

INSTALLATION AND WIRING



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Safety Guidelines



NOTE: Products with CE marks perform their required functions safely and adhere to relevant standards as specified by CE directives, provided they are used according to their intended purpose and that the instructions in this manual are followed. The protection provided by the equipment may be impaired if this equipment is used in a manner not specified in this manual. A listing of our international affiliates is available on our Web site at <http://www.automationdirect.com>.



WARNING: Providing a safe operating environment for personnel and equipment is your responsibility and should be your primary goal during system planning and installation. Automation systems can fail and may result in situations that can cause serious injury to personnel or damage to equipment. Do not rely on the automation system alone to provide a safe operating environment. You should use external electromechanical devices, such as relays or limit switches, that are independent of the PLC application to provide protection for any part of the system that may cause personal injury or damage. Every automation application is different, so there may be special requirements for your particular application. Make sure you follow all national, state, and local government requirements for the proper installation and use of your equipment.

Plan for Safety

The best way to provide a safe operating environment is to make personnel and equipment safety part of the planning process. You should examine every aspect of the system to determine which areas are critical to operator or machine safety. If you are not familiar with PLC system installation practices, or your company does not have established installation guidelines, you should obtain additional information from the following sources.

- NEMA — The National Electrical Manufacturers Association, located in Washington, D.C., publishes many different documents that discuss standards for industrial control systems. You can order these publications directly from NEMA. Some of these include:
 - ICS 1, General Standards for Industrial Control and Systems
 - ICS 3, Industrial Systems
 - ICS 6, Enclosures for Industrial Control Systems
- NEC — The National Electrical Code provides regulations concerning the installation and use of various types of electrical equipment. Copies of the NEC Handbook can often be obtained from your local electrical equipment distributor or your local library.
- Local and State Agencies — many local governments and state governments have additional requirements above and beyond those described in the NEC Handbook. Check with your local Electrical Inspector or Fire Marshall office for information.

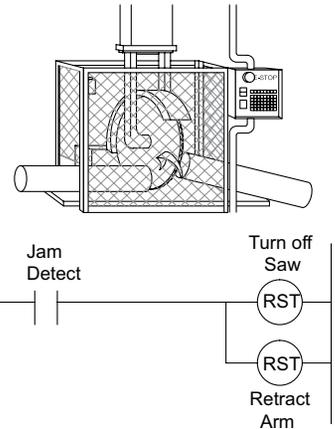
Three Levels of Protection



WARNING: The control program must not be the only form of protection for any problems that may result in a risk of personal injury or equipment damage.

The publications mentioned provide many ideas and requirements for system safety. At a minimum, you should follow these regulations. Also, you should use the following techniques, which provide three levels of system control.

1. Orderly system shutdown sequence in the PLC control program
2. Mechanical disconnect for output module power
3. Emergency stop switch for disconnecting system power



Orderly System Shutdown

The first level of fault detection is ideally the PLC control program, which can identify machine problems. These types of problems are usually things such as jammed parts, etc., that do not pose a risk of personal injury or equipment damage. However, respective shutdown sequences should be performed.

System Power Disconnect

You should also use electromechanical devices, such as master control relays and/or limit switches, to prevent accidental equipment startup at an unexpected time. These devices should be installed in a manner that will prevent any machine operations from occurring.

For example, if the machine in the illustration has a jammed part, the PLC control program can turn off the saw blade and retract the arbor. If the operator must open the guard to remove the part, you should also include a bypass switch that disconnects all system power any time the guard is opened.

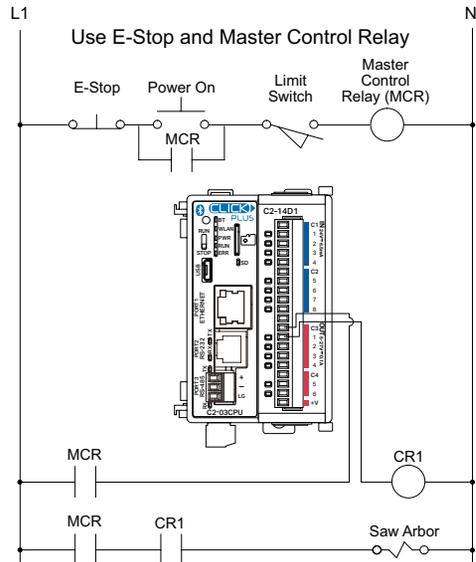
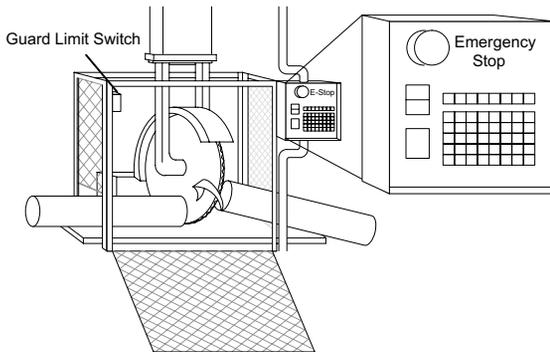
Emergency Stop Circuits

Emergency stop (E-Stop) circuits are a critical part of automation safety. For each machine controlled by a PLC, provide an emergency stop device that is wired outside the PLC and easily accessed by the machine operator.

E-stop devices are commonly wired through a master control relay (MCR) or a safety control relay (SCR) that will remove power from the PLC I/O system in an emergency.

MCRs and SCRs provide a convenient means for removing power from the I/O system during an emergency situation. By de-energizing an MCR (or SCR) coil, power to the input (optional) and output devices is removed. This event occurs when any emergency stop switch opens. However, the PLC continues to receive power and operate even though all its inputs and outputs are disabled.

The MCR circuit could be extended by placing a PLC fault relay (closed during normal PLC operation) in series with any other emergency stop conditions. This would cause the MCR circuit to drop the PLC I/O power in case of a PLC failure (memory error, I/O communications error, etc.).



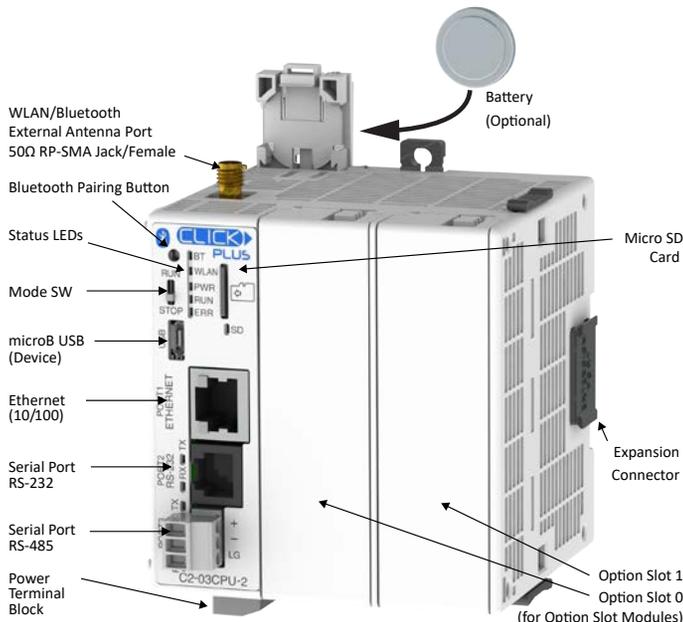
WARNING: For some applications, field device power may still be present on the terminal block even though the PLC is turned off. To minimize the risk of electrical shock, remove all field device power before you expose or remove PLC wiring. The connector is designed for easy removal by hand.

Introduction to the CLICK PLUS PLC Mechanical Design

CLICK PLUS PLC Units

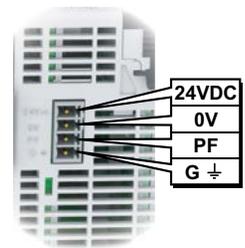
All CLICK PLUS PLCs are similar in appearance. Please see the diagrams below to familiarize yourself with the PLC features. The main components located on the front of the PLC are a Run/Stop switch, communications ports, micro SD card slot, LED status indicators and the Option Slot expansion port. A removable 4-pin 24VDC input power connector is located on the bottom of the PLC. Some models include an RP-SMA antenna port on the top of the PLC. The I/O module extension port is located on the right side of the PLC case. See Mounting Guidelines in this chapter for module dimensions and Chapter 2 for CLICK PLUS PLC specifications.

Component Locations on CLICK PLUS PLC Units



NOTE: High-speed Inputs and Outputs are only available on Slot 0.

CPU is shown with optional C2-FILL Option Slot Covers installed.



Bottom view same for all PLC's

CLICK PLUS Option Slot Modules

All CLICK PLUS PLCs include one or two built-in expansion slots, designated Option Slots. The first Option Slot (Slot 0) has access to the PLC's high-speed bus. Three Intelligent Module and seventeen different Option Slot I/O modules are available, divided into five types, as shown below.

Discrete input sections of the modules are identified with a blue bar, and discrete output sections are identified with a red bar. Analog input and output terminals are identified by "AD" and "DA" prefixes to the terminal names, respectively.

See Mounting Guidelines in this chapter for module dimensions and Chapter 2 for CLICK Option Slot module specifications.

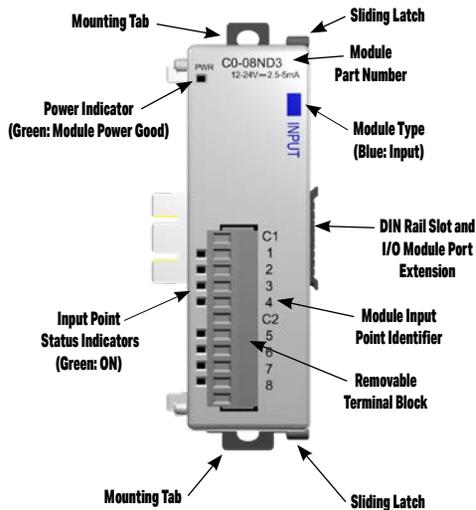
<i>Discrete I/O Modules</i>	<i>Discrete & Analog I/O</i>			<i>Intelligent Modules</i>
	<i>Current I/O Modules</i>	<i>Voltage I/O Modules</i>	<i>Current/Voltage I/O Modules</i>	
C2-14D1	C2-08D1-6C	C2-08D1-6V	C2-08D1-4VC	C2-DCM
C2-14D2	C2-08D2-6C	C2-08D2-6V	C2-08D2-4VC	C2-NRED
C2-14DR	C2-08DR-6C	C2-08DR-6V	C2-08DR-4VC	C2-OPCUA
C2-14AR	C2-08AR-6C	C2-08AR-6V	C2-08AR-4VC	
C2-14TTL				

CLICK I/O Modules

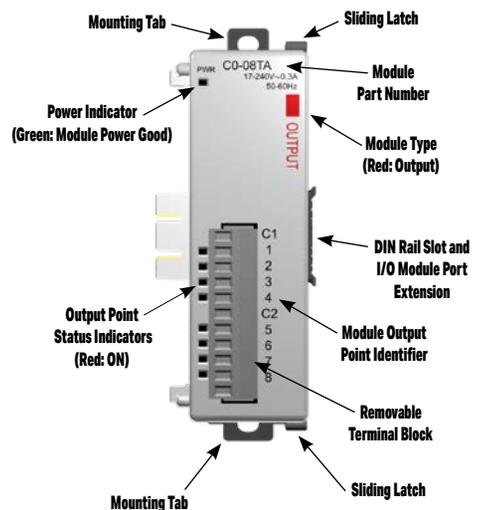
All CLICK PLC system input and output modules are compatible with the CLICK PLUS PLC. Several different types of I/O modules are available. Please see the diagrams below to familiarize yourself with the I/O module features.

Each I/O module is identified as an Input or Output module on its front panel using the color coding scheme listed below. Up to eight I/O option modules can be connected to a CLICK PLC. See Mounting Guidelines in this chapter for module dimensions and Chapter 2 for CLICK I/O module specifications.

Input Modules



Output Modules



CLICK Power Supplies

All CLICK PLUS PLCs require 24VDC input power from either a CLICK power supply or other suitable external power supply. Two models of CLICK power supplies are available to supply power to the PLC and I/O modules.

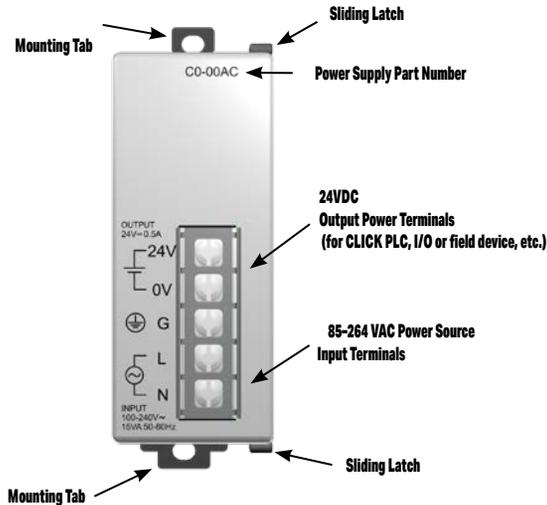
- C0-00AC - 0.5 A @ 24VDC output
- C0-01AC - 1.3 A @ 24VDC output

Select a power supply based on the power requirements of your system components. See Mounting Guidelines in this chapter for module dimensions and Chapter 2 for CLICK power supply specifications.

Power wires must be connected from the output terminals on the front of the power supply to the input power connector on the bottom of the CLICK PLUS PLC (There is no internal 24VDC power bus to the PLC.) See Mounting Guidelines for additional wiring information.

Only a single CLICK power supply can be attached directly to a CLICK PLUS PLC system. If multiple CLICK power supplies are used, or if other type of power supplies are used, mount them separately from the PLC. For example, the PSP24-DC12-1 DC-DC converter shown below must be mounted separately from the PLC.

C0-00AC and C0-01AC Power Supplies Component Locations



The PSP24-DC12-1 DC-DC converter must be mounted separately from the PLC.

Battery Backup

All of the CLICK PLUS PLC units have a super capacitor to maintain back up data in SRAM. The super capacitor should maintain a backup period of at least 1 hour.

If you need the CLICK PLC unit to maintain data in the SRAM for longer than the above period after the power is shut off, you must install a battery in the CLICK PLC unit.

Use battery part number D0-MC-BAT (not included with the PLC unit; order battery separately). Typical battery life is about 3 years, which includes PLC runtime and normal shutdown periods.



NOTE: Please power off the PLC while installing and/or changing the battery.

To install or replace the D0-MC-BAT battery:

1. Power up the CPU for at least 10 minutes to charge the CPU's capacitor prior to removing the battery. This will retain function memories. We recommend you backup data memory before replacing the battery. Plan to complete the battery replacement within 10 minutes of power off.
2. Power off the CPU.
3. Pull out the battery holder. (This may require a small screwdriver to push in the tab and lift it when the unit is mounted.)
4. Put in a new battery, with the positive (+) polarity side facing the battery holder.
5. Insert the battery holder into the CPU and push it all the way in.
6. Power on the CPU.
7. Make a note of the date the battery was installed. (Battery life is about 3 years.)



The battery backup is now available.



WARNING: Do not attempt to recharge the battery or dispose of it by fire. The battery may explode or release hazardous materials.



TIP: The CLICK PLUS PLC has a feature that indicates the pre-scheduled battery replacement date has passed. In the CLICK programming software, go to the pull-down menu: Setup > Battery backup Setup.

Mounting Guidelines

Environmental Specifications

The CLICK family of PLC products should be stored, installed, and used within their range of environmental specifications, such as storage temperature, operating temperature, humidity, environmental air, vibration, shock, and noise immunity. Certain output module circuit types may have derating curves depending on the ambient temperature and the number of outputs ON. Refer to the I/O module specifications in Chapter 2: *Specifications* for CLICK PLUS PLC environmental specifications and I/O module derating curves.

Agency Approvals

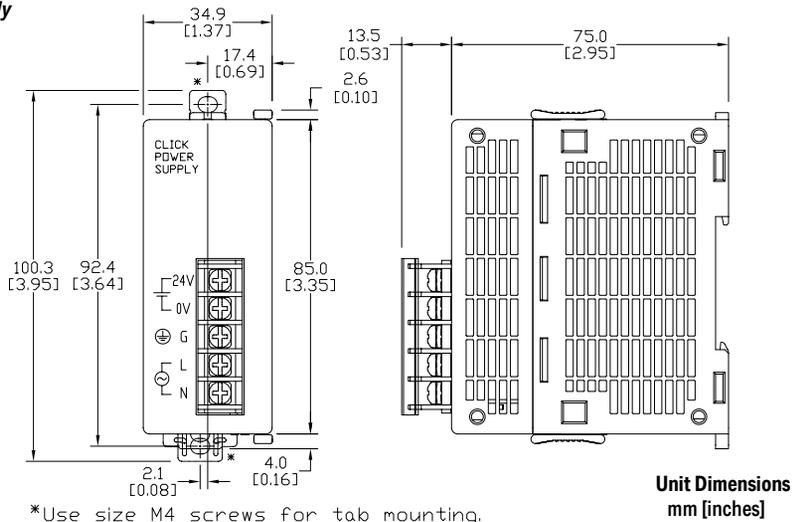
In addition to the panel layout guidelines, other specifications can affect the definition and installation of a PLC system. Always consider the following:

- Environmental Specifications
- Power Requirements
- Agency Approvals
- Enclosure Selection and Component Dimensions

CLICK Unit Dimensions

The following diagrams illustrate the dimensions of the CLICK power supply, CLICK PLUS PLC, Option Slot I/O modules and Stackable I/O modules. The CLICK PLC system is designed to be mounted on standard 35mm DIN rail, or it can be surface mounted. See the following pages for installations and mounting information, including “Mounting CLICK PLUS PLC System on DIN Rail” on page 3-21 for DIN rail and surface-mounting instructions.

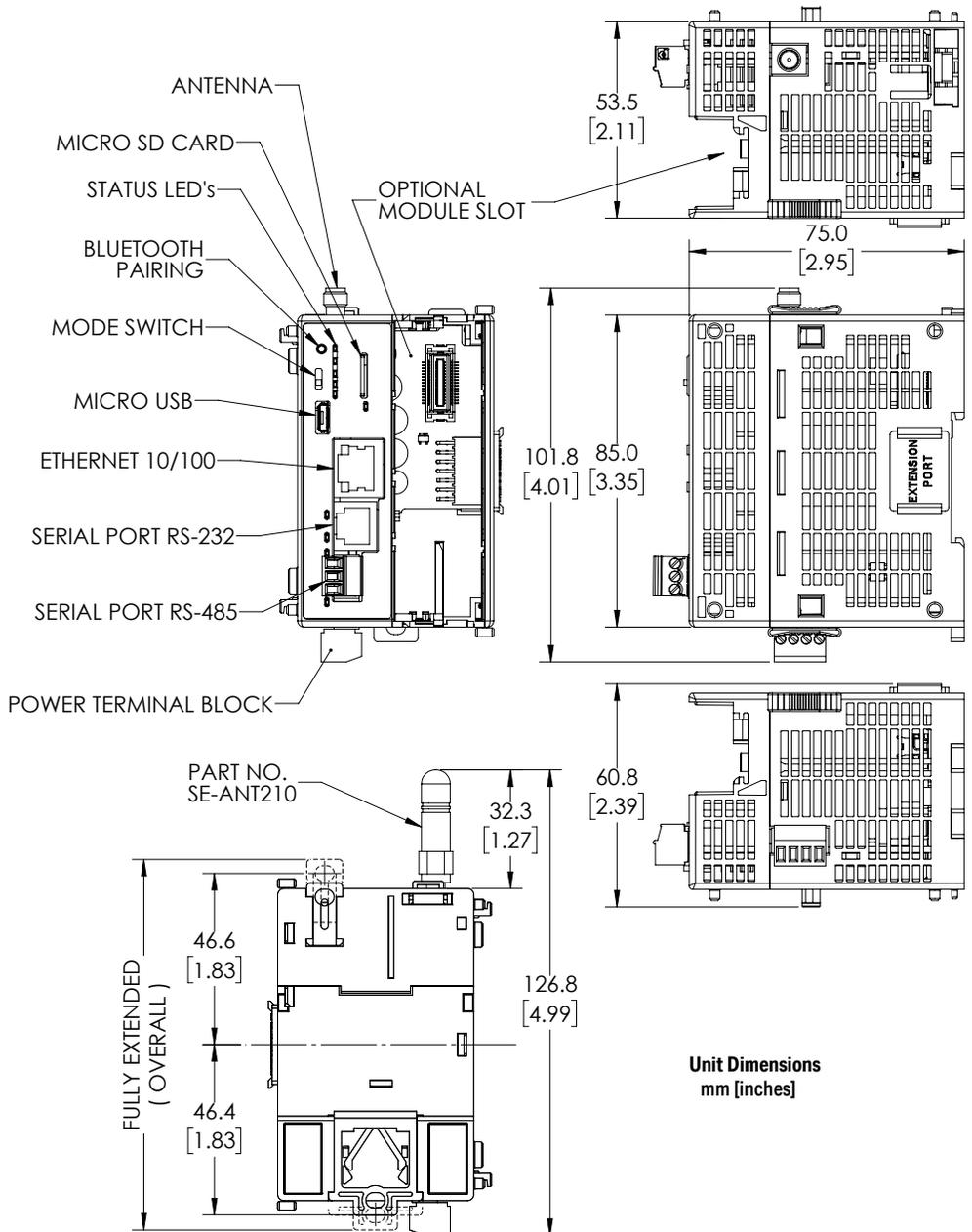
Power Supply



NOTE: The dimensions for the C0-00AC and C0-01AC power supplies are the same.



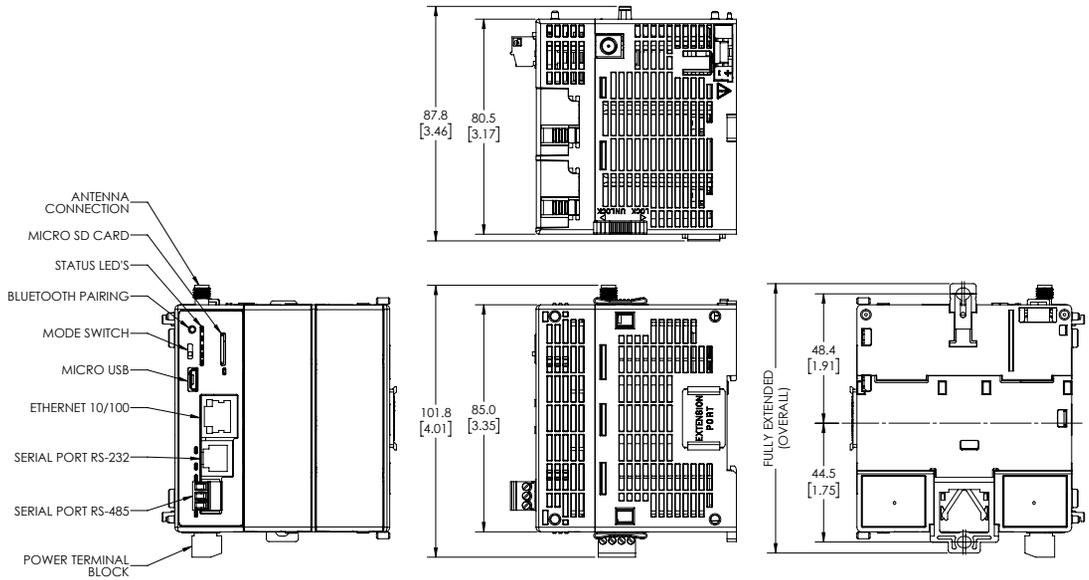
PLC Unit, C0-Series and Single-slot C2-Series



Chapter 3: Installation and Wiring

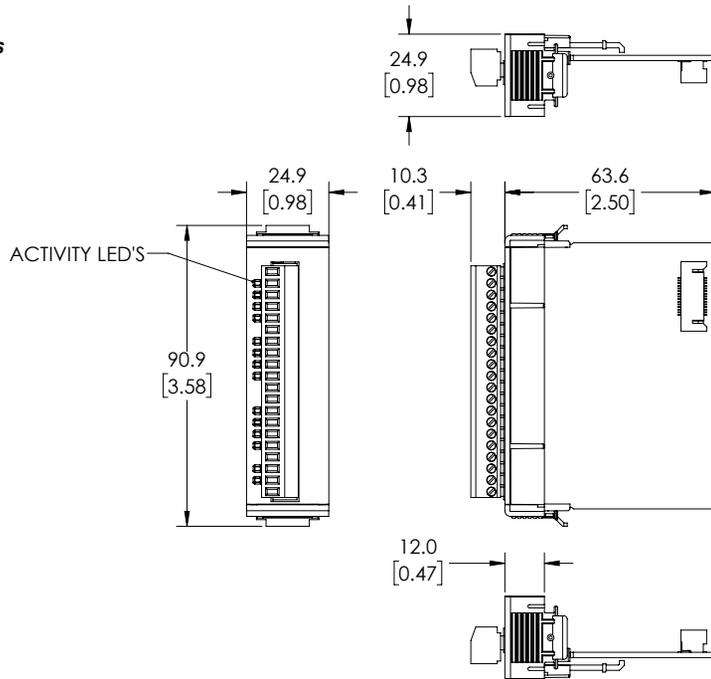
PLC Unit, Dual-slot C2-Series

Unit Dimensions mm [inches]



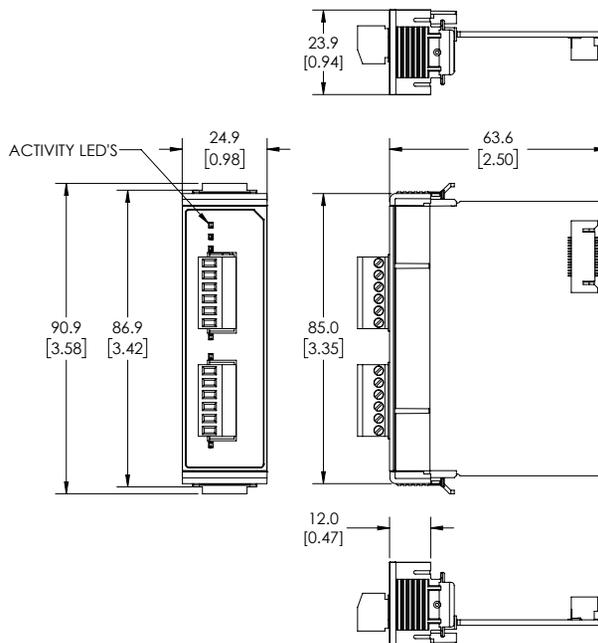
Option Slot I/O Modules

Unit Dimensions
mm [inches]



Option Slot C2-DCM Module

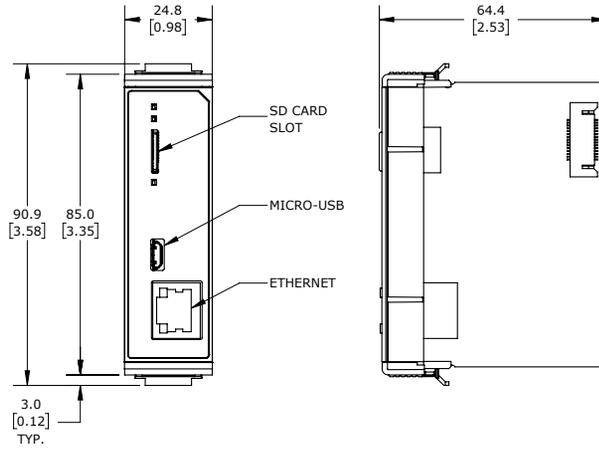
Unit Dimensions
mm [inches]



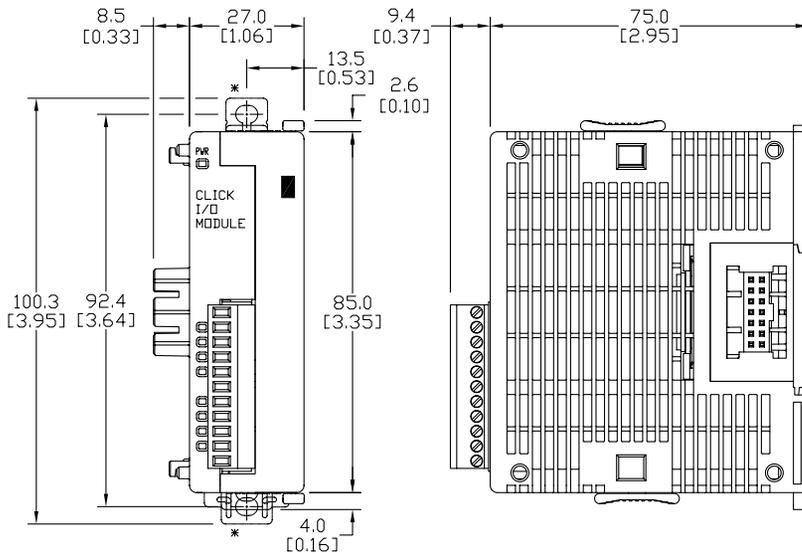
Chapter 3: Installation and Wiring

Option Slot C2-NRED and C2-OPCUA Modules

Unit Dimensions mm [inches]



Stackable I/O Module

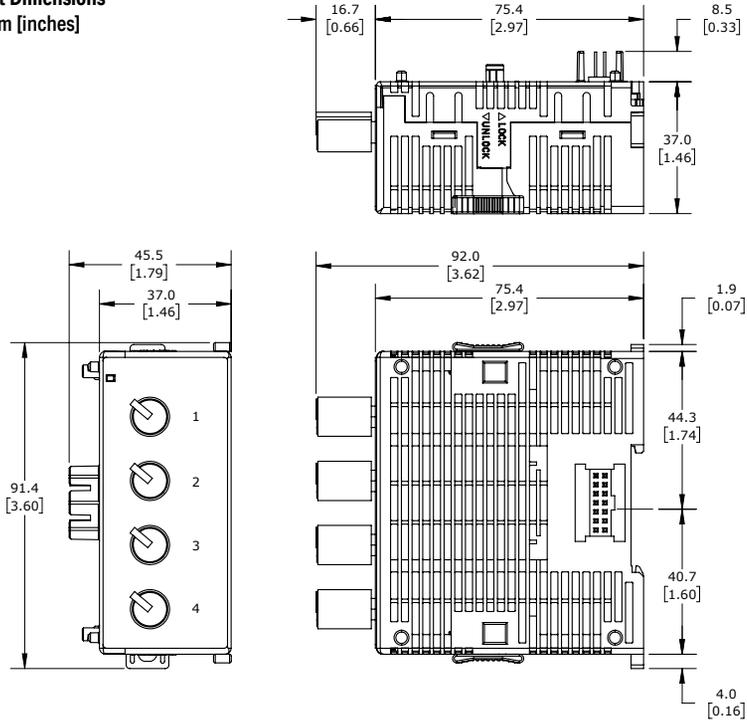


*Use size M4 screws for tab mounting.

Unit Dimensions mm [inches]

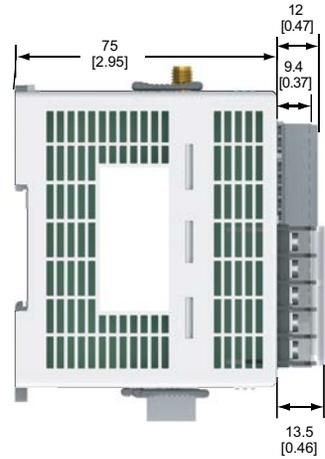
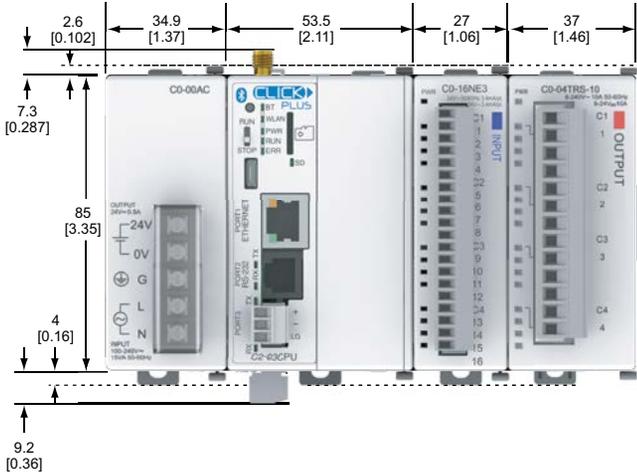
Stackable C0-04POT Module

Unit Dimensions
mm [inches]

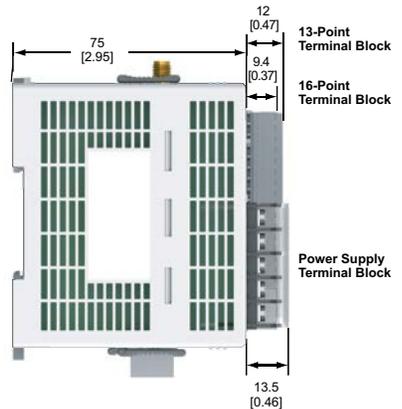
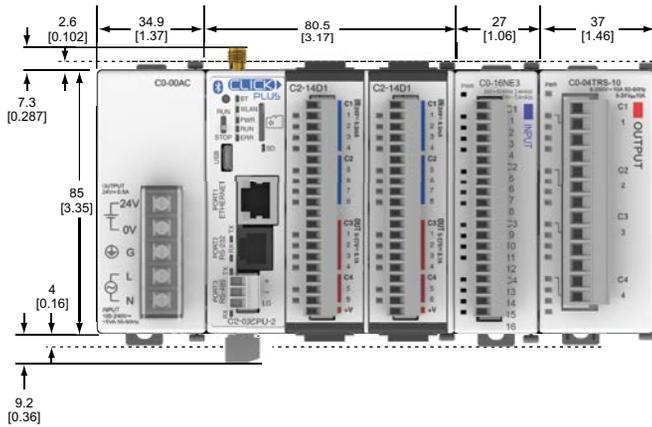


Chapter 3: Installation and Wiring

PLC Unit System

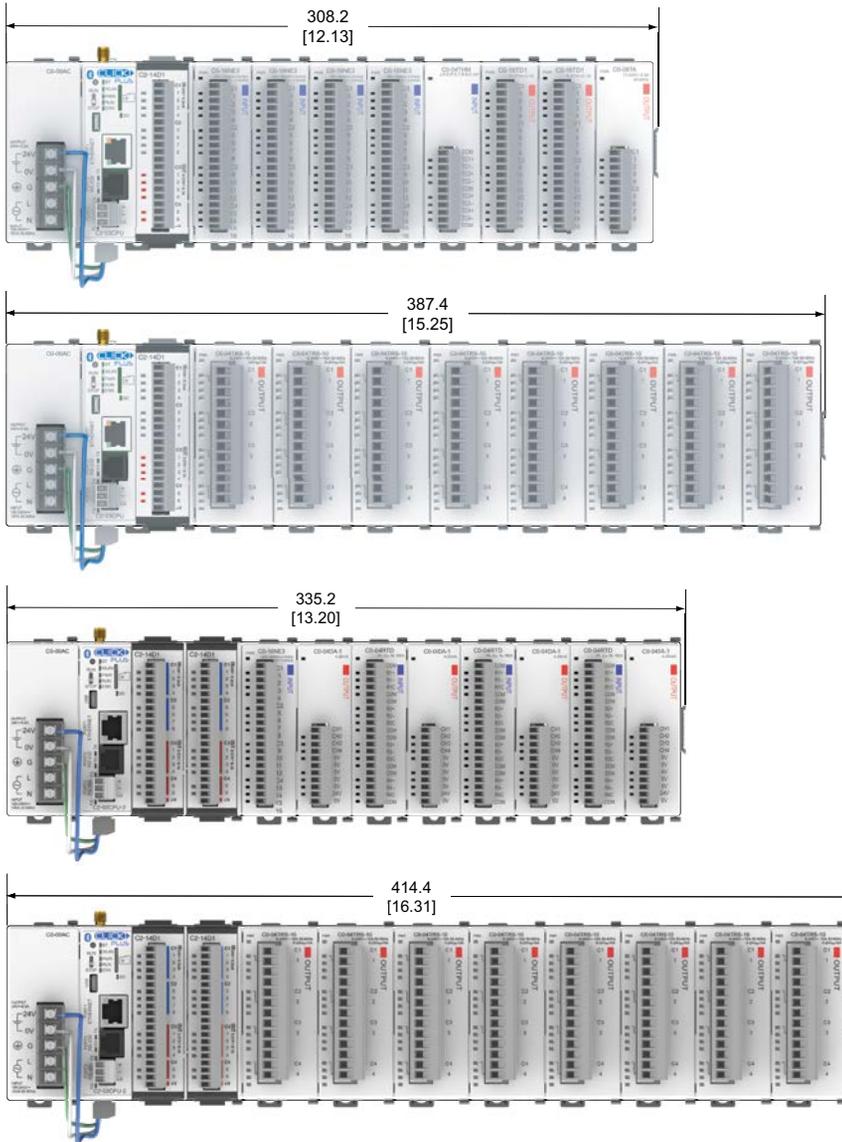


Unit Dimensions
mm [inches]



Maximum system: Power Supply + PLC + eight I/O modules.

Follow the installation guidelines to allow for proper spacing from other components within an enclosure. Note that the relay Stackable modules are each about 10mm wider than non-relay Stackable modules. The diagrams below indicate maximum system width with 8 relay modules and with 8 non-relay modules.



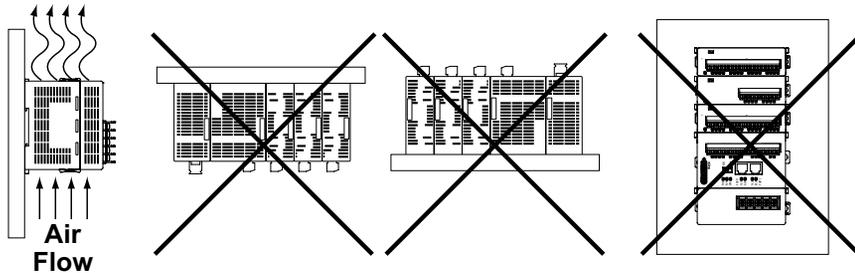
Enclosures

Your selection of a proper enclosure is important to ensure safe and proper operation of your CLICK PLUS PLC system. Control applications vary and yours may require additional considerations. At a minimum your enclosure should include:

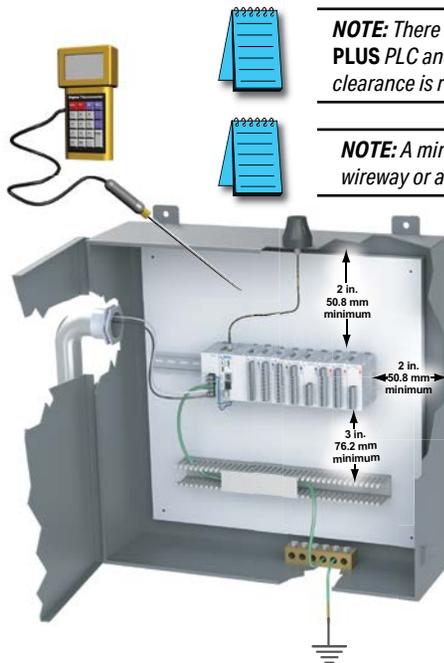
- Conformance to electrical standards
- Protection from the elements in an industrial environment
- Common ground reference
- Maintenance of specified ambient temperature
- Access to equipment
- Security or restricted access
- Sufficient space for proper installation and maintenance of equipment

Panel Layout and Clearances

1. Mount the CLICK PLUS PLC unit (system) horizontally as shown below to provide proper ventilation. Do not mount the CLICK PLUS PLC units upside down, on a horizontal surface or in a vertical arrangement. If you place more than one unit in a cabinet, there must be a minimum of 7.2" (183mm) between the units.

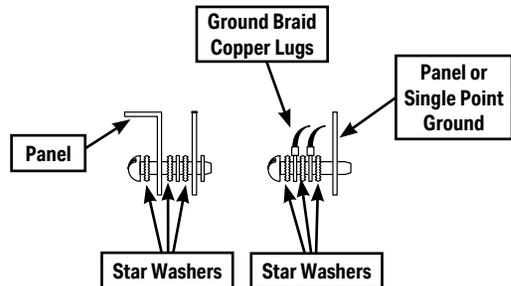


2. Provide a minimum clearance of 2" (50mm) between the unit and all sides of the cabinet.
NOTE: Remember to allow clearance for any operator panels or other items mounted directly in front of the unit in the door.
3. There should also be at least 3" (78mm) of clearance between the unit and any wiring ducts that run parallel to the terminals.
4. The ground terminal on the CLICK PLUS PLC must be connected to a single point ground. Use copper stranded wire to achieve a low impedance. Copper eye lugs should be crimped and soldered to the ends of the stranded wire to ensure good surface contact.
5. There must be a single point ground (i.e. copper bus bar) for all devices in the panel requiring an earth ground return. The single point of ground must be connected to the panel ground termination. The panel ground termination must be connected to ground. Minimum wire sizes, color coding, and general safety practices should comply with appropriate electrical codes and standards for your area.



NOTE: There is a minimum clearance requirement of 2" (51mm) between the **CLICK PLUS PLC** and the panel door or any devices mounted in the panel door. The same clearance is required between the PLC and surrounding enclosure.

NOTE: A minimum clearance of 3" (76mm) is required between the PLC and a wireway or any heat producing device.



6. A good common ground reference (Earth ground) is essential for proper operation of the CLICK PLUS PLC. One side of all control and power circuits and the ground lead on flexible shielded cable must be properly connected to Earth ground. There are several methods of providing an adequate common ground reference, including:
 - a) Tying to a ground rod installed as close as possible to the panel
 - b) Connection to incoming power system ground
7. Evaluate any installations where the ambient temperature may approach the lower or upper limits of the specifications. If you suspect the ambient temperature will not be within the operating specification for the CLICK PLUS PLC system, measures such as installing a cooling/heating source must be taken to get the ambient temperature within the range of specifications.
8. CLICK PLUS PLC systems are modular and can be powered by any suitable 24VDC power supply. The optional CLICK power supply is designed to attach to the left side of the CLICK PLUS PLC case. CLICK power supplies accept 85-264 VAC and produce nominal 24VDC to power the CLICK PLUS PLC and I/O modules. Powerline filters are recommended for protecting the CLICK PLUS PLC from power surges and EMI/RFI noise. The AutomationDirect Powerline Filter, for use with 120VAC and 240VAC, 1-5 Amps, is an excellent choice (locate at www.automationdirect.com), however, you can use a filter of your choice. The filter units install easily between the AC power source and the PLC.

Installing the CLICK PLUS PLC

Installing Option Slot Modules



NOTE: Option Slot Intelligent Modules may require a firmware update on the PLC **before** installing the module. Check Chapter 5 of this manual or the module's installation documentation for any firmware version requirements..

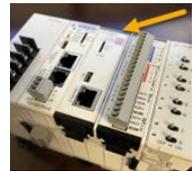
1. Locate the card guides inside the slot.
2. Slide the Option Slot Module into slot ensuring the card falls into the slots.
3. Press the Option Slot Module down to seat the card.
4. Snap the locking tabs down into place.



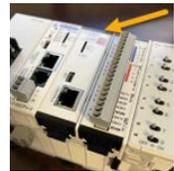
Step 1



Step 2



Step 3



Step 4

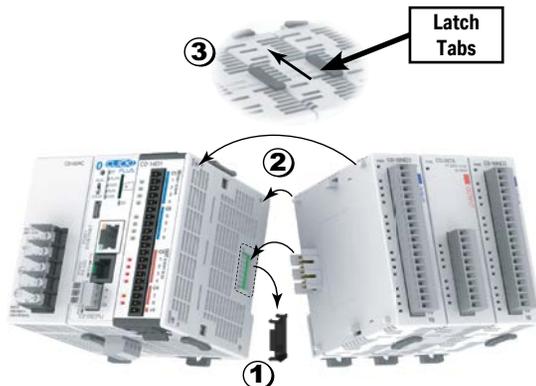
Connecting the Modules Together

CLICK PLUS PLCs and I/O modules connect together using the Extension Ports that are located on the side panels of the modules. The modules secure together by sliding LOCK/UNLOCK latch tabs located on the top and bottom panels of the modules. A PLC backplane or base is not required.

When connecting an I/O module to the PLC, first remove the Extension Port covers, slide the latches forward (unlock), align the module pins, and press the I/O module onto the PLC's right side. Slide the latches backward to lock the modules together.



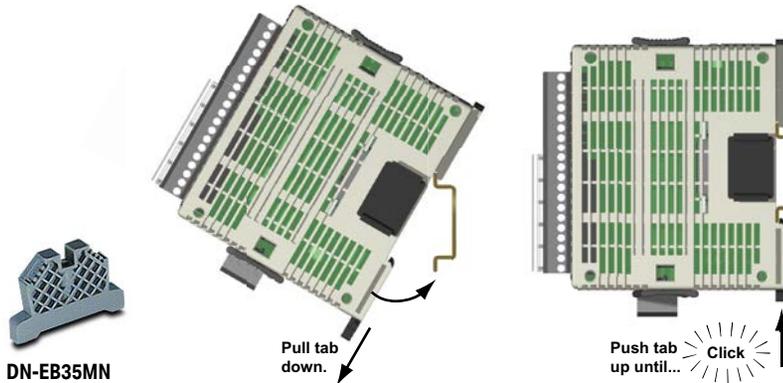
NOTE: If you are using other components in your system, make sure you refer to the appropriate manual to determine how those units can affect mounting dimensions.



- 1) Remove extension port covers and slide latch tabs forward.
- 2) Align the module pins and connection plug, and press the I/O module onto the right side of the PLC.
- 3) Slide the latch tabs backward to lock the modules together.

Mounting CLICK PLUS PLC System on DIN Rail

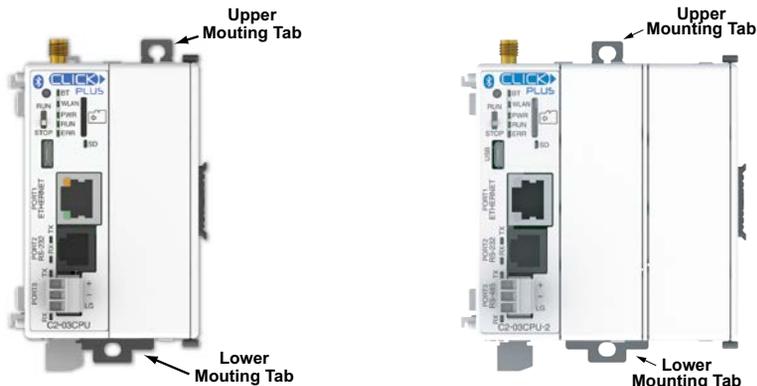
CLICK PLUS PLCs can be secured to a panel by using mounting rails. We recommend rails that conform to DIN EN standard 50 022. They are approximately 35mm high, with a depth of 7mm. If you mount the CLICK PLUS PLC on a rail, consider using end brackets on each side of the PLC. The end bracket helps keep the PLC from sliding horizontally along the rail, reducing the possibility of accidentally pulling the wiring loose. On the bottom of the PLC is a small retaining clip. To secure the PLC to a DIN rail, place it onto the rail and gently push up on the clip to lock it onto the rail. To remove the PLC, pull down on the retaining clip, lift up on the PLC slightly, then pull it away from the rail.



NOTE: When mounting on DIN rail, using DINnectors end brackets at both ends is recommended (part number DN-EB35MN).

Optional Mounting Method

The CLICK PLUS PLC system can be secured to the equipment panel or desired location using the mounting tabs located on the back panel of the PLC, I/O modules and power supplies. Extend the upper and lower retaining clips to the full out position. Mount using M4 screws in the center hole of the tabs.



Wiring Guidelines

Power Input Wiring to Click Power Supply

Connect the AC power source input wiring to the CLICK power supply (the CLICK power supply voltage and current requirements are listed in chapter 2). If you are not using a CLICK power supply, be sure that it meets CLICK PLUS PLC requirements.

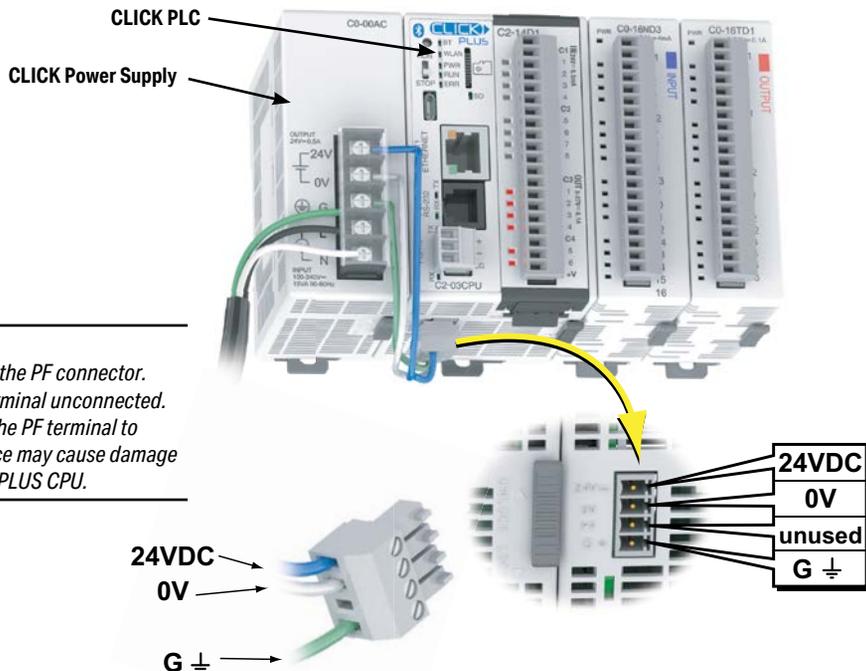
Do not apply power at this time. Observe all precautions stated earlier in this manual.



WARNING: Once the power wiring is connected, secure the terminal block cover in the closed position. When the cover is open there is a risk of electrical shock if you accidentally touch the connection terminals or power wiring.

Power Input Wiring to CLICK PLUS PLC

Connect the 24VDC power source input wiring to the 4-pin 24VDC input connector located on the bottom panel of the CLICK PLUS PLC. Do not apply power at this time. Observe all precautions stated earlier in this manual.



Power Input Wiring to CLICK PLUS PLC, continued

Power Terminal Wiring Specifications	
Terminal Type	3.5 mm pitch pluggable terminal block
Wire Range	16–28 AWG
Wire Strip Length	7.0 mm
Wire Specification	Supported temperature: > 60°C Material: Copper
Screw Torque	2.0–2.2 lb-inch [0.22–0.25 N·m]
Screw Size	M2
Number of Pins	4-pin terminal block
Screwdriver Size	DN-SS1 or compatible (insulated slotted screwdriver 0.4 x 2.5 x 75 mm)

Note: C0-00AC or C0-01AC Power Supply recommended.

Power Terminal Pinout	
24V	24V Power supply in
0V	0V Power supply reference
PF	unused
G	Ground



USB Low Power Mode

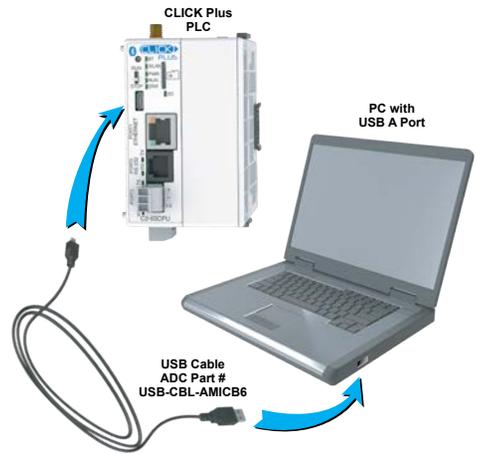
The CLICK PLUS PLC can be powered over its USB port when no 24VDC power is applied. The following capabilities and restrictions apply to USB Low Power Mode.

Available:

- Programming over Ports 1, 2 and 3
- Firmware update
- CLICK Factory Default and CLICK Project Loader Tools
- Modbus Server/Slave over Ports 1, 2 and 3
- Option Slot module can be identified in software

Not Available:

- Not available when C2-NRED or C2-OPCUA modules are installed
- RUN mode is disabled
- WLAN and Bluetooth are disabled
- Access to the microSD Card from software is disabled
- Stackable I/O modules cannot be identified in software.



Fuse Protection

Fuse Protection for PLC Input Power

External circuit protection is needed to ensure the safety of service personnel and the safe operation of the equipment itself. To meet UL/CUL specifications, the input power must be fused. Fuse the AC side of the power supply that provides the 24VDC power to the CLICK PLC.

When operating the power supply from a 110/120 VAC system with a grounded neutral, it is only necessary to fuse the line (L) lead; it is not necessary to fuse the grounded neutral (N) lead. Select the fuse size based on the input current draw of the power supply. Refer to Chapter 2 of this manual for specifications of CLICK power supplies.

Fuse Protection for I/O Module Circuits

Input and Output circuits on CLICK PLUS PLCs do not have internal fuses. In order to protect your PLC, we suggest you add external fuses to your I/O wiring. A fast-blow fuse, with a lower current rating than the I/O bank's common current rating can be wired to each common. Or, a fuse with a rating of slightly less than the maximum current per output point can be added to each output. Refer to the I/O module specifications in Chapter 2 to find the maximum current per output point or per output common. Adding the external fuse does not guarantee the prevention of PLC damage, but it will provide added protection.



WARNING: The discrete inputs and outputs will be damaged if the signal exceeds the rated voltage.

Antenna Installation

Antenna Mounting (SE-ANT250 only)

The antenna should be bulkhead-mounted through the top of the enclosure, and will require a 15mm hole. Please follow mounting instructions found on the antenna datasheet, downloadable from <https://www.automationdirect.com/pn/SE-ANT250>.

RF Connection (SE-ANT210 or SE-ANT250)

Connect the antenna, either directly or via cable, to the RP-SMA connector at the top of the PLC as follows:

1. Ensure that both connectors are clean and dry.
2. Align and finger tighten the connectors.
3. Torque the connection to 3–5 in.-lb.



NOTE: The remote-mount antenna (SE-ANT250) is recommended for long-term use and increased performance. The direct-mount antenna (SE-ANT210) is not intended for use within a closed metal enclosure.

Planning the I/O Wiring Routes

The following guidelines provide general information on how to wire the I/O connections to CLICK PLUS PLCs. For additional information about wiring a particular I/O type refer to the corresponding information in this chapter.

1. Each terminal connection of the CLICK PLUS PLC Option Slot I/O modules can accept one 16AWG wire or two 18AWG size wires. Do not exceed this recommended capacity. Refer to Chapter 2 *Specifications* for more detailed specifications of the terminal blocks.
2. Always use a continuous length of wire. Do not splice wires to attain a needed length.
3. Use the shortest possible wire length.
4. Use wire trays for routing where possible.
5. Avoid running lower voltage wires near higher voltage wiring.
6. Avoid running input wiring close to output wiring where possible.
7. To minimize voltage drops when wires must run a long distance, consider using multiple wires for the return line.
8. Avoid running DC wiring in close proximity to AC wiring where possible.
9. Avoid creating sharp bends in the wires.
10. Install the recommended powerline filter to reduce power surges and EMI/RFI noise.

Wiring I/O Modules

There are three sizes of I/O module terminal blocks used for field wiring connections (11pt, 13pt & 20pt). They can be removed from the module for wiring convenience. There are no clips or screws retaining the terminal block. Firmly grip the block and pull it away from the PLC or I/O module. The connector terminal points have recessed screws to help minimize the risk of someone accidentally touching active wiring. Make sure the terminal blocks are properly seated against the module when replacing them and wiring is properly constrained.

For your convenience we also have DINnectors, DIN-rail mounted terminal blocks. Refer to our website or catalog for a complete listing of all available products. We strongly recommend using our *ZIPLinks* connections systems. See the following pages for *ZIPLink* compatibility and special pre-assembled cables, with the I/O connectors installed and wired.

ZIPLinks Connection Systems



ZIPLinks Cables with Connectors

ZIPLinks Modules



WARNING: For some modules, field device power may still be present on the terminal block even though the PLC system is turned off. To minimize the risk of electrical shock and equipment damage, check all field device power before you remove the connector.

ZIPLink Wiring System Compatibility Matrix for CLICK PLUS PLCs

Use the following tables to select your ZIPLink components. See our website, www.automationdirect.com, for more specifications and information on ZIPLinks.

CLICK PLUS CPU Option Module ZIPLink Selector				
PLC		ZIPLink		
CPU Option Module	Terminals	Component	Module Part No.	Cable Part No.
C2-14D1	20	Feedthrough	ZL-RTB20, ZL-RTB20-1	ZL-C0-CBL20*
C2-14D2				
C2-14DR				
C2-14AR				
C2-14TTL				
C2-08D1-4VC	20	No ZIPLinks are available for Analog Option Slot modules.		
C2-08D2-4VC				
C2-08DR-4VC				
C2-08AR-4VC				
C2-08D1-6C				
C2-08D2-6C				
C2-08DR-6C				
C2-08AR-6C				
C2-08D1-6V				
C2-08D2-6V				
C2-08DR-6V				
C2-08AR-6V				
C2-DCM				
C2-NRED	NA			
C2-OPCUA				

* Select the cable length by replacing the * with: Blank = 0.5 m, -1 = 1.0 m, or -2 = 2.0 m.

ZIPLink Wiring System Compatibility Matrix for CLICK PLCs (continued)

CLICK PLC Discrete Input Module ZIPLink Selector				
I/O Module		ZIPLink		
Input Module	Terminals	Component	Module Part No.	Cable Part No.
CO-08SIM	Not supported by ZIPLink			
CO-08ND3	11	Feedthrough	ZL-RTB20	ZL-CO-CBL11*
CO-08ND3-1				
CO-08NE3				
CO-08NA				
CO-16ND3	20	Feedthrough	ZL-RTB20	ZL-CO-CBL20*
CO-16NE3		Sensor	ZL-LTB16-24-1	
		Feedthrough	ZL-RTB20	
		Sensor	ZL-LTB16-24-1	

* Select the cable length by replacing the * with: Blank = 0.5 m, -1 = 1.0 m, or -2 = 2.0 m.

CLICK PLC Discrete Output Module ZIPLink Selector				
I/O Module		ZIPLink		
Output Module	Terminals	Component	Module Part No.	Cable Part No.
CO-08TD1	11	Feedthrough	ZL-RTB20	ZL-CO-CBL11*
CO-08TD2				
CO-08TR				
CO-08TR-3	Not supported by ZIPLink			
CO-08TA	11	Feedthrough	ZL-RTB20	ZL-CO-CBL11*
CO-16TD1	20	Feedthrough	ZL-RTB20	ZL-CO-CBL20*
CO-16TD2		Fuse	ZL-RFU20 ²	
		Relay (sinking)	ZL-RRL16-24-1	
		Feedthrough	ZL-RTB20	
		Fuse	ZL-RFU20 ²	
CO-04TRS ¹		Relay (sourcing)	ZL-RRL16-24-2	
	Feedthrough	ZL-RTB20		
CO-04TRS-10	Not supported by ZIPLink			

* Select the cable length by replacing the * with: Blank = 0.5 m, -1 = 1.0 m, or -2 = 2.0 m.

¹ NOTE: The CO-04TRS relay output is derated not to exceed 2A per point max. when used with the ZIPLink wiring system.

² NOTE: Fuses (5 x 20 mm) are not included. See Edison Electronic Fuse section for (5 x 20 mm) fuse. S500 and GMA electronic circuit protection for fast-acting maximum protection. S506 and GMC electronic circuit protection for time-delay performance. Ideal for inductive circuits.

To ensure proper operation, do not exceed the voltage and current rating of ZIPLink module. ZL-RFU20 = 2A per circuit.

ZIPLink Wiring System Compatibility Matrix for CLICK PLCs (continued)

CLICK PLC Combo I/O Module ZIPLink Selector				
I/O Module		ZIPLink		
Combo Module	# of Terms	Component	Module Part No.	Cable Part No.
C0-16CDD1	20	Feedthrough	ZL-RTB20	ZL-C0-CBL20*
C0-16CDD2				ZL-C0-CBL11*
C0-08CDR	11			ZL-C0-CBL11*

* Select the cable length by replacing the * with: Blank = 0.5m, -1 = 1.0m, or -2 = 2.0m.

CLICK PLC Analog I/O Module ZIPLink Selector				
I/O Module		ZIPLink		
Analog Module	# of Terms	Component	Module Part No.	Cable Part No.
C0-04POT		Not supported by ZIPLink		
C0-04AD-1	11	Feedthrough	ZL-RTB20	ZL-C0-CBL11*
C0-04AD-2	11			ZL-C0-CBL11*
C0-04RTD	20	No ZIPLinks are available for RTD and thermocouple modules.		
C0-04THM	11			
C0-04DA-1	11	Feedthrough	ZL-RTB20	ZL-C0-CBL11*
C0-04DA-2	11			ZL-C0-CBL11*
C0-4AD2DA-1	20			ZL-C0-CBL20*
C0-4AD2DA-2	20			ZL-C0-CBL20*

* Select the cable length by replacing the * with: Blank = 0.5m, -1 = 1.0m, or -2 = 2.0m.

I/O Wiring Checklist

Use the following guidelines when wiring the I/O modules in your system.

1. There is a limit to the size of wire the modules can accept. The table below lists the suggested AWG. When making terminal connections, follow the suggested torque values.

Terminal Block AWG and Torque	
Connector Type (all)	Removable Terminal Block
Wire Range	28-16 AWG
Wire strip length	7.0 mm
Screw Size	M2.0
Screw Torque	Analog, analog combo I/O modules only: 1.7 lb-in; All other modules: 2.0 to 2.2 lb-in



NOTE: Recommended wire is 16 AWG Type TFFN or Type MTW. Other types of 16 AWG may be acceptable, depending on the thickness and stiffness of the wire insulation. If the insulation is too thick or stiff, and a majority of the module's I/O points are used, then the plastic terminal cover may not close properly or the connector may pull away from the module. This applies especially for high temperature thermoplastic insulation material such as THHN.

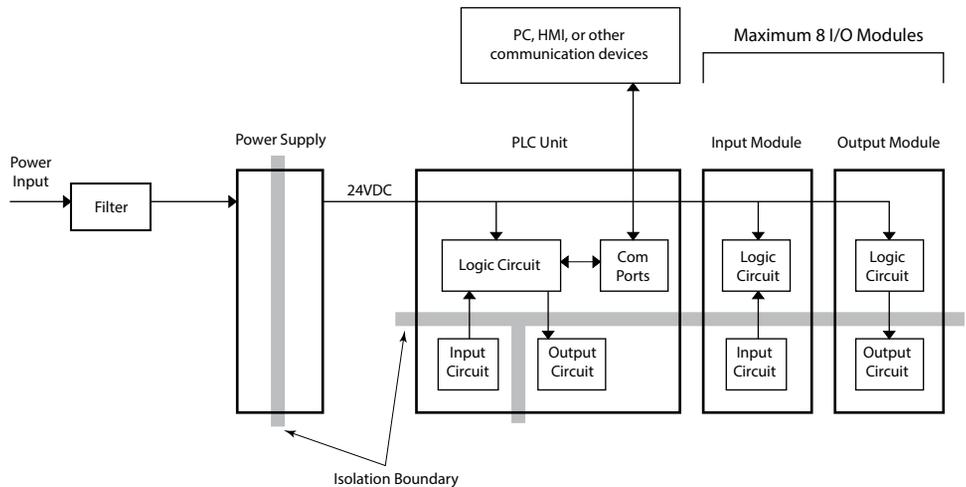
2. Always use a continuous length of wire, do not combine wires to attain a needed length.
3. Use the shortest possible wire length.
4. Use wire trays for routing where possible.
5. Avoid running wires near high energy wiring. Also, avoid running input wiring close to output wiring where possible.
6. To minimize voltage drops when wires must run a long distance, consider using multiple wires for the return line.
7. Avoid running DC wiring in close proximity to AC wiring where possible.
8. Avoid creating sharp bends in the wires.
9. To reduce the risk of having a module damaged, we suggest you add external fuses to your I/O wiring. A fast blow fuse, with a lower current rating than the I/O module fuse, can be added to each common, or a fuse with a rating of slightly less than the maximum current per output point can be added to each output. Refer to our catalog for a complete line of DINnectors, DIN-rail mounted fuse blocks.
10. If using relay outputs with inductive loads, consider using surge suppressors (see section on surge suppression later in this chapter).

System Wiring Strategies

The CLICK PLUS PLC system is very flexible and will work in many different wiring configurations. By studying this section before actual installation, you can find the best wiring strategy for your application. This will help to lower system cost and wiring errors, and avoid safety problems.

PLC Isolation Boundaries

PLC circuitry is divided into three main regions separated by isolation boundaries, shown in the drawing below. Electrical isolation provides safety, so that a fault in one area does not damage an adjacent area. A powerline filter will provide isolation between the power source and the power supply. The transformer in the power supply provides magnetic isolation between the primary and secondary sides. Optical isolators provide optical isolation in Input and Output circuits. These methods isolate logic circuitry from the field side, where factory machinery connects. The discrete inputs are isolated from the discrete outputs, because each is isolated from the logic side. Isolation boundaries protect devices such as PC and HMI that are connected to the communication ports, from power input faults or field wiring faults. When wiring a PLC, it is extremely important to avoid making external connections that connect logic side circuits to more than one circuit.

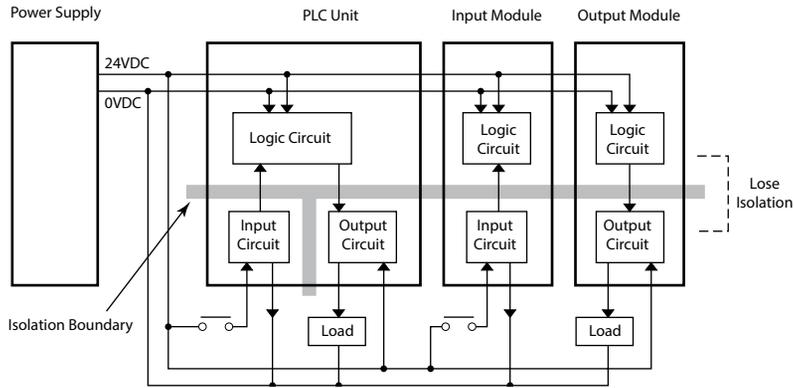


NOTE: If you do not use one of the CLICK PLC power supplies C0-00AC and C0-01AC to provide 24VDC to the PLC module (and I/O modules), be sure the power supply you use has isolation with a transformer.

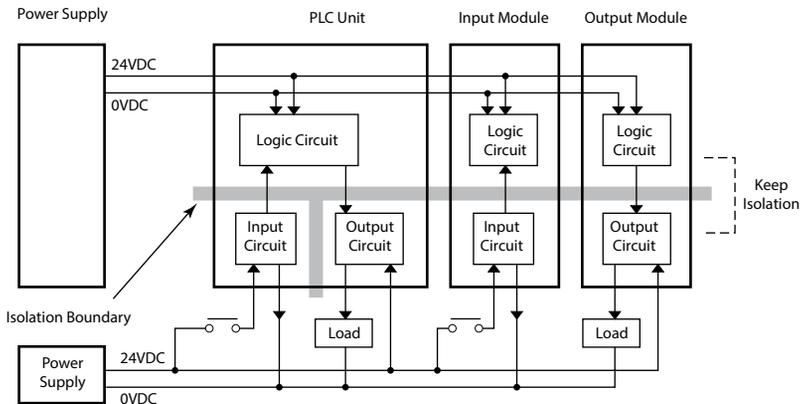
Powering I/O Circuits

In most applications, it will be necessary to power the input devices from one power source, and to power output loads from another source. Loads often require high-energy AC power, while input sensors use low-energy DC. If a machine operator is likely to come in close proximity to input wiring, then for safety reasons, high-energy output circuits would be isolated.

For the DC input/output circuits, you can use the same power source as the PLC module (and I/O modules). However, you lose the isolation between the logic circuits and the input/output circuits. For AC input/output circuits, you don't need to worry about sharing the 24VDC.



To keep the isolation between the logic circuits and the input/output circuits, we recommend using another power supply for the DC input and output circuits.

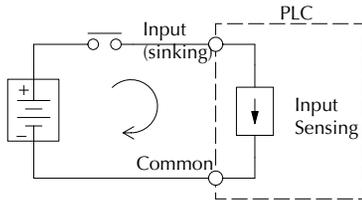


Sinking/Sourcing Concepts

Before wiring field devices to the PLC I/O, it's necessary to have a basic understanding of sinking and sourcing concepts. Use of these terms occurs frequently in input or output circuit discussions. The purpose of this section is to explain the terms. The short definitions are as follows:

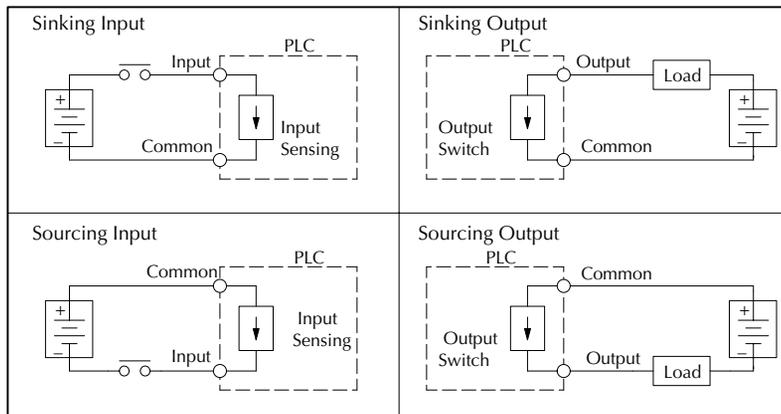
- Sinking = Path to supply ground (-) or switching ground
- Sourcing = Path to supply source (+) or switching +V

These terms only apply to DC circuits, not AC circuits. Input and output points that are either sinking or sourcing can conduct current in only one direction. This means it is possible to wire the external supply and field device to the I/O point with current trying to flow in the wrong direction, in which case the circuit will not operate.



The diagram on the left shows a sinking PLC input. To properly connect the external supply, connect it so the input provides a path to ground (-). Start at the PLC input terminal, follow through the input sensing circuit, exit at the common terminal, and connect the supply (-) to the common terminal.

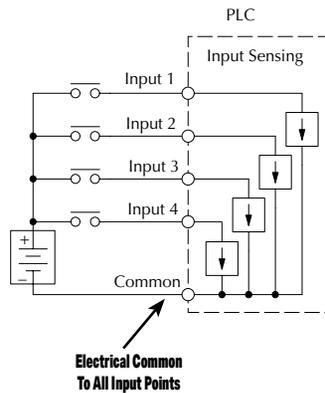
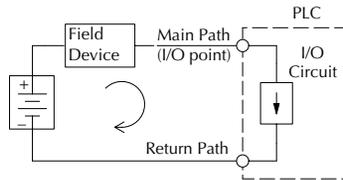
The switch between the supply (+) and the input completes the circuit. Current flows in the direction of the arrow when the switch is closed. By applying the circuit principle above to the four possible combinations of input/output sinking/sourcing types, we have the four circuits as shown below.



I/O “Common Terminal” Concepts

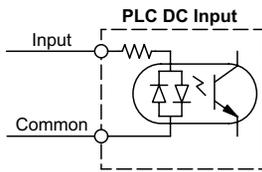
In order for a PLC I/O circuit to operate, current must enter at one terminal and exit at another. This means at least two terminals are associated with every I/O point. In the figure to the right, the input or output terminal is the main path for the current. One additional terminal must provide the return path to the power supply.

If there was unlimited module space, then every I/O point could have two dedicated terminals as the previous figure shows. Providing this level of flexibility is not practical or necessary for most applications. So, most I/O point groups share the return path (common) among two or more I/O points. The figure to the right shows a group (or bank) of 4 input points which share a common return path. In this way, the four inputs require only five terminals instead of eight.



NOTE: In the circuit above, the current in the common path is equal to the sum of the energized channels. This is especially important in output circuits, where larger gauge wire is sometimes needed for the commons.

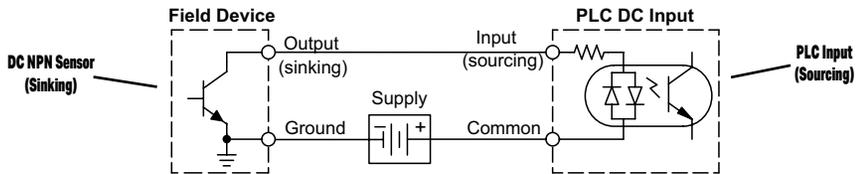
DC Input Wiring Methods



CLICK PLCs and I/O modules with DC inputs can be wired as either sinking or sourcing inputs. The dual diodes (shown in this diagram) allow current to flow in either direction. Inputs grouped by a common point must be either all sinking or all sourcing. DC inputs typically operate in the range of +12-24 VDC.

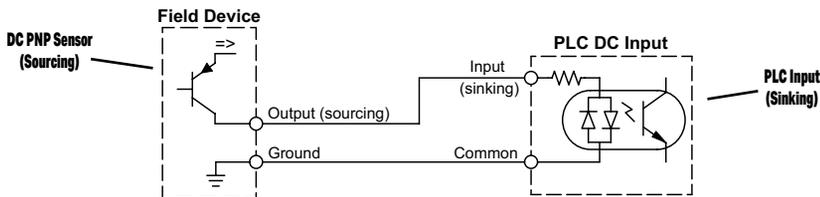
Sinking Input Sensor (NPN Type) to PLC Sourcing Input

In the following example, a field device has an open-collector NPN transistor output. When energized, it sinks current to ground from the DC input point. The PLC input current is sourced from the common terminal connected to power supply (+).



Sourcing Input Sensor (PNP Type) to PLC Sinking Input

In the following example, a field device has an open-emitter PNP transistor output. When energized, it sources current to the PLC input point, which sinks the current to ground. Since the field device loop is sourcing current, no additional power supply is required for the module.



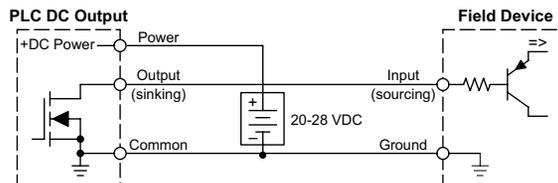
DC Output Wiring Methods

CLICK PLCs and I/O modules with DC output circuits are wired as all current sinking only or current sourcing only depending on which PLC or output module part number is used. DC outputs typically operate in the range of +5-24 VDC.

PLC Sinking Output to Sourcing Load Device

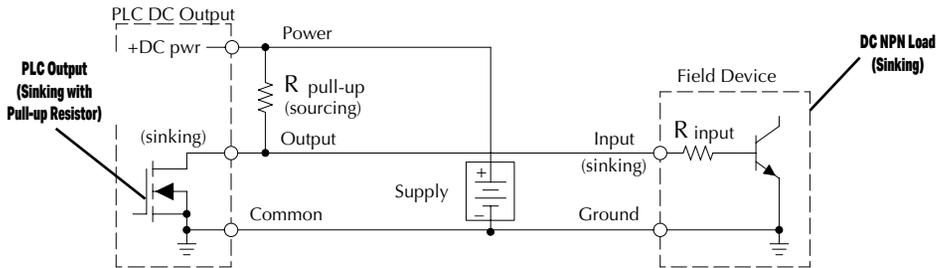
Many applications require connecting a PLC output point to a DC input on a field device load. This type of connection is made to carry a low-level DC signals.

In the following example, the PLC output point sinks current to ground (common) when energized. The output is connected to a field device load with a sourcing input.



PLC DC Sinking Output to Sinking Load Device

In the example below, a PLC sinking output point is connected to the sinking input of a field device load. In this case, both the PLC output and field device input are sinking type. Since the circuit must have one sourcing and one sinking device, we add sourcing capability to the PLC output by using a pull-up resistor. In the circuit below, we connect $R_{pull-up}$ from the output to the DC output circuit power input.



NOTE 1: DO NOT attempt to drive a heavy load (>25 mA) with this pull-up method.

NOTE 2: Using the pull-up resistor to implement a sourcing output has the effect of inverting the output point logic. In other words, the field device input is energized when the PLC output is OFF, from a ladder logic point-of-view. Your ladder program must comprehend this and generate an inverted output. Or, you may choose to cancel the effect of the inversion elsewhere, such as in the field device.

It is important to choose the correct value of $R_{pull-up}$. In order to do so, we need to know the nominal input current to the field device (I_{input}) when the input is energized. If this value is not known, it can be calculated as shown (a typical value is 15 mA). Then use I_{input} and the voltage of the external supply to compute $R_{pull-up}$. Then calculate the power $P_{pull-up}$ (in watts), in order to size $R_{pull-up}$ properly.

$$I_{input} = \frac{V_{input} \text{ (turn-on)}}{R_{input}}$$

$$R_{pull-up} = \frac{V_{supply} - 0.7}{I_{input}} - R_{input}$$

$$P_{pull-up} = \frac{V_{supply}^2}{R_{pull-up}}$$

Relay Outputs - Wiring Methods

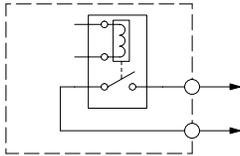
Relay outputs are available for the CLICK PLCs. Relays are best for the following applications:

- Loads that require higher currents than the solid-state outputs can deliver
- Cost-sensitive applications
- Some output channels need isolation from other outputs (such as when some loads require different voltages than other loads)

Some applications in which NOT to use relays:

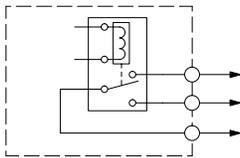
- Loads that require currents under 10mA
- Loads which must be switched at high speed or heavy duty cycle

Relay with Form A contacts



Relay outputs in the CLICK PLCs and modules are available in two contact arrangements. Form A type, or SPST (single pole, single throw) type. They are normally open and are the simplest to use. The Form C, or SPDT (single pole, double throw) type has a center contact which moves and a stationary contact on either side. This provides a normally closed contact and a normally open contact.

Relay with Form C contacts



Some relay output module's relays share common terminals, which connect to the wiper contact in each relay of the bank. Other relay modules have relays which are completely isolated from each other. In all cases, the module drives the relay coil when the corresponding output point is on.

Relay Outputs – Transient Suppression for Inductive Loads in a Control System

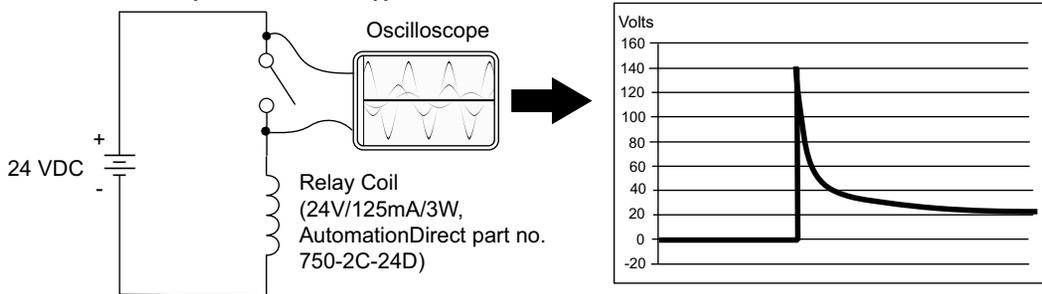
The following pages are intended to give a quick overview of the negative effects of transient voltages on a control system and provide some simple advice on how to effectively minimize them. The need for transient suppression is often not apparent to the newcomers in the automation world. Many mysterious errors that can afflict an installation can be traced back to a lack of transient suppression.

What is a Transient Voltage and Why is it Bad?

Inductive loads (devices with a coil) generate transient voltages as they transition from being energized to being de-energized. If not suppressed, the transient can be many times greater than the voltage applied to the coil. These transient voltages can damage PLC outputs or other electronic devices connected to the circuit, and cause unreliable operation of other electronics in the general area. Transients must be managed with suppressors for long component life and reliable operation of the control system.

This example shows a simple circuit with a small 24V/125mA/3W relay. As you can see, when the switch is opened, thereby de-energizing the coil, the transient voltage generated across the switch contacts peaks at 140V.

Example: Circuit with no Suppression



In the same circuit, replacing the relay with a larger 24V, 290mA, 7W relay will generate a transient voltage exceeding 800V (not shown). Transient voltages like this can cause many problems, including:

- Relay contacts driving the coil may experience arcing, which can pit the contacts and reduce the relay's lifespan.
- Solid state (transistor) outputs driving the coil can be damaged if the transient voltage exceeds the transistor rating. In extreme cases, complete failure of the output can occur the very first time a coil is de-energized.
- Input circuits, which might be connected to monitor the coil or the output driver, can also be damaged by the transient voltage.

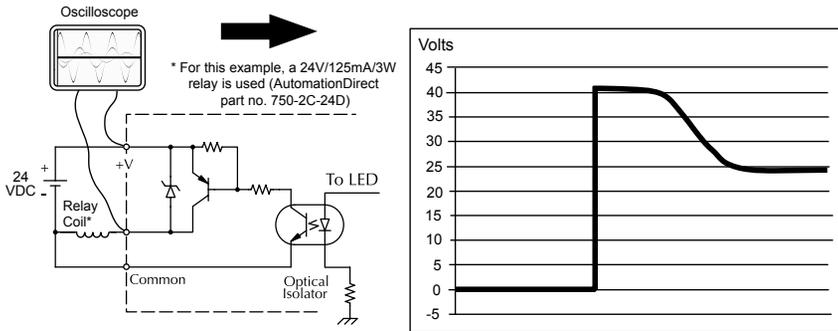
A very destructive side-effect of the arcing across relay contacts is the electromagnetic interference (EMI) it can cause. This occurs because the arcing causes a current surge, which releases RF energy. The entire length of wire between the relay contacts, the coil, and the power source carries the current surge and becomes an antenna that radiates the RF energy. It will readily couple into parallel wiring and may disrupt the PLC and other electronics in the area. This EMI can make an otherwise stable control system behave unpredictably at times.

PLC's Integrated Transient Suppressors

Although the PLC's outputs typically have integrated suppressors to protect against transients, they are not capable of handling them all. It is usually necessary to have some additional transient suppression for an inductive load.

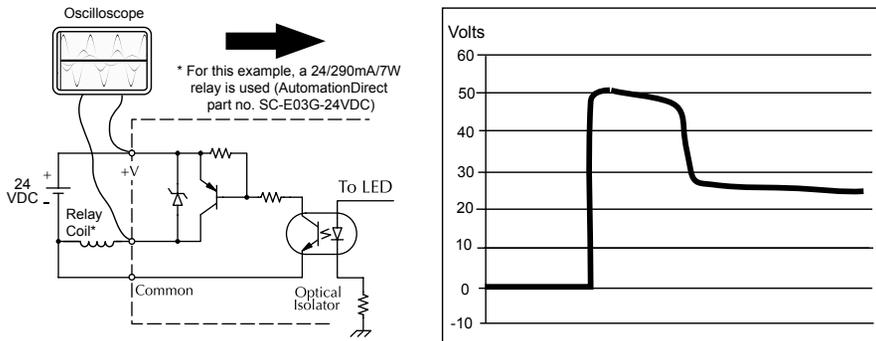
Here is another example using the same 24V, 125mA, 3W relay used earlier. This example measures the PNP transistor output of a D0-06DD2 PLC, which incorporates an integrated Zener diode for transient suppression. Instead of the 140V peak in the first example, the transient voltage here is limited to about 40V by the Zener diode. While the PLC will probably tolerate repeated transients in this range for some time, the 40V is still beyond the module's peak output voltage rating of 30V.

Example: Small Inductive Load with Only Integrated Suppression



The next example uses the same circuit as above, but with a larger 24V, 290mA, 7W relay thereby creating a larger inductive load. As you can see, the transient voltage generated is much worse, peaking at over 50V. Driving an inductive load of this size without additional transient suppression is very likely to permanently damage the PLC output.

Example: Larger Inductive Load with Only Integrated Suppression

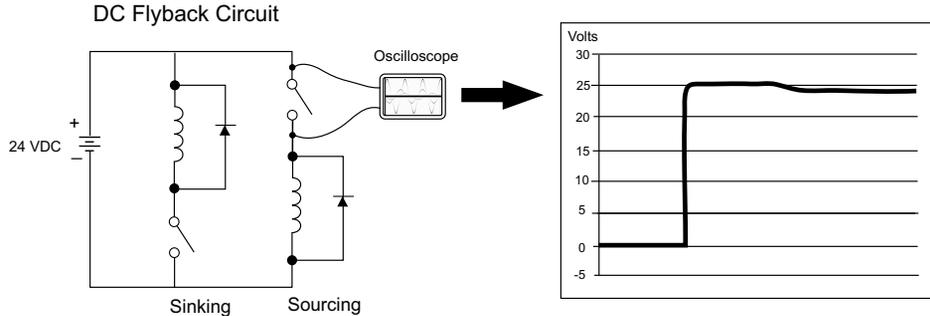


Additional transient suppression should be used in both these examples. If you are unable to measure the transients generated by the connected loads of your control system, using additional transient suppression on all inductive loads would be the safest practice.

Types of Additional Transient Protection

DC Coils:

The most effective protection against transients from a DC coil is a flyback diode. A flyback diode can reduce the transient to roughly 1V over the supply voltage, as shown in this example.



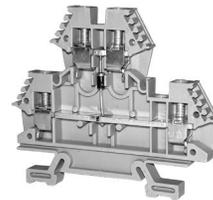
Many AutomationDirect socketed relays and motor starters have add-on flyback diodes that plug or screw into the base, such as the AD-ASMD-250 protection diode module and 784-4C-SKT-1 socket module shown below. If an add-on flyback diode is not available for your inductive load, an easy way to add one is to use an AutomationDirect DN-D10DR-A diode terminal block, a 600VDC power diode mounted in a slim DIN rail housing.



AD-ASMD-250
Protection Diode Module



784-4C-SKT-1
Relay Socket



DN-D10DR-A
Diode Terminal Block

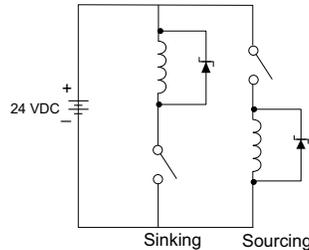
Two more common options for DC coils are Metal Oxide Varistors (MOV) or TVS diodes. These devices should be connected across the driver (PLC output) for best protection as shown below. The optimum voltage rating for the suppressor is the lowest rated voltage available that will NOT conduct at the supply voltage, while allowing a safe margin.

AutomationDirect's ZL-TSD8-24 transorb module is a good choice for 24VDC circuits. It is a bank of 8 uni-directional 30V TVS diodes. Since they are uni-directional, be sure to observe the polarity during installation. MOVs or bi-directional TVS diodes would install at the same location, but have no polarity concerns.



ZL-TSD8-24
Transorb Module

DC MOV or TVS Diode Circuit



AC Coils:

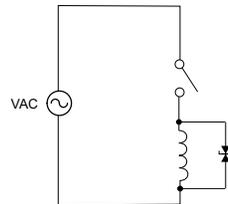
Two options for AC coils are MOVs or bi-directional TVS diodes. These devices are most effective at protecting the driver from a transient voltage when connected across the driver (PLC output) but are also commonly connected across the coil. The optimum voltage rating for the suppressor is the lowest rated voltage available that will NOT conduct at the supply voltage, while allowing a safe margin.

AutomationDirect's ZL-TSD8-120 transorb module is a good choice for 120VAC circuits. It is a bank of eight bi-directional 180V TVS diodes.



ZL-TSD8-120
Transorb Module

AC MOV or Bi-Directional Diode Circuit



NOTE: Manufacturers of devices with coils frequently offer MOV or TVS diode suppressors as an add-on option which mount conveniently across the coil. Before using them, carefully check the suppressor ratings. Just because the suppressor is made specifically for that part does not mean it will reduce the transient voltages to an acceptable level.

For example, a MOV or TVS diode rated for use on 24-48 VDC coils would need to have a high enough voltage rating to NOT conduct at 48V. That suppressor might typically start conducting at roughly 60VDC. If it were mounted across a 24V coil, transients of roughly 84V (if sinking output) or -60V (if sourcing output) could reach the PLC output. Many semiconductor PLC outputs cannot tolerate such levels.

LAN Provisioning over Bluetooth

Provisioning your Wireless CLICK PLUS PLC via Bluetooth (Models C2-02CPU and C2-03CPU only)

To improve the out-of-box experience, a new CLICK PLUS C2-02CPU, C2-02CPU-2, C2-03CPU or C2-03CPU-2 has Bluetooth enabled by default and allows the user with the CLICK PLUS Provisioning App to connect and configure the needed Wi-Fi and network settings. This removes the need for cables with a new CLICK PLUS. Once the Wi-Fi is configured to connect to the local network access point, the user can then connect the Click Programming software via Wi-Fi to load and edit the project. The Temporary settings used for provisioning are stored in temporary memory and will be overwritten by the project settings when written to the PLC.

Install an external antenna

In order to connect to the CLICK PLUS PLC over Bluetooth or WLAN, you will need to install an external 2.4 GHz antenna. We recommend the remote-mounted AutomationDirect P/N SE-ANT250 for a permanent installation. The direct-mounted AutomationDirect P/N SE-ANT210 will also work, but is not intended for use inside a closed metal enclosure.

Prepare a Mobile Device for Connection

If you haven't already done so, install the CLICK PLUS Provisioning mobile app from the Apple App Store or Google Play Store (CLICK PLUS Provisioning, published by Automationdirect.com).

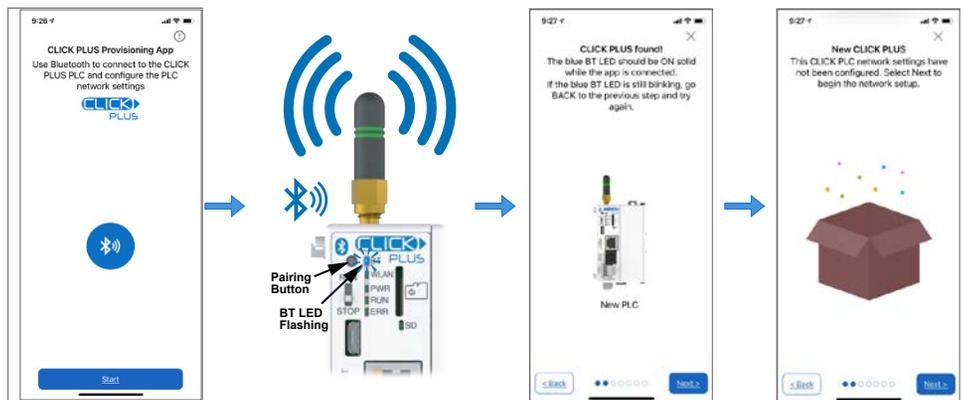


Provisioning your Wireless CLICK PLUS PLC via Bluetooth, (cont'd)

Find the New CPU

Connect to the CPU, as follows:

1. Open the CLICK PLUS Provisioning App.
2. Tap *Start* in the App.
3. Press the pairing button on the CLICK PLUS CPU for 1 second. The BT (Bluetooth) LED will start flashing. If the PLC is factory new, or you have Reset Factory Defaults, the BT LED will flash for 30 seconds after power up.
4. The App will find the CLICK PLUS PLC that is in Provisioning mode. The blue BT LED will be ON solid when the App is connected to the PLC. Tap *Next* in the App to continue.
5. If the App detects that the PLC is factory new and the network settings have not been configured, it will prompt you to Tap *Next* to begin the provisioning process.

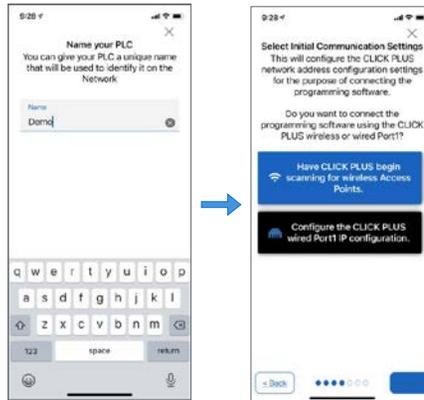


NOTE: If you find that you need to change the settings in order to connect to the network. The PLC can be placed in pairing mode and the provisions app can be used to make needed changes.

Provisioning your Wireless CLICK PLUS PLC via Bluetooth, (cont'd)

Name the CPU and select port to configure

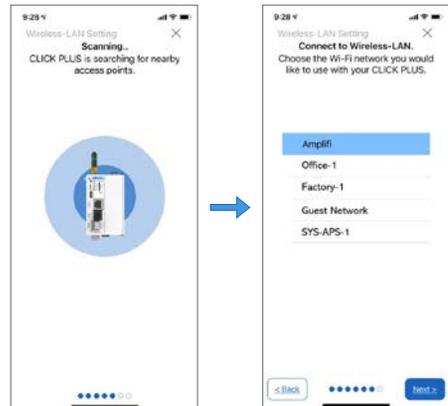
6. You will be requested to assign a name to the PLC. This name will be used to identify it on the network when using the programming software connection Ethernet browse tool. It is good practice to choose a unique name if there are other CLICK PLCs on the network. Enter a name for the PLC and tap *Next*.
7. Choose which network port to provision. This will configure the CLICK PLUS network address settings for the purpose of connecting the programming software.



Setup the Wireless LAN Connection (Skip for Wired Connection)

For this option you will need an active Network Access point available within range of the CLICK PLUS PLC, and know the password to allow the PLC to connect to the Network.

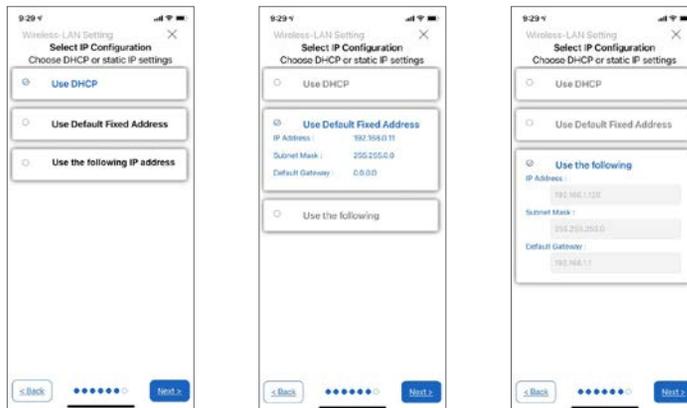
8. The CLICK PLC will scan for any access point within range and then display all access points that are available (you may need to scroll the list to find the desired Access Point). Select an Access Point and type in the correct password that the PLC will need to connect. If the incorrect password is entered, you will be prompted to correct it after the CLICK PLUS fails to connect.



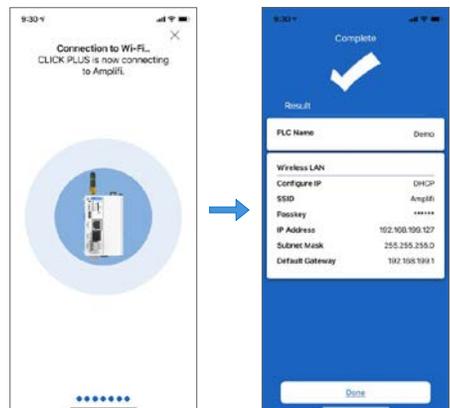
Provisioning your Wireless CLICK PLUS PLC via Bluetooth, (cont'd)

Setup the Network Parameters

9. Once the PLC is connected to the wireless access point or wired network, choose which IP address configuration to use.
 - i. Use DHCP: Automatically assign a network IP address to the CLICK PLUS PLC. This is often the simplest way to connect. Tap *Next* to continue.
 - ii. Use Default Fixed Address: The CLICK PLUS wireless LAN default IP address is 192.168.0.11. This can be selected if it is a valid IP address for your wireless network. Tap *Next* to continue.
 - iii. Use the following IP address: Choose this option if you need to input a valid IP address for your network. Tap *Next* to continue



10. The CLICK PLUS will connect to the access point and exchange configuration information. If the settings are correct, the App will show the Completion screen and the network settings of the CLICK PLUS can be viewed. If using a wireless connection, the CLICK PLUS WLAN LED will also be ON. The PLC is now connected to the network and accessible to PC's running the CLICK Programming Software and connected to the same network.



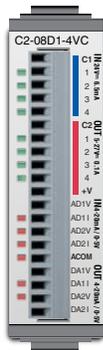
Option Slot Analog I/O Configuration

The following Option Slot Analog I/O modules are available. (Stackable Analog I/O modules are shown on following page.)

Option Slot Analog Units	Inputs	Outputs
C2-08D1-4VC	2 - Current/ Voltage, Selectable	2 - Current/ Voltage, Selectable
C2-08D2-4VC		
C2-08DR-4VC		
C2-08AR-4VC		
C2-08D1-6C	4 - Current only	2 - Current only
C2-08D2-6C		
C2-08DR-6C		
C2-08AR-6C		
C2-08D1-6V	4 - Voltage only	2 - Voltage only
C2-08D2-6V		
C2-08DR-6V		
C2-08AR-6V		

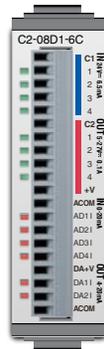
Terminal Block Wiring - Analog Option Slot Units

The C2-08xx-4VC Analog Option Slot modules have two analog inputs and two analog outputs. You can select analog voltage or analog current for each analog I/O separately. As shown below, you must use the proper terminal when using analog voltage or analog current.



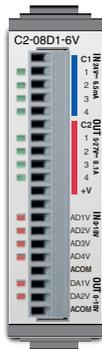
C2-08xx-4VC Analog Terminals	
Terminal Name	Terminal Description
AD1V	Analog voltage input
AD1I	Analog current input
AD2V	Analog voltage input
AD2I	Analog current input
ACOM	Common for all analog inputs and outputs
DA1V	Analog voltage output
DA1I	Analog current output
DA2V	Analog voltage output
DA2I	Analog current output

The C2-08xx-6C Analog Option Slot modules have four analog current inputs and two analog current outputs.



C2-08xx-6C Analog Terminals	
Terminal Name	Terminal Description
ACOM	Common for analog inputs
AD1- AD4I	Analog current input
DA+V	Analog voltage source
DA1- DA2I	Analog current output
ACOM	Common for analog outputs

The C2-08xx-6V Analog Option Slot modules have four analog voltage inputs and two analog voltage outputs.

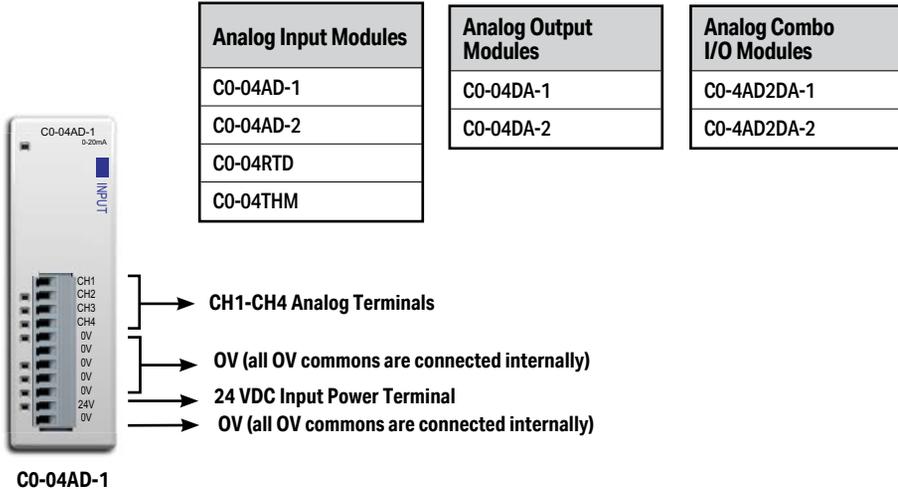


C2-08xx-6V Analog Terminals	
Terminal Name	Terminal Description
AD1V- AD4V	Analog voltage input
ACOM	Common for analog inputs
DA1V- DA2V	Analog voltage output
ACOM	Common for analog outputs

Terminal Block Wiring - Stackable Analog I/O Modules

The terminal block wiring will vary depending on which analog I/O module is being used. For example, the C0-04AD-1 module shown here has four analog terminals, CH1 through CH4, which are all current inputs.

See Chapter 2. Specifications for terminal block wiring diagrams and specifications for all the analog I/O modules.



Configuration in the CLICK Programming Software

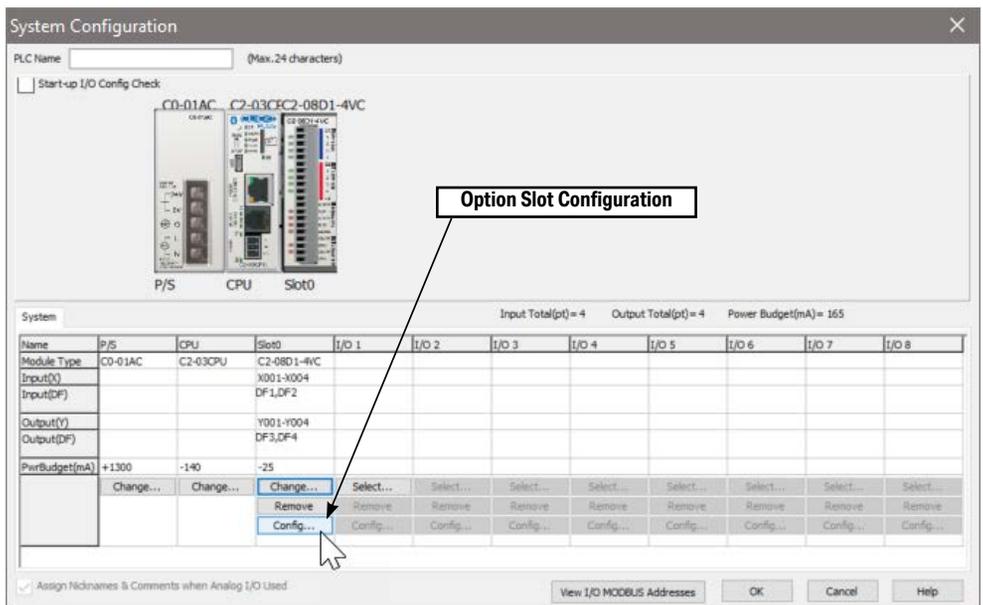
All analog I/O points can be configured in the CLICK Programming Software. There is no jumper switch in these modules.

CLICK PLUS Option Slot Analog Modules

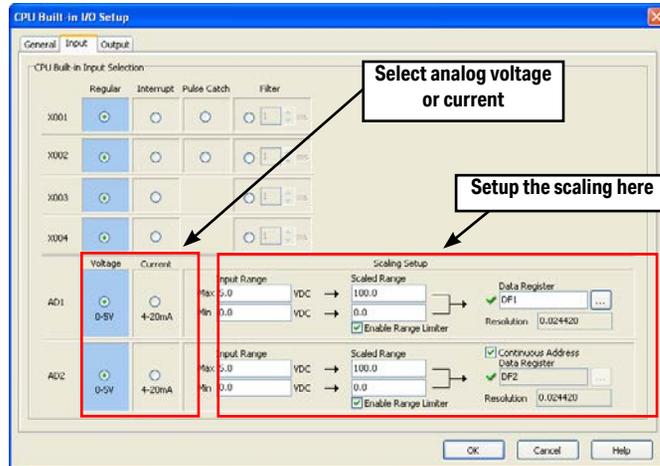
The Option Slot analog modules cannot detect which terminal is used between the analog voltage and analog current, so you must configure which analog type is used for each analog I/O in the CLICK programming software.

Connect the CLICK programming software to the CLICK PLUS PLC unit, then open the System Configuration window as shown below.

(Pull-down menu: Setup > System Configuration)



Click the Input tab to configure the analog inputs and/or click the Output tab to configure the analog outputs. The Input tab is shown below, but the Output tab looks very similar.



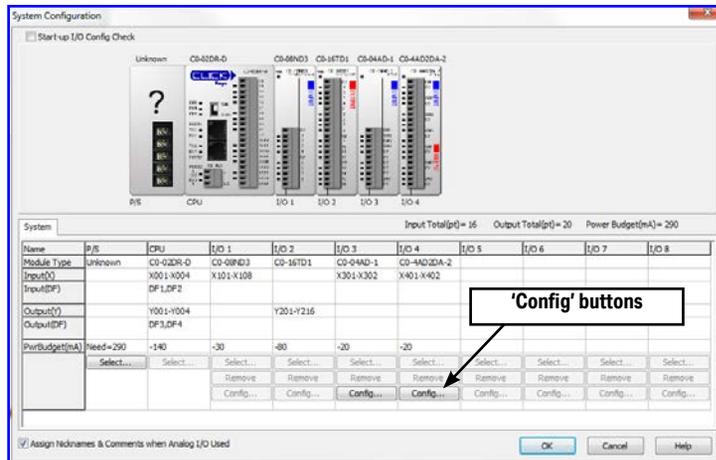
You can select the analog voltage or analog current with the radio buttons. Also use this screen to set the scaling for each Analog I/O. Click the Help button on the right bottom to learn about the scaling feature.

After you configure the Analog I/O, download the project into the Analog PLC module.

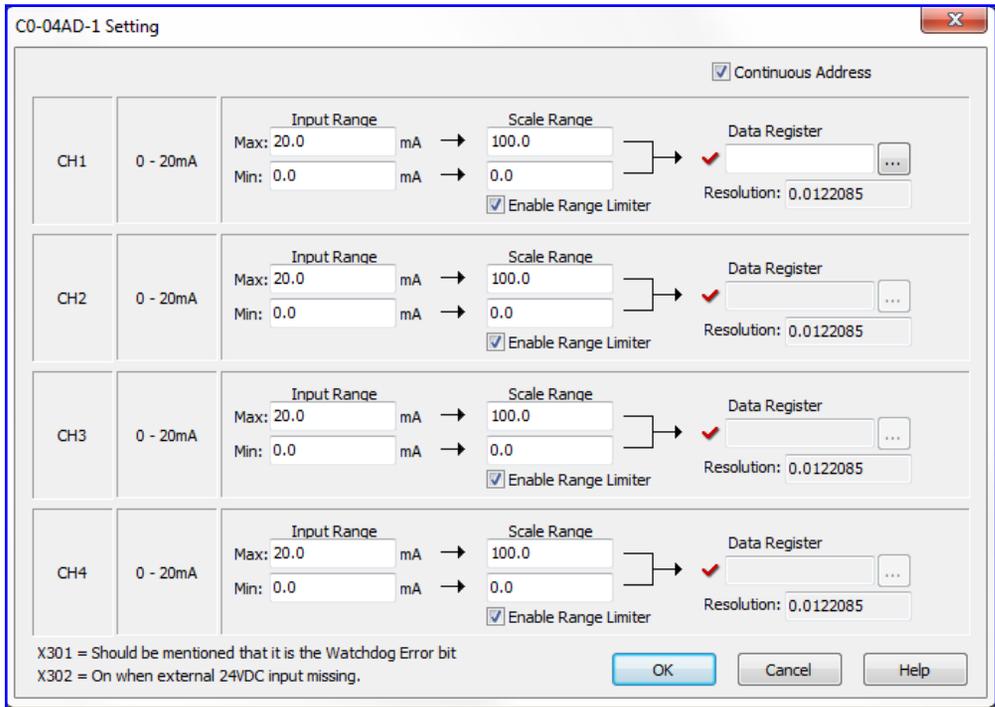
Analog I/O Modules

To configure an Analog I/O module, connect the CLICK programming software to the CLICK PLC including the Analog I/O module, then open the System Configuration window as shown below (Pull-down menu: Setup > System Configuration).

Click the 'Config...' button to open the configuration window to configure each analog I/O module.



The following is the configuration window for the C0-04AD-1 current input I/O module.

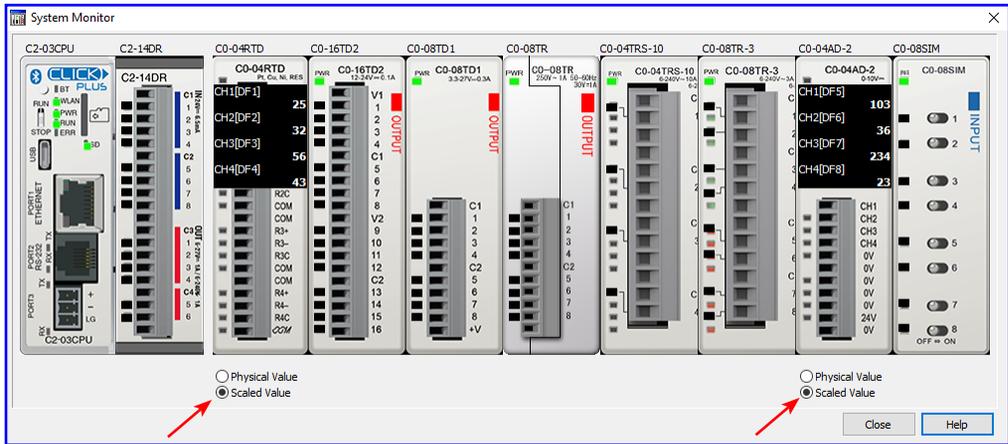


In the CLICK PLC, all analog data is stored in the DF memory addresses. Assign DF memory addresses to the Data Register fields. You can also set up the scaling in this configuration window. For more detailed explanation about this configuration window, refer to the help topic by clicking the Help button on the bottom right corner.

After configuring all the analog I/O modules, download the CLICK project into the CLICK PLC.

Analog I/O Monitoring

To monitor the current analog I/O values, you can use the System Monitor window as shown below (Pull-down menu: Monitor > System Monitor).



You can switch the displayed values between the Physical Value and Scaled Value with the radio buttons below the respective graphic.

High-Speed Input/Output Configuration

CLICK PLUS Option Slot modules that have digital inputs and outputs with High-Speed capability are shown below. The maximum number of available Single Input Counters will depend on the combination of features used.

Module Part Number	High-Speed Input Points	High-Speed Counters (Max.)	High-Speed Output Points	High-Speed Outputs (Max.)
C2-14D1	8	6	3	3
C2-14D2				
C2-14TTL				
C2-14DR			N/A	N/A
C2-14AR	N/A	N/A		
C2-08D1-4VC	4	4	2	2
C2-08D2-4VC				
C2-08DR-4VC			N/A	N/A
C2-08AR-4VC	N/A	N/A		
C2-08D1-6C	4	4	2	2
C2-08D2-6C				
C2-08DR-6C			N/A	N/A
C2-08AR-6C	N/A	N/A		
C2-08D1-6V	4	4	2	2
C2-08D2-6V				
C2-08DR-6V			N/A	N/A
C2-08AR-6V	N/A	N/A		



NOTE: The Option Slot Module must be installed in Option Slot 0 to use High-Speed Input/Output functions.

Chapter 3: Installation and Wiring

Each Input Mode consumes the available number of High-Speed Inputs. The Reset and Enable features can use High-Speed Inputs, Digital Input Modules, or Control Relays (Internal Bits). The transition delay (latency) is longer for Input Modules and Control Relays since these are scan based.

High-Speed Mode	Input Type	High-Speed Inputs Required	Reset Input	Enable Input
High-Speed Count (HSC)	Up Count	1	Optional	Optional
	Down Count			
	Up and Down Counts	2		
	Pulse and Direction			
	Quadrature (A and B)			
	Quadrature (A and B with Z)	3	N/A	
Interval Measurement (ITV)	Single Input	1	Optional	
	Dual Inputs	2		
Duration Measurement (DUR)	Single Input	1		
Frequency Measurement (FRQ)	Single Input	1	N/A	N/A
	Quadrature (A and B)	2		

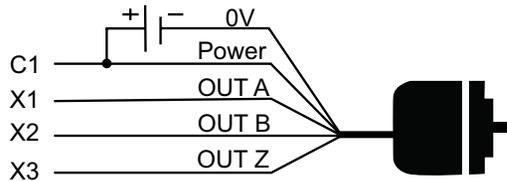
High-Speed Mode	Output Type	High-Speed Outputs Required	Limit Switches
Pulse Train Output (PTO)	Pulse	1	Optional
	Direction	Optional	
Pulse Width Modulation (PWM)	Pulse	1	N/A

Due to internal resource limitations, there is a limit to the number of settings that can be made when using the high-speed counter function and the PTO function simultaneously. The CLICK software High Speed Configuration will automatically limit the selections based on already configured points and the specific Slot I/O Module.

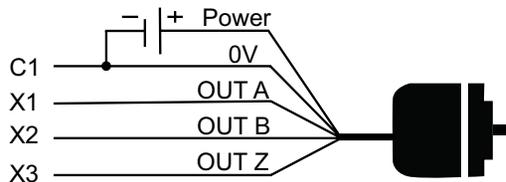
Wiring Examples: High-Speed Inputs

Quadrature with Reset (Z-Pulse):

Sinking Encoder (Open Collector)

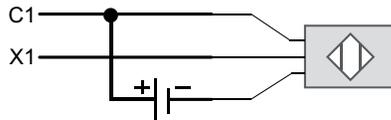


Sourcing Encoder

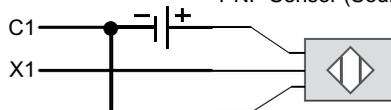


3-Wire Sensors

NPN Sensor (Sinking)

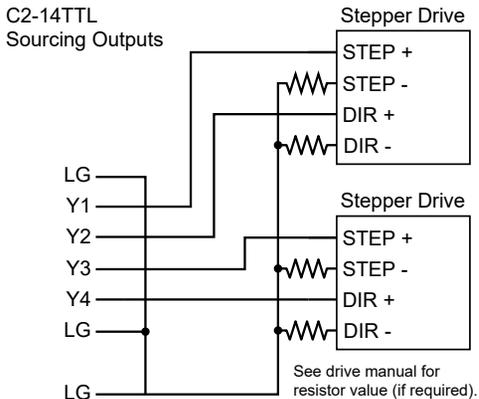
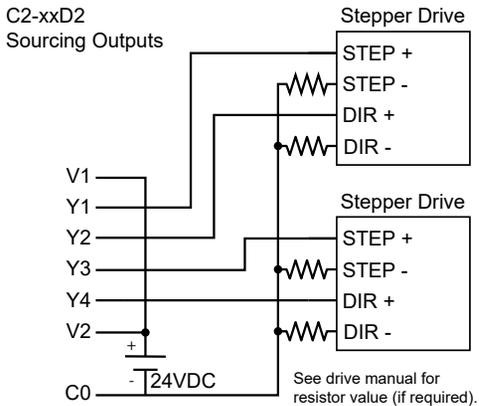
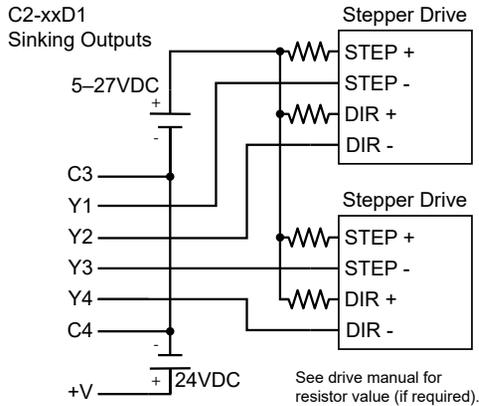


PNP Sensor (Sourcing)



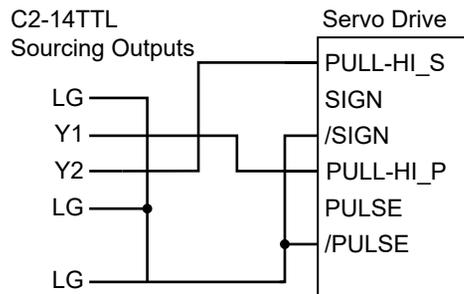
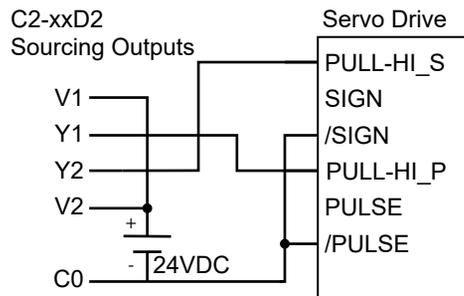
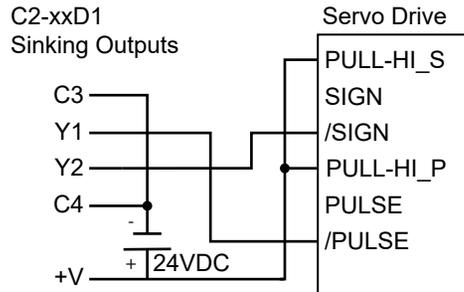
Wiring Examples: High-Speed Outputs

Stepper Motor Drive



Wiring Examples: High-Speed Outputs

Servo Motor Drive



Setting Up and Using an SD Card

Writing to SD Card Devices

Up to 16 addresses of any type may be configured in the CLICK programming software to log data. Along with the 16 address limit, available storage is subject to the memory capacity of the SD card. A new log file can be created based on a time period or an event trigger.

Memory Devices should be formatted according to the following guidelines to insure best performance and integrity of logged data.

SD Card Type	Capacity	Supported Formatting
SD	Not Supported	
SDHC	4GB to 32GB	FAT32
SDXC	Not Supported	

SD cards must be formatted using the SD formatter provided by the SD Association at www.sdcard.org using the standard allocation unit size for best performance.

Minimizing Data Errors

To minimize data errors when logging data to external memory, consider the following:

- Do not turn off power to the PLC while the SD card is being accessed.
- Do not remove the SD card while the device is being accessed by the PLC.

The following addresses should be used to monitor, access and safely remove an SD card:

Address	Description	Read/Write
SC65	SD Eject	R/W
SC66	SD Delete All	R/W
SC67	SD Copy System	R/W
SC68	SD Ready To Use	R
SC69	SD Write Status	R
SC70	SD Error	R

- Be sure to backup the memory device at regular intervals.
- If you suspect the SD card is bad, you may want to use a PC to re-format the device, or use a known good SD card.
- The number of times the SD card can be written to is limited. Consequently, logging frequently may shorten the service life of the SD card. Using slower sample rates will increase the life of the SD card.



NOTE: An SD card with SLC mode, such as AutomationDirect #MSD-SLC16G, is strongly recommended for increased maximum lifetime write cycles.

Monitoring Available Memory

Each external memory device can be monitored and events can be configured to alert the user when available memory is approaching the maximum capacity of the external memory device. The following internal tags allow external memory devices data to be monitored:

Address	Description	Read/Write
SD63	SD Total Memory Low byte	R
SD64	SD Total Memory High byte	R
SD65	SD Free Memory Low byte	R
SD66	SD Free Memory High byte	R
SD67	SD Used Memory Low byte	R
SD68	SD Used Memory High byte	R
SD69	SD Error Information	R
SD70	SD Log File Number	R

Refer to the CLICK programming software online help files for additional information on system tags and managing data logging devices.

File Name Limitations

There is a limit of 999 log files stored on the SD card. As new log files are created based on a set time or trigger event, these files count against the maximum of 999 files. Consider the rate of new file generation when setting the conditions to start a new file, and monitor the current number of stored files to avoid data loss.