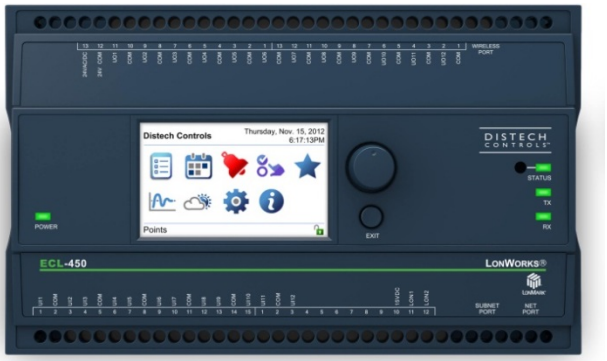
DISTECH CONTROLS™

Datasheet

ECL-400 Series

LONMARK® Certified 24-Point Programmable Controllers



LONMARK

Overview

The ECL-400 Series are microprocessor-based programmable controllers designed to control various building automation applications such as air handling units, multi-zone applications, chillers, boilers, pumps, cooling towers, and roof top units. The ECL-400 Series can also be used for lighting control applications. 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.

This series contains six models: ECL-400, ECL-403, ECL-410, ECL-413, ECL-450, and ECL-453. These models have universal inputs and outputs that are ideal for controlling a wide range of HVAC equipment. The ECL-450 and ECL-453 models have a full-color backlit-display and a jog dial for turn and select navigation to access a wide range of internal controller functions: view, set, and override values, view and modify schedules, tune PID loops with system response graphing, and view connection and communication alarms.

These controllers work with a wide range of sensors, such as those in the Allure™ EC-Smart-Vue series of communicating room sensors that feature a backlit display and graphical menus. These sensors are used for indoor temperature measurement, setpoint adjustment, fan speed selection, and occupancy state override. In addition, these controllers are Open-to-Wireless™ ready, and when paired with the Wireless Receiver, they work with a variety of wireless battery-less sensors and switches.

Custom program these controllers using EC-*gfx*Program through either EC-Net^{AX}™ Pro which is powered by the Niagara^{AX} Framework® or through any LNS®-based software such as Distech Controls' Lonwatcher 3. This allows you to quickly and easily create your own control sequences capable of meeting the most demanding requirements of any engineering specification.

Applications

- Meets the requirements of the following applications:
  - Air Handling Units
  - Multi-Zone Applications
  - Chillers
  - Boilers
  - Cooling Towers
  - Roof Top Units
- Improves energy efficiency when combined with:
  - CO_2 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
- Works with a wide range of wireless battery-less sensors

Features & Benefits

- Use the EC-*gfx*Program's state-of-the-art visual programming wizard to customize controller operation to meet specific engineering requirements. EC-*gfx*Program is accessible in both Niagara^{AX} Framework-based and LNS-based software, allowing you to work with your preferred network management platform.
- Accelerate custom programming development by using pre-built HVAC control sequences supplied with EC-*gfx*Program.
- Available with an optional Wireless Receiver that supports up to 28 wireless inputs, letting you create wire-free installations and use various wireless battery-less sensors and switches.
- LONMARK Static Programmable Device certified, guaranteeing interoperability with other manufacturers' LONMARK certified controllers
- With 12 software configurable universal inputs and 12 software configurable outputs, this controller series covers all medium to large-size industry-standard HVAC applications. Four of these inputs also support fast pulse count reading up to 50 Hz frequency for gas, water, and electric meters.
- 0-20mA inputs and outputs use an internal jumper that eliminates the need for external resistors.
- Highly accurate universal inputs support thermistors and resistance temperature detectors (RTDs) that range from 0 Ohms to 350 000 Ohms, giving you the freedom of using your preferred or engineer-specified sensors, in addition to any existing ones.
- Rugged hardware inputs and outputs eliminate need for external protection components, such as diodes for 12V DC relays.
- Supervised HOA switches and potentiometers, allowing you to override control actions for testing purposes or when performing equipment maintenance.

ECL-400 Series Controllers

Model	ECL-400	ECL-403	ECL-410	ECL-413	ECL-450	ECL-453
Points	24-Point Controller	24-Point Controller	24-Point Controller with HOA	24-Point Controller with HOA	24-Point Controller with Color Display	24-Point Controller with Color Display
Universal hardware inputs	12[1]	12[1]	12[1]	12[1]	12[1]	12[1]
Allure EC-Smart-Vue[2]	12	12	12	12	12	12
Wireless inputs[3]	28	28	28	28	28	28
15 Vdc power supply	■	■	■	■	■	■
Digital (triac) outputs		8		8		8
Universal outputs	12	4	12	4	12	4
HOA switch & potentiometer			■	■		
Operator interface: interactive color display to monitor and override controller parameters					■	■

1. The first four inputs are software configurable for pulse counting up to 50 Hz and are compatible with an S0 rated (optically-isolated) output.
2. A controller can support a maximum of two Allure EC-Smart-Vue models equipped with a CO_2 sensor. The remaining connected Allure EC-Smart-Vue models must be without a CO_2 sensor.
3. 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

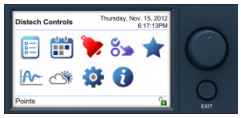
Model	ECL-400	ECL-403	ECL-410	ECL-413	ECL-450	ECL-453
Roof Top		■		■		■
Air Handling Unit	■	■	■	■	■	■
Multi-zone Application	■		■		■	
Chiller	■	■	■	■	■	■
Boiler	■	■	■	■	■	■
Cooling Tower	■	■	■	■	■	■

Additional Features & Benefits

HOA Switches & Potentiometers

Supervised Hand-Off-Auto (HOA) switches and potentiometers that provide feedback of 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.

Operator Interface



A large color backlit-display that allows an operator to have immediate access to internal controller data.

- View, set, and override values. The status is color coded to show if the value is in alarm or overridden.
- Visually tune PID loops with system response graphing.
- View active connection and communication 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.

Open-to-Wireless Series – Controller Wireless Receiver Add-on

Open-to-Wireless™

To reduce the cost of installation, and minimize the impact on pre-existing partition walls, the Wireless Receiver enables these controllers to communicate with a line of wireless battery-less room sensors and switches. These Wireless Receivers are available in EnOcean 315MHz and 868.3MHz versions.

Note that controllers have one wireless port to support a single Wireless Receiver.
For more information about the EnOcean and Open-to-Wireless technologies, refer to the Open-to-Wireless Solution Guide.
For more information about the Wireless Receiver module, refer to the Wireless Receiver Datasheet. These documents can be found on our web site.

Supported Platforms

EC-Net^{AX} Solution

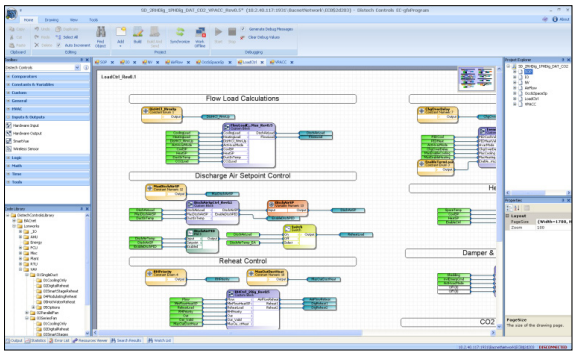
The EC-Net^{AX} multi-protocol integration solution is web-enabled and powered by the Niagara^{AX} Framework, establishing a fully Internet-enabled, distributed architecture for real-time access, automation and control of devices. The EC-Net^{AX} open framework solution creates a common development and management environment for integration of LonWorks®, BACnet® and other protocols. Regardless of manufacturer and protocol, the EC-Net^{AX} system provides a unified modeling of diverse systems and data, providing one common platform for development, management and enterprise applications.

LonWorks Network Services (LNS)

The LNS® client-server platform allows multiple users, running different LNS-compatible applications, to access a common source for directory, installation, management, monitoring and control services for the network system being managed. Distech Controls' Lonwatcher is an example of a LNS-based network management tool that can use Plug-Ins to configure and monitor controllers and devices in the control system.

EC-Net^{AX} Wizards and LNS Plug-Ins

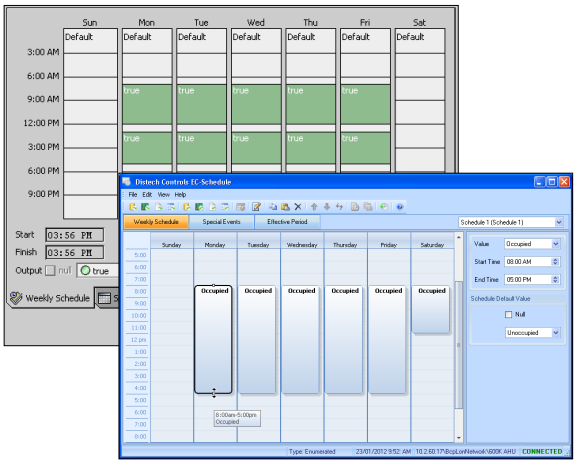
EC-*gfx*Program Graphical Programming Interface (GPI)



Distech Controls' EC-*gfx*Program is a programming tool that allows you to quickly create control sequences by "dragging and dropping" block objects and then linking the objects with a simple "click, select and release". Select objects from an extensive library of over 100 commonly used functions as well as create your own custom blocks. With a user-friendly interface and intuitive programming environment, HVAC programming could not be easier. Refer to the EC-*gfx*Program datasheet for more information.

- Program both ECP and ECL Series LonWorks and ECB Series BACnet controllers with the same tool.
- Supplied as freeware – there are no associated licensing costs.
- Live debugging allows user to view code execution, input/output values and to detect errors in real-time.
- A code library for managing your favorite or most commonly used code or code sections.

EC-Net^{AX} Scheduling / EC-Schedule LNS Plugin / EC-*gfx*Program EC-Schedule



Configure the controller's built-in schedules and holidays from EC-Net^{AX} solution (ECB and ECL series controllers), LNS (ECL series controllers), or directly from within EC-*gfx*Program (ECB and ECL series controllers) with an easy-to-use point, drag, and click interface. It features a weekly schedule for regular, repeating, events by "time-of-day" and "day-of-week", while a holiday schedule is available to define events for specific days.

- Easily configure schedules using a graphical slider.
- Allows you to easily copy and paste entries. Duplicate a schedule entry for Monday to Friday.
- Special events allow you to set exceptions such as holidays to a schedule.
- Holidays can be set for recurring events such as the 9th day, or the 3rd Thursday of a given month.
- A schedule has an effective period during which it is active.
- Schedule provides Next State and Time to Next State that are ideal for use with programming functions such as Optimum Start or Morning Warm Up.

Complementary Products

Temperature Sensors

Allure™ EC-Smart-Vue Series

Line of communicating room temperature sensors with communication jack, a backlit-display and configurable graphic menus that allow occupants to set occupancy, setpoint adjustment, fan speed, or any other system parameters. Models are available with any combination of the following options: humidity sensor, motion sensor, and CO_2 sensor. The ECO-Vue™ icon ( ) shows how environmentally-friendly the zone's energy consumption is in real time.

Allure EC-Sensor Series

Line of discrete temperature sensors. Models are available with the following options: communication jack, occupancy override button, setpoint adjustment, and fan speed selection.

Open-to-Wireless Sensors and Switches

Allure Wireless Battery-less ECW-Sensor Series

Line of wireless, battery-less room temperature sensors. Models are available with the following options: occupancy override button, setpoint adjustment, and fan speed selection.
These sensors are available in EnOcean 315MHz and 868.3MHz versions. The controller must be equipped with a Wireless Receiver.

Wireless Sensors and Switches

A wide range of self-powered wireless sensors and switches, including the following: motion detector and light sensor, 2-/4-channel wireless light switches (North American and European models), outdoor temperature sensor, surface temperature contact sensor, duct temperature sensor, and more.
These sensors are available in EnOcean 315MHz and 868.3MHz versions. The controller must be equipped with a Wireless Receiver.

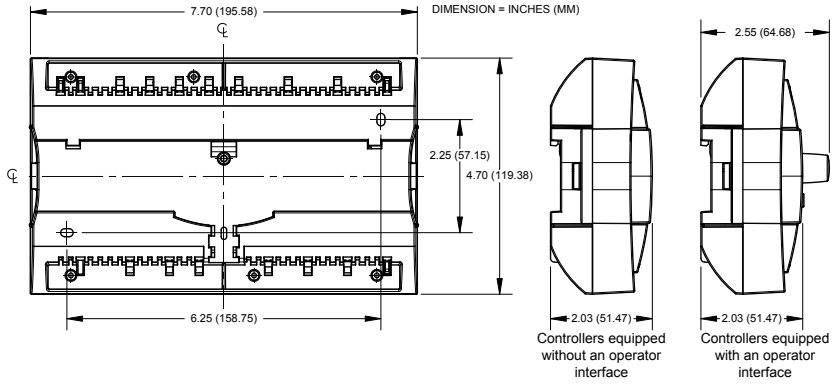
For more information about the available wireless sensors and switches, refer to the Open-to-Wireless Solution Guide which can be found on our web site.

Relay and Relay Base

A SPDT (NO/NC) dry contact relay with a 12VDC coil. This relay's low-power coil allows a controller's universal output to control high-power loads. Optional hardware available includes a din-rail mountable socket base and a red LED for relay status indication.

For more information on these or other Distech Controls products, refer to our web site.

Controller Dimensions



Product Specifications

Power	
Voltage	24VAC/DC; ±15%; 50/60Hz; Class 2
Protection	3.0A user-replaceable fuse
Power Consumption[1]	
- ECL-400/ECL-410	22 VA typical plus all external loads[1], 60 VA max.
- ECL-403/ECL-413	22 VA typical plus all external loads[1], 50 VA max.
- ECL-450	25 VA typical plus all external loads[1], 63 VA max.
- ECL-453	25 VA typical plus all external loads[1], 53 VA max.
Interoperability	
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 discharge time Up to 500 charge / discharge cycles
Status Indicator	Green LEDs: power status & LAN TX Orange LEDs: service & LAN RX
Communication Jack	LON® mono audio jack
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
Enclosure	
Material	FR/ABS
Color	Black & blue casing & grey connectors
Dimensions	
- ECL-400/ECL-403/ ECL-410/ECL-413	7.7 W × 4.7 H × 2.03" D (195.58 × 119.38 × 51.47mm)
- ECL-450/ECL-453	7.7 W × 4.7 H × 2.55" D (195.58 × 119.38 × 64.68mm)
Shipping Weight	
- ECL-400/ECL-403/ ECL-410/ECL-413	1.17lbs (0.53kg)
- ECL-450/ECL-453	1.28lbs (0.58kg)

Inputs	
Input Types	Universal; software configurable
-Voltage	- 0 to 10VDC (40kΩ input impedance) - 0 to 5VDC (high input impedance)
-Current	0 to 20mA with 249Ω jumper configurable internal resistor
-Digital	Dry contact
-Pulse	UI1 to UI4; 50Hz maximum; Min 10ms On/10ms Off - SO output compatible UI5 to UI12: 1Hz maximum; Min 500ms On/500ms Off - Dry contact
-Resistor	0 to 350 KΩ. All thermistor types that operate in this range are supported. The following temperature sensors are pre-configured:
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)
Input Resolution	16-bit analog / digital converter
Power Supply Output	15VDC; maximum 240mA (12 inputs × 20mA each)
Outputs	
Digital	24VAC Triac, digital (on/off), floating, or PWM; software configurable - 0.5A continuous - 1A @ 15% duty cycle for a 10-minute period - PWM control: adjustable period from 2 to 65sec. - Floating control: - Min pulse on/off: 500msec. - Adjustable drive time period External power supply
Universal	Linear (0-10VDC) Digital (on/off), PWM, or floating (0 - 12VDC) 0-20mA (jumper configurable); software configurable Built-in snubbing diode to protect against back-EMF, for example when used with a 12VDC relay. - PWM control: adjustable period from 2 to 65sec. - Floating control: - Min pulse on/off: 500msec. - Adjustable drive time period - HOA: Hand-Off-Auto switch (when equipped) - Hand position potentiometer range: 0-12.5VDC - 60mA maximum @ 12VDC (140°F ; 60°C)
Load Resistance	- Minimum 200Ω for 0-10VDC and 0-12VDC outputs - Maximum 500Ω for 0-20mA output
Auto-reset Fuse	- 60mA @ 140°F; 60°C - 100mA @ 68°F; 20°C
Output Resolution	10-bit digital / analog converter

Product Specifications (continued)

Wireless Receiver[2]

Communication	EnOcean wireless standard
Number of wireless inputs[3]	28
Supported Wireless Receivers	Wireless Receiver (315) Wireless Receiver (868)
Cable	Telephone cord
- Connector	4P4C modular jack
- Length	6.5ft; 2m

Standards and Regulation

CE -Emission	EN61000-6-3: 2007; 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
Material[4]	Plastic housing, UL94-5VB flammability rating Plenum rating per UL1995
CEC Appliance Database	Appliance Efficiency Program[5]

ECL-450 & ECL-453 Display

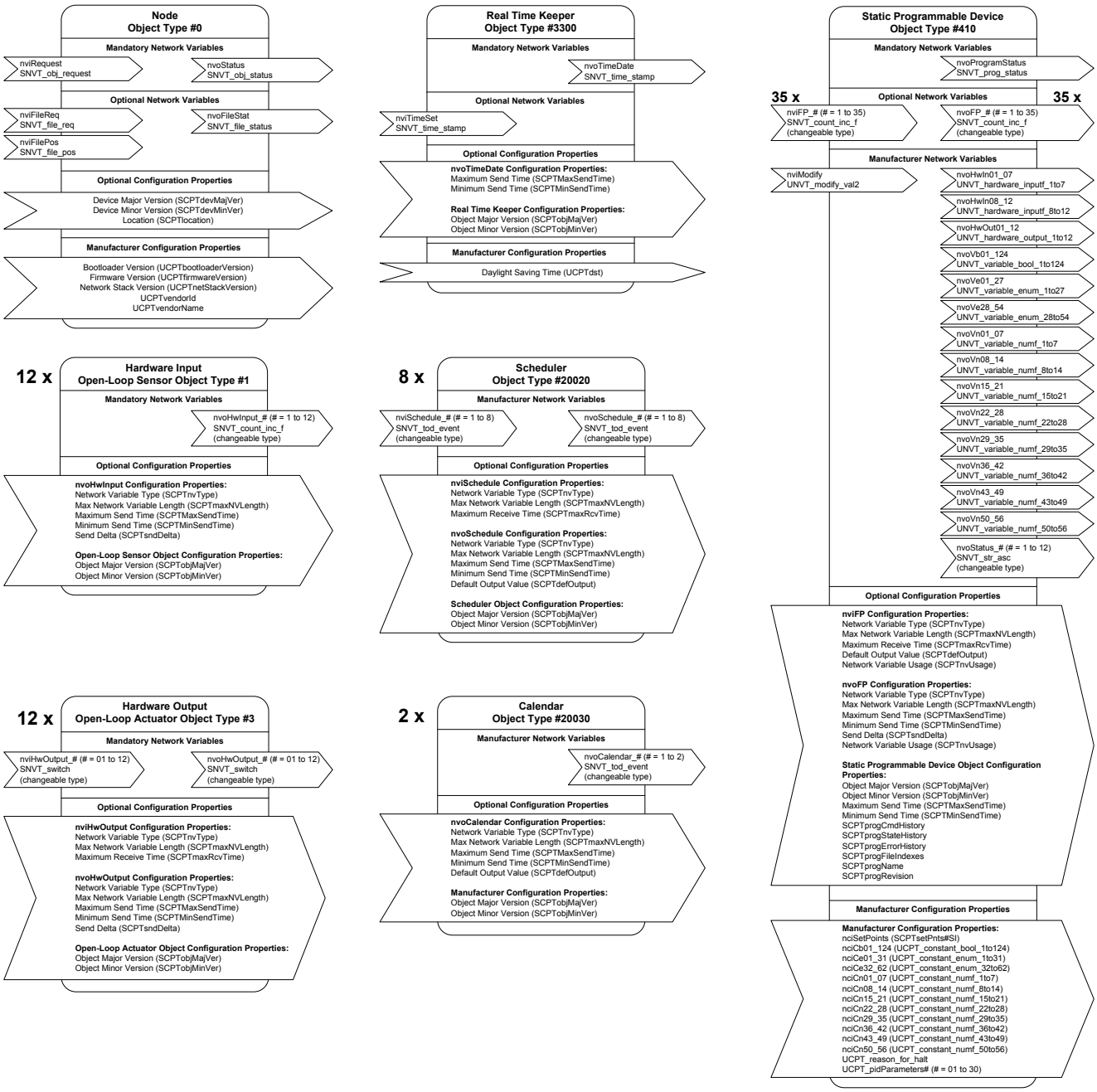
Display Type	Backlit-color LCD
Display Resolution	400 W × 240 H pixels (WQVGA)
Effective Viewing Area	2.4 L × 1.4" H (61.2 × 36.7mm) 2.8" (71mm) diagonal
Menu Navigation	Jog dial turn and select navigation with Exit button

Allure EC-Smart-Vue

Communication	RS-485
Number of sensors per controller	Up to 12, in daisy-chain configuration
Cable	Cat 5e, 8 conductor twisted pair
Connector	RJ-45

Communication Protocols

1. External loads must include the power consumption of any connected modules such as an Allure EC-Smart-Vue. Refer to the respective module's datasheet for related power consumption information.
2. 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.
3. Some wireless modules may use more than one wireless input from the controller.
4. All materials and manufacturing processes comply with the RoHS directive and are marked according to the Waste Electrical and Electronic Equipment (WEEE) directive.
5. California Energy Commission's Appliance Efficiency Program: The manufacturer has certified this product to the California Energy Commission in accordance with California law.


Node
Object Type #0
Mandatory Network Variables
nviRequest
SNVT_obj_request
nvoStatus
SNVT_obj_status
Optional Network Variables
nviFileReq
SNVT_file_req
nvoFileStat
SNVT_file_status
nviFilePos
SNVT_file_pos
Optional Configuration Properties
Device Major Version (SCPTdevMajVer)
Device Minor Version (SCPTdevMinVer)
Location (SCPTlocation)
Manufacturer Configuration Properties
Bootloader Version (UCPTbootloaderVersion)
Firmware Version (UCPTfirmwareVersion)
Network Stack Version (UCPTnetStackVersion)
UCPTvendorId
UCPTvendorName
Real Time Keeper
Object Type #3300
Mandatory Network Variables
nvoTimeDate
SNVT_time_stamp
Optional Network Variables
nviTimeSet
SNVT_time_stamp
Optional Configuration Properties
nvoTimeDate Configuration Properties:
Maximum Send Time (SCPTMaxSendTime)
Minimum Send Time (SCPTMinSendTime)
Real Time Keeper Configuration Properties:
Object Major Version (SCPTobjMajVer)
Object Minor Version (SCPTobjMinVer)
Manufacturer Configuration Properties
Daylight Saving Time (UCPTdst)
Static Programmable Device
Object Type #410
Mandatory Network Variables
nvoProgramStatus
SNVT_prog_status
35 x
Optional Network Variables
35 x
nviFP_# (# = 1 to 35)
SNVT_count_inc_f
(changeable type)
nvoFP_# (# = 1 to 35)
SNVT_count_inc_f
(changeable type)
Manufacturer Network Variables
nviModify
UNVT_modify_val2
nvoHwIn01_07
UNVT_hardware_inputf_1to7
nvoHwIn08_12
UNVT_hardware_inputf_8to12
nvoHwOut01_12
UNVT_hardware_output_1to12
nvoVb01_124
UNVT_variable_bool_1to124
nvoVe01_27
UNVT_variable_enum_1to27
nvoVe28_54
UNVT_variable_enum_28to54
nvoVn01_07
UNVT_variable_numf_1to7
nvoVn08_14
UNVT_variable_numf_8to14
nvoVn15_21
UNVT_variable_numf_15to21
nvoVn22_28
UNVT_variable_numf_22to28
nvoVn29_35
UNVT_variable_numf_29to35
nvoVn36_42
UNVT_variable_numf_36to42
nvoVn43_49
UNVT_variable_numf_43to49
nvoVn50_56
UNVT_variable_numf_50to56
nvoStatus_# (# = 1 to 12)
SNVT_str_asc
(changeable type)
Optional Configuration Properties
nviFP Configuration Properties:
Network Variable Type (SCPTnvType)
Max Network Variable Length (SCPTmaxNVLength)
Maximum Receive Time (SCPTmaxRcvTime)
Default Output Value (SCPTdefOutput)
Network Variable Usage (SCPTnvUsage)
nvoFP Configuration Properties:
Network Variable Type (SCPTnvType)
Max Network Variable Length (SCPTmaxNVLength)
Maximum Send Time (SCPTMaxSendTime)
Minimum Send Time (SCPTMinSendTime)
Send Delta (SCPTsndDelta)
Network Variable Usage (SCPTnvUsage)
Static Programmable Device Object Configuration Properties:
Object Major Version (SCPTobjMajVer)
Object Minor Version (SCPTobjMinVer)
Maximum Send Time (SCPTMaxSendTime)
Minimum Send Time (SCPTMinSendTime)
SCPTprogCmdHistory
SCPTprogStateHistory
SCPTprogErrorHistory
SCPTprogFileIndexes
SCPTprogName
SCPTprogRevision
Manufacturer Configuration Properties
Manufacturer Configuration Properties:
nciSetPoints (SCPTsetPnts#SI)
nciCb01_124 (UCPT_constant_bool_1to124)
nciCe01_31 (UCPT_constant_enum_1to31)
nciCe32_62 (UCPT_constant_enum_32to62)
nciCn01_07 (UCPT_constant_numf_1to7)
nciCn08_14 (UCPT_constant_numf_8to14)
nciCn15_21 (UCPT_constant_numf_15to21)
nciCn22_28 (UCPT_constant_numf_22to28)
nciCn29_35 (UCPT_constant_numf_29to35)
nciCn36_42 (UCPT_constant_numf_36to42)
nciCn43_49 (UCPT_constant_numf_43to49)
nciCn50_56 (UCPT_constant_numf_50to56)
UCPT_reason_for_halt
UCPT_pidParameters# (# = 01 to 30)
12 x
Hardware Input
Open-Loop Sensor Object Type #1
Mandatory Network Variables
nvoHwInput_# (# = 1 to 12)
SNVT_count_inc_f
(changeable type)
Optional Configuration Properties
nvoHwInput Configuration Properties:
Network Variable Type (SCPTnvType)
Max Network Variable Length (SCPTmaxNVLength)
Maximum Send Time (SCPTMaxSendTime)
Minimum Send Time (SCPTMinSendTime)
Send Delta (SCPTsndDelta)
Open-Loop Sensor Object Configuration Properties:
Object Major Version (SCPTobjMajVer)
Object Minor Version (SCPTobjMinVer)
8 x
Scheduler
Object Type #20020
Manufacturer Network Variables
nviSchedule_# (# = 1 to 8)
SNVT_tod_event
(changeable type)
nvoSchedule_# (# = 1 to 8)
SNVT_tod_event
(changeable type)
Optional Configuration Properties
nviSchedule Configuration Properties:
Network Variable Type (SCPTnvType)
Max Network Variable Length (SCPTmaxNVLength)
Maximum Receive Time (SCPTmaxRcvTime)
nvoSchedule Configuration Properties:
Network Variable Type (SCPTnvType)
Max Network Variable Length (SCPTmaxNVLength)
Maximum Send Time (SCPTMaxSendTime)
Minimum Send Time (SCPTMinSendTime)
Default Output Value (SCPTdefOutput)
Scheduler Object Configuration Properties:
Object Major Version (SCPTobjMajVer)
Object Minor Version (SCPTobjMinVer)
12 x
Hardware Output
Open-Loop Actuator Object Type #3
Mandatory Network Variables
nviHwOutput_# (# = 01 to 12)
SNVT_switch
(changeable type)
nvoHwOutput_# (# = 01 to 12)
SNVT_switch
(changeable type)
Optional Configuration Properties
nviHwOutput Configuration Properties:
Network Variable Type (SCPTnvType)
Max Network Variable Length (SCPTmaxNVLength)
Maximum Receive Time (SCPTmaxRcvTime)
nvoHwOutput Configuration Properties:
Network Variable Type (SCPTnvType)
Max Network Variable Length (SCPTmaxNVLength)
Maximum Send Time (SCPTMaxSendTime)
Minimum Send Time (SCPTMinSendTime)
Send Delta (SCPTsndDelta)
Open-Loop Actuator Object Configuration Properties:
Object Major Version (SCPTobjMajVer)
Object Minor Version (SCPTobjMinVer)
2 x
Calendar
Object Type #20030
Manufacturer Network Variables
nvoCalendar_# (# = 1 to 2)
SNVT_tod_event
(changeable type)
Optional Configuration Properties
nvoCalendar Configuration Properties:
Network Variable Type (SCPTnvType)
Max Network Variable Length (SCPTmaxNVLength)
Maximum Send Time (SCPTMaxSendTime)
Minimum Send Time (SCPTMinSendTime)
Default Output Value (SCPTdefOutput)
Manufacturer Configuration Properties:
Object Major Version (SCPTobjMajVer)
Object Minor Version (SCPTobjMinVer)

Total Quality Commitment

All Distech Controls product lines are built to meet rigorous quality standards. Distech Controls is an ISO 9001 registered company.

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