ECx-400 Series Extension Modules

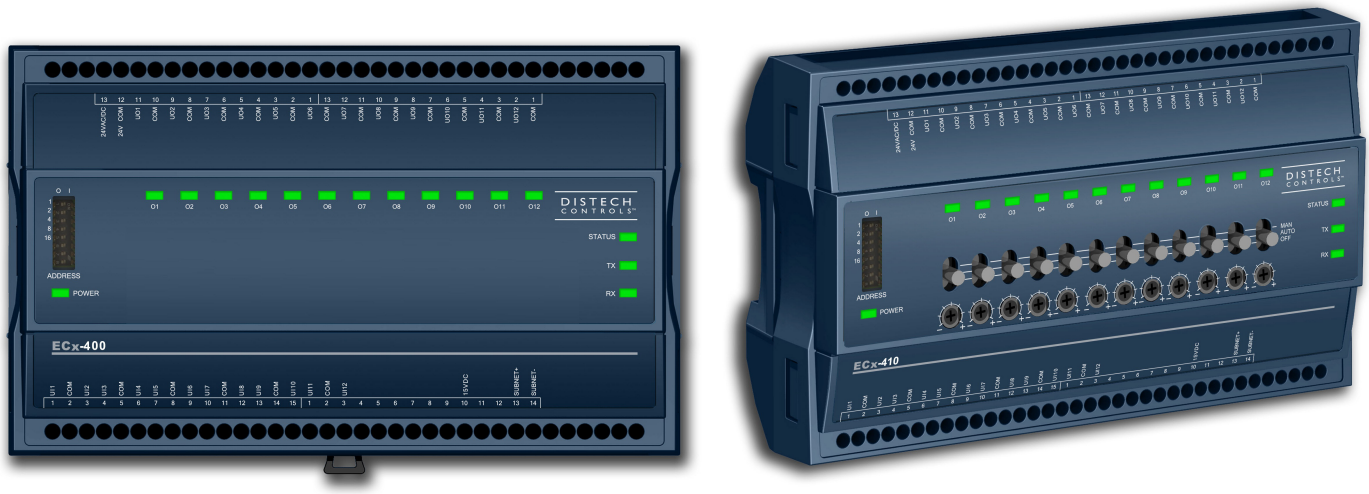


Figure 1: From Left to right: enclosure without HOA switches and enclosure with HOA switches

Product Description

This document describes the hardware installation procedures for the ECx-400 Series I/O Extension Modules.

The Distech Controls ECB-600 and ECL-600 Series controllers product line is designed to control and monitor various HVAC equipment such as roof top units, large air handling units as well as central plant applications such as chillers and boilers. These controllers are compatible with the I/O Extension Module product line, which includes the following modules: ECx-400, ECx-410 and ECx-420.

This document describes the hardware installation procedures for the ECx-400, ECx-410 and ECx-420 I/O Extension Modules only.

These I/O Extension Modules are all built on a similar platform, but have different numbers of inputs and outputs. Moreover, each individual model has different amounts of digital and/or universal outputs. For more information on the specific layout and functionality of each I/O Extension Module, please refer to the ECL-600 or ECB-600 datasheets.

General Installation Requirements

For proper installation and subsequent operation of the device, pay special attention to the following recommendations:

- ☐ It is recommended that the controller(s) be kept at room temperature for at least 24 hours before installation to allow any condensation that may have accumulated due to low temperature during shipping/storage to evaporate.
- ☐ Upon unpacking, inspect the contents of the carton for shipping damages. **Do not install a damaged device.**
- ☐ The device is designed to operate under environmental conditions that are specified in its datasheet.
- ☐ Ensure proper ventilation of the device and avoid areas where corroding, deteriorating or explosive vapors, fumes or gases may be present.
- ☐ Allow for proper clearance around the device's enclosure and wiring terminals to provide easy access for hardware configuration and maintenance.
- ☐ When installing in an enclosure, select one that provides sufficient surface area to dissipate any heat generated by the device and by any other devices installed in the enclosure. A metal enclosure is preferred. If necessary, provide active cooling for the enclosure.
- ☐ Orient the controller with the ventilation slots and power supply/output terminal block connectors towards the top to permit proper heat dissipation.
- ☐ The device's plastic enclosure has a back plate that is separable from the front plate allowing the back plates (with the connectors) to be shipped directly to the installation site while all the engineering is done in the office.
- ☐ The device's datasheet specifies the power consumption (amount of heat generated), the operating temperature range, and other environmental conditions the device is designed to operate under.
- ☐ Ensure that all equipment is installed according to local, regional, and national regulations.
- ☐ Do not drop the device or subject it to physical shock.
- ☐ If the device is used and/or installed in a manner not specified by Distech Controls, the functionality and the protection provided by the device may be impaired.

Any type of modification to any Distech Controls product will void the product's warranty

Take special care to keep the front and back plate aligned when separating and joining them.

Before installation of the Wireless Receiver, verify that local communication regulations allow the installation of wireless devices and available frequencies to be supported in your area. Refer to the Open-to-Wireless™ Application Guide for more information.

Take reasonable precautions to prevent electrostatic discharge to the device when installing, servicing or during operation. Discharge accumulated static electricity by touching one's hand to a well-grounded object before working with the device.

Device Markings (Symbols)

Certain markings (symbols) can be found on the controller and are defined as follows:

Symbol	Description
CE	CE marking: the device conforms to the requirements of applicable EC directives.
UKCA	UKCA marking: the device conforms to the requirements of applicable Great Britain regulations.
	Products must be disposed of at the end of their useful life according to local regulations.
	Read the Hardware Installation Guide for more information.
c UL us LISTED	UL marking: conforms to the requirements of the UL certification.
FC	FCC marking: This device complies with FCC rules part 15, subpart B, class B.
	Warning Symbol: Significant information required. Refer to the Hardware Installation Guide.
	Alternating Current
	Direct Current

General Wiring Recommendations

Risk of Electric Shock: Turn off power before any kind of servicing to avoid electric shock.

- ☐ All wiring must comply with electrical wiring diagrams as well as national and local electrical codes.
- ☐ To connect the wiring to a device, use the terminal connectors. Use a small flat screwdriver to tighten the terminal connector screws once the wires have been inserted (strip length: 0.25'' (6 mm), maximum tightening torque 0,4 Nm (3.45 in-lb)).
- ☐ Comply with all network and power supply guidelines outlined in the Network Guide.
- ☐ Keep wiring separate according to their function and purpose to avoid any ambient noise transmission to other wires. Use strapping to keep these wires separated. For example, keep power, hazardous voltage, SELV, PELV, network, and input wiring separate from each other.
- ☐ The board connectors accept wires or flat cables ranging from 22 to 14AWG (0.644 to 1.630mm diameter) per pole. However, power cables must be between 18 and 14AWG (1.024 to 1.630mm diameter).
- ☐ Keep all wires away from high speed data transmission cables (for example, Ethernet, etc.).
- ☐ Keep input and output wiring in conduits, trays or close to the building frame if possible.
- ☐ Always use unshielded cabling with a minimum Category 5 (CAT5) cable for ethernet communications.
- ☐ Do not connect the universal inputs, analog/digital outputs or common terminals to earth or chassis ground (unless stated otherwise and/or using shielded Ethernet cable).

I/O Extension Module Dimensions & Components

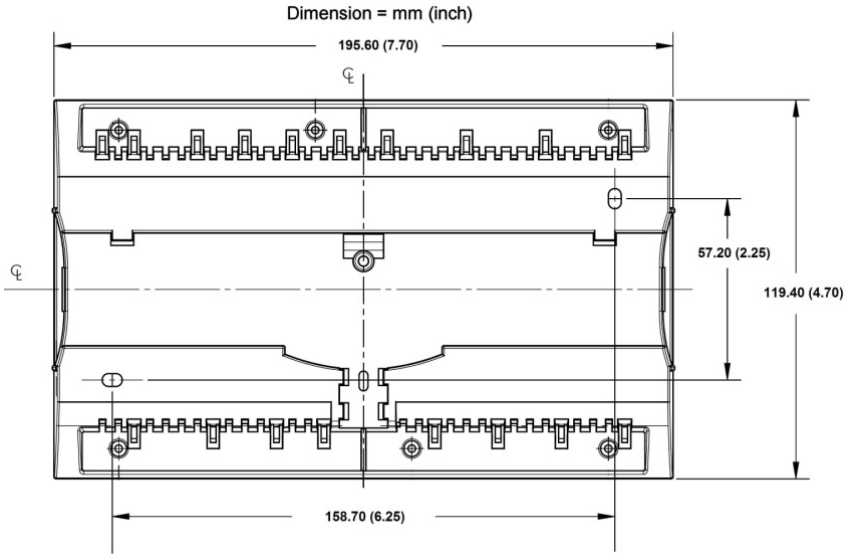


Figure 2: Rear view of large enclosure

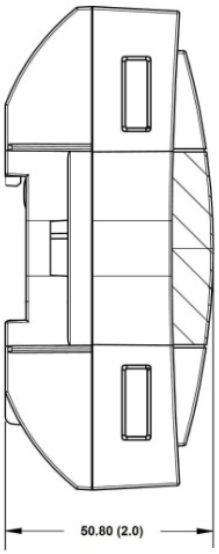
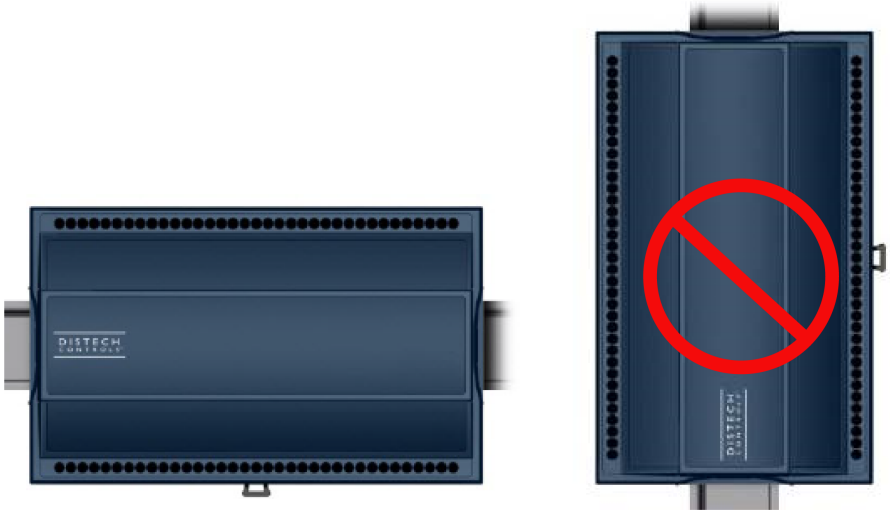


Figure 3: Side view of large enclosure

Mounting Instructions

The I/O Extension Module can be mounted on a DIN rail to speed up the installation procedure. They are also equipped with two mounting holes 0.25” x 0.165” (6.35mm x 4.191mm). The I/O Extension Module can be mounted in a panel or on a wall by using appropriate screw types (use sheet metal, thread forming, or self-tapping screws accordingly).

The controller’s mounting orientation must be horizontal with controller’s back attached to a vertical wall surface.



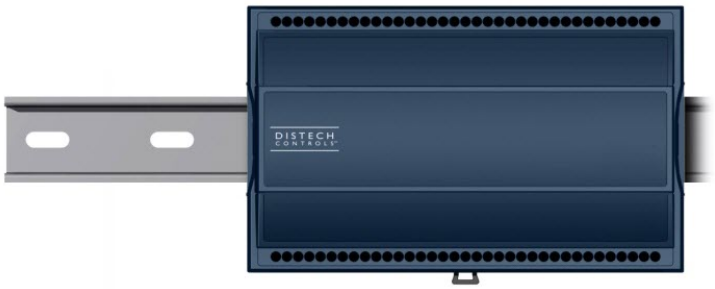
Horizontal Mounting Position:
Required for DIN rail mounting
Required for wall mounting

Vertical Mounting Position:
Is Forbidden

Figure 4: Permitted Mounting Positions

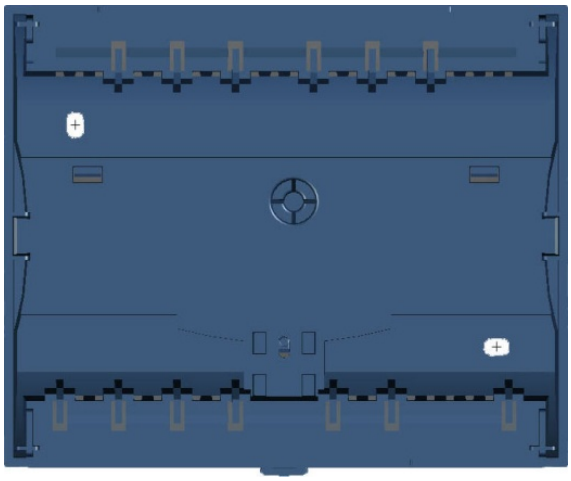
DIN Rail-Mounted Installation

1. Ensure the DIN rail is properly mounted on the wall.
2. Simply clip controller onto the DIN rail.



Wall-Mounted Installation

3. Open the enclosure by separating the front and back plate while pressing on the side clips.
4. Use the back plate's mounting holes to mark the location of any holes that need to be drilled.
5. Drill the holes.
6. Clean the surface and mount the controller using the appropriate screw types.



Power Wiring

Voltage: 24VAC/DC; ± 15%, Class 2

This is a Class 2 Product. Use a Class 2 transformer only (rated at 100VA or less at 24VAC) to power the controller(s).

The Network Guide provides extensive information and requirements for powering a controller. It can be downloaded from our website.

It is recommended to wire only one controller per 24VAC transformer.

If only one 24VAC transformer is available, determine the maximum number of controllers that can be supplied using the following method to determine the required power transformer capacity:

- ☐ Add up the maximum power consumption of all controllers including external loads and multiply this sum by 1.3.
- ☐ If the resulting number is higher than 100VA, use multiple transformers.

Use an external fuse on the 24VAC side (secondary side) of the transformer, as shown below, to protect all controllers against power line spikes.

Maintain consistent polarity when connecting controllers and devices to the transformer. One terminal on the secondary side of the transformer must be connected to the building's ground. All 24V COM terminals of all controllers and peripherals throughout the LAN or the Subnetwork network must be connected to the grounded transformer terminal as shown below. This ensures that the 24V COM terminals of all devices connected to any LAN or Subnetwork in the building are at the same potential.

A mechanical ground is unacceptable: Do not use a pipe, conduit, or duct work for a ground. The power supply must have a dedicated ground wire that comes from the main electrical supply panel.

Failure to maintain consistent polarity throughout the entire network will result in a short circuit and/or damage to the controller!
The COM terminals of the controller are internally wired to the 24V COM terminal of the power supply. Connecting a peripheral or another controller to the same transformer without maintaining polarity between these devices will cause a short circuit.

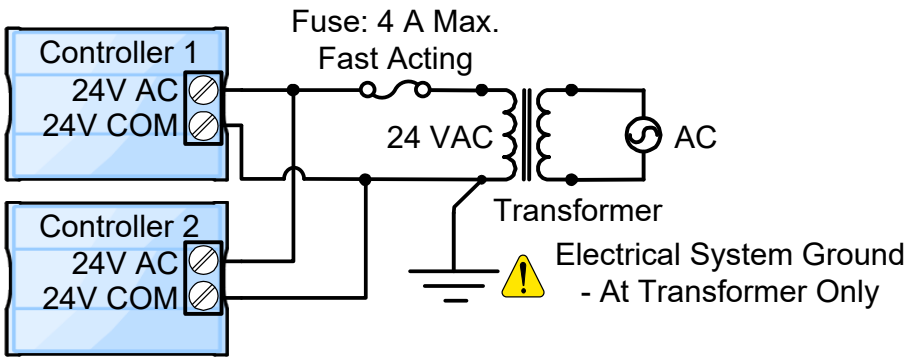


Figure 5: Power wiring – AC

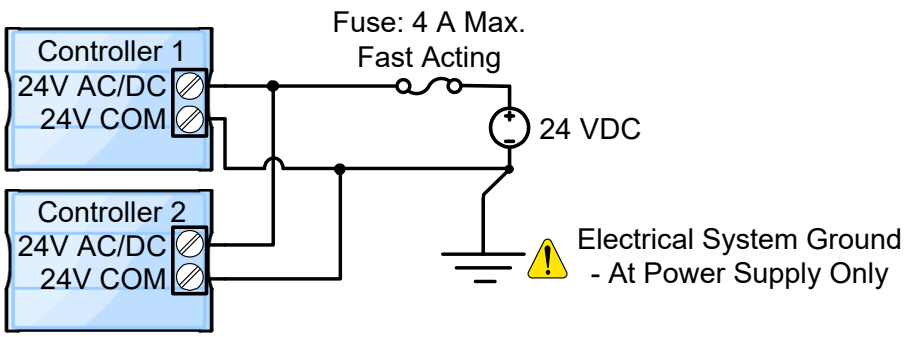


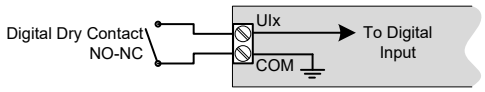
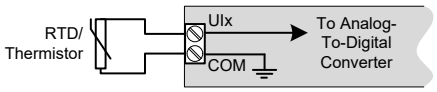
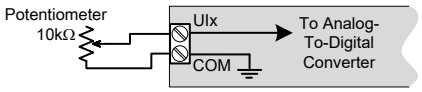
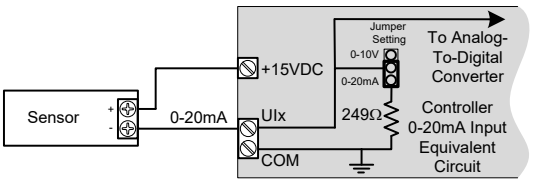
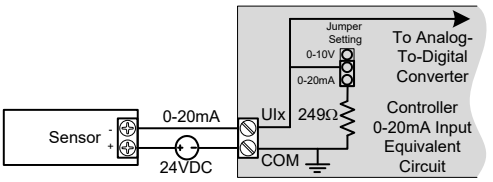
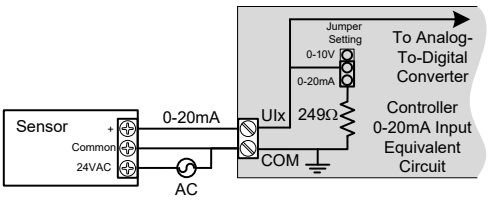
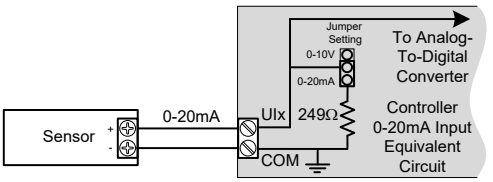
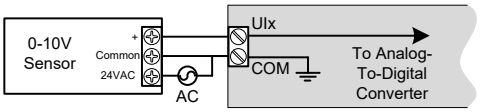
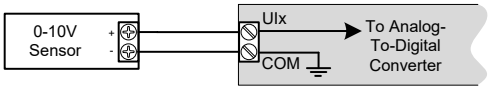
Figure 6: Power wiring – DC

Input Wiring

Before connecting a sensor to the controller, refer to the installation guide of the equipment manufacturer.

- ☐ For a wire length less than 75' (23m), either a shielded or unshielded 18AWG wire may be used.
- ☐ For a wire up to 200' (61m) long, a shielded 18AWG wire is recommended.
- ☐ The shield of the wire should be grounded on the controller side only and shield length should be kept as short as possible.

Input can be connected as follows. Table 1 shows the input designation for the ECx-400 Series I/O Extension Module.

Sensor Input Type	Input Designation	Input Connection Diagram
☐ Dry Contact input. ☐ Pulsed input	UIx	
☐ RTD input (for example, 1000Ω). ☐ Thermistor Input (for example, 10kΩ type II and III).	UIx	
☐ Resistive input, (for example, use with 10kΩ and 100kΩ potentiometers).	UIx	
☐ 0 to 20mA input used with a 2-wire, 0 to 20mA sensor powered by the ECx-400 internal 15VDC power supply.	UIx	
☐ 0 to 20mA input used with a 2-wire, 0 to 20mA sensor powered by an external 24VDC power supply.	UIx	
☐ 0 to 20mA input used with a 3-wire, 0 to 20mA sensor powered by an external 24VAC power supply.	UIx	
☐ 0 to 20mA input used with a sensor powered by its own power source.	UIx	
☐ Voltage input used with a 3-wire 0 to 10VDC or 0 to 5VDC sensor powered by an external 24VAC power supply	UIx	
☐ Voltage input used with a 0 to 10VDC or 0 to 5VDC sensor powered by its own power source.	UIx	

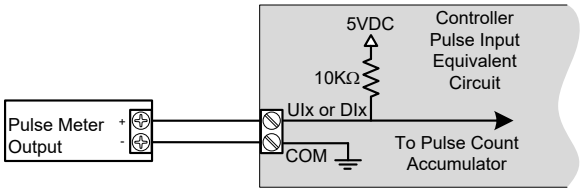
Sensor Input Type	Input Designation	Input Connection Diagram
☐ **Slow Pulse** – **Internal supply**: 2-wire pulse meter, maximum input frequency of 1Hz (500ms minimum ON/OFF) ☐ Connect the pulse input according to the figure for a pulse meter that can pull-down a +5VDC supply with a 10KΩ pull-up resistor (internal supply type).	UIx	

Table 1: Input Wiring

Output Wiring

Before connecting an output device (actuator, relay, etc.) to the controller, refer to the datasheet and installation guide of the equipment manufacturer.

- ☐ For a wire length less than 75' (23m) long, either a shielded or unshielded 18AWG wire may be used.
- ☐ For a wire length up to 200' (61m) long, a shielded 18AWG wire is recommended.
- ☐ The shield of the wire should be grounded on the controller side and the shield length should be kept as short as possible.

Table 2 shows the output designation for the ECx-400 Series I/O Extension Module.

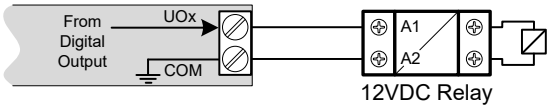
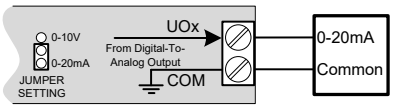
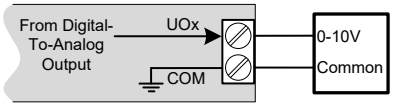
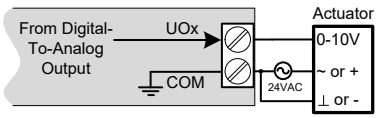
Control Output Type	Output Designation	Output Connection Diagram
☐ Discrete 0 or 12VDC digital, Pulse, or PWM output controlling a 12VDC relay.	UOx	
☐ Current 0 to 20mA universal output & jumper configuration	UOx	
☐ Linear 0 to 10VDC digital to analog output.	UOx	
☐ 0 to 10VDC voltage output controlling an analog actuator that is powered by an external 24VAC power source.	UOx	

Table 2: Output Wiring

Subnet Wiring

The subnet is used to connect a range of Allure Series Communicating Sensors:

- ☐ The Allure EC-Smart-Vue Series sensor is a communicating room temperature sensor with backlit display graphical menus and VAV balancing capabilities.
- ☐ The Allure EC-Smart-Comfort and Allure EC-Smart-Air Communicating Sensors are a range of communicating room temperature sensors.

Connect the Allure Series to the controller's **Subnet Port** with a standard Category 5e Ethernet patch cable fitted with RJ-45 connectors. Refer to the Network Guide for extensive information and requirements for the connection of the Allure Series. It contains information about network topology and length, cable type, setting the Subnet ID, etc. It can be downloaded from the Distech Controls' Documentation and Resources Portal. See also the Hardware Installation Guide supplied with the Allure Series.

If you make your own patch cable, see the Allure Series Hardware Installation Guide.

Protect the controller's connector from being pulled on when a cable to the Allure Series is connected. Create a strain-relief by looping the cable and attaching it to a solid object with a nylon tie so that a tug on the cable will not pull out the connector on the controller.

About the Subnetwork Bus

The ECB-600 and ECL-600 controllers use the Subnetwork bus to support the ECx-400 Series I/O Extension Modules through the controllers **Subnet+** and **Subnet-** terminals with 2-wire shielded cable.

The ECB-600 and ECL-600 controllers also use the Subnetwork bus to support one or more Allure Series(s) using standard structural (Cat 5e) cabling.

Subnetwork Bus Total Length

The total maximum length of all Subnetwork buses, including both the length of the Allure Series Communicating Sensor Subnetwork bus and the ECx-400 Series Subnetwork bus is 300 m (1 000 ft). The maximum length of the Allure Series Communicating Sensor Subnetwork bus is 200 m (650 ft). The maximum length of the ECx-400 Series Subnetwork bus is 300 m (1 000 ft).

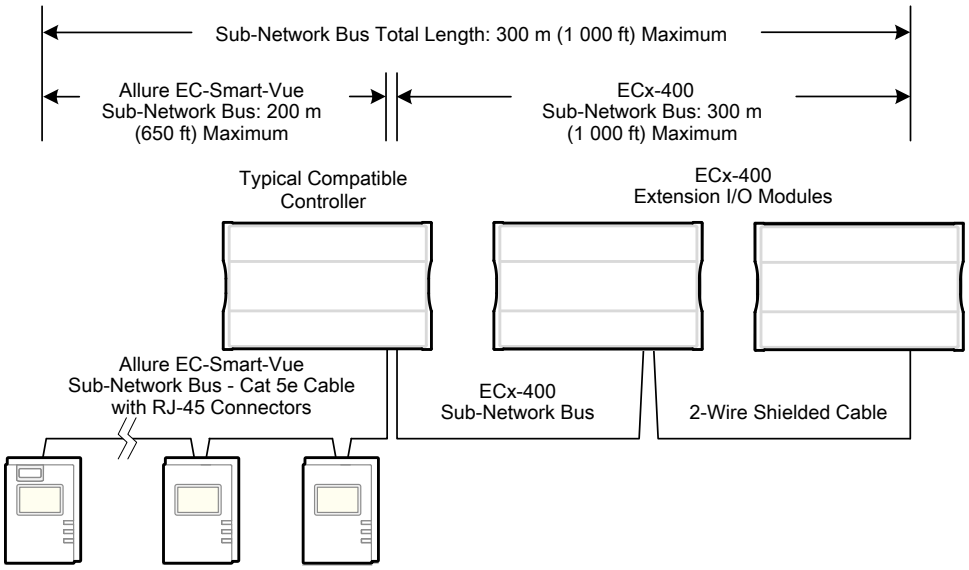


Figure 7: Subnetwork Bus Overview Showing the Allure EC-Smart-Vue Subnetwork Bus and the ECx-400 Series Subnetwork Bus.

Subnetwork Bus Topology and EOL Terminations

When ECx-400 Series I/O Extension Modules are installed with an ECB-600 or ECL-600 Series controller, only the EOL terminations of the ECB-600 / ECL-600 controller and the last I/O Extension Module are set to ON. All other I/O Extension Modules must have their EOL terminations set to OFF.

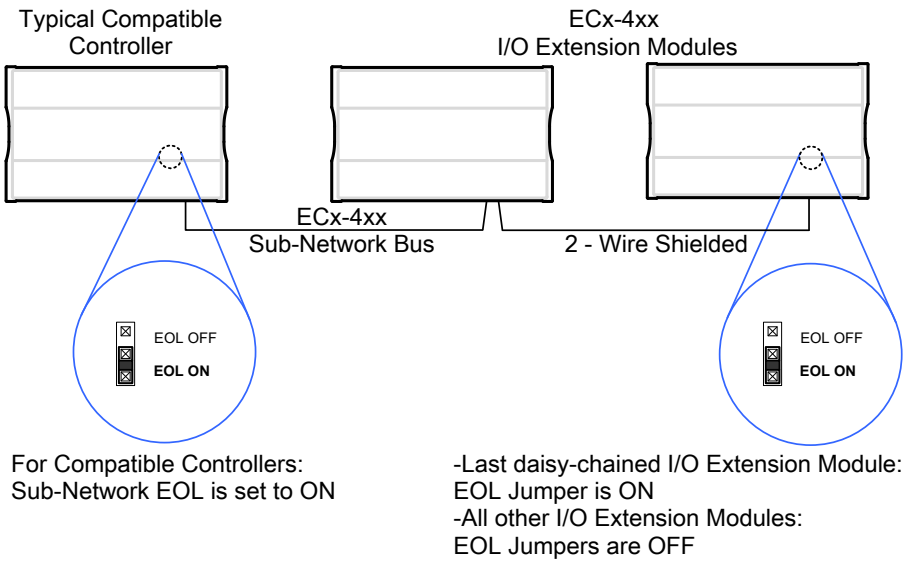


Figure 8: Setting the EOL Terminations on the Subnetwork Bus

When ECx-400 Series I/O Extension Modules are installed with an ECB-600 or ECL-600 Series controller and with Allure Series Communicating Sensors, only the EOL terminations on the last I/O Extension Module and the last Allure Series Communicating Sensor are set to ON. The ECB-600 / ECL-600 and all other I/O Extension Modules and Allure Series Communicating Sensor s must have their EOL terminations set to OFF.

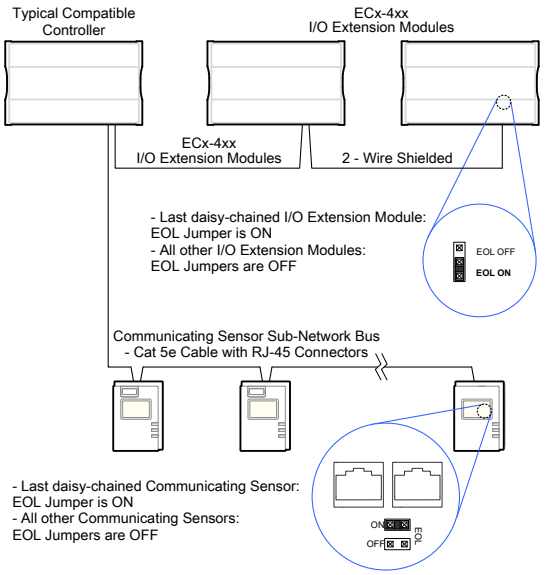


Figure 9: Setting the EOL Terminations on the ECx-400 Series Subnetwork Bus when Allure EC-Smart-Vue Sensors are used

ECx-400 Series devices and Allure EC-Smart-Vue sensors are factory-set with the EOL set to OFF by default.

If inserting multiple wires in the terminals, ensure to properly twist wires together prior to inserting them into the terminal connectors.

For more information and detailed explanations on network topology and wire length restrictions, refer to the Network Guide, which can be downloaded from our website *www.distech-controls.com*.

Communications Wiring

If inserting multiple wires in the terminals, ensure to properly twist wires together prior to inserting them into the terminal connectors.

For more information and detailed explanations on network topology and wire length restrictions, refer to the Network Guide, which can be downloaded from the Distech Controls' Documentation and Resources Portal.

ECx-400 Series IO Extension Modules are connected to the **SUBNET–** and **SUBNET+** terminals of the ECB-600 or ECL-600 Series controller. The Network Guide provides extensive information and requirements to implement the subnetwork for the ECx-400 Series I/O Extension Modules. It contains information about network length, cable type, controller addressing, etc. See the Hardware Installation Guide supplied with the ECx-400 Series I/O Extension Module. It can also be downloaded from the www.distech-controls.com website.

For optimal performance, use Distech Controls 24 AWG (0.65 mm) stranded, twisted pair shielded cable or refer to the Network Guide for cable specification. The subnetwork communication wire is polarity sensitive and the only acceptable topology is to daisy-chain the cable from one I/O Extension Module to the next.

As shown below:

- ☐ The first and last daisy-chained subnetwork device must have its EOL resistors enabled / installed. All other devices must have their EOL resistor disabled (default factory setting).
- ☐ When the subnetwork data bus is connected to a following device, twist data bus shields together.
- ☐ Isolate all shields with electrical tape so there is no exposed metal that can touch ground or other conductors.
- ☐ The shield of the data bus must be connected to the electrical system ground at only one point – usually at one end of the bus as shown below.
- ☐ The I/O Extension Module and the Allure Series share the same subnetwork.

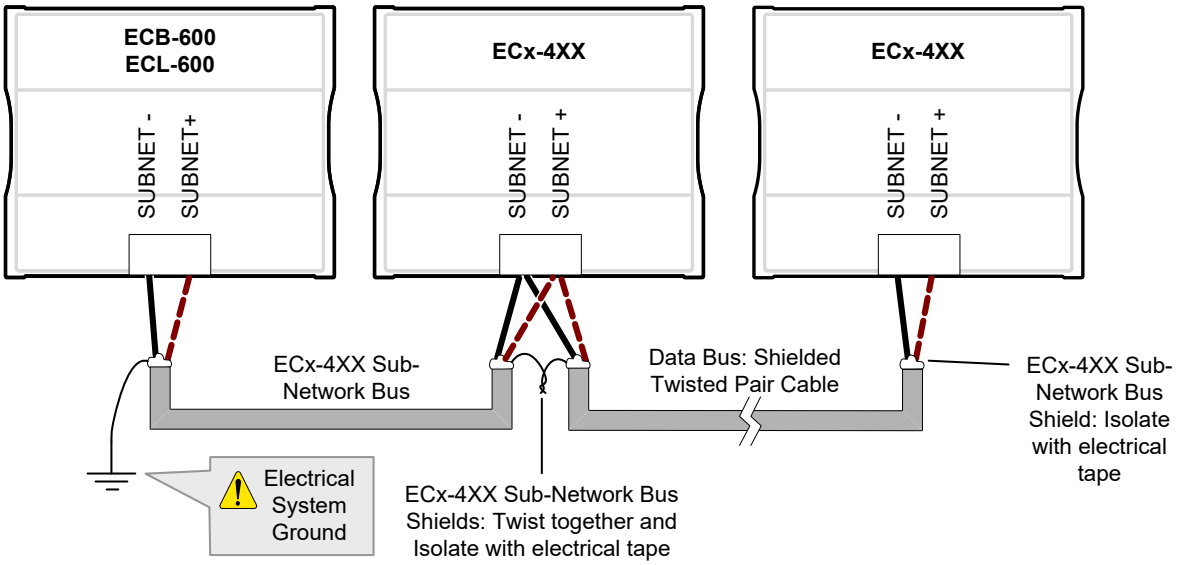


Figure 10: Subnetwork bus shielding

Device Addressing

The Subnet ID Address must be set to one (1) or two (2) by setting the DIP switch located on the faceplate An example of how to set the device's Subnet ID Address DIP switch is shown below.

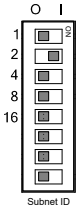


Figure 11: Typical I/O Extension Module DIP Switch Set to 2

The address is the sum of the numbers set to ON. For example, if the second (2) DIP switch is set to ON, the I/O Extension Module address is two (2). Only addresses 1 and 2 are valid.

The I/O Extension Module must be power cycled after the Subnet ID DIP switch has been changed.

Strain Relief and Terminal Block Cover

In certain jurisdictions, terminal block covers are required to meet local safety regulations. Strain reliefs and terminal block covers are available for controllers housed in large enclosures and are used to relieve tension on the wiring and conceal the controllers' wire terminals. Strain reliefs and terminal block covers are optional and are sold as peripherals.

Prior to connecting all wires, it is recommended to install the strain relief. Three screws are provided for its installation under the bottom part of the enclosure. Tie wraps can then be used to group wires together and attach them securely to the strain relief in an effort to relieve undue tension. If necessary, the terminal block cover can then be clipped on to the strain relief as shown below.

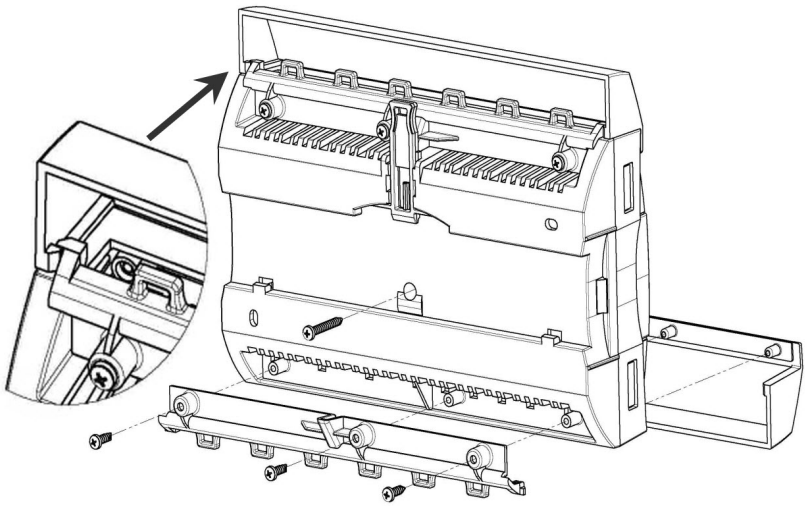


Figure 12: Large enclosure strain relief and terminal block cover installation

Maintenance

Unplug device before any kind of servicing.

The device requires minimal maintenance, but it is important to take note of the following:

- If it is necessary to clean the outside of the device, use a dry cloth.

Disposal

The Waste Electrical and Electronic Equipment (WEEE) Directive set out regulations for the recycling and disposal of products. The WEEE2002/96/EG Directive applies to standalone products, for example, products that can function entirely on their own and are not a part of another system or piece of equipment.

For this reason Distech Controls products are exempt from the WEEE Directive. Nevertheless, Distech Controls products are marked with the WEEE symbol , indicating devices are not to be thrown away in municipal waste.

Products must be disposed of at the end of their useful life according to local regulations and the WEEE Directive.

North American Emissions Compliance

United States

Changes or modifications not expressly approved by Distech Controls could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential and commercial installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Canada

This Class (B) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (B) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Typical Air Handling Unit Application Wiring Diagram

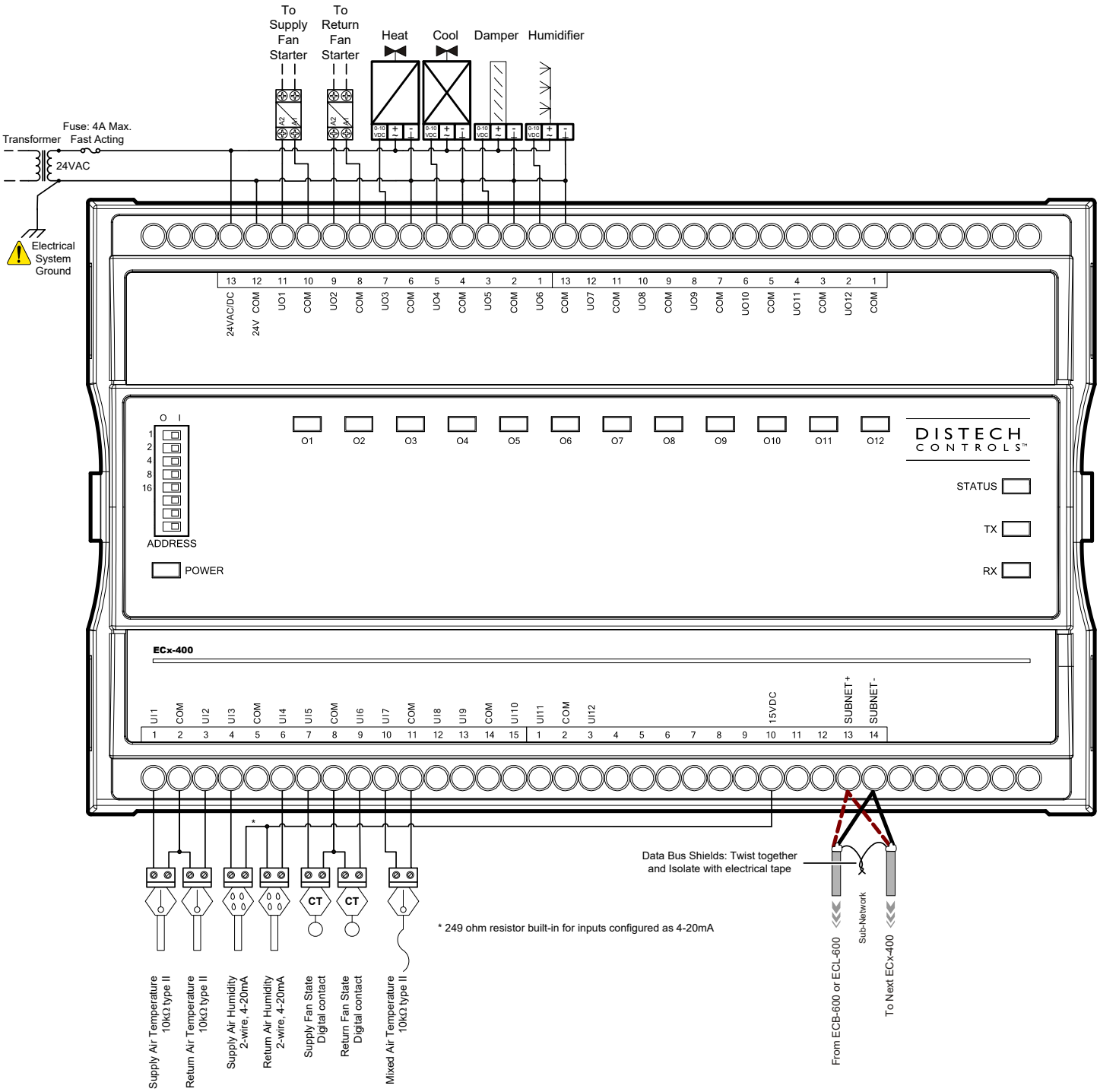


Figure 13: Typical Power and Network Connections

Troubleshooting Guide

Controller is powered but does not turn on

Fuse has blown	Disconnect the power. Check the fuse integrity. Reconnect the power.
Power supply polarity	Verify that consistent polarity is maintained between all controllers and the transformer. Ensure that the 24VCOM terminal of each controller is connected to the same terminal on the secondary side of the transformer. See *Power Wiring*.

I/O Extension Module cannot communicate on the subnetwork

Absent or incorrect supply voltage	1. Check power supply voltage between 24VAC ±15% and 24VCOM pins and ensure that it is within acceptable limits. 2. Check for tripped fuse or circuit breaker.
Overloaded power transformer	Verify that the transformer used is powerful enough to supply all controllers. See *Power Wiring*.
Network not wired properly	Double check that the wire connections are correct.
There is another controller with the same Subnet ID on the subnetwork	Each I/O Extension Module on the subnetwork must have a unique Subnet ID. Look at the Subnet ID DIP switch on the faceplate of each I/O Extension Module.
Network length	Check that the total wire length does not exceed the specifications in the *Network Guide.*
Wire type	Check that the wire type agrees with the specification of the *Network Guide.*
Absent or incorrect network termination	Check the network termination(s). Only the last ECx-400 I/O Extension Module must have its EOL termination set to ON. See *Figure 13*. When one or more Allure EC-Smart-Vue sensors are connected to the controller, only the last sensor must have its EOL termination set to ON. See *Figure 14*.

Hardware input is not reading the correct value

Input wiring problem	Check that the wiring is correct according to this manual and according to the peripheral device's manufacturer.
Configuration problem	Using EC-gfxProgram, check the configuration of the input. Refer to the EC-gfxProgram user guide for more information.
Over-voltage or over-current at an input	An over-voltage or over-current at one input can affect the reading of other inputs. Respect the allowed voltage / current range limits of all inputs. Consult the appropriate datasheet for the input range limits of this controller.

Hardware output is not operating correctly

Fuse has blown (Auto reset fuse)	Disconnect the power and outputs terminals. Then wait a few seconds to allow the auto-reset fuse to cool down. Check the power supply and the output wiring. Reconnect the power.
Output wiring problem	Check that the wiring is correct according to this manual and according to the peripheral device's manufacturer.
Configuration problem	Using EC-gfxProgram, check the configuration of the input. Refer to the EC-gfxProgram user guide for more information.
0 to 10V output, 24VAC powered actuator is not moving.	Check the polarity of the 24VAC power supply connected to the actuator while connected to the controller. Reverse the 24VAC wire if necessary.

Rx/Tx LEDs

RX LED not blinking	Data is not being received from the subnetwork bus.
TX LED not blinking	Data is not being transmitted onto the subnetwork bus.

Status LED– Normal Operation

One fast blink ●	Initialization: The device is starting up.
Fast blink continuous: ● ● ● ● ● (150ms On, 150ms Off, continuous)	Firmware upgrade in progress. Controller operation is temporarily unavailable. The new firmware is being loaded into memory. This takes a few seconds. Do not interrupt power to the device during this time.
The Status LED is always OFF	The controller is operating normally.

Status LED blink patterns – Repeats every 2 seconds (highest priority shown first)

Long blink continuous: ▬ ▬ ▬ ▬ ▬ ... (1s On, 1s Off, continuous)	The controller is not commissioned. Appropriate action: Commission the controller.
Long Long Long blink ▬ ▬ ▬ (800ms On, 300ms Off, 800ms On, 300ms Off, 800ms On)	The controller is offline. ☐ Appropriate action: Verify that the: ☐ I/O Extension Module's Subnet ID Address is correctly set. See *Device Addressing*. ☐ Subnetwork bus cable is not cut, short-circuited, or too long. See *Communications Wiring*. ☐ Associated ECB-600 or ECL-600 has power.

For issues with the Allure EC-Smart-Vue Series Communicating Sensor, refer to the Allure EC-Smart-Vue Series Communicating Sensor Hardware Installation Guide.