NAE35/NAE45

Installation Instructions

MS-NAE35xx-x MS-NAE45xx-x Part No. 24-10050-6, Rev. K Release 5.0 Issued January 4, 2010 Supersedes October 6, 2008

Application

The Network Automation Engine (NAE) is a Web-enabled, Ethernet-based, supervisory device that monitors and controls networks of field-level building automation devices, Heating, Ventilating, and Air Conditioning (HVAC) equipment, and lighting.

This document describes how to install NAE35 and NAE45 models, which are referred to collectively as NAE35/45 unless otherwise specified.

IMPORTANT: In Metasys® system smoke control applications, use only the NAE35/NAE45 models that are UL Listed, UUKL 864 Listed, Smoke Control Equipment. See Repair Information on page 10 for UUKL 864 Listed NAE35/NAE45 models. For Metasys system smoke control applications, you must refer to the Metasys System UL 864 UUKL Ninth Edition Smoke Control System Technical Bulletin (LIT-12011252) for detailed requirements and procedures for installing and operating UUKL 864 Listed Metasys system devices. Failure to meet the requirements or follow the procedures in the Metasys System UL 864 UUKL Ninth Edition Smoke Control System Technical Bulletin (LIT-12011252) can void the UUKL 864 listing for Smoke Control Equipment.

North American Emissions Compliance

United States

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.

Canada

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.

Installation

Follow these guidelines when installing the NAE35/45:

- Transport the NAE35/45 in the original container to minimize vibration and shock damage to the NAE.
- Verify that all the parts shipped with the NAE35/45.
- Do not drop the NAE35/45 or subject it to physical shock.
- Do not open the NAE35/45 housing (except the data protection battery compartment). The NAE35/45 has no user-serviceable parts inside.

Parts Included

- one NAE35/45 with removable terminal plugs
- one data protection battery (installed and connected when the NAE35/45 is shipped)
- one Installation Instructions sheet

Materials and Special Tools Needed

- three fasteners appropriate for the mounting surface (M4 screws [#8 screws])
- one 20 cm (8 in.) or longer piece of DIN rail and appropriate hardware for mounting the DIN rail

Mounting

Location Considerations

Follow these guidelines when mounting an NAE35/45:

- Ensure that the mounting surface can support the NAE35/45 and any user-supplied enclosure.
- Mount the NAE35/45 in proper orientation (Figure 1).







- Mount the NAE35/45 on an even surface in wall mount applications whenever possible. If you must mount the NAE35/45 on an uneven surface, be careful not to crack the mounting clips or NAE35/45 housing when tightening the screws. Use shims or washers to mount the NAE35/45 evenly on the mounting surface.
- Mount the NAE35/45 in areas free of corrosive vapors, and observe the environmental limitations listed in the <u>Technical Specifications</u> section.
- Allow sufficient space for cable and wire connections and access to the data protection battery and End-of-Line (EOL) switch (Figure 1).
- Do not mount the NAE35/45 where the ambient temperature may exceed 50°C (122°F).
- Do not mount the NAE35/45 on surfaces prone to vibration or in areas where electromagnetic emissions can interfere with NAE35/45 communication.
- Do not obstruct the NAE35/45 housing ventilation holes.
- Do not mount power transformers below the NAE35/45.

On applications where the NAE35/45 is mounted inside a panel or enclosure, follow these additional guidelines.

- Do not install the NAE35/45 in airtight enclosures.
- Do not install heat-generating devices in the enclosure with the NAE35/45 that may cause the ambient temperature to exceed 50°C (122°F).

Mounting the NAE35/45

Wall Mount Applications

Use the holes in the three mounting clips for wall mount applications.

To mount the NAE35/45 on a vertical surface:

- 1. Ensure that all three mounting clips are inserted into the back of the NAE35/45 housing, pulled outward, and snapped firmly into the extended position (Figure 3).
- 2. Mark the location of the three wall mount holes using the dimensions in Figure 2, or hold the NAE35/45 up to the wall as a template and mark the locations.
- 3. Drill holes in the wall at the locations marked in Figure 2 and insert wall anchors (if necessary).



Figure 2: NAE Mounting Screw Hole Dimensions and Mounting Area Requirements (mm/in.)

4. Position the NAE35/45, insert the screws through the holes in the mounting clips, and carefully tighten the screws.

IMPORTANT: Do not overtighten the mounting screws. Overtightening the screws may damage the mounting clips or NAE35/45 housing.

DIN Rail Mount Applications

To mount the NAE35/45 on a DIN rail:

- 1. Securely mount a 20 cm (8 in.) or longer section of DIN rail horizontally and centered in the space.
- 2. Ensure that the bottom two mounting clips are pulled outward and snapped firmly into the extended position (Figure 3).



Figure 3: DIN Rail and Mounting Clip Features on the Back of an NAE35/45

- 3. Hang the NAE35/45 by the DIN rail hooks (Figure 3) on the top track of the DIN rail, and position the NAE35/45 DIN rail channel snugly against the tracks of the DIN rail.
- 4. Push the bottom mounting clips up to secure the NAE35/45 on the DIN rail tracks.

To remove the NAE35/45 from the DIN rail, snap the bottom DIN clips to the outward extended position, and carefully lift the NAE35/45 off the DIN rail.

Enclosure Mount Applications

Mount the enclosure per the manufacturer's instructions and mount the NAE35/45 in the enclosure following the guidelines in the *Location Considerations* and *Mounting the NAE35/45* sections.

Wiring

Power Supply, Network, and Bus Connections

See Figure 1 for the location of NAE35/45 ports, modular jacks, and terminal blocks.

Power Supply

In North America, the NAE35/45 requires a dedicated Class 2, 24 VAC, 25 VA minimum power supply. Outside North America, use a 24 VAC Safety Extra-Low Voltage (SELV) transformer at the appropriate rating. The minimum input voltage for the NAE35/45 to operate properly is 20 VAC. Maximum power consumption is 25 VA.

FC Bus Port

MS-NAE351x-x and **MS-NAE451x-x** models support one N2 Bus trunk or one Master-Slave/Token-Passing (MS/TP) Bus trunk on the Field Controller (FC) Bus port. Connect either an N2 Bus trunk or an MS/TP Bus trunk to the 4-wire terminal block plug labeled **FC BUS**. See Table 2 and Table 1 for more information on bus rules and bus device limits.

Note: BACnet® MS/TP and N2 are different protocols with different network requirements. Do not connect N2 devices and MS/TP devices on the same FC Bus.

FC Bus Modular Jack

The 6-pin, RJ-12 modular jack labeled **FC BUS** is an FC Bus service port for MS/TP applications (only).

Note: Do not connect an N2 trunk to the 6-pin RJ-12 FC Bus jack.

Refer to the N2 Communications Bus Technical Bulletin (LIT-636018) or the MS/TP Communications Bus Technical Bulletin (LIT-12011034) for additional information and guidelines on wiring devices on an N2 trunk or an MS/TP trunk.

LON Port

MS-NAE352x-x and **MS-NAE452x-x** models support one LONWORKS® network trunk. Connect a LONWORKS network trunk to the 3-wire terminal block terminal labeled **LON**. The cable shield terminal (SHD) on the LON port is an open terminal and is not connected in the NAE35/45.

Serial Ports

The **RS232C A** and **RS232C B** serial ports provide direct connections using a standard 9-pin female to 9-pin female Data Terminal Equipment (DTE) to DTE null modem cable (Figure 1).

The **RS232C A** serial port connects to a computer serial port to browse to the NAE35/45 or to connect to a VT100 or a computer with a VT100 emulator and perform diagnostic procedures.

Refer to the *Metasys*® *System Extended Architecture Direct Connection and Dial-Up Connection Application Note (LIT-1201639)* for more information.

The **RS232C B** port is only on NAE35/45 models without an internal modem and is used to connect an optional external modem. Refer to the *NAE Commissioning Guide (LIT-1201519)* for information on external modems.

USB Port

The Universal Serial Bus (USB) port connects an external modem. Refer to the *NAE Commissioning Guide (LIT-1201519)* for modem information.

Ethernet Port

The Ethernet connection (10 or 100 Mbps) is an 8-pin RJ-45 network port (Figure 1). Use the Ethernet port to connect to Internet Protocol (IP) networks.

Optional Internal Modem

MS-NAE35x1-x and MS-NAE45x1-x models have an optional internal modem and a 6-pin RJ-12 modular jack labeled **MODEM**. Insert a standard phone line plug to connect the internal modem. Refer to the *NAE Commissioning Guide Technical Bulletin (LIT-1201519)* for information on setting up the internal modem.

Wiring the NAE35/45

IMPORTANT: Do not connect 24 VAC supply power to the NAE before finishing wiring and checking all wiring connections. Short circuits or improperly connected wires may result in permanent damage to the equipment.

IMPORTANT: Use copper conductors only. Make all wiring in accordance with local, national, and regional regulations. The NAE35/45 is a low-voltage (<30 VAC) device. Do not exceed the NAE electrical ratings.

IMPORTANT: Do not remove the terminal block keys. The terminal block plugs and the terminal sockets are keyed to fit together in the correct configuration only.

IMPORTANT: Prevent any static electric discharge to the NAE. Static electric discharge can damage the NAE and void any warranties.

IMPORTANT: Make sure the building automation network wiring meets the specifications, rules, and guidelines in the <u>Power Supply, Network, and Bus</u> <u>Connections</u> section in this document.

Mount the NAE35/45 securely before wiring the NAE35/45. See the *Mounting* section.

Follow these guidelines when wiring an NAE35/45:

- Route the supply power wires and communication cables at least 50 mm (2 in.) away from the vent slots on the sides of the NAE35/45 housing.
- Provide slack in the wires and cables. Keep cables routed neatly around the NAE35/45 to promote good ventilation, Light-Emitting Diode (LED) visibility, and ease of service.

To wire the NAE35/45:

- 1. Connect the Ethernet communication cable to the RJ-45, 8-pin Ethernet port shown in Figure 1.
- Connect the three N2 Bus or FC Bus wires to the removable 4-terminal plug as shown in Figure 4 (labeled FC Bus). For LONWORKS compatible networks, connect the wires from the LON network trunk to the removable 3-terminal plug as shown in Figure 5.

Note: When the NAE35/45 is connected to an N2 Bus or an FC Bus, you must set the End-of-Line (EOL) switch to the proper position. See the <u>Setting the</u> <u>End-of-Line Switch</u> section.



Figure 4: FC Bus Terminal Block and Wiring Connections



LONWORKS Network wires are not polarity sensitive.

Figure 5: LONWORKS Network Terminal Block and Wiring Connections

- If required, connect the telephone line to the modem port or connect an external modem to the RS-232 B port or the USB modem port.
- 4. Make connections to the RS-232 serial ports (if necessary).
- 5. Connect the 24 VAC supply power wires from the transformer to the removable 3-terminal plug as shown in Figure 6. The middle terminal is not used.

Power supply wire colors may be different on transformers not manufactured by Johnson Controls. Follow the transformer manufacturer's instructions or the project installation drawings.

The 24 VAC power should be connected to all network devices so transformer phasing is uniform across the devices. Powering devices with uniform 24 VAC supply power phasing reduces noise, interference, and ground loop problems. The NAE35/45 does not require an earth ground connection.



Figure 6: 24 VAC Supply Power Wiring

Wiring Rules and Guidelines for Network Integrations

Table 1: MS/TP Bus Rules

Category	Rules/Maximums Allowed
General	One MS/TP Bus trunk supported per NAE (on NAE351x-x and NAE451x-x models only)
	Only daisy-chained MS/TP devices
Number of FC Devices Supported	MS-NAE451x-x models support up to 100¹ MS/TP devices total on the FC Bus with no more than two repeaters between an NAE45 and any device and a maximum of 50 devices between repeaters.
	MS-NAE351x-x models support up to 50¹ MS/TP devices total on the FC Bus with no more than two repeaters between an NAE35/45 and any device and a maximum of 50 devices between repeaters.
Bus Length	1,500 m (5,000 ft) cable per bus segment without a repeater
	4,500 m (15,000 ft) cable from NAE to the farthest FC Bus device (three bus segments of 1,500 m [5,000 ft] each, separated by repeaters)
	2,000 m (6,600 ft) between two fiber modems
Cable Type ²	Stranded 0.6 mm (22 AWG) 3-wire twisted, shielded cable is recommended. Stranded 0.6 mm (22 AWG) 4-wire (two twisted-pairs) shielded cable is acceptable. Note: The + and - bus leads should be a twisted pair. On FC Bus applications using 4-wire (two twisted-pairs) cable, isolate and insulate unused conductor. Refer to the <i>MS/TP Communications Bus Technical Bulletin (LIT-12011034)</i> for more information.
Terminations	Two FC Bus devices with EOL switches in the ON position, one at each end of each FC Bus segment

 If TEC Thermostat Controllers or third-party MS/TP devices are connected to the FC Bus, the maximum total number of MS/TP controllers on an FC Bus is 64 for NAE45 models and 32 for NAE35 models. The maximum cable length per bus segment is 1,219 m (4,000 ft) and the maximum total FC bus length is 3,658 m (12,000 ft).

2. Refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)* for more information on alternative cable types and lengths.

Table 2:	N2 Bus Rules
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Category	Rules/Maximums Allowed
General	MS-NAE351x-x and MS-NAE451x-x models (only) support one N2 Bus trunk.
	Only daisy-chained N2 devices (with maximum stub length of 3 m [10 ft] to any device)
Number of N2 Devices Supported	MS-NAE451x-x models support up to 100 N2 devices (maximum) on the N2 trunk with no more than two repeaters between an NAE45 and any device and a maximum of 50 devices between repeaters.
	MS-NAE351x-x models support up to 50 N2 devices (maximum) on the N2 trunk with no more than two repeaters between an NAE35 and any device and a maximum of 50 devices between repeaters.
Line Length and Type	1,500 m (5,000 ft) twisted pair cable without a repeater
	4,500 m (15,000 ft) twisted pair cable from NAE35/45 and the farthest N2 device (three segments of 1,500 m [5,000 ft] each, separated by repeaters)
	2,000 m (6,600 ft) between two fiber modems
Cable	Solid or stranded 1.5 mm ² (18 AWG) 3-wire is recommended. Solid or stranded 0.6 mm (24 AWG) larger 3-wire or 4-wire (two twisted-pairs) is acceptable. Note: The + and - bus leads should be a twisted pair. On applications using 4-wire (two twisted-pairs) cable, isolate and insulate unused conductor.
Terminations	Preferred Termination Configuration: Two N2 devices with EOL switches in the ON position, one at each end of each N2 Bus segment
	Minimally Required Termination Configuration: At least one N2 device with an EOL switch in the ON position somewhere on each N2 Bus segment

Table 3: Guidelines for LONWORKS Network Bus Topology

Cable Type	Maximum Segment Length with FTT10 Devices Only ¹	Maximum Segment Length with FTT10 and/or LPT10 Devices ¹
Belden® 85102 Cable	2,700 m (8,850 ft)	2,200 m (7,200 ft)
Belden 8471 Cable	2,700 m (8,850 ft)	2,200 m (7,200 ft)
Level IV 0.6 mm (22 AWG)	1,400 m (4,600 ft)	1,150 m (3,770 ft)
JY (St.) Y 2 x 2 x 0.8	900 m (2,950 ft)	750 m (2,460 ft)

1. For the bus topology, the maximum length stub cable is 3 m (10 ft), and the stub lengths must be calculated into the overall segment length.

Table 4:	Guidelines f	or LONWORKS	Network Free	Topology
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Cable Type	Maximum Node-to-Node Distance	Maximum Segment Length with FTT10 and/or LPT10 Devices
Belden 85102 Cable	500 m (1,640 ft)	500 m (1,640 ft)
Belden 8471 Cable	500 m (1,640 ft)	500 m (1,640 ft)
Level IV 0.6 mm (22 AWG)	400 m (1,300 ft)	500 m (1,640 ft)
JY (St.) Y 2 x 2 x 0.8	320 m (1,050 ft)	500 m (1,640 ft)

Table 5:	Maximum N	umber of I	Devices pe	er LonWorks	Network S	eament
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Device Type	Maximum Allowed
MS-NAE352x-x models	Supports one LONWORKS Network trunk with up to 64 LONWORKS devices (maximum)
MS-NAE452x-x models	Supports one LONWORKS Network trunk with up to 127 LONWORKS devices (maximum)
FTT-10 Nodes Only	64 (if repeaters are not used)
FTT-10 Nodes Only	127 (if repeaters are used)
Mixed FTT-10 and LPT-10 Nodes ¹	([FTT10 x 2] + LPT10) ≤ 128
Terminators:	
Bus Topology	2 bus type EOL terminators required (NU-EOL202-0)
Free Topology	1 free topology terminator required (NU-EOL203-0)
Physical Layer Repeaters	Maximum of 1 per segment

1. Each LPT10 channel segment (between repeaters) requires its own power supply. Other factors, such as power consumption of individual LPT10 devices, may limit a segment to fewer devices. The MS-NAE352x-x and MS-NAE452x-x models that support a LONWORKS Network trunk do not have an internal network terminator.

Table 6: 1	NAE35/45	Ethernet	Network	Rules
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Category	Rules/Maximums Allowed ¹
General	Point-to-point star topology with network hubs/switches
Number of Devices	Maximum of 100 supervisory devices may be connected to one site in the Metasys system extended architecture.
Line Length and Type	2,000 m (6,600 ft) for plastic/glass fiber optic with external adapter
	100 m (330 ft) CAT5 cable
Terminations	For 10/100 BaseT, no line terminators allowed

1. Refer to the N1 Ethernet/IP Network Technical Bulletin (LIT-6360175) for recommended parts and part numbers.

Setup and Adjustments

Data Protection Battery

The NAE35/45 is shipped with the data protection battery installed and connected. Do not disconnect the battery for any reason other than to replace a defective battery.

The 24 VAC supply power to the NAE35/45 charges the data protection battery. At initial startup, the battery may require a charging period of at least 4 hours before it supports data protection if power fails. Maximum protection (up to 3 consecutive power failures without recharging time) requires a 15-hour charging period.

The data protection battery slowly loses charge when 24 VAC power is removed from the NAE35/45. If the battery completely loses charge, the NAE35/45 real-time clock stops.

Whenever an NAE35/45 is disconnected from 24 VAC power for over 30 days, ensure that the real-time clock is set properly (from the user interface) and that the NAE35/45 is powered long enough to recharge the data protection battery.

Powering on the NAE35/45

After applying 24 VAC power, the NAE35/45 requires approximately 2 minutes to start up and become operational. See the <u>LED Test Sequence at Startup</u> section.

Startup is complete and the NAE35/45 is operational when the (green) RUN LED is On steady and the (red) FAULT LED is Off (Figure 9).

IMPORTANT: Wait for the NAE35/45 to complete the start-up sequence and the RUN LED to go On steady before initiating any other action on the NAE35/45.

Disconnecting Power from the NAE35/45

When 24 VAC supply power to an NAE35/45 is disconnected or lost, the NAE35/45 is nonoperational, but the POWER LED remains On and the data protection battery continues to power the NAE35/45 for approximately 1 to 5 minutes while volatile data is backed up in nonvolatile memory. The RUN LED goes Off when data backup and shutdown are complete.

IMPORTANT: The data protection battery must be installed and charged before disconnecting the 24 VAC supply power.

Setting the End-of-Line Switch

RS485 serial protocol bus segments require proper EOL termination to reduce interference from signal bounce back on the bus segment.

FC Bus (MS/TP) applications require a terminated device at each end of each FC Bus segment. See the <u>Wiring Rules and Guidelines for Network</u> <u>Integrations</u> section for more information on EOL requirements on an FC Bus.

N2 Bus applications require at least one terminated device on each N2 Bus segment, but two terminated devices, one at each end of the N2 Bus segment, are recommended. See the *Wiring Rules and Guidelines* for Network Integrations section for more information on EOL requirements on an N2 Bus.

The NAE35/45 is shipped with the EOL switch in the factory default, ON (up) position (Figure 7). See Figure 8 to determine the appropriate EOL switch setting for the NAE35/45s on N2 Buses and FC Buses.



Figure 7: FC Bus EOL Switch in the Factory Default ON (Up) Position



Figure 8: EOL Switch Setting N2 or MS/TP

Troubleshooting

LED Status Indicators

The NAE35/45 models have up to 11 LEDs (depending on the model) to indicate power and network communication status. Figure 9 shows the LEDs and Table 7 describes the LED indications.

Note: Some of the LEDs shown in Figure 9 are not used or displayed on some NAE35/45 models.



Figure 9: NAE LED Designations

LED Test Sequence at Startup

During startup, the NAE35/45 automatically initiates an LED test to verify the operational status of the LEDs. Immediately after connecting supply power, the following LED lighting sequence occurs:

- The POWER, BAT FAULT, 10 LINK, FAULT, RUN, and PEER COM LEDs turn On, indicating that the Operating System (OS) is booting up. (After 2 seconds, the LEDs may change states depending on site-specific network activity.)
- 2. The BAT FAULT, PEER COM, and FAULT LEDs shut Off. The RUN LED flashes to indicate that the NAE35/45 software is loading.
- 3. The LEDs display the status of the NAE35/45. When the RUN LED goes On Steady, startup is complete, and the NAE35/45 is operational.

The total time to start the NAE35/45 depends on the size of the database and can take several minutes.

See Table 7 for more information on NAE35/45 LEDs. Refer to the *NAE Commissioning Guide (LIT-1201519)* for additional information on troubleshooting an NAE.

LED Designation	Normal Status	Descriptions/Other Conditions
POWER (Green)	On Steady	On Steady = Unit is getting power from either the battery or 24 VAC power. Off Steady = Unit is shut down.
ETHERNET (Green)	Flicker	Flicker = Data is transferring on the Ethernet connection. Ethernet traffic is general traffic (may not be for the NAE35/45). Off Steady = No Ethernet traffic, probably indicates a dead Ethernet network or bad Ethernet connection.
10/LINK (Green)	On Steady	On Steady = Ethernet connection is established at 10 Mbps.
100/LINK (Green)	On Steady	On Steady = Ethernet connection is established at 100 Mbps.
FC BUS (Green)	Flicker	Flicker = Normal communications; the FC Bus is transmitting and receiving data. Flickers are generally in sync with data transmission but should not be used to indicate specific transmission times. Off Steady = No field controllers are defined to FC Bus in the NAE35/45.
PEER COM (Green)	Varies (see next column)	Flicker = Data traffic between NAEs. For an NAE35/45 that is not a Site Director, this LED indicates regular heartbeat communications with the Site Director. For a Site Director NAE, flashes are more frequent and indicate heartbeat communications from all other NAE devices on the site. For a single NAE35/45 on a network without an Application and Data Server (ADS), there is no flicker.
RUN (Green)	On Steady	On Steady = NAE35/45 software is running. On 1 second, Off 1 second = NAE35/45 software is in startup mode. On 0.5 seconds, Off 0.5 seconds = NAE35/45 software is shutting down. Off Steady = Operating system is shutting down or software is not running.
BAT FAULT (Red)	Off Steady	On Steady = Battery defective. Flicker = Data Protection Battery is not installed. Connect or install battery.
FAULT (Red)	Off Steady	On Steady = General Fault. Fault conditions are user configurable in software. Pre-configured fault conditions include excessive Central Processing Unit (CPU) flash or memory use, excessive Printed Wire Board (PWB) temperature.
MODEM RX	Flicker	Flicker = NAE35/45 modem is connected and receiving data.
MODEM TX	Flicker	Flicker = NAE35/45 modem is connected and transmitting data.

 Table 7:
 NAE35/45 LED Designations, Normal Status, and Descriptions

Repair Information

If you replace an NAE35/45 on a site with a new NAE35/45 for any reason or add a new NAE35/45 to a site, you must update the site registration to ensure that the new NAE35/45 is recognized and able to communicate in the site.

Refer to the *Replacing an NAE* section of the *NAE Commissioning Guide (LIT-1201519)* for information on removing an NAE from service and configuring a replacement NAE to communicate in a Metasys® system extended architecture site.

Product Code	Description
Number ¹	
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 RS-485 port.
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 RS-485 port. 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.
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. 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 port.
MS-NAE3525-2	Supports one LONWORKS trunk, features Basic Access support, and includes an internal modem. Supports up to 64 devices on the LONWORKS port.

Table 8: NAE35 Ordering Information

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 9: NAE45 Ordering Information (Part 1 of 2)

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. 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.

Table 9: NAE45 Ordering Information (Part 2 of 2)

Product Code	Description
Number ¹	
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. 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 10:	NAE35/45	Accessories	Ordering	Information
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Product Code Number	Description
MS-BAT1020-0	Replacement data protection battery for NAE35/45 and NCE25: Rechargeable NiMH 3.6 VDC, 500 mAh battery with a typical life of 5 to 7 years at 21°C (70°F) (Higher operating temperatures reduce battery life.)
AS-XFR050-0	Power transformer (Class 2, 24 VAC, 50 VA maximum output), no enclosure

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 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 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-1 and NAE451x-1 models only.) One LONWORKS port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (LONWORKS port available on NAE352x-x and NAE452x models only) One RS-232-C serial port with standard 9-pin sub-D connector that supports standard baud rates There is a second serial port, on models without an internal modem, that supports an optional, user-supplied external modem. One USB serial port with standard USB connector that supports an optional, user-supplied external modem Option: One telephone port for internal modem; up to 56 Kbps; 6-pin RJ-12 connector (NAE35/45 models with optional internal modem have one RS-232-C serial port only.)

NAE35 and NAE45 (Part 2 of 2)

Housing	Plastic housing material: ABS + polycarbonate UL94-5VB 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.) Minimum space for mounting NAE35/45: 210 x 350 x 110 mm (8.3 x 13.8 x 4.3 in.)
Shipping Weight	1.2 kg (2.7 lb)
Compliance	United States: UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment (MS-NAE35x0-2U and MS-NAE45x0-2U models only)
	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 (2001) Generic Emission Standard for Residential and Light Industry and EN 61000-6-2 (2001) 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)

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.



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