Application

The *Metasys*® Network Control Engine (NCE) 25 Series controllers combine the network supervisor capabilities and Internet IP network connectivity of a *Metasys* Network Automation Engine (NAE) with the I/O point connectivity and direct digital control capabilities of a *Metasys* Field Equipment Controller (FEC). These network engines provide a cost-effective solution designed for central plant applications and large built-up air handlers.

NCE25 Series controllers provide integration to the following network protocols: BACnet/IP, BACnet MS/TP, and N2 Bus and integrations to other building management communication technologies, including Modbus®, M-Bus, and KNX. At Release 9.0, the Modbus, M-Bus, and KNX integrations are added and licensed during network engine commissioning. At Release 9.0.7, the Modbus, M-Bus, and KNX integrations are included with the image of the network engine, already pre-licensed and ready for selection during commissioning.

Important: For existing custom integrations, contact your local Systems Integration Services (SIS) team before an upgrade. Updated drivers can be provided on request.

Note:
Beginning with *Metasys* Release 9.0.7, modems (internal and external) and pagers are no longer supported on NCE25 engines that run the Linux operating system, but are still supported on prior releases for engines that use a Windows Embedded operating system. If you receive from the factory a network engine with Release 9.0 that has an internal modem, you can field-upgrade the engine to Release 9.0.7 to acquire new release enhancements, but its modem and pager functionality is lost. If you need modem and pager functionality, do not upgrade the NCE25 engine to Release 9.0.7.

In addition, support for the LonWorks® network is no longer available on the NCE25 engines at Release 9.0.7. Therefore, do **not** upgrade to Release 9.0.7 any NCE25 engine that features the LonWorks integration.

Note: If you receive an NCE25 engine from the factory that is imaged with Release 9.0, you can field-upgrade the engine to Release 9.0.7 if the upgrade is supported.

Figure 3 shows the physical features of an MS-NCE2567-0 model. See Table 19 for NCE25 Series model information and features.

Installation

Follow these guidelines when installing an NCE:

- Transport the NCE in the original container to minimize vibration and shock damage to the network.
- Verify that all the parts shipped with the NCE.
- Do not drop the NCE or subject it to physical shock.

Parts included

- One NCE with removable terminal plugs.
- One data protection battery installed and connected when the NCE is shipped.
- One installation instructions sheet.

Part No. 24-10143-63 Rev. T

2019-05-08

Release 9.0, 9.0.7

(barcode for factory use only)

MS-NCE25xx-0

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 35 mm DIN rail, and appropriate hardware for mounting the DIN rail.

Mounting

Location considerations

Follow these guidelines when mounting a network engine:

- Ensure that the mounting surface can support the NCE and any user-supplied panel or enclosure.
- Mount the NCE in a horizontal, upright orientation.
- Mount the NCE on an even surface in wall mount applications whenever possible. If you must mount the network engine on an uneven surface, be careful not to crack the mounting clips or network engine housing when tightening the screws. Use shims or washers to mount the NCE evenly on the mounting surface.
- Mount the NCE in areas free of corrosive vapors, and observe the environmental limitations listed in the Technical specifications section.
- Allow sufficient space to accommodate cable and wire connections. See Figure 1.
- Do not mount the network engine where the ambient temperature may exceed 50°C (122°F).
- Do not mount the network engine on surfaces that are prone to vibration or in areas where electromagnetic or radio frequency emissions can interfere with network engine communication.
- Do not obstruct the network engine housing ventilation holes.
- Do not mount a power transformer below the network engine.

On applications where the network engine is mounted inside a panel or enclosure, follow these additional guidelines:

- Do not install the network engine in an airtight enclosure.
- Do not install heat-generating devices in the enclosure with the network engine that may cause the ambient temperature to exceed 50°C (122°F).

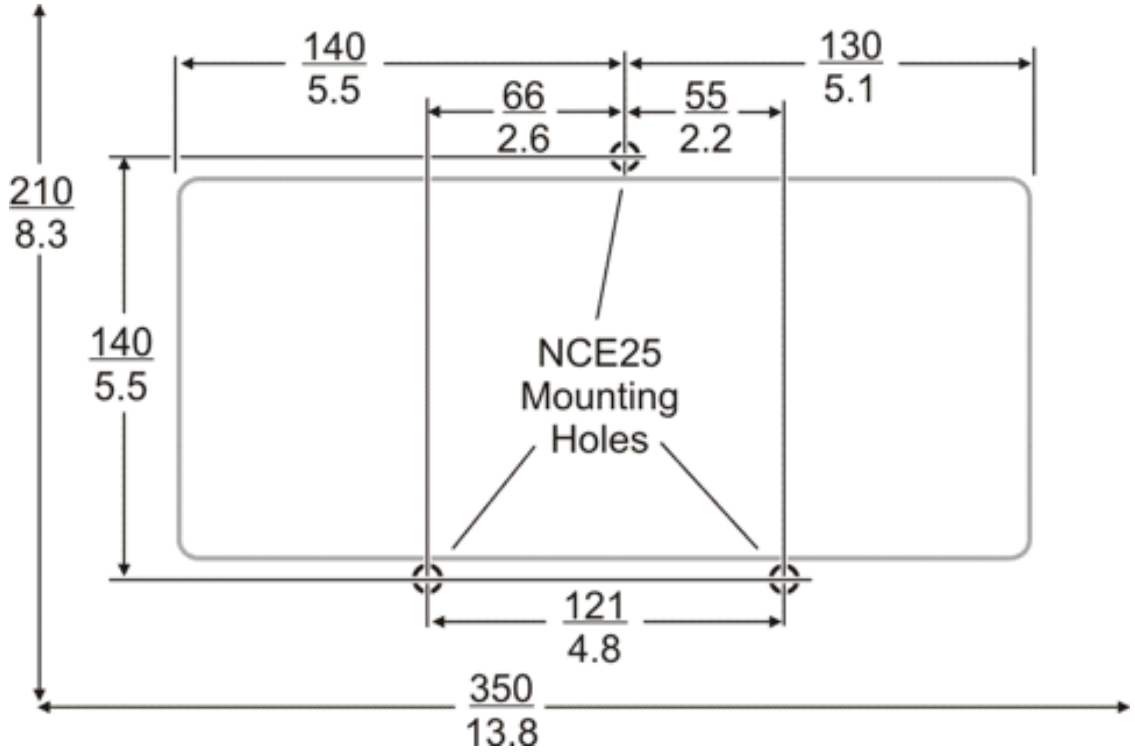
Wall mount applications

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

To mount the network engine on a wall or other vertical surface, complete the following steps:

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

Figure 1: NCE mounting screw hole dimensions, (mm/in.), and mounting area requirements



4. Position the network engine and insert the screws through the holes in the mounting clips, and carefully tighten all the screws.

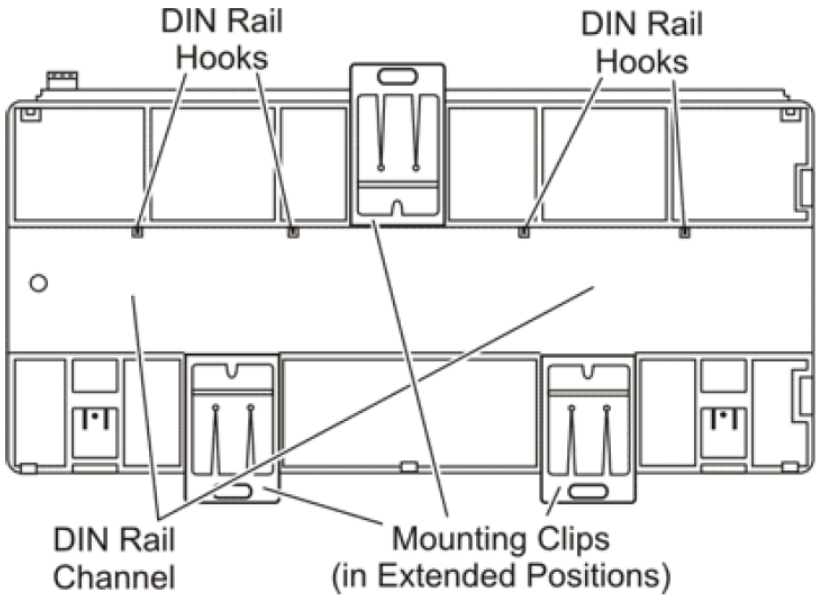
   ➽ **Important:** Do not overtighten the mounting screws. Overtightening the screws may damage the mounting clips or NCE housing.

DIN rail mount applications

To mount the network engine on a DIN rail:

1. Securely mount a 20 cm (8 in.) or longer section of DIN rail horizontally and centered in the required space.
2. Pull out the two mounting clips and snap them firmly. See Figure 2.

Figure 2: DIN rail and mounting clip features on the back of an NCE



3. Hang the network engine by the DIN rail hooks on the top track of the DIN rail, and position the network engine DIN rail channel snugly against the tracks of the DIN rail. See Figure 2.
4. Push the bottom mounting clips up to secure the network engine on the DIN rail tracks.

To remove the network engine from the DIN rail, snap the bottom DIN clips to the outward extended position and carefully lift the network engine off the DIN rail.

Enclosure mount applications

Mount the enclosure in accordance with the manufacturer's instructions, and then mount the network engine in the enclosure following the guidelines in the Location considerations and Mounting sections.

Figure 3: Front of NCE2567-0 showing physical features (power and I/O terminal blocks, and NCE mounting clips not shown)

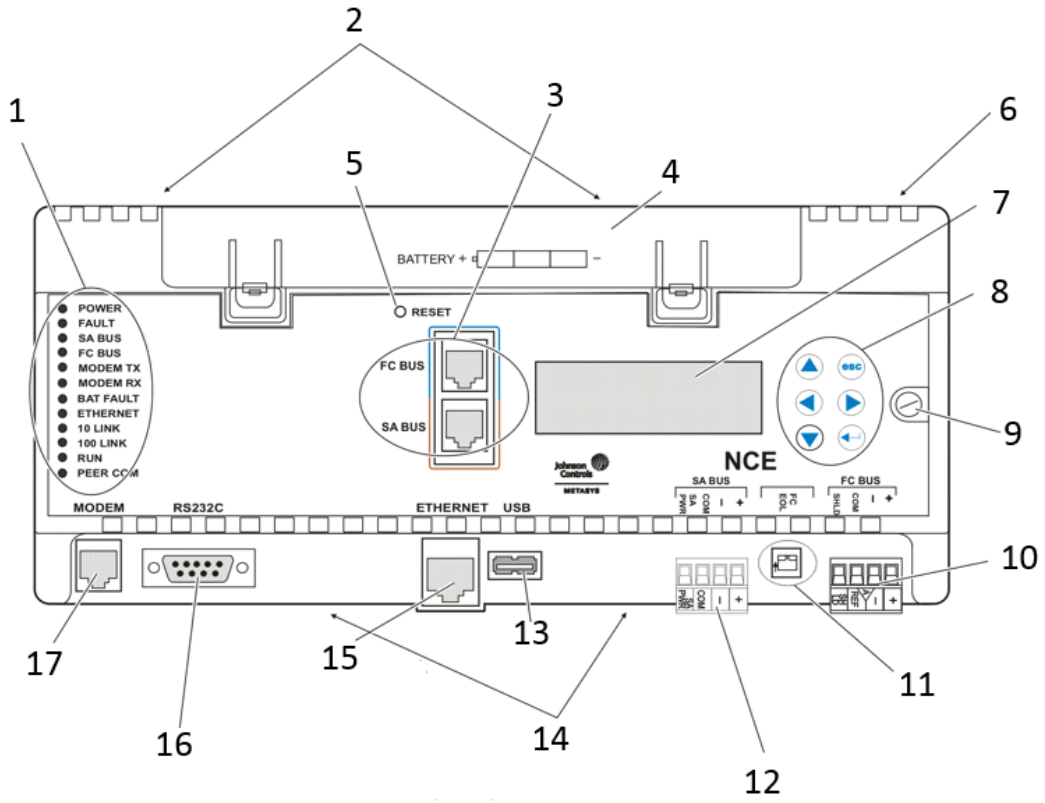


Table 1: Callout table for NCE25 physical features

Callout	Description
1	The LED status indicators vary depending on the NCE model. See LED status indicators.
2	Binary output, configurable output, and analog output terminal blocks are located on the top side of the NCE. See Input and output wiring guidelines.
3	6-Pin modular Bus ports. • FC Bus port for MS/TP models only, connects to a Wireless Commissioning Converter (MS-BTCVT-1). • SA Bus port connects to a NS network sensor, a DIS1710- Local Controller Display, or a Wireless Commissioning Converter (MS-BTCVT-1).
4	Data protection battery component.
5	NCE reset switch.
6	24 VAC Class 2 supply power terminal block is located on the top side of the NCE.
7	Display screen on specified models and displays NCE menus and commands.
8	Display navigation keyypad is used to navigate the display menus and initiate commands.
9	Cover screw.

Table 1: Callout table for NCE25 physical features

Callout	Description
10	FC Bus teminal block connects an NCE to an N2 Bus or FC Bus segment. It is not available on all models.
11	End-of-Line (EOL) Termination Switch sets the NCE as an EOL terminating device. Set the EOL switch according to the NCE position on the N2 or FC Bus segment.
12	SA Bus Terminal Block connects the NCE field controller to the SA Bus.
13	Standard USB port.
14	Universal inputs and Binary input terminal blocks are located on the bottom side of the NCE. See Input and output wiring guidelines.
15	Ethernet port RJ-45 8-pin modular jack connects the NCE to the IP network.
16	RS-232 Serial port.
17	Modem Jack - 6 pin modular jack, only on NCE models with optional internal modems. (functional at Release 9.0; not functional at Release 9.0.7)

Wiring

Power supply, network, and communication connections

See Figure 3 for the location of the NCE's power supply terminal, bus terminals and ports, USB port, Ethernet port, and modem port.

Important: Modem functions are available with *Metasys* Release 9.0, but are not available if you update the NCE25 to Release 9.0.7.

Note: Do not remove the red terminal block keys from the board mounted terminal blocks as this can cause a removable terminal plug being plugged into the wrong terminal block, which can cause the network engine to malfunction.

The NCE25 supports Modbus, M-Bus, and KNX integrations when upgraded to Release 9.0.7.

24~ supply power terminal block

The 24~ supply power terminal block is a gray, keyed, removable 3-terminal block located on the top side of all NCE models. See Figure 3, Figure 11, and Figure 12.

In North America, the NCE25 requires a Class 2, 24 VAC, 25 VA minimum power supply. Outside North America, use a 24 VAC SELV transformer at the appropriate rating. A minimum input voltage of 20 VAC is required for the network engine to operate properly.

Note: The maximum power consumption of an NCE25 is 25 VA, but that does not include power for internally sourced BO points. Applications that provide power to BO points and CO points configured as BO points can require up to 125 VA of additional power over the 25 VA minimum required for the NCE25.

SA Bus terminal block

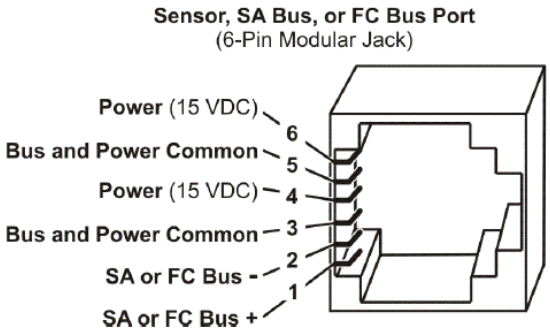
All NCE models provide a brown, keyed, removable 4 terminal Sensor/Actuator (SA) Bus terminal block. See Figure 3. Connect the 4-wire SA Bus cable to the SA BUS terminal block. See SA Bus rules.

SA Bus modular port

The 6-Pin modular SA Bus port is available on all NCE models. See Figure 3 and Figure 4. The SA Bus port connects to the following:

- A Wireless Commissioning Converter (MS-BTCVT-1) to commission the network engine with the Controller Commissioning Tool.
- A DIS1710 Local Controller Display to provide a display screen on NCE25 models without an integral display screen.
- An NS Series Network Sensor to provide room temperature data to the network engine.

Figure 4: Pin number assignments for Sensor, SA Bus, and FC Bus Ports on NCE, FEC, IOM, and VMA16



FC Bus terminal block

The blue, keyed, removable 4-terminal block FC BUS terminal block is designed for RS485 serial protocol field buses and is available on NCE models that support N2 Bus or MS/TP FC Bus applications. See Figure 3 for more information. You can complete the following connections:

- Connect the 3-wire N2 Bus to the FC BUS terminal block on NCE models that support N2 Bus applications. See Figure 3 and N2 Bus rules for more information.
- Connect the 3-wire MS/TP FC Bus to the FC BUS terminal block on NCE models that support MS/TP FC Bus applications. See Figure 3 and MS/TP FC Bus rules for more information.

The SHLD terminal on the FC BUS terminal block is a convenient terminal to connect cable shield drains in daisy-chain bus applications that use shielded cable.

LonWorks network terminal block

The blue, keyed, removable, 3-position LON terminal block connects a LonWorks® network trunk to NCE25 models that support a LonWorks network trunk. The Shield (SHD) on the LON terminal block is soft grounded to the network engine chassis terminal, and you can use it as a convenient terminal to connect cable shield drains in daisy-chain bus applications that use shielded cable.

ⓘ **Note:** The NCE25 models with the LonWorks integration only support the upgrade to Release 9.0. Do not upgrade the LonWorks models to Release 9.0.7. You must keep the LON models at Release 9.0 or earlier.

FC Bus modular port

The 6-pin modular FC BUS port is available only on NCE models that support MS/TP FC Bus applications (Figure 3 and Figure 4). Connect a Wireless Commissioning Converter (MS-BTCVT-1) to the modular FC BUS port to commission the NCE with the CCT.

RS232C serial port

For an NCE25 at **Release 9.0**, use the RS232C serial port to direct connect to a computer serial port to browse to the NCE 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 information about direct connections to an NCE.

For an NCE25 at **Release 9.0.7**, the RS232C serial port only outputs information during startup to a VT100 or a computer with a VT100 emulator. For a network engine at 9.0.7 configured with vendor integrations, the RS232C serial port provides a direct connection to a Modbus RTU or M-Bus network using a standard 9-pin female data terminal equipment (DTE) to 9-pin female DTE null modem cable. You can integrate only one device on this port.

Standard USB port

For an NCE25 at **Release 9.0**, you can connect an external modem to the USB port labeled **USB**. Refer to the *NAE Commissioning Guide (LIT-1201519)* for modem information.

For an NCE25 at **Release 9.0.7**, the use of the USB port to connect an optional external modem is no longer supported. However, you can use the USB port for debugging purposes when integrating to a third-party protocol (for example, Modbus, M-Bus, or KNX).

Ethernet port

The Ethernet port, labeled ETHERNET, is an 8-pin RJ-45 network port for connecting the network engine to Ethernet networks (10 or 100 Mbps). For a network engine configured for vendor integrations, use this port for connecting a Modbus TCP, M-Bus TCP, or KNX network.

Internal modem

Several NCE25 models at Release 9.0 have an optional internal modem and a 6-pin modular jack labeled MODEM. Insert a standard phone line plug to connect the internal modem. Refer to the *NAE Commissioning Guide (LIT-1201519)* for information on setting up the internal modem.

ⓘ **Note:** The modem functionality of the NCE25 models with internal modems is lost if you upgrade these models to Release 9.0.7. Therefore, to retain modem operation, do not upgrade these units.

Wiring rules for networks and field buses

All NCE25 Series models are designed to connect to Ethernet IP networks and support a single SA Bus.

A network engine also supports an MS/TP field bus trunk, an N2 Bus trunk, and up to two vendor integrations. For example, an NCE support two Modbus, two M-bus, or one of each. If a KNX integration is required, an NCE25 supports only one KNX IP Integration.

IP Ethernet network rules

All NCE25 models are designed to connect to properly configured IP Ethernet networks. Observe the IP Ethernet network rules in the following table.

ⓘ **Note:** You can find the Media Access Control (MAC) address on a label on the network engine housing.

Table 2: Ethernet network rules

Category	Rules/maximums allowed
General	Star topology with network hubs/switches.
Number of devices	Maximum number of supervisory devices that you can connect to one site in the *Metasys* system depends on the *Metasys* server. For details, refer to *Metasys System Configuration Guide (LIT-12011832)*.
Line length and type	2,000 m (6,561 ft) for plastic/glass fiber optic with external adapter.
	100 m (328 ft) CAT5 cable.
Terminations	For 10/100 BaseT, no line terminators allowed.

MS/TP FC Bus rules

The MS/TP FC Bus connects FECs, VMA1600s, IOMs, TEC Series thermostats, and third-party MS/TP controllers to NCE256x models.

NCE256x models support an FC Bus trunk with up to 32 MS/TP devices. Observe the rules in the following table when designing and installing the connected FC Bus.

Table 3: FC Bus rules

Category	Rules/maximums allowed
General	One FC Bus with up to 32 MS/TP devices (on NCE256x models only). ⓘ **Note:** An FC port on a network engine can connect to only one bus segment on an FC Bus. Only a daisy-chain topology is allowed (no T or Star topology configurations).
Number of devices	One FC Bus Supports up to 32 MS/TP controllers on a single FC Bus segment.
Cable length for FC bus	FC Bus can be up to 1,520 m (4,987 ft) using 0.6 mm (22 AWG) 3-wire twisted, shielded cable.
	When using fiber-optic connections: 2,010 m (6,594 ft) between two fiber-optic modems.
Cable	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:** Ensure the + and - bus leads are a twisted pair. On applications using 4-wire (two twisted-pairs) cable, isolate and insulate unused conductor. Refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)* for more information.
EOL termination on the FC bus	The EOL switch must be set to **On** (or an EOL terminator installed) on the two devices located at either end of each bus segment on an FC Bus. The EOL switches must be set to **Off** (or EOL termination disabled) for all other devices on the bus segment on an FC Bus. See Setting the end-of-line switch for information on setting the EOL switch.

SA Bus rules

The SA Bus connects the *Metasys* Input/Output Modules (IOMs), NS Series Network Sensors, DIS1710 Local Controller Display, specified variable frequency drives, and Wireless Commissioning Converter (MS-BTCVT-1) to an NCE.

Observe the rules in the following table when designing and installing the SA Bus for your application.

Table 4: SA Bus rules

Category	Rules/limits
General	Each bus supervisor supports one SA Bus.
Number of devices supported on the bus	The SA Bus supports up to 10 devices. ⓘ **Note:** The SA Bus supervisor provides power for the NS network sensors on the bus. Due to power limitations, only 4 of the 10 devices on a SA Bus can be NS sensors. The SA Bus on NCE25 models that have an integral Local Controller Display do not support an optional DIS1710 Local Controller Display.
	The SA Bus does not support repeaters.

Table 4: SA Bus rules

Category	Rules/limits
Cable length for SA Bus	365 m (1,198 ft) maximum bus length.
	152 m (500 ft) maximum between an NS network sensor and the bus supervisor FEC or VMA supplying power to the sensor) using bus cable connected to the SA Bus screw terminal blocks.
	30 m (98 ft) maximum length for network sensors using bus cables connected to the 6-pin modular jack (6-Pin SA Bus port).
	366 m (1,198 ft) maximum Bus Length.
	1.5 m (5 ft) maximum between the network engine and DIS1710 Local Controller Display.
Recommended bus cable type	**Screw Terminal Connections**: 0.6 mm (22 AWG) Stranded 4-wire, 2-Twisted Pairs, Shielded Cable for screw terminals. **Modular Jack Connections**: 6-Pin Modular Connectors with 24 or 26 AWG 6-Wire, 3 Twisted-Pairs.
EOL termination on the SA Bus	Each SA Bus supervisor has integral (fixed ON) EOL termination, which typically provides sufficient EOL termination on a SA Bus. Long SA Bus runs or persistent communication problems on a SA Bus may require EOL termination at the last device on the SA Bus in addition to the integral EOL termination at the SA Bus supervisor) All NCE25 models are SA Bus supervisors.

N2 Bus rules

The N2 Bus connects N2 controllers to specified NCE25 models. NCE251x models support a single N2 Bus trunk with up to 32 N2 devices.

Observe the rules in the following table when designing and installing the connected N2 Bus.

Table 5: N2 Bus rules

Category	Rules/maximums allowed
General	One N2 trunk supported (on NCE251x models only).
	Only daisy-chained devices (with maximum stub length of 3 m [10 ft] to any device).
Number of N2 devices supported	Up to 32 N2 devices supported on the N2 trunk.
Cable length and type	1,500 m (4,921 ft) twisted pair cable.
	2,000 m (6,561 ft) between two fiber modems.
Cable	Solid or stranded 1.0 mm (18 AWG) 3-wire is recommended. Solid or stranded 0.5 mm (24 AWG) larger 3-wire or 4-wire (two twisted-pairs) is acceptable. ⓘ **Note:** Ensure the + and - bus leads are a twisted pair. On applications using 4-wire (two twisted-pairs) cable, isolate and insulate unused conductor.
Bus termination	N2 devices are self-terminating and have no EOL setting.

Modbus RTU rules

The RS-232 port supports the connection of one Modbus RTU (RS-232) device. With the addition of an RS-232/RS-485 converter and connection to the RS-232 port, up to 32 Modbus RTU (RS-485) devices are supported. Observe the rules in the following table when designing and installing the connected Modbus RTU Bus.

Table 6: Modbus RTU rules table

Category	Rules/maximums allowed
General	Supports one direct Modbus RTU (RS-232) connection to the RS232C port. A connection of an RS-232/RS-485 converter to the RS232C port supports up to 32 Modbus (RS-485) devices. FC port does not support Modbus integration.
Number of Devices	RS232C port supports one Modbus RTU (RS-232) device. RS232C port with RS-232/RS-485 converter supports up to 32 Modbus (RS-485) devices.
Cable Length	RS-232 cable length can be up to 15 m (49.2 ft). RS-485 cable length can be up to 1,520 m (4,987 ft).
Cable	RS-232 stranded cable, 3-9 conductors, serial data grade, 20–24 AWG. RS-485 stranded cable, 0.6 mm (22 AWG) 3-wire twisted, shielded cable is recommended. Stranded 0.6 (22 AWG) 4-wire (two twisted pairs) shielded is acceptable.
EOL Termination	RS-232: requires no termination. RS-485: End-of-line (EOL) termination must be set to On (or an EOL terminator installed) on the two devices located at either end of each bus segment on an RS-485 bus. The EOL switches must be set to Off (or EOL termination disabled) for all other devices on the bus segment on an RS-485 bus.

M-Bus protocol rules

Note: Unit load is a defined standby current. A device is permitted a current drain of one unit load by default but may consume more if it is shown at the device (by an integer) and in documentation. Use M-Bus Repeaters to increase the length and the number of unit loads permissible.

Table 7: Rules for M-Bus protocol

Category	Rules/maximums allowed			
General	Supports one direct M-Bus serial (RS-232) connection to the RS232C port. Connection requires an RS232-to-M-Bus Level Converter on the RS232C port. FC port does not support M-Bus integration. No restrictions in topology, but Bus topology is strongly recommended.			
Number of devices	Depends on level converter (logical maximum is 250 devices).			
Line length and type	Length depends on cable resistance, capacitance, number of devices, position of devices, and configured communication speed. Example scenarios to help with calculation:			
	Baud rate	**Maximum number of unit loads**	**Maximum distance between converter and devices**	**Maximum distance for entire Bus**
	2,400	64	3,000 m (9,842 ft)	5,000 m (16,404 ft) (2 x 1.0 mm (18 AWG), shield recommended, resistance < 90 Ohms)
		64	1,000 m (3,281 ft)	4,000 m (13,123 ft) (2 x 1.0 mm (18 AWG), shielded, resistance < 90 Ohms)
		250	350 m (1,148 ft)	4,000 m (13,123 ft) (2 x 0.8 mm (20 AWG), shielded, resistance < 30 Ohms)
	9,600	64	350 m (1,148 ft)	4,000 m (13,123 ft) (2 x 0.8 mm (20 AWG), shielded, resistance < 30 Ohms)

Table 7: Rules for M-Bus protocol

Category	Rules/maximums allowed			
		250	350 m (1,148 ft)	1,000 m (3,281 ft) (2 x 0.8 mm (20 AWG), shielded, resistance < 30 Ohms)
	38,400	64	350 m (1,148 ft)	1,000 m (3,281 ft) (2 x 0.8 mm (20 AWG), shielded, resistance < 30 Ohms)
Cable	Twisted pair cable (shielding optional).			
Termination	No termination.			

KNX protocol rules

Table 8: Rules for KNX protocol

Category	Rules/maximums allowed
General	No restrictions in topology.
Number of devices	Depends on chosen topology and cable type.
Line length and type	Twisted pair cable recommended; length depends on cable resistance, capacitance, number devices, position of devices, and communication speed.
Cable	Copper, solid and stranded wires with outer sheath, one- or two-twisted pair; 0.8 mm to 1.0 mm (20 to 18 AWG). Screen is required and must cover the entire diameter. Drain wire: Diameter minimum 0.4 mm (26 AWG).
Termination	No termination.
Manufacturer's Quality management system	At least ISO 9002.

Dual trunk options

Table 9: Dual trunk options

Trunk type	Supported dual trunk application
Modbus	1 RS232 1 TCP
	2 TCP
M-Bus	1 RS232 1 TCP
	2 TCP

Table 9: Dual trunk options

Trunk type	Supported dual trunk application
Modbus and M-Bus	1 RS232 Modbus 1 TCP M-Bus
	1 RS232 M-Bus 1 TCP Modbus
	1 TCP Modbus 1 TCP M-Bus

Wiring the Network Engine

Mount the network engine securely before wiring the network engine. See the Mounting section.

CAUTION

Risk of Property Damage.
Do not apply power to the system before checking all wiring connections. Short circuited or improperly connected wires may result in permanent damage to the equipment.

Attention

Risque de dégâts matériels.
Ne pas mettre le système sous tension avant d'avoir vérifié tous les raccords de câblage. Des fils formant un court-circuit ou connectés de façon incorrecte risquent d'endommager irrémédiablement l'équipement.

Warning

Risk of Electric Shock.
Disconnect or isolate all power supplies before making electrical connections. More than one disconnection or isolation may be required to completely de-energize equipment. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

⚠ Warning

Risque de décharge électrique.
Débrancher ou isoler toute alimentation avant de réaliser un branchement électrique. Plusieurs isolations et débranchements sont peut-être nécessaires pour -couper entièrement l'alimentation de l'équipement. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

- **Important:** Do not apply 24 VAC power to the network engine before completing and checking connections. Short circuits or improperly connected wires may result in permanent damage to the equipment.
- **Important:** Do not apply 24 VAC power to the network engine before installing the data protection battery. See the section in this document.
- **Important:** Use copper conductors only. Make all wiring in accordance with local, national, and regional regulations.
- **Important:** Use this MS-NCE25xx-x only as an operating control. Where failure or malfunction of the NCE25 could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the NCE25.
- **Important :** Utiliser ce MS-NCE25xx-x uniquement en tant que dispositif de contrôle de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du NCE25 risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d'alarme, ou des dispositifs de sécurité ou de limitation, ayant une fonction d'avertissement ou de protection en cas de défaillance ou de dysfonctionnement du NCE25.
- **Important:** The network engine is a low-voltage (<30 VAC) device. Do not exceed the network engine electrical ratings. Applying high voltage to the network engine may result in permanent damage to the network engine and void any warranties.
- **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 network engine. Static electric discharge can damage the network engine and void any warranties.

Be sure to follow these wiring guidelines:

- Route the supply power wires and communication cables at least 50 mm (2 in.) away from the vent slots in the sides of the network engine housing.
- Provide slack in the wires and cables. Keep cables routed neatly around the network engine to promote good ventilation, LED visibility, and ease of service.
- Ensure that the building automation network wiring meets the specifications, rules, and guidelines as outlined in the Power supply, network, and communication connections section. The network engine does not require an earth ground connection.
- Follow the transformer manufacturer’s instructions and the project installation drawings. Power supply wire colors may be different on transformers not manufactured by Johnson Controls.

- While connecting network devices to 24 VAC power, make sure that transformer phasing is uniform across all devices. Powering network devices with uniform 24 VAC supply power phasing reduces noise, interference, and ground loop problems.

Wiring for N2, MS/TP, or Modbus RTU Protocol

1. Connect the Ethernet cable to the RJ-45, 8-pin Ethernet port as shown in NCE25 physical features.
2. Connect the BAS network cables to the appropriate ports.
3. For Modbus RTU protocol using the RS232C serial port, use a cable to connect the RS-232/ RS-485 converter to the RS232C serial port on the network engine.

   ⓘ **Note:** The maximum cable length between devices connected though an RS-232 line depends on the baud rate used. In general, at 9600 baud ensure the length does not exceed 15 meters.

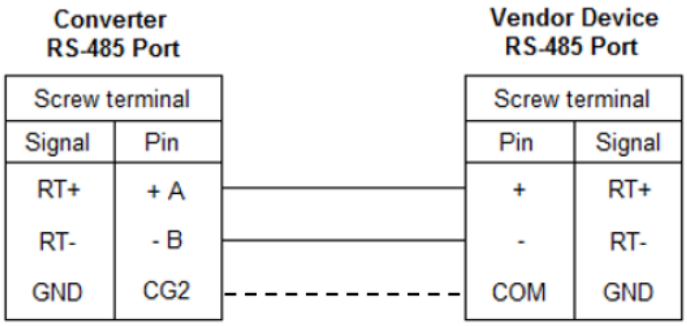
4. Wire from the RS-485 terminal on the converter to the RS-485 port on the vendor device. The RS-485 bus is a two-wire network. See Figure 5.

   a. Connect the converter's **+ A** terminal to the device's **+** (or **A**) terminal.

   b. Connect the converter's **- B** terminal to the device's **-** (or **B**) terminal.

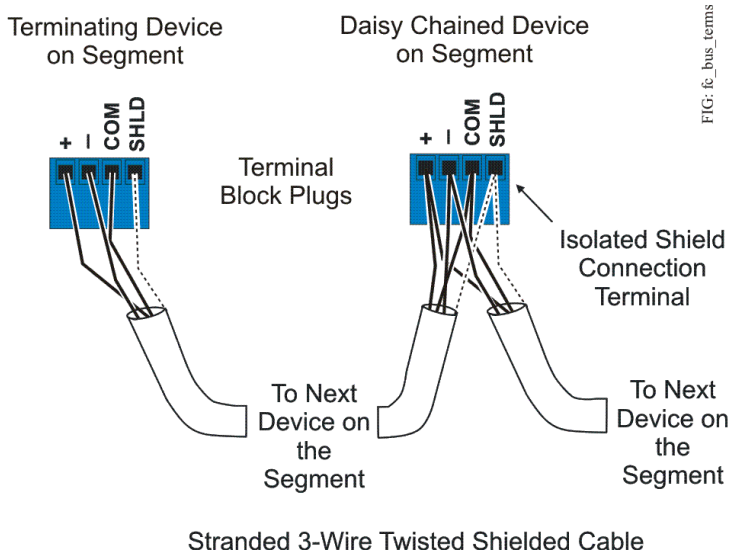
   c. If the device has a Signal Ground or Reference terminal, connect this to the converter's **CG2** terminal.

Figure 5: Connection between converter and device



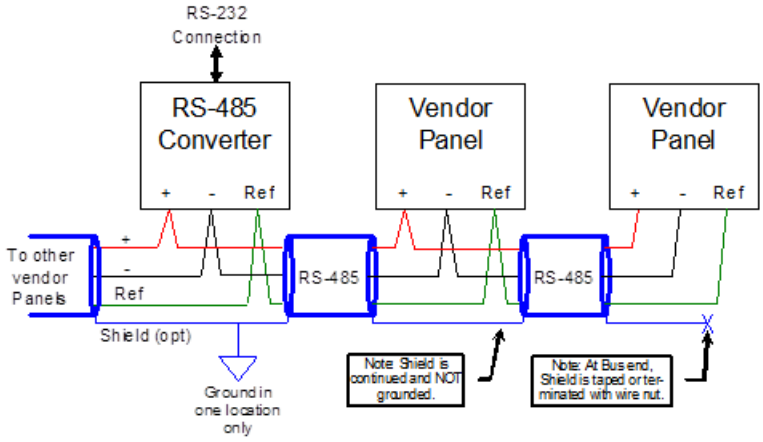
5. To add additional vendor devices, terminate the wires from one device to the next as shown in Figure 6. There must be no more than two wire connected to each terminal to ensure the daisy chain configuration is used.

Figure 6: Daisy Chained Devices



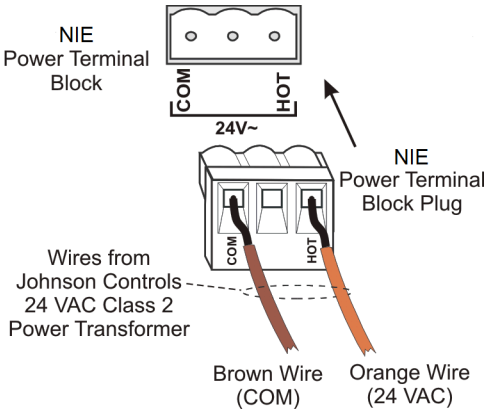
Note: Ensure the completed wiring looks similar to the following figure.

Figure 7: Modbus RTU Wiring Detail Overview



6. Connect the 24 VAC supply power wires from the transformer to the removable power terminal block plug on the network engine as shown in the following figure.

Figure 8: 24 VAC Supply Power Wiring



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

7. Connect the 24 VAC supply power wires from the transformer to the converter. No additional external power adapter is required. Terminate the hot and common wires as you need. The network engine does not require an earth ground connection.

   Note: The 24 VAC power should be terminated to all network devices so transformer phasing is uniform across the devices. Powering network devices with uniform 24 VAC supply power phasing reduces noise, interference, and ground loop problems.

Wiring for serial M-Bus Protocol

1. Connect the Ethernet cable to the RJ-45, 8-pin Ethernet port shown in NCE25 physical features.
2. Connect from the RS232C serial port on the network engine to the RS-232 connecter of the level converter. Wire to terminals **GND**, **RxD**, and **TxD** as shown in NCE25 physical features.
3. Wire from the **M-** and **M+** terminals on the level converter (Figure 9) and to use the line (daisy-chain) topology, especially for long distances and many devices. Specific cabling can vary depending on the topology and site.

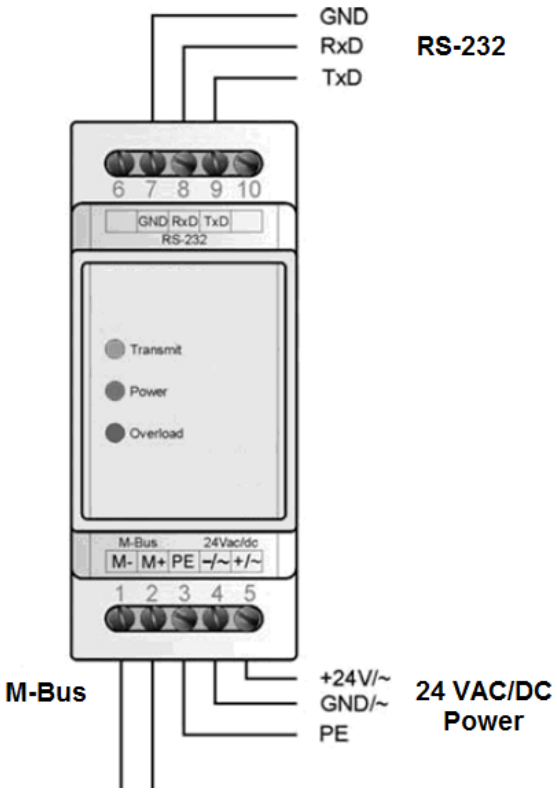
   Note: If the number of M-Bus unit loads or distances exceeds the specifications of a level converter, youcan wire a M-Bus repeater to the converter to increase the number of unit loads and distances. The converter shown in Figure 9 is capable of handling up to six units loads, while other models can handle up to 100.

4. Connect the 24 VAC supply power wires from the transformer to the removable power terminal block plug.

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

5. Connect the 24 VAC supply power wires from the transformer to the **-/~** and **+/~** terminals as shown in Figure 9.

Figure 9: M-Bus Level Converter

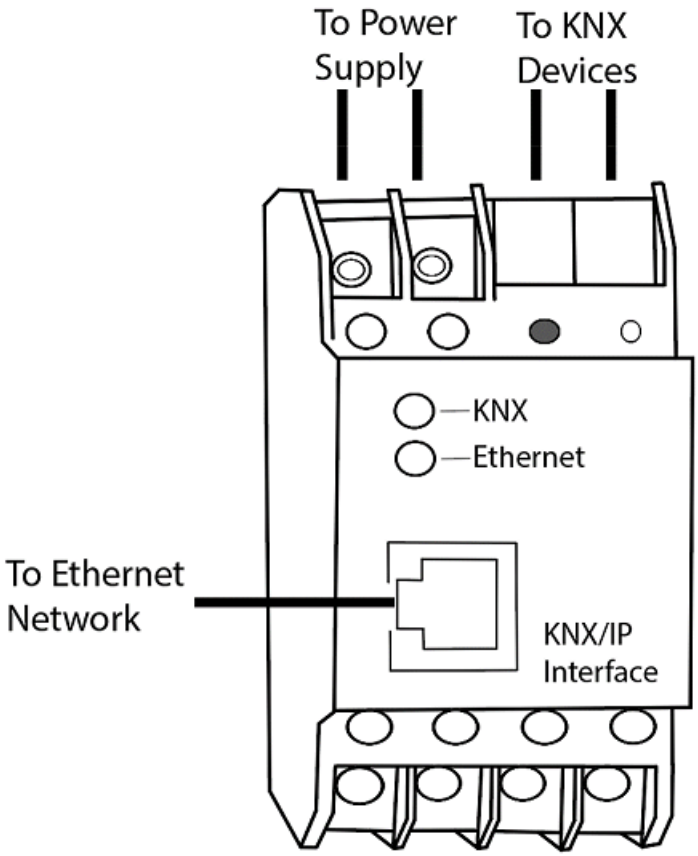


Wiring for KNX Protocol

1. Connect an Ethernet cable to the RJ-45, 8-pin Ethernet port shown in NCE25 physical features.
2. Connect another Ethernet cable to the port on the front of the KNX gateway (Figure 10).

   ⓘ **Note:** Depending on the size of your KNX network, you can use either a KNX Interface or KNX Router as an access point to the KNX network. The interface connects the network engine to a single KNX line, while the router acts as both an interface and a line coupler over Ethernet to connect the NCE to the network.

Figure 10: KNX/IP Interface Router



3. For a single KNX line, wire from the red and black terminals on the gateway to the devices. For multiple KNX lines, wire from the red and black terminals on each gateway to the devices on the same KNX line.

   Note: Specific cabling can vary depending on the topology and site. See Wiring rules for networks and field buses.

4. Wire each KNX gateway to its own dedicated power supply on the KNX line.

Wiring input and output terminals

NCE25 Series models support up to 33 hard-wired I/O points including:

- 7 BO points
- 4 CO points
- 4 AO points
- 8 BI points
- 10 UI points

See Figure 11, Figure 12, and Table 12 for more information.

I/O points are compatible with multiple types of input and output and most of the points are configured in the CCT software.

Figure 11: NCE25 series output terminal blocks, Binary output jumpers, and supply power terminal block as viewed from the top of an NCE25

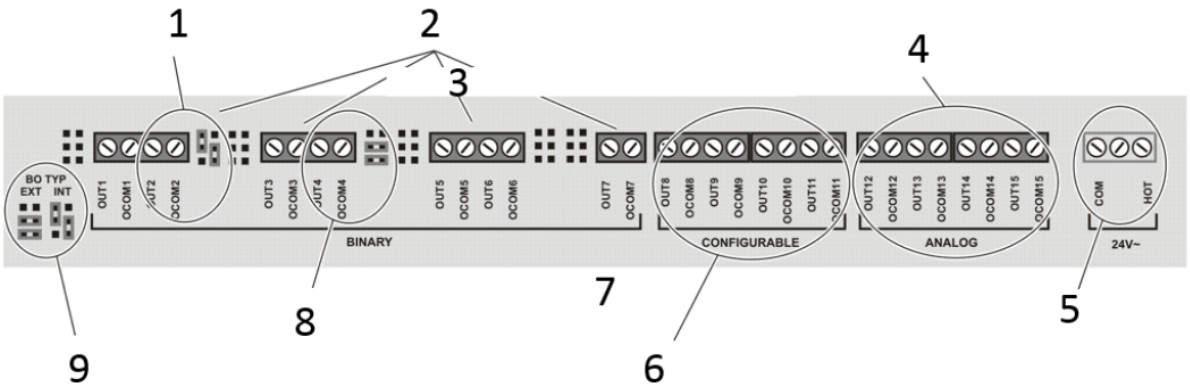


Table 10: Call-out table for NCE25 series output terminal blocks, binary output jumpers, and supply power terminal block as viewed from the top of an NCE25

Callout	Description
1	Binary output - Two jumpers positioned for an internal source of power.
2	Binary outputs are 24 VAC Triac outputs.
3	Back of NCE (Flush to mounting surface).
4	Analog outputs can be defined as: • Voltage Analog outputs (0-10 VDC) • Current Analog outputs (4-20 mA)
5	24 VAC, Class 2 supply power terminal block. The center terminal is not used.
6	Configurable outputs can be defined as the following: • Voltage Analog outputs (0-10 VDC) • Binary outputs (24 VAC Triac)
7	Front of NCE.
8	Binary output - Four jumpers positioned for an external source of power.
9	Required jumper positons for setting a Binary output's power source.

Figure 12: Universal input and Binary input terminal blocks as viewed from the bottom of an NCE25

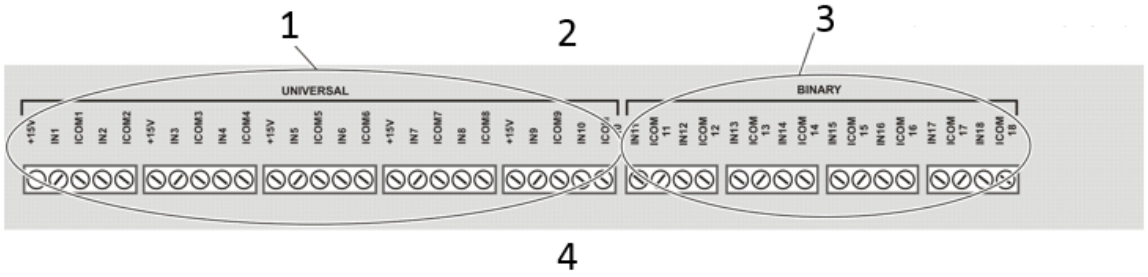


Table 11: Call-out table for Universal input and Binary input terminal blocks as viewed from the bottom of an NCE25

Callout	Description
1	Universal inputs can be defined as the following: • Voltage Analog inputs (0 -10 VDC) • Current Analog inputs (4-20 mA) • Resistive Analog inputs (0-2k Ohm) - RTD: 1k Nickel, 1k Platinum, or A99B SI - NTC: 10k Type L or 2.225k Type 2 • Dry contact Binary inputs
2	Front of NCE.
3	Binary inputs can be defined as: • Dry contact maintained • Pulse counter mode (50 Hz at 50% Duty Cycle)
4	Back of NCE (Flush to Mounting Surface)

Terminal functions, ratings, requirements, and wiring guidelines

Input and output wiring guidelines

Table 12 provides information and guidelines about the functions, ratings, and requirements for the NCE input and output terminals and references to guidelines for determining proper wire sizes and cable lengths.

In addition to the wiring guidelines in Table 12, observe these guidelines when wiring inputs and outputs:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- Ensure all input and output cables, regardless of wire size or number of wires, consist of stranded, insulated, and twisted copper wires.
- Shielded cable is not required for input or output cables.
- Shielded cable is recommended for input and output cables that are exposed to high electromagnetic or radio frequency noise.

Terminal wiring and cable length guidelines

Table 12: Terminal wiring

Terminal block label	Terminal labels	Function, ratings, and requirements	Determine wire size and maximum cable length
UNIVERSAL (Inputs)	**+15 V**	**15 VDC Power Source** for active (3-wire) input devices connected to the Universal IN*n* terminals. Provides 100 mA total current.	Same as Universal IN*n*. ⓘ **Note:** Use 3-wire cable for devices that source power from the +15 V terminal.
	IN*n*	**Analog Input - Voltage Mode (0–10 VDC)** 10 VDC maximum input voltage Internal 75k Ohms Pulldown.	See Guideline A in Table 13.
		Analog Input - Current Mode (4–20 mA) Internal 100 Ohms load Impedance.	See Guideline B in Table 13.

Table 12: Terminal wiring

Terminal block label	Terminal labels	Function, ratings, and requirements	Determine wire size and maximum cable length
		Analog Input - Resistive Mode (0–600k Ohms) Internal 12 V, 15k Ohms pull up. Qualified Sensors: 0–2k potentiometer, RTD (1k Nickel [Johnson Controls sensor], 1k Platinum, and A99B Silicon Temperature Sensor) NTC Sensor (10k Type L, 10k JCI Type II, 2.252k Type II).	See Guideline A in Table 13.
		Binary Input - Dry Contact Maintained Mode1 second minimum pulse width Internal 12 V, 15k Ohms pull up.	See Guideline A in Table 13.
	ICOM*n*	**Universal Input Common** for all Universal IN terminals ⓘ **Note:** All Universal ICOMn terminals share a common, which is isolated from all other commons.	Same as (Universal) **IN**n.
BINARY (Inputs)	**IN***n*	**Binary Input - Dry Contact Maintained Mode** 0.01 second min. pulse width. Internal 18 V, 3k Ohms pull up.	See Guideline A in Table 13.
		Binary Input - Pulse Counter Mode 0.01 second min. pulse width. (50 Hz at 50% duty cycle). Internal 18 V, 3k Ohms pull up.	
	ICOM*n*	**Binary Input Common** for all Binary Input (IN) terminals ⓘ **Note:** All Binary ICOMn terminals share a common, which is isolated from all other commons, except the CO common (OCOMn) when the CO is defined as an AO.	

Table 12: Terminal wiring

Terminal block label	Terminal labels	Function, ratings, and requirements	Determine wire size and maximum cable length
ANALOG (Outputs)	**OUT***n*	**Analog Output - Voltage Mode (0–10 VDC)** 10 VDC maximum output voltage. 10 mA maximum output current. Requires an external load of 1,000 Ohms or more. ⓘ **Note:** The AO operates in Voltage Mode when connected to devices with impedances greater than 1,000 Ohms. Devices that drop below 1,000 Ohms may not operate as intended for Voltage Mode applications.	See Guideline A in Table 13.
		Analog Output - Current Mode (4–20 mA) Requires an external load between 0–300 Ohms. ⓘ **Note:** The AO operates in Current Mode when connected to devices with impedances less than 300 Ohms. Devices that exceed Ohm may not operate as intended for Current Mode applications.	See Guideline B in Table 13.
	OCOM*n*	**Analog Output Signal Common** for all Analog OUT terminals ⓘ **Note:** All Analog OCOMn terminals share a common, which is isolated from all other commons.	Same as (Analog) OUTn.

Table 12: Terminal wiring

Terminal block label	Terminal labels	Function, ratings, and requirements	Determine wire size and maximum cable length
BINARY (Outputs) Power Selection Jumper positioned to External (**EXT**).	**OUT***n*	**Binary Output - 24 VAC Triac (External Power)** Connects OUTn to OCOMn when activated. External Power Source: 30 VAC maximum output voltage. 0.5 A maximum output current. 1.3 A at 25% duty cycle. Maximum 6 cycles/hour with M9220-BGx-3. 40 mA minimum load current.	See Guideline C in Table 13.
	OCOM*n*	**Binary Output Common** (for OUTn terminal) ⓘ **Note:** Each Binary Output common terminal (OCOMn) is isolated from all other commons, including other Binary Output commons.	
BINARY (Outputs) Power Selection Jumper positioned to Internal (INT).	**OUT***n*	**Binary Output - 24 VAC Triac** (Internal Power) Sources internal 24 VAC power (24~ HOT).	See Guideline C in Table 13.
	OCOM*n*	**Binary Output - 24 VAC Triac** (Internal Power) Connects OCOMn to 24~ COM when activated. Internal Power Source: 30 VAC maximum voltage to load. 0.5 A maximum output current. 1.3 A at 25% duty cycle. Maximum 6 cycles/hour with M9220-BGx-3. 40 mA minimum load current.	

Table 12: Terminal wiring

Terminal block label	Terminal labels	Function, ratings, and requirements	Determine wire size and maximum cable length
CONFIGURABLE (Outputs)	**OUT***n*	**Analog Output - Voltage Mode (0–10 VDC)** 10 VDC maximum output voltage. 10 mA maximum output current. Requires an external load of 1000 Ohms or more.	See Guideline A in Table 13.
		Binary Output 24 VAC Triac Connects OUT to OCOM when activated. External Power Source: 30 VAC maximum voltage to load. 0.5 A maximum output current. 1.3 A at 25% duty cycle. Maximum 6 cycles/hour with M9220-BGx-3. 40 mA minimum load current.	See Guideline C in Table 13.
	OCOM*n*	**Analog Output Signal Common**: All Configurable Outputs defined as Analog Outputs share a common, which is isolated from all other commons except the Binary Input common. **Binary Output Signal Common**: All Configurable Outputs defined as Binary Outputs are isolated from all other commons, including other Configurable Output commons.	Same as (Configurable) **OUT**n.

The following table defines cable length guidelines for the various wire sizes can may be used for input and output wiring.

Table 13: Cable length guidelines for recommended wire sizes

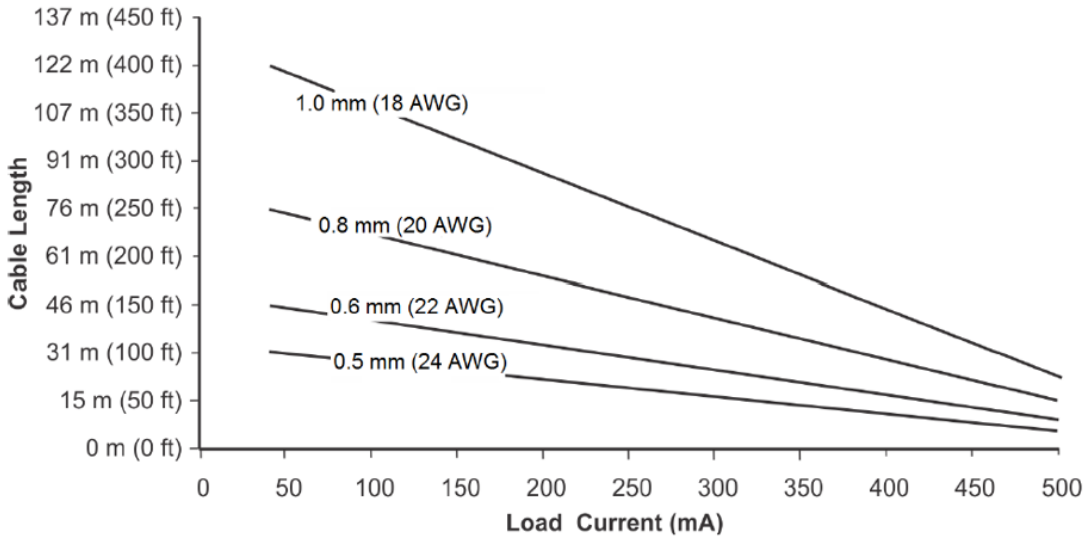
Guideline	Wire size/gauge and type	Maximum cable length and type	Assumptions
A	1.0 mm (18 AWG) stranded copper	457 m (1,500 ft) twisted wire	100 mV maximum voltage drop Depending on the cable length and the connected input or output device, you may have to define an offset in the setup software for the input or output point.
	0.8 mm (20 AWG) stranded copper	297 m (975 ft) twisted wire	
	0.6 mm (22 AWG) stranded copper	183 m (600 ft) twisted wire	
	0.5 mm (24 AWG) stranded copper	107 m (350 ft) twisted wire	
B	1.0 mm (18 AWG) stranded copper	229 m (750 ft) twisted wire	100 mV maximum voltage drop Depending on the cable length and the connected input or output device, you may have to define an offset in the setup software for the input or output point.
	0.8 mm (20 AWG) stranded copper	137 m (450 ft) twisted wire	
	0.6 mm (22 AWG) stranded copper	91 m (300 ft) twisted wire	
	0.5 mm (24 AWG) stranded copper	61 m (200 ft) twisted wire	
C	See Figure 13 to select wire size/ gauge. Use stranded copper wire.	See Figure 13 to determine cable length. Use twisted wire cable.	N/A

Maximum cable length versus load current

In most cases inputs/outputs with cables less than 30 m (100 ft) do not require an offset in the software setup. Cable runs over 30 m (100 ft) may require an offset in the input/output software setup.

Use Figure 13 to estimate the maximum cable length relative to the wire size and the load current (in mA) when wiring inputs and outputs.

Figure 13: Maximum wire length by current and wire size



Communications Bus and supply terminal blocks, functions, ratings, requirements, and cables

Table 14: Communications bus and supply terminal blocks, functions, ratings, requirements, and cables

Terminal block/port label	Terminal labels	Function, electrical ratings/requirements	Recommended cable type
FC BUS	+ –	FC Bus Communications	0.6 mm (22 AWG) stranded, 3-wire twisted, shielded cable recommended
	COM	Signal Reference (Common) for bus communications	
	SHLD	Isolated terminal (optional shield drain connection)	
FC Bus (port)		6-Position Modular Connector provides: • FC Bus Communications • FC Bus Signal References and 15 VDC Common • 15 VDC Power for Wireless Commissioning • Converter or ZFR1811 Wireless Router	Wireless Commissioning Converter retractable cable or 24 AWG 3-pair CAT 3 Cable <30.5 m (100 ft)
SA BUS	+ –	SA Bus Communications	0.6 mm (22 AWG) stranded, 3-wire
	COM	SA Bus Signal Reference and 15 VDC Common	

Table 14: Communications bus and supply terminal blocks, functions, ratings, requirements, and cables

Terminal block/port label	Terminal labels	Function, electrical ratings/requirements	Recommended cable type
	SA PWR	15 VDC Supply Power for Devices on the SA Bus (Maximum total current draw for SA Bus is 240 mA.)	twisted, shielded cable recommended ⓘ **Note:** The + and - wires are one twisted pair and the COM and SA PWR are the second twisted pair of wires.
SA BUS (Port)		6-Position Modular Connector provides: • SA Bus Communications • SA Bus Signal References and 15 VDC Common • 15 VDC Power for devices on the SA Bus and • Wireless Commissioning Converter	24 AWG 3-pair CAT 3 Cable <30.5 m (100 ft)
24~	HOT	**24 VAC Power Supply - Hot** Supplies 20-30 VAC (Normal 24 VAC)	0.8 mm to 1.5 mm (20 to 16 AWG) 2-wire
	COM	**24 VAC Power Supply Common** (Isolated from all other Common terminals on controller)	

ⓘ **Note:**

- See Table 13 to determine wire size and cable lengths for cables other than the recommended cables.
- The SA Bus and FC Bus wiring recommendations in this table are for MS/TP bus communications at 38.4k baud. For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034).*

FC and SA Bus and supply power wiring guidelines

Table 14 provides information about the functions, ratings, and requirements for the NCE communication bus and supply power terminals, and guidelines for wire sizes, cable types, and cable lengths when wiring the communication buses and supply power.

In addition to the guidelines in Table 14, observe these guidelines when wiring the SA/FC Buses and supply power:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- Use twisted, insulated, stranded copper wire for all FC and SA Bus cables, regardless of wire size.
- Shielded cable is strongly recommended for all FC and SA Bus cables.
- Refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)* for detailed information regarding wire size and cable length requirements for the FC and SA buses.

Setup and adjustments

Data protection battery

The battery is pre-installed and connected in the network engine when shipped. Do not disconnect the battery for any reason other than to replace a defective battery.

➤ **Important:** If you are installing a new battery for the first time or you are replacing the battery, disconnect the power from the NCE25 prior to inserting a new battery.

The 24 VAC supply power to the network engine 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.

With the 24 VAC supply power, the battery slowly loses charge. If the battery completely loses charge, the network engine real-time clock stops.

Whenever a network engine is disconnected from 24 VAC power for over 30 days, ensure that the real-time clock is set properly and that the network engine and there is enough power to recharge the data protection battery.

Powering on the network engine

After applying 24 VAC power, the network engine requires approximately five minutes to become operational. See LED Test Sequence at Startup.

Startup is complete and the network engine is operational when the green RUN LED is On steady and the red FAULT LED is Off (Figure 16).

➤ **Important:** Wait for the network engine to complete the start-up sequence and the RUN LED to go On steady before initiating any other action on the network engine.

Disconnecting power from the network engine

When 24 VAC supply power to a network engine is disconnected or lost, the network engine is nonoperational, but the POWER LED (Figure 16) remains on and the data protection battery continues to power the network engine for several (approximately one to eight) minutes while volatile data is backed up in nonvolatile memory. The RUN LED goes off when data backup and shutdown is complete.

➤ **Important:** You must install and charge the data protection battery 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 MS/TP FC Bus rules section for more information on EOL requirements on an FC Bus.

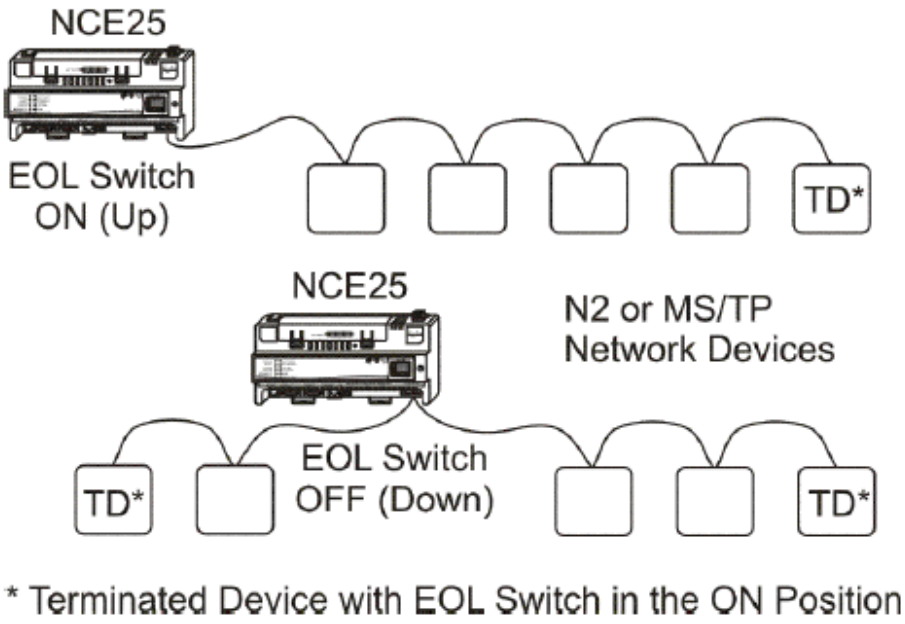
N2 Bus applications are self terminating and have no EOL setting. See the N2 Bus rules section for more information on EOL requirements on an N2 Bus.

The NCE25 models that support MS/TP FC Bus applications or N2 Bus applications have an EOL switch, which must be set according to the position of the NCE on the FC Bus or N2 Bus segment. The NCE25 is shipped with the EOL switch in the factory default, ON (up) position (Figure 14).

Figure 14: FC bus EOL switch in the factory default ON (Up) position

See the following figure to determine the appropriate EOL switch setting for the NCE in your field bus application.

Figure 15: EOL switch setting relative to NCE position on the N2 Bus or FC bus segment



Setting the network and device addresses

You must assign a new IP network address to the NCE25, so it can communicate on the IP Ethernet network. The network engine MAC address on a label on the housing.

The network engine is always the SA Bus supervisor and, therefore, always has a fixed device address of 0 on the SA Bus.

The supervisory controller on NCE25 models that support an (MS/TP) FC Bus is always an FC Bus supervisor and has a fixed device address of 0 on the FC Bus. The field controllers in all the NCE25 models have fixed device addresses of 4 on the network engine FC Bus.

Refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)* for more information on device addresses on (MS/TP) FC Buses and SA Buses.

NCE25 models that support an N2 Bus are always bus supervisors on the N2 Bus. They do not require a user assigned device address to communicate on the N2 Bus.

NCE25 models that support a LONWORKS network trunk have a unique LONWORKS address that is factory-assigned as part of the integral LONWORKS Neuron® chip on the NCE252x Type models. You do not need to assign a LONWORKS device address to an NCE25 on LONWORKS applications.

Binary output source power selection jumpers

The BO source power selection jumpers determine whether a BO provides internal power (sourced from the network engine) to the output load (INT position) or requires an external power source (EXT position) for the output load. Figure 11 shows an example of the NCE controller BOs and the associated power selection jumpers next to the BO terminal blocks.

Position the jumpers next to the BO terminals to provide either internal 24 VAC power to the BO load or act as a switch for an externally powered BO. Each NCE25 BO wired in an application must have the jumpers positioned properly for the application. See Figure 11.

➤ **Important:** Do not connect an external power source to a BO when the BO power source jumper is in the internal power (INT) position. Connecting external power to a BO that sources internal power can damage the controller and void any warranties.

Display screen and display navigation keypad

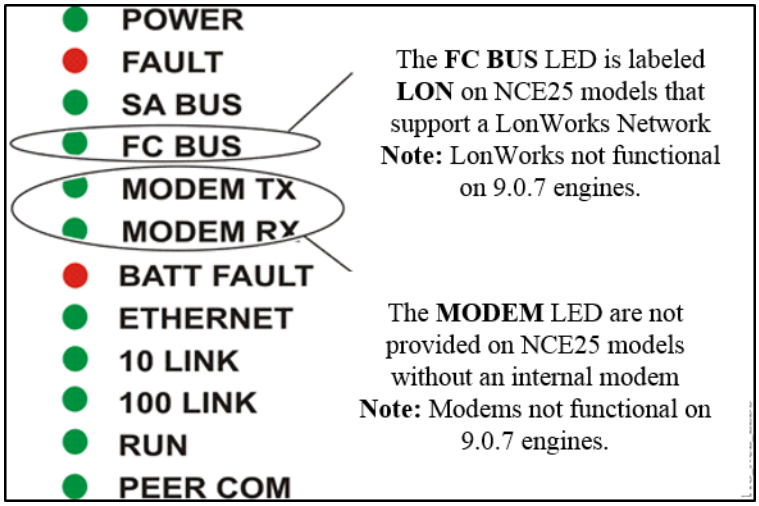
Specified NCE25 models feature an integral display screen and display navigation keypad. Use these features to can view and edit the I/O points settings on the network engine. See Figure 3. Refer to the *DIS1710 Local Controller Display Technical Bulletin (LIT-12011270)* for more information on using the display screen and keypad.

Troubleshooting

LED status indicators

The NCE25 models have up to 11 LEDs (depending on model) to indicate power and network communication status. Figure 16 shows the LEDs and Table 15 describes the LED indications.

Figure 16: NCE/NIE LED designations



LED test sequence at startup

During startup, the network engine automatically initiates an LED test to verify the operational status of the LEDs. When you turn on the NCE, the following LED lighting sequence occurs:

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

The total time to start up the network engine depends on the size of the database and can take several minutes.

Table 15: LED designations, normal status, and descriptions

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.

Table 15: LED designations, normal status, and descriptions

LED designation	Normal status	Descriptions/other conditions
FAULT (Red)	Off steady	Off Steady = Normal operation. On Steady = General Fault. CCT application may be corrupted or missing. Some FAULT conditions are user-configurable in the *Metasys* software. Pre-configured fault conditions include excessive CPU flash or memory use, excessive board temperature. Blink - 2 Hz = Download or Startup in progress, not ready for normal operation. Blink Rapidly - 5 Hz = One or more defined SA Bus devices are offline. Check SA Bus devices for problems, including low batteries on wireless sensor.
SA BUS (Green)	Blinking	Blinking - 5 Hz = Data Transmission (normal communication) Off Steady = No Data Transmission On Steady = Communication lost, waiting to join communication ring
FC BUS or LON (Green)	Flicker	Flicker = Normal communications; the FC Bus or LON network is transmitting and receiving data. Flickers are generally synchronized with data transmission but do not use them to indicate specific transmission times. Off Steady = No field controllers are defined on FC Bus or LON network in the network engine. This LED is always OFF on LON models with 9.0.7 software.
MODEM RX	Flicker	Flicker = NCE modem is connected and receiving data. (Not functional on 9.0.7 engines.)
MODEM TX	Flicker	Flicker = NCE modem is connected and transmitting data. (Not functional on 9.0.7 engines.)
BATT FAULT (Red)	Off steady	On Steady = Battery defective. Flicker = Data Protection Battery is not installed. Connect or install battery.
ETHERNET (Green)	Flicker	Flicker = Data is transferring on the Ethernet connection. Ethernet traffic is general traffic (may not be traffic to or from the network engine). Off Steady = No Ethernet traffic, probably indicates a dead Ethernet network or bad Ethernet connection.
10 LINK (Green)	On steady (10 Mbps network)	On Steady = Ethernet connection is established at 10 Mbps.
100 LINK (Green)	On steady (100 Mbps network)	On Steady = Ethernet connection is established at 100 Mbps.

Table 15: LED designations, normal status, and descriptions

LED designation	Normal status	Descriptions/other conditions
RUN (Green)	On steady	On Steady = NCE software is running. On 1 second, Off 1 second = NCE or NIE software is in startup mode. On 0.5 seconds, Off 0.5 seconds = NCE or NIE software is shutting down. Off Steady = Operating system is shutting down or software is not running.
PEER COM (Green)	Varies	Flicker = Data traffic between network engines. For an NCE or NIE that is not a Site Director, this LED indicates regular heartbeat communications with the Site Director. For a single NCE or NIE on a network without an ADS, there is no flicker.

Accessories

Table 16: NCE25 Accessories Ordering Information

Product Code Number	Description
MS-BAT1020-0	Replacement data protection battery for the NCE25. Rechargeable NiMH battery: 3.6 V 500 mAh, with a typical life of five to seven years at 21°C (70°F).
TL-MAP1810-xx	Pocket-sized web server that provides a wireless mobile user interface to *Metasys* field controllers, thermostats, and smart rooftop units. Refer to the *Mobile Access Portal Gateway Catalog Page (LIT-1900869)* to identify the appropriate product for your region.
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 DIS1710 display does not operate on NCE models that have an integral controller display.
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-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.

ⓘ **Note:**

- Additional Y60 Series transformers are also available.

- The transformers specified here are for North America only. In Europe, you must use an SELV transformer purchased locally.

Table 17: M-Bus accessories ordering information

Product code number	Description
SIS-MBUSRPLL-0E	RS232-to-M-Bus level repeater for up to 100 unit loads; 24 VAC/VDC
SIS-MBUSRPLH-0E	RS232-to-M-Bus level repeater for up to 100 unit loads; 230 VAC
SIS-MBUSNCLL-0E	IP-to-M-Bus level converter for up to 100 unit loads; 24 VAC/VDC
SIS-MBUSNCLH-0E	IP-to-M-Bus level converter for up to 100 unit loads; 230 VAC
INT-DX-KAB01	Optional connection cable SUB-D to RJ-12 for use with SISMBUSSCLL-0E

Modbus Integrations require one or more vendor model definition (VMD) tables for specific third-party equipment. You can purchase tables from your regional System Integration Services (SIS) office, or you can create the tables with the VMD Generator Express (VGE) tool. The VGE tool requires certification and licensing for its use. To obtain a license, attend the training listed in the following table.

Table 18: VGE Tool Training Registration

Product Code Number	Description
C-10077	The VGE Tool Software Training (North America). The VGE tool is required to generate custom Modbus mapping tables.
PTK-CONT-25	The VGE Tool Software Training (Europe and Asia). The VGE tool is required to generate custom Modbus mapping tables.

Repair information

If you replace a network engine for any reason or add a new network engine to a site, you must update the site registration to ensure that the new network engine is recognized and able to communicate.

Except for replacing the data protection battery, the NCE25 cannot be repaired in the field. You must replace the NCE if it fails to operate. Contact your local Johnson Controls representative.

ⓘ **Note:** Batteries removed from this device must be recycled or disposed of in accordance with local, national, and regional regulations. Only use certified technicians or qualified building maintenance personnel to service Johnson Controls® products.

Ordering information

The following table lists the product code numbers for all available NCE25 network engines based on model. If you receive an NCE25 engine from the factory that is imaged with Release 9.0, you can field-upgrade the engine to Release 9.0.7 if the upgrade is supported, but modem and pager functionality is lost. For details, refer to the following table.

ⓘ **Note:** Some NCE models are also available in a Buy American version (add a **G** after the product code number). For the European version, add an **E** after the product code number. For repair parts, add **-703** after the product code number.

Table 19: NCE25 Ordering Information

Product Code Number	Release Supported	Description
MS-NCE25xx-x (Base Features on Each NCE25)	N/A	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. Supports BACnet IP network.
MS-NCE2500-0 (Europe only)	9.0.7	Base features with no physical field controller trunk connection.
MS-NCE2506-0 (Europe only)	9.0.7	Base features with no physical field controller trunk connection. Includes integral display screen.
MS-NCE2510-0	9.0.7	Supports two third-party trunks (Modbus RTU or TCP, M-Bus, or KNX) and one N2 Bus. The number of supported devices on the third-party trunk depends on the protocol. For the N2 Bus, up to 32 devices are supported.
MS-NCE2511-0	9.0.7[1]	Supports two third-party trunks (Modbus RTU or TCP, M-Bus, or KNX) and one N2 Bus. The number of supported devices on the third-party trunk depends on the protocol. For the N2 Bus, up to 32 devices are supported. Includes internal modem. ⓘ **Note:** Modem and pager functions are no longer available if this engine is updated with *Metasys* Release 9.0.7 or later.
MS-NCE2516-0	9.0.7	Supports two third-party trunks (Modbus RTU or TCP, M-Bus, or KNX) and one N2 Bus. The number of supported devices on the third-party trunk depends on the protocol. For the N2 Bus, up to 32 devices are supported. Includes integral display screen.

Table 19: NCE25 Ordering Information

Product Code Number	Release Supported	Description
MS-NCE2517-0	9.0.7[1]	Supports two third-party trunks (Modbus RTU or TCP, M-Bus, or KNX) and one N2 Bus. The number of supported devices on the third-party trunk depends on the protocol. For the N2 Bus, up to 32 devices are supported. Includes integral display screen and internal modem. ⓘ **Note:** Modem and pager functions are no longer available if this engine is updated with *Metasys* Release 9.0.7 or later.
MS-NCE2520-0	9.0	Supports one LonWorks trunk with up to 32 LonWorks devices.
MS-NCE2521-0	9.0	Supports one LonWorks trunk with up to 32 LonWorks devices. Includes internal modem.
MS-NCE2526-0	9.0	Supports one LonWorks trunk with up to 32 LonWorks devices. Includes integral display screen.
MS-NCE2527-0	9.0	Supports one LonWorks trunk with up to 32 LonWorks devices. Includes integral display screen and internal modem.
MS-NCE2560-0	9.0.7	Supports two third-party trunks (Modbus RTU or TCP, M-Bus, or KNX) and one MS/TP Bus. The number of supported devices on the third-party trunk depends on the protocol. For the MS/TP bus, up to 32 devices are supported.
MS-NCE2561-0	9.0.7[1]	Supports two third-party trunks (Modbus RTU or TCP, M-Bus, or KNX) and one MS/TP Bus. The number of supported devices on the third-party trunk depends on the protocol. For the MS/TP bus, up to 32 devices are supported. Includes internal modem. ⓘ **Note:** Modem and pager functions are no longer available if this engine is updated with *Metasys* Release 9.0.7 or later.
MS-NCE2566-0	9.0.7	Supports two third-party trunks (Modbus RTU or TCP, M-Bus, or KNX) and one MS/TP Bus. The number of supported devices on the third-party trunk depends on the protocol. For the MS/TP bus, up to 32 devices are supported. Includes integral display screen.
MS-NCE2567-0	9.0.7[1]	Supports two third-party trunks (Modbus RTU or TCP, M-Bus, or KNX) and one MS/TP Bus. The number of supported devices on the third-party trunk depends on the protocol. For the MS/TP bus, up to 32 devices are supported. Includes integral display screen and internal modem. ⓘ **Note:** Modem and pager functions are no longer available if this engine is updated with *Metasys* Release 9.0.7 or later.

1 This model is imaged with Release 9.0 at the factory but can be field-upgraded to Release 9.0.7.

Technical specifications

Table 20: NCE25

Power Requirement	Dedicated nominal 24 VAC, Class 2 power supply (North America), 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 BOs. BO devices connected to and powered by an NCE can require an additional 125 VA (maximum).
Power Source	+15 VDC power source terminals provide 100 mA total current; quantity of inputs: five, located in Universal IN terminals; for active (3-wire) input devices
Ambient Operating Conditions	0°C to 50°C (32°F to 122°F), 10 to 90% RH, 30°C (86°F) maximum dew point
Ambient Storage Conditions	-40°C to 70°C (-40°F 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 five to seven 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 SDRAM for operations data dynamic memory **Field Controller:** 1 MB flash memory and 1 MB RAM
Operating System	Release 9.0: Microsoft® Windows Embedded CE 6.0 Release 9.0.7: Buildroot 2017.08.2 with Linux kernel 14.4 ⓘ **Note:** The Windows Embedded OS sticker on the bottom of the network engine permits downgrading the engine to an older *Metasys* release that uses a Windows Embedded OS.

Table 20: NCE25

Network and Serial Interfaces (Depending on the NCE model.)	• One Ethernet port; 10/100 Mbps; 8-pin RJ-45 connector • One optically isolated RS-485 SA Bus port; with a pluggable and keyed 4-position terminal block (on all NCE25 models) • 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) • One LonWorks port; FTT10 78 Kbps; pluggable, keyed 3-position terminal block (only on NCE25 models that support a LonWorks Network trunk). The LonWorks models are supported to run the *Metasys* Release 9.0 software, **but not the Release 9.0.7 update.** • One RS-232-C serial port with a standard 9-pin sub-D connector that supports standard baud rates • One USB serial port with a standard USB connector that supports an optional, user-supplied external modem. Modem functions are available with *Metasys* Release 9.0, but **are not** available after the NCE is updated with Release 9.0.7. • Option: One telephone port for the internal modem; up to 56 Kbps; 6-pin modular connector (NCE models with an optional internal modem have one RS-232-C serial port only; not supported for an engine with Release 9.0.7).
Analog Input/Analog Output Point Resolution	• Analog Input Points: 16-bit resolution • Analog Output Points: 16-bit resolution and ±200 mV accuracy on 0-10 VDC applications
Input/Output Capabilities	• 10-Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact • 8-Binary Inputs: Defined as Dry Contact Maintained or Pulse/ Accumulator Mode • 4-Analog Outputs: Defined as 0–10 VDC or 4–20 mA • 7-Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power) • 4-Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO
Dimensions (Height x Width x Depth)	155 mm x 270 mm x 64 mm (6.1 in. x 10.6 in. x 2.5 in.), minimum mounting space required: 250 mm x 370 mm x 110 mm (9.8 in. x 14.6 in. x 4.3 in.)
Housing	Plastic housing Plastic material: ABS and polycarbonate Protection: IP20 (IEC60529)
Mounting	On a flat surface with screws, on three mounting clips, or a single 35 mm DIN rail
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

Table 20: NCE25

CE	**Canada:** UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003
	Europe: CE Mark - Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BTL 135-2010 Listed B-BC at *Metasys* system Release 8.1

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.

Points of single contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIJANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

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 may cause harmful interference, in which case the users will be required to correct the interference at their 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.

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