

## Field Equipment Controller (FEC)

The Field Equipment Controller (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.

FECs feature 32-bit microprocessor architecture, patented continuous tuning adaptive control, and peer-to-peer communications, and are available with an optional built-in LCD screen local UI.

A full range of FEC models combined with the Input/Output Module (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 FEC Series Controllers configured for BACnet support wireless communications using the ZFR System accessories.

- **Important:** You cannot purchase a similar third-party device and install it in a UL/cUL Listed smoke control system. Doing so voids the UL/cUL Smoke Control Listing. Third-party devices must be provided and labeled by the factory as described in the UL/cUL 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 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. Installation of a product that is not UL/cUL Listed and labeled for this application prevents the entire system from being UL/cUL Listed for smoke control.

**Figure 1: Field Equipment Controllers**



## Features

- **Switchable Communications Protocols**—Provides flexibility with a choice between BACnet MS/TP and N2 communication
- **Standard BACnet Protocol**—Provides interoperability with other Building Automation System (BAS) products that use the widely accepted BACnet standard.

- **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.
- **ZFR Wireless Field Bus System (FC)/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.
- **Auto-Tuned Control Loops**—Reduce commissioning time, eliminate change-of-season re-commissioning, and reduce wear and tear on mechanical devices.
- **Universal Inputs and Configurable Outputs**—Allows 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 and Certified**—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.
- **32-bit Microprocessor**—Ensures optimum performance and meets industry specifications.
- **BACnet Automatic Discovery**—Supports easy controller integration into a *Metasys* BAS.
- **End-of-Line (EOL) Switch in MS/TP Field Controllers** —Enables field controllers to be terminating devices on the communications bus.
- **Pluggable Communications Bus and Supply Power Terminal Blocks**—Expedites installation and troubleshooting.
- **Patented proportional adaptive control (P-Adaptive) and PRAC**—Provide continuous loop tuning.
- **Wireless Connectivity through the ZFR1800 Series or the WNC1800/ZFR182x Pro Series Wireless Field Bus Systems in MS/TP Controllers**—Enables wireless mesh connectivity to supervisory controllers, facilitating easy initial location and relocation.
- **Writable Flash Memory**—Allows standard or customized applications to be downloaded from the CCT and enables persistent application data.
- **Large Product Family**—Provides a wide range of point mix to meet application requirements and allows for the addition of one or more IOMs and Network Sensors to provide even more I/O capacity.
- **User-Friendly Graphic Theme and Clear Pushbutton Identification**—Facilitate easy navigation of the integral or optional UI/display.

## Application Documentation

Refer to the *Metasys System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)* for product application details.

# FEC Series Model Information (Including Point Type Counts)

① **Note:** The FEC2511 is currently only available in Europe. Contact your local Johnson Controls representative for more information.

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

		FEC2511	FEC16	FEC26
<b>Communication Protocol</b>		BACnet MS/TP, N2		
<b>Engines</b>		All Model types. Some NIE models support MS/TP and N2 devices. Refer to the <i>Network Engines Product Bulletin (LIT-12012138)</i> for details.		
<b>Modular Jacks</b>		6-pin SA Bus Modular Port supports one communicating sensor. <b>Or</b> 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	
<b>Point Types</b>	<b>Signals Accepted</b>			
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC	4 (Does not support Current Mode)	2	6
	Analog Input, Current Mode, 4–20 mA (set by hardware for the FEC26, and by software for the FEC16)			
	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			
Binary Input (BI)	Dry Contact Maintained Mode	6	1	2
	Pulse Counter/Accumulator Mode (High Speed), 100 Hz			
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC	2 (Does not support Current Mode)		2
	Analog Output, Current Mode, 4–20 mA			
Binary Output (BO)	24 VAC Triac	2 (External Power Only)	3	3

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

		FEC2511	FEC16	FEC26
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	2	4	4

## FEC Series Ordering Information

**Table 2: 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 Touchpad
MS-FEC2511-0	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.  ① <b>Note:</b> This model is currently only available in Asia and Europe. Contact your local Johnson Controls representative for more information.
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

## FEC Series for Smoke Control Ordering Information

**Table 3: FEC Series for Smoke Control Ordering Information**

Product Code Number	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

**Table 3: FEC Series for Smoke Control Ordering Information**

Product Code Number	Description
MS-FEC2621-0U	17-Point Field Equipment Controller with 6 UI, 2 BI, 3 BO, 2 AO, and 4 CO; 24 VAC; FC and SA Bus Support; Integral Display and 6-Button Navigation Touchpad
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 **Note:** These devices are UL/ULC 864 Listed, File S4977, 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System. These devices must be ordered in a Smoke Control UUKL listing.
- ① **Note:** 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 10th Edition UUKL/ORD-C100-13 UUKLC Smoke Control System listing.

## Accessories

- ① **Note:** The accessories marked with an asterisk (\*) in the table are not qualified for use with a UL 864 UUKL/UUKLC 10th Edition Listed Smoke Control system.

**Table 4: FEC Accessories**

Product Code Number	Description
Mobile Access Portal (MAP) Gateway*	Refer to the <i>Mobile Access Portal Gateway Catalog Page (LIT-1900869)</i> to identify the appropriate product for your region.
MS-DIS1710-0	Local Controller Display: Refer to <i>Local Controller Display Product Bulletin (LIT-12011273)</i> for more information.
MS-BTCVT-1*	Wireless Commissioning Converter with Bluetooth Technology
MS-BTCVTCBL-700*	Cable Replacement Set for the MS-BTCVT-1 or the NSATV7003-0; Includes One 5 ft (1.5 m) Retractable Cable
WRZ Series Wireless Room Sensors*	Refer to the <i>WRZ Series Wireless Room Sensors Product Bulletin (LIT-12011653)</i> for specific sensor model descriptions.
ZFR1800 Series Wireless Field Bus System*	This system is used for installations that only support BACnet MS/TP. Refer to the <i>WNC1800/ZFR182x Pro Series Wireless Field Bus System Product Bulletin (LIT-12012320)</i> for a list of available products.
NS Series Network Sensors	Refer to the <i>NS Series Network Sensors Product Bulletin (LIT-12011574)</i> for specific sensor model descriptions.
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

**Table 4: FEC Accessories**

Product Code Number	Description
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-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)
AS-CBLTSTAT-0	Cable adapter that provides a connection between 8-pin TE-6700 Series sensors and field controllers that do not have a 8-pin sensor connection.
ZFR-USBHA-0*	<p>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.</p> <p>❶ <b>Note:</b> The ZFR-USBHA-0 replaces the IA OEM DAUBI_2400 ZigBee® USB dongle. For additional information on the ZFR-USBHA-0 ZigBee dongle, refer to the <i>ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)</i> or <i>ZFR1800 Series Wireless Field Bus System Quick Reference Guide (LIT-12011630)</i>.</p>
TL-BRTRP-0*	Portable BACnet IP to MS/TP Router

## Repair Information

If the product fails to operate within its specifications, replace the product. For a replacement product, contact the nearest Johnson Controls® representative.

# FEC Series Technical Specifications

① **Note:** The MS-FEC2511-0 model is currently only available in Asia and Europe. Contact your local Johnson Controls representative for more information.

**Table 5: FEC Series Technical Specifications**

<b>Product Code Numbers</b>	<p><b>MS-FEC1611-1:</b> 10-Point FEC</p> <p><b>MS-FEC1611-1ET:</b> FEC1611 Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F).</p> <p><b>MS-FEC1621-1:</b> 10-Point FEC with Integral Display and Pushbutton User Interface</p> <p><b>MS-FEC2511-0:</b> 16-Point FEC, only available in Asia and Europe</p> <p><b>MS-FEC2611-0:</b> 17-Point FEC</p> <p><b>MS-FEC2611-0ET:</b> FEC2611 Extended Temperature controller for rooftop applications. Supports Operational Temperature Range of -40 to 70°C (-40 to 158°F).</p> <p><b>MS-FEC2621-0:</b> 17-Point FEC with Integral Display and Push Button User Interface</p> <p><b>Smoke Control Models:</b></p> <p><b>MS-FEC1611-0U:</b> 10-Point FEC</p> <p><b>MS-FEU1610-0U:</b> 10-Point FEC</p> <p><b>MS-FEC2611-0U:</b> 17-Point FEC</p> <p><b>MS-FEU2610-0U:</b> 17-Point FEC</p>
<b>Supply Voltage</b>	<p><b>MS-FEC1611-x, MS-FEC1611-1ET, MS-FEC2511-0, MS-FEC2611-0, MS-FEC2611-0ET, MS-FECx611-0U and MS-FEUx610-0U:</b> 24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, Power Supply Class 2 (North America), Safety, Extra-Low Voltage (SELV) (Europe)</p>
<b>Power Consumption</b>	<p><b>MS-FEC1611-1, MS-FEC2511-0 and MS-FEC2611-0:</b> 14 VA maximum (no integral display)</p> <p><b>MS-FEC1621-1 and MS-FEC2621-0 (with integral display):</b> 20VA maximum</p> <p>① <b>Note:</b> 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).</p>



**Table 5: FEC Series Technical Specifications**

<b>Ambient Conditions</b>	<p><b>Operating:</b> 0 to 50°C (32 to 122°F); 10 to 90% RH noncondensing</p> <p><b>Storage:</b> -40 to 80°C (-40 to 176°F); 5 to 95% RH noncondensing</p> <p>① <b>Note:</b> FEC models with an -xET suffix have an operating temperature range of -40 to 70°C (-40 to 158°F).</p>
<b>Controller Addressing</b>	<p><b>For BACnet-configured controllers:</b> DIP switch set; valid field controller device addresses 4–127 (device addresses 0–3 and 128–255 are reserved)</p> <p><b>For N2-configured controllers:</b> DIP switch set; valid control device addresses 1–255</p>
<b>Communications Bus</b>	<p>RS-485, field selectable between BACnet MS/TP and N2 communications:</p> <p>3-wire FC Bus between the supervisory controller and field controllers</p> <p>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</p> <p>① <b>Note:</b> For more information, refer to the <i>MS/TP Communications Bus Technical Bulletin (LIT-12011034)</i>.</p>
<b>Processor</b>	<p><b>MS-FEC16, MS-FEC26, MS-FEU16 and MS-FEU26 models:</b> H8SX/166xR Renesas® 32-bit microcontroller</p> <p><b>MS-FEC2511-0:</b> RX631 Renesas, 32-bit microcontroller</p>
<b>Memory</b>	<p><b>MS-FEC16, MS-FEC26, MS-FEU16 and MS-FEU26 models:</b> 1 MB Flash Memory and 512 KB RAM</p> <p><b>MS-FEC2511-0:</b> 4 MB Flash Memory and 8 MB SDRAM</p>



**Table 5: FEC Series Technical Specifications**

<p><b>Input and Output Capabilities</b></p>	<p><b>MS-FEC16 Models:</b></p> <p>2 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact</p> <p>1 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode</p> <p>3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power)</p> <p>4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO</p> <p><b>MS-FEC2511-0 Models:</b></p> <p>4 - Universal Inputs: Defined as 0–10 VDC, 0–600k ohm, or Binary Dry Contact</p> <p>6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode</p> <p>2 - Binary Outputs: Does not have internal 24 VAC source, external power is required</p> <p>2 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO</p> <p>2 - Analog Outputs: Defined as 0–10 VDC</p> <p><b>MS-FEC26 Models:</b></p> <p>6 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact</p> <p>2 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode</p> <p>3 - Binary Outputs: Defined as 24 VAC Triac (selectable internal or external source power)</p> <p>4 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO</p> <p>2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA</p>
<p><b>Analog Input/ Analog Output Resolution and Accuracy</b></p>	<p><b>MS-FEC16, MS-FEC26, MS-FEU16 and MS-FEU26 models:</b> Analog Input: 16-bit resolution</p> <p>Analog Output: 16-bit resolution and <math>\pm 200</math> mV in 0–10 VDC applications</p> <p><b>MS-FEC2511-0:</b> Analog Input: 15-bit resolution</p> <p>Analog Output: 0–10 VDC <math>\pm 200</math> mV</p>

**Table 5: FEC Series Technical Specifications**

<b>Terminations</b>	<p><b>MS-FEC16 and MS-FEC26 models:</b></p> <p>Input/Output: Fixed Screw Terminal Blocks</p> <p>FC Bus, SA Bus, and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks</p> <p>FC Bus and SA Bus Port: RJ-12 6-pin Modular Jacks</p> <p><b>MS-FEC2511-0:</b></p> <p>Input/Output: Fixed Screw Terminal Blocks</p> <p>FC Bus, SA Bus, and Supply Power: 3-wire and 4-wire Pluggable Screw Terminal Blocks</p> <p>SA Bus Port: RJ-12 6-pin Modular Jack</p>
<b>Mounting</b>	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
<b>Housing</b>	<p><b>MS-FEC16 and MS-FEC26 models:</b> Enclosure material: ABS and polycarbonate UL94 5VB; self-extinguishing; Plenum-rated protection class: IP20 (IEC529)</p> <p><b>MS-FEC2511-0:</b> Enclosure material: ABS and polycarbonate, Rating V0 minimum Protection Class: IP20 (IEC529)</p>
<b>Dimensions (Height x Width x Depth)</b>	<p><b>MS-FEC16 Models:</b> 150 x 164 x 53 mm (5-7/8 x 6-7/16 x 2-1/8 in.) including terminals and mounting clips</p> <p><b>MS-FEC2511-0:</b> 150 x 164 x 48 mm (5-7/8 x 6-7/16 x 1-7/8 in.) including terminals and mounting clips</p> <p><b>MS-FEC26 Models:</b> 150 x 190 x 53 mm (5-7/8 x 7-1/2 x 2-1/8 in.) including terminals and mounting clips</p> <p>① <b>Note:</b> 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.</p>
<b>Weight</b>	<p><b>MS-FEC16 Models:</b> 0.4 kg (0.9 lb)</p> <p><b>MS-FEC25 and MS-FEC26 Models:</b> 0.5 kg (1.1 lb)</p>

**Table 5: FEC Series Technical Specifications**

<b>Compliance</b>	<p><b>United States:</b> UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class A</p> <p>UL Listed, File S4977, UL 864 UUKL/UUKLC 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems Equipment (models with <b>U</b> product code suffix only)</p>
	<p><b>Canada:</b> UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment; Industry Canada Compliant, ICES-003</p> <p>UL Listed, File S4977, UL 864 UUKL/ORD-C100-13 10th Edition Listed, Smoke Control Units and Accessories for Fire Alarm Systems (models with U product code suffix only)</p>
	<p><b>Europe:</b> CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive.</p>
	<p><b>Australia and New Zealand:</b> RCM Mark, Australia/NZ Emissions Compliant</p>
	<p><b>BACnet International:</b></p> <p><b>MS-FEC16 and MS-FEC26 Models:</b> BACnet Testing Laboratories (BTL) Protocol Revision 4 Listed BACnet Application Specific Controller (B-ASC)</p> <p><b>MS-FEC2511-0:</b> BACnet Testing Laboratories Protocol Revision 9 Listed BACnet Application Specific Controller (B-ASC)</p>

*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.*

