

Application

The FAC3613 Advanced Application Field Equipment Controller (FAC) is part of the Metasys system Field Equipment Controller family. The FAC36 Series controllers run pre-engineered and user-programmed applications and provides the inputs and outputs required to monitor and control a wide variety of HVAC and other facility equipment.

FAC36 controllers operate on an RS-485 BACnet® MS/TP Bus as BACnet Advanced Application Controllers (B-AACs) and integrate into Johnson Controls® and third-party BACnet systems.

FAC36 field 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.

Communications protocols

The FAC3613 field controllers can communicate using BACnet MS/TP, N2, or wireless Zigbee. By default, the FAC3613 field controllers communicate using the standard BACnet MS/TP protocol. The BACnet protocol is a standard for ANSI, ASHRAE, and the International Standards Organization (ISO) for building controls.

The FEC Family Controllers, including the FAC3613, can be used as functional replacements for legacy N2 controllers. The N2-capable MS/TP field controller models provide a cost-effective upgrade and modernization path for customers with existing N2 controllers. For installation and commissioning support, and tips for efficient and safe replacement, refer to the *Modernization Guide for Legacy N2 Controllers (LIT-12012005)* and the controller-specific documentation. For information about mapping N2 Objects in controllers with switchable communications protocols, refer to the *N2 Compatibility Options* chapter of the *Controller Tool Help (LIT-12011147)*.

To configure FAC3613 field controllers to communicate using the N2 communications protocol, see [Configuring N2 Communications](#).

The FAC3613 field controller can also be installed in a wireless application using a ZFR Pro Wireless Field Bus Router. To configure these controllers to communicate using the wireless communications protocol, see [Configuring Wireless Communications](#).

Fast persistence

The FAC3613 model has a fast persistence feature that allows you to retain data values at a configurable interval, up to once per second. Persistence refers to how often samples of data are stored locally. This upgrade to the persistence feature ensures that in the event of a problem, such as a loss of power, more recent 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, is still available and accessible. When persistence is configured for once per second, you risk losing only the most recent one second of data before the power loss. Persisting data may be essential for situations that require greater data accuracy. This may include certain methods of utility data collection and billing

Attributes that can be persisted in the FAC3613 include: Counter Input Present Value Attributes, Binary Input, Binary Output, and Binary Value COS Counts and Active Time Attributes, and PID/PRAC tuning parameters.

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 the following guidelines when installing a field controller:

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

Parts included

- One field Controller. (Power and FC bus and SA bus terminal blocks are removable)
- One installation instructions sheet.



Materials and special tools needed

- Three fasteners appropriate for the mounting surface (M4 screws or #8 screws)

- One 23 cm (9.125 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

FAC3613 physical features

Figure 1: FAC3613 Physical Features

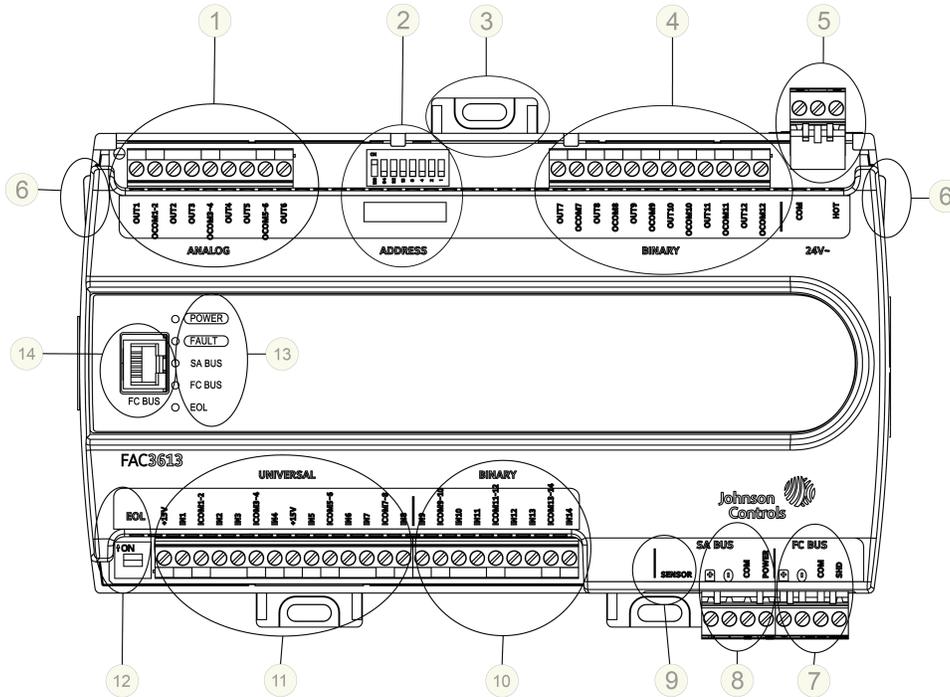


Table 1: Physical features

	Physical feature: description and references
1	Analog Output (AO) Terminal Block: Can be defined as Voltage Analog Output (0–10 VDC) or Current Analog Output (4–20 mA) (see Table 2)
2	Device Address DIP Switch Block (see Setting the Device Addresses)
3	Mounting clip
4	Binary Outputs (BO) Terminal Block: 24 VAC Triac (see Table 2)
5	24 VAC, Class 2/SELV Supply Power Terminal Block (see Supply power terminal block)
6	Cover Lift Tab (One of Two)
7	FC Bus Terminal Block (see FC bus terminal block)
8	SA Bus Terminal Block (see SA bus terminal block)
9	Sensor Port: (SA Bus) RJ-12 6-Pin Modular Jack (see SA Bus port)
10	Binary Input (BI) Terminal Block: Dry Contact Maintained or Pulse Counter/Accumulator Mode (see Terminal wiring guidelines, functions, ratings, and requirements)
11	Universal Inputs (UI) Terminal Block: Can be defined as Voltage Analog Input (0–10 VDC), Current Analog Input (4–20 mA), Resistive Analog Inputs (0–600k ohms), or Dry Contact Binary Input (see Input and Output wiring guidelines)

Table 1: Physical features

	Physical feature: description and references
12	End-of-Line (EOL) Switch (see Setting the End-of-Line (EOL) switch)
13	LED Status Indicators (see Table 7)
14	FC Bus Port (RJ-12 6-pin Modular Jack)

Mounting

Observe the following guidelines when mounting a field controller:

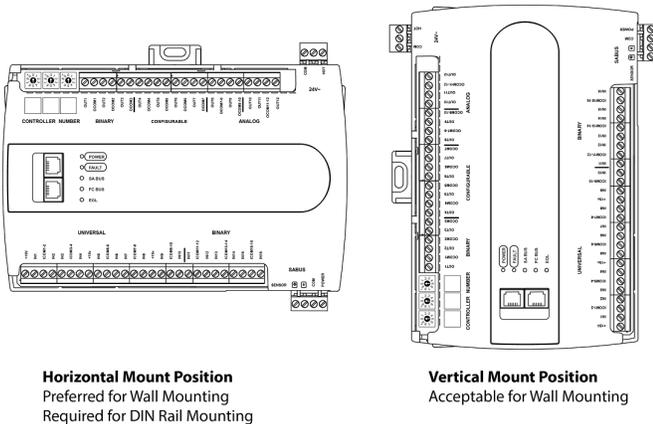
- Ensure the mounting surface can support the controller, DIN rail, and any user-supplied enclosure.
- Mount the controller horizontally on 35 mm DIN rail whenever possible.
- Mount the controller in the correct mounting position (Figure 2).
- Whenever possible in wall-mount applications, mount the controller on a hard, even surface.
- 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 [Technical specifications](#).

- Provide sufficient space around the controller for cable and wire connections, 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 ductwork.
- 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 field 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.

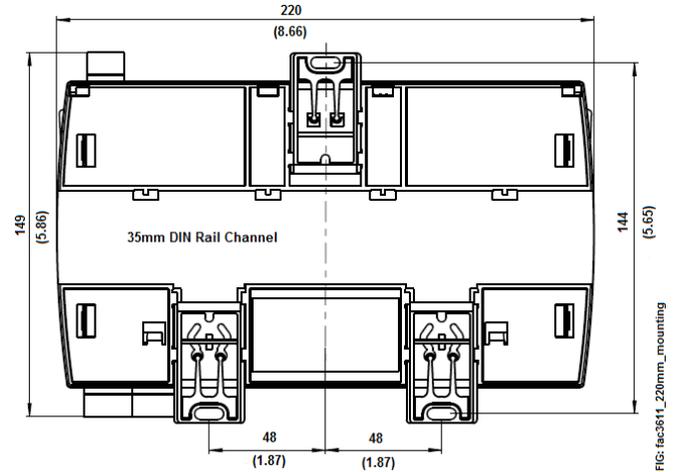
Figure 2: Controller Mounting Positions



Mounting Features and Dimensions

See Figure 3 for mounting dimensions in millimeters and inches. Inches are listed in parenthesis. Figure 3 also illustrates the DIN rail channel and the mounting clips in an extended position.

Figure 3: Back of Controller



DIN Rail mount applications

About this task:

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

1. Securely mount a 23 cm (9.125 in.) or longer section of 35 mm DIN rail, horizontally and centered in the desired space, so that the controller mounts in the position shown in Figure 2.
2. Pull the two bottom mounting clips outward from the controller to the extended position (Figure).
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 (Figure), 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

About this task:

To mount a field 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 in either the horizontal or vertical mounting position. 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.

Wiring

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 about configuring and wiring an MS/TP bus, FC bus and SA bus, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*. For detailed information on wiring an N2 network, refer to the

Terminal blocks and bus ports

See Figure 1 for terminal block and bus port locations on the FAC3613 controller. Observe the following guidelines when wiring a controller.

Input and Output terminal blocks

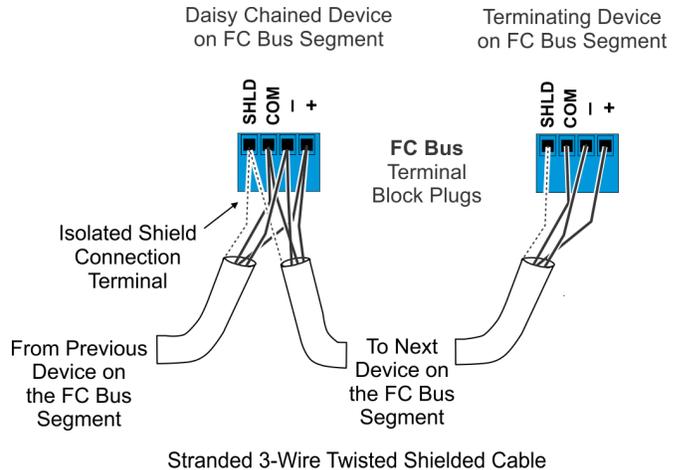
The fixed input terminal blocks are located on the bottom of the controller, and the output terminal blocks are located on the top of the controller. See [I/O Terminal blocks, ratings, and requirements](#) for more information about I/O terminal functions, requirements, and ratings.

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 about the FC Bus terminal function, requirements, and ratings, see [Communications bus and supply power terminal block](#).

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.

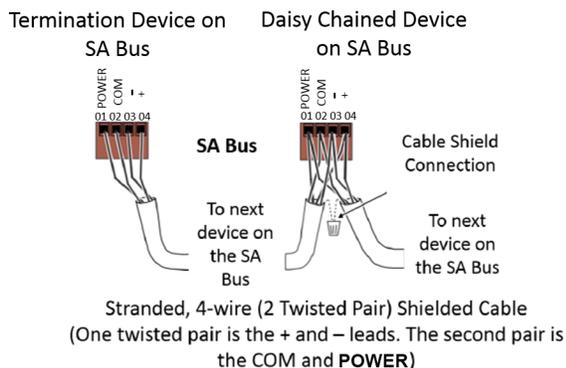
SA bus terminal block

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 about the SA Bus

terminal function, requirements, and ratings, see [Input and Output wiring guidelines](#).

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

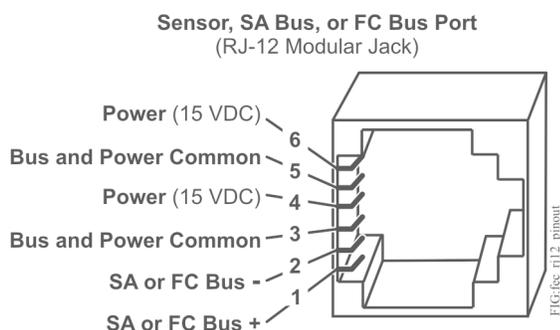
The FC bus port on the front of the controller is an RJ-12, 6-position modular jack that provides a connection for the Mobile Access Portal (MAP) Gateway or the ZFR/ZFR Pro Wireless Field Bus Router.

The FC bus port is connected internally to the FC bus terminal block. For more information about the FC Bus port functions, requirements, and ratings, see [Communications bus and supply power terminal block](#). The FC bus port pin assignment is shown in Figure 6.

Note:

- When the is configured for N2 network communication, the FC bus port is not used.

Figure 6: Pin number assignments for sensor, SA bus, and FC bus ports on Field 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 MAP Gateway, the VAV Balancing Tool, specified network sensors, or other SA Bus devices with RJ-12 plugs.

A DIS1710 Local Controller Display also can be connected to the SA Bus port (but only on FEC models without integral display and push buttons).

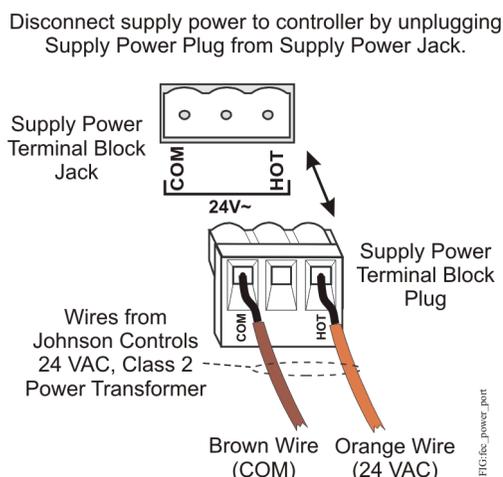
The Sensor port is connected internally to the SA bus terminal block. For more information about the Sensor port functions, requirements and ratings, see [Communications bus and supply power terminal block](#). The Sensor Port pin assignment is shown in Figure 6 (but only on FEC models without integral display and push buttons).

Supply power terminal block

The 24 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 24 VAC supply power wires from the transformer to the HOT and COM terminals on the terminal plug as shown in Figure 7. Do not use the middle terminal on the supply power terminal block. See [Communications bus and supply power terminal block](#) for more information about the Supply Power Terminal Block.

Figure 7: 24 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 24 VAC supply power to the field controller and all other network devices so that transformer phasing is uniform across the network devices. Powering network devices with uniform 24 VAC supply power phasing reduces noise, interference, and ground loop problems. The field controller does not require an earth ground connection.

Terminal wiring guidelines, functions, ratings, and requirements

Input and Output wiring guidelines

Table 2 provides information and guidelines about the functions, ratings, and requirements for the controller input and output terminals. The table also references guidelines for determining proper wire sizes and cable lengths.

In addition to the wiring guidelines in Table 2, observe these guidelines when you wire 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 recommended for input and output cables that are exposed to high electromagnetic or radio frequency noise.
- Inputs/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.

I/O Terminal blocks, ratings, and requirements

Table 2: Terminal blocks, functions, ratings, requirements, and cables

Terminal block label	Terminal label	Function, ratings, requirements	Determine wire size and maximum cable length
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 i Note: Use 3-wire cable for devices that source power from the +15V terminal.
	IN_n	Analog Input - Voltage Mode (0–10 VDC) 10 VDC maximum input voltage Internal 75k ohms pull-down	See Guideline A in Table 3.
		Analog Input - Current Mode (4–20 mA) Internal 100 ohms load impedance. See Setting the Input Jumpers . i Note: A current loop jumper must be in the Enabled position to maintain a closed 4-20 mA current loop. See UI current loop jumpers .	See Guideline B in Table 3.
		Analog Input - Resistive Mode (60–600k ohms) Internal 12 V. 15k ohms pull-up Qualified Sensors: 0–2k ohms 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 ohms pull-up	See Guideline A in Table 3.
	$ICOM_n$	Universal Input Common for all Universal Input terminals i Note: All Universal $ICOM_n$ terminals share a common, which is isolated from all other commons, except the SA bus common. One common screw terminal point is provided for every two input screw terminal points.	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 ohms 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 ohms pull-up	
	$ICOM_n$	Binary Input Common for all Binary Input (IN) terminals i Note: All Binary $ICOM_n$ terminals share a common, which is isolated from all other commons.	

Table 2: Terminal blocks, functions, ratings, requirements, and cables

Terminal block label	Terminal label	Function, ratings, requirements	Determine wire size and maximum cable length
ANALOG (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 ohms or more. ⓘ Note: The Analog Output (AO) operates in the Voltage Mode when connected to devices with impedances greater than 1,000 ohms. Devices that drop below 1,000 ohm may not operate as intended for Voltage Mode applications.	See Guideline C in Table 3.
		Analog Output - Current Mode (4–20 mA) Requires an external load between 0 and 300 ohms. ⓘ Note: The Analog Output (AO) operates in the Current Mode when connected to devices with impedances less than 300 ohms. Devices that exceed below 300 ohms may not operate as intended for Current Mode applications.	
	OCOM _n	Analog Output Signal Common for all Analog OUT terminals. ⓘ Note: All Analog Output Common terminals (OCOM _n) share a common, which is isolated from all other commons. One common screw terminal point is provided for every two output screw terminal points.	
BINARY (Output)	OUT _n	Binary Output - 24 VAC Triac Class 2, 24 V, 500 mA (External Power Source) 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	Binary Output Common (for OUT _n terminal) ⓘ Note: Each Binary Output Common terminal (OCOM _n) is isolated from all other commons, including other Binary Output Common terminals.	

Cable and wire length guidelines

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.

ⓘ **Note:** The required wire sizes and lengths for high-voltage (>30 V) Relay Outputs are determined by the load connected to the relay, and local, national, or regional electrical codes.

Table 3: Cable length guidelines for recommended wire sizes for low-voltage (<30 V) Inputs and Outputs

	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	

Table 3: Cable length guidelines for recommended wire sizes for low-voltage (<30 V) Inputs and Outputs

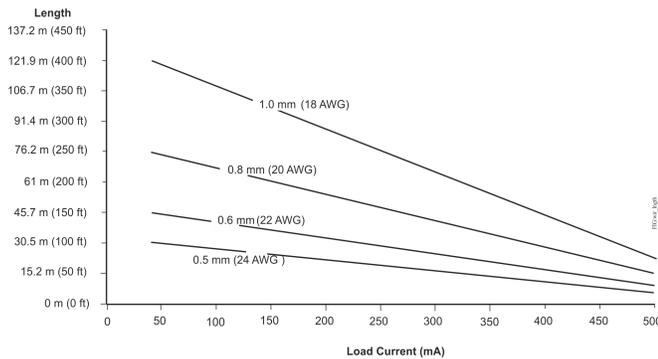
	Wire size/Gauge and type	Maximum cable length and type	Assumptions
B	1.0 mm (18 AWG) stranded copper	229 m (750 ft) twisted wire	100 mV maximum voltage drop Depending on cable and the connected input or output device, you may have to define an offset in the setup software for the input or output point.
	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 (<30 V) inputs and outputs only.

Figure 8: Maximum wire length for low-voltage (<30 V) Inputs and Outputs by current and wire size



Communications bus and supply power wiring guidelines

provides information about the functions, ratings, and requirements for the communication bus and supply

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
	-	Signal Reference (Common) for Bus communications	
	SHLD	Isolated terminal (optional shield drain connection)	
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 Bluetooth Commissioning Converter	Bluetooth Commissioning Converter retractable cable or 24 AWG 3-pair CAT 3 cable or above.

power terminals. The table also provides guidelines for wire sizes, cable types, and cable lengths for when you wire the controller's communication buses and supply power.

Important: Refer to the *N2 Modernization Guide for Legacy N2 Controllers* for guidelines when using this device on an N2 bus.

In addition, observe these guidelines when you wire an SA bus and the 24 VAC supply power:

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

Communications bus and supply power terminal block

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)*.

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
SA BUS	+ -	SA Bus Communications	0.6 mm (22 AWG) stranded, 4-wire (2 twisted-pairs), shielded cable recommended. ⓘ Note: 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 (Port)	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 Bluetooth Commissioning Converter	24 AWG 3-pair CAT3 cable <30.5 m (100 ft)
24~	HOT	24 VAC Power Supply - Hot Supply 20–30 VAC (Nominal 24 VAC)	0.8 mm to 1.0 mm (18 AWG) 2-wire
	COM	24 VAC Power Supply Common (Isolated from all other Common terminals on controller) 14 VA	

Termination diagrams

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

See the figures in Table 6 in this section for the applicable termination diagrams.

Table 5: Termination details

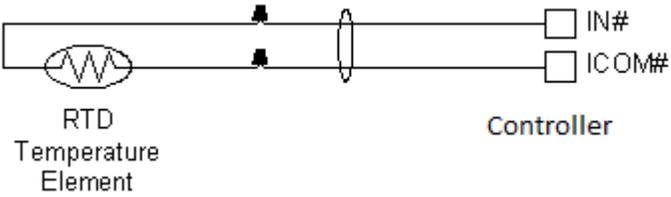
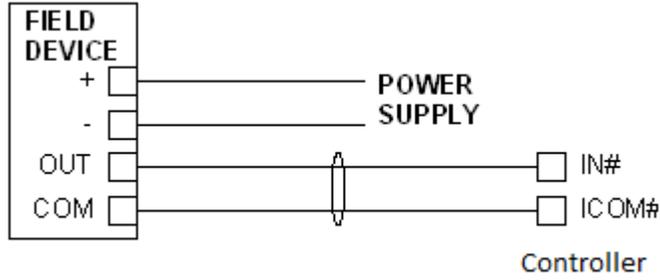
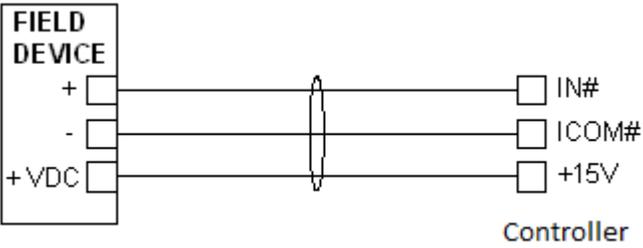
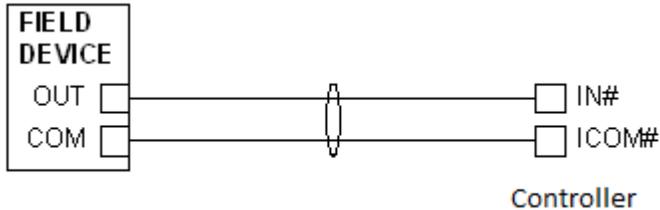
Type of field device	Type of Input/Output	Termination diagrams
Temperature Sensor	UI	 <p>RTD Temperature Element</p> <p>Controller</p>
Voltage Input - External Source	UI	 <p>FIELD DEVICE</p> <p>POWER SUPPLY</p> <p>Controller</p>
Voltage Input - Internal Source	UI	 <p>FIELD DEVICE</p> <p>Controller</p>
Voltage Input (Self-Powered)	UI	 <p>FIELD DEVICE</p> <p>Controller</p>

Table 5: Termination details

Type of field device	Type of Input/Output	Termination diagrams
Current Input - External Source (Isolated)	UI	
Current Input - Internal Source (2-wire)	UI	
Current Input - Internal Source (3 wire)	UI	
Current Input - External Source (in Loop)	UI	
Feedback from EPP-1000	UI	

Table 5: Termination details

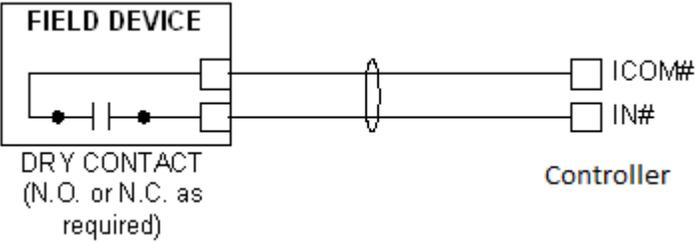
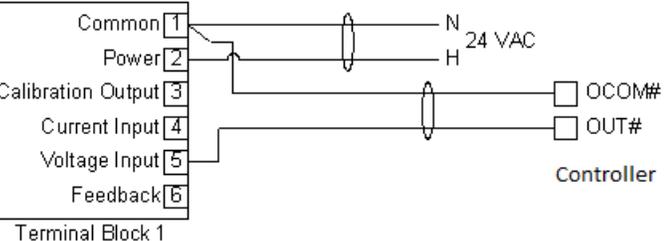
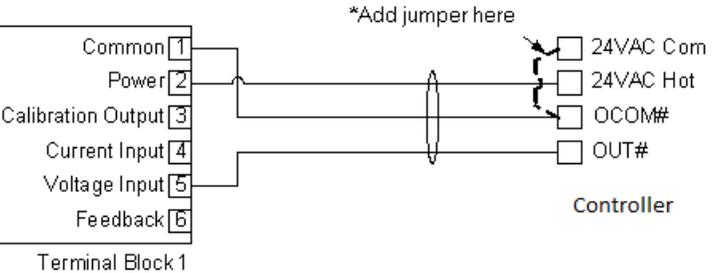
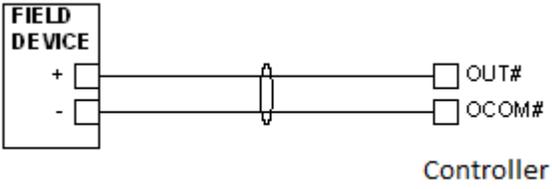
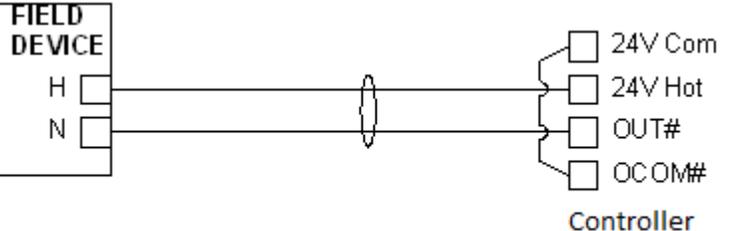
Type of field device	Type of Input/Output	Termination diagrams
<p>Dry Contact (Binary Input)</p>	<p>UI or BI</p>	
<p>0-10 VDC Output to Actuator (External Source)</p>	<p>CO or AO</p>	
<p>0-10 VDC Output to Actuator (Internal Source)</p>	<p>CO or AO</p>	
<p>Current Output</p>	<p>CO or AO</p>	
<p>24 VAC Triac Output (Switch Low, External Source)</p>	<p>CO or AO</p>	

Table 5: Termination details

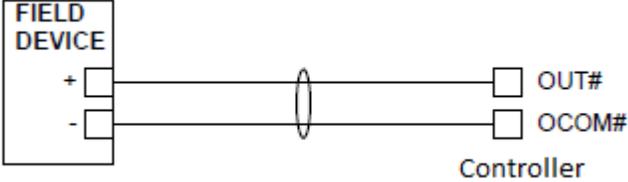
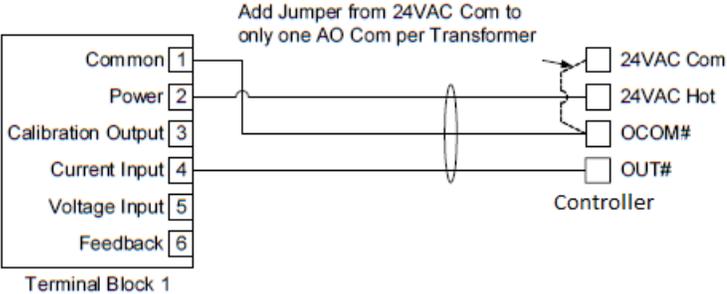
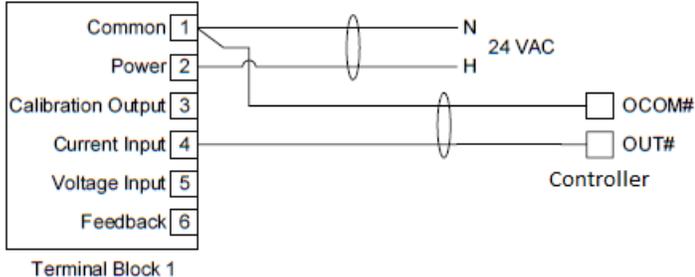
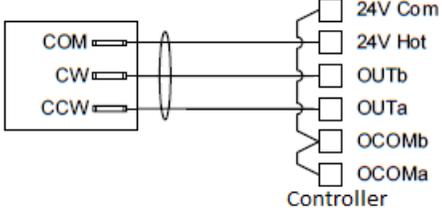
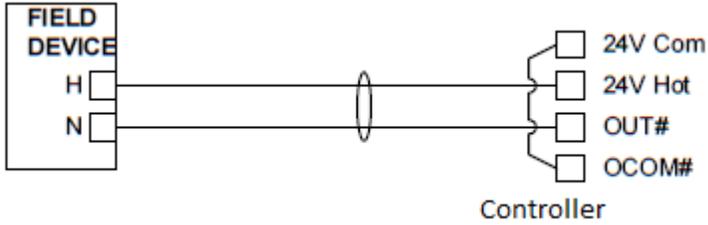
Type of field device	Type of Input/Output	Termination diagrams
Analog Output (Current)	AO	
4-20 mA Output to Actuator	AO	
4-20 mA Output to Actuator	AO	
Incremental Control to Actuator (Switch Low, Externally Sourced)	BO	
24 VAC Binary Output (Switch Low, Externally Sourced)	BO	

Table 5: Termination details

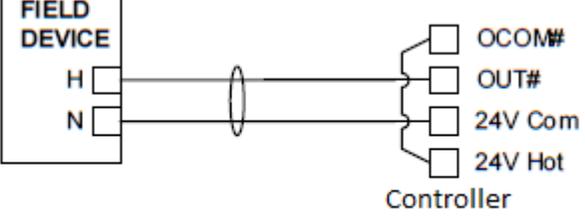
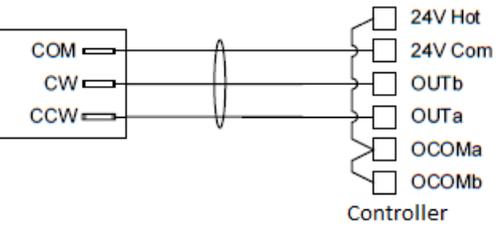
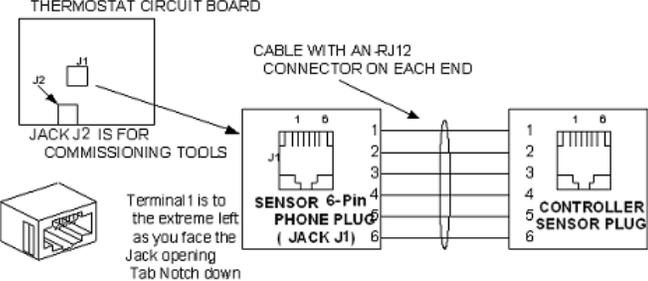
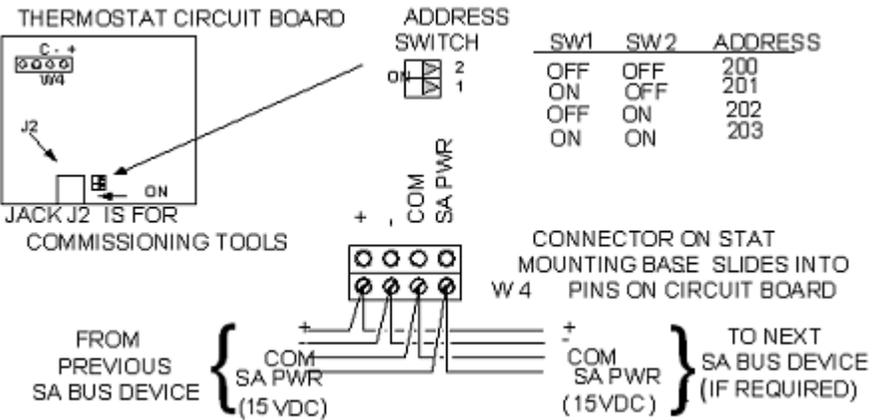
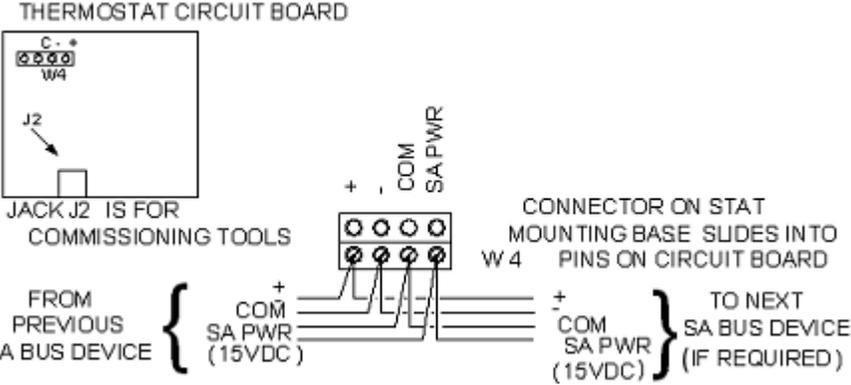
Type of field device	Type of Input/Output	Termination diagrams
24 VAC Binary Output (Switch High, Externally Sourced)	BO	
Incremental Control to Actuator (Switch High, Externally Sourced)	BO	

Table 5: Termination details

Type of field device	Type of Input/Output	Termination diagrams															
<p>Network Stat with Phone Jack (Fixed Address = 199)</p>	<p>SA Bus</p>	 <p>Note: The bottom jack (J2) on the TE-700 and TE-6x00 Series Sensors is not usable as a zone bus or an SAB connection.</p>															
<p>Network Stat with Terminals Addressable</p>	<p>SA Bus</p>	 <table border="1" data-bbox="1039 661 1323 787"> <thead> <tr> <th>SW1</th> <th>SW2</th> <th>ADDRESS</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>OFF</td> <td>200</td> </tr> <tr> <td>ON</td> <td>OFF</td> <td>201</td> </tr> <tr> <td>OFF</td> <td>ON</td> <td>202</td> </tr> <tr> <td>ON</td> <td>ON</td> <td>203</td> </tr> </tbody> </table>	SW1	SW2	ADDRESS	OFF	OFF	200	ON	OFF	201	OFF	ON	202	ON	ON	203
SW1	SW2	ADDRESS															
OFF	OFF	200															
ON	OFF	201															
OFF	ON	202															
ON	ON	203															
<p>Network Stat with Terminals (Fixed Address = 199)</p>	<p>SA Bus</p>																

Setup and Adjustments

Configuring N2 Communications

About this task:

N2-capable controllers support the full range of possible N2 device addresses provided by the N2 protocol standard (1-254).

To configure a controller to communicate using the N2 protocol, complete the following steps:

1. Disconnect the 24 VAC supply from the controller.

2. Set the address switches to the desired N2 address. For details about setting a device address, see [Setting the device address](#).
3. Reconnect the 24 VAC supply to the controller.
4. Using an SA bus connection, download the firmware and controller application file configured for N2 to the controller.

Switching the Communications Protocol from N2 to MS/TP

About this task:

For N2 sites that are converting to BACnet MS/TP, you can switch the communications protocol of N2-configured MS/TP controllers back to BACnet MS/TP.

To switch controller operating in N2 mode back into BACnet MS/TP mode, complete the following steps:

1. Disconnect the 24 VAC supply from the controller.
2. Set the address switches to the desired BACnet MS/TP address. For details about setting a device address, see [Setting the device address](#).
3. Ensure the DIP switch 128 is set to OFF.
4. Reconnect the 24 VAC supply to the controller.
5. Using an SA Bus connection, download a controller application file configured for BACnet MS/TP to the controller.

Configuring Wireless Communications

About this task:

To configure a controller for use with the ZFR/ZFR Pro Series Wireless Field Bus system, complete the following steps:

1. Disconnect the 24 VAC supply from the controller.
2. Wire the input/output terminals and SA bus.
 - ① **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.)
3. **Important:** Before the controller is powered on, connect the ZFR/ZFR Pro Wireless Field Bus Router to the FC bus port (RJ-12 modular jack) on the front of the controller.
4. Ensure that the controller's device address DIP switches are set to the correct device address. For details about setting a device address, see [Setting the device address](#).

For more information about device addresses in wireless applications, refer to the *WNC1800/ZFR182x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12012356)* or the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)*.

5. Reconnect the 24 VAC supply to the controller.
 - For more information about the ZFR Pro Wireless Field Bus system, refer to the *WNC1800/ZFR182x Pro Series Wireless Field Bus System Product Bulletin (LIT-12012320)*.
 - For more information about the ZFR 1800 Wireless Field Bus system, refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)*.

Setting the device address

About this task:

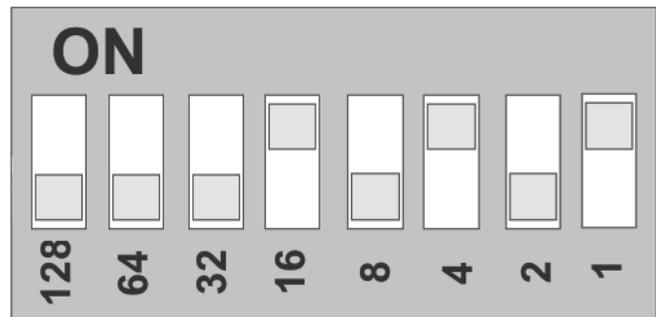
Metasys field controllers are master devices on an MS/TP (SA or FC) bus. Before you operate field controllers on a bus, you **must** set a valid and unique device address for each controller on the bus. You set a field controller's device address by setting the positions of the switches on

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.

Device Address	Use on Description
0 (Switch 128 Off)	Reserved for FC Bus Supervisory Controller(not for use on field controllers).
1-3 (Switch 128 Off)	Reserved for peripheral devices (not for use on field controllers).
4 to 127 (Switch 128 Off)	Used for MSTP master devices (field controllers) that are hardwired to an SA bus or 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



- ① **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, 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 through 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.

- 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.
- 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 Johnson Controls® MS/TP 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.

Removing the Controller cover

About this task:

- Important:** Electrostatic discharge can damage controller components. Use proper electrostatic discharge precautions during installation, setup, and servicing to avoid damaging the controller.
- Important:** Disconnect all power sources to the controller before you remove the cover and change the position of any jumper on the controller. Failure to disconnect power before changing a jumper can result in damage to the controller and void any warranties.

The controller cover is held in place by four plastic latches that extend from the base and snap into slots on the inside of the housing cover.

To remove the controller cover, complete the following steps:

- Place your fingertips under the two cover lift tabs ([FAC3613 physical features](#)) on the sides of the housing cover and gently pry the top of the cover away from the base to release the cover from the two upper latches.
- Pivot the top of the cover further to release it from the lower two latches.
- Replace the cover by placing it squarely over the base, and then gently and evenly push the cover on to the latches until they snap into the latched position.

Figure 10: Cover removed showing EOL switch and jumper positions

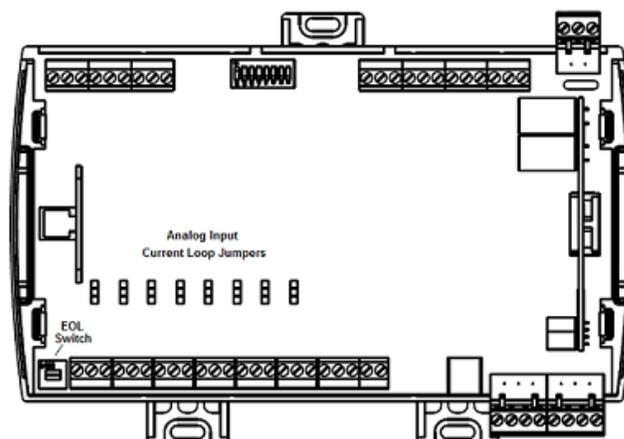


FIG: fac3611_mocover

Setting the End-of-Line (EOL) switch

About this task:

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

Figure 11: End-of-Line switch positions



FIG: fac_eol_switch

To set the EOL switch, complete the following steps:

- Determine the physical location of the expansion module on the FC bus.
- Determine if the expansion module 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)*.
- If the expansion module is a terminating device on the FC bus, set the EOL switch to ON. If the expansion module is not a terminating device on the bus, set the EOL switch to Off.

When an expansion module is connected to power with its EOL switch set to ON, the amber EOL LED on the expansion module cover is lit.

Setting the Input Jumpers

CAUTION

Risk of Electric Shock:

Disconnect supply power to the controller before attempting to adjust the Binary Output Source Power Selection Jumpers. Failure to disconnect the supply power may result in electric shock.

ATTENTION

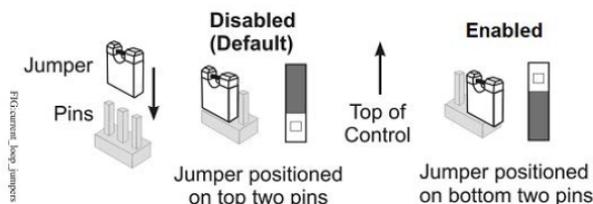
Risque de décharge électrique

Débrancher l'alimentation de l'controller avant tout réglage du Binary Output Source Power Selection Jumpers. Le non-respect de cette précaution risque de provoquer une décharge électrique.

UI current loop jumpers

The UI current loop jumpers are located on the circuit board under the controller cover near the UI terminals. When a UI is defined in the system software as a 4-20 mA Analog Input, set the UI's current loop jumper to the Enabled position as in Figure 12.

Figure 12: Current loop jumper positions



Setting the current loop jumper to the Enabled position connects an internal 100 ohms resistor across the UI terminals, which maintains the 4–20 mA current loop circuit even when power to the controller is interrupted or off.

- **Important:** Current loop jumpers must be in the Disabled (default) position for all UIs that are not set up to operate as 4–20 mA analog inputs.
- **Important:** A current loop jumper must be in the Enabled position to maintain a closed 4–20 mA current loop.

The following table identifies the current loop switches associated with each UI on the controller.

Table 6: FAC3613 UI Inputs and jumper labels

Universal Input label	Jumper label on circuit board
IN1	J5
IN2	J6
IN3	J7
IN4	J8
IN5	J9
IN6	J10
IN7	J11
IN8	J12

Setting up a local display

The FAC3613 model does not have an integral display, but you can connect the controller to a DIS1710 Local Controller Display. For detailed information about setting up and operating either an integral user interface or a remotely connected DIS1710 display, refer to the

Input/Output Wiring Validation

The FAC3613 controllers ship with a default state that can assist in validating the wiring of the input and output terminals prior to download of an application file. When the controller is powered on in this state, the Fault LED will flash in a pattern of two quick blinks and then a long pause (see Table 7).

To make use of this feature, ensure the DIP switches are set to the desired address and wire the input and output terminals. Apply power to the FAC controller and connect to the device with either a MAP Gateway or MS-DIS1710-0 Local Display to view the points in the controller. The FAC controller will report an Operational status even though there is no true application loaded. CCT will not be able to commission or upload the device as a result until a true application is downloaded. The application name displayed will be the address of the controller followed by the model of the controller and “Default State”.

For example, a FAC3613 controller whose DIP switches are set to 8 would have the default state application name of “8-FAC3613 Default State”.

The default state creates I/O points for all connections on the input and output terminals. It assumes all Universal Inputs (UIs) are Nickel temperature sensors. The default state also takes input from a Network Sensor at address 199. If there is no connected Network Sensor, the startup of this default state will be delayed by 30 seconds as the controller attempts to establish connection with the sensor.

Commissioning Controllers

You commission BACnet MS/TP controllers with the (Controller Configuration Tool) CCT software. The controller can be connected using NxE Passthru or through MAP 4.2+/BACnet Router (Mobile Access Portal (MAP) Gateway at version 4.2 or above). Refer to *Controller Tool Help (LIT-12011147)* for detailed information on commissioning field controllers. Beginning at CCT Release 13, the firmware package files are orderable separately; they are not included with CCT. They are obtained from

the Metasys software licensing portal, and are loaded and licensed on the computer/server that is running CCT. .

Firmware Package File

The MS-FCP-0 equipment controller firmware package files are required for CCT to configure and commission the controllers. The firmware package files also allow you to upgrade an existing IOM to the latest firmware release available for that expansion module.

Beginning at CCT Release 13, the firmware package files are orderable separately; they are not included with CCT. They are obtained from the Metasys software licensing portal, and are loaded and licensed on the computer/server that is running CCT.

For additional information about the firmware package files, refer to the *CCT Installation Instructions (LIT-12011259)*.

Troubleshooting Controllers

Observe the Status LEDs on the front of the field controller and see the table below to troubleshoot the controller. To troubleshoot an integral or local controller display, refer to the *DIS1710 Local Controller Display Technical Bulletin (LIT-12011270)*.

LED status and states

Table 7: 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	2 blinks followed by long pause = Controller powered on in default state. For more information about this default state, see Input/Output Wiring Validation . Off Steady = No Faults On Steady = Device Fault; no application loaded; Main Code download required, if controller is in Boot mode or a firmware mismatch exists between the and the ZFR1811 Wireless Field Bus Router.. 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 controller fails to operate within its specifications, replace the controller. For a replacement controller, contact your Johnson Controls representative.

Accessories ordering information

Table 8: Accessories Ordering Information

Product Code Number	Description
IOM Series Controllers	Refer to the <i>Metasys System Field Equipment Controllers and Related Products Product Bulletin (LIT-12011042)</i> for a complete list of available IOM Series Controllers.
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.
TL-CCT-0	Controller Configuration Tool (CCT) Software
MS-FCP-0	Equipment Controller Firmware Package Files for CCT
MS-DIS1710-0	Local Controller Display
NS Series Network Sensors	Refer to the <i>NS Series Network Sensors Product Bulletin (LIT-12011574)</i> for specific sensor model descriptions.
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 <i>Series Y63, Y64, Y65, Y66, and Y69 Transformers Product Bulletin (LIT-125755)</i>
AS-XFR050-0	for more information. Power transformer (Class 2, 24 VAC, 50 VA maximum output), no enclosure for more information.
AS-CBLTSTAT-0	Cable adapter for connecting to 8-pin TE-6700 Series sensors
AP-TBK4SA-0	Replacement SA Bus Terminal Blocks, 4-Position, Brown, Bulk Pack of 10
AP-TBK4FC-0	Replacement FC Bus Terminal Blocks, 4-Position, Blue, Bulk Pack of 10
AP-TBK3PW-0	Replacement Power Terminal Blocks, 3-Position, Gray, Bulk Pack of 10
WRG1830/ZFR183x 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 supervisor such as a network engine. Refer to the <i>WRG1830/ZFR183x Pro Series Wireless Field Bus System Catalog Page (LIT-1901026)</i> for a list of available products.
WRZ Series Wireless Room Sensors	Refer to the <i>WRZ Series Wireless Room Sensors Product Bulletin (LIT-12000653)</i> for specific sensor model descriptions.

Technical specifications

Table 9: FAC3613 Advanced Application Field Equipment Controller

Product Code Numbers	MS-FAC3613-0 Advanced Application Field Equipment Controller with Fast Persistence
Power Requirement	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: The 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 72 VA (maximum).
Power Source	+15 VDC power source terminals provide 100 mA total current. Quantity 2 located in Universal IN terminals - for active (3-wire) input devices
Ambient Conditions	Operating: 0°C to 50°C (32°F to 122°F); 10% to 90% RH noncondensing 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 1-254
Communications Bus	Selectable N2 or BACnet® MS/TP, RS-485: 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	RX631 32-Bit Renesas® microcontroller
Memory	16 MB flash memory and 8 MB RAM
Real-Time Clock Backup Power Supply	Super capacitor maintains power to the onboard real-time clock for a minimum of 72 hours when supply power to the controller is disconnected.
Input and Output Capabilities	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
Analog Input/Analog Output Resolution and Accuracy	Input: 15-bit resolution Output: 15-bit resolution, +/- 200 mV accuracy 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
Housing	Enclosure material: ABS and polycarbonate UL94 5VB; Self-extinguishing Protection Class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	150 mm x 220 mm x 57.5 mm (5-7/8 in. x 8-3/4 in. x 2-3/8 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)

Table 9: FAC3613 Advanced Application Field Equipment Controller

	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 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) Protocol Revision 18 Listed and Certified BACnet Advanced Application Controller (B-AAC), based on the ANSI/ASHRAE 135-2016

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 CHANGJIANG 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