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Network Control Engine (NCE)

Product Bulletin

MS-NCE25xx-x

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The Metasys® Network Control Engine (NCE) Series controllers combine the network supervisor capabilities and Internet Protocol (IP) network connectivity of a Network Automation Engine (NAE) with the Input/Output (I/O) point connectivity and direct digital control capabilities of a Field Equipment Controller (FEC). NCEs provide a cost-effective solution designed for integrating central plants and large built-up air handlers into your Metasys networks.

All NCE models provide IP Ethernet network connectivity, the Metasys Site Management Portal User Interface (UI), and the network supervisory capabilities featured on NAE35/NAE45 Series network automation engines.

All NCE models provide connectivity to and supervisory control of a specified field bus trunk with up to 32 field controllers. Depending on the model, an NCE25 supports either a BACnet® Master-Slave/Token-Passing (MS/TP) trunk, an N2 Bus trunk, or a LONWORKS® network trunk.

All NCE models feature 33 integral I/O points and a Sensor Actuator (SA) Bus, which allow you to increase the NCE's I/O field point capacity and also integrate NS Series Network Sensors and Variable Frequency Drives (VFDs) into your NCE application.

Some NCE models feature an integral field controller display screen with a navigation keypad. In addition, some NCE models feature an internal modem that supports standard dial-up capabilities.

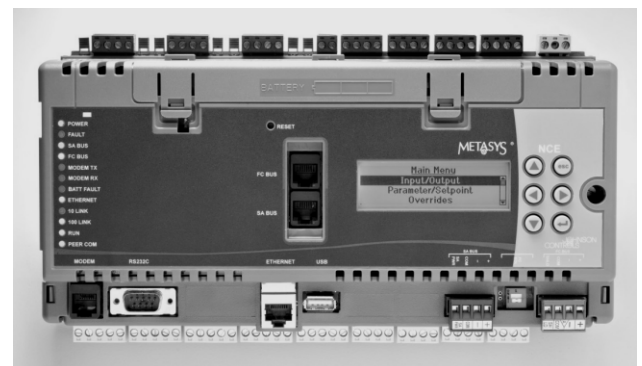


Figure 1: NCE25

Table 1: Features and Benefits

Features	Benefits
Uses Commonly Accepted Information Technology (IT) Standards at the Automation and Enterprise Level	Allows you to install the NCE on the existing IT infrastructure within a building or enterprise and use standard IT communication services over the company intranet, Wide Area Network (WAN), or public Internet with firewall protection.
Web-Based User Interface	Allows you to access, monitor, and control the NCE from a supported Web browser connected to the network, including remote users connected by dial-up telephone or an Internet Service Provider (ISP).
Supervision of Either an N2 Bus, LONWORKS Network, or BACnet MS/TP Bus Field Controller Trunk	Supports connectivity to open network standards for flexibility in the selection of field devices. Supports up to 32 field controllers on either a BACnet MS/TP bus, LONWORKS network, or N2 Bus trunk.
Multiple Connection Options for Data Access	Allow connection of a Web browser via the Internet Protocol (IP) network using the Ethernet port. For a dial-up connection, use the optional internal or external modem.
Integral Field Controller with 33 I/O Points	Provides field level control of central plant and large air-handler applications combined with enterprise level IP network connectivity.
Expandable I/O Point Capacity, NS Sensor Connectivity, and VFD Control on Field Controller SA Bus	Allow you to connect multiple Input/Output Modules (IOMs), NS Series Network Sensors, and VFDs to the field controller SA Bus, which greatly expands the NCE's field level control capabilities.

Enterprise Network Supervisory Control

The NCE features the NAE supervisory controller technology that drives the new generation of Building Automation Systems (BASs). The NCE is a network automation engine, just like the NAE, that manages BASs using information and Internet technology. The NCE provides enterprise level supervisory control of an integral field controller and control of up to 32 additional field controllers on a field controller bus.

The NCE uses standard BAS communication protocols and technologies to monitor and supervise Heating, Ventilating, and Air Conditioning (HVAC) equipment; lighting; security; fire; and access control. Depending on the model, the NCE can monitor and supervise either an MS/TP bus trunk, an N2 Bus trunk, or a LONWORKS network trunk.

A single NCE at a central plant or large air-handler (or a network of multiple NCEs and NAEs in a facility or campus of buildings) provides monitoring and control, alarm and event management, data exchange, trending, energy management, scheduling, and data storage.

NCEs have multiple connection port options that allow you to build an extremely flexible network at the automation and enterprise level of your system, and at the field controller and data acquisition levels.

IP Ethernet Network

The NCE connects directly to an IP Ethernet network running at 10 or 100 Mbps. Multiple NCEs and NAEs communicate with each other over the network, and typically an Application and Data Server/Extended Application and Data Server (ADS/ADX) or NAE is designated as the Metasys network Site Director. The Site Director is the point of access to the entire BAS network on the site and is accessed via a Web browser and the Metasys Site Management Portal UI. Data transmission on the Metasys network uses standard IT protocols, services, and formats.

Networks in different buildings may be interconnected using standard WAN technologies and network service providers. The speed of transmission depends on the technology used.

Web Browser Access

You access building systems through the NCE with a standard supported Web browser on a desktop or laptop computer. The computer does not require any special workstation software other than the browser and a standard Java® software. The Web browser accesses the NCE directly over the IP network, or via the Internet or public telephone service.

Remote NCE

The NCE can be accessed remotely over standard WAN infrastructures, the Internet using an ISP line, or over the public telephone network using a modem and the Point-to-Point Protocol (PPP). The NCE offers an optional internal modem or supports an external modem.

Application and Data Server (ADS)/ Extended Application and Data Server (ADX)

The ADS/ADX is an optional software package running on a computing platform that provides a location for storage of the system configuration database, trend logs, alarm logs, and audit trails. An ADS/ADX is typically configured as the Site Director. The software supports standard IT firewall technologies for protection against unauthorized access.

System Configuration Tool

You can define the NCE supervisory level database online through a Web browser directly connected to an NCE device, or connected from a remote location via a WAN. Using the System Configuration Tool (SCT), you can define the system configuration and database offline for later download to the NCE over the network. In either case, the supervisory level database is typically archived on the SCT or ADS/ADX.

All the software required for supervisory level database configuration resides on the NCE or SCT. You do not need to have a local copy of the database on the Web browser to make authorized changes.

The configuration data for application specific BACnet MS/TP or N2 controllers on the connected field network trunk can be downloaded through the NCE without affecting system operations.

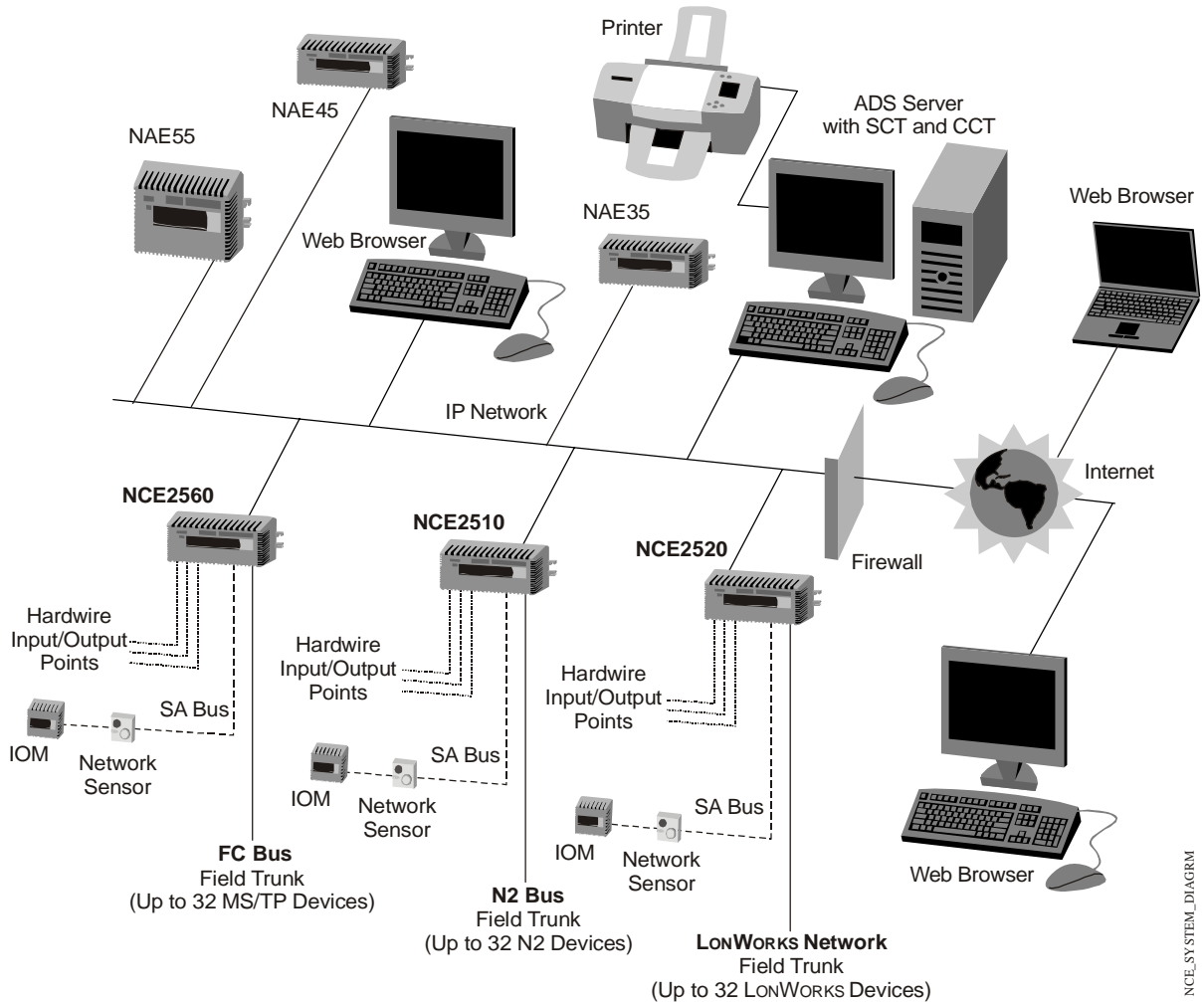


Figure 2: Three NCEs Connected to a Metasys System Network

Field Network Level Control

The NCE also features an integral Field Equipment Controller (FEC) that provides direct interface to and control of remote field equipment, such as large central cooling and heating plants, and large built-up air handler units.

The NCE has 33 onboard I/O control points and a SA Bus. The SA Bus allows you to connect Input/Output Modules (IOMs) and increase the I/O control points in your application.

You can also connect NS Series Network Sensors and supported VFDs to the SA Bus, and integrate state-of-the-art temperature control and motor speed control into your NCE application.

The 33 I/O control points on the NCE, and the I/O points and devices on the NCE SA Bus are defined and configured in the Controller Configuration Tool (CCT) software.

The 33 onboard NCE I/O control points include the following:

- **10 Universal Input** points, each point can be defined as either a Voltage Analog Input (0-10 VDC), a Current Analog Input (4-20 mA), or a Resistive Analog Input
- **8 Binary Input** points, each point can be defined as either Dry Contact Maintained or Pulse Counter Mode (100 Hz high-speed)
- **4 Analog Output** points, each point can be defined as either a Voltage Analog Output (0-10 VDC) or a Current Analog Output (4-20 mA)
- **4 Configurable Output** points, each point can be defined as either a Voltage Analog Output (0-10 VDC) or a Binary Output (24 VAC Triac)
- **7 Binary Output** points (24 VAC Triac)

The CCT has a consistent user interface across the Configuration, Simulation, and Commissioning modes and flexible connection options for downloading and commissioning field controllers, including a wireless connection option using the Wireless Commissioning Converter (MS-BTCVT-1).

Metasys System Software

Metasys Site Management Portal UI

The embedded Metasys NCE UI provides formatted data and graphic screens to any connected Web browser. Authorized users simply log on to the NCE from the Web browser to access the user interface. This embedded user interface is ideal for smaller networks and remote locations where a dedicated computer platform to support a UI is not required.



Figure 4: Metasys Site Management Portal UI Screen

System Security

The NCE recognizes legitimate users through the entry of a user name and a password at the Web browser user interface. User access data are encrypted in the transmission and in the NCE database. The security administrator manages user profiles and accounts at a site or system level. The authorization levels range from configuring the complete system to only viewing one section of the system or site. The system administrator assigns a user name, password, and specific NCE data access privileges in each user account.

Monitoring and Control

The NCE is specifically designed to meet the needs of building owners and managers to efficiently monitor and control all the mechanical and electrical systems in a typical building, such as:

- HVAC units
- central equipment including chillers and boilers
- lighting and electrical distribution
- power generation and energy monitoring equipment
- interfaces to security and fire detection systems

The NCE monitors equipment by collecting data from the field control devices, then coordinating the required commands and sending them to the equipment at the required priority.

You can access information via a navigation tree that represents the logical grouping of network devices and point data names defined when configuring the system. You can also navigate using graphic images or create a customized tree with groups and names based on device location in the building or on system groups.

Global Search

This enhanced search feature allows you to search the Metasys system for multiple objects that meet specific criteria based on naming and object type. The global search provides you with the ability to manage lists of objects, which can be used by other features for commanding, trending, reporting, and object selection.

Global Command

This additional command feature allows you to send a single command to multiple objects and view a log of the command results.

Transaction Recording

All user actions performed through the NCE (including logon and logoff, commands to equipment, changes to parameters, and changes to the system configuration) are recorded in the NCE audit trail log.

Alarm and Event Processing

When a value exceeds a defined limit or changes to an off-normal state, the NCE sends alarm or event messages to online Web browsers, pagers, e-mail servers, and serial printers. The message routing depends on the source, time, and type of the event. The information is also stored immediately in a local log file on the NCE, later transmitted to a site log file on an ADS/ADX, and can be viewed at a later time from a Web browser to trace the history of alarms and events on the site.

The alarm and event information may include a predefined message to facilitate a fast response to the system problem. If you have the appropriate password authority and you acknowledge or clear an alarm, the site log file is updated.

You may also request a summary of all current alarms in the NCE or review a history of recent events.

Historical Trend Data

The NCE supports trending of any monitored value at user-defined periods ranging from 1 minute to 1 week. Alternatively, trending may be configured based on Change-of-Value (COV) sampling. Initially trend logs are stored in the NCE. Trend log information can be transferred to a historical database on the ADS/ADX at user-defined intervals or when the NCE files are nearly full.

Trend logs are useful for analyzing the performance of building control systems and locating the source of system problems. Historical trend data records are required in many industries, such as pharmaceutical and food processing plants, to document the ambient conditions during manufacturing.

Totalization Data

Analog and pulse totalization features in the NCE monitor the use of energy and other consumables. You can generate reports for cost allocation within a facility or to support energy and cost reduction programs.

Event and runtime totalization features, including the number of times specific events occur and how long equipment has been in operation, provide data for servicing and maintenance programs and for early identification of possible system problems.

Trend Studies

This enhanced trend feature allows you to view multiple trend extensions based on the selection of items from the results of a global search or from the navigation tree.

Scheduling

The scheduling feature allows you to define building occupancy periods and the start and stop times for mechanical or electrical equipment. Operating parameters, such as temperature setpoints and power consumption limits, can be set according to the time of day.

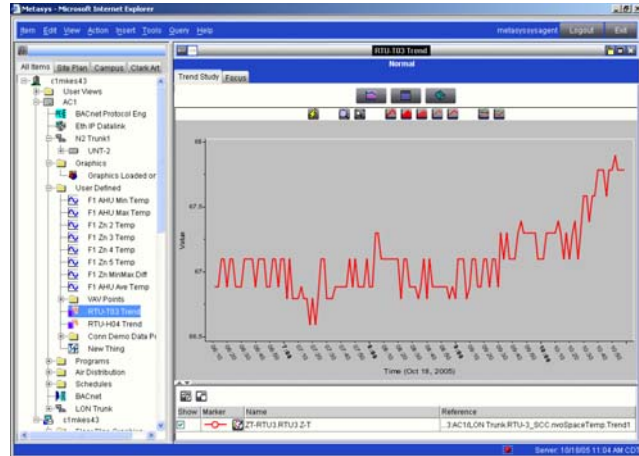


Figure 5: Trend Screen

You can schedule an event for 1 or more days of the week, for a holiday, or for particular calendar dates. Schedules can be defined in one NCE for the whole site or for just the equipment controlled by that NCE. Each NAE/NCE uses a graphical user interface to simplify setting up the schedules from a Web browser.

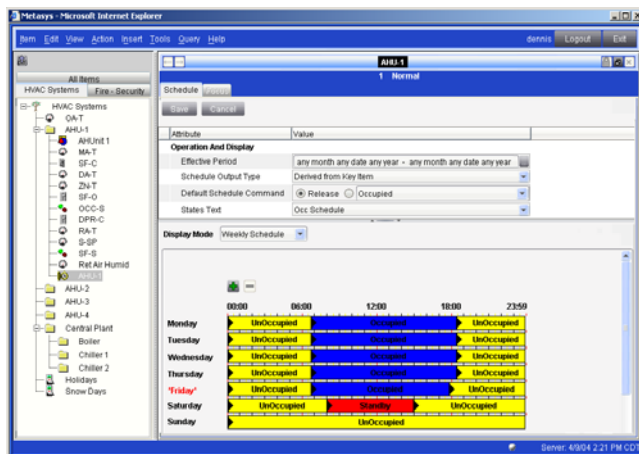


Figure 6: Schedule Screen

Network-Wide System Interlocking

Interlocking enables the NCE to take information from one or more field controllers, make logical comparisons, and issue a set of control instructions to other field controllers anywhere on the network. Interlocking also facilitates sharing analog or binary data between controllers. For example, interlocking allows all the field controllers on a site network to use the input from a single outside air temperature sensor, eliminating the need to wire outside air temperature sensors to each controller, saving hardware and installation costs.

Optimal Start

The Optimal Start feature automatically determines the correct time to start heating and cooling systems to ensure that the facility is ready for occupants at the scheduled time. It adjusts to seasonal variations and minimizes the energy shed.

Demand Limit and Load Rolling

Demand Limit and Load Rolling (DLLR) provides the ability to monitor energy meters for electricity, gas, steam, or water, and control energy consuming building loads to maintain energy use to user specified limits. Demand Limit is used to manage utility demand charges, based on either fixed interval or sliding window metering strategies. Load Rolling is used to turn off or lower the operating levels of selected equipment to reduce total facility energy consumption. Comfort overrides are used to help prioritize which pieces of equipment are eligible for shedding.

NCE Hardware Features

The NCE hardware platform features the following:

- multiple processors for supervisory and direct digital control
- nonvolatile solid-state Flash memory to store all programs and data

- standard Universal Serial Bus (USB) connection
- data protection battery to save data and power the real-time clock when primary power to the NCE is interrupted
- Light-Emitting Diodes (LEDs) to indicate power, communications, and device condition, to allow easy servicing
- removable, color-coded, screw terminal blocks for 24 VAC power, communications bus, and I/O point field wiring connections
- standard 9-pin sub-D connectors for RS-232-C serial port
- RJ-45 8-pin modular connector for Ethernet connection
- optional internal modem and RJ-12 6-pin telephone line connector (on specified models)
- integral display screen with navigation keypad (on specified models)

Ordering Information

Contact the nearest Johnson Controls representative to order an NCE or accessories. Specify the desired product code number using Table 2 and Table 3.

Table 2: NCE Model Ordering Information

Product Code Number ¹	Description
MS-NCE25xx-x (Base Features on Each NCE25)	Each NCE25 Series model requires a 24 VAC power supply and includes one RS-232-C serial port, one RS-485 optically isolated SA Bus port, one USB serial port, one Ethernet port, and an MS-BAT1020-0 Data Protection Battery. Each NCE25 Series model has 33 integral I/O points and supports up to 128 additional I/O points on the SA Bus.
MS-NCE2510-0	Supports one N2 Bus trunk with up to 32 N2 devices.
MS-NCE2511-0	Supports one N2 Bus trunk with up to 32 N2 devices. Includes internal modem.
MS-NCE2516-0	Supports one N2 Bus trunk with up to 32 N2 devices. Includes integral display screen.
MS-NCE2517-0	Supports one N2 Bus trunk with up to 32 N2 devices. Includes integral display screen and internal modem.
MS-NCE2520-0	Supports one LONWORKS network trunk with up to 32 LONWORKS devices.
MS-NCE2521-0	Supports one LONWORKS network trunk with up to 32 LONWORKS devices. Includes internal modem.
MS-NCE2526-0	Supports one LONWORKS network trunk with up to 32 LONWORKS devices. Includes integral display screen.
MS-NCE2527-0	Supports one LONWORKS network trunk with up to 32 LONWORKS devices. Includes integral display screen and internal modem.
MS-NCE2560-0	Supports one FC Bus trunk with up to 32 MS/TP devices.
MS-NCE2561-0	Supports one FC Bus trunk with up to 32 MS/TP devices. Includes internal modem.
MS-NCE2566-0	Supports one FC Bus trunk with up to 32 MS/TP devices. Includes integral display screen.
MS-NCE2567-0	Supports one FC Bus trunk with up to 32 MS/TP devices. Includes integral display screen and internal modem.

1. All models are also available in a Buy American version (add a G after the code number). For the European version, add an E after the code number. For repair parts, add -700 after the code number.

Table 3: NCE Accessories Ordering Information

Product Code Number	Description
MS-BAT1020-0	Replacement data protection battery for NAE35, NAE45, and NCE25. Rechargeable NiMH battery: 3.6 V 500 mAh, with a typical life of 10 years at 21°C (70°F)
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth® technology, for configuring and commissioning the NCE field controller and the devices on the NCE SA Bus
MS-DIS1710-0	Local Controller Display connects to NCE on SA Bus and provides menu display and navigation keypad for monitoring status and controlling parameters on the NCE's integral field controller. Note: A Local Controller Display does not operate on NCE models that have an integral controller display and navigation keypad.
AS-XFR100-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), with enclosure
AS-XFR010-1	Power transformer (Class 2, 24 VAC, 92 VA maximum output), no enclosure
MS-RAP-0	Ready Access Portal Server, which provides a user interface that is a natural, complementary extension of the Metasys Site Management Portal UI. Note: This option is not necessary for sites that have an ADS/ADX as the Site Director because it is provided with the ADS/ADX solution.
MS-EXPORT-0	Metasys Export Utility, which extracts historical trend, alarm, and audit data from the system and presents the historical data in a variety of formats. Note: This option is not necessary for sites that have an ADS/ADX as the Site Director because it is provided with the ADS/ADX solution.

Technical Specifications

NCE25 (Part 1 of 2)

Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), Safety Extra-Low Voltage (SELV) power supply (Europe), at 50/60 Hz (20 VAC minimum to 30 VAC maximum)
Power Consumption	25 VA maximum for NCE25 only Note: The 25 VA rating does not include any power supplied by the NCE to devices connected at the NCE Binary Outputs (BOs). BO devices connected to and powered by an NCE can require an additional 125 VA (maximum).
Ambient Operating Conditions	0 to 50°C (32 to 122°F), 10 to 90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40 to 70°C (-40 to 158°F), 5 to 95% RH, 30°C (86°F) maximum dew point
Data Protection Battery	Supports data protection on power failure. Rechargeable NiMH battery: 3.6 VDC 500 mAh, with a typical life of 5 to 7 years at 21°C (70°F); Product Code Number: MS-BAT1020-0
Processors	Supervisory Controller: 192 MHz Renesas™ SH4 7760 RISC processor Field Controller: 20 MHz Renesas H8S2398 processor
Memory	Supervisory Controller: 128 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup and 128 MB Synchronous Dynamic Random Access Memory (SDRAM) for operations data dynamic memory Field Controller: 1 MB Flash and 1 MB Random Access Memory (RAM)
Operating System	Microsoft® Windows® CE embedded

NCE25 (Part 2 of 2)

Network and Serial Interfaces (Depending on NCE model. See Table 2 for model information.)	<p>One Ethernet port; 10/100 Mbps; 8-pin RJ-45 connector</p> <p>One optically isolated RS-485 SA Bus port; with a pluggable and keyed 4-position terminal block (on all NCE25 models)</p> <p>One optically isolated RS-485 port; with a pluggable and keyed 4-position terminal block (only on NCE25 models that support an N2 Bus or MS/TP bus trunk)</p> <p>One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (only on NCE25 models that support a LONWORKS Network trunk)</p> <p>One RS-232-C serial port with standard 9-pin sub-D connector that supports standard baud rates</p> <p>One USB serial port with standard USB connector</p> <p>Option: One 6-pin RJ-12 jack for connecting to internal modem; up to 56 Kbps</p>
Analog Input/Analog Output Point Resolution	<p>Analog Input Points: 16-bit resolution</p> <p>Analog Output Points: 16-bit resolution and ± 200 mV accuracy on 0-10 VDC applications</p>
Dimensions (Height x Width x Depth)	<p>155 x 270 x 64 mm (6.1 x 10.6 x 2.5 in.)</p> <p>Minimum mounting space required: 250 x 370 x 110 mm (9.8 x 14.6 x 4.3 in.)</p>
Housing	<p>Plastic housing</p> <p>Plastic material: ABS and polycarbonate</p> <p>Protection: IP20 (IEC60529)</p>
Mounting	On flat surface with screws on three mounting clips or a single 35 mm DIN rail
Shipping Weight	1.2 kg (2.7 lb)
Compliance	<p>United States UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment FCC Compliant to CFR47, Part 15, Subpart B, Class A</p> <p>Canada UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003</p> <p>Europe CE Mark, EMC Directive 89/336/EEC, in accordance with EN 61000-6-3 (2001) Generic Emission Standard for Residential and Light Industry and EN 61000-6-2 (2001) Generic Immunity Standard for Heavy Industrial Environment</p> <p>Australia and New Zealand C-Tick Mark, Australia/NZ Emissions Compliant</p> <p>BACnet International BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC)</p>

The performance specifications are nominal and conform to acceptable industry standard. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

United States Federal Communication Commission (FCC) Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

Canadian Compliance Statement

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.



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