FAC2612-2 Advanced Application Field Equipment Controller Installation Guide

Part No. 24-10143-233 Rev. K

2019-10-18

Application

The FAC2612-2 Advanced Application Field Equipment Controller (FAC) is part of the *Metasys*® system Field Equipment Controller family. The FAC26 Series controllers run pre-engineered and user-programmed applications. They provide the inputs and outputs required to monitor and control equipment.

FAC26 field controllers operate on an RS-485 BACnet® MS/TP Bus as BACnet and integrate into the web-based *Metasys*® system.

FAC26 controllers include an integral real-time clock, which enables the controllers to monitor and control schedules, calendars, and trends; and operate for extended periods of time as stand-alone controllers when offline from the *Metasys* system network.

The FAC2612-2 model operates on VAC supply power.

Switchable communications protocol

The *Metasys® system* FEC Family Controllers and network sensors communicate using either the standard BACnet protocol, based on the ANSI/ASHRAE 135-2008, 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 most 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).

Release 10.1 and later of the Controller Configuration Tool (CCT) can be used to switch the Field Bus communications protocol in supported FAC, FEC, and VMA controllers to be either the standard BACnet MS/TP or the N2 protocol. All new controllers use either 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:

- 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 (most models)
- are available in Buy American versions (most models)
- are listed for UL 864 UUKL/ORD-C100-13 UUKLC 10th Edition Smoke Control (some models). N2 is now supported as part of the *Metasys*® 10th Edition listing for Smoke Control System Equipment.

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

North American emissions compliance

United States

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the users will be required to correct the interference at their own expense.

Canada

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Installation

Observe these guidelines when installing a controller:

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

(barcode for factory use only)

Parts included

- One controller with removable terminal blocks
- One installation instructions sheet

Materials and special tools needed

- Three fasteners appropriate for the mounting surface (M4 screws or #8 screws)
- One 20 cm (8 in.) or longer piece of 35 mm DIN rail and appropriate hardware for DIN rail mount (only)
- Small straight-blade screwdriver for securing wires in the terminal blocks

FAC2612-2 physical features

Figure 1: FAC2612-2 physical features

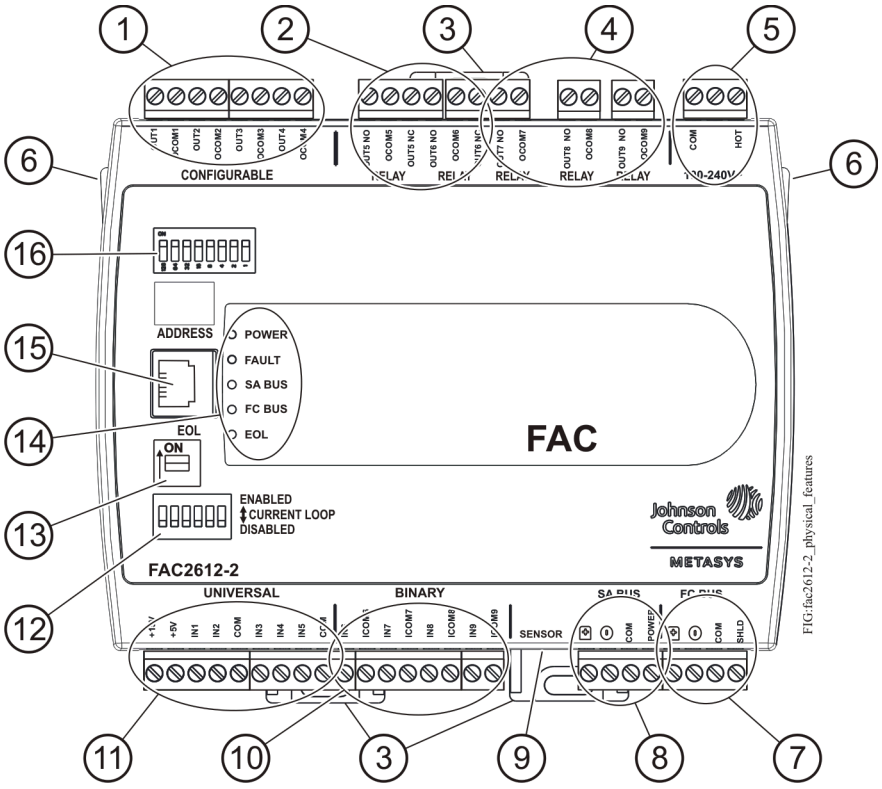


Table 1: FAC2612-2 physical features callouts and descriptions

	Physical feature: description and references
1	Configurable Output (COs) Terminal Blocks.
2	Single-Pole Double-Throw (SPDT) Relay Terminal Blocks.
3	Mounting Clips
4	Single-Pole Single-Throw (SPST) Relay Terminal Blocks.
5	100–240 VAC, Class 1 Supply Power Terminal Block. See Supply Power Terminal Block.
6	Cover Lift Tab
7	Field Controller (FC) Bus Terminal Block. See FC Bus Terminal Block.
8	Sensor Actuator (SA) Bus Terminal Block. See SA Bus Terminal Block.
9	Sensor Actuator (SA) Bus Port (RJ-12 6-pin Modular Jack). See SA Bus Port.
10	Binary Input (BI) Terminal Blocks. Dry Contact Maintained or Pulse Counter/Accumulator Mode. See Table 2.
11	Universal Inputs (UI) Terminal Blocks. Can be defined as Voltage Analog Input (0–10 VDC), Current Analog Input (4–20 mA), Resistive Analog Inputs (0–600k ohm), or Dry Contact Binary Input. See Table 2.
12	Current Loop Mode DIP Switch Block for Universal Inputs that are defined as Current Analog Input (4–20 mA) in the system software. See Table 7.
13	End-of-Line (EOL) Switch. See Setting the End-of-Line (EOL) switch.

Table 1: FAC2612-2 physical features callouts and descriptions

	Physical feature: description and references
14	LED Status Indicators. See Table 8.
15	Field Controller (FC) Bus Port (RJ-12 6-pin Modular Jack). See FC Bus Port.
16	Device Address DIP Switch Block. See Setting the device address.

Mounting

Observe these guidelines when mounting a controller.

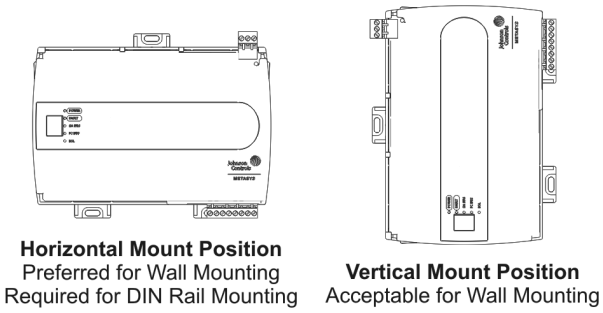
- Ensure the mounting surface can support the controller, DIN rail, and any user-supplied enclosure.
- Mount the controller horizontally on 35 mm DIN rail whenever possible.
- Mount the controller in the proper mounting position.
- Mount the controller on a hard, even surface whenever possible in wall-mount applications.
- Use shims or washers to mount the controller securely and evenly on the mounting surface.
- Mount the controller in an area free of corrosive vapors and observe the Ambient Conditions requirements in .

- Provide for sufficient space around the controller for cable and wire connections for easy cover removal and good ventilation through the controller (50 mm [2 in.] minimum on the top, bottom, and front of the controller).
- Do not mount the controller on surfaces prone to vibration, such as duct work.
- Do not mount the controller in areas where electromagnetic emissions from other devices or wiring can interfere with controller communication.

Observe these additional guidelines when mounting a controller in a panel or enclosure:

- Mount the controller so that the enclosure walls do not obstruct cover removal or ventilation through the controller.
- Mount the controller so that the power transformer and other devices do not radiate excessive heat to the controller.
- Do not install the controller in an airtight enclosure.

Figure 2: Controller mounting positions



Horizontal Mount Position
Preferred for Wall Mounting
Required for DIN Rail Mounting

Vertical Mount Position
Acceptable for Wall Mounting

DIN rail mount applications

Mounting the controller horizontal on 35 mm DIN rail is the preferred mounting method. To mount a controller on 35 mm DIN rail, complete the following steps:

1. Securely mount a 20 cm (8 in.) or longer section of 35 mm DIN rail horizontally and centered in the desired space so that the controller mounts in the horizontal position.
2. Pull the two bottom mounting clips outward from the controller to the extended position.
3. Hang the controller on the DIN rail by the hooks at the top of the (DIN rail) channel on the back of the controller, and position the controller snugly against the DIN rail.
4. Push the bottom mounting clips inward (up) to secure the controller on the DIN rail. To remove the controller from the DIN rail, pull the bottom mounting clips out to the extended position and carefully lift the controller off the DIN rail.

Wall-mount applications

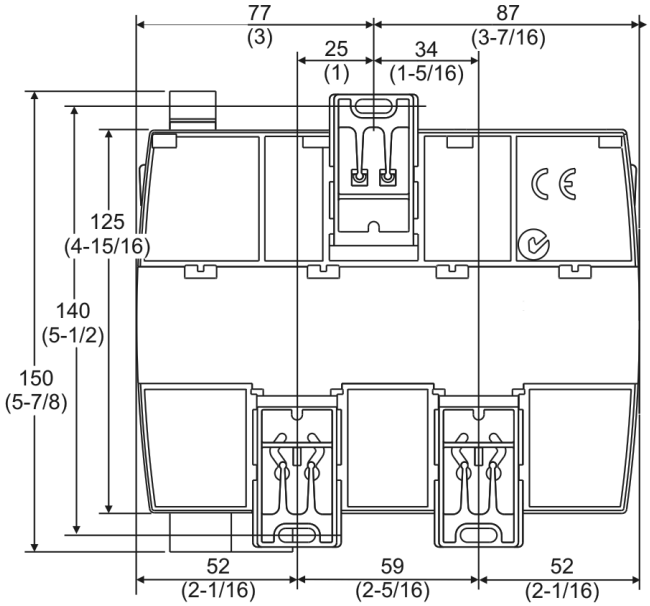
To mount the controller directly on a wall or other flat vertical surface, complete the following steps:

1. Pull the two bottom mounting clips outward and ensure they are locked in the extended position.
2. Mark the mounting hole locations on the wall using the dimensions in Figure 3 and one of the mount positions shown in Figure 2. Or hold the controller up to the wall or surface in a proper mount position and mark the hole locations through the mounting clips.
3. Drill holes in the wall or surface at the marked locations, and insert appropriate wall anchors in the holes (if necessary).
4. Hold the controller in place, and insert the screws through the mounting clips and into the holes (or anchors). Carefully tighten all of the screws.

➤ **Important:** Do not overtighten the mounting screws. Overtightening the screws may damage the mounting clips.

Mounting features and dimensions

Figure 3: Back of controller showing extended mounting clips, DIN rail channel, and mounting dimensions, mm (in.)



Wiring

Observe the following guidelines when wiring a controller:

CAUTION

Risk of Electric Shock

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

ATTENTION

Mise En Garde: Risque de décharge électrique

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

CAUTION

Risk of Property Damage

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

ATTENTION

Mise En Garde: Risque de dégâts matériels:

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

- **Important:** Do not exceed the controller electrical ratings. Exceeding controller electrical ratings can result in permanent damage to the controller and void any warranty.
- **Important:** Use copper conductors only. Make all wiring in accordance with local, national, and regional regulations.
- **Important:** Electrostatic discharge can damage controller components. Use proper electrostatic discharge precautions during installation, setup, and servicing to avoid damaging the controller.

For detailed information on configuring and wiring an MS/TP Bus, FC bus, and SA bus, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.

FAC terminal blocks and bus ports

See FAC2612-2 physical featuresfor terminal block and bus port locations on the FAC2612-2 controller.

Observe the following guidelines when wiring a controller:

Input and output Terminal Blocks

Most of the input terminal blocks are mounted on the bottom of the controller and the output terminal blocks are mounted on the top of the controller.

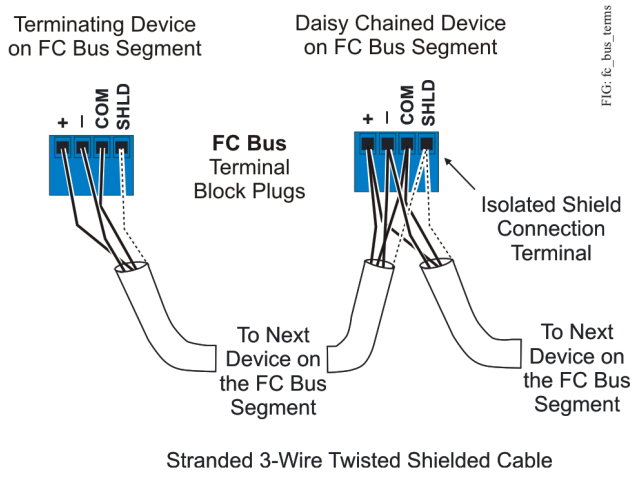
See Table 2 for more information about I/O terminal functions, requirements, and ratings.

FC Bus Terminal Block

The FC Bus terminal block is a blue, removable, 4-terminal plug that fits into a board-mounted jack.

Wire the removable FC bus terminal block plugs on the controller, and other controllers in a daisy-chain configuration using 3-wire twisted, shielded cable as shown in Figure 4 for more information.

Figure 4: FC Bus Terminal Block Wiring



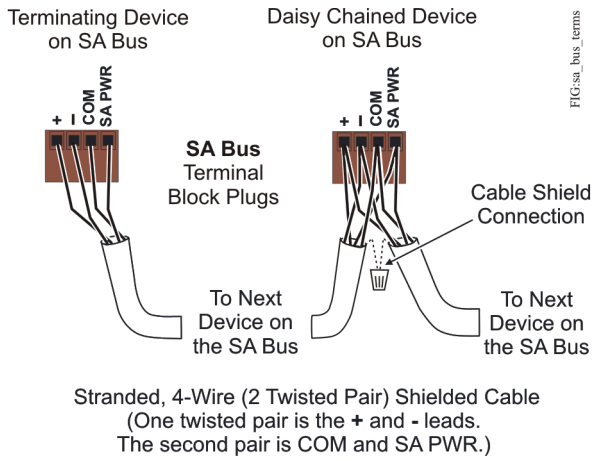
Note: The FC bus Shield (SHLD) terminal is isolated and can be used to connect (daisy chain) the shields for FC bus wiring.

SA Bus Terminal Block

The SA Bus terminal block is a brown, removable, 4-terminal plug that fits into a board-mounted jack.

Wire the removable SA Bus terminal block plugs on the controller, and other SA bus devices in a daisy-chain configuration using 4-wire twisted, shielded cable as shown in Figure 5 for more information.

Figure 5: SA Bus Terminal Block Wiring



Note: The SA PWR terminal supplies 15 VDC. The SA PWR terminal can be used to connect (daisy chain) the 15 VDC power leads on the SA bus.

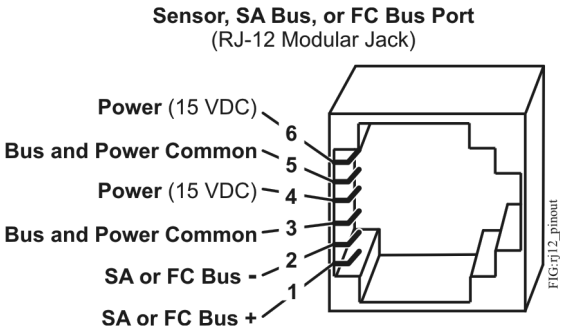
FC Bus Port

The FC bus port on the front of the controller is an RJ-12, 6-pin modular jack that provides a connection for the Wireless Commissioning Converter, ZFR181x Wireless Field Bus Router, or ZFR182x Wireless Field Bus Router.

The FC bus port is connected internally to the FC bus terminal block. See Table 4.

Note: When the FAC is configured for N2 network communication, the FC bus port **cannot be used**.

Figure 6: Pin Number Assignments for Sensor, SA Bus, and FC Bus Ports on Controllers



SA Bus Port

The Sensor (SA Bus) port on the bottom of the controller is an RJ-12, 6-position modular jack that provides a connection for the Wireless Commissioning Converter, the VAV Balancing Tool, specified network sensors, or other SA Bus devices with RJ-12 plugs. When the FEC is configured for N2 network communication, the SA Bus port must be used to download and commission the controller.

A DIS1710 Local Controller Display also can be connected to the SA Bus port.

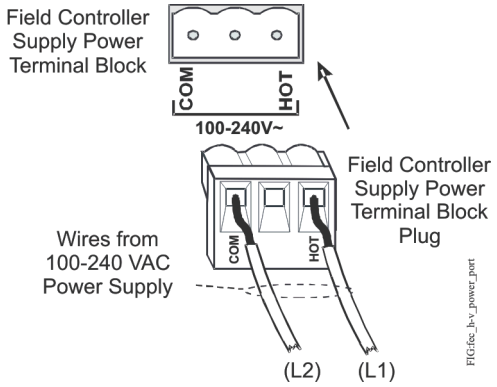
The Sensor port is connected internally to the SA bus terminal block.

Supply Power Terminal Block

The 100-240 VAC supply power terminal block is a gray, removable, 3-terminal plug that fits into a board-mounted jack on the top right of the controller.

Wire the 100–240 VAC supply power wires from the transformer to the HOT and COM terminals on the terminal plug as shown in the following figure:

Figure 7: 100-240 VAC Supply Power Terminal Block Wiring



Note: The supply power wire colors may be different on transformers from other manufacturers. Refer to the transformer manufacturer's instructions and the project installation drawings for wiring details.

Important: Connect 100–240 VAC supply power to the controller and all other network devices so that transformer phasing is uniform across the network devices. Powering network devices with uniform 100–240 VAC supply power phasing reduces noise, interference, and ground loop problems. The controller does not require an earth ground connection.

Wireless network applications

When configured for BACnet MS/TP communication, the controller can also be installed in a wireless application using a ZFR181x or ZFR182x Wireless Field Bus Router. To configure a controller for use with the WNC1800/ZFR182x Pro (ZFR Pro) Series Wireless Field Bus system:

1. Wire the input/output terminals and SA bus.

Note: In wireless network applications, do **not** connect any wires to the FC bus terminal block. (Connect the SA/FC terminal block on an IOM to an SA bus only.)

2. Connect the ZFR181x or ZFR182x Wireless Field Bus Router to the FC bus port (RJ-12 modular jack) on the front of the field controller.

3. Ensure that the controller's device address DIP switches are set to the correct device address. See Setting the device address.
4. Set DIP switch 128 to ON, which enables wireless operation on the field controller.

For more information on the ZFR 1800 Wireless Field Bus system, refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)*. For more information on the ZFR Pro Wireless Field Bus system, refer to the *WNC1800/ZFR182x Pro Series Wireless Field Bus System Product Bulletin (LIT-12012320)*.

Terminal wiring guidelines, functions, ratings, and requirements

Input and output wiring guidelines

The following table provides information and guidelines about the functions, ratings, and requirements for the controller input and output terminals; and references guidelines for determining proper wire sizes and cable lengths.

In addition to the wiring guidelines in the following table, observe these guidelines when wiring controller inputs and outputs:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- All input and output cables, regardless of wire size or number of wires, should consist of stranded, insulated, and twisted copper wires.
- Shielded cable is not required for input or output cables.
- Shielded cable is required for input and output cables that are exposed to high electromagnetic or radio frequency noise.
- Inputs or outputs with cables less than 30 m (100 ft) typically do not require an offset in the software setup. Cable runs over 30 m (100 ft) may require an offset in the input/output software setup.

FAC2612-2 I/O wiring ratings and requirements table

Table 2: Field Controller terminal blocks, functions, ratings, requirements, and cables

Terminal block Label	Terminal label	Function, ratings, requirements	Determine wire size and maximum cable length [1]
UNIVERSAL (Inputs)	**+15 V**	**15 VDC Power Source** for active (3-wire) input devices connected to the Universal IN*n* terminals. Provides 100 mA total current	Same as (Universal) **IN***n* **Note:** Use 3-wire cable for devices that source power from the +15V terminal.
	+5V	5 VDC Power Source for active (3-wire) input devices connected to the Universal INn terminals. Provides 40 mA total current.	Same as (Universal) **IN***n*. **Note:** Use 3-wire cable for devices that source power from the +5 V terminal.
	IN*n*	**Analog Input - Voltage Mode (0–10 VDC)** 10 VDC maximum input voltage Internal 75k ohm Pull-down	See Guideline **A** in Table 3.
		Analog Input - Current Mode (4–20 mA) Internal 100 ohm load impedance **Note:** A current loop fail-safe jumper can be positioned to maintain a closed 4 to 20 mA current loop, even when the power to the controller is interrupted or off.	See Guideline **B** in Table 3.
		Analog Input - Resistive Mode (0–600k ohm) Internal 12 V. 15k ohm pull up Qualified Sensors: 0–2k ohm potentiometer, RTD (1k Nickel [Johnson Controls® sensor], 1k Platinum, and A99B Silicon Temperature Sensor) Negative Temperature Coefficient (NTC) Sensor	See Guideline **A** in Table 3.
		Binary Input - Dry Contact Maintained Mode 1 second minimum pulse width Internal 12 V. 15k ohm pull up	See Guideline **A** in Table 3.
	ICOM*n*	**Universal Input Common** for all Universal Input terminals **Note:** All Universal ICOM*n* terminals share a common, which is isolated from all other commons.	Same as (Universal) **IN***n*
BINARY (Inputs)	**IN***n*	**Binary Input - Dry Contact Maintained Mode** 0.01 second minimum pulse width Internal 18 V. 3k ohm pull up	See Guideline **A** in Table 3.
		Binary Input - Pulse Counter/Accumulator Mode 0.01 second minimum pulse width (50 Hz at 50% duty cycle) Internal 18 V. 3k ohm pull up	
	ICOM*n*	**Binary Input Common** for all Binary Input (IN) terminals **Note:** All Binary ICOM*n* terminals share a common, which is isolated from all other commons, except the Configurable Output (CO) common (OCOM*n*) when the CO is defined as an Analog Output.	

Table 2: Field Controller terminal blocks, functions, ratings, requirements, and cables

Terminal block Label	Terminal label	Function, ratings, requirements	Determine wire size and maximum cable length [1]
CONFIGURABLE (Outputs)	**OUT***n*	**Analog Output - Voltage Mode (0–10 VDC)** 10 VDC maximum output voltage 10 mA maximum output current Required an external load of 1,000 ohm or more.	See Guideline **A** in Table 3.
		Binary Output - 24 VAC Triac (External Power Source only) Connects OUT*n* to OCOM*n* when activated. External Power Source Requirements: 30 VAC maximum output voltage 0.5 A maximum output current 1.3 A at 25% duty cycle 40 mA minimum load current	See Guideline **C** in Table 3.
	OCOM*n*	**Analog Output Signal Common** All Configurable Outputs (COs) defined as Analog Outputs (AOs) share a common, which is isolated from all other commons except the Binary Input common. **Binary Output Signal Common** All Configurable Outputs (COs) defined as Binary Outputs are isolated from all other commons, including other CO commons.	Same as (Configurable) **OUT***n*.
RELAY ***n*** (Outputs)	**OUT NO***n*	**Normal Open Contact** Connects OCOM to OUT NO when activated. **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) Amperes N.O. or N.C. only	The RELAY output terminals can accommodate the following maximum wire sizes: Two wires per terminal: 1.3 mm (16 AWG) maximum **or** One wire per terminal: 2.1 mm (maximum 12 AWG or 2–16 AWG) ⓘ **Note:** You must determine the required wire size for the high-voltage (>30 V) terminals according to relay ratings, the applied load, and the local, national, or regional electrical codes. Maximum loads stated require 12 AWG or 2–16 AWG wires.
	OCOM*n*	**Relay Common** Isolated from all other terminal commons, including other Relay Commons.	
	OUT NC*n*	**Normally Closed Contact** Disconnects OCOM to OUT NC when activated. **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) Amperes N.O. or N.C. only ⓘ **Note:** Relay Outputs 5 and 6 (only) are SPDT relays and have a Normal Closed Contact terminal. Relay Outputs 7, 8, and 9 are SPST relays and do not have a Normal Closed Contact terminal.	

1 See Table 3

Cable and wire length guidelines

Table 3 defines cable length guidelines for the various wire sizes that may be used for wiring low-voltage (less than 30 V) input and outputs.

Cable length guidelines for required wire sizes

The following table defines cable length guidelines for the various wire sizes that may be used for wiring low-voltage (<30 V) input and outputs

Table 3: Cable length guidelines for required wire sizes for low-voltage (<30 V) inputs and outputs

Guideline	Wire size/Gauge and type	Maximum cable length and type	Assumptions
A	1.0 mm (18 AWG) stranded copper	457 m (1,500 ft) twisted wire	100 mV maximum voltage drop Depending on cable and the connected input or output device, you may have to define an offset in the setup software for the input or output point.
	0.8 mm (20 AWG) stranded copper	297 m (975 ft) twisted wire	
	0.6 mm (22 AWG) stranded copper	183 m (600 ft) twisted wire	
	0.5 mm (24 AWG) stranded copper	107 m (350 ft) twisted wire	
B	1.0 mm (18 AWG) stranded copper	229 m (750 ft) twisted wire	100 mV maximum voltage drop Depending on cable and the connected input or output device, you may have to define an offset in the setup software for the input or output point.
	0.8 mm (20 AWG) stranded copper	137 m (450 ft) twisted wire	
	0.6 mm (22 AWG) stranded copper	91 m (300 ft) twisted wire	
	0.5 mm (24 AWG) stranded copper	61 m (200 ft) twisted wire	
C	See Figure 8 to select wire size/gauge. Use stranded copper wire	See Figure 8 to determine cable length. Use twisted wire cable.	N/A

Maximum cable length versus load current

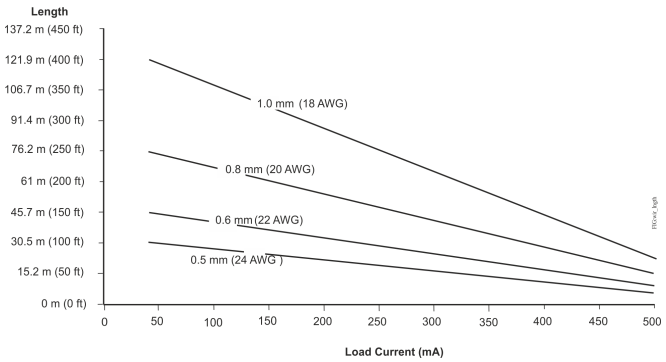
Use Figure 8 to estimate the maximum cable length relative to the wire size and the load current (in mA) when wiring inputs and outputs.

Note: Figure 8 applies to low-voltage (less than 30 V) inputs and outputs only. The required wire size and length for high-voltage (greater than 30 V) Relay Outputs is determined by the load connected to the relay and local electrical codes.

Maximum wire length by current and wire size

Use the following figure to estimate the maximum cable length relative to the wire size and the load current (in mA) when wiring inputs and outputs. This figure applies to low-voltage (<30 V) inputs and outputs only.

Figure 8: Maximum wire length for low-voltage Inputs and Outputs by current and wire size



Communication bus and supply power wiring guidelines

provides information about the functions, ratings, and requirements for the communication bus and supply power terminals; and guidelines for wire sizes, cable types, and cable lengths when wiring the controller's communication buses and 24 VAC supply power.

In addition, observe these guidelines when wiring an SA or FC bus and supply power:

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

Communications bus and supply power terminal blocks, functions, ratings, requirements, and cables

Table 4: Communications bus and supply power terminal blocks, functions, ratings, requirements, and cables

Terminal block/ Port label	Terminal labels	Function, electrical ratings/Requirements	Recommended cable type
FC BUS	+ -	FC Bus Communications	0.6 mm (22 AWG) stranded, 3-wire twisted, shielded cable recommended
	COM	Signal Reference (Common) for Bus communications	
	SHLD	Isolated terminal (optional shield drain connection)	

Table 4: Communications bus and supply power terminal blocks, functions, ratings, requirements, and cables

Terminal block/ Port label	Terminal labels	Function, electrical ratings/Requirements	Recommended cable type
FC BUS (Port)		RJ-12 6-Position Modular Connector provides: FC Bus Communications FC Bus Signal Reference and 15 VDC Common 15 VDC, 180 mA, Power for Wireless Commissioning Converter or ZFR181x/ZFR182x Wireless Router	Wireless Commissioning Converter retractable cable or 0.5 mm (24 AWG) 3-pair CAT 3 Cable <30.5 m (100 ft)
SA BUS	**+** **-**	SA Bus Communications	0.6 mm (22 AWG) stranded, 4-wire (2 twisted-pairs), shielded cable recommended. ⓘ **Note:** On the SA Bus, the + and - wire are one twisted pair, and the COM and SA PWR are the second twisted pair of wires.
	COM	SA Bus Signal Reference and 15 VDC Common	
	SA PWR	15 VDC Supply Power for Devices on the SA Bus (Maximum total current draw for SA bus is 240 mA.)	
Sensor	**Sensor**	RJ-12 6-Position Modular Connector provides: SA Bus Communications SA Bus Signal Reference and 15 VDC Common 15 VDC Power for devices on the SA bus and Wireless Commissioning Converter	0.5 mm (24 AWG) 3-pair CAT3 cable <30.5 m (100 ft)
240 VAC	**HOT**	**100–240 VAC Power Supply - Hot** 100–240 VAC, 50/60 Hz	The power supply terminals can accommodate the following maximum wire sizes: Two wires per terminal: 1.0 mm (18 AWG) maximum, **or** One wire per terminal: 2.05 mm (12 AWG) maximum ⓘ **Note:** Determine the **required** wire size for the line voltage input power terminals according to the controller operational VA specification and the local, regional, or national, electrical codes.
	COM	**100–240 VAC Power Supply - Common - COM** 100–240 VAC, 50/60 Hz 40 VA	

ⓘ **Note:** The SA Bus and FC Bus wiring recommendations in this table are for MS/TP bus communications at 38.4k baud. For more information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*

See the figures in this section for the applicable termination diagrams.

Termination diagrams

A set of Johnson Controls termination diagrams provides details for wiring inputs and outputs to the controllers.

Table 5: Termination details

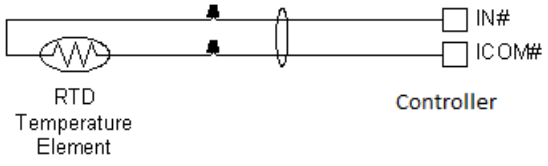
Type of field device	Type of Input/Output	Termination diagrams
Temperature Sensor	UI	

Table 5: Termination details

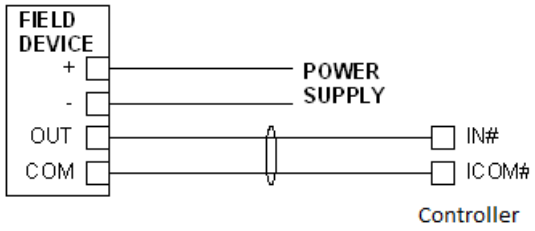
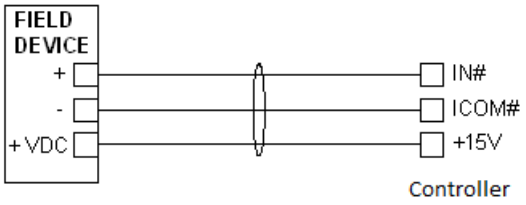
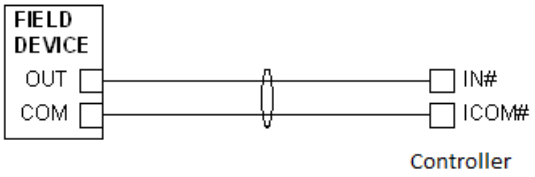
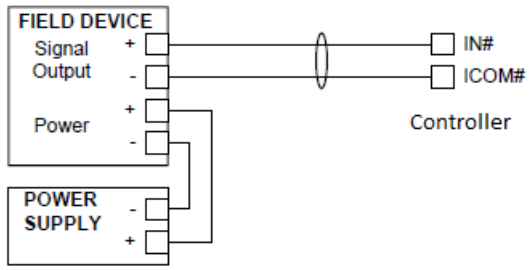
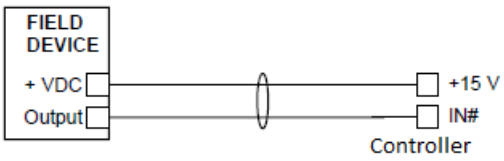
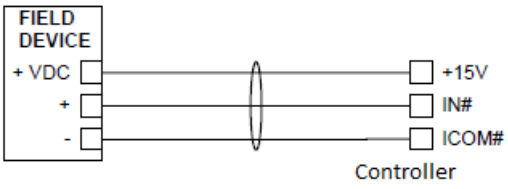
Type of field device	Type of Input/Output	Termination diagrams
Voltage Input - External Source	UI	
Voltage Input - Internal Source	UI	
Voltage Input (Self-Powered)	UI	
Current Input - External Source (Isolated)	UI	
Current Input - Internal Source (2-wire)	UI	
Current Input - Internal Source (3 wire)	UI	

Table 5: Termination details

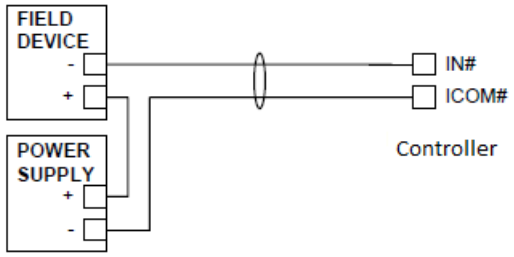
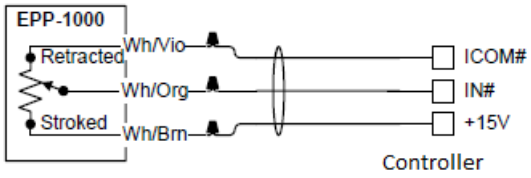
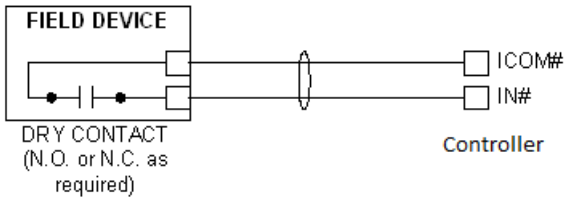
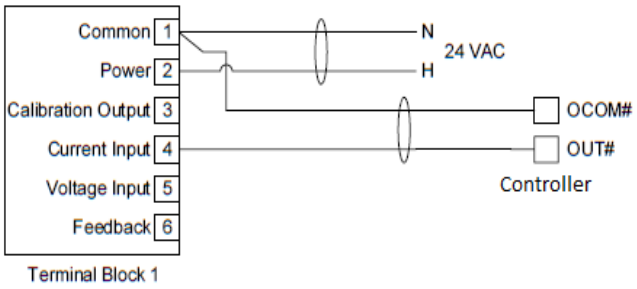
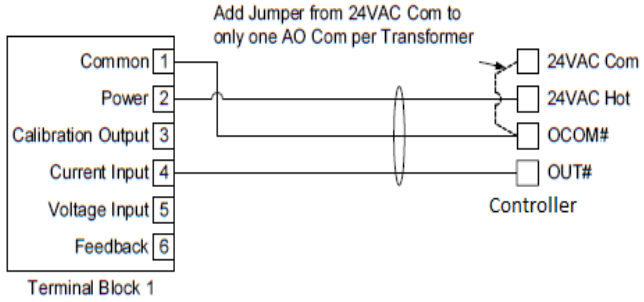
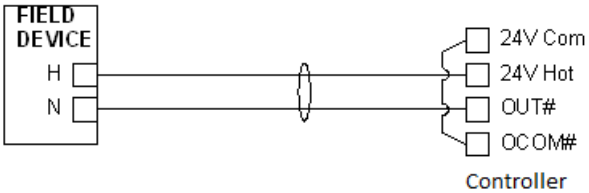
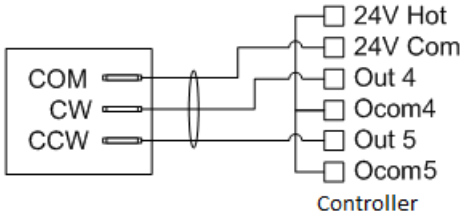
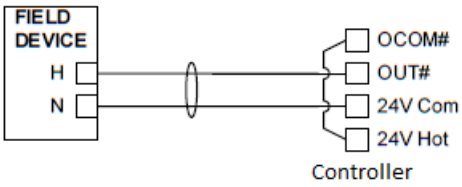
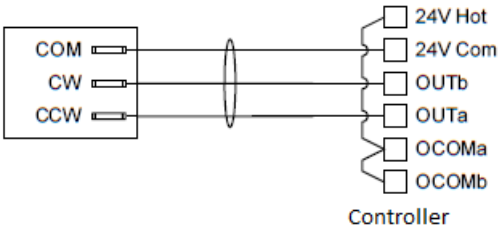
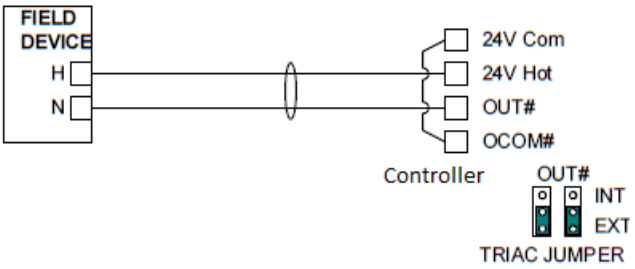
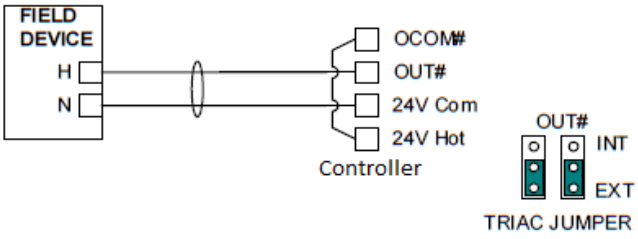
Type of field device	Type of Input/Output	Termination diagrams
Current Input - External Source (in Loop)	UI	
Feedback from EPP-1000	UI	
Dry Contact (Binary Input)	UI or BI	
0–10 VDC Output to Actuator (External Source)	CO or AO	
0–10 VDC Output to Actuator (Internal Source)	CO or AO	
24 VAC Triac Output (Switch Low, External Source)	CO or AO	

Table 5: Termination details

Type of field device	Type of Input/Output	Termination diagrams
Incremental Control to Actuator (Switch Low, Externally Sourced)	CO or AO	
24 VAC Binary Output (Switch High, Externally Sourced)	CO or AO	
Incremental Control to Actuator (Switch High, Externally Sourced)	CO or AO	
24 VAC Binary Output (Switch Low, Externally Sourced)	RO	
24 VAC Binary Output (Switch High, Externally Sourced)	RO	

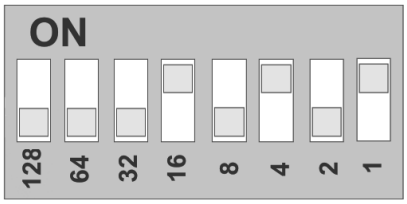
Setup and Adjustments

Setting the device address

Metasys field controllers are master devices on an MS/TP (SA or FC) bus. Before you operate field controllers on a bus, you **must** set a valid and unique device address for each controller on the bus. You set a field controller's device address by setting the positions of the switches on the DIP switch block at the top of the controller. Device addresses 4 through 127 are the valid addresses for these controllers on an MS/TP FC Bus.

The DIP switch block has eight switches numbered 128, 64, 32, 16, 8, 4, 2, and 1. Switches 64 through 1 are device address switches. Switch 128 must be set to **OFF** for all hard-wired SA and FC bus applications.

Figure 9: Device address DIP switch block set to address 21



Note: *Metasys* field controllers ship with switch 128 ON and the remainining adress switches off rendering the controllers wired subordinate devices, which do not operate on MS/TP buses, but do not interfere with bus operation. Set a valid and unique device address on the controller before applying power to the controller on the bus.

To set the device addresses on the controllers, complete the following steps:

1. Set **all** of the switches on the address DIP switch block (128 through 1) to OFF.
2. Set one or more of the seven address switches (64 though 1) to ON, so that the sum of the switch numbers set to ON equals the intended device address. Set the highest number switch that is less than or equal to the intended device address to ON. Then continue setting lower numbered switches until the total equals the intended address. For example, if the intended device address is 21, set switch 16 to ON first, then set switch 4 ON, followed by switch 1 (16+4+1= 21). See Figure 9.See for valid device addresses.
3. Set switch 128 to ON only for controllers on an WNC1800/ZFR182x Pro (ZFR Pro) Series Wireless Field Bus application. For all hard-wired SA and FC bus applications, ensure that switch 128 is set to Off

Note: Do not connect an controller with switch 128set to ON to anactive (hard-wired) SA or FC bus. When a controller with switch 128 set to ON and a device address from 4 to 127 is connected to a wired field bus, the entire field bus is rendered inoperable until the controller is disconnected or switch 128 is set to Off.

Refer to the *WNC1800/ZFR182x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12012356)* for more information on device addresses in wireless applications

4. Set a unique and sequential device address for each of the controllers connected on the SA or FC bus starting with device address 4. To ensure the best bus performance, set sequential device addresses with no gaps in the device address range (4, 5, 6, 7, 8, 9, and so on). The controllers do not need to be physically connected on the bus in their numerical device address order.
5. Write each controller's device address on the white label below the DIP switch block on the controller's cover.

The following table describes the FC bus and SA bus devices addresses for controllers communications bus applications.
Refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)* for more information on controller device addresses and how to set them on MS/TP buses.

Table 6: SA/FC bus device address descriptions

Device address	Use on description
0 (Switch 128 Off)	Reserved for FC Bus Supervisory Controller (not for use on controllers).
1 to 3 (Switch 128 Off)	Reserved for peripheral devices (not for use on controllers).
4 to 127 (Switch 128 Off)	Used for MS/TP master devices (controllers) that are hardwired to an SA bus or FC bus.
0 to 3 (Switch 128 ON)	Reserved addresses for wired subordinate devices (not for use on controllers). **Note:** *Metasys* field controllers ship with switch 128 ON and the remaining address switches off rendering the controllers wired subordinate devices, which do not operate on MS/TP buses.
4 to 127 (Switch 128 ON)	Valid for MS/TP Master controllers on **wireless FC Buses only**. **Note:** Do **not** connect a controller with switch 128 ON to an active (**hard-wired**) SA or FC bus. When a controller with switch 128 ON and a device address from 4 to 127 is connected to a wired field bus, the entire field bus is rendered inoperable until the controller is disconnected or switch 128 is set to **Off**.

Setting the N2 Controller address to be greater than 127

N2-configured controllers support the full range of possible N2 device addresses provided by the N2 protocol standard (1–254). However, these controllers require special configuration for addresses above 127.
Use the following instructions for controllers greater than 127.

Note: This special configuration is required because controller addresses above 127 were originally intended for use with the Wireless Field Bus system.

Note: Prior to performing this procedure, be sure the controller has been converted from BACnet to N2 protocol first. Refer to the *Modernization Guide for Legacy N2 Controllers (LIT-12012005)* for more information.

1. Disconnect the 24 VAC supply from the controller.

2. Remove the FC Bus connector from the controller.
3. Set the address switch set to the desired N2 address.
4. Set the address switch segment labeled 128 to OFF.
5. Reconnect the 24 VAC supply to the controller.
6. Using an SA bus connection, download the firmware and controller application file. The download process asks to confirm switching the communication protocol to N2.
7. Click **OK**.
8. After the download is finished, disconnect the 24 VAC supply to the controller.
9. Set the address switch segment labeled 128 to ON.
10. Reattach the FC Bus connector to the controller.
11. Reconnect the 24 VAC supply to the controller.

Setting the End-of-Line (EOL) switch

Each field controller has an EOL switch, which, when set to ON, sets the controller as a terminating device on the bus. The default EOL switch position is OFF.

Figure 10: End-of-Line switch positions

To set the EOL switch on a field controller, complete the following steps:

1. Determine the physical location of the field controller on the FC bus.
2. Determine if the controller must be set as a terminating device on the bus.

Note: For detailed information regarding EOL termination rules and EOL switch settings on FC buses, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.

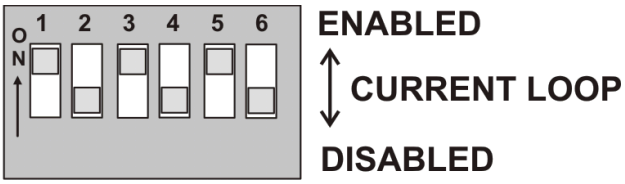
3. If the controller is a terminating device on the FC bus, set the EOL switch to ON. If the controller is not a terminating device on the bus, set the EOL switch to Off.

When a controller is connected to power with its EOL switch set to ON, the amber EOL LED on the controller cover is lit.

Setting the UI current loop DIP switches

The five Universal Input (UI) current loop switches are on the (6-switch) DIP switch block on the controller cover near the UI terminals (see FAC2612-2 physical features). When a UI is defined in the system software as a 4–20 mA Analog Input (AI) and the UI's current loop switch is in the DISABLED (default/off/down) position, the 4–20 mA current loop circuit opens whenever power to the field controller is interrupted or off. Setting a current loop switch to the ENABLED (ON/up) position maintains the 4–20 mA current loop circuit even when power to the field controller is interrupted or off.

Figure 11: Current loop jumper positions



To set the current Loop Mode switches:

1. Determine if the UI is intended to operate as a 4–20 mA AI (and configure the system software accordingly).
2. If the UI is not intended to be a 4–20 mA AI, set the UI's corresponding Current Loop Mode switch to the off/ down position.
3. If the UI is intended to be a 4–20 mA AI and the current loop is intended to be maintained, set the UI's corresponding Current Loop Mode switch to the ON/up position.

Important: Current Loop switches must be in the DISABLED (off/down) position for all UIs that are not set up to operate as 4–20 mA analog inputs.

FAC2612-2 current loop jumper

Table 7 identifies the current loop switches associated with each UI on the FAC26 controller.

Table 7: UI Inputs and jumper labels

Universal Input label	Switch label on current loop DIP switch block board
IN1	1
IN2	2
IN3	3
IN4	4
IN5	5
IN6	Not Used

Setting up a local display

FAC2612 models do not have an integral display, but can be connected to a DIS1710 Local Controller Display. For detailed information on setting up and operating either an integral user interface or a remotely connected DIS1710 display, refer to the *DIS1710 Local Controller Display Technical Bulletin (LIT-12011270)*.

Note: FAC devices do not support display of Schedules, Clock, Trend, or Alarms on the DIS1710 Local Controller Display.

Commissioning the Controllers

Commission BACnet MS/TP field controllers with the controller (CCT) software, either via a Bluetooth® Wireless Commissioning Converter, a ZFR wireless adapter

(BACnet MS/TP only), or in BACnet routing mode when connected to an NAE or NCE.

Note: N2-capable FAC controllers do not support Zone Bus or XT Bus. They do not support wireless connections to the N2 Bus.

Refer to the *Controller Tool Help (LIT-12011147)* for detailed information on commissioning field controllers.

Troubleshooting the Controllers

Observe the Status LEDs on the front of the controller and see Table 8 to troubleshoot the controller. To troubleshoot the local controller display, refer to the *DIS1710 Local Controller Display Technical Bulletin (LIT-12011270)*.

LED status and states

Table 8: Status LEDs and description of LED states

LED label	LED color	Normal LED state	Description of LED states
POWER	Green	On Steady	Off Steady = No Supply Power or the controller's polyswitch/resettable fuse is open. Check Output wiring for short circuits and cycle power to controller. On Steady = Power Connected
FAULT	Red	Off Steady	Off Steady = No Faults On Steady = Device Fault; no application loaded; Main Code download required. Blink - 2 Hz = Download or Startup in progress, not ready for normal operation
SA BUS	Green	Blink - 2 Hz	Blink - 2 Hz = Data Transmission (normal communication) Off Steady = No Data Transmission (N/A - auto baud not supported) On Steady = Communication lost, waiting to join communication ring
FC BUS	Green	Blink - 2 Hz	Blink - 2 Hz = Data Transmission (normal communication) Off Steady = No Data Transmission (auto baud in progress) On Steady = Communication lost, waiting to join communication ring
EOL	Amber	Off (Except on terminating devices)	On Steady = EOL switch in ON position Off Steady = EOL switch in Off position

Repair information

If a controller fails to operate within its specifications, replace the controller. For a replacement controller, contact your Johnson Controls representative.

Accessories

Table 9: Accessories ordering information

Product code number	Description
MS-BTCVT-1	Wireless Commissioning Converter
MS-DIS1710-0	Local Controller Display (FAC devices do not support display of Schedules, Clock, Trend or Alarms on the DIS1710 Local Controller Display)
WNC1800/ZRF182x Pro Wireless Field Bus System	This system is used for installations that support BACnet/IP but can also coexist with the ZFR1800 Series when installed under the same network engine. Refer to the *WNC1800/ ZFR182x Pro Series Wireless Field Bus System Product Bulletin (LIT-12012320)* for a list of available products.
ZFR1800 Series Wireless Field Bus System	This system is used for installations that only support BACnet MS/TP. Refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)* for a list of available products.
NS Series Network Sensors	Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for specific sensor model descriptions.
WRZ Series Wireless Room Sensors	Refer to the *WRZ Series Wireless Room Sensors Product Bulletin (LIT-12000653)* for specific sensor model descriptions.
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 - *Metasys*/FX for Europe (All EU Countries); Middle East (UAE and Qatar)
TL-MAP1810-0PA	Portable - *Metasys*/FX for Asia (China, Japan, Australia, New Zealand, India, Singapore, Thailand)
TP-2420	Transformer, 120 VAC Primary to 24 VAC secondary, 20 VA, Wall Plug
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount, 8 in. Primary Leads and Secondary Screw Terminals, Class 2 ⓘ **Note:** Additional Y6x-x Series transformers are also available. Refer to the *Series Y63, Y64, Y65, Y66, and Y69 Transformers Product Bulletin (LIT-125755)* for more information.
AS-XFR050-0	Power transformer (Class 2, 24 VAC, 50 VA maximum output), no enclosure
AP-TBK4SA-0	Replacement SA Bus Terminal Blocks, 4-Position, Brown, (Bulk Pack of 10)Power transformer (Class 2, 24 VAC, 50 VA maximum output), no enclosure
AP-TBK4FC-0	Replacement FC Bus Terminal Blocks, 4-Position, Blue, (Bulk Pack of 10)
AP-TBK3PW-0	Power transformer (Class 2, 24 VAC, 50 VA maximum output), noReplacement Power Terminal Blocks, 3-Position, Gray, (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 - 9 Pieces
MS-TBKUI05-0	Terminal Block Kit - FAC 5-Position Universal Input - 3 Pieces

Technical specifications

Table 10: FAC2612-2 technical specifications

Product Code Number	MS-FAC2612-2 Field Equipment Controller
Supply Voltage	100–240 VAC, 50/60 Hz
Power Consumption	40 VA maximum for FAC2612-2 ⓘ **Note:** VA rating does **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°C to 50°C (32°F to 122°F); 10% to 90% RH noncondensing; Pollution Degree 2 **Storage:** -40°C to 80°C (-40°F to 176°F); 5% to 95% RH noncondensing
Controller Addressing for BACnet MS/TP	DIP switch set; valid controller device addresses 4–127 (Device addresses 0–3 and 128–255 are reserved and not valid controller addresses.)
Controller Addressing for N2	DIP switch set; valid control device addresses 1–255
Communications Bus	**RS-485: selectable BACnet MS/TP or N2** 3-wire FC bus between the supervisory controller and controllers 4-wire SA bus between controller, network sensors and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from controller) to bus devices.
Processor	H8SX/166xR Renesas® 32-bit microcontroller
Memory	4 MB Flash Memory and 1 MB Random Access Memory (RAM)
Input and Output Capabilities	**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) Amperes 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) Amperes N.O. or N.C. only
Analog Input/Analog Output Resolution and Accuracy	**Input:** 16-bit resolution **Output:** 16-bit resolution, +/- 200 mV accuracy in 0-10 VDC applications
Terminations	**Input/Output:** Pluggable 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
Housing	**Enclosure material:** ABS and polycarbonate UL94 5VB; Self-extinguishing Protection Class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	150 mm x 164 mm x 53 mm (5-7/8 in. x 7-1/2 in. x 2-1/8 in.) including terminals and mounting clips ⓘ **Note:** Mounting space 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 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 Compliant, ICES-003
	Europe: Johnson Controls declares that this product is also in compliance with the essential requirements and other relevant provisions of the EMC Directive and Low Voltage Directive (LVD). Declared as Free Standing Operating Control Type 1.B 2,500 V rated impulse voltage. 100°C ball pressure test.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories (BTL) Revision 7 Listed BACnet Advanced Application Controller (B-AAC)

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

Product warranty

This product is covered by a limited warranty, details of which can be found at www.johnsoncontrols.com/buildingswarranty.

Single point of contact

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

For more contact information, refer to www.johnsoncontrols.com/locations.