# IOM3731 Input/Output Module Installation Guide

Part No. 24-10143-322 Rev. J

2019-10-18

## Application

The IOM3731 Input/Output Expansion Module (IOM) is part of the *Metasys*® system Field Equipment Controller family. IOM field controllers expand the number of I/O points connected to a Network Automation Engine (NAE), Network Control Engine (NCE), Field Equipment Controller (FEC), or Advanced Application Field Equipment Controller (FAC) to monitor and control a wide variety of HVAC equipment.

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

**Note:** At CCT Release 10.1 and later, a new capability was introduced allowing VMAs, FECs, and FACs to communicate by using either the BACnet or the N2 field bus networking protocol. The operation of the IOM Input/Output Module is not affected by the selection of the BACnet or the N2 protocol in the host controller, when the IOM is connected to the host controller using the SA bus. Only the BACnet protocol is supported when the IOM is connected directly to the trunk using the FC bus.

## North American Emissions Compliance

### 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.

### 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.

## 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.

### Parts included

- One controller with removable terminal blocks (Power and SA/FC bus are removable)
- 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

## Physical features

(barcode for factory use only)

**Figure 1: IOM3731 physical features**

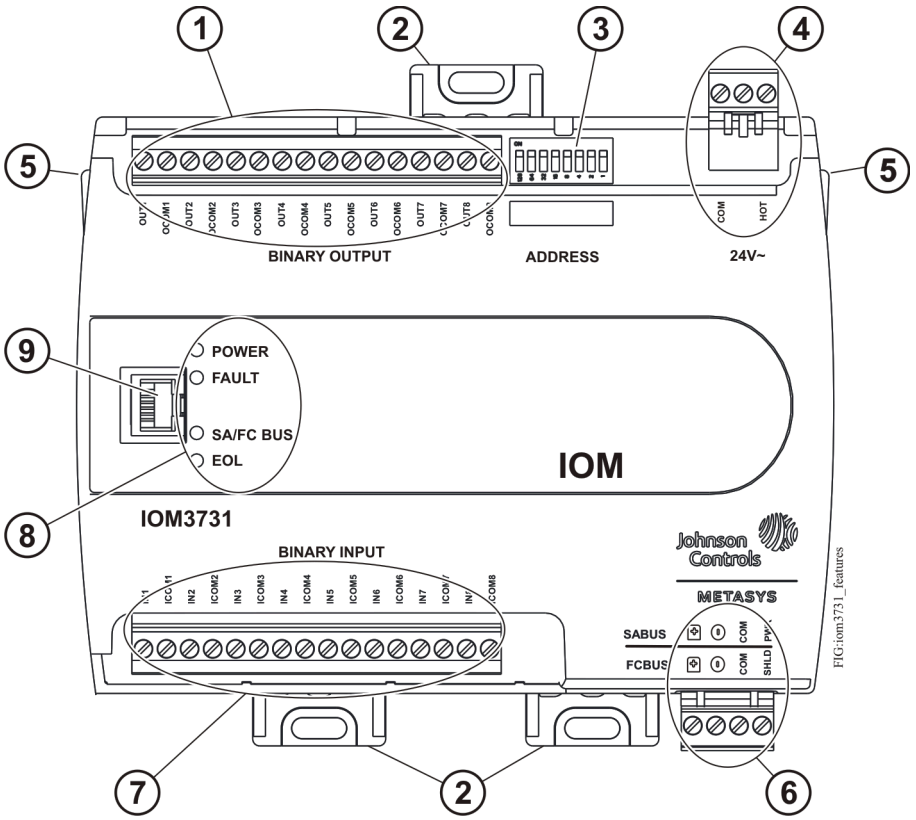



**Table 1: IOM3731 physical features callouts and descriptions**

| Callout | Physical feature: description and references |
|---|---|
| 1 | Binary Outputs (BOs) Terminal Block (see Table 2) |
| 2 | Mounting Clip |
| 3 | Device Address DIP Switch Block (see Setting the device addresses) |
| 4 | 24 VAC, Class 2 Supply Power Terminal Block (see Supply power terminal block) |
| 5 | Cover Lift Tab (see Removing the Controller cover) |
| 6 | Sensor Actuator (SA) Bus / Field Controller (FC) Bus Terminal Block (see SA/FC bus terminal block) |
| 7 | Binary Inputs (BIs) Terminal Block (see Table 2) |
| 8 | LED Status Indicators |
| 9 | Sensor Actuator (SA) Bus or Field Controller (FC) Bus Port (RJ-12 6-pin Modular Jack) (see SA/FC bus port) |

## Mounting

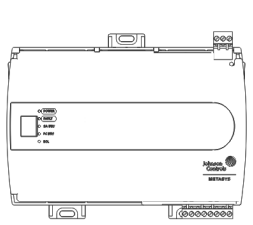
Observe these guidelines when mounting a field controller:

- 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 proper mounting position (Figure 2).
- 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 Table 9.
- 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.

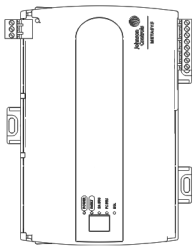
Observe these additional guidelines when mounting a controller in a panel or enclosure:

- 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 field controller on 35 mm DIN rail:

1. Securely mount a 20 cm (8 in.) or longer section of 35 mm DIN rail horizontal and centered in the desired space so that the controller mounts in the horizontal position shown in Figure 2.
2. Pull the bottom mounting clips outward from the controller to the extended position as shown in Figure 3.
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 3), and position the controller snugly against the DIN rail.
4. Push the bottom mounting clip inward (up) to secure the controller on the DIN rail.

To remove the controller from the DIN rail, pull the bottom mounting clip out to the extended position and carefully lift the controller off the DIN rail.

## Wall mount applications

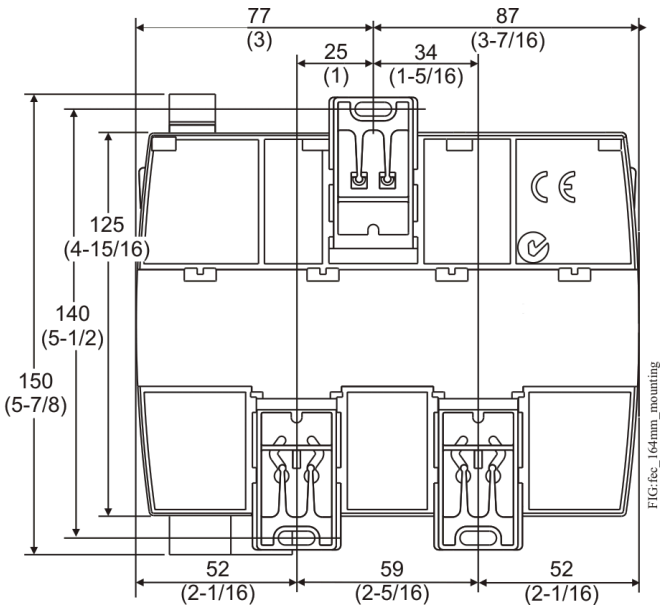
To mount a field controller directly on a wall or other flat vertical surface:

1. Pull the two bottom mounting clips outward and ensure they are locked in the extended position as shown in Figure 3.
2. Mark the three 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 and insert appropriate wall anchors in all of the mounting 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

**Warning**

**Risk of Electric Shock**

Disconnect or isolate all power supplies before making electrical connections. More than one disconnect or isolation may be required to completely de-energize equipment. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

**Avertissement**

**Risque de décharge électrique**

Débrancher ou isoler toute alimentation avant de réaliser un branchement électrique. Plusieurs isolations et débranchements sont peut-être nécessaires pour -couper entièrement l'alimentation de l'équipement. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

**CAUTION**

**Risk of Personal Injury and 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)*.

## Terminal blocks and bus ports

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

### Input and Output terminal blocks

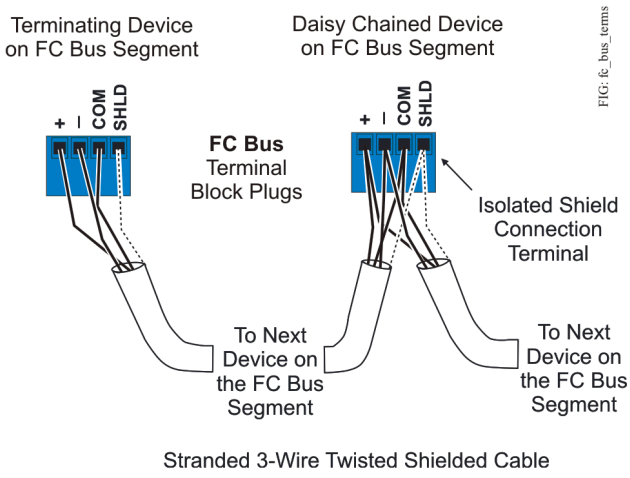
All of the input terminal blocks are mounted on the bottom of the controller and the output terminal blocks are mounted on the top of the controller. See Table 2 for more information about I/O terminal functions, requirements, and ratings.

### SA/FC bus terminal block

An IOM can be connected to a SA bus or a FC bus, but not to both buses simultaneously. The SA/FC bus terminal block is a removable, 4-terminal plug that fits into a board-mounted jack.

When connecting the IOM to an FC bus, wire the bus terminal block plugs on the controller, and the other controllers in a daisy-chain configuration using 3-wire twisted, shielded cable as shown in Figure 4. See Table 4 for more information.

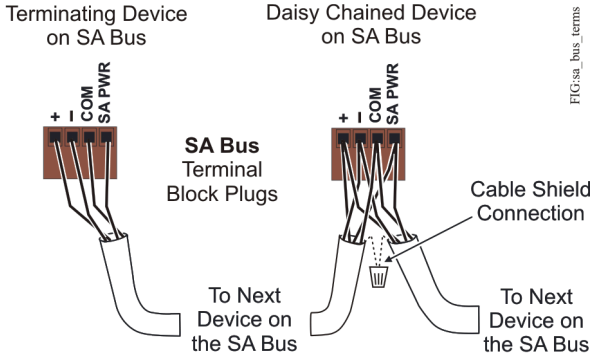
**Figure 4: FC bus terminal block wiring**




Stranded 3-Wire Twisted Shielded Cable

When connecting the IOM to an SA bus, wire the 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. See Table 3 for more information.

**Figure 5: SA bus terminal block wiring**




Stranded, 4-Wire (2 Twisted Pair) Shielded Cable
(One twisted pair is the + and - leads.
The second pair is COM and SA PWR.)

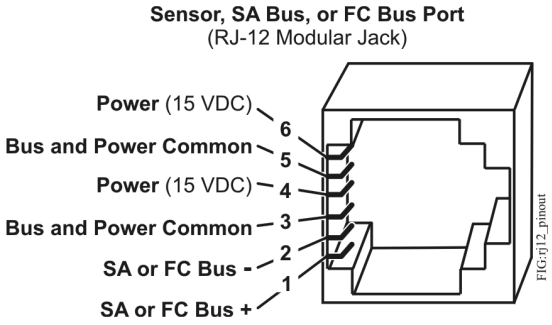
**Note:** The SA PWR/SHLD terminal does not supply 15 VDC. The SA PWR/SHLD terminal is isolated and can be used to connect (daisy chain) the 15 VDC power leads on the SA bus (Figure 5) or the cable shields on the FC bus (Figure 4). The SA bus supervisor (FAC, FEC, or VMA) supplies 15 VDC to devices on the SA bus requiring power.

## SA/FC bus port

The SA/FC bus port on the front of the controller is an RJ-12, 6-position modular jack that provides a connection for devices on the SA bus, a Bluetooth® Wireless Commissioning Converter, an ZFR/ZFR Pro Wireless Router (depending on which bus the controller is operating on).

The SA/FC bus port is connected internally to the SA/FC bus terminal block. See Table 4 for more information. The SA/FC bus port pin assignment is shown in Figure 6.

**Figure 6: Pin number assignments for sensor, SA bus and FC bus ports on controllers**

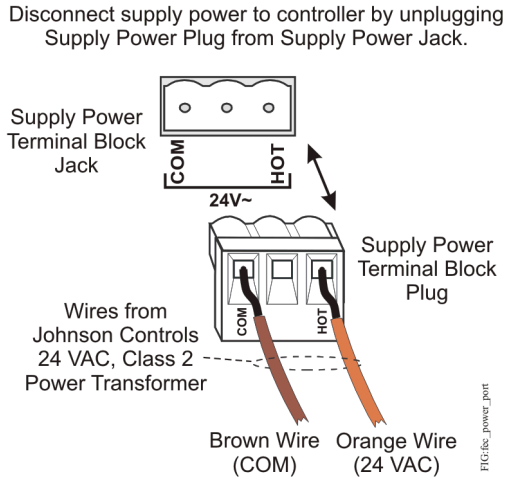



## Supply power terminal block

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. The middle terminal on the supply power terminal block is not used. See Table 4 for more information about the supply 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 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 controller does not require an earth ground connection.

## Wireless network applications

The controller can also be installed in a wireless application using a ZFR/ZFR Pro Wireless Field Bus Router. To configure a controller for use with the ZFR/ZFR Pro Series Wireless Field Bus system:

**Note:** IOMs can communicate wirelessly on the FC bus only.

1. Connect the ZFR/ZFR Pro Wireless Field Bus Router to the FC bus port (RJ-12 modular jack) on the front of the controller.
2. Ensure that the controller's device address DIP switches are set to the correct device address. See Setting the device addresses.
3. Set DIP switch 128 to ON, which enables wireless operation on the controller.

# 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; and references guidelines for determining proper wire sizes and cable lengths.

In addition to the wiring guidelines in Table 2, 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 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 wiring ratings and requirements

**Table 2: IOM3731 terminal blocks, functions, ratings, requirements, and cables**

| Terminal block label | Terminal label | Function, ratings, requirements | Determine wire size and maximum cable length |
|---|---|---|---|
| **BINARY INPUT** | **IN***n* | **Binary Input - Dry Contact Maintained Mode**<br>0.01 second minimum pulse width Internal 18 V, 3k ohm pull up | See Guideline A in Cable and wire length guidelines. |
| | | **Binary Input - Pulse Counter/Accumulator Mode**<br>0.01 second minimum pulse width<br>(50 Hz at 50% duty cycle)<br>Internal 18 V, 3k ohm pull up | |
| | **ICOM** *n* | **Binary Input Common** for all Binary Input (IN) terminals<br>ⓘ **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. | |
| **BINARY OUPUT**(External Power Source Only) | **OUT***n* | **Binary Output - 24 VAC Triac (External Power)**<br>Connects OUTn to OCOMn when activated.<br>External Power Source Requirements:<br>30 VAC maximum output voltage<br>0.5 A maximum output current<br>1.3 A at 25% duty cycle<br>40 mA minimum load current | See Guideline C in Cable and wire length guidelines. |
| | **OCOM***n* | **Binary Output Common** (for OUT*n* terminal)<br>ⓘ **Note:** Each Binary Output common terminal (OCOM*n*) is isolated from all other commons, including other Binary Output commons. | |
| **BINARY OUPUT**(Internal Power Source Only) | **OUT***n* | **Binary Output - 24 VAC Triac (Internal Power)**<br>Sources internal 24 VAC power (24~ HOT) | See Guideline C in Cable and wire length guidelines. |
| | **OCOM***n* | **Binary Output - 24 VAC Triac (Internal Power)**<br>Connects OCOM*n* to 24~ COM when activated.<br>Internal Power Source:<br>30 VAC maximum voltage to load<br>0.5 A maximum output current<br>1.3 A at 25% duty cycle<br>40 mA minimum load current | |

ⓘ **Note:** See Cable and wire length guidelines to determine wire size and cable lenghts for cables.

## 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.

**Table 3: Cable length guidelines for recommended 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<br>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**

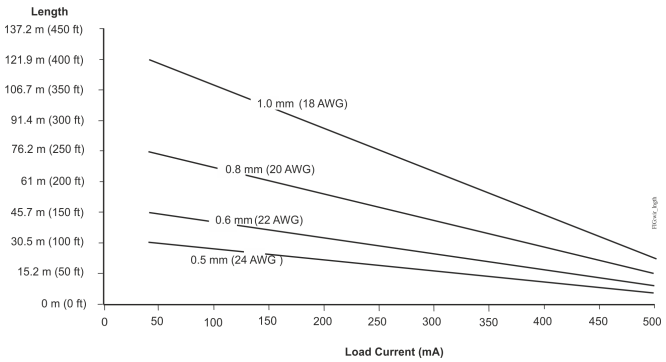
| Guideline | Wire size/Gauge and type | Maximum cable length and type | Assumptions |
|---|---|---|---|
| B | 1.0 mm (18 AWG) stranded copper | 229 m (750 ft) twisted wire | 100 mV maximum voltage drop<br>Depending on cable and the connected input or output device, you may have to define an offset in 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 | |
| | 0.5mm (24 AWG) stranded copper | 61 m (200 ft) twisted wire | |
| C | See Maximum cable length versus load current to select wire size/gauge. Use stranded copper wire | See Maximum cable length versus load current to determine cable length. Use twisted wire cable. | N/A |

## Maximum cable length versus load current

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

**Note:** The following 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**




## SA/FC bus and supply power wiring guidelines

Table 4 provides information about the functions, ratings, and requirements for the controller communication bus and supply power terminals; and guidelines for wire sizes, cable types, and cable lengths when wiring the controller communication buses and supply power.

In addition to the guidelines in Table 4, observe these guidelines when wiring an SA or FC bus and the 24 VAC 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 recommended 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 power supply terminal block rating and requirements

**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 |
|---|---|---|---|
| **FCBUS or SABUS** | **+**<br>**-** | FC or SA Bus Communications | FC Bus: 0.6 mm (22 AWG) stranded, 3-wire twisted, shielded cable recommended.<br>SA Bus: 0.6 mm (22 AWG) stranded, 4-wire (2 twisted-pairs), shielded cable recommended.<br>ⓘ **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** | Signal Reference (Common) for FC or SA Bus communications | |
| | **SHLD**<br>or<br>**SAPWR** | **SHLD on FC Bus:** Isolated terminal (optional shield drain connection<br>**SAP WR on SA Bus:** 15 VDC power lead connection<br>ⓘ **Note:** The SA PWR terminal on an IOM controller does not supply 15 VDC. The SA Bus supervisor (FAC, FEC, or VMA) supplies 15 VDC to devices on the SA Bus requiring power. | |
| **SA/FC BUS**<br>(Port) | | RJ-12 6-Position Modular Connector provides:<br>FC or SA Bus Communications<br>FC or SA Bus Signal Reference and 15 VDC Common<br>Commissioning Converter or ZFR /ZFR Pro Wireless Router<br>(Maximum total current draw for SA Bus is 100 mA.) | Wireless Commissioning Converter retractable cable or 24 AWG 3-pair CAT 3 Cable <30.5 m (100 ft) |
| **24~** | **HOT** | **24 VAC Power Supply - Hot**<br>Supplies 20-30 VAC (Nominal 24 VAC) | 0.8 mm to 1.0 mm (18 AWG) 2-wire |
| | **COM** | **24 VAC Power Supply - Common**<br>(Isolated from all other Common terminals on controller.) | |

ⓘ **Note:** The SA Bus and FC Bus wiring recommendations in this table are for MS/TP bus communications at 38,400 baud. For more information, refer to the MS/TP Communications Bus Technical Bulletin (LIT-12011034)

### Commissioning the Controllers

You commission controllers with the CCT software, either via a Bluetooth Wireless Commissioning Converter, a ZigBee wireless dongle, or through MAP 4.2+/BACnet Router (Mobile Access Portal (MAP) Gateway at version 4.2 or above), or in BACnet router mode when connected to an NAE or NCE. Refer to the Controller Tool *Help (LIT-12011147)* for detailed information on commissioning controllers.

## Troubleshooting the Controllers

Observe the Status LEDs on the front of the controller and use the following table to troubleshoot the controller.

**Table 5: Status LEDs and descriptions 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.<br>On Steady = Power Connected |
| **FAULT** | Red | Off Steady | Off Steady = No Faults<br>On Steady = Device Fault; no application loaded; Main Code download required, if controller is in Boot mode, or a firmware mismatch exists between the controller and the ZFR1811 Wireless Field Bus Router.<br>Blink - 2 Hz = Download or Startup in progress, not ready for normal operation |

**Table 5: Status LEDs and descriptions of LED states**

| LED label | LED color | Normal LED state | Description of LED states |
|---|---|---|---|
| **SA/FC BUS** | Green | Blink - 2 Hz | Blink - 2 Hz = Data Transmission (normal communication)<br>Off Steady = No Data Transmission (N/A - auto baud not supported)<br>On Steady = Communication lost, waiting to join communication ring |
| **EOL** | Amber | Off (Except on terminating devices) | On Steady = EOL switch in ON position<br>Off Steady = EOL switch in Off position |

## Termination details

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

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

**Table 6: Termination details**

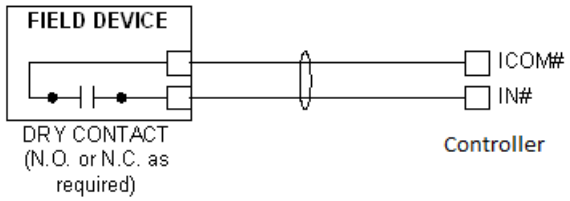
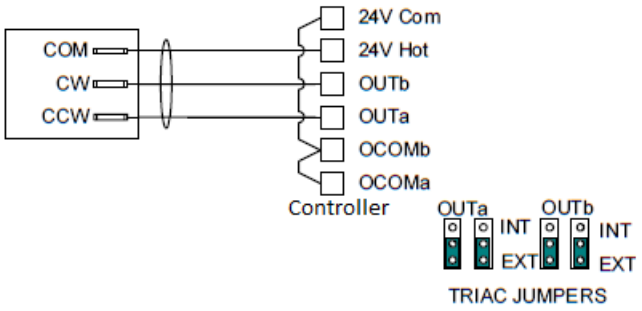
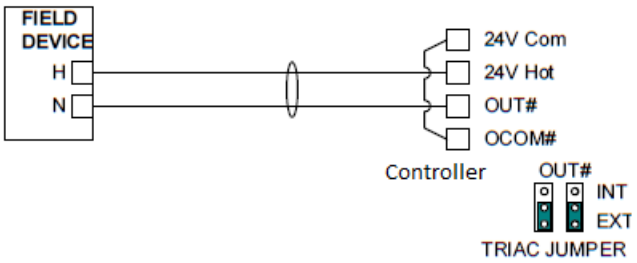
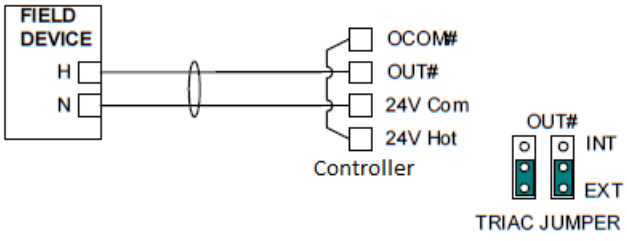
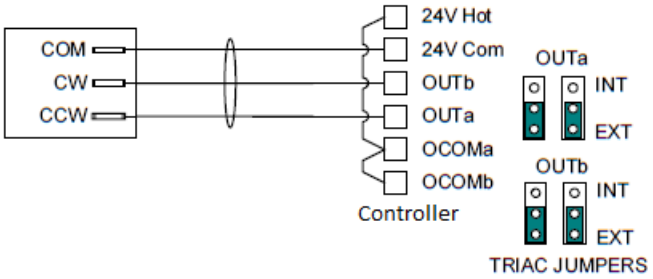
| Type of field device | Type of Input/Output | Termination diagrams |
|---|---|---|
| **Dry Contact (Binary Input)** | BI |  |
| **Incremental Control to Actuator (Switch Low, Externally Sourced)** | BO |  |
| **24 VAC Binary Output (Switch Low, Externally Sourced)** | BO |  |
| **24 VAC Binary Output (Switch High, Externally Sourced)** | BO |  |

**Table 6: Termination details**

| Type of field device | Type of Input/Output | Termination diagrams |
|---|---|---|
| **Incremental Control to Actuator (Switch High, Externally Sourced)** | BO |  |



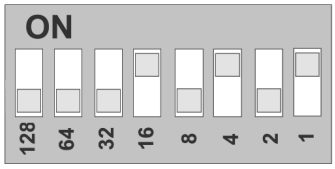
# Setup and Adjustments

## Setting the device addresses

*Metasys* field controllers are master devices on MS/TP (SA or FC) buses. Before operating controllers on a bus, you **must** set a valid and unique device address for each controller on the bus. You set a controller's device address by setting the positions of the switches on the DIP switch block at the top of the controller (Figure 1). Device addresses 4 through 127 are the valid addresses for these controllers.

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 is a mode switch that enables a controller to operate on a ZFR/ZFR Pro Series Wireless Field Bus. Switch 128 must be set to off for all hard-wired SA and FC bus applications. Set switch 128 to ON for wireless FC bus applications **only**.

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




**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 will 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 *Metasys* field controllers:

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. See Table 7 for valid device addresses.

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).

3. Set switch 128 to ON **only** for controllers on a ZFR/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 a controller with switch 128 set to ON to an active (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)* or the *ZFR1800 Series Wireless Field Bus System Technical Bulletin (LIT-12011295)* 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.

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 7: 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).<br>**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**.<br>**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. |

## Removing the Controller cover

- **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 the power sources to the controller before removing cover and changing the position of any jumper or the EOL switch on the controller. Failure to disconnect power before changing a jumper or EOL switch position can result in damage to the controller and void any warranties.

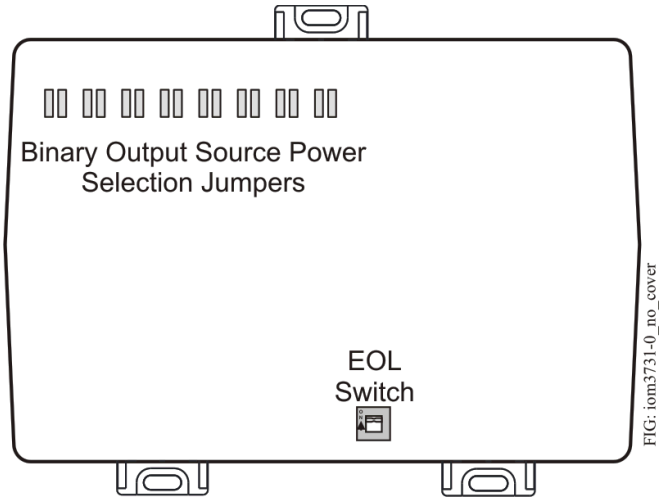
  The controller cover is held in place by four plastic latches that extend from the base and snap into slots on the inside of the housing cover.

  To remove the controller cover:

1. Place your fingernails under the two cover lift tabs (Figure 1) 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.
2. Pivot the top of the cover further to release it from the lower two latches.
3. 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.

## EOL switch location

**Figure 10: IOM3731 with cover removed showing EOL switch location**




## Binary Output (BO) source power selection jumpers

**Warning**

**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.

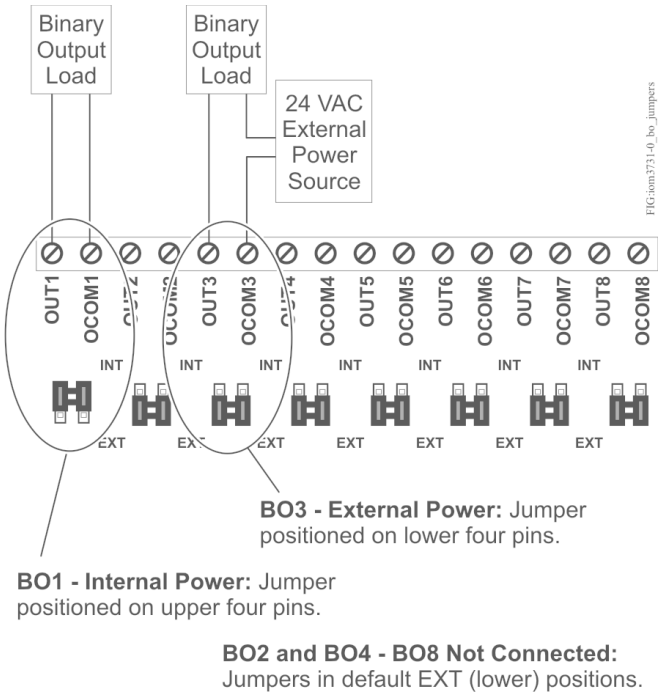
**Avertissement**

**Mise En Garde: 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.

The BO source power selection jumpers determine whether a BO provides internal power (sourced from the controller) to the output load (INT position) or requires an external power source (EXT position) for the output load. Figure 11 shows an example of a controller BOs and the associated power selection jumpers to the right of the BOs terminal block.

**Figure 11: Example binary Outputs and the associated source power jumper positions**




## Setting the End-of-Line (EOL) switch

Each controller has an EOL switch, which, when set to ON, sets the controller as a terminating device on the bus. See Figure 10 for the EOL switch location. The default EOL switch position is Off.

**Figure 12: End-of-Line switch positions**


To set the EOL switch on a controller:

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

**Note:** The EOL termination rules for SA buses and FC buses are different. Refer to the *MS/TP Communications Bus Technical Bulletin, (LIT-12011034)* for detailed information regarding EOL termination rules and EOL switch settings on SA and FC buses.

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.

## 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 8: Accessories ordering information**

| Product code number | Description |
|---|---|
| **MS-DIS1710-0** | Local Controller Display |
| **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<br>ⓘ **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 |
| **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 |
| **WNC1800/ZFR182x 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 (i.e., 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. |
| **Mobile Access Portal (MAP)Gateway** | Refer to the *Mobile Access Portal Gateway Catalog Page (LIT-1900869)* to identify the appropriate product for your region. |

# Technical specifications

**Table 9: IOM3731 technical specifications**

| | |
|---|---|
| **Product Code Number** | MS-IOM3731-x Input/Output Module |
| **Supply Voltage** | 24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, power supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe) |
| **Power Consumption** | 14 VA maximum for IOM3731-0A only |
| **Ambient Conditions** | **Operating:** 0°C to 50°C (32°F to 122°F); 10% to 90% RH noncondensing<br>**Storage:** -40°C to 80°C (-40°F to 176°F); 5% to 95% RH noncondensing |
| **Addressing** | DIP switch set; valid controller device addresses 4–127 (Device addresses 0–3 and 128–255 are reserved and not valid addresses.) |
| **Communications Bus** | **BACnet MS/TP, RS-485:**<br>3-wire FC bus between the supervisory controller and other controllers<br>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** | 640 KB Flash Memory and 128 KB Random Access Memory (RAM) |
| **Input and Output Capabilities** | **8 - Binary Inputs:** Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode<br>**8 - Binary Outputs:** Defined as 24 VAC Triac (external source power only) |
| **Terminations** | **Input/Output:** Fixed Screw Terminal Blocks<br>**SA/FC Bus and Supply Power:** 4-Wire and 3-Wire Pluggable Screw Terminal Blocks<br>**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, Plenum Rated<br>Protection Class: IP20 (IEC529) |

**Table 9: IOM3731 technical specifications**

| | |
|---|---|
| **Dimensions(Height x Width x Depth)** | 150 mm x 164 mm x 53 mm (5-7/8 in. x 6-1/2 in. x 2-1/8 in.) including terminals and mounting clips<br>**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**<br>CE | **United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment<br>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<br>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 4 Listed BACnet Application Specific Controller (B-ASC) |

*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<br>C/O CONTROLS PRODUCT MANAGEMENT<br>NO. 32 CHANGJIJANG RD NEW DISTRICT<br>WUXI JIANGSU PROVINCE 214028<br>CHINA | JOHNSON CONTROLS<br>WESTENDHOF 3<br>45143 ESSEN<br>GERMANY | JOHNSON CONTROLS<br>507 E MICHIGAN ST<br>MILWAUKEE WI 53202<br>USA |

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