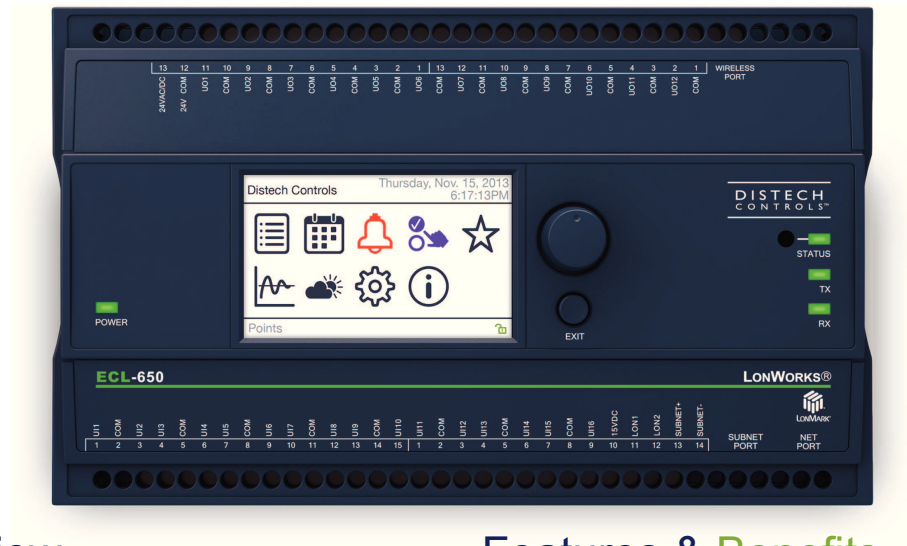




# ECL-600 Series & ECx-400 Series

LONMARK® Certified Programmable Controllers and I/O Extension Modules



## Overview

The ECL-600 Series controllers are microprocessor-based programmable controllers designed to control various building automation applications such as air handling units, chillers, boilers, pumps, cooling towers, and central plant applications. This series supports up to two ECx-400 Series I/O extension modules.

These controllers use the LonTalk® communication protocol and are LONMARK certified as a Static Programmable Device, guaranteeing compatibility and interoperability with other manufacturers' LONMARK certified controllers.



## Applications

These controllers meet the requirements of the following applications:

- ☐ Central Plant
- ☐ Air Handling Units
- ☐ Multi-Zone Applications
- ☐ Chillers
- ☐ Boilers
- ☐ Cooling Towers
- ☐ Roof Top Units
- ☐ Power Measurement

## Features & Benefits

### Universal Inputs and Outputs

This controller has various software configurable universal inputs and software configurable universal outputs, and covers all medium to large-size industry-standard HVAC applications.

This series supports up to two ECx-400 Series I/O extension modules that operate off of a separate sub-bus, giving this controller a total of up to 40 universal inputs and 36 universal outputs.

### Highly Accurate Universal Inputs

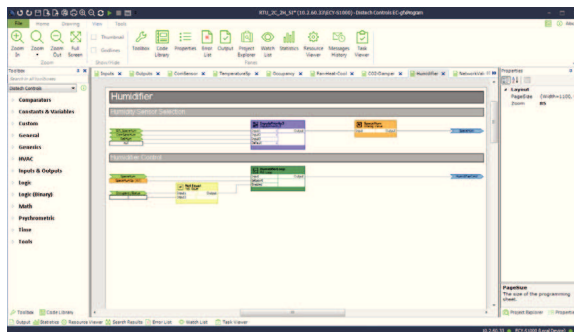
Highly accurate universal inputs support thermistors and resistance temperature detectors (RTDs) that range from 0 Ohms to 350,000 Ohms, as well as support for inputs requiring 0 to 10VDC or a pulse count. 0-20mA inputs and outputs have a jumper that eliminates the need for external resistors. This provides the freedom of using your preferred or engineer-specified sensors, in addition to any existing ones. The first four universal inputs support fast pulse count reading up to 50 Hz for gas, water, and electric meters and are compatible with an SO rated (optically-isolated) output.

## Rugged Inputs/Outputs

Rugged hardware inputs and outputs eliminate need for external protection components, such as diodes for 12V DC relays.

## Programmability

Supports Distech Controls' EC-gfxProgram, which makes Building Automation System (BAS) programming effortless by allowing you to visually assemble building blocks together to create a custom control sequence for any HVAC / building automation application.

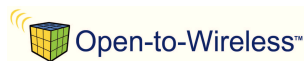


## Increased Energy Efficiency

Improves energy efficiency when combined with:

- CO<sub>2</sub> sensors as part of a demand-controlled ventilation strategy that adjusts the amount of fresh air intake according to the number of building occupants
- Variable-frequency drives to adjust motor speed according to the instantaneous demand of the application.

## Open-to-Wireless™ Solution



The controllers are Open-to-Wireless™ ready, and when paired with the Wireless Receiver, work with a variety of wireless battery-less sensors and switches, to reduce the cost of installation and minimize the impact on existing partition walls. For supported frequencies in your area, refer to the [Open-to-Wireless Solution Guide](#).

Available with an optional Wireless Receiver that supports up to 28 wireless inputs to create wire-free installations.

## HOA Switches & Potentiometers

Certain models have the convenience of supervised Hand-Off-Auto (HOA) switches and potentiometers that provide feedback on an operator's manual override of an output to the controller's code. HOA switches are ideal for testing purposes or when performing equipment commissioning and maintenance.

## Allure™ Series Communicating Sensor Support

These controllers work with a wide range of sensors, such as the Allure Series Communicating Sensors that are designed to provide intelligent sensing and control devices for increased user experience and energy efficiency.

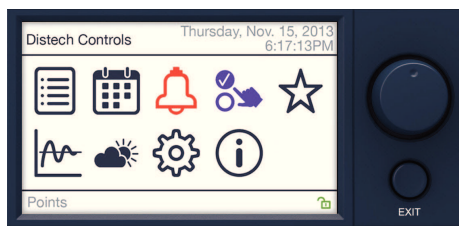
- Allure EC-Smart-View sensors feature a backlit-display and graphical menus that provide precise environmental zone control, with any combination of the following: temperature, humidity, CO<sub>2</sub>, and motion sensor.
- Allure EC-Smart-Comfort sensors feature colored LED indicators to provide user feedback, rotary knobs to adjust the setpoint offset and fan speed, and an occupancy override push button. This sensor can also be expanded with a combination of up to 4 add-on push button modules for lighting and shade/ sunblind control.
- Allure EC-Smart-Air sensors combine precise environmental sensing in a discreet and alluring enclosure for temperature, humidity, and CO<sub>2</sub>.




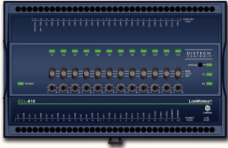

## Operator Interface

The ECL-650 model has a full-color backlit-display and a jog dial for turn and select navigation to access a wide range of internal controller functions:

- ☐ View and override values. The status is color coded to show if the value is overridden.
- ☐ Visually tune PID loops with system response graphing.
- ☐ View active alarm list.
- ☐ View and modify schedules and calendars through a graphic interface. Also create or delete schedule events, special events, and calendar entries.
- ☐ Create a list of favorites to provide quick access to commonly-used values.
- ☐ Multi-User access management.
- ☐ Multilingual interface: English, French, German, etc.



## Model Selection

			
<b>Model</b>	<b>ECL-600</b>	<b>ECL-610</b>	<b>ECL-650</b>
<b>Points</b>	28-Point Controller	28-Point Controller with HOA	28-Point Controller
Universal hardware inputs	16	16	16
Wireless inputs <sup>1</sup>	28	28	28
15 Vdc Power Supply	■	■	■
Universal outputs	12	12	12
HOA switch & potentiometer		■	
Operator interface: interactive color display to monitor and override controller parameters			■
Number of ECx Modules Supported	2	2	2

1. All controllers are Open-to-Wireless ready. Available when an optional Wireless Receiver is connected to the controller. Some wireless sensors may use more than one wireless input from the controller.

## Recommended Applications


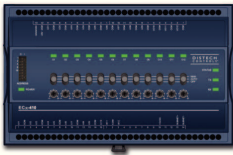

<b>Model</b>	<b>ECL-600</b>	<b>ECL-610</b>	<b>ECL-650</b>
Air Handling Units	■	■	■
Multi-Zone Application	■	■	■
Chiller	■	■	■
Boiler	■	■	■
Cooling Tower	■	■	■
Central Plant	■	■	■

## Objects List

<b>Objects List</b>	
Calendar Objects	2
<input type="checkbox"/> Special events per calendar	50
Schedule Objects	8
<input type="checkbox"/> Special events per schedule	10
PID Loop Objects	30
Constants:	
<input type="checkbox"/> Boolean	124
<input type="checkbox"/> Enumeration	62
<input type="checkbox"/> Numeric	56
Variables:	
<input type="checkbox"/> Boolean	124
<input type="checkbox"/> Enumeration	54
<input type="checkbox"/> Numeric	56
nciSetpoint	■
Total Network Variables	254
Network Variable Input (General Usage):	
<input type="checkbox"/> NVI Changeable Type, Up to 31 Bytes <sup>1</sup>	35
Network Variable Output (General Usage):	
<input type="checkbox"/> NVO Changeable Type, Up to 31 Bytes	35
Hardware Input Network Variable:	
<input type="checkbox"/> nvoHwInput per Hardware Input	■
Hardware Output Network Variable:	
<input type="checkbox"/> nviHwInput per Hardware Output	■
<input type="checkbox"/> nvoHwInput per Hardware Output	■

1. Any type of Fan-In function is supported in combination with the "FOR" loop function.

## ECx-400 Series I/O Extension Modules

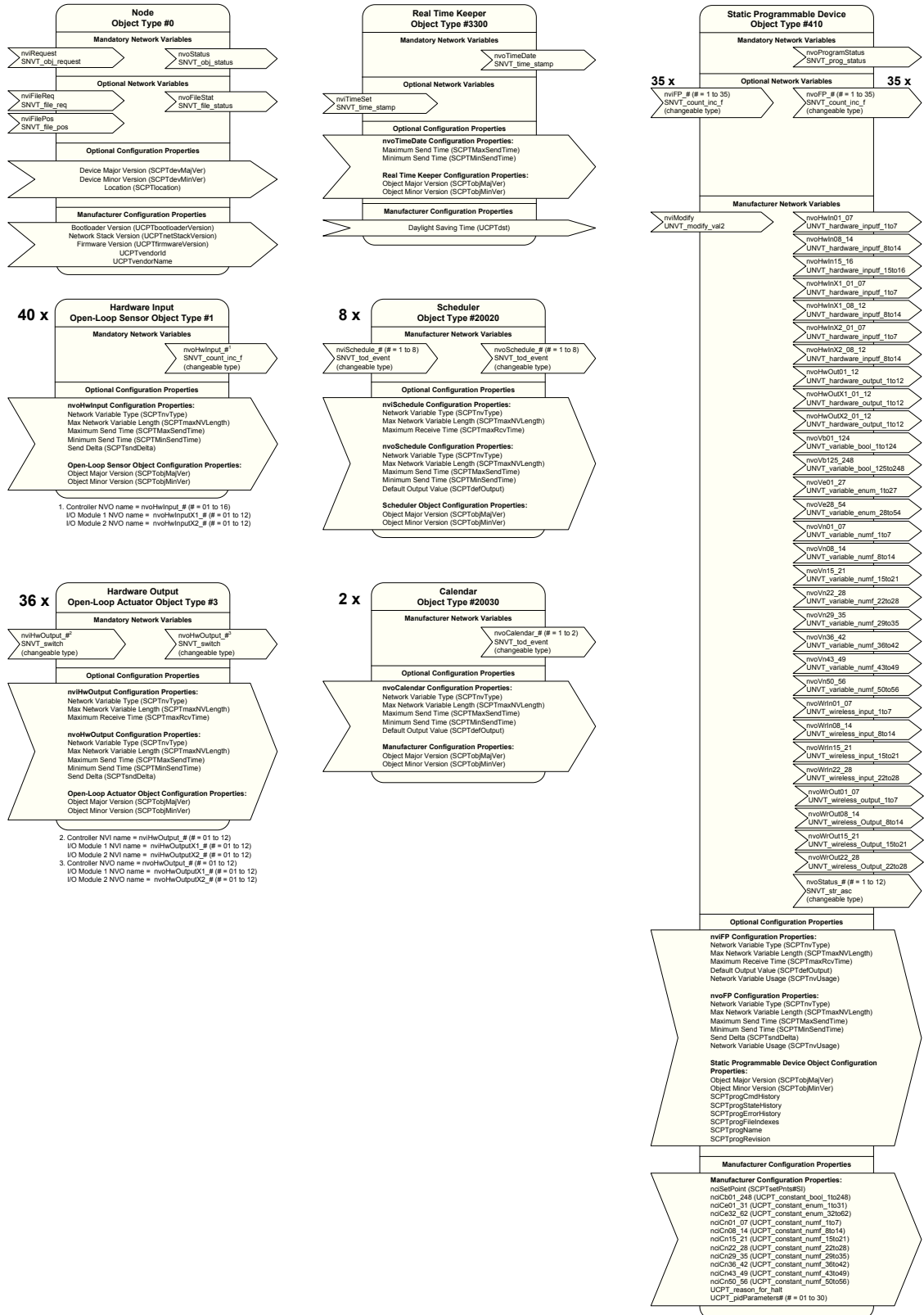
			
Model	ECx-400	ECx-410	ECx-420
Additional points	24-Point I/O Extension Module	24-Point I/O Extension Module	12-Point I/O Extension Module
Universal hardware inputs	12	12	12
15 Vdc Power Supply	■	■	■
Universal outputs	12	12	0
HOA switch		■	

## ECx-400 Series Objects List

Model	ECx-400	ECx-410	ECx-420
Hardware Input Network Variable:			
<input type="checkbox"/> nvoHwInput per Hardware Input	■	■	■
Hardware Input Network Variable:			
<input type="checkbox"/> nviHwOutput per Hardware Output <sup>1</sup>	■	■	■
<input type="checkbox"/> nvoHwOutput per Hardware Output <sup>1</sup>	■	■	■

1. These Network Variables are managed by the ECL-600, ECL-610, or ECL-650 controller (master).

# Functional Profile



# Product Specifications - ECL-600 Series

## Power Supply Input

Voltage Range ————— 24VAC/DC;  $\pm 15\%$ ; Class 2

Frequency Range ————— 50/60Hz

Overcurrent Protection ————— Field replaceable fuse

Fuse Type ————— 3.0A

### Power Consumption:

☐ ECL-600/ECL-610 ————— 22 VA typical plus all external loads<sup>1</sup>, 65 VA max.

☐ ECL-650 ————— 25 VA typical plus all external loads<sup>1</sup>, 68 VA max.

1. External loads must include the power consumption of any connected modules such as an Allure Series Communicating Sensor. Refer to the respective module's datasheet for related power consumption information.

## Communications

Communication ————— LonTalk Protocol

Transceiver ————— FT 5000 Free Topology Smart Transceiver

Channel ————— TP/FT-10; 78Kbps

LonMark Interoperability Guidelines ————— Version 3.4

Device Class ————— Static Programmable Device

### LonMark Functional Profile :

☐ Input Objects ————— Open-Loop Sensor #1

☐ Output Objects ————— Open-Loop Actuator #3

☐ Node Object ————— Node Object #0

☐ Real Time Clock ————— Real Time Keeper #3300

☐ Scheduler ————— Scheduler #20020

☐ Calendar ————— Calendar #20030

☐ Programmable Device ————— Static Programmable Device #410

## Hardware

Processor ————— STM32 (ARM Cortex™ M3) MCU, 32 bit

CPU Speed ————— 72 MHz

Memory ————— 1 MB Non-volatile Flash (applications)

————— 2 MB Non-volatile Flash (storage)

————— 96 kB RAM

Real Time Clock (RTC) ————— Built-in Real Time Clock with rechargeable battery

————— Network time synchronization is initially required

RTC Battery ————— 20 hours charge time, 20 days recharge time

————— Up to 500 charge/discharge cycles

Status Indicator ————— Green LEDs: power status & LAN Tx

————— Orange LEDs: controller status & LAN Rx

Communication Jack ————— LON® audio jack



## Subnetwork

Communication	RS-485
Cable	Cat 5e, 8 conductor twisted pair
Connector	RJ-45
Connection Topology	Daisy-chain
Maximum number of supported devices per controller combined	12
<input type="checkbox"/> Allure EC-Smart-Vue Series	Up to 12 <sup>1</sup>
<input type="checkbox"/> Allure EC-Smart-Comfort Series	Up to 6
<input type="checkbox"/> Allure EC-Smart-Air Series	Up to 6 <sup>1</sup>

1. A controller can support a maximum of two Allure Series Communicating Sensor models equipped with a CO<sub>2</sub> sensor. The remaining connected Allure Series Communicating Sensor models must be without a CO<sub>2</sub> sensor.

## I/O Extension Modules (ECx-400 Series)

Communication	RS-485
Number of I/O extensions modules per controller	Up to 2, in daisy-chain configuration

## Wireless Receiver<sup>1</sup>

Communication Protocol	EnOcean wireless standard
Number of Wireless Inputs <sup>2</sup>	28
Supported Wireless Receivers	Refer to the Open-to-Wireless Solution Guide
Cable	Telephone cord
<input type="checkbox"/> Connector	4P4C modular jack
<input type="checkbox"/> Length (maximum)	6.5ft (2m)

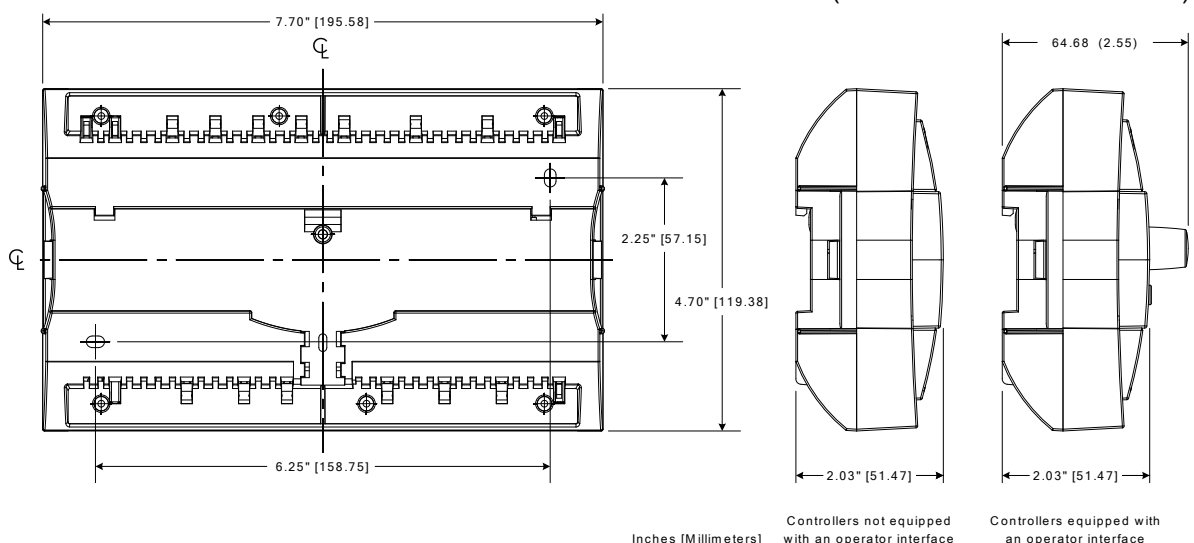


1. Available when an optional external Wireless Receiver module is connected to the controller. Refer to the Open-to-Wireless Solution Guide for a list of supported EnOcean wireless modules.
2. Some wireless modules may use more than one wireless input from the controller.

## Mechanical

Dimensions (H × W × D):

<input type="checkbox"/> ECL-600/ECL-610	4.7 × 7.7 × 2.03" (119.38 × 195.58 × 51.47 mm)
<input type="checkbox"/> ECL-650	4.7 × 7.7 × 2.55" (119.38 × 195.58 × 64.68 mm)



Shipping Weight:

☐ ☐ ☐ ECL-600 Series & ECx-400 Series

- ☐ ECL-600/ECL-610 1.17lbs (0.53 kg)
- ☐ ECL-650 1.28lbs (0.58 kg)

Enclosure Material<sup>1</sup> FR/ABS

Enclosure Rating Plastic housing, UL94-5VB flammability rating  
Plenum rating per UL1995

Color Black & blue casing & grey connectors

Installation Direct DIN-rail mounting or wall mounting  
through mounting holes (see figure above for hole positions)

1. All materials and manufacturing processes comply with the RoHS directive and are marked according to the Waste Electrical and Electronic Equipment (WEEE) directive

## Environmental

Operating Temperature 32°F to 122°F (0°C to 50°C)

Storage Temperature -4°F to 122°F (-20°C to 50°C)

Relative Humidity 0 to 90% Non-condensing

## Standards and Regulations

CE:

- ☐ Emission EN61000-6-3: 2007; A1:2011; Generic standards for residential, commercial and light-industrial environments
- ☐ Immunity EN61000-6-1: 2007; Generic standards for residential, commercial and light-industrial environments

FCC This device complies with FCC rules part 15, subpart B, class B

UL Listed (CDN & US) UL916 Energy management equipment

CEC Appliance Database Appliance Efficiency Program<sup>1</sup>

1. California Energy Commission's Appliance Efficiency Program: The manufacturer has certified this product to the California Energy Commission in accordance with California law.



## ECL-650 Display

Display Type Backlit-color LCD

Display Resolution 400 W x 240 H pixels (WQVGA)

Effective Viewing Area (W x H) 2.4 x 1.4" (61.2 x 36.7mm)  
2.8" (71mm) diagonal

Menu Navigation Jog dial turn, select navigation with Exit button

# Specifications - Universal Inputs (UI)

## General

Input Type \_\_\_\_\_ Universal; software configurable  
Input Resolution \_\_\_\_\_ 16-bit analog / digital converter  
Power Supply Output \_\_\_\_\_ 15VDC; maximum 320mA

## Contact

Type \_\_\_\_\_ Dry contact

## Counter

UI1 to UI4:

Type \_\_\_\_\_ SO output compatible  
Maximum Frequency \_\_\_\_\_ 50Hz maximum,  
Minimum Duty Cycle \_\_\_\_\_ 10milliseconds On / 10milliseconds Off

UI5 to UI10:

Type \_\_\_\_\_ Dry contact  
Maximum Frequency \_\_\_\_\_ 1Hz maximum,  
Minimum Duty Cycle \_\_\_\_\_ 500milliseconds On / 500milliseconds Off

## 0 to 10VDC

Range \_\_\_\_\_ 0 to 10VDC (40k $\Omega$  input impedance)

## 0 to 5VDC

Range \_\_\_\_\_ 0 to 5VDC (high input impedance)

## 0 to 20mA

Range \_\_\_\_\_ 0 to 20mA  
\_\_\_\_\_ 249 $\Omega$  jumper configurable internal resistor

## Resistance/Thermistor

Range \_\_\_\_\_ 0 to 350 K $\Omega$

Supported Thermistor Types \_\_\_\_\_ Any that operate in this range

Pre-configured Temperature Sensor Types:

- ☐ Thermistor \_\_\_\_\_ 10K $\Omega$  Type 2, 3 (10K $\Omega$  @ 77°F; 25°C)
- ☐ Platinum \_\_\_\_\_ Pt1000 (1K $\Omega$  @ 32°F; 0°C)
- ☐ Nickel \_\_\_\_\_ RTD Ni1000 (1K $\Omega$  @ 32°F; 0°C)  
\_\_\_\_\_ RTD Ni1000 (1K $\Omega$  @ 69.8°F; 21°C)

# Specifications - Universal Outputs (UO)

## General

Output Type — Universal; software configurable  
Output Resolution — 10-bit digital to analog Converter  
Output Protection — Built-in snubbing diode to protect against back-EMF,  
for example when used with a 12VDC relay  
Output is internally protected against short circuits  
Load Resistance — Minimum 200  $\Omega$  for 0-10VDC and 0-12VDC outputs  
Maximum 500  $\Omega$  for 0-20mA output  
Auto-reset fuse — Provides 24VAC over voltage protection

## 0 or 12VDC (On/Off)

Range — 0 or 12VDC  
Source Current — Maximum 60 mA at 12VDC (minimum load resistance 200 $\Omega$ )

## PWM

Range — Adjustable period from 2 to 65seconds  
Thermal Actuator Management — Adjustable warm up and cool down time

## Floating

Minimum Pulse On/Off Time — 500milliseconds  
Drive Time Period — Adjustable

## 0 to 10VDC

Voltage Range — 0 to 10VDC linear  
Source Current — Maximum 60 mA at 10VDC (minimum load resistance 200  $\Omega$ )

## 0 to 20mA

Range — 0 to 20mA  
Type — Current source (jumper configurable)

## HOA

Hand-Off-Auto switch — When equipped  
Supervision allows control logic to read the current  
HOA switch and potentiometer settings  
Threshold — Configurable  
Potentiometer Voltage Range — 0 to 12.5VDC

## Product Specifications- ECx-400 Series

### Power Supply Input

Voltage Range	24VAC/DC; $\pm 15\%$ ; Class 2
Frequency Range	50/60Hz
Overcurrent Protection	Field replaceable fuse
Fuse Type	3.0A
Power Consumption:	
<input type="checkbox"/> ECx-400/ECx-410	22 VA typical plus all external loads, 50 VA max.
<input type="checkbox"/> ECx-420	10 VA typical, 16 VA max.

### Communication

Communication Bus	RS-485
Baud Rates	38 400 bps
Addressing	Dip Switch

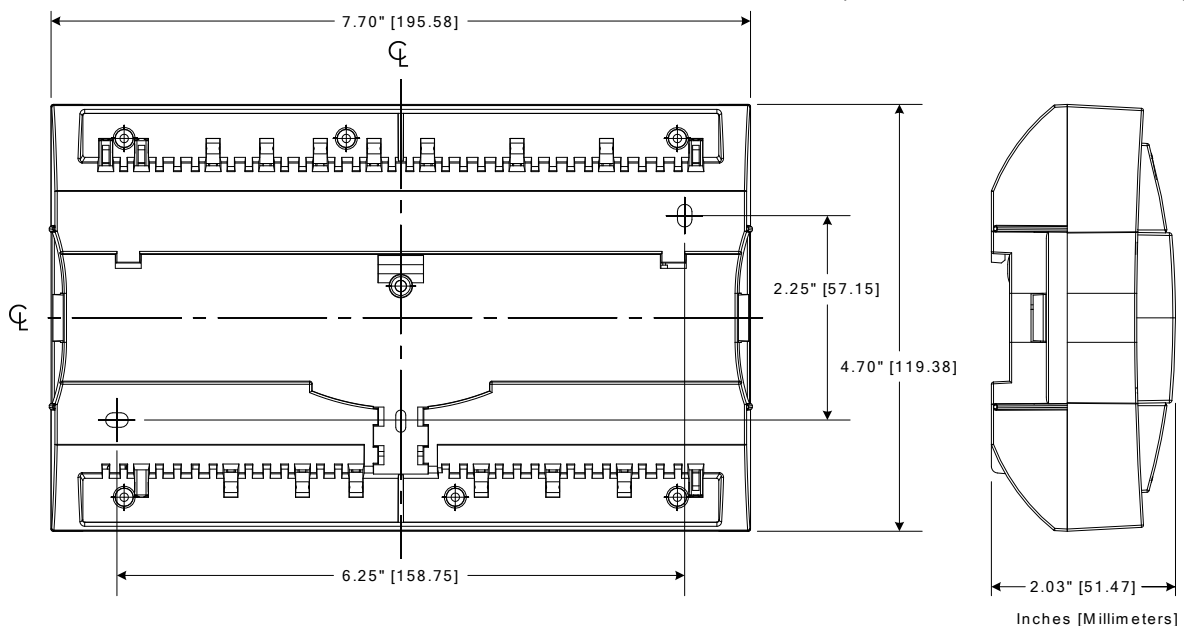
### Hardware

Processor	STM32 (ARM Cortex™ M3) MCU, 32 bit
CPU Speed	64 MHz
Memory	64 kB Non-volatile Flash (applications and storage) 20 kB RAM
Status Indicator	Green LEDs: power status & LAN Tx Orange LEDs: controller status & LAN Rx

### Mechanical

#### Dimensions:

With Screws 4.7 × 7.7 × 2.03" (119.38 × 195.58 × 51.47mm)



Shipping Weight ————— 1.17lbs (0.53kg)

Enclosure Material<sup>1</sup> ————— FR/ABS

Enclosure Rating ————— Plastic housing, UL94-5VB flammability rating  
Plenum rating per UL1995

Color ————— Black & blue casing & grey connectors

Installation ————— Direct DIN-rail mounting or wall mounting  
through mounting holes (see figure above for hole positions)

1. All materials and manufacturing processes comply with the RoHS directive and are marked according to the Waste Electrical and Electronic Equipment (WEEE) directive

## Environmental

Operating Temperature ————— 32°F to 122°F (0°C to 50°C)

Storage Temperature ————— -4°F to 122°F (-20°C to 50°C)

Relative Humidity ————— 0 to 90% Non-condensing

## Standards and Regulations

CE:

☐ Emission ————— EN61000-6-3: 2007; A1:2011; Generic standards for residential, commercial and light-industrial environments

☐ Immunity ————— EN61000-6-1: 2007; Generic standards for residential, commercial and light-industrial environments

FCC ————— This device complies with FCC rules part 15, subpart B, class B

UL Listed (CDN & US) ————— UL916 Energy management equipment



## Specifications - Universal Inputs (UI)

### General

Input Type ————— Universal; software configurable

Input Resolution ————— 16-bit analog / digital converter

Power Supply Output ————— 15VDC; maximum 240mA

### Contact

Type ————— Dry contact

### Counter

Type ————— Dry contact

Maximum Frequency ————— 1Hz maximum,

Minimum Duty Cycle ————— 500milliseconds On / 500milliseconds Off

### 0 to 10VDC

Range ————— 0 to 10VDC (40kΩ input impedance)

### 0 to 5VDC

Range ————— 0 to 5VDC (high input impedance)

### 0 to 20mA

Range ————— 0 to 20mA



\_\_\_\_\_ 249Ω external resistor wired in parallel

**Resistance/Thermistor**

Range \_\_\_\_\_ 0 to 350 KΩ

Supported Thermistor Types \_\_\_\_\_ Any that operate in this range

Pre-configured Temperature Sensor Types:

☐ Thermistor \_\_\_\_\_ 10KΩ Type 2, 3 (10KΩ @ 77°F; 25°C)

☐ Platinum \_\_\_\_\_ Pt1000 (1KΩ @ 32°F; 0°C)

☐ Nickel \_\_\_\_\_ RTD Ni1000 (1KΩ @ 32°F; 0°C)

\_\_\_\_\_ RTD Ni1000 (1KΩ @ 69.8°F; 21°C)

# Specifications - Universal Outputs (UO)

## General

Output Type	Universal; software configurable
Output Resolution	10-bit digital to analog Converter
Output Protection	Built-in snubbing diode to protect against back-EMF, for example when used with a 12VDC relay Output is internally protected against short circuits
Load Resistance	Minimum 200 $\Omega$ for 0-10VDC and 0-12VDC outputs Maximum 500 $\Omega$ for 0-20mA output
Auto-reset fuse	Provides 24VAC over voltage protection

## 0 or 12VDC (On/Off)

Range	0 or 12VDC
Source Current	Maximum 60 mA at 12VDC (minimum load resistance 200 $\Omega$ )

## PWM

Range	Adjustable period from 2 to 65seconds
Thermal Actuator Management	Adjustable warm up and cool down time

## Floating

Minimum Pulse On/Off Time	500milliseconds
Drive Time Period	Adjustable

## 0 to 10VDC

Voltage Range	0 to 10VDC linear
Source Current	Maximum 60 mA at 10VDC (minimum load resistance 200 $\Omega$ )

## 0 to 20mA

Range	0 to 20mA
Type	Current source (jumper configurable)

## HOA

Hand-Off-Auto switch	When equipped Supervision allows control logic to read the current HOA switch and potentiometer settings
Threshold	Configurable
Potentiometer Voltage Range	0 to 12.5VDC

Specifications subject to change without notice.

Distech Controls, the Distech Controls logo, Innovative Solutions for Greener Buildings, EC-Net, ECO-Vue, Allure, and Open-To-Wireless are trademarks of Distech Controls Inc.; LonWorks, LON, and LNS are registered trademarks of Echelon Corporation; BACnet is a registered trademark of ASHRAE; BTL is a registered trademark of the BACnet Manufacturers Association; Niagara<sup>AX</sup>Framework is a registered trademark of Tridium, Inc.; EnOcean is a registered trademark of EnOcean GmbH. All other trademarks are property of their respective owners.  
©, Distech Controls Inc., 2011 - 2016. All rights reserved.