# Network Automation Engine

## Product Bulletin

MS-NAE35xx-x, MS-NAE45xx-x
MS-NAE55xx-x, NAE8500-0

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Network Automation Engines (NAEs) enable Internet Protocol (IP) connectivity and Web-based access to Metasys® Building Management Systems (BMSs).

NAEs leverage standard building management communication technologies, including BACnet® protocol, LONWORKS® network, and N2 Bus protocol to monitor and supervise a wide variety of Heating, Ventilating, and Air Conditioning (HVAC); lighting; security; fire; and access control equipment.

NAEs provide comprehensive equipment monitoring and control, scheduling, alarm and event management, energy management, data exchange, data trending, and data storage.

NAEs feature an embedded Site Management Portal user interface, support multiple concurrent Web browser sessions with password and permission access control, and provide the protection of industry standard Information Technology (IT) security.

NAE55 models support a comprehensive set of supervisory features and functions for large facilities and technically advanced buildings and complexes.


**NAE55 Network Automation Engine**

The NAE35/NAE45 models enable cost-effective NAE connectivity and control in smaller facilities, and can extend NAE supervisory functions in larger facilities.

The NAE85 is a high-capacity NAE that allows integration of large BACnet IP systems and can take the place of multiple NAEs.

**Table 1: Features and Benefits**

| Features | Benefits |
|---|---|
| **Communication Using Commonly Accepted IT Standards at the Automation and Enterprise Level** | Allows you to install a system on your 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 system data in the NAEs from any supported Web browser device connected to the network including remote users connected by dial-up telephone or an Internet Service Provider (ISP). |
| **Site Director Function** | Allows you to access all data on one site through one device. The device designated as the Site Director coordinates the display of data from multiple NAE devices for easy navigation through the entire site. |
| **Support for Web Services at the Automation Network Level** | Allows you to develop facility-specific advanced data interfaces and applications. |
| **User Interface and Online System Configuration Software Embedded in NAE** | Allows configuration, commissioning, data archiving, monitoring, commanding, and system diagnosis from any device with Web browser software and does not require separate workstation software. |
| **Supervision of Field Controller Networks Including BACnet MS/TP, N2 Bus, LONWORKS Network, and BACnet IP Devices** | Supports connectivity to open network standards for complete flexibility in the selection of field devices. Supported protocols include BACnet Master-Slave/Token-Passing (MS/TP), BACnet IP, LONWORKS, and N2. |
| **Multiple Connection Options for Data Access** | Allow connection of a Web browser via the Internet Protocol (IP) network using the Ethernet port or directly to an RS-232 serial port. For a dial-up connection, use the optional internal or external modem. |



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## NAE Networking

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

### *Web Browser Access*

You view building systems through the NAE with a supported Web browser on a desktop or laptop computer. The computer does not require any special workstation software, just a supported browser and a standard Java® plug-in. The Web browser accesses the NAE directly over the IP network, or via the Internet or public telephone service.

### *IP Ethernet Network*

NAEs connect directly to IP Ethernet networks running at 10 or 100 Mbps. NAE85s can also connect to 1 Gbps networks. Multiple NAEs communicate with each other over the network, and one NAE can act as the Site Director.

Authorized users log on to the Site Director via a supported browser to access the entire Metasys system for the site. Data transmission on the 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.

### *Remote NAE*

The NAE can be accessed remotely over standard WAN infrastructures, over the Internet using an ISP line, or over the public telephone network using a modem and Point-to-Point Protocol (PPP). Specified NAE models offer an optional internal modem; most models support 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, audit trails, and graphics.

An ADS/ADX can also be configured as the Site Director to allow more concurrent users and coordinate access to all components on a site via a Web browser connected over the network, Internet, or telephone line via dial-up communication. Refer to the *Application and Data Server Product Bulletin (LIT-1201525)* for more information about ADSs and ADXs.

## Field Networks and Protocols

The NAE communicates data from one field network to another and from the field network level to the enterprise and automation network level; enabling your system to operate as one virtual control network.

### *Automation Level Communication*

NAEs communicate internal system data using peer-to-peer messaging over the IP Ethernet network. Each NAE shares data and has access to information on the other NAEs connected on the network, which enables coordination and control of the entire building management system.

### *BACnet Protocol*

The automation level communication also supports the BACnet protocol and facilitates the network integration of other systems and devices that use BACnet. The Johnson Controls® N30 Supervisory Controller can also be integrated into the NAE network at the automation level using BACnet services.

The NAE supports the BACnet services and objects typically used by a workstation and a field controller device, including BACnet alarm and event services.

Refer to the *NAE/NCE Protocol Implementation Conformance Statement Technical Bulletin (LIT-1201532)* for detailed information on BACnet conformance and the supported BACnet Interoperability Building Blocks.

### *MS/TP Field Controller (FC) Bus*

The BACnet MS/TP FC Bus is a standard peer-to-peer, multiple-master protocol in which each master device takes turns originating messages to pass to any device on the bus.

NAEs can communicate via the MS/TP FC Bus with the Metasys Field Equipment Controller family of controllers, including FEC16 and FEC26 field equipment controllers; VMA16 variable-air-volume controllers; and IOM17, IOM27, IOM37, and IOM47 input/output control modules.

NAEs can also communicate over the FC Bus with TEC26xx Series thermostat controllers and third-party MS/TP devices that comply with the BACnet standard protocol based on American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ANSI/ASHRAE) Standard 135-2004.

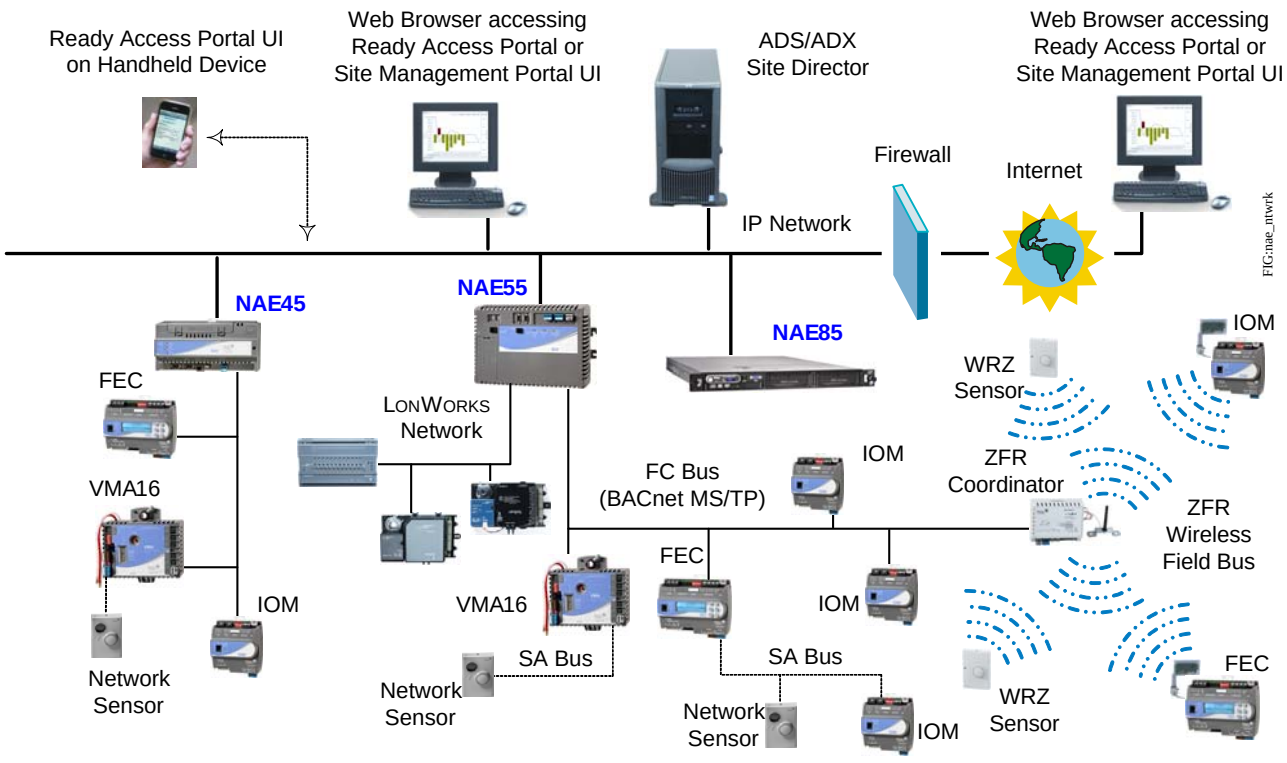


**Figure 1: Metasys Network with Multiple NAEs**

### *N2 Bus*

The N2 Bus is an open Johnson Controls field communications trunk that links Application Specific Controllers (ASCs) and programmable controllers to a supervisory controller. ASCs include the Air Handling Unit (AHU) controller, Unitary (UNT) controller, VAV controllers, and VAV Modular Assembly devices. Programmable controllers include the DX9100.

The N2 Bus supports Metasys system compatible devices from other manufacturers and the Metasys Integrator® system.

Specified NAE55 models can route communication over an IP network from an ASC or N2-compatible device to the NAE, providing greater flexibility in product applications. These models enable you to connect remote N2 devices and the NAE using N2 Tunneling over Ethernet applications. For more information, refer to the *SECVT Technical Bulletin (LIT-1201790)*.

### *LONWORKS Bus*

Specified NAE models can supervise LONWORKS devices, if the network interface follows current LONMARK® guidelines, and uses the Free Topology Transceiver (FTT)10. The LONWORKS network interface in specified NAE models supports all current LONMARK certified devices including Johnson Controls devices, such as the LN Series Controllers, the NexSys® controller line, and the LONWORKS enabled programmable Flexible System Controller (FSC).

## Software for Efficient Building Operation

NAEs ship with the latest version of the Metasys system software, which provides the following features:

- **Metasys Site Management Portal User Interface** provides data and graphic screens to supported Web browsers. Authorized users simply log on to the NAE from the Web browser to access the Site Management Portal. This embedded user interface is ideal for smaller networks and remote locations where a dedicated computer platform to support a user interface is not required.

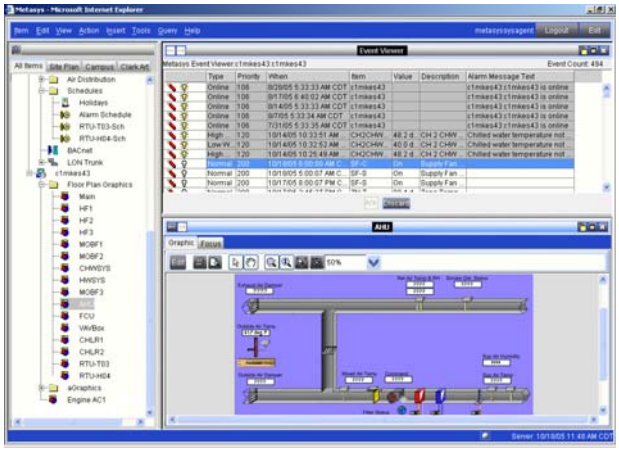

**Figure 2: Metasys Site Management Portal Screen**

- **System Security** enables an NAE to recognize legitimate users with valid user IDs and passwords at the Site Management Portal user interface. User access data is encrypted in the transmission and in the NAE database. The system administrator manages user profiles, authorization levels, user ID, password, and specific NAE data access privileges in each user account.
- **Basic Access** allows access to a subset of the standard Site Management Portal capabilities based on their assigned permissions.
- **Monitoring and Control** all the mechanical and electrical systems in a typical building by collecting data from the field devices and then coordinating and sending the required commands to the controlled equipment at the required priority.
- **Global Search** allows you to search the Metasys system and manage lists of objects, which can be used by other features for commanding, trending, reporting, and object selection.
- **Global Command** allows you to send a single command to multiple objects, and view a log of the command results.
- **Transaction Recording** audits and logs all user actions performed through the NAE.
- **Alarm and Event Processing** enables NAEs to send alarm and event messages to Web browsers, pagers, e-mail servers, Network Management Systems, and serial printers, as well as store and view alarm and event logs on the NAE and transfer it to an ADS/ADX
- **Historical Trend Data** can be collected by NAEs for any monitored value at user-defined intervals, or trending can be based on Change-of-Value. You can use trend logs to analyze building system performance and locate system problems. NAE trend logs can be transferred to the ADS/ADX at defined intervals or when the NAE logs are full.
- **Totalization Data** allows you to monitor energy (and other consumables) use and generate cost reports to support utility cost reductions, and also provides data for service, maintenance, and early identification of building system problems.
- **Trend Studies** allows you to view multiple trend extensions in a single view to facilitate monitoring and troubleshooting your Metasys site.
- **Scheduling** allows you to define occupancy periods and start and stop times for mechanical or electrical equipment. Operating parameters can be set according to time of day, day/days of the week, holiday, or for calendar dates.
- **Network-Wide System Interlocking** enables NAEs to collect field controller data, make logical comparisons, and issue relevant commands to other field controllers anywhere on the network.
- **Optimal Start** automatically determines the best time to start heating and cooling systems to ensure that the facility is ready for occupants. It adjusts to seasonal variations and reduces energy use.
- **Demand Limit and Load Rolling** (DLLR) monitors energy meters for electricity, gas, steam, or water, and automatically sheds equipment loads according to user-defined levels. Demand Limit helps manage utility demand charges. Load Rolling controls equipment operating levels to reduce total energy consumption. Comfort overrides prioritize equipment shedding.

- **Database Configuration Management** allows you to define the Metasys system configuration and database offline for download to the NAE. All the required database configuration software resides on the NAE or SCT. You do not need a copy of the database on your local client computer to make authorized changes.

### *Metasys for Validated Environments*

Metasys for Validated Environments (MVE), extended architecture is designed for Johnson Controls customers who manage facilities that require compliance to Food and Drug Administration (FDA) Title 21, Code of Federal Regulations (Part 11) and other electronic information management requirements. MVE provides:

- precise digital control of the facility environment
- electronic records and signatures
- time-stamped audit and events trail
- secure user access
- Web-based advanced reporting
- scalable configuration
- intuitive Web browser interface

The MVE feature is available on NAE55 models only.

## Hardware Features

### *NAE35, NAE45, and NAE55*


**Figure 3: NAE45 Network Automation Engine**

Depending on the model, an NAE35, NAE45 (Figure 3), and NAE55 (Figure ) provide the following features for the building controls market:

- industrial Single Board Computer (SBC)
- nonvolatile solid-state Flash memory to store all programs and data
- standard Universal Serial Bus (USB) connections
- battery backup to save data from Dynamic Random Access Memory (DRAM) into Flash memory when power to the NAE is interrupted
- real-time clock with battery backup
- Light-Emitting Diodes (LEDs) to indicate power, communications, and fault, to allow easy servicing
- optional internal modem
- removable screw terminals for 24 VAC power and field network bus connections
- standard 9-pin sub-D connectors for RS-232-C serial ports
- RJ-11 telephone line connector for internal modem
- RJ-45 connector for Ethernet connection

### *NAE85*

**Figure 4: NAE85 Network Automation Engine**

The NAE85 (Figure 4) has most of the same functions and capabilities as the NAE35, NAE45, and NAE55; features a scalable design; and is used to integrate large numbers of BACnet I/P devices into your Metasys network. The NAE85 is available in a 1U rack-mount chassis configuration.

The NAE85 does **not** support:

- BACnet MS/TP field controllers
- N2 networks
- LONWORKS networks
- dial-out to an ADS/ADX
- device Reset command in the Metasys Site Management Portal UI
- upgrade using the NAE/NIE Update Tool

## NAE Series Comparison

Table 2 contains a brief comparison of the features of the different NAE Series engines. (Not all features are available on every model in a series.)

**Table 2: Comparison of Features for NAE Models**

| Features | NAE85 | NAE55 | NAE45 | NAE35 |
|---|---|---|---|---|
| **Number of N2 or BACnet MS/TP Trunks** | None | 2 | 1 | 1 |
| **Maximum Number of N2 or MS/TP Devices per Trunk** | None | 100 | 100 | 50 |
| **Maximum Number of Objects** | 25,000[1] | 5,000 | 2,500 | 2,500 |
| **Model with Internal Modem** | No | Available | Available | Available |
| **RS-232-C Serial Ports** | None | 2 | 1 or 2 | 1 or 2 |
| **USB Serial Ports** | 2 | 2 | 1 | 1 |
| **RS-485 Ports** | None | 2 | Available | Available |
| **Ethernet Ports** | 2 | 1 | 1 | 1 |
| **LONWORKS Network Support (Number of Devices)** | No | Available (255) | Available (127) | Available (64) |
| **Smoke Control Applications (UUKL Listed)** | No | Available | Available | Available |
| **N2 Tunneling Over Ethernet Applications** | No | Available | No | No |

1. Standard is 10,000 objects; 15,000 object upgrade available

## Conclusion

The NAE affirms Johnson Controls position as a leader in the BMS industry and as an innovator of solutions for the complete management of buildings. The integration of Information Technology and Internet standards into the NAE platform, as well as the use of open protocols for field networks, bring the benefits of the global communications and control industries into one system. Web browser-based access from any location is a key to the effective use of the automation network.

The Metasys system continues to be the integrating network within buildings and has now been extended to bridge the gap between traditional control systems and the business and communication network systems of the enterprise.

The Metasys Network Automation Engine and Metasys Web-enabled network are wise investments that yield returns to the building owner and operator far into the future.

## Ordering Information

Contact the nearest Johnson Controls representative to order an NAE. Specify the desired product code from Table 3 for the NAE35, Table 4 for the NAE45, Table 5 for the NAE55, Table 6 for the NAE85, and Table 7 for accessories.

**Table 3: NAE35 Ordering Information (Part 1 of 2)**

| Product Code Number[1] | Description |
|---|---|
| **MS-NAE35xx-xxx (Base Features of Each NAE35)** | NAE35 Network Automation Engines: Requires a 24 VAC power supply. Each model includes one RS-232-C serial port, one USB serial port, one Ethernet port, and an MS-BAT1020-0 Data Protection Battery. |
| **MS-NAE3510-2** | Supports one N2 or BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports up to 50 devices on the N2 or BACnet MS/TP trunk. |
| **MS-NAE3510-2U** | Supports one N2 or BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports up to 50 devices on the N2 or BACnet MS/TP trunk.<br>**Note:** This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment. |
| **MS-NAE3511-2** | Supports one N2 or BACnet MS/TP (RS-485) trunk (RS-485 port); includes an internal modem; supports up to 50 devices on the N2 or BACnet MS/TP trunk. |
| **MS-NAE3514-2** | Supports one N2 or BACnet MS/TP (RS-485) trunk; features Basic Access support; includes an additional RS-232-C serial port for optional external modem; supports up to 50 devices on the N2 or BACnet MS/TP trunk. |
| **MS-NAE3515-2** | Supports one N2 or BACnet MS/TP (RS-485) trunk; features Basic Access support; includes an internal modem; supports up to 50 devices on the N2 or BACnet MS/TP trunk. |

**Table 3: NAE35 Ordering Information (Part 2 of 2)**

| Product Code Number[1] | Description |
|---|---|
| **MS-NAE3520-2** | Supports one LONWORKS trunk, includes an additional RS-232-C serial port for optional external modem. Supports up to 64 devices on the LONWORKS port. |
| **MS-NAE3520-2U** | Supports one LONWORKS trunk, includes an additional RS-232-C serial port for optional external modem. Supports up to 64 devices on the LONWORKS port.<br>**Note:** This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment. |
| **MS-NAE3521-2** | Supports one LONWORKS trunk, includes an internal modem. Supports up to 64 devices on the LONWORKS port. |
| **MS-NAE3524-2** | Supports one LONWORKS trunk, features Basic Access support, and includes an additional RS-232-C serial port for optional external modem. Supports up to 64 devices on the LONWORKS trunks. |
| **MS-NAE3525-2** | Supports one LONWORKS trunk, features Basic Access support, and includes an internal modem. Supports up to 64 devices on the LONWORKS trunks. |

1. Some models are also available in a Buy American version (add a G after the code number). For repair parts, add -702 after the code number.

**Table 4: NAE45 Ordering Information**

| Product Code Number[1] | Description |
|---|---|
| **MS-NAE45xx-xxx (Base Features of Each NAE45)** | NAE45 Network Automation Engines: Requires a 24 VAC power supply. Each model includes one RS-232-C serial port, one USB serial port, one Ethernet port, and an MS-BAT1020-0 Data Protection Battery. |
| **MS-NAE4510-2** | Supports one N2 or BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports up to 100 devices on the N2 or BACnet MS/TP trunk. |
| **MS-NAE4510-2U** | Supports one N2 or BACnet MS/TP (RS-485) trunk; includes an additional RS-232-C serial port for optional external modem; supports up to 100 devices on the N2 or BACnet MS/TP trunk.<br>**Note:** This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment. |
| **MS-NAE4511-2** | Supports one N2 or BACnet MS/TP (RS-485) trunk; includes an internal modem; supports up to 100 devices on the N2 or BACnet MS/TP trunk. |
| **MS-NAE4520-2** | Supports one LONWORKS trunk, includes an additional RS-232-C serial port for optional external modem; supports up to 127 devices on the LONWORKS port. |
| **MS-NAE4520-2U** | Supports one LONWORKS trunk, includes an additional RS-232-C serial port for optional external modem; supports up to 127 devices on the LONWORKS port.<br>**Note:** This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment. |
| **MS-NAE4521-2** | Supports one LONWORKS trunk, includes an internal modem; supports up to 127 devices on the LONWORKS port. |

1. Some models are also available in a Buy American version (add a G after the code number). For repair parts, add -702 after the code number.

**Table 5: NAE55 Ordering Information (Part 1 of 2)**

| Product Code Number[1] | Description |
|---|---|
| **MS-NAE55xx-x (Base Features of Each NAE55)** | NAE55 Network Automation Engines: Requires a 24 VAC power supply. Each model includes two RS-232-C serial ports, two USB serial ports, two RS-485 ports, one Ethernet port, and one MS-BAT1010-0 Data Protection Battery. Supports up to 100 devices on each N2 or BACnet MS/TP trunk. |
| **MS-NAE5510-1** | Supports two N2 or two BACnet MS/TP (RS-485) trunks (or one N2 trunk and one BACnet MS/TP trunk). |
| **MS-NAE5510-1U** | Supports two N2 or two BACnet MS/TP (RS-485) trunks (or one N2 trunk and one BACnet MS/TP trunk).<br>**Note:** This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment. |

**Table 5: NAE55 Ordering Information (Part 2 of 2)**

| Product Code Number[1] | Description |
|---|---|
| **MS-NAE5511-1** | Supports two N2 or two BACnet MS/TP (RS-485) trunks (or one N2 trunk and one BACnet MS/TP trunk); includes an internal modem. |
| **MS-NAE5512-1** | Supports two N2 or two BACnet MS/TP (RS-485) trunks (or one N2 trunk and one BACnet MS/TP trunk).<br>**Note:** MS-NAE5512-1 models support N2 tunneling on N2 trunks (only). |
| **MS-NAE5513-1** | Supports two N2 or two BACnet MS/TP (RS-485) trunks (or one N2 trunk and one BACnet MS/TP trunk); includes an internal modem.<br>**Note:** MS-NAE5513-1 models support N2 tunneling on N2 trunks (only). |
| **MS-NAE5520-1** | Supports a LONWORKS trunk, and two N2 trunks or two BACnet MS/TP (RS-485) trunks (or one N2 trunk and one BACnet MS/TP trunk). Supports up to 255 devices on the LONWORKS trunk. |
| **MS-NAE5520-1U** | Supports a LONWORKS trunk, and two N2 trunks or two BACnet MS/TP (RS-485) trunks (or one N2 trunk and one BACnet MS/TP trunk). Supports up to 255 devices on the LONWORKS trunk.<br>**Note:** This model is UL Listed, File S4977, UUKL 864 - 9th Edition Smoke Control Equipment. |
| **MS-NAE5521-1** | Supports a LONWORKS trunk, and two N2 trunks or two BACnet MS/TP (RS-485) trunks (or one N2 trunk and one BACnet MS/TP trunk); includes an internal modem. Supports up to 255 devices on the LONWORKS trunk. |

1. Some models are also available in a Buy American version (add a G after the code number). For the European versions of the NAE55, add an E after the code number. For repair parts, add -701 after the code number.

**Table 6: NAE85 Ordering Information**

| Product Code Number | Description |
|---|---|
| **MS-NIE8500-0**[1] | NxE85 model with 1U chassis for mounting in a server rack<br>**Note:** The NAE85 models ship as MS-NIE8500-0 models. Use the ChangeModel utility in the NxE85 Metasys software to change an NIE85 to an NAE85. |
| **MS-NxE85SW-0** | NxE85 software for 10,000 objects (new projects only software) |

1. Standard NxE85 models supports 10,000 objects; an upgrade is available to support an additional 15,000 objects.

**Table 7: NAE Accessories Ordering Information (Part 1 of 2)**

| Product Code Number | Description |
|---|---|
| **MS-BAT1010-0** | Replacement data protection battery for NAE55 and NIE55. Rechargeable gel cell battery: 12 V, 1.2 Ah, with a typical life of 3 to 5 years at 21°C (70°F) |
| **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-15KUPG-0** | 15,000 object upgrade for NxE85 |
| **MS-MULTENGSW-6** | Contains ToggleTunnel utility for converting an NAE55/NIE55 to an NAE55 model with the N2 Tunneling features enabled. Not for use with MS-NAE5510-OU or MS-NIE5510-OU. |
| **MS-RAP-0** | Ready Access Portal Server provides a user interface that is a natural, complementary extension of the Metasys Site Management Portal user interface.<br>**Note:** This option is not necessary for sites that have an ADS/ADX that is the Site Director because Ready Access Portal Server is provided with the ADS/ADX solution. |
| **MS-EXPORT-0** | Export Utility extracts historical trend, alarm, and audit data from the system and presents the historical data in a variety of formats.<br>**Note:** This option is not necessary for sites that have an ADS/ADX that is the Site Director because Export Utility is provided with the ADS/ADX solution. |
| **AS-XFR100-1** | Power transformer (Class 2, 24 VAC, 92 VA maximum output), with enclosure |

**Table 7: NAE Accessories Ordering Information (Part 2 of 2)**

| Product Code Number | Description |
|---|---|
| **AS-XFR010-1** | Power transformer (Class 2, 24 VAC, 92 VA maximum output), no enclosure |
| **SC450RM1U (OEM Part No.)** | Recommended Uninterruptable Power Supply (UPS) for NxE85 model: American Power Conversion (APC®) Smart-UPS SC 450VA, 280 W 120 VAC input/output with NEMA 5-15R output connections |

## Technical Specifications

### *NAE35 and NAE45 (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 |
| **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 |
| **Processor** | 192 MHz Renesas™ SH4 7760 RISC processor |
| **Memory** | 128 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup<br>128 MB Synchronous Dynamic Random Access Memory (DRAM) for operations data dynamic memory |
| **Operating System** | Microsoft® Windows® CE embedded |
| **Network and Serial Interfaces** | One Ethernet port; 10/100 Mbps; 8-pin RJ-45 connector<br>One optically isolated RS-485 port; 9600, 19.2k, 38.4k, or 76.8k baud (depending on protocol); with a pluggable and keyed 4-position terminal block (FC Bus available on NAE351x and NAE451x models only)<br>One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (LONWORKS port available on NAE352x-x and NAE452x models only)<br>One RS-232-C serial port with standard 9-pin sub-D connector that supports standard baud rates.<br>A second serial port, on models without an internal modem, that supports an optional, user-supplied external modem.<br>One USB serial port with standard USB connector that supports an optional, user-supplied external modem.<br>Option: One telephone port for internal modem; up to 56 Kbps; 6-pin RJ-11 connector (NAE models with an optional internal modem have one RS-232-C serial port only.) |
| **Housing** | Plastic housing material: ABS + polycarbonate UL94-5VB<br>Protection: IP20 (IEC 60529) |
| **Mounting** | On flat surface with screws on three mounting clips or a single 35 mm DIN rail |
| **Dimensions (Height x Width x Depth)** | 131 x 270 x 62 mm (5.2 x 10.6 x 2.5 in.)<br>Minimum space for mounting NAE35 and NAE45: 210 x 350 x 110 mm (8.3 x 13.8 x 4.3 in.) |
| **Shipping Weight** | 1.2 kg (2.7 lb.) |

### *NAE35 and NAE45 (Part 2 of 2)*

| | |
|---|---|
| **Compliance** | **United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment,<br>UL Listed, FIle S4977, UUKL 864 - 9th Edition, Smoke Control Equipment<br>(MS-NAE35x0-2U and MS-NAE45x0-2U models only)<br>FCC Compliant to CFR47, Part 15, Subpart B, Class A |
| | **Canada:** UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003 |
| | **Europe:** CE Mark, EMC Directive 2004/108/EC, in accordance with<br>EN 61000-6-3 Generic Emission Standard for Residential and Light Industry and<br>EN 61000-6-2 Generic Immunity Standard for Heavy Industrial Environment |
| | **Australia and New Zealand:** C-Tick Mark, Australia/NZ Emissions Compliant |
| | **BACnet International:** BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC) |

### *NAE55 (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** | 50 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 gel cell battery: 12 V, 1.2 Ah, with a typical life of 3 to 5 years at 21°C (70°F); Product Code Number: MS-BAT1010-0 |
| **Clock Battery** | Maintains real-time clock through a power failure. Onboard cell; typical life 10 years at 21°C (70°F) |
| **Processor** | 400 MHz Pentium® class Geode® GX533 processor for MS-NAE55xx-1 models |
| **Memory** | 512 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup for MS-NAE55xx-1 models.<br>256 MB Synchronous Dynamic Random Access Memory (DRAM) for operations data<br>dynamic memory for all models |
| **Operating System** | Microsoft Windows XP® embedded |
| **Network and Serial Interfaces** | One Ethernet port; 10/100 Mb; 8-pin RJ-45 connector<br>Two optically isolated RS-485 ports; 9600, 19.2k, 38.4k, or 76.8k baud; pluggable and keyed 4 position terminal blocks<br>Two RS-232-C serial ports, with standard 9-pin sub-D connectors, that support all standard baud rates<br>Two USB serial ports, standard USB connectors support an optional, user-supplied external modem<br>Options: One telephone port for internal modem; up to 56 Kbps; 6-pin RJ-11 connector<br>One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (LONWORKS port available on NAE552x-xxx models only) |
| **Housing** | Plastic housing with internal metal shield Plastic material: ABS + polycarbonate UL94-5VB<br>Protection: IP20 (IEC 60529) |
| **Mounting** | On flat surface with screws on four mounting feet or on dual DIN rail |
| **Dimensions (Height x Width x Depth)** | 226 x 332 x 96.5 mm (8.9 x 13.1 x 3.8 in.) including mounting feet<br>Minimum space for mounting: 303 x 408 x 148 mm (12.0 x 16.1 x 5.8 in.) |
| **Shipping Weight** | 2.9 kg (6.4 lb) |

### *NAE55 (Part 2 of 2)*

| | |
|---|---|
| **Compliance** | **United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment<br>UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment (MS-NAE55x0-1U models only)<br>FCC Compliant to CFR47, Part 15, Subpart B, Class A |
| | **Canada:** UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment, Industry Canada Compliant, ICES-003 |
| | **Europe:** CE Mark, EMC Directive 2004/108/EC, in accordance with EN 61000-6-3 Generic Emission Standard for Residential and Light Industry and EN 61000-6-2 Generic Immunity Standard for Heavy Industrial Environment |
| | **Australia and New Zealand:** C-Tick Mark, Australia/NZ Emissions Compliant |
| | **BACnet International:** BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC) |

### *NAE85*

| | |
|---|---|
| **Computer Type** | Dell® PowerEdge® R410 |
| **Power Requirement** | 100–240 VAC 50/60 Hz |
| **Power Supply** | 480 W |
| **Ambient Operating Conditions** | 10 to 35°C (50 to 95°F); 20 to 80% RH, noncondensing (twmax=29C) |
| **Ambient Storage Conditions** | -40 to 65°C (-40 to 149°F); 5 to 95% RH, noncondensing (twmax=38C) |
| **Data Protection** | Recommended Uninterruptable Power Supply (UPS): American Power Conversion (APC®) Smart-UPS SC 450 VA, 280 W, 120 VAC input/output, NEMA 5-15R output connections, OEM Part No. SC450RM1U |
| **Processor** | Intel® Xeon® L5520, 2.26 GHz, 8 MB Cache, 5.86 GT/s QPI, Turbo, HT |
| **Memory** | 2 GB DDR2, 1066 MHz, 2x1 GB, Single Ranked UDIMMs for 1 Processor |
| **Hard Disk** | 2x500 GB 7.2K RPM Serial Advanced Technology Attachment (SATA), 8.9 cm (3.5 in.) Cabled<br>3 Gbps, RAID 1 configuration with add-in SAS6/iR (SATA/SAS Controller) |
| **Internal Optical Drive** | DVD ROM, SATA |
| **Operating System** | Microsoft Windows Web Server 2008 OS with SP2, 32-bit x 86 Version |
| **Network and Serial Interfaces** | 2 RJ45 1 Gbps Ethernet Ports, Port 2 is disabled.<br>2 video ports; 1 front, 1 back<br>1 9-pin Serial port<br>4 USB ports (2 on front, 2 on back) |
| **Dimensions (Height x Width x Depth)** | 4.3 x 43.4 x 62.7 cm (1.7 x 17.1 x 24.7 in.) |
| **Mounting** | Mount in an EIA-310D compatible server cabinet |
| **Shipping Weight** | 15.9 kg (35 lb) |
| **Compliance** | Europe: CE Mark<br>**NAE only** BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Building Controller (B-BC) |

### *Computer Requirements for NxE85 Installation/Upgrade*

| | | |
|---|---|---|
| **Product Code** | MS-NxE85SW-0 | NxE85 software for 10,000 objects (new projects only software) |
| **Recommended Computer Platform** | Intel® Xeon® L5520, 2.26 GHz, 8 MB Cache, 5.86 GT/s QPI, Turbo, HT<br>2x500 GB 7.2K RPM Serial Advanced Technology Attachment (SATA), 8.9 cm (3.5 in.) Cabled<br>3 Gbps, RAID 1 configuration with add-in SAS6/iR (SATA/SAS Controller)<br>DVD ROM, SATA | |
| **Memory** | 1 GB RAM minimum | |

### *Computer Requirements for NxE85 Installation/Upgrade*

| | |
|---|---|
| **Hard Disk** | 160 GB minimum |
| **Operating System** | Microsoft® Windows® 2003 OS[1] with SP2 Web Edition<br>Microsoft Windows Web Server 2008 OS[2] with SP2 |
| **Communication** | Network Interface<br>Single 1 Gbps Ethernet network interface card 10/100/1000 Mbps (100 Mbps or better recommended) |
| **Data Protection** | Recommended Uninterruptible Power Supply (UPS): American Power Conversion (APC®) Smart-UPS SC 450VA,<br>280 W, 120 VAC input/output, NEMA 5-15R output connections, OEM Part No. SC450RM1U |
| **Software** | **Microsoft Windows 2003 OS with SP2 Web Edition**<br>IIS Version 6.0<br>Microsoft .NET Framework Version 3.5 with SP1 |
| | **Microsoft Windows Web Server OS 2008**<br>IIS Version 7.0<br>Microsoft .NET Framework Version 3.5 with SP1 |

1. We support the 32-bit x86 version. We do not support the x64 version
2. We support the 32-bit x86 version without Hyper-V. We do not support the x64 version.

*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 Emissions Compliance***

*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 Emissions Compliance***

*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.*

**Building Efficiency**
507 E. Michigan Street, Milwaukee, WI 53202





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