

NS Series CO₂ Network Sensors

Installation Instructions

NS-BCN7004-0, NS-BCN7004-2

Part No. 24-10424-6, Rev. E
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Applications

The NS Series CO₂ Network Sensors are electronic zone sensors designed to function directly with Johnson Controls® BACnet® MS/TP digital controllers in Heating, Ventilating, and Air Conditioning (HVAC) systems.

These sensors monitor room carbon dioxide (CO₂). This data is transmitted to a field controller on the Sensor Actuator (SA) Bus.

Applications include Demand Control Ventilation (DCV) with fresh air and Indoor Air Quality (IAQ), as part of a system to meet ANSI/ASHRAE Standard 62.1-2010 *Ventilation for Acceptable Indoor Air Quality*. For DCV applications, fresh air is brought into a zone based on the concentration levels of CO₂.

The NS Series CO₂ Network Sensors include DIP switches to set a unique address in averaging applications. The wires connecting the network sensor to the controller can be terminated using either a modular jack or screw terminal block, offering wiring flexibility.

The NS Series CO₂ Network Sensors include an SA Bus access port for connecting accessories to access the SA Bus. This feature allows a technician to commission or service the controller via the network sensor.

IMPORTANT: The NS Series CO₂ Network Sensors are intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the network sensor 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 network sensor.

IMPORTANT : Le NS Series CO₂ Network Sensors est destiné à transmettre des données entrantes à un équipement dans des conditions normales de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du network sensor 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 network sensor.

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.

Installation

Special Tools Needed

A 1/16 in. (1.5 mm) Allen wrench or a Johnson Controls T-4000-119 Allen-Head Adjustment Tool is required during installation.

Mounting

Note: The NS Series CO₂ Network Sensors are intended to be mounted on a vertically roughed-in wallbox only; do not attempt to mount the network sensor on a horizontally roughed-in wallbox.

Location Considerations

Locate the network sensor:

- on a partitioning wall, approximately 5 ft (1.5 m) above the floor in a location of average temperature
- away from direct sunlight, radiant heat, outside walls, outside doors, air discharge grills, or stairwells; and from behind doors
- away from steam or water pipes, warm air stacks, unconditioned areas (not heated or cooled), or sources of electrical interference

Note: The network sensor is shock and vibration resistant; however, be careful not to drop the unit or mount it where it could be exposed to excessive vibration.

The following ambient operating conditions apply:

- Temperature: 32 to 104°F (0 to 40°C)
- Humidity: 10 to 90% Relative Humidity (RH), noncondensing; 85°F (29°C) maximum dew point

To mount the network sensor to a wallbox:

1. Use a 1/16 in. (1.5 mm) Allen wrench or Johnson Controls T-4000-119 Allen-Head Adjustment Tool to loosen the security screw on the top of the unit.
2. Insert a coin into the slot next to the security screw location, pressing the tab that keeps the unit closed. Then carefully pry the top edge of the sensor assembly away from its mounting base and remove.

IMPORTANT: Do not insert tools into the housing. Be careful not to damage any components when pushing on the tab.

IMPORTANT: Do not remove the Printed Circuit Board (PCB). Removing the PCB voids the product warranty.

Pull out approximately 6 in. (152 mm) of cable from the wallbox, and insert the cable through the hole in the mounting base.

3. Align the mounting base on the wallbox.

Note: Confirm that the mounting base is positioned with the proper edge up. The mounting base is positioned properly when the security screw is located on the top edge of the base.

4. Secure the mounting base to the wallbox using the appropriate mounting hardware (field furnished).
5. Wire the network sensor as follows:

SA Bus Wiring: For the modular jack, simply snap the wiring plug into the jack. See Figure 1 for modular jack pin number assignments. A modular jack requires a straight-through, one-to-one connection (not a crossover). For the screw terminal block, wire the unit as illustrated in Figure 2.

Note: Connect to the SA Bus using either the screw terminal block or the modular jack. Do not use both.

24-Volt Supply Wiring: Connect the 24 VAC/VDC, Class 2 power supply required by the NS Series CO₂ Network Sensors to the HOT and COM screw terminal block, whether using the screw terminal block or modular jack for the SA Bus connection.

IMPORTANT: Do not connect the 24 power common to the SA Bus common. The SA Bus common is an isolated signal common.

For more details on wiring and distance guidelines for the MS/TP Communications Bus, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.



CAUTION: Risk of Electric Shock.

Disconnect the power supply before making electrical connections to avoid electric shock.

MISE EN GARDE : Risque de décharge électrique.

Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.

IMPORTANT: Failure to adhere to these wiring details causes the network sensor to function incorrectly. You will not be able to connect to the system using the wireless commissioning converter or the handheld Variable Air Volume (VAV) balancing tool, and you will not be able to expand the system with future offerings.

6. Align the tabs on the bottom edge of the mounting base with the slots on the bottom edge of the network sensor assembly, and rotate the assembly onto its mounting base.

Note: For the screw terminal block, be certain that the terminal block pins align with the holes in the terminal block.

7. Use a 1/16 in. (1.5 mm) Allen wrench or Johnson Controls T-4000-119 Allen-Head Adjustment Tool to tighten the security screw and fasten the network sensor assembly to the mounting base.

Note: Do not overtighten the security screw; doing so may damage the unit.

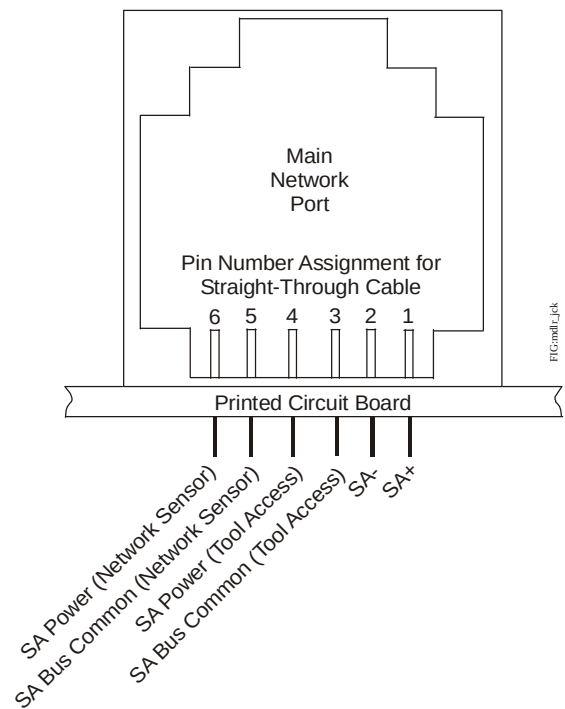


Figure 1: Modular Jack Pin Number Assignments

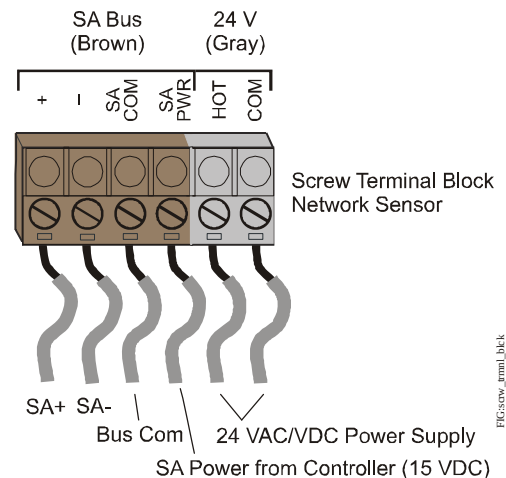


Figure 2: Wiring to the Screw Terminal Block

8. Use the Metasys® Controller Configuration Tool (CCT) or Facility Explorer Programmable Controller Tool (FX-PCT) software to commission the network sensor. Refer to the Controller Tool Help (LIT-12011147) for more details.

Setup and Adjustments

Network Sensor Addressing

Table 1 lists the available DIP switch addresses and the DIP switch settings required to obtain them.

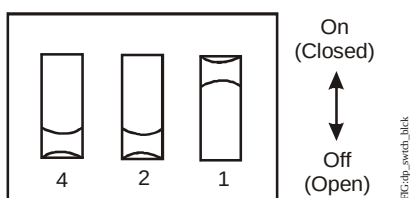


Figure 3: Setting the DIP Switch Block

Table 1: Setting the DIP Switch Address

Available DIP Switch Addresses	DIP Switch Settings		
	Switch 4	Switch 2	Switch 1
212	Off (Open)	Off (Open)	Off (Open)
213	Off (Open)	Off (Open)	On (Closed)
214	Off (Open)	On (Closed)	Off (Open)
215	Off (Open)	On (Closed)	On (Closed)
216	On (Closed)	Off (Open)	Off (Open)
217	On (Closed)	Off (Open)	On (Closed)
218	On (Closed)	On (Closed)	Off (Open)
219	On (Closed)	On (Closed)	On (Closed)

CO₂ Altitude Compensation

The Johnson Controls NS Series CO₂ Network Sensors ship from the factory calibrated for an altitude range of 0 to 2,000 ft (0 to 600 m) without compensation.

For altitudes above 2,000 ft (600 m) where optimum accuracy of the CO₂ concentration measurement is essential, modify the Offset property of the NS Series CO₂ Network Sensors (Zone Quality [ZN-Q] Analog Input [AI]). The Offset represents the local atmospheric pressure in hectopascals (hPa). Set the Offset to the known local pressure or use the local altitude value listed in Table 2. The factory default value is 978 hPa.

As of Release 5.3, the NS Series CO₂ Network Sensors (Zone Quality [ZN-Q] Analog Input [AI]) in the CCT and FX-PCT software automatically change the hPa value entered from Table 2 into the correct Offset value. The Offset value for the SA Bus device is labeled ppm; however, it is the proper field to enter the hPa value found in Table 2. Refer to the Controller Tool Help (LIT-12011147) for more details.

Note: Enter the pressure value only in units of hPa. The sensor reads the value entered as hectopascals. The CO₂ Present Value may require several minutes to settle after changing the Offset value.

Table 2 lists local altitude values.

Table 2: CO₂ Altitude Compensation

Altitude Above Sea Level		Absolute Pressure	
Feet	Meters	in. Hg	hPa
-656	-200	30.6	1,038
0	0	29.9	1,013
656	200	29.2	989
1,312	400	28.5	966
1,969	600	27.9	943
2,625	800	27.2	921
3,281	1,000	26.5	899
3,937	1,200	25.9	877
4,593	1,400	25.3	856
5,249	1,600	24.7	835
5,906	1,800	24.1	815
6,562	2,000	23.5	795
7,218	2,200	22.9	775
7,874	2,400	22.3	756
8,530	2,600	21.8	738
9,186	2,800	21.2	719
9,843	3,000	20.7	701

Reset

If the NS Series CO₂ Network Sensors need a reset, cycle the 24-volt power supply. The 15-volt SA Bus power does not require cycling.

Repair Information

If the NS Series CO₂ Network Sensor fails to operate within its specifications, replace the unit. For a replacement network sensor, contact the nearest Johnson Controls representative.

Technical Specifications

NS Series CO₂ Network Sensors (Part 1 of 2)

Supply Voltage	Non-isolated: 20 to 30 VAC (18 to 30 VDC), Class 2 or Safety Extra-Low Voltage (SELV)
	Isolated: 9.8 to 16.5 VDC; 15 VDC Nominal (From SA Bus)
Current Consumption	Non-isolated: 22 mA Average at 24 VAC; 28 mA Average at 24 VDC
	Isolated: 5 mA Maximum, Non-transmitting (From SA Bus)
Power Consumption	Non-isolated: Less Than 0.7 W Average
Terminations	Non-isolated Supply: Screw Terminal Block
	SA Bus: Modular Jack or Screw Terminal Block
Sensor Addressing	DIP Switch Set from 212 to 219; Factory Set at 212
Wire Size	Modular Jack: 24 or 26 AWG (0.5 or 0.4 mm Diameter); Three Twisted Pair (Six Conductors)
	Screw Terminal Block: 18 to 22 AWG (1.0 to 0.6 mm Diameter); 22 AWG (0.6 mm Diameter) Recommended
Communication Rate	Auto-Detect: 9.6k, 19.2k, 38.4k, or 76.8k bps
CO ₂ Measurement Range	0 to 2,000 ppm
CO ₂ Sensing Accuracy	Plus or Minus the Sum of 40 ppm and 2.0% of the CO ₂ Reading at 77°F (25°C) and 978 hPa or an Altitude of 1,000 ft/300 m Note: All accuracy specifications reflect the testing of the device using high-grade certified gases. This device is intended for an altitude range of 0 ft/0 m to 2,000 ft/600 m above sea level without compensation.
	Temperature Dependence of Output: -0.35% of the CO ₂ Reading per 1.8F°/1C° Typical
	Pressure Dependence of Output: +0.15% of the CO ₂ Reading per 1 hPa Typical
CO ₂ Sensing Resolution	1 ppm
CO ₂ Sensing Response Time	1 Minute (0 to 90%)
CO ₂ Sensing Warm-Up Time	Less Than 1 Minute; Less Than 10 Minutes for Full Accuracy
CO ₂ Sensing Long-Term Stability	Less Than ±100 ppm Over 5 Years
Mounting	Surface-Mounted or Vertical Wallbox-Mounted: 120 x 80 mm
Ambient Conditions	Operating: 32 to 104°F (0 to 40°C); 10 to 90% RH, Noncondensing; 85°F (29°C) Maximum Dew Point; 700 to 1,200 hPa
	Storage: -40 to 158°F (-40 to 70°C); 5 to 95% RH, Noncondensing

NS Series CO₂ Network Sensors (Part 2 of 2)

	Compliance BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Smart Sensor (B-SS)
	United States: UL Listed, File E107041, CCN PAZX, Under UL 916, Energy Management Equipment; FCC Compliant to CFR 47, Part 15, Subpart B, Class A
	Canada: UL Listed, File E107041, CCN PAZX7, Under CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada, ICES-003
	Europe: CE Mark – Johnson Controls, Inc., 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
Shipping Weight	0.35 lb (0.16 kg)

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

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