I/O HUB

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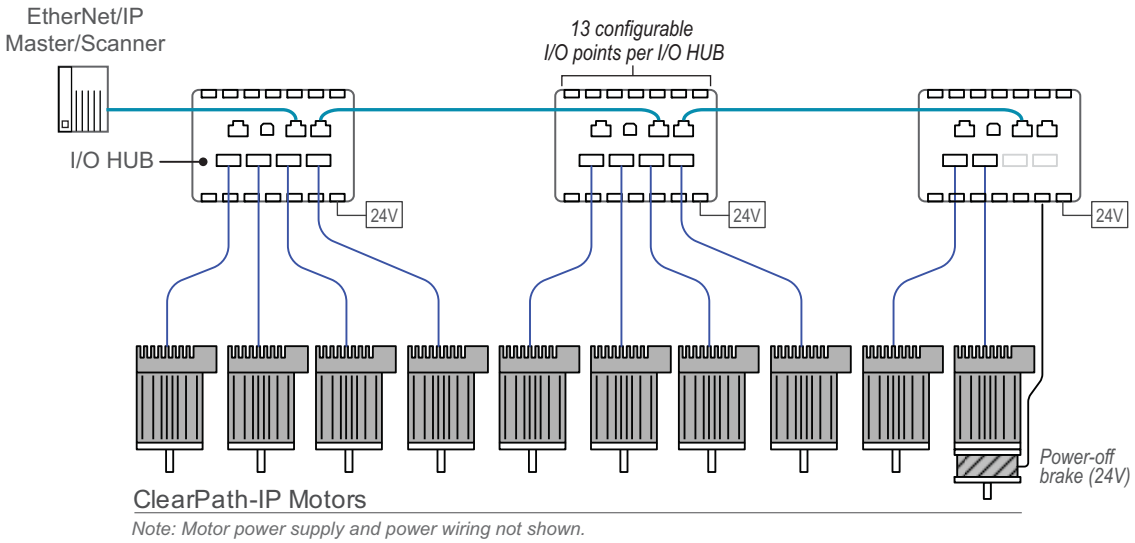
INTRODUCTION

WHAT IS CLEARPATH-IP AND THE I/O HUB?

ClearPath-IP is a multi-axis servo motion control and I/O system that is fully compliant with the EtherNet/IP™ communication protocol[1].

ClearPath-IP motors are brushless DC servomotors with custom rare-earth magnets, a powerful servo drive, and a high-resolution optical encoder, featuring advanced EtherNet/IP™ firmware, all in a package about the size of a typical non-integrated motor.

The I/O HUB serves as the interface between your EtherNet/IP™ network and ClearPath-IP motors. It supports up to 4 axes of motion and up to 13 points of configurable I/O. The I/O complement can include NPN and PNP limit switches, home sensors, stop sensors, analog I/O, spring-applied brakes, relays, GPIO, external encoder input and more.



Example ClearPath-IP network.

ClearPath-IP is a rugged, industrial-grade product. The motor subsystem is based on Teknic's Hudson family of brushless servo motors, with similar instrument grade bearings, stainless steel shaft, windings, rare earth magnets, and encoder technology. The drive electronics and advanced motion control firmware bring smooth, accurate, and responsive motion to EtherNet/IP™-based automation projects.

Easy setup. Install ClearView 3.0 software, connect ClearPath to your PC via USB, and run the included auto-tune software to optimize servo performance for your mechanical system. I/O HUB setup and network configuration typically take just a few minutes. Once you're up and running, Teknic's motion AOIs (Add-On Instructions) simplify and streamline application development.

ClearView 3.0 software features an intuitive user interface that allows users to quickly change motor settings, assign I/O functions, and test

[1] EtherNet/IP™ is a trademark of ODVA, Inc.

motors and mechanics using only ClearView's built-in Move Generator and Software Scope.

Teknic's IP-Sync™ technology provides exceptionally tight motor-to-motor synchronization. Most EtherNet/IP™ networks update in the millisecond range. ClearPath-IP motors can now achieve synchronization in the 200 nanosecond range as a result of Teknic's IP-Sync technology. This feature can give machine builders a noteworthy performance advantage on high-speed, coordinated multi-axis systems.

Safety and self-protection features are standard. ClearPath-IP will rapidly shut down if it becomes overloaded, overheated, detects a hard stop, or exceeds any of the safety and motion limits you specify.

Made in USA. Each ClearPath-IP motor and I/O HUB is built and tested in our New York manufacturing facility, so you can be certain you're purchasing a high quality, fully tested motion control product right out of the box. And, Teknic backs up each ClearPath-IP motor with a three-year warranty.

SAFETY WARNINGS

IMPORTANT: Read this manual before attempting to install, power up, or operate a ClearPath motor. Failure to understand and follow the safety information presented in this document could result in a serious injury to humans and property.

Always use caution and common sense when handling motion control equipment. Even the smallest ClearPath motor is powerful enough to crush fingers, tear off a shirt sleeve, or pull out a patch of hair faster than the blink of an eye[2]. These devices are extremely powerful and **dangerous if used carelessly**.

PERSONAL SAFETY WARNINGS

- Do not wear loose clothing or unconfined long hair when using ClearPath-IP motors. Remove ties, rings, watches and other jewelry before operating an unguarded motor.
- Do not operate a ClearPath-IP motor if your alertness, cognitive function, or motor skills are impaired.
- Avoid carrying a ClearPath-IP motor by its cable.
- Always understand how to use ClearPath-IP software controls and associated features before attempting to power, enable, or otherwise operate a ClearPath-IP motor.
- Install and test all emergency stop devices and controls before using ClearPath-IP.
- Before applying DC power, secure the ClearPath-IP motor to a stable, solid work surface and install a finger-safe guard or barrier between the user and the motor shaft.
- Provide appropriate space around the ClearPath-IP motor for ventilation and cable clearances.
- Do not allow cables or other loose items to drape over, or rest near the ClearPath-IP motor shaft.
- Never place fingers, hands, or other body parts on or near a powered ClearPath-IP motor.
- Thoroughly test all ClearPath-IP applications at low speed to ensure the motor, controls, and safety equipment operate as expected.

CE COMPLIANCE WARNINGS

- There are no user serviceable parts inside.
- Follow all instructions and use the product only as directed.

[2] A single blink of the human eye takes between 100 and 400 milliseconds according to the *Harvard Database of Useful Biological Numbers*.

- The safety of any system incorporating this equipment is the responsibility of the system designers and builders.
- The machine designers need to recognize and incorporate required warning symbols, guards and shields for ClearPath-IP motors that are used in applications that can result in the externally accessible parts of their machine exceeding a temperature of 65 Celsius. This is required to reduce the possibility of burns. A tool shall be required to remove any guards and/or shields.
- ClearPath-IP motors require that a path exist between the motor chassis and the Protective Earth (PE) connection of the machine to which it is affixed. (Note: The PE connection is often satisfied by simply bolting the motor to the machine; however it is the users responsibility to verify the PE connection.) If an external grounding wire is required, use the same or larger wire gauge as used between the DC power supply and ClearPath Motor.
- Any maintenance or repair guide created by the user shall state that power shall be removed before the Protective Earth ground conductor is disconnected. When reconnecting power, the Protective Earth ground conductor shall be the first wire reconnected. Main power may be reconnected only after the Safety Ground connection is secure.
- When the ClearPath-IP motor is mounted in an application where the shaft end is higher than the electrical connection end of the motor, the USB connector plug provided by Teknic must be installed. The USB plug in these installations becomes an element to prevent the spread of fire per EN 61010-1 section 9.3.2 part c.

GENERAL DISCLAIMER

The User is responsible for determining the suitability of products for their different applications. The User must ensure that Teknic's products are installed and utilized in accordance with all local, state, federal and private governing bodies and meet all applicable health and safety standards.

Teknic has made all reasonable efforts to accurately present the information in the published documentation and shall not be responsible for any incorrect information which may result from oversights. Due to continuous product improvements, the product specifications as stated in the documentation are subject to change at any time and without notice. The User is responsible for consulting a representative of Teknic for detailed information and to determine any changes of information in the published documentation.

If Teknic's products are used in an application that is safety critical, the User must provide appropriate safety testing of the products, adequate safety devices, guarding, warning notices and machine-specific training to protect the operator from injury.

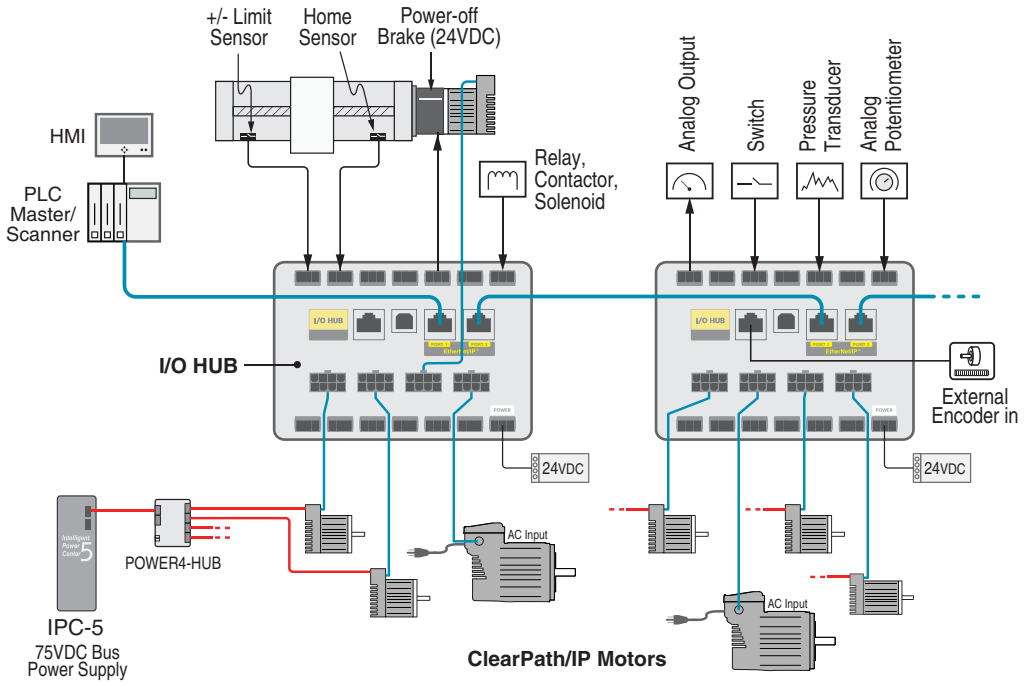
INTRODUCTION

The **I/O HUB** serves as both the EtherNet/IP™ communication interface and the I/O and motor connection hub for ClearPath-IP systems. Each hub appears as a single device on the EtherNet/IP™ network and can support two or four ClearPath-IP motors, depending on the model.

Each I/O HUB has a built-in two-port Ethernet switch. This enables multiple hubs to be daisy-chained or connected directly to existing network drops and switches.

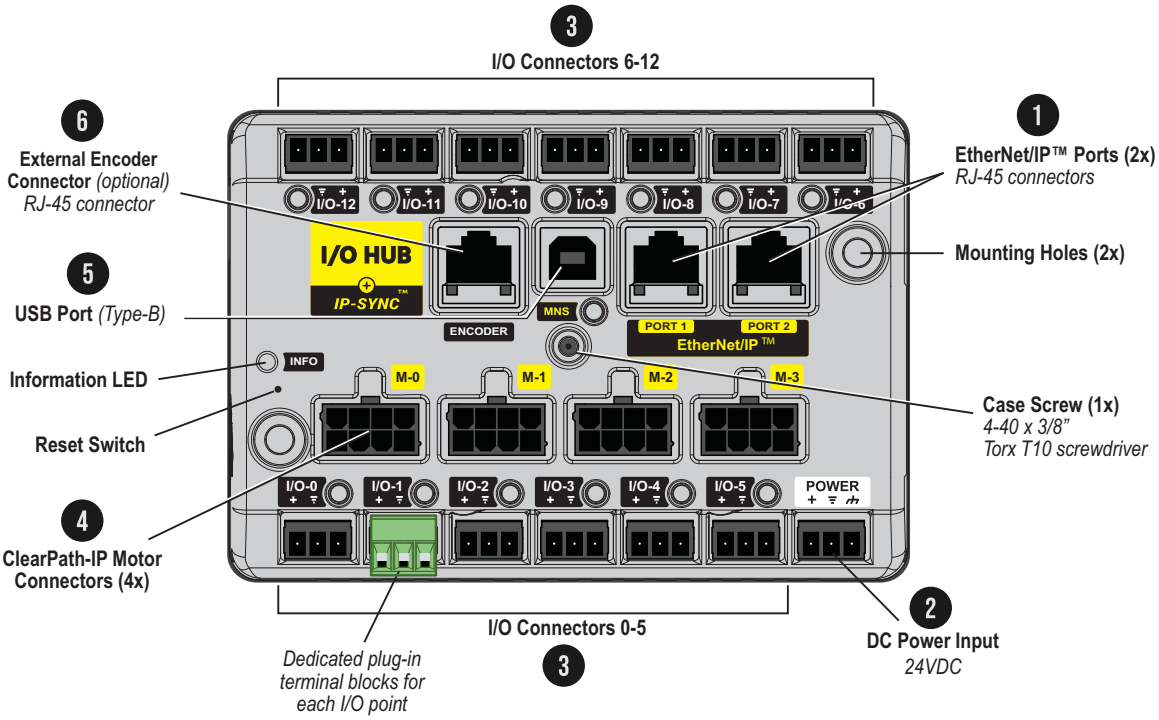
The I/O HUB directly interfaces with:

- EtherNet/IP™ Master/Scanner
- ClearPath-IP motors (2 or 4 depending on model)
- Input devices, such as sensors, switches, brakes, potentiometers, etc.
- Output devices, such as brakes, LED indicators, etc.
- A PC, via USB, for setup and configuration tasks



I/O HUBs in a ClearPath-IP system

PARTS OF AN I/O HUB



I/O HUB with callouts

MAIN CONNECTORS

1) EtherNet/IP™ Ports (2x) - Connect your EtherNet/IP™ network to either of these RJ-45 connectors, or make use of the built-in switch feature to daisy-chain I/O HUBs or to connect other network devices. Note: always use CAT-5e cable or better.

2) Power Input Connector - Connect 24VDC power to this 3-position connector. See Powering an I/O HUB later in this section. Note: I/O HUBs can be powered from lower voltages (down to 12VDC), but 24VDC is the most common supply voltage used for this product.

3) I/O Connectors - There are 13 3-position I/O connectors that can support simple switches, NPN and PNP sensors, analog I/O, spring-applied brakes, relays, GPIO, external encoder input and more[3].

4) ClearPath-IP Motor Connectors - Connect your ClearPath-IP motors here. The required cable is a straight-through, 8-pin to 8-pin Molex MiniFit Jr. cable.

5) USB Port - Connect your PC running ClearView 3.0 to this USB-B connector for I/O HUB setup and configuration tasks. Use only high quality, data-rated USB cables.

6) External Encoder Connector - *(Applies to IO-HUB-4-E only)* Connect an optional third-party 5V differential encoder to this standard RJ-45 connector. Courtesy 5V power is provided at connector.

[3] Check your I/O HUB model for supported features.

I/O HUB MODELS AND FEATURES

Teknic offers three I/O HUB models with different motor and I/O capabilities. See model descriptions and features by model for details.

Note: The last two characters in an I/O HUB model number indicate the number of motors the model supports, 2 or 4, and the type of I/O available, -E or -R.

I/O HUB MODEL NUMBERS

IO-HUB-2-R supports up to 2 CPM-IP motors, and R ***(Motor I/O)*** functionality.

IO-HUB-4-R supports up to 4 CPM-IP motors and R ***(Motor I/O)*** functionality.

IO-HUB-4-E supports all features. This includes R ***(Motor I/O)*** and E ***(Enhanced I/O)*** functionality.

TABLE OF I/O HUB FEATURES BY MODEL

Note: Model IO-HUB-4-E supports all I/O HUB features.

Table Key

ALL = Feature available on **ALL** I/O HUB models.

2R = Feature available on IO-HUB-2-R.

4R = Feature available on IO-HUB-4-R.

4E = Feature available on IO-HUB-4-E.

Connector Name	Digital Inputs		Digital Outputs		Analog Inputs	Analog Output	ClearPath-IP Motors	Encoder Input	High-Speed Encoder Capture Input
	Motor I/O	GPIO	Motor I/O	GPIO (PWM Capable)					
I/O-0	ALL	4E	ALL	4E	4E				
I/O-1	ALL	4E	ALL	4E	4E				
I/O-2	ALL	4E	ALL	4E	4E				
I/O-3	ALL	4E	ALL	4E	4E				
I/O-4	ALL	4E	ALL	4E	4E				
I/O-5	ALL	4E	ALL	4E	4E				
I/O-6	ALL	4E	ALL	4E	4E				
I/O-7	ALL	4E	ALL	4E	4E				
I/O-8	ALL	4E	ALL	4E	4E				
I/O-9	ALL	4E	ALL	4E	4E				
I/O-10	ALL	4E	ALL	4E	4E				ALL
I/O-11	ALL	4E	ALL	4E	4E				
I/O-12	ALL	4E			4E	4E			
M-0							ALL		
M-1							ALL		
M-2							4R, 4E		
M-3							4R, 4E		
ENCODER								4E	4E

"MOTOR I/O" (ALL MODELS)

The Motor I/O type lets you assign I/O devices such as sensors, switches, or brakes to predefined motion-related functions.

Each Motor I/O function can be assigned to any available I/O point and then mapped to a specific motor connected to the I/O HUB. Motor and I/O configuration is done using either ClearView 3.0 or programmatically through the Master controller.

Motor I/O points may be assigned to any of these predefined functions:

- Positive Limit Input
- Negative Limit Input
- Home Switch Input
- Stop Switch Input
- Position Capture Input[4]
- Brake Output

Note: Motor I/O is not general-purpose I/O (GPIO). The Master/Scanner cannot directly read or write to Motor I/O points. Only the Enhanced I/O HUB model supports GPIO functionality.

How to configure Motor I/O in ClearView 3.0

1. Connect the I/O HUB to your PC running ClearView 3.0 via the USB port.
2. Set the I/O HUB to **Full Access** mode.
3. Click on the desired motor connector from the UI graphic (**M-0, or M-1** for example).
4. Click **Configure** to open the Motor Configuration window.
5. Decide which Motor I/O function you want to configure (for example, **Positive Limit**).
6. Next to the [Positive Limit] function, select the desired I/O connector from the I/O Point dropdown list (**I/O-1** for example).
7. Select the device type from the **Configuration** dropdown list (e.g., Switch, NPN, PNP).
8. Select the "Trigger On" behavior. This defines the condition under which the I/O point is considered asserted.

[4] When I/O-10 is configured as a Position Capture Input, it provides high-speed motor encoder position capture. This capability applies only to I/O-10.

"ENHANCED I/O" (-E)

The Enhanced I/O Model (IO-HUB-4-E):

- Supports all -R (Motor I/O) functions.
- Supports general-purpose I/O (GPIO) in any combination up to:
  - 13 digital inputs
  - 12 digital outputs (PWM capable)
  - 13 analog inputs
  - 1 analog output on I/O-12 only (4-20mA or 0-20mA)
- **External Encoder Input** - The I/O HUB features one dedicated RJ-45 encoder input port.

  Note: Third-party encoders must support differential RS-422 quadrature signals to channels A and B; an optional index channel (I) is supported. The port provides 5VDC@300mA courtesy power.

Enhanced I/O points can be read and written by the Master controller. Configuration is performed through ClearView 3.0, or programmatically through the Master/Scanner.

How to configure Enhanced I/O in ClearView 3.0

1. Connect the I/O HUB to your PC running ClearView 3.0 via the USB port.
2. Set the I/O HUB to **Full Access** mode.
3. Click on the desired I/O connector from the UI graphic (**I/O-0, or I/O-1,** for example).
4. From the center drop-down list, select an I/O configuration (for example, Digital Input).
5. Select the appropriate Input or Output Wiring Option from the drop-down list (for example Switch, NPN, or PNP device).
6. Configure other options as presented in the setup dialog, if any.

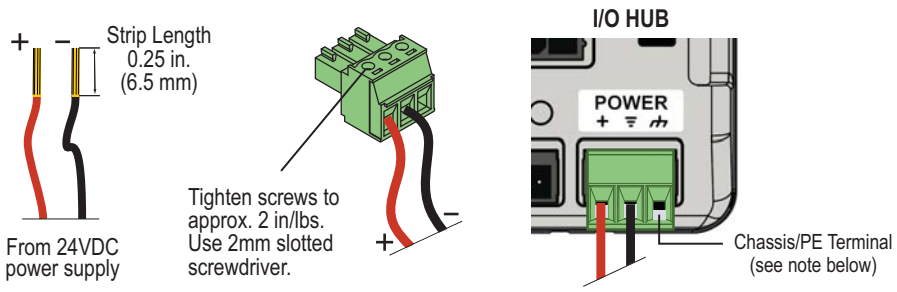
POWERING AN I/O HUB

TOOLS AND PARTS REQUIRED:

- **Power supply (24VDC[5]).** The minimum required wattage depends on the total power draw of all connected devices. See the I/O HUB specifications for details.
- **Slotted screwdriver.** A 2 mm blade is recommended.
- **Wire cutter/stripper.**
- **Connectors:** Three-position Molex P/N 0395105003. These connectors are available at Teknic.com. Order PN CC-3TERM-PLUG-10PC.

WIRING INSTRUCTIONS

1. Turn off power supply.
2. Strip positive and negative wires coming from the power supply. Strip length: 0.25" (6.5 mm).
3. Insert wires into terminal block as shown below.
4. Tighten terminal screws.
5. Visually inspect the connector for good wire capture. Verify that no wire insulation is captured in the closure, and that no loose wire strands are present.
6. Recommended: Before connecting the terminal block to the I/O HUB, test for correct voltage polarity between "+" and ground terminals.



Chassis Connection: If direct mounting to a PE-bonded chassis is not possible, connect the chassis terminal to a nearby PE-bonded point on the machine. Use uncoated, conductive hardware, and ensure the connection is made to an uncoated, conductive part of the chassis close to the I/O HUB.

[5] The recommended supply voltage for the I/O HUB is 24VDC. The hub can also operate with supply voltages as low as 12VDC; however, when using a lower voltage supply (e.g., 12VDC), use only I/O devices rated for that voltage.

TEKNIC 24VDC POWER SUPPLY

The **PWR-IO-24VDC power supply** (Mean Well PN LRS-150-24) is an inexpensive, 24VDC, 6.5A (156W) switching supply capable of powering most ClearPath-IP and I/O HUB applications.

Product Datasheet

Installation Information



Application Note: A higher-current power supply may seem excessive for an I/O HUB application, but it helps ensure that the processor remains powered under adverse conditions, such as overloads or shorts. It also provides overhead for future expansion if additional I/O devices are added. Lower-current supplies, in some cases, may experience shutdowns or brownouts when the I/O HUB is overloaded or shorted.

SETTING THE I/O HUB'S IP ADDRESS

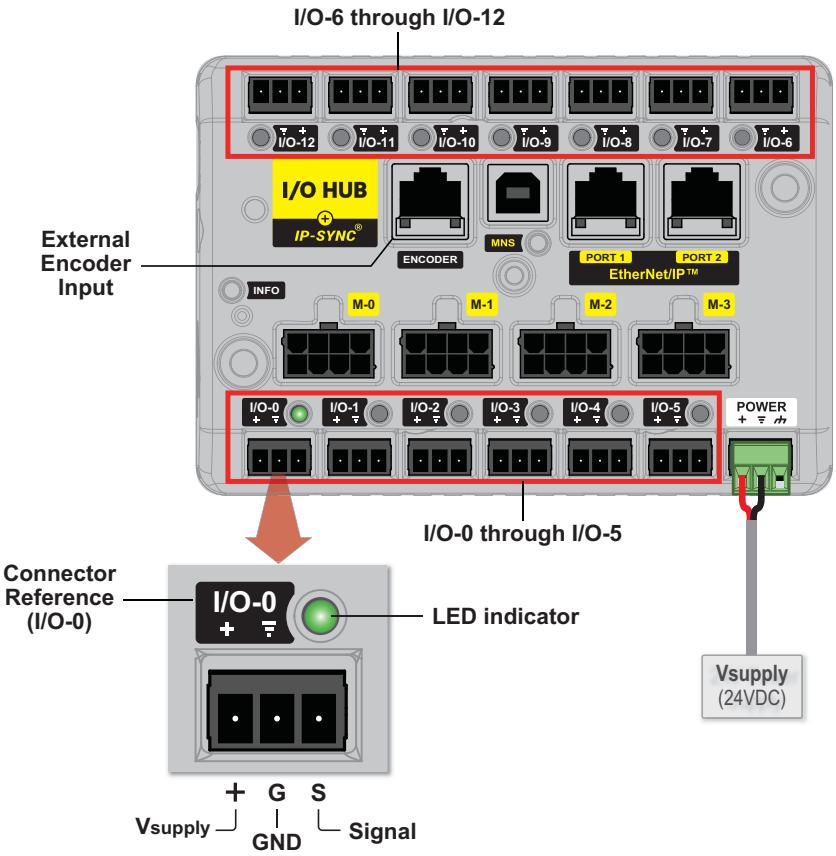
1. Apply power to the I/O HUB.
2. Open ClearView 3.0.
3. Connect a USB cable from your computer to the USB port on the I/O HUB. The I/O HUB will show up in ClearView's Device List.
   Note: Use a high speed, data-rated USB cable.
4. Set the I/O HUB Access Level to "Full". Access Level settings are located at upper right of the ClearView 3.0 UI.
5. Plug your network cable into Port 1 or Port 2 of the I/O HUB.
6. Click the "Edit Network Settings..." button at bottom of UI; or, choose *Setup>Edit Network Settings...* from the main menu.
7. Follow the instructions in the Network Settings dialog window to configure for DHCP or Static IP settings.

I/O WIRING

This section contains hookup diagrams and wiring details for connecting common I/O devices to an I/O HUB.

Note: 24VDC is the recommended supply voltage for an I/O HUB; however, the device will operate properly at lower voltages; 12VDC is the practical minimum.

DAMAGE WARNING: Never apply an external voltage higher than your chosen V_{supply} to any I/O point on the I/O HUB. Doing so will damage the hub's circuitry.

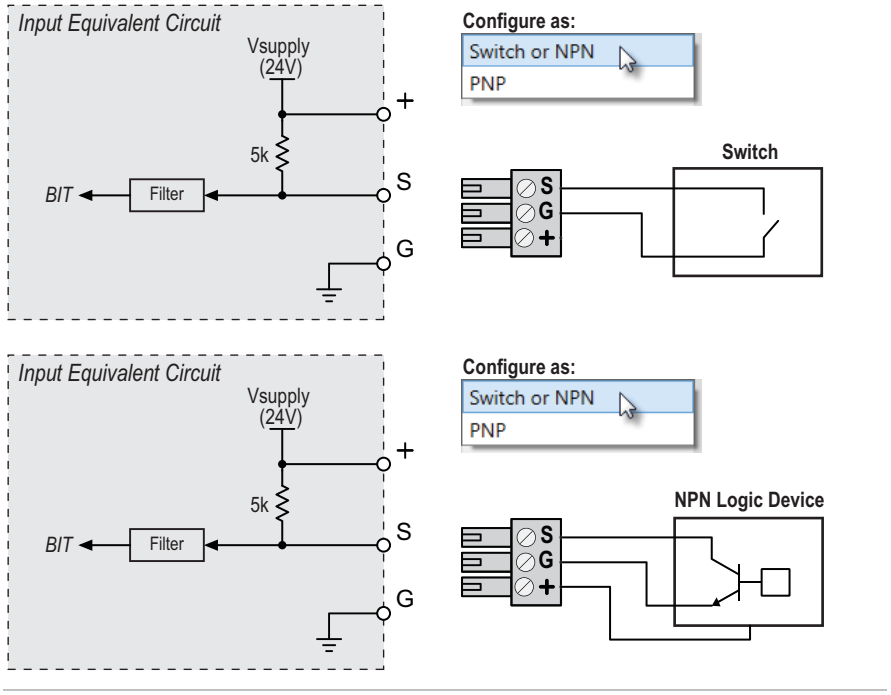


I/O HUB with enlarged view of I/O-0

DIGITAL INPUTS: SWITCHES, NPN LOGIC DEVICES

Supported I/O HUB models

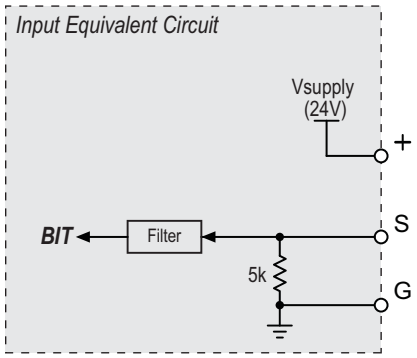
- IO-HUB-2-R
- IO-HUB-4-R
- IO-HUB-4-E

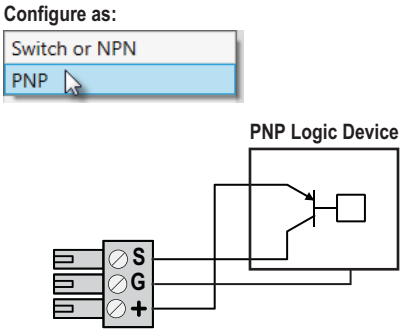


DIGITAL INPUTS: PNP LOGIC DEVICES

Supported I/O HUB models

- IO-HUB-2-R
- IO-HUB-4-R
- IO-HUB-4-E



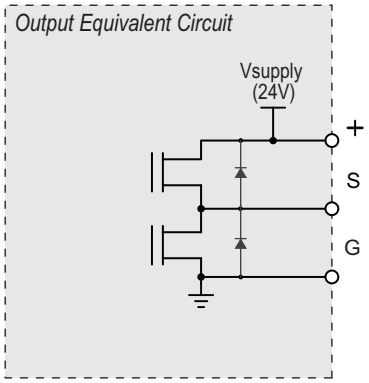


DIGITAL OUTPUTS: GPIO (PUSH-PULL, PWM)

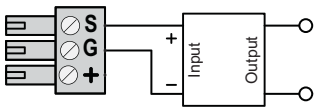
Supported models:

- IO-HUB-4-E

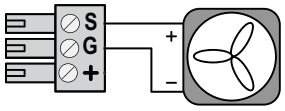
Digital Output / PWM Output



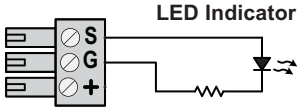
Solid State Relay (SSR)



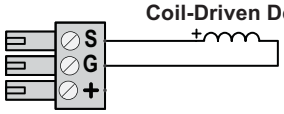
DC Fan / DC Motor



LED Indicator



Coil-Driven Device

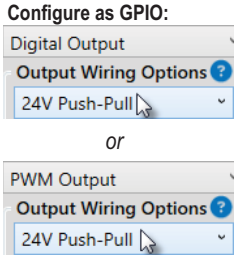


Note: a shunt diode is *not* required

Examples of coil-driven devices

- Relays
- Contactors
- Brakes
- Vacuum Valves
- Solenoid Actuators
- Pneumatic Valves

Configure as GPIO:

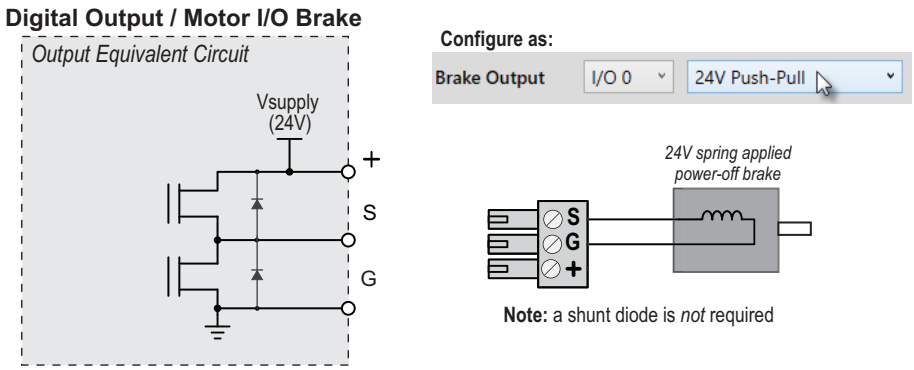


DIGITAL OUTPUTS: MOTOR I/O (BRAKE OUTPUT)

When configured as *Motor I/O*, this output serves as a pre-programmed brake output.

Supported models

- IO-HUB-2-R
- IO-HUB-4-R
- IO-HUB-4-E



DIGITAL OUTPUTS: OPEN-COLLECTOR (3.3V AND 5V INPUTS)

Supported I/O HUB models:

- IO-HUB-4-E

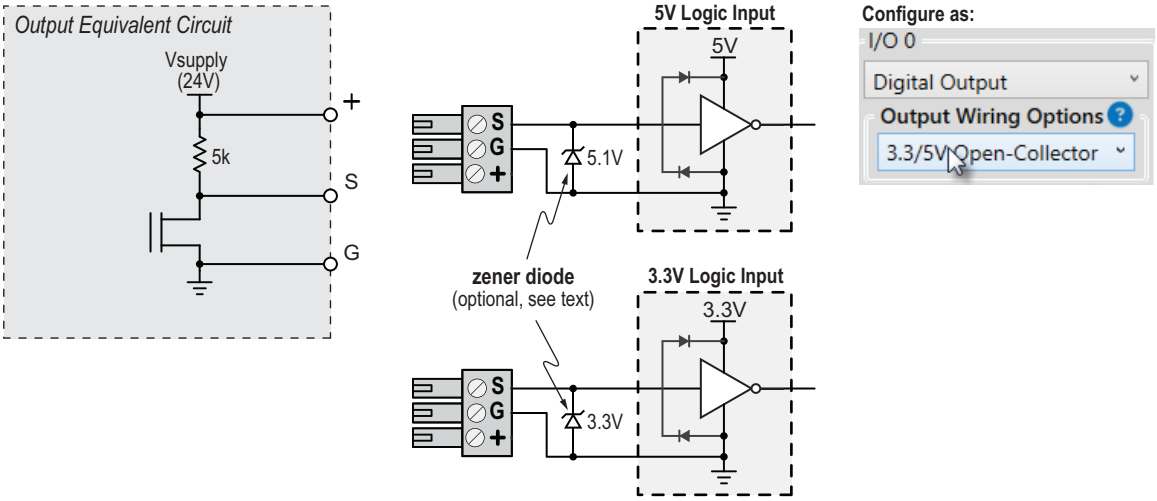
Digital Output Open-Collector mode allows you to connect I/O HUB outputs directly to lower voltage logic inputs, such as a 5V or 3.3V logic inputs.

Damage Warning: Use 3.3/5V Open Collector Output mode only. Do not use *Push-Pull mode*.

Application Notes

- Lower-voltage inputs may include internal protection circuitry to clamp the signal voltage to a safe level. If such protection is not present, the input can be damaged by direct connection to 24V. Check the manufacturer's documentation if you are unsure.
- Install a **zener diode** if the logic input cannot safely tolerate a 24V open-collector output (or if you aren't sure). Select a standard zener diode with zener voltage close to the input's nominal logic level. Use a 5.1V zener for 5V logic inputs; use a 3.3V zener for 3.3V inputs. See figure below for zener placement information.
- Even with a zener diode installed for voltage limiting, the I/O HUB output **must be configured for Open-Collector mode**.

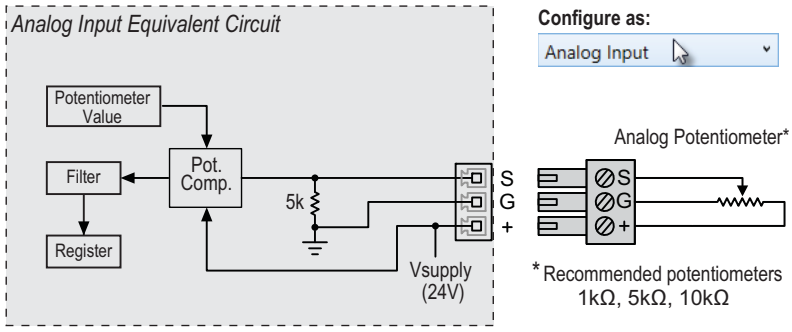
Digital Output: Open Collector

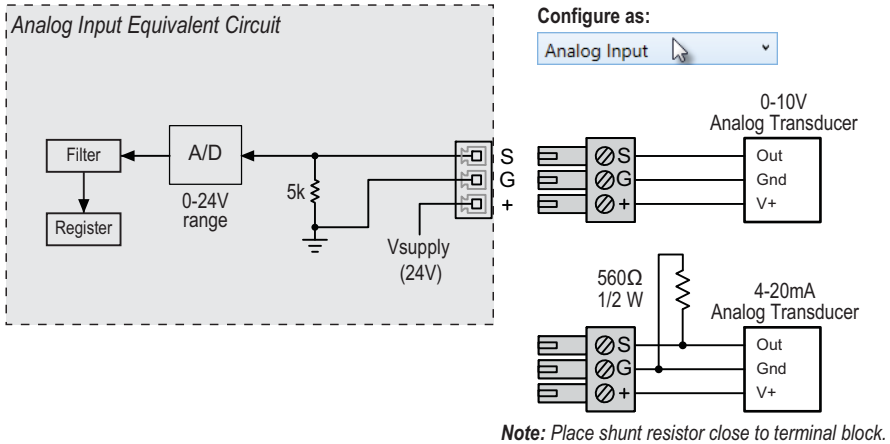


ANALOG INPUTS: POTENTIOMETER, TRANSDUCER

Supported I/O HUB models

- IO-HUB-4-E





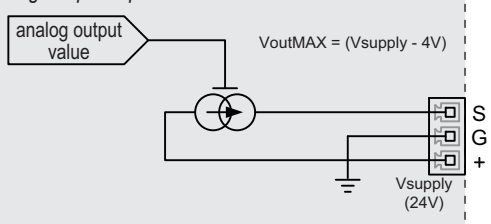
Note: *Place shunt resistor close to terminal block.*

ANALOG OUTPUTS: VARIOUS

Supported I/O HUB models

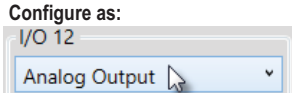
- IO-HUB-4-E ***(applies to I/O-12 only)***

Analog Output Equivalent Circuit

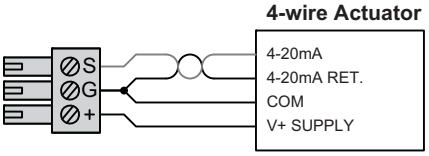


Output produces positive current flow through the S (signal) pin as shown, i.e., output is "sourcing".

Configure as:



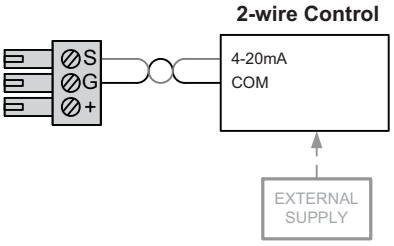
4-wire Actuator



Notes:

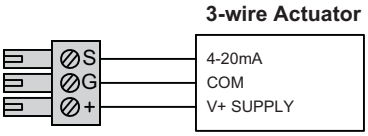
- Connect signal and supply return wires close to output terminal block
- Use twisted pair as shown for best noise immunity

2-wire Control

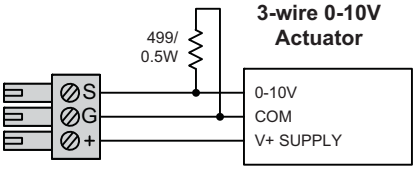


May be required depending on device

3-wire Actuator



3-wire 0-10V Actuator



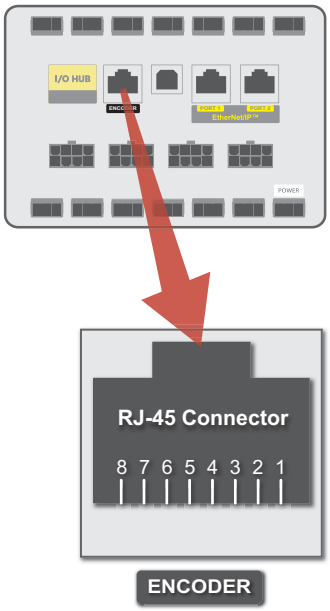
Note:
Place 499 Ohm shunt resistor close to actuator

ENCODER INPUT

Connect an external encoder to the I/O HUB for encoder-following and external position-reference functions. Refer to the *ClearPath-IP Software Reference Manual* for programming information.

Supported I/O HUB models:

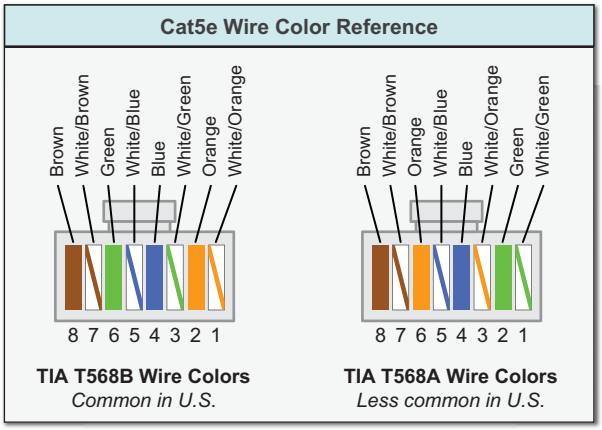
- IO-HUB-4-E



External Encoder Requirements

- Differential, quadrature A/B/I
- RS-422 signal levels
- 5VDC@300mA courtesy power at jack
- Max.10 Mhz quadrature count rate

Pin#	Signal
1	ENC A
2	ENC A~
3	GND
4	ENC B
5	ENC B~
6	5V (out)
7	ENC I
8	ENC I~



Notes:

- Use high quality CAT5e cable or better.
- External encoders are not sold or supplied by Teknic.
- 5VDC courtesy power and ground provided at pins 3 and 6. Maximum current is 300mA.

SOFTWARE (CLEARVIEW 3.0)

ClearView 3.0 is the configuration and diagnostic application for ClearPath-IP systems. ClearView 3.0 allows you to:

- View and interact with the ClearPath-IP motors and I/O HUBs on the network.
- Load motor configuration files and I/O HUB configuration files.
- Configure motor settings and I/O HUB network settings.
- Auto-Tune ClearPath-IP motors.
- Use the Move Generator and Jog Motion controls to test, refine, and troubleshoot motion and mechanical performance (without a controller present).
- Access the software oscilloscope to analyze motor variables in real time. Variables include Measured Torque, Position Error, Measured Velocity, Bus Voltage, and more.
- Assign functions to the I/O points on the I/O HUB.

MINIMUM SYSTEM REQUIREMENTS

Operating System:	Windows 10, 11
Processor:	1.5 GHz or faster. ARM-based processors not supported.
Memory:	1 GB RAM
HD Free Space:	1 GB
Monitor:	1280 x 1024 pixels or higher
Other:	Sound card with speakers (optional)

DOWNLOAD LINK

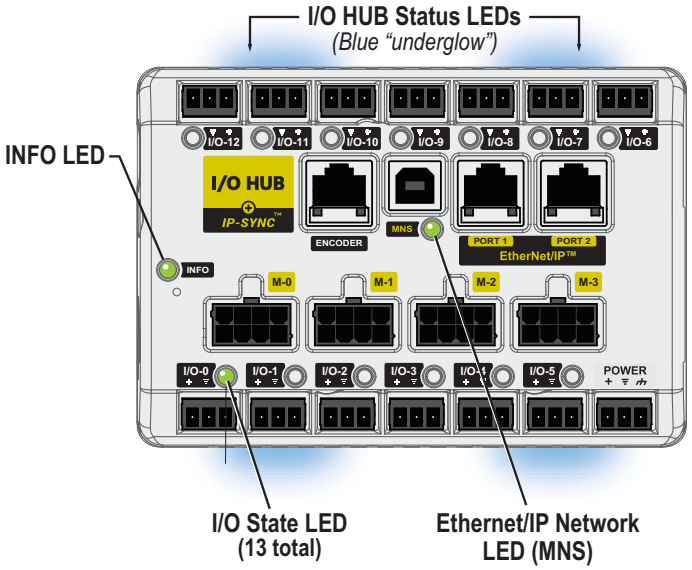
Download the ClearView 3.0 installer from https://www.teknic.com/downloads/.

APPENDIX A: TROUBLESHOOTING

The ClearPath-IP motor and I/O HUB each include LED indicators that provide visual feedback on system operating status.

This section describes:

- The names and physical locations of each LED indicator.
- The meaning of each LED color and flash pattern.



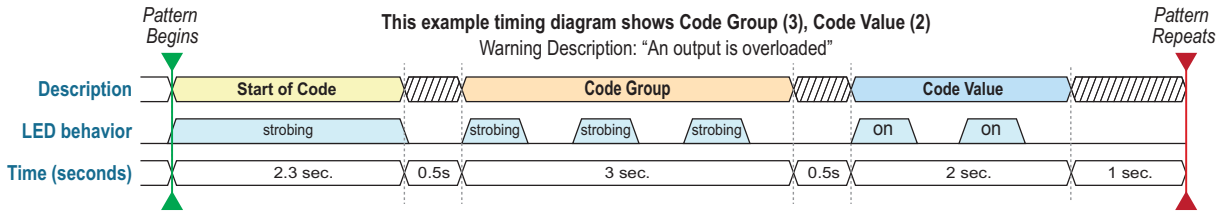
- **I/O HUB Status LED:** These LEDs, seen as a blue underglow around the base of the I/O HUB, indicate the ongoing operational state of the I/O HUB. During normal operation, the LEDs fade in and out at a regular interval. When an I/O HUB warning is triggered, the normal breathing pattern is replaced with a blink code corresponding to the specific warning.
- **Info LED:** Mirrors the behavior of the I/O HUB Status LED when an I/O HUB warning is present.
- **I/O State LEDs:** These LEDs (13 in all) show the logical state of each I/O point on the I/O HUB.
- **MNS LED (EtherNet/IP™ Network):** Displays the device's connection and communication status on the EtherNet/IP™ network.

LED CODES: I/O HUB STATUS LED AND INFO LED

The I/O HUB Status LED is the blue "underglow" at the base of the I/O HUB. During normal operation this LED fades in and out in a slow breathing pattern. **The Info LED** (top left of the device) mirrors the behavior of the Status LED when (and only when) a warning is present.

I/O HUB Status codes are divided into three segments. Refer to the description and timing table below.

- **The Start-of-Code** segment is indicated by a 2.3 second strobing pulse, followed by a 1/2 second off period.
- **The Code Group** segment follows the Start-of-Code segment and indicates the general category of the warning (e.g., 'Device Error'). It is defined by the number of strobing pulses. Each strobing pulse is 1/2 second on, followed by 1/2 second off.
- **The Code Value** follows the Code Group and indicates the specific warning within the designated Code Group. One pulse is defined as 1/2 second solid on, followed by 1/2 second off.

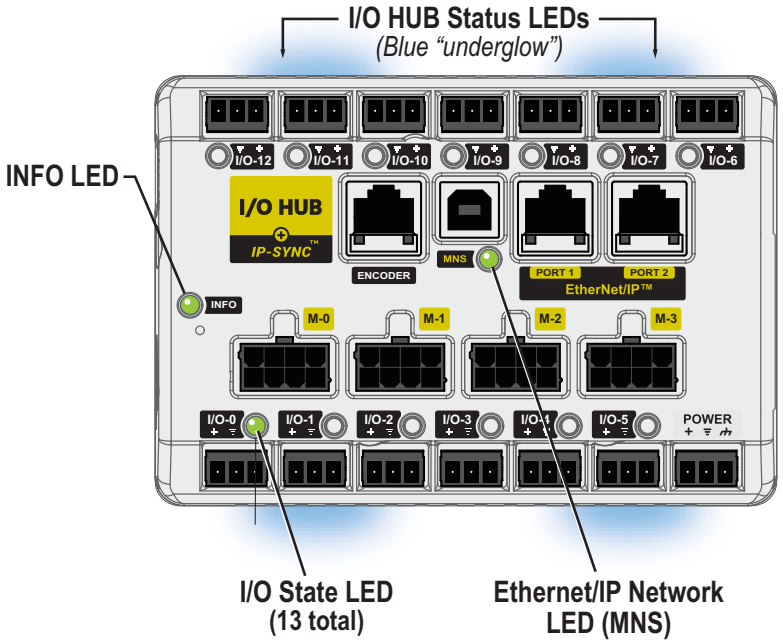


Note: *If multiple I/O HUB warnings are present simultaneously, the codes will be displayed sequentially with a brief pause between codes.*

Code Group	Code Value	Description
1 Strobe: HW Failure	1 Blink: Unit Requires Repair	Hardware problem. Return unit to Teknic.
2 Strobes: Device Error	1 Blink: IP Address Conflict	The I/O HUB's configured IP Address is the same as another device on the network. Make sure the I/O HUB has a unique IP Address configured in ClearView 3.0.
	2 Blinks: Config Load Required	Configuration file load failed. Try loading the file again, or reset the I/O HUB.
	3 Blinks: Encoder Noise	The I/O HUB detected noise on the external encoder input.
	4 Blinks: ADC Over-voltage	An analog input's voltage was too high. Check the I/O State LEDs to determine which analog input was overloaded.
3 Strobes: Power Error	1 Blink: 5V Supply Overloaded	The 5-volt supply for the Encoder Input has been overloaded.
	2 Blinks: Output Overloaded	An output on the I/O HUB has been overloaded. Check the I/O State LEDs to determine which output was overloaded.
	3 Blinks: Supply Voltage Too Low	The supply voltage dropped below 10 VDC. Check the I/O HUB's power supply.
	4 Blinks: Supply Voltage Too High	The supply voltage rose above 29 VDC. Check the I/O HUB's power supply.

LED CODES: MNS LED

The MNS (Module and Network Status) LED conveys information such as I/O HUB power status, IP Address status, and EtherNet/IP™ connection status.



LED State	Description
Steady Off	The I/O HUB is powered off, or is powered on but an IP Address has not been configured.
Flashing Green and Red	Startup sequence in progress.
Flashing Green	The I/O HUB's IP Address has been configured, but a communication link has not been established, and a connection timeout between the I/O HUB and PLC has not occurred.
Steady Green	The I/O HUB's IP Address has been configured, a connection has been established with at least one other Ethernet/IP™ device, and a connection timeout between the I/O HUB and PLC has not occurred.
Flashing Red	The I/O HUB's IP Address has been configured, and a timeout between the I/O HUB and PLC has occurred.

APPENDIX B: MECHANICAL INDEX

DIMENSIONAL DRAWINGS

ACCESSORIES

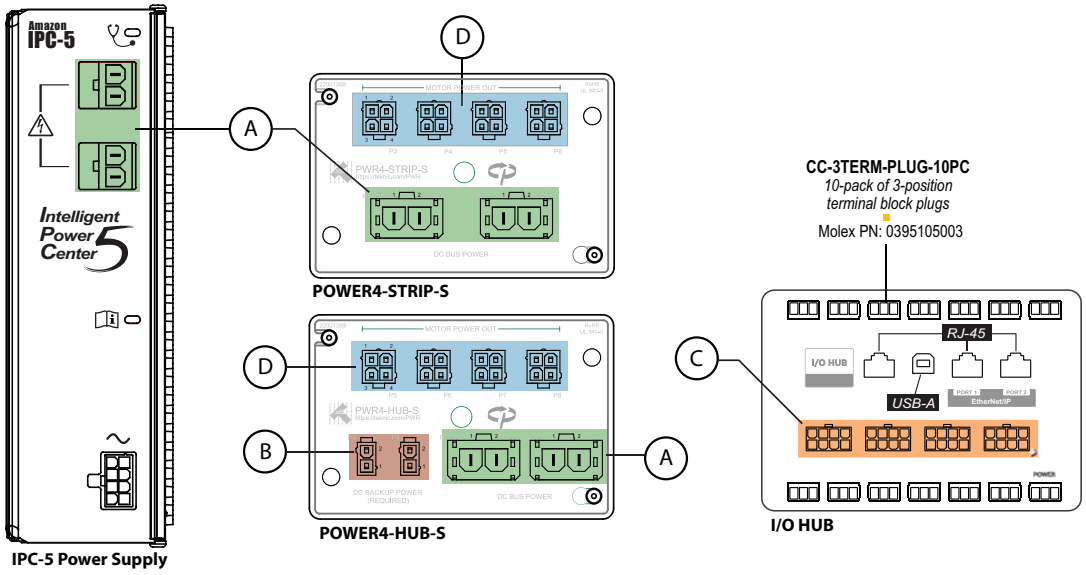
I/O HUB

DIN-MNT (optional DIN rail mounting plate for I/O HUB)

APPENDIX C: MATING CONNECTORS AND CABLES

MATING CONNECTORS

This section contains a list of mating connectors, terminals, and hand tools needed for making ClearPath-IP cables.



Ref.	Description	Mating Connector PN	Terminal PN	Terminal Desc.	Crimp Tool	Extraction Tool	Wire Gauge [1]
A	Molex Sabre, Receptacle, 2 circuits	44441-1002 (black, UL 94V-2) 44441-2002 (black, UL 94V-0)	43375-0001	Female crimp terminal, tin plate, 14-16 AWG	63811-7200 (14-16 AWG)	63813-2700	16 AWG
B	Molex MiniFit-Jr, Receptacle, 2 circuits	39-01-2020 (natural, UL 94V-2) 39-01-3025 (black, UL 94V-2) 39-01-3028 (natural, UL 94V-0) 39-03-9022 (black, UL 94V-0)	39-00-0059 (reel) 39-00-0060 (loose)	Female crimp terminal, tin plate, 18-24 AWG	63819-0900 (16-24AWG)	11-03-0044	20 AWG
C	Molex MiniFit-Jr, Receptacle, 8 circuits	39-01-2080 (natural, UL 94V-2) 39-01-3085 (black, UL 94V-2) 39-01-2085 (natural, UL 94V-0) 39-03-9082 (black, UL 94V-0)	39-00-0046 (reel) 39-00-0047 (loose)	Female crimp terminal, tin plate, 22-28 AWG	63819-1000 (22-28 AWG)	11-03-0044	22-24 AWG
D	Molex MiniFit-Jr, Receptacle, 4 circuits	39-01-2040 (natural, UL 94V-2) 39-01-3045 (black, UL 94V-2)	39-00-0046 (reel) 39-00-0047 (loose)	Female crimp terminal, tin plate, 22-28 AWG	63819-1000 (22-28 AWG)	11-03-0044	22 AWG **(Pins 1,4)**
		39-01-2045 (natural, UL 94V-0) 39-03-9042 (black, UL 94V-0)	39-00-0077 (reel) 39-00-0078 (loose)	Female crimp terminal, tin plate, 16 AWG	200218-2200 (16 AWG)		16 AWG **(Pins 2,3)**

[1] AWG values listed are the actual wire gauges used in Teknic-manufactured cables.

CABLE DRAWINGS

NETWORK CABLE: CABLE-CAT5-120



Cat5e cable, 10 ft. end-to-end. Flexible, snag-free, cable boot protects the plug while making it easy to depress the locking clip. 24AWG stranded, pure bare copper conductors. 50µm gold-plated contacts. Link

APPENDIX D: SPECIFICATIONS

Mechanical	
Dimensions	5.0" x 3.5" x 1.0" (127mm x 88.9mm x 25.4mm)
Weight (with cover)	6.66 oz (189 g)
Material	3mm thick polycarbonate cover, aluminum baseplate
Electrical	
Voltage Input	10-28VDC (24VDC nominal)
Output Current Capability	I/O 0,1,2,3,4,5,6,7,8,9,10,11 - 750mA RMS (1000mA peak) each Group total for each 0/1/2/3, 4/5/6/7, 8/9/10/11 - 1.5A RMS (2A peak) Total continuous for all outputs - 4A RMS (7A peak for 10mS Max)
Power Consumption (I/O HUB only)	300mA @ 24VDC
Protection features	Overcurrent protection on all outputs Inductive clamping on all outputs Board master overvoltage and overcurrent protection ESD protection features on all I/O circuits
Capacitive load (max.)	Capacitance on I/O power pins collectively may not exceed 250uF.
Motion Axes by Model	
IO-HUB-2-R	2 motion axes available per I/O HUB; with Regular (R) axis I/O only
IO-HUB-4-R	4 motion axes available per I/O HUB; with Regular (R) axis I/O only
IO-HUB-4-E	4 motion axes available per I/O HUB; with Enhanced (E) general purpose I/O (GPIO) and axis I/O
I/O Points by Model	
Total I/O Points (all models)	13 built-in I/O points. I/O points each have an individual LED indicator.
IO-HUB-2-R	Software configurable I/O can serve as motion axis Home Switch Input, +/- Limit Switch Inputs, Stop Sensor Input, Position Capture Input, or Brake Output. I/O is not general purpose (i.e., the master/scanner cannot directly read or write this I/O). Analog I/O is not supported.
IO-HUB-4-R	Software configurable I/O can serve as motion axis Home Switch Input, +/- Limit Switch Inputs, Stop Sensor Input, Position Capture Input, or Brake Output. I/O is not general purpose (i.e., the master/scanner cannot directly read or write this I/O). Analog I/O is not supported.
IO-HUB-4-E	Supports all motion axis functions of the IO-HUB-2-R and IO-HUB-4-R (Home Switch Input, +/- Limit Switch Inputs, Stop Sensor Input, Position Capture Input, and Brake Output). In addition, this model supports software configurable GPIO in any combination of up to 13 digital inputs, 12 digital outputs (PWM capable), 13 analog inputs, and 1 analog output (4-20mA or 0-20mA). The master/scanner can directly read/write the GPIO.
External Encoder Input by Model	
IO-HUB-2-R	No external encoder support
IO-HUB-4-R	No external encoder support
IO-HUB-4-E	1 RJ-45 port configured for optional external encoder input. Encoder requirements: 5V differential, quadrature A/B/I supported, index not required RS-422 levels, Max. count rate 10Mhz 5V @ 300mA courtesy power available on this port.
Communications	
Ethernet	EtherNet/IP™ in/out switching capability. Accessed via 2 standard RJ-45 ports. 10Base-T/100Base-TX Ethernet. Use CAT5e cable or better.
USB	USB 2.0, for configuration only
Environmental	
IP rating	IP20
Operating Temperature/Humidity	-20°C to 50°C / 0-90% non-condensing
Storage Temperature	-40°C to 85°C
Compliance	
	CE (pending), RoHS

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