Metasys® System Field Equipment Controllers and Related Products Product Bulletin

Overview

The *Metasys*® system family of Field Equipment Controllers comprises a group of versatile field controllers. There are controllers that can communicate on the BACnet/IP protocol and controllers that can be switched between using the Master-Slave/Token-Passing (MS/TP) or N2 communications protocols. Both the BACnet/IP controllers and the field controllers in MS/TP mode are BACnet® network-compliant field controllers designed to monitor, control, and integrate a wide variety of HVAC and other building equipment. Controllers running in N2 mode can be used to maintain or modernize sites with installed legacy Johnson Controls® controllers.

The FEC family of controllers integrate into the web-based Metasys system, and include a broad portfolio of controllers, including: the Advanced Application Field Equipment Controllers (FACs), Field Equipment Controllers (FECs), Variable Air Volume Modular Assembly (VMA) VMA16 (32-and16-bit models), VMA18 Series, VMA1930 Controllers, and Input/Output Modules (IOMs).

The FAC, FEC, VMA16 (32-bit), VMA18, VMA1930, and IOM models feature an advanced design that provides optimum performance and easy access to power, network, and field terminations. These controllers come with 32-bit microprocessors to meet and exceed demanding industry standards. Some FEC models include an intuitive UI with an integral LCD screen and a 6-button navigation touchpad that provides enhanced local monitoring of controlled field equipment.

The VMA18 Controller's embedded capabilities, in addition to its modular accessories, make it well suited as a replacement for legacy VMA14xx Series Controllers. VMA16 (16-bit) Series Controllers (models VMA1610 and VMA1620) are also part of this family of controllers but cannot be configured as N2 Controllers.

For demanding environments, such as rooftop applications, extended temperature range models are available that provide accurate control over a wider operational temperature range. Look for the ET (Extended Temperature) suffix in the controller model.

Devices in the Field Equipment Controller family integrate easily with the NS Series Network Sensors, the ZFR1800 Series Wireless Field Bus system (ZFR), the WNC1800/ZFR182x Pro Series Wireless Field Bus system (ZFR Pro), and WRZ Series Wireless Sensors. The Field Equipment Controller family also supports the WRZ Series Wireless Sensors using the WRZ-78xx One-to-One Wireless Receiver. These products complement the Field Equipment Controller (FEC) family of controllers and enable enhanced capabilities in both wired and wireless field controller network applications.

**Figure 1: *Metasys* System Field Equipment Controllers and Accessories**

A wide variety of network sensor models provides options for measuring and displaying zone temperature, duct temperature, zone humidity, carbon dioxide level, setpoint adjustments, fan speed control, and discharge air temperatures.

The ZFR1800, WNC1800/ZFR182x Pro, and WRZ Series devices use open wireless technology standards, including Institute of Electrical and Electronic Engineers, Inc. (IEEE) 802.15.4 and meshing technology, to provide flexibility and reliability.

Features and Benefits

- **Large product family:** Provides a wide range of point mix to meet application requirements and allows for the addition of one or more Input/Output Module (IOM)s and/or Network Sensors to provide even more I/O capacity.
- **Standard Hardware and Software Platform:** Uses a common hardware design throughout the family line to support standardized wiring practices and installation workflows. Also uses a common software design to support use of a single tool for control applications, commissioning, and troubleshooting to minimize technical training.
- **Auto-Tuned Control Loops:** Reduce commissioning time, eliminate change-of-season re-commissioning, and reduce wear and tear on mechanical devices.
- **Patented proportional adaptive control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC):** These technologies provide continuous loop tuning
- **Standard BACnet® Protocol:** Provides interoperability with other Building Automation System (BAS) products that use the widely accepted BACnet standard.
- **Models to support communication protocols that are switchable between BACnet MS/TP and N2:** With CCT Release 10.1 and later, FACs, FECs, and VMAs can be configured to communicate using either the BACnet MS/TP or the N2 field bus networking protocol. The operation of the IOM is not affected by the selection of the BACnet MS/TP or the N2 protocol in the host controller.
- **Models to support BACnet/IP communications:** The FAC4911 and the VMA1930 communicate over the BACnet/IP protocol. This allows more flexibility in choosing the devices for your site's network.
- **ZFR Wireless Field Controller (FC) or Sensor/Actuator (SA) Bus Interface:** Both the ZFR1800 Series Wireless and WNC1800/ZFR182x Pro Series Wireless Field Bus (ZFR Pro) provide a wireless alternative to hard-wired *Metasys* system counterparts, offering application flexibility and mobility with minimal disruption to building occupants.
- **Bluetooth® Wireless Commissioning:** Provides an easy-to-use connection to the configuration and commissioning tool.
- **Universal Inputs, Configurable Outputs, and Point Expansion Modules:** Allow multiple signal options to provide input/output flexibility.
- **Optional Local User Interface Display:** Allows convenient monitoring and adjusting capabilities at the local device.
- **BACnet Testing Laboratories™ (BTL) Listed:** Ensures interoperability with other BTL-listed devices. BTL is a third-party agency which validates that BAS vendor products meet the BACnet industry-standard protocol.

Figure 2: *Metasys* System with Field Equipment Controllers
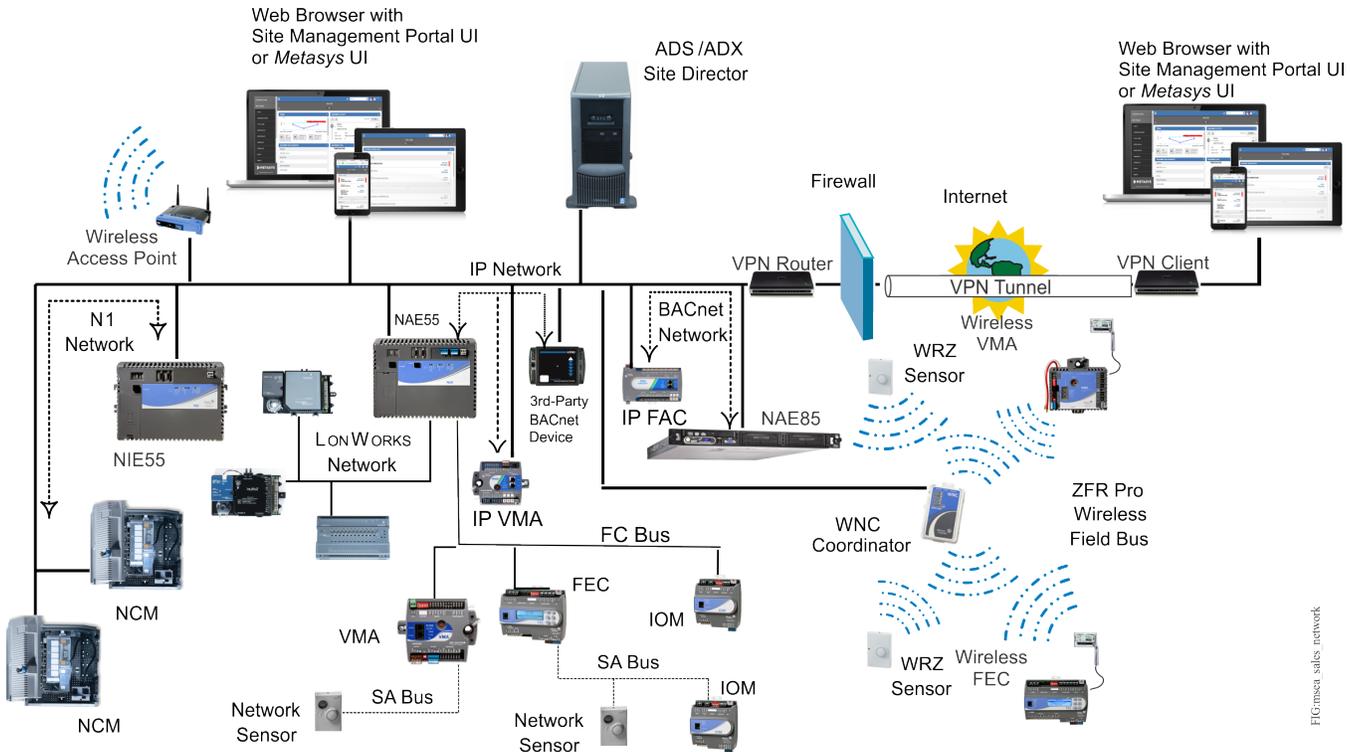
Integration to the *Metasys* System Supervisory Devices

The FEC family is designed to integrate seamlessly into the *Metasys* system by connecting and communicating directly with a Network Automation Engine (NAE) or a Network Control Engine (NCE). This seamless integration of field controllers with *Metasys* supervisory controllers enables building operators to monitor and adjust field controllers directly from the *Metasys* system UI.

In addition, service personnel can view field controller information locally through the integral LCD (included on some FEC models), through an optional local controller display (MS-DIS1710-0) available for field controllers, or through the optional Mobile Access Portal (MAP) Gateway.

Field Equipment Controller Family

The full range of Advanced Application Field Equipment Controller (FAC) and 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. All controllers in the *Metasys* Field Equipment Controller family run pre-engineered and user-programmed applications and provide the I/O required to monitor and control a wide variety of HVAC equipment.

This large family of diverse field controllers is designed to install easily and communicate through standard RS485 BACnet Master-Slave/Token-Passing (MS/TP) protocol or BACnet/IP protocol, enabling you to build an almost endless variety of field controller network applications, ranging from simple fan coil, heat pump, or VAV control applications to very advanced central plant management and stand-alone applications.

Note: The VMA18 Series controller is a programmable digital controller tailored for VAV applications that communicate through the N2 protocol. VMA18 controllers are intended for use as functional replacements for the VMA1410, VMA1415, VMA1420, and VMA1440 controllers only. VMA18 controllers support the N2 Open Communications protocol at a maximum rate of 9600 baud.

Metasys Field Controller Features

Features and benefits common to the FAC, FEC, VMA16 and VMA18 Series, VMA1930, and IOM controllers include the following:

- 32-bit microprocessor ensures optimum performance and meets industry specifications
- BACnet Automatic Discovery support enables easy controller integration into a *Metasys* BAS
- MS/TP Field Controllers have an integral end-of-line (EOL) switch that enables field controllers to be terminating devices on the communications bus
- Pluggable communications bus and supply power terminal blocks expedite installation and troubleshooting
- MS/TP controllers have wireless connectivity through the ZFR1800 Series or the WNC1800/ZFR182x Pro Series Wireless Field Bus Systems that enables wireless mesh connectivity to supervisory controllers, facilitating easy initial location and relocation

Additional features and benefits common to FAC, FEC, and VMA field controllers include the following:

- Writable flash memory allows standard or customized applications to be downloaded from the Controller Configuration Tool (CCT) and enables persistent application data
- Local UI display provides enhanced local monitoring
- User-friendly graphic theme and clear push-button identification facilitate easy navigation of the integral or optional UI/display

Switchable Communications Protocols

By default, the *Metasys®* system FEC Family Controllers and network sensors communicate using either the standard BACnet protocol based on the ANSI/ASHRAE 135-2004, or the BACnet/IP protocol.

The BACnet protocol is a standard for ANSI, ASHRAE, and the International Standards Organization (ISO) for building controls.

FEC, VMA16, VMA18, and IOM field controllers are BTL-listed as BACnet Application Specific Controllers (B-ASCs). FAC Field Controllers and the VMA1930 Field Controller are BTL-listed as BACnet Advanced Application Controllers (B-AACs). The NS Series Sensors are BTL-listed as BACnet Smart Sensors (B-SSs).

Release 10.1 and later of the Controller Configuration Tool (CCT) can be used to switch the Field Bus communications protocol in supported FEC Family Field Controllers to be either the standard BACnet Master-Slave/Token-Passing (MS/TP) or the N2 protocol. All new controllers either use BACnet MS/TP as the default communications protocol, or BACnet/IP. Switchable communications protocols in the MS/TP models provide a cost-effective upgrade and modernization path for customers with existing N2 controllers. The *Modernization Guide for Legacy N2 Controllers (LIT-12012005)* and the controller-specific documentation provide installation and commissioning support and include tips for efficient and safe replacement. Refer to the *N2 Compatibility Options* chapter of the *Controller Tool Help (LIT-12011147)* for information about mapping N2 Objects in controllers with switchable communications protocols.

The N2-capable FEC Family Controllers can be used as functional replacements for legacy N2 controllers. The N2-capable FEC Family Controllers:

Note: The IOM modules are not capable nor required to work as N2 devices as they communicate through the SA bus from a field controller.

- have the input and output (I/O) quantities and characteristics of the FEC Family Controllers
- must be programmed with CCT, which has similar, but not identical programming capabilities as HVACPro, GX9100, GPL, and other legacy tools
- support SA Bus devices
- support WRZ wireless sensors from the controller using the WRZ-7860 receiver
- are available in Buy American versions (most models)

The N2-capable FEC family controllers:
- do not support Zone Bus (for example, TMZ sensors and M100 actuators) or XT-Bus (System 91) devices (for example, XT, XTM, and XP modules)
- do not support a wireless connection to the N2 bus
- do not support NxE passthrough
- are not listed for UL864 UUKL; N2 **is not** supported as part of the *Metasys* 9th Edition listing for Smoke Control System Equipment

Hardware and Installation

Metasys field controllers are encased in a durable plastic housing. The plastic housing may eliminate the need for a separate enclosure for plenum-rated construction. Check specific controller documentation and regional, national, and local code requirements for appropriate applications.

Metasys field controllers feature bright, color-coded LEDs, visible on the controller cover, that indicate the supply power, communications bus, and EOL switch status, as well as a variety of fault conditions to aid troubleshooting the controller and bus.

An integral EOL switch on MS/TP field controllers allows you to enable the controller as a bus terminating device, which when properly configured, reduces reflected noise on the bus and improves bus communication.

Each MS/TP field controller has an easily accessible eight-position DIP switch that allows you to set a valid and unique device address for each field controller on the bus. A blank space is included on the controller cover for recording the device address.

The BACnet/IP field controllers feature rotary switches to give each controller a unique number on the subnet where it resides, in order to identify it in the Controller Tool for uploading, downloading, and commissioning.

The field controllers feature removable, color-coded, keyed, and labeled terminal block plugs for the supply power and communications bus terminations. Most models have fixed, color-coded, and labeled terminal blocks for the input and output terminations, which facilitate installing and servicing the controllers.

The I/O terminations on the VMA models are spade lugs. Pluggable screw terminal blocks that connect to the I/O spade terminations are available as optional accessories.

FAC2612 models have removable, color-coded, and labeled terminal block plugs for the I/O terminations.

On FAC, FEC, and IOM Series Controllers, integral mounting clips and a DIN rail track on the controller back-plate allow you to easily mount the field controller either on a horizontal section of 35 mm DIN rail or directly to a wall or flat vertical surface.

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 FAC and FEC models without a display, a stand-alone DIS1710 Local Controller Display module and MAP Gateway are available that connect directly to the SA Bus port. For details, refer to the *DIS1710 Local Controller Display Product Bulletin (LIT-12011273)* and the *Mobile Access Portal Gateway Product Bulletin (LIT-1201184)*.

Advanced Application Field Equipment Controller (FAC)

The FAC Series Controllers are programmable controllers that can communicate using BACnet/IP, MS/TP, or N2 communications protocols, depending on the model. The FAC4911 communicates using BACnet/IP communications protocol, and is a BACnet Advanced Application Controller (B-AAC). The other FAC Series controllers can be switched between MS/TP and N2 Communications protocols. These controllers used as MS/TP devices are BACnet Advanced Application Controllers (B-AACs) with integral RS-485 MS/TP communications.

FAC Series Controllers feature an integral real-time clock and support time-based tasks, which enables these field controllers to monitor and control schedules, calendars, alarms, and trends. FACs can continue time-based control and monitoring when offline for extended periods of time from a *Metasys* system network.

FAC Series Controllers can also operate as stand-alone controllers in applications that do not require a networked supervisory device or for network applications where it is preferred to have the scheduling, alarming, and/or trending performed locally in the field controllers.

The FAC4911 controllers operate on BACnet/IP networks and integrate into Johnson Controls® and third-party systems.

The FAC3611 model includes a fast persistence feature that allows data values to be held a configurable value, up to once per second. Persistence refers to how often samples of data are stored locally. In the event of a problem, such as a loss of power, data can be retrieved up to the rate that the data is persisted, minimizing the potential loss of data. When power is restored, previously persisted data, up to the rate of persistence, remains available and accessible. For example, if persistence is configured for once per second, you only risk losing one second of data. Persisting data may be essential for situations that require greater data accuracy, including certain methods of utility data collection and billing.

The FAC2612 controller features line-voltage relay outputs, making this controller well-suited for use in terminal units. The FAC2612-2 model uses a line-voltage power supply, eliminating the need for a 24 VAC transformer in line-voltage applications.

FAC controllers using the MS/TP protocol support wireless communications using the ZFR or ZFR Pro Series accessories and the WRZ-7860 One-to-One Receiver.

Figure 3: Advanced Application Field Equipment Controllers (FACs)

Features

In addition to the features and benefits listed in *Metasys Field Controller Features*, FACs also provide the following:

- MS/TP FACs support Network Automation Engine (NAE) and Network Control Engine (NCE) Automatic Discovery ability for easy controller integration
- The BACnet/IP FAC4911 is supported on the NAE55, NAE85, and the Open Data Server (ODS).
- Support for the DIS17 remote display and the MAP Gateway for monitoring and commanding of I/O and configuration parameters

Table 1: FAC Series Model Information (Including Point Type Counts)

		FAC2611	FAC2612	FAC3611[1]	FAC4911
Communication Protocol		BACnet MS/TP, N2			BACnet/IP
Engines Supported		All Model types. Some NIE models support MS/TP and N2 devices. Refer to the *Network Engines Product Bulletin (LIT-12012138)* for details.			NAE55, NAE85, ODS
Modular Jacks		6-pin SA Bus Modular Port supports one communicating sensor. **Or** you can wire up to four communicating sensors to the SA Bus Terminal Block. They cannot be used at the same time.			
		6-pin FC Bus for tool support			
Point Types	**Signals Accepted**				

Table 1: FAC Series Model Information (Including Point Type Counts)

		FAC2611	FAC2612	FAC3611[1]	FAC4911
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC	6	5	8	10
	Analog Input, Current Mode, 4–20 mA				
	Analog Input, Resistive Mode, 0–2k ohm, resistance temperature detector (RTD) (1k NI [Johnson Controls], 1k PT, A99B SI), negative temperature coefficient (NTC) (10k Type L, 2.252k Type 2)				
	Binary Input, Dry Contact Maintained Mode				
Binary Input (BI)	Dry Contact Maintained Mode	2	4	6	6
	Pulse Counter/Accumulator Mode (High Speed), 100 Hz				
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC	2		6	4
	Analog Current Mode, 4–20 mA				
Binary Output (BO)	24 VAC Triac	3		6	4
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC	4	4		4
	Binary Output Mode, 24 VAC Triac				
Relay Output (RO)	Relay Output: Single-Pole, Double-Throw (SPDT)		2 - SPDT		
	Relay Output: Single-Pole, Single-Throw (SPST)		3 - SPST		

1 The FAC3611-0 model is available globally, while the FAC3611-0A is available only in Asia. Contact your local Johnson Controls representative for more information.

Field Equipment Controller (FEC)

The FEC Series products are programmable controllers that can be switched between BACnet MS/TP and N2 communications protocols. When they are used as BACnet MS/TP devices, they are BACnet Application Specific Controllers (B-ASCs) with integral MS/TP communications. In N2 mode, they can be used to modernize sites with legacy Johnson Controls® controllers.

Important: You cannot purchase a similar third-party device and install it in a UL/ULC Listed smoke control system. Doing so voids the UL/ULC Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/ULC Smoke Control Listing.

Important: Only those Johnson Controls products identified for use in smoke control applications have been tested and listed by UL for use in a *Metasys* System UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. Installation of a product that is not UL/ULC Listed and labeled for this application prevents the entire system from being UL/ULC Listed for smoke control.

Figure 4: Field Equipment Controllers

Table 2: FEC Series Model Information (Including Point Type Counts)

		FEC16	FEC2511[2]	FEC26
Communication Protocol		BACnet MS/TP, N2		
Engines		All Model types. Some NIE models support MS/TP and N2 devices. Refer to the *Network Engines Product Bulletin (LIT-12012138)* for details.		
Point Types	Signals Accepted			
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	4 (Does not support Current Mode)	6
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter/Accumulator Mode (High Speed), 100 Hz	1	6	2
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Output, Current Mode, 4–20 mA		2 (Voltage Only)	2
Binary Output (BO)	24 VAC Triac	3	2 (Ext Power Only)	3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	4	2	4

1   Analog Input, Current Mode is set by hardware for the FEC26, and by software for the FEC16.
2   The FEC2511 is only available in Asia and Europe. Contact your local Johnson Controls representative for more information.

VMA16 (32-bit), VMA18, and VMA1930 VAV Modular Assembly Controller Series

VMA16s (32-bit) and VMA18s are programmable digital controllers tailored for VAV applications that can be switched between MS/TP and N2 communications protocols. When they are used as MS/TP devices, they communicate through the BACnet MS/TP protocol. In N2 mode, they can be used as replacements for legacy Johnson Controls® controllers.

Note: When replacing a VMA1400 Series controller on an existing N2 network, the VMA18 Series controller is the preferred device because certain existing sensor models can be reused. VMA18 controllers are intended for use as functional replacements for the VMA1410, VMA1415, VMA1420, and VMA1440 controllers only. VMA18 controllers support field-selectable BACnet MS/TP or N2 protocols.

The VMA1930 programmable controller uses BACnet/IP networking for higher speed communication with the CCT and improved bandwidth. This gives you more flexibility in choosing controllers for your site's specific needs.

The VMA1615, VMA1630, VMA1832, and VMA1930 (32-bit) controllers feature an integral digital differential pressure transducer (DPT), an integral damper actuator, and a 32-bit microprocessor. The controllers' small package size facilitates quick field installation and efficient use of space, while not compromising high-tech control performance. These controllers easily adapt NS Series Network Sensors for zone and discharge air temperature sensing.

The VMA1626 controller is shipped with an actuator but without a differential pressure transducer (DPT), making it well suited for commercial zoning applications or for pressure-dependent VAV box applications where no DPT is required.

The VMA1656 controller is shipped without a differential pressure transducer but with an integrated actuator and ball valve linkage. These controllers are for use on the Johnson Controls VG-1000 1/2 - 1 inch valves and needs to be used primarily as a replacement for the VMA assembly of the VG-1000 Series Smart Valve product. The smart valve product line is ideal for chilled beam applications.

The VMA1628 includes a DPT but does not have an actuator. Without an actuator, this controller is well suited for controlling large VAV boxes that require more than 4 N•m of torque.

These features make the VMA16 (32-bit) controllers the product of choice for VAV systems. The wide variety of network sensor models provides options for measuring and displaying zone temperature, occupancy detection, duct temperature, zone humidity and dewpoint determination, carbon dioxide (CO_2) level, setpoint adjustments, VAV box fan speed control, and discharge air temperatures.

The VMA18 models are designed to be functional replacements for the VMA14xx Series Variable Air Volume Modular Assembly controllers. They contain a sensor actuator bus port and accessories well suited for replacing VMA14xx controllers.

Figure 5: VAV Modular Assembly Controllers (VMAs) Family

VMA16 (32-bit) Features

In addition to the features and benefits listed in *Metasys Field Controller Features*, VMA16s (32-bit) provide the following:

- Models that include an actuator feature a fast response actuator that drives the damper from full open to full closed (90°) in 60 seconds to reduce commissioning time
- Models that include a DPT feature a state-of-the-art digital non-flow DPT to provide 14-bit resolution with bidirectional flow operation that supports automatic correction for polarity on high- and low-pressure DP tube connections; this pressure sensor eliminates high- and low-pressure connection mistakes.
- A phone jack-style connector on the FC Bus and SA Bus of the VMA16 that supports quick connection to the Wireless Commissioning Converter, ZFR or ZFR Pro Series Wireless Field Bus System wireless routers, MAP Gateway, and network sensors.
- A 33 percent smaller package than the VMA16s (16-bit)
- Two additional Universal Inputs that provide more low-cost sensor options

VMA16 (16-bit) VAV Modular Assembly Series

VMA16 (16-bit) VAV Modular Assembly controllers are programmable BACnet® Application Specific Controllers (B-ASCs) with RS-485 MS/TP communications. VMA controllers feature an integral 4 N•m damper actuator and Differential Pressure Transducer (DPT) with models for cooling only or cooling with reheat applications and fan control.

Note: These 16-bit models are **only** available for UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System applications.

The differential pressure transducer (DPT) in the VMA16 (16-bit) 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.

The VMA16 (16-bit) controllers can be configured for single-duct, dual-duct, and supply/exhaust applications. Note that some of these applications may require an additional actuator and DPT.

VMA16 (16-bit) controllers support NS and WRZ Series Communicating Network Sensors for temperature sensing, fan override, and occupancy override control.

Important: You cannot purchase a similar third-party device and install it in a UL/ULC Listed smoke control system. Doing so voids the UL/ULC Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/ULC Smoke Control Listing.

Important: Only those Johnson Controls products identified for use in smoke control applications have been tested and listed by UL for use in a *Metasys* System UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. Installation of a product that is not UL/ULC Listed and labeled for this application prevents the entire system from being UL/ULC Listed for smoke control.

Figure 6: VMA16 (16-bit) Controller

Features

In addition to the features and benefits listed in *Metasys Field Controller Features*, VMAs (16-bit) provide the following:

- Integrated differential pressure transducer (DPT) sensor and actuator reduces installation time
- 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 SA Bus, providing further application flexibility

Installation

Field mounting the VMA16 controllers is straightforward. The VMA16 controllers require minimal wiring and are 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 fully open or fully closed.

The housing dimensions of the VMA16 controllers meet industry mounting requirements and make the controllers easy to handle.

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

Table 3: VMA16 (16-bit) Series Information (Including Point Type Counts per Model) (For Smoke Control Applications Only)

		VMA1610-0U and -1U	VMA1620-0U and -1U
Communication Protocol		BACnet MS/TP	
Engines		MS-NAE5510-1U, MS-NAE5510-2U, MS-NAE4510-2U, MS-NAE3510-2U, MS-NCE2560-0U	
Point Types	**Signals Accepted**		
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC	1	1
	Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A998SI), NTC (10k Type L, 2.252k Type 2)		
	Binary Input, Dry Contact Maintained Mode		
Binary Output (BO)	24 VAC Triac		3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC		2
	Binary Output Mode, 24 VAC Triac		

Table 3: VMA16 (16-bit) Series Information (Including Point Type Counts per Model) (For Smoke Control Applications Only)

		VMA1610-0U and -1U	VMA1620-0U and -1U
Integrated Actuator	Internal	1	1
Integrated Flow Sensor	Internal	1	1

Table 4: VMA16 (32-bit) Series and VMA1930 Information (Including Point Type Counts per Model)

		VMA1615	VMA1626	VMA1628	VMA1630	VMA1656	VMA1930	VMA1617[2]	VMA1632[2]
Communication Protocol		BACnet MS/TP, N2					BACnet/IP	BACnet MS/TP, N2	
Engines		All Model types. Some NIE models support MS/TP and N2 devices. Refer to the *Network Engines Product Bulletin (LIT-12012138)* for details.					NAE55, NAE85, ODS	All Model types. Some NIE models support MS/TP and N2 devices. Refer to the *Network Engines Product Bulletin (LIT-12012138)* for details.	
Modular Jacks		6-pin SA Bus Modular Port supports one communicating sensor. **Or** you can wire up to four communicating sensors to the SA Bus Terminal Block. They cannot be used at the same time.						8-pin SA Bus supports analog non-communicating sensor (port labeled TSTAT)	
		6-pin FC Bus for tool support							
Point Types	**Signals Accepted**								
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Current Mode, 4-20mA Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	3	3	3	3	3	3	3	3
Binary Output (BO)	24 VAC Triac	2	3	3	3	3	3	2	3

Table 4: VMA16 (32-bit) Series and VMA1930 Information (Including Point Type Counts per Model)

		VMA1615	VMA1626	VMA1628	VMA1630	VMA1656	VMA1930	VMA1617[2]	VMA1632[2]
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac		2	2	2	2	2		2
Integrated Actuator	Internal	1	1		1	1 with ball valve linkage	1	1	1
Differential Pressure Transducer	Internal	1		1	1		1	1	1
Zone Sensor Input	On SA Bus[1]	Up to 4 NS Series Network Zone Sensors							
		Up to 9 WRZ sensors when using the ZFR or ZFR Pro Series wireless router configuration and up to 5 WRZ sensors when using the one-to-one WRZ-78xx wireless configuration							

1 A total of 10 MS/TP master addresses (IOMs), not including sensor addresses (MS/TP slaves), can be used in a single VMA controller.

2 This model is currently available only in Asia. Contact your local Johnson Controls representative for more information.

Table 5: VMA18 Series Information (Including Point Type Counts per Model)

		VMA1826	VMA1832
Communication Protocol		BACnet MS/TP, N2	
Engines		NAEs, NCEs, ODS	
Modular Jacks		8-pin SA Bus supports analog non-communicating sensor	
Point Types	**Signals Accepted**		
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	3	3
Binary Output (BO)	24 VAC Triac	3	3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	2	2
Integrated Actuator	Internal	1	1
Differential Pressure Transducer	Internal		1
Zone Sensor Input	On SA Bus[1]	Up to 4 NS Series Network Zone Sensors Up to 9 WRZ sensors when using the ZFR or ZFR Pro Series wireless router configurations and up to 5 WRZ sensors when using the one-to-one WRZ-78xx wireless configuration	

1 A total of 10 MS/TP master addresses (IOMs), not including sensor addresses (MS/TP slaves), can be used in a single VMA controller.

Input/Output Module (IOM)

The IOM Series expansion I/O modules are BACnet Application Specific Controllers (B-ASCs) with integral RS-485 MS/TP communications. IOM controllers integrate into the web-based *Metasys* system.

Note: At CCT Release 10.1 and later, FACs, FECs, and VMAs can communicate by using either the BACnet or the N2 field bus networking protocol. The operation of the IOM Input/Output Module is not affected by the selection of the BACnet or the N2 protocol in the host controller.

IOMs can serve in one of two capacities, depending on where they are installed in the *Metasys* system. When installed on the SA Bus of an FAC, FEC, or VMA controller, the IOM expands the point count of these controllers. When installed on the FC Bus, IOMs can be used as I/O point multiplexors to support monitoring and control from an NAE or NCE. The point multiplexor can also be useful for sharing points between other field controllers on the FC Bus using peer-to-peer connectivity.

Important: You cannot purchase a similar third-party device and install it in a UL/ULC Listed smoke control system. Doing so voids the UL/ULC Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/ULC Smoke Control Listing.

Important: Only those Johnson Controls products identified for use in smoke control applications have been tested and listed by UL for use in a *Metasys* System UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. Installation of a product that is not UL/ULC Listed and labeled for this application prevents the entire system from being UL/ULC Listed for smoke control.

Figure 7: Input/Output Modules (IOMs)

Features

In addition to the features and benefits listed in *Metasys Field Controller Features*, IOMs provide the following:

- Ability to reside on the FC Bus or SA Bus provides application flexibility

Table 6: IOM Series Point Type Counts per Model

		IOM 1711	IOM 2711	IOM 2721	IOM 3711	IOM 3721	IOM 3731	IOM 4711
Communication Protocol		BACnet MS/TP						
Engines		All Model types. Some NIE models support MS/TP and N2 devices. Refer to the *Network Engines Product Bulletin (LIT-12012138)* for details.						
Point Types	**Signals Accepted**							
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC		2	8	4			6
	Analog Input, Current Mode, 4–20 mA							
	Analog Input, Resistive Mode, 0–2 kohm, RTD (1k NI [Johnson Controls], 1k PT, A99B SI), NTC (10k Type L, 2.252k Type 2)							
	Binary Input, Dry Contact Maintained Mode							
Binary Input (BI)	Dry Contact Maintained Mode	4				16	8	2
	Pulse Counter/Accumulator Mode (High Speed), 100 Hz							

Table 6: IOM Series Point Type Counts per Model

		IOM 1711	IOM 2711	IOM 2721	IOM 3711	IOM 3721	IOM 3731	IOM 4711
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC			2				2
	Analog Output, Current Mode, 4–20 mA							
Binary Output (BO)[1]	24 VAC Triac						8	3
Universal Output (UO)	Analog Output, Voltage Mode, 0–10 VDC		2		4			
	Binary Output Mode, 24 VAC/DC Field-Effect Transistor (FET)							
	Analog Output, Current Mode, 4–20 mA							
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC							4
	Binary Output Mode, 24 VAC Triac							
Relay Output (RO) (-0 models only)	120/240 VAC		2		4			
Relay Output (RO) (-1 models only)	24 VAC, SELV		2		4			
Relay Output (RO) (-2 models only)	240 VAC		2		4			

1   The BOs on the IOM3731-0A model require an external low-voltage power source.

Panel and Sub-Panel Assembly Options

FAC, FEC, and IOM field controllers are also available in pre-wired panels and sub-panel assemblies. The panelized controller options provide all of the controllers necessary for a complete application solution, including a pre-wired power source and a latching or lockable door.

Controller Configuration Tool

The CCT is used in conjunction with the *Metasys* system to configure, simulate, and commission the FEC family of controllers.

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 Field Equipment Controllers that use a local controller display (*Figure 8*).

Figure 8: Mechanical Selection in CCT
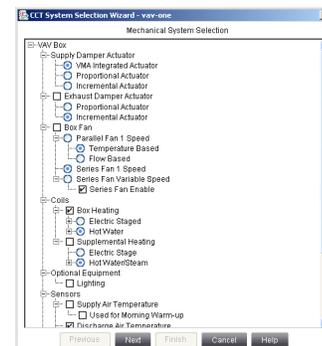
Simulation mode allows you to review, run, or simulate the application logic as if you were commissioning a live system. You can make adjustments to setpoints, inputs, or sensors during a simulation session to validate the logic before assigning the configuration to a specific controller.

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 or N2 Field Bus, or using the Ethernet Passthru mode in conjunction with the System Configuration Tool (SCT) through a NAE or NCE.

Note: Ethernet Passthru is not available on controllers configured for N2 communications.

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 (*Figure 9*).

CCT includes integrated productivity features with utilities to facilitate mass application uploads and downloads, including upgrades of entire trunks of controllers with just a few mouse clicks. Template files provide an intuitive method of reading and writing configuration parameters to multiple controllers, reducing the time it takes to commission your field controller networks.

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 that require only commissioning tasks (for example, balancing contractors). The Configuration and Simulation modes are disabled in the CCT Commissioning software.

Figure 9: CCT User Interface
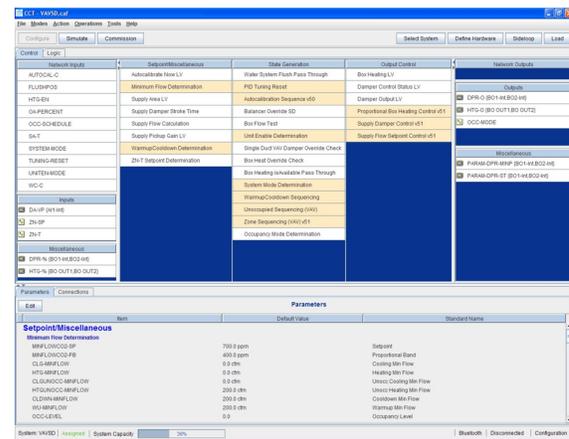
Features

- 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

Mobile Access Portal (MAP) Gateway

The MAP Gateway is a pocket-sized web server that provides a wireless mobile user interface to SMART Equipment and Johnson Controls branded system controllers and thermostats. Small, lightweight, and easy to use, the MAP Gateway joins the rapidly expanding list of Johnson Controls® products that leverage the power of mobility and smart devices to improve daily operations.

The MAP Gateway can be used to access field bus devices on Metasys® systems, Facility Explorer systems, and SMART Equipment rooftop units (RTUs) with unit control boards (UCBs). The MAP Gateway supports Johnson Controls branded Field Controllers, including FAC, FEC, and VMA Series devices. It also supports the TEC3000 Series Thermostats. Offering many-to-one, multi-client connectivity, the MAP Gateway provides access to any SMART Equipment device that is on a connected BACnet® Master-Slave/Token-Passing (MS/TP) field bus. The MAP Gateway solution is conveniently sized and has a built-in wireless access point. The MAP Gateway provides an intuitive, browser-based user interface to access advanced features like alarms and point configuration.

The MAP Gateway at Release 4.2 can be used to commission the BACnet/IP field controllers, the FAC4911 and VMA1930, when directly connected to them using their SA bus sensor port or through a thermostat connected on the same port.

For more information on the MAP Gateway, refer to the *Mobile Access Portal Gateway Product Bulletin (LIT-12011884)*.

Figure 10: MAP Gateway

Wireless Commissioning Converter

The Wireless Commissioning Converter provides a temporary Bluetooth connection between *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*).

The Wireless Commissioning Converter provides communication from the BACnet MS/TP FC Bus or the SA Bus to a Bluetooth-enabled computer running the CCT software. Any MS/TP controller on an FC Bus can be commissioned by connecting to any other controller, any network sensor, or any IOM connected to any controller on the bus, provided a FC/SA bus port is available. The Wireless Commissioning Converter can also provide CCT support for BACnet/IP controllers. However, it does not download Firmware or Applications to the BACnet/IP controllers. Only upload and commissioning of BACnet/IP controllers is supported through BTCVT.

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

Figure 11: Wireless Commissioning Converter

Features

The Wireless Commissioning Converter provides the following features:

- 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-enabled laptop
- Standard Bluetooth technology allows you to use a Bluetooth-enabled laptop or any laptop with a commercial off-the-shelf Bluetooth adapter

Handheld VAV Balancing Tool

The Handheld VAV Balancing Tool lets you set the parameters for VAV applications that reside on *Metasys* system VMA16 Series, VMA1930, FEC Series, or FAC Series Controllers.

The VAV balancing parameters appear on the tool's LCD. A dial and two buttons let you navigate through intuitive menus to balance the VAV box. The menus are customized to the type of application residing in the controller. The balancing operation features an adjustable time-out parameter that returns the tool and controller to normal operation if you leave the controller in balancing mode.

The Handheld VAV Balancing Tool is lightweight and portable. It can plug into most models of network sensor to access the VAV controller.

The Handheld VAV Balancing Tool is compatible with the following *Metasys* system field equipment controllers:

- FAC or FEC loaded with a VAV application
- VMA16 or VMA1930 loaded with a VAV application
- NS Series Network Sensor connected to an FAC, FEC, or VMA16, or VMA1930 loaded with a VAV application

Figure 12: Handheld VAV Balancing Tool

Features

The Handheld VAV Balancing Tool provides the following features:

- Allows VAV balancing and commissioning without a laptop
- Connects directly to the controller or the controller NS Series Network Sensor through standard RJ-12 plug
- Intuitive, menu-driven operation simplifies balancing tasks

Network Sensors

The NS Series Network Sensor offering includes NS Series Network Zone Sensors and NS Series Network Discharge Air Sensors (*Figure 13*).

Figure 13: Network Zone Sensors and Discharge Air Sensors

The NS Series Network Zone Sensors are designed to function directly with the *Metasys* system family of FEC field controllers. Several models of network zone sensors monitor room temperature. Options are available to also monitor zone humidity, carbon dioxide (CO_2), local temperature setpoint adjustments, and other variables. 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 LCD that allows occupants to view the zone temperature 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 the user 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 network zone sensor to a controller can be terminated using either a modular jack or screw terminals.

Most network zone sensors include 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.

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 HVAC systems. Models in this series monitor the duct temperature, typically at the discharge of the VAV box, and transmit this data to an FAC, FEC, VMA16, VMA1930, or an NCE on the SA Bus using the 10 ft (305 cm) wiring lead included with the unit. The 10 ft (305 cm) 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 4 or 8 in. (102 or 203 mm) temperature probe. All models include DIP switches for applications requiring multiple discharge air sensors, each with a unique DIP switch address.

When using the VMA18 as a replacement for an existing VMA1400, note the following:
- VMA18 is able to reuse existing TE-6xxx Series sensors.
- VMA18 is able to reuse existing TE-700 Series sensors.
- VMA18 is able to reuse existing TE-730 Series sensors.
- VMA18 is not able to reuse existing TMZ1600 Series sensors and requires replacement of the TMZ with a new sensor.
- VMA18 can be used with the NS Series Network sensors.
- VMA18 can be used with the WRZ Series wireless sensors and the WRZ78xx Series One-to-One wireless receiver.

Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for important product application information, ordering information, and technical specifications.

WNC1800/ZFR182x Pro Series Wireless Field Bus System

The WNC1800/ZFR182x Pro (ZFR Pro) Series Wireless Field Bus System provides a wireless platform and an IP interface for all BACnet MS/TP *Metasys* FEC and TEC3000 Thermostat Controller (TEC) family controllers using BACnet® protocol over 2.4 GHz wireless ISM band.

The pairing of a ZFR1821 or ZFR1822 router and any BACnet MS/TP FEC family device, or a wireless TEC3000 model (with built-in router), are referred to as Wireless-Enabled Field Controllers (WEFCs).

Figure 14: ZFR Pro Wireless Field Bus Devices

A ZFR Pro Series system consists of the following:

- up to 8 Wireless Network Coordinators (WNC) Gateways per network engine
- up to 35 Wireless Enabled Field Controllers (WEFCs) per coordinator
- up to 100 WEFCs per field bus, depending on the network engine (50 with NAE35, 32 with an NCE)
- up to 9 WRZ Sensors per FEC or VMA16 field controllers
- additional ZFR1821 or ZFR1822 Wireless Field Bus Router-Repeaters connected as required, acting as repeaters

Note: Repeaters extend the wireless transmission distance of the BACnet data communications, fill in any gaps within the wireless mesh network, and provide alternate wireless data transmission pathways.

Together, these components create a wireless mesh network that allows the exchange of data between the collection of WNC Gateways, WEFCs, TEC3000s, and WRZs within the ZFR Pro Series system's wireless network and a network engine, using standard BACnet/IP communications.

For more information refer to the *WNC1800/FX-ZFR 182x Pro Series Wireless Field Bus System Product Bulletin (LIT-12012378)*.

ZFR1800 Series Wireless Field Bus System

The ZFR1800 Series System provides wireless monitoring and control of HVAC equipment within multiple levels of a *Metasys* system. It sends BACnet messages over an 802.15.4, 2.4 GHz wireless signal, to communicate between supervisory engines, field controllers, and room temperature sensors.

Any BACnet MS/TP *Metasys* FEC family field controller can be wirelessly enabled using a ZFR1811 Wireless Field Bus Router or the ZFR1812 Wall Mount Wireless Field Bus Router. One router is required per field controller. This pairing is referred to as a Wireless Enabled Field Controller (WEFC).

Figure 15: ZFR1811/ZFR1812 Router, ZFR1810 Coordinator, WRZ-TTx Series Sensors

A ZFR1800 Series System consists of:

- up to 8 ZFR1810 Wireless Field Bus Coordinators per MS/TP field bus
- up to 35 WEFCs per coordinator
- up to 100 WEFCs per field bus depending on the network engine. (50 with an NAE35, 32 with an NCE)

- up to 9 WRZ-TTx Series sensors per controller with a maximum of 100 combined total of WEFC and WRZ sensors
- additional ZFR1811 Wireless Field Bus Routers or ZFR1812 Wall Mount Wireless Field Bus Routers connected to ZFRRPTs, as required, acting as repeaters

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 MS/TP devices.

Use the MS-ZFRRPT-0 optional repeater power supply with a ZFR1811 or ZFR1812 router to serve as a repeater to extend wireless mesh networks and provide multiple wireless transmission pathways.

For more information refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)*.

Repair Information

If a *Metasys* system field equipment controller, network sensor, or any related product fails to operate within its specifications, replace the product. For replacement products, contact the nearest Johnson Controls® representative.

Ordering Information

Contact your Johnson Controls representative to order *Metasys* field controllers and related products. See *FAC Series Ordering Information*, *FEC Series Ordering Information*, *VMA16 (32-bit),VMA18 Series, and VMA1930 Ordering Information*, and *IOM Series Ordering Information* for product code numbers and product descriptions.

See *FEC for Smoke Control Ordering Information* and *IOM Series for Smoke Control Ordering Information* for product code numbers and descriptions of field controllers used in smoke control applications.

Table 7: FAC Series Ordering Information

Product Code Number	Description
MS-FAC2611-0	17-Point Advanced Application Field Equipment Controller with 6 UI, 2 BI, 4 CO, 3 BO, and 2 AO; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock
MS-FAC2612-1	18-Point Advanced Application Field Equipment Controller with 5 UI, 4 BI, 4 CO, 2 SPDT RO, and 3 SPST RO; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock
MS-FAC2612-2	18-Point Advanced Application Field Equipment Controller with 5 UI, 4 BI, 4 CO, 2 SPDT RO, and 3 SPST RO; 100–240 VAC; SA Bus; FC Bus; Integral Real-time Clock
MS-FAC3611-0	26-Point Advanced Application Field Equipment Controller with 8 UI, 6 BI, 6 BO, and 6 AO; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock; Improved Fast Persistence

Table 7: FAC Series Ordering Information

Product Code Number	Description
MS-FAC3611-0A[1]	26-Point Advanced Application Field Equipment Controller with 8 UI, 6 BI, 6 BO, and 6 AO; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock
MS-FAC4911-0	28-Point Advanced Application Field Equipment Controller with 10 UI, 6 BI, 4 BO, 4 AO, and 4 CO; 24 VAC; SA Sensor Port; Integral Real-time Clock; 2 Ethernet Ports for BACnet/IP Communications

1 This model is currently available only in Asia. Contact your local Johnson Controls representative for more information.

Table 8: FEC Series Ordering Information

Product Code Number	Description
MS-FEC1611-1	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support
MS-FEC1611-1ET	10-Point Field Equipment Controller Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F).
MS-FEC1621-1	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support; Integral Display and 6-Button Navigation Touch Pad
MS-FEC2511-0[1]	16-Point Field Equipment Controller with 4 UI, 6 BI, 2 AO, 2 BO, and 2 CO; 24 VAC; FC and SA Bus Support. The FEC2511 model does not support current mode.
MS-FEC2611-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support
MS-FEC2611-0ET	FEC2611 Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F).
MS-FEC2621-0	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support; Integral Display and 6-Button Navigation Touchpad

1 This model is available only in Asia and Europe. Contact your local Johnson Controls representative for more information.

Table 9: FEC Series for Smoke Control Ordering Information

Product Code Number[1, 2]	Description
MS-FEC1611-1U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC, FC and SA Bus, with Mounting Base
MS-FEU1610-0U	10-Point Field Equipment Controller with 2 UI, 1 BI, 3 BO, and 4 CO; 24 VAC; FC and SA Bus Support; with Mounting Base
MS-FEC2611-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC, FC and SA Bus, with Mounting Base
MS-FEU2610-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support; with Mounting Base

1 These devices are UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. These devices must be ordered in a Smoke Control UUKL listing.
2 You cannot purchase a similar third-party device and install it in a UL/ULC Listed smoke control system. Doing so voids the UL/ULC Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/ULC Smoke Control Listing.

Table 10: VMA16 (32-bit), VMA18 and VMA1930 Series Ordering Information

Product Code Number	Description
MS-VMA1615-0	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI and 2 BO; 24 VAC; FC Bus, and SA Bus
MS-VMA1617-0[1]	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI and 2 BO; 24 VAC; FC Bus, and SA Bus, includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors
MS-VMA1626-0	32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus; (No DPT)

Table 10: VMA16 (32-bit), VMA18 and VMA1930 Series Ordering Information

Product Code Number	Description
MS-VMA1628-0	32-bit, Integrated VAV Controller and DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus (No Actuator)
MS-VMA1630-0	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus
MS-VMA1632-0[1]	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus, Includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors
MS-VMA1656-0	32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus, Integrated Ball Valve Linkage
MS-VMA1826-0	32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus; Includes cable adapters for use when replacing VMA14xx Series controllers. Recommended replacement for VMA1440 controller (No DPT)
MS-VMA1832-0	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI and 2 BO; 24 VAC; FC Bus, and SA Bus, includes cable adapters for use when replacing VMA14xx Series controllers. Recommended replacement for VMA1410, VMA1415, or VMA1420 controller.
MS-VMA1930-0	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; and SA Sensor Port; Integral Real-time Clock; 2 Ethernet Ports for BACnet/IP Communications

1   This model is currently available only in Asia. Contact your local Johnson Controls representative for more information.

Table 11: VMA16 (16-bit) Series for Smoke Control Ordering Information

Product Code Number[1][1]	Description
MS-VMA1610-0U	1-Point Variable Air Volume Modular Assembly with Integrated VAV Controller, Actuator and Pressure Sensor; 1 UI; 24 VAC; FC and SA Bus Support (Cooling only)
MS-VMA1610-1U	Integrated VAV Controller/Actuator/Pressure Sensor (Cooling Only), FC Bus and SA Bus, 3.3 Volt Model
MS-VMA1620-0U	6-Point Variable Air Volume Modular Assembly with Integrated VAV Controller, Actuator, and Pressure Sensor; 1 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus (with Reheat and Fan Control)
MS-VMA1620-1U	Integrated VAV Controller/Actuator/Pressure Sensor (with Reheat and Fan Control), FC Bus and SA Bus, 3.3 Volt Model

1   These devices are UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System.
2   You cannot purchase a similar third-party device and install it in a UL/ULC Listed smoke control system. Doing so voids the UL/ULC Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/ULC Smoke Control Listing.

Table 12: IOM Series Ordering Information

Product Code Number	Description	UL and cUL (Canada)	CE Marked
MS-IOM1711-0	4-Point IOM with 4 BI, FC Bus and SA Bus Support	X	X
MS-IOM2711-0	6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support. Relays are rated for 120/240 VAC.	X	
MS-IOM2711-2	6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support. Relays are rated for 240 VAC.		X
MS-IOM2721-0	10-Point IOM with 8 UI, 2 AO, FC Bus, and SA Bus Support	X	X
MS-IOM3711-0	12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support. Relays are rated for 120/240 VAC.	X	
MS-IOM3711-2	12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support. Relays are rated for 240 VAC.		X

Table 12: IOM Series Ordering Information

Product Code Number	Description	UL and cUL (Canada)	CE Marked
MS-IOM3721-0	16-Point IOM with 16 BI, FC Bus, and SA Bus Support	X	X
MS-IOM3731-0	16-Point IOM with 8 BI, 8 BO, FC Bus, and SA Bus Support	X	X
MS-IOM3731-0A[1]	16-Point IOM with 8 BI, 8 BO, FC Bus, and SA Bus Support **Note:** Binary Outputs (BOs) on MS-IOM3731-0A controllers do not supply power for the outputs; the BOs require external low-voltage (<30 VAC) power sources.	X	X
MS-IOM4711-0	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, FC and SA Bus Support	X	X

1   This model is currently available only in Asia. Contact your local Johnson Controls representative for more information.

Table 13: IOM Series for Smoke Control Ordering Information

Product Code Number[1] , [2]	Description
MS-IOM1710-0U	4-Point IOM with 4 BI; 24 VAC; FC Bus and SA Bus Support
MS-IOM1711-0U	4-Point IOM with 4 BI; 24 VAC; FC Bus and SA Bus Support
MS-IOM2710-0U	6-Point IOM with 2 UI, 2 UO, 2 BO; 24 VAC; FC Bus and SA Bus Support
MS-IOM2711-0U	6-Point IOM with 2 UI, 2 UO, 2 BO; 24 VAC; FC Bus and SA Bus Support
MS-IOM3710-0U	12-Point IOM with 4 UI, 4 UO, 4 BO; 24 VAC; FC Bus and SA Bus Support
MS-IOM3711-0U	12-Point IOM with 4 UI, 4 UO, 4 BO; 24 VAC; FC Bus and SA Bus Support
MS-IOU4710-0U	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO; 24 VAC; FC Bus and SA Bus Support with Mounting Base
MS-IOM4711-0U	17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO; 24 VAC; FC Bus and SA Bus Support with Mounting Base

1 These devices are UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. These devices must be ordered in a Smoke Control UUKL listing.
2 All field controllers in a smoke control system must be mounted in Johnson Controls custom or standard UL 864 panels or in panels that are ordered from Johnson Controls. If these field controllers are used with panels that are not supplied by Johnson Controls, they are not compliant with the UL 864 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System listing.

Table 14: Field Equipment Controller Family Accessories (Order Separately)

Product Code Number	Description
TL-MAP1810-0P	Portable MAP Gateway for US/Canada - includes MAP Gateway, RJ-12 cable, bumper guard, and lanyard
TL-MAP1810-0S	Stationary MAP Gateway for US/Canada - includes MAP Gateway, field bus adapter, mounting bracket, and AC power supply. (Adapters for the power supply may vary by country.)
TL-MAP1810-0PE	Portable MAP Gateway - for Europe (All EU Countries); Middle East (UAE and Qatar)
TL-MAP1810-0PA	Portable MAP Gateway - for Asia (China, Japan, Australia, New Zealand, India, Singapore, Thailand)
MS-BTCVT-1	Wireless Commissioning Converter with Bluetooth Technology
MS-BTCVTCBL-700	Cable Replacement Set for the MS-BTCVT-1 or the NS-ATV7003-0; Includes One 5 ft (1.5 m) Retractable Cable
NS-ATV7003-0	Handheld VAV Balancing Tool
MS-DIS1710-0	Local Controller Display: Refer to *Local Controller Display Product Bulletin (LIT-12011273)* for more information.
NS Series Sensors	NS Series Network Sensors: Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for specific sensor model descriptions.
NS-WALLPLATE-0	Network Sensor Wall Plate
WRZ Series Sensors	WRZ Series Wireless Room Sensors: Refer to the *WRZ Series Wireless Room Sensors Product Bulletin (LIT-12011653)* for specific sensor model descriptions.
WRZ-7860-0	Receiver for One-to-One Wireless Room Sensing Systems - functions with WRZ Series Sensors room sensors
WRZ-SST-120	Wireless System Survey Tool
MS-ZFR1821-x and MS-ZFR1822-x	ZFR1821 or ZFR1822 Pro Wireless Router/Repeater for use in ZFR Pro Series Wireless Field Bus system. For more information refer to the *WNC1800/ZFR182x Pro Series Wireless Field Bus System Product Bulletin (LIT-12012320)*.
MS-ZFR1820-x and MS-ZFR1823-x	ZFR1820 or ZFR1823 Pro Coordinator Radio for use in ZFR Pro Series Wireless Field Bus system. For more information refer to the *WNC1800/ZFR182x Pro Series Wireless Field Bus System Product Bulletin (LIT-12012320)*.

Table 14: Field Equipment Controller Family Accessories (Order Separately)

Product Code Number	Description
MS-ZFR1810-1	Wireless Field Bus Coordinator for use in the ZFR1800 Wireless Field Bus System. For more information, refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)*.
MS-ZFR1811-1	Wireless Field Bus Router for use in ZFR1800 Wireless Field Bus System. For more information, refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)*.
MS-ZFR1812-1	Wall Mount Wireless Field Bus Router for use in ZFR1800 Wireless Field Bus System. For more information, refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)*.
ZFR-USBHA-0	ZFR USB Dongle provides a wireless connection through CCT to allow wireless commissioning of the wirelessly enabled FEC, FAC, IOM, and VMA16 controllers. Also allows use of the ZFR Checkout Tool (ZCT) in CCT. **Note:** The ZFR-USBHA-0 replaces the IA OEM DAUBI_2400 ZFR USB dongle. For additional information on the ZFR-USBHA-0 ZFR dongle, refer to the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)* or *ZFR1800 Series Wireless Field Bus System Quick Reference Guide (LIT-12011630)*.
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 Lug
AP-TBK1003-0	3-Position Screw Terminal that Plugs onto VMA Output Point Spade Lugs
AP-TBK4SA-0	Replacement MS/TP SA Bus Terminal, 4-Position Connector, Brown (Bulk Pack of 10)
AP-TBK4FC-0	Replacement MS/TP FC Bus Terminal, 4-Position Connector (Bulk Pack of 10)
AP-TBK3PW-0	Replacement Power Terminal, 3-Position Connector, Gray (Bulk Pack of 10)
AP-TBK2PW-0	Replacement Power Terminal, 2-Position Connector, Gray (Bulk Pack of 10)
AS-CBLVMA-1	Cable Adapter, 8-Pin Female Socket to 6-Pin Male Jack (Bulk Pack of 10)
AS-CBLVMA-2	Cable Adapter, 8-Pin Female Socket to 8-Pin Male Jack with 6-Pin Female Socket for Wireless Commissioning Converter (Bulk Pack of 10)
MS-TBKLV03-0	Terminal Block Kit - FAC Line Voltage AC Power - 3 Pieces
MS-TBKRO02-0	Terminal Block Kit - FAC 2-Position Relay Output - 9 Pieces
MS-TBKRO03-0	Terminal Block Kit - FAC 3-Position Relay Output - 6 Pieces
MS-TBKCO04-0	Terminal Block Kit - FAC 4-Position Configurable Output - 6 Pieces
MS-TBKUI04-0	Terminal Block Kit - FAC 4-Position Universal Input - 3 Pieces
MS-TBKUI05-0	Terminal Block Kit - FAC 5-Position Universal Input - 3 Pieces
MS-VMAACT-701	VMA Actuator Assembly Gearbox Replacement Kit
F-1000-325	Replacement Barbed Fitting for use on VMA1615, VMA1630, and VMA1832 for Connecting Tubing (Bulk Pack of 10)
F-1000-326	Flexible Tubing Extension with Barbed Fitting for VMA1615, VMA1630, and VMA1832, 14 in. Length (Bulk Pack of 20)
TL-BRTRP-0	Portable BACnet/IP to MS/TP Router
TE730-29C-0	Sensor with Temperature Setpoint Adjustment and without Occupancy Button
TE730-39C-0	Sensor with Temperature Setpoint Adjustment and Occupancy Button

FAC Series Technical Specifications

Table 15: FAC Series

Product Code Numbers	**MS-FAC2611-0**: 17-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power
	MS-FAC2612-1: 18-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power
	MS-FAC2612-2: 18-Point FAC with Integral Real-Time Clock and 100–240 VAC Supply Power
	MS-FAC3611-0: 26-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power with Fast Persistence
	MS-FAC3611-0A[1] : 26-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power
	MS-FAC4911-0: 28-Point FAC with Integral Real-Time Clock and 24 VAC Supply Power; Communicates over BACnet/IP network
Communications Protocol	**MS-FAC2611-0, MS-FAC2612-1, MS-FAC3611-0, MS-FAC3611-0A:**
	BACnet MS/TP, N2
	MS-FAC4911-0
	BACnet/IP
Engines Supported	**MS-FAC2611-0, MS-FAC2612-1, MS-FAC3611-0, MS-FAC3611-0A:**
	All Models except NIEs
	MS-FAC4911-0:
	NAE55, NAE85, ODS
Supply Voltage	**MS-FAC2611-0, MS-FAC2612-1, MS-FAC3611-0, MS-FAC3611-0A, and MS-FAC4911-0:** 24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60Hz, Power Supply Class 2 (North America), SELV (Europe)
	MS-FAC2612-2: 100–240 VAC 50/60 Hz
Power Consumption	**MS-FAC2611-0, MS-FAC3611-0, MS-FAC3611-0A, and MS-FAC4911-0:** 14 VA maximum
	MS-FAC2612-1: 30 VA maximum
	MS-FAC2612-2: 40 VA maximum
	Note: VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 84 VA (maximum).
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F), 10 to 90% RH noncondensing; Pollution Degree 2
	Storage: -40 to 80°C (-40 to 176°F), 5 to 95% RH noncondensing
Controller Addressing	**For BACnet MS/TP-configured controllers:** DIP switch set; valid field controller device addresses 4-127 (device addresses 0-3 and 128-255 are reserved)
	For BACnet/IP controllers: 3 rotary switches to assign unique number for each controller on the subnet to identify it in the Controller Tool for uploading, downloading, and commissioning
	For N2-configured controllers: DIP switch set; valid control device addresses 1-255
Communications Bus	**RS-485, field selectable between BACnet MS/TP and N2 communications:** • 3-wire FC Bus between the supervisory controller and field controllers • 4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from field controller) to bus devices. **MS-FAC4911-0:** • BACnet/IP over Ethernet cable • 4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from field controller) to bus devices.

Table 15: FAC Series

Processor	**MS-FAC2611-0, MS-FAC2612-1, MS-FAC2612-2, MS-FAC3611-0, and MS-FAC3611-0A:** H8SX/166xR Renesas® microcontroller
	MS-FAC3611-0 and MS-FAC3611-0A: RX630 32-Bit Renesas microcontroller
	MS-FAC4911-0: RX63N 32-Bit Renesas microcontroller
Memory	**MS-FAC2611-0, MS-FAC2612-1, and MS-FAC2612-2:** 4 MB Flash Memory and 1 MB RAM
	MS-FAC4911-0: 16 MB Flash Memory and 8 MB RAM
Input and Output Capabilities	**MS-FAC2611-0:**
	6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode
	2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
	3 - 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
	MS-FAC2612-1 and MS-FAC2612-2:
	5 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	4 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode
	4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO
	2 - Relay Outputs (Single-Pole, Double-Throw): UL 916: 1/4 hp 120 VAC, 1/2 hp 240 VAC; 360 VA Pilot Duty at 120/240 VAC (B300); 3 A Non-inductive 24-240 VAC; EN 60730: 6 (4) A N.O. or N.C. only
	3 - Relay Outputs (Single-Pole, Single-Throw): UL 916:1/4 hp 120 VAC, 1/2 hp 240 VAC; 360 VA Pilot Duty at 120/240 VAC (B300); 3 A Non-inductive 24-240 VAC; EN 60730: 6 (4) A N.O. or N.C. only
	MS-FAC3611-0 and MS-FAC3611-0A[1]:
	8 - Universal Inputs: Defined as 0-10 VDC, 4-20 mA, 0-600k ohms, or Binary Dry Contact
	6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode
	6 - Binary Outputs: Defined as 24 VAC Triac (external power source only)
	6 - Analog Outputs: Defined as 0-10 VDC or 4-20 mA
	MS-FAC4911-0:
	10 - Universal Inputs: Defined as 0-10 VDC, 4-20 mA, 0-600k ohms, or Binary Dry Contact
	6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode
	4 - Binary Outputs: Defined as 24 VAC Triac (external power source only)
	4 - Analog Outputs: Defined as 0-10 VDC or 4-20 mA
	4 - Configurable Outputs: Defined as AO mode , 0-10 VDC or BO mode, 24 VAC Triac
Analog Input/Analog Output Resolution and Accuracy	Analog Input: 15-bit resolution
	Analog Output: 15-bit resolution, +/- 200 mV accuracy in 0-10 VDC applications

Table 15: FAC Series

Terminations	**MS-FAC2611-0, MS-FAC3611-0, and MS-FAC3611-0A:**
	Input/Output: Fixed Screw Terminal Blocks
	FC Bus, SA Bus and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks
	FC Bus and SA Bus Port: RJ-12 6-pin Modular Jacks
	MS-FAC2612-1 and MS-FAC2612-2:
	Input/Output: Pluggable Screw Terminal Blocks
	FC Bus, SA Bus and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks
	FC Bus and SA Bus Port: RJ-12 6-pin Modular Jacks
	MS-FAC4911-0:
	Input/Output: Fixed Screw Terminal Blocks
	SA Bus and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks
	SA Bus Port: RJ-12 6-pin Modular Jacks
Mounting	Horizontal on single 35 mm DIN rain mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	Enclosure material: ABS and polycarbonate UL94 5VB, self-extinguishing; Plenum-rated Protection Class: IP20 (IEC529) (except the FAC2612 controller)
Dimensions (Height x Width x Depth)	**MS-FAC2611-0:** 150 x 190 x 53 mm (5-7/8 x 7-1/2 x 2-1/8 in.) including terminals and mounting clips
	MS-FAC2612 Models: 150 x 164 x 53 mm (5-7/8 x 6-7/16 x 2-1/8 in.) including terminals and mounting clips
	MS-FAC3611-0, MS-FAC3611-0A[1], and MS-FAC4911-0: 150 x 220 x 57.5 mm (5-7/8 x 8-3/4 x 2-3/8 in.) including terminals and mounting clips
	Note: Mounting space for FAC models requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	0.5 kg (1.1 lb)
Compliance C€	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; 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 – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive.
	Johnson Controls, declares that the FAC2612-2 models are also in compliance with the essential requirements and other relevant provisions of the Low Voltage Directive. Declared as Independently Mounted, Intended for Panel Mounting, Operating Control Type 1.B, 4kV rated impulse voltage, 100°C ball pressure test.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International:
	MS-FAC26 Models: BACnet Testing Laboratories (BTL) Protocol Revision 7 Listed BACnet Advanced Application Controller (B-AAC)
	MS-FAC3611-0 and MS-FAC3611-0A[1]: BACnet Testing Laboratories™ Protocol Revision 9 (BTL) Listed BACnet Advanced Application Controller (B-AAC)
	MS-FAC4911-0: BACnet Testing Laboratories™ Protocol Revision 12 (BTL) Listed BACnet Advanced Application Controller (B-AAC)

1 FAC3611-0A is available only in Asia. Contact your local Johnson Controls representative for more information.

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 shall not be liable for damages resulting from misapplication or misuse of its products.

Table 16: FEC Series Technical Specifications

Product Code Numbers	**MS-FEC1611-1:** 10-Point FEC
	MS-FEC1611-1ET: FEC1611 Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F).
	MS-FEC1621-1: 10-Point FEC with Integral Display and Push Button User Interface
	MS-FEC2511-0: 16-Point FEC, only available in Asia and Europe
	MS-FEC2611-0: 17-Point FEC
	MS-FEC2611-0ET: FEC2611 Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F).
	MS-FEC2621-0: 17-Point FEC with Integral Display and Push Button User Interface
	Smoke Control Models:
	MS-FEC1611-0U: 10-Point FEC
	MS-FEU1610-0U: 10-Point FEC
	MS-FEC2611-0U: 17-Point FEC
	MS-FEU2610-0U: 17-Point FEC
Supply Voltage	**MS-FEC1611-x, MS-FEC1611-1ET, MS-FEC2511-0, MS-FEC2611-0, MS-FEC2611-0ET, MS-FECx611-0U and MS-FEUx610-0U:** 24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety, Extra-Low Voltage (SELV) (Europe)
Power Consumption	**FEC2511 :** 14 VA maximum (no integral display)
	FEC1621 and FEC2621 (with integral display): 20 VA maximum
	Note: VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 84 VA (maximum).
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F); 10 to 90% RH noncondensing
	Storage: -40 to 80°C (-40 to 176°F); 5 to 95% RH noncondensing
	Note: FEC models with an -xET suffix have an operating temperature range of -40 to 70°C (-40 to 158°F).
Controller Addressing	**For BACnet-configured controllers:** DIP switch set; valid field controller device addresses 4-127 (device addresses 0-3 and 128-255 are reserved)
	For N2-configured controllers: DIP switch set; valid control device addresses 1-255
Communications Bus[1]	RS-485, field selectable between BACnet MS/TP and N2 communications:
	3-wire FC Bus between the supervisory controller and field controllers
	4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from field controller) to bus devices
Processor	**MS-FEC16, MS-FEC26, MS-FEU16 and MS-FEU26 models:** H8SX/166xR Renesas® 32-bit microcontroller
	MS-FEC2511-0: RX631 Renesas, 32-bit microcontroller
Memory	**MS-FEC16, MS-FEC26, MS-FEU16 and MS-FEU26 models:** 1 MB Flash Memory and 512 KB RAM
	MS-FEC2511-0: 4 MB Flash Memory and 8 MB SDRAM

Table 16: FEC Series Technical Specifications

Input and Output Capabilities	**MS-FEC16 Models:**
	2 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	1 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode
	3 - 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
	MS-FEC2511-0 Models:
	4 - Universal Inputs: Defined as 0–10 VDC, 0–600k ohm, or Binary Dry Contact
	6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode
	2 - Binary Outputs: Does not have internal 24 VAC source, external power is required
	2 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO
	2 - Analog Outputs: Defined as 0–10 VDC
	MS-FEC26 Models:
	6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode
	3 - 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
	2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
Analog Input/Analog Output Resolution and Accuracy	**MS-FEC16, MS-FEC26, MS-FEU16 and MS-FEU26 models:** Analog Input: 16-bit resolution
	Analog Output: 16-bit resolution and ±200 mV in 0–10 VDC applications
	MS-FEC2511-0: Analog Input: 15-bit resolution
Terminations	**MS-FEC16 and MS-FEC26 models:**
	Input/Output: Fixed Screw Terminal Blocks
	FC Bus, SA Bus, and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks
	FC Bus and SA Bus Port: RJ-12 6-pin Modular Jacks
	MS-FEC2511-0:
	Input/Output: Fixed Screw Terminal Blocks
	FC Bus, SA Bus, and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks
	SA Bus Port: RJ-12 6-pin Modular Jack
Mounting	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	**MS-FEC16 and MS-FEC26 models:** Enclosure material: ABS and polycarbonate UL94 5VB; self-extinguishing; Plenum-rated protection class: IP20 (IEC529)
	MS-FEC2511-0: Enclosure material: ABS and polycarbonate, Rating V0 minimum Protection Class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	**MS-FEC16 Models:** 150 x 164 x 53 mm (5-7/8 x 6-7/16 x 2-1/8 in.) including terminals and mounting clips
	MS-FEC2511-0: 150 x 164 x 48 mm (5-7/8 x 6-7/16 x 1-7/8 in.) including terminals and mounting clips
	MS-FEC26 Models: 150 x 190 x 53 mm (5-7/8 x 7-1/2 x 2-1/8 in.) including terminals and mounting clips
	Note: Mounting space for all field controllers requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.

Table 16: FEC Series Technical Specifications

Weight	**MS-FEC16 Models:** 0.4 kg (0.9 lb)
	MS-FEC25 and MS-FEC26 Models: 0.5 kg (1.1 lb)
Compliance $C\kern-0.1em E$	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System (models with **U** product code suffix 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; UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System (models with U product code suffix only); 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: **MS-FEC16 and MS-FEC26 Models:** BACnet Testing Laboratories (BTL) Protocol Revision 4 Listed BACnet Application Specific Controller (B-ASC) **FEC2511:** BACnet Testing Laboratories Protocol Revision 9 Listed BACnet Application Specific Controller (B-ASC)

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

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 shall not be liable for damages resulting from misapplication or misuse of its products.

VMA16 (32-bit), VMA18 Series, and VMA1930 Technical Specifications

Table 17: VMA16 (32-bit), VMA18 Series, and VMA1930

Product Code Numbers	**MS-VMA1615-0:** 32-bit, Integrated VAV Controller/Actuator/Pressure Sensor, 3 UI and 2 BO; 24 VAC; FC and SA Bus **MS-VMA1626-0:** 32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus (No DPT) **MS-VMA1628-0:** 32-bit, Integrated VAV Controller and DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus (No Actuator) **MS-VMA1630-0:** 32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, 2 CO; 24 VAC; FC and SA Bus **MS-VMA1617-0[1]:** Same description as VMA1615 but includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors **MS-VMA1632-0[1]:** Same description as VMA1630 but includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors **MS-VMA1656-0:** 32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus, Integrated Ball Valve Linkage (No DPT) **MS-VMA1826-0:** 32-bit, Integrated VAV Controller and Actuator, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus, with 8-9in TSTAT Port, Recommended for use as a replacement for VMA1440 (No DPT) **MS-VMA1832-0:** 32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, 2 CO; 24 VAC; FC and SA Bus, with 8-pin TSTAT Port. Recommended for use as a replacement for VMA1410, VMA1415, or VMA1420 **MS-VMA1930-0:** 32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; and SA Sensor Port; Integral Real-Time Clock; 2 Ethernet Ports for BACnet/IP Communications
Communications Protocol	**MS-VMA16xx:** BACnet MS/TP, N2 **MS-VMA1930-0:** BACnet/IP
Engines Supported	**VMA16xx:** All Models **VMA1930:** NAE55, NAE85, ODS
Supply Voltage	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power Consumption	10 VA typical, 14 VA maximum **Note:** VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 60 VA (maximum).
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F) **Storage:** -40 to 70°C (-40 to 158°F)

Table 17: VMA16 (32-bit), VMA18 Series, and VMA1930

Terminations	**MS-VMA1615-0, MS-VMA1626-0, MS-VMA1628-0, MS-VMA1630-0, and MS-VMA1656-0:** Inputs/Outputs: 6.3 mm (1/4 in.) Spade Lugs FC Bus, SA Bus, and Supply Power: 4-Wire and 2-Wire Pluggable Screw Terminal Blocks FC Bus and SA Bus Port: RJ-12 6-Pin Modular Jacks **MS-VMA1617-0 and MS-VMA1632-0:** Inputs/Outputs, SA Bus, and Supply Power: 6.3 mm (1/4 in.) Spade Lugs FC Bus: Pluggable Screw Terminal Block TSTAT Modular Port: RJ-45 8-Pin Modular Jack **MS-VMA1826-0 and MS-VMA1832-0:** Inputs/Outputs, SA Bus, and Supply Power: 6.3 mm (1/4 in.) Spade Lugs N2/FC Bus: Pluggable Screw Terminal Block TSTAT Modular Port: RJ-45 8-Pin Modular Jack **MS-VMA1930-0:** Inputs/Outputs: 6.3 mm (1/4 in.) Spade Lugs SA Bus and Supply Power: 4-Wire and 2-Wire Pluggable Screw Terminal Blocks SA Bus Modular Ports: RJ-12 6-Pin Modular Jacks
Controller Addressing	**For BACnet-configured controllers:** DIP switch set: valid field controller device addresses 4-127 (device addresses 0-3 and 128-255 are reserved) **For N2-configured controllers:** DIP switch set; valid control device addresses 1-255
Communications Bus [2]	**MS-VMA16xx and MS-VMA18 models:** RS-485, field selectable between BACnet MS/TP and N2 communications: **N2/FC Bus:** 1.5 mm (18 AWG) standard 3-wire, twisted, shielded cable recommended between the supervisory controller and field controllers **BACnet MS/TP:** 0.6 mm (22 AWG) stranded, 4-wire (2-twisted pairs) shielded cable recommended from the VMA controller for network sensors and other sensor/actuator devices; includes a terminal to source 15 VDC supply power from VMA to SA Bus devices[2] **MS-VMA1930-0:** **BACnet/IP:** Two Ethernet ports; 10/100 Mbps; 8-pin RJ-45 connector
Processor	**MS-VMA16 (32-bit) and MS-VMA18 models:** RX630 32-bit Renesas® microcontroller **MS-VMA1930-0:** RX63N 32-bit Renesas microcontroller
Memory	**MS-VMA16 (32-bit) and MS-VMA18 models:** 1 MB Flash Memory and 512 KB RAM **MS-VMA1930-0:** 16 MB serial flash memory and 8 MB of SDRAM
Input and Output Capabilities	**MS-VMA1615-0 and MS-VMA1617-0:** 3 - Universal Input: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Binary Outputs: Defined as 24 VAC Triac (internal power source) **MS-VMA1626-0, MS-VMA1628-0, MS-VMA1630-0, MS-VMA1632-0, MS-VMA1656-0, MS-VMA1826-0, MS-VMA1832-0 and MS-VMA1930-0:** 3 - Universal Input: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 3 - Binary Outputs: Defined as 24 VAC Triac (internal power source) 2 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO

Table 17: VMA16 (32-bit), VMA18 Series, and VMA1930

Analog Input/Analog Output Accuracy	**Analog Input:** 15-bit resolution on UIs
	Analog Output: 0–10 VDC ± 200 mV
Differential Pressure Transducer	Range: -1.5 in. to 1.5 in. W.C.
	Performance Characteristics:
	Accuracy +/-1.3% Full Span Maximum[3] (+/- .039 in. w.c.)
	Typical accuracy at zero (null) pressure is +/-0.2% full scale[4]
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.)
Dimensions	**Height x Width x Depth:** 165 x 125 x 73 mm (6.5 x 4.92 x 2.9 in.)
	Center of Output Hub to Center of Captive Spacer: 135 mm (5-5/16 in.)
Weight	0.65 kg (1.45 lb)
Compliance $C\,E$	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment.
	Suitable for use in other environmental air space (plenums) in accordance with Section 300.22(C) of the National Electric Code (VMA1615, VMA1630, and VMA1832 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 – 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:
	MS-VMA16xx and MS-VMA18 models: BACnet Testing Laboratories (BTL) Protocol Revision 7 Listed BACnet Application Specific Controller (B-ASC)
	MS-VMA1930-0: BACnet Testing Laboratories (BTL) Protocol Revision 12 Listed BACnet Advanced Application Controller (B-AAC)

1   This model is currently available only in Asia. Contact your local Johnson Controls representative for more information.
2   For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.
3   Combined error due to offset, non-linearity, and temperature variation.
4   Includes error due to non-linearity.

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 shall not be liable for damages resulting from misapplication or misuse of its products.

VMA (16-bit) Series Technical Specifications

Table 18: VMA16 (16-bit) Series For Smoke Control Ordering Information

Product Code Numbers	**Smoke Control Models:**
	MS-VMA1610-0U: 1-Point VMA (Cooling Only)
	MS-VMA1610-1U: Integrated VAV Controller/Actuator/DPT (Cooling Only), 3.3 Volt Model
	MS-VMA1620-0U: 6-Point VMA (Cooling with Reheat and Fan Control)
	MS-VMA1620-1U: Integrated VAV Controller/Actuator/DPT (with Reheat and Fan Control), 3.3 Volt Model
Supply Voltage	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)

Table 18: VMA16 (16-bit) Series For Smoke Control Ordering Information

Power Consumption	10 VA typical, 14 VA maximum
	Note: VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 60 VA (maximum).
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F)
	Storage: -40 to 70°C (-40 to 158°F)
Terminations	Inputs/Outputs: 6.3 mm (1/4 in.) Spade Lugs
	FC Bus, SA Bus, and Supply Power: 4-Wire and 3-Wire Pluggable Screw Terminal Blocks
	Sensor Port: RJ-12 6-Pin Modular Jacks
Controller Addressing	DIP switch set; valid field controller device addresses 4–127
	(Device addresses 0–3 and 128–255 are reserved and not valid field controller addresses.)
Communications Bus[2]	BACnet MS/TP, RS-485:
	3-wire FC Bus between the supervisory controller and field controllers
	4-wire SA Bus from the VMA controller, network sensors, and other sensor/actuator devices, includes a terminal to source 15 VDC supply power from VMA to SA Bus devices
Processor	Renesas® 16-bit H8S/239x microcontroller
Memory	1 MB Flash Memory and 512 KB RAM
Input and Output Capabilities	**MS-VMA1610-0:**
	1 - Universal Input: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	MS-VMA1620-0:
	1 - Universal Input: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	3 - Binary Outputs: Defined as 24 VAC Triac (internal power source)
	2 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO
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
Differential Pressure Transducer	Setra transducer, differential pressure to electrical, 0 to 0.375 kPa (0 to 1.5 in. WC) , 0.5 to 4.5 VDC output, 5 VDC supply, aluminum plated.
	Performance Characteristics
	Combined Repeatability and Hysteresis Error: ±0.05% of Full Span Maximum
	Non-linearity Errors (Best Fit Method): ±1.0% of Full Span Maximum
	Response Time (to within 63% of Full Scale Pressure with Step Change on Input): 15 ms
	Temperature Error from 15.6 to 48.9°C (60 to 120°F)
	Null: ±0.06% of Full Span per °F Maximum
	Span: ±1.5% of Full Span Maximum
	Stability, Null: ±0.5% of Full Scale Maximum, 1 Year Minimum
	Stability, Span: ±2.0% of Full Scale Maximum, 1 Year Minimum
Mounting	Mounts to damper shaft using single set screw and to duct with single mounting screw.
Housing	Enclosure Material: ABS polycarbonate UL94 5VB; Self-extinguishing, Plenum Rated Protection Class: IP20 (IEC529)
Actuator Rating	4 N•m (35 lb•in.) minimum shaft length = 44 mm (1-3/4 in.)

Table 18: VMA16 (16-bit) Series For Smoke Control Ordering Information

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.)
	Note: Mounting space for all field controllers requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	0.86 kg (1.9 lb)
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System (models with **U** product code suffix 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; UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System (models with U product code suffix only); 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 and the Low Voltage Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories (BTL) Protocol Revision 7 Listed BACnet Application Specific Controller (B-ASC)

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

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 shall not be liable for damages resulting from misapplication or misuse of its products.

IOM Series Technical Specifications

Table 19: IOM Series

Product Code Numbers	**MS-IOM1711-0:** 4-Point IOM with 4 BI, FC Bus and SA Bus Support
	MS-IOM2711-0: 6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support. Relays are rated for 120/240 VAC
	MS-IOM2711-2: 6-Point IOM with 2 UI, 2 UO, 2 BO, FC Bus, and SA Bus Support. Relays are rated for 240 VAC.
	MS-IOM2721-0: 10-Point IOM with 8 UI, 2 AO, FC Bus, and SA Bus Support
	MS-IOM3711-0: 12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support. Relays are rated for 120/240 VAC
	MS-IOM3711-2: 12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support. Relays are rated for 240 VAC
	MS-IOM3721-0: 16-Point IOM with 16 BI, FC Bus, and SA Bus Support
	MS-IOM3731-0: 16-Point IOM with 8 BI, 8 BO, FC Bus, and SA Bus Support
	MS-IOM3731-0A[1]: 16-Point IOM with 8 BI, 8 BO, FC Bus, and SA Bus Support
	MS-IOM4711-0: 17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, FC and SA Bus Support
	Smoke Control Models:
	MS-IOM1710-0U: 4-Point IOM with 4 BI, FC Bus and SA Bus Support
	MS-IOM1711-0U: 4-Point IOM with 4 BI, 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
	MS-IOM2711-0U: 6-Point IOM with 2 UI, 2 UO, 2 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
	MS-IOM3711-0U: 12-Point IOM with 4 UI, 4 UO, 4 BO, FC Bus, and SA Bus Support
	MS-IOU4710-0U: 17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, FC Bus and SA Bus Support with Mounting
	MS-IOM4711-0U: 17-Point IOM with 6 UI, 2 BI, 3 BO, 2 AO, 4 CO, FC Bus and SA Bus Support with Mounting
Supply Voltage	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety Extra-Low Voltage (SELV) Europe
Power Consumption	14 VA maximum
	Note: VA ratings do not include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO, for a possible total consumption of an additional 84 VA (maximum), depending on the IOM model.
Ambient Conditions	**Operating:** 0 to 50°C (32 to 122°F); 10 to 90% RH noncondensing
	Storage: -40 to 80°C (-40 to 176°F); 5 to 95% RH noncondensing
Addressing	DIP switch set; valid field controller device addresses 4–127
	(Device addresses 0–3 and 128–255 are reserved and not valid IOM addresses).
Communications Bus[2]	BACnet MS/TP, RS-485
	3-wire FC Bus between the supervisory controller and field devices
	4-wire SA Bus between field controller, network sensors, and other sensor/actuator devices. Includes a lead source 15 VDC supply power (from field controller) to bus devices.
Processor	H8SX/166xR Renesas® 32-bit microcontroller
Memory	512 KB Flash Memory and 128 KB RAM

Table 19: IOM Series

Input and Output Capabilities	**MS-IOM1711-0:**
	4 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode
	MS-IOM2711 Models:
	2 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	2 - Universal Outputs: Analog Output: Voltage Mode, 0-10 VDC; Binary Output Mode: 24 VAC/DC FET; Analog Output: Current Mode, 4-20 mA
	2 - Relay Outputs: (Single-Pole, Double-Throw);
	UL 916 (-0 model only): 1/4 hp 120 VAC, 1/2 hp 240 VAC; 360 VA Pilot Duty at 120/240 VAC (B300); 3 A Non-inductive 24-240 VAC;
	EN 60730 (-2 model only): 6 (4) A N.O. or N.C. only, 240 VAC
	MS-IOM2721-0:
	8 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
	MS-IOM3711 Models:
	4 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	4 - Universal Outputs: Analog Output: Voltage Mode, 0-10 VDC; Binary Output Mode: 24 VAC/DC FET; Analog Output: Current Mode, 4-20 mA
	4 - Relay Outputs: (Single-Pole, Double-Throw);
	UL 916 (-0 model only): 1/4 hp 120 VAC, 1/2 hp 240 VAC; 360 VA Pilot Duty at 120/240 VAC (B300); 3 A Non-inductive 24-240 VAC;
	EN 60730 (-2 model only): 6 (4) A N.O. or N.C. only, 240 VAC
	MS-IOM3721-0:
	16 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode
	MS-IOM3731-0:
	8 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode
	8 - Binary Outputs: Defined as 24 VAC Triac (Require external low-voltage power source.)
	Note: Binary Outputs (BOs) on MS-IOM3731-0A controllers do not supply power for the outputs; the BOs require external low-voltage (< 30 VAC) power sources.
	MS-IOM4711-0:
	6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact
	2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse/Counter Accumulator Mode
	3 - 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
	2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
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
Terminations	Input/Output: Fixed Screw Terminal Blocks
	SA/FC Bus and Supply Power: 4-wire and 3-wire Pluggable Screw Terminal Blocks
	SA/FC Bus Port: RJ-12 6-Pin Modular Jacks
Mounting	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller

Table 19: IOM Series

Housing	Enclosure material: ABS and polycarbonate UL94 5VB; self-extinguishing, Plenum-rated protection class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	**MS-IOM17 and MS-IOM27 Models:** 150 x 120 x 53 mm (5-7/8 x 4-3/4 x 2-1/8 in.) including terminals and mounting clips **MS-IOM2721-0, MS-IOM3721-0 and MS-IOM3731-0 models:** 150 x 164 x 53 mm (5-7/8 x 6-7/16 x 2-1/8 in.) including terminals and mounting clips **MS-IOM3711-0 and MS-IOM4711-0 Models:** 150 x 190 x 53 mm (5-7/8 x 7-1/2 x 2-1/8 in.) including terminals and mounting clips **Note:** Mounting space for all field controllers requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	0.5 kg (1.1 lb) maximum
Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System (models with **U** product code suffix only); FCC Compliant to CFR47, Part 15, Subpart B, Class A **Note:** Except MS-IOM2711-2 and MS-IOM3711-2
	Canada: UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System (models with U product code suffix only); UL/ULC 864 Listed, File S4977, 9th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System (models with U product code suffix only); Industry Canada Compliant, ICES-003 **Note:** Except MS-IOM2711-2 and MS-IOM3711-2
	Europe: CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive. Declared as Independently Mounted, Intended for Panel Mounting, Operating Control Type 1.B, 4kV rated impulse voltage, 100.7°C ball pressure test. **Note:** Except MS-IOM2711-0 and MS-IOM3711-0
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant **Note:** Except MS-IOM2711-0 and MS-IOM3711-0
	BACnet International: BACnet Testing Laboratories (BTL) Protocol Revision 4 Listed BACnet Application Specific Controller (B-ASC)

1   This model is currently available only in Asia. Contact your local Johnson Controls representative for more information.
2   For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034).*

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 shall not be liable for damages resulting from misapplication or misuse of its products.

Wireless Commissioning Converter Technical Specifications

Table 20: Wireless Commissioning Converter

Product Code	MS-BTCVT-1
Power Requirement	Nominal 15 VDC, supplied by the field controller SA/FC Bus Port
Power Consumption	1.35 watts maximum
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
Transmission Power	2.5 mW maximum

Table 20: Wireless Commissioning Converter

Transmission Speed	**Wireless Communication:** 115.2 bits per second (bps)
	Serial Communication (SA/FC Bus): 9600, 19.2k, 38.4k, or 76.8k bps
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
Compliance CE	**United States:** UL 916 Energy Management; Plenum-rated per UL1995 UL94-5VB Flammability Rating
	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 FFC Identification: CB2-MS-BTCVT-0)
	Canada: Industry Canada (IC: 279A-MSBTCVT0)
	Europe: CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the R&TTE Directive.
	Japan: Telecommunications Certification - 003NY05068 0000

Handheld VAV Balancing Tool Technical Specifications

Table 21: Handheld VAV Balancing Tool

Product Code	NS-ATV7003-0
Supply Voltage	9.8 to 16.5 VDC; 15 VDC Nominal, supplied by the Sensor Actuator (SA) Bus Port
Current Consumption	90 mA 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
Dimensions	80 x 80 x 25 mm (3.2 x 3.2 x 1.0 in.)
Weight	0.165 kg (0.365 lb)

Table 21: Handheld VAV Balancing Tool

Compliance	
CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; 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, 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: BACnet Testing Laboratories (BTL) Listed BACnet Smart Sensor (B-SS)

North American Emissions Compliance for FEC Series, IOM Series, VMA16, VMA18 Series, and VMA1930 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 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.

North American Emissions Compliance for 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 Federal Communications Commission (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.

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 2 dB. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms. Cet appareil a été conçu pour fonctionner avec une antenne d'un gain maximum de 2 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 50 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.

European Single Point of Contact:	**NA/SA Single Point of Contact:**	**APAC Single Point of Contact:**
JOHNSON CONTROLS	JOHNSON CONTROLS	JOHNSON CONTROLS
WESTENDHOF 3	507 E MICHIGAN ST	C/O CONTROLS PRODUCT MANAGEMENT
45143 ESSEN	MILWAUKEE WI 53202	NO. 22 BLOCK D NEW DISTRICT
GERMANY	USA	WUXI JIANGSU PROVINCE 214142
		CHINA