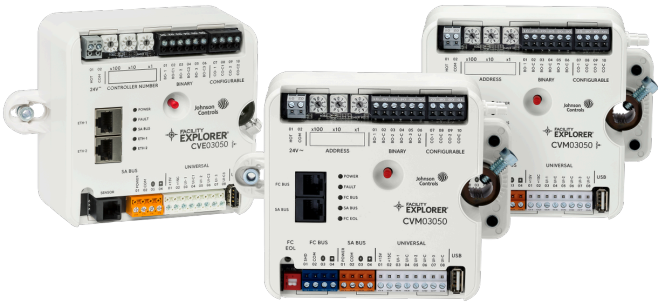
F4-CV Series VAV Box Controllers Catalog Page

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LIT-1901107

VAV Box Controllers (CV Series)

Figure 1: F4 Series VAV Box Controllers



The CV series equipment controllers, which include the CVM and CVE models, are designed for variable air volume (VAV) box applications. These controllers are fully programmable, but also feature a set of preloaded applications allowing these controllers to be made fully operational by selecting the appropriate VAV box application using the Mobile Access Portal (MAP) Gateway.

CV series controllers feature an integral damper actuator, and a digital Differential Pressure Transducer (DPT) sensor. Certain models also feature an integral potentiometer to sense actual VAV box damper position. CV series 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.

CVE controllers communicate using the BACnet® Secure Connect (BACnet/SC) or BACnet/IP communication protocols. CVM controllers are switchable to use either the BACnet MS/TP or N2 communications protocol. Equipment controllers in BACnet/SC, BACnet/IP, or BACnet MS/TP communication mode are BACnet network-compliant devices. You can use controllers running in N2 mode to maintain or modernize sites with installed legacy Johnson Controls® 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

Proportional Adaptive Control (P-Adaptive) and Pattern Recognition Adaptive Control (PRAC) deliver continuous control loop tuning, that reduces commissioning time, eliminates change-of season re-commissioning, and reduces wear and tear on actuators.

Standard BACnet protocol

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

Model to support BACnet/SC and BACnet/IP communications

CVE controllers provide higher speed communication with the Controller Configuration Tool (CCT) and improved bandwidth. BACnet/SC is a new protocol that provides a secure method of communication on IP networks. It uses standards widely accepted by the IT community, eliminating many of the IT concerns.

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Models to support wired BACnet MS/TP, ZFR wireless, and N2 with streamlined workflow

CVM controllers can support multiple communication protocols without the need to purchase a special model per protocol and without extra manual setup. If an application configured for N2 communication is loaded on the controller, it automatically communicates through N2. Controllers otherwise default to MS/TP communication. If a ZFR Pro Wireless Field Bus Router is connected to the controller when the controller is initially powered on, it automatically enters wireless mode.

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 Facility Explorer (FX) BAS.

Device Security

Ensures device integrity while the system is restarting and during normal operation. Embedded software in the CVE controller provides secure boot operation, firmware protection, secure communications, and secure firmware updates to comply with cyber security best practices.

FIPS 140-2 Level 1 compliance using FIPS validated components

CVE controllers are FIPS 140-2 Level 1 compliant using FIPS validated components. FIPS 140-2 is a U.S. government cyber security standard used to approve cryptographic modules and algorithms used for encryption. Assures operators that Facility Explorer uses leading cyber security techniques to help prevent unauthorized access to systems and data.

Wireless ZFR Pro support

Wireless 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, that 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.

Rotary switches for controller address or controller number

Easy-to-use rotary switches set the address for MS/TP controllers or controller number for Ethernet controllers 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 application for Input/Output wiring validation

Enables validation of the input and output terminals' wiring without having to download an application file.

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

Saves field technicians' time, enables productivity and minimizes equipment disruption, because 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 device provisioning 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 devices (XPM, PCX, NS8000) connected to it.

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.

Preloaded, selectable applications

The CV series VAV box controller is shipped with a factory-installed library of the most popular VAV box control applications. You can make this controller fully operational by using the MAP Gateway to select the appropriate VAV box application, thereby, saving field technicians' time by eliminating the provisioning workflow.

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.

Local Controller Display and the Mobile Access Portal (MAP) Gateway Support

Enable monitoring and commanding of I/O and configuration parameters.

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CV series model information

Table 1: CV series information including point type counts

		F4-CVM03050-0	F4-CVM03050-0P	F4-CVE03050-0P
Communication protocols	**CVM models:** BACnet MS/TP, N2, or Zigbee Wireless using add-on modules **CVE models:** BACnet/SC or BACnet/IP			
Modular jacks	**CVM models:** FC and SA Bus modular ports: RJ-12 6-pin modular jacks **CVE models:** RJ-12 6-pin sensor port			
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	3	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	2	2
Binary Output (BO)	Binary Output - 24 VAC Triac	3	3	3
Integrated actuator	Internal	1	1	1
Differential pressure transducer	Internal	1	1	1
Integrated feedback potentiometer	Internal	No	Yes	Yes
SA Bus	Supports up to 10 total wired SA Bus devices, including the XPM and PCX series I/O expansion modules and up to 4 NS series network sensors.			
WRZ sensors	Support up to 9 WRZ sensors when using the ZFR Pro Series wireless router configuration			
	Support up to 5 WRZ sensors when using the one-to-one WRZ-7860 wireless configuration			

CV series ordering information and accessories

Table 2: CV series ordering information

Product code number	Description
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; 24 VAC input.
F4-CVM03050-0P	VAV Box Controller with Integrated Actuator, Position Feedback, and DPT Sensor. Includes MS/TP and N2 communication; 8 points (3 UI, 2 CO, and 3 BO); real-time clock; 24 VAC input
F4-CVE03050-0P	VAV Box Controller with Integrated Actuator, Position Feedback, and DPT Sensor. Includes BACnet/SC and BACnet/IP communication; 8 points (3 UI, 2 CO, and 3 BO); real-time clock; 24 VAC input.

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ⓘ **Note:** F4-CVM03050-0PG and F4-CVE03050-0PG are orderable models that comply with Buy American Act requirements.

Table 3: CV series accessories (order separately)

Product code number	Description
XPM Series Expansion Modules	Refer to the *F4-XPM Expansion Modules Catalog Page (LIT-1901150)* for a complete list of available Expansion Modules.
PCX Series Expansion Modules	Refer to the *FX-PC Series Programmable Controllers and Related Products Product Bulletin (LIT-12011657)* for a complete list of available Expansion Modules.
TL-CCT-0	License enabling Controller Configuration Tool (CCT) software for one user
FX-FCP-0	License enabling Facility Explorer Equipment Controller Firmware Package Files required for CCT
TL-CWCVT-0	Communications converter that provides a temporary wireless connection between a host device and equipment controllers that support the BACnet MS/TP protocol.
F4-DLK0350-0	Local controller display with a 3.5 in. (8.9 cm) color display and a navigation keypad
NS-ATV7003-0	Handheld VAV Balancing Tool
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-12011653)* for specific sensor model descriptions.
WRZ-7860-0	Receiver for One-to-One Wireless Room Sensing Systems - functions with WRZ Series Sensors room sensors. 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	Wireless System Survey Tool (for use with the lower power 10mW WRZ and WRZ-7860 systems) Refer to the *WRZ-SST-120 Wireless Sensing System Tool Installation Instructions (LIT-24-10563-55)* for usage instructions.
ZFR-HPSST-0	Wireless System Survey Tool. For use with the higher power WRG1830/ZFR183x System and lower power WRZ Sensors (10mW). Refer to the *Hi Power Survey Tool Installation Document (LIT-24-11461-00012)* for usage instructions.
WRG1830/ZFR183x Pro Series Wireless Field Bus System	For more information on products needed for wireless field bus installations and for a list of available products, refer to the *WRG1830/FX-ZFR183x Pro Series Wireless Field Bus System Catalog Page (LIT-1901153)*.
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 is not compatible with the WRG1830/ZFR183x Pro Series. ⓘ **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

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Table 3: CV series accessories (order separately)

Product code number	Description
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
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
ACC-TBKPWFCSA-0	Power, FC Bus, and SA Bus terminal block replacement kit for SNC, CG series, CV series, CCM, and XPM series of products. Kit includes 5 of each terminal block type. 15 terminal blocks in total.
ACC-TBKINOUT-0	Input and Output terminal block replacement kit for SNC, CG series, CV series, CCM, and XPM series of products. Kit includes 5 of each 2, 3, and 4 position Input and Output terminal blocks. 30 terminal blocks in total.
ACC-CVDPT-0R	Replacement DPT sensor with barbed fittings for CV series VAV controllers with Rev B boards, with date code starting from RY12106 to present.
F4-CVACT-0R	Actuator Assembly Replacement Kit for F4-CV series controllers.

CV series technical specifications

Table 4: Technical specification for CV Series Controllers

Specification	Description
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
Ambient conditions	**Operating:** 0°C to 50°C (32°F to 122°F) **Storage:** -40°C to 70°C (-40°F to 158°F)
Communications protocol	**F4-CVM models:** BACnet MS/TP, N2, Zigbee Wireless also supported (at FC Bus and for Sensors) with additional hardware. **F4-CVE03050-0P:** BACnet/SC or BACnet/IP
Device addressing for BACnet MS/TP	Decimal address set using the three rotary switches: valid controller device addresses 4-127
Controller number for Ethernet controller	3 rotary switches to assign a unique number for each controller to physically identify the controller and relate it to the building drawings; valid controller numbers 0-999
Device addressing for N2	Decimal address set using the three rotary switches: valid controller device addresses 1-253

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Table 4: Technical specification for CV Series Controllers

Specification	Description
Communications bus	**F4-CVM models:** BACnet MS/TP (default), N2. CV Series controllers support wireless functionality for the FC bus and for sensors with additional hardware. 3-wire FC Bus between the supervisory controller and equipment controllers ⓘ **Note:** For more information, refer to the *FX MS/TP Communications Bus Technical Bulletin (LIT-12011670)*. **F4-CVE03050-0P:** BACnet/IP (default); BACnet/SC Two Ethernet ports; 10/100 Mbps; 8-pin RJ-45 connector ⓘ **Note:** For more information, refer to the *Facility Explorer IP Networks for BACnet/IP Controllers Configuration Guide (LIT-12012980)*. **All CV series models:** 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 (internal power)
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: -2 in. to 2 in. H2O **Performance Characteristics:** Typical accuracy at ambient operating conditions: +/- 0.5 % in. Water column full scale Typical accuracy at zero (null) pressure is +/- 0.0006 in. Water column
Actuator rating	4 N·m (35 lb·in) minimum shaft length = 44 mm (1-3/4 in.) (if provided)
Terminations	**Inputs/Outputs**: Pluggable Screw Terminal **FC Bus, SA Bus, and Supply Power**: 4-Wire and 2-Wire Pluggable Screw Terminal Blocks **SA Bus Modular Ports**: RJ-12 6-Pin Modular Jacks ⓘ **Note:** The FC Bus Terminal and FC Bus Port are only available on the CVM models
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)

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Table 4: Technical specification for CV Series Controllers

Specification	Description
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
CE	**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 18 Listed and Certified BACnet Advanced Application Controller (B-AAC), based on ANSI/ASHRAE 135-2020
UK CA	**United Kingdom:** Johnson Controls declares that this product is in compliance with Electromagnetic Compatibility Regulations, the Electrical Equipment (Safety) Regulations, and the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations.

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).

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.

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.

Product warranty

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

Patents

Patents: https://jcipat.com

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Single point of contact

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