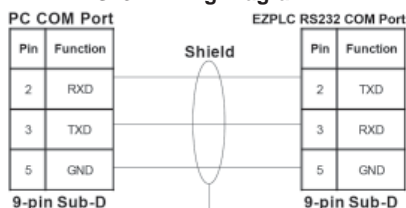
The equipment enclosures are generally either painted or anodized. It is imperative that the equipment chassis are grounded. Not only is this good safety practice, but it also helps noise immunity problems. Mounting of painted or anodized enclosures to like surfaces does not insure good metallic contact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

Cabinet Wiring

The wiring of the PLC 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.

Some general rules that apply in most situations are:
- 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 two times the load voltage and have a sufficient energy rating corresponding to the load.*
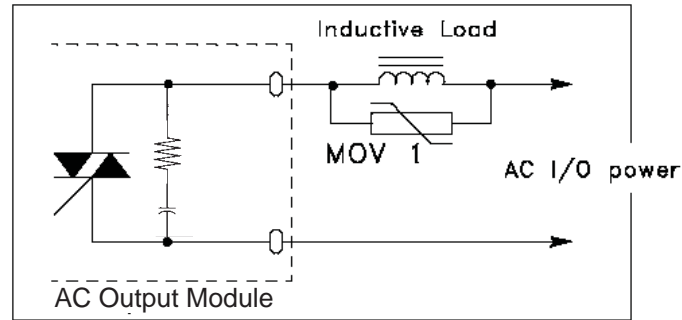
CAUTION! *D1 should have at least 100 PIV and a 3 Amp current capacity.*

Recommended DC Sinking Transient Protection

CAUTION!
EZTouchPLC'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.
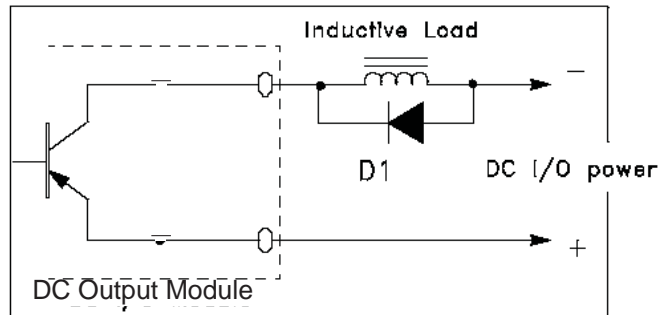
Power connection

DC
+
−

⚠ **CAUTION!** Do not apply AC power to EZTouchPLC's Input Power Terminals.

⚠ **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. However, an I/O DC Power Supply does not have to be that well regulated.

DC Powered EZTouchPLC System

We recommend that the power for the CPU (Card Engine) be a separate Power Supply and the power source for DC Loads be a separate DC Load supply.

The Power Cable Ferrite Core is a solid ferrite cylinder. The Power Cable should pass once through the core, be looped around and pass through a second time. Pull the excess cable so that it rests snugly against the outside of the core.
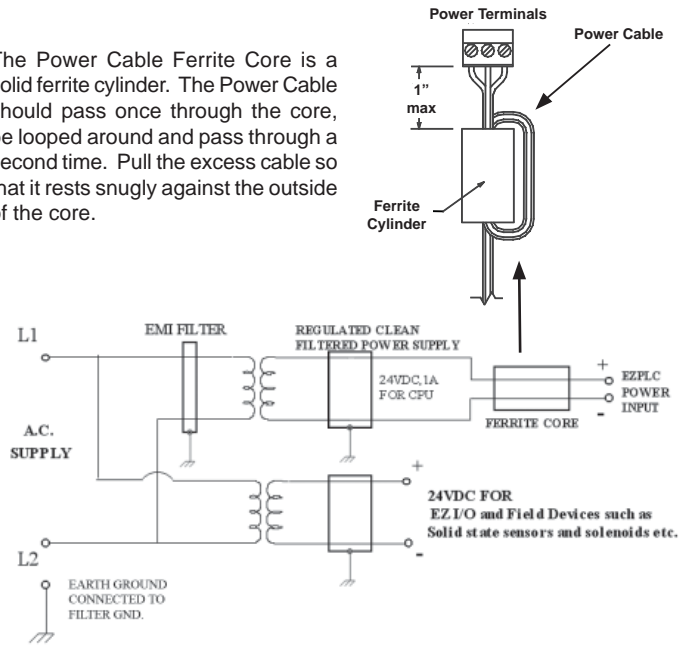
2.4 Sourcing (P type) and Sinking (N type) I/O

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.*

(Internal)   (External)
VS+

Short Circuit Protection

Sources/Supplies Positive Voltage to Load

+   (10-28 VDC)

Output

Flyback Diode

L
O
A
D

-

GND

DC OUTPUT [SOURCE]

(External Wiring)

Sources/Supplies Positive Voltage to Input

(Internal)

+V

(+V)   +

INPUT

To Other Circuit

(10-28 VDC)
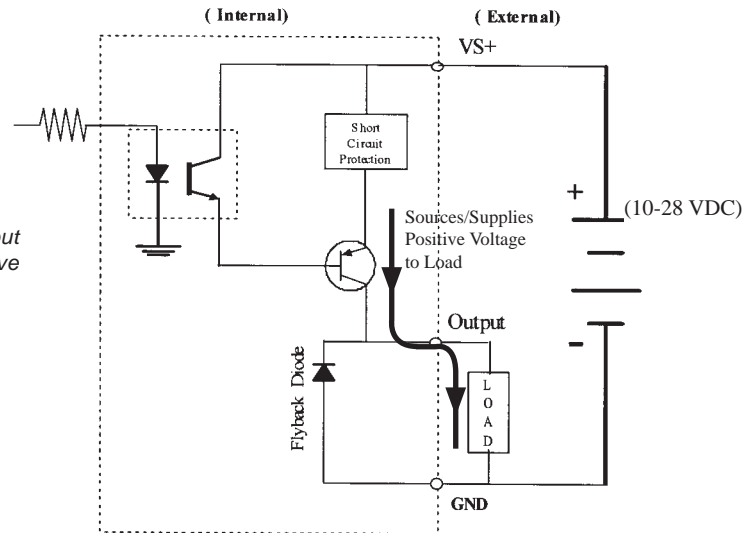
NOTE: *A sourcing input expects positive voltage for it to activate.*

COM
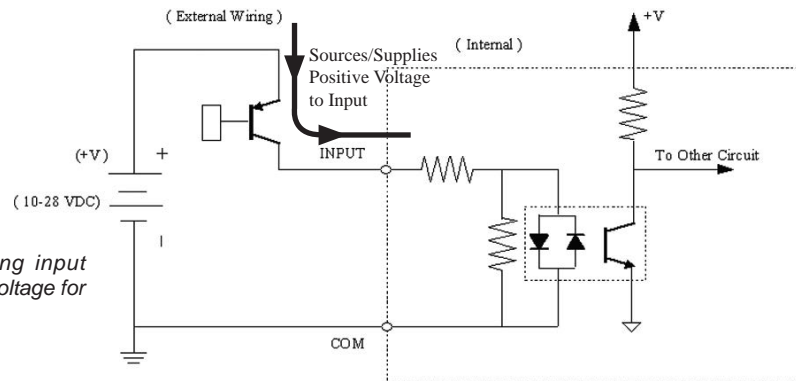
DC INPUT (SOURCE)

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

(Internal)

(External)

VS+

Flyback Diode

L
O
A
D

Output

(10-28 VDC)

Sinks/
Receives
Current
through
the Load

+

−

Short
Circuit
Protection

GND
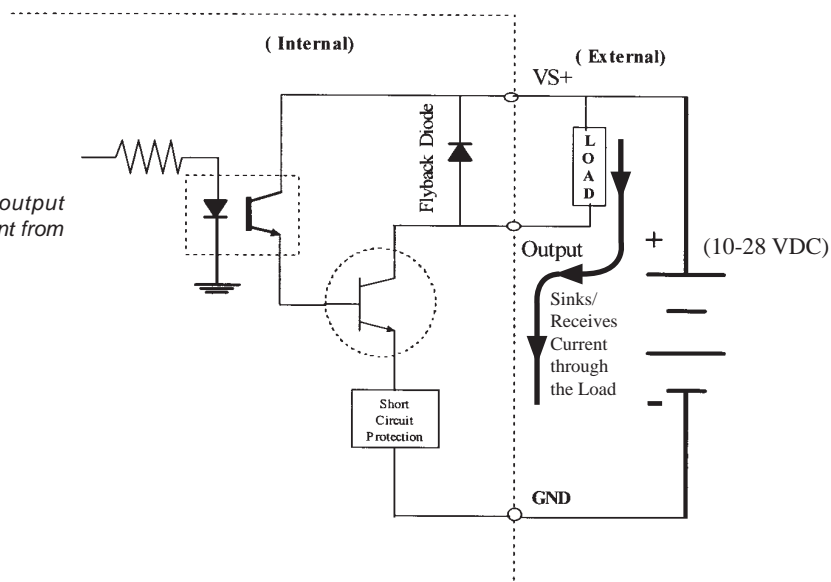
DC OUTPUT [SINK]

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

(External wiring)

(Internal)

+V

COM

To Other Circuit

(+V)

(10-28 VDC)

+

−

INPUT

Sinks
Current to
Field Output
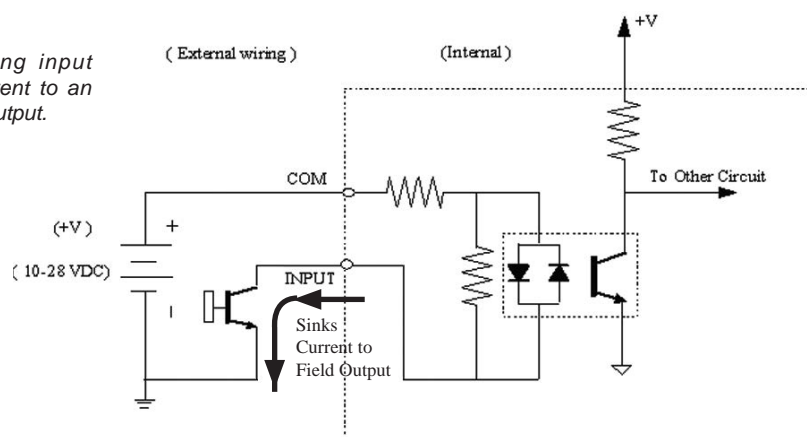
DC INPUT (SINK)

2.5 EZTouchPLC Mounting

EZTouchPLC is a panel-mount unit. 6-inch Slim models are DIN Clip mounted, 8, 10, and 15 inch units are stud mounted only. The following diagrams show the outline and cutout dimensions necessary to mount the panel using studs. (See page 2-18 for diagrams showing DIN Clips.)

Stud Mounting

CAUTION

1) DO NOT use any thread locking compounds to secure the studs. Many of these compounds will degrade the plastic housing.

2) Mount on a VERTICAL SURFACE ONLY in order to ensure proper cooling of the panel.

Allow 1-inch clearance between rear of panel and enclosure

EZTouchPLC mounting in a NEMA4 rated enclosure
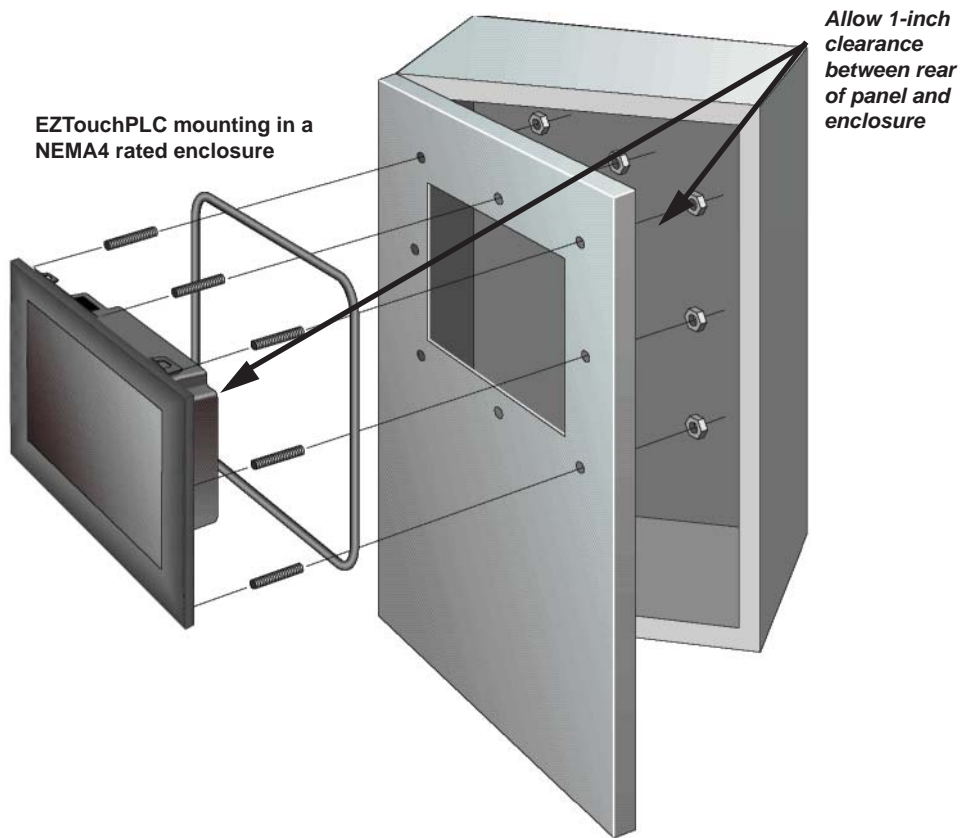
6" White on Blue, 6" Gray Scale, 6" TFT, & 6" STN
Slim Bezel Outline & Cutout Dimensions

Models:

EZP-S6W-RS-PLC	EZP-S6C-FS-PLC
EZP-S6W-RS-PLC-E	EZP-S6C-FS-PLC-E
EZP-S6W-RS-PLC-D	EZP-S6C-FS-PLC-D
EZP-S6W-RS-PLC-P	EZP-S6C-FS-PLC-P
EZP-S6M-FS-PLC	EZP-T6C-FS-PLC
EZP-S6M-FS-PLC-E	EZP-T6C-FS-PLC-E
EZP-S6M-FS-PLC-D	EZP-T6C-FS-PLC-D
EZP-S6M-FS-PLC-P	EZP-T6C-FS-PLC-P

All the necessary mounting hardware is provided with the unit. Dimensions are provided in inches and millimeters, mm appear in brackets [ ].
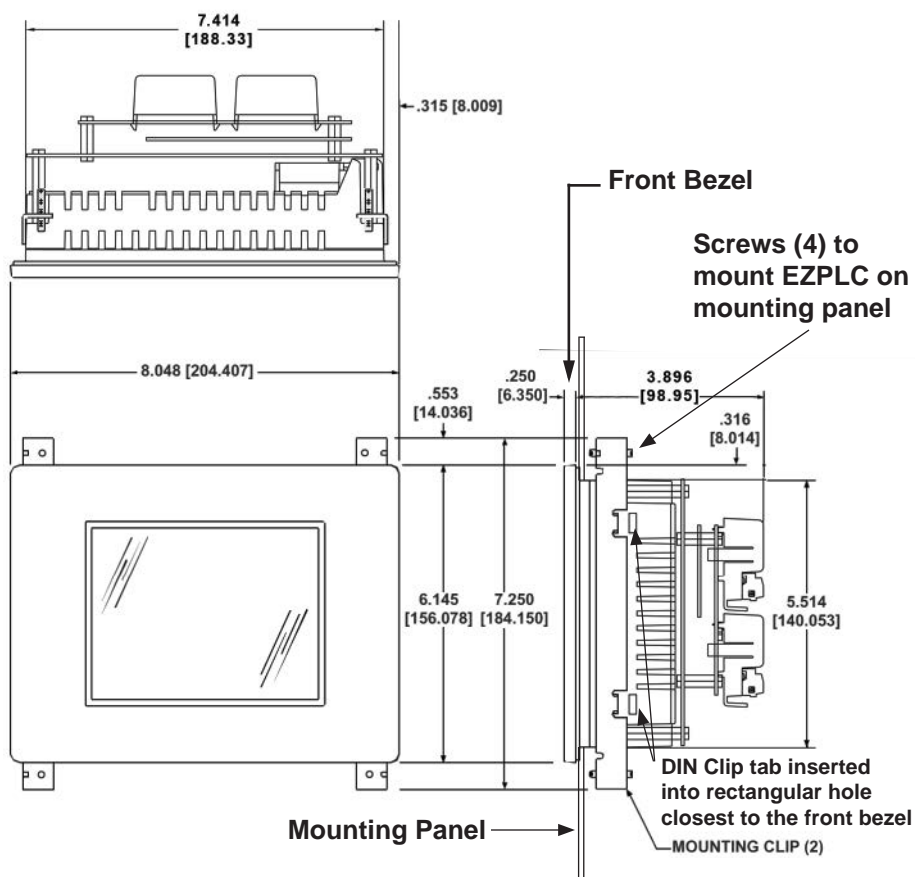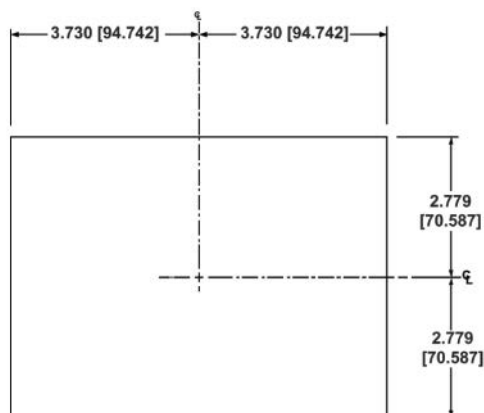
DIN Clip Mounting

The 6-inch Slim Bezel models must be mounted using DIN Clips. DIN Clips are metal brackets (P/N EZP-BRK-1, package of 2 brackets and 4 screws) that attach to the panel and secure the front panel to a mounting surface with 4 screws. Use the diagram and instructions below to mount the EZTouchPLC using DIN Clips.

1. There are 4 rectangular holes in each side (two at the top and two at the bottom) of the chassis as shown in the figure to the left. Choose the holes that allow the appropriate space for your mounting panel thickness.

2. On each DIN Clip there are two metal tabs (bent inward) that fit into these holes. Insert the two clip tabs into two holes (top and bottom) and secure the panel by alternately tightening the DIN Clip screws (4) until the back edge of the EZTouchPLC front bezel is flush with the mounting panel.

CAUTION

CAUTION: Tighten DIN Clips to a maximum of 1.5 inch-pounds to provide a proper seal. EZAutomation assumes no responsibility for "liquids" damage to the unit or other equipment within the enclosure because of improper installation.

8" TFT and 8" STN Color Slim Bezel Outline and Cutout Dimensions

EZP-S8C-FS-PLC
EZP-S8C-FS-PLC-E
EZP-S8C-FS-PLC-D
EZP-S8C-FS-PLC-P
EZP-T8C-FS-PLC
EZP-T8C-FS-PLC-E
EZP-T8C-FS-PLC-D
EZP-T8C-FS-PLC-P

The 8-inch Slim Bezel Models are Stud Mount only. All the necessary mounting hardware is provided with the unit. Use the 8 studs and 8 nuts with captive washers to secure the unit to the mounting surface. Dimensions are provided in inches and millimeters, mm appear in brackets [ ].
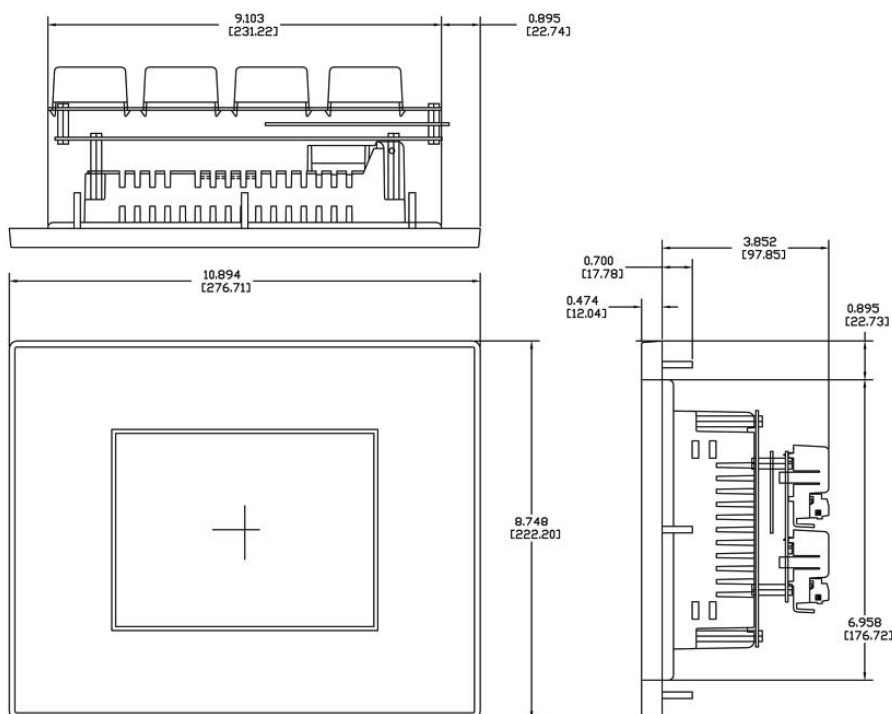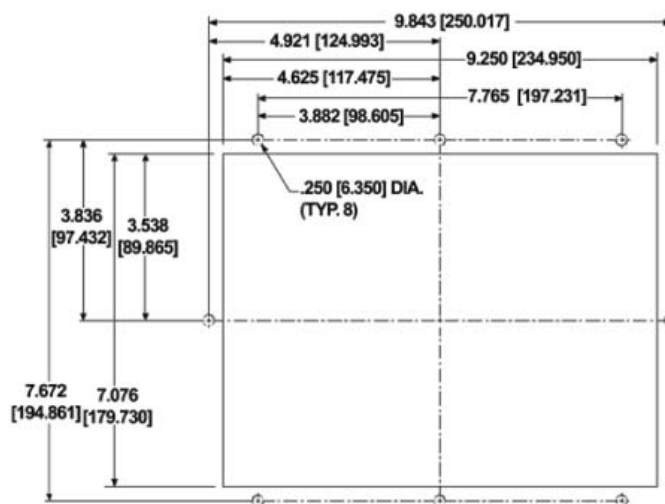
10" TFT Color Slim Bezel Outline and Cutout Dimensions

EZP-T10C-FS-PLC
EZP-T10C-FS-PLC-E
EZP-T10C-FS-PLC-D
EZP-T10C-FS-PLC-P

The 10-inch Slim Bezel Models are Stud Mount ONLY. All the necessary mounting hardware is provided with the unit. Use the 8 studs and 8 nuts with captive washers to secure the unit to the mounting surface.
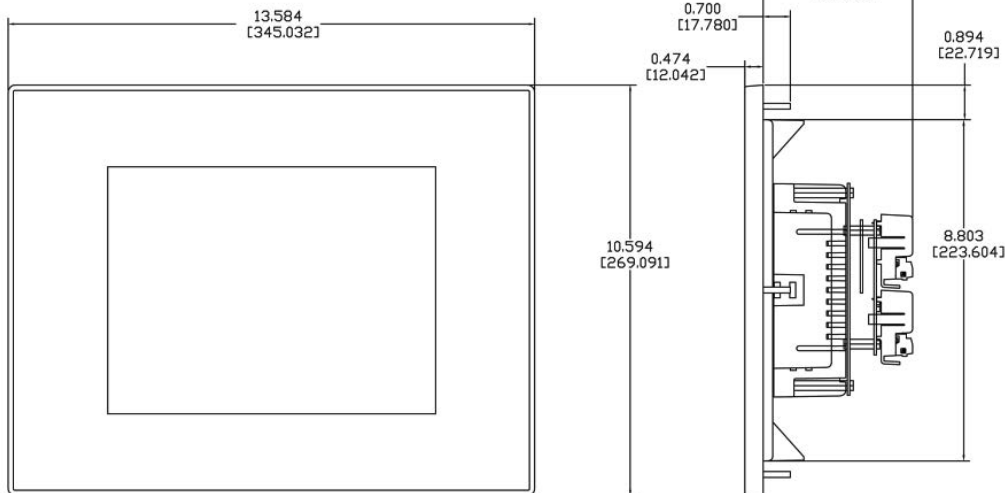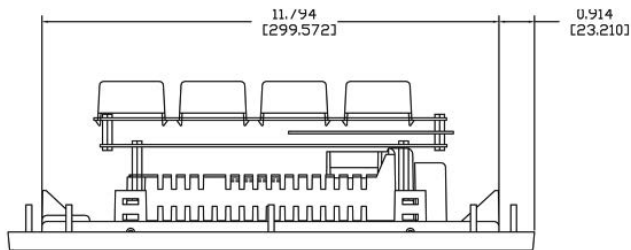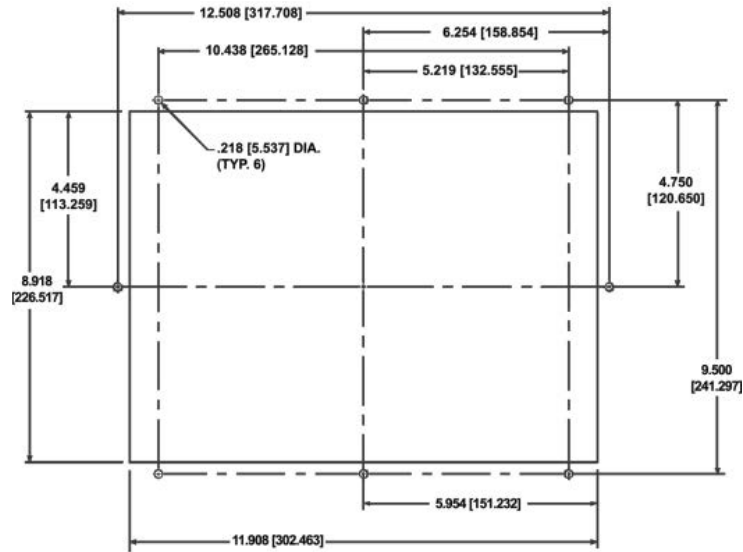
15" TFT Color Slim Bezel Outline Dimensions

    EZP-T15C-FS-PLC
    EZP-T15C-FS-PLC-E
    EZP-T15C-FS-PLC-D
    EZP-T15C-FS-PLC-P

The 15-inch Slim Bezel Models are Stud Mount ONLY. All the necessary mounting hardware is provided with the unit. Use the 18 studs and 18 nuts with captive washers to secure the unit to the mounting surface.

15" TFT Cutout Dimensions

EZP-T15C-FS-PLC
EZP-T15C-FS-PLC-E
EZP-T15C-FS-PLC-D
EZP-T15C-FS-PLC-P

The 15-inch Slim Bezel Models are Stud Mount ONLY. All the necessary mounting hardware is provided with the unit. Use the 18 studs and 18 nuts with captive washers to secure the unit to the mounting surface.

NOTE: *6" models have M1-M4, whereas 8", 10" and 15" models have M1-M8.*

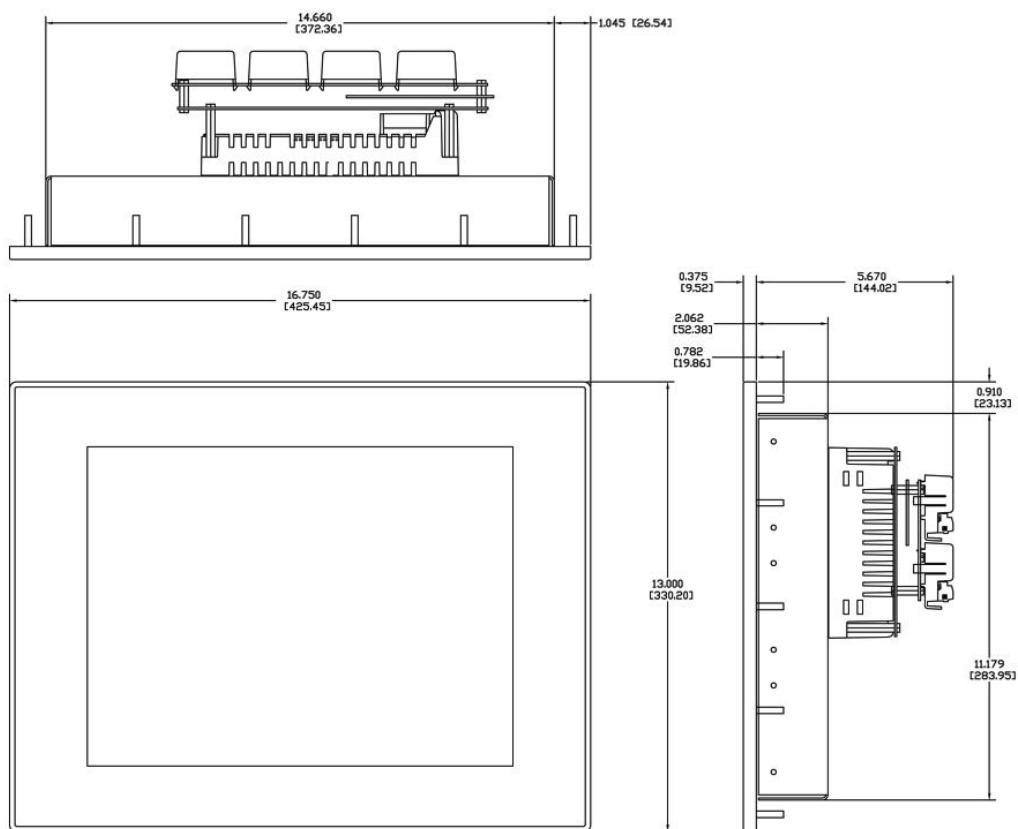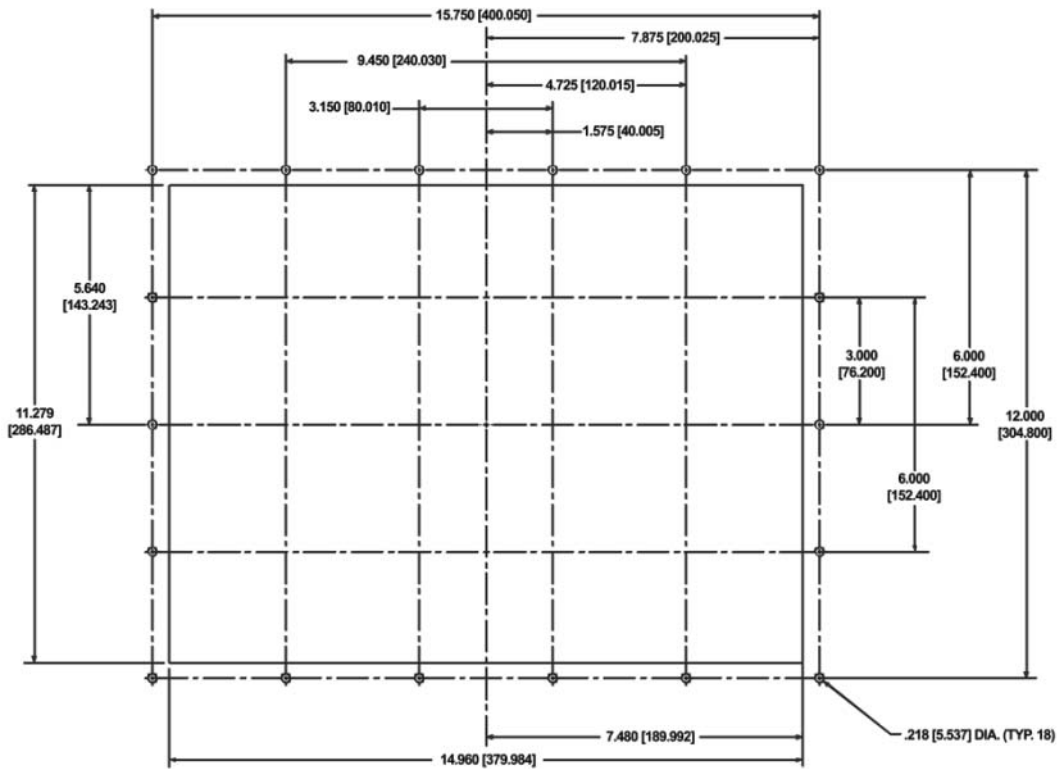**CAUTION!** *M2 slot cannot be used for any AC or Relay output module. Also, modules with both Analog inputs and outputs can be used only on slots M1 through M4.*

2.6 EZIO Module Positioning
Slots Numbering System
As discussed earlier there are 2 bases you can choose from: 4 slots and 8 slots, that can support up to a maximum of 32 and 64 I/O points respectively. Use the following conventions to identify the slot numbers on the bases.

You can configure the positioning of the I/O modules on the Base by clicking on the Configure I/O button. The picture to the right shows the I/O module positioning convention employed in EZTouchPLC. Below are the guidelines/recommendations for installing I/O modules on an EZTouchPLC base.

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	Any Slot Except M2 (will not fit over battery)
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 Except M2
EZIO-4ACI4ACO	4 point AC Inputs; 4 point AC Outputs	Any Slot Except M2
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 Except M2
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 Except M2
EZIO-8ANIC	8 channel Analog Input module (Current)	
EZIO-4ANI4ANOV	4 Channel Analog Inputs; 4 Channel Analog Outputs	Any Slot Between M1 and M4 Except M2
EZIO-4ANI4ANOC	4 Channel Analog Inputs; 4 Channel Analog Outputs	
Relay Modules		
EZIO-4IORLO	4 point Relay Outputs	Any Slot Between M1 and M10 Except M2
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 Between M1 and M10 Except M2
EZIO-4HSCM1	High Speed 24-Bit Counter module	Any Slot Between M1 and M10 Except M2 3 Modules Max per Base
EZIO-4HSCM2	High Speed 24-Bit Counter module	

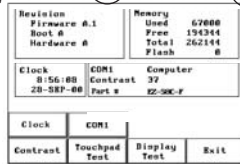# EZTouchPLC™ Quick and EZ Wiring and Set-up Reference

EZTouchPLC 6 inch Models
EZTouchPLC is shipped with dummy cover modules. Please remove the dummy modules and insert the proper EZI/O modules in the appropriate slots on the EZTouch-PLC base. You should leave the dummy cover module in an unused slot.

Main Setup Screen ①
After the

EZTouchPLC is powered up, you may enter the Setup Mode by simultaneously pressing the extreme upper left and lower left touch cells on the panel screen. The screen above is displayed. Information is displayed in the upper left hand corner about the current revision of the Firmware, Hardware, and Boot program. Also shown is RAM memory — Used, Free and Total, and Flash memory. Below that is displayed the time and date, whether the COM1 port is connected to a computer or a printer, and the current Contrast setting. Six buttons at the bottom are labeled Clock, COM1, Contrast, Touchpad Test, Display Test and Exit.

Exit ⑥
Press the Exit button to display the Powerup screen you have selected in your project (selected under Project Attributes.)

Reboot ⑦
To reboot the EZTouchPLC from any programmed screen, simultaneously press the extreme upper left and extreme lower left touchpad area on the panel screen.
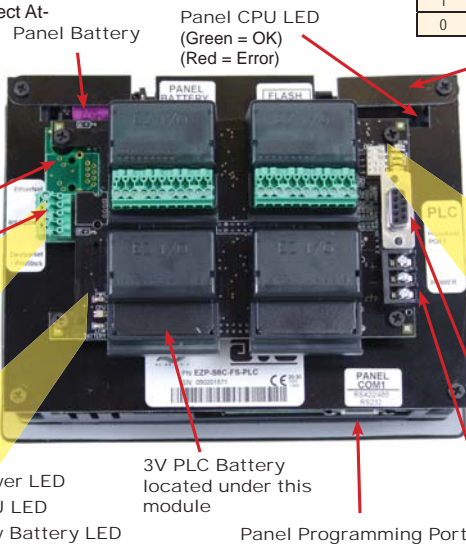
Optional Ethernet connectivity on Enhanced model

RS422/485 ASCII Port

SD-
SD+
RD+
RD-

Clock Setup Screen, Set Time and Date ②
Press clock button, enter the current time and date. Press the keypad button of the number you want to enter. It will show in the display window. If correct, press Hr, Min, Sec, or Day, Mon, Yr corresponding to the time or date position you are setting. If not correct, press CL to clear the window. For the month, enter the number of the month and the three letter abbreviation for the month will be displayed (e.g., 7 = July = JUL).

Touchpad Test Screen ⑤
Press the Touchpad test button. You can check all the touch cells, 48 or 192 depending on the model, by pressing on each touch cell. It will be highlighted after pressing to show that it has been tested. Press the square again to deselect it. Each square should beep when pressed. Press Exit to quit.

Touch panel COM1 Setup Screen ③
Press COM1 button and press "Computer" or "Printer" to determine port connection. You will need to be in "Computer" mode to program Touch panel.

Contrast Setup Screen ④
Press the Contrast button to adjust the screen contrast. Setting depends on each individual model. Some TFT models do not need contrast adjustment. Press Exit to return to the setup screen.

PLC Run/Program Set up

SW3	SW4	Tri-Color LED	Operation
1	0	Green	Run
0	1	Red	Program
1	1	Amber	Run/Program
0	0	Off	No Operation

Cover for expansion RAM and Flash for Panel

RS232 Programming Port and Communication Selector

SW1	SW2	PLC LED	Panel LED	RUN LED
1	0	On	Off	Off
0	0	Off	Off	On

SW1 must be ON to program PLC
SW2 must be OFF for proper operation

Panel Battery

Panel CPU LED
(Green = OK)
(Red = Error)

Run Mode PLC to Touch Panel LED

Program PLC LED

Power LED
CPU LED
Low Battery LED

3V PLC Battery located under this module

Panel Programming Port

RS232 PLC Programming Port

24VDC Power Input

Caution: Do not use AC output module in the bottom left slot due to height of the battery. Analog IN/OUT module can be used only on the first 4 slots. Other analog modules or High Speed counter module can be used only in the first ten slots.

EZTouchPLC ™   Quick and EZ Wiring and Set-up Reference

EZTouchPLC 8, 10 and 15 inch Models
EZTouchPLC is shipped with dummy cover modules. Please remove the dummy modules and insert the proper EZI/O modules in the appropriate slots on the EZTouchPLC base. You should leave the dummy cover module in an unused slot.

Main Setup Screen (1)

After the

EZTouchPLC is powered up, you may enter the Setup Mode by simultaneously pressing the extreme upper left and lower left touch cells on the panel screen. The screen above is displayed. Information is displayed in the upper left hand corner about the current revision of the Firmware, Hardware, and Boot program. Also shown is RAM memory — Used, Free and Total, and Flash memory. Below that is displayed the time and date, whether the COM1 port is connected to a computer or a printer, and the current Contrast setting. Six buttons at the bottom are labeled Clock, COM1, Contrast, Touchpad Test, Display Test and Exit.

Optional Ethernet connectivity on Enhanced model

RS422/485 ASCII Port

SD-
SD+
RD+
RD-

Optional DeviceNet or Profibus port here

Power LED
CPU LED
Low Battery LED

24VDC Power Input

3V PLC Battery located under this module

RS232 PLC Programming Port

Caution: Do not use AC output module in the bottom left slot due to height of the battery. Analog IN/OUT module can be used only on the first 4 slots. Other analog modules or High Speed counter module can be used only in the first ten slots.

2   **Clock Setup Screen, Set Time and Date**

Press clock button, enter the current time and date. Press the keypad button of the number you want to enter. It will show in the display window. If correct, press Hr, Min, Sec, or Day, Mon, Yr corresponding to the time or date position you are setting. If not correct, press CL to clear the window. For the month, enter the number of the month and the three letter abbreviation for the month will be displayed (e.g., 7 = July = JUL).

Touchpad Test Screen (5)

Press the Touchpad test button. You can check all the touch cells, 48 or 192 depending on the model, by pressing on each touch cell. It will be highlighted after pressing to show that it has been tested. Press the square again to deselect it. Each square should beep when pressed. Press Exit to quit.
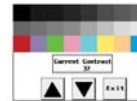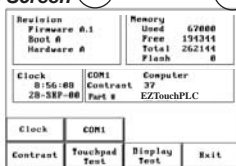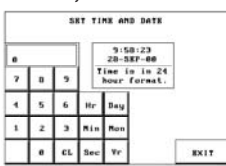
Panel Battery

Panel CPU LED
(Green = OK)
(Red = Error)

Touch panel COM1 Setup Screen (3)

Press COM1 button and press "Computer" or "Printer" to determine port connection. You will need to be in "Computer" mode to program Touch panel.

Contrast Setup Screen (4)

Press the Contrast button to adjust the screen contrast. Setting depends on each individual model. Some TFT models do not need contrast adjustment. Press Exit to return to the setup screen.

Exit (6)

Press the Exit button to display the Powerup screen you have selected in your project (selected under Project Attributes.)

Reboot (7)

To reboot the EZTouchPLC from any programmed screen, simultaneously press the extreme upper left and extreme lower left touchpad area on the panel screen.

Cover for Expansion RAM and Flash for Panel

RS232 Programming Port and Communication Selector

SW1	SW2	PLC LED	Panel LED	RUN LED
1	0	On	Off	Off
0	0	Off	Off	On

SW1 must be ON to program PLC
SW2 must be OFF for proper operation

PLC Run/Program Set up

SW3	SW4	Tri-Color LED	Operation
1	0	Green	Run
0	1	Red	Program
1	1	Amber	Run/Program
0	0	Off	No Operation

Run Mode PLC to Touch Panel LED

OFF ON
SW1
SW2
SW3
SW4

Program PLC LED

Panel Programming Port

EZIO Module Dimensions
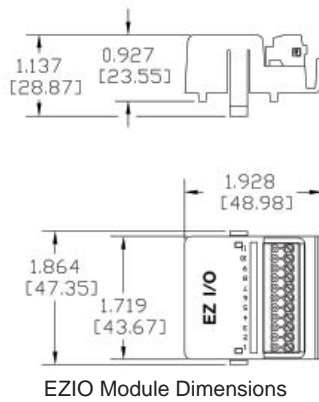
2.7 EZIO Mounting and Wiring

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 PLC Base.

STEP 1

STEP 2

STEP 1 - Hold the module between your thumb and index finger so that your fingertips are on the clips.
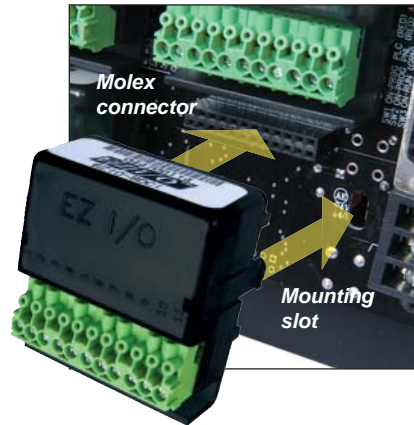
STEP 2 - Snap the module onto the board so that clips are placed on the open mounting slots. Make sure that the Molex connector is aligned with the female counterpart on the base. Push the module gently from the top to insert it completely until you hear a clicking sound.

Wiring EZIO Modules
As shown in the picture, simply insert the wire and tighten the screw. 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.
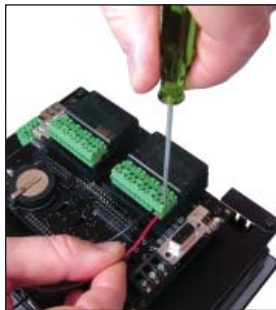
Routing EZIO Wiring
EZIO modules have wiring trays for proper routing of field wires as shown in the figure below.
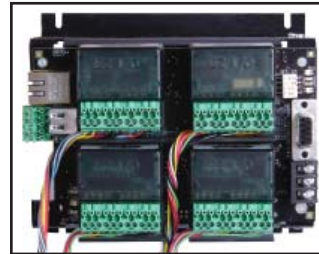
Number of Wires Allowed in Each Terminal	
1	14 AWG
2	18 AWG
4	22 AWG

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 I/O points activity.
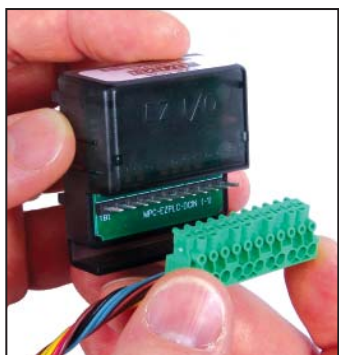
Removable Terminal Blocks
EZIO eliminates the need for rewiring your terminal block anytime you need to swap a module. Since these modules are built to withstand industrial environments, terminal blocks fit very snugly on the module. Slip the edge of the screwdriver under the terminal block and lift to pop it off.
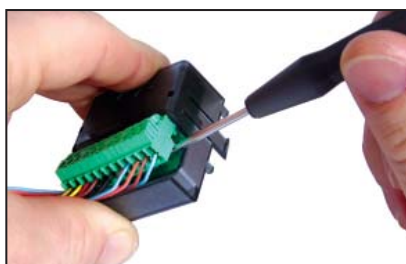
Removing I/O Modules
- Hold the module in the thumb and index finger so that your fingertips are on the clips.
- Apply inward pressure on the two clips with your fingers to release the module from the mounting slots on the base.
- Pull the module out.

2.8 EZI/O Modules (Sold Separately)
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)
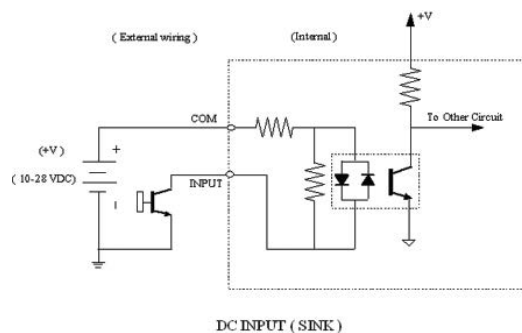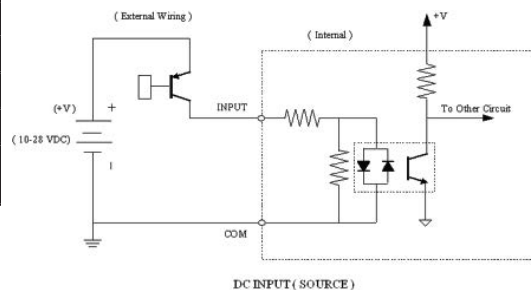
EZIO-8DCOP
8 pt. 24VDC Output Module (Source)

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]
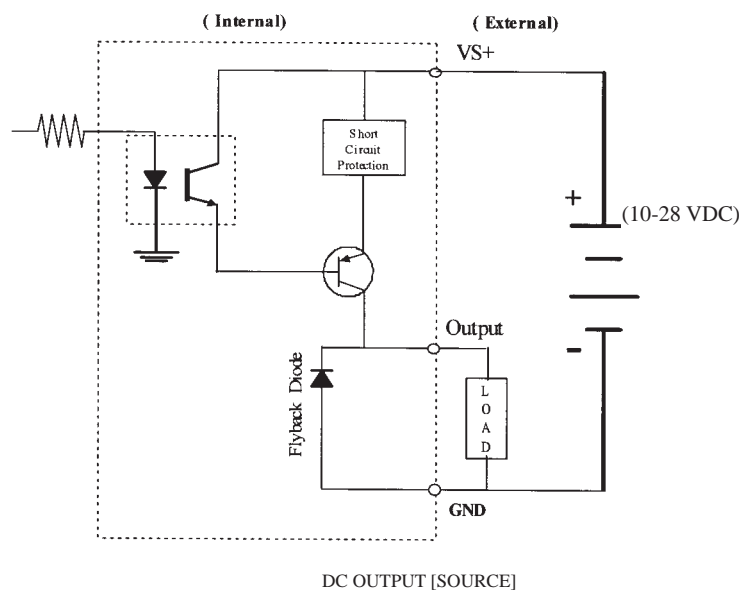
EZIO-8DCON
8 pt. 24VDC Output Sinking Module

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]
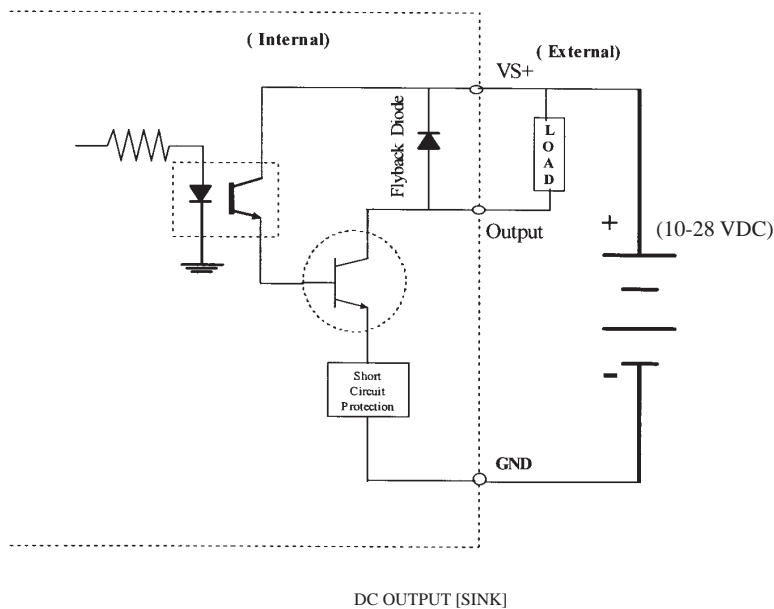
EZIO-8HSDCI
8 pt. 24VDC High Speed Input Module

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

DC INPUT (SOURCE)
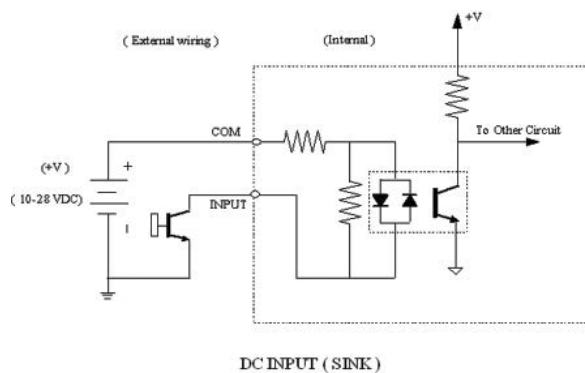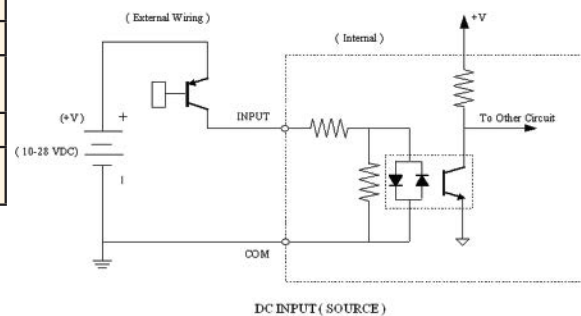
DC INPUT (SINK)

EZIO-4DCI4DCON
8 pt. 24VDC Output Sinking Module

Module Specifications		
	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
DC Input Specs	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
	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
DC Output Specs	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
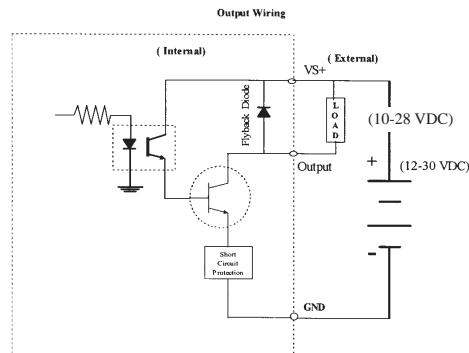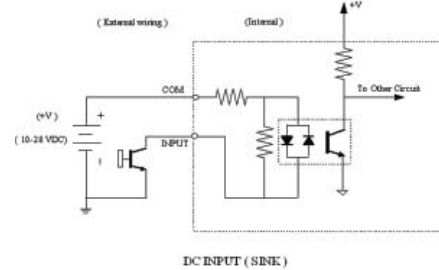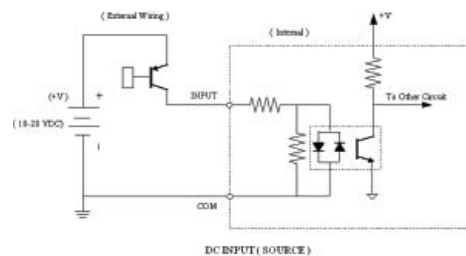
EZIO-4DCI4DCIF
4 pt. 24VDC In/4 pt. 24VDC Fast
Input Module with Interrupt

Module Specifications	
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)
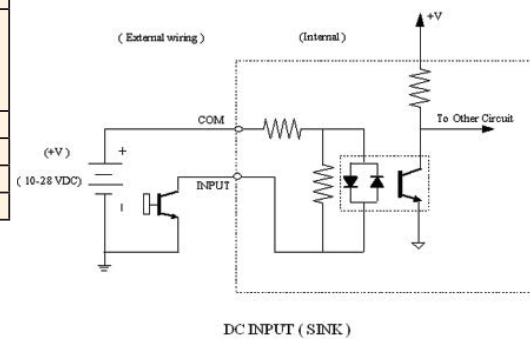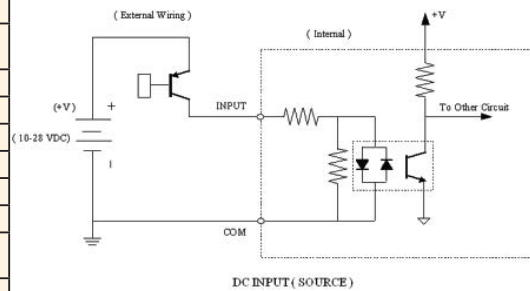
DC INPUT (SINK)

EZIO-4DCI4DCON
4 pt. 24VDC In/4 pt. 24VDC Out Module (Source)

Module Specifications		
	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
DC Input Specs	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
	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
DC Output Specs	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)

Output Wiring
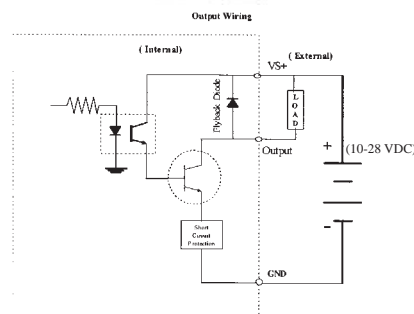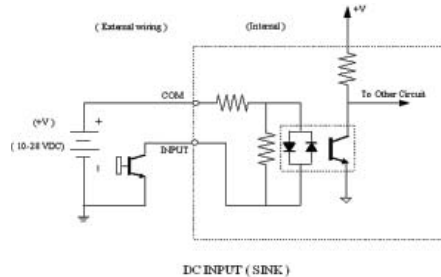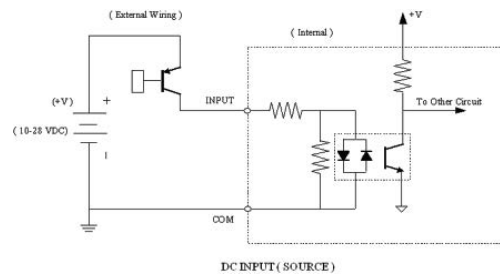
EZIO-8ACI
8 pt. 110VAC Input Module

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
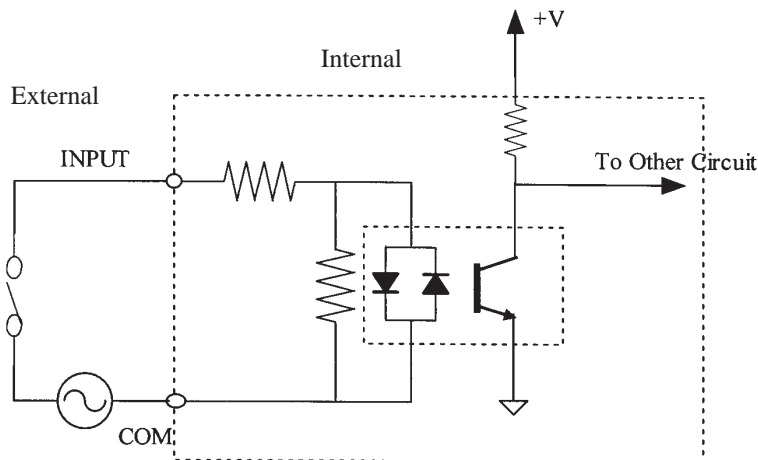
EZIO-8ACO
8 pt. 110VAC Output Module

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
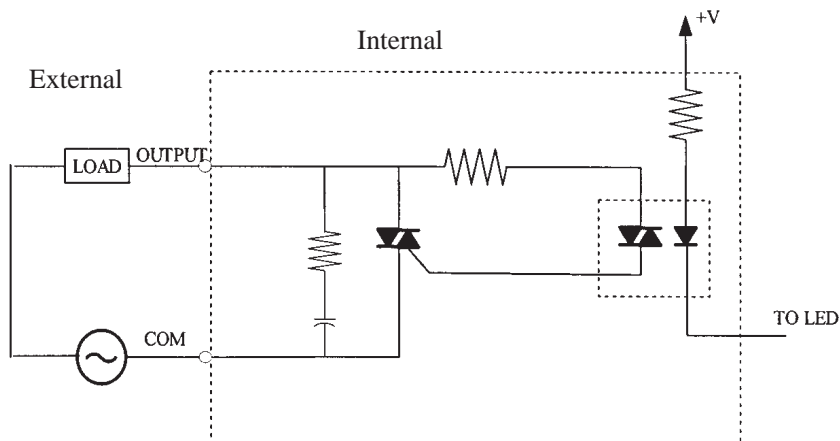
EZIO-4ACI4ACO
4 pt. 110VAC In, 4 pt. 110VAC Out Module

Module Specifications		
	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
AC Input Specs	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
	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
AC Output Specs	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
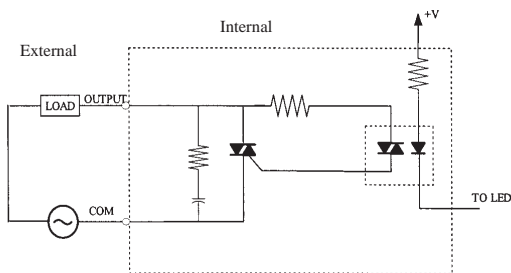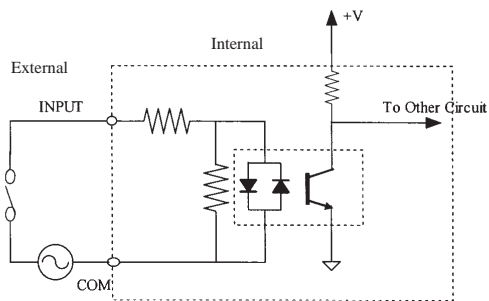
EZIO-4DCOP4ACO
4 pt. 24VDC Out (Source), 4 pt. 110AC Out Module

Module Specifications		
	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
DC Output Specs	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
	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
AC Output Specs	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)
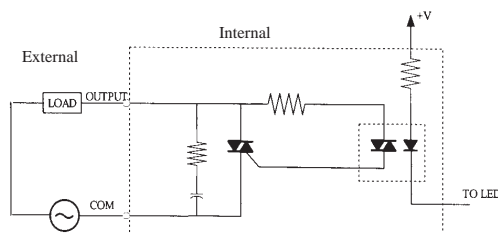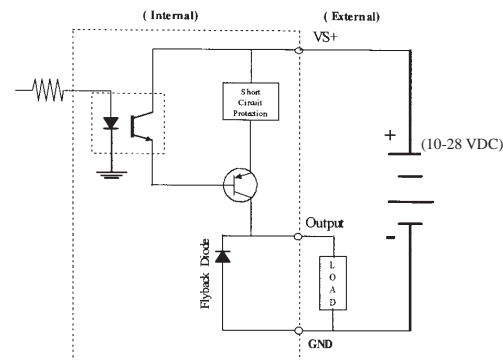
EZIO-4ACI4DCOP
4 pt. 110VAC In/4 pt. 24VDC Out Module (Source)

Module Specifications		
AC 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)
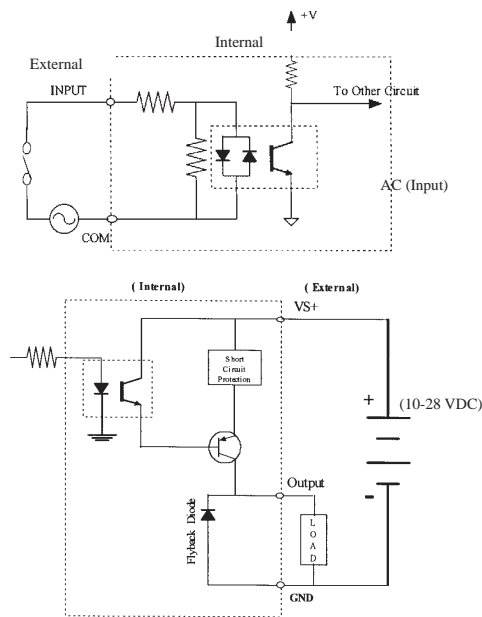
AC (Input)

DC Output (Source)

EZIO-4DCI4ACO
4 pt. 24VDC In/4 pt. 110VAC Out Module

Module Specifications		
	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
DC Input Specs	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
	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
AC Output Specs	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)
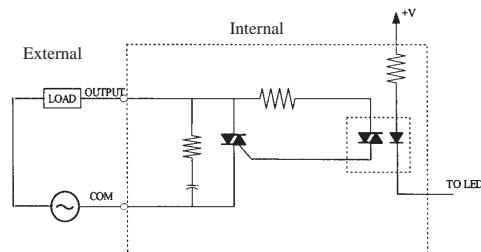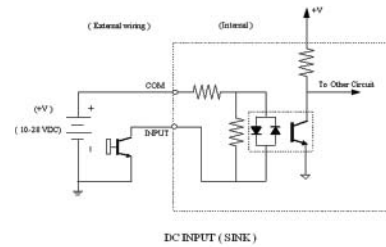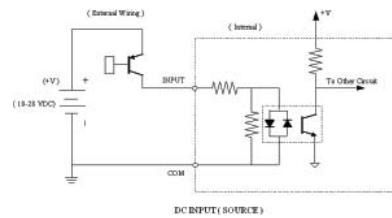
EZIO-4RLO
4 pt. Relay Out Module w/built-in Electromagnetic shield

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

External   Internal

To Other Circuit

LOAD   OUTPUT

(20-132 VAC)

(6-120VAC)
(5-180 VDC)

COM

(6-180 VDC)
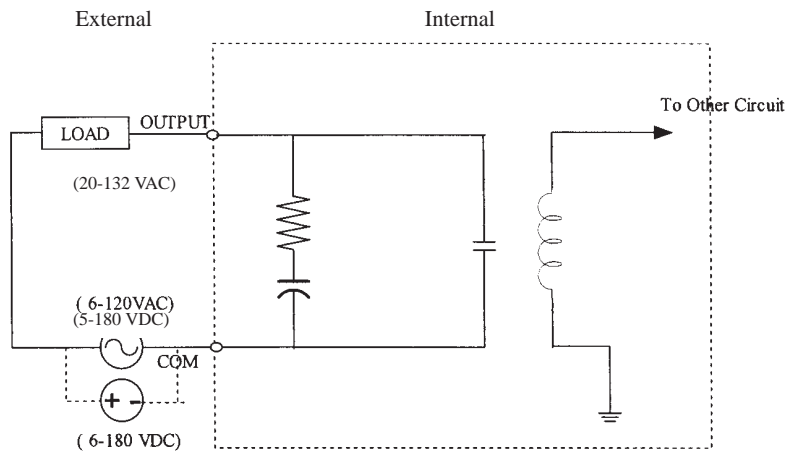
EZIO-4ACI4RLO
4 pt. 110 AC In/4 pt. Relay Out Module
w/built-in Electromagnetic shield

Module Specifications		
	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
AC Input	OFF Voltage Level	40 VAC
Specs	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
	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
Relay	ON Voltage Drop	1.5 V @ 1 Amp
Output	Maximum Switching Current	0.5A
Specs	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

Module Specifications	
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
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

(Left column labels: DC Input Specs, Relay Output Specs)

EZIO-4DCIP4RLO
4 pt. 24VDC In/4 pt. Relay Out Module
w/built-in Electromagnetic shield

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)
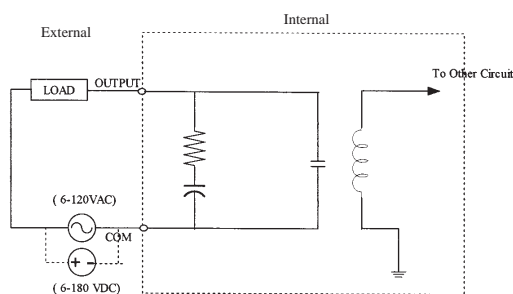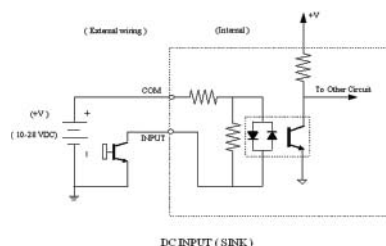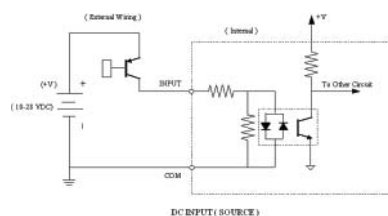
EZIO-8ANIV
8 pt. Analog In Module (Voltage)

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
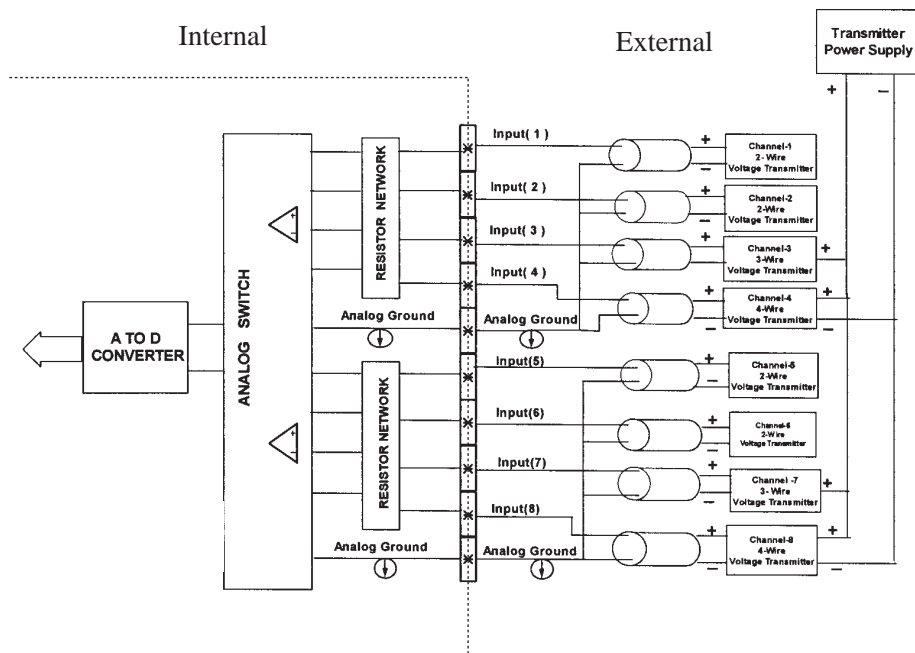
EZIO-8ANIC
8 pt. Analog In Module (Current)

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
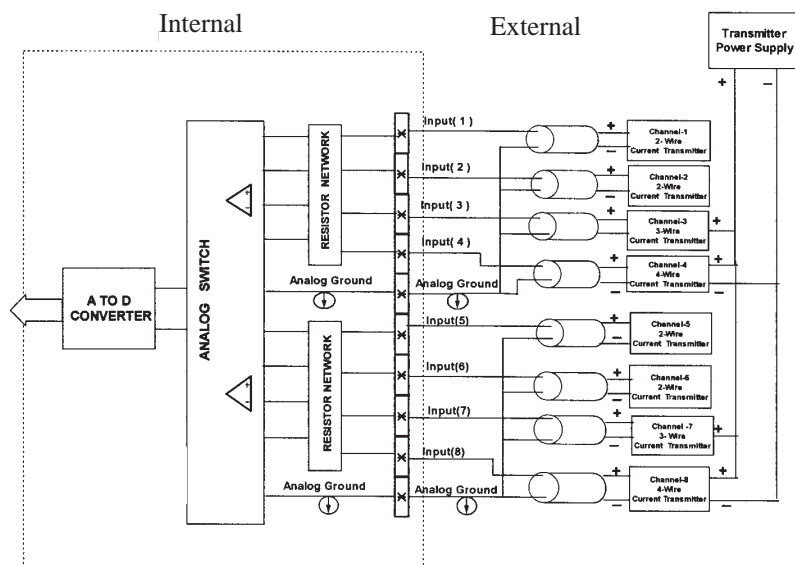
EZIO-4ANI4ANOV
4 pt. Analog In/4 pt. Analog Out Module (Voltage)

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
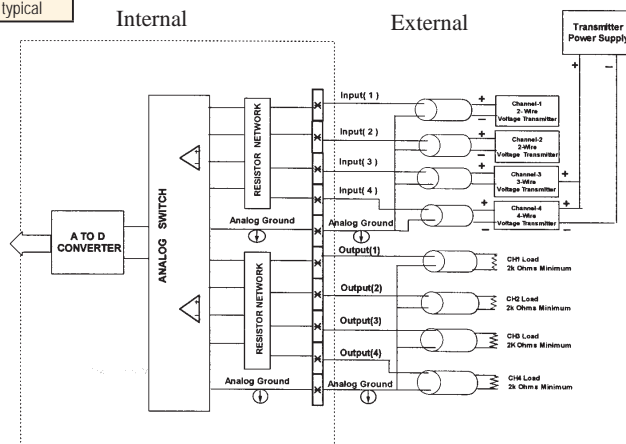
EZIO-4ANI4ANOC
4 pt. Analog In/4 pt. Analog Out Module (Current)

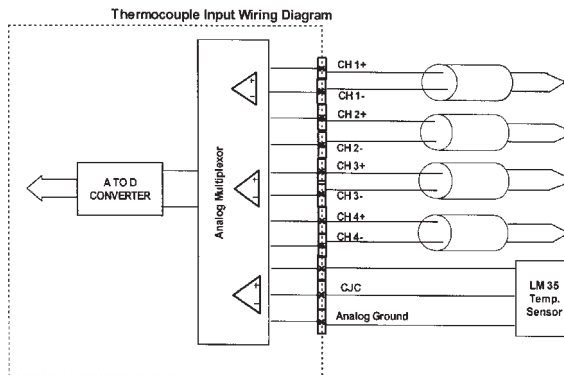| Module Specifications		
AC Input Specs	Number of Channels	4 Single Ended
	Input Range	0-20mA or 4-10 mA DIP switch selectable
	Resolution	12 bit (1 in 4 or 6)
	Step Response	1ms for 95% FS
	Crosstalk	1/2 count max, -80db
	Input Impedance	62.5Ω ± 0.1%
	Absolute Max Ratings	-30mA to 30mA
	Converter Type	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
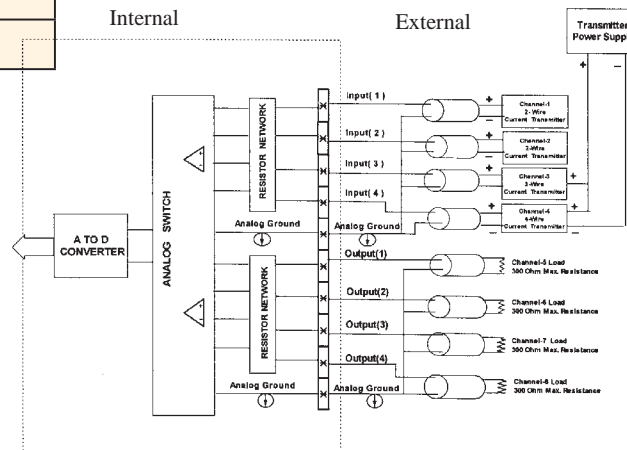
EZIO-4THI
Thermocouple Input Module

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** Type J -59 to 405°C Type K -103 to 516°C Type S -50 to 1768°C Type T -108 to 400°C	**Range in F** -138 to 761°F -217 to 961°F -122 to 3214°F -226 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%

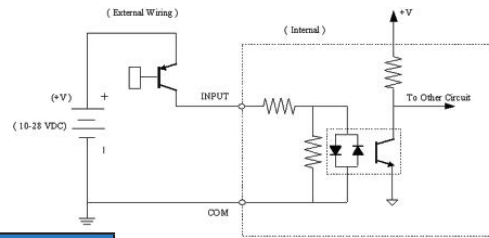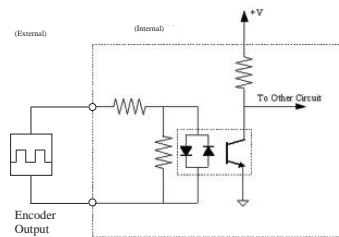| Module Specifications		
Feature	EZIO-HSCM1	EZIO-HSCM2
Module Type	Intelligent High Speed Dual Counter Module	Intelligent High Speed Single Counter Module
Maximum Input Frequency	60KHz after 1X, 2X or 4X Multiplication	100KHz after 1X, 2X or 4X Multiplication
Minimum Pulse Width	5 µs	
Resource Options	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	

Output Wiring

3

Specifications, Operation of Two CPUs, PLC Modes and PLC Memory Map

In this chapter....

3.1 EZTouchPLC Models

6" White on Blue Models

Model Number	Description	Connectivity
EZP-S6W-RS-PLC	6" White on Blue, 32 I/O EZPLC Base	N/A
EZP-S6W-RS-PLC-E	6" White on Blue, 32 I/O EZPLC Base	EtherNet
EZP-S6W-RS-PLC-D	6" White on Blue, 32 I/O EZPLC Base	DeviceNet
EZP-S6W-RS-PLC-P	6" White on Blue, 32 I/O EZPLC Base	Profibus

6" Monochrome Slim Bezel Models

Model Number	Description	Connectivity
EZP-S6M-FS-PLC	6" STN Mono, 32 I/O EZPLC Base	N/A
EZP-S6M-FS-PLC-E	6" STN Mono, 32 I/O EZPLC Base	EtherNet
EZP-S6M-FS-PLC-D	6" STN Mono, 32 I/O EZPLC Base	DeviceNet
EZP-S6M-FS-PLC-P	6" STN Mono, 32 I/O EZPLC Base	Profibus

6" STN Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-S6C-FS-PLC	6" STN Color, 32 I/O EZPLC Base	N/A
EZP-S6C-FS-PLC-E	6" STN Color, 32 I/O EZPLC Base	EtherNet
EZP-S6C-FS-PLC-D	6" STN Color, 32 I/O EZPLC Base	DeviceNet
EZP-S6C-FS-PLC-P	6" STN Color, 32 I/O EZPLC Base	Profibus

6" TFT Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-T6C-FS-PLC	6" TFT Color, 32 I/O EZPLC Base	N/A
EZP-T6C-FS-PLC-E	6" TFT Color, 32 I/O EZPLC Base	EtherNet
EZP-T6C-FS-PLC-D	6" TFT Color, 32 I/O EZPLC Base	DeviceNet
EZP-T6C-FS-PLC-P	6" TFT Color, 32 I/O EZPLC Base	Profibus

8" STN Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-S8C-FS-PLC	8" STN Color, 32 I/O EZPLC Base	N/A
EZP-S8C-FS-PLC-E	8" STN Color, 32 I/O EZPLC Base	EtherNet
EZP-S8C-FS-PLC-D	8" STN Color, 32 I/O EZPLC Base	DeviceNet
EZP-S8C-FS-PLC-P	8" STN Color, 32 I/O EZPLC Base	Profibus

8" TFT Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-T8C-FS-PLC	8" TFT Color, 64 I/O EZPLC Base	N/A
EZP-T8C-FS-PLC-E	8" TFT Color, 64 I/O EZPLC Base	EtherNet
EZP-T8C-FS-PLC-D	8" TFT Color, 64 I/O EZPLC Base	DeviceNet
EZP-T8C-FS-PLC-P	8" TFT Color, 64 I/O EZPLC Base	Profibus

10" TFT Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-T10C-FS-PLC	10" TFT Color, 64 I/O EZPLC Base	N/A
EZP-T10C-FS-PLC-E	10" TFT Color, 64 I/O EZPLC Base	EtherNet
EZP-T10C-FS-PLC-D	10" TFT Color, 64 I/O EZPLC Base	DeviceNet
EZP-T10C-FS-PLC-P	10" TFT Color, 64 I/O EZPLC Base	Profibus

15" TFT Color Slim Bezel Models

Model Number	Description	Connectivity
EZP-T15C-FS-PLC	15" TFT Color, 64 I/O EZPLC Base	N/A
EZP-T15C-FS-PLC-E	15" TFT Color, 64 I/O EZPLC Base	EtherNet
EZP-T15C-FS-PLC-D	15" TFT Color, 64 I/O EZPLC Base	DeviceNet
EZP-T15C-FS-PLC-P	15" TFT Color, 64 I/O EZPLC Base	Profibus

3.2 EZIO Modules List

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-4DCIP4RLO	4 point DC (sink/source) Inputs; 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

3.3 PLC Accessories

Part Number	Description
EZP-TOUCHPLC-EDIT	EZTouchPLC Programming Software
EZP-TOUCHPLC-M	Hardware User Manual for EZTouchPLC
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-DNTERM5	DeviceNet 5 Pin Field Terminal Block

3.4 Panel Accessories

| Part Number	Description
EZP-PANELEDIT	EZPanel Programming Software
EZP-PANEL-M	Hardware User Manual
EZP-RAM-1	512K RAM Card
EZP-RAM-2	1MB RAM Card
EZP-FLASH-1	512K Flash Card
EZP-FLASH-2	1MB Flash Card
EZP-FLASH-3	2MB Flash Card
EZP-BAT	Replacement 1/2 AA, 3.6 volt Lithium Battery
EZP-BRK-1	EZTouch optional DIN Mounting Clips (pk. of 2)
EZP-COMCON3	15-pin male D-sub connectors with terminal blocks, for connecting RS422 network cable from EZTouch or EZText panels
EZ-PANEL-STUDS	Spare mounting studs (four with nuts)
EZP-6SLIMF-GSK	(6") Slim bezel FDA replacement gasket
EZP-8SLIMF-GSK	(8") Slim bezel FDA replacement gasket
EZP-10SLIMF-GSK	(10") Slim bezel FDA replacement gasket
EZP-15SLIMF-GSK	(15") Slim bezel FDA replacement gasket
EZP-COV6	Pack of 3 protective shields for any 6" EZTouch panel
EZP-COV8	Pack of 3 protective shields for any 8" EZTouch panel
EZP-COV10	Pack of 3 protective shields for any 10" EZTouch panel
EZP-COV15	Pack of 3 protective shields for any 15" EZTouch panel

3.5 EZTouchPLC Specifications

Specifications	6" White on Blue	6" STN Mono	6" STN Color	6"TFT Color	8" STN Color	8" TFT Color	10" TFT Color	15" TFT Color
Display Type	5.7" STN (4 Shades of Blue) 320 x 240	5.7" STN (16 Shades of Gray) 320 x 240	5.7" STN (128-color palette) 320 x 240	5.7" TFT (128-color palette) 320 x 240	8.2" STN (128-color palette) 640 x 480	8" TFT (128-color palette) 640 x 480	10.4" TFT (128-color palette) 640 x 480	15" TFT (128-color palette) 640 x 480
Brightness/Life	140 nits/25,000 hours		180 nits/25,000 hours	200 nits/50,000 hours	140 nits/25,000 hours	200 nits/40,000 hours		250 nits/40,000 hours
Touch Screen	48 Resistive Touch Cells (8x6)	192 Resistive Touch Cells (16x12)						
Num of Display Screens	Up to 999 Limited by display memory							
Display Screen Saver	Yes, Backlight Off							
HMI User Memory	256K HMI RAM Mem.	512K HMI RAM Memory						1MB HMI RAM Memory
Maximum I/O Capacity	4 Slot Base (32I/O Max)				8 Slot Base (64I/O Max)			
Maximum Power Consumption	20 Watts @ 24VDC	22 Watts @ 24VDC	23 Watts @ 24VDC	25 Watts @ 24VDC	27 Watts @ 24VDC	29 Watts @ 24VDC	29 Watts @ 24VDC	33 Watts @ 24VDC
Processors	Two 32 Bit, 40 MHz RISC Processors (One for PLC and One for HMI)							
Total PLC Memory	64 KB (Ladder)							
# of PLC Registers	8192 16Bit, 8192 Variables							
PLC Typical Scan Time	3ms (1K Boolean)							
Real Time Clock/Cal.	Built-in							
Battery Backup	Yes, Lithium coin cell battery with 5 year life expectancy, with a low battery indicator							
PLC LED Indicators	Input Power, CPU Status (Run, Program & Run/Program), Low Battery, Program PLC and Run Mode LED indicators							
I/O Supported	EZIO Snap-in modules with status LEDs and Removable Terminal Block; DC / AC / Analog / Relay / Thermocouple / High Speed Counter							
Electrical Noise	Nema ICS 2-230 Showering arc; ANSI C37.90a SWC; Level C Chattering Relay Test							
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							
Enclosure	Nema 1 FDA Compliant				Nema 4,4x (indoor):			
Operating Temperature	0C to 45C	0C to 50C	0C to 55C	0C to 50C	0C to 55C			
Storage Temperature	-20C to 60C		-25C to 65C	-25 to 60C	-25C to 65C			
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							
Humidity	10-95% Non-Condensing							
Protocols Supported	ASCII In/Out: EZ Protocol, Ethernet, DeviceNet Slave, and Profibus Slave for communicating to PLC							
Built-In Serial Communication Ports	Port 1: RS232 (Programming and HMI Port Only) Port 2: RS422 (1.2K, 2.4K, 4.8K, 9.6K, 19.2K, and 38.4K Baud Rates supported)							
Agency Approval	UL, CUL, CE (pending)							
External Dimensions	8.048" x 6.145" x 3.896" (204.41 x 156.08 x 98.95mm)				10.894" x 8.748" x 3.852" (276.71 x 222.20 x 97.85mm)		13.584"x10.594"x3.856" (345x269.1x97.95mm)	16.75"x13"x5.678" (425.45x330.2x144.02mm)
Weight	2 lbs				3.5 lbs		4.5 lbs	7.5 lbs

3.6 Overview of CPUs

The EZTouchPLC has two Coldfire processors, one for the Touch panel and the other for its PLC. Not only does it have two CPUs, the EZTouchPLC has two separate switching Power supplies to maintain independent operation. The PLC CPU is one of the most crucial and important components of the EZTouchPLC. All PLC operations are carried out in this CPU so it is very important to understand its capabilities. This section will provide you with all the information regarding to the EZTouchPLC CPU and its communication specifications.

NOTE: Two separate CPUs and two separate Power supplies not only enhance the speed of operation, they work independent of each other. If the Touch panel CPU was to stop functioning, the PLC CPU is not affected!
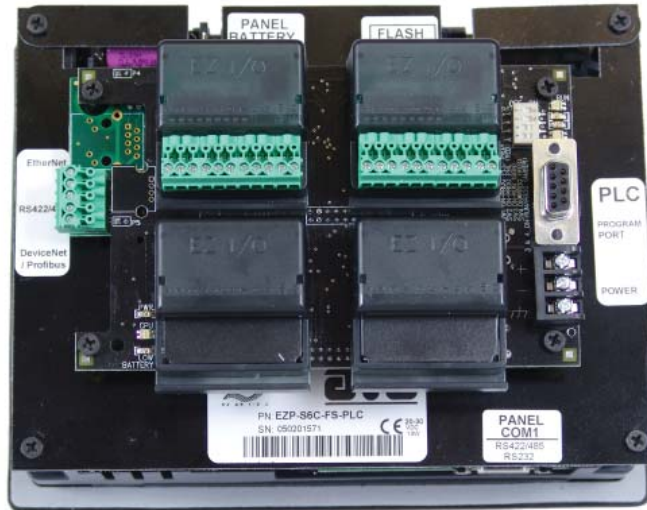
The standard EZPLC CPU has two integrated serial communication ports. It is also offered in different models -E, -D, and -P that have additional communication capabilities with Ethernet DeviceNet and Profibus networks respectively. The EZPLC CPU offers a very robust processing power with a rich instruction set. Common features to all CPU configurations include:

- 55 RLL 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)
- The CPU is a 32 bit 40 MHz Motorola ColdFire processor
- Available Ethernet, DeviceNet, Profibus models

3.7 PLC CPU Operation Modes

The Mode DIP Switches on an EZPLC are used to switch between Program and Run modes, as well as determine the connectivity of the RS232 Port on its PLC. Use the following table as a guide to different modes.

RS232 Programming/Communication Port Enable Switch Setup

SW1	SW2	PLC LED	Panel LED	RUN LED	Connection
0	0	Off	Off	On	Panel communicating to its built-in PLC and external RS232 port is disconnected
1	0	On	Off	Off	RS232 to PLC
0	1	Off	On	Off	Port Disconnected
1	1	On	On	Off	Port disconnected

CAUTION! *SW2 Must be OFF for proper operation of the EZTouchPLC.*

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.

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.

SW1
SW2
SW3
SW4
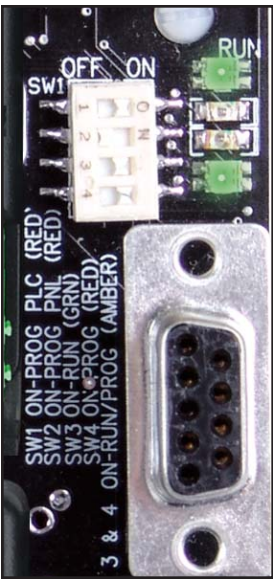
Run LED
PLC LED
HMI LED
Tri-Color LED

NOTE: *Shown for 4 slot, 8 slot base has 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

Program mode disables all I/O and you can modify the logic program in the 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.

PLC CPU Status Indicator LEDs

The PLC has 3 Status indicator LEDs. They have specific functions that can help you in programming and troubleshooting the PLC. These LEDs provide a 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 PLC 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.

PLC CPU Indicators

Panel CPU Indicator located underneath the PLC base
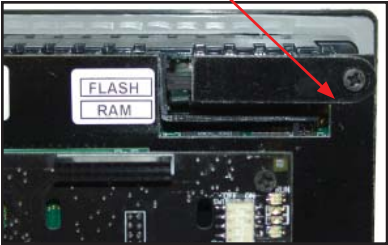
Touch panel CPU Status LED

The Status LED provides an indication of unit status. It will illuminate as RED or GREEN. If the LED does not light, this indicates that there is NO POWER to unit or the power supply failed. Check or replace power supply. If the LED turns RED and stays RED, check power supply to ensure it has sufficient current capability. If the LED flashes RED and turns GREEN that indicates normal operation. For more information, see the Troubleshooting section of this manual.

Communications

All PLC CPU models (standard E, D, and P) have 2 built-in serial ports. Port 1 is an RS232 that can be used for programming. Port 2 is an RS-422/485 port that can be used for networking with marquees, barcode printers, scanners and other ASCII type devices.

The Ethernet EZTouchPLC model comes with a built-in Ethernet communication interface (RJ45) along with serial ports. The EZTouchPLC can also be ordered with optional DeviceNet or Profibus slave cards for communications to a larger PLC network.

Ethernet

DeviceNet
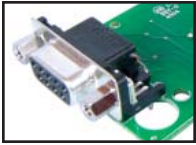
Profibus

PLC Serial Port 1 Specification

Use port 1 for programming the PLC. You will need to use an appropriate RS-232C cable for programming from a PC. This port is located on the 9-pin D-shell connector and supports EZ Protocol.

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

.
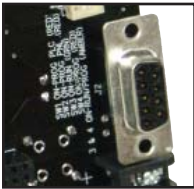
RS232 Wiring Diagram
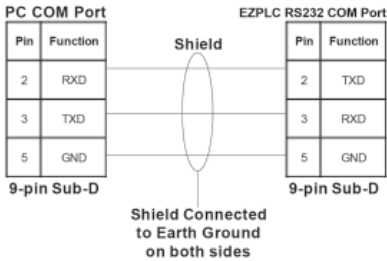
PLC Serial Port 2 Specification

Use Port 2 to network AC drives or any other compatible device with multidrop 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
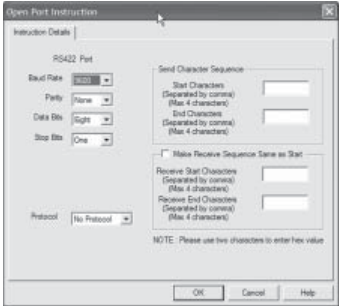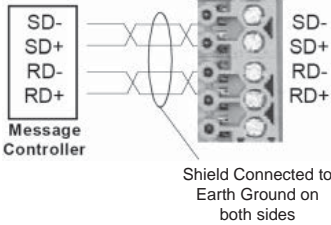
The RS422/485 port can be accessed from the ladder logic program using Communication Instructions. See the EZPLC Software Manual for information on how to configure a port to communicate with an ASCII device.

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.

Panel COM1 Port

The COM1 Port is used to connect a programming computer or a printer to the Panel. *The panel only needs to be connected to a PC when you are programming the unit.* You will use the EZPanel Enhanced Editor included with EZTouchPLC Editor CD (P/N EZP-TOUCHPLC-EDIT) to design the touch panel screens. A wiring diagram for the Panel RS-232C Programming Cable is shown below. The table shows EZTouchPLC's pinout for RS-232C and RS-422A connections.

Connect a Programming PC or Printer
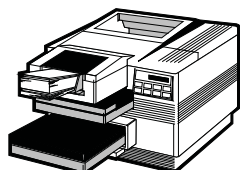
RS-232C Panel Programming Cable (P/N EZP-PGMCBL)

PC COM Port		RS-232	Panel COM1	
TXD	(3)		(3)	RXD
RXD	(2)		(2)	TXD
GND	(5)		(5)	
DTR	(4)		(Shell)	
DSR	(6)		D-sub 9-pin Male	
CTS	(8)			
D-sub 9-pin Female				
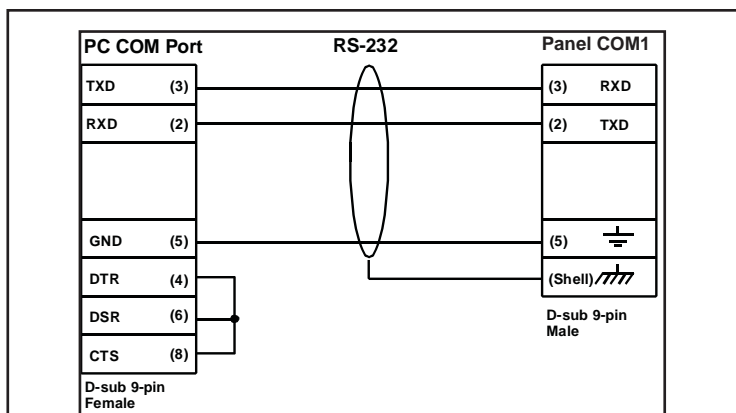
COM1 Connector		
Pin #	**RS-232C Connection**	**RS-422A Connection**
1	*DO NOT USE TXD– (RS-422/485)*	TXD– (RS-422/485)
2	TXD (RS-232C)	*DO NOT USE TXD (RS-232C)*
3	RXD (RS-232C)	*DO NOT USE RXD (RS-232C)*
4	*DO NOT USE RXD– (RS-422/485)*	RXD– (RS-422/485)
5	Logic GND	Logic GND
6	*DO NOT USE TXD+ (RS-422/485)*	TXD+ (RS-422/485)
7	*DO NOT USE CTS (NOT USED)*	*DO NOT USE CTS (NOT USED)*
8	*DO NOT USE RTS (NOT USED)*	*DO NOT USE RTS (NOT USED)*
9	*DO NOT USE RXD+ (RS-422/485)*	RXD+ (RS-422/485)

3.8 Battery Backup

The EZTouchPLC has a built-in 3V Lithium ion cell battery to maintain the PLC system RAM when the EZTouchPLC system is without external power. Typical 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:
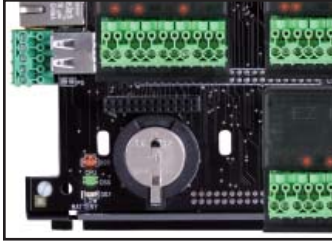
3V Lithium Cell Battery under module M2

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 EZTouchPLC Editor software and Save the program onto your computer's hard disk.
4. Disconnect the 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.*

3.9 PLC CPU Operation Sequence

A good understanding of PLC'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 to see 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 PLC's internal storage location where it stores all the values of inputs/outputs for ONE scan while it is executing ladder logic. The 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.

```
        ┌─────────────────────┐
   ┌───▶│      Power Up        │
   │    └─────────────────────┘
   │    ┌─────────────────────┐
   │    │    Initialize HW     │
   │    └─────────────────────┘
   │    ┌─────────────────────┐
   │    │    Update Inputs     │◀──────┐
   │    └─────────────────────┘        │
   │    ┌─────────────────────┐        │
   │    │   Read input data    │        │
   │    │ from specialty modules│       │
   │    └─────────────────────┘        │
   │    ┌─────────────────────┐        │
   │    │   Update date/time   │        │
   │    └─────────────────────┘        │
   │              ◇                     │
   │  Program   ◇ CPU ◇  Program        │
   │  ◀────────◇ Mode ◇                 │
   │              ◇                     │
   │            Run                     │
   │    ┌─────────────────────┐        │
   │    │   Execute Ladder     │        │
   │    └─────────────────────┘        │
   │    ┌─────────────────────┐        │
   │    │   Update outputs     │        │
   │    └─────────────────────┘        │
   │    ┌─────────────────────┐        │
   │    │  Write output data   │        │
   │    │  to specialty modules│        │
   │    └─────────────────────┘        │
   │    ┌─────────────────────┐        │
   │    │    House Keeping     │        │
   │    └─────────────────────┘        │
   │    ┌─────────────────────┐        │
   │    │ Check for watchdogs  │        │
   │    └─────────────────────┘        │
   │    ┌─────────────────────┐        │
   │    │   Error Checking     │        │
   │    └─────────────────────┘        │
   │              ◇          Yes        │
   │            ◇ OK ◇──────────────────┘
   │              ◇
   │            No
   │    ┌─────────────────────┐
   │    │    Report Error      │
   │    │    Set Register      │
   │    └─────────────────────┘
   │              ◇          No
   │            ◇ Fatal ◇──────────────┐
   │            ◇ Error ◇               │
   │              ◇                     │
   │            Yes                     │
   │    ┌─────────────────────┐        │
   │    │    Force I/O         │        │
   │    │   disable and        │        │
   │    │ turn off CPU LED     │        │
   │    └─────────────────────┘        │
   └────────────────────────────────────┘
```

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 when called 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.
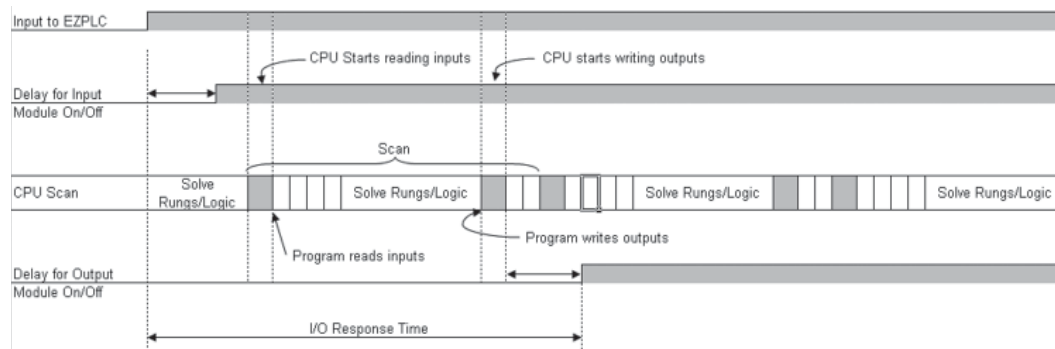
3.10 I/O Response Time

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
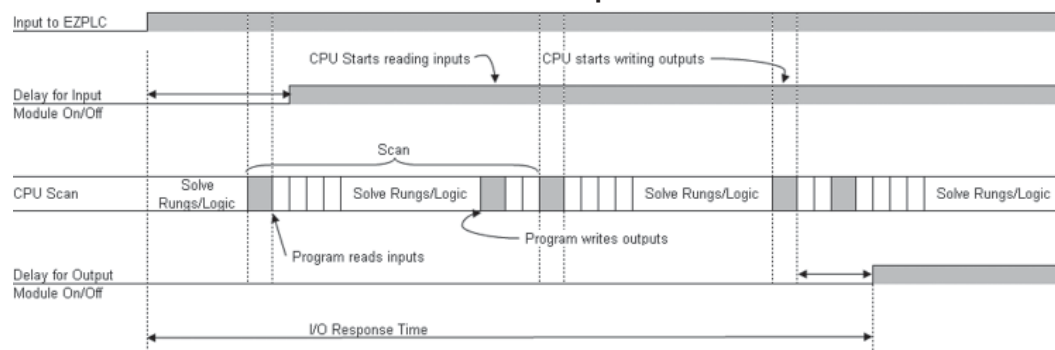4. Delay time for Output module to change state

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*
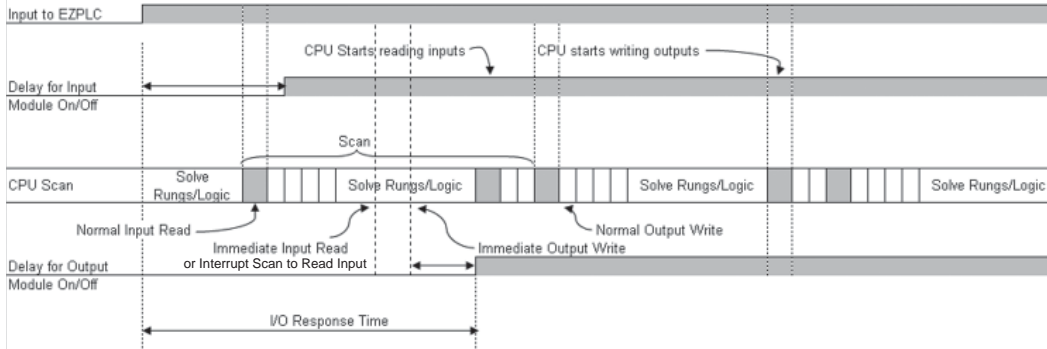
Maximum I/O Response Time

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 PLC system. The immediate instructions update the I/O points during the ladder logic program execution. See the EZTouchPLC Software Manual for a 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.*

3.11 PLC 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, register SR7 holds the value of the last CPU scan time. You can display this data value from the logic program.

3.12 PLC Memory Map

A PLC system handles many numbers representing different types of information regarding the process. These process/machine parameters may be anything from the status of the input or output devices, timers/counters, or other data values. Before you start programming the PLC, 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 PLC of the EZTouchPLC. 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). The 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" prefix (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 rung.

Discrete Outputs

Discrete Outputs are denoted using an "O" prefix (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" prefix (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" prefix (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 an "S" prefix (e.g. S1, S4, etc…). There are 1024 Discrete Internals available in the PLC. 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.

```
        I1                 S1
  |-----| |--------------(   )
        S1                 O1
  |-----| |--------------(   )
  |
```
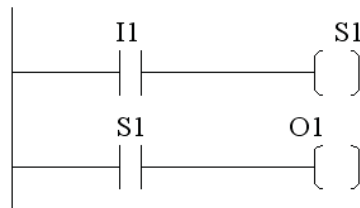
In this example, memory location S1 will be powered when input I1 turns on; you can then use a discrete internal as an input in another rung.

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

System Discretes (Discrete)
System Discretes are denoted using an "SD" prefix (e.g. SD1, SD4, etc…). There are 16 System Discretes available in the PLC. Some of the System Discretes are READ_WRITE type and others are READ_ONLY 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" prefix (e.g. SR1, SR4, etc…). These are 16-bit Word data types (registers). There are 20 System Registers available in the PLC. Some of the System registers are READ_WRITE and others are READ_ONLY type.

Index and Value Registers (Word)
The Index Register data type is represented by an "XR" prefix (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.

The Value Register data type is represented by "#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 the 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.

Memory Types, Address Ranges & Syntax					
MEMORY TYPE	**ADDRESS RANGE**	**READ/WRITE**	**VALUE TYPE**	**SYNTAX EXAMPLE**	**DESCRIPTION**
I - Discrete Inputs	1 - 128	READ_ONLY	DISCRETE	I4	Inputs are denoted using an **I** prefix. Inputs are used as a real world interface to a physical Input Device.
O - Discrete Outputs	1 - 128	READ_WRITE	DISCRETE	O5	Outputs are denoted using an **O** prefix. Outputs are used as a real world interface to a physical Output Device.
S - Discrete Internals	1 - 1024	READ_WRITE	DISCRETE	S3	Discrete Internals are denoted using an **S** prefix.
IR - Input Register	1 - 64	READ_ONLY	WORD (16 Bit)	IR3	Input Registers are denoted using an **IR** prefix. Input Registers are used as a real world interface to a physical Input Device.
OR - Output Register	1 - 64	READ_WRITE	WORD (16 Bit)	OR2	Output Registers are denoted using an **OR** prefix. Output Registers are used as a real world interface to a physical Output Device.
R - Register Internals	1 - 8192	READ_WRITE	WORD (16 Bit)	R123	Internal Registers are denoted using an **R** prefix.
SR - System Registers	1 - 20	*Some READ_ONLY, Others READ_WRITE	WORD (16 Bit)	SR6	System Registers are denoted using an **SR** prefix. System Registers hold various information about the EZPLC. The user may reference these registers to display that information.
SD - System Discretes	1 - 16	*Some READ_ONLY, Others READ_WRITE	DISCRETE	SD1	System Discretes are denoted using an **SD** prefix. 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	1 - 4	READ_WRITE	WORD (16 Bit)	XR2	Index Registers are denoted using an **XR** prefix. These registers contain the address of the operand (R registers) and are used in conjunction with value registers (#R).
****#R** - Value Registers	1 - 4	READ_WRITE	WORD (16 Bit)	#R2	Value Registers are denoted using the **#R** prefix. These registers are used to read or write a value to the operand (R Registers) and are used in conjunction with Index registers.
*See the EZPLC Software Manual for more details.					
**These types are used only with the Move Block, Move Data, and Block Fill instructions.					

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.

SW1
SW2
SW3
SW4
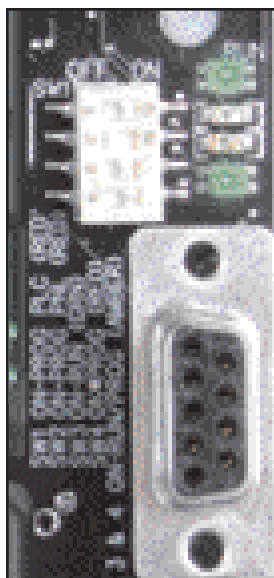
Run LED
PLC LED
HMI LED
Tri-Color LED

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

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

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.

RS232 Wiring Diagram

PC COM Port			EZPLC RS232 COM Port	
Pin	Function	Shield	Pin	Function
2	RXD		2	TXD
3	TXD		3	RXD
5	GND		5	GND
9-pin Sub-D			9-pin Sub-D	

Shield Connected to Earth Ground on both sides
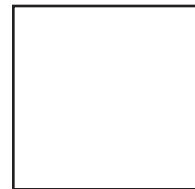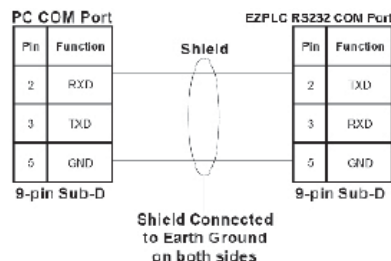
Serial Port 2 Specification

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

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.

RS422/485 Wiring Diagram
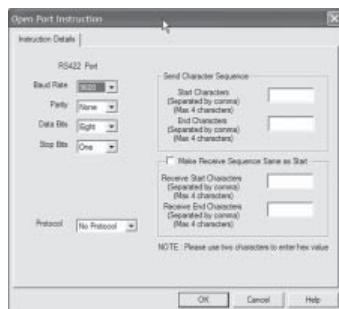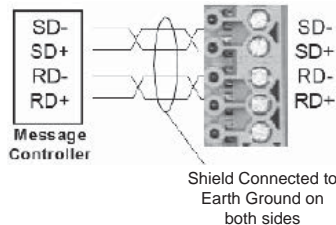
SD-
SD+
RD-
RD+

Message Controller

SD-
SD+
RD-
RD+

Shield Connected to Earth Ground on both sides

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:
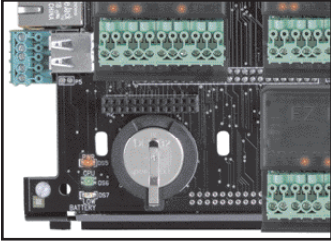
1. Remove the M2 EZI/O module to access the battery.
2. Connect the EZPLC with a programming computer using an RS-232C cable.
3. Open the EZPLC Editor software and Save the program on your computer's hard disk.
4. Disconnect Power source.
5. Simply remove the old battery from the slot.
6. Gently insert 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.

3V Lithium Cell Battery under module M2

*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.

```
        ┌──────────────────┐
        │     Power Up      │
        └──────────────────┘
        ┌──────────────────┐
        │   Initialize HW   │
        └──────────────────┘
        ┌──────────────────┐
        │   Update Inputs   │
        └──────────────────┘
        ┌──────────────────┐
        │  Read input data  │
        │ from specialty modules │
        └──────────────────┘
        ┌──────────────────┐
        │  Update date/time │
        └──────────────────┘
             ╱CPU╲
    Program ╱ Mode ╲
            ╲      ╱
             ╲Run ╱
        ┌──────────────────┐
        │  Execute Ladder   │
        └──────────────────┘
        ┌──────────────────┐
        │  Update outputs   │
        └──────────────────┘
        ┌──────────────────┐
        │  Write output data │
        │ to specialty modules │
        └──────────────────┘
        ┌──────────────────┐
        │   House Keeping   │
        └──────────────────┘
        ┌──────────────────┐
        │ Check for watchdogs │
        └──────────────────┘
        ┌──────────────────┐
        │  Error Checking   │
        └──────────────────┘
             ╱  ╲    Yes
            ╱ OK ╲──────
            ╲    ╱
             ╲  ╱
              No
        ┌──────────────────┐
        │   Report Error    │
        │   Set Register    │
        └──────────────────┘
             ╱Fatal╲   No
            ╱ Error ╲──────
            ╲       ╱
             ╲     ╱
              Yes
        ┌──────────────────┐
        │    Force I/O      │
        │   disable and     │
        │ turn off CPU LED  │
        └──────────────────┘
```

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.

```
        I1                    S1
    ┤├                    ( )

        S1                    O1
    ┤├                    ( )
```
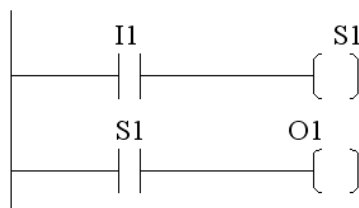
In this example, memory location S1 will be powered when input I1 turns on; you can then use a discrete internal as an input in another rung.

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

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