Operation Maintenance Manual

OM 751
Group: **Unit Ventilator**
Part Number: **106506304**
Date: **August 2002**
Supercedes: New

MicroTech II™ Unit Ventilator Controls

for AAF®-HermanNelson® Classroom Unit Ventilators

DX Cooling Only – Software Model UV05

Used with AAF-HermanNelson Classroom Unit Ventilator
Model AVV – Floor Mounted
Model AHV – Ceiling Mounted
Model AZV, AZU – Floor Mounted Self Contained Air Conditioner

IMPORTANT
Before unit commissioning, please read this publication in its entirety. *Develop a thorough understanding before starting the commissioning procedure.* *This manual is to be used by the commissioner as a guide. Each installation is unique, only general topics are covered.* *The order in which topics are covered may not be those required for the actual commissioning.*

AAF® HermanNelson®

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Table 1. Abbreviations

Index of Abreviations	Meaning of Abreviations
AHED	Auxiliary Heat End Differential
AHSD	Auxiliary Heat Start Differential
ASCII	American Standard Code for Information Interchange
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc
CCLO	Compressor Cooling Lockout Setpoint
CO2S	CO_2 Setpoint
CW	Chilled Water
CWVP	Chilled Water Valve Position
DA	Discharge Air
DAHL	Discharge Air High Limit
DAT	Discharge Air Temp
DATS	Discharge Air Temp Setpoint
DCV	Demand Controlled Ventilation
ECD	Economizer Compare Differential
EED	Economizer Enthalpy Differential
EES	Economizer Enthalpy Setpoint
EHS	Emergency Heat Setpoint
EOAD	Exhaust Outdoor Air Damper
EOAT	Outdoor Air Temperature Output
EOC	End-of-Cycle
EOCS	End-of-Cycle Low OAT Setpoint
EORH	Outdoor Air Humidity Output
ERH	Space Humidity Output
ETD	Economizer Temperature Differential
ETS	Economizer Temperature Setpoint
EWIT	Source (Water-in) Temperature
FBDP	Face and Bypass Damper Position
FCC	Federal Communications Commission
F & BP	Face & Bypass
HVACR	Heating, Ventilating, Air Conditioning, Refrigerating
HW	Hot Water
IA	Indoor Air
IAF	Indoor Air Fan
IAT	Indoor Air Temperature

Index of Abreviations	Meaning of Abreviations
LED	Light Emitting Diode
LUI	Local User Interface
MCLL	Mechanical Cooling Low Limit
NEC	National Electrical Code
OA	Outdoor Air
OAD	Outdoor Air Damper
OADE	Energize Exhaust Fan OAD Setpoint
OADH	OAD Min Position High-Speed Setpoint
OADL	OAD Min Position Low-Speed Setpoint
OADM	OAD Min Position Medium-Speed Setpoint
OADP	Outdoor Air Damper Position
OALS	Outside Air Lockout Position
OAMX	OAD Maximum Position Setpoint
OAT	Outdoor Air Temperature
OCS	Occupied Cooling Setpoint
OHS	Occupied Heating Setpoint
PI	Proportional Integral
PPM	Parts Per Million
RH	Relative Humidity
RHS	Space Humidity Setpoint
RO	Read Only
RW	Read Write
SCS	Standby Cooling Setpoint
SHS	Standby Heating Setpoint
TXV	Thermal eXpansion Value
UCS	Unoccupied Cooling Setpoint
UHS	Unoccupied Heating Setpoint
UV	Unit Ventilator
UVC	Unit Ventilator Controller
UVCM	UVC (Heat/Cool) Mode Output
UVCS	UVC State Output
VALP	Wet Heat Valve Position
VCLL	Ventilation Cooling Low Limit
WH	Wet Heat
WITD	Source (Water-in) Temperature Differential

SAFETY INFORMATION

Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing operations. Have a fire extinguisher available. Follow all warnings and cautions in these instructions and attached to the unit. Consult applicable local building codes and National Electrical Codes (NEC) for special requirements.

Recognize safety information. When you see a safety symbol on the unit or in these instructions, be alert to the potential for personal injury. Understand the meanings of the words DANGER, WARNING, and CAUTION. DANGER identifies the most serious hazards that will result in death or severe personal injury; WARNING means the hazards can result in death or severe personal injury; CAUTION identifies unsafe practices that can result in personal injury or product and property damage.

Improper installation, adjustment, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may result in personal injury or property damage. This product must be installed only by personnel with the training, experience, skills, and applicable licensing that makes him/her "a qualified professional HVACR installer."

⚠ DANGER	⚠ WARNING	⚠ CAUTION
DISCONNECT ALL ELECTRICAL POWER BEFORE SERVICING UNIT TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK.	HAZARDOUS VOLTAGE! DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING. FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.	USE COPPER CONDUCTORS ONLY. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS. FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

⚠ WARNING

Electric shock hazard. Can cause personal injury or equipment damage.
This equipment must be properly grounded. Connections and service to the MicroTech II control panel must be performed only by personnel that are knowledgeable in the operation of the equipment being controlled.

⚠ WARNING

Hazardous Voltage! Disconnect all electric power before servicing.
Failure to disconnect power (including remote disconnects) before servicing can cause severe personal injury or death.

⚠ WARNING

Rotating Fan Blade! Disconnect all electric power before servicing.
Failure to disconnect power (including remote disconnects) before servicing can cause severe personal injury or death.

⚠ WARNING

Hot Surface! Do not touch surface.
Can cause minor to severe burns.

⚠ WARNING

If the unit ventilator is to be used for temporary heating or cooling, the unit must first be properly commissioned. Failure to comply with this requirement will void the warranty.

⚠ CAUTION

Extreme temperature hazard can cause damage to system components.
This MicroTech II controller is designed to operate in ambient temperatures from -40°F to 158°F. It can be stored in ambient temperatures from -65°F to 176°F. The controller is designed to operate in a 10% to 90% RH (non-condensing) and be stored in a 5% to 95% RH (non-condensing) environment.

⚠ CAUTION

Static sensitive components. A static discharge while handling electronic circuit boards can cause damage to the components.
Discharge any static electrical charge by touching the bare metal inside the main control panel before performing any service work. Never unplug any cables, circuit board terminal blocks, relay modules, or power plugs while power is applied to the panel.

⚠ CAUTION

For proper space control, and a more trouble free unit operation, it is important that an occupancy control means be used such that the unit is placed into unoccupied mode during regular low load conditions such as nighttime, weekends and holidays.

NOTICE

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause interference to radio communications. It 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 the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
McQuay® International disclaims any liability resulting from any interference or for the correction thereof.

INTRODUCTION

This manual contains information regarding the MicroTech II™ control system used in the AAF®-HermanNelson® Unit Ventilator product line. It describes the MicroTech II components, input/output configurations, field wiring options and requirements, and service procedures.

For installation and general information on the MicroTech II Unit Ventilator Controller, refer to the appropriate installation and maintenance bulletin, see Table 2.

For installation, commissioning instructions and general information on a particular unit ventilator model, refer to the appropriate model-specific installation manual, refer to Table 3.

For installation and manual instructions on a particular plug-in communications card, refer to the appropriate protocol-specific installation manual, see Table 4. For a description of supported network variables for each protocol refer to Protocol Data Packet bulletin, see Table 4.

Table 2. MicroTech UVC Installation Literature

Unit Ventilator Control Configuration	Bulletin Number
MicroTech II Unit Ventilator Controller	IM 747

Table 3. Model-Specific Unit Ventilator Installation Literature

Unit Ventilator Model Designations	Description	Installation Manual Bulletin Number
AED, AEQ	Air Source Heat Pump	IM 502
ARQ, ERQ	Water Source Heat Pump	IM UV-3-202
AZS, AZQ, AZV, AZU, AZR	Self-contained	IM 503
AVS, AVV, AVR, AVB	Vertical Split-system	IM 725
AHF, AHV, AHR, AHB	Horizontal Split-system	

Table 4. Protocol-Specific Communication Card Installation Literature and Protocol Data

Unit Ventilator Available Protocols	Bulletin Number
Unit Ventilator Unit Controller LonWorks® Communications Module	IM 729
Unit Ventilator Unit Controller JCI N2 Open® Communications Module	IM 730
Unit Ventilator Unit Controller BACnet® Communications Module	IM 731
Protocol Data Packet	ED-15065

GETTING STARTED

Using the Local User Interface (LUI)

The MicroTech II UVC is a self-contained device that is capable of complete, stand-alone operation. Information in the controller can be displayed and modified by using the Local User Interface (LUI). The following sections describe how to use the LUI.

Figure 1. Local User Interface (LUI)

NOTICE

Many UVC parameters are accessible both through the LUI and the network interface. The shared LUI and the network interface variables have a "last-change-wins" relationship.

2-DIGIT 7-SEGMENT DISPLAY

The LUI 2-digit 7-segment display normally will be displaying the effective (current) heating or cooling setpoint (Effective Setpoint Output). The LUI display is also used to view and adjust many UVC parameters as explained in the following sections.

NOTICE

When the UVC is in the Off mode, the LUI will display the current heating setpoint and all other LED's will be switched off.

ON/STOP BUTTON AND LED

The On/Stop button is used to toggle the UVC between Off mode and running (Application Mode Input). The On/Stop LED will be off when the UVC is in the off mode.

NOTICE

The UVC archives each change to the LUI Fan and Mode buttons. When the On/Stop button is used to bring the unit out of Off mode, the UVC will implement the last active fan and unit modes.

NOTICE

Each time the UVC power is cycled, the UVC will be in auto fan and auto unit modes when power is returned.

FAN BUTTON

The Fan button is used to toggle through each of the Fan speeds (Fan Speed Command Input): Auto, Low, Medium, and High.

MODE BUTTON

The Mode button is used to toggle through the LUI accessible unit modes (Heat/Cool Mode Input): Auto, Heat, Cool, and Fan Only.

ARROW BUTTONS

The arrow buttons are used to scroll between and adjust parameters.

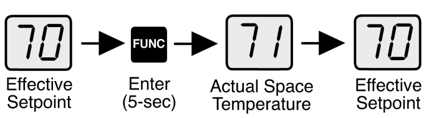
FUNC BUTTON

The Func button is used to view the actual space temperature. The Func button is also used as an ENTER key to confirm selection and changes to user adjustable or viewable parameters.

VIEWING ACTUAL TEMPERATURE (IAT)

The LUI displays the setpoint temperature. The LUI can be used to view the actual room temperature. See Figure 2.

Figure 2. Viewing Actual Temperature (IAT)



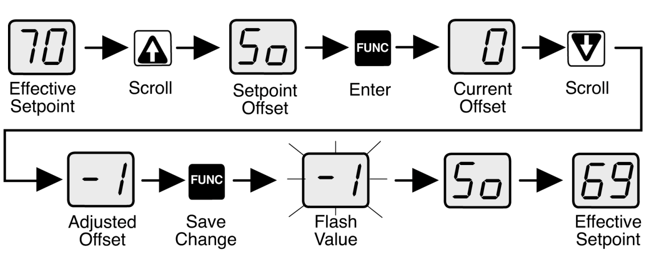
NOTICE

When the actual space temperature (Effective Space Temp Output) equals the effective setpoint (Effective Setpoint Output) you will see no change to the LUI display when you view space temperature.

USING THE LUI TO ADJUST SETPOINT OFFSET

The LUI can be used by room occupants to easily make +/- 5°F (+/- 3°C) adjustments to the effective temperature setpoint. See the Space Temperature Setpoints section to learn more about temperature setpoints.

Figure 3. Adjusting the Setpoint Offset



NOTICE

The setpoint offset is cleared after every power cycle. When changing the setpoint offset after a power cycle, or for the first time, this cleared value will be shown as the highest allowed value (5°F / 3°C) but will not be an actual offset value.

NOTICE

When using the 55°F to 85°F remote wall sensor, the UVC will ignore any LUI setpoint offset adjustments.

NOTICE

When using the +/- 3°F (+/- 1.7°C) remote wall sensor, any setpoint offset adjustment made at the LUI will cause the UVC to override and ignore the remote wall sensor setpoint adjustment knob. To again use the remote wall sensor setpoint adjustment knob, you must clear the LUI setpoint offset adjustment by cycling UVC power.

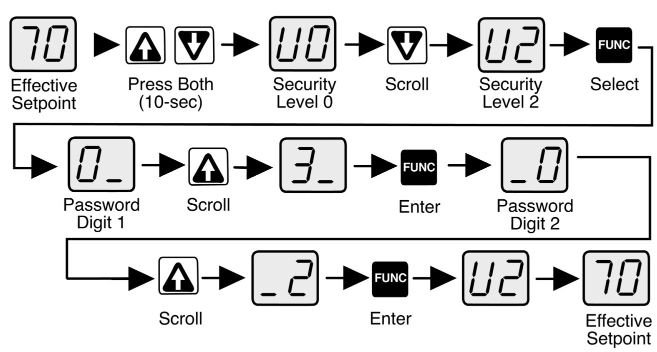
LOCAL USER INTERFACE (LUI) SECURITY LEVELS

The LUI provides a 4-level password security feature which can be used by owners to restrict LUI access.

Table 5. LUI Security Levels

	Two Digit Display	What is Restricted?	Password
Level 0	Uo	Default level (access all)	10
Level 1	U1	Do not allow user to adjust setpoint	21
Level 2	U2	Do not allow user to adjust setpoint nor make Mode button changes	32
Level 3	U3	Do not allow user to adjust setpoint nor make Mode and Fan button changes	43

Figure 4. Changing LUI Security Levels



WHY CAN'T I USE THE MODE OR FAN BUTTON, OR ADJUST SETPOINT OFFSET?

Most likely this is due to the security feature being used. If the security feature is set higher than level 0, then some LUI functionality is locked out. To ensure this is not the problem, enter the level 0 password then try again to use the LUI.

LUI Menu Reference

The LUI menu eases troubleshooting and simplifies UVC configuration as the most common parameters and system status values can be accessed without the need of a Personal Computer or network interface. The LUI menu is accessed via an unmarked, Hidden button. This Hidden button is located behind the letter "h" in the MicroTech II logo on the LUI face.

The LUI menu consists of two levels. The first level is the LUI Menu Item List containing alphanumeric characters which represent each parameter. The second level is the level where the parameters value is viewed, and can be adjusted if the parameter is adjustable. A 5-second inactivity timer is used to automatically back out of the menu levels until returning to the effective setpoint display. See figure 5 for procedure to change LUI Menu Item.

Figure 5. Changing an LUI Menu Item

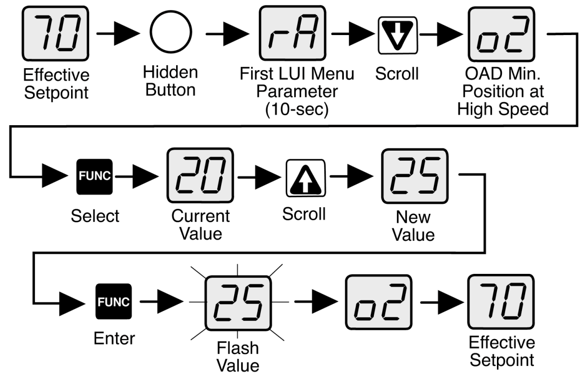


Table 6. LUI Menu Item List

Two Digit Display	LUI Menu Item List	Abr.	Description	②	05	Default
rA	Reset Alarm Input		Enter 1 to clear alarms (clears all inactive alarms, except filter alarm). You must enter a 0 value after entering a 1 in order to re-enable the alarm feature.	RW	x	┌┘┌┘ ①
HC	UVC (Heat/Cool) Mode Output	UVCM	Display current UVC mode.	RO	x	
St	UVC State Output	UVCS	Display current UVC state.	RO	x	
d0	Discharge Air Temp Setpoint Output	DATS	Display current DA temperature setpoint.	RO	x	
d1	Discharge Air Temp Output	DAT	Display current DA temperature.	RO	x	
d2	Ventilation Cooling Low Limit Setpoint	VCLL	Adjust economizer cooling DA temperature low limit.	RW	x	54°F (12°C)
d3	Mechanical Cooling Low Limit Setpoint	MCLL	Adjust mechanical cooling DA temperature low limit. This value can only be displayed in degrees C.	RW	x	45°F (7°C)
SL	Slave Type Configuration		Set slave type: 0 = Independent (slave uses own sensors), 2 = bypass, 1 = Dependent (slave follows master).	RW	x	0
Eo	Effective Occupancy Output		Display current occupancy: 0 = occupied, 1 = unoccupied, 3 = standby.	RO	x	
oC	Occupancy Override Input		Set occupancy: 0 = occupied, 1 = unoccupied, 2 = bypass, 3 = standby. Adjusting this variable is only intended for troubleshooting, once you are done you must cycle unit power to clear this variable and return the UVC to normal operation.	RW	x	┌┘┌┘ ①
Co	Occupied Cooling Setpoint	OCS	Adjust occupied cooling setpoint.	RW	x	73°F (23°C)
CS	Standby Cooling Setpoint	SCS	Adjust standby cooling setpoint.	RW	x	77°F (25°C)
CU	Unoccupied Cooling Setpoint	UCS	Adjust unoccupied cooling setpoint.	RW	x	82°F (28°C)
Ho	Occupied Heating Setpoint	OHS	Adjust occupied heating setpoint.	RW	x	70°F (21°C)
HS	Standby Heating Setpoint	SHS	Adjust standby heating setpoint.	RW	x	66°F (19°C)
HU	Unoccupied Heating Setpoint	UHS	Adjust unoccupied heating setpoint.	RW	x	61°F (16°C)
rS	Wall Sensor Type		Set wall sensor type: 0 = +/- 3°F, 1 = 55°F to 85°F.	RW	x	0
o1	Outside Air Damper Position Output	OADP	Display OA damper position.	RO	x	
o2	OAD Min Position High-Speed Setpoint	OADH	Adjust OA damper minimum position with IAF at high speed. (this variable will be factory set to 5% open when the unit is ordered with optional CO2 DCV)	RW	x	20%
o3	OAD Min Position Med-Speed Setpoint	OADM	Adjust OA damper minimum position with IAF at medium speed. (this variable is ignored when the unit is ordered with optional CO_2 DCV)	RW	x	30%
o4	OAD Min Position Low-Speed Setpoint	OADL	Adjust OA damper minimum position with IAF at low speed. (this variable is ignored when the unit is ordered with optional CO_2 DCV)	RW	x	35%
o5	Exhaust Interlock OAD Min Position Setpoint	EOAD	Adjust OA damper minimum position when the exhaust interlock input is energized.	RW	x	99%
o6	Energize Exhaust Fan OAD Setpoint	OADE	Adjust OA damper position above which the exhaust fan output will be energized.	RW	x	10%
o7	OAD Max Position Setpoint	OAMX	Adjust OA damper maximum position.	RW	x	99%
o8	OAD Lockout Enable		Set OA damper lockout feature status: 0 = disable, 1 = enable. (this variable will be factory set to 1 when the unit is ordered as a recirc unit with no OAD)	RW	x	0
o9	OAD Lockout Setpoint	OALS	Adjust OA temperature below which the OA damper will be closed if the OA damper lockout is enabled. (this variable will be factory set to –99°C when the unit is ordered as a recirc unit with no OAD)	RW	x	36°F (2°C)

Continued on next page.

Table 6. LUI Menu Item List (Continued)

Two Digit Display	LUI Menu Item List	Abr.	Description	②	05	Default
E1	Economizer Enable		Set economizer status: 0 = disable, 1 = enable.	RW	x	1
E2	Economizer OA Temp Setpoint	ETS	Adjust economizer OA temperature setpoint.	RW	x	68°F (20°C)
E3	Economizer IA/OA Temp Differential	ETD	Adjust economizer IA/OA temperature differential.	RW	x	2°F (1°C)
E4	Economizer Compare Differential	ECD	Adjust economizer IA/OA temperature differential. This variable is identical to Economizer IA/OA Temp Differential and therefore need not be used (do not change).	RW	x	0°F (0°C)
E5	Economizer OA Enthalpy Setpoint	EES	Adjust economizer OA enthalpy setpoint.	RW	x	25 btu/lb (58 kJ/kg)
E6	Economizer IA/OA Enthalpy Differential	EED	Adjust economizer IA/OA enthalpy differential.	RW	x	1 btu/lb (3 kJ/kg)
r2	Space Humidity Setpoint	RHS	Adjust room humidity setpoint, for active dehumidification (optional).	RW	x	60%
r3	Outdoor Air Humidity Output	EORH	Display OA humidity (optional).	RO	x	
ot	Outdoor Air Temp Output	EOAT	Display OA temperature.	RO	x	
H1	Emergency Heat Enable		Set emergency heat status: 0 = disable, 1 = enable.	RW	x	1
H2	Emergency Heat Setpoint	EHS	Adjust emergency heat setpoint.	RW	x	54°F (12°C)
H3	Emergency Heat Shutdown Configuration		Set emergency heat operation during shutdown, 0 = no emergency heat during shutdown: 1 = allow emergency heat during shutdown.	RW	x	0
A1	Auxiliary Heat Start Differential	AHSD	Adjusts auxiliary heat start differential.	RW	x	2°F (1°C)
A2	Auxiliary Heat End Differential	AHED	Adjusts auxiliary heat stop differential.	RW	x	2°F (1°C)
A3	Auxiliary Heat Configuration		Set auxiliary heat type: 0 = N.O. device, 1 = N.C. device	RW	x	0
b3	External BI-3 Configuration		Set the function of external binary input 3: 0 = ventilation lockout, 1 = exhaust interlock.	RW	x	0
b6	External BO-3 Configuration		Set the function of external binary output 3: 0 = auxiliary heat, 1 = exhaust fan on/off signal.	RW	x	0
CF	Fan Cycling Configuration		Set if IAF cycles (switches off) during occupied, bypass, and standby mode: 2 = no cycling, 3 = cycle IAF.	RW	x	2
CE	Filter Alarm Enable		Set filter alarm status: 0 = disable, 1 = enable.	RW	x	0
Cr	Reset Filter Alarm Input		Enter 1 to clear filter alarm. You must go back and enter a 0 value after entering a 1 to re-enable the filter alarm.	RW	x	--①
C1	Compressor Enable		Set compressor status: 0 = disable, 1 = enable.	RW	x	1
C2	Compressor Cooling Lockout Setpoint	CCLO	Adjust compressor cooling lockout setpoint. When the OA temperature falls below this setpoint compressor cooling is not allowed.	RW	x	61°F (16°C)
C6	Compressor Start Delay		Adjust compressor start delay. This setpoint should be changed for every UVC to prevent many compressors from energizing at the same time after a power failure or occupancy change.	RW	x	0 sec
Un	LUI Temperature Units		Set LUI temperature display units in degrees F or degrees C.	RW	x	F

① If a menu item value is greater than 2-digits (higher than 99), then -- will be displayed by the LUI.

② RW = read and write capable, RO = read only. (All RO values displayed are snapshots and are not dynamically updated as the value is displayed.)

③ Additional UVC field configuration is required if the dewpoint/humidity binary input is used, consult the factory.

State Programming

The MicroTech II UVC takes advantage of state machine programming to define and control unit ventilator operation. State machines define specific states, or modes of operation for each process within the unit ventilator (i.e. heating, cooling, etc.) and contain the specific logic for each state. This eliminates some of the most common problems associated with control sequences such as the possibility of simultaneous heating and cooling, rapid cycling, etc.

State machine programming, and the unique nature of state diagrams, can be easily used to describe unit ventilator operation, and can vastly simplify sequence verification during unit commissioning, as well as simplify troubleshooting. With the unique combination of state machine programming and the LUI's ability to allow a technician to easily determine the active UVC state, troubleshooting the UVC can be very simple.

The state diagrams presented in the following sections consist of several "elements" including Super States, States, Conditional Jumps (also called transitions) and a Transition Point. Super states are used as a means to group two or more related states into a single control function such as cooling, or heating, etc. States are where all the actual work takes place, within each state the UVC enables PI-loops and other logic sequences required to control unit ventilator operation within that particular state, while other functions and PI-loops not needed during that state may be disabled. Conditional jumps, or transitions, are the logic paths used by the UVC to determine which state should be made active, these are the "questions" the UVC will continually consider. The transition point is simply a point through which a number of conditional jumps meet, you can think of it as a point where a number of questions must be considered from which the UVC then determines which path is followed and which state is then made active.

The UVC states and super states are used to define the "normal" unit modes, such as Off, Night Purge, Fan Only, Emergency Heat, Auto, Cool and Heat. The UVC also supports several "special purpose" unit modes such as Purge, Pressurize, De-pressurize, and Shutdown, which can be forced via a network connection and override typical UVC operation.

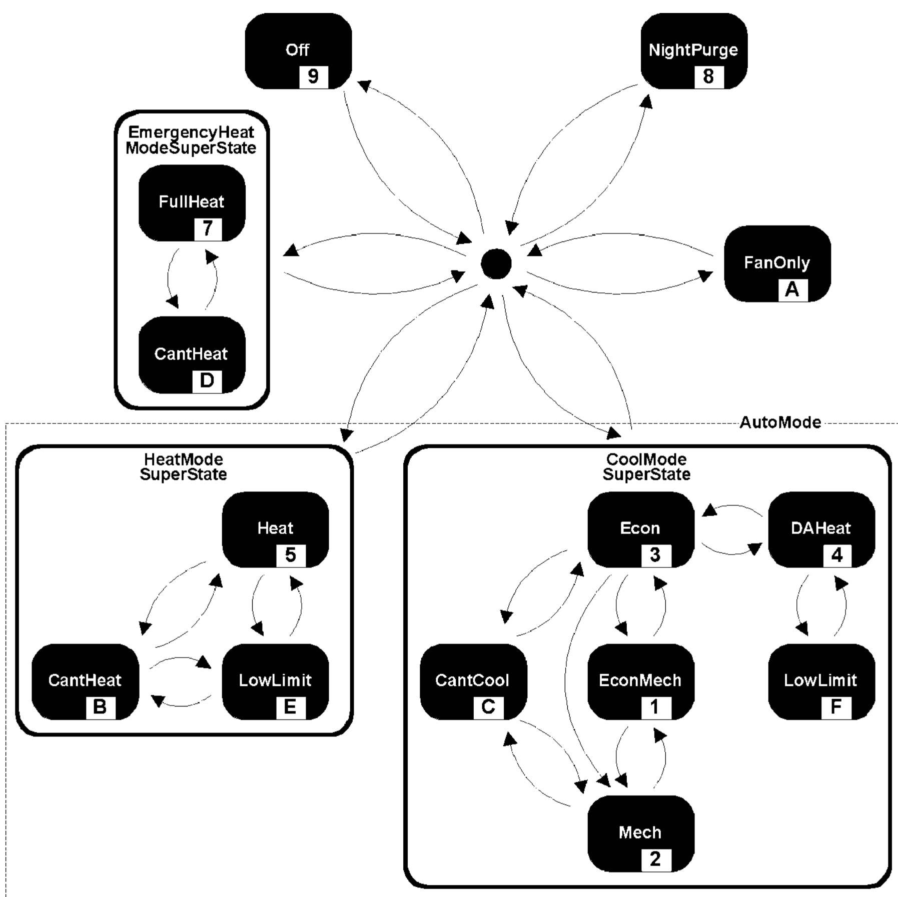
NOTICE

Not all states or modes are available for all UV configurations, and some states (such as Active Dehumidification) are optional.

NOTICE

In the state descriptions below the terms saturated high and saturated low indicate that the heating or cooling function being described has reached 100% or 0% respectively.

Figure 6. Complete UVC - State Program



UVC Unit Modes

The UVC provides several “normal” modes of unit operation, these include Off, Night Purge, Fan Only, Cool, Emergency Heat, Auto, Heat and Cool.

Normal UVC modes can contain a single state or several states dependent upon the functionality required for each particular mode.

Each UVC state has been assigned a number. This state number can be very helpful when trying to understand which state is currently active within the UVC. The current UVC state number can be viewed using the LUI. See Figure 6 for Super State and State.

Table 7. UVC State Names and Numbers (see figure 6)

Normal UVC Modes		State Names	State Numbers (ASCII)
Off		Off	9(57)
Night Purge		Night Purge	8(56)
Fan Only		Fan Only	A(65)
Emergency Heat Super State		Full Heat	7(55)
		Cant Heat	D(68)
Auto	Heat Super State	Heat	5(53)
		Cant Heat	B(66)
		Low Limit	E(69)
	Cool Super State	EconMech	1(49)
		Mech	2(50)
		Econ	3(51)
		DA Heat	4(52)
		Cant Cool	C(67)
		Low Limit	F(70)

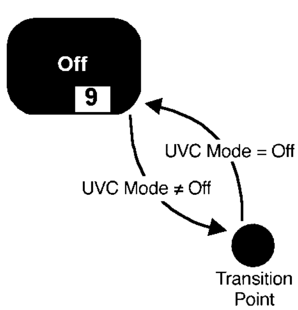
⚠ WARNING

Off mode is a “stop” state for the unit ventilator. It is not a “power off” state. Power may still be provided to the unit.

OFF MODE (STATE NUMBER 9)

Off mode is provided so that the UVC can be forced into a powered off condition. The Off mode is a “stop” state for the unit ventilator, it is not a power off state. The LUI or a network connection can force the unit into the Off mode. Off mode consists of a single UVC state: Off [9].

Figure 7. Off State Diagram



Transition into State (UVC Mode = Off)

Operation within State When Off mode becomes active, the UVC stops all normal heating, cooling, ventilation (OA damper is closed), and fan operation. The UVC will continue to monitor space conditions, indicate faults, and provide network communications (if connected to a network) as long as power is maintained to the unit. If the space temperature drops below EHS, and the Emergency Heat function is enabled, the UVC will be forced into the Emergency Heat mode (see Emergency Heat Mode). The space lighting output will continue to operate normally based upon the current UVC occupancy mode.

Special purpose unit modes (i.e. Purge, Pressurize, and De-pressurize modes) accessed via a network connection can force the UVC to perform “special” functions during which the UVC will appear to be in the Off mode. See Special Purpose Unit Modes, and the UVC Unit Mode Priority sections for more information.

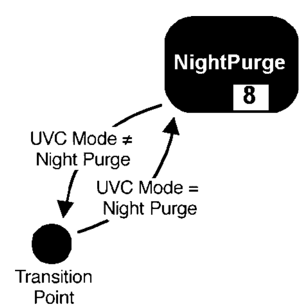
The UVC will remain in this state until one of the transition out conditions become true.

Transition out of State (UVC Mode ≠ Off)

NIGHT PURGE MODE (STATE NUMBER 8)

Night Purge mode is provided as a means to more easily and quickly ventilate a space. Night purge can be useful in helping to remove odor build up at the end of each day, or after cleaning, painting, or other odor generating operations occur within the space. Night Purge is a full ventilation with exhaust mode, during which room comfort will very likely be compromised, it is therefore strongly recommended that Night Purge only be used when the space is unoccupied. The LUI or a network connection can force the unit into the Night Purge mode. Night Purge mode consists of a single UVC state: Night Purge [8].

Figure 8. Night Purge State Diagram



Transition into State (UVC Mode = Night Purge)

Operation within State When Night Purge mode becomes active, the UVC stops all normal heating and cooling as any new energy used to treat the incoming air would be wasted in the

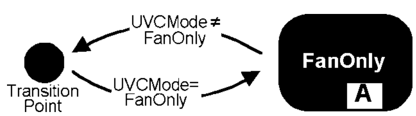
purging process. In the Night Purge mode the space fan will be set to high speed, the OA damper will be set to 100% open, and the Exhaust Fan binary output (see External Binary Outputs) will be set to On. If not set to another mode within 1-hour, the UVC will force itself into the Fan Only mode (see Fan Only Mode). If the space temperature drops below the EHS, and the Emergency Heat function is enabled, the UVC will be forced into the Emergency Heat mode (see Emergency Heat Mode).
The UVC will remain in this state until one of the transition out conditions become true.

Transition out of State (UVC Mode ≠ Night Purge)

FAN ONLY MODE (STATE NUMBER A)

The Fan Only mode is provided so that the UVC can be forced into a Fan Only operation. The LUI or a network connection can force the unit into the Fan Only mode. Fan Only mode consists of a single UVC state: Fan Only [A].

Figure 9. Fan Only State Diagram



Transition into State (UVC Mode = Fan Only)

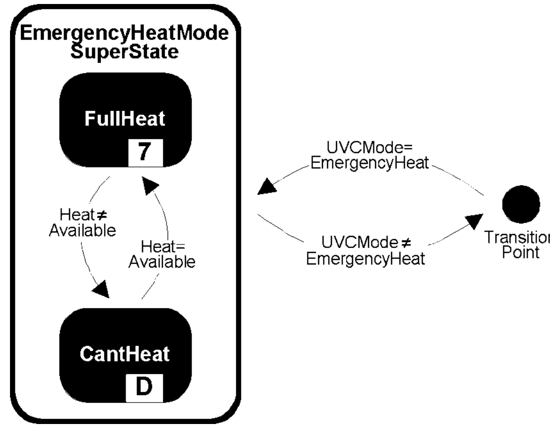
Operation within State When Fan Only mode becomes active, the UVC stops all normal heating and cooling. If the space temperature drops below the EHS, and the Emergency Heat function is enabled, the UVC will be forced into the Emergency Heat mode (see the Emergency Heat Mode).
The UVC will remain in this state until one of the transition out conditions become true.

Transition out of State (UVC Mode ≠ Fan Only)

EMERGENCY HEAT MODE (SUPER STATE)

The Emergency Heat mode is provided for situations where the UVC is in a mode that does not normally allow heating, such as Off, Cool, Night Purge, or Fan Only. If Emergency Heat mode is enabled, the UVC can automatically force itself into the Emergency Heat mode from Off, Cool, Night Purge, Fan Only, Purge, Pressurize, De-pressurize, and Shutdown. Additionally, the LUI or a network connection can be used to force the unit into the Emergency Heat mode. Emergency Heat mode consists of two UVC states: Full Heat [7] and Cant Heat [D]. Software model 05 does not have primary or secondary heating devices. The UVC will use auxiliary heat (if field provided and field connected) when emergency heat is required.

Figure 10. Emergency Heat State Diagram



Transition into Super State (UVC Mode = Emergency Heat)

Operation within Super State When the Emergency Heat mode super state becomes active, the UVC will automatically determine which UVC state to make active, Full Heat [7] or Cant Heat [D], based upon the transitions for each of those states.
The UVC will remain in this super state until one of the transition out conditions become true.

Transition out of Super State (UVC Mode ≠ Emergency Heat)

Full Heat State (State Number 7)

The Full Heat state is the "normal" state that the UVC will go into when Emergency Heat mode is active.

Transition into State Heat = Available

Operation within State When Emergency Heat mode becomes active, the UVC will go into 100% heating until the space temperature raises to the EHS plus a fixed differential (9°F / 5°C). In the Emergency Heat mode the space fan will be set to high speed, and the OA damper will operate normally. If the UVC forces itself into the Emergency Heat mode from another mode, then the UVC will return to the appropriate unit mode once the space temperature rises to the EHS plus the fixed differential. The UVC will monitor the DAT to ensure it does not exceed DAHL. If the DAT does exceed DAHL (140°F / 60°C default), then heating will be set to 0% for a minimum of 2-minutes (fixed) and until the DAT drops 18°F (10°C) fixed differential below DAHL.
The UVC will remain in this state until one of the transition out conditions become true, or until one of the superstate transition out conditions becomes true.

Transition out of State (Heat ≠ Available)

Notes:
(Heat ≠ Available) is true when an IAT or DAT sensor fault exists (see Unit Faults).

Cant Heat State (state number D)

The Cant Heat state is a “non-normal” state that the UVC can go into when Emergency Heat mode is active. Only an IAT or DAT sensor fault during Emergency Heat mode will cause the UVC to make this state active.

Transition into State | (Heat ≠ Available)

Operation within State | When the Cant Heat state becomes active, the space fan will remain at high speed.
The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.

Transition out of State | (Heat = Available)

Notes:
(Heat ≠ Available) is true when an IAT or DAT sensor fault exists (see Unit Faults).

AUTO MODE

Auto mode is provided so that the UVC can be set to automatically determine if heating, cooling or dehumidification is required. Auto mode is the default start-up UVC mode. Auto mode is made up of the Heat and Cool modes. When the UVC is set to auto mode, the UVC will determine which mode (Heat or Cool) to use.

HEAT MODE (SUPER STATE)

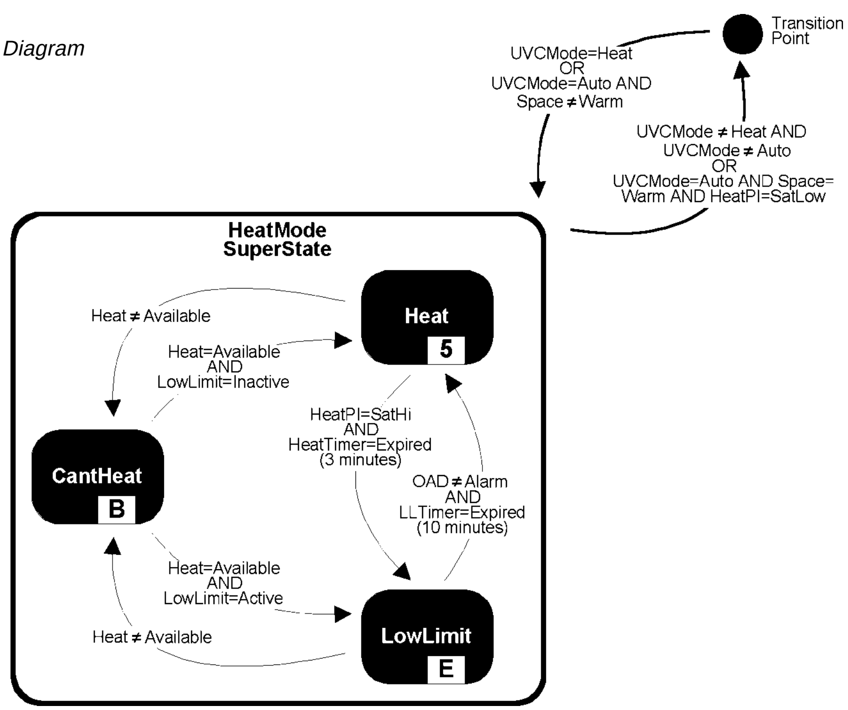
When in Heat mode the UVC will use auxiliary heat (if field provided and field connected to the unit) as needed to maintain the effective heating setpoint. The LUI or a network connection can be used to force the unit into the Heat mode. Additionally, the UVC when set to Auto mode can automatically force the unit into the Heat mode as needed. When the UVC is in Auto mode, it is “normal” for the UVC to “idle” in Heat mode when there is no need to switch to another mode. The Heat mode super state consists of three UVC states: Heat [5], Low Limit [E] and Cant Heat [B].

Transition into Super State | (UVC Mode = Heat)
OR
(UVC Mode = Auto ***AND*** Space Temperature ≠ Warm)

Operation within Super State | When the Heat mode super state becomes active, the UVC will automatically determine which UVC state to make active, Heat [5], Low Limit [E], or Cant Heat [B] based upon the transitions for each of those states. The UVC will remain in this super state until one of the transition out conditions become true.

Transition out of Super State | (UVC Mode ≠ Heat ***AND*** UVC Mode ≠ Auto)
OR
(UVC Mode = Auto ***AND*** Space Temp = Warm ***AND*** Heat PI = Saturated Low)

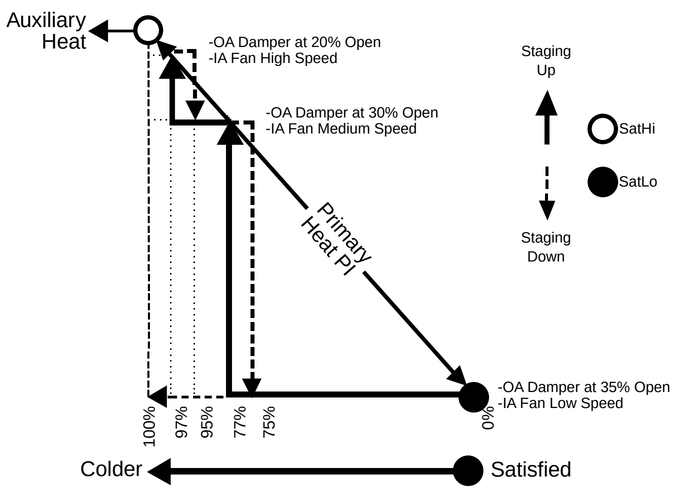
Figure 11. Heat Mode Super State Diagram



Heat State (state number 5)

The Heat state is the "normal" state that the UVC will go into when Heat mode is active.

Figure 12. Heat State Operation (Occupied Mode and Auto Fan)



Transition into State
(Heat = Available AND Low Limit = Inactive)
OR
(OAD ≠ Alarm ***AND*** Low Limit Timer = Expired)

Operation within State
When the Heat state becomes active, the UVC will continually calculate the DATS (see Discharge Air Temperature Control) required to maintain the effective heat setpoint (see Space Temperature Setpoints). The calculated DATS will not be allowed to go above DAHL. The UVC will use auxiliary heat (if field provided and field connected to the unit) as needed to maintain the current DATS. The Auxiliary Heat binary output (see External Binary Outputs) will be used as needed. The Heat Timer (3-minutes fixed) will begin counting. The CO_2 demand controlled ventilation function will be active, if the unit is equipped for CO_2 control (see CO_2 Demand Controlled Ventilation), and the OA damper will be adjusted as needed to maintain the CO_2 setpoint.
The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.

Transition out of State
(Heat ≠ Available)
OR
(Heat PI = Saturated High ***AND*** Heat Timer = Expired)

Notes:
The OAD is considered to be in "alarm" when the OAD is forced below the active minimum position in the Low Limit state. This is not an actual unit "alarm" or "fault" condition, but only a condition used for the purpose of transition arguments.

Low Limit State (state number E)

The Low Limit state is a "non-normal" state that the UVC can go into while Heat mode is active when the unit reaches 100% heating and still cannot meet the current DATS (see Discharge Air Temperature Control) required to maintain the effective heating setpoint (see Space Temperature Setpoints). This is only likely to occur if the OA temperature is very cold, the OA damper minimum position is set too high, the unit ventilator is oversized for the application, or if the electric heat has failed.

Transition into State
(Heat PI = Saturated High ***AND*** Heat Timer = Expired)
OR
(Heat = Available ***AND*** Low Limit = Active)

Operation within State
When the Low Limit state becomes active, the Low Limit PI-loop will override the OA damper minimum position (see Outdoor Air Damper Operation) and adjust the OA damper toward closed as necessary to maintain the current DATS (see Discharge Air Temperature Control). The Low Limit Timer (10-minutes fixed) will begin counting.
The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.

Transition out of State
(OAD ≠ Alarm ***AND*** Low Limit Timer = Expired)
OR
(Heat ≠ Available)

Notes:
The OA damper is considered to be in "alarm" when the OA damper is forced below the active minimum position in the Low Limit state. This is not an actual unit "alarm" or "fault" condition, but only a condition used for the purpose of transition arguments.

Cant Heat State (state number B)

The Cant Heat state is a "non-normal" state that the UVC can go into when Heat mode is active. An IAT or DAT sensor fault during the Heat mode will cause the UVC to make the Cant Heat state active.

Transition into State
(Heat ≠ Available)

Operation within State
When the Cant Heat state becomes active, no heating or ventilation will take place. The OA damper will be closed.
The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.

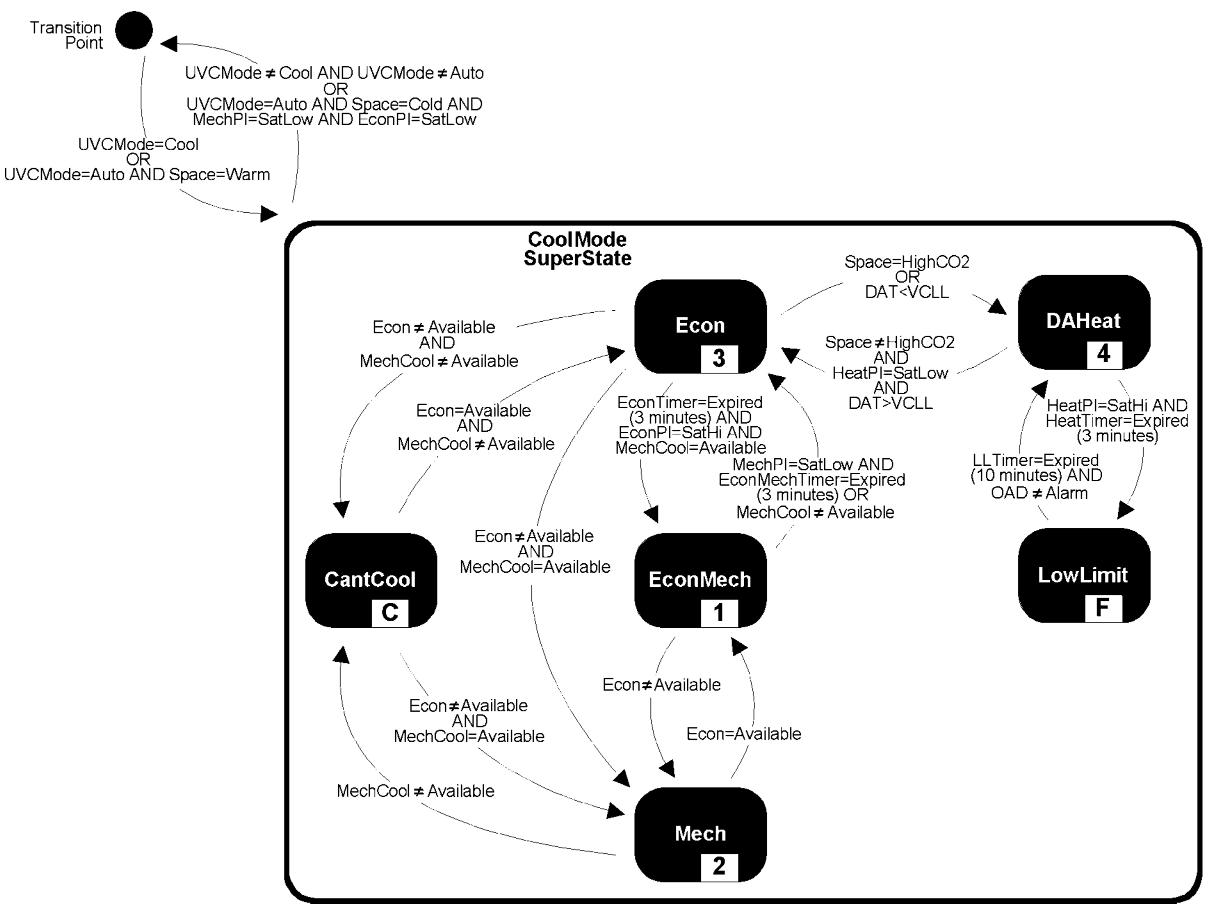
Transition out of State
(Heat = Available ***AND*** Low Limit = Active)
OR
(Heat = Available ***AND*** Low Limit = Inactive)

COOL MODE (SUPER STATE)

When in Cool mode the UVC will use primary cooling (economizer) and secondary cooling (mechanical, DX) as needed to maintain the effective cooling setpoint (see Space Temperature Setpoints). The LUI or a network connection can be used to force the unit into the Cool mode. Additionally, the UVC when set to Auto mode can automatically force the unit into the Cool mode. When the UVC is in Auto mode, it is "normal" for the UVC to "idle" in Cool mode when there is no need to switch to another mode. The Cool mode super state consists of seven UVC states: Econ [3], Econ Mech [1], Mech [2], DA Heat [4], Low Limit [F], Cant Cool [C], and Active Dehum [6] (optional).

Transition into Super State	(UVC Mode = Cool) ***OR*** (UVC Mode = Auto ***AND*** Space Temperature = Warm)
Operation within Super State	When the Cool mode super state becomes active, the UVC will automatically determine which UVC state to make active, Econ [3], Econ Mech [1], Mech [2], DA Heat [4], Low Limit [15] or Cant Cool [12] based upon the transitions for each of those states. If the space temperature drops below EHS, and the Emergency Heat function is enabled, the UVC will be forced into the Emergency Heat mode (see Emergency Heat Mode). The UVC will remain in this super state until one of the transition out conditions become true.
Transition of out Super State	(UVC Mode ≠ Cool ***AND*** UVC Mode ≠ Auto) ***OR*** (UVC Mode = Auto ***AND*** Space Temp = Cold ***AND*** Mech PI = Saturated Low ***AND*** Econ PI = Saturated Low)

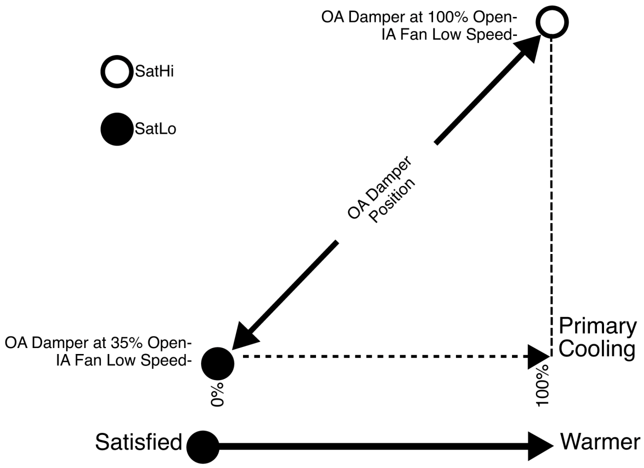
Figure 13. Cool Mode Super State Diagram



Econ State (state number 3)

The Econ state is a "normal" state that the UVC can go into when Cool mode is active. The Econ state is typically active in the Cool mode when primary cooling (economizer) is available and adequate to meet the cooling requirements.

Figure 14. Econ State Operation (Occupied Mode and Auto Fan)



Transition into State

(Econ = Available **AND** *Mech Cooling ≠ Available)*
OR
(Space ≠ High CO_2 ***AND*** Heat PI = Saturated Low ***AND*** DAT > VCLL)
OR
((Mech PI = Saturated Low ***AND*** Econ Mech Timer = Expired) ***OR*** (Mech Cooling ≠ Available))

Operation within State

When the Econ state becomes active, the UVC will use economizer cooling (see Economizer Operation) as needed to maintain the effective cooling setpoint (see Space Temperature Setpoints). The Econ Timer (3-minutes fixed) will begin counting. The UVC will monitor the DAT to ensure it does not fall below VCLL (see Ventilation Cooling Low Limit) setpoint. The CO_2 demand controlled ventilation function will be active, if the unit is equipped for CO_2 control (see CO_2 Demand Controlled Ventilation), and the OA damper will be adjusted as needed to maintain the CO_2 setpoint. The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.

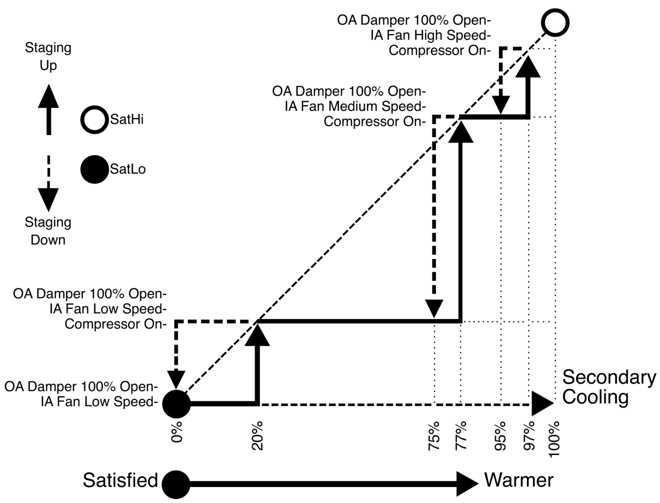
Transition out of State

(Econ ≠ Available ***AND*** Mech Cooling ≠ Available)
OR
(Space = High CO_2 ***OR*** DAT < VCLL)
OR
(Econ Timer = Expired ***AND*** Econ PI = Saturated High ***AND*** MechCool = Available)
OR
(Econ ≠ Available ***AND*** Mech Cooling = Available)

Econ Mech State (state number 1)

The Econ Mech state is a "normal" state that the UVC can go into when Cool mode is active. The Econ Mech state is typically active in the Cool mode when primary cooling (economizer) alone is not adequate to meet the cooling requirements and both primary cooling and secondary cooling (compressor) are available.

Figure 15. Econ Mech State Operation (Occupied Mode and Auto Fan)



Transition into State

(Econ Timer = Expired ***AND*** Econ PI = Saturated High ***AND*** Mech Cooling = Available)
OR
(Econ = Available)

Operation within State

When the Econ Mech state becomes active, the OA damper will be set to 100% open, and the UVC will use the unit's mechanical cooling capabilities (see Compressor Operation) as needed to maintain the effective cooling setpoint (see Space Temperature Setpoints). The Econ Mech Timer (3-minutes fixed) will begin counting. The UVC will monitor the DAT to ensure it does not fall below MCLL (see Mechanical Cooling Low Limit) setpoint.
The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.

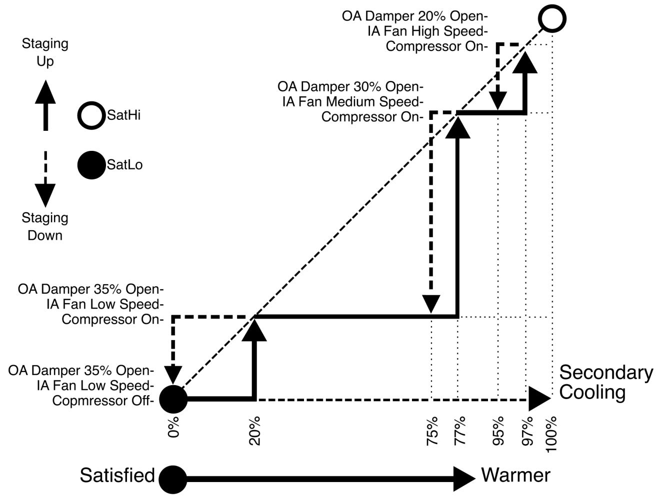
Transition out of State

((Mech PI = Saturated Low ***AND*** Econ Mech Timer = Expired) ***OR*** (Mech Cooling ≠ Available))
OR
(Econ ≠ Available)

Mech State (state number 2)

The Mech state is a "normal" state that the UVC can go into when Cool mode is active. The Mech state is typically active in the Cool mode when primary cooling (economizer) is not available and secondary cooling (compressor) is available.

Figure 16. Mech State Operation (Occupied Mode and Auto Fan)



Transition into State
(Econ ≠ Available)
OR
(Econ ≠ Available ***AND*** Mech Cooling = Available)

Operation within State
When the Mech state becomes active, the UVC will use the unit's mechanical cooling capabilities (see Compressor Operation) as needed to maintain the effective cooling setpoint (see Space Temperature Setpoints). The UVC will monitor the DAT to ensure it does not fall below MCLL (see Mechanical Cooling Low Limit) setpoint. The CO_2 demand controlled ventilation function will be active, if the unit is equipped for CO_2 control (see CO_2 Demand Controlled Ventilation), and the OAD will be adjusted as needed to maintain the CO_2 setpoint.
The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.

Transition out of State
(Econ = Available)
OR
(Mech Cooling ≠ Available)

CANT COOL STATE (STATE NUMBER C)

The Cant Cool state is a "non-normal" state that the UVC can go into when Cool mode is active. The Cant Cool state typically becomes active when primary (economizer) and secondary (compressor) cooling are not available (or they are disabled), an IAT, DAT or OAT sensor failure during the Cool mode can also cause the UVC to make the Cant Cool state active.

Transition into State
(Econ ≠ Available ***AND*** Mech Cooling ≠ Available)
OR
(Mech Cooling ≠ Available)

Operation within State
When the Cant Cool state becomes active, no cooling will take place.
The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.

Transition out of State
(Econ = Available ***AND*** Mech Cooling ≠ Available)
OR
(Econ ≠ Available ***AND*** Mech Cooling = Available)

DA Heat State (state number 4)

The DA Heat state is a "normal" state that the UVC can go into when Cool mode is active. The DA Heat state is typically active when reheat is required to maintain DATS while maintaining the required OA damper position. The DA Heat state can also be active if the optional CO_2 DCV feature is provided and CO_2 levels are high, requiring the OA damper to open beyond what would be required for economizer cooling.

Transition into State
(Space = High CO_2 ***OR*** DAT < VCLL)
OR
(Low Limit Timer = Expired ***AND*** OAD ≠ Alarm)

Operation within State
When DA Heat state is active, then the UVC will use the unit's heating capability as needed to maintain the VCLL setpoint. The Heat Timer (3-minutes fixed) will begin counting. The CO_2 demand controlled ventilation function will be active, if the unit is equipped for CO_2 control (see CO_2 Demand Controlled Ventilation), and the OAD will be adjusted as needed to maintain the CO_2 setpoint.
The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.

Transition out of State
(Space ≠ High CO_2 ***AND*** Heat PI = Saturated Low ***AND*** DAT > VCLL)
OR
(Heat PI = Saturated High ***AND*** Heat Timer = Expired)

Notes:
The OAD is considered to be in "alarm" when the OAD is forced below the active minimum position in the Low Limit state. This is not an actual unit "alarm" or "fault" condition, but only a condition used for the purpose of transition arguments.

Low Limit State (state number F)

The Low Limit state is a "non-normal" state that the UVC can go into while Cool mode is active. The Low Limit state typically follows the DA Heat state when the UVC has reached 100% heat and still cannot maintain VCLL.

Transition into State	(Heat PI = Saturated High ***AND*** Heat Timer = Expired) ***OR*** (Heat = Available ***AND*** Low Limit = Active)
Operation within State	When the Low Limit state becomes active, the Low Limit PI-loop will override the OAD minimum position (see Outdoor Air Damper Operation) and adjust the OAD toward closed as necessary to maintain the DAT setpoint (see Discharge Air Temperature Setpoint). The Low Limit Timer (10-minutes fixed) will begin counting. The UVC will remain in this state until one of the transition out conditions become true, or until one of the super state transition out conditions becomes true.
Transition out of State	(OAD ≠ Alarm ***AND*** Low Limit Timer = Expired) ***OR*** (Heat ≠ Available)

Notes:

The OAD is considered to be in "alarm" when the OAD is forced below the active minimum position in the Low Limit state. This is not an actual unit "alarm" or "fault" condition, but only a condition used for the purpose of transition arguments.

Special Purpose Unit Modes

There are some additional UVC modes that are considered special purpose unit modes, these include Pressurize, Depressurize, Purge, Shutdown and Energy Hold Off. These modes force the UVC to perform very specific and limited functions and must be used with caution and only for short periods as needed. These modes can only be accessed via a network connection.

In each of these special purpose UVC modes, if the space temperature drops below EHS, and the Emergency Heat function is enabled, the UVC will be forced into the Emergency Heat mode (see Emergency Heat Mode) and then return once the Emergency Heat function is satisfied.

Table 8. Actions during Special Purpose Unit Modes

	Indoor Air Fan (IAF)	Outdoor Air Damper (OAD)	Exhaust Fan Output
Pressurize	High	100% Open	Off
Depressurize	Off	Closed	On
Purge	High	100% Open	On
Shutdown	Off	Closed	Off
Energy Hold Off	Off	Closed	Off

Pressurize Mode

When in Pressurize mode the UVC will use the IAF, OAD, and exhaust output as needed to pressurize the space. The UVC stops all normal heating and cooling but does allow emergency heat if required. The pressurize mode can only be accessed via a network connection.

Depressurize Mode

When in Depressurize mode the UVC will use the IAF, OAD, and exhaust output as needed to depressurize the space. The UVC stops all normal heating and cooling but does allow emergency heat if required. The de-pressurize mode can only be accessed via a network connection.

Purge Mode

When in Purge mode the UVC will use the IAF, OAD, and exhaust output as needed to purge the space. The UVC stops all normal heating and cooling but does allow emergency heat if required. The purge mode can only be accessed via a network connection.

Shutdown Mode

Shutdown mode is the equivalent of the Off mode, but is an Off mode forced by a network connection. When in Shutdown mode the UVC stops all normal heating, cooling, ventilation (OA damper is closed), and fan operation. By default emergency heat will not be used during the shutdown mode, however, the UVC can be configured (Emergency Heat Shutdown Configuration) to allow emergency heat operation during shutdown mode. The shutdown mode can be accessed via a network connection and a binary input to the UVC.

> **⚠ WARNING**
>
> Shutdown mode and energy hold off mode is a "stop" state for the unit ventilator. It is not a "power off" state. Power may still be provided to the unit.

Energy Hold Off Mode

The UVC supports an energy hold off state, which when active forces the UVC to stop all normal heating, cooling and ventilation. Typically used by a network connection to force the UVC to cease heating, cooling and ventilation when conditions exist where heating, cooling and ventilation are not required or desired. Energy hold off mode is very similar to shutdown mode except that energy hold off always allows emergency heat if required. The energy hold off mode can only be accessed via a network connection.

UVC UNIT MODE PRIORITY

The UVC uses the network variables and binary inputs listed in the following tables, to determine unit mode. Special purpose UVC unit modes have higher priority than the normal UVC unit modes as shown in the following tables. Each table lists the highest priority items on the left to the lower priority items to the right, the right most columns indicate unit operation as a result of the left most columns.

Table 9. Special Purpose UVC Unit Mode Priority

			Priority Result		
Emergency Override Input ④	**Remote Shutdown Binary Input**	**Energy Hold Off Input ④**	**Energy Hold Off Output ④**	**Unit Mode Output ④**	**Actual UVC Action**
Normal	De-energized	Normal	Normal	See the Normal UVC Mode Priority table	
		Energy Hold Off	Energy Hold Off	Off	Off
	Energized	Don't Care	Energy Hold Off	Off	Off
Pressurize	Don't Care	Don't Care	Don't Care	Off	Pressurize
De-pressurize	Don't Care	Don't Care	Don't Care	Off	De-pressurize
Purge	Don't Care	Don't Care	Don't Care	Off	Purge
Shutdown	Don't Care	Don't Care	Don't Care	Off	Off

① Normal here indicated the UVC power-up condition.
② De-energized here means that the contacts connected to this binary input are open.
③ Energized here means that the contacts connected to this binary input are closed.
④ These are network variables.

Table 10. Normal UVC Mode Priority

		Priority Result
Application Override Input ②	**Unit Mode Override Input ②**	**Unit Mode Output ②**
Normal (Auto) ①	Normal (Auto) ①	Heat
		Cool
		Emergency Heat
	Heat	Heat
	Cool	Cool
	Night Purge	Night Purge
	Off	Off
	Emergency Heat	Emergency Heat
	Fan Only	Fan Only
Heat	Don't Care	Heat
Cool	Don't Care	Cool
Night Purge	Don't Care	Night Purge
Off	Don't Care	Off
Emergency Heat	Don't Care	Emergency Heat
Fan Only	Don't Care	Fan Only

① Normal (Auto) is the normal UVC power-up state.
② These are network variables.

Occupancy Modes

The UVC is provided with four occupancy modes: Occupied, Standby, Unoccupied, and Bypass. The occupancy mode effects which heating and cooling temperature setpoints will be used, effects IAF operation, and effects OAD operation. The Manual Adjust Occupancy and Networked Occupancy Sensor network variables, along with the Unoccupied and Tenant Override binary inputs, are used to determine the Effective Occupancy.

Table 11. Occupancy Mode Priority

			Priority Result
Occupancy Override Input ③	**Occupancy Sensor Input ③**	**Unoccupied Input Signal**	**Effective Occupancy Output ③**
Occupied	Don't Care	Don't Care	Occupied
Unoccupied	Don't Care	Don't Care	Unoccupied
Bypass	Occupied	Don't Care	Occupied
	Unoccupied	Don't Care	Bypass
	Null (default)	Contacts Open (Occupied)	Occupied
		Contacts Closed (Unoccupied)	Bypass
Standby	Don't Care	Don't Care	Standby
Null (default) ②	Occupied	Don't Care	Occupied
	Unoccupied	Don't Care	Unoccupied ①
	Null (default)	Contacts Open (Occupied)	Occupied
		Contacts Closed (Unoccupied)	Unoccupied ①

① The tenant override switch (unit or wall sensor mounted) can be used here to force the UVC into the Bypass Mode.
② Typical operation is defined in this row of the table.
③ These are network variables.

OCCUPIED MODE

The occupied mode is the normal day time mode of UVC operation. During occupied mode the UVC will use the occupied heating and cooling setpoints, the OAD will operate normally, and by default the IAF will remain on.

UNOCCUPIED MODE

The unoccupied occupancy mode is the normal night time mode of UVC operation. During unoccupied mode the UVC will use the unoccupied heating and cooling setpoints, the OAD will remain closed, and the IAF will cycle as needed for heating or cooling. The IAF will remain off when there is no need for heating or cooling.

STANDBY MODE

The standby mode is a special purpose day time mode of UVC operation. During standby mode the UVC will use the standby heating and cooling setpoints, the OAD will remain closed, and by default the IAF will remain on.

BYPASS MODE

The bypass mode (also called Tenant Override) is the equivalent of a temporary occupied mode. Once the bypass mode is initiated it will remain in effect for a set period of time (120-minutes default). During the bypass mode the UVC will use the occupied heating and cooling setpoints, the OAD will operate normally, and by default the IAF will remain on.

NETWORKED OCCUPANCY SENSOR CAPABILITY

A networked occupancy sensor can be interfaced with the Occupancy Sensor Input variable to select occupancy modes. When the Occupancy Sensor Input variable is used, it will automatically override any hard-wired unoccupied binary input signal.

UNIT-MOUNTED TIME-CLOCK

An optional unit-mounted factory-installed electronic 24-hour/7-day time clock can be provided on some unit ventilator configurations. This time clock is factory wired to the UVC unoccupied binary input and can be set to automatically place the unit into occupied and unoccupied modes based upon its user configured schedule.

UNIT-MOUNTED TENANT OVERRIDE SWITCH

A tenant override switch is factory installed in all floor mounted units. This tenant override switch is located near the LUI on the unit. The tenant override switch provides a momentary contact closure that can be used by room occupants to temporarily force the UVC into the bypass occupancy mode from unoccupied mode.

REMOTE WALL-MOUNTED SENSOR TENANT OVERRIDE SWITCH

The optional remote wall-mounted sensors include a tenant override switch. This tenant override switch provides a momentary contact closure that can be used by room occupants to temporarily force the UVC into the bypass occupancy mode from unoccupied mode.

REMOTE WALL-MOUNTED SENSOR STATUS LED

The optional remote wall-mounted sensors each include a UVC status LED. This status LED aids is diagnostics by indicating the UVC occupancy mode and fault condition.

Table 12. Remote Wall-Mount Sensor Status LED

Indication	LED Operation
Occupied	On Continually
Unoccupied	On 1-sec / Off 9-sec
Bypass	On Continually
Standby	On 9-sec / Off 1-sec
Fault	On 5-sec / Off 5-sec

Space Temperature Setpoints

The UVC uses the six occupancy-based temperature setpoints as the basis to determine the Effective Setpoint Output. The UVC will calculate the effective setpoint based upon the unit mode, the occupancy mode, and the values of several network variables. The effective setpoint is then used as the temperature setpoint that the UVC will maintain.

Table 13. Default Occupancy-based Temp Setpoints

Temperature Setpoints	Abr.	Defaults
Unoccupied Cool	UCS	82.4°F (28.0°C)
Standby Cool	SCS	77.0°F (25.0°C)
Occupied Cool	OCS	73.4°F (23.0°C)
Occupied Heat	OHS	69.8°F (21.0°C)
Standby Heat	SHS	66.2°F (19.0°C)
Unoccupied Heat	UHS	60.8°F (16.0°C)

NETWORKED SETPOINT CAPABILITY

The Space Temp Setpoint Input variable is used to allow the temperature setpoints for the occupied and standby modes to be changed via the network, the unoccupied setpoints are not effected by this variable.

NETWORKED SETPOINT OFFSET CAPABILITY

The Setpoint Offset Input variable is used to shift the effective occupied and standby temperature setpoints by adding the value of the Setpoint Offset Input variable to the current setpoints, the unoccupied setpoints are not effected by this variable. This variable is typically bound to a supervisory network controller (by others) or to a networked wall module (by others) having a relative setpoint adjustment.

NETWORKED SETPOINT SHIFT CAPABILITY

The Setpoint Shift Input variable is used to shift the effective heat/cool setpoints. It is typically bound to a networked supervisory controller which provides functions such as outdoor air temperature compensation. All occupied, standby and unoccupied setpoints will be shifted upward (+) or downward (-) by the corresponding value of the Setpoint Shift Input variable.

NOTICE

The Setpoint Shift Input capability is not available through the BACnet® interface.

NETWORKED SPACE TEMPERATURE SENSOR CAPABILITY

A networked space temperature sensor can be interfaced with the Space Temp Input variable. When the Space Temp Input variable is used (valid value), it will automatically override the hard-wired space temperature sensor.

LUI SETPOINT OFFSET ADJUSTMENT

The LUI can be used to make adjustments to the value of the Setpoint Offset Input variable. See “Using the LUI to adjust Setpoint Offset”.

NOTICE

The LUI and the network can both effect the Setpoint Offset Input variable, keep in mind that changes to this variable will be last-one-wins.

REMOTE WALL-MOUNTED SENSOR WITH +/- 3°F ADJUSTMENT (OPTIONAL)

When the optional remote wall-mounted sensor with +/- 3°F adjustment dial is used, the UVC will effectively write the value of the setpoint adjustment dial to the Setpoint Offset Input variable.

NOTICE

If it is intended that a network connection will be used to adjust the Setpoint Offset Input variable, then you must not use the optional remote wall-mounted sensor with +/- 3°F adjustment.

NOTICE

If it is intended that the LUI will be used by room occupants to adjust the Setpoint Offset, then you must not use the optional remote wall-mounted sensor with +/- 3°F adjustment. If you have the optional remote wall-mounted sensor with +/- 3°F adjustment and an occupant uses the LUI to make Setpoint Offset adjustments, this will override any +/- 3°F adjustment on the optional remote wall-mounted sensor as the LUI has higher priority. If you find that changes to the +/- 3°F adjustment on the remote wall-mounted sensor have no effect, it is likely the LUI has been used by an occupant to make a Setpoint Offset change, cycle unit power to clear this situation and restore the ability to change the Setpoint Offset from the +/- 3°F adjustment on the remote wall-mounted sensor.

REMOTE WALL-MOUNTED SENSOR WITH 55°F TO 85°F ADJUSTMENT (OPTIONAL)

When the optional remote wall-mounted sensor with 55°F to 85°F adjustment dial is used, the UVC will effectively write the value of the setpoint dial to the Space Temp Setpoint Input variable.

NOTICE

If it is intended that a network connection will be using the Space Temp Setpoint Input variable, then you must not use the optional remote wall-mounted sensor with 55°F to 85°F adjustment.

NOTICE

If it is intended that the LUI will be used by room occupants to adjust the Setpoint Offset, then you must not use the optional remote wall-mounted sensor with 55°F to 85°F adjustment. When using the optional remote wall-mounted sensor with 55°F to 85°F adjustment, the UVC will ignore any Setpoint Offset changes made at the LUI.

NOTICE

When using the optional remote wall-mounted sensor with 55°F to 85°F adjustment, the adjustment dial sets the value of the Space Temp Setpoint Input variable. The LUI will display the Effective Setpoint Output as shown in the Effective Setpoint Calculation Examples.

EFFECTIVE SETPOINT CALCULATION EXAMPLES

The UVC calculates the effective setpoint (Effective Setpoint Output) based upon the six occupancy setpoints for heating and cooling, occupancy mode, and the value of the network variables Space Temp Setpoint Input, Setpoint Offset Input and Setpoint Shift Input. The UVC will determine if heating or cooling is required based upon the current unit mode (Heat/Cool Mode Output) and then calculate the required setpoint for heating or cooling. After this calculation, the UVC sets the Effective Setpoint Output network variable equal to the calculated setpoint. The Effective Setpoint Output is the temperature setpoint that the UVC will maintain and which is normally displayed on the LUI. The following table provides some examples of how the UVC temperature setpoints are calculated.

Table 14. Effective Temp Setpoint Calculation Examples

Example A	**Given** OccupancyMode = Occupied or Bypass Heat/CoolMode = Heat SpaceTempSetpoint = (not used) SetpointOffset = (not used) = 0.0°F SetpointShift = (not used) = 0.0°F OHS = 69.8°F **Effective Setpoint Calculations** EffectiveSetpoint = OHS + SetpointOffset + SetpointShift = 69.8 + 0.0 + 0.0 = 69.8°F
Example B	**Given** OccupancyMode = Occupied or Bypass Heat/CoolMode = Heat SpaceTempSetpoint = 71.0°F SetpointOffset = -1.0°F (occupant adjustment on remote wall sensor, or LUI) SetpointShift = (not used) = 0.0°F OCS = 73.4°F, OHS = 69.8°F **Effective Setpoint Calculations** AbsoluteOffset = (OCS – OHS) / 2 =(73.4°F – 69.8°F) / 2 = 1.8°F EffectiveSetpoint = SpaceTempSetpoint – AbsoluteOffset + SetpointOffset + SetpointShift = 71.0 - 1.0 - 1.0 + 0.0 = 68.2°F
Example C	**Given** OccupancyMode = Occupied or Bypass Heat/CoolMode = Cool SpaceTempSetpoint = 71.0°F SetpointOffset = (not used) = 0.0°F SetpointShift = (not used) = 0.0°F OCS = 73.4°F, OHS = 69.8°F **Effective Setpoint Calculations** AbsoluteOffset = (OCS – OHS) / 2 = (73.4 – 69.8) / 2 = 1.8°F EffectiveSetpoint = SpaceTempSetpoint + AbsoluteOffset + SetpointOffset + SetpointShift = 71.0 + 1.8 + 0.0 + 0.0 = 72.8°F
Example D	**Given** OccupancyMode = Unoccupied Heat/CoolMode = Heat SpaceTempSetpoint = 71.0°F SetpointOffset = -1.0°F (occupant adjustment on remote wall sensor, or LUI) SetpointShift = (not used) = 0.0°F UHS = 60.8°F **Effective Setpoint Calculations** EffectiveSetpoint = UHS + SetpointShift = 60.8 + 0.0 = 60.8°F

See table 13 for default values.

Note OHS, OCS can be different than default values.

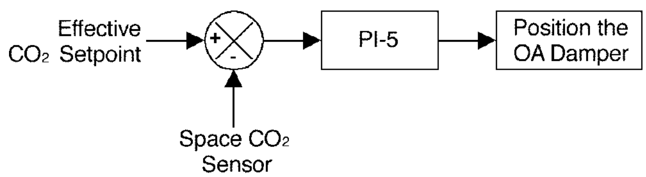
PI Control Loops

The MicroTech II UVC uses PI-loop control for heating, cooling and ventilation processes within the unit ventilator. As many as six PI algorithms may be used for software model 05, dependent upon the unit ventilator configuration. The UVC uses “single” and “cascading” PI loops where needed.

Table 15. PI Loop List

PI Loops		PI Loop Type	Setpoint	Feedback (Controlled Variable)	Output
PI-1	SpaceTemperature	Cascaded	Effective Heating or Cooling Temperature Setpoint	Space Temperature	Calculated Discharge Air Temperature Setpoint Output
PI-2	Primary Cooling (Economizer)		Calculated Discharge Air Temperature Setpoint Output	Discharge Air Temperature	Position the OA Damper
PI-3	Secondary Cooling		Calculated Discharge Air Temperature Setpoint Output	Discharge Air Temperature	Operate the Compressor
PI-4	Primary Heating		Calculated Discharge Air Temperature Setpoint Output	Discharge Air Temperature	Software model 05 has no primary heating, this PI loop is used to determine when auxiliary heat will be made avialable
PI-5	CO_2 (optional)	Single	Discharge Air Temperature	Space CO_2	Position the OA damper
PI-6	Low Limit	Single	Calculated Discharge Air Temperature Setpoint Output	Discharge Air Temperature	Position the OA Damper

Figure 17. PI Loop Graphic for CO_2



DISCHARGE AIR TEMPERATURE CONTROL

The UVC uses two “cascaded” PI loops to aid in providing very stable space temperature control. The Space Temperature PI-loop is used to calculate the Discharge Air Temperature Setpoint Output required to meet the Effective Setpoint Output, a second PI-loop (Primary Cooling, Secondary Cooling, or Primary Heating) is then activated to control the heating or cooling device required to achieve the calculated Discharge Air Temperature Setpoint Output. The second PI-loop used is dependent upon unit mode (i.e. Heat or Cool).

Figure 18. Cascading PI Loop Graphic 1 (Primary Heat)

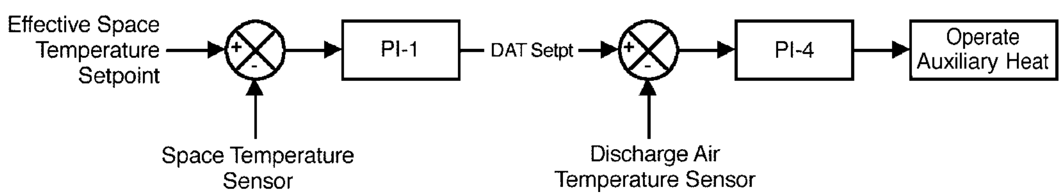
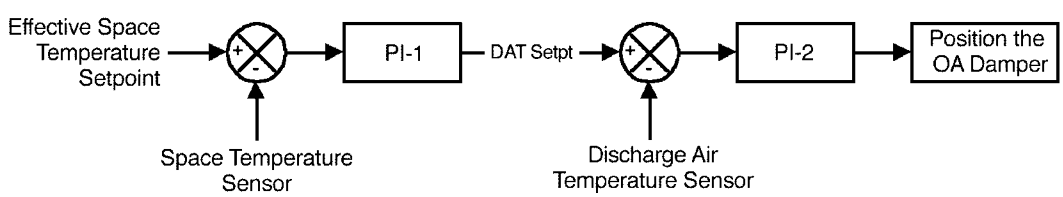


Figure 19. Cascading PI Loop Graphic 2 (Primary Cool – Economizer)



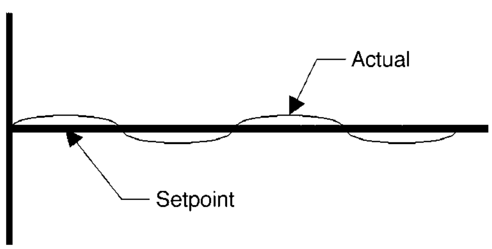
PI CONTROL PARAMETERS

Associated with each PI loop is a set of two adjustable PI parameters. These parameters are "Proportional Band" and "Integral Time". When the unit ventilator is properly sized for the space, the factory settings for these parameters will provide the best and most robust control action. See Figure 20.

If field problems do arise, first ensure these parameters are set back to the factory default settings. If adjustment is then required, only make small adjustments to one parameter at a time. After each adjustment, enough time for the system to stabilize should be allowed before further adjustments are made. You must have patience. If you do not have the benefit of a means to graph the space performance, you can still record the actual measured value and setpoint on paper for several minutes and then plot the results using a spreadsheet to determine the correct action in changing PI parameters.

> ⚠ **CAUTION**
>
> **Adjusting PI parameters can cause erratic unit operation and equipment damage!**
> PI control parameters should only be adjusted by trained personnel having a thorough understanding of how the parameters affect system operation. Generally these parameters do not need to be adjusted from the factory default settings.

Figure 20. Optimized PI Loop Control

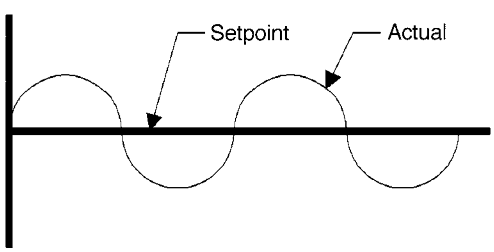


PROPORTIONAL BAND

The Proportional Band, or proportional action, causes the controlled output to change in proportion to the magnitude of the difference between the sensor value and setpoint.

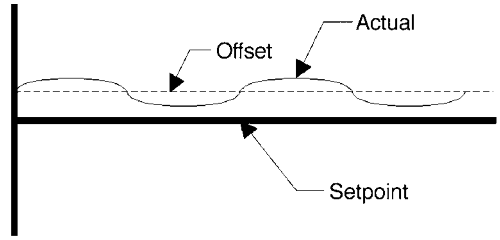
A Proportional Band setting that is too small (See Figure 21.) will cause control oscillations that go fully above and below the setpoint.

Figure 21. Proportional Band too Small



A Proportional Band setting that is too large (See Figure 22.) will cause an offset between the actual measured oscillation center and the setpoint. A small offset is not necessarily a problem as most systems have a small "natural" offset and the Integral function will automatically work to eliminate or reduce this effect.

Figure 22. Proportional Band too Large



In general, it is best to start with relatively large Proportional Band setting (the factory default setting is best) and adjust to smaller values.

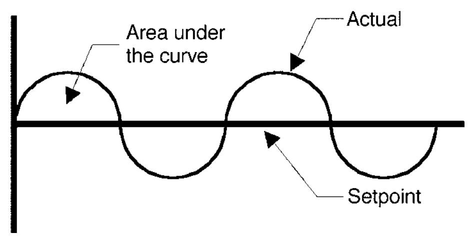
If you wish the system to respond strongly to even small changes in the space, you would lower the Proportional Band.

If you wish the system to react weakly to small changes in the space, then you would adjust the Proportional Band to a higher setting.

INTEGRAL TIME

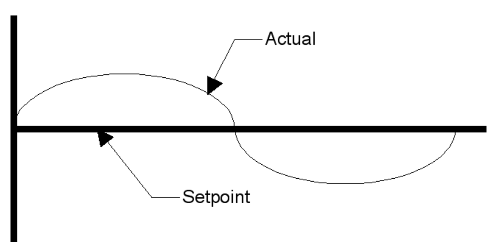
The Integral Time, or integral action, causes the controlled output to change in proportion to time integral of the difference between the sensor value and setpoint. The difference over time between the actual value and setpoint forms an "area under the curve." See Figure 23. The integral action works to reduce this "area under the curve", and to eliminate any natural system offset.

Figure 23. Area Under the Curve



The smaller the Integral Time, the faster the output will ramp up or down with small changes in the space. The smaller the Integral Time, the quicker the system can become "upset" due to small changes in the space. If the Integral Time is set too small, long period oscillations will occur. See Figure 24.

Figure 24. Integral Time too Small



In general, it is best to start with a relatively large Integral Time setting (the factory default setting is best) and adjust to smaller values.

If you wish the system to respond strongly to even small changes in the space, you would lower the Integral Time.

If you wish the system to react weakly to small changes in the space, then you would adjust the Integral Time to a higher setting.

Indoor Air Fan Operation

The UVC supports a 3-speed IA fan: Low, Medium, and High. The UVC will calculate the effective fan speed and operation based upon the unit mode, the occupancy mode, and the values of several network variables.

AUTO MODE

The UVC is provided with a user selectable auto fan mode feature. When in auto fan mode, the UVC uses the space temperature PI loop to automatically adjust the fan speed as needed to maintain space temperature. This ensures that the UVC will maintain the lowest and quietest fan speed whenever possible. When in auto fan mode, a maximum of 6 fan speed changes per hour is allowed (by default), this prevents frequent automatic fan speed changes from disturbing room occupants.

OCCUPIED, STANDBY AND BYPASS OPERATION

During occupied, standby and bypass modes the IA fan will, by default, remain On.

UNOCCUPIED OPERATION

During unoccupied mode the IA fan will typically remain off and will cycle with calls for heating and cooling.

CYCLE FAN

The UVC is provided with a Fan Cycling Configuration variable which can be used to force the IA fan to cycle with calls for heating and cooling during the occupied, standby and bypass occupancy modes. When the fan is off, the OA damper will be closed, therefore, it is recommended that this feature only be used when it is acceptable that normal ventilation is not required.

OFF DELAY

When the IA fan is set to cycle, or during the unoccupied mode, or when the UVC is placed into off mode, the UVC is configured to continue fan operation for a time period (30-seconds default) after heating or cooling is complete.

Outdoor Air Damper Operation

The UVC is configured for an OA damper operated by a floating-point actuator. The OA damper actuator contains a spring which will ensure that the OA damper is closed upon loss of power. The floating-point actuator is driven by the UVC using two binary (Triac) outputs. The OA damper is typically open to the current minimum position during the occupied and bypass occupancy modes, and closed during the unoccupied and standby occupancy modes.

MINIMUM POSITION

The UVC is configured to maintain three OA damper minimum positions based upon the operation of the IAF. This allows the ability for each unit to be field configured to provide the amount of fresh air required to the space at each of the three IA fan speeds.

Table 16. Default OA Damper Minimum Positions

	w/o CO_2	w/ CO_2
IAF High Speed	20%	5%
IAF Medium Speed	30%	5%
IAF Low Speed	35%	5%

NOTICE

If the CO_2 Demand Controlled Ventilation (DCV) option is used, then the UVC will only use the IA fan high speed OA damper minimum position regardless of fan speed, the DCV function will adjust the OA damper above this minimum as needed to maintain CO_2 setpoint.

ECONOMIZER OPERATION

The economizer function is used by the UVC to determine if the OA is adequate for economizer (primary) cooling. When both the economizer and mechanical cooling are available, the economizer will be used as primary cooling and the UVC will add mechanical cooling only if the economizer is not adequate to meet the current cooling load (i.e. the OA damper reaches 100% and cooling is still required).

The UVC is configured to support three economizer types:

- Temperature Comparison Economizer (default)
- Temperature Comparison with OA Enthalpy Setpoint Economizer (optional)
- Temperature Comparison with Enthalpy Comparison Economizer (optional)

Temperature Comparison Economizer

The UVC uses two configuration variables to determine if the economizer can be used: Economizer OA Temp Setpoint and Economizer Temp Differential. See Table 17.

Table 17. Economizer Available Calculation – Temperature Comparison

Economizer Available	EffectiveOutdoorTemp < (EconomizerOATempSetpoint – EconomizerTempDifferential) ***OR*** EffectiveOutdoorTemp < (EffectiveSpaceTemp – EconomizerTempDifferential)

Temperature Comparison with OA Enthalpy Setpoint Economizer (optional)

The UVC uses three configuration variables to determine if the economizer can be used: Economizer OA Temp Setpoint, Economizer Temp Differential and Economizer OA Enthalpy Setpoint. See Table 18.

Table 18. Economizer Available Calculation – OA Enthalpy Setpoint

Economizer Available	EffectiveOutdoorEnthalpy < EconomizerOAEnthalpySetpoint – EconomizerEnthalpyDifferential **AND** ((EffectiveOutdoorTemp < (EconomizerOATempSetpoint – EconomizerTempDifferential) **OR** EffectiveOutdoorTemp < (EffectiveSpaceTemp – Economizer TempDifferential))

NOTICE

Temperature Comparison with OA Enthalpy Setpoint economizer requires an optional OA humidity sensor.

Temperature Comparison with Enthalpy Comparison Economizer (optional)

The UVC uses four configuration variables to determine if the economizer can be used: Economizer OA Temp Setpoint, Economizer Temp Differential and Economizer OA Enthalpy Setpoint, and Economizer EnthalpyDifferential. See Table 19.

Table 19. Economizer Available Calculation – Enthalpy and Temperature Comparison

Economizer Available	EffectiveOutdoorEnthalpy < (EconomizerOAEnthalpySetpoint – EconomizerEnthalpyDifferential) **AND** EffectiveOutdoorTemp < (EffectiveSpaceTemp – EconomizerTempDifferential)

NOTICE

Temperature Comparison with Enthalpy Comparison requires both an optional OA humidity sensor and an optional IA humidity sensor.

NETWORKED SPACE HUMIDITY SENSOR CAPABILITY

A networked space humidity sensor can be interfaced with the Space Humidity Input variable. When the Space Humidity Input variable is used (valid value), it will automatically override the hard-wired space humidity sensor (if present).

NETWORKED OUTDOOR HUMIDITY SENSOR CAPABILITY

A networked outdoor humidity sensor can be interfaced with the Outdoor Humidity Input variable. When the Outdoor Humidity Input variable is used (valid value), it will automatically override the hard-wired outdoor humidity sensor (if present).

CO_2 DEMAND CONTROLLED VENTILATION (OPTIONAL)

Ventilation equipment typically uses fixed damper positions to determine the amount of OA for proper ventilation within the space. Most commonly, the fixed position of the OA damper is based upon the maximum number of occupants the space is designed to accommodate. This fixed OA damper operation however ignores the fact that most spaces during the day have varying occupancy levels, and may only rarely reach maximum design occupancy levels. This type of fixed damper control for ventilation is energy wasteful as you are treating OA not actually needed for ventilation during low occupancy levels.

People produce CO_2 when they breath. The CO_2 level within the space has a direct relationship with the number of people within that space.

The UVC can optionally be factory configured to provide CO_2-based Demand Controlled Ventilation (DCV). The CO_2 DCV function is very useful in saving the energy typically wasted in treating OA that is not actually needed for ventilation within a space during occupancy levels below maximum design. The CO_2 DCV function uses a PI-loop control to adjust the OA damper above the minimum position as needed to maintain the Space CO_2 Setpoint (1200 PPM default). The minimum damper position used with CO_2 DCV can typically be set at 20% of the minimum position that would be used without CO_2 DCV, this number should then provide enough ventilation to keep odors within the space in check for most applications.

NOTICE

The CO_2 DCV function can increase the OA damper position past that required by the economizer and vice versa.

NOTICE

If odors within the space become a problem, increase the OA damper minimum position as needed to eliminate these odors. It may be necessary with new construction or after renovation to raise the minimum position for some time period to help reduce odor buildup due to the out-gassing of new construction material, and then return the minimum OA damper position at a later date.

NOTICE

If the CO_2 Demand Controlled Ventilation (DCV) option is used, then the UVC will only use the IA fan high speed OA damper minimum position regardless of fan speed, the DCV function will adjust the OA damper above this minimum as needed.

NETWORKED SPACE CO_2 SENSOR CAPABILITY

A networked space CO_2 sensor can be interfaced with the Space CO_2 Input variable. When the Space CO_2 Input variable is used (valid value), it will automatically override the hard-wired space CO_2 sensor (if present).

ASHRAE CYCLE II

The UVC supports ASHRAE Cycle II operation. The basis of ASHRAE Cycle II is to maintain the required minimum amount of ventilation whenever possible, which can be increased during normal operation for economizer cooling or CO_2 DCV control, but can also be reduced to prevent excessively cold discharge air temperatures.

A discharge air temperature sensor is installed in all unit ventilators. If necessary, the ASHRAE II control algorithm will override room control and modify the heating, ventilating, and cooling functions (as available) to prevent the discharge air temperature from falling below the VCLL setpoint.

Compressor Operation

The UVC is configured to operate the compressor as secondary (mechanical) cooling when the economizer is available, when the economizer is not available and the compressor is available then the UVC will use the compressor when cooling is required.

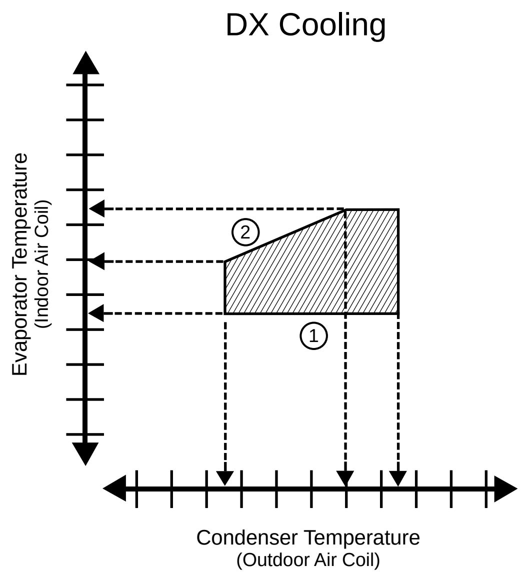
COMPRESSOR ENVELOPE

The compressor envelope protects the compressor from adverse operating conditions which can cause damage and or shortened compressor life by ending compressor operation if coil temperatures exceed the defined operating envelope.

For self-contained units, the UVC is configured to monitor both the inside air/refrigerant and outside air/refrigerant coil temperatures to prevent compressor operation under adverse conditions.

For split-system units, the UVC will be configured at the factory to only monitor the inside air/refrigerant coil as part of the compressor envelope function.

Figure 25. Compressor Envelope in Self-Contained Units



Area for compressor operation envelope.
① Area where liquid slugging could occur.
② Area where starving could occur.

COMPRESSOR COOLING LOCKOUT

The UVC is configured to lockout compressor cooling when the OA temperature falls below the Compressor Cooling Lockout setpoint (60.8°F/16.0°C). Below this OA temperature setpoint only economizer cooling will be available.

MINIMUM ON AND OFF TIME

The UVC is provided with minimum On (3-minutes default) and minimum Off (3-minutes default) timers to prevent adverse compressor cycling.

COMPRESSOR START DELAY

The UVC is provided with a Compressor Start Delay configuration variable which is intended to be adjusted as part of the start-up procedure for each unit. This variable provides a compressor delay (0-seconds default) used to delay compressor operation each time the compressor is required.

NOTICE

To prevent multiple unit compressors from all starting at the same time after a power failure, or after an unoccupied-to-occupied changeover, it is strongly recommended that each unit be configured at start-up with a slightly different (random) delay, or that groups of units be provided with different delays.

OUTDOOR AIR FAN OPERATION

For self-contained units, the UVC has been configured with a fan on delay which delays OA fan operation for a time period (30-seconds default) after the compressor starts. The OA fan will stop with the compressor.

Floating-point Actuator Auto-Zero, Overdrive and Sync

The UVC at power-up will auto-zero all floating-point actuators (OA damper) before going into normal operation to ensure proper positioning, this can take as long as 150-seconds after power-up. During auto-zero the unit will remain Off, the actuators will open approximately 30% and then be driven full closed, the overdrive feature is then used to continue forcing the actuators closed for one full stroke period. Once the zeroing process is complete normal unit operation will begin.

The UVC is configured such that whenever a floating-point actuator is commanded to go to 0% or 100%, the UVC will overdrive the actuator one full stroke period past the 0% or 100% position to ensure proper positioning.

Additionally, the UVC is configured to sync all floating-point actuators once every 12-hours of operation. To do this the UVC will force the actuator to the nearest rail position (0% or 100%), use the overdrive feature, and then return to its normal position. For example, if the actuator is at 20% when the 12-hour limit is reached, then the UVC will force the actuator to 0%, use overdrive, and then return to the 20% position.

External Binary Inputs

The UVC is provided with three (3) binary inputs which can provide the following functions. These inputs each allow a single set of dry-contacts (no voltage source) to be used as a signal to the UVC, multiple units can be connected to a single set of dry-contacts. For wiring see MicroTech II Unit Ventilator Controller IM747.

NOTICE

Not all of the functions listed can be used at the same time. The UVC is provided with configuration parameters which can be adjusted to select which function will be used for these inputs when multiple functions are indicated below.

EXTERNAL BINARY INPUT 1

This binary input can be configured as an unoccupied (default) or dewpoint/humidity signal.

Unoccupied Input Signal

This input allows a single set of dry-contacts to be used to signal the UVC to go into unoccupied or occupied mode. When the contacts close (unoccupied) the UVC will go into unoccupied mode. When the contacts open (occupied) the UVC will go into occupied mode. Additional variables can effect occupancy mode and override this binary input. See Occupancy Modes.

EXTERNAL BINARY INPUT 2

This input can only be used for remote shutdown.

Remote Shutdown Input Signal

This input allows a single set of dry-contacts to be used to signal the UVC to go into shutdown mode. When the contacts close (shutdown) the UVC will go into shutdown mode, when the contacts open the UVC will return to normal operation. See Special Purpose Unit Modes.

EXTERNAL BINARY INPUT 3

This input can be configured as a ventilation lockout (default) or exhaust interlock signal.

Ventilation Lockout Input Signal

This input allows a single set of dry-contacts to be used to signal the UVC to close the OA damper. When the contacts close (ventilation lockout signal) the UVC will close the OA damper, when the contacts open the UVC will return to normal OA damper operation.

Exhaust Interlock Input Signal

This input allows a single set of dry-contacts to be used to signal the UVC that an exhaust fan within the space has been energized, the UVC will reposition the OA damper to a user adjustable minimum position (Exhaust Interlock OA Damper Min Position Setpoint). When the contacts close (exhaust fan on signal) the UVC will use the value defined by the Exhaust Interlock OA Damper Min Position Setpoint as the minimum OA damper position regardless of IA fan speed, when the contacts open the UVC will return to normal OA damper operation.

External Binary Outputs

The UVC is provided with three (3) binary outputs which can provide the following functions. These outputs are relay type outputs which are intended to be used with signal level voltages (24vac max) only. For wiring see MicroTech II Unit Ventilator Controller IM747.

NOTICE

Not all of the functions listed can be used at the same time. The UVC is provided with configuration parameters which can be adjusted to select which function will be used for these outputs when multiple functions are indicated below.

EXTERNAL BINARY OUTPUT 1

This output can only be used as a signal for space lights.

Lights On/Off Signal

This relay output provides one set of NO dry-contacts which can be used to signal the operation of the space lights. When the UVC is in occupied, standby or bypass occupancy modes the relay output will signal the lights on (contacts closed), when the UVC is in unoccupied occupancy mode the relay output will signal the lights off (contacts open).

EXTERNAL BINARY OUTPUT 2

This output can only be used as a fault signal.

Fault Signal

This relay output provides a NO, NC, and Common connections that can be used to signal a fault condition. When a fault exists, the UVC will energize this relay output, when the fault or faults are cleared the UVC will de-energize this relay output.

EXTERNAL BINARY OUTPUT 3

This output can only be used to signal exhaust fan operation.

Auxiliary Heat Signal

This relay output provides one set of NO dry-contacts which can be used to operate an auxiliary heat device. The UVC by default is configured to operate a NO auxiliary heat device (de-energize when heat is required) such as a wet heat valve actuator with a spring setup to open upon power failure. However, the Auxiliary Heat Configuration variable can be used to set the UVC to use a NC auxiliary heat device (energize when heat is required) such as electric heat.

Table 20. Auxiliary Heat Calculation

Auxiliary Heat Start/ Stop Calculation	**Auxiliary Heat Starts…** Primary Heat PI-loop = Saturated High (100%) for more than 2-minutes ***AND*** EffectiveSpaceTemp ≤ EffectiveSetpoint – AuxiliaryHeatStartDifferential **Auxiliary Heat Stops…** EffectiveSpaceTemp ≥ (EffectiveSetpoint – AuxiliaryHeatStartDifferential) + AuxiliaryHeatStopDifferential

Exhaust Fan On/Off Signal

This relay output provides one set of NO dry-contacts which can be used to signal the operation of an exhaust fan. When the OA damper opens more than the Energize Exhaust Fan OA Damper Setpoint then the relay output will signal the exhaust fan on (contacts closed), when the OA damper closes below this setpoint the relay output will signal the exhaust fan off (contacts open).

UVC INPUT AND OUTPUT TABLE

All UVC input and output connections and their corresponding unit ventilator usage are shown in the following table.

Table 21. Inputs and Outputs for Software Model 05 – DX Cooling only

	Description
BO-1	Inside Fan High
BO-2	Inside Fan Medium
BO-3	
BO-4	
BO-5	
BO-6	External Output Option 3: Fault Indication②
BO-7	
BO-8	
BO-9	Compressor⑤
BI-1	Condensate Overflow
BI-2	
BI-3	
BI-4	External Input Option 1: Ventilation Lockout (default) or Exhaust Interlock③
BI-5	External Input Option 2: Remote Shutdown ③
BI-6	External Input Option 3: Unoccupied (default)
BI-7	
BI-8	
BI-9	
BI-10	
BI-11	
BI-12	DX Press Switch (NC)④
AI-1	IA Temp. Sensor + T.O.
AI-2	Remote Setpt. Adjust. Pot.
AI-3	DA Temp Sensor
AI-4	OA Temp Sensor
AI-5	IA Coil DX Temp Sensor
AI-6	OA Coil DX Temp Sensor⑥
	Expansion Board
xBO-1	External Output Option 2: Lights On/Off②
xBO-2	External Output Option 1: Exhaust Fan On/Off (default) or auxiliary heat ②
xBO-3	OA Damper Open
xBO-4	OA Damper Close
xBO-5	
xBO-6	
xBO-7	Outdoor Fan⑥
xBO-8	Inside Fan Low
xAI-1	IA Humidity Sensor①
xAI-2	OA Humidity Sensor①
xAI-3	Indoor CO_2 Sensor①
xAI-4	

① Optional.
② Field selectable external output options (all possible options are shown).
③ Field selectable external input options (all possible options are shown).
④ DX pressure switch not installed on split-systems, this input will then be wired for constant no-fault condition.
⑤ This is the condensing unit on/off signal on split-systems.
⑥ Not installed or wired on split-systems.

DIAGNOSTICS AND SERVICE

The most important aspect of troubleshooting unit ventilator controls is to isolate the source of the problem into one of two categories: 1) the problem resides within the UVC, or 2) the problem is external to the UVC. Under most circumstances the problem will reside external to the UVC.

Alarm and Fault Monitoring

The UVC is programmed to monitor the unit for specific alarm conditions. If an alarm condition exists, a fault will occur. When a fault condition occurs, the UVC will indicate the fault condition by displaying the fault code on the LUI, the remote wall-mounted sensor (optional) LED will flash a pattern indicating that a fault condition exists, the fault signal binary output will be energized, and the UVC will perform the appropriate control actions.
Manual reset faults can be reset in one of three ways: 1) cycle unit power, 2) LUI menu, or 3) via network interface.

Table 22. Alarm and Fault Code Summary

Priority	Fault Description	Reset	LUI Fault Codes
1	Space Temp Sensor Failure	Auto	F0
2	DX Pressure Fault	2-Auto in 7-days then Manual	F1
3	Compressor Envelope Fault	2-Auto in 7-days then Manual	F2
4	Discharge Air DX Cooling Low Limit Indication	Auto	F3
5	Condensate Overflow Indication	Auto	F4
6	Space Coil DX Temp Sensor Failure	Auto	F5
7	Outdoor Temp Sensor Failure	Auto	F6
8	Discharge Air Temp Sensor Failure	Auto	F7
9	Outdoor Coil DX Temp Sensor Failure	Auto	F8
10	Not Used		F9
11	Space Humidity Sensor Failure	Auto	FA
12	Outdoor Humidity Sensor Failure	Auto	Fb
13	Space CO_2 Sensor Failure	Auto	Fc
14	Not Used		Fd
15	Not Used		FE
16	Change Filter Indication	Manual	FF

SPACE TEMP SENSOR FAILURE (F0)

The Space Temp Sensor Failure fault will occur when the UVC detects an open or a short condition from the space temperature sensor.

Effect:
- Space fan is de-energized (unless in emergency heat mode)
- Compressor is immediately de-energized
- Outdoor fan (if present) is de-energized
- Outside air damper is forced closed
- Electric heat stages are de-energized
- Fault is indicated

DX PRESSURE FAULT (F1)

The DX Pressure Fault will occur when the UVC detects a switch open condition from the refrigerant pressure switch.

Effect:
- Compressor is immediately de-energized
- Outdoor fan (if present) is de-energized
- Fault is indicated

COMPRESSOR ENVELOPE FAULT (F2)

The UVC monitors refrigerant temperatures. The Compressor Envelope Fault will occur when the UVC detects compressor operation that has exceeded the allowed operating parameters.

Effect:
- Compressor is immediately de-energized
- Outdoor fan (if present) is de-energized
- Fault is indicated

Cause:
- Poor air flow through the refrigerant coils, check fans for proper RPM, check air filters
- If the unit has a 3-phase scroll compressor, check for proper electrical phasing
- Refrigerant circuit component failure or improper adjustment, check refrigerant pressures and TXV adjustment
- Coil sensors may have lost proper contact with the refrigerant coil, check coil sensors

DISCHARGE AIR DX COOLING LOW LIMIT INDICATION (F3)

The Discharge Air DX Cooling Low Limit Indication will occur when the UVC detects a low discharge air temperature (DAT < MCLL) during compressor cooling.

Effect:
- Compressor is immediately de-energized
- Outdoor fan (if present) is de-energized
- Fault is indicated

CONDENSATE OVERFLOW INDICATION (OPTIONAL) (F4)

The Condensate Overflow Indication (optional) will occur when the UVC detects high condensate levels within the units indoor coil drain pan.

Effect:
- Compressor is immediately de-energized if in cooling
- Outdoor fan (if present) is de-energized
- Fault is indicated

SPACE COIL DX TEMP SENSOR FAILURE (F5)

The Space Coil DX Temp Sensor Failure fault will occur when the UVC detects an open or a short condition from the DX temperature sensor.

Effect:
- Compressor is immediately de-energized
- Outdoor fan (if present) is de-energized
- Fault is indicated

OUTDOOR TEMP SENSOR FAILURE (F6)

The Outdoor Temp Sensor Failure fault will occur when the UVC detects an open or a short condition from the OA temperature sensor.

Effect:
- Compressor is immediately de-energized
- Outside air damper is forced closed
- Fault is indicated

DISCHARGE AIR TEMP SENSOR FAILURE (F7)

The Discharge Air Temp Sensor Failure fault will occur when the UVC detects an open or a short condition from the DA temperature sensor. Emergency heat mode is available during this fault condition.

Effect:
- Space fan is immediately de-energized (unless in emergency heat mode)
- Compressor is immediately de-energized
- Outdoor fan (if present) is immediately de-energized
- Outside air damper is forced closed
- Electric heat stages are de-energized
- Fault is indicated

OUTDOOR COIL DX TEMP SENSOR FAILURE (F8)

The Outdoor Coil DX Temp Sensor (air source self-contained type units – AZ and AE only) Failure fault will occur when the UVC detects an open or a short condition from the OA DX temperature sensor.

Effect:
- Compressor is immediately de-energized
- Outdoor fan (if present) is de-energized
- Fault is indicated

SPACE HUMIDITY SENSOR FAILURE (OPTIONAL) (FA)

The Space Humidity Sensor Failure fault will occur when the UVC detects an open or a short condition from the IA space humidity sensor.

Effect:
- IA/OA Enthalpy comparison economizer (if used) is disabled
- Dehumidification function (optional) is disabled
- Fault is indicated

OUTDOOR HUMIDITY SENSOR FAILURE (OPTIONAL) (Fb)

The Outdoor Humidity Sensor Failure fault will occur when the UVC detects an open or a short condition from the OA humidity sensor.

Effect:
- IA/OA Enthalpy comparison or OA Enthalpy economizer (if used) is disabled
- Fault is indicated

SPACE CO_2 SENSOR FAILURE (OPTIONAL) (Fc)

The Space CO_2 Sensor Failure fault will occur when the UVC detects an open or a short condition from the space CO_2 sensor.

Effect:
- CO_2 Demand Controlled Ventilation function is disabled
- Fault is indicated

CHANGE FILTER INDICATION (FF)

The Change Filter Indication will occur when the UVC calculates that the total fan run time has exceeded the allowed number of hours since the last filter change.

Effect:
- Fault is indicated

Troubleshooting Temperature Sensors

The UVC is configured to use passive positive temperature coefficient (PTC) sensor whose resistance increases with increasing temperature. The element has a reference resistance of 1035 ohms at 77°F (25°C). Each element is calibrated according to the tables shown.

The following procedure can be used to troubleshoot a suspect sensor.
1. Disconnect both sensor leads from the UVC.
2. Take a temperature reading at the sensor location.
3. Use the temperature reading from Step 2 to determine the expected sensor resistance from the Temperature versus Resistance Table 23.
4. Using an ohmmeter, measure the actual resistance across the two sensor leads.
5. Compare the expected resistance to the actual resistance.
6. If the actual resistance value deviates substantially (more than 10%) from the expected resistance, replace the sensor.

Table 23. Temperature versus Resistance Table

°F (°C)	Resistance in Ohms°	°F (°C)	Resistance in Ohms
-40 (-40)	613	113 (45)	1195
-31 (-35)	640	122 (50)	1237
-22 (-30)	668	131 (55)	1279
-13 (-25)	697	140 (60)	1323
-4 (-20)	727	149 (65)	1368
5 (-15)	758	158 (70)	1413
14 (-10)	789	167 (75)	1459
23 (-5)	822	176 (80)	1506
32 (0)	855	185 (85)	1554
41 (5)	889	194 (90)	1602
50 (10)	924	203 (95)	1652
59 (15)	960	212 (100)	1702
68 (20)	997	221 (105)	1753
77 (25)	1035	230 (110)	1804
86 (30)	1074	239 (115)	1856
95 (35)	1113	248 (120)	1908
104 (40)	1153		

Troubleshooting Humidity Sensors

The UVC is configured to use 0-100% RH, 0-5 VDC, capacitive humidity sensors. Each sensor is calibrated according to the table shown.

⚠ CAUTION

The humidity sensor is not protected against reversed polarity. Check carefully when connecting the device or damage will result.

The following procedure can be used to troubleshoot a suspect humidity sensor.
1. Disconnect the sensor(s)' output voltage lead from the UVC analog input.
2. Take a humidity reading at the sensor location.
3. Use the humidity reading from Step 2 to determine the expected sensor voltage from the Humidity versus Voltage Table 24.
4. Using a multi-meter, measure the actual voltage across the yellow and white sensor leads.
5. Compare the expected voltage to the actual voltage.
6. If the actual voltage value deviates substantially (more than 10%) from the expected voltage, replace the sensor.

Table 24. Humidity versus Voltage Table

RH (%)	VDC (mV)	RH (%)	VDC (mV)
10	1330	55	2480
15	1475	60	2600
20	1610	65	2730
25	1740	70	2860
30	1870	75	2980
35	1995	80	3115
40	2120	85	3250
45	2235	90	3390
50	2360	95	3530

Troubleshooting Carbon Dioxide (CO_2) Sensors

The UVC is configured to use 0-2000 PPM, 0-10 VDC, single beam absorption infrared gas sensor. Each sensor is calibrated according to the table shown.

The following procedure can be used to troubleshoot a suspect sensor.
1. Disconnect the sensor(s)' output voltage lead from the UVC analog input.
2. Take a CO_2 reading at the sensor location.
3. Use the CO_2 reading from Step 2 to determine the expected sensor voltage from the CO_2 versus Voltage Table 25.
4. Using a multi-meter, measure the actual voltage across the lead removed from xAI-3 and ground.
5. Compare the expected voltage to the actual voltage.
6. If the actual voltage value deviates substantially (more than 10%) from the expected voltage, replace the sensor.

In the unlikely event that the CO_2 sensor requires calibration, consult the factory for information on obtaining calibration equipment and instructions.

Table 25. CO_2 versus Voltage Table

CO_2 (PPM)	VDC (V)	CO_2 (PPM)	VDC (V)
300	1.5	1200	6.0
400	2.0	1300	6.5
500	2.5	1400	7.0
600	3.0	1500	7.5
700	3.5	1600	8.0
800	4.0	1700	8.5
900	4.5	1800	9.0
1000	5.0	1900	9.5
1100	5.5	2000	10.0

UVC CONFIGURATION PARAMETERS

The UVC has been provided with a number of configuration variables as listed in the following table. These configuration variables are stored in UVC non-volatile memory.

For a description of supported network variables for each protocol refer to Protocol Data Packet bulletin, see Table 4.

NOTICE

The software ServiceTools™ can be used to adjust parameters not adjustable through the LUI.

Table 26. UVC Configuration Parameters

Configuration Parameter Name	Abr.	Notes	Default	LUI Menu Item ①
Occupied Cooling Setpoint	OCS		73°F (23°C)	Co
Standby Cooling Setpoint	SCS		77°F (25°C)	CS
Unoccupied Cooling Setpoint	UCS		82°F (28°C)	CU
Occupied Heating Setpoint	OHS		70°F (21°C)	Ho
Standby Heating Setpoint	SHS		66°F (19°C)	HS
Unoccupied Heating Setpoint	UHS		61°F (16°C)	HU
Local Bypass Time		Tenant override	100 min	
Space CO_2 Setpoint②	CO2S		1200 PPM	
Space Humidity Setpoint②	RHS	used with both active (reheat) and passive dehumidification sequences	60% RH	
Emergency Heat Enable		0 = disable, 1 = enable (uses auxiliary heat where primary heat is not applicable)	1	H1
Emergency Heat Setpoint	EHS		54°F (12°C)	H2
Emergency Heat Shutdown Configuration		0 = no emergency heat during shutdown, 1 = emergency heat available during shutdown	0	H3
Wall Sensor Type②		0 = +/- 3°F, 1 = 55°F to 85°F	0	rS
Slave Type Configuration②		0 = independent slave, 1 = dependent slave	0	SL
OAD Min Position High-Speed Setpoint	OADH	(this variable will be factory set to 5% open when the unit is ordered with optional CO_2 DCV)	20% open	o2
OAD Min Position Med-Speed Setpoint	OADM	(this variable is ignored when the unit is ordered with optional CO_2 DCV)	30% open	o3
OAD Min Position Low-Speed Setpoint	OADL	(this variable is ignored when the unit is ordered with optional CO_2 DCV)	35% open	o4
Exhaust Interlock OAD Min Position Setpoint	EOAD	OA damper minimum position when the exhaust interlock input is energized	100% open	o5
Energize Exhaust Fan OAD Setpoint	OADE	defines position above which exhaust fan output will be energized	10% open	o6
OAD Max Position Setpoint	OAMX		100% open	o7
OAD Lockout Enable		0 = disable, 1 = enable (this variable will be factory set to 1 when the unit is ordered as a recirc unit with no OAD)	0	o8
OAD Lockout Setpoint	OALS	OA temperature below which the OA damper will remain closed (this variable will be factory set to –99°C when the unit is ordered as a recirc unit with no OAD)	36°F (2°C)	o9
Economizer Enable		0 = disable, 1 = enable	1	E1
Economizer OA Temp Setpoint	ETS		68°F (20°C)	E2
Economizer IA/OA Temp Differential	ETD		2°F (1°C)	E3
Economizer OA Enthalpy Setpoint	EES		25 btu/lb (58 kJ/kg)	E5
Economizer IA/OA Enthalpy Differential	EED		1.3 btu/lb (3 kJ/kg)	E6
External BI-3 Configuration		0 = Ventilation Lockout, 1 = Exhaust Interlock	0	b3
External B0-3 Configuration		0 = Auxiliary Heat, 1 = Exhaust Fan On/Off	0	b6
Filter Alarm Enable		0 = disable, 1 = enable	0	CE
Filter Change Hours Setpoint		fan run hours between filter change alarms	700 hrs	
Primary Cool Proportional Band			18°F (10°C)	
Primary Cool Integral Time			180 sec	
Secondary Cool Proportional Band			11°F (6°C)	

Continued on next page.

Table 26. UVC Configuration Parameters (Continued)

Configuration Parameter Name	Abr.	Notes	Default	LUI Menu Item ①
Secondary Cool Integral Time			600 sec	
Discharge Air Temp Proportional Band			13.5°F (7.5°C)	
Discharge Air Temp Integral Time			900 sec	
CO_2 Proportional Band②			100 PPM	
CO_2 Integral Time②			600 sec	
Ventilation Cooling Low Limit Setpoint	VCLL	discharge air low limit during ventilation or economizer cooling	54°F (12°C)	d2
Mechanical Cooling Low Limit Setpoint	MCLL	discharge air low limit during mechanical (compressor) cooling	45°F (7°C)	d3
Discharge Air High Limit	DAHL		140°F (60°C)	
Space Fan Off Delay			30 sec	
Fan Cycling Configuration		space fan operation during occupied, standby and bypass occupancy modes: 2 = continuous, 3 = cycle	2	CF
Space Fan Speed Changes Per Hour		example: 6/60min = 10min (maximum of 1 fan speed change every 10min when fan in auto)	6	
Space Fan Run Time Reset		reset total run time: 1 = reset (you must return the variable back to 0 after reset)	0	
Compressor Run Time Reset		reset total run time: 1 = reset (you must return the variable back to 0 after reset)	0	
Compressor Enable		0 = disable, 1 = enable	1	C1
Compressor Minimum On Time			180 sec	
Compressor Minimum Off Time			180 sec	
Compressor Cooling Lockout Setpoint	CCLO	OA temperature below which compressor cooling is not allowed	61°F (16°C)	C2
Compressor Envelope Cool Max In			68°F (20°C)	
Compressor Envelope Cool Min In			28°F (-2.2°C)	
Compressor Envelope Cool Max Out			150°F (65.6°C)	
Compressor Envelope Cool Min Out			50°F (10.0°C)	
Compressor Envelope Cool Max Ratio			0.56	
Compressor Envelope Cool Max Offset			30°F (-1.16°C)	
Compressor Envelope Cool Min Ratio			0.0	
Compressor Envelope Cool Min Offset			28°F (-2.2°C)	
Auxiliary Heat Start Differential	AHSD	degrees below effective heating setpoint where auxiliary heat starts	2°F (1°C)	A1
Auxiliary Heat End Differential	AHED	degrees above auxiliary heat start point where auxiliary heat ends	2°F (1°C)	A2
Auxiliary Heat Configuration		0 = normally open heat device (hot water valve, etc.), 1 = normally closed heat device (electric heat, etc.)	0	A3
Space Humidity Sensor Enable②		0 = disable, 1 = enable (this variable will be factory set to 1 when the unit is ordered with optional humidity sensor)	0	
Outdoor Humidity Sensor Enable②		0 = disable, 1 = enable (this variable will be factory set to 1 when the unit is ordered with optional humidity sensor)	0	
OAD Stroke Time			90 sec	
Split-System OA/DX Coil Temp		used on split-system units only to partially disable the compressor envelope by setting the outside DX coil temperature to a fixed valid value, enter 122 °F (50°C) on split-systems, use 327.67 for self-contained units (327.67 = invalid)	327.67	
Application Name and Version Label				
Compressor Start Delay		adjust the compressor delay used to prevent multiple compressorized units from starting simultaneously (each unit or group of units should have a different delay setting)	0 sec	C6
Outdoor Fan On Delay			10 sec	

① Indicates parameters accessible through the LUI.

② Requires optional equipment.

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to **www.mcquay.com.**

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