



techsystem

automatyka klimatyzacja wentylacja

▸ zapoznaj się z naszą ofertą

Metasys® System Field Equipment Controllers, Network Sensors, and Related Products

Product Bulletin

Code No. LIT-12011042
 Software Release 4.1
 Issued October 6, 2008
 Supersedes March 17, 2008

Overview

The Metasys® system Field Equipment Controllers bring an entirely new generation of hardware devices into the Metasys Building Automation System (BAS). The family of Field Equipment Controllers (FECs), Input/Output Modules (IOMs), Variable Air Volume (VAV) Modular Assembly (VMA) 1600, NS Series network sensors, and the ZFR1800 Series Wireless Field Bus system provide unrivaled compatibility with the higher level components of the Metasys system.

This family of Metasys system components further the commitment of Johnson Controls to use open standards. The FEC Series communicates using standard BACnet® Master-Slave/Token-Passing (MS/TP) protocol and provides a wide range of standard applications to control Heating, Ventilating, and Air Conditioning (HVAC) equipment. Some FEC models also feature a Liquid Crystal Display (LCD) that can be used to monitor and adjust local building conditions controlled at the device. A wide variety of network sensor models provides options for measuring and displaying zone temperature, duct temperature, zone humidity, setpoint adjustments, fan speed control, and discharge air temperatures. The ZFR1800 Series uses open wireless technology standards, including IEEE 802.15.4 and ZigBee™ technology, to provide flexibility and mobility advantages.

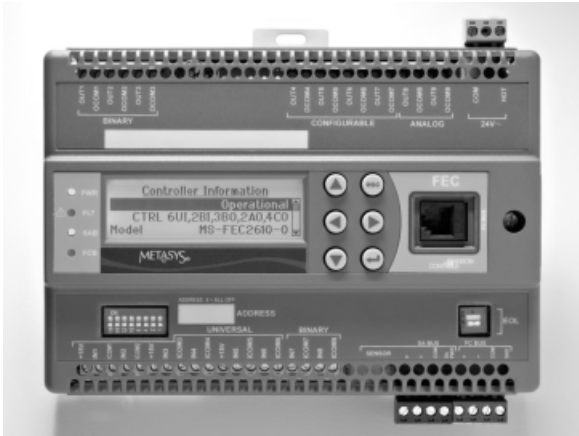


Figure 1: Metasys System Field Equipment Controller

Table 1: Features and Benefits (Part 1 of 2)

Features	Benefits
Standard BACnet Protocol	Allows controllers to use standard open protocol for building systems coordination.
Standard Hardware Platform	Uses a common design throughout the family line to assist in standard controller wiring practices.
Wireless Commissioning Interface	Provides an easy-to-use connection to the configuration and commissioning tool.
Wireless Mesh Capabilities	Provide a wireless alternative to hard-wired Metasys system counterparts, providing application flexibility, mobility, and minimal disruption to building occupants.

Table 1: Features and Benefits (Part 2 of 2)

Features	Benefits
Complete Product Family	Provides the ability to meet any HVAC control requirement.
Auto Tuned Control Loops	Reduce commissioning time, eliminate change-of-season re-commissioning, and reduce wear and tear on mechanical devices.
Universal Inputs and Outputs and Point Expansion Modules	Allow multiple signal options and provide input/output flexibility.
Local User Interface Display Option	Allows convenient monitoring and adjusting capabilities at the local device.
BACnet Testing Laboratories (BTL) Listing	Provides compliance with BACnet Testing Laboratories™ Testing and Interoperability, which measures meeting their universal protocol.

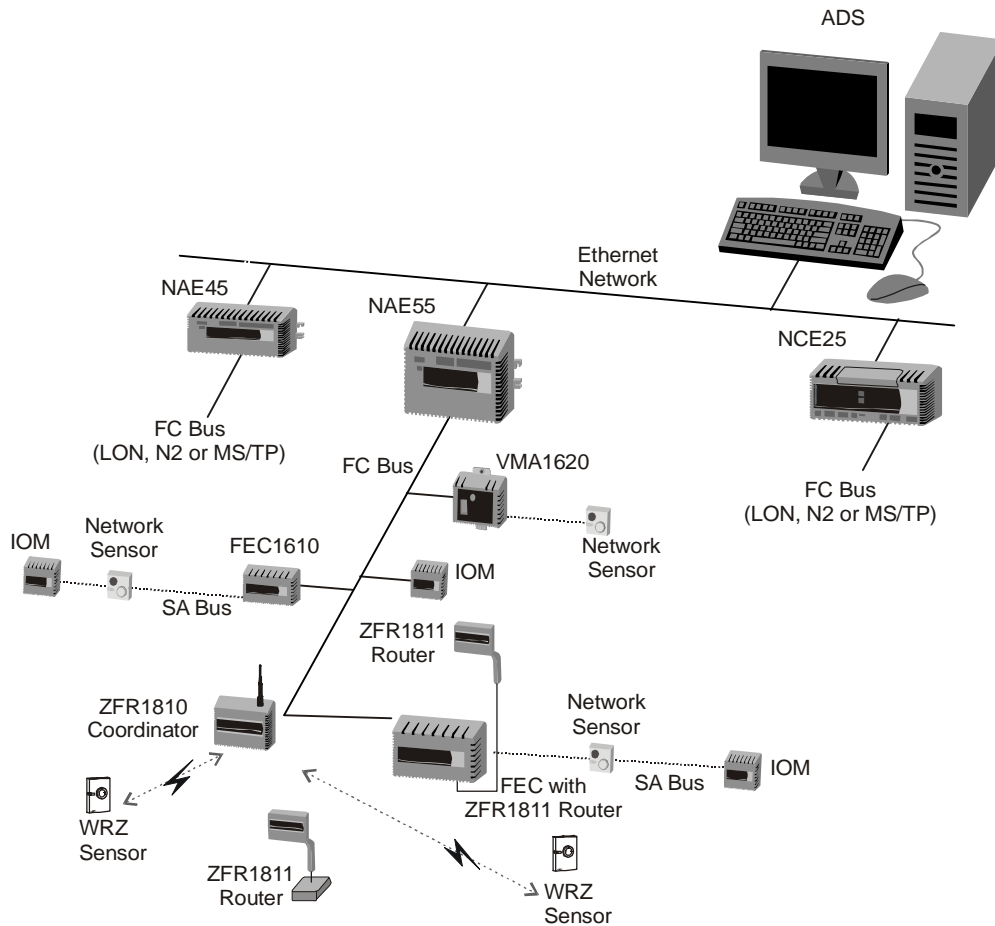


FIG:mstp_exmpl

Figure 2: Metasys System with Field Equipment Controllers

Integration to the Metasys System Supervisory Devices

The FEC Series controllers are designed to integrate seamlessly into the Metasys system by connecting and communicating directly to the Network Automation Engine (NAE) or Network Control Engine (NCE). With this integration, the building operator can view the FEC Series controller directly from the Metasys system User Interface (UI). In addition, the operator can view FEC information locally with the local display.

BACnet Protocol Compatible

The Metasys system field controllers and network sensors communicate using the standard BACnet protocol, based on ANSI/ASHRAE 135-2004.

BACnet protocol is a standard for the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE); the American National Standards Institute (ANSI); and the International Organization for Standardization (ISO) for building controls.

The FEC family of controllers and input/output modules are BACnet Testing Laboratory (BTL) tested and listed as Application Specific Controllers (B-ASC). The Network Sensors are BTL listed as Smart Sensors (B-SS).

Controller Configuration Tool

The Controller Configuration Tool (CCT) is used in conjunction with the Metasys system to configure, simulate, and commission the FECs, IOMs, and VMA1600s on an MS/TP bus.

The **Configuration** mode allows you to select a number of mechanical and control logic options through System Selection Trees for typical air handling, terminal unit, VAV box, and central plant mechanical systems. When required, you can customize the standard logic provided by the system selection process to meet your specialized control logic requirements. Configuration mode also allows you to customize certain display options available to FECs that use a local controller display.

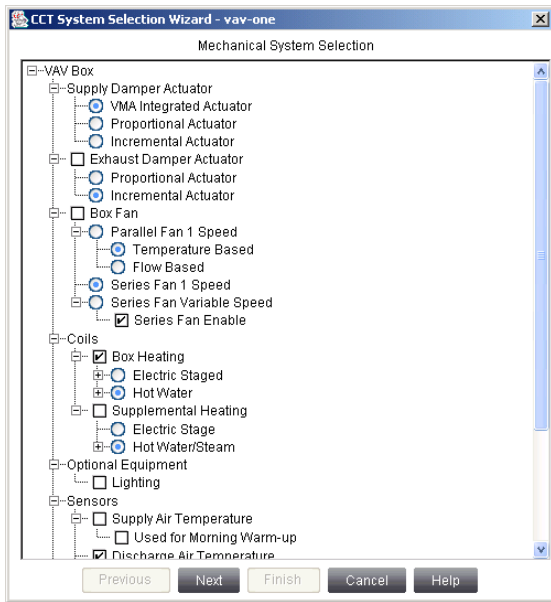


Figure 3: Mechanical Selection

The **Simulation** mode allows you to review, run, or simulate the application logic as if you were commissioning a live system. You can make adjustments to setpoints, inputs, or sensors during a simulation session to validate the logic before assigning the configuration to a specific controller.

The **Commissioning** mode manages the downloading of files to the field equipment controllers through two different network connection points. You can connect using the Wireless Commissioning Converter between your laptop and the MS/TP bus, or using the Ethernet Passthru mode in conjunction with the System Configuration Tool (SCT) through an NAE or NCE.

After downloading the controllers, you can use the CCT Commissioning mode to validate the sensor and control point interfaces and adjust key setpoints and setup parameters.

For VAV applications, CCT features an optional box flow test to automatically exercise all the VAV boxes to ensure correct mechanical installation and proper configuration of the key flow setup parameters. Additionally, the Metasys system provides multiple configurations of room network sensors and a handheld VAV balancing tool that can be used to perform VAV balancing tasks.

In addition, the Commissioning wizard has a Balancer tab for VAV applications to easily auto calibrate VAV boxes and set flow constants in one location.

A Commissioning mode only version of the CCT software is available to the Johnson Controls® branch offices for jobs or individuals having only commissioning tasks (for example, balancing contractors). The Configuration and Simulation modes are disabled in the CCT Commissioning software.



Figure 4: CCT User Interface

Features of the CCT

- capability to customize standard control system logic that is created from simple system selection trees
- consistent user interface across the Configuration, Simulation, and Commissioning modes
- flexible connection capabilities for loading and commissioning controllers

Field Equipment Controller (FEC)

The FEC is a programmable digital controller that communicates via BACnet MS/TP protocol. The controllers featured in this family are the 10-point FEC16x0 and the 17-point FEC26x0. Some models also feature a built-in LCD screen that serves as a local user interface to the application in the device.

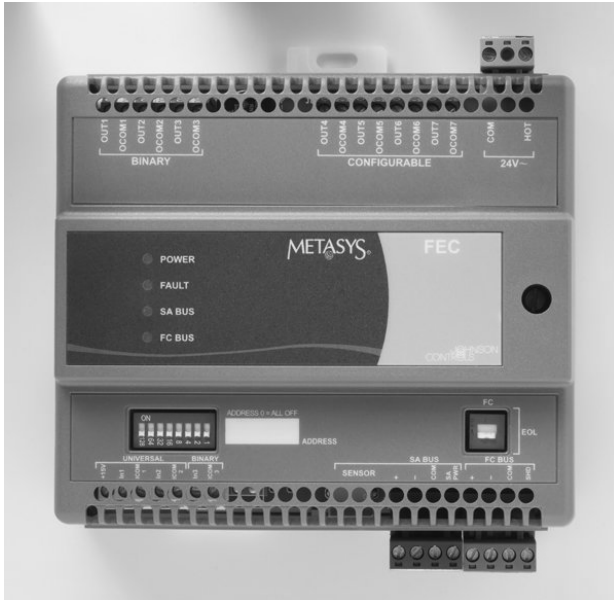


Figure 5: FEC



Figure 6: IOM

Features of the FEC

- Continuous loop tuning is provided by patented proportional adaptive control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) technologies.
- BACnet MS/TP communication provides open system compatibility.
- Writable flash memory allows you to download standard or customized applications from the CCT software.
- Wireless capabilities via ZFR1800 Series Wireless Field Bus System enable wireless mesh connectivity between FECs to WRZ Series Wireless Room Temperature Sensors, and to NAE/NCE devices. This facilitates easy initial location and relocation.
- Removable base allows the base to be ordered, mounted, and pre-wired without the controller electronics.
- Universal and configurable inputs and outputs support multiple signal options and increase controller application flexibility.
- Different models provide a wide range of point mix to meet application requirements and allow for the addition of one or more Input/Output Modules (IOMs) and/or Network Sensors to provide even more application capacity.
- Ability to be automatically discovered by NAEs and NCEs allows for easy controller integration.
- Local user interface display option (integral display or stand-alone display)

Input/Output Module (IOM)

IOMs can serve in one of two capacities depending on where they are installed in the Metasys system. When installed on the Sensor Actuator Bus (SA Bus) of an FEC or VMA controller, the IOMs expand the point count of these controllers. When installed on the Field Controller (FC) Bus as point multiplexors, IOMs allow a Network Automation Engine (NAE) or Network Controller Engine (NCE) to monitor and control supervisory points directly.

Features of the IOM

- BACnet MS/TP communication provides open system compatibility.
- Different models provide a wide range of input/output point combinations to best fit the applications.
- Universal and configurable inputs and outputs support multiple signal options and increase controller application flexibility.
- Ability to reside on the FC Bus or SA Bus provides application flexibility.
- Pluggable communications bus, Inputs/Outputs (not available on the IOM4710), and power terminals speed installation.

Applications

A full range of FEC models combined with the IOM models can be applied to a wide variety of building applications ranging from simple fan coil or heat pump control to advanced central plant management.

Hardware

The FECs and IOMs are assembled in durable, plenum-rated, plastic housing. The plastic housing may eliminate the need for a separate enclosure for plenum-rated construction. Check code requirements for appropriate applications.

Light-Emitting Diodes (LEDs), visible through the housing, indicate the status of power to the controller, communications status, and a number of diagnostic indicators.

Some FEC models have a backlit user interface display with adjustable brightness and contrast to ensure readability in low-light environments. The easy-to-use display provides convenient local monitoring and adjusting of key setpoints and control parameters. For the FEC models without a display, a stand-alone DIS1710 Local Controller Display module is available that connects directly to the SA Bus port. For details, refer to the *DIS1710 Local Controller Display Product Bulletin (LIT-12011273)*.

Installation

Mounting clips allow the FEC or IOM to be mounted directly on a wall or other flat surface, or allow the FEC or IOM to be mounted on 35-mm DIN rail.

The FEC Series and the IOM4710 include a removable base that allows the base to be ordered, mounted, and pre-wired without the controller.

You can make the controller address unique for each VMA using the DIP switches that are accessible through the VMA controller housing.

The AC power input is isolated from the DC inputs and outputs by an internal transformer. This eliminates polarity issues, ground loops, and the need for a separate isolation transformer. Power, MS/TP communications, and binary outputs are all separately isolated.

Models and Capabilities

Table 2 lists the point type counts for the FEC and IOM Series.

Table 2: Point Type Counts per Model

Point Types	Signals Accepted	FEC1610 FEC1620	FEC2610 FEC2620	IOM1710	IOM2710	IOM3710	IOM4710
Universal Input (UI)	Analog Input, Voltage Mode, 0 - 10 VDC Analog Input, Current Mode, 4 - 20 mA ¹ Analog Input, Resistive Mode, 0 - 2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A99B SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	2	6	0	2	4	6
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter Mode (High Speed), 100 Hz	1	2	4	0	0	2
Analog Output (AO)	Analog Output, Voltage Mode, 0 - 10 VDC Analog Output, Current Mode, 4 - 20 mA	0	2	0	0	0	2
Binary Output (BO)	24 VAC Triac	3	3	0	0	0	3
Universal Output (UO)	Analog Output, Voltage Mode, 0 - 10 VDC Binary Output Mode, 24 V AC/DC FET Analog Output, Current Mode, 4 - 20 mA	0	0	0	2	4	0
Configurable Output (CO)	Analog Output, Voltage Mode, 0 - 10 VDC Binary Output Mode, 24 VAC Triac	4	4	0	0	0	4
Relay Output	120/240 VAC	0	0	0	2	4	0

1. Analog Input, Current Mode is as hardware for the FEC2610 and as software for the FEC1610.

Panelized Options

The Field Controllers and Input/Output Modules are also available in pre-built panels. The panelized options provide all of the controllers necessary for a complete application solution, including a pre-wired power source and a lockable door.

Variable Air Volume Modular Assembly (VMA) 1600 Series

The VMA1600 Series controllers are programmable digital controllers that communicate via BACnet Master-Slave/Token-Passing (MS/TP) Protocol. Both the VMA1610 and VMA1620 controllers have a pressure sensor and actuator in a pre-wired unit. The VMA1600 Series controllers connect easily to the NS Series Network Sensors for zone and discharge air temperature sensing.

Applications

The VMA1600 Series controllers can be configured for both single and dual duct VAV applications. The VMA1610 and VMA1620 controllers require an additional damper actuator and Differential Pressure Transducer (DPT) sensor for dual duct or supply/exhaust applications.

Features of the VMA1600 Series Controllers

- BACnet MS/TP protocol communication provides open system compatibility.
- Writable flash memory allows standard or customized applications to be downloaded from the CCT.
- The integrated pressure sensor and actuator reduce installation time.
- Wireless capabilities, via the ZFR1800 Series Wireless Field Bus System, enable wireless mesh connectivity between VMA1600s to the WRZ Series Wireless Room Temperature Sensors, and to NAE/NCE devices. This facilitates easy initial location and relocation.
- The fast response actuator drives the damper from full open to full closed (90°) in 60 seconds to reduce commissioning time.
- Point capacity can be expanded by adding IOMs to the Sensor Actuator bus, providing further application flexibility.
- Continuous loop tuning through patented proportional adaptive control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) technologies.

Hardware

The VMA1600 Series controllers are in a durable, plenum-rated, ABS plastic housing. The controller, transducer, and actuator are all integrated into a single enclosure..

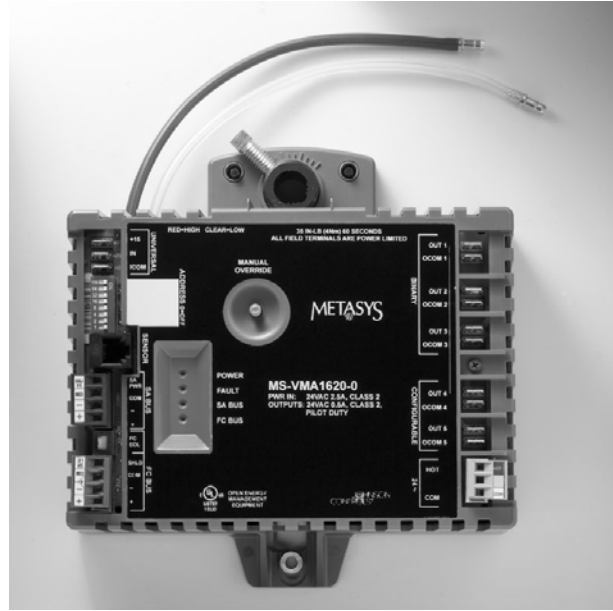


Figure 7: VMA Hardware

The VMA1600 Series controllers' plenum-rated housing may eliminate the need for a separate enclosure for plenum applications. Check code requirements for appropriate applications.

The FC Bus and SA Bus communication connectors have removable screw terminals. Input/Output (I/O) connections to the VMA are easy-to-use spade lugs. Screw terminal I/O connectors are available as optional accessories.

The differential pressure sensor in the VMA1600 Series controllers provides consistent flow readings with minimal drift and requires minimal auto-zero calibration. There are no filters to change, which helps to ensure very close tolerance to published accuracy.

LEDs, visible through the housing, indicate the status of power to the controller, communications status, and a number of diagnostic indicators.

Models and Capabilities

Table 3 lists the point type counts for the VMA1600 Series controllers.

Table 3: VMA Point Type Counts per Model

Point Types	Signals Accepted	VMA1610	VMA1620
Universal Input (UI)	Analog Input, Voltage Mode, 0 - 10 VDC Analog Input, Resistive Mode, 0 - 2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A99B SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	1	1
Binary Output (BO)	24 VAC Triac	0	3
Configurable Output (CO)	Analog Output, Voltage Mode, 0 - 10 VDC Binary Output Mode, 24 VAC Triac	0	2
Integrated Actuator	Internal	1	1
Integrated Flow Sensor	Internal	1	1
Zone Sensor Input	On Sensor-Actuator Bus (SA Bus)	up to 4 zone sensors	
Discharge Air Sensor Input	On Sensor-Actuator Bus (SA Bus)	up to 5 discharge air sensors	

Installation

Field mounting the VMA1600 Series controller is easy. The VMA1600 Series controller requires minimal wiring and is mounted to the terminal box using a single sheet metal screw and a single set screw to lock the actuator to the damper shaft. The set screw has a self-locking cup point end to resist loosening due to vibration.

The actuator coupling is serrated, providing additional damper shaft grip and minimizing shaft slippage during operation. The coupling accommodates shafts from 10 mm (3/8 in.) square and up to 13 mm (1/2 in.) diameter round. A gear release lever allows easy resetting of the damper to full open or close.

The housing dimensions of the VMA1600 Series controllers (182 x 182 x 64 mm [7.2 x 7.2 x 2.5 in.]) meet industry mounting requirements and make the controllers easy to handle.

You can make the controller address unique for each VMA using the DIP switches that are accessible through the VMA controller housing.

The AC power input is isolated from the DC inputs and outputs by an internal transformer. This eliminates polarity issues, ground loops, and the need for a separate isolation transformer. Power, MS/TP communications, and binary outputs are all separately isolated.



Figure 8: Network Zone Sensors and Discharge Air Sensors

Network Sensors

The NS Series Network Sensors are electronic zone, discharge air, and balancing sensors designed to function directly with Metasys system FECs, Input/Output Modules (IOMs), and the Variable Air Volume (VAV) Modular Assembly (VMA) 1600.

All models of wall-mounted network zone sensors monitor room temperature. Options are available to also monitor zone humidity, local temperature setpoint adjustments, and other variables identified in the following sections. This data is transmitted to a field controller on the SA Bus.

The NS Series Network Zone Sensors include models with a temperature setpoint dial and Liquid Crystal Display (LCD) that allows occupants to view the zone temperature, Relative Humidity (RH), and view and adjust the zone temperature setpoint. A fan mode push button is included to set the desired fan speed (AUTO-OFF-low-medium-high). An occupancy override function allows you to signal the controller that the zone is occupied to override the scheduled mode. Some models have DIP switches to set a unique address for applications that require multiple sensors.

For communication wiring flexibility, the wires connecting the sensor to a controller can be terminated using a modular jack or screw terminals.

Each network zone sensor includes an SA Bus access port to allow accessories to access the SA Bus. This plug allows accessories to service or commission the connected controller or gain access to any other controller on the same FC Bus.

Features of the NS Series Network Zone Sensors

- BACnet MS/TP protocol communication provides compatibility with Metasys system Field Controllers in a proven communication network.
- Backlit LCD (available on some models) provides real-time status of the environment in easy-to-read, plain text messages with backlighting activated during user interaction.
- Simple temperature setpoint adjustment (available on some models) enables you to change the setpoint with the turn of a dial.
- Temporary occupancy (available on some models) provides a timed override command, which temporarily initiates an alternate mode.
- Fahrenheit/Celsius (F/C) button (available on some models) toggles the display temperature between degrees Celsius and degrees Fahrenheit.
- DIP switches (available on some models) provide selectable addresses for multiple locations and averaging applications.



Figure 9: VAV Balancing Tools

NS Series VAV Balancing Tool

In addition to the standard models, there are four special models of network sensor and a handheld VAV balancing tool that provide VAV balancing functionality. These four sensors look and perform like a network zone sensor but have the added capability to serve as a tool to balance the VAV box.

The Variable Air Volume (VAV) Balancing Tool allows you to easily view and adjust the required parameters for VAV applications that reside on the Metasys system VAV Modular Assembly (VMA) 1600 Series or Field Equipment Controller (FEC) Series controllers.

The VAV balancing parameters are displayed on the sensor's Liquid Crystal Display (LCD). You use the dial and two buttons on the sensor to navigate through simple and intuitive menus to provide the air-side balancing of the VAV box. The menus you see are customized to the type of application residing in the controller. The balancing operation also features an adjustable time-out parameter that returns the tool and controller to normal operation in the event that the controller is left in balancing mode.

The handheld VAV balancing tool is lightweight, portable, and can be plugged into any model of network zone sensor to access the VAV controller.

The VAV Balancing Tools are compatible with the following Metasys system BACnet protocol devices:

- FEC loaded with a VAV application
- VMA1600 loaded with a VAV application
- Network Sensors connected to an FEC or VMA1600 loaded with a VAV application

Features of the Handheld VAV Balancing Tool

- Handheld balancing tool allows VAV balancing and commissioning without a laptop.
- Standard plug connects directly to the controller or the controller's NS Series Network Zone Sensor.
- Intuitive, menu-driven operation simplifies balancing tasks.

NS Series Network Discharge Air Sensor

The NS Series Network Discharge Air Sensors are electronic duct sensors designed to function directly with the Johnson Controls FEC family of digital controllers in Heating, Ventilating, and Air Conditioning (HVAC) systems. Models in this series monitor the duct temperature, typically at the discharge of the Variable Air Volume (VAV) box, and transmit this data to a Field Equipment Controller (FEC), a VAV Modular Assembly (VMA) 1600, or a Network Control Engine (NCE) on the Sensor Actuator (SA) Bus using the 305 cm (10 ft) wiring lead included with the unit. The 305 cm (10 ft) wiring lead consists of four 22 AWG trade size color-coded wires encased in a plenum-rated jacket. Each of the wires is stripped and tinned for easy connection to the SA Bus screw terminal block.

The NS Series Network Discharge Air Sensors are available with either a 102 or 203 mm (4 or 8 in.) temperature probe. All models include DIP switches for applications requiring multiple discharge air sensors, each with a unique DIP switch (204-211) address.

Features of the NS Series Network Discharge Air Sensor

- BACnet MS/TP protocol communication provides compatibility with Metasys system Field Controllers in a proven communication network.
- 4 or 8 in. (102 or 203 mm) probe lengths meet requirements for various duct diameters.
- 10 ft (305 cm) plenum-rated cable provides easy connection to the SA Bus.
- DIP Switches provide easily selectable addresses for multiple locations and averaging applications.
- Easy installation requires only two self-drilling screws.

Installation

The network sensor installation is simple and flexible. The network sensors are available in compact models that mount directly on the wall, in models sized to fit standard wall boxes, and in duct-mount models. Additionally, the network sensors provide flexibility in the type of wiring in your installation by being available with screw terminal block or modular jacks.

ZFR1800 Series Wireless Field Bus System

The ZFR1800 Series Wireless Field Bus System uses ZigBee technology to provide a new wireless platform for Metasys Field Equipment Controllers (FEC) or Variable Air Volume (VAV) Modular Assembly (VMA) 1600 Series field controllers using Johnson Controls Metasys BACnet protocol.



Figure 10: ZFR1811 Routers (left), ZFR1810 Coordinator (center), and WRZ-TTx Series Sensors (right)

A ZFR1800 Series System consists of:

- a ZFR1810 Wireless Field Bus Coordinator, connected to a Metasys Network Automation Engine (NAE) 35, NAE45, NAE55 or Network Control Engine (NCE) 25
- one or more ZFR1811 Wireless Field Bus Routers, each connected to an FEC or VMA1600 field controller
- multiple WRZ-TTx Series Wireless Room Temperature Sensors

Together, these components create a wireless mesh network that allows the exchange of data between the collection of devices within the ZFR1800 Series System's wireless network and wired BACnet Master-Slave/Token-Passing (MS/TP) devices.

Features of the ZFR1800 Series Wireless Field Bus System

- Wireless communications for a Metasys system provides a wireless platform for Metasys BACnet devices across multiple levels of a Metasys Building Automation System (BAS)—from supervisory engines, to field controllers, to room temperature sensors; Enables wireless devices to coexist with hard-wired devices on the same Metasys network; Offers simple add-on hardwired to seamlessly enable standard hard-wired Metasys BACnet field controllers to function wirelessly.
- Wireless mesh network enables quick, economical, and low-maintenance installation; Minimizes MS/TP BACnet hard wiring; Enhances reliability through automatically forming wireless links and redundant wireless data transmission paths.
- Support of up to four wireless room temperature sensors per wirelessly enabled field controller facilitates temperature averaging and high/low selection to optimize comfort in larger zones.

Refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)* for additional information.

Wireless Commissioning Converter

The Wireless Commissioning Converter is a communications converter that provides a temporary Bluetooth® wireless connection between the Metasys system field controllers and the laptop computer used to commission them. It allows technicians to commission and service the controllers over a wireless connection.



Figure 11: Wireless Commissioning Converter

The Wireless Commissioning Converter provides communication from the BACnet MS/TP FC Bus or the SA Bus to a Bluetooth wireless technology enabled laptop computer running the CCT software. Any controller on a FC bus can be commissioned by connecting to any other controller on the same bus, or any sensor or IOM connected to any controller on that bus.

The 2.4 GHz Bluetooth wireless connection allows you to be up to 10 m (33 ft) away while commissioning the controller with a laptop computer and the CCT software.

Features of the Wireless Commissioning Converter

- Bluetooth wireless communication provides a secure and reliable untethered connection between the laptop and the Metasys system hardware.
- Standard connection jacks on both the Metasys system sensors and controllers provide multiple connection points to the system.
- The Wireless Commissioning Converter allows online access to controllers while the technician is using the Bluetooth wireless enabled laptop.
- Standard Bluetooth wireless technology allows you to use a Bluetooth wireless-enabled laptop or laptop with a commercial off-the-shelf Bluetooth wireless adapter.

Additional BACnet Protocol Connected Devices

TEC2600 Series Network Thermostats

The TEC2600 Series Network Thermostats control a variety of commercial HVAC equipment. The features include a backlit LCD, easy-to-use three or five button interface, and BACnet MS/TP network communications. The network interface supports remote programming and monitoring, enabling each thermostat to be easily customized for the most efficient operation. From the thermostat or a supervisory controller, you can easily adjust heating or cooling setpoints, view the room or outside air temperatures, select mode of operation (Day/Night), and more.



Figure 12: TEC2600 Series Network Thermostat

The TEC260x-2 Series staged controllers can be used with rooftop units (with and without economizers), heat pumps, and single and multi-stage heating/cooling equipment.

The TEC2645, TEC26x6, and TEC26x7 Series thermostats provide single and dual duct outputs offering On/Off, Floating or Proportional control and optional 1-, 2-, or 3-Speed Fan control for two- or four-pipe systems such as cabinet unit heater, perimeter heat, fan coils, zoning equipment, and more.

For more information on the TEC2600 Series Network Thermostats, refer to the following documents:

- *TEC2645-2 BACnet MS/TP Networked Thermostat with Single Proportional Output and One-Speed Fan Control Product Bulletin (LIT-12011113)*
- *TEC26x6(H)-2 Series BACnet MS/TP Networked Thermostats with Two Outputs, Dehumidification Capability, and Three Speeds of Fan Control Product Bulletin (LIT-12011114)*
- *TEC26x7-2 Series BACnet MS/TP Networked Thermostats with Two Outputs Product Bulletin (LIT-12011115)*
- *TEC260x-2 Series BACnet MS/TP Networked Thermostats Product Bulletin (LIT-12011116)*

Conclusion

The Metasys system BACnet protocol field controllers, network sensors, ZFR1800 wireless solution, and related products affirm Johnson Controls position as a leader in the BAS industry and as an innovator of solutions for the complete management of buildings. The complete integration with the Metasys system as well as the use of open protocols for field networks combine the benefits of the global communications and control industries into one system.

Ordering Information

Contact the nearest Johnson Controls representative to order Metasys system FECs, IOMs, VMA1600s, network sensors, and related products. Specify the desired product code number from Table 4 for the FEC, IOM, VMA, Wireless Commissioning Converter, or handheld VAV balancing tool. See Table 6 for the network sensors.

The FEC (MS-**FEU**x6x0-0) and the IOM4710 (MS-**IOU**4710-0) consist of two parts, which are also available separately: mounting base (MS-**FEB**x610-0, MS-**IOB**4710-0) and the controller cover (MS-**FEC**x6x0-0, MS-**IOM**4710-0). **FEU = FEB + FEC** and **IOU = IOB + IOM**.

Repair Information

If the Metasys System field equipment controllers, network sensors, or any related product fails to operate within its specifications, replace the unit. For a replacement device, contact the nearest Johnson Controls representative.

Table 4: FEC, VMA, IOM, Wireless Commissioning Converter, Handheld VAV Balancing Tool, and ZFR1800 Series Wireless Field Bus System Ordering Information (Part 1 of 2)

Product Code Number	Description
MS-FEU1610-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base
MS-FEU1610-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-FEC1610-0	Field Equipment Controller Cover with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus
MS-FEB1610-0	Triac Mounting Base for FEC16x0
MS-FEU1620-0	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display
MS-FEU1620-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-FEC1620-0	Field Equipment Controller Cover with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; SA Bus; Integral Display
MS-FEU2610-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base
MS-FEU2610-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-FEC2610-0	Field Equipment Controller Cover with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus
MS-FEC2620-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO and 4 CO; 24 VAC; SA Bus; Integral Display
MS-FEB2610-0	Triac Mounting Base for FEC26x0

Table 4: FEC, VMA, IOM, Wireless Commissioning Converter, Handheld VAV Balancing Tool, and ZFR1800 Series Wireless Field Bus System Ordering Information (Part 2 of 2)

Product Code Number	Description
MS-FEU2620-0	Field Equipment Controller Cover with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display
MS-FEU2620-0U	Field Equipment Controller Cover with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; SA Bus; Mounting Base; Integral Display Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-IOM1710-0	4-Point IOM with 4 BI, FC Bus and SA Bus Support
MS-IOM1710-0U	4-Point IOM with 4 BI, FC Bus and SA Bus Support Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-IOM2710-0	6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support
MS-IOM2710-0U	6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-IOM3710-0	12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support
MS-IOM3710-0U	12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-IOU4710-0	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Mounting Base
MS-IOU4710-0U	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, 24 VAC, and SA Bus with Mounting Base Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-IOB4710-0	Triac Mounting Base for IOM4710 (17-Point)
MS-IOM4710-0	Controller Cover for IOB4710 (17-Point)
MS-VMA1610-0	Integrated VAV Controller/Actuator/Pressure Sensor (Cooling only), FC Bus, and SA Bus
MS-VMA1610-0U	Integrated VAV Controller/Actuator/Pressure Sensor (Cooling only), FC Bus, and SA Bus Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
MS-VMA1620-0	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan Control), FC Bus, and SA Bus
MS-VMA1620-0U	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan Control), FC Bus, and SA Bus Note: This model is UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment.
NS-ATV7003-0	Handheld VAV balancing tool
MS-BTCVT-1	Wireless Commissioning Converter, with Bluetooth technology
MS-ZFR1810-0	Wireless Field Bus Coordinator, 10 mW Transmission Power. Functions with NAE35xx, NAE45xx, NAE55xx, and NCE25xx Models
MS-ZFR1811-0	Wireless Field Bus Router, 10 mW Transmission Power. Functions with Metasys BACnet FECs, VMA1600s, and WRZ-TTx Series Wireless Mesh Room Temperature Sensors
WRZ-TTP0000-0	Wireless Mesh Room Temperature Sensor, Warmer/Cooler (+/-) Setpoint Adjustment, 10 mW Transmission Power
WRZ-TTR0000-0	Wireless Mesh Room Temperature Sensor, No Setpoint Adjustment, 10 mW Transmission Power
WRZ-TTS0000-0	Wireless Mesh Room Temperature Sensor, Set Point Adjustment Scale: 13 to 29°C/55 to 85°F, 10 mW Transmission Power
MS-ZFRRPT-0	Optional Repeater Accessory for use with ZFR1811 Router as a repeater. Includes 24 VAC to 15 VDC power supply, and 4 x 4 in. electrical box with cover.
MS-ZFRCBL-0	Wire Harness for use with ZFR1811 Router. Allows ZFR1811 Router to function with FEC1620; and with FEC1610, VMA1610, or VMA1620 controllers in conjunction with NS Series Sensors, Wireless Commissioning Converter, or DIS1710 Local Controller Display.

Table 5: FEC Family Accessories (Order Separately)

Product Code Number	Description
Y64T15-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 92 VA, Foot Mount, 30 in. Primary Leads and 30 in. Secondary Leads, Class 2
Y65A13-0	Transformer, 120 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount [Y65AS], 8 in. Primary Leads and 30 in. Secondary Leads, Class 2
Y65T42-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Hub Mount [Y65SP+], 8 in. Primary Leads and Secondary Screw Terminals, Class 2
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount [Y65AR+], 8 in. Primary Leads and Secondary Screw Terminals, Class 2
AP-TBK1002-0	2-position Screw Terminal that Plugs onto VMA output point Spade Lugs
AP-TBK1003-0	3-position Screw Terminal the Plugs onto VMA output point Spade Lugs
AP-TBK4SA-0	Replacement MS/TP SA Bus Terminal, 4 Position Connector, Brown, Bulk Pack
AP-TBK4FC-0	Replacement MS/TP FC Bus Terminal, 4 Position Connector, Blue, Bulk Pack
AP-TBK3PW-0	Replacement Power Terminal, 3 Position Connector, Gray, Bulk Pack
MS-BTCVTCBL-700	Cable replacement Set for the MS-BTCVT-1 or the NS-ATV7003-0; includes one 5-foot retractable cable.
MS-DIS1710-0	Local Controller Display for FEC1610 and FEC2610 models
NS-WALLPLATE-0	Network Sensor wall plate
WRZ-SST-100	Wireless Sensing System Tool Kit

Table 6: Network Sensor Ordering Information — Temperature Only Models (Part 1 of 2)

Product Code Number	Size (mm), Height x Width	Vertical Wallbox-Mounted (WB), Surface-Mounted (SM), or Duct-Mounted (Duct)	Johnson Controls Logo	LCD Display	Temperature Adjustment: Setpoint (Set), or Warmer/Cooler Dial (W/C)	Occupancy Override	F/C Scale Toggle	Fan Control	Screw Terminals (ST), or Modular Jack (MJ)	Address Switches	VAV Balancing Feature
NS-ATA7001-0	80 x 80	SM	Yes	Yes	Set	Yes	No	No	MJ	No	No
NS-ATA7002-0	80 x 80	SM	Yes	Yes	Set	Yes	No	No	ST	No	No
NS-ATA7003-0	80 x 80	SM	Yes	Yes	Set	Yes	No	No	ST	Yes	No
NS-ATB7001-0	80 x 80	SM	Yes	Yes	Set	Yes	Yes	No	MJ	No	No
NS-ATB7002-0	80 x 80	SM	Yes	Yes	Set	Yes	Yes	No	ST	No	No
NS-ATB7003-0	80 x 80	SM	Yes	Yes	Set	Yes	Yes	No	ST	Yes	No
NS-ATC7001-0	80 x 80	SM	Yes	Yes	Set	Yes	No	Yes	MJ	No	No
NS-ATC7002-0	80 x 80	SM	Yes	Yes	Set	Yes	No	Yes	ST	No	No
NS-ATD7001-0	80 x 80	SM	Yes	Yes	Set	Yes	Yes	Yes	MJ	No	No
NS-ATD7002-0	80 x 80	SM	Yes	Yes	Set	Yes	Yes	Yes	ST	No	No
NS-ATN7001-0	80 x 80	SM	Yes	No	N/A	No	No	No	MJ	No	No

Table 6: Network Sensor Ordering Information — Temperature Only Models (Part 2 of 2)

Product Code Number	Size (mm), Height x Width	Vertical Wallbox-Mounted (WB), Surface-Mounted (SM), or Duct-Mounted (Duct)	Johnson Controls Logo	LCD Display	Temperature Adjustment: Setpoint (Set), or Warmer/Cooler Dial (W/C)	Occupancy Override	F/C Scale Toggle	Fan Control	Screw Terminals (ST), or Modular Jack (MJ)	Address Switches	VAV Balancing Feature
NS-ATN7001-2	80 x 80	SM	No	No	N/A	No	No	No	MJ	No	No
NS-ATN7003-0	80 x 80	SM	Yes	No	N/A	No	No	No	ST	Yes	No
NS-ATP7001-0	80 x 80	SM	Yes	No	W/C	Yes	No	No	MJ	No	No
NS-ATP7001-2	80 x 80	SM	No	No	W/C	Yes	No	No	MJ	No	No
NS-ATP7002-0	80 x 80	SM	Yes	No	W/C	Yes	No	No	ST	No	No
NS-ATP7003-0	80 x 80	SM	Yes	No	W/C	Yes	No	No	ST	Yes	No
NS-ATV7001-0	80 x 80	SM	Yes	Yes	Set	Yes	Yes	No ¹	MJ	No	Yes
NS-ATV7002-0	80 x 80	SM	Yes	Yes	Set	Yes	Yes	No ¹	ST	No	Yes
NS-BTB7001-0	120 x 80	WB, SM	Yes	Yes	Set	Yes	Yes	No	MJ	No	No
NS-BTB7002-0	120 x 80	WB, SM	Yes	Yes	Set	Yes	Yes	No	ST	No	No
NS-BTB7003-0	120 x 80	WB, SM	Yes	Yes	Set	Yes	Yes	No	ST	Yes	No
NS-BTN7001-0	120 x 80	WB, SM	Yes	No	N/A	No	No	No	MJ	No	No
NS-BTN7001-2	120 x 80	WB, SM	No	No	N/A	No	No	No	MJ	No	No
NS-BTN7003-0	120 x 80	WB, SM	Yes	No	N/A	No	No	No	ST	Yes	No
NS-BTP7001-0	120 x 80	WB, SM	Yes	No	W/C	Yes	No	No	MJ	No	No
NS-BTP7001-2	120 x 80	WB, SM	No	No	W/C	Yes	No	No	MJ	Yes	No
NS-BTP7002-0	120 x 80	WB, SM	Yes	No	W/C	Yes	No	No	ST	No	No
NS-BTP7003-0	120 x 80	WB, SM	Yes	No	W/C	Yes	No	No	ST	Yes	No
NS-BTV7001-0	120 x 80	WB, SM	Yes	Yes	Set	Yes	Yes	No ¹	MJ	No	Yes
NS-BTV7002-0	120 x 80	WB, SM	Yes	Yes	Set	Yes	Yes	No ¹	ST	No	Yes
NS-DTN7043-0	102 mm (4 in) probe	Duct	Yes	No	N/A	No	No	No	ST	Yes	No
NS-DTN7083-0	203 mm (8 in) probe	Duct	Yes	No	N/A	No	No	No	ST	Yes	No

1. In the VAV Balancing models, the Fan Control button is replaced by a light bulb button used in the VAV Balancing Process.

Table 7: Network Sensor Ordering Information — Temperature and Humidity Models

Product Code Number	Size (mm), Height x Width	Vertical Wallbox-Mounted (WB), or Surface-Mounted (SM)	LCD Display, RH Display	Humidity Element Accuracy	Temperature Adjustment: Setpoint (Set), or Warmer/Cooler Dial (W/C)	Occupancy Override	F/C Scale Toggle	Screw Terminals (ST), or Modular Jack (MJ)
NS-AHA7001-0	80 x 80	SM	Yes, No	3%	Set	Yes	No	MJ
NS-AHA7002-0	80 x 80	SM	Yes, No	3%	Set	Yes	No	ST
NS-AHB7001-0	80 x 80	SM	Yes, No	3%	Set	Yes	Yes	MJ
NS-AHB7002-0	80 x 80	SM	Yes, No	3%	Set	Yes	Yes	ST
NS-AHB7003-0	80 x 80	SM	Yes, No	3%	Set	Yes	Yes	ST
NS-AHN7001-0	80 x 80	SM	None	3%	N/A	No	No	MJ
NS-AHP7001-0	80 x 80	SM	None	3%	W/C	Yes	No	MJ
NS-AHR7001-0	80 x 80	SM	Yes, Yes	3%	Set	No	Yes	MJ
NS-AHR7002-0	80 x 80	SM	Yes, Yes	3%	Set	No	No	ST
NS-APA7001-0	80 x 80	SM	Yes, No	2%	Set	Yes	No	MJ
NS-APA7002-0	80 x 80	SM	Yes, No	2%	Set	Yes	No	ST
NS-APB7001-0	80 x 80	SM	Yes, No	2%	Set	Yes	Yes	MJ
NS-APB7002-0	80 x 80	SM	Yes, No	2%	Set	Yes	Yes	ST
NS-APB7003-0	80 x 80	SM	Yes, No	2%	Set	Yes	Yes	ST
NS-APR7001-0	80 x 80	SM	Yes, Yes	2%	Set	No	Yes	MJ
NS-APR7002-0	80 x 80	SM	Yes, Yes	2%	Set	No	Yes	ST
NS-BHB7001-0	120 x 80	WB, SM	Yes, No	3%	Set	Yes	Yes	MJ
NS-BHB7002-0	120 x 80	WB, SM	Yes, No	3%	Set	Yes	Yes	ST
NS-BHB7003-0	120 x 80	WB, SM	Yes, No	3%	Set	Yes	Yes	ST
NS-BHN7001-0	120 x 80	WB, SM	None	3%	N/A	No	No	MJ
NS-BHP7001-0	120 x 80	WB, SM	None	3%	W/C	Yes	No	MJ
NS-BHR7001-0	120 x 80	WB, SM	Yes, Yes	3%	Set	No	No	MJ
NS-BPB7001-0	120 x 80	WB, SM	Yes, No	2%	Set	Yes	Yes	MJ
NS-BPB7002-0	120 x 80	WB, SM	Yes, No	2%	Set	Yes	Yes	ST
NS-BPB7003-0	120 x 80	WB, SM	Yes, No	2%	Set	Yes	Yes	ST

Technical Specifications

FEC Series

Product Code Numbers	MS-FEC1610-0 - Cover MS-FEB1610-0 - Triac Mounting Base MS-FEU1610-0 - Cover and Triac Mounting Base MS-FEC2610-0 - Cover MS-FEB2610-0 - Triac Mounting Base MS-FEU2610-0 - Cover and Triac Mounting Base MS-FEC1620-0 - Cover with Integral Display MS-FEU1620-0 - Cover with Integral Display and Triac Mounting Base MS-FEC2620-0 - Cover with Integral Display MS-FEU2620-0 - Cover with Integral Display and Triac Mounting Base
Supply Voltage	20 - 30 VAC at 50 or 60 Hz, Class 2 or Safety Extra-Low Voltage (SELV)
Power Consumption	10 VA typical, 14 VA maximum, plus all BO and Configurable Output loads
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F); 10 to 90% RH noncondensing Storage: -40 to 70°C (-40 to 158°F); 10 to 90% RH noncondensing
Terminations	Screw Terminals and Screw Terminal Pluggable Blocks
Controller Addressing	DIP switch set (4-127). Addresses 0-3, 128-255 are reserved.
Communications Bus	BACnet MS/TP; 3-wire FC Bus between the NAE/NCE and other devices. 4-wire SA Bus between network sensors and other devices. ¹
Analog Input/Analog Output Resolution and Accuracy	Analog Input: 16-bit resolution (15 bit on FEx1610) Analog Output: 16-bit resolution and ±200 mV in 0-10 VDC applications
Mounting	On flat surface with screws on three mounting clips or a single 35 mm DIN rail
Compliance	United States: UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment (MS-FEU16x0-0U and MS-FEU26x0-0U models only). FCC Compliant to CFR47, Part 15, Subpart B, Class A Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003 Europe: CE Mark, EMC Directive 89/336/EEC, in accordance with EN 61000-6-3 (2001) Generic Emission Standard for Residential and Light Industry and EN 61000-6-2 (2001) Generic Immunity Standard for Heavy Industrial Environment and the Low Voltage Directive. 73/23/EEC in accordance with EN 60730-1 (1999) Automatic electrical controls for household and similar use. Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant BACnet International: BACnet Testing Laboratories™ (BTL) 135-2004 Listed BACnet Application Specific Controller (B-ASC)
Weight	FEC16x0 Models: 0.5 kg (1.10 lb) FEC26x0 Models: 0.68 kg (1.5 lb)
Dimensions (Height x Width x Depth)	FEC16x0 Models: 144 x 127 x 58 mm (5-11/16 x 5 x 2-1/4 in.) FEC26x0 Models: 180 x 127 x 58 mm (7-1/16 x 5 x 2-1/4 in.)
Housing	Plastic housing Plastic material: ABS + polycarbonate UL 94-5VB Protection: IP20 (IEC 60529)

1. For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.

IOM Series

Product Code Numbers	MS-IOM1710-0 MS-IOM2710-0 MS-IOM3710-0 MS-IOM4710-0 - Cover MS-IOB4710-0 - Triac Mounting Base MS-IOU4710-0 - Cover and Triac Mounting Base
Supply Voltage	20 - 30 VAC at 50 or 60 Hz, Class 2 or Safety Extra Low Voltage (SELV)
Power Consumption	10 VA typical, 14 VA maximum plus all BO and Configurable Output loads
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F); 10 to 90% RH noncondensing Storage: -40 to 70°C (-40 to 158°F); 10 to 90% RH noncondensing
Terminations	Screw terminals, 3-Position Screw Terminal Pluggable Blocks, 4-Position Screw Terminal Pluggable Blocks
Controller Addressing	DIP switch set (4-127). Addresses 1-3, 128-255 are reserved.
Communications Bus	BACnet MS/TP; 3-wire FC Bus between the NAE/NCE and other devices. 4-wire SA Bus when used as expansion to FEC. ¹
Analog Input/Analog Output Resolution and Accuracy	Analog Input: 16-bit resolution Analog Output: 16-bit resolution and ±200 mV in 0-10 VDC applications
Mounting	On flat surface with screws on three mounting clips or a single 35 mm DIN rail
Compliance	<p>United States: UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment (MS-IOMx710-0U and MS-IOU4710-0U models only) FCC Compliant to CFR47, Part 15, Subpart B, Class A</p> <p>Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003</p> <p>Europe: CE Mark, EMC Directive 89/336/EEC, in accordance with EN 61000-6-3 (2001) Generic Emission Standard for Residential and Light Industry and EN 61000-6-2 (2001) Generic Immunity Standard for Heavy Industrial Environment and the Low Voltage Directive 73/23/EEC in accordance with EN 60730-1 (1999) Automatic electrical controls for household and similar use.</p> <p>Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant</p> <p>BACnet International: BACnet Testing Laboratories (BTL) 135-2004 Listed BACnet Application Specific Controller (B-ASC)</p>
Dimensions (Height x Width x Depth)	<p>IOM1710: 108 x 127 x 58 mm (4-1/4 x 5 x 2-1/4 in.)</p> <p>IOM2710: 180 x 127 x 58 mm (7-1/16 x 5 x 2-1/4 in.)</p> <p>IOM 3710: 180 x 127 x 58 mm (7-1/16 x 5 x 2-1/4 in.)</p> <p>IOM4710: 180 x 127 x 58 mm (7-1/16 x 5 x 2-1/4 in.)</p>
Housing	Plastic housing Plastic material: ABS + polycarbonate UL94 5VB Protection: IP20 (IEC529)
Weight	<p>IOM1710: 0.31 kg (0.7 lb)</p> <p>IOM2710: 0.48 kg (1.1 lb)</p> <p>IOM 3710: 0.55 kg (1.2 lb)</p> <p>IOM4710: 0.68 kg (1.5 lb)</p>

1. For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.

VMA1600 Series Controllers

Product Code Numbers	MS-VMA1610-0: Cooling Only MS-VMA1620-0: Cooling with Reheat and Fan Control
Supply Voltage	20 - 30 VAC at 50 or 60 Hz, Class 2 or Safety Extra Low Voltage (SELV)
Power Consumption	10 VA typical, 14 VA maximum Power delivered to devices connected to the binary outputs (for example, valves, relays, and so on) is not included in this rating.
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F) Storage: -40 to 70°C (-40 to 158°F)
Terminations	6.3 mm (1/4 in.) spade lugs except communications and 24 VAC power, which are screw terminal pluggable blocks
Controller Addressing	DIP switch set (4-127). Addresses 0 - 3, 128 - 255 are reserved.
Communications Bus	BACnet MS/TP; 3-wire FC Bus between the NAE/NCE and other devices. 4-wire SA Bus from the VMA to network sensors and other devices. ¹
Analog Input/Analog Output Resolution and Accuracy	Analog Input: 15-bit resolution Analog Output: 16-bit resolution and ±200 mV in 0-10 VDC applications
Mounting	Mounts to damper shaft using single set screw and to duct with single mounting screw.
Actuator Rating	4 N-m (35 lb-in) minimum shaft length = 44 mm (1-3/4 in.)
Compliance	<p>United States: UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; UL Listed, File S4977, UUKL 864 - 9th Edition, Smoke Control Equipment (MS-VMA1610-0U, MS-VMA1620-0U only); FCC Compliant to CFR47, Part 15, Subpart B, Class A</p> <p>Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003</p> <p>Europe: CE Mark, EMC Directive 89/336/EEC, in accordance with EN 61000-6-3 (2001) Generic Emission Standard for Residential and Light Industry and EN 61000-6-2 (2001) Generic Immunity Standard for Heavy Industrial Equipment, and the Low Voltage Directive 73/23/EEC in accordance with EN 60730-1 (1999) Automatic electrical controls for household and similar use.</p> <p>Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant.</p> <p>BACnet International: BACnet Testing Laboratories (BTL) 135-2004 Listed BACnet Application Specific Controller (B-ASC)</p>
Dimensions	(Height x Width x Depth): 182 x 182 x 64 mm (7-3/16 x 7-3/16 x 2-1/2 in.) Center of Output Hub to Center of Anti-rotation Slot: 160 mm (6-5/16 in.)
Weight	0.86 kg (1.9 lb)

1. For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.

NS Series Network Zone Sensors (Part 1 of 2)

Supply Voltage	9.8 to 16.5 VDC; 15 VDC Nominal (From SA Bus)
Current Consumption	With LCD Display: 25 mA Maximum (Non-Transmitting) Without LCD Display: 13 mA Maximum (Non-Transmitting) 12 mA (NS-DTN70x3-0 Models)
Terminations	Modular Jack or Screw Terminal Block
Sensor Addressing	NS-ATx7003-0, NS-BTB7003-0, NS-BTN7003-0, and NS-BTP7003-0 Models: DIP Switch Set from 200 to 203; Factory Set at 203 All Other Models: Fixed Address of 199
Wire Size	Modular Jack Models: 26 AWG (0.4 mm Diameter) Recommended; Three Twisted Pair (Six Conductors) Screw Terminal Block Models: 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
Mounting	Surface-Mounted: 80 x 80 mm Surface-Mounted or Vertical Wallbox-Mounted: (120 x 80 mm)
Temperature Measurement Range	0.0°C/ 32.0°F to 40.0°C/104.0°F
Humidity Measurement Range	Full Range: 0 to 100% RH Calibrated Range: 10 to 90% RH
Temperature Sensor Type	Local Platinum Resistance Temperature Detector (RTD)
Humidity Sensor Type	Thin Film Capacitive Sensor
Temperature Resolution (Models with LCD)	±0.5C°/±0.5F°
Temperature Sensor Accuracy	±0.6C°/±1.0F°
Humidity Element Accuracy	NS-APx700x-0 and NS-BPB700x-0 Models: ±2% RH for 20 to 80% RH; ±4% RH for 10 to 20% and 80 to 90% RH NS-AHx700x-0 and NS-BHx700x-0 Models: ±3% RH for 20 to 80% RH; ±6% RH for 10 to 20% and 80 to 90% RH
Time Constant	10 Minutes Nominal at 10 fpm Airflow
Default Temperature Setpoint Adjustment Range	With LCD Display: 10.0°C/50.0°F to 30.0°C/86.0°F in 0.5° Increments Without LCD Display: ±3.0C°/±5.0F°
Ambient Conditions	Operating: 0 to 40°C (32 to 104°F); 10 to 95% RH, Noncondensing; 29°C (85°F) Maximum Dew Point Storage with LCD Display: -20 to 60°C (-4 to 140°F); 5 to 95% RH, Noncondensing Storage without LCD Display: -40 to 70°C (-40 to 158°F); 5 to 95% RH, Noncondensing

NS Series Network Zone 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 CSA C22.2 No. 205, Signal Equipment; Industry Canada, ICES-003
	Europe: CE Mark, EMC Directive 89/336/EEC; EN61000-6-3 (2001) Generic Emission Standard for Residential and Light Industry; EN61000-6-2 (2001) Generic Immunity Standard for Heavy Industrial Environment
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
Shipping Weight	NS-Axx7xxx-0 Models: 0.09 kg (0.20 lb) NS-Bxx7xxx-0 Models: 0.11 kg (0.25 lb)

NS Series Network Discharge Air Sensors (Part 1 of 2)

Supply Voltage	9.8 to 16.5 VDC; 15 VDC Nominal
Current Consumption	12 mA Maximum (Non-Transmitting) per Discharge Air Sensor; 60 mA Maximum Total Current Consumption per SA Bus
Terminations	Four Color-Coded Wiring Leads, Stripped and Tinned; Factory Installed at the Discharge Air Sensor Screw Terminal Block
Sensor Addressing	DIP Switch Set from 204 to 211; Factory Set at 204
Wire Size	1.0 to 0.6 mm Diameter (18 to 22 AWG); 0.6 mm Diameter (22 AWG) Recommended; 305 cm (10 ft) Wiring Lead Included with the Unit
Communication Rate	Auto-Detect: 9.6k, 19.2k, 38.4k, or 76.8k bps
Mounting	Duct-Mounted: 4 or 8 in. (102 or 203 mm) Temperature Probe Length
Temperature Measurement Range	-10°C/14°F to 60°C/140°F
Temperature Sensor Type	Local Platinum Resistance Temperature Detector (RTD)
Temperature Sensor Accuracy	±0.6C°/±1.0F°
Dimensions (Height x Width x Depth)	76 x 76 x 51 mm (3 x 3 x 2 in.)
Ambient Conditions	Operating: -10 to 60°C (14 to 140°F); 10 to 90% RH, Noncondensing; 29°C (85°F) Maximum Dew Point Storage: -40 to 70°C (-40 to 158°F); 5 to 95% RH, Noncondensing

NS Series Network Discharge Air 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, EMC Directive 89/336/EEC; EN61000-6-3 (2001) Generic Emission Standard for Residential and Light Industry; EN61000-6-2 (2001) Generic Immunity Standard for Heavy Industrial Environment
	Australia and New Zealand: C-Tick Mark, Australia/NZ Emissions Compliant
Shipping Weight	NS-DTN7043-0: 0.52 kg (1.15 lb) NS-DTN7083-0: 0.53 kg (1.17 lb)

Handheld VAV Balancing Tool

Product Code	NS-ATV7003-0
Supply Voltage	9.8 to 16.5 VDC; 15 VDC Nominal, Provided through the SA Bus Port;
Current Consumption	90mA maximum
Terminations	RJ-12 6-Position Modular Jack
Transmission Speed	Serial Communication (SA BUS) 9600, 19.2k, 38.4k, or 76.8k bps
Sensor Addressing	Fixed Address of 198
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F); 5 to 95% RH, Noncondensing; 30°C (86°F) Maximum Dew Point Storage: -40 to 85°C (-40 to 185°F); 5 to 95% RH, Noncondensing
Compliance	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, EMC Directive 89/336/EEC; EN61000-6-3 (2001) Generic Emission Standard for Residential and Light Industry; EN61000-6-2 (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 Smart Sensor (B-SS)
Dimensions	80 x 80 x 25 mm (3.2 x 3.2 x 1.0 in.)
Weight	0.165 kg (0.365 lb)

ZFR1810 Wireless Field Bus Coordinator

Product Code Number	MS-ZFR1810-0
Power Supply Input	<p>One of the following:</p> <ul style="list-style-type: none"> 24 VAC +10%/-15%, 50/60 Hz, Class 2. Transformer allowance should be 2.5 VA maximum, 2 VA typical. Provided through the three-position 24 V~ screw terminal pluggable block. 15 VDC, 180 mA (7 to 18 VDC, 185 mA maximum current draw) on the FC Bus provided through the FC/SA BUS IN RJ-12 jack from the FC Bus Jack on a Field Controller or NxE supervisory engine.
Power Supply Output	15 VDC; Provided through the FC/SA BUS, FC/SA BUS OUT RJ-12 jack for external devices.
Addressing	DIP Switches, Field Adjustable
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	76.2 m (250 ft) Maximum Line-of-Sight 15 m (50 ft) Practical Average
Ambient Conditions	<p>Operating: 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing</p> <p>Storage: -20 to 70°C (-4 to 158°F), 5 to 90% RH, Noncondensing</p>
Materials	White Plastic Housing with Plenum rating per UL1995 UL94-5VB Flammability Rating
Terminations	<p>Two spade terminals with three-position screw terminal pluggable block for 24 VAC power supply input.</p> <p>Four spade terminals with four-position screw terminal pluggable block for RS-485 communications.</p> <p>RJ-12 IN jack for 15 VDC power supply and communications connection from an NxE or FEC FC Bus jack.</p> <p>RJ-12 OUT jack supplies 15 VDC and communications to BTCVT Wireless Commissioning Converter.</p>
Dimensions	146 x 122 x 52 mm (5.8 x 4.8 x 2.1 in.)
Mounting Hardware	Four No. 6 Trade Size Sheet Metal Screws
Shipping Weights	0.45 kg (1.0 lb)
Compliance	<p>United States:</p> <p>Intended for Connection to an NEC Class 2 Power Source; UL 916 Energy Management Plenum rated per UL1995 UL94-5VB Flammability Rating FCC Compliant to CFR47, Part 15, Subpart B, Class A Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL</p> <p>Canada:</p> <p>CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada (IC) Compliant to Canadian ICES-003, Class B Limits Industry Canada IC: 5969A-MATRIXL</p> <p>Europe:</p> <p>CE Mark – EMC Directive 89/336/EEC, Radio Telecommunications Terminal Equipment Directive 99/5/EC</p>

ZFR1811 Wireless Field Bus Router

Product Code Number	MS-ZFR1811-0
Supply Voltage	8 to 18 VDC, 15 VDC Nominal, Provided from the FC/SA BUS RJ-12 jack on the FEC or VMA1600
Current Consumption	90mA maximum
Addressing	DIP Switches, Field Adjustable
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Bands
Transmission Power	10 mW Maximum
Transmission Range	76.2 m (250 ft) Maximum Line-of-Sight 15 m (50 ft) Practical Average
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing Storage: -20 to 70°C (-4 to 158°F), 5 to 90% RH, Noncondensing
Materials	Translucent Plastic Housing with Plenum rating per UL1995 UL94-5VB Flammability Rating
Terminations	RJ-12 plug for connection to FEC or VMA1600 FC/SA Bus jack
Dimensions	136 x 100 x 18 mm (5-3/8 x 3-15/16 x 3/4 in.)
Mounting Hardware	1/2 in. trade size Electrical Mechanical Tubing (EMT) connector
Shipping Weights	0.095 kg (0.21 lb)
Compliance	<p>United States: Intended for Connection to an NEC Class 2 Power Source; UL 916 Energy Management Plenum rated per UL1995 UL94-5VB Flammability Rating FCC Compliant to CFR47, Part 15, Subpart B, Class A Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL</p> <p>Canada: CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada (IC) Compliant to Canadian ICES-003, Class B Limits Industry Canada IC: 5969A-MATRIXL</p> <p>Europe: CE Mark – EMC Directive 89/336/EEC, Radio Telecommunications Terminal Equipment Directive 99/5/EC</p>

WRZ-TTx0000 Series Wireless Room Temperature Sensors (Part 1 of 2)

Product Codes	<p>WRZ-TTP0000-0: Warmer/Cooler (+/-) Set Point Adjustment</p> <p>WRZ-TTR0000-0: No Set Point Adjustment</p> <p>WRZ-TTS0000-0: Set Point Adjustment Scale: 13 to 29°C/55 to 85°F</p>
Power Requirements	3 VDC Supplied by Two 1.5 VDC AA Alkaline Batteries (Included with Sensor); Typical Battery Life: 48 Months (36 Months Minimum)
Addressing	DIP Switches, Field Adjustable. MS/TP Address, Network Number, and Zone Address
Ambient Conditions	Operating: 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing Storage: -40 to 71°C (-40 to 160°F), 5 to 95% RH, Noncondensing
Wireless Band	Direct-Sequence Spread-Spectrum, 2.4 GHz ISM Band
Transmission Power	10 mW Maximum
Transmission Range	30 m (100 ft) Maximum Line of Sight; 15 m (50 ft) Practical Average
Transmissions	Every 60 Seconds (\pm 20 Seconds)

WRZ-TTx0000 Series Wireless Room Temperature Sensors (Part 2 of 2)

Temperature System Accuracy	0.6C°/1.0F° Over the Range of 13 to 29°C (55 to 85°F); 0.9C°/1.5F° Over a Range of 0 to 13°C (32 to 55°F) and 29 to 43°C (85 to 110°F)
Temperature Sensor Type	Internal 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Materials	NEMA 1 White Plastic Housing
Mounting	Screw Mount or Double-Sided Adhesive Foam Tape Mount; Double-Sided Adhesive Foam Tape Included
Dimensions	120 x 80 x 38 mm (4.7 x 3.1 x 1.5 in.)
Shipping Weight	0.14 kg (0.3 lb)
Compliance	<p>United States: Transmission Complies with FCC Part 15.247 Regulations for Low Power Unlicensed Transmitters Transmitter FCC Identification: TFB-MATRIXL</p> <p>Canada: Industry Canada IC: 5969A-MATRIXL</p> <p>Europe: CE Mark – EMC Directive 89/336/EEC, Radio Telecommunications Terminal Equipment Directive 99/5/EC</p>

Wireless Commissioning Converter (Part 1 of 2)

Product Code	MS-BTCVT-1
Supply Voltage	9.8 to 16.5 VDC, Nominal 15 VDC, provided through the SA/FC Bus Port
Current Consumption	90 mA maximum
Ambient Conditions	<p>Operating: 0 to 50°C (32 to 122°F), 5 to 95% RH, Noncondensing, 30°C (86°F) Maximum Dewpoint</p> <p>Storage: -40 to 85°C (-40 to 185°F), 5 to 95% RH, Noncondensing</p>
Transmission Power	2.5 mW maximum
Transmission Speed	<p>Wireless Communication: 115.2k bits per second (bps)</p> <p>Serial Communication (SA/FC Bus): 9600, 19.2k, 38.4k, or 76.8k bps</p>
Transmission Range (Typical)	Wireless Communication: 10 m (33 ft) line-of-sight
Wireless Security	Security Mode 3 - Link Level Enforced Security
Network and Serial Interfaces	Bluetooth Wireless Technology One RS-485 Bus
Dimensions	116 x 75 x 35 mm (4.6 x 3.0 x 1.4 in.)
Housing	Black ABS Plastic Housing Blue PVC Protective Boot
Weight	0.165 kg (0.365 lb) without hanging components

Wireless Commissioning Converter (Part 2 of 2)

Compliance	United States: FCC Title 47 - Telecommunications, Transmitter Complies with FCC part 15.247; Regulations for Low Power Unlicensed Transmitters (Transmitter FCC Identification: CB2-MS-BTCVT-0), Receiver Complies with FCC part 15.109; Regulations for Low Power Unlicensed Receivers (Transmitter FCC Identification: CB2-MS-BTCVT-0)
	Canada: Industry Canada (IC: 279A-MSBTCVT0) Transmitter RSS-210 Receiver RSS-210
	Europe: CE Mark Transmitter - RTTE Directive 1995/5/EC Test Standard is ETSI EN 300 328 ISM Spread Spectrum 2.4 GHz. Transmitter/Receiver - EMC Directive 89/336/EEC Test Standard is ETSI EN 300 328 ISM Spread Spectrum 2.4 GHz.
	Japan: Telecommunications Certification - 003NY05068 0000

North American Emissions Compliance for FEC Series, IOM Series, and VMA1610/1620 Controllers

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.

North American Emissions Compliance for NS Series Network Sensors, VAV Series Balancing Sensors, ZFR1800 Series Wireless Field Bus System, and Wireless Commissioning Converters

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.

RF Transmitters: Compliance Statement (Part 15.19)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Warning (Part 15.21)

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

RF Transmitters: Industry Canada Statement

The term **IC** before the certification/registration number only signifies that the Industry Canada technical specifications were met. Le terme «IC» précédant le numéro d'accréditation/inscription signifie simplement que le produit est conforme aux spécifications techniques d'Industry Canada.

Section 5.5 of RSS-210

This device has been designed to operate with an antenna having a maximum gain of [x] dB. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is [y] ohms.

Cet appareil a été conçu pour fonctionner avec une antenne d'un gain maximum de [x] dBi. En application des réglementations d'Industry Canada, l'utilisation d'une antenne de gain supérieur est strictement interdite. L'impédance d'antenne requise est de [y] ohms.

Section 5.11 of RSS-210

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication.

Pour réduire les interférences radio potentielles avec les dispositifs d'autres utilisateurs, le type d'antenne et son gain doivent être choisis de façon à ce que la puissance isotrope rayonnée équivalente (PIRE) ne soit pas supérieure à la puissance nécessaire pour une bonne communication.



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

*Metasys® and Johnson Controls® are registered trademarks of Johnson Controls, Inc.
All other marks herein are the marks of their respective owners. © 2008 Johnson Controls, Inc.*