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MICROTECH® VISION® AND SKYLINE® EC FAN CONTROLLER

NETWORK INTEGRATION GUIDE

BACnet® MS/TP and IP Protocol Information
Vision and Skyline EC Fan Array Controller
Models CAH, CAC, OAH, OAC

Member of BACnet International

Introduction

This manual describes how to integrate the MicroTech® fan array controller to a BMS (building management system) for network communication.

Product Description

The MicroTech 4 (MicroTech) is the dedicated fan controller for Vision® and Skyline® air handler EC fan array systems. The fan controller accepts a setpoint command from the unit controller or building management system (BMS). Inputs then control the fan array based on the configuration selected for the application. All fans in the array are driven by the fan controller to run at the same speed to achieve the commanded setpoint condition.

The EC fans are controlled via an internal RS-485 bus built into the unit controller using a Modbus protocol. The MicroTech controller passes fan array data to the network via BACnet® to coordinate operation of the fan series. It supports fan addressing, system setpoints, monitoring, and alarm objects with onboard BACnet MS/TP and BACnet IP capability.

NOTE: BACnet addressing and commissioning is performed from the remote HMI. This step is required before BAS integration and configuration.

This document is intended for system integrators and engineers familiar with the BACnet protocol. Contact the Daikin Applied Controls Customer Support group at 866-462-7829 or email DaikinControls@daikinapplied.com for additional assistance.

Software Version

This document supports the latest version of the MicroTech controller application and all subsequent versions. However, if the software is a later version, some of the information in this document may not completely describe the application.

The revision of the application software can be determined from the MicroTech controller HMI under the 'About This Unit' menu. The software version can also be read from the Application_Software_Version property of the Device Object.

Hazardous Information Messages

⚠ WARNING

Warning indicates a potentially hazardous situations, which can result in property damage, personal injury, or death if not avoided.

⚠ CAUTION

Caution indicates a potentially hazardous situations, which can result in minor injury or equipment damage if not avoided.

NOTICE

Notice indicates practices not related to physical injury.

Reference Documents

Title	Number	Company	Source
Vision/Skyline MicroTech 4 ECM Fan Controller	OM 1329	Daikin Applied	www.DaikinApplied.com
BACnet A Data Communication Protocol for Building Automation and Control Networks	ANSI/ASHRAE 135-2014	American Society of Heating, Refrigeration, and Air-Conditioning Engineers	www.ashrae.org

BACnet Agency Conformance

The MicroTech unit controller supports the American National Standards Institute and American Society of Heating, Refrigeration and Air-Conditioning Engineers (ANSI/ASHRAE) standard 135-2014.

The MicroTech unit controller is tested according to the BACnet Testing Laboratory (BTL) Test Plan. It is designed to meet the requirements of the BACnet Standard as stated in the Protocol Implementation and Conformance Statement (PICS). However, it is not BTL listed. See BACnet PICs.

BACnet Objects

The MicroTech controller incorporates standard BACnet object types (i.e., object types defined in the BACnet Standard) that conform to the BACnet Standard. Each object has properties that define unit variables or data points. Some object types occur more than once; each occurrence or instance has different properties and controls different unit variables or data points. Each instance is designated with a unique object identifier. Some properties can be adjusted from the network and others can only be interrogated (read-only properties).

The MicroTech controller follows the standard BACnet convention for prioritizing data points using the Present_Value property, (current value) of each object and is automatically set to the highest priority level. The Present_Value is writeable if it is commandable or if Out_Of_Service is set to TRUE as determined by each object type (AI, AO, AV, BI, etc). Refer to the table notes included in BACnet PICs.

All BACnet objects available to the network are found in the BACnet Data Points section.

Device Object Properties

Each BACnet compatible device can only have a single BACnet Device Object.

⚠ CAUTION

If another device in the network already has this object identifier, change the instance number of one device object so that all devices in the network have a unique object identifier.

The Device Object contains other informative properties as shown in Table 1.

Table 1: Device Object Properties

Property	ID	Default Value	Data Type
Object Identifier	75	Device	BACnetObjectIdentifier
Object Name	77	MT4_ DFA_#### (#### is Instance ID)	Character String
Object Type	79	8	BACnetObjectType
System Status	112		BACnetDeviceStatus
Vendor Name	121	Daikin Applied	Character String
Vendor Identifier	120	3	Unsigned 16
Model Name	70	MT4_DFA	Character String
Firmware Revision	44	Variable	Character String
Application Software Version	12	Variable	Character String
Description	28	Daikin MT4	Character String
Protocol Version	98	1	Unsigned
Protocol Services Supported	97		BACnetServices Supported
Protocol Object Types Supported[1]	96	AI, AV, BI, CSV, and MSV	BACnetObjectTypes Supported
Object List	76		Sequence of BACnetObjectIdentifer
Max APDU Length Accepted	62	480	Unsigned 16
Segmentation Supported	107	None	BACnetSegmentation
Max Segments Accepted	167	16	Unsigned
Local Time	57	Variable	Time
Local Date	56	Variable	Date
UTC Offset	119	-60 (Range: -780...780)	Integer
Daylight Savings Status	24	Variable	Boolean
APDU Segment Timeout	10	5000	Unsigned
APDU Timeout	11	6000	Unsigned
Number of APDU Retries	73	3	Unsigned
Device Address Binding	30		Sequence of BACnetAddressBinding
Database Revision	115	1	Unsigned
Active COV Subscriptions	152		List of BACnetCOV Subscriptions

[1]While the controller supports the entire set of object types, not all object types are used.

Device Object Identifier

The Device Object_Identifier uniquely specifies the unit within the network. The initial device object instance number is calculated depending on the either the production code (IP) or the MAC Address (MS/TP). This number must be unique on the entire BACnet network. The device instance number can be changed via the HMI display.

Select Apply Changes under the BACnet MSTP or BACnet IP Set Up Menu for the change to take effect.

Device Object_Name

Each device has a unique Object_Name by default. The Object_Name is MT4_DFA_#####. The ##### represents the Device Instance. If the Device Instance changes, and the “MT4_DFA_” portion of the Object_Name is retained, the Device Name is updated as well.

Setting BAS Communication Parameters

There are certain parameters involved in setting up the MicroTech controller for either BACnet MS/TP or BACnet IP communications (Table 2.) The bold parameters can be changed using the HMI display menu. See Vision/Skyline EC Fan Controller, OM 1329 (www.DaikinApplied.com).

Table 2: Communication Parameter Settings

Parameter Name	BACnet MS/TP	BACnet IP
Device Object Name	MT4_DFA_####[4] ‘####’ is the Instance ID	MT4_DFA_####[3] ‘####’ is the instance ID
Device Instance Number	####, default is the last 4 digits of the serial number	####, default is the last 4 digits of the serial number
DHCP	NA	**On**
Actual IP Address	NA	DHCP Enabled
Actual IP Subnet Mask	NA	DHCP Enabled
Actual Gateway Address	NA	DHCP Enabled
Given IP Address[1]	NA	127.0.0.1
Given IP Subnet Mask[1]	NA	255.255.255.0
Given Gateway Address[1]	NA	127.0.0.1
UDP Port Number	NA	47808
MS/TP MAC Address[2]	18	NA
MS/TP Baud Rate	76800	NA
Max APDU Length	480	1476
Receive Heartbeat	NA	NA
Max Master	127	NA
Max Info Frames	1	NA
BACnet IP (Enable)	NA	Passive
BACnet Over RS485	Passive	NA

[1]These addresses are used if DHCP (Dynamic Host Configuration Property) is set to Off. For changes to take effect, use the HMI display and set Apply Changes on the BACnet IP Setup menu to Yes. This causes the power on the fan controller to reset.
[2]The MS/TP MAC Address is set via the HMI display. Set Apply Changes to Yes for changes to take effect.
[3] The last 6 digits are the last 6 digits of the MAC address. The MAC address is a printed sticker affixed to the BACnet communication module.
[4]The last 8 digits are computed from the production number and date code.

Network Addressing and Configuration

BACnet MS/TP

The BACnet MS/TP device address is set using the MicroTech controller HMI keypad display menu.

From the HMI main menu, navigate to the BMS Communications\BACnet MS/TP Set-Up menu to change this value. Set Apply MSTP Chgs to Save Config in order for the new address to take effect. This causes the power on the fan controller to reset.

BACnet IP

The BACnet/Internet Protocol (BACnet/IP) address consists of the four-octet Internet Protocol address followed by the two-octet UDP (User Datagram Protocol) port number. The BACnet/IP address is a six-octet value analogous to a MAC address. The IP address portion of the BACnet/IP address must be unique in the BACnet/IP network segment. The default UDP port number is 47808 (BAC0 in hexadecimal).

The device object contains a Given Internet Protocol Subnet Mask (Default is 255.255.255.0) and a default Given IP address of 127.0.0.1. The MicroTech controller supports DHCP (Dynamic Host Configuration Protocol) IP addressing which is enabled by default.

From the HMI main menu, navigate to the BMS Communications\BACnet IP Set-Up menu to change the Device Object Name, Device Instance Number and to disable DHCP, if applicable.

BACnet Device Management

The following functions are specific to the internal BACnet device. These functions are used for maintenance and testing. A network management tool such as VTS is typically used to issue the network commands.

DeviceCommunicationControl - Disable

The purpose of this command is to reduce network traffic for diagnostic testing of the BACnet network. When the MicroTech controller receives a network command to disable communications, it stops passing information to the network. It is possible to specify an optional length of time that communication is suspended. The unit continues to operate during the disabled state.

DeviceCommunicationControl - Enable

When the MicroTech controller receives a network command to Enable communications, fan array communication to the BACnet network is restored.

BACnet Data Points

Table 3 - Table 6 describe the points supported by the MicroTech unit controller via BACnet MS/TP and BACnet IP protocols. See the Alarms section for alarm objects, notification, and clearing.

BACnet parameters available to the BAS remain at the last valid value upon loss of communications. If the network input value is invalid, the MicroTech controller reverts to a default value. In the case of network sensor inputs, it reverts to the corresponding local sensor input when installed.

The unit controller interface is used to set BACnet addressing parameters to establish network communication. See Vision/ Skyline EC Fan Array Controller OM 1329 for all keypad/ display menu options available (www.DaikinApplied.com). Also refer to the BACnet PICs.

Table 3: BACnet Analog I/O Points

Point Name	Object Type/ Instance	BACnet Object Name	Read/ Write	Range (In Units)	Default	Description
Fan Speed Demand	Demand Input	AI:1	R	0-100%	NA	Displays the fan speed commanded input value.
Duct Static Pressure Sensor	DSP Pressure	AI:2	R	0-40 inch wc	NA	Displays the duct static pressure sensor input value used to control the supply air fan. See Duct Static Pressure Setpoint, AV:9. An alarm is generated if the duct static pressure input is not within the acceptable range. Also see Unit Alarm Info (CSV:2)
CFM Pressure Sensor	DPCfm	AI:3	R	0-40 inch wc	NA	Displays the CFM pressure sensor input value.

Table 4: BACnet Digital I/O Points

Point Name	Object Type/ Instance	BACnet Object Name	Read/ Write	Range (In Units)	Default	Description
Fire Alarm Input	Fire Mode Input	BI:1	R	1=On 0=Off	Off	Displays the fire alarm input status. 1=On indicates no fire alarm present 0=Off indicates a fire alarm Applies when an optional fire sensor is installed and when Fire Alarm Enable, *FireEn* is configured to Yes = enabled from the HMI keypad. Also see Unit Alarm Info (CSV:2).
Interlock Switch Input	Interlock Input	BI:2	R	1=On 0=Off	Off	Displays the interlock switch status. Disables fan array operation until the circuit is closed (On). 0=Off indicates interlock switch is in open position. Fans are disabled 1=On indicates interlock switch is in closed position. Fans are enabled, and allowed to run Applies when Interlock Enable, *IntLckEn* is configured to Yes = enabled from the HMI keypad. Also see Unit Alarm Info (CSV:2).
Pressure Alarm	Safety Input	BI:3	R	1=On 0=Off	Off	Displays the safety switch status. Disables fan array operation until the circuit is closed (On). 1=On indicates Safety Input switch is in closed position. Fans are enabled and allowed to run. 0=Off indicates Safety Input switch is in open position. Fans are disabled. Applies when Pressure Alarm, Safety In= On from the HMI keypad. Also see Unit Alarm Info (CSV:2).
Start-Stop	Array ON/OFF	BI:4	R	1=On 0=Off	Off	Displays the array on/off switch status. When the fan array is on, it reflects the input from Fan Speed Demand Setpoint (AV:1). 1=On indicates Array On/Off switch is in closed position. Fans are enabled and allowed to run. 0=Off indicates Array On/Off switch is in open position. Fans are disabled. Applies when On/Off Input Enable, Array ON/ OFF=On from the HMI keypad. Also see Unit Alarm Info (CSV:2)

Table 4: BACnet Digital I/O Points, Continued

Point Name	Object Type/ Instance	BACnet Object Name	Read/ Write	Range (In Units)	Default	Description
Unit Alarm Information	Unit Alarm Info	CSV:2	R	Dynamically changing string value. See Description	Off	Reflects the alarms generated by the fan controller alarm object. Alarms are displayed by highest to lowest priority. Also refer to the Alarms section. • Fire Alarm: Indicates if the fan array is operating in fire mode. When a fire alarm sensor is installed and the Fire Alarm relay output is in the open (On) position, the fan array is shut down immediately, the unit is placed in Emergency mode, and the alarm generated. • External Safety Alarm: Indicates if the safety input is On (in alarm.) The fan does not operate under any condition. • Fan #x Alarm: Indicates the fan (#1-20) currently in alarm condition. The "x" refers to the fan ID that fails first in case of a multi-fan failure event.) • Sensor Error: Indicates if one of sensors is not functioning as expected. • InterLock Alarm: Indicates that the fan interlock signal has not been received within the allowable time range and the start/stop input is in the open (On) position. Applies when both the fan array interlock switch and start/stop inputs are available and enabled. • Duct Static pressure alarm: Indicates that the DSP sensor is not functioning properly or is out of range. • No Alarm
Unit Device Name	Unit Name	CSV:1	R/W	Any 14 alpha-numeric characters are supported	Vision	Assigns a unique BACnet identifier (device name) for each fan in the array. Up to 14 alpha-numeric characters are supported.
Unit Serial Number	Unit SN	CSV:3	R/W	Any 13 alpha-numeric characters are supported	FBOU12345	Assigns a unique BACnet identifier (unit serial number) for each fan in the array. Up to 13 alpha-numeric characters are supported.

Table 5: BACnet Points for Setpoint and Feedback Variables

Point Name	Object Type/ Instance	BACnet Object Name	Read/ Write	Range (In Units)	Default	Description
Fan Speed Output	AO1 RPM	AV:1	R	0-100%	0	Fan tracking output used to control a secondary fan array. Displays the command speed value of the analog output, AO1 as a percent. For example, 2-10VDC = 0-100%.
Air Flow CFM Output	AO2 CFM	AV:2	R	0-100%	0	Air flow sensor analog input (X4) value scaled and converted to represent air flow volume and then sent to Analog Output, X5. Displays the CFM air flow measurement represented by analog output, AO2 in percent. For example, AO2 (X5-CFM Out) is displayed as 2-10 VDC: (0-100%)
Fan Speed Command	FanSpdCmd	AV:3	R	0-100%	0	Displays the commanded fan speed value sent to the fan motors over Modbus.
Average Fan Speed	AvgFanSpd	AV:4	R	0-5000 RPM	0	Displays the average speed of all fans in the array.
Total Fan Power	TotalFanPwr	AV:5	R	1.4-6.3 kW	1.9 kW	Displays the total power usage (in kW) of all fans in the array. Full range includes: 1.4, 1.8, 1.9, 2.9, 3.1, 3.8, 5.9, 6.0, 6.3 kW.
Fan Speed Actual Command	FanSpdActCmd	AV:6	R	0-100%	NA	Actual average fan speed command (%) of all fans (On and Off) in the array.
Fan Number	FanNumber	AV:7	R	1-20 Fans	4	Displays the number of fans running in the array.
Total Airflow	TotalAirFl	AV:8	R	0-340,000 ft^3/min (US) 0-340,000 ft^3/min(CA) 0-200,000 m^3/h (SI)	0	Displays the total airflow of the fan array.

Table 5: BACnet Points for Setpoint and Feedback Variables, Continued

Point Name	Object Type/ Instance	BACnet Object Name	Read/ Write	Range (In Units)	Default	Description
Duct Static Pressure Setpoint	PressSP	AV:9	R/W	0-40 inch wc 10,000 Pa	0	Sets the duct static pressure setpoint that the controller is attempting to maintain. Applies when Control Mode is set to DSP and when a DSP sensor is installed and functioning properly. If the value is set beyond the allowable range from the network, it is ignored and the controller continues to control to the last valid value. Changes made to the Duct Static Pressure Setpoint or Demand Setpoint (AV:11) synchronize automatically.
Airflow Setpoint	CFMSP	AV:10	R/W	0-240000 CFM	0	Sets the airflow setpoint value when configured for CFM control. The controller capacity modulates to maintain this value when the unit is equipped with a fan airflow measuring system and when Control Mode (MSV:4) is configured for CFM. If the value is set beyond the allowable range from the network, it is ignored and the controller continues to control to the last valid value. Changes made to either the CFM Pressure Setpoint or Fan Speed Demand Setpoint (AV:11) synchronize automatically. Control Method must be CFM.
Demand Setpoint	Demand SP	AV:11	R/W	0-100%	0	Sets the fan speed demand setpoint in percent.
Max RPM	MaxRPM	AV:12	R	5000 RPM		Displays the maximum speed the fan can run.
Air Flow Nominal	Air Flow	AV:14	R	1=SI (m^3/hr) 2=US (ft^3/m) 3=CA (L/s)	US	Displays the nominal or maximum calculated air flow possible from the fan array. Items such as fan type, fan size, number of fans and altitude contribute to the calculation of this value.
Fan Speed RPM Setpoint	RPMSP	AV:15	R/W	0-3230 RPM	0	Sets the fan speed setpoint that the controller is attempting to maintain. Applies to fixed speed fan applications, when Control Mode is set to RPM, and Demand Source is set to BACnet. Changes made to the Fan Speed Command (AV:6) or Demand Setpoint (AV:11) synchronize automatically. Note the HMI keypad RPM input reflects setpoint as a percentage (0-100%).
Secondary Fan Speed Offset	TrckSpdOffsetSP	AV:16	R/W	1000 RPM	0	Sets the secondary fan speed offset value. It is used to modulate capacity in fan tracking applications in order to maintain the desired offset between the primary and secondary fan arrays. Applies only when fan tracking is configured for Primary from the HMI keypad.
Fan 1-20 Speed	Fan1Spd - Fan20Spd	AV:101 - AV:120	R	0-3300 RPM	NA	Displays the current speed of individual fans in the array #1-20. Fans are controlled to the same speed by an internal Modbus communication protocol. Applies when Control Mode is configured to RPM (MSV:4)

[1] Not supported in unit controller application versions v2.0 and earlier.

Table 6: BACnet Points for Operating Modes and Configuration

Point Name	Object Type/ Instance	BACnet Object Name	Read/ Write	Range (In Units)	Default	Description
Unit Mode	UnitMode	MSV:1	R	1=Off 2= Normal 3=Manual 4=Manual Off	Normal	Displays the current operating state of the fan array. 1 = Off (Control Mode is set to Off) 2 = Normal (Control Mode = Auto) Manual mode must be set to Normal. 3 = Manual (Manual Mode = Manual) Control mode is overwritten via the HMI display. Only manual control of unit allowed. 4 = Manual Off (Manual Mode = Off) Unit start is prevented under all control modes. Notes: Manual Mode allows user to override the fan array speed and physical outputs via the HMI display. This setting is retained thru a power cycle. When saving fan array configuration parameters via the HMI display, Control Mode must be in Auto to prevent unexpected startup of the unit.
Fan Ready to Run	RO1 Ready	MSV:2	R	1=Off 2=On	Off	Displays the fan array run ready to run output status.
Fan Array Alarm Output	RO3 Alarm	MSV:3	R	1=Off 2=On	Off	Displays the fan array alarm relay output state. 1=On indicates an alarm condition. Safety En must be set to Yes in the Config Array HMI menu screen.
Fan Run Status	RO2 Running	MSV:4	R	1=Off 2=On	Off	Displays the fan array run output state. The fan array is currently in operation when 1=On.
Demand Source	DmdSrc	MSV:5	R	1=0-10 VDC 2=4-20mA 3=BACnet 4=HMI	0-10 VDC	Displays the demand input signal used for modulating fan speed control.
Adaptive Speed	AdaptiveSpd	MSV:6	R	1=No 2=Yes	No	Indicates the ability to maintain air flow rate in the event of a fan shut down.
Fire Alarm Enable	FireAlmEnable	MSV:7	R	1= FireAlm Disabled 2= FireAlm Enabled	Disabled	Indicates if the fire alarm input is enabled.[2] Applies when an optional fire sensor is installed. Fire EN must be set to Yes in the Config Array HMI menu screen.
Interlock Enable	InterlockEnable	MSV:8	R	1=Interlock Switch Disabled 2= Interlock Switch Enabled	Disabled	Indicates if the interlock switch input is available. When enabled, the interlock delays fan operation until an external contact is closed.[2] Applies when Interlock Input, IntLck (BI:2) is configured from the HMI keypad.
Alarm Input Enable	SafetyInputEnable	MSV:9	R	1=AlmIn Disabled 2=AlmIn Enabled	Disabled	Indicates if external alarm signal is available. Fan operation stops when this input is in the open (On) position.[2]
On/Off Input Enable	StartSiglEnEff	MSV:10	R	1=Start Switch Disabled 2=Start Switch Enabled	Disabled	Indicates if the on/off input is available. When enabled from the HMI keypad, this input allows fan array operation to be controlled on or off with an external contact closure.[2] Applies when Control Source is a 0-10 VDC or 4-20mA signal. Also see Unit Alarm Info (CSV:2)
Control Mode	CtrlModeCfg	MSV:12	R	1= Dmd RPM 2= Dmd CFM 3= Dmd DuctP 4=Fan Tracking	Dmd RPM	Displays the control mode strategy selected for the supply fan. 1=Dmd RPM: Modulates the fan array capacity based on fan speed. Demand signal is determined by the control source. When configured for BACnet, the fan speed value can also be set as a percent. See Demand Setpoint (AV:11). 2=Dmd CFM: Modulates the fan array capacity to maintain the airflow speed (CFM) setpoint. See Airflow Setpoint, CFMSP (AV:10). 3=Dmd DuctP: Modulates the fan array to maintain a duct static pressure setpoint based on an external pressure sensor. See Duct Static Pressure Setpoint (AV:9). 4=Fan Tracking: Fan tracking allows the speed of a secondary fan array to be controlled based on the output of the primary fan array.

Table 6: BACnet Points for Operating Modes and Configuration, Continued

Point Name	Object Type/ Instance	BACnet Object Name	Read/ Write	Range (In Units)	Default	Description
Unit State	UnitState	MSV:13	R	1=Off 2=Ready 3=Running 4=Manual 5=Alarm 6=EmergencyWarning 7=Emergency Alarm 8=Run with Alarm 9=Off with Alarm 10=DmdSigLow	Off	Displays the operating state of the fan array. 1=Off: The fan array is not operating. The controller may not be energized. 2=Ready: The ready relay output contact on the controller is closed, indicating that the fan array is ready to run. 3= Running: The fan array running relay output is closed; indicating it is currently in operation. 4=Manual: The fan array is configured for manual (direct) control from the HMI keypad.[1] 5=Alarm: The alarm output contact on the controller is closed, indicating there are one or more active alarms. 6=Emergency Warning: The fan array has been shut down due to an active fire alarm. The controller alarm relay output is in the open (On) position which then triggers the Emergency mode. 7= Emergency Alarm: The fan array has been shut down due to an active safety input alarm. The controller alarm relay output is in the open (On) position which then triggers the Emergency mode. 8=Run with Alarm: The fan array continues to operate in the Run mode during any alarms except for a sensor reliability problem. 9=Off with Alarm: The sensor is not reliable. 10= DmdSigLow: Demand signal low. Applies when Control Mode is RPM.
Pressure Alarm	PressureAlmBN	MSV:14	R	1=Off 2=On	Off	Displays the interlock switch status. Disables fan array operation until the circuit is closed (On). Interlock Enable (IntLck En) must be set to Yes in from the Config Array HMI keypad menu.
Interlock Alarm	InterlockAlm	MSV:15	R	1=Off 2=On	Off	Displays the interlock switch status. Disables fan array operation until the circuit is closed (On). Interlock Enable (IntLck En) must be set to Yes in from the Config Array HMI keypad menu.
Unit Control Mode HMI	UnitCtrlModeHMI	MSV:16	R	1=Off 2=Auto	Off	Displays the running status (mode) of the fan array.
BACnet Units of Measurement	BNUnitSystem	MSV:18	R/W	1=SI 2=US 3=CA	US	Aligns the fan array controller data with the desired units of measurement across the BACnet network. Change this setting from either the HMI keypad or via BACnet. 1=SI (International System of Units/Metric) 2=US (English) 3=CA (Canadian)
Clear Alarms	ClearAlarms	MSV:20	R/W	1=No 2=Yes	No	Clears all active alarms when set to Yes.
Manual Mode	ManualMode	MSV:21	R	1=Off 2=Normal 3=Manual[1]	Normal	Initiates manual control of the fan array independently of the fan controller sequence. Manual mode is used during initial start-up or for troubleshooting. After 60 minutes, the controller automatically resumes normal operation. 1 = Off: Unit will not start, effectively locked out from run command from either the HMI display or BACnet. 2= Normal: Unit allowed to start from either source. 3=Manual: Allows for manual control while testing digital/analog outputs and fan speed.

[1]Manual mode is not intended for extended operation beyond initial start-up and troubleshooting. After 60 minutes, the controller automatically resumes normal operation.
[2]Open (On) = Enabled. The contact is in the closed position. Closed (Off) = Disabled. The contact is in the open position.

Alarms

Alarms provide the user with information about abnormal conditions that affect unit operation. The cause of the alarm should be investigated and eliminated before the unit or any disabled equipment in it is placed back into service.

Alarm Notification

There are 21 alarm object alarms supported by the MicroTech controller (Table 7). These include one unit alarm object (CSV:2) and 20 individual fan alarm objects (MSV:101-MSV:120.) The fan controller follows the standard BACnet method for alarm notification. Alarms are displayed by the highest priority active alarm based on the Present_Value property of the alarm object.

Alarm Clearing

To clear all active alarms from the network, change the Present_Value property of BACnet MSV:20 *ClearAlarm* multistate object to a 2 = On. After three seconds and the alarms are cleared, this object returns to 1 = Off. All active alarms are cleared automatically when power is cycled to the controller. This can be done manually or by Present_Value property the BACnet multistate value *Reboot*, MSV:11. If the conditions that triggered the alarm are still present after a power cycle, these active alarms are re-initiated with new date/time stamp.

NOTE: Alarms can also be cleared either through the fan controller HMI or a local sensor input, if available.

NOTE: Alarms are read-only.

Table 7: BACnet Alarm Descriptions: Delta Fans

Below reflects the alarms generated by individual Delta fans in the array. Applies when the fan is configured with a unique BACnet identifier (CSV:1) alarm object for each fan. Only the enumeration value is displayed via BACnet or HMI. Alarms are displayed by highest to lowest priority.

Delta Fan Alarm Code	Object Type/ Instance (Fan #1-20)	BACnet Object Name	Range (In Units)	Default	Description
1=Offline	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	The fan is not communicating to the controller.
2=Hall	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Hall Sensor Error: The fan is not functioning as expected and is attempting to reset.
3=OC	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Over Current: Overcurrent on the drive. Possible earth ground fault indicating the fan is not grounded properly.
4=ACOV	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Supply VAC High: The incoming voltage to the controller has exceeded the maximum value allowed.
5=ACUV	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Supply VAC Low: The incoming voltage to the controller is below the minimum value allowed.
6=EEPROM	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	EEPROM Error: IGBT (insulated gate bipolar transistor) current switch fault condition. It is not functioning as expected and the fan is shut down.
7=POC	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Peak Over Current: The current load has exceeded the maximum threshold and the fan is shut down.
8=PL	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Line Fault: The fan is not running due to power line disruption. Possible causes include improper line connection or power surges.
9=OV	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	DC Link Voltage High: The internal fan voltage has exceeded the threshold. A power cycle may be necessary.
10=UV	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	DC Link Voltage Low: The internal fan voltage is lower than the threshold. A power cycle may be necessary.
11=Lock	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	High Temp Motor Blocked: The fan motor impeller has a physical obstruction that requires removal and controller restart.
12=OT	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	High Temp: The internal fan temperature has exceeded the maximum threshold of 104˚F.
13=RPMRRP	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Fan Running in Reverse: The fan motor shaft is rotating in the opposite direction of the commanded direction, exceeding the allowable RPM threshold.
14=RPMERR	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	RPM Error: The difference between the fan speed setpoint command and actual fan speed has exceeded the threshold value (300 RPM).
15=Online	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Fan is communicating to the controller as expected.

Table 8: BACnet Alarm Descriptions: EBM Fans

Below reflects the alarms generated by individual EBM fans in the array. Applies when the fan is configured with a unique BACnet identifier (CSV:1) alarm object for each fan. Only the enumeration value is displayed via BACnet or HMI. Alarms are displayed by highest to lowest priority.

EBM Fan Alarm Code	Object Type/ Instance (Fan #1-20)	BACnet Object Name	Range (In Units)	Default	Description
1=Offline	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	The fan is not communicating to the controller.
2=HALL	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Hall Sensor Error: The fan is not functioning as expected and is attempting to reset.
3=TFEI	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Elec Temp High: The internal electronics temperature has exceeded the threshold.
4=TFM	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Motor Over Temp: Fan motor temperature has exceeded the threshold. Indicates overheating condition.
5=TFE	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	OutStg Over Temp: The output stage overheating alarm is active.
6=BLK	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Motor Blocked: The fan motor impeller has a physical obstruction that requires removal and controller restart.
7=SKF	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Internal Comm Error: A communication error has occurred between the unit controller (client) and fan controller (device server.)
8=PHA	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Power Failure: The phase failure (3-phase devices) or line under voltage (single-phase devices) fan alarm
9=UzL	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	DC Link Voltage Low: The DC link voltage is lower than the threshold. A power cycle may be necessary.
10=UzH	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	DC Link VoltageHigh: The DC link voltage has exceeded the threshold. A power cycle may be necessary.
11=UeL	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	LineV Low: The line voltage is below the threshold.
12=UeH	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	LineV High: The line voltage has exceeded the threshold.
13=nLim	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Over Speed Limit: The fan speed has exceeded the threshold.
14=RLC	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Rotor Posn Snsr Err: Rotor position sensor calibration error alarm.
15=RPMERR	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	RPM Error: The difference between the fan speed setpoint command and actual fan speed has exceeded the threshold value (300 RPM).
16=Online	Fan#AlmCode	MSV:101 - MSV:120	Active = 2 Inactive = 1	Inactive = 1	Fan is communicating to the controller as expected.

BACnet PICs

MicroTech 4 Vision/Skyline EC Fan Controller

This section contains the Protocol Implementation Conformance Statement (PICS) for the MicroTech 4 fan controller from Daikin Applied as required by ANSI/ASHRAE Standard 135-2014, BACnet: A Data Communication Protocol for Building Automation and Control Networks.

Date	March 2024
Vendor Name	Daikin Applied
Product Name	VisionSkyline
Product Model Number	MT4_DFA
Application Software Version	2506990
Firmware (BSP) Revision	11.58
BACnet Protocol Version	1
BACnet Protocol Revision	14

Product Description

The MicroTech 4 EC fan controller with native BACnet MS/TP is designed to operate the Vision/Skyline air handling unit fan array and integrate it into a BACnet building automation system.

The controller is used to supervise the modular fan array so air handler supply or exhaust/return fans operate in tandem. It provides normal temperature and pressure setpoints, operating states, and alarm monitoring with safety for critical system conditions. Access to the fan array control parameters is available through the HMI and the BACnet control network.

BACnet Standardized Device Profile

☐	BACnet Advanced Workstation	(B-AWS)
☐	BACnet Operator Workstation	(B-OWS)
☐	BACnet Operator Display	(B-OD)
☐	BACnet Building Controller	(B-BC)
☒	BACnet Advanced Application Controller	(B-AAC)
☐	BACnet Application Specific Controller	(B-ASC)
☐	BACnet Smart Sensor	(B-SS)
☐	BACnet Smart Actuator	(B-SA)

BACnet Interoperability Building Blocks Supported

Data Sharing

Data Sharing – Read Property-B	DS-RP-B
Data Sharing – Write Property-B	DS-WP-B

Alarm and Event Management

Alarm and Event – Notification Internal-B	AE-N-I-B
Alarm and Event – ACK-B	AE-ACK-B
Alarm and Event – Alarm Summary-B	AE-ASUM-B
Alarm and Event – Enrollment Summary-B	AE-ESUM-B
Alarm and Event – Information-B	AE-INFO-B

Device Management

Device Management – Dynamic Device Binding-A	DM-DDB-A
Device Management – Dynamic Device Binding-B	DM-DDB-B
Device Management – Dynamic Object Binding-B	DM-DOB-B
Device Management – Device Communication Control-B	DM-DCC-B
Device Management – Time Synchronization-B	DM-TS-B
Device Management – UTC Time Synchronization-B	DM-UTC-B
Device Management – Reinitialize Device-B	DM-RD-B
Device Management – Backup and Restore-B	DM-BR-B
Device Management – Object Creation and Deletion-B	DM-OCD-B

Network Management

☐	Router, Clause 6 (remote management functionality/BACnet PTP)		
☐	Annex H, BACnet Tunneling Router over IP		
☐	BACnet/IP Broadcast Management Device (BBMD) Number of BDT entries: 10 Number of FDT entries: 10		
-	Does the BBMD support registrations by foreign devices?	☒ Yes	☐ No

Segmentation Capability

☒	Able to transmit segmented messages	Window size	1 for MS/TP 2..8 for IP
☒	Able to receive segmented messages	Window size	1 for MS/TP 2..8 for IP

Data Link Layer Options

☒	BACnet IP, (Annex J)	-
☒	BACnet IP, (Annex J), Foreign Device	-
☐	ISO 8802-3, Ethernet (Clause 7)	-
☐	ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)	-
☐	ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s)	-
☒	MS/TP master (Clause 9), baud rate(s)	9600 19200 38400 57600 76800 115000
☒	MS/TP slave (Clause 9), baud rate(s)	9600 19200 38400 57600 76800 115000
☐	Point-To-Point, EIA 232 (Clause 10), baud rate(s)	-
☐	Point-To-Point, modem, (Clause 10), baud rate(s)	-
☐	LonTalk, (Clause 11), medium	-
☐	Other	-

Device Address Binding

Is static device binding supported?	☐ Yes	☒ No

Character Sets Supported

NOTE: Support for multiple character sets does not imply they can be supported simultaneously.

☒ UTF-8	☐ IBM / Microsoft DBCS	☒ ISO 8859-1
☒ ISO 10646 (UCS-2)	☐ ISO 10646 (UCS-4)	☐ JIS C 6226

Standard Object Types Supported

Analog Inputs

Properties	Readable / Writable	Range restrictions
Object_Identifier	R	-
Object_Name	R	-
Object_Type	R	-
Present_Value	R	-
Description	W	-
Status_Flags	R	-
Event_State	R	-
Reliability	R	-
Out_Of_Service	R	-
Units	R	-
Min_Pres_Value	R	-
Max_Pres_Value	R	-
Property_List	R	-

Binary Inputs

Properties	Readable / Writable	Range restrictions
Object_Identifier	R	-
Object_Name	R	-
Object_Type	R	-
Present_Value	R[1]	-
Description	R	-
Status_Flags	R	-
Event_State	R	-
Reliability	R	-
Out_Of_Service	R	-
Polarity	R	-
Inactive_Text	R	-
Active_Text	R	-
Elapsed_Active_Time	W	Only 0
Time_Of_Active_Time_Reset	R	-
Property_List	R	-
Event_Time_Stamps	R	-
Property_List	R	-
Event_Detection_Enable	R	-

[1] Object is writeable when Out_Of_Service is set to TRUE.

Analog Values

Properties	Readable / Writable	Range restrictions
Object_Identifier	R	-
Object_Name	R	-
Object_Type	R	-
Present_Value	W[1]	-
Status_Flags	R	-
Event_State	R	-
Reliability	R[1]	-
Out_Of_Service	W	-
Units	R	-
Priority_Array	R	-
Relinquish_Default	W	-
Property_List	R	-

[1]Object is writeable when Out_Of_Service is set to TRUE.

Multistate Values

Properties	Readable / Writable	Range restrictions
Object_Identifier	R	-
Object_Name	R	-
Object_Type	R	-
Present_Value	W[1]	-
Description	R	-
Status_Flags	R	-
Event_State	R	-
Reliability	R[1]	-
Out_Of_Service	R	-
Number_Of_States	R	-
State_Text	R	-
Priority_Array	R	-
Relinquish_Default	W	-
Property_List	R	-

[1]Object is writeable when Out_Of_Service is set to TRUE.

Characterstring Values

Properties	Readable / Writable	Range restrictions
Object_Identifier	R	-
Object_Name	R	-
Object_Type	R	-
Present_Value	W	-
Out_Of_Service	W	-
Description	R	-
Status_Flags	R	-
Property_List	R	-

Device

Properties	Readable / Writable	Range restrictions
Object_Identifier	R	-
Object_Name	R	-
Object_Type	R	-
System_Status	R	-
Vendor_Name	R	-
Vendor_Identifier	R	-
Model_Name	R	-
Firmware_Revision	R	-
Application_Software_Version	R	-
Description	R	-
Protocol_Version	R	1
Protocol_Revision	R	10
Protocol_Services_Supported	R	-
Protocol_Object_Types_ Supported	R	-
Object_List	R	-
Max_APDU_Length_Accepted	W	MS/TP: 50..480 IP: 50..1024
APDU_Segment_Timeout	W	0..65535
APDU_Timeout	W	0..65535
Number_Of_APDU_Retries	W	0..65535
Segmentation_Supported	W	-
Max_Segments_Accepted	W	2..8
Active_COV_Subscriptions	R	-
Local_Time	R	-
Local_Date	R	-
UTC_Offset	W	-
Daylight_Savings_Status	R	-
Max_Master (MS/TP only)	W	1..127
Max_Info_Frames (MS/TP only)	W	1..255
Device_Address_Binding	R	-
Database_Revision	R	-
Property_List	R	-

Revision History

Revision	Date	Changes
ED 19122	April 2023	Initial release
ED 19122-1	September 2023	Updated PICS: changed Device Profile to BACnet Advanced Application Controller, BAA-C and changed Device location and description to writeable. Corrected BO:1 and BO:5 object names.
ED19122-2	July 2024	Significant changes to Data Points and Alarm sections for Control Mode code and addition of EBM fans. Changed BO objects to MSV object types. Removed MSV:23 UnitCtrlModeBN. Fixed all BI ranges to 1=On, 0=Off. Reformatted PICs to application-specific object property types supported; updated Product Name and current BSP 11.58. Corrected ControlMode, UnitMode and CtrlModeCfg parameter descriptions. Corrected MSV:1-MSV:6 and Table 7- Delta Fan ranges. Added Delta alarm code 13. Corrected AV:8 and AV:13 descriptions.

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