EZTouhPLC Nano

Table of contents

Warnings

Programmable control devices such as the EZTouhPLC Nano 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 EZTouhPLC Nano.

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. AVG Automation disclaims any proprietary interest in the marks and names of others.

Designed, Built and Marketed by AVG
4140 Utica Ridge Rd. · Bettendorf, IA 52722-1327
Phone: **1-877-774-EASY** · Fax: **1-877-775-EASY** · www.ezautomation.net

EU Information

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

Products with CE marks perform their required functions safely and adhere to relevant standards as specified by EU directives provided they are used according to their intended purpose and that the instructions in this manual are adhered 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 AVG Automation or its agents should be used.

Technical Support

Consult PLC Editor Programming Software Help. You may also find answers to your questions in the operator interface section of our website @ flash.ezautomation.net. If you still need assistance, 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).

Preventative and Maintenance Cleaning

No special preventative measurement is required.

Product Overview

Thank You for using EZ Automation's new model of integrated logic controller - the EZTouhPLC Nano. The EZTouhPLC Nano is a fixed I/O PLC and offers 16 Digital DC inputs and 8 Digital Relay outputs.

This manual presents information on the installation, wiring and specifications of the EZTouhPLC Nano. It also covers the troubleshooting and maintenance of an existing setup and provides understanding on how to connect the PLCs with other components in your control system.

All of our PLCs use ladder logic for programming and share the same programming environment. In addition, the ladder logic developed for one model can be used with other models by changing the target device. The ladder instructions are subject to the model's limitations.

EZTouhPLC Nano Specifications

INPUT POWER
    Voltage: 24 VDC nominal (20-28VDC)
    Max. Power Consumption: 10 Watts

MECHANICAL
    Mounting: DIN Mount (using 4 DIN Clips)
    Enclosure: NEMA 4, 4x (indoor)
    External dimensions:

Unit Size	X	Y	Z
6"	8.05" [204.42mm]	6.15" [156.11mm]	4.37" [110.93mm]
8"	10.89" [276.71mm]	8.75" [222.20mm]	4.53" [115.09mm]
10"	13.58" [345.03mm]	10.59" [269.09mm]	4.31" [109.35mm]

ENVIRONMENTAL
    Operating Temperature: 0°C to 55°C
    Storage Temperature: -20°C to 60°C
    Humidity: 10-95% Non-Condensing
    Atmospheric Conditions: Non-corrosive gases
    Vibration: 5 to 55Hz, 2g for 2 hours in X, Y, and Z axis
    Shock: 10g for under 12ms in the X, Y, and Z axis
    Electrical Noise: Nema ICS 2-230 Showering arc, ANSI C37.90a SWC; Level C Chattering Relay Test

PLC MEMORY
    User Program Memory: 64 KB
    Total Number of Registers: 8192 (256 registers retained on power down)
    Typical Scan Time: 5 ms (1K Boolean)

HMI DISPLAY
    Backlight: White LED
    Brightness/Life: 400 nits/75,000 hours
    Touch Screen: 192 resistive touch cells (16x12)
    Display Type:

Unit Size	Display Type
6"	6" TFT
8"	8" TFT
10"	10" TFT

COMMUNICATIONS
    Communication ports: 1 RS-232 port (9 pin D-Sub), 1 RS-485 port, USB Host, RJ45 Ethernet (optional)

INPUTS/OUTPUTS
    Digital Input specifications (DC Input)
        Number: 16
        Input Voltage Range: 12-26 VDC
        Input Current: 1.92 mA @12 VDC or 4mA @ 24VDC
        On Voltage > 12VDC and OFF Voltage < 2VDC

Minimum ON Current: 2 mA, OFF Current: 0.2mA
Red LED Status Indicators
(See Digital Input Section for more info)

Digital Output specifications (Relay)
Number: 8
Max Switching Voltage: 277VAC or 30VDC
Max Switching Power: 300W
Rated Switching Current: 10A
Red LED Status Indicators
(See Digital Output Section for more details)

Installation

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.

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

Safety Guidelines

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 guidelines:

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 the PLC.

2) Safety Circuits
Most of the machines are installed with safety circuits such as limit switches, emergency stop push buttons, and interlocks. These circuits should always be hardwired directly to the EZTouhPLC Nano. 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 this could result in serious injury or damage to the machine.

3) Fail-Safe Operation
Our products are not fault-tolerant. They are not designed or intended for use as online 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.

Installation Considerations

Our products have been designed and tested for operation in the most demanding industrial environments. Modern solid-state industrial controls are complex electronic equipment that operate at low levels of voltage and current, co-existing 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, thus 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 for 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 Considerations

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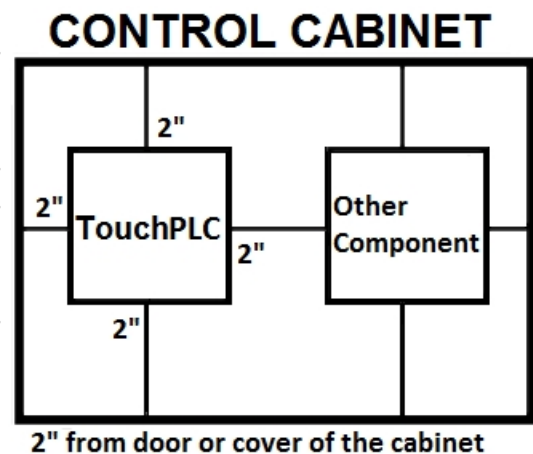- Environmental temperatures above or below those specified by the EZTouhPLC Nano
- Prolonged exposure to humidity and liquids which may be sprayed or splashed on the equipment
- Dusty environments where airborne particles may accumulate on equipment causing reduction of heat dissipation and reduction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

Physical Layout in a Control Cabinet

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 EZTouhPLC Nano have a minimum clear space of 2" on all sides for adequate ventilation as shown in the image on the right.

Electrical Considerations

This section is designed to provide you with a very basic understanding of electrical noise and how to keep it away from CPUs. Industrial plants have a number of generators of electrical noise that are sometimes also referred to as Radio Frequency Interference (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 lightning storm has to flow back to Earth. RFI is short bursts of electrical energy at very high frequencies. Other sources include RF Welders or Radio Transmitters.

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 EZTouhPLC Nano Card Engine, when faced with RFI, halts its operation instead of giving false outputs.

Types of RFI

RFI enters electronic controls in two ways: radiated RFI or 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.

Equipment cabinets usually incorporate one or two doors and/or hinged cabinet panels. 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. Instead, the use of ground straps is recommended. It is vital for the reliable operation of any electronic device to have any of its metallic surfaces well grounded to Earth. This not only provides for safe operation, it will also drain out any conducted RFI to Earth, away from the CPU's signal ground.

Shielding from RFI

Shielded Cables

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. Another path for RFI into the PLC is through its RS232 port. Hence, the cables to this port must be shielded properly.

Equipment Cabinets

As mentioned, equipment cabinets typically 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. However, the door hinges and swinging panels by themselves are not enough to ensure adequate grounding.

Similarly, the equipment enclosures are generally either painted or anodized. Mounting of painted or anodized enclosures to like surfaces also does not ensure good metallic contact between the equipment chassis and cabinet. It is imperative that the equipment chassis are grounded such as through the use of grounding straps as illustrated below.

**Cabinet Door Grounding Straps**
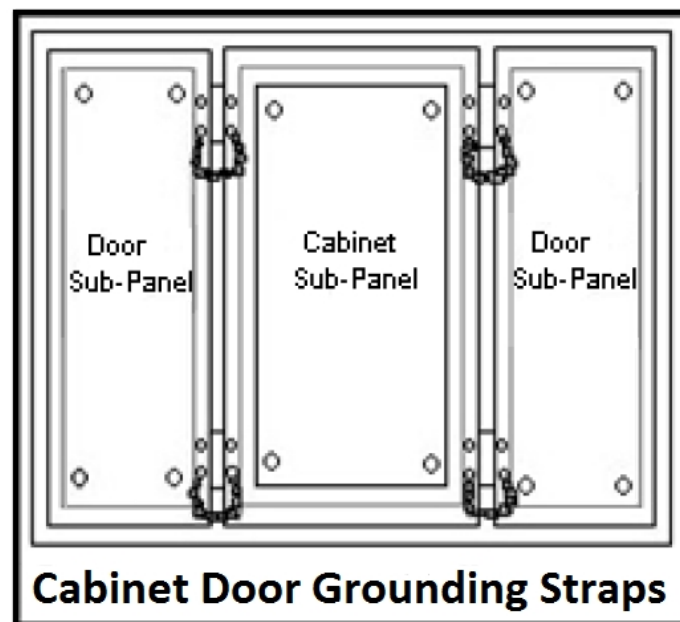
Cabinet Wiring

The wiring of the EZTouhPLC Nano 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. Below are some general rules that apply in most situations:

- o Provide a separate power source to electronic controls and keep this power bus away from any I/O power.
- o 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.
- o 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.
- o The safety ground terminal of each component can, and should be, connected with the shortest wire possible, to the cabinet or sub-panel frame.
- o 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.
- o 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 bus and all other wiring.
- o Primary power leads to the control equipment (Base power terminals) should be made with a two wire twisted cable with approximately 12 turns per foot. The length of these cables should be kept to a minimum, and to the greatest extent possible, such cable runs should be kept separate from other wiring.

Mounting Information

Cutout Dimensions

Units: inches [millimeters]
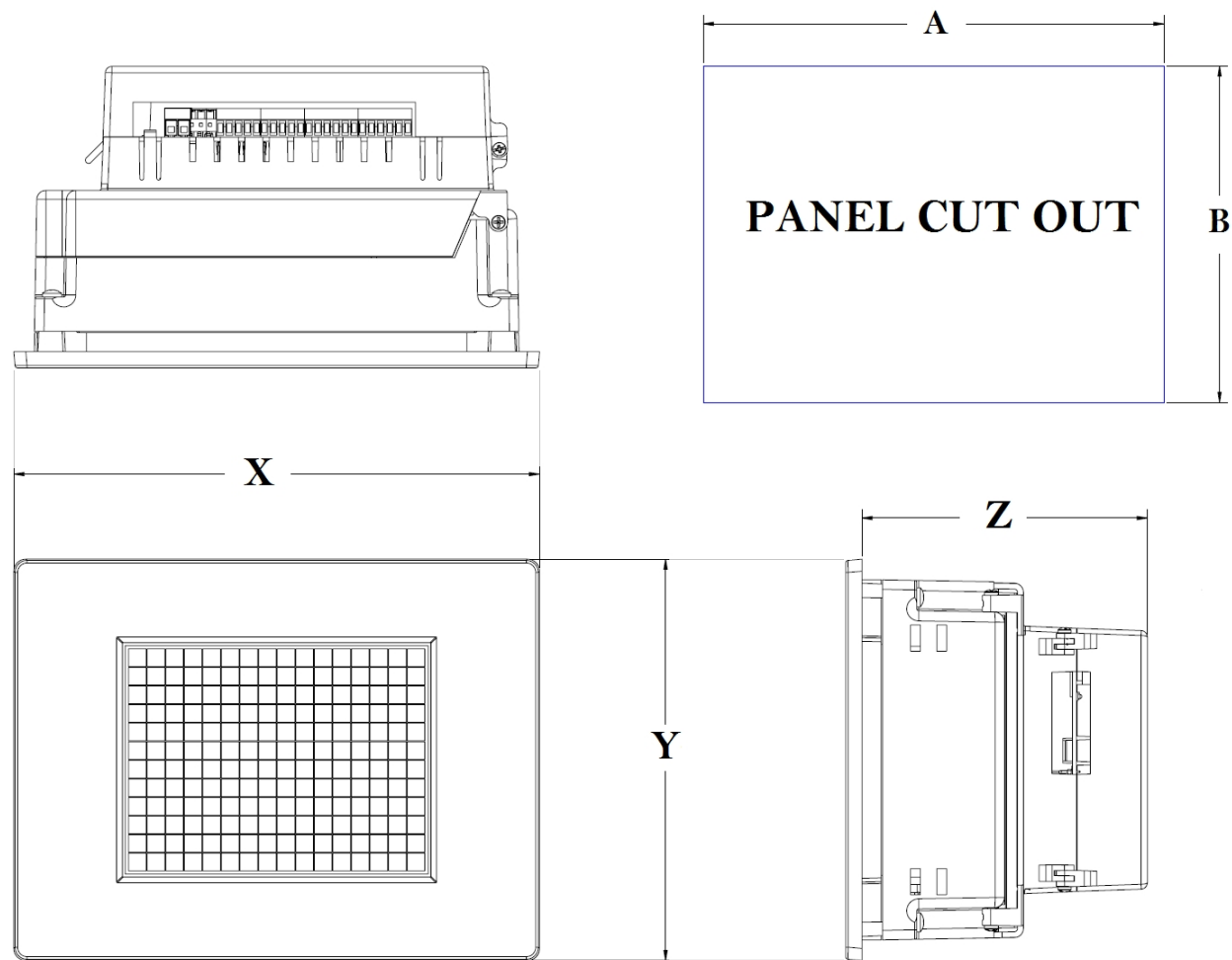
EZTouhPLC Panel Dimensions

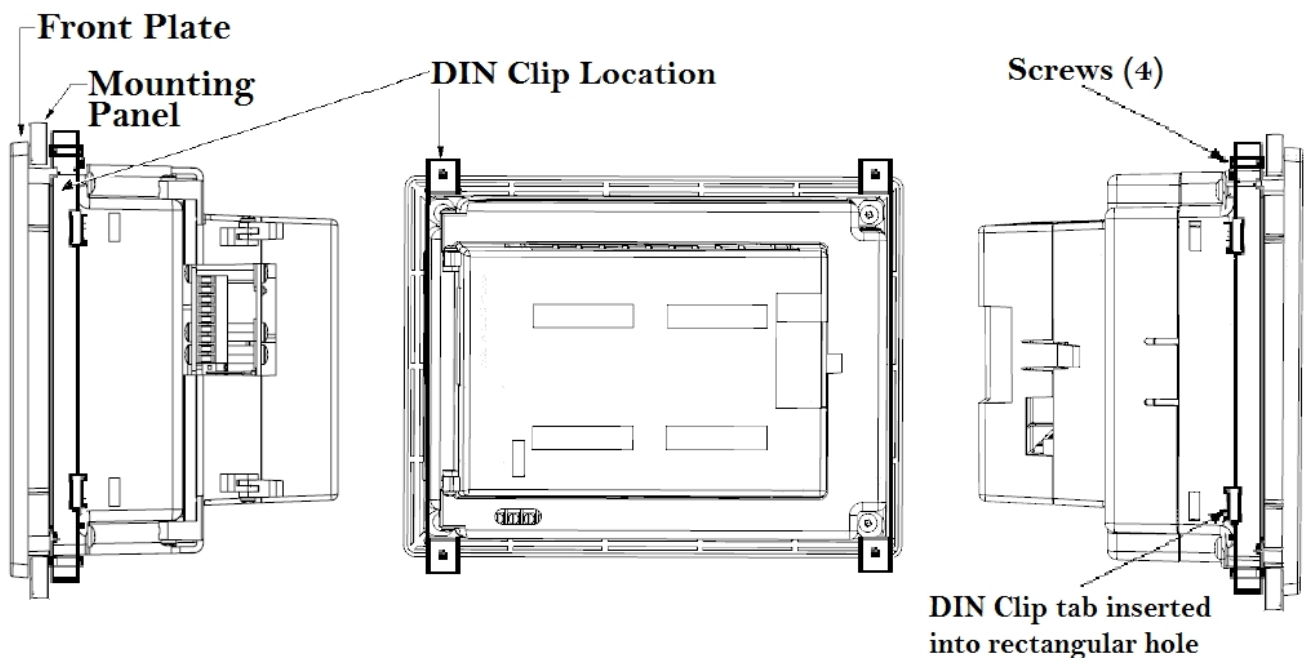| Unit Size	X	Y	Z
6"	8.05" [204.42mm]	6.15" [156.11mm]	4.37" [110.93mm]
8"	10.89" [276.71mm]	8.75" [222.20mm]	4.53" [115.09mm]
10"	13.58" [345.03mm]	10.59" [269.09mm]	4.31" [109.35mm]

Panel Cutout Dimensions

Unit Size	A	B	Depth
6"	8.05" [204.42mm]	6.15" [156.11mm]	5.37" [136.40mm]
8"	9.25" [234.50mm]	7.08" [179.73mm]	5.53" [140.46mm]
10"	11.91" [302.41mm]	8.92" [226.48mm]	5.31" [134.87mm]

Mounting Instructions (6 Inch Model)

The 6-inch models must be mounted using DIN Clips. DIN Clips are metal brackets (P/N EZ-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 EZ Touch Nano unit 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 following figure. 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 EZSeries Touch Panel front bezel is flush with the mounting panel.

Front Plate

Mounting Panel

DIN Clip Location

Screws (4)

DIN Clip tab inserted into rectangular hole

Mounting Instructions (8 and 10 Inch Model)

4 rectangular holes at the top of the chassis
(similarly 4 rectangular holes at the bottom of the chassis)
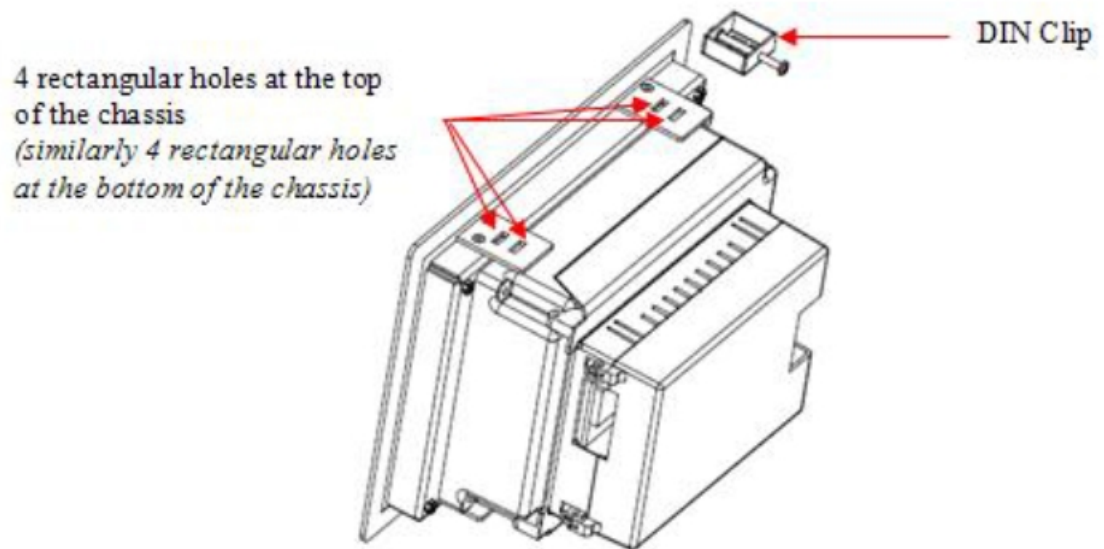
DIN Clip

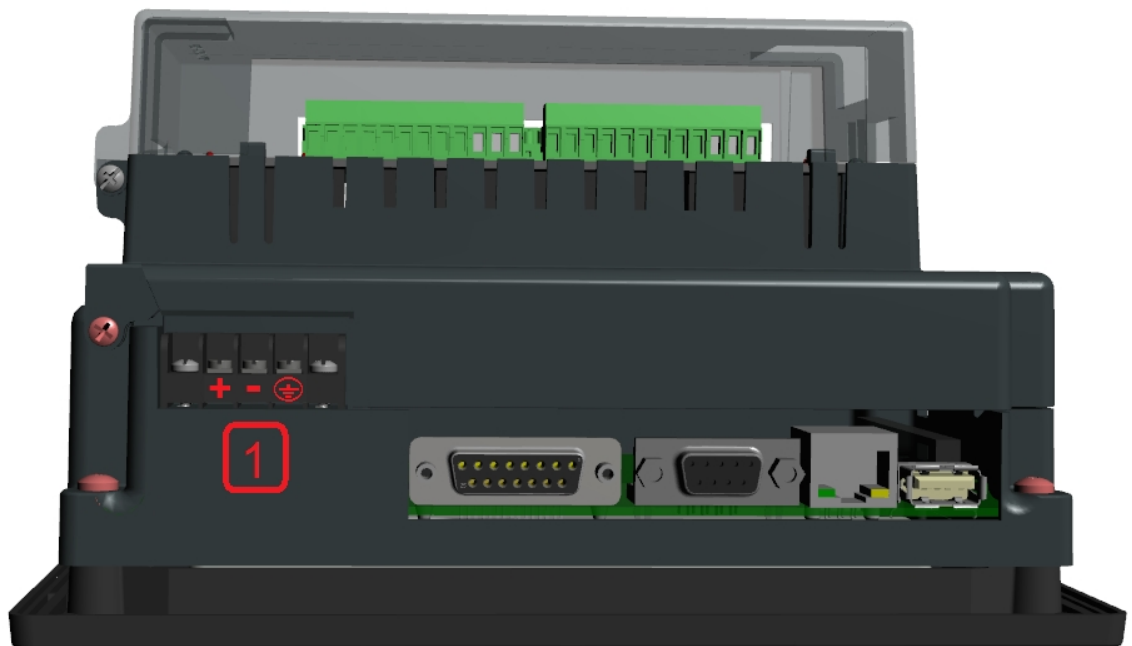Before mounting your EZTouhPLC Nano unit, please verify you have the necessary items:
- EZTouhPLC Nano unit
- 4 DIN clip assemblies
- a Phillips #1 screwdriver (or equivalent)

When ready to proceed:
1. Prepare the DIN clip assembly first by placing the nut on the screw. Insert the screw into the DIN clip in the non-threaded end first using the Phillips #1 screwdriver if necessary. Leave a gap between the DIN clip and the head of the screw.
2. After ensuring the cut-out is sized properly and allows for adequate ventilation, place the EZTouhPLC Nano unit into the cut-out horizontally.
3. Once in place, use the hooks on the DIN clip to locate the DIN clip assembly onto the side of the EZTouhPLC Nano unit. Tighten the screw into place. Then rotate the nut until it is snug against the DIN clip to prevent it from vibrating loose. Repeat this process with the other 3 DIN clip assemblies until the unit is secure.

Communications and Wiring

1. Power Terminal 24 VDC

2. COM1 Port Programming Port

3. RJ45 (optional) Ethernet Port

4. USB Port
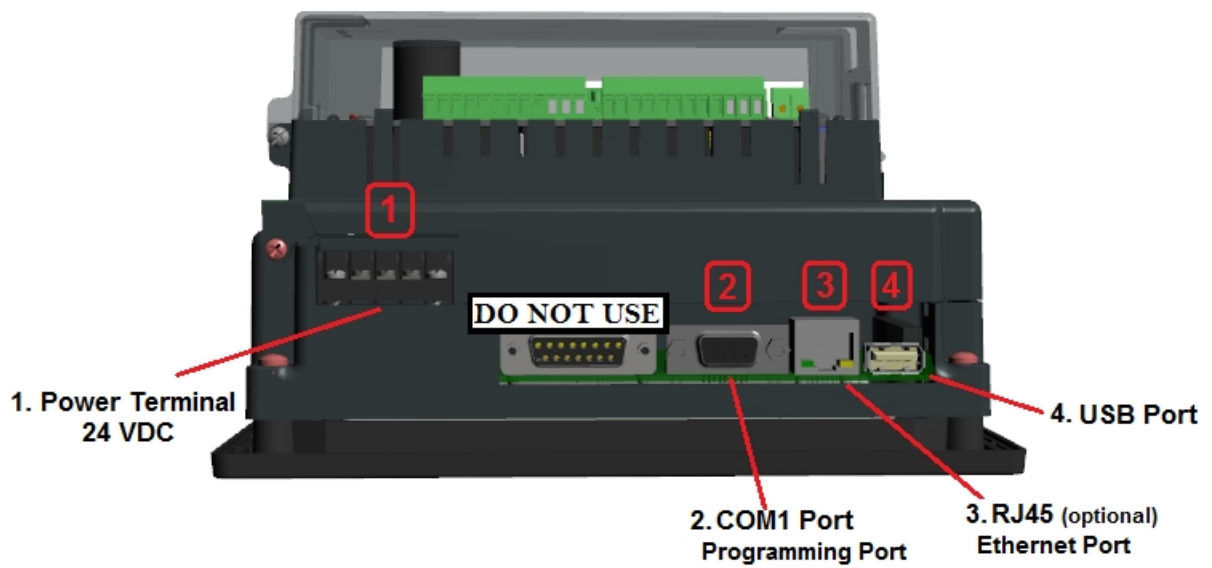
1. Powering the EZTouhPLC Nano

Connect the power input wires into the PLC's power terminals. Supply 24VDC nominal (20-28VDC) power to the system depending on the model. If the unit does not power up correctly, remove power from the system and check all the wiring. In addition, see the Indicator Light section for troubleshooting.
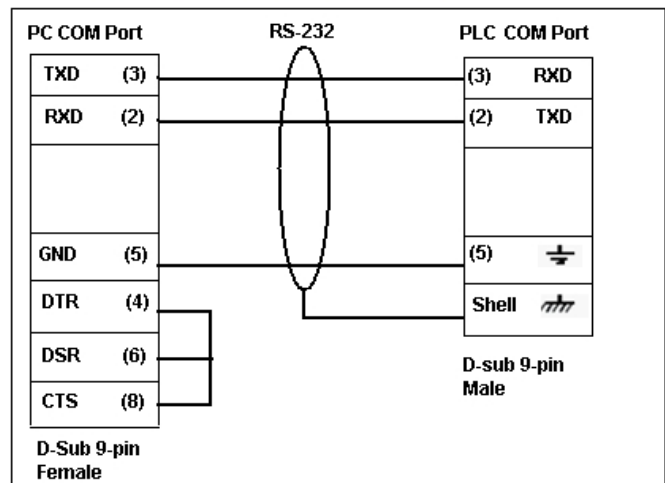
2. COM1 Port
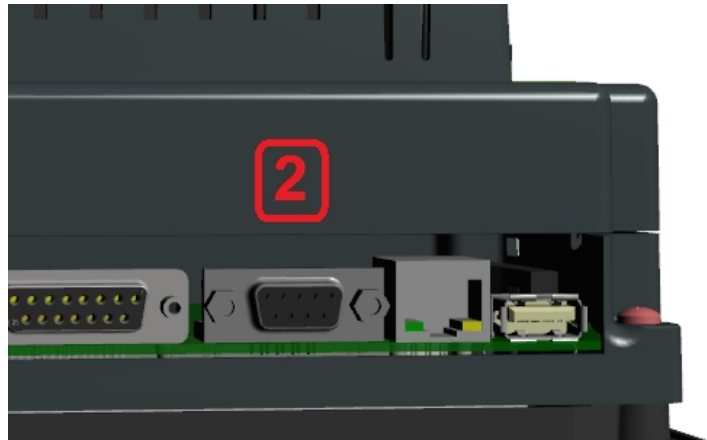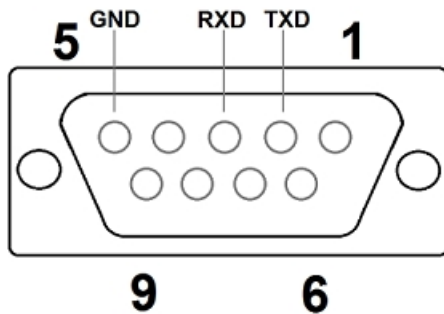
The EZTouhPLC Nano has a built-in serial port (COM1 PORT) located on the 9-pin D-Sub connector. COM1 PORT is an RS-232 port which requires an appropriate RS-232C cable (**P/N: EZ-PGMCBL**) for programming the EZTouhPLC Nano through a PC. It serves as the default programming port on the EZTouhPLC Nano. Since COM1 has fixed communication parameters, you can always connect the programming software to the PLC through the port without needing to make different configuration changes.

PGMCBL: Programming Cable Wiring

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

PC COM Port		RS-232	PLC COM Port	
TXD	(3)		(3)	RXD
RXD	(2)		(2)	TXD
GND	(5)		(5)	⏚
DTR	(4)		Shell	⏚
DSR	(6)			
CTS	(8)			

D-Sub 9-pin Female

D-sub 9-pin Male

3. Ethernet Port (optional)

There is also an optional Ethernet port available on select models for the EZTouhPLC Nano. This port enables users to add/update programming through an Ethernet connection.

> **Note:** The units will ship with a fixed IP Address (192.168.0.1) preprogrammed. Please edit the address as per your requirements.
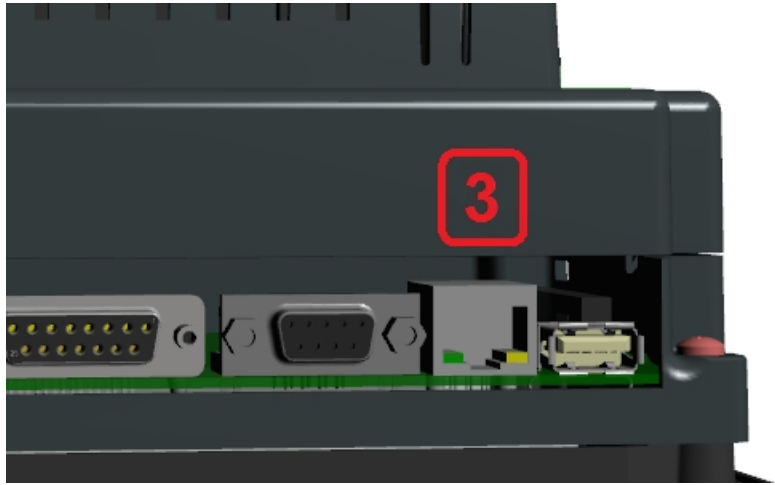
4. USB Port
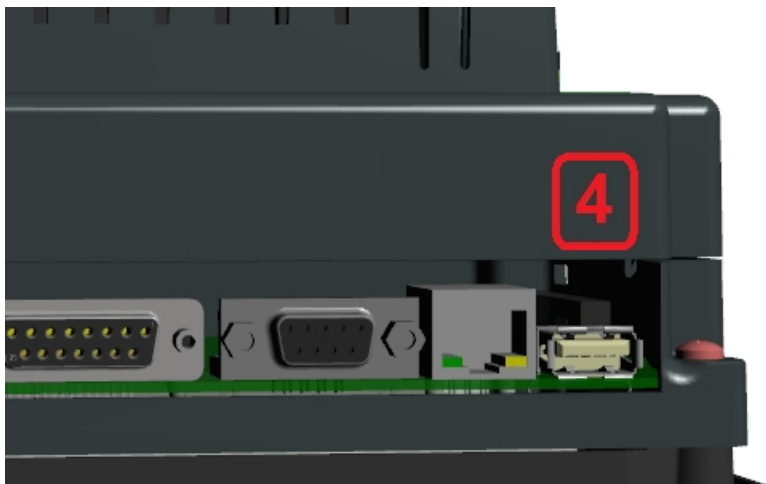
Full Speed USB

A flash drive can be used for backing up the unit's program or for data acquisition. More information about the functionality of the USB port is available in the EZ Series Editor Software Manual.

RS485 Port

The EZTouhPLC Nano comes available with two serial communication ports including a RS485 port. This RS485 port would allow the user to utilize the Communication Instructions supported by the PLC as outlined in the **EZ Panel Enhanced Software Manual**.
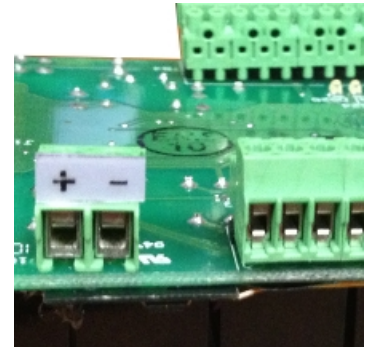
To enable this port, you would use the Open Port command. The port only needs to be opened once. It will stay on unless the Close Port command is used or until a power cycle. More information about the functionality of this port is available in the Software Manual Help section.

Wiring I/O Connections

The EZTouhPLC Nano comes with Easy to Wire Phoenix Terminals.

As shown in the picture, simply insert the wire and screw to tighten. You can wire up to ONE 14 AWG wire, TWO 18 AWG wires, or FOUR 22 AWG wires in every terminal. You will need a 2.5mm blade screwdriver (P/N **EZIO-SCDRV**) to work with the I/O terminals and wiring.
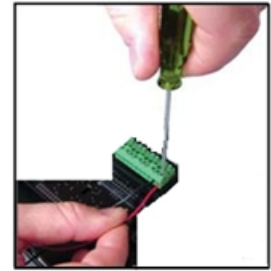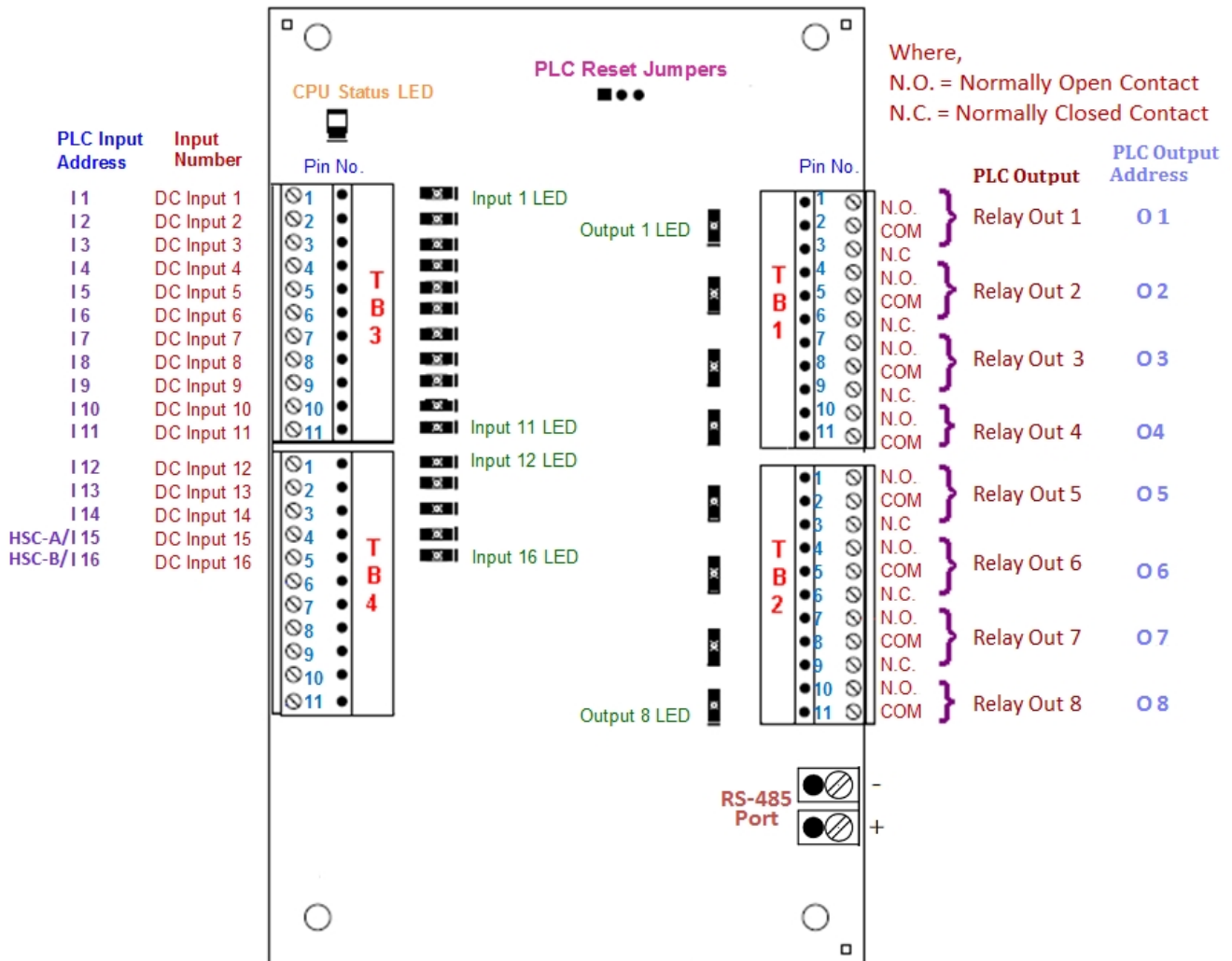
Wires Supported
UL rated at 300 volts, 10 amps 14 AWG

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

Terminal Layout

Terminal Pinouts

TB3 Pinout Information	
Pin No.	**Pin Function**
1	DC Input(1)
2	DC Input(2)
3	DC Input(3)
4	DC Input(4)
5	DC Input(5)
6	DC Input(6)
7	DC Input(7)
8	DC Input(8)
9	DC Input(9)
10	DC Input(10)
11	DC Input(11)

TB4 Pinout Information	
Pin No.	**Pin Function**
1	DC Input(12)
2	DC Input(13)
3	DC Input(14)
4	DC Input(15)
5	DC Input(16)
6	DC Input COM
7	DC Input COM
8	--
9	--
10	--
11	--

TB1 Pinout Information	
Pin No.	**Pin Function**
1	Output (1)_Normally open
2	Output (1)_COM
3	Output (1)_Normally closed
4	Output (2)_Normally open
5	Output (2)_COM
6	Output (2)_Normally closed
7	Output (3)_Normally open
8	Output (3)_COM
9	Output (3)_Normally closed
10	Output (4)_Normally open
11	Output (4)_COM

TB2 Pinout Information	
Pin No.	**Pin Function**
1	Output (5)_Normally open
2	Output (5)_COM
3	Output (5)_Normally closed
4	Output (6)_Normally open
5	Output (6)_COM
6	Output (6)_Normally closed
7	Output (7)_Normally open
8	Output (7)_COM
9	Output (7)_Normally closed
10	Output (8)_Normally open
11	Output (8)_COM

I/O Specifications

Digital Input Specifications	
Number of Inputs	16
Input Voltage Range	12-26 VDC
Input Current	1.92 mA @12 VDC 4.0 mA @ 24VDC
Maximum Input Current	4.3 mA @ 26 VDC
Input Impedance	11.5k @ 12-26 VDC
ON Voltage Level	>12 VDC
OFF Voltage Level	<2 VDC
Min. ON Current	2mA
Min. OFF Current	0.2 mA
OFF-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
Wires	1 of 14 AWG, 2 of 18 AWG 4 of 22 AWG

Discrete Input Wiring
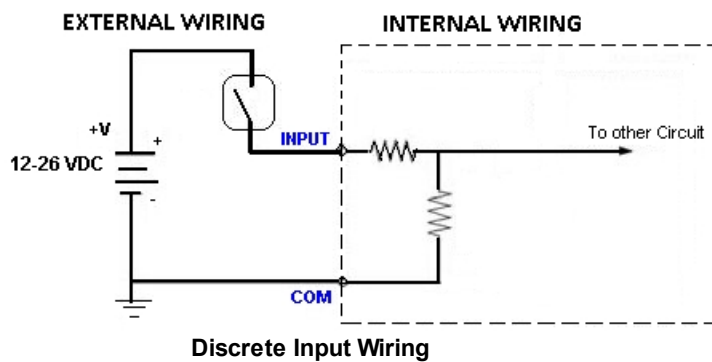
Relay Output Specifications	
Number of Outputs	8
Max Switching Voltage	277 VAC or 30 VDC
Max Switching Power	2770 VA or 300 W
Rated Switching Current	10A
Contact Resistance	100mΩ (at 1A 6VDC)
Insulation Resistance	100MΩ Min. at 500VDC
Dielectric Strength	1500VAC between Coil & Contact, for 60sec
	750VAC between Contacts for 60sec
Operate Time	Max 10ms
Release Time	Max 5ms
Status Indicators	Red LEDs
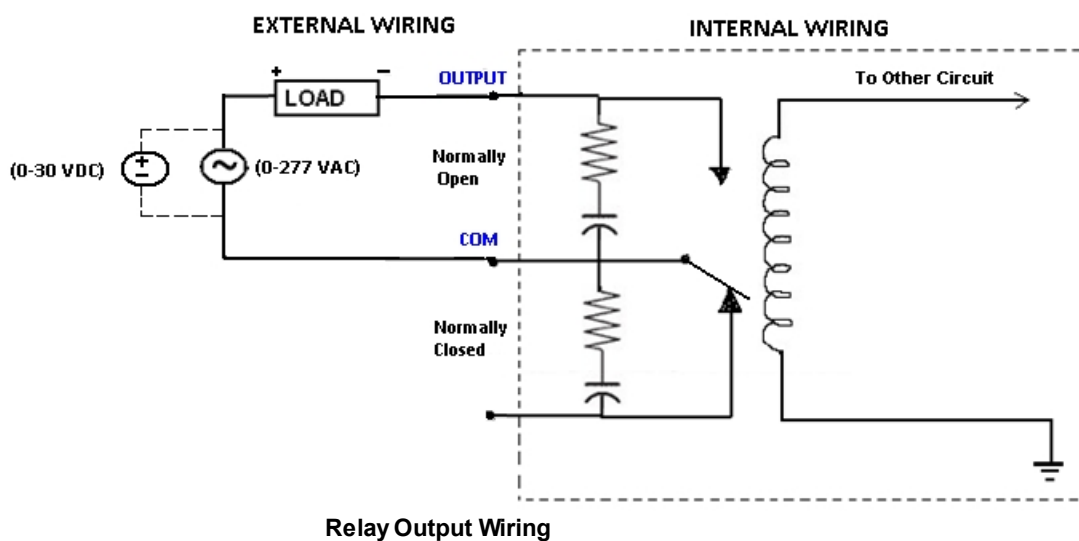
Relay Output Wiring

Using the EZTouhPLC Nano

Quickstart the EZTouhPLC Nano

This section outlines the steps needed to setup the EZTouhPLC Nano and get it started. This is not intended to explain specific details needed to start your system. Rather, it provides a quick guide to give a broad picture of what is needed to power-up EZTouhPLC Nano 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:
 - EZTouhPLC Nano unit
 - USB to serial port connector if the Programming Computer does not include a RS-232 port
 - RS-232C Programming cable (P/N EZ-PGMCBL)*
 - 2.5mm blade screwdriver for I/O wiring (P/N EZIO-SCDRV)*
 - Programming Software: EZSeries Editor Programming Software*
 - 24VDC Power Supply*
 * These accessories have to be purchased separately

Step 2: Install Programming Software on your PC and connect the PLC to PC port
Install the appropriate programming software (EZSeries Editor) depending upon how you would like to program the PLC on your Personal Computer (PC).
Connect the PLC and the PC as shown below:
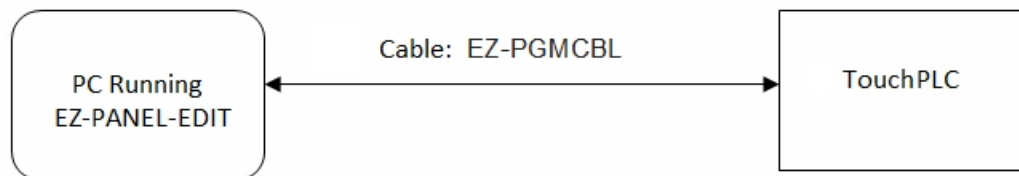
Step 3: (Optional) Wire Input / Outputs
You may wire required inputs and outputs now or later. Please refer to the wiring section for information on connecting the Input/Outputs to the EZTouhPLC Nano terminals.

Step 4: Connect Power
If not already completed, please connect the power input wires to the TouchPLC's power terminals as outlined in the Powering the EZTouhPLC Nano section. Supply 24VDC nominal (20-28VDC) power to the system based on the model type. Ensure the PWR indicator LED located on the PLC base is ON (blinking green LED). If not, remove power from the system and check all the wiring. More information on the CPU Status LED Indicator is also located in the Indicator Light section.

Step 5: Create and Transfer Program to PLC
Open your Touch Panel Editor and create your HMI screen and Ladder Logic. The EZSeries Editor Software Manual explains the programming instructions in detail. Use the Software manual and/or programming software help for information on programming the unit. A brief description of the process is available in the following section.

PLC Operation Sequence
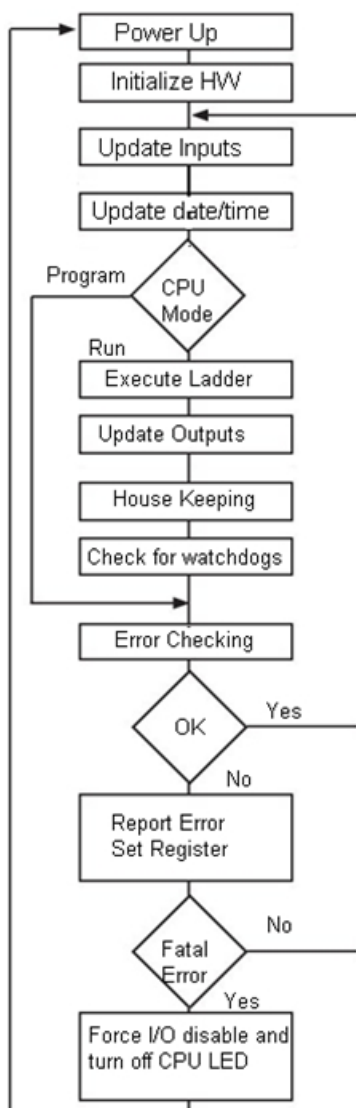
A good understanding of the EZ TouchPLC's CPU operating sequence will help you achieve the proper control for your equipment or process. The flow chart on the left shows how the CPU controls all aspects of system operation.

Power-up Initialization

On 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. 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 EZ TouchPLC'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.

Execute Logic Time

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.

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 image 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.
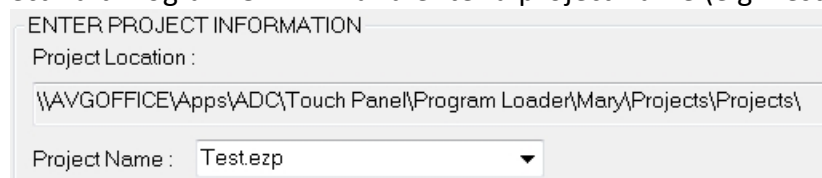
Subroutines

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.

Editing IP Address

This section applies only to the units purchased with Ethernet capabilities. Units with Ethernet capabilities arrive with a factory-programmed IP Address that may need edited to be compatible with your LAN network. The COM1 Port in combination with the editing software, can be utilized to update the IP Address information. Alternatively, you can download our free IP Config Utility to make the necessary changes to the IP parameters.

Serial Port (COM1) Method

1. Insert a RS-232C cable into the serial port (COM1) and launch the editing software EZPanel Editor.
2. Select Edit Program ON-LINE and enter a project name (e.g. Test). Click OK.

3. Next select EZ-SE Series under Panel Family and then select the appropriate unit size.
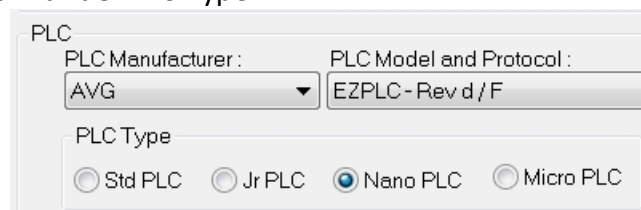
4. Using the drop-down under Select Model, select the model with Ethernet.

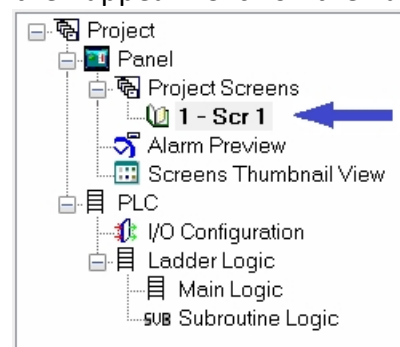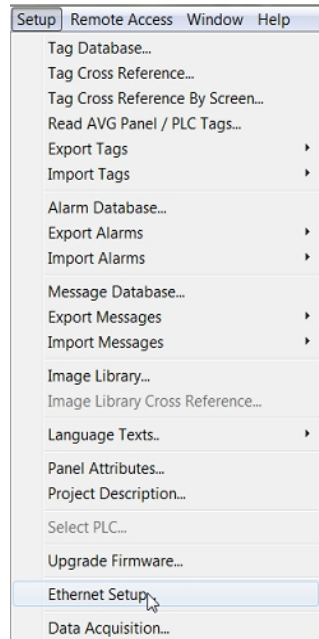5. Select PLC Manufacturer as AVG. This will then allow you to select NanoPLC from under PLC Type.

6. Click OK to launch the editing software program. The Main Project Window will then appear. Click on the Panel side.

7. Click **Set-up** > **Ethernet Set up**. A dialog box will appear displaying the current IP parameters.

8. Once the dialog box appears, select 'Configure Ethernet Attributes.' Type in the necessary changes and click 'Set Ethernet Parameters.' Click OK.
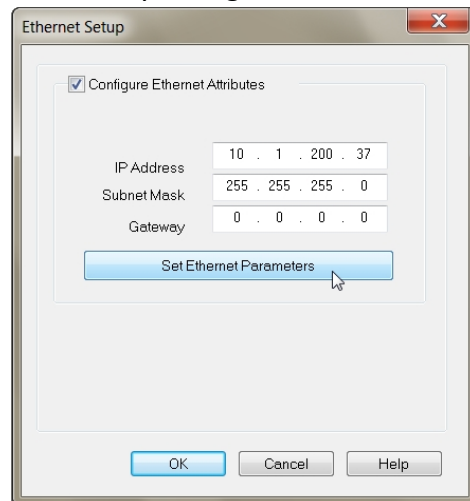

9. Next, save the project.

IP Config Utility Method

The IP Config Utility enables IP parameter editing through the Ethernet connection and allows automatic discovery of AVG devices connected to the local area network (LAN) even if a device's IP address is not on the same subnet. To download this free utility please visit our website at www.ezautomation.net and click on the downloads tab.

1. Install the IP Config Utility.
2. Once installed, launch the software by clicking on its icon or loading it from the Start Menu. A dialog box similar to the one shown below will appear.
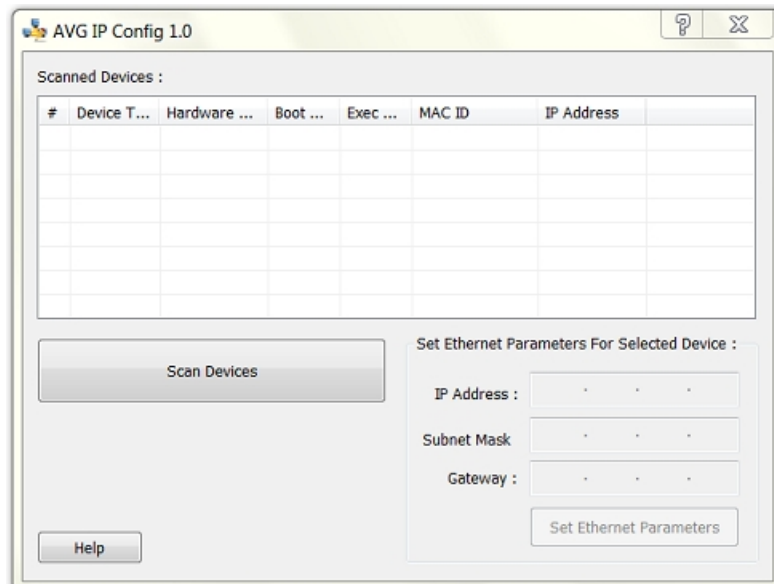
3. Click 'Scan Devices' to locate available AVG devices on the network. While the utility scans, a dialog box will appear temporarily.

Note: If the computer has multiple networks, the utility will prompt you to choose one. Please select the network connected to the EZTouhPLC Nano unit.

4. When the utility is finished scanning, a list of AVG devices will populate the field similar to the example shown below.

5. Next, identify the device in the list that you would like to edit. For example, if you know its current IP address, MAC-ID, or it's the only device of its type, use this information to select it from the list.

Note: The unit typically displays the MAC-ID and current IP address at start up.

6. Once selected, the current IP address information for the unit will appear in the IP address field. Type in the necessary changes.

7. Click 'Set Ethernet Parameters' to save the new values for the device.

Once the IP Address has been adjusted to the LAN, the EZTouch I / O Nano can receive programming instructions through either the serial port (COM1) connection or via the Ethernet.

Programming the EZTouhPLC Nano

Create a Project

This section outlines the basics of creating a project using the EZSeries Editor software. Further programming information, including a complete listing of supported RLL instructions, for the EZTouhPLC Nano is located in the **EZTouch Editor Software Manual** and the **EZPLC Software Manual.**

Launch your Programming Software and select how you would like the program to link to the EZTouhPLC Nano unit. For this scenario, you can select 'Edit Program OFF-LINE.' This will enable you to create a program without having the EZTouhPLC Nano unit connected through the serial port.

1. Enter a project name (e.g. Test). Click OK.

2. Select EZ-SE Series under Panel Family and 6" for size.

3. Using the drop-down under Select Model, select whether or not, your unit has Ethernet capabilities.

Select Model   6" SE Series (with Ethernet)
                6" SE Series (w/o Ethernet)
                6" SE Series (with Ethernet)

4. Select PLC Manufacturer as AVG. This will then allow you to select NanoPLC from under PLC Type.

PLC
PLC Manufacturer :   PLC Model and Protocol :
AVG   EZPLC - Rev d / F
PLC Type
○ Std PLC   ○ Jr PLC   ● Nano PLC   ○ Micro PLC
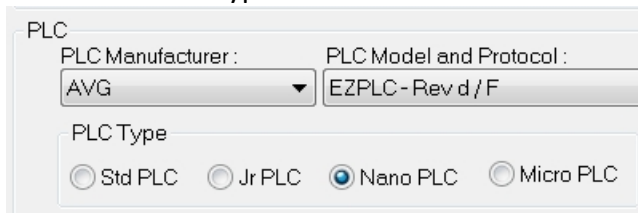
5. Click OK to launch the editing software program. The Main Project Window will then appear. The steps below outline how to create a sample PLC Ladder Logic program.

Create PLC Program: Click on "PLC" and select "Main Logic" to start creating a sample PLC Ladder Logic program as described in the example below.
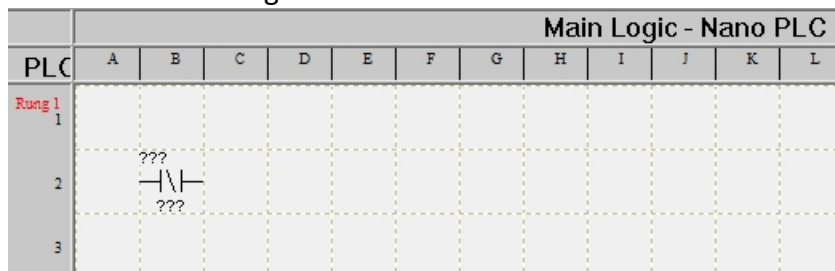
1. Select the "Relay/Boolean" type instruction set in the instruction toolbar (located on the right side of the programming screen). Click on "NO Contact."
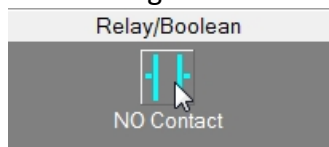
2. Click on the main ladder logic programming window to place the instruction as shown in the image below.

3. Once placed, double-click on the icon and enter the tag name as "Start." Click OK.
4. A new dialog box will appear asking for the PLC address (memory location). Enter "S1" in the field to the right of "Address String." The Data Type should be marked as DISCRETE. Click OK.
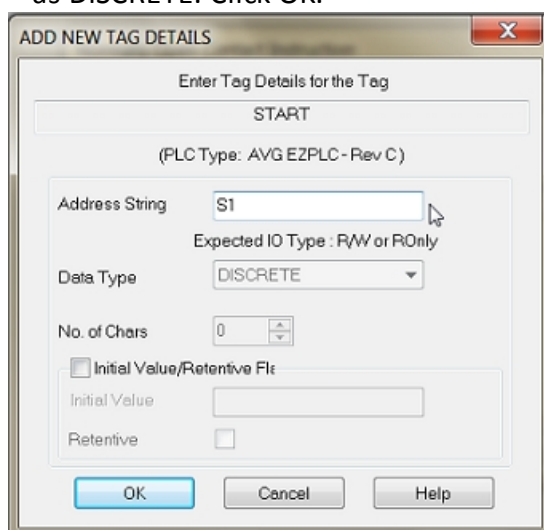
5. Similarly, click on "NO Coil" under the Relay/Boolean instructions and place the instruction in the ladder logic programming window. Double-click the icon to select

the tag name as "Button."

6. Once again, a dialog box will appear. Enter "O1" as the address string. Click OK.
7. Click on **Instructions** > **Line** to wire "NO Contact" and "NO Coil."

Your screen should look like this when finished:

Create a Panel Program: Click on "Panel" and "Scr 1" to create the Panel display screen as explained in the sample below.

1. In the Main Menu, click on **Objects** > **Buttons** > **Buttons**. The screen below will appear. Enter **BUTTON** for Tag Name. Click OK.
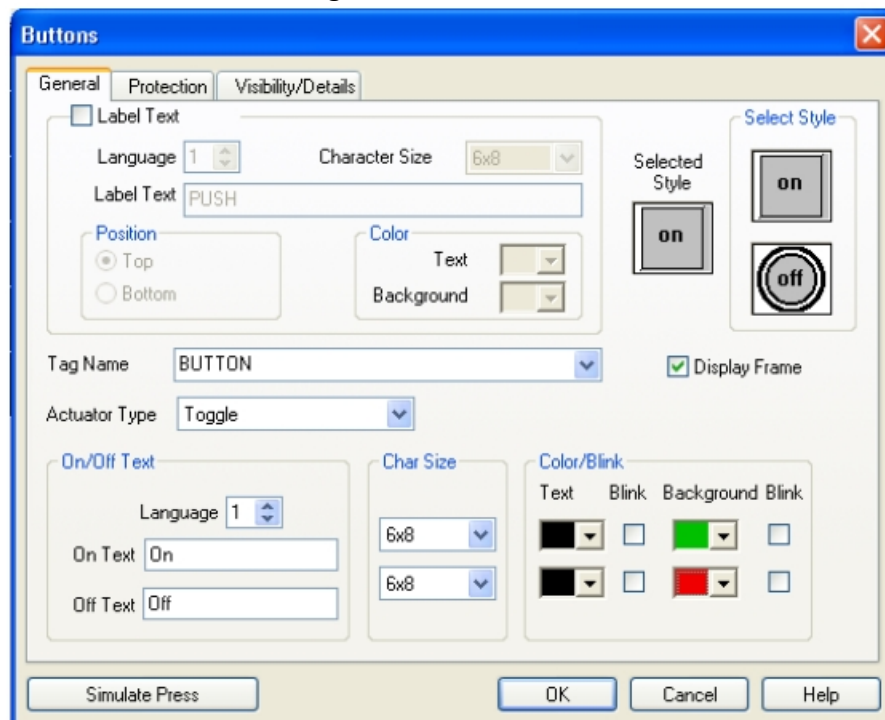
2. A dialog box will appear requesting the memory location. Enter "S1" in the field to the right of "Address String." The Data Type should be marked as DISCRETE. Click OK.

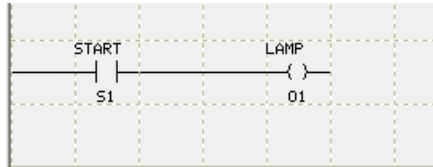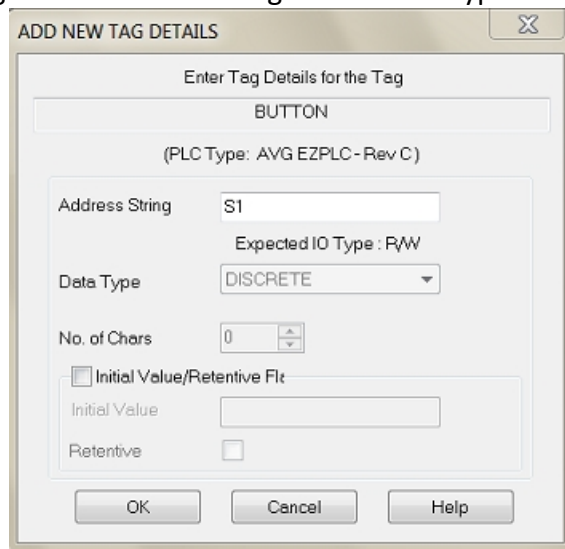3. Click anywhere on the screen to place the Button object. Double click the icon to open its object dialog box if you need to make any adjustments to the object's

appearance or attributes. Clicking "Simulates Press" will allow you to toggle between On and Off states.
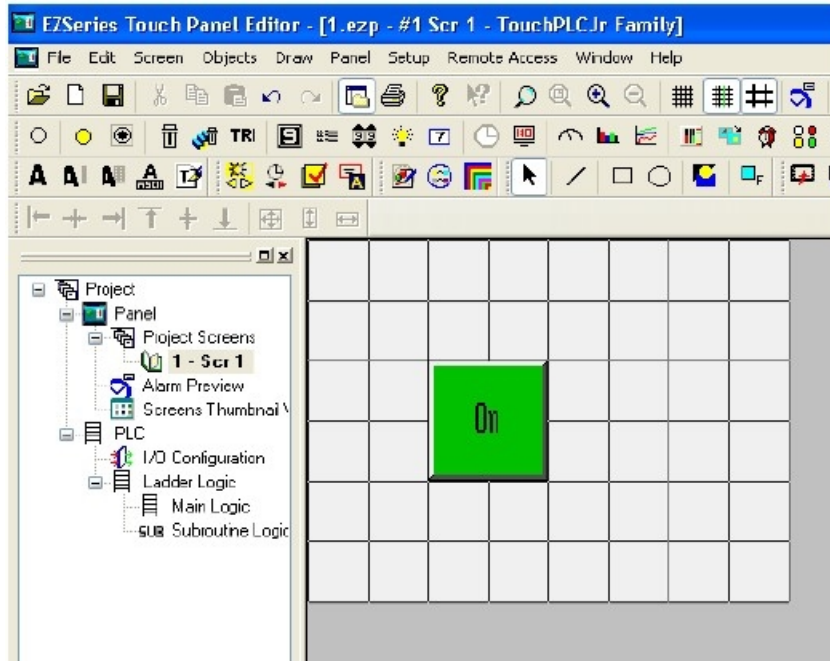
4. Similarly, you can create an Indicator Light Object by selecting **Objects** > **Buttons** > **Indicator Buttons**. Enter **O1** for Tag Name. Click OK. Place the object on the panel. Your screen should look like the picture below.
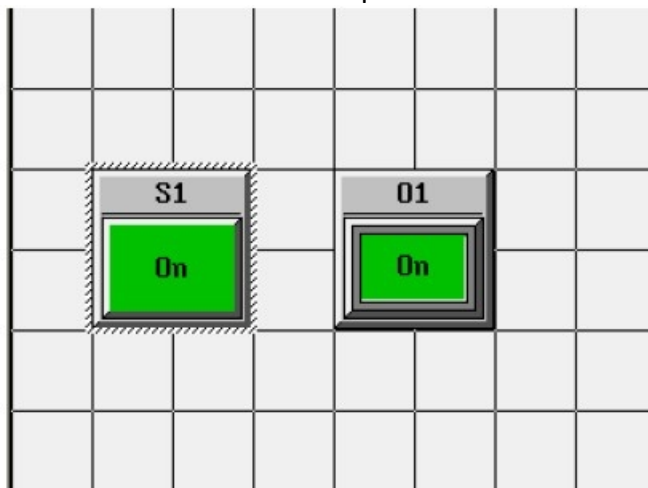
Transfer a Project

After a project is complete, the next step is to transfer the project to the EZTouhPLC Nano. When editing projects online, programming information is automatically sent to the EZTouhPLC Nano unit once the project is saved.   When editing in an off-line mode, the project information will need to be transferred.   To transfer the project follow the steps outlined below:

From the Project drop down menu, select **File** > **Transfer to Panel**. A dialog box similar to the one below will appear.

1. Verify the RS-232C cable (**P/N: EZ-PGMCBL**) is connected between the unit and the PC. In the absence of an RS-232 port on the PC, a USB to RS-232 converter may be used to connect the programming cable to the PC.

   Note: The recommended USB to Serial converters are ATEN-UC-232A or Belkin-F5U409.

2. Select *Serial (COM1)* as method of transfer under PC to Panel Connection. And then click *Start*.

When finished, a Transfer Completed message will be displayed. Click OK to continue and the project is now transferred.

High Speed Counter

Overview

The NanoPLC and MicroPLC possess the following new High Speed Counter feature. High speed counting allows either two 32-bit up counters, or one 32-bit up-down counter, or one 32-bit quadrature encoder. These features involve use of newly added SR registers and SD bits. Both the NanoPLC and MicroPLC have a maximum count frequency of 40KHz.

The following table summarizes the availability of these features for various models:

Feature	Nano	Micro
Program Loader	PLC Editor 1.8.6, uwin2.0.11, ezpanel 5.10.11	
Firmware	c.3.75 or above	
Counter function		
Up Counter	2x32 bit (Counter A Input on I15 Counter B Input on I16)	2x32 bit (Counter A Input on I23 Counter B Input on I24)
Up/Down Counter	1x32 Bit (Counter A Input on I15 Direction Input on I16)	1x32 Bit (Counter A Input on I23 Direction Input on I24)
Quadrature Encoder	1x32 bit Quadrature A on I15 Quadrature B on I16 (Increasing counts when A leads B)	1x32 bit Quadrature A on I15 Quadrature B on I16 (Increasing counts when A leads B)

SR Registers for high speed counter function

Following table describes the registers used for High Speed counting function:

Register	Description
SR21	Counter configuration word
SR22	Reserved (Do not use)
SR23-SR24	Lower Limit of Quadrature Range (signed 32-bit number)
SR25-SR26	(Upper Limit+1) of Quadrature Range (signed 32 bit number)
SR27-SR28	Counter A Counts (signed 32 bit number)
SR29-SR30	Counter B Counts (signed 32 bit number)
SR31-SR32	Setpoint 1 for Counter A (signed 32 bit number)
SR33-SR34	Setpoint 2 for Counter A (signed 32 bit number)

Lower and Upper Limits:
User programs these registers as per their requirements. As an example, if you would like to count from 0 to 359, set lower limit register to 0, and upper limit register to 360 (i.e. 359+1).

- When count value equals the Lower Limit, the next input to decrease the counts would rollover the count value to Upper Limit value.

- When count value equals to the Upper Limit, the next input to increase the count would roll over the count value to Lower Limit.

SD bits for high speed counter function

Following SD bits have been used for counter functions:

Bit	Description
SD15	Pause Counter A
SD16	Pause Counter B
SD17	Reset Counter A
SD18	Reset Counter B
SD19	Setpoint 1 Match Bit: The Bit is set whenever Counter A is greater than or equal to Setpoint 1 Whenever the bit goes from 0 to 1 (clear to set), the PLC executes logic programmed in the interrupt routine.
SD20	Setpoint 2 Match Bit: The Bit is set whenever Counter A is greater than or equal to Setpoint 2 Whenever the bit goes from 0 to 1 (clear to set), the PLC executes logic programmed in the interrupt routine.

CPU Memory

Memory Types

A PLC system handles many numbers representing different types of information regarding processes/machine parameters. These processes/machine parameters may be anything from status of the input or output devices, timers/counters, or other data values. Before you start programming the EZTouhPLC Nano, 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 process in their PLCs.

The Mapping Conventions section outlines the specific memory types used in the EZTouhPLC Nano in greater detail. The memory types can be used to store a variety of information and can be used within 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.

Since the EZTouhPLC Nano relies on flash memory, the only values saved during a power loss are the ones associated with the registers/discretes that are retained during a power cycle. The specific registers/discretes available on a power cycle are listed in the table below. The following table also displays all the Register/Discrete types supported by the EZTouhPLC Nano Nano along with their address range, syntax etc.

| EZTouhPLC Nano Memory Map					

SYNTAX: TAAAA
 	
  T - TYPE
 	
  AAAA - Address of Memory Type in Decimal					

MEMORY TYPE	ADDRESS RANGE	I/O TYPE	VALUE TYPE	SYNTAX EXAMPLES	DISCRETES / REGISTERS RETAINED ON POWER CYCLE
I- Discrete Inputs	1-128	READ_ONLY	DISCRETE	I5	NONE
O- Discrete Outputs	1-128	READ_WRITE	DISCRETE	O6	O1- O32
S- Discrete Internals	1-1024	READ_WRITE	DISCRETE	S4	S1- S128
IR- Input Register	1-64	READ_ONLY	WORD	1R3	NONE
OR- Output Register	1-64	READ_WRITE	WORD	OR2	OR1 - OR64
R- Register Internals	1-8192	READ_WRITE	WORD	R100	R1 – R256
SR- System Registers	1-64	READ_WRITE	WORD	SR1	SR1 –SR64
SD- System Discrete	1-64	READ_WRITE	DISCRETE	SD10	SD1 –SD64
XR- Index Registers	1-4	READ_WRITE	WORD	XR10	NONE
#R – Value Registers	1-4	READ_WRITE	WORD	#R6	#R1 - #R4
Note: Does not Support Access to a Bit of Word (E.g.: R100/ 0, R100/5…etc)					

Please Note: Since the PLC Editor is a common programming platform for all the models offered by the AVG PLC family, it may allow you to include 128 Inputs (I), 128 Output (O), 64 input Registers (IR) and 64 Output Registers (OR) in the main logic. However, the EZTouhPLC Nano only physically supports 16 inputs and 8 outputs; hence it is recommended that you only use I1- I16 and O1-O8 while programming the Nano. The remaining O bits may be used as "Scratch bits" . Similarly, only IR1-IR4 and OR1- OR4 should be used to address the I/O Registers, while the rest of the Output Registers may be used as "Scratch Registers" . Although there are 64 System Registers (SR) and 64 System Discretes (SD) available in the programming software, some of them are preassigned a function.

Mapping Conventions

Discrete Inputs/Outputs

Discrete Inputs

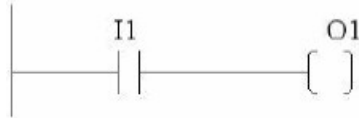Discrete Inputs are denoted using an "I" pre-fix (e.g. I1, I4, etc.). The maximum number of physical Inputs available in an EZTouhPLC Nano is 16. Hence, you may only use I1 – I16 in your main logic. Discrete inputs are Read only type.
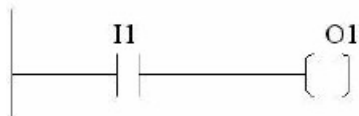
Note: All the discrete type EZ Inputs are mapped to Discrete Input bits. In the example above, the output bit O1 will be turned on when input I1 allows power through the rung.

Discrete Outputs

Discrete Outputs are denoted using an "O" pre-fix (e.g. O1, O4, etc.). The maximum number of programmable Outputs available is 1 through 128. Although, the number of discrete physical outputs available in an EZTouhPLC Nano is 8, the remaining "O" registers can be used as 'Scratchbits   ' in the main logic. Discrete Outputs are Read-Write type.

Note: All the discrete type EZ Outputs are mapped to Discrete Outputs bits.

Word Inputs/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 EZ Analog Inputs (if available) are mapped to Input Registers.

Output Register (Word)

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

Note: All the EZ Analog Outputs (if available) are mapped to Output Registers.

Internals

Discrete Internals (Discrete)

Discrete Internals are denoted using "S" pre-fix (e.g. S1, S4, etc.). There are 1024 Discrete Internals available in the EZTouhPLC Nano. Discrete Internals are Read-write type and are used as "Scratchbits"   . Discrete internal bits are mainly used to control the user logic program. They do not represent a real physical device, like a switch, output coil, etc. They are only internal to the CPU. You cannot program discrete internals as discrete inputs or discrete outputs for the
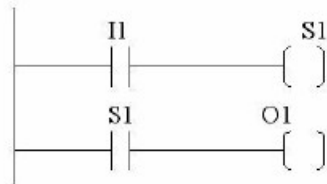
Note: In this example, memory location S1 will be powered when input I1 turns on; you can then use a discrete internal as an input in another rung.

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 EZTouhPLC Nano. R are Read-Write type of data registers.

System

System Discretes (Discrete)

System Discretes are denoted using an "SD" prefix (e.g. SD1, SD4, etc.). SDs are discrete memory locations with pre-assigned functionality. There are many different types of System Discretes. They are used to help in logic program development, provide system operating status info and more.

System Registers (Word)

System Registers are denoted using an "SR" prefix (e.g. SR1, SR4, etc.). These are 16-bit Word data types (registers). System registers are Read-Write type data points.

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 EZTouhPLC Nano. "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" prefix (e.g. #R1, #R2 etc.). There are 4 #R memory locations available in EZTouhPLC Nano. "#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.

Maintenance and Troubleshooting

Hardware Maintenance

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

The key points to be checked include:
· Ambient operating conditions
· Wiring and connections

Maintaining the Ambient Operating Conditions

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

1. Always ensure that ambient temperature inside the cabinet is within EZTouhPLC temperature ratings.

2. If any other equipment inside or outside of the cabinet is producing heat, employ cooling methods like a blower fan to reduce 'hot spots' around the EZTouhPLC Nano

3. Periodically inspect and clean if there are any air filters on the cabinet. Ensure that the PLC is free from dust, humidity and corrosive gases.

Error Checking Process

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

Fatal Errors

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

Non-Fatal Errors

These errors just need your attention and are not detrimental to PLC operation. Unlike fatal errors, the PLC will continue in Run mode despite an occurrence of non-fatal errors. When you identify such errors, you can proceed with an orderly shutdown and take the required corrective action. An example of non-fatal error is – a minor programming error.

Changing the Battery

The unit comes with a built in Lithium coin cell battery with a 5 year life expectancy. The steps below outline the process to change the battery in the inside the units. Since only the information saved to the registers/discretes available on a power cycle will remain intact, please save pertinent information before attempting to change the battery. Then remove power from the unit.

1. Open the back cover to access the battery.
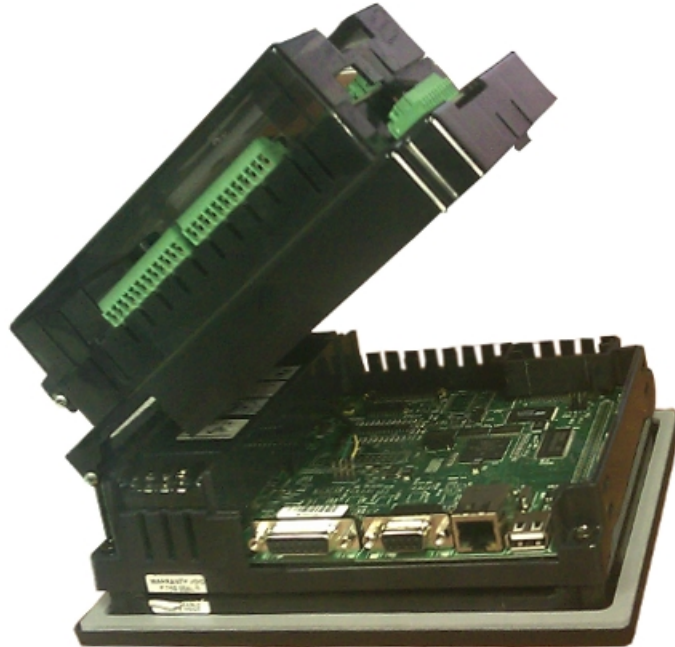
2. The battery is located in the upper-left hand corner as shown in the figure below. Remove the old battery and replace with a new 1/2 AA, 3.6 V Lithium Battery (Part Number: **EZP-BAT**).

3. Close rear cover and ensure that the door latches.
4. Reconnect power source. Connect to PC and run the Programming Software to transfer back the user program to the TouchPLC.

The Real Time Clock (RTC) will need reset after the battery has been replaced. All information saved to the registers/discretes available on a power cycle will remain intact. Data not saved to registers/discretes available during a power cycle will be lost. For information on registers/discretes available during a power cycle, please review this table.

Indicator Light

Indicator Light Status

Indicator Light	Status Description	Possible Error
Blinking Red	PLC running in Boot Mode only	Missing firmware / Outdated firmware installed
Blinking Red and Green	Data abort Power cycle	Bad or corrupted program
Red	PLC locked up	Hardware trouble
Blank - No Light	No program loaded or PLC in "Stop Mode"	Power source not connected or inadequate
Green	Program loaded and running	
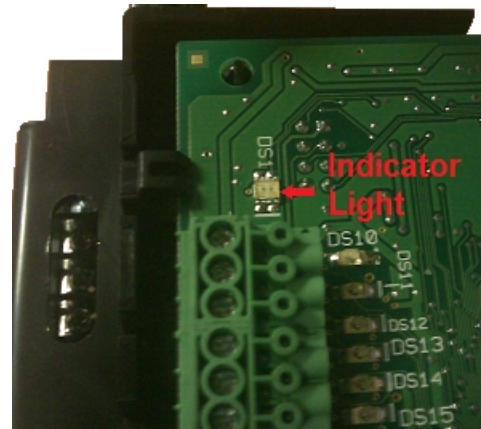
Troubleshooting

If you encounter difficulties while using our EZTouhPLC Nano device, please consult the table below. Additional assistance is also available within the **EZTouch Editor Software Help**. Alternatively, you may also find answers to your questions in the operator interface section of our website @ www.ezautomation.net.

Problem		Possible Cause	Suggested Action
Operation	CPU Status LED is off	Disconnected or faulty power source	Check and repair power source.
			Check the wiring for loose contacts and secure them if found.
			Ensure that proper polarity is observed.
		Input power level is outside of TouchPLC's power rating specifications	Ensure that the power being presented to the PLC terminal is within the specified range.
	CPU LED is blinking red and green	Bad or corrupted program	Check the logic program
			Pay special attention to Program Control Instructions and make sure there is a Next or Return statement at the end of Jump and Subroutine Instructions
	CPU LED is red	Electrical Noise	Power cycle the PLC once to see if an intermittent high frequency noise has caused the failure.
			Follow instructions to avoid electrical noise.
			Consider installing an Isolation Transformer if you think the noise is making its way through the Power source.
			Check to ensure that RS232 signal GND is not connected to Earth ground and the shield is

			connected to Earth ground on both sides.
			If problem persists, call AVG Automation for assistance.
Communication	No communication with EZTouhPLC Nano	Disconnected or loose cable	Check the wiring for loose contacts and secure them if found.
			Ensure you are using a correct communication cable.
	No communication with the PC (RS232 Port error)	Wrong/broken cable	Ensure the correct communication cable is being used (PGMCBL).
		Wrong communication port settings	Check and correct the COM port attributes.
			Open the PLC Editor and click on the configuration button
		Wrong COM port assignment on the computer	Check if correct Serial Port (COM1) of the computer has been selected.

Still Need Help?

Technical Support

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

Warranty Repairs

If your EZTouhPLC Nano is under warranty, contact us at 1-877-774-EASY.

Out of Warranty Services

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