## Overview of FX CGM and CVM Equipment Controllers

The FX General Purpose Application Controller (CGM) and VAV Box Controllers (CVMs) are the first models of a new, modernized family of equipment controllers which integrate in the web-based FX system. The CGM and CVM controllers are versatile equipment controllers designed to monitor, control, and integrate a wide variety of HVAC and other building equipment. These controllers support BACnet® MS/TP and N2 communication protocols, and auto-detect which protocol is connected to it. In MS/TP mode, these equipment controllers are BACnet network-compliant devices. Controllers running in N2 mode can be used to maintain or modernize sites with installed legacy Johnson Controls® controllers.

The CGM and CVM equipment controllers feature an advanced design that provides optimum performance. CGM and CVM controllers run pre-engineered and user-programmed applications and provide the I/O required to monitor and control a wide variety of HVAC equipment. These controllers are designed to install easily and communicate through standard RS485 BACnet MS/TP protocol, which enables you to build a variety of equipment controller network applications, ranging from simple fan coil, heat pump, or VAV control applications to advanced central plant management and stand-alone applications. The CGM and CVM also provide easy access to power, network, and field terminations.

Figure 1: FX CGM and CVM Equipment Controllers
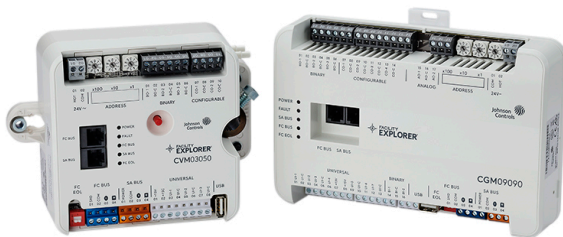
Features and benefits

Sleek and modern packaging and styling

Provides a modern, aesthetically pleasing industrial design.

Standard hardware and software platform

Uses a common hardware design throughout the family line to support standardized wiring practices and installation workflows. Also uses a common software design to support use of a single tool for control applications, commissioning, and troubleshooting to minimize technical training.

High memory capacity and fast processing power

Provides application engineers with the horsepower to meet sophisticated control requirements.

Auto-Tuned Control Loops

Reduce commissioning time, eliminate change-of-season re-commissioning, and reduce wear and tear on mechanical devices.

Patented Proportional Adaptive Control (P-Adaptive) and PRAC

Provides continuous loop tuning.

Standard BACnet protocol

Provides interoperability with other Building Automation System (BAS) products that use the widely accepted BACnet standard.

Models to support both BACnet MS/TP and N2, with auto-detection of the communications protocols

Controller auto-detects the BACnet MS/TP or N2 protocol that is connected to it, which enables the same controller to support multiple communication protocols without the need to purchase a special model per protocol, and without extra manual setup.

BACnet Testing Laboratories (BTL) listed and certified as BACnet Advanced Application Controllers (B-AAC)

Ensures openness and interoperability with other BTL-listed devices. BTL is a third-party agency, which validates that BAS vendor products meet the BACnet industry-standard protocol.

BACnet automatic discovery

Supports easy controller integration into a FX BAS.

Wireless ZFR and ZFR Pro support

Provides a wireless alternative to hard-wired MS/TP networking, offering application flexibility and mobility with minimal disruption to building occupants, and also simplifies and speeds up replacements.

Integral real-time clock

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 FX system network.

Pluggable screw terminal blocks

Pluggable input/output wiring terminal blocks that can be removed from the controller provide electrical installers and field technicians the ability to quickly and easily install and service a controller without the need to disconnect and reconnect the input/output wiring.

Decimal MS/TP address set with three rotary switches

Easy-to-use rotary switches set the MS/TP address in decimal format.

Universal Inputs and Configurable Outputs

Allows multiple signal options to provide input/output flexibility.

End-of-Line (EOL) switch in MS/TP equipment controllers

Enables equipment controllers to be terminating devices on the communications bus.

Default state for Input/Output wiring validation

Enables validation of the input and output terminals' wiring prior to download of an application file.

Background transfer coupled with enable/disable logic options in Controller Configuration Tool (CCT)

Saves field technicians' time, enables productivity and minimizes equipment disruption, since the controllers are operating while file updates take place in the background and the application can be left disabled until the system is ready to run.

SA Bus commissioning improvements

Saves field technicians time when commissioning SA Bus devices by enabling an equipment controller to transfer and apply firmware files to all the SA Bus IOM devices connected to it at the same time.

Network Diagram with Equipment Controllers

Figure 2: FX System with Equipment Controllers
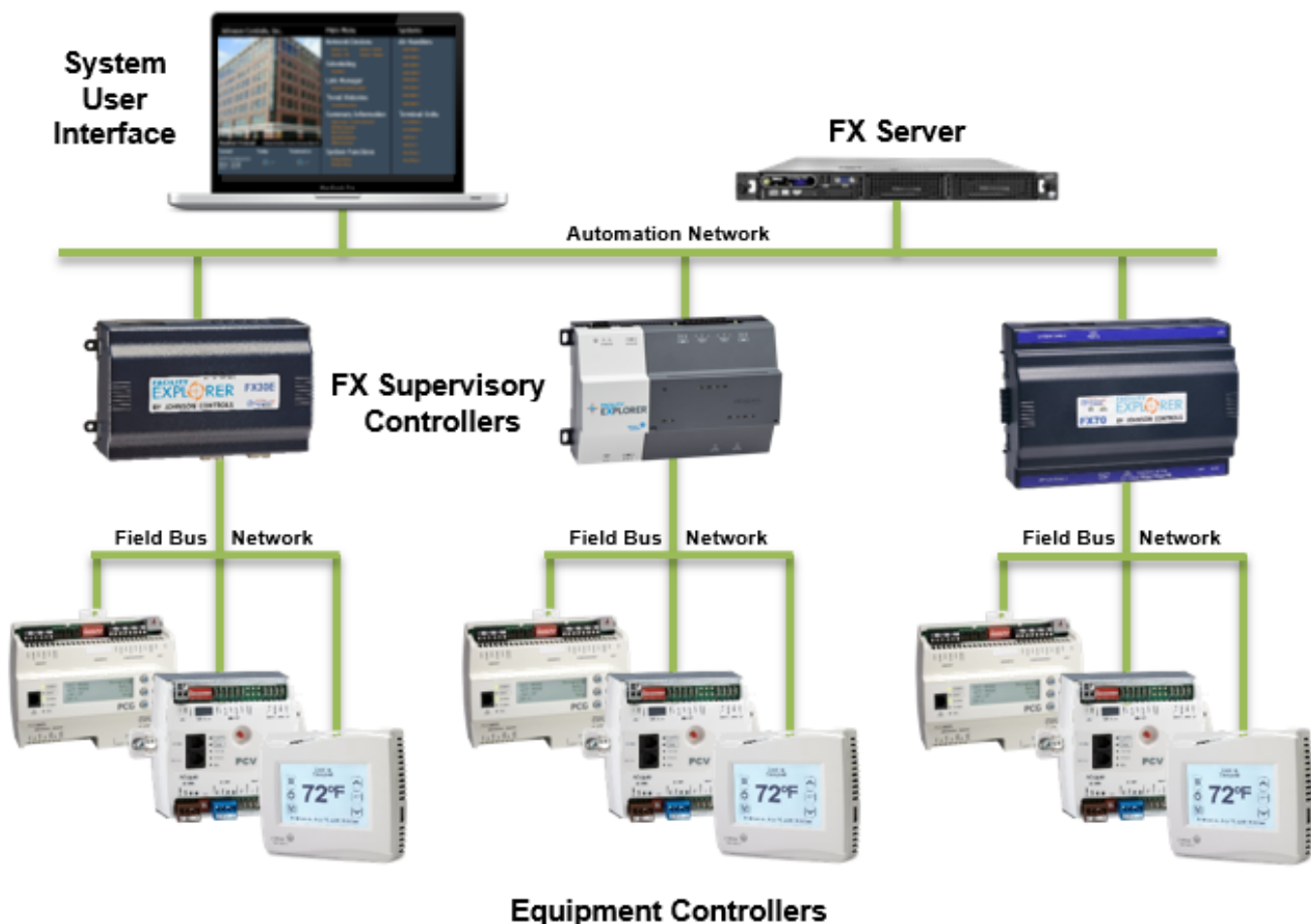
Integration to the FX system supervisory devices

The CGM and CVM equipment controllers are designed to integrate seamlessly into the FX system by connecting and communicating directly with a FX80. This seamless integration of equipment controllers with FX supervisory controllers enables building operators to monitor and adjust equipment controllers directly from the FX system UI.

In addition, service personnel can view equipment controller information locally through an optional local controller display (FX-DIS1710-0) available for equipment controllers, or through the optional Mobile Access Portal (MAP) Gateway.

Communications protocols

The CGM and CVM controllers can communicate using BACnet MS/TP, N2, or wireless Zigbee. The controllers auto-detect the protocol that is connected, which enables the same controller to support multiple communication protocols without the need to purchase a special model per protocol, and without extra manual setup.

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

The CGM and CVM controllers can be used as functional replacements for legacy N2 controllers. The N2-capable MS/TP equipment controller models provide a cost-effective upgrade and modernization path for customers with existing N2 controllers.

The CGM and CVM controllers can also be installed in a wireless application using a ZFR/ZFR ProWireless Field Bus Router, see Related products.

Hardware and installation

FX equipment controllers are encased in a durable plastic housing. The plastic housing may eliminate the need for a separate enclosure for plenum-rated construction. Check

specific controller documentation and regional, national, and local code requirements for appropriate applications.

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

The equipment 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.

The CGM and CVM controllers feature removable, color-coded, keyed, and labeled terminal block plugs for the input and output, supply power, and communications bus terminations.

The CGM and CVM controllers feature rotary switches that allow you to set a valid and unique device address for each equipment controller on the bus. A blank space is included on the controller cover for recording the device address.

Integral mounting clips and a DIN rail track on the CGM controllers' back-plate allow you to easily mount the equipment controller either on a horizontal section of 35 mm DIN rail, or screw mount on a flat surface with three integral mounting clips on controller.

An integral EOL switch on MS/TP equipment controllers allows you to enable the controller as a bus terminating device, which when properly configured, reduces reflected noise on the bus and improves bus communication.
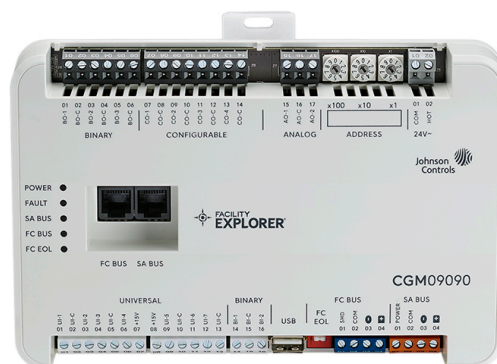
General Purpose Application Controllers (F4-CGM)

The CGM09090 General Purpose Application MS/TP Controller (CGM) is an equipment controller that runs 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.

CGM09090 equipment 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. CGM equipment 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 standalone controllers when offline from the Facility Explorer® system network.

For product application details, refer to the *Facility Explorer CGx, CVx Equipment Controllers Product Bulletin (LIT-12013225)*.

Figure 3: FX-CGM09090 General Purpose Application Controller

CGM model information

Table 1: CGM series information including point type counts

		CGM09090-0
Communication protocol	BACnet MS/TP, N2	
Network Engines	All network engine model types Refer to the *Network Engines Product Bulletin* (LIT-12012138) for details.	
Modular Jacks	FC and SA Bus Modular Ports: RJ-12 6-Pin Modular Jacks	
Point Types	Signals Accepted:	
Universal Input (UI)	15 VDC Power Source (Provide 100mA total current) Analog Input - Voltage Mode (0–10 VDC) Analog Input - Current Mode (4–20 mA) Analog Input - Resistive Mode (0–600k ohm), RTD (1k Nickel [Johnson Controls sensor], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode Universal Input Common (ICOMn)	7
Binary Input (BI)	Binary Input, Dry Contact Maintained Mode Binary Input - Pulse Counter/Accumulator Mode Binary Input Common for all Binary Input (IN) terminals	2
Binary Output (BO)	Binary Output - 24 VAC Triac (External Power Source) Binary Output Common (for OUTn terminal)	3
Configurable Output (CO)	Analog Output - Voltage Mode (0–10 VDC) Binary Output 24 VAC Triac Analog Output Signal Common Binary Output Signal Common	4
Analog Output (AO)	Analog Output - Voltage Mode (0–10 VDC) Analog Output - Current Mode (4–20 mA) Analog Output Signal Common for all Analog OUT terminals	2

Panel and sub-panel assembly options

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

F4-VAV Box Controller (CVM)

The CVM03050 equipment controllers are designed for variable air volume (VAV) box applications. CVM03050 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.

CVM03050 controllers feature an integral damper actuator, a digital Differential Pressure Transducer (DPT) sensor, and a 32-bit microprocessor. These 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 Facility Explorer® system network. These controllers also connect easily to the wired and wireless network sensors for zone and discharge air temperature sensing.

For product application details, refer to the *Facility Explorer CGx, CVx Equipment Controllers Product Bulletin (LIT-12013225)*.

Figure 4: F4-CVM03050 VAV Box Controller

CVM series features

In addition to the features listed in Features and benefits, CVM equipment controllers provide the following benefits:

An integrated damper actuator and digital Differential Pressure Transducer (DPT) sensor

Reduces installation time

Fast response actuator

Drives the damper from full open to full closed (90°) in 60 seconds to reduce commissioning time

Optional integrated feedback potentiometer

Reassures users and field technicians of the VAV box damper's actual position and enables them to easily confirm and troubleshoot VAV controller operations, confirm actuator is at the desired position and track damper position.

Small, convenient package size

Facilitates quick field installation and efficient use of space without compromising control performance

CVM installation

Field mounting the CVM controllers is straightforward. The CVM controllers require minimal wiring and are mounted to the VAV box using a single sheet metal screw and a single set screw to lock the actuator to the damper shaft. The set screw has a self-locking cup point end to resist loosening due to vibration.

The actuator coupling is serrated, providing additional damper shaft grip and minimizing shaft slippage during operation. The coupling accommodates shafts from 10 mm (3/8 in.) square and up to 13 mm (1/2 in.) diameter round. A gear release lever allows easy resetting of the damper to fully open or fully closed.

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

The controller device address can be unique for each CVM using the rotary switches that are accessible through the controller housing.

For more information about installing CVM controllers, refer to *F4-CVM VAV Terminal Equipment Controllers Installation Instructions (Part No. 24-10143-01817)*.

CVM model information

Table 2: CVM Series information including point type counts

		CVM03050-0	
Communication Protocols	BACnet MS/TP, N2		
Network Engines	All network engine model types Refer to the *Network Engines Product Bulletin (LIT-12012138)* for details.		
Modular Jacks	FC and SA Bus Modular Ports: RJ-12 6-Pin Modular Jacks		
Point Types	Signals Accepted:		
Universal Input (UI)	15 VDC Power Source (Provides 35mA total current source) Analog Input - Voltage Mode (0–10 VDC) Analog Input - Resistive Mode (0–600k ohm), RTD (1k Nickel [Johnson Controls sensor], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	3	
Configurable Output (CO)	Analog Output - Voltage Mode (0–10 VDC) Binary Output 24 VAC Triac Analog Output Signal Common Binary Output Signal Common	2	
Binary Output (BO)	Binary Output - 24 VAC Triac	3	
Integrated Actuator	Internal	1	
Differential Pressure Transducer	Internal	1	
Integrated Feedback Potentiometer	Internal	No	
Zone Sensor Input	On SA Bus ⓘ **Note:** A total of 10 MS/TP addresses, not including sensor addresses, can be used in a single CVM equipment controller.	Up to 4 NS Series Network Sensors Up to 9 WRZ sensors when using the ZFR or ZFR Pro Series wireless router configuration and up to 5 WRZ sensors when using the one-to-one WRZ-78xx wireless configuration	

Related products

For information about the FX system and related products, refer to *FX80 Supervisory Controller Product Bulletin (12012250)*.

Controller Configuration Tool (CCT)

The CCT is used in conjunction with the FX system to configure, simulate, and commission CGM and CVM controllers.

For information about using CCT for configuration, simulation, and commissioning of the CGM and CVM equipment controllers, refer to *Controller Configuration Tool (CCT) Catalog Page (LIT-1900386)*.

Mobile Access Protocol (MAP) Gateway

The MAP Gateway is a pocket-sized web server that provides a wireless mobile user interface to SMART Equipment and Johnson Controls branded equipment controllers and thermostats.

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

ⓘ **Note:** The MAP Gateway serves as a replacement for the BTCVT, which is no longer available for purchase, but continues to be supported.

Handheld VAV Balancing Tool

The Handheld VAV Balancing Tool lets you set the parameters for VAV applications that reside on CVM equipment controllers.

For more information on the Handheld VAV Balancing Tool, refer to the *Handheld VAV Balancing Tool Catalog Page (LIT-1090348)*.

Network Sensors

The NS Series Network Sensor offering includes NS Series Network Zone Sensors and NS Series Network Discharge Air Sensors. The NS Series Network Zone Sensors are designed to function directly with the FX equipment controllers.

For more product application information, ordering information, and technical specifications, refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)*.

WNC1800/ZFR182x Pro Series Wireless Field Bus System

The WNC1800/ZFR182x Pro (ZFR Pro) Series Wireless Field Bus System provides a wireless platform and for BACnet MS/TP FX controllers using BACnet protocol over 2.4 GHz wireless ISM band.

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

ZFR1800 Series Wireless Field Bus System

The ZFR1800 Series System provides wireless monitoring and control of HVAC equipment within multiple levels of a FX system. Most BACnet MS/TP FX equipment controllers can be wirelessly enabled using a ZFR1811 Wireless Field Bus Router or the ZFR1812 Wall Mount Wireless Field Bus Router.

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

CGM and CVM ordering information

Information about the CGM09090 and CVM03050 models and accessories are provided in Table 3 and Table 4.

Table 3: CGM and CVM ordering information

Product code number	Description
F4-CGM09090-0	General Purpose Application Controller Includes: MS/TP (and N2) communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); real-time clock; 32-bit microprocessor; 24 VAC input
F4-CVM03050-0	VAV Box Controller with Integrated Actuator and Digital Differential Pressure Transducer (DPT) Sensor. Includes MS/TP (and N2) communication; 8 points (3 UI, 2 CO, and 3 BO); real-time clock; 32-bit microprocessor; 24 VAC input.

Table 4: CGM and CVM accessories (order separately)

Product code number	Description
PCX Series Controllers	Refer to the *FX-PC Series Programmable Controllers and Related Products Product Bulletin (LIT-12011657)* for a complete list of available Controllers.
TL-CCT-0	License enabling Controller Configuration Tool (CCT) software for one user
Mobile Access Portal (MAP) Gateway	Refer to the *Mobile Access Portal Gateway Catalog Page (LIT-1900869)* to identify the appropriate product for your region. ⓘ **Note:** The MAP Gateway serves as a replacement for the BTCVT, which is no longer available for purchase, but continues to be supported.
FX-DIS1710-0	Local Controller Display
NS Series Network Sensors	Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for specific sensor model descriptions.
AS-CBLTSTAT-0	Cable adapter for connection to 8-pin TE-6700 Series sensors
NS-WALLPLATE-0	Network Sensor Wall Plate
WRZ Series Wireless Room Sensors	Refer to the *WRZ Series Wireless Room Sensors Product Bulletin (LIT-12000653)* for specific sensor model descriptions.
WRZ-7860-0	Refer to the *WRZ-7860 Receiver for One-to-One Wireless Room Sensing Product Bulletin (LIT-12011640)* for a list of available products.
WRZ-SST-120	Refer to the *WRZ-SST-120 Wireless Sensing System Tool Installation Instructions (LIT-24-10563-55)* for usage instructions.
WNC1800/ZFR182x Pro Wireless Field Bus System	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	Refer to the *ZFR1800 Series Wireless Field Bus System Product Bulletin (LIT-12011336)* for a list of available products.

Product code number	Description
ZFR-USBHA-0	ZFR USB Dongle provides a wireless connection through CCT to allow wireless commissioning of the wirelessly enabled CGM and CVM controllers. It also allows use of the ZFR Checkout Tool (ZCT) in CCT. ⓘ **Note:** The ZFR-USBHA-0 replaces the IA OEM DAUBI_2400 ZFR USB dongle. For additional information about the ZFR-USBHA-0 ZFR dongle, refer to the *ZCT Checkout Tool Help LIT-12012292* or the *WNC1800_ZFR182x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12012356)*.
Y64T15-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 92 VA, Foot Mount, 72.2 cm (30 in.), Primary Leads and 76.2 cm (30 in.) Secondary Leads, Class 2
Y65A13-0	Transformer, 120 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AS), 20.32 cm (8 in.), Primary Leads and 76.2 cm (30 in.) Secondary Leads, Class 2
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AR+), 20.32 cm (8 in.), Primary Leads and Secondary Screw Terminals, Class 2
Y65T42-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Hub Mount (Y65SP+), 20.32 cm (8 in.), Primary Leads and Secondary Screw Terminals, Class 2

Table 4: CGM and CVM accessories (order separately)

Product code number	Description
MS-FIT100-0	The Field Inspection Tool or (FIT) is a portable handheld device with a user interface that is used to test and troubleshoot the BACnet protocol MS/TP RS-485 communications bus that connects supervisory controllers and equipment controllers to field point interfaces. The FIT can be used to check out the wiring of the MS/TP RS-485 bus as well as verify proper communications of supervisory controllers and equipment controllers connected to the bus. The FIT can be used on both the FC Bus and SA Bus.
TL-BRTRP-0	Portable BACnet/IP to MS/TP Router

Repair Information

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

CGM series technical specifications

Table 5: Technical specifications for CGM09090

Product code numbers	**F4-CGM09090-0** General Purpose Application Controller Includes: MS/TP (and N2) communication; 18 points (7 UI, 2 BI, 4 CO, 2 AO, 3 BO); real-time clock; 32-bit microprocessor; 24VAC input
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[1] ⓘ **Note:** The USB feature is not currently supported.
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
Communications protocol	BACnet MS/TP; N2. Wireless also supported (at FC Bus and for Sensors) with additional hardware.
Device addressing for BACnet MS/TP	Decimal address set via three rotary switches; valid controller device addresses 4-127
Device addressing for N2	Decimal address set via three rotary switches: valid controller device addresses 1-254
Communications Bus	BACnet MS/TP (default); N2 3-wire FC Bus between the supervisory controller and equipment controllers 4-wire SA Bus between equipment controller, network sensors and other sensor/actuator devices, includes a lead to source 15 VDC supply power (fromequipment controller) to bus devices.
Processor	RX64M Renesas® 32-Bit microcontroller
Memory	16 MB flash memory and 8 MB SDRAM
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.

Table 5: Technical specifications for CGM09090

Input and Output Capabilities	**7 - Universal Inputs:** Defined as 0–10 VDC, 4–20 mA, 0–600k ohms, or Binary Dry Contact **2 - Binary Inputs:** Defined as Dry Contact Maintained or Pulse Counter/Accumulator Mode **4 - Configurable Outputs** Defined as 0-10 VDC or 24 VAC Triac BO **2 - Analog Outputs:** Defined as 0–10 VDC or 4–20 mA **3 - Binary Outputs:** Defined as 24 VAC Triac (external power source only)
Universal Input (UI) Resolution/ Analog Output (AO) Accuracy	**Input:** 24-bit Analog to Digital converter **Output:** +/- 200 mV accuracy in 0–10 VDC applications
Terminations	**Input/Output:** Pluggable Screw Terminal Blocks **SA/FC Bus and Supply Power:** 4-Wire and 2-Wire Pluggable Screw Terminal Blocks **SA/FC Bus Port:** RJ-12 6-Pin Modular Jacks
Mounting	Horizontal on single 35 mm DIN rail mount (recommended), 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 190 mm x 44.5 mm (5-7/8 in. x 7-1/2 in. x 2-1/8 in.) including terminals and mounting clips ⓘ **Note:** Mounting space requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	0.5 kg (1.1 lb)

Table 5: Technical specifications for CGM09090

Compliance ⊂€	**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 nd RoHS Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) Protocol Revision 15 Listed and Certified BACnet Advanced Application Controller (B-AAC), based on ANSI/ASHRAE 135-2016

1   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 84 VA (maximum).

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.

CVM Series technical specifications

Table 6: Technical specification for CVM03050 Controllers

Product code numbers	**F4-CVM03050-0** VAV Box Controller with Integrated Actuator and Digital Differential Pressure Transducer (DPT) Sensor. Includes MS/TP (and N2) communication; 8 points (3 UI, 2 CO, and 3 BO); real-time clock; 32-bit microprocessor; 24 VAC input.
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	10 VA typical, 14 VA maximum[1] ⓘ **Note:** The USB feature is not currently supported.
Power source	+15 VDC power source terminals provide 35 mA total current. Quantity 1 located in Universal IN terminals - for active (3-wire) input devices

Table 6: Technical specification for CVM03050 Controllers

Ambient conditions	**Operating:** 0°C to 50°C (32°F to 122°F) **Storage:** -40°C to 70°C (-40°F to 158°F)
Network engines	All network engine model types
Communications protocol	BACnet MS/TP; N2. Wireless also supported (at FC Bus and for Sensors) with additional hardware.
Device addressing for BACnet MS/TP	Decimal address set via three rotary switches: valid controller device addresses 4-127
Device addressing for N2	Decimal address set via three rotary switches: valid controller device addresses 1-254
Communications bus[2] ⓘ **Note:** For more information refer to *FX-PC Series Controllers MS/TP Communications Bus Technical Bulletin (LIT-12011670)*, or *N2 Communication Bus Technical Bulletin (LIT-636018)*	BACnet MS/TP (default), N2 3-wire FC Bus between the supervisory controller and equipment controllers 4-wire SA Bus between equipment controller, network sensors and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from equipment controller) to bus devices
Processor	RX64M 32-bit Renesas microcontroller
Memory	16MB Flash Memory and 8MB SDRAM
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	**3 - Universal Inputs**: Defined as 0–10 VDC, 0–600k ohms, or Binary Dry Contact **2 - Configurable Outputs:** Defined as 0-10 VDC or 24 VAC Triac BO **3 - Binary Outputs**: Defined as 24 VAC Triac (external power source only)
Universal Input (UI) Resolution/ Configurable Output (CO) accuracy	**UI Analog Input Mode:** 15-bit resolution on UIs **CO Analog Output Mode:** 0–10 VDC ± 200 mV
Air pressure differential sensor	Range: -1.5 in. to 1.5 in. W.C. **Performance Characteristics:** Typical Accuracy at ambient operating conditions: +/- 1% in W.C. Typical accuracy at zero (null) pressure is +/- 0.0006 in W.C.
Actuator rating	4 N·m (35 lb·in) minimum shaft length = 44 mm (1-3/4 in.) (if provided)

Table 6: Technical specification for CVM03050 Controllers

Terminations	**Inputs/Outputs**: Pluggable Screw Terminal
	FC Bus, SA Bus, and Supply Power: 4-Wire and 2-Wire Pluggable Screw Terminal Blocks
	FC and SA Bus Modular Ports: RJ-12 6-Pin Modular Jacks
Mounting	Mounts to damper shaft using single set screw and to duct with single mounting screw
Housing	**Enclosure material:** ABS and polycarbonate UL94 5VB; Self-extinguishing
	Protection Class: IP20 (IEC529)
Dimensions (height x width x depth)	165 mm x 125 mm x 73 mm (6.5 in. x 4.92 in. x 2.9 in.)
	Center of Output Hub to Center of Captive Spacer: 135 mm (5-5/16 in.)
Weight	0.69 kg (1.52 lb)
Compliance	**United States:**
	UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment.
	FCC Compliant to CFR47, Part 15, Subpart B, Class A.
	Suitable for Use in Other Environmental Air Space (Plenums) in Accordance with Section 300.22(C) of the National Electrical Code.
	Canada:
	UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment.
	Industry Canada Compliant, ICES-003
	Europe:
	CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and RoHS Directive.
	Australia and New Zealand:
	RCM Mark, Australia/NZ Emissions Compliant.
	BACnet International: BACnet Testing Laboratories™ (BTL) Protocol Revision 15 Listed and Certified BACnet Advanced Application Controller (B-AAC), based on ANSI/ASHRAE 135-2016

1   The VA rating does not include any power supplied to the peripheral devices connected to Configurable Outputs (COs) or Binary Outputs (BOs), which can consume up to 12 VA for each CO or BO, for a possible total consumption of an additional 60 VA (maximum).

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

The performance specifications are nominal and conform to acceptable industry 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.

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.

Product warranty

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

Single point of contact

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

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

Facility Explorer CGx, CVx Equipment Controllers Product Bulletin