



System 450™ Series Modular Controls

Product Bulletin

C450xxx-x

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System 450™ is a family of modular, digital electronic controls that is easily assembled and set up to provide reliable temperature, pressure, and humidity control for a wide variety of HVACR and commercial or industrial process applications.

The System 450 control system is designed to replace System 350™ control system and System 27, and provide many additional features and benefits with less than a dozen model variations.

All System 450 control modules are multipurpose and field configurable out-of-the-box; each module is designed for use in temperature, pressure, and humidity systems. A System 450 control system can be easily assembled and configured to monitor and control temperature, pressure, and humidity simultaneously.

A single C450 control module can be set up as a stand-alone control or connected to expansion modules to control up to ten outputs based on any of the three available inputs.



Figure 1: System 450 Control System with Control, Power, and Expansion Modules

A control system may consist of Single-Pole, Double-Throw (SPDT) relay outputs, (0–10 VDC or 4–20 mA) analog outputs, or any combination of relay and analog outputs; and any combination of input sensors or transducers.

Table 1: Features and Benefits (Part 1 of 2)

Features	Benefits
Durable, Compact, Interchangeable Modular Components with Plug-Together Connectors and DIN Rail or Direct Wall Mount Capability	Eliminate field wiring between modules and allow you to quickly and easily design, assemble, install, and upgrade your control systems.
Versatile, Multipurpose, Field-Configurable Control Modules and Expansion Modules Designed for Global Use	Allow you to create a wide variety of application-specific control systems capable of controlling temperature, pressure, or humidity, or all three conditions simultaneously, with only a small suite of module models.
Up to Three Hard-Wired Input Sensors and Up to Ten Relay or Analog Outputs (In Any Combination) per Control System	Allow you to build complex custom control systems while reducing your control system cost to only the cost of the required components.
Control Modules with Bright Backlit LCDs and Four-Button Touchpad User Interfaces	Provide quick, clear, visual status of your System 450 control system inputs and outputs with the touch of a button and enable you to quickly and easily set up and adjust your control system.
Multipurpose, All-In-One Control Modules	Enable simple stand-alone, single-module control systems that are temperature, pressure, and humidity capable out of the box and easy to set up in the field to replace a wide variety of OEM HVACR and process controls.
An Extensive Suite of Compatible Temperature and Humidity Sensors, and Pressure Transducers	Allows you to monitor and control a wide range of HVACR and process conditions in a variety of standard and global units of measurement.

Table 1: Features and Benefits (Part 2 of 2)

Features	Benefits
High Input Signal Selection	Enables your control system to monitor temperature, pressure, or humidity conditions with two or three sensors (of the same type) and control your system outputs based on the highest condition value sensed by the referenced sensors.
Differential Control	Enables your control system to monitor and maintain a temperature, pressure, or humidity differential between two sensor points within a system, process, or space.
A User-Defined Reset Setpoint Sensor (C450Rxx Reset Control Modules Only)	Provides a calculated (variable) reset setpoint based on an ambient (master) sensor and a control loop sensor, which saves you energy in a wide variety of temperature and humidity reset control applications.
Adjustable Minimum and Maximum Setpoint Temperatures (C450Rxx Reset Control Modules Only)	Enable compliance with the manufacturer's specifications for your controlled HVACR and process equipment.
Selectable Shutdown-High and Shutdown-Low Temperature Settings (C450Rxx Reset Control Modules Only)	Saves you energy by shutting down controlled equipment when the ambient temperature either rises or drops to a point where heating or cooling is no longer required.
Adjustable Setback Temperature (C450Rxx Reset Control Modules Only)	Saves you energy by adjusting the supply temperature setpoint up (for cooling) or down (for heating) during unoccupied time periods.

System 450 Overview

The Johnson Controls/PENN® System 450 Series is a small, versatile family of compact, multipurpose, digital electronic control, expansion, and power modules.

System 450 modules provide accurate, reliable SPDT and analog control of temperature, pressure, and humidity conditions for a wide variety of HVACR and commercial/industrial process applications.

A System 450 control system includes:

- a single System 450 control module
- one to three inputs
- one to ten relay and/or analog outputs (provided by the control module and expansion modules)

A System 450 control system often also includes a System 450 power module.

A System 450 control system is the next generation of System 350 and System 27 modular controls, but a System 450 control system, with less than a dozen model variations, provides far more features and flexibility than either a System 350 system (54 models) or a System 27 system (40 models).

Compact Modular Plug-Together Design

All System 450 modules feature a compact, durable, gray Lexan® housing with DIN rail clips and slotted mounting holes molded into the back of the housing for easy installation.

System 450 modules also feature 6-pin connectors on the sides of the housing, enabling easy assembly and upgrade of your control systems and eliminating the need for field wiring between modules.

A System 450 control system provides compact, clean, and consistent control system assemblies that are simple to build, install, and maintain.

Multipurpose and Field Configurable

System 450 control, expansion, and power modules are multipurpose devices that can be easily configured in the field to operate as a temperature, pressure, or humidity control system.

In fact, a System 450 control system can be quickly assembled and easily configured in the field to monitor and control temperature, pressure, and humidity conditions simultaneously.

Note: C450RxN-x Reset Control Modules control temperature and humidity, but not pressure.

Global Design

System 450 modules are designed, tested, and certified for global application and are Underwriters' Laboratories, Inc. (UL) Listed and CE compliant.

System 450 control systems can be set up in standard units of measurement used worldwide; Fahrenheit, Celsius, psi, bar, inches water column (in. W.C.), and Relative Humidity (RH).

System 450 Applications

You can create a wide variety of custom, application-specific control systems with System 450 modules. The following are some common control application examples:

- temperature control
- pressure control
- humidity control
- multipurpose control
- reset and setback control
- high input-signal selection
- differential control

Temperature Control

Temperature control application examples include:

- heating and/or cooling control
- heating and cooling control with deadband
- boiler temperature stage control
- boiler circulating pump control
- chilled water temperature stage control
- discharge air temperature control
- modulating damper or valve control

Pressure Control

Pressure control application examples include:

- refrigeration compressor capacity control
- staged SPDT condenser fan control
- two-speed fan motor control
- floating pressure control of an actuator
- constant static pressure or air velocity control
- relief damper building pressurization control
- relief fan building pressurization control
- Electronically Commutated (EC) motor control (C450CPW-100 model)

Humidity Control

Humidity control examples include:

- humidification/dehumidification control
- staged SPDT humidity control

Multipurpose Control

Multipurpose application examples include:

- temperature and pressure based refrigeration rack control
- temperature and humidity control for a wine cellar or greenhouse
- temperature, static pressure, and humidity for a clean room application

Reset and Setback Control

Reset and setback control applications include:

- temperature control for single stage or multi-stage (up to ten stages) boilers with or without load balancing (equal runtime hours)
- humidity reset and temperature control for natatorium/swimming pool zones

High Input Signal Selection

Beginning with firmware Version 2.00, standard System 450 control modules include the High Input-Signal Selection control capability.

The High Input-Signal Selection feature enables a System 450 control system to monitor a condition (temperature, pressure, or humidity) with two or three sensors (of the same type) and control relay and/or analog outputs based on the highest condition value sensed by the two or three referenced sensors.

High Input Signal Selection examples include:

- fan-staging control on multi-circuit condensers
- fan speed control on multi-circuit condensers

Differential Control

Beginning with Version 2.00 firmware, standard System 450 control modules also include Differential Control capability.

Differential control is used to monitor and maintain a given difference in a condition (temperature, pressure, or humidity) between two sensor points within a system, process, or space.

The Differential Control feature enables a System 450 control system to monitor the temperature, pressure, or humidity differential between two sensors of the same type (Sn-1 and Sn-2) and control relay and/or analog outputs based on the sensed differential value relative to user-selected differential values.

Differential Control application examples include:

- solar heating systems
- pump pressure-drop monitoring and control
- fluid filter pressure-drop monitoring

System 450 Control Modules

The System 450 control module is the supervisor of your control system and the interface for the system's inputs, supply power, and outputs. Figure 2 shows an example of the available System 450 control modules. See Table 3 in [Ordering Information](#) for information on all of the available control modules.

All System 450 control systems require a control module for setting up the control system's inputs and outputs, monitoring the control system's status, and controlling the system's outputs.

System 450 control modules are capable of monitoring up to three inputs and controlling up to ten outputs that can be any combination of relay and analog outputs (provided by expansion modules).

User-Friendly LCD and Touchpad UI

System 450 control modules feature a backlit LCD screen, which during normal operation displays the real-time status of the sensors that are set up in your control system.

The four-button touchpad enables you to quickly scroll through and view the output status screens and access the system setup screens to set up or adjust the sensors and outputs in your control system.

After you have assembled and powered your control system, and selected the Sensor Types in the UI, the control module automatically determines the output numbers and output types. The control module then generates the menu-based setup screens and supplies all of the default setup values required to set up your custom control system.

Control Modules with Relay Outputs

C450CBN-x and C450CCN-x model control modules have SPDT relay output.



Figure 2: System 450 Control Module with Two Relay Outputs

Control Modules with Analog Outputs

C450CPN-x and C450CQN-x control module models have analog output (0–10 VDC or 4–20 mA).

Reset Control Modules with Real-Time Clock and Relay Output

C450RxN-x Reset Control models are SPDT relay control modules. C450RxN-x reset control modules provide many of the features of the standard control modules for temperature and humidity control. In addition, these modules provide temperature and humidity reset, real-time setback, and load balancing (equal runtime) capability.

Note: C450RxN-x Reset Control models control temperature and humidity, but not pressure.

Control Module with Hybrid Analog Output

The C450CPW-100 control module is designed for use with variable speed Electronically Commutated (EC) fan motors on a wide variety of refrigeration and HVAC condensing units.

The C450CPW-100 module has an onboard analog output that can be configured as a hybrid analog output to optimize and extend the controlled speed range of variable speed EC motors. The onboard analog output can also be configured for High Input Signal Selection, which enables precise and efficient EC motor speed control on multi-circuit condensing units.

Stand-Alone Multipurpose Controller

The versatile System 450 control module can also be easily configured out-of-the-box as a stand-alone control, which can provide SPDT control or proportional analog signal control (depending on the model) for a wide range of HVACR and commercial/industrial applications.

With a C450CxN-x control module and the available sensors and transducers (see Table 3 through Table 9), almost any temperature, pressure, or humidity control you may encounter in the field can be quickly replaced.

Control module models are available with either one or two relay outputs or one or two analog outputs. See [Ordering Information](#) and [Technical Specifications](#) for more information on System 450 control modules and specifications.

Expansion Modules and Outputs

System 450 expansion modules (Figure 3) allow you to increase the number of outputs in your control system to meet your application requirements (Figure 11 through Figure 13). System 450 relay expansion modules have either one or two SPDT relay outputs. System 450 analog expansion modules have either one or two analog outputs (0–10 VDC or 4–20 mA).



Figure 3: System 450 Expansion Module With Two Relay Outputs

Relay Outputs

System 450 relay outputs provide SPDT control to your system equipment based on the reference sensors set up in your control system. Multiple relay outputs can provide staged SPDT control. Single relay outputs can also activate alarms for your controlled systems.

Each relay output is an SPDT set of line-voltage contacts with Normally Open (LNO), Normally Closed (LNC), and Common (LC) wiring terminals (Figure 11 through Figure 13). See [Technical Specifications](#) for more information, including electrical ratings.

SPDT relay outputs are featured on two control module models and two expansion module models. See [Ordering Information](#) for model information.

Analog Outputs

System 450 analog outputs generate proportional signals to your system equipment. Each analog output generates either a 0–10 VDC or 4–20 mA signal. The signal type is self-selecting; the output automatically detects the input signal target on the controlled equipment and generates the appropriate type of analog output signal to the equipment's input.

Analog outputs are featured on two control module models and two expansion module models. See [Ordering Information](#) for model information.

Selectable Proportional Control Action

A System 450 control system allows you to set up the control action of each analog output in your control system to respond to load changes in one of four different ways:

- Proportional output lowest at setpoint, with output increasing as sensor value increases
- Proportional output lowest at setpoint, with output increasing as sensor value decreases
- Proportional output highest at setpoint, with output decreasing as sensor value decreases
- Proportional output highest at setpoint, with output decreasing as sensor value increases

An analog output's control action is automatically determined by the setup values you select for the Setpoint, End Point, % Output at Setpoint, and % Output at Endpoint values when you set up the output in the UI.

An indicator (control ramp) appears on the output status screen for each analog output to represent the analog output's control action.

For a more detailed explanation of the control actions and control ramps, refer to the *System 450 Series Modular Controls Technical Bulletin (LIT-12011459)*.

Proportional Plus Integral Control

In addition to standard proportional (only) control analog signals, a System 450 control system provides integral control capability and six time integral selections that enable you to set up analog outputs to generate a proportional plus integral signal.

In many system control loops, proportional plus integral control provides more precise control by driving the controlled system closer to setpoint, even when under large load conditions.

System 450 Power Module

System 450 modules require 24 VAC - Class 2 power. In applications where 24 VAC power is not available, the C450YNN-1 Power Module provides a convenient means of transforming 120/240 VAC to 24 VAC to power System 450 modules.

System 450 Sensors and Transducers

System 450 control modules are designed to process input from a variety of compatible temperature sensors, humidity sensors, and pressure transducers.

For ease of installation and setup, the Sensor Type that you select in the UI for a sensor or transducer automatically determines the sensed condition, unit of measurement, minimum differential, setup value ranges, and the default setup values for each control system output that references the sensor or transducer.

System 450 Compatible Temperature Sensors

Table 3 on page 15 provides product code numbers and model information for compatible A99 Series Temperature Sensors (Figure 4).



Figure 4: A99B Temperature Sensors

See Table 4 on page 16 and refer to the *TE-6000 Series Temperature Sensing Elements Product Bulletin (LIT-216288)* for information on compatible TE-6000 Series temperature sensing elements.

See Table 5 on page 16 and refer to the *TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)* for information on compatible TE-6300 Series temperature sensors (Figure 5).



Figure 5: TE-6300 Series Temperature Sensors

Table 6 on page 16 provides the product code number and model information for the compatible TE-6800 Series wall mount temperature sensor (Figure 6).



Figure 6: TE-6800 Series Wall Mount Temperature Sensor

System 450 Compatible Humidity Sensors

Table 7 on page 16 provides product code numbers and information about the compatible HE67SE Type humidity sensors with integral A99B temperature sensor (Figure 7 and Figure 8).

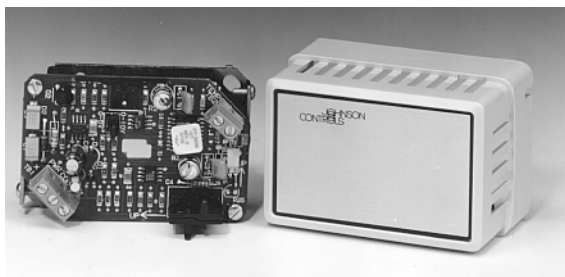


Figure 7: HE-67S3-0N0BT Wall Mount Humidity Sensor with Integral A99 Temperature Sensor



Figure 8: HE-67S3-0N00P Duct Mount Humidity Sensor with Integral A99 Temperature Sensor

System 450 Compatible Pressure Transducers

Table 8 on page 17 provides product code numbers and model information for compatible DPT265 Series low pressure differential transducers.

Table 9 on page 17 provides product code numbers and model information for compatible P499 Series pressure transducers (Figure 9).



Figure 9: P499 Series Electronic Pressure Transducers

System 450 Control Systems

You can connect a single sensor to a System 450 control module and configure the module as a simple stand-alone control system for almost any temperature, pressure, or humidity application.

You can also connect up to three inputs and ten relay or analog outputs to a control module (using expansion modules) to create a multipurpose control system capable of controlling temperature, pressure, and humidity devices simultaneously.

System 450 modules enable you to build and upgrade your control systems to meet your specific application requirements without having to purchase unwanted extra sensors, outputs, or control features; thereby reducing the cost of installing and upgrading your control systems.

System 450 also provides a wide range of cost-effective, custom control systems.

Standard System 450 Control Systems

Figure 10 shows a standard System 450 control system for a heating and cooling application that uses temperature and pressure input sensors; and relay and analog outputs to control the system equipment.

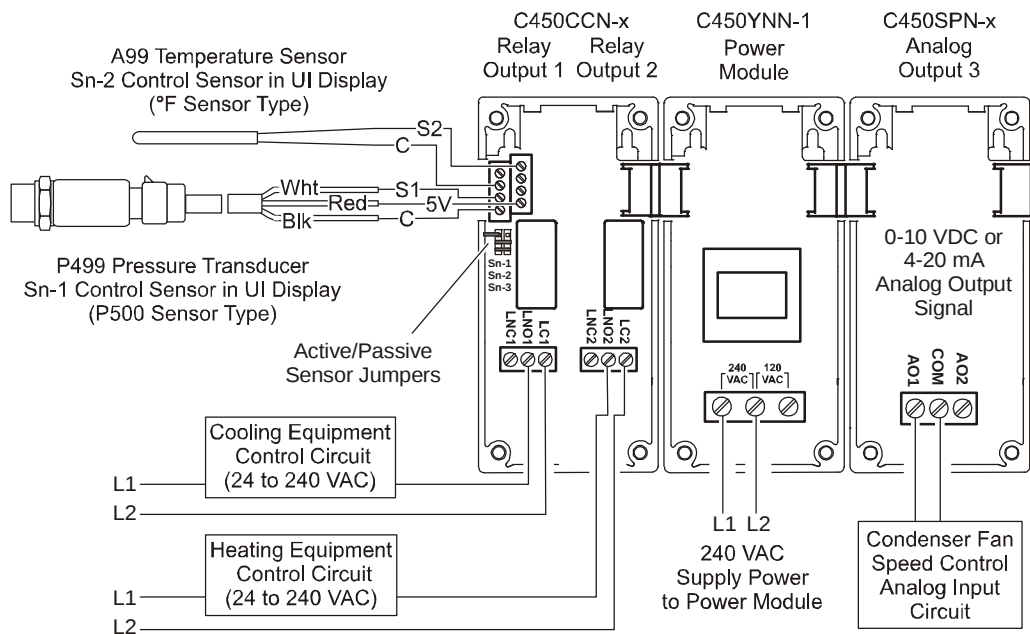


Figure 10: System 450 Control System for a Room Heating and Cooling Application with Condenser Fan Speed Control

Figure 11 shows a standard System 450 control system for a clean room application that uses temperature, pressure, and humidity input sensors; and relay and analog outputs to control the equipment.

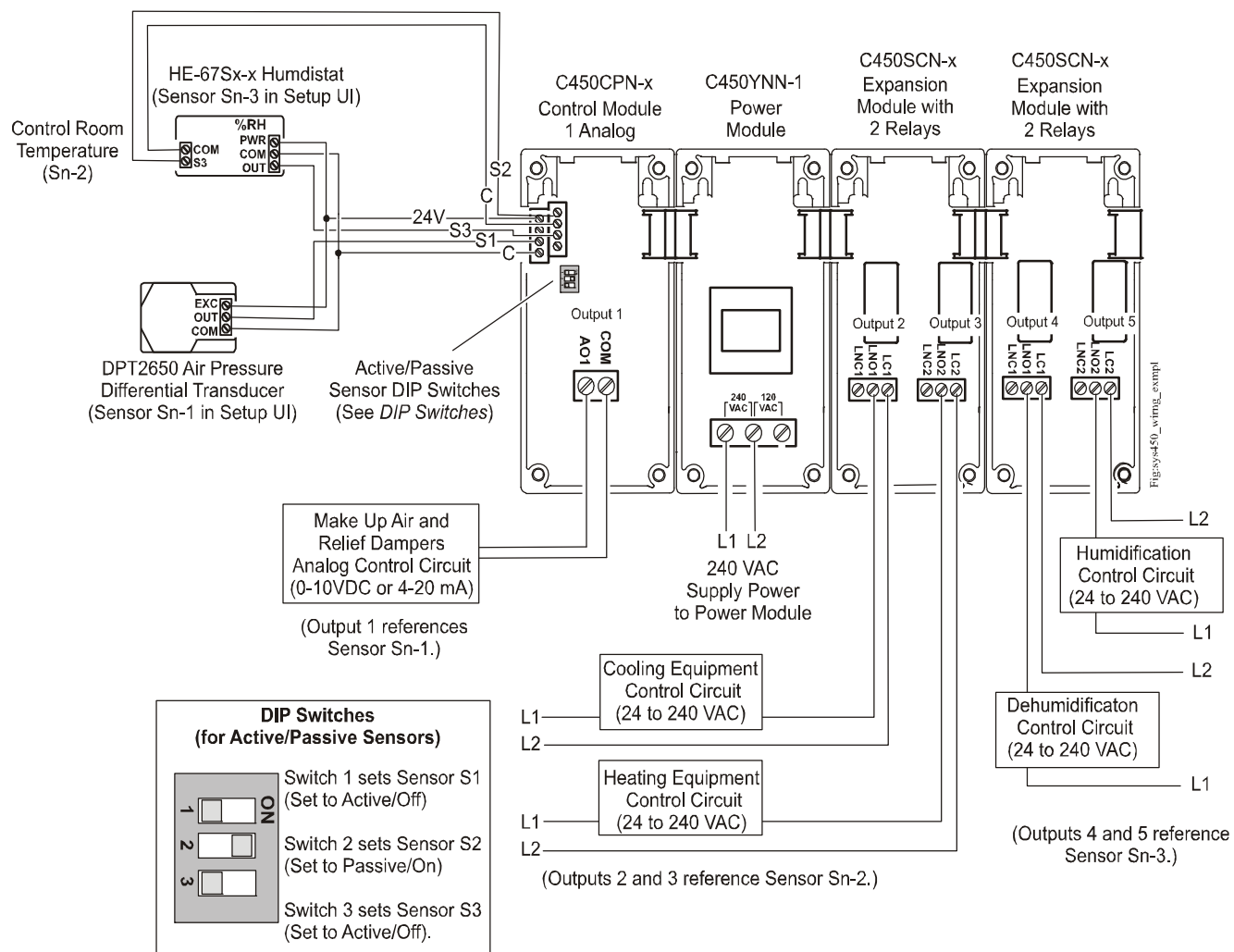


Figure 11: System 450 Control System Example for a Clean Room Application That Controls Temperature, Pressure, and Humidity Simultaneously

System 450 Reset Control Systems

Figure 12 shows a System 450 Reset Control system that uses an outdoor air temperature master sensor and a supply water temperature sensor configured to reset the boiler supply water temperature relative to the outdoor air temperature. This control system can also be configured to use the Load Balancing feature to equalize the time that each of the four boilers run.

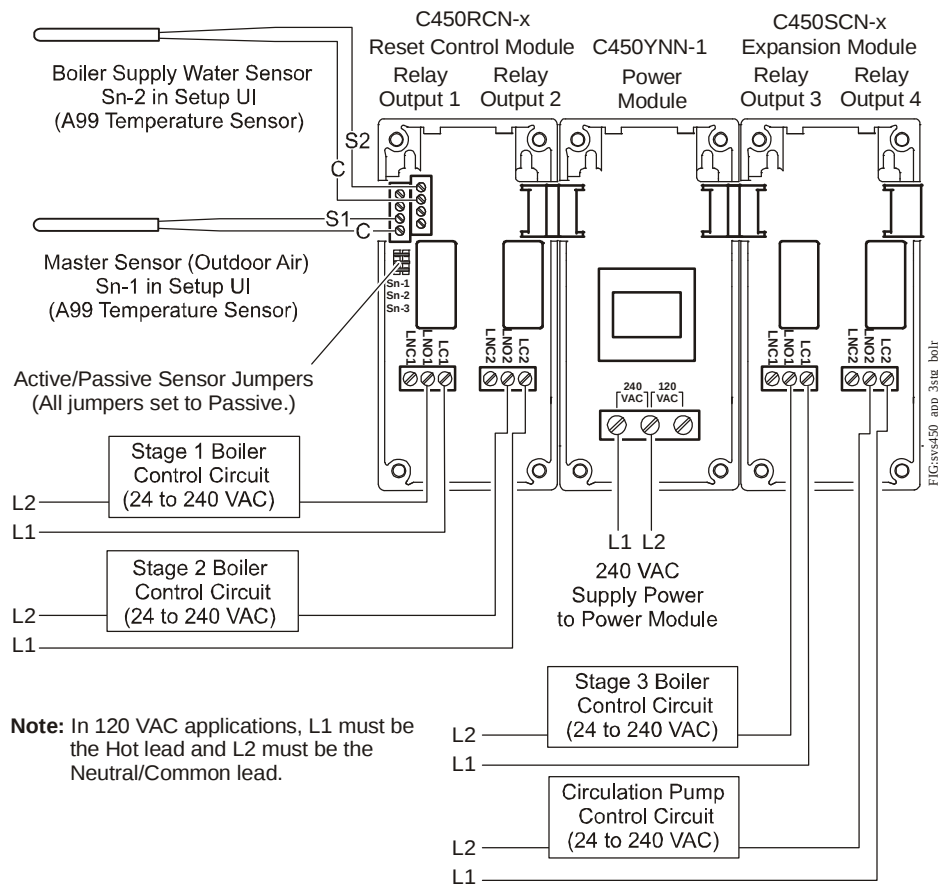


Figure 12: System 450 Reset Control System Example for a Three-Stage Boiler with or without Load Balancing

Figure 13 shows a System 450 Reset Control System for a natatorium/swimming pool application that uses temperature and humidity input sensors; and analog and relay outputs to control the heating equipment, dehumidification equipment, make-up air dampers, and exhaust air dampers.

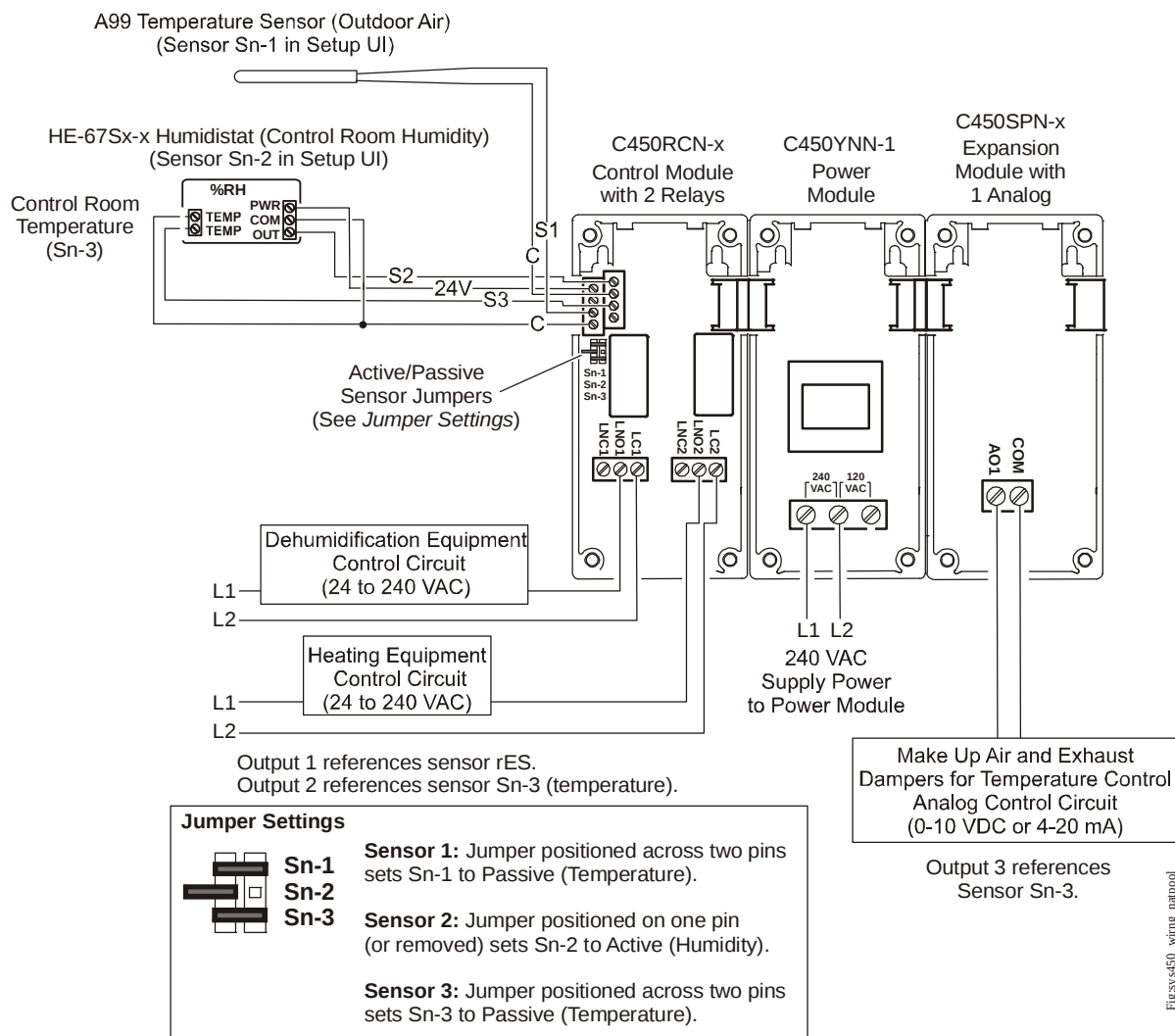


Figure 13: System 450 Reset Control System Example for a Natatorium/Swimming Pool Zone

Hybrid Analog Output and High Input Signal Selection Control

Figure 14 shows a System 450 control system that uses the hybrid analog output to control motor speed on an Electronically Commutated (EC) condenser fan motor and the High Input Signal Selection feature to provide the pressure input signal according to the higher of the two pressure values sensed at the two transducers.

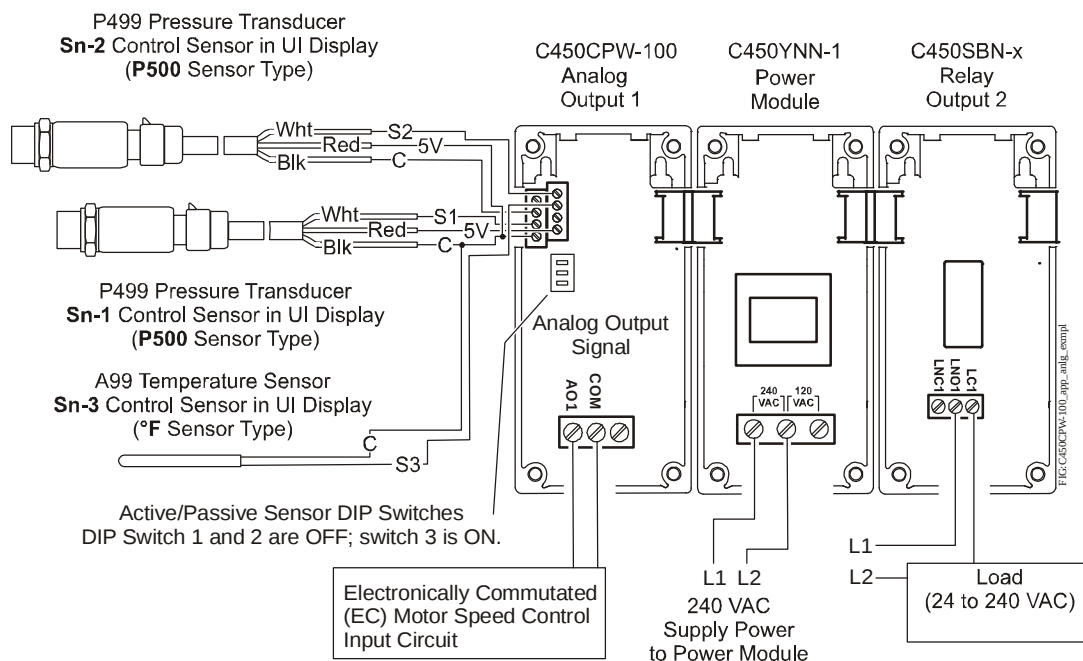


Figure 14: System 450 EC Motor Speed Control Application Using High Input Signal Selection

System 450 Differential Control

Figure 15 shows a System 450 solar water heating application that uses the Differential Control feature to enable a solar panel circulating pump whenever the temperature at the solar panel exceeds the temperature in the solar water storage tank by a differential of 10 F° (5.6 C°).

The space heating circulating pump is enabled whenever the solar water storage tank temperature reaches 75°F (23.9°C) at Sn2 and the controlled space is calling for heat at Sn3.

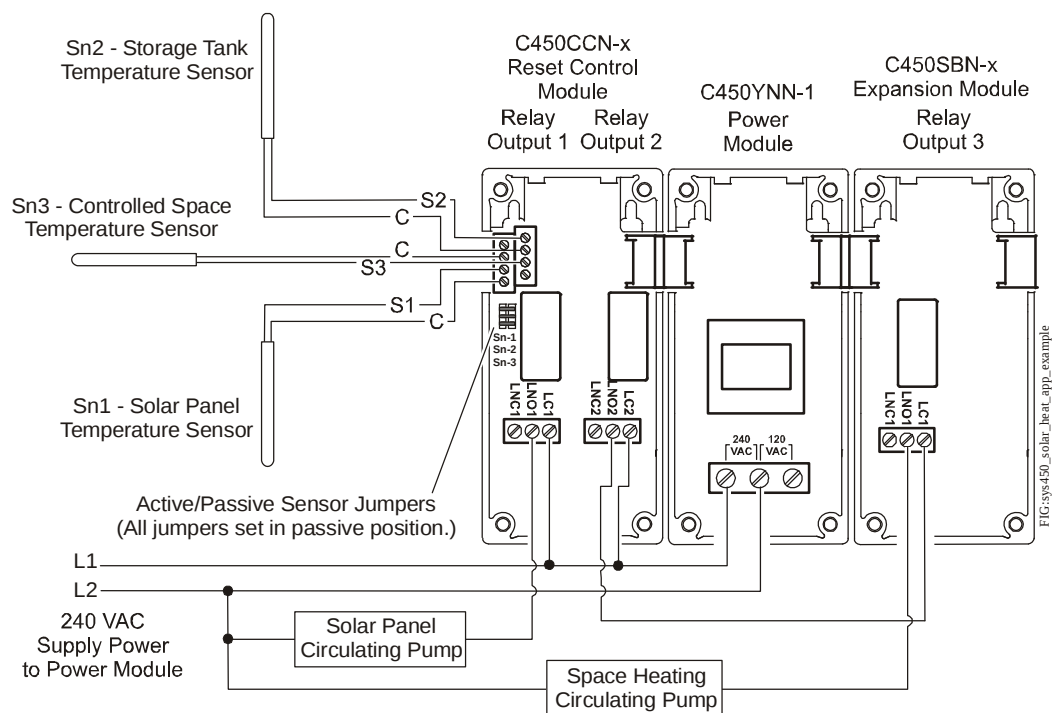


Figure 15: System 450 Solar Water Heating Application Using Differential Control

Ordering Information

Table 2 provides ordering information for System 450 Series modules and accessories.

Table 3, Table 7, Table 8, and Table 9 provide ordering information for System 450 compatible sensors, transducers, and accessories.

Table 2: System 450 Modules and Accessories Ordering Information (Part 1 of 2)

Product Code Number	Product Description
C450CBN-2C	Control Module ¹ with LCD, Four-Button Touchpad UI, and Relay Output; provides one relay output (SPDT line-voltage relay) for SPDT control. Version 2.00 and later firmware provides Differential Control and High Input Signal Selection. Note: This model is currently available only in North America.
C450CCN-2C	Control Module ¹ with LCD, Four-Button Touchpad UI, and Relay Output; provides two relay outputs (SPDT line-voltage relays) for SPDT control. Version 2.00 and later firmware provides Differential Control and High Input Signal Selection. Note: This model is currently available only in North America.
C450CBN-3C	Control Module ¹ with LCD, Four-Button Touchpad UI, and Relay Output; provides one relay output (SPDT line-voltage relay) for SPDT control. Version 2.00 and later firmware provides Differential Control and High Input Signal Selection. Note: This model is currently available only in Europe.
C450CCN-3C	Control Module ¹ with LCD, Four-Button Touchpad UI, and Relay Output; provides two relay outputs (SPDT line-voltage relays) for SPDT control. Version 2.00 and later firmware provides Differential Control and High Input Signal Selection. Note: This model is currently available only in Europe.
C450CPN-3C	Control Module ¹ with LCD, Four-Button Touchpad UI, and Analog Output; provides one analog output (0–10 VDC or 4–20 mA self-selecting signal) for proportional control. Version 2.00 and later firmware provides Differential Control and High Input Signal Selection.
C450CQN-3C	Control Module ¹ with LCD and Four-Button Touchpad UI, and Analog Output; provides two analog outputs (0–10 VDC or 4–20 mA self-selecting signals) for proportional control. Version 2.00 and later firmware provides Differential Control and High Input Signal Selection.
C450RBN-1C	Reset Control Module ¹ with LCD, Four-Button Touchpad UI, and SPDT relay output; provides one SPDT output relay. Note: This model is currently available only in North America.
C450RCN-1C	Reset Control Module ¹ with LCD, Four-Button Touchpad UI, and SPDT relay output; provides two SPDT output relays. Note: This model is currently available only in North America.
C450RBN-3C	Reset Control Module ¹ with LCD, Four-Button Touchpad UI, and SPDT relay output; provides one SPDT output relay. Note: This model is currently available only in Europe.
C450RCN-3C	Reset Control Module ¹ with LCD, Four-Button Touchpad UI, and SPDT relay output; provides two SPDT output relays. Note: This model is currently available only in Europe.
C450CPW-100C	Control Module ¹ with LCD, Four-Button Touchpad UI, Hybrid Analog Output and Optional High Input Signal Select; provides one hybrid analog output and optional high input signal select primarily used for variable-speed EC motor speed control. Note: Only Analog Output 1 can be configured as a hybrid analog output and/or use the High Input Signal Selection feature. These features are not available for any of the other outputs in a System 450 control system that uses the C450CPW-100C as the control module.
C450SBN-1C	Relay Output Expansion Module; provides one SPDT line-voltage relay output. Note: This model is currently available only in North America.
C450SCN-1C	Relay Output Expansion Module; provides two SPDT line-voltage relay outputs. Note: This model is currently available only in North America.
C450SBN-3C	Relay Output Expansion Module; provides one SPDT line-voltage relay output. Note: This model is currently available only in Europe.

Table 2: System 450 Modules and Accessories Ordering Information (Part 2 of 2)

Product Code Number	Product Description
C450SCN-3C	Relay Output Expansion Module; provides two SPDT line-voltage relay outputs. Note: This model is currently available only in Europe.
C450SPN-1C	Analog Output Expansion Module; provides one analog output (0–10 VDC or 4–20 mA self-selecting signal) for proportional control.
C450SQN-1C	Analog Output Expansion Module; provides two analog outputs (0–10 VDC or 4–20 mA self-selecting signals) for proportional control.
C450YNN-1C	Power Module; provides 24 V to System 450 Module Assembly; 120 VAC or 240 VAC supply power input terminals.
BKT287-1R	DIN Rail; 12 in. (0.30 m) long
BKT287-2R	DIN Rail; 39-1/3 in. (1 m) long
BKT287-3R	DIN Rail; 24 in. (0.61 m) long
BKT287-4R	DIN Rail; 14 in. (0.36 m) long
PLT344-1R	DIN Rail End Clamps (2 clamps)

1. You can set up and control both analog and relay outputs with any System 450 control module.

Table 3: System 450 Compatible A99B Temperature Sensors and Accessories Ordering Information (Part 1 of 2)

Product Code Number	Product Description
A99BA-200C	PTC Silicon Sensor with Shielded Cable; Cable length (2 m) 6-1/2 ft Sensor Temperature Range: -40 to 120°C (-40 to 250°F) Cable Jacket Temperature Range: -40 to 100°C (-40 to 212°F)
A99BB-25C	PTC Silicon Sensor with PVC Cable; Cable length (0.25 m) 9-3/4 in. Sensor Temperature Range: -40 to 120°C (-40 to 250°F) Cable Jacket Temperature Range: -40 to 100°C (-40 to 212°F)
A99BB-200C	PTC Silicon Sensor with PVC Cable; Cable length (2 m) 6-1/2 ft Sensor Temperature Range: -40 to 120°C (-40 to 250°F) Cable Jacket Temperature Range: -40 to 100°C (-40 to 212°F)
A99BB-300C	PTC Silicon Sensor with PVC Cable; Cable length (3 m) 9-3/4 ft Sensor Temperature Range: -40 to 120°C (-40 to 250°F) Cable Jacket Temperature Range: -40 to 100°C (-40 to 212°F)
A99BB-500C	PTC Silicon Sensor with PVC Cable; Cable length (5 m) 16-3/8 ft Sensor Temperature Range: -40 to 120°C (-40 to 250°F) Cable Jacket Temperature Range: -40 to 100°C (-40 to 212°F)
A99BB-600C	PTC Silicon Sensor with PVC Cable; Cable length (6 m) 19-1/2 ft Sensor Temperature Range: -40 to 120°C (-40 to 250°F) Cable Jacket Temperature Range: -40 to 100°C (-40 to 212°F)
A99BC-25C	PTC Silicon Sensor with High Temperature Silicon Cable; Cable length (0.25 m) 9-3/4 in. Sensor Temperature Range: -40 to 120°C (-40 to 250°F) Cable jacket rated for full sensor temperature range.
A99BC-300C	PTC Silicon Sensor with High Temperature Silicon Cable; Cable length (3 m) 9-3/4 ft Sensor Temperature Range: -40 to 120°C (-40 to 250°F) Cable jacket rated for full sensor temperature range.
A99BC-1500C	PTC Silicon Sensor with High Temperature Silicon Cable; Cable length (15 m) 49 ft Sensor Temperature Range: -40 to 120°C (-40 to 250°F) Cable jacket rated for full sensor temperature range.
BOX10A-600R	PVC enclosure for A99 sensor; includes wire nuts and conduit connector (for outdoor sensor)
WEL11A-601R	Immersion well for A99 sensor liquid sensing applications

Table 3: System 450 Compatible A99B Temperature Sensors and Accessories Ordering Information (Part 2 of 2)

Product Code Number	Product Description
A99-CLP-1	Mounting clip for A99 temperature sensor
ADP11A-600R	Conduit adaptor, 1/2 in. snap-fit EMT conduit adaptor (box of 10)
TE-6001-1	Duct mounting hardware with handy box for A99 sensor
TE-6001-11	Duct mounting hardware without handy box for A99 sensor
SHL10A-603R	Sun Shield (for use with outside A99 sensors in sunny locations)

Table 4: System 450 Compatible TE-6000 Series 1,000 Ohm Nickel Temperature Sensors and Accessories Ordering Information

Product Code Number	Product Description
TE-6000-x	TE6000 Series 1,000 ohm nickel temperature sensors (only). For a complete list of compatible 1,000 ohm nickel sensors, including sensor descriptions, technical specifications, and accessories, refer to the <i>TE-6000 Series Temperature Sensing Elements Product Bulletin (LIT-216288)</i> . (System 450 Sensor Types HI°C and HI°F)

Table 5: System 450 Compatible TE-6300 Series 1,000 Ohm Nickel Temperature Sensors and Accessories Ordering Information

Product Code Number	Product Description
TE-631xx-x	TE6300 Series 1,000 ohm nickel averaging and 1,000 ohm thin-film nickel temperature sensors (only). For a complete list of compatible 1,000 ohm nickel averaging and thin-film nickel sensors, including sensor descriptions, technical specifications, and accessories, refer to the <i>TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)</i> . (System 450 Sensor Types HI°C and HI°F)

Table 6: System 450 Compatible TE-68NT-0N00S 1,000 Ohm Nickel Temperature Sensor Ordering Information

Product Code Number	Product Description
TE-68NT-0N00S	TE6800 Series 1,000 ohm nickel temperature sensor for wall-mount applications. For more information, including sensor description, technical specifications, and accessories, refer to the <i>TE-6800 Series Temperature Sensors Product Bulletin (LIT-12011542)</i> . (System 450 Sensor Types HI°C and HI°F)

Table 7: System 450 Compatible HE67S3 Type Humidity Sensors with Integral A99B Temperature Sensor Ordering Information¹

Product Code Number	Product Description
HE-67S3-0N0BT	Wall Mount Humidity Sensor with A99B Type Temperature Sensor: 10 to 90% RH; -40 to 121°C (-40 to 250°F)
HE-67S3-0N00P	Duct Mount Humidity Sensor with A99B Type Temperature Sensor: 10 to 90% RH; -40 to 121°C (-40 to 250°F)

1. Refer to the *TrueRH Series HE-67xx Humidity Element with Temperature Sensors Product Bulletin (LIT-216245)* on the Johnson Controls Product Literature Web site for more information.

Table 8: System 450 Compatible Low Pressure Differential Transducer Ordering Information¹

Product Code Number	Product Description
DPT2650-0R5D-AB	Low Pressure Differential Transducer: 0 to 0.5 in. W.C. (System 450 Sensor Type: P 0.5)
DPT2650-2R5D-AB	Low Pressure Differential Transducer: 0 to 2.5 in. W.C. (System 450 Sensor Type: P 2.5)
DPT2650-005D-AB	Low Pressure Differential Transducer: 0 to 5.0 in. W.C. (System 450 Sensor Type: P 5)
DPT2650-10D-AB	Low Pressure Differential Transducer: 0 to 10 in. W.C. (System 450 Sensor Type: P 10)

1. Refer to the *Setra Systems Model DPT265 Very Low Differential Pressure Transducer Catalog Page* on the Johnson Controls Product Literature Web site for more information.

Table 9: System 450 Compatible P499 Series Electronic Pressure Transducer and WHA-PKD3 Wire Harness Ordering Information¹ (Part 1 of 2)

Product Code Number	Product Description
P499RCP-401C	Electronic Pressure Transducer: -1 to 8 bar; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). Order WHA-PKD3 type wire harness separately.
P499RCP-402C	Electronic Pressure Transducer: -1 to 15 bar; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). Order WHA-PKD3 type wire harness separately.
P499RCP-404C	Electronic Pressure Transducer: 0 to 30 bar; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). Order WHA-PKD3 type wire harness separately.
P499RCP-405C	Electronic Pressure Transducer: 0 to 50 bar; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). Order WHA-PKD3 type wire harness separately.
P499RAPS100C	Electronic Pressure Transducer: -10 to 100 psig; 1/8 in.-27 NPT External Thread (Style 49) Order a WHA-PKD3 type wire harness separately.
P499RAPS100K	Electronic Pressure Transducer Kit: -10 to 100 psig; 1/8 in.-27 NPT External Thread (Style 49) WHA-PKD3-200C wire harness included.
P499RAP-101C	Electronic Pressure Transducer: 0 to 100 psig; 1/8 in.-27 NPT External Thread (Style 49) Order a WHA-PKD3 type wire harness separately.
P499RAP-101K	Electronic Pressure Transducer Kit: 0 to 100 psig; 1/8 in.-27 NPT External Thread (Style 49) WHA-PKD3-200C wire harness included.
P499RCP-101C	Electronic Pressure Transducer: 0 to 100 psig; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). Order WHA-PKD3 type wire harness separately.
P499RCP-101K	Electronic Pressure Transducer Kit: 0 to 100 psig; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). WHA-PKD3-200C wire harness included.
P499RAP-102C	Electronic Pressure Transducer: 0 to 200 psig; 1/8 in.-27 NPT External Thread (Style 49) Order a WHA-PKD3 type wire harness separately.
P499RCPS102C	Electronic Pressure Transducer: 0 to 200 psig (sealed for wet and freeze/thaw applications); 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). Order WHA-PKD3 type wire harness separately.
P499RCPS102K	Electronic Pressure Transducer Kit: 0 to 200 psig (sealed for wet and freeze/thaw applications); 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). WHA-PKD3-200C wire harness included.
P499RAP-105C	Electronic Pressure Transducer: 0 to 500 psig; 1/8 in.-27 NPT External Thread (Style 49) Order WHA-PKD3 type wire harness separately.
P499RAP-105K	Electronic Pressure Transducer Kit: 0 to 500 psig; 1/8 in.-27 NPT External Thread (Style 49) WHA-PKD3-200C wire harness included.
P499RCP-105C	Electronic Pressure Transducer: 0 to 500 psig; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). Order WHA-PKD3 type wire harness separately.
P499RCP-105K	Electronic Pressure Transducer Kit: 0 to 500 psig; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). WHA-PKD3-200C wire harness included.

Table 9: System 450 Compatible P499 Series Electronic Pressure Transducer and WHA-PKD3 Wire Harness Ordering Information¹ (Part 2 of 2)

Product Code Number	Product Description
P499RAP-107C	Electronic Pressure Transducer: 0 to 750 psig; 1/8 in.-27 NPT External Thread (Style 49) Order WHA-PKD3 type wire harness separately.
P499RAP-107K	Electronic Pressure Transducer Kit: 0 to 750 psig; 1/8 in.-27 NPT External Thread (Style 49) WHA-PKD3-200C wire harness included.
P499RAPS102C	Electronic Pressure Transducer: 0 to 200 psis (sealed for wet and freeze/thaw applications); 1/8 in.-27 NPT External Thread (Style 49). Order WHA-PKD3 type wire harness separately.
P499RAPS102K	Electronic Pressure Transducer Kit: 0 to 200 psis (sealed for wet and freeze/thaw applications); 1/8 in.-27 NPT External Thread (Style 49). WHA-PKD3-200C wire harness included.
P499RCP-107C	Electronic Pressure Transducer: 0 to 750 psig; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). Order WHA-PKD3 type wire harness separately.
P499RCP-107K	Electronic Pressure Transducer Kit: 0 to 750 psig; 1/4 in. SAE 45° Flare Internal Thread (7/16-20 UNF) with Depressor (Style 47). WHA-PKD3-200C wire harness included.
WHA-PKD3-200C	Plug and 3-Wire Harness for P499 Electronic Pressure Transducers: 2.0 m (6-1/2 ft) cable
WHA-PKD3-400C	Plug and 3-Wire Harness for P499 Electronic Pressure Transducers: 4.0 m (13 ft) cable
WHA-PKD3-600C	Plug and 3-Wire Harness for P499 Electronic Pressure Transducers: 6.0 m (19-5/8 ft) cable

1. Refer to the *P499 Series Electronic Pressure Transducers Product/Technical Bulletin (LIT-12011190)* on the Johnson Controls Product Literature Web site for more information.

Technical Specifications

C450Cxx Control Modules with Analog Output (Part 1 of 2)

Product	C450Cxx: System 450 Control Module models are sensing controls and operating controls with LCD, four-button touchpad, and analog output C450CPN-x: Control Module with one analog output C450CPW-100: Control Module with Hybrid Analog Output and High Input Signal Selection C450CQN-x: Control Module with two analog outputs
Supply Power	C450YNN-1 Power Supply Module or 24 (20–30) VAC Safety Extra-Low Voltage (SELV) (Europe) or Class 2 (North America) 50/60 Hz, 10 VA minimum
Ambient Operating Conditions	Temperature: -40 to 66°C (-40 to 150°F) when using 0–10 VDC outputs; -40 to 40°C (-40 to 104°F) when using 4–20 mA outputs Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)
Ambient Shipping and Storage Conditions	Temperature: -40 to 80°C (-40 to 176°F) Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)
Input Signal	0–5 VDC; 1,035 ohm at 25°C (77°F) for an A99 PTC Temperature Sensor

C450Cxx Control Modules with Analog Output (Part 2 of 2)

Analog Output	Voltage Mode (0–10 VDC): 10 VDC maximum output voltage 10 mA maximum output current Requires an external load of 1,000 ohm or more The AO operates in Voltage Mode when connected to devices with impedance greater than 1,000 ohm. Devices that drop below 1,000 ohm may not operate as intended with Voltage Mode applications.
	Current Mode (4–20 mA): Requires an external load between 0–300 ohm The AO operates in Current Mode when connected to devices with impedances less than 300 ohm. Devices that rise above 300 ohm may not operate as intended with Current Mode applications.
Analog Input Accuracy	Resolution: 14 bit
Control Construction	Independently mounted control, surface mounted with Lexan® 950 enclosure suitable for DIN rail mounting or direct mounting to a hard, even surface.
Dimensions (H x W x D)	127 x 61 x 61 mm (5 x 2-3/8 x 2-3/8 in.)
Weight	C450CPN-x: 195 g (0.43 lb) C450CPW-100: 195 g (0.43 lb) C450CQN-x: 195 g (0.43 lb)
Compliance 	North America: cULus Listed; UL 60730, File E27734, Vol. 1; FCC Compliant to CFR47, Part 15, Subpart B, Class B Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits
	Europe: CE Mark - Johnson Controls Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the Low Voltage Directive (2006/95/EC); EMC Directive (2004/108/EC); RoHS Directive (2002/95/EC); WEEE Directive (2002/96/EC).
	Australia: Mark: C-Tick Compliant (N1813)

C450CxN Control Modules with Relay Output (Part 1 of 2)

Product	C450Cxx: System 450 Control Module models are sensing controls and operating controls with LCD, four-button touchpad, and On/Off relay output C450CBN-x: Control Module with one SPDT output relay C450CCN-x: Control Module with two SPDT output relays		
Supply Power	C450YNN-1 Power Supply Module or 24 (20-30) VAC Safety Extra-Low Voltage (SELV) (Europe) or Class 2 (North America) 50/60 Hz, 10 VA minimum		
Ambient Operating Conditions	Temperature: -40 to 66°C (-40 to 150°F) when using 0–10 VDC outputs; -40 to 40°C (-40 to 104°F) when using 4–20 mA outputs Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)		
Ambient Shipping and Storage Conditions	Temperature: -40 to 80°C (-40 to 176°F) Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)		
Input Signal	0–5 VDC, 1,035 ohm at 25°C (77°F) for an A99 PTC Temperature Sensor		
Output Relay Contacts	General: 1/2 HP at 120/240 VAC, SPDT		
	Specific:	<u>AC Motor Ratings</u>	<u>120 VAC</u> <u>208/240 VAC</u>
		AC Full-load Amperes:	9.8 A 4.9 A
		AC Locked-Rotor Amperes:	58.8 A 29.4 A
	10 Amperes AC Non-inductive at 24/240 VAC Pilot Duty: 125 VA at 24/240 VAC		
Analog Input Accuracy	Resolution: 14 bit		

C450CxN Control Modules with Relay Output (Part 2 of 2)

Control Construction	Independently mounted control, surface mounted with Lexan® 950 enclosure suitable for DIN rail mounting or direct mounting to a hard, even surface.
Dimensions (H x W x D)	127 x 61 x 61 mm (5 x 2-3/8 x 2-3/8 in.)
Weight	C450CBN-x: 209 g (0.46 lb) C450CCN-x: 222 g (0.49 lb)
Compliance	North America: cULus Listed; UL 60730, File E27734, Vol. 1; FCC Compliant to CFR47, Part 15, Subpart B, Class B Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits Europe: CE Mark - Johnson Controls Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the Low Voltage Directive (2006/95/EC); EMC Directive (2004/108/EC); RoHS Directive (2002/95/EC); WEEE Directive (2002/96/EC). Australia: Mark: C-Tick Compliant (N1813)



C450RxN Reset Control Modules with Relay Output (Part 1 of 2)

Product	C450RxN: System 450 Reset Control Module models are sensing controls and operating controls with LCD, four-button touchpad, and On/Off relay output. C450RBN-x: Reset Control Module with one SPDT output relay, one A99BC-25 temperature sensor, and one A99BC-300 temperature sensor C450RCN-x: Reset Control Module with two SPDT output relays, one A99BC-25 temperature sensor, and one A99BC-300 temperature sensor
Supply Power	C450YNN-1 Power Supply Module or 24 (20-30) VAC Safety Extra-Low Voltage (SELV) (Europe) or Class 2 (North America) 50/60 Hz, 10 VA minimum
Ambient Operating Conditions	Temperature: -40 to 66°C (-40 to 150°F) Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)
Ambient Shipping and Storage Conditions	Temperature: -40 to 80°C (-40 to 176°F) Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)
Input Signal	0–5 VDC, 1,035 ohm at 25°C (77°F) for an A99 PTC Temperature Sensor
Output Relay Contacts	General: 1/2 HP at 120/240 VAC, SPDT Specific: AC Motor Ratings 120 VAC 208/240 VAC AC Full-load Amperes: 9.8 A 4.9 A AC Locked-Rotor Amperes: 58.8 A 29.4 A 10 Amperes AC Non-inductive at 24/240 VAC Pilot Duty: 125 VA at 24/240 VAC
Clock Accuracy	±4 minutes per year
Clock Backup Power	12 hours (capacitor reserve)
Setback Events	one occupied and one unoccupied event per day; 7 day schedule
Analog Input Accuracy	Resolution: 14 bit
Control Construction	Independently mounted control, surface mounted with Lexan® 950 enclosure suitable for DIN rail mounting or direct mounting to a hard, even surface.

C450RxN Reset Control Modules with Relay Output (Part 2 of 2)

Dimensions (H x W x D)	127 x 61 x 61 mm (5 x 2-3/8 x 2-3/8 in.)
Weight	C450RBN-x: 209 g (0.46 lb) C450RCN-x: 222 g (0.49 lb)
Compliance 	North America: cULus Listed; UL 60730, File E27734, Vol. 1; FCC Compliant to CFR47, Part 15, Subpart B, Class B Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits Europe: CE Mark - Johnson Controls Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the Low Voltage Directive (2006/95/EC); EMC Directive (2004/108/EC); RoHS Directive (2002/95/EC); WEEE Directive (2002/96/EC). Australia: Mark: C-Tick Compliant (N1813)

C450SxN Analog Output Expansion Modules

Product	C450SPN-x: System 450 Expansion Module with one Analog output C450SQN-x: System 450 Expansion Module with two Analog outputs
Supply Power	C450YNN-1 Power Supply Module or 24 (20-30) VAC Safety Extra-Low Voltage (SELV) (Europe) or Class 2 (North America) 50/60 Hz, 10 VA minimum
Ambient Operating Conditions	Temperature: -40 to 66°C (-40 to 150°F) when using 0–10 VDC outputs; -40 to 40°C (-40 to 104°F) when using 4–20 mA outputs Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)
Ambient Shipping and Storage Conditions	Temperature: -40 to 80°C (-40 to 176°F) Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)
Analog Output	Voltage Mode (0–10 VDC): 10 VDC maximum output voltage 10 mA maximum output current Requires an external load of 1,000 ohm or more The AO operates in Voltage Mode when connected to devices with impedance greater than 1,000 ohm. Devices that drop below 1,000 ohm may not operate as intended with Voltage Mode applications. Current Mode (4–20 mA): Requires an external load between 0–300 ohm The AO operates in Current Mode when connected to devices with impedances less than 300 ohm. Devices that rise above 300 ohm may not operate as intended with Current Mode applications.
Control Construction	Independently mounted control, surface mounted with Lexan® 950 enclosure suitable for DIN rail mounting or direct mounting to a hard, even surface.
Dimensions (H x W x D)	127 x 61 x 61 mm (5 x 2-3/8 x 2-3/8 in.)
Weight	C450SPN-x: 150 g (0.33 lb) C450SQN-x: 150 g (0.33 lb)
Compliance 	North America: cULus Listed; UL 60730, File E27734, Vol. 1; FCC Compliant to CFR47, Part 15, Subpart B, Class B Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits Europe: CE Mark - Johnson Controls Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the Low Voltage Directive (2006/95/EC); EMC Directive (2004/108/EC); RoHS Directive (2002/95/EC); WEEE Directive (2002/96/EC). Australia: Mark: C-Tick Compliant (N1813)

C450SxN Relay Output Expansion Modules

Product	C450SBN-x: System 450 Expansion Module with one SPDT output relay C450SCN-x: System 450 Expansion Module with two SPDT output relays		
Supply Power	C450YNN-1 Power Supply Module or 24 (20-30) VAC Safety Extra-Low Voltage (SELV) (Europe) or Class 2 (North America) 50/60 Hz, 10 VA minimum		
Ambient Operating Conditions	Temperature: -40 to 66°C (-40 to 150°F) Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)		
Ambient Shipping and Storage Conditions	Temperature: -40 to 80°C (-40 to 176°F) Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)		
Output Relay Contacts	General: 1/2 HP at 120/240 VAC, SPDT		
	Specific:	AC Motor Ratings	120 VAC 208/240 VAC
		AC Full-load Amperes:	9.8 A 4.9 A
		AC Locked-Rotor Amperes:	58.8 A 29.4 A
	10 Amperes AC Non-inductive at 24/240 VAC Pilot Duty: 125 VA at 24/240 VAC		
Control Construction	Independently mounted control, surface mounted with Lexan® 950 enclosure suitable for DIN rail mounting or direct mounting to a hard, even surface.		
Dimensions (H x W x D)	127 x 61 x 61 mm (5 x 2-3/8 x 2-3/8 in.)		
Weight	C450SBN-x: 172 g (0.38 lb) C450SCN-x: 186 g (0.41 lb)		
Compliance		North America: cULus Listed; UL 60730, File E27734, Vol. 1; FCC Compliant to CFR47, Part 15, Subpart B, Class B Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits	
		Europe: CE Mark - Johnson Controls Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the Low Voltage Directive (2006/95/EC); EMC Directive (2004/108/EC); RoHS Directive (2002/95/EC); WEEE Directive (2002/96/EC).	
		Australia: Mark: C-Tick Compliant (N1813)	

C450YNN Power Module (Part 1 of 2)

Product	C450YNN-1: System 450 Power Supply Module; 120 or 240 VAC stepdown to 24 VAC Class 2 (North America) or SELV (Europe)
Supply Power	110/120 VAC or 220/240 VAC at 50/60 Hz (100 mA maximum)
Secondary Power	24 VAC, 10 VA
Ambient Operating Conditions	Temperature: -40 to 66°C (-40 to 150°F) Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)
Ambient Shipping and Storage Conditions	Temperature: -40 to 80°C (-40 to 176°F) Humidity: Up to 95% RH noncondensing; Maximum Dew Point 29°C (85°F)
Control Construction	Independently mounted control, surface mounted with Lexan® 950 enclosure suitable for DIN rail mounting or direct mounting to a hard, even surface.



Building Efficiency

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C450YNN Power Module (Part 2 of 2)

Dimensions (H x W x D)	127 x 61 x 61 mm (5 x 2-3/8 x 2-3/8 in.)
Weight	C450YNN-1: 390 g (0.86 lb)
Compliance 	North America: cULus Listed; UL 60730, File E27734, Vol. 1; FCC Compliant to CFR47, Part 15, Subpart B, Class B Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits Europe: CE Mark - Johnson Controls Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the Low Voltage Directive (2006/95/EC); EMC Directive (2004/108/EC); RoHS Directive (2002/95/EC); WEEE Directive (2002/96/EC). Australia: Mark: C-Tick Compliant (N1813)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult Johnson Controls Application Engineering at (414) 524-5535. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

United States Emissions Compliance

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 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.*

Canadian Emissions Compliance

*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.*