

Operations Manual

MicroTech[®] 4 Unit Controller for Rebel Applied Rooftop Systems

Model: DPSA

OM 1288-1

Group: **Applied Air Systems** Part Number: **OM 1288** Date: **March 2021**



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This manual provides operating information about the Rebel Applied Daikin rooftop unit, DPSA models. In addition to an overall description of the unit, it includes mechanical and controller operation sequences as well as maintenance and start-up procedures. For installation and/or maintenance procedures, see IM 1287.

🖄 WARNING

Only qualified personnel should install, operate and service the equipment and that improper adjustment of settings and operation by an unqualified person could result in property damage, injury, or death.

Table 1: Installation and Maintenance Resources

	Unit	Manual
Rebel Applied DPSA units	Unit Installation and Start Up	<u>IM 1287</u>
	Unit Operations and Maintenance	<u>OM 1288</u>
	Non-Daikin	<u>See vendor</u> <u>manuals</u>

Nomenclature

DPSA 050 A 4 B \$	SAS
Daikin Rebel Applied Packaged DX System	Cooling Modulation S – Staged Compressors H – Staged Compressor with HGBP (Lead Circuit) B – Staged Compressors with HGBP (All) Cooling Coil A – 4 Row Evaporator B – 6 Row Evaporator C – 4 Row Evaporator – Small Face D – 6 Row Evaporator – Small Face E – 4 Row Evaporator – Small Face E – 4 Row Evaporator – Small Face – Bypass Damper F – 6 Row Evaporator – Small Face – Bypass DamperCooling Damper
Efficiency S – Standard Efficiency	

Unit Description

Figure 1 shows a typical DPSA unit. Figure 2 shows a typical DPSA unit with the locations of the major components. These figures are for general information only. See the project's certified submittals for actual specific dimensions and locations.

Figure 1: DPS-A Typical Unit



Figure 2: Typical Component Locations—DPS-A Units

Top View



Side View



Refrigeration Piping

This section presents the unit refrigeration piping diagrams for the various available configurations.

Figure 3: Schematic, Standard Circuit



Figure 4: Schematic, Hot Gas Bypass Circuit



Figure 5: Schematic, MHGRH Circuit







Speedtrol (Variable speed fans) + Splitter solenoid down to -10F

Figure 7: Condenser Piping, Compressors, 1 to 2 Compressors per Circuit are Provided*



Control/Component Locations

Figure 8 shows basic control and component locations within a typical unit

Figure 8: Control and Component Locations



Control Panel

The unit control panels and their locations are shown in the following figures that show a typical unit. Specific unit configurations may differ.

Figure 9: Control Panel Locations



Figure 10: Typical Main Control Panel



Figure 11: Typical Low Voltage Control Panel



Figure 12: Typical Return Control Panel (with Prop Exhaust Fan VFD)





Figure 13: Typical Return Control Panel (without Prop Exhaust Fan VFD)

Figure 14: Typical Return Control Panel (with Energy Recovery Wheel)



Getting Started

This manual contains information designed to assist the field technician with unit setup. The technician will need to be familiar with the following topics, at a minimum, to successfully set up unit operation:

- Keypad navigation/editing/passwords
- Control Mode
- Occ Mode (Occupancy)
- DSP Setpoint (Duct Static Pressure)
- BSP Setpoint (Building Static Pressure)
- Heat/Cool Changeover
- DAT Clg Setpoint (Discharge Air Temperature)
- DAT Htg Setpoint (Discharge Air Temperature)
- Clg Enable (OAT/EWT lockout)
- Htg Enable (OAT lockout)
- Econo Enable (Changeover temp/Enthalpy switch)
- Ventilation Limit/OA damper

The keypad/display consists of a 5-line by 22 character display, three keys and a "push and roll" navigation wheel. There is an **Alarm Button**, **Menu (Home) Button**, and a **Back Button**. The wheel is used to navigate between lines on a screen (page) and to increase and decrease changeable values when editing. Pushing the wheel acts as an **Enter Button**.

Figure 15: Keypad Controls



The first line on each page includes the page title and the line number to which the cursor is currently "pointing." The line numbers are X/Y to indicate line number X of a total of Y lines for that page. The left most position of the title line includes an "up" arrow to indicate there are pages "above" the currently displayed items, a "down" arrow to indicate there are pages "below" the currently displayed items, or an "up/down" arrow to indicate there are pages "above and below" the currently displayed page.

Each line on a page can contain status only information or include changeable data fields. When a line contains status only information and the cursor is on that line, all but the value field of that line is highlighted - meaning the text is white with a black box around it. When the line contains a changeable value and the cursor is at that line, the entire line is highlighted. Each line on a page may also be defined as a "jump" line, meaning pushing the navigation wheel will cause a "jump" to a new page. An arrow is displayed to the far right of the line to indicate it is a "jump" line and the entire line is highlighted when the cursor is on that line.

The keypad/display Information is organized into Menu groups: Main Menu, Quick Menu, View/Set Unit Menu, Commission

Unit Menu, Manual Control Menu, Service Menu, Unit Configuration Menu, and Alarm list Menus.

NOTE: Only menus and items that are applicable to the specific unit configuration are displayed.

The Main Menu allows the user to enter a password, access the Quick Menu pages, view the current unit state, access the Alarm List Menu, as well as access to information about the unit. The Quick Menu provides access to status information indicating the current operating condition of the unit. The View/ Set Unit Menus include basic menus and items required to setup the unit for general operation. These include such things are control mode, occupancy mode and heating and cooling setpoints. The Commission Unit Menus include more advanced items for "tuning" unit operation such as PI loop parameters and time delays. The Manual Control **Menu** allows service personnel to test unit specific operation manually. The Unit Configuration Menu allows the user to access to the unit specific configuration information. These generally do not needing changing or accessing unless there is a fundamental change to or a problem with the unit operation. The Alarm Lists Menu includes active alarm and alarm log information

Passwords

Various menu functions are accessible or inaccessible depending on the access level of the user and the password they enter, if any. There are four access levels, including: **No Password, Level 2, Level 4,** and **Level 6**, with Level 2 having the highest level of access. Without entering a password, the user has access only to basic status menu items. Entering the Level 6 password (5321) allows access to the **Alarm Lists Menu, Quick Menu**, and the **View/Set Unit Menus** group. Entering the Level 4 password (2526) allows similar access as Level 6 with the addition of the **Commission Unit Menu, Manual Control**, and **Service Menu** groups. Entering the Level 2 password (6363) allows similar access as Level 4 with the addition of the **Unit Configuration Menu**.

NOTE: Alarms can be acknowledged without entering a password.

The main password page is displayed when the keypad/display is first accessed, the **Home Key** is pressed, the **Back Key** is pressed multiple times, or if the keypad/display has been idle longer than the **Password Timeout** (default 10 minutes). The main password page provides access to enter a password, access the **Quick Menu**, view the current **Unit State**, access the alarm lists, or view information about the unit.

Figure 16: Password Main Page

🔷 AHU 01	1/5
Enter Password	
Quick Menu	
Unit State=	
Alarm Lists	
About This AHU	

The password field initially has a value **** where each * represents an adjustable field. These values can be changed by entering the **Edit Mode** described below.

Figure 17: Password Entry Page

Enter Password		1/1
Enter Password	* * * *	

Entering an invalid password has the same effect as continuing without entering a password. Once a valid password has been entered, the controller allows further changes and access without requiring the user to enter a password until either the password timer expires or a different password is entered. The default value for this password timer is 10 minutes. It is changeable from 3 to 30 minutes via the **Timer Settings Menu**.

Navigation Mode

In the **Navigation Mode**, when a line on a page contains no editable fields, all but the value field of that line is highlighted - meaning the text is white with a black box around it. When the line contains an editable value field, the entire line is inverted when the cursor is pointing to that line.

When the navigation wheel is turned clockwise, the cursor moves to the next line (down) on the page. When the wheel is turned counter-clockwise, the cursor moves to the previous line (up) on the page. The faster the wheel is turned the faster the cursor moves.

When the **Back Button** is pressed the display reverts back to the previously displayed page. If the **Back button** is repeated pressed the display continues to revert one page back along the current navigation path until the "Main Menu" is reached.

When the **Menu (Home) Button** is pressed the display reverts to the "main page."

When the **Alarm Button** is depressed, the **Alarm Lists Menu** is displayed.

Edit Mode

The **Editing Mode** is entered by pressing the navigation wheel while the cursor is pointing to a line containing an editable field. Once in the edit mode, pressing the wheel again causes the editable field to be highlighted. Turning the wheel clockwise while the editable field is highlighted causes the value to be increased. Turning the wheel counter-clockwise while the editable field is highlighted causes the value to be decreased. The faster the wheel is turned the faster the value is increased or decreased. Pressing the wheel again causes the new value to be saved and the keypad/display to leave the **Edit Mode** and return to the **Navigation Mode**.

Service Timers

A user may override timers for a period of up to 240 minutes by setting the **Service Timer** to a non-zero number. When the **Service Timer** is not zero, the times listed below are set to the **Service Time** (Default = 20 seconds) instead of the normal values. This allows the unit to be run through its operating states without having to wait for the normal time delays to expire. These times revert to the standard values when the **Service Timer** counts down to zero or is set to zero by the user.

The affected times are:

- Cooling Stage Time
- Heating Stage Time
- Start Initial Time
- Recirculation
- ZeroOATime

Rapid Start

The user may elect to initiate a rapid startup sequence at unit power up by setting the **Rapid Start** flag to Yes. When this flag is set to Yes, the **Service Timer** is set to 10 minutes whenever the power is reset to the controller.

Main Menu

The following is a description of the MicroTech 4 menu structure. These menus and items can all be displayed with the keypad/ display. Menu items displayed will change based on the selected unit configuration.

Figure 18: Main Menu – Keypad/Display Menu Structure



DAT Htg Spt= 85.0°F

Rel Hum2 = XXX%

Manual Control

Manual Ctrl= Normal
Supply Fan= Off
SAF Cap Cmd= 0%
OAF1 Circ1 = Off
OAF2 Circ1 = Off
OAFs Circ1 = Off
OF2 Ovrd Circ1 = Off
OAFCap Circ1= 0%
OAF1 Circ2 = Off
OAF2 Circ2 = Off
OAFs Circ2 = Off
OF2 Ovrd Circ2 = Off
OAFCap Circ2= 0%
Exh Dampers= 0%
Ret/Exh Fan= Off
RF/EF Cap Cmd= 0%
OADamperPos= 0%
VCmp1= Off
VCmp1 Cmd= 0%
VCmp2= Off
VCmp2 Cmd= 0%
FCmp1= Off
FCmp2= Off
FCmp3= Off
FCmp4= Off
FCmp5= Off
FCmp6= Off

CondSolCirc1= Off
CondSolCirc2= Off
EVI1 Cap= 0%
EVI2 Cap= 0%
EHGBP1 Cap=0%
EHGBP2 Cap=0%
CW Valve=0%
Heat Enable= Off
Htg Valve= 0
SCR Capacity= 0%
F&BP Damper= 0%
Htg Stg 1= Off
Htg Stg 2= Off
Htg Stg 3= Off
Htg Stg 4= Off
MHGRht Valve= 0%
RH Bleed Valve= Off
LSCRht Valve= 0%
ER Wheel= Off
ER WhI CapCmd= 0%
ERBP Dmpr CI= Off
ERBP Dmpr Op= Off
SCR Preheat= 0%
Alm Output= Off
Aux Output= Off

Trending Set-Up Apply Chgs= No

Sample Time= 60s
TrendOnOff= On
Enable Trend1= Yes
Enable Trend2= No
Enable Trend3= No
Enable Trend4= No
EnaFreeTrend= No
AutoExpTime=1440 min
Export Data= No
Clear Trend= Done
TrendFull = Wrap

+
Unit Maintenance
Operating Hours
Air Filters
Operating Hours
Supply Fan= XXXXXh
Ret/Exh Fan= XXXXXh
Cooling= XXXXXh
Heating= XXXXXh
Economizer= XXXXXh
Tnt Override= XXXXXh
VCmp1= XXXXXh
VCmp2= XXXXXh
FCmp1= XXXXXh
FCmp2= XXXXXh
FCmp3= XXXXXh
FCmp4= XXXXXh
FCmp5= XXXXXh
FCmp6= XXXXXh
Dehumid= XXXXXh
Reheat= XXXXXh
ER Wheel= XXXXXh
ER Preheat= XXXXXh
Air Filters
MainFltrSpt1= 0.5in
MainFltrPres1=
MainFltrSpt2= 0.5in
MainFltrPres2=
MainFltrSw=
FinalFltrSpt= 0.5in
FinalFltrPres=
FinalFltrSw=

Enter (Press Wheel) Display Alarm Lists Display Main Screen Back

Turn Wheel To Scroll Up and Down Menu or To Change Values This navigation map represents all possible AHU menus and menu items. Not all menus and items shown here will appear on the HMI display depending upon the specific unit configuration. Those that do not appear are not applicable to this unit.

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Figure 20: View Status Menu Structure





Figure 21: Commission Unit Menu Structure



Values

			+ +	
+	↓	↓	+	+
Econo Set-Up	OA Damper Set-Up	Heating Set-Up	Humidity Sensor Set-Up	Configurable I/O
Control Temp= XXX°F	Vent Limit= 20%	Control Temp= XXX°E	Hum Sensor 1= SpaceH1	Apply IO Chas= No
Occ Clg Spt= 72.0°F	LoFlo V Lmt= 30%	Occ Htg Spt= 68.0°F	Hum Sensor 2 = OAH	X1 Cfg= AL V
Occ Clg DB= 2.0°F	DCV Limit= 10%	Occ Hlg DB= 2.0°F	SpcHumSensType = VDC	Input X1=
Disch Air= XXX.X°F	OAD Position= XXX%	Disch Air= XXX.X°F	SpcHum MinSig= 0.0V	X2 Cfg= AI V
UseDATClgSpt=Yes	Min OA Pos= XXX%	DAT Htg Spt= 85.0°F	SpcHum MaxSig= 10.0V	Input X2=
DAT Econ Spt= 55.0°F	Min OA Src=	DAT Htg DB= 2.0°F	SpaceRel Hum 1=	X3 Cfg= AI_V
DAT Econ DB= 2.0°F	Min OA Reset= None	EffSpactT= XXX°F	SpaceDwpnt1=	Input X3=
Clg Stage Time= 5min	External Reset	Unocc Clg Spt= 85.0°F	SpaceRel Hum2=	X4 Cfg= AI_V
Econ Chgovr= EnthOAT	OA @ MinV/mA= 0%	Unocc Dif f= 3.0°F	SpaceDwpnt2=	Input X4=
OA Temp= XXX°F	OA @ MaxV/mA= 100%	Htg Stage Time= 5min	RARelHum=	X5 Cfg= AI_V
Chgover Temp= 70.0°F	Min V/mA= 0.0V	OA Temp= XXX.X°F	RADewpoint=	Input X5=
Econo Dif f= 2°F	Max V/mA=10.0V	Htg Hi OAT Lk= 55°F	OARelHum=	X6 Cfg= AI_V
Econo FDD= On	CO2 Reset	OAT Diff= 2°F	OADewpoint=	Input X6=
Econo Reset= None		Htg Keset= None		X/ Cfg= AI_V
Min Econ Spt= 55.0°F	PPM@DCVLmt= 800PPM	Min Htg Spt= 55.0°F		
Min Econ Spt $@= 0$ Max Econ Spt $= 65.0^{\circ}$ E	CO2 PPM = XXXppm	Max Htg Spt @= 0		
Max Econ Spt= 03.0 T	CO2 OMXSnsr = OMX1	Max Htg Spt= 120.0 1		
Max OAT Lmt @= 75°F	Flow Reset	Min DAT Ctrl= Yes		
Min OAT Lmt @= 70°F	OA Flow Reset= Yes	Min DAT Limit= 55.0°F	Energy Rec Set-Up	
Calibrate OAD=No	OA Flow= XXXXXCFM	MWU Sensor= CtrlTemp	Energy Rcvy= Yes	\perp
Pos Sw Open= 97%	OA Flow Spt= 2000CFM	StgGpriState=		•
Max Sw Diff= 3%	OA Flow DB= 3%	StgGSpltState=	Whi Spd Cmd= XXX%	Alarm/Event Config
Pos Sw Close= 3%	BSP Reset	StgGDiagCode=	ERWhiRotSw=	Alarm Limits
Min Sw Diff= 5%	BSP OA Ovrd= No	ModGState=	ER1ErrStatus=	Hi Disch Temp= 1/0°F
OAD Sw Status=	BldgSP Spt= 0.05in	ModGDiagCode=	ER2ErrStatus=	Li Disch Temp= 40 F
OAEOffset= 0.0°F	BSP DB= 0.010in		ER LWT= XXX°F	Alarm Out Config
		F&BP Method= OpenVIV	ER EWT= XXX°F	Faults= Fast
OAEnthalpy=			RARelHum=XXX%	Problems= Slow
RADewpoint=				Warnings= Off
RARelHum=				
RAEnthalpy=				
DATSptEnth=		+		
		Dehum Set-Up	*	
		Dehum Method= None	Relief Damper Set-Up	
		RelHum 1=XXX%	Exh Plen Press=X.XXXin	
		RelHum 2=XXX%	Ef fExh PSP Spt=	
		Hum 1 Spt=50%	Rel Dmpr Cmd=	
		Hum 2 Spt=50%	ExhPSP Lo Spt= 0.150in	
		Dewpoint 1=XXX°F	ExhPSP Hi Spt= 0.350in	
		Dewpoint 2=XXX°F	Exh PSP DB= 0.050in	
		Dewpnt 1 Spt=XXX°F		
		Dewpnt 2 Spt=XXX*F		
		Dewpoint DB = 2%		
		LCT Setpoint= XXX°F	+	
		LCT Spt Reset= None	Snace Sensor Set-Un	
		Min LCT Spt= 45°F	CommissionSnsrs= No	
		Min LCT Spt@= 0.0	Sensor1SN= 000000	
		Max LCT Spt= 52.0°F	Sensor2SN= 000000	
		Max LCT Spt@= 100	Sensor3SN= 000000	
		Min Rheat Spt= 55.0°F	SerialNo1=	
		Max Rheat Spt= 65.0°F	SerialNo2=	
		DAT Clg DB= 2.0°F	SerialNo3=	

Field Control Wiring

Rebel Applied units are available with several control schemes which may require low voltage field wiring. Use the Unit Specific Electrical Schematics to determine which control connections will be required for installation. Check unit specific electrical documentation in the door of the unit's control panel. Figure 22 is a graphical representation of TB2 and Table 2 shows the possible field connections that can be made.

Table 2: Potential Field Connections and Locations on TB2

Terminal Block Number	Description	Signal
200	Power	24V AC
201	Signal for Tennant Override	Contact Closure
202	Condensate Overflow Switch Contact 1	Contact Closure
203	Condensate Overflow Switch Contact 2 & feed into SD2 E-stop series	Contact Closure
204	Feed from SD2 into E-Stop Series	Contact Closure
205	Field Provisions for E-Stop	Contact Closure
206	Field Provisions for E-Stop	Contact Closure
207E	Relative Humidity Sensor #1 (ZRH1)	4-20mA
208E	Humidity Sensor	4-20mA
208G	Relative Humidity Sensor #2 (ZRH2)	4-20mA
210	Space Temperature Sensor 1	Thermistor
210E	Space Temperature Sensor 2	thermistor
210G	Space Temperature Sensor 3	thermistor
212	Setpoint Adjustment, Wallstat	Signal
214	CO2 / Ext OA Reset	0-10V DC
215	Alarm Output	24VAC relay
216	Alarm Return	24VAC relay
217	Fan Operation	24VAC relay
220	Freezestat Sensor Terminal 1	Contact Closure
221	Freezestat Sensor Terminal 2	Contact Closure
231	Alarm Reset	Contact Closure
236	Controller Common	
240	Local / Remote Status	relay output
240C	System Ready Output	relay output
242	Cooling system Interlock (From Field)	Contact Closure
246	Reheat Valve Cmd	0-10V DC
247	Cooling Capacity Input	0-10V DC
250	Cooling Actual Capacity Output	0-10V DC
267	SAF1 Capacity Cmd (From Field)	0-10V DC
275	EF Capacity Cmd (From Field)	0-10V DC
296A	Return Air SD Aux Contact	relay output
296B	Return Air SD Aux Contact	relay output
296C	Supply Air SD Aux Contact	relay output
296D	Supply Air SD Aux Contact	relay output
297	Passive Ventilation Input	Contact Closure
297A	Passive Ventilation Input	Contact Closure
2100	Smoke Purge - Purge	Contact Closure
2101	Smoke Purge - Pressurize	Contact Closure
2102	Smoke Purge - Vent	Contact Closure
2103	Smoke Purge - Shutdown	Contact Closure

Figure 22: Graphical Representation of TB2



MicroTech 4 Field Installed Sensors

The MicroTech 4 unit controller can be connected to a variety of field installed sensors.

- Space Sensor w/tenant override Daikin PN: 113117701
- DDC Space Sensor with Setpoint Adjust and Tenant Override - Daikin PN: 910143408
- Combo DDC Temp and Humidity Sensor with Setpoint Adj and Tnt Ovrd - Daikin PN: 910191961
- Communicating Network Space Sensors Daikin PN: 910279216 and 910278050
- Space Humidity Sensor Daikin PN: 910202119
- Wall Mounted CO2 Sensor Daikin PN: 107287012
- · Duct Mounted CO2 Sensor Daikin PN: 910111672

Space Temperature Sensors

The Rebel Applied MicroTech 4 works with 10kohm Type 2 thermistors and can support up to 3 space sensors. These sensors can drive cooling and heating based on the highest, lowest, or average space sensor reading.

Figure 23: Space Temperature Sensors Wiring Diagram



DDC Space Sensors

The Rebel Applied MicroTech 4 works with 10kohm Type 2 thermistors and can support up to 3 sensors. These sensors can drive cooling and heating based on the highest, lowest, or average space sensor reading. A combo sensor version provides temperature and humidity.

NOTE: Only one sensor can drive the Setpoint adjustment.





Communicating Network Space

Sensors

The MicroTech 4 unit controller can be connected to a Network of the 3 space sensors as either a temperature sensor only or a temperature, Humidity and CO2 combo sensor. Each Sensor comes with a backlit LCD screen to show current space conditions, allow setpoint adjustment and commands.

- Network Temperature Sensor: Part Number 910279216
- Network Combo Temperature Sensor: Part Number 910278050

Figure 25: Temperature Sensor



The MicroTech 4 can support up to 3 Network (QMX) sensors wired to the Process Bus terminals with a Daisy Chain Twisted pair.

Figure 26: Wired Network Sensor Example



NOTE: The sensor is available in English units only and does not show SI units.

IAQ/OA Flow

All units equipped with 100%, 0-30% OA or 0-100% OA Economizer dampers can be supplied with outdoor airflow measuring stations. Refer to the wiring diagram in the Appendix at line 901 for wiring details on OA flow stations. Additionally, these variations can also be provided with a field mounted CO2 sensor for **Demand Control Ventilation**. CO2 sensors are wired to the LVTB2 in the low voltage panel at terminal 214. **Demand Control Ventilation** can also be performed using the Communicating Network sensors. See Table 104 on page 174

Figure 27: CO2/OA Wiring Diagram



Humidity Sensors

The MicroTech 4 will support up to 2 remote, field wired remote mounted humidity sensors and two factory installed **Outdoor** and **Return Air Humidity Sensors**. Humidity sensors are used for economizer control, dehumidification control, and for monitoring via a Building Automation System. See Table 36 on page 101 and refer to Table 25 on page 72.

Figure 28: Humidity Sensors Wiring Diagram



Emergency Off Circuit

The **Emergency Off Circuit** will shut down the unit when the Digital Input is open. This circuit contains the smoke detector and field wired emergency off terminals.

Figure 29: Emergency Off Circuit Wiring Diagram



Smoke Detectors

The **Supply** and **Return Air Smoke Detectors** have Auxiliary outputs from Pin 8 and 18 on the detector that are available on the TBLV2 Terminals. These contacts provide field status and are available on TBLV2 terminals 296A and 296B.

Figure 30: Smoke Detector Wiring Diagram



Tenant Override

Figure 31: Tenant Override Wiring Diagram



Ventilation Override and Smoke Purge

The optional **Ventilation Override Smoke Purge** sequence provides (4) field wire terminal block inputs that allow override of unit operation during an emergency control scenario. This control occurs with hardwired relays outside of the MicroTech 4. The inputs provide an override function to **Ventilate**, **Pressurize**, or **Purge**.

Table 3:	TBLV2	Terminal	Sequence
----------	-------	----------	----------

	TB LV2 Terminal	Sequence
Unit Shut Down	2103	The unit must be shut down to initiate the emergency override functions
Ventilate	2102	When the ventilate contact is active, the Outdoor Air Damper is drive open to 100%.
Pressurize	2101	When the Pressurize contact is active, the Outdoor Air damper is driven open to 100% and the supply fan ramps to the SAF Vent Speed. This is adjustable in the Commissioning SAF Set-up menu.
Purge	2100	When the Pressurize contact is active, the Return Air damper is driven open to 100% and the Relief fan, return or exhaust) ramps to the RFEF Vent Speed. This is adjustable in the Commissioning RFEF Set-up menu.

Alarm Output and Auxiliary Output

MicroTech 4 has an **Alarm Output** contact, DO9, that is available on TBLV2 Terminals 215,217 that provides a digital output anytime an alarm is active on the controller. MicroTech 4 also has an **Auxiliary Output** contact, DO10, that is available on TBLV2 Terminals 216,217 that can be configure to provide a digital output anytime the fan is operational or to be used as a VAV active signal to drive boxes open during morning warmup. To configure DO10, review Table 80 on page 158.

Figure 32: Alarm/Auxiliary Outputs Wiring Diagram



Manual Unit Operation

🖄 WARNING

Only qualified personnel should install, operate and service the equipment and that improper adjustment of settings and operation by an unqualified person could result in property damage, injury, or death.

Manual Control can be initiated during start up to control individual features of the air handling system independent of the control sequence. Place the unit into **Manual Control** mode through the MicroTech 4 Keypad menu - Main Menu\ Manual Control\Manual Ctrl = Manual. Once in manual control, you can activate fans and compressors manually, check damper operation, etc.

NOTE: Manual operation is not intended for extended operation beyond troubleshooting or initial start-up.

Table 4: Manual Unit Operation Keypad Descriptions

Menu Display Name	Default	Range	Description
Menu Display Name	Default	Range	Description
Manual Ctrl	Normal	Normal ManCtrl	Manual Ctrl is an adjustable item that allows the unit to enter manual control mode.
Supply Fan	Off	Off On	Supply Fan is an adjustable item that manually turns the fan on.
SAF Cap Cmd	0%	0-100%	SAF Cap Cmd is an adjustable item that manually drive the supply fan to a capacity.
OAF1 Circ1	Off	Off On	OAF1 Circ1 is an adjustable item that manually turns the outdoor fan 1 on on Circuit 1
OAF2 Circ 1	Off	Off On	OAF2 Circ 1 is an adjustable item that manually turns the outdoor fan 2 on on Circuit 1
OAFs Circ 1	Off	Off On	OAFs Circ 1 is an adjustable item that manually turns the outdoor fans on for circuit 1.
OF2Ovrd Circ1	Off	Off On	OF2Ovrd Circ1 is an adjustable item that manually turns the outdoor fan 2 on on Circuit 1
OAFCap Circ 1	0%	0-100%	OAFCap Circ 1 is an adjustable item that manually sets the outdoor fan capacity on Circuit 1 when equipped with a modulating condenser fan control.
OAF1 Circ2	Off	Off On	OAF1 Circ2 is an adjustable item that manually turns the outdoor fan 1 on on Circuit 2
OAF2 Circ 2	Off	Off On	OAF2 Circ 2 is an adjustable item that manually turns the outdoor fan 3 on on Circuit 2
OAFs Circ 2	Off	Off On	OAFs Circ 2 is an adjustable item that manually turns the outdoor fans on for circuit 2.
OF2Ovrd Circ2	Off	Off On	OF2Ovrd Circ2 is an adjustable item that manually turns the outdoor fan 2 on on Circuit 2
OAFCap Circ 2	0%	0-100%	OAFCap Circ 2 is an adjustable item that manually sets the outdoor fan capacity on Circuit 2 when equipped with a modulating condenser fan control
Exh Dampers	0%	0-100%	Exh Dampers is an adjustable item that sets the exhaust damper position if the unit is equipped with a modulating exhaust damper.

Menu Display Name	Default	Range	Description
Ret/Exh Fan	Off	Off On	Ret/Exh Fan is an adjustable item that manually turns on the Return or Exhaust Fan
RFEF Cap Cmd	0%	0-100%	RFEF Cap Cmd is an adjustable item that manually sets the Return or Exhaust Fan capacity
OADamper Pos	0%	0-100%	OADamper Pos is an adjustable item that manually sets the outdoor air damper position capacity
DXBP Dmpr Cmd	0%	0-100%	DXBP Dmpr Cmd is an adjustable item that manually sets the DX Bypass Damper position capacity
VCmp1	Off	Off On	VCmp1 is an adjustable item that manually turns on Variable Compressor 1.
VCmp1 Cmd	0%	0-100%	VCmp1 Cmd is an adjustable item that manually sets the capacity of the Variable Compressor 1.
VCmp2	Off	Off On	VCmp2 is an adjustable item that manually turns on Variable Compressor 2.
VCmp2 Cmd	0%	0-100%	VCmp2 Cmd is an adjustable item that manually sets the capacity of the Variable Compressor 2.
FCmp1	Off	Off On	FCmp1 is an adjustable item that manually turns on the Fixed Compressor 1.
FCmp2	Off	Off On	FCmp2 is an adjustable item that manually turns on the Fixed Compressor 2.
FCmp3	Off	Off On	FCmp3 is an adjustable item that manually turns on the Fixed Compressor 3.
FCmp4	Off	Off On	FCmp4 is an adjustable item that manually turns on the Fixed Compressor 4.
FCmp5	Off	Off On	FCmp5 is an adjustable item that manually turns on the Fixed Compressor 5.
FCmp6	Off	Off On	FCmp6 is an adjustable item that manually turns on the Fixed Compressor 6.
CondSol Circ 1	Off	Off On	CondSol Circ 1 is an adjustable item that manually turns on the Low Ambient Condenser Slitter Solenoid on Circuit 1
CondSol Circ 2	Off	Off On	CondSol Circ 2 is an adjustable item that manually turns on the Low Ambient Condenser Slitter Solenoid on Circuit 1
EVI1 Cap	0%	0-100%	EVI1 Cap is an adjustable item that manually sets the capacity of the Electronic Expansion Valve on Circuit 1
EVI2 Cap	0%	0-100%	EVI2 Cap is an adjustable item that manually sets the capacity of the Electronic Expansion Valve on Circuit 2
EHGBP1 Cap	0%	0-100%	EHGBP1 Cap is an adjustable item that manually sets the capacity of the Hot Gas Bypass Electronic Expansion Valve on Circuit 1
EHGBP2 Cap	0%	0-100%	EHGBP2 Cap is an adjustable item that manually sets the capacity of the Hot Gas Bypass Electronic Expansion Valve on Circuit 2
CW Valve	0%	0-100%	CW Valve is an adjustable item that manually sets the capacity of the chilled water control valve.
Heat Enable	Off	Off On	Heat Enable is an adjustable item that manually turns on the primary heater
Htg Valve	0%	0-100%	Htg Valve is an adjustable item that manually sets the capacity of the hot water or steam control valve.
SCR Capacity	0%	0-100%	SCR Capacity is an adjustable item that manually sets the capacity of the SCR electric heater

Menu Display Name	Default	Range	Description
F&BP Damper	0%	0-100%	F&BP Damper is an adjustable item that manually sets the capacity of the Face and Bypass Damper
Htg Stg 1	Off	Off On	Htg Stg 1 is an adjustable item that manually turns on stage 1 of heat in a staged heater.
Htg Stg 2	Off	Off On	Htg Stg 2 is an adjustable item that manually turns on stage 2 of heat in a staged heater.
Htg Stg 3	Off	Off On	Htg Stg 3 is an adjustable item that manually turns on stage 3 of heat in a staged heater.
Htg Stg 4	Off	Off On	Htg Stg 4 is an adjustable item that manually turns on stage 4 of heat in a staged heater.
MHGRht Valve	0%	0-100%	MHGRht Valve is an adjustable item that manually sets the capacity of the modulating hot gas reheat valve.
RH Bleed Valve	0%	0-100%	RH Bleed Valve is an adjustable item that manually sets the capacity of the modulating hot gas reheat bleed valve.
LSCRht Valve	0%	0-100%	LSCRht Valve is an adjustable item that manually sets the capacity of the modulating hot gas reheat valve.
ER Wheel	Off	Off On	ER Wheel is an adjustable item that manually turns on the energy recovery wheel.
ER Whl CapCmd	0%	0-100%	ER WhI CapCmd is an adjustable item that manually sets the capacity the energy recovery wheel speed
ERBP Dmpr Cl	Off	Off On	ERBP Dmpr CI is an adjustable item that manually closes the Energy recovery wheel bypass damper.
ERBP Dmpr Op	Off	Off On	ERBP Dmpr Op is an adjustable item that manually opens the Energy recovery wheel bypass damper.
SCR Preheat	0%	0-100%	SCR Preheat is an adjustable item that manually sets the capacity of the SCR Preheat defrost coil.
Alm Output	Off	Off On	Alm Output is an adjustable item that manually turns on the alarm output.
Aux Output	Off	Off On	Aux Output is an adjustable item that manually turns on the Auxiliary output DO10
RelDampCls	Off	Off On	RelDampCls is an adjustable item that manually turns on the Relief Damper Close output.

Temporary Operation for Heating and Cooling

For **Temporary Heating and Cooling** operation during the construction or prior to building occupancy follow these steps.

- **NOTE:** This temporary control works on all units with a Return Air Opening (and not 100% OA configured equipment) and controls to maintain the return air temperature at the setpoint before space sensors or additional controls are available. It is not intended to directly control humidity or building pressure.
 - 1. Be prepared to record the original settings on paper for each of the following sets. You will need to revert the settings to the defaults prior to final commissioning.
 - Configure for Zone Control: For Temporary Heating and Cooling operation you will need to configure the MicroTech 4 for Zone Control operation using the keypad menu.
 - a. Enter Password 6363

b. Navigate: Main Menu\Advanced Menu\Unit Configuration (you will need to enable the advanced menu in the service menu)

c. Set Control Type = Zone Temperature Control (ZTC)

d. Scroll to the top save settings. The controller will cycle power

3. Configure for RAT; set temporary cooling or heating

setpoint

a. Enter Password 6363

b. Navigate: Main Menu\Commission Unit\Htg/Clg ChgOvr Set-Up

c. Set Ctrl Temp Src = RAT

d. Set OccClg Spt = desired setpoint for temporary cooling

e. Set Occ Htg Spt= desired setpoint for temporary heating

- f. Return to Main Menu
- 4. Set-Up OA Damper

a. Navigate: Main Menu\Commission Unit\OA Damper Set-Up

- b. Set Vent Limit = 0%
- c. Return to Main Menu
- 5. Configure for Cooling or Heating
 - a. Navigate: Main Menu\ Quick Menu
 - b. Set Ctrl Mode = CoolOnly for Cooling Operation OR Heat for Heating operation
 - c. Set Occ Mode = Occ.
- 6. Revert to original control settings once temporary operation is complete

Unit Set-Up

The units of measure can be set to English or SI units. General unit set-up configurations are used to adjust the MicroTech 4 controllers units of measure: **Unit Name**, **Space Temperature Configuration**, and **Emergency Stop** control.

Unit Name

A customized **Unit Name** can be entered. This helps identify each unit when more than one unit is connected to a single remote HMI. Example: RTU-1

Local Space Temperature Configuration

More than one **Local Space Temperature Sensor** can be connected to the MicroTech 4. This configuration sets which

Unit Set-Up Menu

Table 5: Main Menu \ Commission Unit \ Unit Set-Up

sensor will drive the unit operation; either Sensor 1, Sensor 2, sensor 3 or Minimum value, Maximum value, or Average value.

Emergency Stop

The **Emergency Stop** configuration determines how the MicroTech 4 will resume operation after an emergency off signal. "ManClr" requires a cycling of the power at the disconnect. When set to "AutoClr" the unit will resume operation once the emergency off singal disappears.

Menu Display Name	Default	Range	Description
Eng Units	English	English SI	Eng Units is an adjustable item to indicate if the unit is to display English or Metric units of measure
Unit Name	-	-	Unit Name is an adjustable item that allows each controller to be given a unique name. This may be useful when multiple units are connected to a single remote HMI
Loc SpaceT Cfg	Sens1	Min Max Avg Sens1 Sens2 Sens3	Loc SpaceT Cfg is an adjustable item that allows the user to select which space temperature sensor will be used as the effective space temperature sensor. MicroTech 4 can be equipped with up to 3 space sensors, where the Min (lowest reading), Max (Highest Reading), Average (average reading) or a specifc sensor can be used as the effective space sensor.
Emerg Stop	ManClr	ManClr AutoClr	Emerg Stop is an adjustable item that sets if the unit requires a manual reset after an emergency stop or if it will automatically restart once the emergency signal does not exist.

Enable the Unit

Control Mode

The unit heating and cooling can be set up for automatic heat/ cool, heating only, cool only, or fan only operation based on a network signal by setting the **Control Mode** parameter to "Auto." With the **Control Mode** parameters set to "Auto," the heat/cool, cool only, heat only, fan only decision is determined by the Net App Mode. The Net App Mode is set by a signal. The following sections describe the five available Net App Mode selections.

NOTE: The Net App Mode has no effect on the unit operation unless the Control Mode parameter is set to "Auto."

Off

When the Net App Mode is set to "**OFF**," the Unit Status is "Off Net" and the unit is completely disabled, including unoccupied heating (night set back) and unoccupied or unoccupied cooling (night set up) operation.

Heat Only

When the Net App Mode is set to "**Heat Only**," heating operation is allowed to operate as required to maintain the heating set points. Cooling operation is disabled (Cooling Status is "Off Net").

Cool Only

When the Net App Mode is set to "**Cool Only**," cooling operation is allowed to operate as required to maintain the cooling set points. Heating operation is disabled (Heating Status is "Off Net").

Fan Only

When the Net App Mode is set to "**Fan Only**," the fans are allowed to operate but cooling and heating operation is disabled (Cooling Status and Heating Status are "Off Net").

Heat Cool

When the Control Mode is set to "Heat/Cool," both cooling and heating operation are allowed to operate as required to maintain the cooling and heating set points.

Auto

When the Net App Mode is set to "**Auto**," heating and cooling operation are allowed to operate as required to maintain the heating and cooling set points.

NOTE: Control Mode can be viewed and changed in the Main Menu, Quick Menu, and Unit Status/Setting Menu

Occupancy

Occupancy Mode is a configurable item that determines the current unit mode. Settings can be, Occ, Occupied, Unocc (Unoccupied), TntOvrd (Tenant Override), or Auto/Net (Auto change based on network or schedule)

Occupied Operation

During **Occupied Operation**, the unit starts and runs continuously, cooling, dehumidifying and heating as required to maintain the occupied setpoints.

Unoccupied Operation

During **Unoccupied Operation** the unit operates normally except that the Minimum OA position is always set to zero so that the damper is closed to the outdoor air.

- **Unoccupied Cooling:** Unoccupied operation is initiated if the space sensor is reliable, the space temperature is greater than the Unoccupied Cooling Setpoint, and the Unoccupied Cooling Setpoint is set lower than its maximum setting. In this case, the unoccupied source indicates "UnoccClg".
- Unoccupied Heating: Unoccupied operation is initiated if the space sensor is reliable, the space temperature is less than the Unoccupied Heating Setpoint, and the Unoccupied Heating Setpoint is set higher than its minimum setting. In this case, the Unoccupied Source indicates "UnoccHtg"
- Unoccupied Dehumidification: Dehumidification may be initiated in the unoccupied mode only if Dehumidification Control is set to Always instead of Occupied on the keypad. When this is the case and the humidity goes high the unit transitions in the normal manner through Start up and Recirc to Fan Only and then into the Dehumidification Mode. In this case, the UnoccSrc= parameter indicates "Unocc Dehum".

Determining Occupancy Source

Occupancy can be driven by a number of sources: Network Schedule, Internal Schedule, a preprogrammed event, Manual Control of Occupancy, a remote wired switch, a Building Automation System or a Temperature Sensor Override.

- **Schedule:** Occupancy can be driven off of a schedule either through the network or using the internal schedule function on MicroTech 4.
 - Network: When occupancy is set to Net Schedule, this means that occupancy is being driven to

occupancy due to a network schedule.

- Internal: When occupancy is set to IntSchedule, this means that occupancy is being driven to occupancy due to the internal schedule in the unit controller.
- One Event: When occupancy is set to OneEventSchedule, this means that occupancy is being driven to occupancy due to a preprogrammed, scheduled event in the unit controller.
- Manual Occupancy: Occupancy can be driven manually to occupied, at the MicroTech 4 controller interface, via a contact closure of a switch or via a Building Automation network.
 - Occupancy Mode: Occ Mode is when the occupancy has manually been set to Occ at the unit controller.
 - Remote Switch: When the unit is in occupancy due to a field supplied external time clock or a tenant override switch in the form of a set of dry contacts is closed across terminals 200 and 201 on the unit field terminal block TBLV2.
 - Network: When an OccManCmd is shown for occupancy status, the network is sending a manual occupied signal.
- **Tenant Override:** Tenant override is when the unit occupancy status is overridden from unoccupied to occupied operation for a override timer, and adjustable timer from 0-300 min.
 - TStat Tenant Override: The TStat Tenant Override (TstatTO), status is occupancy override due to the tenant override button on the any zone thermostat being pushed and held for at least 1 second.
 - ManTenant Override: Manual Tenant Override (ManTO) status is occupancy override due to the unit is manually set to occupied at the unit controller and the override timer is set to a non-zero value.
 - Tenant Override can be set to not be activated by any space sensors by setting the TOTime = 0min and by setting the TOSensorSrc = None
 - The TOTime entry on the keypad can also be manually set to a non-zero value. In this case the value begins timing down from the edited value.
 - Tenant Override operation may be terminated by manually setting the Tenant Override parameter on the keypad to zero or by disabling the unit.

Determining Unoccupied Source

Unoccupied operation is allowed when a valid space temperature sensor(s) is present.

- Unoccupied Dehumidification: Unoccupied operation is enabled with the Unocc Dehum in the Dehumidification set-up menu is set to Yes. In order for unoccupied operation to be performed a valid space humidity sensor must be connected to the unit and configured in the Humidity Sensor set up menu. During unoccupied dehumidification, the unit will activate the unit with the outside air damper closed and will start cooling plus dehumidification operation to control the space sensor relative humidity, or dewpoint setpoint. Refer to the Dehumidification method, and sensor setpoints.
- **UnoccClg:** Unoccupied operation is initiated if the space sensor is reliable, the space temperature is greater than the Unoccupied Cooling Setpoint, and the Unoccupied Cooling Setpoint is set lower than its maximum setting In this case, the unoccupied source indicates "UnoccClg".
- **Unocc Htg:** Unoccupied operation is initiated if the space sensor is reliable, the space temperature is less than the Unoccupied Heating Setpoint, and the Unoccupied Heating Setpoint is set higher than its minimum setting. In this case, the Unoccupied Source indicates "UnoccHtg"
- Internal Optimal Start: Unoccupied operation is enabled due to an internal optimal start schedule being activated. In this case, the Unoccupied Source indicates "IntOptStrt".
- Network Optimal Start: Unoccupied operation is enabled due to a network optimal start schedule being activated. In this case, the Unoccupied Source indicates "NetOpStrt".

Occupancy Menu

Table 6: Main Menu \ View Status \ Occupancy

Menu Display Name	Default	Range	Description
Occupancy	-	Occ Unocc TntOvrd	Occupancy is a status only item that displays the current occupancy status. Occupancy can be one of three values, Occupied(Occ), Unoccupied(Unocc) and Tenant Override (TntOvrd).
Occ Mode	Auto/Net	Occ Unocc TntOvrd Auto/Net	Occ Mode is an adjustable item that sets the occupancy mode for manual occupied and unoccupied operation, or for automatic operation based on a time schedule input, or manual tenant override operation.
OccSrc	-	None NetSchd IntSchd OneEvnt RemoteSW NetManCmd OccMode TstatTO ManTO	OccSrc is a status only item which indicates the input source or function that is responsible for setting the Occupancy parameter to "Occ" or "TntOvrd."
UnoccSrc	-	UnoccDehum Unocc Clg UnoccHtg IntOptStrt NetOptStrt IntPurge NetPurge None	UnoccSrc is a status only item which indicates the input source or function that is responsible for running the unit while the Occupancy parameter to "Unocc."
Tnt Ovrde Tm	0	0-300min	The Overd Time is an adjustable item which indicates the amount of time remaining for unit operation since tenant override operation was activated.
TOSensorSrc	Any	None Sensor1 Sensor2 Sensor3 Any	TOSensorSrc is an adjustable item which indicates which space sensor can drive tenant override. MicroTech4 can support up to 3 space sensor with tenant override.

Scheduling

The unit can be scheduled for operation by using the following three methods:

- Unit internal time scheduling functions
- External time clock function
- Network time scheduling function

Provided the unit is not locally or remotely disabled, the unit operates when any of these scheduling functions is calling for occupied operation. Conversely, the unit enters the unoccupied mode when all of these scheduling functions are calling for unoccupied operation. Therefore, any unused scheduling functions should be set for continuous unoccupied operation.

The next four sections: "Controller Date and Time," "Internal Daily Scheduling," "Holiday Scheduling," and "One Event Scheduling" describe functions related to the internal unit scheduling functions. These are followed by a section describing the optimal start function which can be used with internal scheduling and network scheduling. This is followed by two sections that describe the external time scheduling and network time scheduling functions.

Date and Time

The controller uses the **Date and Time** to execute its internal scheduling functions. The current Time and Date will not be lost if the unit is turned off for up to forty-eight hours. The Time and Date are set from the keypad. The Time of day can be set by entering the hour (00-23), minute (00-59), and second (00-59) into three fields of the Current Time. Note that MicroTech 4 uses "military" time. The current Date can be set by entering the date (00-31), month (01- 12) and year (1999-2155) into the three fields of the Current Date.

Internal Daily Scheduling

An **Internal Daily Schedule** provides one start time and one stop time for each of the seven days of the week and for holidays. When the Occ Mode= parameter is set to "Auto/Net", and the unit is not disabled for other reasons, it starts and stops according to the controller internal schedule.

Holiday Scheduling

The operator may select the days when start and stop times for holidays are used by selecting a start date and an end date for up to ten periods during the year using the **Holiday Scheduling** feature. Whenever a holiday period occurs, the controller uses the **Holiday** Schedule start and stop time for the period. For example, assume that Christmas Eve occurs on a Thursday. The building is shut down on both Christmas Eve and Christmas Day, but operates normally on the weekend. This holiday period would be scheduled by setting the Holiday Schedule to the default "no schedule" values "HH:MM-HH:MM" and setting the Holiday Period to "12/24/19 - 12/25/19

One Event Scheduling

One-Event Scheduling is provided so that one operating period can be scheduled without affecting the regular internal schedule. A start date/time and an end date/time can be set. The unit can be scheduled to operate during a specified period by using this feature. During the specified period defined by the One Event Beginning Date/Time and One Event Ending Date/Time parameters, the unit starts up and runs continuously regardless of any other time scheduling functions. For example, assume that a space served by the unit is occupied for a special event on March 12, 2019 from 5:00 p.m. to 10:00 p.m. when the normal time scheduling has the unit shut off after 4:00 p.m. on that date. This event can be accounted for by setting the One Event Beginning Date/Time to "3/12/19 @ 17:00:00" and the One Event Ending Date/Time to "3/12/19 @ 22:00:00."

External Time Scheduling

An **External Time Scheduling** clock can be used to schedule unit operation. This is accomplished by a field supplied external time clock signal in the form of a set of dry contacts wired across terminals 101 and 102 on the unit field terminal block TB2. In this case, all internal daily schedules should be set to "HH:MM-HH:MM" (default setting).

Date/Time/Schedules Menu

Table 7: Main Menu \ View Status \ Date/Time/Schedule

Menu Display Name	Default	Range	Description		
Time	-	00:00:00- 23:59:59	Time: is an adjustable item that sets the current time (Hr:Mn:Sec)		
Date	-	1/1/1970- 1/31/9999	Date is an adjustable item that sets the current date. (M/D/Y)		
UTC Diff	60min	-	UTC Diff is an adjustable parameter that can be set to indicate how the load time where the unit is situated differs from the Coordinated Universal Time.		
DAILY SCHED	ULE	L			
Mon	HH:MM-	00:00-23-59	The Daily Schedule sets the start and stop times for each of the days of the		
Tue	HH:MM		week. One start and one stop time can be set for each day.		
Wed					
Thur					
Fri					
Sat					
Sun					
Hol					
HOLIDAY DAT	ES				
Hol 1	MM/DD/99-	00/00/00-	The Holiday Schedule is used to set the start and stop times for up to 10 different		
Hol 2	MM/DD/99	12/31/99	holidays.		
Hol 3					
Hol 4					
Hol 5	-				
Hol 6					
Hol 7					
Hol 8					
Hol 9					
Hol 10					
ONE EVENT S	CHEDULE				
Beg	MM/DD/99 @ HH:MM	00/00/00 -12/31/99 @ 00:00 - 23:59	The One Event Schedule is used to set the start and stop times for one event.		
End	MM/DD/99 @ HH:MM	00/00/00 -12/31/99 @ 00:00 - 23:59			
DAYLIGHT SA	DAYLIGHT SAVINGS				
DLS Strt	Mar	NA	DLS Strt Mon is an adjustable item that sets the month for daylight savings time		
Month		Jan-Dec	to begin.		
DLS Strt	2ndWeek	1stWeek	DLS Strt Week is an adjustable item that sets the week of the month for daylight		
VVeek		2ndWeek	savings time to begin.		
		3rdWeek			
		4thWeek			
		5thWeek			
DLS End	Nov	NA	DLS End Mon is an adjustable item that sets the month for daylight savings time to end		
		Jan-Dec			
Menu Display Name	Default	Range	Description		
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DLS End Week	1stWeek	1stWeek 2ndWeek 3rdWeek 4thWeek 5thWeek	DLS End Week is an adjustable item that sets the week of the month for daylight savings time to end.		
DLSEnable	Auto	Off Auto	DLS Enable is an adjustable item that sets whether or not daylight savings time is enabled.		

Optimal Start (Morning Warm-Up/ Cool Down)

The **Optimal Start** sequence is used so the unit starts at the most efficient time before building occupancy. Optimal Start can be initiated based on an internal schedule or from a signal from a connected network. When Optimal Start is based on an internal schedule, the controller uses start history, outdoor air temperature and space temperature to determine when the unit should start. The unit may start up to four hours before the schedule occupancy time. When Optimal Start is based on network control, the network may write a time to occupancy to the unit to initiate the start time.

Morning Warm-Up

Morning Warm-Up operates when the space temperature is below the Occupied or Unoccupied Heating Setpoint by ½ the Zone Htg Deadband. During Morning Warm-up operation the outside air damper is kept closed and the unit heating is used to warm-up the space while recirculating air. The timer, ZeroOATime, is set equal to the time to occupancy during optimal start so that the OA dampers will open at the start of occupancy. DAT units have a Morning Warm-Up setpoint available.

• **Zone Control Units:** When a Zone Control Unit (Ctrl Type=Zone) first starts in the morning, it enters the Heating operating state if the Control Temperature is below the Occupied Heating Setpoint by more that ½ the heating dead band. In this case, the Occupied Heating Setpoint is the "morning warmup setpoint"

• DAT Control Units: For Discharge Temperature Control units (Ctrl Type=DAC) there are two additional morning warmup related adjustable parameters; MWU Heating Setpoint and MWU Sensor. When a Discharge Temperature Control unit first starts in the morning it enters the Heating operating state if the sensor selected by the MWU Sensor parameter (RAT or Space) is below the MWU Heating Setpoint by more that ½ the Heating dead band. The MWU Sensor can also be set to None. If the MWU Sensor is set to None the MWU Heating Setpoint has no effect and the unit only enters heating based on the Occupied Setpoint in the normal manner.

Morning Cool Down

Morning Cool Down operates when the space temperature is above the Occupied or Unoccupied Cooling Setpoint by ½ the Zone Cooling Deadband. During Morning Cool Down operation the outside air damper is kept closed and the unit operates cooling to cool the space down using recirculated air. The timer, ZeroOATime, is set equal to the time to occupancy during optimal start so that the OA dampers will open at the start of occupancy.

No Optimal Start

If the space temperature is between the Occupied or Unoccupied Heating and Cooling setpoints, the unit will start at the occupancy time, and not when Morning Warm-Up or Cool Down operation is performed.

Optimal Start Menu

Table 8: Main Men	u \ View Status	\ Date/Time/Schedules
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Menu Display Name	Default	Range	Description			
Enable	No	Yes	Enable is an adjustable item that turns on the optimal start feature. Setting the value to ves will activate this function			
		No				
Htg Rate	0.4°F/min	0.0-1.0°F/min	Htg Rate is an adjustable item used by the controller in determining the amount time before occupancy to start when the Optimal Start parameter is set to "ON."			
Htg OAT	35°F	-40-60°F	Htg OAT is an adjustable item used by the controller in determining the amou time before occupancy to start when the Optimal Start parameter is set to "O			
Des Htg OAT	0°F	-40-60°F	Design Htg OAT is an adjustable item that sets the outdoor air temperature at which the heating system could just hold the load. The rate of temperature rise would equal zero.			
Clg Rate	0.4°F/min	0.0-1.0°F/min	Clg Rate is an adjustable item that sets the rate of temperature drop in degrees per minute when the unit last started optimally in cooling.			
Clg OAT	85°F	-40-140°F	Clg OAT is an adjustable item that sets the outdoor air temperature when the unit was last started optimally in cooling.			
Des Clg OAT	95°F	-40-140°F	Design Clg OAT is an adjustable item that sets the outdoor air temperature at which the cooling system could just hold the load. Rate of temperature rise would equal zero.			

Purge Operation

Purge Operation will provide pre-cooling to the space when the space OccStatus is Uocc by initiating unoccupied operation similarly to unoccupied cooling except that only economizer cooling will be used to cool the space. In this mode, mechanical cooling will be disabled (off Ambient). Purge Operation will be enabled prior to any scheduled start by the amount of time defined by the max purge time. Purge Operation is only valid if conditions are suitable for economizer operation and there is a space temperature sensor connected to the unit.

Purge Menu

Table 9: Main Menu \ View Status \ Date/Time/Schedules

Menu Display Name	Default	Range	Description
Menu Display Name	Default	Range	Description
Max Purge	0min	0-300min	Max Purge is an adjustable item that sets the value of the maximum purge hold timer.

Quick Menu

Items in the **Quick Menu** contain basic unit operating status and control set point parameters. The items shown in the Quick Menu are Read Only if a valid password has not been entered. The following are brief descriptions of the Quick Menu items. No password is required to view the Quick Menu.

Table 10: Main Menu \ Quick Menu

Menu Display Name	Default	Range	Description
Unit State	-	Off Start Recirc FanOnly MinDAT Htg Econo Clg	Unit State is a status only item which indicates the state of unit operation in which the unit is currently operating. The unit can be in any of the operating states shown.
Unit Status	-	Enable OffMan OffManCtrl OffNet OffAImt OffRetry OffPassVnt	Unit Status is a status only item which indicates the status of operation in which the unit is currently operating. The unit status can be any of the status values shown
MWU Status	-	Inactive Active	MWU Status is a status only item that indicates whether or not the unit is in the heating state due to MWU function
Dehum Status	-	Inactive Active	Dehum Status is a status only item which indicates the status of operation of the dehumidification operation. Dehumidification operation can be active or inactive.
System Mode	Local	Local Active	
ClgIntr Lock	-	Open Closed	
Cntrl Mode	Off	Off HeatOnly CoolOnly FanOnly HeatCool Auto/Net	Cntrl Mode is an adjustable item which sets the occupancy mode of the unit. The unit can be Heat Only, CoolOnly, Fan Only, HeatCool, or Auto/Net
Occ Mode	Auto/Net	Occ Unocc TntOvrd Auto/Net	Occ Mode is an adjustable item which sets the occupancy mode of the unit. TThe unit can be occupied, unoccupied, tenant override, or auto modes.
Clg Capacity	-	0-100%	Clg Capacity is a status only item which indicates the percentage of the unit maximum cooling capacity currently operating
OAD Position	-	0-100%	OAD Position is a status only item which indicates the percentage that the outdoor air damper is currently open

Menu Display Name	Default	Range	Description				
Htg Capacity	-	0-100%	Htg Capacity is a status only item which indicates the percentage of the unit maximum heating capacity currently operating				
Rht Cap	-	0-100%	Rht Cap is a status only item which indicates the percentage of the unit maximum reheat capacity the unit is currently operating at.				
Control Temp	-	-50.0-200.0°F	Control Temp is a status only item which displays the current value of the "Control Temperature." The "Control Temperature" is defined as the temperature input selected by the Control Temperature Source parameter For example, if the Control Temperature Source parameter is set to "Return," then the control temperature parameter reads the same value as the Return Air parameter.				
Occ Clg Spt	72.0°F	0.0-100.0°F	Occ Clg Spt is a status only item which indicates the temperature in which the unit will go into the cooling mode of operation. Once a valid password has been entered this item becomes an adjustable item.				
Occ Htg Spt	68.0°F	0.0-100.0°F	Occ Htg Spt is a status only item which indicates the temperature in which the unit will go into the heating mode of operation. Once a valid password has been entered this item becomes an adjustable item.				
Disch Air	-	-50.0-250.0°F	Disch Air is a status only item which displays the current temperature reading from the unit's discharge air temperature sensor (DAT). This ser is standard on all units.				
DAT Clg Spt	55.0°F	40.0-100.0°F	DAT Clg Spt is a status only item which indicates the temperature that th DAT should be maintained at when it is in the cooling mode of operation Once a valid password has been entered this item becomes an adjustab- item.				
DAT Htg Spt	85.0°F	40.0-140.0°F	DAT Htg Spt is a status only item which indicates the temperature that t DAT should be maintained at when in the heating mode of operation. Or a valid password has been entered this item becomes an adjustable ite				
Min DAT Limit	55.0°F	0.0-70.0°F	Min DAT Limit is a status only item which indicates the discharge air low limit temperature on CAV zone control units. Heating will be activated to maintain this setting when the discharge temperature falls below it during the Fan Only operating state. On VAV or CAV discharge control units, the minimum discharge temperature limit is the DAT Clg Spt. Once a valid password has been entered this item becomes an adjustable item.				
Unocc Clg Spt	85.0°F	40.0-100.0°F	Unocc Clg Spt is a status only item which indicates the temperature in which the unit will go into the cooling mode of operation in the unoccupied occupancy state. Once a valid password has been entered this item becomes an adjustable item.				
Unocc Htg Spt	55.0°F	40.0-140.0°F	Unocc Htg Spt is a status only item which indicates the temperature in which the unit will go into the heating mode of operation in the unoccupied occupancy state. Once a valid password has been entered this item becomes an adjustable item.				
SAF Capacity	-	0-100%	SAF Capacity is a status only item which indicates the current capacity of the supply air fan				
SAF DuctPress	-	0.0-5.0in	SAF DuctPress is a status only item which displays the current supply duct static pressure reading.				
SAF DSP Spt	1.0in	0.2-4.0in	SAF DSP Spt is a status only item which displays the current supply fan duct static pressure setpoint. Once a valid password has been entered this item becomes an adjustable item				
RFEF Cap	-	0-100%	RFEF Cap is a status only item indicated the curent capacity of the return/ exhaust fans.				
Bldg Press	-	-0.250-0.250in	Bldg Press is a status only item indicated the current building static pressure reading				
BldgSP Spt	0.050in	-0.250-0.250in	BldgSP Spt is a status only item which displays the current building static pressure setpoint. Once a valid password has been entered this item becomes an adjustable item.				
RAF DuctPress	-	0-5.0in	RAF DuctPress is a status only item which displays the current return duct static pressure reading.				

Menu Display Name	Default	Range	Description
RAF DSP Spt	1.0in	0.2-4.0in	RAF DSP SPt is a status only item which displays the current return duct static pressure setpoint. Once a valid password has been entered this item becomes an adjustable item.
CO2 PPM	-	0-5000ppm	CO2 PPM is a status only item which displays the current CO2 PPM reading
OA Flow	-	0-60000 CFM	OA Flow is a status only item which displays the current OA Flow reading
OA Flow Spt	2000CFM	0-60000 CFM	OA Flow Spt is a status only item which displays the current minimum outdoor air flow setpoint. Once a valid password has been entered this item becomes an adjustable item
SAF Flow	-	0-60000 CFM	SAF Flow is a status only item which displays the current supply air fan airflow reading
SAF Flow Spt	2000CFM	0-60000 CFM	SAF Flow Spt is a status only item which displays the current supply air flow setpoint. Once a valid password has been entered this item becomes an adjustable item
OA Temp	-	-50.0-200.0°F	OA Temp is a stauts only item which displays the current temperature reading from the unit mounted Outdoor air temperature sensor. This sensor is standard on all units
Rel Hum1	-	0-100%	Rel Hum1 is a status only item that displays the current relative humidity reading from the optional relative humidity sensor at user defined location 1
Rel Hum2	-	0-100%	Rel Hum2 is a status only item that displays the current relative humidity reading from the optional relative humidity sensor at user defined location 2

Unit State

The **Unit State** can operate in one of eight operational states. From and OFF state, the unit will always go into the "Start-Up" sequence. It will firstly enter the Start-Up state for 3 minutes (see Table 53 on page 124) before transitioning to the "Recirculation" state of operation for another 3 minutes. Once recirculation is complete, the unit will enter the Fan Only state of operation. Then, based on the control temperature source, (Ctrl Temp Src), selected in the HtgClg ChngOVr (see Table 13 on page 49) set up menu, a sensor will drive the unit into the correct state of the 4 remaining states - heating, cooling, economizer, or min DAT.

The current state will be displayed by the Unit State parameter in the Main Menu \ Quick Menu, or the Main Menu \ ViewStatus \ Unit Status/Settings Menu

Neither heating or cooling is provided when the unit is in the Fan Only state, with the exception of when dehumidification is active. The outdoor air dampers are open to the minimum position in the fan only when the fan ON time exceeds the Zero OA time.

Figure 33: Unit State Diagram



Off

In the **OFF** operating state the fans are off, the outsider air dampers are closed and cooling and heating are disabled. The unit is in the OFF state when it is not enabled, or when it is in unoccupied mode with no call for unoccupied operation.

Start

When a unit is commanded to **Start**, it will always enter the START operating state for an adjustable time period (default is 180s, see Table 53 on page 124) before entering the Recirculation operating state. During start up operation, the fans remain OFF, the outdoor air dampers remain closed, and cooling and heating are disabled (except for 100% outdoor air heating start sequences). The Fan Operation output is turned ON (DO10, TBLV2 216) to allow shut off dampers and VAV boxes to be opened before the fan is turned ON

Recirculation

Units with return air always enter the **Recirculation** operating state after the completion of the Start operating state. In the Recirculation operating state, fans are started and operated while the outdoor air dampers remain closed. This allows temperature conditions throughout the unit and space to equalize before temperature control begins. Cooling and heating remain disabled. The unit remains in the Recirculation operation state until the recirculate State Timer expires (default 180 seconds, see Table 53 on page 124).

NOTE: 100% outdoor air units do not transition through the Recirculating operating state.

Fan Only

The unit enters the **Fan Only** operating state after the recirculation timer expires. Units configured for 100% outside air operation will transition directly from the Start up operating state to the Fan Only operating state. Neither heating or cooling is provided when the unit is in the Fan Only state, with the exception of when dehumidification is active. The outdoor air dampers are open to the minimum position in this state when the fan ON time exceeds the Zero OA time. Once entering the Fan Only state, the unit will then, based on the control temperature source, (Ctrl Temp Src), selected in the HtgClg ChngOVr set up menu, a sensor will drive the unit into the correct state of the 4 remaining states - heating, cooling, economizer, or min DAT (see Table 13 on page 49).

Cooling

The unit enters the **Cooling** operating state when cooling is required and the economizer is disabled, not present, or already fully open. Cooling operation can be mechanical DX compressors or chilled water coils. To determine what unit configuration you have, review "Control Type" on page 47

- Zone Temperature Control (ZTC) or Single Zone VAV (1ZnVAV): If the unit is configured for Zone Temperature Control(ZTC) or Single Zone VAV(1ZnVAV), the transition to cooling will occur when the following are true:
 - The control temperature rises above the occupied or unoccupied cooling setpoint by more than ½ the occupied or unoccupied cooling deadband.
 - The discharge air temperature is greater than the Min DAT limit by more than ½ the DAT heating deadband. This will prevent more cold air from being brought in when the DAT is already cold.

- The economizer operation is disabled or not present.
- **Discharge Air Temperature (DAC):** If the unit is configured for Discharge Air Temperature Control the transition to Cooling will occur when the following are true.
 - The control temperature rises above the occupied or unoccupied cooling setpoint by more than ½ the occupied or unoccupied cooling deadband. Note: for control temperature source none, the control temperature is the discharge air temperature.
 - The discharge air temperature is greater than the DAT cooling setpoint by more than ½ the DAT cooling deadband.
 - Post heat operation is complete
 - The economizer operation is disabled or not present.

Economizer

If the unit is equipped with a 0-100% modulating **Economizer** and the conditions are suitable for free cooling, the unit attempts to satisfy the cooling load by using outdoor air before using mechanical cooling. Suitability for Economizer operation is determined by drybulb, comparative drybulb, or comparative energy/enthalpy. See "Economizer Control" on page 88 for details.

- Zone Temperature Control (ZTC) or Single Zone VAV (1ZnVAV): If the unit is configured for Zone Temperature Control or Single Zone VAV, the transition to Economizer will occur when the following are true:
 - The control temperature rises above the occupied or unoccupied cooling setpoint by more than ½ the occupied or unoccupied cooling deadband.
 - The discharge air temperature is greater than the Min DAT limit by more than ½ the DAT heating deadband. This will prevent more cold air from being brought in when the DAT is already cold.
 - The economizer operation is not disabled
- **Discharge Air Temperature (DAC):** If the unit is configured for Discharge Air Temperature Control, the transition to Economizer will occur when the following are true.
 - The control temperature rises above the occupied or unoccupied cooling setpoint by more than ½ the occupied or unoccupied cooling deadband. Note: for control temperature source none, the control temperature is the discharge air temperature.
 - The discharge air temperature is greater than the DAT cooling setpoint by more than ½ the DAT cooling deadband.
 - Post heat operation is complete
 - The economizer operation is not disabled
- **Dehumidification:** When a unit is operating in dehumidification in Fan Only or Cooling operating states, dehumidification must finish operation and transition to

cooling before the unit will enter economizer

Dehumidification

Dehumidification alone is not an operating state, but a mode of operation that can be active or inactive in the Fan Only and Cooling operating states when properly equipped. If the unit is equipped with a Liquid Sub-Cool Coil or Modulating Hot Gas Reheat Coil, dehumidification operation is allowed in the Fan Only and Cooling operating states. Dehumidification is activated based on a selectable humidity or dewpoint sensor input. Units can use up to two humidity or dewpoint inputs to determine dehumidification state. The user selects which location the humidity or dewpoint references for each position. Possible options are Return, Outdoor, or Space Humidity. The user can define if they want to use the maximum, minimum, or average of these two readings to drive dehumidification. Dehumidification is not allowed in Economizer, Heating, or Min DAT operating states.

Heating

The unit enters the **Heating** operating state when the control temperature falls below the Occupied or Unoccupied Heating Setpoint by more than ½ the occupied or unoccupied heating deadband. During the Heating operating state, the outdoor air dampers are either 100% opening if the unit is a 100% outdoor air unit, or controlled to the minimum outside air position. Cooling is disabled.

- Zone Temperature Control (ZTC) or Single Zone VAV (1ZnVAV): If the unit is configured for Zone Temperature Control(ZTC) or Single Zone VAV(1ZnVAV), the transition to heating will occur when the following are true:
 - The control temperature falls below the occupied or unoccupied heating setpoint by more than ½ the occupied or unoccupied heating deadband.
 - The discharge air temperature is less than the Min DAT limit by more than ½ the DAT heating deadband.
 - Dehumidification is not active
 - $-\!\!-$ The economizer operation is disabled or not present.
- **Discharge Air Temperature (DAT)**: If the unit is configured for Discharge Air Temperature control, the transition to Heating will occur when the following are true:
 - The control temperature falls below the occupied or unoccupied heating setpoint by more than ½ the occupied or unoccupied cooling deadband. Note: for control temperature source none, the control temperature is the discharge air temperature.
 - The Discharge Air Temperature is less than the DAT heating setpoint by more than ½ the DAT heating deadband.
 - Dehumidification is not active
 - The Economizer operation is disabled or not present.

Special Gas Heat Start-Up for 100% OA

A **Special Gas Heat Start Up** sequence is used for 100% outdoor air units with gas heat. The special start sequence applies to both Zone Control and DAT Control units. If heat is required at unit start up, the furnace enters a special burner startup sequence as the unit enters its Startup operating state. Pre-firing the burner allows the gas heat pre-purge sequences to occur and the burner to fire and warm up so that tempered air is available immediately when the fans start.

- Initiation 100% OA Zone Control: The 100% OA gas heat sequence is initiated at startup if the control temperature is less than the Effective Occupied or Unoccupied Heating Setpoint by ½ of the Heating deadband, or the OAT is less than the Min DAT Limit by the amount of the DAT heating deadband.
- Initiation 100% OA DAT Control: The 100% OA gas heat sequence is initiated at start up if the Min DAT Ctrl parameter is set via the keypad and the OAT is less than the DAT Clg Spt by the amount of the DAT heating deadband.
- Special Start Up Sequence: Initiated during the Start Up operating state, the fans remain off, and the main gas valve is energized so that the burner starts during the Warm up Time (default =240s) and operates at low fire. At the end of the warmup time, the modulating gas valve is set to a position based on the calculated application requirements. Once the gas valve is set to the calculated position, a HeatUpDelay starts (default =60s) to allow the heat exchanger to heat up. After this delay, since the unit is 100% Outside Air, the unit immediately transitions from Startup to the Fan Only state. As soon as the unit enters the Fan Only state, the unit will immediately transition to the Heating state or MinDAT.

Min DAT

If heating is enabled and there is no heating load (normally Fan Only operating state), the controller activates the units heating equipment as required to prevent the discharge air temperature from becoming too cool if the Min DAT Ctrl Flag is set to yes via the Main Menu \ Commission Unit \ Heating Set-Up. The unit enters the MinDAT operating state during occupied operation when neither cooling or heating is required based on the HtgClgChgOvr function, but based on the if the discharge air temperature falls below a minimum discharge air limit. If the discharge air temperature falls below the minimum discharge air limit by more than half the discharge heating deadband, the unit operating state changes from Fan Only to Min DAT. The unit transitions out of the Min DAT operating state once the discharge air temperature is above minimum discharge temperature limit and the heating capacity has been at its minimum position for the duration of the heating stage timer.

NOTE: On discharge air control and single zone vav units, the DAT cooling setpoint parameter in the Cooling Setup menu acts as the minimum discharge temperature limit. On Zone Control units, the Min DAT limit parameter in the Heating Set-Up menu (Main Menu \ Commission Unit \ Heating Set-Up \ MinDAT Limit) acts as the minimum discharge temperature limit.

The unit will not be allowed to transition to MinDAT if Dehumidification is active. The unit will transition to Fan Only operation if the dehumidification becomes active while in the MinDAT state.

Unit Status/Settings

The "**Unit Status Settings**" menu provides a summary of basic unit status and control items. This menu summarizes the current operating state of the unit, giving the operating state the unit is in, along with the current capacity level of that operating state.

Table 1	11: Main	Menu \ V	/iew Status	\ Unit S	tatus \ Settings
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Menu Display Name	Default	Range	Description			
Unit State	-	Off Start Recirc FanOnly MinDAT Htg Econo Clg	Unit State is a status only item which indicates the state of unit operation in which the unit is currently operating. The unit can be in any of the operating states shown.			
Unit Status	-	Enable OffMan OffManCtrl OffNet OffAlmtry OffPassVnt	Unit Status is a status only item which indicates the status of opera in which the unit is currently operating. The unit status can be any the status values shown			
MWU Status	-	Inactive Active	MWU Status is a status only item that indicates whether or not the u is in the heating state due to MWU function			
System Mode	Local	Local Remote	System Mode is a			
Cntrl Mode	Off	Off HeatOnly CoolOnly FanOnly HeatCool Auto/Net	Cntrl Mode is an adjustable item which sets the occupancy mode of the unit. The unit can be Heat Only, CoolOnly, Fan Only, HeatCool, or Auto/Net			
Occ Mode	Auto/ Net	Occ Unocc TntOvrd Auto/Net	Occ Mode is an adjustable item which sets the occupancy mode of the unit. TThe unit can be occupied, unoccupied, tenant override, or auto modes.			
Clg Status	-	Enabled None OffAmb OffAlm OffNet OffMan	Clg Status is a status only item which indicates whether or not mechanical cooling is currently allowed. If cooling is disabled, the reason is indicated.			

Menu Display Name	Default	Range	Description			
Htg Status	-	Enabled None OffAmb OffAlm OffNet OffMan	Htg Status is a status only item which indicates whether or not heat is currently allowed. If heating is disabled, the reason is indicated.			
Econo Status	-	Enabled None OffAmb OffAlm OffNet OffMan OffDehum	Econo Status is a status only item which indicates whether or not the economizer is currently enabled. If economizer is enabled, the rease is indicated.			
Clg Capacity	-	0-100%	Clg Capacity is a status only item which indicates the percentage of the unit maximum cooling capacity currently operating			
Htg Capacity	-	0-100%	Htg Capacity is a status only item which indicates the percentage of the unit maximum heating capacity currently operating			
Rht Cap	-	0-100%	Reheat Cap is a status only item which indicates the percentage of the unit maximum reheat capacity currently operating			
SAF Capacity	-	0-100%	SAF Capacity is a status only item which indicates the current capacity of the supply air fan			
RFEF Capacity	-	0-100%	RFEF Capacity is a status only item indicated the curent capacity of the return/exhaust fans.			
OAD Position	-	0-100%	OAD/Economizer Cap is a status only item which indicates the percentage that the outdoor air damper is currently open			
Rel Hum 1	-	0-100%	Rel Hum 1 is a status only item that displays the current relative humidity reading from the optional relative humidity sensor at user defined location 1			
Rel Hum 2	-	0-100%	Rel Hum 2 is a status only item that displays the current relative humidity reading from the optional relative humidity sensor at user defined location 2			
Net Emrg Ovrd	Normal	Normal Off	Net Emrg Ovrd is an adjustable item which indicates if the unit was shut down in an emergency situation via a network command.			
Net App Mode	Auto	Off HeatOnly CoolOnly FanOnly HeatCool Auto NA	Net App Mode is a network adjustable item which indicates that the unit is set for network off, cooling only, heating only, fan only or auto heating/cooling operation via a network signal. This item has no affect on the unit operation unless the Ctrl Mode item is set to "Auto."			

Control Type

Temperature Control Configurations

Temperature Control is based on a Control Type that may be set to Zone, DAT Control, or Single Zone VAV. The setting will be based on the system and application the rooftop equipment is configured to serve.

Zone Temperature Control (ZTC)

When the Control Type is set to **Zone Temperature Control**, heating, compressors, and the economizer are controlled to maintain the temperature of the zone at a desired setpoint. This configuration is used on units equipped with constant volume supply fans. Compressors and heating stages are staged to maintain space or return temperature. The number of compressors is decreased when it is too cold and increased when it is too hot subject to stage timers. The number of heat stages is decreased when it is too hot and increased when it is too cold subject to stage timers.

Discharge Air Control (DAC)

When the Control Type is set to **DAC**, heating, compressors, and the economizer are controlled to maintain the discharge air temperature at a desired setpoint. This configuration is typically used on units equipped with variable air volume supply fans.

Single Zone VAV (1ZnVAV)

When the Control Type is set to **Single Zone VAV**, heating, compressors, and the economizer are controlled to maintain the discharge air temperature at the desired setpoint, while the variable volume supply fan is modulated to maintain the temperature of the zone at the desired heating and cooling setpoints. In heating mode, the supply fan capacity is increased as the zone temperature falls and decreased as the zone temperature rises.

To determine which control configuration your unit is configured for, review "Unit Configuration" on page 154

Heating/Cooling Changeover

Control Temperature Source

When the control temperature is below the occupied or unoccupied heating setpoint by more than $\frac{1}{2}$ the deadband (point A), heating operation is enabled. Heating operation then remains enabled until the control temperature begins to rise and rises above the occupied or unoccupied heating setpoint by more than $\frac{1}{2}$ the deadband (point B), at which point heating operation is disabled and the unit enters the fan only (or Min DAT) operating state. If the control temperature rises above the occupied or unoccupied cooling setpoint by more than $\frac{1}{2}$ the deadband (point C) cooling operation is enabled. Cooling operation remains enabled until the control temperature begins to fall below the occupied or unoccupied cooling setpoint by more than $\frac{1}{2}$ the deadband (point D), at which point the unit returns or fan only (or Min DAT) operating state.



The "Control Temperature" is defined as the unit temperature input used to make the heat/cool changeover decision. This determines whether or not cooling or heating is enabled. The **Control Temperature Source** (Cntrl Temp Src) can be selected as RAT, OAT, Space, None or Network. The control temperature source selected will vary by application and temperature control configuration.

Table 12: Control Temp Source Quick Reference Table

	Mixed	Air-Econo	100% OA		
Source	Zone Control	DAT Control	Single Zone VAV	DAT Control	Zone Control
OAT	NA	NR	NA	R	NA
RAT	А	R	А	NR	А
Space	R	NR	R	NR	R
None	NA	А	NA	NR	NA

A - Available

R - Recommended

NA- Not Available NR- Not Recommended

Space Temperature Control – Zone Control

A unit configured for **Space Temperature Control (Zone Control)** operates the cooling and heating capacities to either maintain the Occupied or Unoccupied Cooling Setpoint using economizer and/or Mechanical Cooling or the Occupied or Unoccupied Heating SetPoint using the heating equipment.

- Space- Space is the most common and ideal change over source temperature for Zone control units. The MicroTech 4 controller can handle up to three space temperature sensor inputs and the min, max, average or a specific sensor can be used for control. Review "Unit Set-Up Menu" on page 30 for multiple space sensor operation and settings.
- RAT- Return is an ideal change over source temperature for zone control units that do not have a space sensor available.
- None, and OAT are not allowed for this configuration.

Discharge Air Temperature Control

In general, a unit configured for discharge air temperature control (DTC) either operates to deliver the cooling discharge air temperature set point using economizer and or mechanical cooling or the heating discharge air temperature setpoint using the heating equipment. Cooling and heating never operate simultaneously. The unit state in a **Discharge Air Temperature Control** can be operated to change between cooling, fan only, and heating based on RAT, OAT, Space or None. Units operating in discharge air control are typically serving multiple zones through VAV boxes or are operating as a dedicated outside air unit.

DAT Control – Multi-Zone VAV

Units serving VAV systems typically use the control temp source as Return Air Temperature or None to transition states.

- **RAT:** Return air is typically used when the zones the unit serves are not extremely diverse in unit state, when the transition to heat is relatively the same across the served zones and the rooftop is not the primary zone control heat source. Each zone may have base board, or heat in each VAV box.
- None: Control temp source as None is used when the VAV box distribution is diverse in state and load. In this case control temp source None, the unit no longer "changes over" between heating and cooling in the normal manner. Instead it acts as if it is always in the "cooling" mode of operation controlling to the discharge air cooling set point. In this case the unit operating state will vary between Cooling, Fan Only and Min DAT (heating) in order to maintain the discharge air cooling state and control to the discharge heating operating state and control to the discharge heating set point. The unit will only enter the Heating operating state and control to the discharge heating set point for morning warm up purposes.
- **Space and OAT** are not commonly used as the control temp in VAV systems

DAT Control – Dedicated Outside Air Systems

Units serving as a Dedicated outside air system are typically configured for discharge air temperature control with a control temperature source as outdoor air temperature (OAT).

- **OAT:** Outdoor air temperature is the ideal change over source temperature for DOAS because it links unit state to load.
- **RAT, Space, None:** Control Temp Source None, Space, and RAT is not recommended for DOAS applications because unit state may transition to an improper mode of operation for the weather resulting in heating in summer and fan only in winter. These poor transitions will lead to nuisance alarms and poor control.

Single Zone VAV - 1ZnVAV

A unit configured for single zone VAV operates to deliver the cooling discharge air temperature setpoint using economizer and/or mechanical cooling or the heating discharge air temperature setpoint using the heating equipment. Cooling and heating never operate simultaneously. The unit state as a **Single Zone VAV** can be operated to change between cooling, fan only, and heating based on RAT or Space.

- **Space:** Space is the most common and ideal change over source temperature for single zone vav units. The Microtech 4 controller can handle up to three space temperature sensor inputs and the min, max, average or a specific sensor can be used for control. Review "Unit Set-Up Menu" on page 30 for Space Temperature Control Configuration.
- **RAT:** Return is an ideal change over source temperature for single zone VAV units that do not have a space sensor available.
- None and OAT are not allowed.

Space Setpoint Adjustment

When a unit is configured for space temperature control or single zone vav and the control temperature source is set to Space; the user has the option of using a space mounted remote sensor with setpoint adjustment functionality to control the setpoint of the space being controlled. The MicroTech 4 controller will allow one space sensor to drive the **Space Setpoint Adjustment** feature. Rem Spt Src allows the user to select which Network sensor (up to 3 sensors) will drive the setpoint adjustment or if an analog sensor will be driving the Space Setpoint Adjustment.

Heat/Cool Changeover Menu HtgClg ChgOvr Set-Up

The **Heating Cooling Change Over Set-Up** menu is a commissioning menu that provides adjustable parameters to configure the method and conditions with which the unit state changes.

Table	13:	Main	Menu \	View	Status	\ Unit	Status	Settings
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Menu Display Name	Default	Range	Description
Ctrl Temp Src	RAT	RAT	Ctrl Temp Src is an adjustable item which selects the temperature sensor input
		Space	to be used for the unit heating/cooling changeover or occupied cooling and heating capacity change decisions.
		OAT	
		None	
Rem Spt Src	None	None	Rem Spt Src is an adjustable item used to set whether or not to use the a
		AI	Spt and Occ Htg Spt. This can be designated to a single sensor.
		QMX1	
		QMX2	
		QMX3	
Control Temp	-	-461.2-525.2°F	Control Temp is a status only item which displays the current value of the "Control Temperature." The "Control Temperature" is defined as the temperature input selected by the Control Temperature Source parameter. For example, if the Control Temperature Source parameter is set to "Return," then the control temperature parameter reads the same value as the Return Air parameter.
Occ Clg Spt	72.0°F	0.0-100.0°F	Occ Clg Spt is an adjustable item adjusts the temperature in which the unit will go into the cooling mode of operation. Once a valid password has been entered this item becomes an adjustable item.
Occ Htg Spt	68.0°F	0.0-100.0°F	Occ Htg Spt is an adjustable item which adjusts the temperature in which the unit will go into the heating mode of operation. Once a valid password has been entered this item becomes an adjustable item.
Occ Clg DB	2.0°F	0.0-10.0°F	Occ Clg DB is an adjustable item which sets a dead band around the Occ Cooling Set Point parameter. For example, if the Occ Cooling Set Point parameter is set to 75°F and the Clg Deadband parameter is set to 2°F the dead band around the set point would be from 76.0°F to 74.0°F.
Occ Htg DB	2.0°F	0.0-10.0°F	Occ Htg DB is an adjustable item which sets a dead band around the Occ Heating Set Point parameter. For example, if the Occ Heating Set Point parameter is set to 70°F and the Htg Deadband parameter is set to 2°F the dead band around the set point would be from 69.0°F to 71.0°F.
RmtSptLoLmt	40.0°F	40.0°F-100.0°F	RmtSptLoLmt is an adjustable item which sets the lower bound of the allowed range of setpoint adjustment from the remote space temperature sensor.
RmtSptHiLmt	100.0°F	40.0°F-100.0°F	RmtSptHiLmt is an adjustable item which sets the higher bound of the allowed range of setpoint adjustment from the remote space temperature sensor.
CalRemSpt@10°C	No	No	CalRemSpt@10°C is an adjustable item used to calibrate the digital space
		Yes	sensor minimum setpoint input when the engineering units set to SI.
CalRemSpt@50°F	No	No	CalRemSpt@30°C is an adjustable item used to calibrate the digital space
		Yes	sensor maximum setpoint input when the engineering units set to SI.
CalRemSpt@30°C	No	No	CalRemSpt@50°F is an adjustable item used to calibrate the digital space
		Yes	sensor minimum setpoint input when the engineering units set to English.
CalRemSpt@86°F	No	No	CalRemSpt@86°F is an adjustable item used to calibrate the digital space
		Yes	sensor maximum setpoint input when the engineering units set to English.
Demand Shed	Enable	Disable	Demand Shed is an adjustable item used to enable or disable the ability of
		Enable	the a demand shed sequence to be initiated where the OccClg or Occ Heat setpoints are overridden by predetermine shed increments

Supply Air Fan

Supply Air Fan Operation

At least two **Supply Air Fans** will be provided with every unit. The standard supply fans will be controlled using a factory EC motor for each fan. Each motor will be designated as either a "master" or a "slave" motor. Each master motor is controlled via a Modbus interface. Each master motor will have a 0-10VDC analog output which may be connected to a 0-10VDC input on a slave motor. Each slave motor will have a 0-10VDC analog output which may be connected to a 0-10VDC input on another slave unit. There can be up to 4 master fans.

An option for controlling a single VFD connected to one or more supply fan motors is available where the VFD is controlled to one or more supply air fans with a single 0-10VDC analog capacity output and a digital start/stop command.

The supply fans will control between an adjustable minimum and maximum fan capacity. The range is adjustable from 0-100% with separate ranges for cooling and heating operation.

The supply fan is turned ON when the unit enters the Recirculation state. The supply fan is turned OFF when the unit transitions to the OFF state, but stays on for the Off HtClDelayTime (Default=120s) if the unit is turned OFF while DX Cooling or heating is active. The OffHtClDelay time function is overridden when an Emergency Off or Duct High Limit Fault is active

- Speed/Network Control(Spd/Net): A speed/network fan control type controls the supply fan capacity to fixed speed value that is set at the unit controller or via a network input signal.
- Single Zone VAV Control(1ZnVAV): Single Zone VAV

control operates the unit as a single VAV box. The cooling is controlled to maintain a discharge air temperature setpoint and the supply fan is modulated to maintain a space temperature setpoint, the occupied cooling and occupied heating setpoint.

- Duct Pressure Control(DSP): Duct pressure control operates the unit to maintain the supply duct conditions. The cooling is controlled to maintain a discharge air temperature setpoint and the supply fan is modulated to maintain a supply duct static pressure setpoint. The duct pressure setpoint can be adjusted at the unit controller interface or via a network input signal.
- Carbon Dioxide Control(CO2): When a unit is configured for 100% outdoor air application and the control type is discharge temperature control, the unit can be configured to control the supply fan capacity based on a CO2 sensor input. The supply fan capacity will vary linearly between a minimum and maximum CO2 SAF capacity based on a minimum and maximum CO2 input (PPM) from a field mounted sensor.
- **Supply Airflow Control (Flow):** When a unit is equipped with a supply fan airflow measuring station, the control type is discharge temperature control and the unit is configured to flow control, the supply air fan capacity is modulated to maintain an adjustable airflow(cfm) setpoint.
- **Building Static Pressure Control (BSP):** When a unit is configured for 100% outdoor air application and the control type is discharge temperature control, the supply fan control can be configured to modulate to maintain a supply fan building static pressure setpoint.

Supply Fan Menus

The SAF Control Menu displays the fan operation and the relevant current control parameters.

Table 14: Main Menu \ View Status \ SAF Control

Menu Display Name	Default	Range	Description
SAF Capacity	-	0-100%	SAF Capacity is a status only item that indicates the current supply fan capacity
SAF Cap Cmd	-	0-100%	SAF Cap Cmd is a status only item that indicates the current supply fan commanded capacity.
SAF DuctPress	-	0.0-5.0in	SAF Duct Press is a status only item which displays the curent supply duct static pressure reading.
CO2 PPM	-	0-5000 ppm	CO2 PPM is a status only item which displays the current CO2 PPM reading
OA Flow	-	0-60000CFM	OA Flow is a status only item which displays the current OA Flow reading
SAF Flow	-	0-60000CFM	SAF Flow is a status only item which displays the current supply air fan airflow reading
Bldg Press	-	-0.250-0.250in	Bldg Press is a status only item indicated the current building static pressure reading

Supply Fan Set-Up Menu

Table 15: Main Menu \ View Status \ SAF Setup

Menu Display Name	Default	Range	Description	
Menu Display Name	Default	Range	Description	
SAF Ctrl	CAV	CAV DSP Spd/Net 1ZnVAV CO2 Flow BSP	SAFCtrl is an adjustable parameter used to select how the supply fan is to be controlled. The supply fan can normally be controlled by CAV, duct pressure(DSP), space temperature (1ZnVAV), or Speed/Net Control which allows a constant speed to be set or adjusted with a building automation system. In 100% Outside air applications the supply fan can be controlled with a PI_Loop to maintain a CO2 setpoint, a constant CFM setpoint (Flow), or Build static pressure setpoint (BSP).	
SPEED CONTROL				
Rem SAF Cap	33%	0-100%	Rem SAF Cap is an adjustable item for setting the supply fan speed by the keypad or by a network control signal.	
DSP CONTROL				
SAF DuctPress	-	0.0-5.0in	SAF Duct Press is a status only item that indicates the current value for the duct static pressure sensor	
SAF DSP SPt	1.0in	0.2-4.0in	SAF DuctSP Spt is an adjustable item which sets the supply fan duct static pressure setpoint. The SAF is modulated with a PI_Loop to maintain this setpoint	
SAF DSP DB	0.1in	0.0-0.5in	SAF DSP DB is an adjustable item which sets a dead band around the DuctSP Spt. No Duct static pressure control action is taken when the current duct static pressure input is within this deadband	
1 ZONEVAV CONTROL				
Control Temp	-	-461.2-525.2°F	Control Temp is a status only item which displays the current value of the "Control Temperature." The "Control Temperature" is defined as the temperature input selected by the Control Temperature Source parameter. For example, if the Control Temperature Source parameter is set to "Return," then the control temperature parameter reads the same value as the Return Air parameter.	

Menu Display Name	Default	Range	Description
Occ Clg Spt	72.0°F	0.0-100.0°F	Occ Clg Spt is a status only item which indicates the temperature in which the unit will go into the cooling mode of operation. Once a valid password has been entered this item becomes an adjustable item.
Occ Htg Spt	68.0°F	0.0-100.0°F	Occ Htg Spt is a status only item which indicates the temperature in which the unit will go into the heating mode of operation. Once a valid password has been entered this item becomes an adjustable item.
Occ Clg DB	2.0°F	0.0-10.0°F	Occ Clg DB is an adjustable item which sets a dead band around the Occ Cooling Set Point parameter. For example, if the Occ Cooling Set Point parameter is set to 75°F and the Clg Deadband parameter is set to 2°F the dead band around the set point would be from 76.0°F to 74.0°F.
Occ Htg DB	2.0°F	0.0-10.0°F	Occ Htg DB is an adjustable item which sets a dead band around the Occ Heating Set Point parameter. For example, if the Occ Heating Set Point parameter is set to 70°F and the Htg Deadband parameter is set to 2°F the dead band around the set point would be from 69.0°F to 71.0°F.
CO2 CONTROL			
CO2 PPM	-	0-5000ppm	CO2 PPM is a status only item which indicates the current reading from the CO2 sensor.
CO2SensorSrc	QMX1	QMX1 QMX2 QMX3	CO2SensorSrc is an adjustable item that sets the source sensor type for CO2 control.
Min SAF PPM	800	0-5000ppm	Min SAF PPM is an adjustable item that sets the PPM value at which the supply fan speed is controlled to minimum when CO2 supply fan control is selected.
Max SAF PPM	1100	0-5000ppm	Max SAF PPM is an adjustable item that sets the PPM value at which the supply fan speed is controlled to maximum when CO2 supply fan control is selected.
Min PPM Cap	50	0-100%	Min PPM Cap is an adjustable item that sets the supply fan capacity when the CO2 input signal is at minimum when CO2 supply fan control is selected.
Max PPM Cap	100	0-100%	Max PPM Cap is an adjustable item that sets the supply fan capacity when the CO2 input signal is at maximum when CO2 supply fan control is selected.
FLOW CONTROL	<u>I</u>		
OA Flow	-	0-60000CFM	OA Flow is a status only item that displays the current outdoor air flow CFM
OA Flow Spt	2000CFM	0-60000CFM	OA Flow Spt is an adjustable item that sets the Outdoor airflow cfm that the PI_loop will modulating the SAF capacity to maintain
OAFlow DB	3%	0-100%	OAFlow DB is an adjustable item that sets a deadband around the OA Flow Setpoint.
SAF Flow	-	0-60000CFM	SAF Flow is a status only item that displays the current supply air fan airflow CFM
SAF Flow Spt	2000CFM	0-60000CFM	SAF Flow Spt is an adjustable item that sets the SAF Flow CFM setpoint that the PI_Loop will modulate the supply air fan capacity to maintain
SAF Flow DB	3%	0-100%	SAF Flow DB is an adjustable item that set a deadband around the SAF Flow Setpoint
BSP CONTROL			
Bldg Press	-	-0.250-0.250in	Bldg Press is a status only item indicated the current building static pressure reading
Bldg SP Spt	0.050in	-0.250-0.250in	BldgSP Spt is an adjustable item which sets the current building static pressure setpoint.
BSP DB	0.010in	0.000-0.100in	BSP DB is an adjustable item that sets the deadband around the Bldg SP setpoint that the PI Loop will modulating the Supply air fan capacity to maintain
SAF SETUP			
MaxSAF Hz	60Hz	0-100Hz	MaxSAF Hz is an adjustable item that sets the maximum supply air fan speed (Hz) that will be allowed in units using the analog VFD output.

Menu Display Name	Default	Range	Description
MaxSAF RPM	2600RPM	0-2600RPM	MaxSAF RPM is an adjustable item that sets the maximum supply air fan speed (RPM) that the supply air fans will be allowed to operate at in units that are us the ECM supply fans. Note this is set based on the supply fan model size and the system specifications
Min Clg Spd	33%	0-100%	MinClgSpd is an adjustable item that sets the minimum supply fan speed used for cooling operation.
Max Clg Spd	100%	0-100%	MaxClgSpd is an adjustable item that sets the maximum supply fan speed used for cooling operation
Min Htg Spd	33%	0-100%	MinHtgSpd is an adjustable item that sets the minimum supply fan speed used for heating operation.
Max Htg Spd	100%	0-100%	MaxHtgSpd is an adjustable item that sets the maximum supply fan speed used for heating operation
VAVBox Out	-	Heat Cool	VAVBox Out is a status only item that indicates the current value of the VAV output. The VAV output is only available to the field via network communications
SAF Status	-	Fault OK	SAF Status is a status only item that indicates if there are any Faults with the SAF operation for units using the VFD analog output control
SAF1Status - SAF4Status	-	OK HLL	SAF1Status - SAF4Status is a status only option that indicates the fault status with SAF operation for each ECM fan.
		TFEI	HLL=Hall Sensor Error
		TFM	TFEI= Electronics Interior Overheated
		TFE	TFM=Motor Overheated
		BLK	TFE=Power Mod Overheated
		SKF	BLK=Locked Motor
		PHA	SKF=Communication Error
		UzLow	PHA=Phase Failure
		UzHigh	UzLow=DC-Link Undervoltage
		UeLow	UzHigh=DC Link Overvoltage
		UeHigh	UeHigh=Mains Overvoltage
		NoComm	UeLow=Mains Undervoltage

Return Exhaust Fan

Rooftop units may be equipped with zero, one, or more **Return** or **Exhaust Fans.** Normally, each return fan or exhaust will be controlled with an ECM Motor per fan via a Modbus interface. An option for controlling a single VFD connected to one or more exhaust fan motors will also be provided. In this case, the VFD will be controlled with a single 0-10VDC analog capacity value and a single digital start/stop output. The return or exhaust fan capacity of the fan will be controlled between an adjustable minimum and maximum fan capacity.

Return Fan/Exhaust Fan Operation

Return Fan

When a unit is equipped with a **Return Fan**, the return fan will generally be Off when the unit state is Off, or Start and On in any other state. The return fan operates in both occupied and unoccupied modes when the unit is in a valid unit state. Note: When the unit enters Recirc state, the RFEF start command will be delayed by 4 secondes before turning on to reduce the amp draw peak at start up.

Exhaust Fan

When a unit is equipped with an **Exhaust Fan**, the exhaust fan On/Off command logic will depend on the selected return/ exhaust fan control method.

Return Fan/Exhaust Fan Control Types

Constant Volume Control (CAV)

When the RFEF Ctrl is set to **CAV**, the return fan or the exhaust fans will be controlled to the MaxRFEF Capacity.

Building Static Pressure Control (BSP)

When the RFEF Ctrl is set to **BSP** the return fan or exhaust fans capacity will be modulated to maintain the building static pressure at the building static pressure setpoint (BldgSPSpt).

Fan Tracking Control (Tracking)

When the RFEF Ctrl is set to **Tracking** the return fan or exhaust fan capacity is varied to maintain an adjustable offset between the Return Fan/Exhaust Fan capacity and the Supply Fan Capacity. The user specifies the offset at maximum supply fan capacity and the offset at minimum supply fan capacity and the RFEF controls linearly between the two points.

Figure 35: Return/Exhaust Fan Tracking



The field process for setting these parameters will be as follows:

- With the unit running and the outdoor air dampers at minimum position (in Fan Only State for example), the VAV box system will be manipulated to simulate a call for maximum airflow.
- 2. The Supply air fan will be allowed to stabilize (normally under DSP control) and the SAFMax parameter will be set to the steady-state SAF Capacity value.
- 3. The RFEF@SAFMax value will then be adjusted until the desired building pressure is obtained (usually slightly positive).
- 4. The VAV Box system will then be manipulated to simulate call for minimum airflow.
- 5. The supply air fan will be allowed to stabilize (normally under DSP control) and the SAFMin Parameter will be set to the steady-state SAF Capacity value.
- The RFEF@SAFMin Value will be adjusted until the desired building pressure is obtained (generally slightly positive).
- **NOTE:** Ideally the minimum and maximum conditions should be checked with the outdoor dampers at minimum and maximum positions to assure there are not significantly different requirements depending on the outdoor damper position. If the differences are significant then the parameters may be manually

adjusted to compromise between the two conditions. If the differences are too great, it may be necessary to change to building pressure RAF/EAF control for the application.

NOTE: Setting the minimum and maximum tracking points will not necessarily establish minimum and maximum SAF modulation ranges, but rather simply establishes the slope of the tracking curve. The curve line will be projected up to effective max SAF capacity and down to the effective minimum SAF capacity.

Speed/Network Control(Spd/Net)

When the RFEF Ctrl is set to **Spd/Net** the fan capacity is set to the remote return/exhaust fan capacity parameter value (RemRFEFCap). These values may be set via the HMI or a network input signal.

Airflow Control(Flow)

When a unit is equipped with a return /exhaust airflow measuring station and the RFEF Ctrl is set to **Flow**, the Return Fan or Exhaust fan capacity will be modulated to maintain the airflow at the airflow setpoint.

Flow Differential Control (FlowDiff)

When the unit is equipped with a supply airflow measuring station and a return/exhaust fan airflow measuring station and the RFEFCtrl is set to **Flow Diff**, the Return Fan or Exhaust fan capacity will be modulated to maintain an adjustable flow differential between the return fan exhaust fan flow and the supply fan flow. The flow differential setpoint will vary linearly between an adjustable maximum differential (MaxFlwDiff) when the supply air fan airflow is at a maximum flow (SAFHiFlow) to a minimum differential(MinFlwDiff) when the supply fan airflow is at minimum flow (SAFLoFlow).

Outdoor Air Damper Control (OAD)

When the unit is equipped with a exhaust fan and the RFEF Ctrl is set to **OAD** the exhaust fan capacity will be varied based on the current outdoor air damper position. The exhaust fan capacity will vary linearly between the minimum return fan/exhaust fan capacity (MinRFEF Cap) and the maximum (MaxRFEFCap) as the OA damper varies between the exhaust on outdoor air damper position (ExhOnOA Pos) and the exhaust maximum outdoor air position (ExhMxOAPos).

Return Fan Duct Static Pressure Control(DSP)

When a unit is equipped with a return fan and a modulating relief damper and the RFEF Ctrl is set to **DSP**, the return fan capacity will modulate to maintain a return duct static pressure setpoint (RAF DSP Spt). Return fan duct static pressure control is recommended for applications where building pressure is being controlled at the zone level with return duct VAV boxes. This function is intended for use in conjunction with the modulating relief damper control and is designed to maintain a negative pressure in the return air plenum. The modulating relief damper control is modulated to maintain positive pressure in the exhaust plenum to prevent outdoor air from entering the relief damper and to maintain proper ventilation control and damper authority.

Passive Ventilation Sequence

An optional **Passive Ventilation Sequence** will be performed when the passive ventilation digital input on the control is closed (on) Or when the Network passive ventilation input is set to On. When passive ventilation is active several actions occur.

- · Unit state is switched to OFF
- The Supply Fan is switched of OFF
- The Return Fan or Exhaust Fan is Held on and set to the return /exhaust air fan ventilation capacity
- The OA Damper is set to 0%

Return Fan/Exhaust Fan Menus

RFEF Control Menu

The **RFEF Control Menu** is a view status menu that displays all relevant return or exhaust fan control parameters

Table 16: Main Menu \ View Status \ RFEF Control

Menu Display Name	Default	Range	Description
Menu Display Name	Default	Range	Description
RFEF Capacity	-	0-100%	RFEF Capacity is a status only item that indicates the current return/ exhaust fan capacity
RFEF Cap Cmd	-	0-100%	RFEF Cap Cmd is a status only item that indicates the current return/ exhaust fan commanded capacity
Bldg Press	-	-0.250-0.250in	Bldg Press is a status only item indicated the current building static pressure reading
RFEF Flow	-	0-60000CFM	RFEF Flow is a status only item which displays the current return/exhaust air fan airflow reading
RAF DuctPress	-	-5.0-0.0	RAF DuctPress is a status only item which displays the current return duct static pressure reading.

RFEF Set-Up Menu

The RFEF Set-Up menu is a commissioning menu that provides access to adjustable parameters to set the return fan or exhaust fan operating controls.

Table 17: Main Menu \ Commission Unit \ RFEF Set-Up

Menu Display Name	Default	Range	Description
Menu Display Name	Default	Range	Description
RFEF Ctrl	BSP	CAV BSP Tracking DSP Spd/Net Flow OAD FlowDiff	RFEF Ctrl is an adjustable parameter used to select how the return/ exhaust fans are to be controlled. The exhaust fans can be controlled by the building static pressure (BSP), A fixed Speed that can be adjusted through a building automation system (Spd/Net), a CFM setpoint (Flow), and Outdoor air damper position (OAD) where the exhaust fan speed changes with the OA damper position. In 100% Outside air application with exhaust fans, tracking of the supply fan can be used. The return fans can be controlled by all of the previous options, plus direct static pressure control (DSP) and to maintain a flow differential between the supply and return fans (Flow Diff)
SPEED CONTROL		L	·
Rem RFEF Cap	5%	0-100%	Rem RFEF Cap is an adjustable item for setting the return/exhaust fan capacity by the keypad or by a network control signal.
BSP CONTROL			
Bldg Press	-	-0.250-0.250in	Bldg Press is a status only item indicated the current building static pressure reading
Bldg SP Spt	0.050in	-0.250-0.250in	BldgSP Spt is an adjustable item which sets the current building static pressure setpoint.
BSP DB	0.010in	0.000-0.100in	BSP DB is an adjustable item that sets the deadband around the Bldg SP setpoint that the PI Loop will modulating the return fan/exhaust air fan capacity to maintain
FAN TRACKING CO	NTROL		

Menu Display Name	Default	Range	Description
Sup Fan Max	100%	0-100%	Sup Fan Max is an adjustable item used to set the supply fan maximum capacity when the RFEF control method is set to tracking.
RFEF @ SF Max	95%	0-100%	RFEF @ SF Max is an adjustable setting used to set the return fan capacity when the supply fan is operating at its maximum capacity.
Sup Fan Min	30%	0-100%	Sup Fan Min is an adjustable item used to set the supply fan minimum capacity when the RFEF control method is set to tracking
RFEF @ SF Min	25%	0-100%	RFEF @ SF Min is an adjustable setting used to set the return fan capacity when the supply fan is operating at its minimum capacity.
RAF DSP CONTROL	_		
RAF DuctPress	-	-5.0-0.0in	RFEF Duct Press is a status only item that indicates the current value for the Return duct static pressure sensor
RAF DSP Spt	-1.0in	-5.0-0.0in	RFEF DuctSP Spt is an adjustable item which sets the Return fan duct static pressure setpoint. The Return Fan is modulated with a PI_Loop to maintain this setpoint
RAF DSP DB	0.1in	0.0-0.5in	RFEF DSP DB is an adjustable item which sets a dead band around the RFEF DuctSP Spt. No Duct static pressure control action is taken when the current RFEF duct static pressure input is within this deadband
FLOW CONTROL			
RFEF Flow	-	0-60000CFM	RFEF Flow is a status only item that displays the current return/exhaust air fan airflow CFM
RFEF Flow Spt	2000CFM	0-60000CFM	RFEF Flow Spt is an adjustable item that sets the RFEF Flow CFM setpoint that the PI_Loop will modulate the return/exhaust air fan capacity to maintain
RFEF Flow DB	3%	0-100%	RFEF Flow DB is an adjustable item that set a deadband around the RFEF Flow Setpoint. No action is taken when the current RFEF Flow input is within this deadband
FLOW DIFF CONTR	OL		
SAF Flow	-	0-60000CFM	SAF Flow is a status only item that displays the current supply air fan airflow CFM
RFEF Flow	-	0-60000CFM	RFEF Flow is a status only item that displays the current return/exhaust air fan airflow CFM
Min Flow Diff	0CFM	-20000- +20000CFM	Min Flow Diff is an adjustable item that sets the airflow differential between the SAF and the RAF at SAF Low Flow
Max Flow Diff	0CFM	-20000- +20000CFM	Max Flow Diff is an adjustable item that sets the airflow differential between the SAF and the RAF at the SAF Hi Flow
SAF Lo Flow	150 CFM	0-60000CFM	SAF Lo Flow is an adjustable item that sets the supply air fan cfm that the Min Flow Diff Occurs.
SAF Hi Flow	748 CFM	0-60000CFM	SAF Hi Flow is an adjustable item that sets the supply air fan cfm that the Min Flow Diff Occurs.
Flow Diff Spt	-	-20000- +20000CFM	Flow Diff Spt is a status item that displays the current flow differential setpoint. The flow differential setpoint is linearly between the min and max flow diff as the SAF flow varies between the Low and High Flow. The return fan capacity is controlled to maintain this setpoint.
Flow Diff DB	15CFM	0-75CFM	Flow Diff DB is an adjustable item that sets a deadband around the Flow Diff Spt. No action is taken when the current calculated flow differential is within the band.
OAD POSITION CO	NTROL		
ExhOn OA Pos	40%	0-100%	ExhOn OA Pos is an adjustable item that sets the damper position that the exhaust fan turns on at minimum capacity. Less than this position, the exhaust fan is off.
ExhMx OA Pos	100%	0-100%	ExhMx OA Pos is an adjustable item that sets the damper position that the exhaust fan is operating at maximum capacity.
RFEF SETUP			

Menu Display Name	Default	Range	Description
MaxRFEF Hz	60Hz	0-100Hz	Max RF/EF Hz is an adjustable item that sets the maximum return/exhaust fan value. The maximum value settings must also be changed in the VFD's to match this setting. This is only for units with VFDs
MaxRFEF RPM	2600RPM	0-2600RPM	MaxRFEF RPM is an adjustable item that sets the maximum return/exhaust air fan speed (RPM) that the return/exhaust air fans will be allowed to operate at in units that are us the ECM fans. Note this is set based on the Return/exhaust fan model size and the system specifications
Min RFEF Cap	5%	0-100%	MinRFEF Cap is an adjustable item used to set the minimum capacity that the Return/Exhaust fans will be allowed to operate at
Max RFEF Cap	100%	0-100%	MaxRFEF Cap is an adjustable item used to set the maximum capacity that the Return/Exhaust fans will be allowed to operate at
RFEF Status	-	Fault OK	RFEF Status is a status only item that indicates if there are any Faults with the RFEF operation for units using the VFD analog output control
RFEF1Status - RFEF4Status	-	OK HI I	RFEF1Status - RFEF4Status is a status only option that indicates the fault status with RFEF operation for each ECM fan.
		TFEI	HLL=Hall Sensor Error
		TFM	TFEI= Electronics Interior Overheated
		TFE	TFM=Motor Overheated
		BLK	TFE=Power Mod Overheated
		SKF	BLK=Locked Motor
		РНА	SKF=Communication Error
		UzLow	PHA=Phase Failure
		UzHigh	UzLow=DC-Link Undervoltage
		UeLow	UzHigh=DC Link Overvoltage
		UeHigh	UeHigh=Mains Overvoltage
		NoComm	UeLow=Mains Undervoltage

Relief Damper Control

When the unit is equipped with a set of modulating relief dampers, the damper position command will be set to maintain the exhaust air plenum static pressure setpoint. This function is intended for use in conjunction with a return fan using return duct static pressure control.

In this operation, the return fan will maintain a return duct static pressure setpoint. The **Relief Damper Control** will modulate to maintain the exhaust plenum static pressure at a slightly positive pressure to prevent air from sucking in through the relief damper, and to provide good damper authority and control. To function properly, this return damper control function requires VAV boxes in the return duct that are controlling the building pressure of the spaces they serve.

RFEF Control Menu

The RFEF Control Menu is a view status menu that displays all relevant return or exhaust fan control parameters

Table 18: Main Menu \ Commission Unit \ Relief Damper Set-Up

Menu Display Name	Default	Range	Description
Exh PlenPress	-	-0.250-0.250in	Exh Plen Press is a status only item that indicates the current exhaust plenum static pressure reading
Exh PSP Spt	0.100in	-0.250-0.250in	Exh PSP Spt is an adjustable item that sets the exhaust plenum static pressure setpoint that the modulating relief damper will be controlled to maintain
Exh PSP DB	0.050in	0.0-0.100in	Exh PSP DB is an adjustable item that sets the deadband around the exhaust plenum static pressure.

Cooling

Zone Temperature Control

Staged Compressors

In units equipped with staged compressors that are configured for **Zone Temperature Control**, the compressors stage on and off to maintain the control temperature (Space or RAT). The control temperature being maintained is the occupied or unoccupied cooling setpoint.

When a unit first enters the cooling state, the unit goes directly to Cooling Stage #1 so that the first compressor is turned On immediately. During normal cooling operation, the number of compressor stages increases when the time since last stage exceeds the Cooling Stage Timer (Default=5 min) and the projected control temperature is greater than the occupied or unoccupied cooling setpoint by more than half of the cooling deadband. Compressor stages decrease when the time since the last stage exceeds the cooling stage timer and the projected control temperature is less than the occupied or unoccupied cooling setpoint by more than half of the cooling deadband.

During normal cooling operation, the compressor stages may also decrease when the time since the last stage exceeds the cooling stage timer and the discharge air temperature is less than the minimum DAT cooling setpoint.

Variable Speed Compressors

In units equipped with Variable Speed Compressors that are configured for Zone Temperature control, the compressor capacity will modulate to maintain the control temperature (Space or RAT). The control temperature being maintained is the occupied or unoccupied cooling setpoint. Compressor capacity will increase or decrease if the current reading of the control temperature is above, or below, the occupied or unoccupied cooling temperature setpoint by more than half of the cooling deadband.

Discharge Air Temperature Control

Staged Compressors

In units equipped with Staged Compressors that are configured for discharge air temperature control or 1ZnVAV operation, the compressors are staged on and off to maintain a cooling discharge air temperature setpoint. A time average control method is used to stage compressors up and down to provide smooth, average temperature control around the cooling discharge air temperature setpoint.

Variable Speed Compressors

In units equipped with Variable Speed Compressors that are configured for discharge air temperature control or single zone vay, the compressor capacity is modulated to maintain the cooling discharge air temperature setpoint. Compressor capacity is increased if the projected discharge air temperature reading is greater than the cooling discharge air temperature

setpoint by more than 1/2 the cooling DAT deadband. Conversely, the compressor capacity is decreased if the projected discharge air temperature reading is less than the cooling discharge air temperature setpoint by more than 1/2 the cooling DAT deadband.

Cooling DAT Reset

The Cooling DAT Setpoint may be reset for units with DAT Cooling Control. The reset type may be set to one of the following:

- None: Discharge Cooling Spt is user adjustable
- Network: Discharge Cooling Spt is equal to the Network DAT Clg Setpoint when it is valid
- Space: Discharge Cooling Spt is based on the Space Sensor
- Return: Discharge Cooling Spt is based on the Return Air Sensor
- OAT: Discharge Cooling Spt is based on the Outdoor Air Temperature
- Ext mA: Discharge Cooling Spt is determined by a 0-20 mA signal
- Ext V: Discharge Cooling Spt is determined by a 0-10 VDC signal
- · Airflow: Discharge Cooling Spt is based on the airflow as indicated by the variable frequency drive speed
- SpaceH1: Discharge Cooling Spt is based on the humidity based on humidity sensor 1.
- SpaceH2: Discharge Cooling Spt is based on the humidity based on humidity sensor 2.
- SpcDwpt1: Discharge Cooling Spt is based on the calculated dewpoint based on dewpoint sensor 1
- SpcDwpt2: Discharge Cooling Spt is based on the calculated dewpoint based on dewpoint sensor 2
- · OADwpt: Discharge Cooling Spt is based on the calculated Outdoor Air Dewpoint
- RADwpt: Discharge Cooling Spt is based on the calculated Return Air Dewpoint

Reset reverts from Return to None when a Return Air Sensor opens or Shorts. Reset Reverts from Space to None when a Space Sensor opens or shorts. Reset Reverts from OAT to None when an Outdoor Air Sensor opens or shorts.

When Space, Return, OAT, Airflow, SpaceH1, SpaceH2, SpcDwpt1, SpcDwpt2, OADwpt, RADwpt, Ext mA or ExtV is selected, the Discharge Cooling Spt equals the Max Clg Spt when the selected value equals the Max Clg Spt @ value. Similarly, the Discharge Cooling Spt equals the Min Clg Spt when the selected value equals the Min Clg Spt @ Value.

When the Space, Return, OAT, SpaceH1, SpaceH2, SpcDwpt1, SpcDwpt2, OADwpt, RADwpt, or Airflow is selected, the reset schedule should be set so that the DAT Cooling Setpoint decreases as the selected temperature increases as shown in the graph.

Figure 36: Cooling DAT Setpoints



When Airflow, Hum1, or Hum2 is selected, the values "Min Clg Spt@" and "Max Clg Spt @" are entered as percentage values. When ExtmA is Selected, the values "Min Clg Spt@" and "Max Cl Spt @" are entered as mA values. When Ext VDC is selected, the values "Min Clg Spt@" and "Max Cl Spt @" are entered as VDC values.

If Ext mA or Ext V is selected as the type of reset, the Min Clg Spt@ value may be set above the Max Clg Spt@ value to cause a decrease in the DAT setpoint as the external signal or the Min Clg Spt @ value may be set below the Max Clg @ Spt Value to cause an increase in the DAT setpoint as the external setpoint increases.

The Min Clg Spt@ value can be set below the Max Clg Spt @ Value for all types of reset, but it only makes sense for external reset.

Cooling DAT Reset Application Considerations

These examples are just some common uses of DAT reset, other building/application factors may require different values or schedule sources.

Table 19: Cooling DAT Reset

	1			2	3	
	OAT	Clg DAT	Airflow	Clg DAT	ExtSig	Clg DAT
Min	45F	60F	40%	65F	0V	65F
Max	65F	55F	60%	55F	10V	50F

- OAT: OAT is an effective reset control strategy if all the zones served have similar loads and are mostly dependent on outdoor air temperatures. Examples would be west facing perimeter zones with the same lighting/equipment/occupancy loads. This reset strategy is problematic if zones require cooling regardless of outdoor air temperature. This could be due to internal gains or general interior spaces of large buildings.
- 2. Airflow: This is an effective reset control strategy for single zone or multizone vav units because airflow is a close indicator of cooling demand. If a typical VAV unit supply fan speed range is 40-100% a good airflow capacity to being to reset the DAT is roughly 60-65%. By the time the fan speed is down to 50% the DAT can be reset to a warmer temperature.
- 3. **Network, ExtSig:** It is recommended that a network control the DAT reset schedule when a rooftop unit is applied in a multizone vav system with diverse loads. In this case, the network can combine a building specific reset sequence based on the polling of VAV boxes and synchronizing the reset with a duct static pressure reset that maximizes energy efficiency.

DX Coil Bypass Damper Operation

A compressorized cooling unit may be equipped with a set of DX coil bypass dampers. When the Unit state is Heating, MinDAT or Fan Only, the bypass damper will be 100% open to minimize the air pressure drop and supply fan power consumption. The DX Coil Bypass Damper will operate in Cooling operation only as described in the description below.

Cooling

During Cooling Operation, if a unit is equipped with a DX Coil Bypass Damper; the unit will control the compressors to maintain the DXBP LCT Setpoint. The DX Coil Bypass Damper will modulating to maintain the Effective Clg DAT Setpoint.

Cooling + Dehumidification

During Cooling Operation when the unit is equipped with hot gas reheat or liquid subcool reheat and Dehumidification is active, the DX Coil Bypass Damper will shut and all of the supply air will flow through the DX Coil to maximize dehumidification using the reheat source.

DX Coil Bypass Damper Application Considerations

\land WARNING

Operational settings should only be made with the advisement of a qualified person; changing key configurations away from factory settings may result in damage equipment or surrounding property. Recommended settings may vary based on application specific requirements.

Should I use a Bypass Damper?

DX Coil Bypass is ideal for applications with high sensible loads, or that have very light dehumidification requirements. **DX Coil Bypass Dampers** use some bypass air for decreasing the sensible load to the space, while providing some dehumidification. DX bypass dampers are not recommended for applications with large latent and sensible loads that occur at the same time. Geographic location / Climate, and the SHR of the space will determine if DX bypass dampers are right for you. As shown in Table 20 on page 62, your application is considered a sensible BP Damper Design if you are in Climate Zones B or C any zone number and the application SHR (Sensible Heat Ratio) is > than 0.8, meaning the load is mostly sensible. Your application is considered a Latent Bypass Application if you are in Climate Zones A, B, or C, and/or you have a SHR <0.8.



Figure 37: Climate Zone Map

All of Alaska in Zone 7 except for the following Boroughs in Zone 8: Bethel, Dellingham, Fairbanks, N. Star, Nome North Slope, Northwest Arctic, Southeast Fairbanks, Wade Hampton, and Yukon-Koyukuk

Zone 1 includes: Hawaii, Guam, Puerto Rico, and the Virgin Islands

Table 20: Sensible and Latent A	oplications
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	Sensib	le DXBP Application	Latent DX BP Application		
Climate Zone		1-6 B or C.	Any		
Application SHR		SHR is >.8	SHR is between 0.7-0.8		
Outside Air	Mixed Air	100% Outside Air	Mixed Air	100% Outside Air	
Hot Gas Reheat	Not Required	Not Required	Required	Required	
Mixing Blender	65F 55F		60% 55F		

If the SHR is less than 0.7, DX Bypass Dampers are not recommended.

The Application SHR is calculated for the loads between the MAT and the DX leaving coil temperature at the desired balance of coil air flow and bypass airflow.

Sensible DX Bypass Applications

A **Sensible DX Bypass Application** occurs only in dry climates when the design SHR is greater than 0.8. In this scenario, no additional dehumidification devices are required. Blenders can be useful for applications where the OA is >30% of the SA CFM.

Latent DX Bypass Applications

A Latent DX BP Application can occur in any climate zone where the design SHR is between 0.7 and 0.8. If the unit is a mixed air unit, it is recommended the unit use hot gas reheat (HGRH) for supplemental dehumidification control. HGRH dehumidification should be configured to trigger based on OADewpoint and the space setpoint. Review the Dehumidification Set-up menu on how to configure dehumidification to use two setpoints. The OA Dewpoint should be set to 60F or lower. Blenders are highly recommended if the OA is >20% of SA CFM in latent applications. This will help ensure you are mixing properly before the DX Coil and Bypass Damper control.

DX Coil Bypass Damper LCT Reset

The **DX Bypass LCT Setpoint** may be reset for units with DX Bypass Dampers. The reset type may be set to one of the following:

- None: DXBP LCTSpt is user adjustable
- Network: DXBP LCTSpt is equal to the Network DAT Clg Setpoint when it is valid

- Space: DXBP LCTSpt is based on the Space Sensor
- Return: DXBP LCTSpt is based on the Return Air Sensor
- **OAT:** DXBP LCTSpt is based on the Outdoor Air Temperature
- Ext mA: DXBP LCTSpt Spt is determined by a 0-20 mA signal
- Ext V: DXBP LCTSpt is determined by a 0-10 VDC signal
- Airflow: DXBP LCTSpt is based on the airflow as indicated by the variable frequency drive speed
- **SpaceH1:** DXBP LCTSpt is based on the humidity based on humidity sensor 1.
- **SpaceH2:** DXBP LCTSpt is based on the humidity based on humidity sensor 2.
- **SpcDwpt1:** DXBP LCTSpt is based on the calculated dewpoint based on dewpoint sensor 1
- **SpcDwpt2:** DXBP LCTSpt is based on the calculated dewpoint based on dewpoint sensor 2
- **OADwpt:** DXBP LCTSpt is based on the calculated Outdoor Air Dewpoint
- **RADwpt:** DXBP LCTSpt is based on the calculated Return Air Dewpoint

Reset reverts from Return to None when a Return Air Sensor opens or Shorts. Reset Reverts from Space to None when a Space Sensor opens or shorts. Reset Reverts from OAT to None when an Outdoor Air Sensor opens or shorts.

Cooling Menus

Cooling Status

The **Cooling Menu** is a view status menu that displays all relevant **Cooling Status** items.

Table 21: Main Menu \ View Status \ Cooling

Menu Display Name	Default	Range	Description
Menu Display Name	Default	Range	Description
Clg Capacity	-	0-100%	Clg Capacity is a status only item which indicates the percentage of the unit maximum cooling capacity currently operating.
Clg Status	-	Enabled None OffAmb OffAlm OffNet OffMan	Clg Status is a status only item which indicates whether or not mechanical cooling is currently allowed. If cooling is disabled, the reason is indicated.
VCmp1	-	On Off	Vcmp1 is a status only item which indicates whether or not the variable compressor on circuit #1 is on or off
VCmp2	-	On Off	Vcmp2 is a status only item which indicates whether or not the variable compressor on circuit #2 is on or off
VCmp1 Cmd	-		VCmp1 Cmd is a status only item which indicates the current capacity command to the variable compressor on circuit #1
VCmp2 Cmd	-		VCmp2 Cmd is a status only item which indicates the current capacity command to the variable compressor on circuit #2
FCmp1	-	On Off	FCmp1 is a status only item which indicates whether or not the fixed speed compressor #1 is on
FCmp2	-	On Off	FCmp2 is a status only item which indicates whether or not the fixed speed compressor #2 is on
FCmp3	-	On Off	FCmp3 is a status only item which indicates whether or not the fixed speed compressor #3 is on
FCmp4	-	On Off	FCmp4 is a status only item which indicates whether or not the fixed speed compressor #4 is on
FCmp5	-	On Off	FCmp5 is a status only item which indicates whether or not the fixed speed compressor #5 is on
FCmp6	-	On Off	FCmp6 is a status only item which indicates whether or not the fixed speed compressor #6 is on

Cooling Setup

The Cooling Setup Menu is a view status menu that displays all relevant cooling status items.

Table 22: Main Menu \ View Status \ Cooling Setup

Menu Display Name	Default	Range	Description
Circ1 CmpState -	-	Off	Circ1 CmpStat or Circ2Cmp Stat is a status only item that displays the current
Circ2 Cmp State		Start	state/activity for each cooling circuit.
		Init1	
		Init2	
		Init3	
		Normal	
		Pmpdn1	
		Pmpdn2	
		Pmpdn3	
		Standby	
Circ1Status- Circ2Status	-	Enabled Disabled	Circ1Status or Circ2Status is a status only item that displays if the refrigeration circuit is enabled or disabled for cooling operation.
FCmp1-FCmp6	-	Off On	FCmp1-6 is a status only item that indicates whether the fixed speed compressor# 1,2,3,4,5,6 is ON or OFF.
Control Temp	-	-50.0-200.0°F	Control Temp is a status only item which displays the current value of the "Control Temperature." The "Control Temperature" is defined as the temperature input selected by the Control Temperature Source parameter. For example, if the Control Temperature Source parameter is set to "Return," then the control temperature parameter reads the same value as the Return Air parameter.
Occ Clg Spt	72.0°F	0.0-100.0°F	Occ Clg Spt is an adjustable item which indicates the temperature in which the unit will go into the cooling mode of operation.
Occ Clg DB	2.0°F	0.0-10.0°F	Occ Clg DB is an adjustable item which sets a dead band around the Occ Cooling Set Point parameter. For example, if the Occ Cooling Set Point parameter is set to 75°F and the Clg Deadband parameter is set to 2°F the dead band around the set point would be from 76.0°F to 74.0°F.
Disch Air	-	-50.0-250.0°F	Disch Air is a status only item which displays the current temperature reading from the unit's discharge air temperature sensor (DAT). This sensor is standard on all units.
DAT ClgSpt	55.0°F	40.0-100.0°F	DAT Clg Spt is an adjustable item which sets the temperature that the DAT should be maintained at when it is in the cooling mode of operation. Tis value is adjustable on DAC and 1ZnVAV units. It is not adjustable on CAV units
DAT Clg DB	2.0°F	1.0-10.0°F	DAT Clg DB is an adjustable item which sets the deadband around the DAT Clg Spt. If the disch air is within the DB no action is take. For example, if the discharge cooling set point is set to 55°F and the Clg DB is set to 2°F the dead band around the set point would be from 56.0°F to 54.0°F
Eff Space T	-	0.0-150.0°F	Eff Space T is a status only item that displays the current effective space temperature
Uocc Clg Spt	85.0°F	40.0-100.0°F	Unocc Clg Spt is an adjustable item which sets the zone temperature above which the unit starts up and provides unoccupied cooling (night setup) during unoccupied periods. Note: setting this to its maximum value will disable unocc cooling
Unocc Diff	3.0°F	0-10.0°F	Unocc Diff is an adjustable item which sets a differential above and below the Ucc Clg Spt. Mechanical Cooling operation is enabled when the Control temp is above the Uocc Clg spt by the unocc diff. Conversely, mechanical cooling operation is disabled when the control temp is below the Uocc Clg Spt by the Unocc Diff.
Clg Stg Time	5 min	5-60min	Clg Stage Time is an adjustable item used to set a minimum time period between compressor stage changes.

Menu Display Name	Default	Range	Description
OA Temp	-	-50.0-200.0°F	OA Temp is a stauts only item which displays the current temperature reading from the unit mounted Outdoor air temperature sensor. This sensor is standard on all units
Clg Lo OAT Lk	25°F	-20.0-100°F	Clg Lo OAT Lk is an adjustable item which sets the low outdoor air temperature mechanical cooling lockout point. Mechanical cooling operation is disabled when the outdoor air temperature sensor input falls below this set point.
OAT Diff	2.0°F	0-10.0°F	OATDiff is an adjustable item which sets a differential above the OAT Clg Lock parameter. Mechanical cooling operation is re-enabled when the outdoor air temperature sensor input rises above the OAT Clg Lock value by more than this differential.
Clg Reset	None	None Network Space Return OAT ExtmA ExtV Airflow SpaceH1 SpaceH2 OAH RAH SpcDpt1 SpcDpt2 OADwpt RADwpt	Clg Reset is an adjustable item that is used to set the type of cooling reset to be used. Notes: Space (Not selectable when SpaceTCfgis none) ExtmA (Not selectable when RemSptSrc is Yes) ExtV (Not Selectable when RemSptSrc is Yes)
Min Clg Spt	55.0°F	40.0-100.0°F	Min Clg Spt is an adjustable item which sets the minimum cooling discharge set point for use with a cooling discharge air temperature set point reset schedule.
Min Clg Spt@	0	0-100/ NA °F °C mA V %	Min Clg Spt @ is an adjustable item which sets the value of the sensor input, selected with the Cooling Reset parameter, at which the DAT cooling set point parameter is reset to the minimum DAT cooling set point value.
Max Clg Spt	65.0°F	40.0-100.0°F	Max Clg Spt is an adjustable item which sets the maximum cooling discharge set point for use with a cooling discharge air temperature set point reset schedule.
Max Clg Spt@	100	0-100/ NA °F °C mA V %	Max Clg Spt @ is an adjustable item which sets the value of the sensor input, selected with the Cooling Reset parameter, at which the DAT cooling set point parameter is reset to the maximum DAT cooling set point value.
DXBP LCTSpt	52.0°F	45.0-65.0°F	DXBPLCTSpt is an adjustable item which sets the leaving dx coil setpoint used for controlling cooling during DX Bypass damper operation. The cooling will modulate and control to maintain this setpoint.

Menu Display Name	Default	Range	Description
DXBP LCTDB	2.0°F	1-10.0°F	DXBP LCTDB is an adjustable item which sets the deadband around the DXBP LCT Spt. If the leaving coil temperature air is within the DB no action is take. For example, if the DXBP Leaving Coil Temperature set point is set to 52°F and the DXBP LCT DB is set to 2°F the dead band around the set point would be from 54.0°F to 50.0°F
DXBPLCTSptRst	None	None	DXBPLCTSptRst is an adjustable item that is used to set the type of
		Network	DXBPLCT reset to be used.
		Space	
		Return	
		OAT	
		Airflow	
		SpaceH1	
		SpaceH2	
		OAH	
		RAH	
		SpcDpt1	
		SpcDpt2	
		OADwpt	
		RADwpt	
DXBPMinLCTSpt	45.0°F	45.0-65.0°F	DXBPMinLCTSpt is an adjustable item which sets the minimum DXBP Leaving Coil Temperature set point for use with a DXBP LCT set point reset schedule.
DXBPMnLCTSpt@	0.0	0-100/	DXBPMnLCTSPT@ is an adjustable item which sets the value of the sensor
		NA	setpoint parameter is reset to the minimum DXBP LCT Setpoint value.
		°F	
		°C	
		%	
DXBPMaxLCTSpt	52.0°F	45.0-65.0°F	DXBPMaxLCTSpt is an adjustable item which sets the maximum DXBP Leaving Coil Temperature set point for use with a DXBP LCT set point reset schedule.
DXBPMxLCTSpt@	100.0	0-100/	DXBPMxLCTSPT@ is an adjustable item which sets the value of the sensor
		NA	input, selected with the DXBP LCT Reset parameter, at which the DXBP LCT setpoint parameter is reset to the maximum DXBP LCT Setpoint value
		°F	
		°C	
		%	

Dehumidification

Dehumidification is an operating mode that is only allowed when the unit is in either the Fan Only or Cooling States. When dehumidification is active, the unit is not allowed to operate in the Economizer or MinDAT states. Normal temperature control is overridden and mechanical cooling will instead be used to lower the air temperature enough to wring out moisture and subsequently, reheat will be used to raise it back up to achieve the unit discharge air temperature requirements. Reheat types can be Liquid Subcool Reheat, Hot Gas Reheat, or the standard heating equipment (Gas or Steam/Hot Water).

Dehumidification Initiation

Dehumidification operation is available in both the Cooling and Fan Only unit states, and is initiated by one or two analog or network humidity sensors that are mounted in the return duct, space, or outdoors to sense relative humidity. The unit may be set up to dehumidify based on relative humidity, dewpoint, or continuously. Each humidity sensor can have a separate setpoint, Hum1, Hum2, or Dwpt1 and Dwpt2. Humidity sensors are configured in the Humidity Sensor Set-Up Menu and the setpoints are configured in the Dehumidification Set-Up menu.

- **Relative Humidity or Dewpoint:** When configured for relative humidity or dewpoint, the basis of dehumidification will be determined by one or two relative humidity sensors.
- Figure 38: Cooling/Dehumidification Psychrometric Charts

- Always: When configured to dehumidify continuously, dehumidification and reheat will operate regardless of relative humidity or dewpoint, and will operate any time the unit is in the Cooling or Fan Only unit states.
- **Unoccupied:** Dehumidification default settings allow dehum to operate in occupied only, The unoccupied operation is an adjustable setting to allow unoccupied dehumidification.

Dehumidification Operation

The left psychrometric chart below shows typical cooling operation. The space is $74^{\circ}F$ and 50% and the rooftop unit is in mechanical cooling, providing $55^{\circ}F$ air leaving the unit. If the space humidity rises above its 50% RH setpoint, Dehumidification is activated.

The right psychrometric chart shows cooling operation in dehumidification. In dehumidification operation, the unit is cooling the air temperature lower to provide a lower dewpoint supply air and latent dehumidification.

In the example below, the air cooled to provide 50°F dewpoint and is reheated to the DAT Cooling setpoint of 55°F to continue providing the same sensible cooling load. With this example in mind, the MicroTech 4 has several methods for initiating dehumidification, and several variations of temperature and reheat control parameters that modify and enhance dehumidification performance.



Staged Compressors

When Dehumidification is active, compressor stages are controlled to maintain the leaving coil temperature between the minimum leaving coil temperature setpoint (MinLCTSpt) and the maximum leaving coil temperature setpoint(MaxLCT Spt). During dehumidification operation, the number of compressor stages increases or decreases to maintain the leaving coil temperature between the minimum and maximum leaving coil temperature setpoint.

Figure 39: Compressor Staging Psychrometric Charts



Variable Speed Compressor

When dehumidification is active, **Variable Speed Compressor** capacity is modulated to maintain the leaving coil temperature within the deadband near the leaving coil temperature setpoint.

Reheat Control

The reheat process is a critical component of the dehumidification process. All MicroTech 4 controlled rooftops use a fully modulating reheat control to provide precise discharge temperature control during dehumidification. There are several forms of reheat that can be used. Reheat types can be Liquid Subcool Reheat, Hot Gas Reheat, or the standard heating equipment (Gas or Steam/Hot Water).

• **Cooling:** In the cooling state, the modulating hot gas, liquid subcool, and standard heat reheat will be controlled to the DAT Cooling. This is demonstrated in Figure 39. For DAT controlled units this is the normal DAT Cooling setpoint resulting from any reset. For Zone Control units, this setpoint is the result of a calculation based on the control temperature.

• Fan Only: In the fan only, state, the modulating hot gas, liquid subcool and standard heat reheat will be controlled to the reheat setpoint. The reheat setpoint equals an editable MaxReheatSpt (Default = 65°F) when the control temperature drops to the Occupied or Unoccupied Heating Setpoint, and equals an editable MinReheatSpt (Default = 55°F) when the control temperature rises to the Occupied or Unoccupied Cooling setpoint. The Dehumidification Reheat Setpoint varies linearly between these two points. Users can choose to set these to be the same value (Example = 65°F) if they desire neutral air when there is no sensible cooling load.

Figure 40: Reheat Control



LCT (Leaving Coil Temperature) Reset

Using a **Leaving Coil Temperature Reset** can be useful in humidity control applications where dehumidification loads vary greatly with occupancy or climate. By implementing a reset of the leaving coil temperature based on feedback from load driving variables, dehumidification control is enhanced by reacting to changing dehumidification loads throughout operation.

Table 23: Recommer	nded LCT	Reset	Schedules
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	1		2			3		
	Space/RAT	LCT	Space RH/Dwpt	LCT	Airflow	LCT	Outdoor RH	LCT
Min	74°F	50°F	50%	52°F	100%	52°F	70%	52°F
Max	70°F	45°F	60%	45°F	30%	45°F	100%	45°F

- 1. Space/RAT: Space or Return Air Temperature is a good reset temperature source for LCT when the primary dehumidification fluctuations happen during periods of little or no cooling load and the unit is most likely to be in the Fan Only state. If we consider a space with occupied cooling and heating setpoints of 74°F and 70°F respectively, at 74°F and 50% the dewpoint is 54.2°F and at 70°F and 50% RH the dewpoint is 50.5°F. As the space/unit operates in fan only and the temperature drops the dewpoint required to maintain 50% RH also drops. If a unit is likely to require dehumidification operation during fan only, this will requires the LCT setpoint to drop as the space temperature drops in order to maintain a 50%RH space setpoint. Maintaining a constant LCT during fan only could result in a space humidity to increase by as much as 10%.
- 2. Space RH or Dewpoint: Space Relative Humidity or Dewpoint is a good source for LCT reset source when the dehumidification operation is likely to occur in both cooling and fan only operation. As the space humidity rises above the 50% RH or 55°F Dewpoint setpoint the LCT should be reduced proportional to the increase in RH or dewpoint so that any extra moisture in the space can be removed effectively.
- 3. Airflow: Airflow is a good LCT reset source for most

modulating supply fan applications. As fan speed slows proportionally with load, to provide the same moisture removal to the space (#/hr) a lower supply dewpoint is required. As an example, a 10,000 CFM air handler that delivers 52°F dewpoint air in dehumidification to a 74°F/50% space is removing 35.6 lbs/hr. At 50% airflow, that same air handler needs to supply 49°F dewpoint air to provide the same amount of dehumidification. Note: this reset type may be less effective in duct pressure VAV systems that have significant duct static pressure resets schedules being used.

4. Outdoor RH or Dewpoint: Outdoor RH or Dewpoint is a good LCT reset source in 100% outdoor air applications, where constant dehumidification and reheat is being performed. As the outdoor air humidity becomes more mild, the need to dehumidify to lower LCT's is reduced and can be reset higher to save energy. For example, a 100% OA unit may be designed to supply 68°F/52°F dewpoint air at design summer conditions, but during cool rainy whether a lower LCT may be desired to provide extra dehumidification to the space. Resetting based on outdoor air humidity above 70% could provide added dehumidification under rainy conditions.

Dehumidification Menus

Dehumidification Status

The **Dehumidification Menu** is a view status menu that displays all relevant **Dehumidification Status** items

Menu Display Name	Default	Range	Description
Menu Display Name	Default	Range	Description
Dehum Status	-	Inactive Active	Dehum Status is a status only item which indicates the status of operation of the dehumidification operation. Dehumidification operation can be active or inactive.
Rel Hum 1	-	0-100%	Rel Hum1 is a status only item that displays the current relative humidity reading from the optional relative humidity sensor at user defined location 1
Rel Hum 2	-	0-100%	Rel Hum2 is a status only item that displays the current relative humidity reading from the optional relative humidity sensor at user defined location 2
Dewpoint 1	-	-50.0-150.0°F	Dewpoint 1 is a status only item that displays the current dewpoint value that is calculated by the controller using the Rel humidity and Temperature at user defined location 1
Dewpoint 2	-	-50.0-150.0°F	Dewpoint 2 is a status only item that displays the current dewpoint value that is calculated by the controller using the Rel humidity and Temperature at user defined location 2
Reheat Spt	-	40.0-100.0°F	Reheat Spt is a status only item that displays the current reheat setpoint the reheat system is controlling to during dehumidification operation.
Rht Capacity	-	0-100%	Reheat Cap is a status only item that indicates the current reheat capacity value.

Table 24: Main Menu \ View Status \ Dehumidification

Dehumidification Setup

The Dehumidification Menu is a view status menu that displays all relevant Dehumidification status items

Table 25: Main Menu \ View Status \ Dehumidification Setup

Menu Display Name	Default	Range	Description	
Dehum Method	None	None RelHum1 RelHum2 RelHum12 DewPt1 DewPt2 DewPt12 Always	Dehum Method is an adjustable item used to set the dehumidification method to either "RH" or "DewPt." When this parameter is set to RH1, RH2, or RH12, dehumidification operation is controlled to maintain the Rel Humidity value at the Relative Humidity Set Point(s) based on the selection. When this parameter is set to DewPt1, DewPt2, DewPt12, dehumidification operation is controlled to maintain the Dew Point= value at the Dew Point Set Point(s). The location/type of sensor driving the RH or DewPt at 1,2, or 12 is configured in the Humidity Sensor Set Up menu. When this parameter is set to "Always" dehumidification will be active as long as mechanical cooling is not disabled.	
Rel Hum1	-	0-100%	Rel Hum1 is a status only item that displays the current relative humidity of humidity sensor 1	
Rel Hum2	-	0-100%	Rel Hum2 is a status only item that displays the current relative humidity of humidity sensor 2	
Hum1 Spt	50%	0-100%	Hum1 Spt is an adjustable item used to set the relative humidity value at sensor location 1 at which the relative humidity will be controlled to during dehumidification operation.	
Menu Display Name	Default	Range	Description	
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Hum2 Spt	50%	0-100%	Hum2 Spt is an adjustable item used to set the relative humidity value at sensor location 2 at which the relative humidity will be controlled to during dehumidification operation.	
Dewpoint 1	-	-50.0-150.0°F	Dewpoint 1 is a status only item that indicates the current dew point value that is calculated by the controller using the Rel Humidity= value and either the Space Temp= or Return Air= value, depending on the setting of the Humidity Sensor Location. This parameter can either be set to "Space" or "Return."	
Dewpoint 2	-	-50.0-150.0°F	Dewpoint 2 is a status only item that indicates the current dew point value that is calculated by the controller using the Rel Humidity= value and either the Space Temp= or Return Air= value, depending on the setting of the Humidity Sensor Location. This parameter can either be set to "Space" or "Return."	
Dewpnt 1 Spt	50°F	0.0-100.0°F	Dewpnt Spt 1 is an adjustable item used to set the dewpoint value at location 1 at which the dewpoint with will be controlled to during dehumidification operation.	
DewPnt 2 Spt	50°F	0.0-100.0°F	Dewpnt Spt 2 is an adjustable item used to set the dewpoint value at location 2 at which the dewpoint with will be controlled to during dehumidification operation.	
Rel Hum DB	6%	0-10%	Rel Hum DB is an adjustable item that sets a dead band around the relative humidity set point. For example, if the RH Setpoint parameter is set to 50% and the RH Db parameter is set to 2% the dead band around the set point would be from 49% to 51%.	
Dewpoint DB	2.0°F	2-10.0°F	Dewpoint DB is an adjustable item that sets a dead band around the dew point set point. For example, if the DewPoint Spt parameter is set to 50°F and the DewPntDb parameter is set to 2°F the dead band around the set point would be from 49°F to 51°F.	
LCT Setpoint	55°F	0-100°F	LCT Setpoint is an adjustable item which is used to set the leaving coil temperature setpoint the compressors control to maintain during dehumidification operation	
LCT Spt Reset	None	None Network Space Return OAT RelHum1 RelHum2 DewPt1 DewPt2	LCT Spt Reset is an adjustable item which is used to set the variable that will be used to reset the leaving coil temperature setpoint	
Min LCT Spt	45°F	40-100°F	Min LCT Spt is an adjustable item which sets the minimum leaving coil themperature setpoint for use with a leaving coil temperature setpoint reset schedule	
Min LCT Spt@	0	0-100/ NA °F °C mA V %	Min LCT Spt@ is an adjustable item which sets the value of the sensor input, selected with the leaving coil temperature reset parameter, at which the leaving coil temperature setpoint is reset to the Min LCT Spt value.	
Max LCT Spt	52°F	40-100°F	MaxC1 Spt is an adjustable item which sets the maximum coil themperature setpoint for use with a leaving coil temperature setpoint reset schedule	

Menu Display Name	Default	Range	Description	
Max LCT Spt@	0	0-100/ NA °F °C mA V %	Max LCT Spt@ is an adjustable item which sets the value of the sensor input, selected with the leaving coil temperature reset parameter, at which the leaving of temperature setpoint is reset to the Max LCT Spt value.	
Min Reheat Spt	55°F	40-100°F	Min Reheat Spt is an adjustable item which is used to set the minimum DAT during dehumidification.	
Max Reheat Spt	65°F	40-100°F	Max Reheat Spt is an adjustable item which is used to set the maximum DAT during dehumidification.	
DAT Clg DB	1.0°F	1-10.0°F	DAT Clg DB is an adjustable item which sets the deadband around the DAT Clg Spt. If the disch air is within the DB no action is take. For example, if the discharge cooling set point is set to 55°F and the Clg DB is set to 2°F the dead band around the set point would be from 56.0°F to 54.0°F	
DAT Htg DB	1.0°F	1-10.0°F	DAT Htg DB is an adjustable item which sets the deadband around the DAT Htg Spt. If the disch air is within the DB no action is take. For example, if the discharge heating set point is set to 85°F and the Htg DB is set to 2°F the dead band around the set point would be from 83.0°F to 87.0°F	
Unocc Dehum	No	No Yes	Unocc Dehum is an adjustable item which sets if dehumidification is allowed in Unoccupied operation.	

Heating

Heating Operation

A unit may be configured with one of several optional types of primary **Heating:** Hot Water, Steam, Natural Gas, Propane, or Electric Heat. The options will either be staged or modulating controlled. The unit enters the Heating operating state from the Fan Only operating state when the control temperature falls below the Occupied or Unoccupied Heating Set Point by more than half the Occupied or Unoccupied Heating Deadband. The unit transitions from the Heating to Fan Only operating state when the control temperature rises above the Occupied or Unoccupied Heating Set Point by more than half the Occupied or Unoccupied Heating Dead Band. The unit will also transition from the Heating to Fan Only operating state if heating operation is disabled due to OA ambient lockout.

Staged Control

Staged Control is available for electric and gas heat types.

- Zone Control: When the unit first enters the Heating operating state the unit goes directly to Stage # 1.The number of heating stages increases when the time since the last stage change exceeds the stage time, the Projected Control Temperature and the actual Control Temperature are less then the Occ Htg Spt (minus ½ the deadband), and the DAT is less than the Max DAT Htg Spt. The number of heating stages decreases when the time since the last stage change exceeds the stage time, and the Projected Control Temperature and actual Control Temperature are greater then the Occ Htg Spt (plus ½ the deadband). The number of heating stages also decreases when the time since the time since the last stage the the Max DAT Htg Spt. The number of heating stages also decreases when the time since the last stage change exceeds the stage time, and the Art the time since the last stage the the time since the last stage change exceeds the stage time, and the DAT is greater than the MaxDATHtgSpt.
- DAT Control: When the unit enters the Heating or Minimum DAT states and all heating is off, the unit goes directly to Heating Stage # 1 so that the first stage of heat is turned on immediately. The number of heating stages increases when the time since the last stage change exceeds the stage time, and DAT is less than the effective DAT setpoint (DAT staging) or the Min DAT limit (MinDAT staging) by ½ the deadband. One exception to this is that if the current heating stage is zero, the heating stage can increase without regard to the stage timer. The last stage change exceeds the stage time, and the DAT is greater than the effective DAT setpoint (DAT staging) or the MIN DAT limit (MinDAT staging) by ½ the deadband.
- Min DAT: The unit enters the Min DAT operating state during occupied operation when neither cooling nor heating is required based on the unit heat/cool changeover function but the discharge air temperature falls below a minimum discharge temperature limit by more than ½ the deadband. The Min DAT operating state prevents cold discharge air temperatures during what would normally be the Fan Only operating state.

Modulating Control

Modulating heating control is available with gas, electric, hot water, and steam heating types. There are some differences in the control sequence depending on the heat type installed. The different types are described in the following sections.

- **Zone Control:** When a unit is equipped with a modulating heat type and is performing zone temperature control, the controller will calculate the required Heating DAT setpoint to maintain the desired Control Temperature (Space or RAT) at the OccHeating Setpoint. The DAT heating setpoint will not be user adjustable and will be continuously reset between the Minimum discharge air heating setpoint(MinHtg Spt) and the maximum discharge air heating setpoint(MaxHtgSpt).
- **DAT Control:** When a unit is equipped with a modulating heating type and is the heating operating state, the modulating valve or control is modulated to maintain the discharge temperature setpoint.
- Min DAT: If heating is enabled and there is no heating load (normally Fan Only operating state), the controller activates the units heating equipment as required to prevent the discharge air temperature from becoming too cool if the Min DAT Flag (DAT units only) is set to yes in the Heating Menu. The unit enters the Min DAT operating state during occupied operation when neither cooling nor heating is required based on the heat/cool changeover function but the discharge temperature falls below a minimum discharge temperature limit. If the discharge air temperature falls below this minimum discharge temperature limit by more than half the discharge heating deadband, the unit operating state changes from Fan Only to Min DAT. (Note: On VAV or CAV Discharge Control Units, the DAT cooling setpoint parameter in the Cooling Menu acts as the minimum discharge temperature limit. On CAV Zone Control Units the Min DAT Limit in the Heating Menu acts as the minimum discharge temperature limit.)
- **Gas heat:** On units equipped with modulating gas heat, the Discharge heating setpoint is limited according to the maximum heat exchanger temperature rise limit. This factory set limit varies by burner model and can be found on the gas heat data plate attached to the unit. The controller does not allow the Discharge heating setpoint to be set above the current temperature entering the discharge fan by more than this maximum heat exchanger temperature rise limit.

Heating DAT Setpoint Reset

The **Heating DAT Setpoint** may be reset for units with DAT Heating Control. The Discharge Air Temperature Setpoint will never be set below the Minimum DAT Heating Setpoint or above the Maximum DAT heating Setpoint on the Heating Reset menu. The reset type may be set to one of the following:

- · None: Discharge Heating Spt is user adjustable
- **Network:** Discharge Heating Spt is equal to the Network DAT Htg Setpoint when it is valid
- **Space:** Discharge Heating Spt is based on the Space

Sensor

- **Return:** Discharge Heating Spt is based on the Return Air Sensor
- **OAT:** Discharge Heating Spt is based on the Outdoor Air Temperature
- **Ext Signal:** Discharge Heating Spt is determined by a 0-20 or 4-20 mA signal by a 0-10 or 2 10 VDC signal

Reset reverts from Return to None when the return air sensor opens or shorts. Reset reverts from Space to None when the space sensor opens or shorts. Reset reverts from OAT to None when the outdoor air sensor opens or shorts.

When Space, Return, OAT, Ext mA, or Ext V is selected, the Discharge Heating Spt equals the Max Htg Spt when the selected value equals the Max Htg Spt @ value. Similarly, the Discharge Heating Spt equals the Min Htg Spt when the selected value equals the Min Htg Spt @ value.

When Space, Return, or OAT is selected, the reset schedule should be set so that the DAT Heating setpoint decreases as the selected temperature increases as shown in the graph.

When Ext mA is selected, the values "Min Htg Spt @" and "Max Htg Spt @" are entered as mA values. When Ext VDC is selected, the values "Min Htg Spt @" and "Max Htg Spt @" are entered as VDC values.

If Ext mA or Ext V is selected as the type of reset, the Min Htg Spt @ value may be set above the Max Htg Spt @ value to cause a decrease in the DAT setpoint as the external signal or the Min Htg Spt @ value may be set below the Max Htg Spt @ value to cause an increase in the DAT setpoint as the external signal increase.

Figure 41: Heating DAT Reset



Face and Bypass Control (Steam, Hot Water):

When a unit is equipped with steam or hot water, and with face and bypass damper heating, there are two different methods used for controlling the heating arrangement. These are the "Open Valve" and "Auto" methods and are described in the following sections.

- **Open Valve:** When the unit enters the Heating operating state, the steam or hot water valve is driven fully open. The face and bypass dampers are then modulated to maintain the discharge air temperature at the discharge heating set point.
- Auto: When the outdoor air temperature is below the F&BP changeover temperature, the Heating valve is driven to 100% open to protect the coil. The face and bypass dampers are then modulated to satisfy the heating load. When the outdoor air temperature rises above the F&B Changeover temperature by a differential of 2.0°F, the face and bypass dampers are set at 100% open to the face of the coil and the Heating valve is modulated to satisfy the heating load. The default value for the changeover temperature is 37°F.

Special Gas Heat Start Up for 100% OA Units

A special start sequence is used for 100% outdoor air units with gas heat. The special start sequences applies to both Zone Control and DAT Control units. If heat is required at unit start up, the furnace enters a special burner startup sequences as the unit enters its Startup operating state. Pre-firing the burner allows the gas heat pre-purge sequences to occur and the burner to fire and warm up so that tempered air is available immediately when the fans start.

- Initiation 100% OA Zone Control: The 100% OA gas heat sequence is initiated at startup if the control temperature is less than the Effective Occupied or Unoccupied Heating Setpoint by ½ of the Heating deadband or the OAT is less than the Min DAT Limit by the amount of the DAT heating deadband.
- Initiation 100% OA DAT Control: The 100% OA gas heat sequence is initiated at start up if the Min DAT Ctrlk parameter is set via the keypad and the OAT is less than the DAT Clg Spt by the amount of the DAT heating deadband.
- The Sequence: The special start up sequence is initiated during the Start up operating state, the fans remain off, and the main gas valve is energized so the burner starts during the Warm up Time (default =240s) and operates at low fire. At the end of the warmup time, the modulating gas valve is set to a position based on the calculated application requirements. Once the gas valve is set to the calculated position, a HeatUpDely starts (default =60s) to allow the heat exchanger to heat up. After this delay, since the unit is 100% Outside Air, the unit immediately transitions from Startup to the Fan Only State. As soon as the unit enters the Fan Only Stat, the unit will immediately transition to the Heating State or MinDAT.

Outdoor Air Ambient Heating Lockout

Heating is disabled whenever the outdoor air temperature is greater than the Outdoor Air Ambient Heating Lockout Set Point. When the outdoor air temperature drops below the Outdoor Air Ambient Heating Lockout Set Point by more than the Heating Lockout Differential, heating operation is re-enabled. Cooling is disabled if outdoor air temperature or entering water temperature is too low for operation. The outdoor air temperature becomes too low for operation when it drops below the Outdoor Air Ambient Cooling Lockout Set Point. Outdoor air temperature becomes high enough for operation when it rises above the Outdoor Air Ambient Cooling Lockout Set Point by more than the Cooling Lockout Differential. The entering water temperature becomes too low for operation when it drops below the Minimum Entering Water Temperature Setpoint. Entering water temperature becomes high enough for operation when it rises above the Minimum Entering Water Temperature Setpoint by more the Cooling Lockout Differential.

Post Heat Operation

Post Heat Operation is a time delay feature used in duct pressure VAV systems that utilize the VAVBoxOut digital output or network command(DO10, or network variable) in the unit MicroTech 4 controller. The VAV Box output varies from off (heat mode to On (cool mode) to tell the VAV boxes what state the unit is operating in. Post heat operation is a time delay for switching the VAV box output function from heat to cool. The intention of this timer is to allow the supply fan capacity to be reduced to the Minimum supply fan capacity to help prevent high duct pressure conditions during transitions that may otherwise occur due to the relative faster response of the VAV boxes versus the supply fan. Post heat operation remains active until either the discharge fan capacity reaches the minimum value, or until the Post Heat Timer Expires, which ever occurs first.

NOTE: During "post heat" operation and for 120 seconds afterward, the proof of airflow input is ignored. This is to prevent nuisance Fan Fail fault alarms that may occur if the airflow switch opens during or following post heat operation. The unit cannot leave Fan Only or Min DAT operation while the airflow switch is being ignored.)

Freezestat

When a unit is equipped with chilled water, hot water, or steam coil, a freeze problem occurs when the optional **Freezestat** contacts open as a result of detecting an abnormally low water or steam coil temperature while the fans are off.

When the freeze problem occurs, the controller opens the waterside economizer valve, chilled water and heating valves, and sets a 10-minute timer. If the unit is equipped with a waterside economizer, the pump output is also turned on. When the 10-minute timer expires, the controller checks the freezestat input again. If the freezestat contacts are closed, the pump output is de-energized and the valves close. If the freezestat contacts are still open, the pump output remains energized, the valves remain open, and the 10-minute timer resets. This continues while the unit remains off. Whenever the freezestat closes, the Freeze problem automatically clears. This feature protects the coil(s).

Heating Menus

Heating Status

The Heating Menu is a view status menu that displays all relevant Heating status items

Table 26: Main Menu \ View Status \ Heating

Menu Display Name	Default	Range	Description
Htg Capacity	-	0-100%	Htg Capacity is a status only item which indicates the percentage of the unit maximum heating capacity currently operating.
Htg Status	-	Enabled None OffAmb OffAlm OffNet OffMan	Htg Status is a status only item which indicates whether or not heating is currently allowed. If heating is disabled, the reason is indicated.
Htg Stg 1	-	On Off	Htg Stg 1 is an adjustable item that turns on the first stage of heat on units equipped with staged heating.
Htg Stg 2	-	On Off	Htg Stg 2 is an adjustable item that turns on the second stage of heat on units equipped with staged heating.
Htg Stg 3	-	On Off	Htg Stg 3 is an adjustable item that turns on the third stage of heat on units equipped with staged heating.
Htg Stg 4	-	On Off	Htg Stg 4 is an adjustable item that turns on the fourth stage of heat on units equipped with staged heating.

Heating Set-Up Menu

Table 27: Main Menu Commission Unit \ Heating Set-Up Menu

Menu Display Name	Default	Range	Description	
Control Temp	-	-50.0- 200.0°F	Control Temp is a status only item which displays the current value of the "Control Temperature." The "Control Temperature" is defined as the temperature input selected by the Control Temperature Source parameter. For example, if the Control Temperature Source parameter is set to "Return," then the control temperature parameter reads the same value as the Return Air parameter.	
Occ Htg Spt	68.0°F	0.0- 100.0°F	Occ Htg Spt is an adjustable item which indicates the temperature in which the unit will go into the heating mode of operation.	
Occ Htg DB	2.0°F	0.0-10.0°F	Occ Htg DB is an adjustable item which sets a dead band around the Occ Heating Set Point parameter. For example, if the Occ Heating Set Point parameter is set to 68°F and the Htg Deadband parameter is set to 2°F the dead band around the set point would be from 70.0°F to 66.0°F.	
Disch Air	-	-50.0- 250.0°F	Disch Air is a status only item which displays the current temperature reading from the unit's discharge air temperature sensor (DAT). This sensor is standard on all units.	
DAT HtSpt	85.0°F	40.0- 100.0°F	DAT Htg Spt is an adjustable item which sets the temperature that the DAT should be maintained at when it is in the heating mode of operation. Tis value is adjustable on DAC and 1ZnVAV units. It is not adjustable on CAV units	
DAT Htg DB	2.0°F	1.0-10.0°F	DAT Htg DB is an adjustable item which sets the deadband around the DAT Htg Spt. If the disch air is within the DB no action is take. For example, if the discharge heating set point is set to 85°F and the Htg DB is set to 2°F the dead band around the set point would be from 83.0°F to 87.0°F	
Eff Space T	-	0.0- 150.0°F	Eff Space T is a status only item that displays the current effective space temperature	

Menu Display Name	Default	Range	Description	
Uocc Htg Spt	55.0°F	40.0- 100.0°F	Unocc Htg Spt is an adjustable item which sets the zone temperature below which the unit starts up and provides unoccupied heating (night setup) during unoccupied periods. Note: setting this to its maximum value will disable unocc heating	
Unocc Diff	3.0°F	0-10.0°F	Unocc Diff is an adjustable item which sets a differential above and below the Ucc Htg Spt. Heating operation is enabled when the Control temp is below the Uocc Htg spt by the unocc diff. Conversely, Heating operation is disabled when the control temp is above the Uocc HtgSpt by the Unocc Diff.	
Htg Stg Time	5 min	2-60min	Htg Stage Time is an adjustable item used to set a minimum time period between compressor stage changes.	
OA Temp	-	-50.0- 200.0°F	OA Temp is a stauts only item which displays the current temperature reading from the unit mounted Outdoor air temperature sensor. This sensor is standard on all units	
Htg Hi OAT Lk	55°F	0-100°F	Htg Hi OAT Lk is an adjustable item which sets the maximum outdoor air temperature heating lockout point. Heating operation is disabled when the outdoor air temperature sensor input rises above this set point.	
OAT Diff	2.0°F	0-10.0°F	OATDiff is an adjustable item which sets a differential below the OAT Htg Lock parameter. Heating operation is re-enabled when the outdoor air temperature sensor input falls below the OAT Htg Lock value by more than this differential.	
Htg Reset	None	None Network Space Return OAT ExtmA ExtV	Htg Reset is an adjustable item that is used to set the type of heating reset to be used.	
Min Htg Spt	55.0°F	40.0- 100.0°F	Min Htg Spt is an adjustable item which sets the minimum heating discharge set point for use with a heating discharge air temperature set point reset schedule.	
Min Htg Spt@	0	0-100/ NA °F °C mA V %	Min Htg Spt @ is an adjustable item which sets the value of the sensor input, selected with the Heating Reset parameter, at which the DAT heating set point parameter is reset to the minimum DAT heating set point value.	
Max Htg Spt	65.0°F	40.0- 100.0°F	Max Htg Spt is an adjustable item which sets the maximum heating discharge set point for use with a heating discharge air temperature set point reset schedule.	
Max Htg Spt@	100	0-100/ NA °F °C mA V %	Max Htg Spt @ is an adjustable item which sets the value of the sensor input, selected with the Heating Reset parameter, at which the DAT heating set point parameter is reset to the maximum DAT heating set point value.	
Min DAT Ctrl	Yes	No Yes	Min DAT Ctrl is an adjustable item which determines whether or not MinDAT operation is allowed. When set to No, the unit will not enter MinDAT tempering during Fan Only Operation.	
Min DAT Limit	55.0°F	0.0-70.0°F	Min DAT Limit is a status item that indicates the discharge air low limit temperature on CAV zone control units. Heating will be activated to maintain this setting when the discharge temperature falls below it during the Fan Only operating state. On VAV or CAV discharge control units, the minimum discharge temperature limit is the DAT Clg Spt. Once a valid password has been entered this item becomes an adjustable item.	

Menu Display Name	Default	Range	Description
MWU Sensor	CtrlTemp	CtrlTemp RAT Space None	MWU Sensor is an adjustable item that sets the temperature sensor input to be used for morning warmup heating operation on discharge air control units. Setting this parameter to none disables morning warm up operation.
StgGPriState		Lckout Retry Off PrePg IgnOn GasOn Warmup Run No Comm	StgGPriState is a status item that indicates the Previous State of the staged gas furnace control board. This board is communicating via modbus. For detail on the gas heat states see the Appendix Section labeled Gas Furnace Controller Diagnostics
StgGSpltState		Lckout Retry Off PrePg IgnOn GasOn Warmup Run No Comm	StgGSpltState is a status item that indicates the current state of the staged gas furnace control board. This board is communicating via modbus. For detail on the gas heat states see the Appendix Section labeled Gas Furnace Controller Diagnostics
StgGDiagCode		None 11-15 21-25 31-35 41-45 51 54-55 NoComm NA	StgGDiagCode is a status item that indicates a diagnostics codes for the staged gas furnace control board. For detail on the gas heat diagnostic codes see the Appendix Section labeled Gas Furnace Controller Diagnostics
ModGState		Lckout Retry Off PrePg IgnOn GasOn Warmup Run No Comm	ModGState is a status item that indicates the current state of the modulating gas furance control board. This board is communicating via modbus. For detail on the gas heat states see the Appendix Section labeled Gas Furnace Controller Diagnostics
ModGDiagCode		None 1-15 18-20 22-24 33-34 No Comm	ModGDiagCode is a status item that indicates a diagnostics codes for the modulating gas furnace control board. For detail on the gas heat diagnostic codes see the Appendix Section labeled Gas Furnace Controller Diagnostics

Menu Display Name	Default	Range	Description
ModGErrCode		None 3-4 6-8 10 18 22 26 28-29 NoComm	ModGDiagCode is a status item that indicates a diagnostics codes for the modulating gas furnace control board. For detail on the gas heat diagnostic codes see the Appendix Section labeled Gas Furnace Controller Diagnostics
F&BP Method	OpenVlv	OpenVlv Auto	F&BP Method is an adjustable item used to set the face and bypass control method. When a unit equipped with steam or hot water and face and bypass damper, there are two methods available for controlling the heating arrangement. These are the "Open Valve" and "Modulating Valve" methods.
F&BP ChgOvrT	37.0°F	0.0-60.0°F	F&BP ChgOvrT is an adjustable item used to set the face and bypass changeover temperature.

Outside Air Damper

Outside Air Damper Operation

Units may be configured with a 100% **Outdoor Air (OA) Damper**, a 0-100% OA Economizer, or a 0-30% OA damper. During occupied normal operation, units with a 0-30% OA or 0-100% OA economizer damper control to a minimum outdoor air position, which is determined from a number of control factors, including: fans speed, CO2, or other reset methods. Control of the dampers in the Economizer state is described "Economizer Control" on page 88.

100% Outside Air Damper Operation

100% Outside Air (OA) two position actuators are controlled by an analog output so the OA damper is driven to 100% open position when the OA damper analog output is at its maximum value and it is driven closed when the OA damper analog output is at its minimum value. In units equipped with a 100% OA Damper the OA damper is open during the start period and it remains open during all operating states. The OA damper remains open after the fan is turned off until 30 seconds after the airflow status indicates a loss of airflow. This keeps the outside air damper open in case there is a failure or external override that keeps the fan running after it is turned off by controller logic.

0-30% Outside Air Operation

A two position **0-30% Outside Air** (OA) actuator is controlled by a modulating analog output. This actuator is driven to its fully open position, nominally 30%, when the OA damper analog output is at its maximum value, and it is closed when the OA damper analog output is at its minimum value. The desired minimum open position between 0 and 30% is normally set by an editable keypad menu item (Vent Limit). The two position damper is driven to the closed position when the supply fan is OFF (OFF and Startup state), the unit is in the

		OA Damper Control States/Damper Type					
	Unit State	0-30% OA	0-100% OA Econo	100% OA			
Occupied	Off, Start Up, Recirculation	Closed	Closed	Closed			
	Cooling, Heating, Fan Only, Min DAT	Min OA Control	Min OA Control	100%			
	Economizer	NA	Economizer Control	NA			
Unoccupied	Any State	Closed	Closed	100%			

Table 28: Main Menu \ View Status \ Dehumidification

Recirculation state, unoccupied operation is active, or the fan has been on for less than the Zero OA Time. As a result, the OA dampers are driven closed in unoccupied operation, and morning start-up situations. The two position damper is driven to the desired minimum open position in all other conditions.

0-100% Outside Air Economizer Operation

A 0-100% outdoor air economizer damper is controlled by a modulating analog output. This actuator is driven to its fully open position - nominally 100%, when the OA damper analog output is at its maximum value, and it is closed when the OA damper analog output is at its minimum value. The desired minimum open position between 0 and 100% is normally set by an editable keypad menu item (Vent Limit). The modulating damper is driven to the closed position when the supply fan is OFF, (OFF and Start up states), the unit is the recirculation state, unoccupied operation is active, or the fan has been on for less than the Zero OA time. The modulating damper is driven to the desired minimum open position in all other conditions. Control of the dampers in the Economizer state is described "Economizer Control" on page 88.

Outside Air Damper States

The minimum OA Position is set to zero, or the closed position, when the supply fan is Off, the unit is in the recirculation state, Occupancy is set to Unocc, or the fan has been on for less than the Zero OA Time.

Outdoor air damper control varies, by damper type, occupancy and unit state. If unoccupied operation occurs, the OA damper is always closed and unoccupied condition occurs while recirculating air. In occupied operation, the OA damper will operate in one of three control states: closed, Min OA control, or Economizer control.

Closed Operation

In the occupied mode in the Off, Start-up and Recirculation unit states the OA damper position is always closed. In the unoccupied mode the outdoor air damper is always closed and with a 0-100% economizer damper, the recirculation damper is open.

Minimum Outside Air Damper Control

When a unit is equipped with a 0-30% OA or 0-100% OA modulating economizer damper the effective minimum ventilation position (Min OA position) is controlled using a minOA process. In occupied cooling, heating, fan only, and min DAT unit state operation, the damper will operate following the Minimum OA control sequences.

There are several key minimum outside air damper control process definitions required to understand this process.

- Ventilation Limit: Ventilation limit process line sets the maximum outdoor air damper position required based on the outdoor air volume required space and occupancy during regular occupied operation. This damper position varies between two setpoints, the VentLimit, and the LoFlow Vent limit (LoFloVentLmt) as the SAF capacity varies from maximum to minimum respectively.
- Demand Control Ventilation Limit: The DCV limit

Figure 42: Outdoor Air Damper Reset

process line sets the minimum damper positioned allowed based on the a minimum outdoor air reset. For this line to be relevant the minimum outside air reset type cannot be set to None. This process line will vary based on fan speed and varies based on the variation in the ventilation limit. The DCV Limit cannot be set higher than the Vent Limit.

- Minimum Outdoor Air Reset: The Min OA Reset varies the effective damper position between the DCV limit (DCVLimit) (minimum) and the Ventilation Limit (VentLimit) (maximum) based on an external variable like a network signal, external signal, or a CO2 Sensor.
- Outdoor Airflow Reset: Units equipped with an Outdoor air flow measuring station will control the minimum damper position based on the greater of the three damper positions, DCV Limit (minimum), the Minimum OA Reset Method or The Outdoor Airflow Reset. If the Outdoor Airflow setpoint, CFM, requires a greater damper position than the Min OA Reset, then the minimum OA damper position will be driven based on the Outdoor Airfow Setpoint.



Minimum Outside Air Reset Types

- **None:** If The minimum Outside Air Reset is selected as None, the Minimum OA Damper position is always equal to the Ventilation Limit. The Demand Control Ventilation Limit is not applicable, and can be ignored.
- Network Control: If Network is selected as the Min OA Reset Type and a valid value for the minimum position is provided via a network the Minimum OA position is set equal to that value. The network is only allowed to write a value that is between the Ventilation Limit and the Demand Control Ventilation Limit. If the Min OA Reset Type is set to Network and a valid minimum position is not provided, the Min OA Damper Position is set equal to the Ventilation Limit.
- External Signal: If the ExtSig is selected as the Min OA Reset Type, the Minimum OA position is calculated based on an external analog 0-10 VDC, 0-20 mA signal or a CO2 sensor input. The CO2 sensor range can be adjusted to control between the Demand Control Ventilation Limit CO2 PPM (minimum) and a Ventilation Limit CO2 PPM (maximum). The Minimum OA damper position will vary linearly between the DCV and Vent Limit positions as these the CO2 input (PPM) varies between these points.

Table 29: Main Menu \ View Status \ Dehumidification

Recommended Reset Settings

These example settings are for illustration purposes; real application settings may vary.

- For units with the Reset Type selected as None the only parameters that require commissioning are the Vent Limit and LoFlow Vent Limit (if the unit is VAV).
- For units with Reset Type selected as Network, to give the network complete control over the damper, the DCV and Vent Limits need to be set to 0% and 100% respectively.
- For units with Reset Type selected as Ext Signal, to give the external signal complete control over the damper the for the 0-10 VDC and 0-20 mA signal ranges the DCV and Vent limits need to be set to 0% and 100% respectively.
- For units with Reset Type selected as Ext Signal for use with CO2, the minimum signal is the MinPPM@ the DCV limit damper position and the max signal is the MaxPPM@ the Vent limit damper position.

OA Damper	None	Network	Ext Signal			
Set-Up Parameters			VDC (0-10)	mA (0-20)	CO2 (See Note)	
Min Signal	NA	0%	0V	0 mA	4 PPM	
DCV Limit	NA	0%	0%	0%	1	
Max Signal	NA	100%	10V	20 mA	4 PPM	
Vent Limit	2	100%	100%	100%	2	
LoFlow Vent Limit	3	100%	100%	100%	3	
OA @ Min	NA	NA	0%	0%	NA	
OA @ Max	NA	NA	100%	100%	NA	

NA - Not Available

 DCV Limit damper position is set at 100% SAF Capacity minimum occupancy outside air volume required by application

 Vent Limit damper position is set at 100% SAF Capacity maximum occupancy outside air volume required by application

 LoFloVent Limit damper position is set at minimum SAF Capacity, maximum occupancy outsider air volume required by application

Min Signal is PPM @ DCVlimit and Max Signal is PPM@Vent Limit

Damper Override Operations

There are several scenarios where a unit operating in occupied minimum outside air control can be configured to override damper position.

- **Zero OATime:** Upon Occupied start up, a zero OA timer can be configured to hold the damper shut for a predetermined time. This timer starts once the unit first enters Fan Only upon occupied start up. See Timer Settings on how to set this Timer.
- Optimal Start/Morning Warm-Up: During Optimal Start/ Morning Warm-Up/Morning Cool Down operation, the outdoor air damper is held shut for a the duration of the optimal start sequence where the Zero OA Timer is set equal to the Optimal start time. See Optimal Start/Morning Warm-Up Section for details on how this sequence works
- Return Fan Capacity Override: The minimum outside air position may be overridden for units equipped with return fans when the return fan capacity is below the supply fan capacity by more than an adjustable value. In this situation, the outdoor air damper minimum position is reset up based on a schedule if the normal control of the minimum position would result in a lower value. The minimum position will be controlled in a normal manner if that results in a higher value than determined by the reset schedule.
- Building Static Pressure Override: When the unit is equipped with a 0-30% OA or 0-100% OA modulating economizer and a building static pressure sensor the minimum outside air position may be overridden to maintain building pressure when the return/exhaust fan is at minimum capacity, off, or not present. To activate this override feature, the building pressure override flag must be set to yes. The damper position will be overridden when the return or exhaust fan, if present, is at minimum capacity and the building static pressure is below the building static pressure setpoint by more than half of the dead band for a stage timer. Once building pressure override is active, the damper will modulate to maintain the building pressure setpoint.

Cold Start Operation

A special "**Cold Start**" sequence will slow the opening of the dampers when it is cold outdoors and the unit is equipped with either Hot water/Steam or Face and Bypass heating. This is to try to prevent nuisance freezestat trips associated with dampers opening up rapidly to minimum position before the heat has a chance to ramp up. The "cold start" sequence is initiated if the following conditions are all true.

- · OAT is below the current LoDAT Limit
- · The unit equipped with an Airside Economizer
- The current Unit State is beyond the Recirc
- The current Minimum Outdoor Damper Position setpoint is greater than 0%
- The unit is equipped with Hot water/Steam or F& BP heating.

When the sequence is active the dampers will move more slowly the colder it is outdoors. The minimum and maximum rap rates are adjustable via the keypad by navigating to the commission unit/Min OA Set-Up menu. The effective rap rate will vary from Minimum 40% 100% (Minimum) Airflow rate at OAT equal to -30°F to the maximum at OAT equal to 100°F. Once the damper position reaches a point 1% below the actual effective minimum position normal operation will begin. If the unit enters the Economizer operating state before the damper regulation begins, the regulation will begin from the current economizer position.

OA Damper Commissioning

Common **OA Damper** menu items that need to be configured at commissioning are the Vent Limit, LoFloVent Limit, DCV Limit, and MinOA Reset, CO2, or Flow reset.

OA Damper Menus

OA Damper Set-Up

Table 30: Main Menu \ Commission Unit \ OA Damper Set-Up

Menu Display Name	Default	Range	Description	
Vent Limit	20%	0-100%	Vent Limit is an adjustable item that sets the value of the Ventilation Limit on a CAV unit or when a VAV unit is at 100% discharge fan speed.	
LoFlo VntLmt	30%	0-100%	LoFlo Vent Limit is an adjustable item that sets the maximum value for the Ventilation Limit on a VAV unit. The ventilation limit is raised toward this value as the discharge fan speed decreases toward the Min Clg Cap value.	
DCV Limit	10%	0-100%	DCV Limit is an adjustable item that sets the value of the Demand Control Ventilation Limit on a CAV unit or when a VAV unit is at 100% discharge fan speed. This item is only used when the "CO2 Reset" is set to "Yes"	
OAD Position	-	0-100%	OAD Position is a status only item which displays the current OAD position.	
Min OA Pos	-	0-100%	Min OA Pos is a status only item which indicates the current minimum position of the outdoor damper. This value does not go above a value called the Ventilation Limit and does not go below a value called the Demand Control Ventilation Limit.	
Min OA Src	-	VentLmt OAFlw ExtSig CO2 Network BSP RstTLmt FanDIff ZeroOA	Min OA Src is a status only item that indicates the action that is winning for control of the OA damper position.	
MinOA Reset	None	None Network ExtSig	Min OA Reset is an adjustable item used to determine the method used the OA damper reset. The reset can be based on a network signal, or an external signal. The external signal can be either a VDC signal or a CO2 sensor signal.	
EXTERNAL RESET		-		
OA @ MinV/mA	0%	0-100%	OA @ MinV/mA is an adjustable item used when Min OA Reset= is set to "ExtSig" to define the Min OA Pos= is when the field signal is at minimum value. NOTE: Min OA Pos= is limited above the Demand Control Ventilation Limit.	
OA @ MaxV/mA	100%	0-100%	OA @ MaxV/mA is an adjustable item used when Min OA Reset= is set to "Ext VDC" or "ExtSig" to define the Min OA Pos= when the field signal is at the minimum value. NOTE: Min OA Pos= is limited below the ventilation limit.	
CO2 RESET		-		
CO2 Reset	Yes	No Yes	CO2 Reset is an adjustable item used to determine if CO2 reset is being used to control the Min OA damper position	
PPM @ DCV Lmt	800ppm	0-5000ppm	PPM @ DCV Lmt is an adjustable item used when Min OA Reset= is set to "ExtSig" to define at what PPM value the Min OA Pos= is to be at the Demand Control Ventilation Limit value.	
PPM @ Vnt Lmt	1000ppm	0-5000ppm	PPM @ Vent Lmt is an adjustable item used when Min OA Reset= is set to "ExtSig" to define at what PPM value the Min OA Pos= is to be at the Ventilation Limit value.	
CO2 PPM	-	0-5000ppm	CO2 PPM is a status only item which displays the current CO2 PPM reading	
FLOW RESET		-		
OA Flow Reset	No	No Yes	OA Flow Reset is an adjustable item that allows or disallows the Outdoor air flow to reset the Outdoor air damper.	
OA Flow	-	0-60000CFM	OA Flow is a status only item that dispays the current outdoor air flow CFM	

Menu Display Name	Default	Range	Description	
OA Flow Spt	2000CFM	0-60000CFM	OA Flow Spt is an adjustable item that sets the Outdoor airflow cfm that the PI_loop will modulating the SAF capacity to maintain	
OA Flow DB	3%	0-100%	OAFlow DB is an adjustable item that sets a deadband around the OA Flow Setpoint.	
BSP RESET		-		
BSP OA Ovrd	No	No Yes	BSP OA Ovrd is an adjustable Setting that allows or disables the building static pressure override feature	
Bldg Press	-	-0.250- 0.250in	Bldg Press is a status only item indicated the current building static pressure reading	
BldgSP Spt	0.050in	-0.250- 0.250in	BldgSP Spt is an adjustable item which sets the current building static pressure setpoint.	
BSP DB	0.010in	0.000- 0.100in	BSP DB is an adjustable item that sets the deadband around the Bldg SP setpoint that the PI Loop will modulating the return fan/exhaust air fan capacity to maintain	

Economizer Control

Economizer Operation

If a unit is equipped with a 0-100% Outside Air **Economizer**, and the outdoor air is suitable for free cooling, the unit attempts to satisfy the cooling load by using the outdoor air before using mechanical cooling. If the control temperature is above the Occupied Cooling Setpoint by half the deadband and the outdoor air is suitable for free cooling, the unit will enter the Econo State.

The transition from the Econo to Cooling operating state occurs when the economizer is unable to satisfy the cooling load and mechanical cooling is available. This will occur when the commanded economizer position indicates more than 95% open and the discharge air temperature (DAT control units), or the control temperature (Zone control units) is above the applicable Cooling Setpoint by more than half the applicable Cooling Deadband for longer than the Cooling Interstage Timer.

Fixed Drybulb Economizer

All units equipped with an **Economizer** can be configured to determine if the outdoor air is suitable for free cooling by using a single, fixed outdoor air drybulb setpoint. When the outdoor air temperature is below this setpoint, the unit will enter economizer mode.

Comparative Drybulb Economizer

Units equipped with a **Comparative Drybulb Economizer** determine the outdoor air is suitable for free cooling by comparing the return air temperature with the outdoor air temperature.

Comparative Energy/Enthalpy Economizer

Units equipped with a **Comparative Energy Economizer** determines if the outdoor air is suitable for free cooling by comparing the energy enthalpy of the outdoor air and return air, and the energy to cool to meet the cooling DAT or Zone Setpoint. There are four operating cases the MicroTech 4 controller compares to evaluate energy efficient economizer control. These cases are summarized in Table 31 The economizer logic evaluates if free cooling is more energy efficient by comparing the Return air dewpoint against the DAT Spt – an Offset. The offset is to account for fan heat or other factors that move the discharge air away from the saturation line. The default offset is 0.0° F.

Table 31: Energy/Enthalpy Economizer Offsets

	Economize	Outside Air Dewpt (DP2)		
	Decision Matrix	> DAT Stpt - Offset (DB3)	< DAT Stpt - Offset (DB3)	
Return Air Dewpt (DP1)	> DAT Stpt - Offset (DB3)	Case 1 Economize if h2 < Rh1	Case 2 Economize if 0.245*(DB2 - DB3) < (h1 -h3)	
	< DAT Stpt - Offset (DB3)	Case 3 Economize if 0.245*(DB1 - (DB3-Offset)) < (h2 -h3)	Case 4 Economize if DB2 < DB1	

Notes:

A key assumption of this table is that DATsetpoint is at saturation and therefore equal to the DAT dewpoint. This is not always the case and will need to subtract an offset to cover the various applications like remote mounted DAT sensors. The DAT offset should be between 0-10°F.

Case 2 and Case 3 use simplified formulas for sensible heat transfer rates (q = m x Cp x ΔT, where m= mass flow rate of the air, Cp = 0.245 BTU/ lbm °F, ΔT is the change in dry bulb temperature (°F)) and total heat transfer (q = m x Δh, where m= mass flow rate of the air, Δh is the change in enthalpy)

Case 1 and 2

The light blue row in Table 31 is represented by Figure 43 The green shaded areas of this chart represents outdoor air conditions where economizing is allowed to occur for cases 1 and 2. Cases 1 and 2 are only valid for cases where the return air dewpoint is greater than the discharge air setpoint dewpoint.

Figure 43: Case 1 and 2



Case 3 and 4

The light red row in Table 31 on page 88 is represented by Figure 44 below. The shaded greed areas of this chart represent the Outdoor air conditions where economizing is allowed to occur for cases 3 and 4. Cases 3 and 4 are valid if the Return air dewpoint is less than the discharge air setpoint less the offset.

Figure 44: Case 3 and 4



Economizer Fault Detection Diagnostics

The comparative drybulb and comparative enthalpy economizers are available with an optional **Fault Detection Diagnostics** function. The economizer fault detection and diagnostics function provides a warning alarm indication of over economizing, under economizing, stuck dampers and excess outdoor air.

OAD End Switch Calibration

The **Outdoor Air Damper (OAD) End Switch** input requires calibration function that captures the command position, at which the switches open and close at the closed and open ends of the damper modulation range. This function consists of a manually initiated sequence that strikes the dampers fully open, then fully closed, and detects the changes of state of the switch input and records the points where changes occur. The sequence must be initiated while the Unit State is Off and starting with the end switch input in the closed position.

When the Calibrate OAD parameter is set from No to Yes, the following sequence occurs:

- 1. The damper command is increased 1% every 2 seconds until the OAD End Switch opens.
- The damper command is then be decreased 1% every 2 seconds until the OAD End Switch input closes. At this point the current command % is captured.
- 3. The damper command is increased 1% every 2 seconds until the OAD End Switch input opens. At this point the difference between the current command % and the damper end switch closed value is captured.
- 4. The damper command is increased and held at 100% until the OAD End Switch input closes.
- 5. The damper command is decreased 1% every 2 seconds until the OAD End Switch input opens.
- 6. The damper command is increased 1% every 2 seconds until the OAD End Switch input closes. At this point the current command % is captured.
- 7. The damper command is decreased 1% every 2 seconds until the OAD End Switch input opens. At this point the difference between the damper open end switch value and the current command % value is captured.
- The damper command is decreased and held at 0% until the OAD End Switch input closes at which point the values captured in Step 2, Step 3, Step 6, Step 7 are written to the damper end switch open (posSwOpen%). Minimum switch differential (MinSwDiff), damper end switch closed (PosSwClose%) and maximum switch differential (MaxSwDiff) parameters respectively.

Calibrate OAD= parameter is then be set back to No and normal unit operation resumes.

Economizer DAT Setpoint

When the unit is in the Econo operating state, the outdoor air dampers are modulate as required to maintain the Discharge Cooling Set Point unless the UseDATClgSpt flag is set to No. If the UseDATClgSpt flag is set to N, then the **Economizer DAT Spt** is used. The benefit of using the separate economizer DAT spt is that it allows buildings to balance fan or economizer energy to reduce compressor run hours during economizing where possible.

Economizer DAT Reset

Units with the UseDATClg Spt =No can configure the DAT Econo Spt for use with a **Economizer Reset** schedule. The Economizer Reset schedule can be used with the following reference sources:

- None: Discharge Cooling Spt is user adjustable
- **Network:** Discharge Cooling Spt is equal to the Network DAT Clg Setpoint when it is valid
- **Space:** Discharge Cooling Spt is based on the Space Sensor
- **Return:** Discharge Cooling Spt is based on the Return Air Sensor
- **OAT:** Discharge Cooling Spt is based on the Outdoor Air Temperature

Economizer Menus

Economizer Status

The Economizer Menu is a view status menu that displays all relevant Economizer status item

Table 32: Main Menu \ View Status \ Economizer

Menu Display Name	Default	Range	Description	
OAD Position	-	0-100%	OAD Position is a status only item which indicates the percentage that the outdoor air damper is currently open	
Min OA Pos	-	0-100%	Min OA Pos is a status only item which indicates the current minimum position of the outdoor air damper.	
Econo Status	-	Enabled None OffAmb OffAlm OffNet OffMan Off Dehum	Econo Status is a status only item which indicates whether or not the economizer is currently enabled. If economizer is enabled, the reason is indicated.	
FreeClgStatus	-	Unavail Avail	Free Clg Status is a status only item that indicates whether airside economizer free cooling is available or unavailable based on a definable ambient temperature range.	

Econo Set-Up Menu

Table 33: Main Menu \ Commission Unit \ Econo Set-Up Menu

Menu Display Name	Default	Range	Description	
Menu Display Name	Default	Range	Description	
Control Temp	-	-50.0- 200.0°F	Control Temp is a status only item which displays the current value of the "Control Temperature." The "Control Temperature" is defined as the temperature input selected by the Control Temperature Source parameter. For example, if the Control Temperature Source parameter is set to "Return," then the control temperature parameter reads the same value as the Return Air parameter.	
Occ Clg Spt	72.0°F	0.0- 100.0°F	Occ Clg Spt is an adjustable item which indicates the temperature in which the unit will go into the cooling mode of operation.	
Occ Clg DB	2.0°F	0.0- 10.0°F	Occ Clg DB is an adjustable item which sets a dead band around the Occ Cooling Set Point parameter. For example, if the Occ Cooling Set Point parameter is set to 75°F and the Clg Deadband parameter is set to 2°F the dead band around the set point would be from 76.0°F to 74.0°F.	
Disch Air	-	-50.0- 250.0°F	Disch Air is a status only item which displays the current temperature reading from the unit's discharge air temperature sensor (DAT). This sensor is standard on all units.	
UseDATClgSpt	Yes	No Yes	UseDATClgSpt is an adjustable parameter that sets the DAT setpoint used during economizer. When set to Yes, the DAT cooling setpoint is used. When set to No, the DAT Econ Spt is used	
DAT Econ Spt	55.0°F	40.0- 100°F	DAT Econo Spt is an adjustable item which sets the DAT setpoint the cooling capacity is controlled to maintain when the UseDATClgSpt is set to No	
DAT Econ DB	2.0°F	1.0- 10.0°F	DAT Econ DB is an adjustable item which sets the deadband around the DAT Econ Spt. If the disch air is within the DB no action is take. For example, if the discharge cooling set point is set to 55°F and the Clg DB is set to 2°F the dead band around the set point would be from 56.0°F to 54.0°F	
Clg Stg Time	5 min	5-60min	Clg Stage Time is an adjustable item used to set a minimum time period between compressor stage changes.	

Menu Display Name	Default	Range	Description
Econ Chgovr	Energy	None OAT OAT_ RAT Energy	EconChangovr is an adjustable item used to set the method that will be used to determine how economizer operation will be enabled
OA Temp	-	-50.0- 200.0°F	OA Temp is a stauts only item which displays the current temperature reading from the unit mounted Outdoor air temperature sensor. This sensor is standard on all units
Chgover Temp	70°F	0.0- 100.0°F	Chngover Temp is a adjustable item that sets the maximum outdoor air temp at which economizer is allowed
Econo Diff	2.0°F	0.0- 10.0°F	Econo Diff is an adjustable item which sets a differential above the ChgoverTemp parameter. Economizer operation is disabled when the OA Temp parameter indicates a value above the ChgoverTemp= parameter by more than this differential.
Econo FDD	On	Off On	Econo FDD is an adjustable item used to enable or disable the Economizer Fault Detection and Diagnostics function
Econ Reset	None	None Network Space Return OAT	Clg Reset is an adjustable item that is used to set the type of cooling reset to be used.
Min Econ Spt	55.0°F	40.0- 100.0°F	Min Econ Spt is an adjustable item which sets the minimum cooling discharge set point for use with a economizer discharge air temperature set point reset schedule.
Min Econ Spt@	0	0-100/ NA °F °C mA V %	Min Econ Spt @ is an adjustable item which sets the value of the sensor input, selected with the Cooling Reset parameter, at which the DAT Econ set point parameter is reset to the minimum DAT Econ set point value.
Max Econ Spt	65.0°F	40.0- 100.0°F	Max Econ Spt is an adjustable item which sets the maximum economizer discharge set point for use with a economizer discharge air temperature set point reset schedule.
Max Econ Spt@	100	0-100/ NA °F °C mA V %	Max Econ Spt @ is an adjustable item which sets the value of the sensor input, selected with the Econ Reset parameter, at which the DAT Econ set point parameter is reset to the maximum DAT Econ set point value.
Max OAT Lmt	75°F	50.0- 100.0°F	Max OAT Lmt is an adjustable item which sets the maximum outdoor air temperature for the applicable climate zone above which economizer should not be enabled.
Min OAT Lmt	70°F	50.0- 100.0°F	Min OAT Lmt is an adjustable item which sets the minimum outdoor air temperature for the applicable climate zone below which economizer should be enabled.
Calibrate OAD	No	No Yes	Calibrate OAD is an adjustable item used to initiate the calibration function that captures the command position at which the outdoor damper position end switches open and close at the closed and open ends of the damper modulation range.
Pos Sw Open	97%	0-100%	PosSwOpen is an item that indicates the captured command position at which the outdoor damper position end switch closes at the open end of the damper modulation range. This parameter can also be manually adjusted.
Max Sw Diff	3%	0-100%	Max Sw Diff is an item that indicates the captured switch differential at the open (maximum) end of the damper modulation. This parameter can also be manually adjusted.

Menu Display Name	Default	Range	Description	
Pos Se Close	3%	0-100%	PosSwClose is an item that indicates the captured command position at which the outdoor damper position end switch closes at the closed end of the damper modulation range. This parameter can also be manually adjusted.	
Min Sw Diff	5%	0-100%	Min SW Diff is an item that indicates the captured switch differential at the closed (minimum) end of the damper modulation. This parameter can also be manually adjusted.	
OAD Sw Status	-	Open Closed	OAD Sw Status is a status only item that indicates the current condition of the dampe end switch position input (Open/Closed).	
OAEOffset	0.0°F	0.0- 10.0°F	OAEOffset is an adjustable item used to account for fan heat or for the discharge air temperature setpoint dewpoint calculation used to enable energy economizers.	
OADewpoint	-	-50.0- 150.0°F	OADewpoint is a status only item that indicates the current calculated outdoor air dewpoint.	
OARelHum	-	0-100%	OARelHum is a status only item that indicates the current outdoor air relative humidity reading.	
OAEnthalpy	-	TBD BTU/lb	OAEnthalpy is a status only tem that indicates the current calculated outdoor air enthalpy	
RADewpoint	-	-50.0- 150.0°F	RADewpoint is a status only item that indicates the current calculated return air dewpoint.	
RARelHum	-	0-100%	RARelHum is a status only item that indicates the current return air relative humidity reading.	
RAEnthalpy	-	TBD BTU/lb	RAEnthalpy is a status only tem that indicates the current calculated return air enthalpy	
DATSptEnth	-	TBD BTU/lb		

Energy Recovery

Energy Recovery is provided by drawing outside air across half of an energy recovery wheel and drawing exhaust air across the other half. Latent and sensible heat is transferred from the hotter, moister air stream, to the colder dryer air stream. In summer operation the direction of transfer is from the outdoor air to the exhaust air. In winter operation, the direction of transfer is from the warm exhaust air to the cold dry outdoor air. Control of the wheel consists of starting and stopping the wheel, and modulating the speed. The outdoor air dampers and supply and exhaust fans are controlled normally during wheel operation.

Energy Wheel Operation

The energy recovery wheel is turned on whenever the unit is occupied, the exhaust fans are on, the OA dampers are at the minimum position, the unit is not in economizer, and the wheel has not been shut off due to frost prevention, enthalpy override, or capacity limiting control. Exhaust fans and outdoor air dampers are controlled to their normal states when equipped with energy recovery wheels.

- Enthalpy Override: During Cooling or Dehumidification operation, the MicroTech 4 will evaluate if the energy wheel should be operating or if it is more energy efficient to bring outdoor air directly. Enthalpy override is decided by following the same cases as the energy economizer option except for case 4 where the LWT must less than the RAT. Review Energy Economizer for details. Enthalpy override is true when the Clg/DHERWOvrdOff Flag is True. Once True this flag will be held true for at least the ERWStgTime before changing to false.
- Heating Override: During Heating, Fan Only, or MinDAT operation, if the energy recovery wheel heat transfer is in cooling, the wheel will shut off and the HtgERWOvrdOff flag will be set to true. Once True, this flag will be held true for at least the ERWStgTime before changing to false.

Energy Recovery Wheel Bypass

For units equipped with an **Energy Recovery Wheel** and a 0-100% modulating mixed air damper, a bypass damper may be provided for economizer operation or Enthalpy or Heating override conditions. During economizer, enthalpy override, and heating override operation, the energy wheel is turned Off and the bypass damper is opened to bypass the outside air around the energy wheel. This lowers the total air pressure drop and increases the effectiveness of economizer operation.

Capacity Limiting

Energy wheel **Capacity Limiting** control is a means to limit the capacity of an energy wheel during part load conditions. Normally, wheels are sized for the worst case winter/summer load. Therefore, at part load the wheel may be oversized. Capacity limiting control is allowed when the energy recovery wheel leaving air temperature sensor is present and the outdoor air temperature is colder than the return air temperature.

- Fan Only: When the unit is in the Fan Only state, the energy recovery wheel is slowed do due to capacity limiting whenever the discharge air temperature (DAT) is above the MinDAT Limit setpoint by more than ½ the discharge air heating deadband. The wheel will modulate to maintain the DAT at the MinDAT Limit setpoint. If the DAT falls back below the MinDAT Limit setpoint plus ½ of the discharge heating deadband, the wheel will modulate back to full speed.
- Heating: When the unit is operating in the Heating state, the energy recovery wheel is slowed down due to capacity limiting whenever all heating is OFF and the discharge air temperature (DAT) is above the discharge heating setpoint by more than ½ the discharge air heating deadband. The wheel will modulate to maintain the heating discharge air setpoint when all other heating is OFF and capacity limiting is active. The wheel is modulated back to full speed when the DAT falls back to or below the discharge heating setpoint plus ½ the discharge air heating deadband.
- **Cooling:** When the unit is operating in the Cooling state, the energy recovery wheel is slowed down due to capacity limiting whenever all cooling is OFF and the discharge air temperature is below the discharge cooling setpoint by more than ½ the discharge air cooling deadband. The wheel will modulate to maintain the cooling discharge air setpoint when all other cooling is OFF and the capacity limiting is active. The wheel is modulated back to full speed when the DAT falls back to, or above, the discharge cooling setpoint plus ½ the discharge air cooling deadband.

Energy Wheel Frost Prevention

Two different **Energy Wheel Frost Prevention** methods are provided depending on whether or not the unit is supplied with an electric preheat energy wheel defrost coil. When there is a threat of frost or condensation on the enthalpy wheel, a wheel with a electric preheat will be defrosted by modulating the electric preheat to raise the outdoor air temperature coming into the wheel to eliminate the frost potential. A variable speed wheel may be first slowed down, and then stopped so that less enthalpy transfer occurs and frosting or condensation the energy wheel is avoided. In either case, the frost control action is based on a calculated psychrometric intersection point.

Condensation and frosting on the energy recovery wheel is possible when the exhaust air leaving the wheel is saturated. This condition is only possible when the energy recovery psychrometric saturation process line between the indoor and outdoor design points intersect the psychrometric saturation curve. The two ends of the energy recovery process line will be the outdoor air temperature at 95% relative humidity, and the return air temperature at the return air relative humidity. The process line examples shown below depict one process line that intersects the saturation curve, and one that does not. The one that does intersect does so at two points which indicates a potential for energy recovery wheel frosting. The higher of the two points is the intersection point that will be used by the frost prevention functions. The curve that does not intersect indicates no potential for frosting.

Energy Wheel Frost Prevention Initiation

Condensation and frosting on the energy recovery wheel is possible when the exhaust air leaving the wheel is saturated. This condition is only possible when the energy recovery psychrometric saturation process line between the indoor and outdoor design points intersect the psychrometric saturation curve. The two ends of the energy recovery process line will be the outdoor air temperature at 95% relative humidity and the return air temperature at the return air relative humidity. The process line example shown below depicts one process line that intersects the saturation curve, and one that does not. The one that does intersect does so at two points, which indicates a potential for energy recovery wheel frosting. The higher of the two points is the intersection point that will be used by the frost prevention functions. The curve that does not intersect indicates no potential for frosting.

Figure 45: Frost Prevention Curve



Modulating Wheel Frost Prevention

Modulating Wheel Frost Prevention is initiated when the exhaust air temperature leaving the wheel is below the intersection point, plus an adjustable minimum temperature difference. In the example below, the Exhaust air (EA) is significantly below the intersection point (Intersection).

During modulating wheel frost prevention, the wheel is

Figure 46: Modulating Wheel Frost Prevention Curve

controlled to its minimum wheel speed (default 15%) When the wheel is at its minimum speed, the wheel effectiveness is reduced. The resulting exhaust air temperature during frost prevention (EAF) is warmer than the intersection point and frost is prevented. The leaving wheel temperature (LWF) during frost prevention is also reduced.



Modulating Wheel Preheat Frost Prevention

The energy recovery wheel SCR preheat coil of frost prevention will modulate the SCR preheat coil to increase the incoming outdoor air when the exhaust air temperature is below the intersection point plus an adjustable minimum temperature difference. As the preheat coil modulates warming the outdoor design point, the process line between the indoor and outdoor design points moves away from the saturation line and will eliminate the intersection point, which will remove the potential for frosting of the wheel. This is illustrated below, where the dashed black line is the process line that creates frost (the same line as the examples above). The red line between the OA Prht and the return air (RA) is the new process line with Preheat frost prevention active. The new intersection point is labeled and the exhaust air (EA) temp is greater than the intersection, meaning frost is being prevented.

Figure 47: Modulating Wheel Preheat Frost Prevention Curve



Energy Recovery Wheel Commissioning

Energy Recovery Wheel units should come from the factory pre-programmed with the correct control requirements. There is nothing to commission during start up. The menu below displays energy recovery operating information. Advanced menu energy recovery options can be viewed in Table 111 on page 180

Table 34: Main Menu \ Commission Unit \ Energy Recovery Set-Up

Menu Display Name	Default	Range	Description
Energy Rec	Yes	No Yes	Energy Rec is an adjustable item which states if there is an energy recovery system or not
ER Wheel	-	On Off	ER Wheel is a status only item used to indicate whether the energy recovery wheel is currently ON or OFF
ER WhI Cap	-	0-100%	ER Wheel Cap is a status only item that displays the current wheel capacity/ speed
ER WhI CapCmd	-	0-100%	ER Wheel CapCmd is a status only item that displays the capacity the wheel is being commanded to operate at
ERWhIRotSw	-	On Off	ERWhIRotSw is a status only item used to indicate whether the energy recovery wheel is currently ON or OFF; This is only available when ER Config Type is ECM
ER1ErrStatus	-	Ok Stndby HiAmp HiTmp FqCnvtr MtrConn Voltage StrtPrb FA	ER1ErrStatus is a status only item used to indicate the current Status from the EC Motor on the Energy Recovery Wheel. This is only available when the ER Config Type is 1 or 2ECM.
ER2ErrStatus	-	Ok Stndby HiAmp HiTmp FqCnvtr MtrConn Voltage StrtPrb FA	ER2ErrStatus is a status only item used to indicate the current Status from the EC Motor on the Energy Recovery Wheel. This is only available when the ER Config Type is 2ECM.
ER LWT	-	-50.0- 200.0°F	ER LWT is status only item which displays the current discharge air temperature leaving the optional energy recovery wheel.
ER EWT	-	-50.0- 200.0°F	ER EWT is a stuats only item which displays the current discharge air temperature leaving the optional energy recovery wheel
RARelHum	-	0-100%	RARelHum is a status only item that displays the current relative humidity of the return air Humidity sensor.

Other Configurations

This **Other Configurations** section covers commissioning items and miscellaneous Rebel Applied features.

Timer Settings

The **Timer Settings** menu contains adjustable timers for various unit functions. This menu is also available in the Service menu (Main Menu \ Service Menu \ Timer Settings)

Menu Display Name	Default	Range	Description
Start Up	180s	10-1800s	Startup is an adjustable item that sets the time in seconds that the unit will perform its startup operation.
Recirculate	180s	10-3600s	Recirculate is an adjustable item that sets the time in seconds that the unit operates with only the fan, recirculating the building air upon unit start up.
Clg Stg Time	5min	5-60min	Clg Stg Time is an adjustable item used to set a minimum time period between compressor stage changes.
Htg Stg Time	5min	2-60min	Htg Stg Time is an adjustable item used to set a minimum time period between heating stage changes.
Zero OA Time	0min	0-240min	Zero OA Time is an adjustable item that sets the time in minutes that the outdoor air damper stays at a zero position upon unit start up.
Tnt Ovrd Incr	120min	0-300min	The Ovr Incr is an adjustable item that sets the amount of time that the unit will go into operation when the tenant override function is activated. Tenant override can be activated by the space sensor button, the network occupancy mode parameter or the keypad Occ Mode= parameter.
Post Heat	0s	0-180s	Post Heat is an adjustable item that sets the duration of the post heat function available on VAV units.
Low DAT	6min	0-60min	Low DAT is an adjustable item that sets the duration of a time period upon unit start up during which the Low Discharge Temperature fault is ignored. This may be particularly important in colder climates when a unit has been off for a significant time period during which the unit, including the discharge air temperature sensor, has become very cold. This time period allows the unit to run long enough to turn the unit heat on and warm the discharge sensor above the alarm limit, preventing nuisance unit alarm shutdown. This time period begins when the supply fan starts.
Service Time	0min	0-60min	Service Time is an adjustable item that sets the amount of time the internal control timers can be temporarily sped up.

Table 35: Main Menu \ Commission Unit \ Timer Settings

Humidity Sensor Set-Up

The **Humidity Sensor Set-Up** menu is important to set up at commissioning, as it is critical to proper unit function. All humidity sensors that are connected and reliable are usable for temperature reset, and can be configured for use with dehumidification control. Dehumidification will control to maintain the source location of the sensors set for Hum Sensor1 and Hum Sensor 2. See"Dehumidification" on page 68 for details on dehumidification operation.

Table 36: Main Menu \ Commission Unit \ Humidity Sensor Set-Up

Menu Display Name	Default	Range	Description
Hum Sensor 1	SpaceH1	None SpaceH1 SpaceH2 RAH OAH	Hum Sensor 1 is an adjustable item used to set the location of sensor used for humidity setpoint 1. This humidity setpoint is configured to drive dehumidification in the Dehum Set-Up menu
Hum Sensor 2	None	None SpaceH1 SpaceH2 RAH OAH	Hum Sensor 2 is an adjustable item used to set the location of sensor used for humidity setpoint 2. This humidity setpoint is configured to drive dehumidification in the Dehum Set-Up menu
SpaceRH1Src	Analog	Analog QMX1 QMX3	SpaceRH1Src is an adjustable item that sets the type of sensor located at the Humidity Sensor 1 location.
SpaceRH2Src	Analog	Analog QMX2 QMX3	SpaceRH2Src is an adjustable item that sets the type of sensor located at the Humidity Sensor 2 location.
SpcHumSensTyp	VDC	VDC mA	SpcHumSensType is an adjustable item that sets the signal type for when either the SpaceRH1Src and SpaceRH2Src is set to Analog.
SpcHum MinSig	0.0V	0.0-20.0 V/ mA	SpcHum MinSig is an adjustable item that sets the minimum of the signal range for when either the SpaceRH1Src and SpaceRH2Src is set to Analog.
SpcHum MaxSig	10.0V	0.0-20.0 V/ mA	SpcHum MaxSig is an adjustable item that sets the maximum of the signal range for when either the SpaceRH1Src and SpaceRH2Src is set to Analog.
SpaceRel Hum 1	-	0-100%	SpaceRel Hum 1 is a status only item that shows the current space relative humidity reading of space sensor 1.
SpaceDwpnt1	-	-50-150°F	SpaceDwpnt1 is a status only item that shows the current calculated space dewpoint of space sensor 1.
SpaceRel Hum2	-	0-100%	SpaceRel Hum 2 is a status only item that shows the current space relative humidity reading of space sensor 2.
SpaceDwpnt2	-	-50-150°F	SpaceDwpnt2 is a status only item that shows the current calculated space dewpoint of space sensor 2.
RARelHum	-	0-100%	RARel Hum is a status only item that shows the current relative humidity reading of Return air.
RADewpoint	-	-50-150°F	RADewpoint is a status only item that shows the current calculated dewpoint of the return air.
OARelHum	-	0-100%	OARel Hum is a status only item that shows the current relative humidity reading of Outdoor air.
OADewpoint	-	-50-150°F	OADewpoint is a status only item that shows the current calculated dewpoint of the Outdoor air.

Remote Sensor Set-Up

When one or more network space sensors (up to three will be supported) are present, the sensors must be commissioned using the **Remote Sensor Set-Up** menu. Before network space sensors can be commissioned, the SpaceTCfg in the Unit Configuration Menu of the MicroTech 4 must be set to QMXS1, QMXS2, QMXS3, QMX+1. QMX+2, or QMX+3. The QMXS# is a space temperature and setpoint adjust only sensor: the QMX+# is a Combo sensor with Temperature. adjustment, humidity, and CO2. For the unit to use the QMX+ Combo sensor for CO2 OA reset, the Unit configuration ExtOAInput must be set to CO2QMX+. The sensors will be identified by MicroTech 4 based on a sensor ID number that is unique to each individual device. Write this number on the Box and on the sticker on each sensor. Write down the Room Zone name, and the ID (SN) for each room Zone Sensor. This will make it easier to name them during commissioning.

Room Zone 1: Name:		
Туре:	ID:	h
Room Zone 2: Name:		
Туре:	ID:	h
Room Zone 2: Name:		
Туре:	ID:	h

Set-Up and Commissioning Sensors

- 1. Turn Unit Off: The Unit State must be Off before the commissioning process can be activated and the unit will not be allowed to start while the commissiong process is active.
- 2. Verify Unit Configuration: Go To the Unit Configuration Menu: Main Menu \ Advanced Menu \ Unit Configuration Menu.
 - Verify the SpaceTCfg paramter matches the number and type of sensors you have.
 - Option 1 Temperature Only: (1)QMXS, (2) QMXS, or (3) QMXS. Sensor Model number/Type: QMX3.P34 or QMX3.P34-1WSB.
 - Option 2 Temperature/Humidity/CO2: (1)QMX+, (2) QMX+, or (3) QMX+. Sensor Model number/Type: QMX3.P74 or QMX3.P74-1WSB
 - Verify the ExtOAInput paramter matches the type and quantity of sensors.
 - ExtOAInput = CO2QMX+
 - CO2 capable network sensors you have. The QMX3.74 or QMX3.74-1WSB have CO2.
 - If any changes to the Unit Configuration were made you will need to "Apply Changes" on the Advanced Menus "Unit Configuration" Screen. The controller will reset.
- 3. Verify the Unit Commissioning Set-Up:
 - In the Unit Set-Up Menu, set the Eng Units= English

or SI based on the application.

- In the HtgClg ChgOver Set-up Menu, set Rem Spt Src = QMX1, QMX2 or QMX3 based on which sensor you want to drive the setpoint.
- 4. **Name Each Sensor:** Name Each Enabled QMX Sensors Room Zone (As Applicable) Each enabled Sensor can be named to correspond to the particular Room Zone Location it is in (recommended). The Name is limited to 7 Alpha numeric characters.
 - Navigate: Commission Unit \ Remote Sensor Set-Up \ Snsr#:RoomZn# Info. The default name is RoomZn# where # is the sensor number.
 - While in the Snsr#:RoomZn# Info Screen change the associated name of Sensor# by selecting the Sensor#Name= RoomSn# and edit as desired. There is a max length of 7 alpha/numeric characters
 - After editing the Room Zone Names of each Sensor exit back to the Remote Sensor Set-Up Screen to initiate a Commissiong Sensor Sequence.

5. Commissioning QMX Sensors:

- Navigate: Main Menu \ Commission Unit \ Remote Sensor Set-Up
- While in the Remote Sensor Set-Up Screen review the status (Valid/Invalid) of each Room Zone QMX Space Sensor and compare the ID(s) currently displaying on the HMI for each Sensor to the documented physical Sensor Room Zone ID(s) as denoted Above. Also inspect each sensor in its associated Room Zone location for proper IDs (as documented) and for proper operation and configured display. The configured display on each QMX Space Sensor should match the current "Unit Configuration".
- Determine which, if any, Sensor(s) need to be commissioned. Note that if any Sensor currently has its "Status=Invalid" the QMX Space Sensor "Commission Procedure" needs to be performed prior to the QMX Space Sensor System being ready and usable for Space Control Operations. In order to initiate the Sensor(s) Commissioning Procedure the "Unit" must also be in the "Off State". If the "Unit" is not currently in the "Off State" proceed back to the Main "Daikin AHU" Menu Screen and put the "Unit" in the "Off State" when it is safe to do so and then proceed to the next step to initiate the "Commissioning Procedure" as desired.
- Proceed to the next step to initiate the "QMX Room Zone Space Sensor Commission Process".
- **NOTE:** Commissioning is required if any Room Zone Sensor is considered "Invalid" or if any of the currently displayed IDs for a Room Zone Sensor on the "Remote Sensor Set-Up" Screen does not match the documented ID(s) for those Sensor's Room Zone.
 - Initiate the QMX Commissiong Process: In the "Remote Sensor Set-Up" Screen initiate the QMX Space Sensor(s) Commissioning Process by Selecting "CommissionMode=On". If there is not a current Sensor Fault preventing the

"CommissionMode" from turning "On", the MicroTech 4 Controller will automatically "re-start" after a short time delay of Commissioning Mode becoming "Active".

- Main "Commissioning Active" (Chg&/orCnfrmIDs) Screen: (Once the controller re-starts proceed to the Main Commissioning Active "Chg&/orCnfrmIDs" Menu Screen when prompted to do so on the HMI. The status of the commissioning process should be on the HMI:
- "Commission Sts=Active"
- "CommissionMode=On"
- "ConfirmSnsrIDs=No"
- **NOTE:** If there was a Sensor "Alarm" upon restart of the controller the commissioning mode sequence will reset to "Off", with the controller re-starting after a short time delay. The "Alarm" will need to be remedied prior to re-initiating the "Commissioning Process"
 - Reset a Room Zone QMX Space Sensor Status to "Invalid": Only Sensor(s) with a "SensorX Status=Invalid" will go thru the "Commissioning Process". So, if you want a "Valid" QMX Space Sensor to go thru the "Commissioning Process" it will need to have its status reset to "Invalid" first.
 - Go to the "Reset Sensors" Screen to reset Sensor(s) status from "Valid" to "Invalid" as required.
- **NOTE:** This is not a typical step you will have to perform and is only needed if you suspect or denote that a particular Room Zone Sensor that has its "Status=Valid" is not configured or working properly.
 - Change (Update) a Room Zone QMX Space Sensor(s) ID: To change a Room Zone Sensor's ID currently displaying on the HMI that does not match the ID of the documented Sensor located in that Room Zone proceed to the "Chg Sensor IDs" Menu Screen. Then go to the corresponding "SnsrX:'RoomZnX' ID Chg" Screen and update the ID of the selected Sensor accordingly.
- **NOTE:** You can only change the ID of a Sensor that currently has its "SensorX Status=Invalid".
 - Confirm Displayed Sensor(s) IDs are Correct: Once the desired Sensor(s) to be "Commissioned" have an "Invalid" Status and the displayed IDs for each Room Zone Sensor on the Main Commissioning Active "Chg&/orCnfrmIDs" Screen match the documented IDs of the Sensors physically located in those Room Zones, initiate the "Confirm Space Sensor IDs" Step by setting "ConfirmSnsrIDs=Yes". After a short time delay the Controller will "reset".
- **NOTE:** If the "Commissioning Mode" is manually turned "Off" while it is "Active, the controller will re-start after a short time delay and have to be re-initiated from step 1
 - Main "Commissioning Active" (Config Sensors)
 Screen: Once the controller re-starts proceed back to the Main Commissioning Active "Config Sensors"

Menu Screen when prompted to do so on the HMI. The Sensor(s) "Reset" and "ID Change" Functions are disabled once the "ConfirmSnsrIDs=Done".

If the confirm process was successful, the status of the commissioning process should be on the HMI:

- "Commission Sts=Active"
- "CommissionMode=On"
- "ConfirmSnsrIDs=Done"
- "Config Sensors=Off"
- **NOTE:** If there was a Sensor "Alarm" upon restart of the controller the commissioning mode sequence will reset to "Off", with the controller re-starting after a short time delay. The "Alarm" will need to be remedied prior to re-initiating the "Commissioning Process" from step 4.5.1.
 - Initiate the QMX Space Sensor(s) Assignment & Configuration Phase: To Initiate the "Assignment & Configuration" Phases of the Sensor(s)
 "Commissioning Process" for each "Invalid" Sensor, set "Config Sensors=Execute". This will initiate each "Invalid" sensor's assignment and configuration steps. When the process has successfully started "Config Sensors=Active" on the HMI.
 - QMX Space Sensor(s) Assignment & Configuration Phases are In-Process:Monitor the "SensorX State=" displays on the HMI. The State of each Sensor going thru the "Commissioning Process" should go from "OK" to "Init" and back to "OK" when it has completed the "assignment" step. When the "assignment" phase for all of the sensor(s) has successfully completed the "Configuration" phase for those sensor(s) will begin. For each Sensor going thru the "Commissioning Process" the State of that Sensor will go from "OK" to "Config" and back to "OK" as the configuration phase of each sensor proceeds and completes. Each Sensor's status will transition from "Invalid" to "Valid" as its "Commissioning Process" is completed.
- **NOTE:** If there is an "Alarm", or Commissioning Mode is turned "Off" during this step, the commissioning sequence will reset to "Off and will have to be reinitiated from Step 1
 - QMX Space Sensor(s) Commissioning Complete: Once each QMX Space Sensor's Commissioning Process is complete its status will go from "Invalid" to "Valid". When all of the Sensor status's are "Valid" and their respective State(s) are back to "OK", the "Commissioning Mode will turn "Off" and the controller will reset one final time after a short time delay to complete the commissioning process.
 - Once the controller re-starts the QMX Space Sensor(s) Commissioning Process is Complete. With "CommissionMode=Off" after the controller re-start, you will now be able to proceed back to the Main "Daikin AHU" Menu Screen when pressing the back button on the HMI when prompted to.
 - 6. Verify that the Remote Sensor(s) are Configured and Working Properly: Once the "Commissioning Process" of the Room Zone Sensor(s) is complete, proceed back to the "Remote Sensor Set-Up" Screen. All of

the Enabled Sensors should be displayed with a "nonzero" ID and all should have a "Valid" status. Make sure after the long initialization and start-up delay that the "AllSnsrsReady=Yes". Once "AllSnsrsReady=Yes" go to each individual Sensor's Room Zone information screen (located towards the bottom of the "Remote Sensor SetUp" Menu Screen) and verify that the "Relative Humidity, CO2, and/or Temperature" values being displayed on the QMX Space Sensor's display are correct for the Sensor(s) physically located in those rooms and are correctly being transmitted back to and displayed on the Microtech 4 Controller HMI.

Table	37:	Main	Menu \	Commission	Unit	\ Remote	Sensor	Set-Up
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Menu Display Name	Default	Range	Description
Snsr1 ID	-	000000000000000000000000000000000000000	Snsr1 ID = "h" is a status only item that indicates the current remote sensor ID connected as "Sensor1" (RoomZn1).
Snsr2 ID	-	0000000000000-fffffffffff	Snsr2 ID = "h" is a status only item that indicates the current remote sensor ID connected as "Sensor2" (RoomZn2).
Snsr3 ID	-	0000000000000-fffffffffff	Snsr3 ID = "h" is a status only item that indicates the current remote sensor ID connected as "Sensor3" (RoomZn3).
Commission Sts	-	Inactive Active	Commision Sts is a status only item that Indicates current status of commission mode. "Active" means sensor commissioning mode is in process.
CommissionMode	Off	Off On	CommissionMode is an adjustable item that allows you to turn "Commission Mode" On or Off. Turn "Commission Mode" to "On" to initiate the Remote Networked Sensor(s) Commissioning Mode that defines the Sensor ID assigned to each configured Room Zone and the type of QMX Sensor they are. Turn "Commission Mode" to "Off" to disable currently "Active" Commissioning Mode. Controller will perform a "reset" upon turning "Commissioning Mode "Off".
AllSnsrsReady	-	No Yes	AllSnsrsRady is a status only item that Indicates whether all of the system Networked Remote QMX Sensors are configured and ready to operate or not. A status of "Yes" indicates all remote sensors on the network are properly configured and are ready for operation with valid values. A status of "No" indicates one or more of the remote sensors are not configured, commissioned, or ready for operation yet.
Sensor1Sts	-	Invalid Valid	Sensor1Sts is a status only item that Indicates whether the Remote QMX Space Sensor assigned to Sensor1 (RoomZn1) on the network is currently considered "Valid" (Commissioned) or "Invalid" (Commissioning Required). A "Valid" Sensor has been assigned, is Configured correctly, and is communicating with the controller properly with the assigned ID for that sensor.
Sensor2Sts	-	Invalid Valid	Sensor2Sts is a status only item that Indicates whether the Remote QMX Space Sensor assigned to Sensor2 (RoomZn2) on the network is currently considered "Valid" (Commissioned) or "Invalid" (Commissioning Required). A "Valid" Sensor has been assigned, is Configured correctly, and is communicating with the controller properly with the assigned ID for that sensor.
Sensor3Sts	-	Invalid Valid	Sensor3Sts is a status only tem that Indicates whether the Remote QMX Space Sensor assigned to Sensor3 (RoomZn3) on the network is currently considered "Valid" (Commissioned) or "Invalid" (Commissioning Required). A "Valid" Sensor has been assigned, is Configured correctly, and is communicating with the controller properly with the assigned ID for that sensor.

Menu Display Name	Default	Range	Description
Sensor1 State, Sensor2 State,	-	OK Init	Sensor1,2,3 State is a status only item that indicates the current state of the remote QMX Sensor.
Sensor3 State		DAA Absence	(0) "OK" – Indicates any given Device Command has finished successfully and the sensor with the assigned ID for this Room Zone is communicating properly with the C600 Controller.
		Config Error	(1) "Init" – Indicates a sensor initialization is in process or is needed. An initialization is done for each PL-Link Device on the network when the controller is re-starting. If a given sensor state stays in "Init" indefinitely it is an indication that there is no sensor attached to the network with the given sensor ID or an incorrect sensor is attached to the network for that Room Zone
			(2) "DAA" – Indicates a Device Command to assign an address to a network remote QMX sensor is in process.
			(3) "Absence" – Indicates that the Sensor with the assigned sensor ID for this Room Zone has not been detected on the PL-Link network by the ProcessBus Communications for a length of time. If the sensor with the assigned ID for the Room Zone is detected again on the network before a communications fault has occurred the system and sensor ready status can return to normal "Valid – OK" status.
			(4) "Config" – The remote QMX Sensor with the given room zone ID is currently being configured with all of the properties and parameters in the configuration XML file being downloaded to it.
			(5) "Error" – Indicates that the QMX Sensor with the given room zone ID is currently faulted.
Sensor1:RmZn1	Menu		Select this to access additional information for Sensor1 "RoomZn1". The default room name for Sensor1 is within the parenthesis "RoomZn1". The name of Sensor1 within the "" can be changed on the "Snsr1 Information" Screen. The "name" is limited to 7 characters.
Sensor2:RmZn2	Menu		Select this to access additional information for Sensor2 "RoomZn2". The default room name for Sensor2 is within the parenthesis "RoomZn2". The name of Sensor1 within the "" can be changed on the "Snsr2 Information" Screen. The "name" is limited to 7 characters.
Sensor3:RmZn3	Menu		Select this to access additional information for Sensor3 "RoomZn3". The default room name for Sensor3 is within the parenthesis "RoomZn3". The name of Sensor3 within the "" can be changed on the "Snsr3 Information" Screen. The "name" is limited to 7 characters.

Table 38: Main Menu \ Commission Unit \ Sensr1:RmZn1, 2, or 3

Menu Display Name	Default	Range	Description
Sensor1 Name	RoomZn1	******* (7 character name)	This is a text input for defining the name of the Room Zone associated with "SensorX". It is limited to 7 characters. Upper Case, Lower Case, and Numbers are allowed
Rem Space T	-	-0.0-150°F	Actual "Temperature" value detected by SensorX in that space
Rem Space CO2	-	0-5000ppm	Actual "CO2" concentration value detected by SensorX in that space
Rem Space RH	-	0-100%	Actual "Relative Humidity" value detected by SensorX in that space.
Rem Space Spt	-	50.0-86.0°F	Space Temperature Setpoint. This setpoint may or may not be adjustable via the Remote QMX SensorX in the Space. That depends on the Remote Setpoint Source
Rem Occupancy	-	UnOcc Occ	This displays the current occupancy of the space. The Occupancy can be put into Tenant Override Occupancy locally at the Remote QMX Space Sensor by using the Local Tenant Override on the QMX Space Sensor. The Sensor will also display whether the Space is currently in Occupancy or not. Pressing the Tenant Override button on the QMX Space Sensor, while the Space is already Occupied in Tenant Override, will reset the Tenant Override time back to its starting default value and re-start time down.
Snsr1 ID	-	00000000000-ffffffffffff	This displays the current ID(SN) assigned for SensorX for this Room Zone. The SensorX "ID" on the physical sensor in this Room Zone must match this value or the sensor and C600 Controller will not communicate or transmit data properly. If the display shows "000000000000h"s then the Sensor ID assignment for this Room Zone is unknown. In this case the sensor is not present on the network, it is in alarm, a different sensor ID is attached to this room zone, a wrong type of sensor is in this room zone, or the sensor for this room zone has yet to be commissioned. In any case, if this displays "00h" then the physical wiring and operation of the sensor in this Room Zone must be verified and the Sensor Commissioning Procedure Performed. Initially when Sensor Commissioning is started the Sensor ID shown here could be incorrect to what is physically in this Room Zone if more than one sensor is on the network.
Sensor 1 Addr	-	000-999	This displays the actual "KNX" address of this device on the PL- Link Network. It is only valid when the "SnsrX ID" above has a valid 13 character ID and the sensor has been Commissioned
Snsr1 Alm Sts	-	OK Fault	This displays the current Alarm Status of this Sensor.
Sensor1 Cmd	-	OK Init AddrPMode AddrSnr Auto Config AssignPMode	This indicates the current "Cmd" the C600 Controller is issuing to the currently Assigned QMX Sensor for this Room Zone on the KNX PL-Link Network. A value of "OK" means that no current command is in process. A value of "Init" means that Sensor is in an "initialization" command state on the network. Note that the "Init" command happens automatically when the controller starts. A value of "Config" means that this sensor is in the process of being configured. Note that "AddrPMode/AddrSnr/AssignPMode" are not used for the QMX Sensor Device use on the PL-Link Network in this application.
Sensor1 State	-	OK Init DAA Absence Config Error	This indicates the current state of the QMX SensorX for this Room Zone. See Section 2.2 for detailed description of each possible state.

Menu Display Name	Default	Range	Description
Snsr1 Rdy Sts	-	No Yes	This indicates that the remote QMX Space Sensor for this Room Zone is commissioned, "Valid", communicating properly, and is ready for operation on the KNX PL-Link Network.
ID Assign Done	-	No Yes	This indicates if this particular QMX Space Sensor's Room Zone Network Assign Address Step of the Commissioning Process is complete or not. Note that this possibly can indicate whether this sensor is causing the "SnsrX Rdy Sts" and/or "AllSnsrReady" Display Status to not indicate "Yes".
Config Done	-	No Yes	This indicates if this particular QMX Space Sensor Configuration Step of the Commissioning Process is complete or not. Note that this possibly can indicate whether this sensor is causing the "SnsrX Rdy Sts" and/or "AllSnsrReady" Display Status to not indicate "Yes".

Configurable I/O

A MicroTech 4 can be equipped with a field configurable I/O Module which allows for field added sensors or inputs and Outputs to be read by the MicroTech 4 and displayed to the Building Automation System. Outputs can be written through the BAS to a third party device. Outputs can be analog 0-10V or 0-20.0mA and can be used to modulate field/BAS controlled devices.

Table 39: Main Menu \ Commission Unit \ Configurable I/O

Menu Display Name	Default	Range	Description
ApplyIOChgs	No	No Yes	ApplyIOChgs is a adjustable item that configures the IO when changes are made to the X1—X8 Cfg or the input ranges.
X1X8 Cfg	AI_V	DI AI_V AI_mA NTC10k AO_V AO_mA	X1X8 Cfg is an adjustable item that configures the IO type that will be used at that input or out on the expansion module. There are 8 configurable IO on the I/O Module.
Input X1X8 DI	-	Open Close	Input X1X8 DI is a status only item of the current digital input device.
Input X1X8 AI	-	0-10.0V	Input X1X8 AI is a status only item that shows the current analog input voltage
Input X1X8 AI	-	4-20.0mA	Input X1X8 AI is a status only item that shows the current analog input mA
Input X1X8 Temp	-	-50-250°F	Input X1X8 Temp is the status only item that shows the current temperature reading of the input.
Output X1X8 AO	-	0-10.0V	Output X1X8 AO is a status only item that shows the current analog output voltage at this output
Output X1X8 AO	-	0-20.0mA	Output X1X8 AO is a status only item that shows the current analog output mA at this output

Trending Set-Up

The MicroTech 4 ships from the factory with four pre-configured **Trend Sets** and one freely definable trend set. One or all of these sets may be activated at anytime. Trend Set 1 will come from the factory preconfigured to trend. Each trend set contains up to 30 data points. The data collected may be manually or automatically exported to an SD card (factory provided)

inserted into the controllers built in SD card reader. All of the defined points in all activated trend sets will be trended as one group when the TrendOnOff automation object is set to On. The trending method will be fixed as a cyclic trend with an adjustable CycleTime.

Table 40: Trend Set 1 Names and Descriptions

Trend Set 1					
Point #	Point Name	Description			
1	UnitState	Unit State			
2	ClgCapacity	Cooling Capacity			
3	HtgCapacity	Heating Capacity			
4	ReheatCapacity	Reheat Capacity			
5	OADmprOut	Outdoor Air Damper Position			
6	MinOASrc	Minimum Outdoor Air Source			
7	SAFCapOut	Supply Fan Capacity Command			
8	SAFCapFbk	Supply Fan Capacity Feedback			
9	SAFDSP	Duct Static Pressure			
10	RFEFCapOut	Return/Exhaust Fan Command			
11	RFEFCapFbk	Return/Exhaust Fan Capactiy Feedback			
12	BSP	Building Static Pressure			
13	RAFDSP	Return Air Fan Duct Static Pressure			
14	UnitStatus	Unit Status			
15	ClgStatus	Cooling Status			
16	DehumStatus	Dehumidification Status			
17	EconStatus	Economizer Status			
18	HtgStatus	Heating Status			
19	ControlTemp	Control Temperature			
20	CtrlTempSrc	Control Temperature Source			
21	DAT	Dischare Air Temperature			
22	RAT	Return Air Temperature			
23	EffOAT	Outdoor Air Temperature			
24	SpaceTemp1	Space Temperature 1			
25	SpaceTemp2	Space Temperature 2			
26	SpaceTemp3	Space Temperature 3			
27	EFT_LCT	Entering Fan/Leaving Cooling Coil Temperature			
28	ActiveAlarmEnu	Current Alarm Enumeration			
29	CurrentClgStg	Current Cooling Stage			
30	CurrentHtgStg	Current Heating Stage			
Table 41: Trend Set 2 Names and Descriptions

Trend Set 2				
Point #	Point Name	Description		
1	AirFlwStatus	Airflow Status		
2	OccSrc	Occupancy Source		
3	UnoccSrc	Unoccupied Source		
4	OccClgSpt	Occupied Cooling Setpoint		
5	OccHtgSpt	Occupied Heating Setpoint		
6	DATCIgSetpoint	Discharge Air Temperature Cooling Setpoint		
7	DATHtgSetpoint	Discharge Air Temperature Heating Setpoint		
8	MinOAPos	Effective Minimum Outdoor Air Position		
9	OAFlow	Outdoor Airflow		
10	OAFlowSpt	Outdoor Ariflow Setpoint		
11	PPM	Carbon Dioxide		
12	RemRFEFCap	Remote Return/Exhaust Air Fan Capacity		
13	RemSAFCap	Remote Supply Air Fan Capacity		
14	VFDAnlg_RFEFStatus	Return/Supply Fan Drive Status (RFEFType=RFAnalog or EFAnalog)		
	VFD_RFEFStatus	Return/Supply Fan Drive Status (RFEFType=RFEFVFDMB(ABB))		
	ECM_RFEF1Status	Return/Exhaust Fan Drive Status		
15	ECM_RFEF2Status	Return/ Exhaust Fan Drive Status		
16	ECM_RFEF3Status	tatus Return/ Exhaust Fan 3 Drive Status		
17	ECM_RFEF4Status	Return/ Exhaust Fan 4 Drive Status		
18	RFEF1CommStatus	Return/Exhaust Fan Communication Status		
19	RFEF2CommStatus	Return/Exhaust Fan Communication Status		
20	VFDAnlg_SAFStatus	Supply Fan Drive Status		
	VFD_SAFStatus	Supply Fan Drive Status		
	ECM_SAF1Status	Supply Fan 1 Drive Status		
21	ECM_SAF2Status	Supply Fan 2 Drive Status		
22	ECM_SAF3Status	Supply Fan 3 Drive Status		
23	ECM_SAF4Status	Supply Fan 4 Drive Status		
24	SAF1CommStatus	Supply Air Fan 1 Communication Status		
25	SAF2CommStatus	Supply Air Fan 2 Communication Status		
26	SAF3CommStatus	Supply Air Fan 3 Communication Status		
27	SAF4CommStatus	Supply Air Fan 4 Communication Status		
28	EconChgOvr	Economizer Changeover Method Status		
29	FanInterlock	FanInterlock Supply Fan Interlock Input Status		
30	EPSP	Exhaust Plenum Static Pressure		

Table 42: Trend Set 3 Names and Descriptions

Trend Set 3			
Point #	Point Name	Description	
1	ERWhlCapOut	Energy Recovery Wheel Capacity	
2	ER_EWT	Energy Recovery Wheel Exhaust Air Temperature	
3	ER_LWT	Energy Recovery Wheel Leaving Air Temperature	
4	Hum_1	Relative Humidity Input 1	
5	Hum_2	Relative Humidity Input 2	
6	Hum1Spt	Relative Humidity Setpoint 1	
7	Hum2Spt	Relative Humidity Setpoint 2	
8	ReheatSpt	Reheat Setpoint	
9	Dewpoint1	Calculated Dewpoint Input 1	
10	Dewpoint2	Calculated Dewpoint Input 2	
11	Dewpnt1Spt	Dewpoint 1 Setpoint	
12	Dewpnt2Spt	Dewpoint 2 Setpoint	
13	SpaceRelHum1	Space Relative Humidity Sensor 1	
14	SpaceRelHum2	Space Relative Humidity Sensor 2	
15	OARelHum	Outdoor Air Relative Humidity Sensor	
16	RARelHum	Return Air Relative Humidity Sensor	
17	SpaceDewpoint1	Calculated Dewpoint Space Input 1	
18	SpaceDewpoint2	Calculated Dewpoint Space Input 2	
19	OADewpoint	Calculated Outdoor Air Dewpoint	
20	RADewpoint	Calculated Return Air Dewpoint	
21	CmpCapOut	Refrigeration Only Control Compressor Capacity Out	
22	CmpCapCmd	Refrigeration Only Control Compressor Capacity Command Input	
23	RhtCapCmd	Refrigeration Only Control Reheat Capacity Command Input	
24	CmpInterlock	Refrigeration Only Control Compressor Interlock Input	
25	LocRemStatus	Refrigeration Only Control System Mode Status Output	
26	AlarmReset	Refrigeration Only Control Alarm Reset Input	
27	ROSAFCapIn	Refrigeration Only Control Supply Fan Capacity Input	
28	RORFEFCapIn	Refrigeration Only Control Return/Exhaust Fan Capacity Input	
29	Spare		
30	Spare		

Table 43: Trend Set 4 Names and Descriptions

Trend Set 4			
Point #	Point Name	Description	
1	PTS1	Suction Refrigerant Presssure Circuit 1	
2	PTS2	Suction Refrigerant Presssure Circuit 2	
3	PTD1	Discharge Refrigerant Presssure Circuit 1	
4	PTD2	Discharge Refrigerant Presssure Circuit 2	
5	DRT1	Discharge Refrigerant Temperature Circuit 1	
6	DRT2	Discharge Refrigerant Temperature Circuit 2	
7	DSH1	Discharge Superheat Circuit 1	
8	DSH2	Discharge Superheat Circuit 2	
9	Subcooling1	Subcooling Circuit 1	
10	Subcooling2	Subcooling Circuit 2	
11	VCmp1CommSts	Vairable Compressor 1 Compressor Status	
12	VCmp2CommSts	Variable Compressor 2 Compressor Status	
13	VCmp1RpsOut	Variable Compressor 1 Command Output	
14	VCmp2RpsOut	Variable Compressor 2 Command Output	
15	VCmp1HMICapOut	Variable Compressor 1 Capacity Output	
16	VCmp2HMICapOut	Variable Compressor 2 Capacity Output	
17	VCmp1SSOut	Variable Compressor 1 Start/Stop Output	
18	VCmp2SSOut	Variable Compressor 2 Start/Stop Output	
19	FCmp1SSOut	Compressor 1 Output Status	
20	FCmp2SSOut	Compressor 2 Output Status	
21	FCmp3SSOut	Compressor 3 Output Status	
22	FCmp4SSOut	Compressor 4 Output Status	
23	FCmp5SSOut	Compressor 5 Output Status	
24	FCmp6SSOut	Compressor 6 Output Status	
25	Spare		
26	Spare		
27	Spare		
28	Spare		
29	Spare		
30	Spare		

Trending Set-Up Menu

Table 44: Main Menu \ Trending Set-Up

Menu Display Name	Default	Range	Description
Apply Chgs	No	No Yes	Apply Chgs is an adjustable item used to reset the controller when changes to the trending have been made. This flag must be set to yes for changes in this menu to become active.
Sample Time	60s	1-3600s	Sample Time is an adjustable item that sets how frequently trended data points are collected and recorded.
TrendOnOff	Off	Off On	TrendOnOff is an adjustable item that sets if trending is active or not.
Enable Trend 1	Yes	No Yes	Enable Trend 1 is an adjustable item that sets if Trend set 1 is being recorded or not.
Enable Trend 2	No	No Yes	Enable Trend 2 is an adjustable item that sets if Trend set 2 is being recorded or not.
Enable Trend 3	No	No Yes	Enable Trend 3 is an adjustable item that sets if Trend set 3 is being recorded or not.
Enable Trend 4	No	No Yes	Enable Trend 4 is an adjustable item that sets if Trend set 4 is being recorded or not.
Ena Free Trend	No	No Yes	Ena Free Trend is and adjustable item that allows the user to select up to 30 of their own trend points using the Free Trend Points menu.
AutoExpTime	1440min	0-1440min	AutoExpTime is an adjustable item that sets the time interval that all accumulated trend data in the controller is exported to the SD card. The default value of 1440 means the data would transfer once a day at 11:59 PM. When the AutoExp Time is set to any value less than 1440 all the accumulated trend data in the controller will be exported to the SD cart at intervals equal to that value.
Export Data	No	No Yes	Export Data is an adjustable item initiates an export of all currently accumulated trend data. When ExportData is set to Yes, all the accumulated trend data in the controller will be exported to the SD card. ExportData will automatically revert to No when export is complete.
Clear Trend	Done	Done ClrData ClrCfg	ClearTrend is an adjustable item that is used to clear the Trend Archive Memory. ClrData will delete all the data and the trend set-up will remain. When ClrCfg is used the trend memory will be completely erased including all of the data.
TrendFull	Wrap	Wrap Stop	TrendFull is an adjustable item that is used to determine if the data should overwrite the oldest data on the card when the memory is full "Wrap", or if it should strop trending when the memory is full.
Free Trend Points	Menu		FreeTrend Points is a menu where the user can pick the points for a custom trend.

BMS Communications

Refer to the installation manuals below for detailed instructions for each BMS communication type.

- IM 916 Microtech 4 Unit Controller BACnet IP
- IM 917 Microtech 4 Unit Controller BACnet MSTP
- IM 918 Microtech 4 Unit Controller LON Communications

LON Set-Up

Table 45: Main Menu \ BMS Communications \ LON Set-Up

Menu Display Name	Default	Range	Description
Neuron ID	-	-	Neuron ID is a status only item that indicates the Neuron ID of the LonWorks communication module. The Neuron ID field displays zeros and does not populate until the communication module has been commissioned.
Snd Hrt Bt	60s	0-6553s	Send Heartbeat.
Rcv Hrt Bt	0s	0-6553s	Receive Heartbeat. Defines the maximum time that elapses after the last update to a specified network variable input before the unit starts to use default values. ncIRCvHrBt can also be used to change these values.
Min Snd Tm	0s	0-6553s	Minimum Send Time. Controls the minimum period of time that expires before certain network variables are transmitted. nclMinSendTime can also be used to change these values.
Comm Status	-	OK(0) Hardware(1) Init(2) Memory(3) ID(4) COVReg(5) Other (6)	Comm Status shows the status of the communications.
LON BSP	-	-	Board Support Package. Displays the version of firmware loaded in the LonWorks communication module.
Lon App Ver	-	-	LonWorks application version. Displays the version of the chiller software application loaded in the LonWorks communication module. This parameter remains blank until the communication module is commissioned.

BACnet MSTP Set-Up

Menu Display Name	Default	Range	Description
ApplyMSTPChgs	No	No Yes	ApplyMSTPChgs is an adjustable flag that when set to yes will cycle power to the controller to allow the network setup changes to take place.
Name	-	-	Up to a 17 Character Device Object Name. Change this value as needed to match installation parameters
Dev Instance	-	0-4194302	Device Instance of the BACnet communication module
MSTP Address	-	0-127	This is the MST/TP address of the BACnet communication module.
Baud Rate	38400	9600 19200 38400 76800	Baud Rate is an adjustable item that is the Data Transfer speed.
Max Master	127	1-127	Max Master is an adjustable item that specifies the highest possible address for master nodes and shall be less than or equal to 127.
Max Info Frm	10	1-32	Max Info Frm is an adjustable item that specifies the maximum number of information frames the BACnet communication module may send before it must pass the token.
Unit Support	English	SI English	Unit Support is an adjustable item that sets the types of units passed through BACnet. (English or Metric)
Term Resistor	No	No Yes	Term Resistor is an adjustable item that be set to yes – no.
NC Dec 1	0	0-4194302	NC Dev 1 is an adjustable item that sets the device instance of the BACnet workstation or device that will receive the alarm notifications.
NC Dev 2	0	0-4194302	NC Dev 2 is an adjustable item that sets the device instance of the BACnet workstation or device that will receive the alarm notifications.
Comm Status	-	OK(0) Hardware(1) Init(2) Memory(3) ID(4) COVReg(5) Other (6)	Comm Status shows the status of the communications.
BACnet BSP	-	-	Board Support Package. Displays the version of firmware loaded in the LonWorks communication module.

Table 46: Main Menu \ BMS Communications \ BACnet MSTP Set-Up

BACnet IP Set-UP

Table 47: Main Menu \ BMS Communications \ BACnet IP Set-Up

Menu Display Name	Default	Range	Description
ApplyIPChgs	No	No Yes	ApplyIPChgs is an adjustable flag that when set to yes will cycle power to the controller to allow the network setup changes to take place.
Name	-	-	Up to a 17 Character Device Object Name. Change this value as needed to match installation parameters
Dev Instance	-	0-4194302	Device Instance of the BACnet communication module
UDP Port	47808	0-65535	UDP Port is the User Datagram Protocol. The UDP Port allows host to host communication via the IP network and is used to identify the application process in the destination unit. Only change the UDP Port if there are multiple subnets. See a network administrator before modification.
DHCP	On	On Off	DHCP is the Dynamic Host Configuration Protocol. The DHCP is a network protocol that enables a server to automatically assign an IP Address. Set to Off if a static IP address is needed.
Act IP	0.0.0.0	-	Act IP Is the Actual IP Address of the BACnet Communication module.
ActMsk	0.0.0.0	-	ActMsk is the actual Subnet Base of the BACnet Communication Module.
ActGwy	-	-	ActGwy is the actual gateway address.
Gvn IP	127.0.0.1	-	Gvn IP is the Given IP Address of the BACnet Communication Module.
GvnMsk	255.255.255.0	-	Gvn Msk is the Given Subnet Mask of the BACnet Communication Module.
GvnGwy	127.0.0.1	-	GvnGwy is the Given Gateway address of the BACnet Communication Module.
Unit Support	English	SI English	Unit Support is an adjustable item that sets the types of units passed through BACnet. (English or Metric)
NC Dec 1	0	0	NC Dev 1 is an adjustable item that sets the device instance of the BACnet workstation or device that will receive the alarm notifications.
NC Dev 2	0	0	NC Dev 2 is an adjustable item that sets the device instance of the BACnet workstation or device that will receive the alarm notifications.
EnaWebSrvr	Off	Off On	EnaWebSrvr is a flag to enable the web server.
Comm Status	-	OK(0) Hardware(1) Init(2) Memory(3) ID(4) COVReg(5) Other (6)	Comm Status shows the status of the communications.
BACnet BSP	-	-	Board Support Package. Displays the version of firmware loaded in the LonWorks communication module.

Network Unit Set-Up

Menu Display Name	Default	Range
Ctrl Mode	Off	Off
		HeatOnly
		CoolOnly
		FanOnly
		HeatCool
		Auto/Net
Occ Mode	Auto/Net	Occ
		Unocc
		TntOvrd
		Auto/Net
Clg Reset	None	None
		Network
		Space
		Return
		OAT
		ExtmA
		ExtV
		Airflow
		SpaceH1
		SpaceH2
		OAH
		RAH
Econo Reset	None	None
		Network
		Space
		Return
		OAT
Htg Reset	None	None
		Network
		Space
		Return
		OAT
		ExtmA
		ExtV
Min OA Reset	None	None
		Network
		ExtSig
Ctrl Temp Src	RAT	RAT
		Space
		OAT
		None

Table 48: Main Menu \ BMS Communications \ Network Unit Set-Up

Menu Display Name	Default	Range
Rem Spt Src	None	None
		AI
		QMX1
		QMX2
		QMX3
Occ Clg Spt	72.0°F	0.0-100.0°F
Occ Htg Spt	68.0°F	0.0-100.0°F
SAF Ctrl	CAV	DSP
		Spd/Net
		1ZnVAV
		BSP
		CO2
		Flow
		CAV
RFEF Ctrl	BSP	CAV
		BSP
		Tracking
		DSP
		Spd/Net
		Flow
		OAD
		FlowDiff

Network Input Status

Table 49: Main Menu \ BMS Communications \ Network Input Status

Menu Display Name	Default	Range
Menu Display Name	Default	Range
Net OAT In	-	-50.0-200.0°F (621.8°F)
Net SpaceT In	-	-0.0-150.0°F
		(621.8°F)
NetCurrState	-	Occ
		Unocc
		TntOvrd
		Standby
		NUL
NetNextState	-	Occ
		Unocc
		TntOvrd
		Standby
		NUL
NetTmToNxtSt	-	0-65534min
		(65535min)
Net App Mode	-	Off
		HeatOnly
		CoolOnly
		FanOnly
		Auto
		NA
Net CI Ena S	-	-1.0-1.0
		(-1.0)
Net CI Ena V	-	0-255%
		(255%)
Net HT Ena S	-	-1.0-1.0
		(-1.0)
Net Ht Ena V	-	0-255%
		(255%)
Net Ec Ena S	-	-1.0-1.0
		(-1.0)
Net Ec Ena V	-	0-255%
		(255%)
Net SAF Cap	-	0-100%
		(164%)
Net RFEF Cap	-	0-100%
		(164%)
Net Space PPM	-	0-5000ppm
		(65535ppm)

Menu Display Name	Default	Range
Net Rel Humid	-	0-100%
		(164%)
Net DATCIg Spt	-	40.0-100.0°F
Net DATHtgSpt	-	40.0-140.0°F
NetLCTSpt	-	45.0-65.0°F
NetDXBPLCTSpt	-	45.0-65.0°F
NetDemandShed	-	Inactive
		Auto
		Manual
nviSetpoint	-	0.0-100.0°F
		(621.8°F)
NetOccManCmd	-	Occ
		Unocc
		TntOvrd
		Standby
		Auto
Net Min OA	-	0-100%
nvoEffSpt	-	0.0-100.0°F
nciOccClgSpt	-	0.0-100.0°F
nciOccHtgSpt	-	0.0-100.0°F
nciHVACType	-	Generic
		FanCoil
		VAV
		Hpump
		RTU
		UV
		ChilCeil
		Rad
		AHU
		SCU

Power Monitor

The **Power Monitor** menu displays the relevant Inputs from the option Power Monitor Features. The Power Monitor is a reporting only feature.

Table 50: Main Menu \ View Status \ Power Monitor

Menu Display Name	Default	Range	Description
TotalUnitkWh	-	0.0-1000000.0	TotalUnit kWh - How much energy the unit has consumed – this is what a residential customer might get billed for on based on your power meter. This number is for reference only, the meter is not "revenue grade" and cannot be used for accurate billing.
UnitkW	-	0.0-1000000.0	UnitkW is how much energy is being consumed at an instantaneous moment in time, the kWhs is the integral of this value.
PeakUnitkW	-	0.0-1000000.0	PeakUnitkW is the highest instantaneous power that the meter has ever seen the unit draw. This can be used to track to see if starts are getting harder or if coils need to be cleaned.
AverageUnitkW	-	0.0-100000.0	AverageUnitkW is the average power draw of the unit over a period. It is not the power consumption.
L1L2Voltage	-	0.0-700.0V	L1L2Voltage is the RMS voltage on a given phase.
L2L3Voltage	-	0.0-700.0V	L2L3Voltage is the RMS voltage on a given phase.
L1L3Voltage	-	0.0-700.0V	L1L3Voltage is the RMS voltage on a given phase.
L1kW	-	0.0-100000.0	L1kW Power draw on each one of the three phases, which allows you to see if the power draw is equal across the phases.
L2kW	-	0.0-100000.0	L2kW Power draw on each one of the three phases, which allows you to see if the power draw is equal across the phases.
L3kW	-	0.0-100000.0	L3kW Power draw on each one of the three phases, which allows you to see if the power draw is equal across the phases.
L1Current	-	0.0-200.0A	L1Current is the current per phase. These should all be close together. If they are not they may indicate a loose connection or blown fuse.
L2Current	-	0.0-200.0A	L2Current is the current per phase. These should all be close together. If they are not they may indicate a loose connection or blown fuse.
L3Current	-	0.0-200.0A	L3Current is the current per phase. These should all be close together. If they are not they may indicate a loose connection or blown fuse.
NetSyskVAR	-	0.0-200.0	NetSyskVAR is the current reading of the System Total Reactive Power; which is the unsigned absolute value of KVAR L1 + kVAR L2 + kVAR L3. This is the imaginary portion of power (from a mathematical perspective) that we call VARs (Volt Ampere Reactive or Apparent Power). The ratio of real power to reactive power is the power factor. So this value in conjunction with real power can be used to determine power factor (Power Factor = True Power / Apparent Power).
kVAR L1	-	0.0-200.0	kVAR L1 is the current reading of the individual L1 phase reactive Energy LSW kVARh) (Signed)
kVAR L2	-	0.0-200.0	kVAR L2 is the current reading of the individual L2 phase reactive Energy LSW kVARh) (Signed)
kvar L3	-	0.0-200.0	kVAR L3 is the current reading of the individual L3 phase reactive Energy LSW kVARh) (Signed)
kVA L1		0.0-200.0	kVA L1 is the current Individual L1 Phase Apparent Powers (kVA) Signed
kVA L2		0.0-200.0	kVA L2 is the current Individual L2 Phase Apparent Powers (kVA) Signed

Menu Display Name	Default	Range	Description
kVA L3		0.0-200.0	kVA L3 is the current Individual L3 Phase Apparent Powers (kVA) Signed
Power Factor	-	0.0-200.0	Power Factor is the system Total Power Factor (PF) (Signed). The ratio of the real power to the reactive power. (Power Factor = True Power / Apparent Power)
Accm kVARh L1	-	0.0-1000000.0	Accm kVARh L1 is a running total of the reactive power hours that a given piece of equipment is consumed per phase.
Accm kVARh L2	-	0.0-1000000.0	Accm kVARh L2 is a running total of the reactive power hours that a given piece of equipment is consumed per phase.
Accm kVARh L3	-	0.0-1000000.0	Accm kVARh L3 is a running total of the reactive power hours that a given piece of equipment is consumed per phase.
Accum kVAh	-	0.0-1000000.0	Accum kVAh – How much energy the unit has consumed. This is what commercial customers likely will get billed for. This number is for reference only, the meter is not "revenue grade" and should not be used for accurate billing.

Unit Maintenance

The **Unit Maintenance** section covers several menus that will be useful while maintaining the equipment.

Operating Hours Menu

Table 51: Main Menu \ Commission Unit \ Unit Maintenance \ Operating Hours

Menu Display Name	Default	Range	Description
Supply Fan	-	0.0-999999.0h	Supply Fan is a status only item that displays the number run hours on the Supply Fan
Ret/Exh Fan	-	0.0-999999.0h	Ret/Exh Fan is a status only item that displays the number run hours on the Return or Exhaust Fan
Cooling	-	0.0-999999.0h	Cooling is a status only item that displays the number run hours spent in Cooling
Heating	-	0.0-999999.0h	Heating is a status only item that displays the number run hours spent in Heating
Economizer	-	0.0-999999.0h	Economizer is a status only item that displays the number run hours spent in Economizer
Tnt Override	-	0.0-999999.0h	The Override is a status only item that displays the number run hours spent in The Override
VCmp1	-	0.0-999999.0h	VCmp1 is a status only item that displays the number run hours for Variable Compressor 1
VCmp2	-	0.0-999999.0h	VCmp2 is a status only item that displays the number run hours for Variable Compressor 2
FCmp1	-	0.0-999999.0h	FCmp1 is a status only item that displays the number run hours for Fixed Compressor 1
FCmp2	-	0.0-999999.0h	FCmp2 is a status only item that displays the number run hours for Fixed Compressor 2
FCmp3	-	0.0-999999.0h	FCmp3 is a status only item that displays the number run hours for Fixed Compressor 3
FCmp4	-	0.0-999999.0h	FCmp4 is a status only item that displays the number run hours for Fixed Compressor 4
FCmp5	-	0.0-999999.0h	FCmp5 is a status only item that displays the number run hours for Fixed Compressor 5
FCmp6	-	0.0-999999.0h	FCmp6 is a status only item that displays the number run hours for Fixed Compressor 6
Dehumid	-	0.0-999999.0h	Dehumid is a status only item that displays the number run hours spent in Dehumidification
Reheat	-	0.0-999999.0h	Reheat is a status only item that displays the number run hours spent in Reheat
ER Wheel	-	0.0-999999.0h	ER Wheel is a status only item that displays the number run hours for the Energy Recovery Wheel
ER Preheat	-	0.0-999999.0h	ER Preheat is a status only item that displays the number run hours for the Energy Recovery Pre-heater

Air Filters

Menu Display Name	Default	Range	Description
Start Up	180s	10-1800s	Startup is an adjustable item that sets the time in seconds that the unit will perform its startup operation.
Recirculate	180s	10-3600s	Recirculate is an adjustable item that sets the time in seconds that the unit operates with only the fan, recirculating the building air upon unit start up.
Clg Stg Time	5min	5-60min	Clg Stg Time is an adjustable item used to set a minimum time period between compressor stage changes.
Htg Stg Time	5min	2-60min	Htg Stg Time is an adjustable item used to set a minimum time period between heating stage changes.
Zero OA Time	Omin	0-240min	Zero OA Time is an adjustable item that sets the time in minutes that the outdoor air damper stays at a zero position upon unit start up.
Tnt Ovrd Incr	120min	0-300min	The Over Ince is an adjustable item that sets the amount of time that the unit will go into operation when the tenant override function is activated. Tenant override can be activated by the space sensor button, the network occupancy mode parameter or the keypad Occ Mode= parameter.
Post Heat	0s	0-180s	Post Heat is an adjustable item that sets the duration of the post heat function available on VAV units.
Low DAT	6min	0-60min	Low DAT is an adjustable item that sets the duration of a time period upon unit start up during which the Low Discharge Temperature fault is ignored. This may be particularly important in colder climates when a unit has been off for a significant time period during which the unit, including the discharge air temperature sensor, has become very cold. This time period allows the unit to run long enough to turn the unit heat on and warm the discharge sensor above the alarm limit, preventing nuisance unit alarm shutdown. This time period begins when the supply fan starts.
Service Time	Omin	0-60min	Service Time is an adjustable item that sets the amount of time the internal control timers can be temporarily sped up.

 Table 52: Main Menu \ Commission Unit \ Unit Maintenance \ Air Filters

Timer Settings

The **Timer Settings** menu contains adjustable timers for various unit functions. This menu is also available in the Commission Unit menu (Main Menu \ Commission Unit \ Timer Settings).

Table 53	B: Main	Menu	Service	Menus \	Timer	Settings
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Menu Display Name	Default	Range	Description
Start Up	180s	10-1800s	Startup is an adjustable item that sets the time in seconds that the unit will perform its startup operation.
Recirculate	180s	10-3600s	Recirculate is an adjustable item that sets the time in seconds that the unit operates with only the fan, recirculating the building air upon unit start up.
Clg Stg Time	5min	5-60min	Clg Stg Time is an adjustable item used to set a minimum time period between compressor stage changes.
Htg Stg Time	5min	2-60min	Htg Stg Time is an adjustable item used to set a minimum time period between heating stage changes.
Zero OA Time	Omin	0-240min	Zero OA Time is an adjustable item that sets the time in minutes that the outdoor air damper stays at a zero position upon unit start up.
Tnt Ovrd Incr	120min	0-300min	The Ovr Incr is an adjustable item that sets the amount of time that the unit will go into operation when the tenant override function is activated. Tenant override can be activated by the space sensor button, the network occupancy mode parameter or the keypad Occ Mode= parameter.
Post Heat	0s	0-180s	Post Heat is an adjustable item that sets the duration of the post heat function available on VAV units.
Low DAT	6min	0-60min	Low DAT is an adjustable item that sets the duration of a time period upon unit start up during which the Low Discharge Temperature fault is ignored. This may be particularly important in colder climates when a unit has been off for a significant time period during which the unit, including the discharge air temperature sensor, has become very cold. This time period allows the unit to run long enough to turn the unit heat on and warm the discharge sensor above the alarm limit, preventing nuisance unit alarm shutdown. This time period begins when the supply fan starts.
Service Time	Omin	0-60min	Service Time is an adjustable item that sets the amount of time the internal control timers can be temporarily sped up.

Operating Hours

The **Operating Hours** menu contains status items that display the number run hours for various components and operating states. This menu is also available in the Commission unit menu (Main Menu \ Commission Unit \ Unit Maintenance \ Operating Hours).

Menu Display Name	Default	Range	Description
Supply Fan	-	0.0-999999.0h	Supply Fan is a status only item that displays the number run hours on the Supply Fan
Ret/Exh Fan	-	0.0-999999.0h	Ret/Exh Fan is a status only item that displays the number run hours on the Return or Exhaust Fan
Cooling	-	0.0-999999.0h	Cooling is a status only item that displays the number run hours spent in Cooling
Heating	-	0.0-999999.0h	Heating is a status only item that displays the number run hours spent in Heating
Economizer	-	0.0-999999.0h	Economizer is a status only item that displays the number run hours spent in Economizer
Tnt Override	-	0.0-999999.0h	Tnt Override is a status only item that displays the number run hours spent in Tnt Override
VCmp1	-	0.0-999999.0h	VCmp1 is a status only item that displays the number run hours for Variable Compressor 1
VCmp2	-	0.0-999999.0h	VCmp2 is a status only item that displays the number run hours for Variable Compressor 2
FCmp1	-	0.0-999999.0h	FCmp1 is a status only item that displays the number run hours for Fixed Compressor 1
FCmp2	-	0.0-999999.0h	FCmp2 is a status only item that displays the number run hours for Fixed Compressor 2
FCmp3	-	0.0-999999.0h	FCmp3 is a status only item that displays the number run hours for Fixed Compressor 3
FCmp4	-	0.0-999999.0h	FCmp4 is a status only item that displays the number run hours for Fixed Compressor 4
FCmp5	-	0.0-999999.0h	FCmp5 is a status only item that displays the number run hours for Fixed Compressor 5
FCmp6	-	0.0-999999.0h	FCmp6 is a status only item that displays the number run hours for Fixed Compressor ${\bf 6}$
Dehumid	-	0.0-999999.0h	Dehumid is a status only item that displays the number run hours spent in Dehumidification
Reheat	-	0.0-999999.0h	Reheat is a status only item that displays the number run hours spent in Reheat
ER Wheel	-	0.0-999999.0h	ER Wheel is a status only item that displays the number run hours for the Energy Recovery Wheel
ER Preheat	-	0.0-999999.0h	ER Preheat is a status only item that displays the number run hours for the Energy Recovery Pre-heater

Flow Control

The **Flow Control** menu displays the current flow status for the Supply fan, return fan and exhaust fans in the unit.

Table 55: Main Menu \ Service Menus \ Flow Control

Menu Display Name	Default	Range	Description
Airflow	-	NoFlow Flow	Airflow is a status only item that indicates whether or not discharge airflow is detected. Airflow status is sensed by feedback from the supply fan EC motors to determine rotation/ operation
Supply Fan	-	Off On	Supply Fan is a status only item which indicates whether or not the controller is commanding the unit supply fan on.
Ret/Exh Fan	-	Off On	Ret/Exh Fan is a status only item which indicates whether or not the controller is commanding the unit RF/EF fan on.

Temperatures

The **Temperatures** menu displays the current reading of many of the key temperature sensors throughout the unit.

Table 56: Main Menu \ View Status \ Temperatures

Menu Display Name	Default	Range	Description
Control Temp	-	-50.0-200.0°F	Control Temp is a status only item which indicates the current Control Temperature value.
Disch Air	Auto/Net	-50.0-250.0°F	Disch Air is a status only item which displays the current temperature reading from the unit's discharge air temperature sensor (DAT). This sensor is standard on all units.
Return Air	-	-50.0-200.0°F	Return Air is a status only item which displays the current temperature reading from the unit's return air temperature sensor (RAT).
Eff Space T	-	0.0-150.0°F	Eff Space T is a status only
Space Temp 1		0.0-150.0°F	Space Temp 1 is a status only item which displays the current temperature reading from a space temperature sensor. Up to 3 sensors can be attached to the unit.
Space Temp 2		0.0-150.0°F	Space Temp 2 is a status only item which displays the current temperature reading from a space temperature sensor. Up to 3 sensors can be attached to the unit.
Space Temp 3		0.0-150.0°F	Space Temp 3 is a status only item which displays the current temperature reading from a space temperature sensor. Up to 3 sensors can be attached to the unit.
OA Temp		-50.0-200.0°F	OA Temp is a status only item which displays the current temperature reading from the unit mounted outdoor air temperature sensor.
EF/LC Temp		-50.0-250.0°F	EF/LC Temp is a status only item which displays the current entering fan/leaving coil temperature reading from the unit mounted temperature sensor. This sensor is available on RTU units with dehumidification capability. This sensor is also installed on RTU units equipped with either gas or electric heat and is used by the controller to calculate the heat rise across the heat exchanger by comparing it to the discharge air temperature input. The controller uses this information to protect the heat exchanger against overheating
ER LWT		-50.0-200.0°F	ER LWT is status only item which displays the current discharge air temperature leaving the optional energy recovery wheel.
ER EWT		-50.0-200.0°F	ER EWT is status only item which displays the current exhaust air temperature leaving the optional energy recovery wheel.
DRT1		-50.0-392.0°F	DRT1 is a status only item which displays the current discharge refrigerant line temperature sensor reading on Circuit #1
DRT2		-50.0-392.0°F	DRT2 is a status only item which displays the current discharge refrigerant line temperature sensor reading on Circuit #2
SRT1		-50.0-200.0°F	SRT1 is a status only item which displays the current suction refrigerant line temperature sensor reading on Circuit #1
SRT2		-50.0-200.0°F	SRT2 is a status only item which displays the current suction refrigerant line temperature sensor reading on Circuit #2
VCmp1 Temp		-50.0-392.0°F	VCmp1Temp is a status only item which displays the curent temperature of variable Compressor 1
VCmp2Temp		-50.0-392.0°F	VCmp2Temp is a status only item which displays the curent temperature of variable Compressor 2
LRT1		-50.0-392.0°F	LRT1 is a status only item which displays the current Liquid refrigerant line temperature sensor reading on Circuit #1

Menu Display Name	Default	Range	Description
LRT2		-50.0-392.0°F	LRT2 is a status only item which displays the current Liquid refrigerant line temperature sensor reading on Circuit #2

Alarms and Events

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

Viewing Alarms

The **Active Alarms** menu displays up to 10 active alarms. Pushing the scroll wheel in, will show details about the alarm, as well as when it occurred. The Alarm Log, shows the same information, but up to 50 of the latest alarms - both active and previous alarms.

Alarms are categorized as Warnings, Problems or Faults.

Faults are conditions that are serious enough to shut down the unit. The alarm must be manually cleared to allow unit operation.

Problems are conditions that result in some limitation of unit operation, but the unit is allowed to continue to operate. Some

Table 57: Main Menu \ Service Menus \ Active Alarms

of these alarms must be cleared manually, but others clear automatically.

Warnings inform the user of conditions that should be addressed, but do not limit operation in any way. The alarm condition needs to be fixed and the alarm must be manually cleared to cause this alarm to no longer be active.

All active alarms as well as the date and time that they were detected are displayed on the Active Alarm menu. These alarms are displayed in order of priority. Higher priority alarms are displayed first. The last 50 alarm "events" detected, as well as the date and times that they were detected, are displayed on the Alarm Log menu. An alarm "event" is either an alarm becoming active, or being cleared. A "+" symbol precedes the active alarm event and a "-" symbol precedes the cleared alarm event. These alarms are displayed in the order that they were detected. The alarm that was detected most recently is displayed first. Multiple occurrences of the same alarm may appear.

Menu Display Name	Default	Range	Description
Alarm Ct: ** Clr	- : No	0-10 : No	The top of the alarm menu will show the current count of alarms
Alms		0-10 : Flts	and their types.
		0-10 : Prbs	
		0-10 : Wrns	
		0-10 : All	
Alarm1: Alarm Type	-	Dirty Filter : Warning	The Alarm will display the alarm name : Alarm Type
Alarm Date	-	11/26/2019	Each alarm will display the date and time the alarm occurred.
Alarm TIme		12:10:10	

Table 58: Main Menu \ Service Menus \ Alarm Log

Menu Display Name	Default	Range	Description
Alarm Ct: ** Clr -	- : No	0-50: No	The top of the alarm menu will show the current count of alarms
Alms		0-50: Yes	and their types.
Alarm1: Alarm Type	-	Dirty Filter : Warning	The Alarm will display the alarm name : Alarm Type
Alarm Date	-	11/26/2019	Each alarm will display the date and time the alarm occurred.
Alarm TIme		12:10:10	

Alarm and Event Descriptions

Warnings

Warnings are notifications only. No action is taken by the controller in response to a Warning.

Table 59: Main Menu \ Service Menus \ Active Alarms

Alarm Number	Alarm Display Name	Description			
0	No Active Warnings	No Active Warnings are indicated.			
24	Main Filter: Warning	A warning alarm indicating the unit Main filter bank is dirty. The filter is considered dirty when the FilterSw1 across the Main filter bank is in alarm continuously for 60 seconds or Filter press 1 or 2 analog inputs is above the HiFltPress1Spt continuously for 60 seconds. This alarm requires a manual clear.			
25	Final Filter: Warning	A warning alarm indicating the unit Final filter bank is dirty. The filter is considered dirty when the FilterSw2 across the Final filter bank is in alarm continuously for 60 seconds or Filter press 3 analog input is above the HiFltPress3Spt continuously for 60 seconds. This alarm requires a manual clear.			
34	Ret/ Exh Fan: Warning	A warning alarm indicating the unit Ret/Exh Fan status is not as expected. This warning occurs only on units equipped with Return or exhaust fans when the RFEF Status is expected to be true and it is false for at least 30 seconds. This alarm will automatically clear if status changes to the expected vale.			
50	Over Econo: Warning	A warning alarm indicating the unit is economizing when it should not be will be generated whenever the outdoor air dampers are stuck open while operating in the Econo or Cooling operating state. The dampers are considered stuck open when either of the following abnormal situations occurs:			
		• The damper command value is less than the calibrated damper end switch closed value continuously for 180 seconds yet the outside air damper end switch input remains open.			
		 The damper end switch input does not change from closed to open with 30 seconds of the damper command value dropping (and remaining) below the calibrated damper end switch open value (less the calibrated maximum switch differential). 			
		The over economizing warning will also be generated if the Econo Status is Enabled when the OAT is greater than the Max OAT Limit setting (default 75F). Exception: This case is ignored when the economizer enable decision is being controlled by a network input or when the economizer changeover method (EconChgovr) is set for OAT/RAT dry bulb comparison (OAT/RAT).			
		The alarm will automatically clear when the conditions causing the alarm are no longer present.			
		NOTE: The damper end switch open (PosSwOpen%), Minimum switch differential (MinSwDiff), damper end switch closed (PosSwClose%) and maximum switch differential (MaxSwDiff) values are determined during the OAD damper end switch calibration process.			

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Alarm Number	Alarm Display Name	Description
52	Under Econo: Warning	A warning alarm indicating the unit is not economizing when it should be will be generated whenever the outdoor air dampers are stuck closed while operating in the Econo or Cooling state. The dampers are considered stuck closed when either of the following abnormal situations occurs:
		 The damper command value is greater than the calibrated damper end switch open value continuously for 180 seconds yet the outside air damper end switch input remains open.
		 The damper end switch input does not change from closed to open with 30 seconds of the damper command value rising above the calibrated damper end switch closed value (plus the calibrated minimum switch differential)
		The under economizing alarm will also be generated if the Econo Status is not Enabled when the OAT is less than the Min OAT Limit setting (default 70F). Exception: This case is ignored when the economizer enable decision is being controlled by a network input or when the economizer changeover method (EconChgovr) is set for OAT/RAT dry bulb comparison (OAT/RAT).
		The under economizing alarm will also be generated when the OAT sensor is unreliable or the RAT sensor is unreliable while the OAT is below the Min OAT Limit setting (default 70F) and the economizer changeover method (EconChgovr) is set for OAT/RAT dry bulb comparison (OAT/RAT).
		The alarm will automatically clear when the conditions causing the alarm are no longer present.
		NOTE: The damper end switch open (PosSwOpen%), Minimum switch differential (MinSwDiff), damper end switch closed (PosSwClose%) and maximum switch differential (MaxSwDiff) values are determined during the OAD damper end switch calibration process.
54	Excess OA: Warning	A warning alarm indicating the unit is delivering excessive outdoor air will be generated whenever the outdoor air dampers are stuck open. The outdoor dampers are considered stuck open when either of the following abnormal situations occurs:
		• The damper command value is less than the calibrated damper end switch closed value continuously for 180 seconds yet the outside air damper end switch input remains open.
		• The damper end switch input does not change from closed to open with 30 seconds of the damper command value dropping (and remaining) below the calibrated damper end switch open value (less the calibrated maximum switch differential).
		The excess outdoor air warning will also be generated while operating in the Econo or Cooling state when the Econo Status is Enabled and the OAT is greater than the Max OAT Limit setting (default 75F). Exception: This case is ignored when the economizer enable decision is being controlled by a network input or when the economizer changeover method (EconChgovr) is set for OAT/RAT dry bulb comparison (OAT/ RAT).
		The alarm will automatically clear when the conditions causing the alarm are no longer present.
		NOTE: The damper end switch open (PosSwOpen%), Minimum switch differential (MinSwDiff), damper end switch closed (PosSwClose%) and maximum switch differential (MaxSwDiff) values are determined during the OAD damper end switch calibration process.
		The alarm will automatically clear when the conditions causing the alarm are no longer valid.

Alarm Number	Alarm Display Name	Description
56	OADStuck: Warning	A warning alarm indicating the outdoor air dampers are stuck and not modulating will be generated whenever the damper are stuck open or stuck closed.
		The dampers are considered stuck open when either of the following abnormal situations occurs:
		• The damper command value is less than the calibrated damper end switch closed value continuously for 180 seconds yet the outside air damper end switch input remains open.
		 The damper end switch input does not change from closed to open with 30 seconds of the damper command value dropping (and remaining) below the calibrated damper end switch open value (less the calibrated maximum switch differential).
		 The dampers are considered stuck closed when either of the following abnormal situations occurs:
		 The damper command value is greater than the calibrated damper end switch open value continuously for 180 seconds yet the outside air damper end switch input remains open.
		 The damper end switch input does not change from closed to open with 30 seconds of the damper command value rising above the calibrated damper end switch closed value (plus the calibrated minimum switch differential)
		The damper stuck warning will also be generated when the damper end switch operation is unreliable. The ends switches are considered unreliable when the end switch input remains closed when the damper command value is between the calibrated end switch closed and open values (plus and minus the calibrated minimum and maximum switch differentials).
		The alarm will automatically clear when the conditions causing the alarm are no longer present.
58	ERWheel: Warning	Some units are equipped with a wheel rotation detection capability. This is present if the wheel is using an ECM motor. The ERWheel Warning flag is present if the wheel rotation is not detected. The alarm will automatically clear when the conditions causing the alarm are no longer present

Problems

Problems class alarms will not cause the unit to shut down completely but generally mean unit operation is altered in some way.

Table 60: Main Menu \ Service Menus \ Problem Alarms

Alarm Number	Alarm Display Name	Description		
0	No Active Problems	No Active Problems		
101	MHGRhtVlv1: Problem	The MHGRhtVlv1 Problem occurs when MHGRht valve synchronization sequence has started and is not completed successfully. As a result, the Dehumidification operation will be disabled unless primary heat back up reheat is available. This problem requires a Manual clear of the alarm.		
105 or 106	DRT1 Sensor: Problem or DRT2 Sensor: Problem	This alarm occurs when the DRT1 or DRT2 (Discharge Refrigerant Temperature) sensor input is shorted or open circuited for the Sensor Alarm Delay (default 30 seconds). It can also occur when the variable speed compressor is off and the input is above 329°F or the compressor has been off for 20 minutes and the input is below -4°F. When this alarm is active compressor cooling operation is disabled. The alarm must be manually cleared once corrective action is taken		
109	ProtIntrick: Problem	When configured for refrigeration only control there is generic interlock digital input defined that must be made to allow cooling operation (for an airflow switch for example). If the field calls for cooling but this input in not made you end up with the ProtIntrlck: Problem alarm.		
110 or 111	VCmp1: Problem or VCmp2: Problem	If the Variable Speed Compressor on Circuit 1 or Circuit 2 is enabled and commanded to run for 30 seconds but the controller fails to receive the variable speed run verification input the variable speed compressor is cycled OFF (a variable speed Compressor Emergency Stop Control Event is logged) for 5 secondes and then back on. The variable speed compressor is then ramped to 45%. If this occurs 5 times in a 100 min period the variable speed compressor is shut off and the VCmp1 or VCmp2: Problem alarm is generated. This alarm must be manually cleared once corrective action is taken.		
115 or 116	SRT Sensor 1: Problem or SRT Sensor 2: Problem	This alarm occurs when the SRT1 Sensor (Suction Refrigerant Temperature) sensor input is shorted or open for the Sensor Alarm Delay (default 30s) It can also occur when the variable speed compressor is off and the input is above 329°F		
120 or 121	Hi DL Temp_1: Problem or Hi DL Temp_2: Problem	Normal compressor control is limited when a high discharge line temperature conditions occur. If the variable speed compressor is operating and the discharge line temperature is greater than 250F for 15 seconds a High Discharge Line Temperature Event is generated and the variable speed compressor capacity is reduced every 15 seconds until the discharge line temperature falls below 220F. If the discharge line temperature is above 250F continuously for 3 minutes the variable speed compressor is stopped and a High Discharge Line Temperature problem alarm is generated. The alarm must be manually cleared.		
125 or 126	Exp Valve 1: Problem or Exp Valve 2: Problem	Exp Valve 1 or 2 Problem indicates the EVI valve resync Counter is greater than or equal to 4 or that EVI synchronization sequence is not completed within 60 seconds. This alarm must be manually cleared once corrective action is taken.		
130	OA Fan 1: Problem	Outdoor Fan 1 or 2 Problem indicates		
or	or			
131	OA Fan 2: Problem			
135 or 136	PTS1 Sensor: Problem or PTS2 Sensor: Problem	PTS1 or 2 Sensor Problem indicates the a sensor malfunction. This alarm is present when the following is true for 30 seconds where PTS<96kPa and the CircState is not in pumpdown or where the following is true for 30 minutes; the SSH1-SSHSpt >20.0F, DSH1<5.0F, and EVI Pos >95%. This alarm must be manually cleared once corrective action has been taken.		

Alarm Number	Alarm Display Name	Description
140 or 141	PTD1 Sensor: Problem or PTD2 Sensor: Problem	This alarm occurs when either the circuit 1 discharge line pressure inputs (PTD1) remains above 705 psi for 10 seconds or a compressor on circuit 2 has been operating for 60 seconds and the PTD1 value remains less than 155 psi. When this alarm is active compressor cooling operation is disabled. The alarm must be manually cleared once corrective action is taken.
145 or 146	Lo Charge 1: Problem or Lo Charge 2: Problem	The Lo Charge 1 Problem alarm indicates a condition that is consistent with a low refrigerant charge on circuit 1. This alarm occurs when the suction super heat is more than 20F greater than the setpoint, the expansion valve is >95% open for more than 30 min. This alarm must be manually cleared once corrective action has been taken.
150 or 151	ChargeLoss 1: Problem or ChargeLoss 2: Problem	The ChargeLoss 1 or 2 Problem alarm indicates a condition where the charge is not present. This alarm occurs when the suction superheat is more than 20F greater than the setpoint, the expansion valve is >95% open and the HDRT is > 150.0F for 30 minutes. This alarm must be manually cleared once corrective action has been taken.
155 or 156	VCmp1LoDSH: Problem or VCmp2LoDSH: Problem	The VCmp1LoDSH Problem alarm indicates a condition where the variable compressor has been disabled due to 3 lo discharge super heat events. This alarm must be manually cleared once corrective action has been taken.
160 or 161	Lo Press 1: Problem or Lo Press 2: Problem	The Lo Press 1 Problem alarm indicates a condition a low pressure condition on a circuit. This condition occurs when the low pressure switch input has been in alarm (open) position for longer than the LP Pressure Switch Delay (Default = 2 Seconds). This alarm will automatically reset if the Lo Pressure Event has not occurred more than 4 times in 24 hours. Otherwise a manual clear is required once action has been taken.
165 or 166	Hi Press 1: Problem or Hi Press 2: Problem	Normal variable speed compressor control is limited when a high discharge pressure conditions occur on the variable speed compressor circuit. If the variable speed compressor is operating and the discharge pressure (PTD) is greater than 525 PSI, a High Pressure Unloading Control Event is generated and the variable speed compressor is slowed every 10 seconds until either the discharge pressure falls to less than 525 PSI or remains higher than 575 PSI for 10 minutes. If the discharge pressure is above 575 PSI for 10 minutes the variable speed compressor is shut off and a High Pressure Problem alarm is generated. If the OAT is below 45F at the time the variable speed compressor is shut off immediately and a High Pressure Problem alarm is generated anytime the discharge pressure rises above 575 PSI. The alarm must be manually cleared.
170 or 171	Lo Press Diff 1: Problem or Lo Press Diff 2: Problem	The Lo Pressure Diff Problem alarm indicates a condition where the differential pressure between the high and low side of the refrigeration circuit becomes too low for proper oil lubrication in the inverter comperssor. This alarm occurs when the counter exceeds 3 events in a 45 min period. Alarm requires manual reset once corrective action is taken.
175 or 176	HiVCmpTmp 1: Problem or HiVCmpTmp 2: Problem	The HiVCmpTmp Problem alarm indicates a condition where the variable speed compressor exceeds its maximum temperature of 248F for 5 seconds. The alarm automatically resets after 100 min if the condition does not occur again.
180 or 181	VCmpTSnsr 1: Problem or VCmpTSnsr 2: Problem	The VCmpTSnsr Problem alarm indicates a condition where the compressor temp sensor is present and shorted. The alarm requires manual clearing after manually cleared.

Alarm Number	Alarm Display Name	Description			
185 or 186	VCmp1HiDSH: Problem or VCmp2HiDSH: Problem	The VCmp1HiDSH Problem alarm indicates a condition where the discharge super heat is detected and the compressor is forced to standby to prevent the variable speed compressor from operating under high motor, discharge port or oil temperature conditions. The alarm requires manual clearing.			
190 or 191	IFB1 Comm: Problem (VCmp1 & 2) or IFB2 Comm: Problem (VCmp3 & 4)	The IFB1 Comm Problem alarm indicates a condition where the HP switches are normal and the IFB comm module has a loss of communication. This alarm automatically clears when comms are re-established unless there are 5 occurrences in a 100 minute period.			
192	EFT/LCT Snsr: Problem (Control Type: ZTC, DTC or 1ZnVAV)	This alarm occurs when the Entering Fan Temperature/Leaving Coil Temperature sensor is present and either shorted or open circuited for longer than the Sensor Alarm Delay (Default = 30 seconds). When this alarm occurs the unit continues to operate however dehumidification operation is disabled until the sensor becomes reliable. The maximum DAT limit function associated with gas or electric heat is also disabled until the sensor becomes reliable.			
193	RAT Sensor: Problem (Control Type: ZTC, DTC or 1ZnVAV)	If the return air temperature sensor (RAT) is present and either shorted or open circuited for longer than the Sensor Alarm Delay (default is 30 seconds), the Return Air Sensor problem occurs. When the RAT Sensor problem occurs, the unit continues to operate with the following modifications: Cooling Reset and Heating Resets revert to None if they are set to Return and Control temperature Source reverts from return to space temperature if a space temperature is present and reliable. When the alarm condition is no longer present, the RAT sensor problem automatically clears.			
194	Space Sensor 1: Problem (Control Type: ZTC, DTC or 1ZnVAV)	If the space air temperature sensor (SAT) is present and either shorted or open circuited for longer than the Sensor Alarm Delay (default is 30 seconds), the Space Sensor problem occurs. When the SAT Sensor problem occurs, the unit continues to operate with the following modifications: Cooling Reset and Heating Resets revert			
195	Space Sensor 2: Problem (Control Type: ZTC, DTC or 1ZnVAV)	to None if they are set to Space and Control temperature Source reverts from Space to return temperature if a return temperature is present and reliable. When the alarm condition is no longer present, the Space sensor problem automatically clears.			
196	Space Sensor 3: Problem (Control Type: ZTC, DTC or 1ZnVAV)				
197	OAT Sensor: Problem	If the outside air temperature sensor (OAT) is present, a valid OAT value is not provided via the network and the local OAT sensor is either shorted or open circuited for longer than the Sensor Alarm Delay (default is 30 seconds), the Outside Air Sensor problem occurs. When the OAT Sensor problem occurs, the unit continues to operate with the following modifications: Heating is not locked out due to high OAT, Cooling is not locked out due to low OAT, Cooling Reset and Heating Reset revert to none if they are set to OAT and Economizer is locked out due to high OAT. When the alarm condition is no longer present, the OAT Sensor problem automatically clears			
198	Freeze: Problem (Control Type: ZTC, DTC or 1ZnVAV)	When a unit is equipped with chilled water, hot water, or steam coil, the Freeze problem occurs when the optional freezestat contacts open as a result of detecting an abnormally low water or steam coil temperature while the fans are off.			
		When the Freeze problem occurs, the controller opens the chilled water and heating valves, and sets a 10-minute timer. When the 10-minute timer expires, the controller checks the freezestat input again. If the freezestat contacts are closed the valves close. If the freezestat contacts are still open, the valves remain open, and the 10-minute timer resets. This continues while the unit remains off. Whenever the freezestat closes the Freeze problem automatically clears. This feature protects the coil(s) and allows the system to start normally when an occupied command is received.			
199	Heat Fail: Problem (Control Type: ZTC, DTC or 1ZnVAV)	When a unit is equipped with a Natural Gas or Propane Burner and the modulating burner Modbus status is Fault for 20 seconds. This automatically clears once communications are reestablished.			

Faults

Faults class alarms will cause the unit to shut down completely.

Table 61: Main Menu	\ Service Menus	\ Fault Alarms
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Alarm Number	Alarm Display Name	Description			
0	No Active Faults				
208	Airflow: Fault	The Airflow Fault occurs when the fan does not provide flow feedback after 5 start attempts. This requires a manual clear once corrective action has been taken.			
212	Lo Disch Temp: Fault	The Lo Disch Occurs If the unit is not in the operating state and the discharge air temperature is less than the Low Discharge Temperature Limit (Default = 40°F) for longer than 35 seconds and the supply fan has been on for longer than the LowDAT temperature alarm delay (Default = 6 minutes), the Low Discharge Air Temperature fault occurs. When the Low Discharge Air Temperature fault occurs, the unit is shut down. It remains shut down until the Low Discharge Air Temperature fault is manually cleared through the unit keypad or via a network signal.			
216	Hi Disch Temp: Fault	If the discharge air temperature is greater than the High Discharge Temperature Limit (Default = 170°F) and the supply fan has been on for longer than the Temperature Alarm Delay (Default = 35 seconds), the High Discharge Air Temperature fault occurs. When the High Discharge Air Temperature fault occurs, the unit is shut down. It remains shut down until the High Discharge Air Temperature fault is manually cleared through the unit keypad or via a network signal.			
220	Hi Return Tmp: Fault	If the return air temperature is greater than the Return Air Temperature Limit (Default = 120°F) and the supply fan has been on for longer than the temperature alarm delay (Default= 35 seconds), the High Return Air Temperature fault occurs. When the High Return Air Temperature fault occurs, the unit is shut down. It remains shut down until the High Return Air Temperature fault is manually cleared through the unit keypad or via a network signal.			
224	Duct Hi Limit: Fault	If the unit is variable air volume, the contacts of the duct high pressure limit control (DHL) open, and the unit state is not Off or Startup, the Duct High Limit fault occurs. When the Duct High Limit fault occurs, the unit is shut down. The unit remains shut down until the Duct High Limit fault is manually cleared through the unit keypad or via a network signal.			
228	Disch Tmp: Fault	If the discharge air temperature sensor (DAT) is open or short circuited for longer than the Sensor Alarm Delay (Default= 30 seconds), the Discharge Air Sensor fault occurs. When the Discharge Air Sensor fault occurs, the unit is shut down. It remains shut down until the Discharge Air Sensor fault is manually cleared through the unit keypad or via a networksignal.			
244	Control Temp: Fault	If the temperature sensor (ZNT1, RAT, OAT, MAT) selected as the control temperature source is not reliable for longer than the Sensor Alarm Delay (Default= 30 seconds), a Control Temperature Fault occurs. When the Control Temperature Fault occurs, the unit is shut down. It remains shut down until the Control Temperature Fault is manually cleared through the unit keypad or via a network signal.			
250	Emerg Stop: Fault	An Emergency Stop Fault will occur if either of the following conditions is true: Emergency Stop Input in the Alarm (Open) condition Or The Net Emrg Ovrd input is set to Off via a network signal or the keypad/display			
252	Freeze: Fault	When a unit is equipped with a waterside economizer, chilled water, hot water, or steam coil, the Freeze Fault occurs when the optional freezestat contacts open as a result of detecting an abnormally low water or steam coil temperature while the fans are running. When the Freeze fault occurs, the controller shuts down the fans, opens the chilled water, economizer, and heating valves and set a 10-minute timer. If the unit is equipped with a waterside economizer, the pump output is also turned on. When the 10-minute timer expires, the controller checks the freezestat input again. If the freezestat contacts are closed the pump output is de-energized and the valves close. If the freezestat contacts are still open the pump output remains energized, the valves remain open, and the 10-minute timer resets. This continues until the fault is manually cleared through the keypad or via a network signal			

Viewing Events

Event Log

Table 62: Main Menu \ Service Menus \ Events

Event Name	Description		
FanRetry_Event (Control Type: ZTC, DTC or 1ZnVAV)	Supply Fan Retry Active		
TenantOR_Event (Control Type: ZTC, DTC or 1ZnVAV)	Tenant Overridden Operation Active		
Passive Vent_Event	Passive Ventilation Sequence Active		
HPUL1_Event	Circuit 1 or 2 High Pressure Unloading Control Active		
HPUL2_Event			
LPUL1_Event	Circuit 1 or 2 Low Pressure Unloading Control Active		
LPUL2_Event			
HDLTUL1_Event	Circuit 1 or 2 High Discharge Line Temperature Unloading Control Active		
HDLTUL2_Event			
HiAmpUL1_Event	Circuit 1 or 2 High Current Unloading Control Active		
HiAmpUL1_Event			
ReqUL1_Event	Circuit 1 or 2 Unload Request Control Active		
ReqUL2_Event			
HCRUL1_Event	Circuit 1 or 2 High Compression Ratio Unloading Control Active		
HCRUL2_Event			
FinTUL1_Event	Circuit 1 or 2 High Fin Temperature Unloading Control Active		
FinTUL2_Event			
LDPUL1_Event	Circuit 1 or 2 Low Differential Pressure Unloading Control Active		
LDPUL2_Event			
Reheat Lmtg_Event	Reheat Compressor Limiting Control Active		
HPLmtg1_Event	Fixed Compressor Circuit 1 or 2 High Pressure Limiting Control Active		
HPLmtg2_Event			
LoVCmpTmpHld1_Event	Circuit 1 or 2 Low Variable Compressor Body Temperature Protection Active		
LoVCmpTmpHId2_Event			
LoSSH1_Event	Circuit 1 or 2 Low Suction Superheat Conditions Present.		
LoSSH2_Event	Suction superheat <5F for 60 minutes continuous.		
	Clear Issue when suction superheat > 8F for 15 minutes		
HiSSH1_Event	Circuit 1 or 2 High Suction Superheat Conditions Present		
HiSSH2_Event	Suction Superheat > 30F for 60 minutes continuous		
	Clear Issue when suction superheat <=25F for 15 minutes continuous		
LoSubClg1_Event	Circuit 1 or 2 Low Subcooling Conditions Present		
LoSubClg2_Event	Subcooling <1F for 60 minutes continuous		
	All Compressors in circuit operating		
	OA ambient >75F		
	Cooling mode only (does not apply to Dehum)		
	Clear issue when subcooling > 5F for 15 minutes continuously		

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Event Name	Description				
HiSubClg1_Event	Circuit 1 or 2 High Subcooling Conditions Present				
HiSubClg2_Event	Subcooling >25F for 60 minutes continuous.				
	All Compressors in circuit operating				
	OA Ambient >70F and <95F				
	Cooling mode only (does not apply to Dehum)				
	Clear issue when subcooling <20F for 15 minutes continuously.				
LoDSH1_Event	Circuit 1 or 2 Low Discharge Superheat Conditions Present.				
LoDSH2_Event	Discharge Superheat <20F for 60 minutes continuous				
	Clear issue when discharge Super heat > 20F for 15 min				
HiDSH1_Event	Circuit 1 or 2 High Discharge Superheat Conditions Present				
HiDSH2_Event	Discharge Superheat > 100F for 60 minutes continuous				
	Clear issue when discharge < 75F for 15 minutes				
LoTc1_Event	Circuit 1 or 2 Low Tc Conditions Present				
LoTc2_Event	Tc <77F Sat (225 psig) for 45 minutes continuous				
	Clear issue when Tc > 78F Sat (230 psig) for 15 min continuous.				
HiTc1_Event	Circuit 1 or 2 High Tc Conditions Present				
HiTc2_Event	Tc >140F Sat (540 psig) for 45 minutes continuous				
	OA ambient < 100F				
	Clear issue when Tc > 130F Sat (480 psig) for 15 min continuous.				
LoTe1_Event	Circuit 1 or 2 Low Te Conditions Present				
LoTe2_Event	Te< 30F Sat (99psig) for 45 minutes continuous				
	Clear issue when Te > 33F Sat (105 psig) for 15 minutes continuous.				
HiTe1_Event	Circuit 1 or 2 High Te Conditions Present				
HiTe2_Event	Te > 70F Sat (205 psig) and Tc Sat > 140F (540 psig) for 45 minutes continuous.				
	or				
	Te > 70F Sat (205 psig) and Tc <100F Sat (320 psig) for 45 minutes continuous.				
	or				
	Te > 80F Sat (238 psig) for 45 minutes continuous.				
	Clear issue when Te < 68F Sat (198 psig) for 15 minutes continuous.				
HiDRT1_Event	Circuit 1 High Discharge Refrigerant Temperature Conditions Present				
HiDRT2_Event	Discharge Temp > 275F for 30 minutes continuous				
	Clear issue when suction temp < 90F for 15 minutes continuous				
HiSRT1_Event	Circuit 1 High Suction Refrigerant Temperature Conditions Present				
HiSRT2_Event	Suction Temp > 95F for 45 minutes continuous				
	Clear issue when suction temp < 90F for 15 minutes.				

Standby Events

Table 63: Main Menu \ Service Menus \ Standby Events

Event Name	Description
HPSB_Event	CircState forced to standby by the High Pressure Unloading Control function
LPSB_Event	CircState forced to standby by the Low Pressure Unloading Control function
HDLTSB_Event	CircState forced to standby by the High Discharge Line Temperature Unloading Control function
LDPSB_Event	CircState forced to standby by the Low Differential Pressure Protection Unloading Control function
HiTSB_Event	CircState forced to standby by the Compressor Body High Temperature Protection function
OAFSB_Event	CircState forced to standby due to a fault detected by the outdoor fan VFD
VcmpReqSB_Event	CircState forced to standby due to a request from the variable compressor control board
VCmpPrbSB_Event	CircState forced to standby by the due to a fault detected by the variable compressor control
EVISyncSB_Event	CircState forced to standby by the expansion valve resynchronization function
LoDSHDsbl_Event	CircState forced to standby by the Low Discharge Superheat Protection function
HiDSHSB_Event	CircState forced to standby by the high discharge superheat protection function

Event Troubleshooting

Table 64: Main Menu \ Service Menus \ Event Troubleshooting

MT4 Event Name	Event Description	Possible Field Actions			
LoSSH1_Event	Low Suction Superheat	TXV adjustment	Low evap airflow	TXV Malfunction	
HiSubClg1_Event	High Suction Superheat	TXV adjustment	TXV Malfunction	Low charge	
LoDSH1_Event	Low Subcooling	Low charge	Dirty/fouled condenser coil	Condenser Fan motor issue	
HiDSH1 Event	High Subcooling	Overcharge			
LoDSH1_Event	Low Discharge superheat	TXV adjustment	TXV Malfunction		
HiDSH1_Event	High Discharge superheat	TXV adjustment	TXV Malfunction	Low charge	
LoTc1_Event	Low Condensing Temp	Condenser Fan Staging/ Modulation	Cond Splitter Solenoid Malfunction		
HiTc1_Event	High Condensing TempD	Dirty/fouled condenser coil	Cond Splitter Solenoid Malfunction	Condenser Fan motor issue	Overcharge
LoTe1_Event	Low Evaporator Temp	Dirty filter	Low load/Low RA Temp		
HiTe1_Event	High Evaporator Temp	High load/High RA Temp			
HiDRT1_Event	High Discharge Temp	Low charge	TXV Malfunction		
HiSRT1_Event	High Suction Temp	TXV adjustment	TXV Malfunction	Low charge	

Alarm/Event Configurations

Some **Alarm/Event Configurations** can be customized based on application. Several temperature limits can be adjusted and logging of alarms can be customized and captured to SD cards based on the configurations set in the Alarm Config Menu.

Table 65: Main Menu \ Service Menus \ Alarm/Event Config Menu

Menu Display Name	Default	Range	Description		
ALARM LIMITS					
Hi DAT Limit 170°F 90.0-250.0		90.0-250.0°F	Hi DAT Limit is a adjustable setpoint for the Hi Discharge air temperature limit alarm.		
Lo DAT Limit	40°F	-50.0-50.0°F	Lo DAT Limit is an adjustable setpoint for the Lo Discharge Air Temperature Limit alarm.		
Hi RAT Limit	120°F	90.0-150.0°F	Hi RAT Limit is an adjustable setpoint for the Hi Return Air Temperature Limit.		
ALARM OUT CONFIG					
Faults	Fast	On Off Fast Slow	Faults are conditions serious enough to shut down the unit operation. The alarm must be manually cleared to allow unit operation.		
Problems	Slow	On Off Fast Slow	Problems are conditions that result in some limitation of unit operation, but the unit is allowed to continue to operate. Some of these alarms must be cleared manually, but others clear automatically.		
Warnings	Off	On Off Fast Slow	Warnings Inform the user of conditions that should be addressed, but do not limit the operation in any way The alarm condition needs to fixed and the alarm must be manually cleared to cause this alarm to no longer be active.		
AlmLogToSD	No	No SI English	AlmLogToSD sets if the alarms are logged on the SD card.		
EVENT CONFIG					
Show Events	Yes	No Yes	Show Events is a flag that sets that we are seeing the events log.		
EventLogToSD	No	No SI English	EventLogToSD is the Flag that sets if the event log is saved to the SD Card.		
SNAPSHOT CONFIG					
SnaptshotsToSD	No	No SI English	SnaptshotsToSD is the Flag that sets if the snapshot log is saved to the SD Card.		

Data Snapshots

Data Snapshots will provide a means of recording certain unit operating conditions at the moment of an alarm or event occurrence. The MicroTech 4 controller is capable of capturing up to 10 snapshots (sets of data) each containing up to 25 data points for each alarm or event. "Data Set 1-5" on page 202 and "Data Set 6-10" on page 203 for data snapshots that are captured whenever any alarm or event becomes active.

MicroTech 4 Inputs/Outputs

The complete set of **Inputs and Outputs** that are possible on a MicroTech 4 are listed below. These vary by configuration and may or not be included on any given unit based on the features selected and shipped from the factory.

Main Control Board

Table 66: Main Control Board

Unive	ersal In	puts/O	Itputs					
#	DI	AI	DO	AO	Point	Comments		
X1				Х	Chilled Water Valve	2-10 VDC		
X2		Х			CO2/ExtOAReset	0-10VDC or 4-20 mA		
X3		Х			OA Humidity Sensor	4-20 mA		
X4		Х			Space Temperature Sensor 1	10K Thermistor (STD) SpaceTCfg: 1Sen, 2Sen, or 3 Sen		
X5		Х			Zone Setpoint	5 – 15 kOhm		
		Х			DAT Reset	0-10VDC/4-20mA		
X6		Х			SAF Duct Static Pressure	4-20mA		
X7		Х			Building Static Pressure (BPS)	4-20mA		
		Х			Return Air Fan Duct Static Pressure (RAFDPS)	4-20mA		
X8		Х			SAF Flow Input	0-10VDC or 4-20 mA		
X9		Х			Discharge Air Temperature	10K Thermistor (STD)		
X10		Х			Outdoor Air Temperature	10K Thermistor (STD)		
X11		Х			Entering Fan/Leaving Cooling Coil Temperature	10K Thermistor (STD) Unit must have Gas or electric heat; or have Reheat.		
Digit	al Input	s – Dry	Contac	cts				
DI1					Emergency Off (Fault/Normal)			
DI2					Fan Interlock Input	Dry Contact		
Digit	al Input	is – 24V						
DI3					RemoteSwitch (Stop/Start)			
DI4					Passive Ventilation Input			
Digit	al Input	s – 115	v		•			
DI5					DHL (Fault/Normal)			
DI6					Freezestat	Only used when equiped with F&BP, HW or Steam Heat		
Digit	al Oupi	ıts – Re	lay, SP	ST, No	rmally Open, 230VAC 3 Amp			
D01					Not Used			
DO2					Reheat Bleed Valve	Used with HGRH or MLSC		
DO3					Not Used			
DO4					Not Used			
DO5					Heat (On/Off)			
					Heat Stage 1			
DO6					Heat Stage 2			
D07					Heat Stage 3			
DO8					Heat Stage 4			
Digit	al Outp	uts – S	olid Sta	te Rela	ys, 24-230VAC, 0.5 Amp	1		
DO9					Alarm			
DO10					Auxiliary Output			
EEV	Drivers				1	1		
EV1					MHGRH Valve 1	Sporlan 3-Way Valve • 200 Steps/second • Bipolar • 6386 steps		
EV2					MHGRH Valve 2	160mA current No holding current 0 overdrive open steps 639 overdrive close steps DeadTimoSuge		

Expansion Module A I/O (POL965) (Main Control Panel)

POL96E module will be used when the unit is equipped with more than on modulating hot gas reheat valve. Otherwise POL965 will be used.

Univer	rsal Inp	uts/Ou	tputs			
#	DI	AI	DO	AO	Point	Comments
X1				Х	Heating Valve	2-10 VDC F&BP or HW or Steam
				Х	SCR	1-10 VDC
X2				Х	F&BP Damper	0-10 VDC
X3				Х	LSCRH Output	0-10 VDC
X4		Х			Space Humidity Sensor 1	0-10 VDC or 4-20 mA
X5		Х			Fitler Transducer 3 (Final Filter Section)	4-20 mA
X6		Х			Space Humidity Sensor 2	0-10 VDC or 4-20 mA
X7		Х			Space Temperature Sensor 2	10K Thermistor (STD)
X8		Х			Space Temperature Sensor 3	10K Thermistor (STD)
X9					Not Used	
X10					Not Used	
X11					Not Used	
X1 2					Not Used	
Digita	l Input -	- 115V	230V		•	
DI1					Filter Switch Input 2 (Final Filter Section)	
DI4					Not Used	
Digita	l Inputs	– Dry	Contact	ts		
DI1					Not Used	
DI2					Not Used	
DI3					Not Used	
Digita	l Outpu	ts – Re	elays, S	SPT, No	rmally Open, 230VAC 3 Amps	
D01					Preheat Heating Valve	Preheat Type = F&BP
DO2					Not Used	
DO3					Not Used	
DO4					Not Used	
Digita	l Outpu	ts – So	lid Stat	e Relay	s, 24-230VAC, 0.5 AMp	
DO5					Not Used	
DO6					Not Used	
EEV D	rivers					
EV1					MHGRH Valve 3	POL96E Sporlan 3-Way Valve
					Unit Size >95	 200 Steps/second Bipolar 6386 steps 160mA current No holding current 0 overdrive open steps 630 overdrive steps DeadTimeSync
EV2					Not Used	

Expansion Module B I/O (POL965) (Main Control Panel)

Expansion Module B is designated for the field configurable I/O option which allows for field added sensors or inputs and Outputs to be read by the MicroTech 4 and displayed to the Building Automation System. Outputs can be written through the BAS to a third party device. Outputs can be analog 0-10V or 0-20.0mA and can be used to modulate field/BAS controlled devices.

Table 68: Expansion Module B I/O

Universal Inputs/Outputs								
#	DI	Al	DO	AO	Point	Comments		
X1	Х	Х		Х	Configurable Input 1	Configurable I/O points to one of the following:		
X2	Х	Х		Х	Configurable Input 2	 DI – Open/Close 		
X3	Х	Х		Х	Configurable Input 3	 AI – 0-10VDC or 4-20mA AO – 0.40VDC or 3.20mA 		
X4	Х	Х		Х	Configurable Input 4	 AU = 0-10VDC or 0-20MA NTC = 10kobm Type2 (-50 to 250°E) 		
X5	Х	Х		Х	Configurable Input 5			
X6	Х	Х		Х	Configurable Input 6			
X7	Х	Х		Х	Configurable Input 7			
X8	Х	Х		Х	Configurable Input 8			
X9					Not Used			
X10					Not Used			
X11					Not Used			
X1 2					Not Used			
Digital	Input -	- 115V-2	230V					
DI1					Not Used			
DI4					Not Used			
Digital Inputs – Dry Contacts				S				
DI1	DI1				Not Used			
DI2	DI2				Not Used			
DI3	DI3				Not Used			
Digital	Digital Outputs – Relays, SSPT, Normally Open, 230VAC 3 Amps							
DO1					SAF VFD On/Off			
DO2					RF/EFF VFD On/Off			
DO3					Not Used			
DO4	DO4				Not Used			
Digital Outputs – Solid State Relays, 24-230VAC, 0.5 AMp								
DO5					Not Used			
DO6					Not Used			

Expansion Module J I/O (POL965)

Expansion Module J is only present if a special scenario has been provided for SAF or RFEF VFD controlled fans.

Table 69: Expansion Module J I/O

Univer	Universal Inputs/Outputs								
#	DI	AI	DO	AO	Point	Comments			
X1				Х	SAF Capacity Command	0-10VDC			
						SAFType= Analog			
X2		Х			SAF Capacity Feedback	0-10VDC or 4-20mA fro VFD			
						SAFType= Analog			
				Х	RFEF Capacity Command	0-10VDC			
	ļ					RFEF Type = Analog			
X4		X			RFEF Capacity Feedback	0-10VDC or 4-20mA fro VFD			
						RFEF Type = Analog			
X5	X				SAF Status Input (Fault/OK)	Digital Input from VFD			
VC	V					SAFT Type= Analog			
X6	X				(Fault/OK)	Digital Input from VFD REFE Type = Analog			
¥7					Net Used	Ri El Type - Allalog			
×9					Not Used				
 	+				Net Lloed				
7.5 V10					Net Lloed				
×10					Not Used				
×12					Net land				
NIZ					Not Used				
DI	Digital input – 115V-250V				NotUsed				
DIA					Net Used				
Digita	Digital Inputa Dry Contacta				Not Used				
Digital inputs – Dry Contacts			contact		NotUsed				
					Not Used				
DI2					Not Used				
Digita	Digital Outpute Delaye SSDT Normally Open 230V/AC 3 Ames								
Digita	routpu	10 110	iayo, o.	, 1, 10					
DO1					SAF VFD On/Off				
DO2					RF/EFF VFD On/Off				
DO3					Not Used				
DO4	DO4				Not Used				
Digita	l Outpu	ts – So	lid State	e Relay	s, 24-230VAC, 0.5 AMp				
D05					Not Used				
DO6					Not Used				

Model Expansion Module C I/O (POL965) – Refrigeration Circuit 1

Expansion Module C is I/O dedicated for Circuit 1 Refrigeration and is present on units with fixed speed compressors on Circuit 1.

Table 70: Expansion Module C I/O

Unive	sal Inp	uts/Ou	tputs			
#	DI	Al	DO	AO	Point	Comments
X1		х			Suction Refrigerant Pressure 1	0.5-4.5VDC 0-350psi
X2		х			Discharge Refrigerant Pressure 1	0.5-4.5VDC 0-700psi
X3		Х			Discharge Line Temperature 1	10K Thermistor
X4		х			Circuit 1 Suction Refrigerant Temperature	10K Thermistor
X5	Х				LP1 (Low Pressure 1)	Dry Contact
X6		х			Liquid Line Refrigerant Temperature 1	10K Thermistor (STD)
X7				Х	Electronic HGBP 1	0-10 VDC
X8				Х	DX Bypass Damper	0-10 VDC
X9					Not Used	
X10					Not Used	
X11					Not Used	
X1 2					Not Used	
Digita	l Input ·	- 115V	-230V			
DI1					HP1 (High Pressure 1)	FixedComps>0
DI4					Not Used	
Digita	l Inputs	– Dry	Contact	ts		
DI1					Not Used	
DI2					Not Used	
DI3					Not Used	
Digita	l Outpu	ts – Re	elays, S	SPT, No	ormally Open, 230VAC 3 Amps	
DO1					FCmp1SSOut	Compressor 1 <u>FixedComps</u> >0
DO2					FCmp3SSOut	Compressor 3 FixedComps>2
DO3					FCmp5SSOut	Compressor 5 FixedComps>4
DO4					Cond Solenoid 1	
Digita	l Outpu	ts – So	olid Stat	e Relay	s, 24-230VAC, 0.5 AMp	
DO5					Circuit 1 (OAFan1SSOut)	
DO6					Circuit 1 (OAFan2SSOut)	
EEV D	rivers					
EV1					Not Used	
EV2					Not Used	
Model Expansion Module D I/O (POL965) – Refrigeration Circuit 2

Expansion Module D is I/O dedicated for Circuit 2 Refrigeration and is present on units with fixed speed compressors on Circuit 2.

Table 71: Expansion Module D I/O

Univer	sal Inp	uts/Ou	tputs			
#	DI	AI	DO	AO	Point	Comments
X1		Х			Suction Refrigerant Pressure 2	0.5-4.5VDC
2/2						
X2		X			Discharge Refrigerant Pressure 2	0.5-4.5VDC 0-700psi
X3		Х			Discharge Line Temperature 2	10K Thermistor
X4		х			Circuit 2 Suction Refrigerant Temperature	10K Thermistor
X5	Х				LP1 (Low Pressure 2)	Dry Contact
X6		х			Liquid Line Refrigerant Temperature 2	10K Thermistor (STD)
X7				Х	Electronic HGBP 2	0-10 VDC
X8					Not Used	
X9					Not Used	
X10					Not Used	
X11					Not Used	
X1 2					Not Used	
Digita	I Input -	- 115V	230V			
DI1					HP1 (High Pressure 2)	FixedComps>0
DI4					Not Used	
Digita	l Inputs	– Dry	Contact	ts		
DI1					Not Used	
DI2					Not Used	
DI3					Not Used	
Digita	l Outpu	ts – Re	elays, S	SPT, No	rmally Open, 230VAC 3 Amps	
DO1					FCmp2SSOut	Compressor 2 FixedComps>0
DO2					FCmp4SSOut	Compressor 4 FixedComps>2
DO3					FCmp6SSOut	Compressor 6 FixedComps>4
DO4					Cond Solenoid 2	
Digita	l Outpu	ts – So	lid Stat	e Relay	s, 24-230VAC, 0.5 AMp	
DO5					Circuit 2 (C2OAFan1SSOut)	
DO6					Circuit 2 (C2OAFan2SSOut)	
EEV D	rivers				· · · ·	
EV1					Not Used	
EV2					Not Used	
	-					

Model Expansion Module E I/O (POL96E) – Refrigeration Circuit 1 Variable Speed

Expansion Module E is I/O dedicated for Circuit 1 Refrigeration and is present on units with variable speed compressors on Circuit 1.

Table 72: Expansion Module E I/O

Univer	Universal Inputs/Outputs					
#	DI	AI	DO	AO	Point	Comments
X1		Х			Suction Refrigerant Pressure 1	0.5-4.5VDC 0-350psi
X2		х			Discharge Refrigerant Pressure 1	0.5-4.5VDC 0-700psi
X3		х			VFD Compressor 1 Discharge Line Temperature	10K Thermistor (STD)
X4		Х			VFD Compressor 1 Suction Refrigerant Temperature	10K Thermistor
X5					Not Used	
X6		Х			Liquid Line Refrigerant Temperature 1	10K Thermistor (STD)
X7		Х			VCmp 1 Body Temperature	10K Thermistor (STD)
X8				Х	DX Bypass Damper	0-10 VDC
X9					Not Used	
X10					Not Used	
X11					Not Used	
X12					Not Used	
Digita	Input -	- 115V-	230V		•	•
DI1					High Pressure 1 (High/Normal)	
DI4					Not Used	
Digita	Inputs	– Dry (Contact	ts		
DI1					Not Used	
DI2					Not Used	
DI3					Not Used	
Digita	Outpu	ts – Re	lays, S	SPT, No	rmally Open, 230VAC 3 Amps	1
DO1					VCmp1 Board Enable	
DO2					Cmp3SSOut	Compressor 3
DO3					CCH1	
DO4					Cond Solenoid 1	
Digita	Outpu	ts – So	lid Stat	e Relay	s, 24-230VAC, 0.5 AMp	1
DO5					Not Used	
DO6					Not Used	
EEV D	rivers				l	1
EV1					EVI1 Circuit 1	POL96E
						Danfoss Valve
						 300 step/sec
						Bipolar
						Zb25 steps OvrDnrCl=263 steps
						OvrDrvOn=203 steps OvrDrvOn=0 steps
						Current=115mA
						 HoldCurrent=50
EV2					Not Used	

Model Expansion Module F I/O (POL96E) – Refrigeration Circuit 2 Variable Speed

Expansion Module F is I/O dedicated for Circuit 2 Refrigeration and is present on units with variable speed compressors on Circuit 2.

Table 73: Expansion Module F I/O

Unive	rsal Inp	uts/Out	tputs			
#	DI	AI	DO	AO	Point	Comments
X1		Х			Suction Refrigerant Pressure 2	0.5-4.5VDC 0-350psi
X2		Х			Discharge Refrigerant Pressure 2	0.5-4.5VDC 0-700psi
X3		Х			VFD Compressor 2 Discharge Line Temperature	10K Thermistor (STD)
X4		Х			VFD Compressor 2 Suction Refrigerant Temperature	10K Thermistor
X5					Not Used	
X6		Х			Liquid Line Refrigerant Temperature 2	10K Thermistor (STD)
X7		Х			VCmp 2 Body Temperature	10K Thermistor (STD)
X8					Not Used	
X9					Not Used	
X10					Not Used	
X11					Not Used	
X12					Not Used	
Digita	I Input	- 115V-	230V	1		1
DI1					High Pressure 2 (High/Normal)	
DI4					Not Used	
Digita	I Inputs	s – Dry (Contact	ts		
DI1					Not Used	
DI2					Not Used	
DI3					Not Used	
Digita	l Outpu	ıts – Re	lays, S	SPT, No	ormally Open, 230VAC 3 Amps	
D01					VCmp2 Board Enable	
DO2					Cmp4SSOut	Compressor 3
DO3					CCH2	
DO4					Cond Solenoid 2	
Digita	l Outpu	its – So	lid Stat	e Relay	s, 24-230VAC, 0.5 Amps	
D05					Not Used	
DO6					Not Used	
EEV D)rivers					•
EV1					EVI1 Circuit 2	POL96E Danfoss Valve 300 step/sec Bipolar 2625 steps OvrDrvCl=263 steps OvrDrvOp=0 steps Current=115mA HoldCurrent=50
EV2					Not Used	

Expansion Module H I/O (POL965) – Return Section Controls

Expansion Module H contains the Return Section Control Panel I/O. All units will have an Expansion module H.

Table 74: Expansion Module H I/O

Unive	Universal Inputs/Outputs						
#	DI	AI	DO	A0	Point	Comments	
X1		Х			OAFlow Input	0-10VDC or 4-20 mA	
X2	Х				Filter Switch Input 1 (Main Filter Section)	Dry Contacts	
X3		Х			Return Air Temperature	10K Thermistor (STD)	
X4					Not Used		
X5				Х	OA Damper	0-10 VDC	
X6		Х			Not Used		
X7					Not Used		
X8		Х			RA Humidity Sensor	4-20 mA	
Digita	al Input -	- 115V-2	230V				
DI1					OADPosSw (Open/Closed)		
Digita	al Outpu	ts – Rel	lays, S	SPT, No	ormally Open, 230VAC 3 Amps		
DO1					Positive Rel Damper Closure		
D02					Not Used		
DO3	DO3				Not Used		
DO4	DO4				Not Used		
Digita	al Outpu	ts – Sol	lid Stat	e Relay	s, 24-230VAC, 0.5 Amp		
D05					Not Used		
DO6					Not Used		

Model Expansion Module I I/O (POL965 or POL96U) – Return Section Controls

Expansion Module I I/O contains the I/O for energy recovery and premium options like electronic filter monitoring pressure transducers or exhaust fan flow measuring;

Table 75: Expansion Module I I/O

Univers	Universal Inputs/Outputs						
#	DI	AI	DO	AO	Point	Comments	
X1		х			Supply Air Temp Leaving Wheel (ER_LWT)	10K Thermistor (STD)	
X2		Х			Exhaust Air Temp Exiting Wheel (ER_EWT)	10K Thermistor (STD)	
X3				Х	Relief Dampers	0-10 VDC	
X3				Х	Energy Recovery Wheel Command	0-10VDC	
X4		Х			Exhaust Air Plenum Static Pressure	4-20mA	
X 5		Х			Filter Transducer 1 (Main Filter Section)	4-20mA	
X 6		Х			Filter Transducer 2 (Main Filter Section)	4-20mA	
Χ7				Х	Energy Recovery SCR Preheat	1-10VDC	
X 8		Х			RFEF Flow Input	0-10VDC or 4-20 mA	
X9					Not Used		
X10					Not Used		
X11							
X12							
Digital	Input –	- 115V-3	230V				
DI1					Not Used		
DI4					Not Used		
Digital	Input -	- 115V-3	230V				
DI1					Not Used		
DI2					Not Used		
DI3					Not Used		
Digital	Output	ts – Re	lays, SS	SPT, No	rmally Open, 230VAC 3 Amps		
DO1					Energy Recovery Wheel On/Off	Energy Recovery	
DO2							
DO3					Bypass Damper Closed	Energy Recovery	
DO4					Bypass Damper Open	Energy Recovery	
Digital	Output	ts – So	lid State	e Relay	s, 24-230VAC, 0.5 Amp		
DO5					Not Used		
DO6					Not Used		
EEV D	rivers						
EV1					Not Used		
EV2					Not Used		

Universal I/O, Digital Input Status, Digital Output Status

Menu Display Name	Default	Range	Description				
Menu Display Name	Default	Range	Description				
UNIVERSAL I/O S	UNIVERSAL I/O STATUS: MCB, EMA, EMB, EMC, EMD, EME, EMF, EMG, EMH, EMI, EMJ						
X1X12	-	0-9999999	Displays the current I/O reading for each I/O				
DIGITAL INPUT ST	ATUS: MCB, E	EMA, EMB, EMC, EMD, EME,	EMF, EMG, EMH, EMI, EMJ				
DI1DI6	Off	Off	Displays the current Digital Input status for each DI point				
		On					
DIGITAL OUTPUT STATUS: MCB, EMA, EMB, EMC, EMD, EME, EMF, EMG, EMH, EMI, EMJ							
DO1DO6	Off	Off	Displays the current Digital Output status for each DO point				
		On					

Table 76: Main Menu \ Service Menus \ Digital Input/Output Status

Network Input Status

Table 77:	Main Men	I \ Service	Menus	\ Network	Input Status
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Menu Display Name	Default	Range
Menu Display Name	Default	Range
Net OAT In	-	-50.0-200.0°F (621.8°F)
Net SpaceT In	-	-0.0-150.0°F
		(621.8°F)
NetCurrState	-	Occ
		Unocc
		TntOvrd
		Standby
		NUL
NetNextState	-	Occ
		Unocc
		TntOvrd
		Standby
		NUL
NetTmToNxtSt	-	0-65534min
		(65535min)
Net App Mode	-	Off
		HeatOnly
		CoolOnly
		FanOnly
		Auto
		NA
Net CI Ena S	-	-1.0-1.0
		(-1.0)
Net CI Ena V	-	0-255%
		(255%)



Menu Display Name	Default	Range
Net HT Ena S	-	-1.0-1.0
		(-1.0)
Net Ht Ena V	-	0-255%
		(255%)
Net Ec Ena S	-	-1.0-1.0
		(-1.0)
Net Ec Ena V	-	0-255%
		(255%)
Net SAF Cap	-	0-100%
		(164%)
Net RFEF Cap	-	0-100%
		(164%)
Net Space PPM	-	0-5000ppm
		(65535ppm)
Net Rel Humid	-	0-100%
		(164%)
Net DATCIg Spt	-	40.0-100.0°F
Net DATHtgSpt	-	40.0-140.0°F
NetLCTSpt	-	45.0-65.0°F
NetDXBPLCTSpt	-	45.0-65.0°F
NetDemandShed	-	Inactive
		Auto
		Manual
nviSetpoint	-	0.0-100.0°F
		(621.8°F)
NetOccManCmd	-	Occ
		Unocc
		TntOvrd
		Standby
		Auto
Net Min OA	-	0-100%
nvoEffSpt	-	0.0-100.0°F
nciOccClgSpt	-	0.0-100.0°F
nciOccHtgSpt	-	0.0-100.0°F
nciHVACType	-	Generic FanCoil VAV Hpump RTU UV ChilCeil Rad AHU SCU

Modbus Status

Table 78: Main Menu \ Service Menus \ Modbus Status

Menu Display Name	Default	Range	Description
SAF1 MB Status	-	Fault OK	SAF1 MB Status is a status only item that displays the current Modbus Device Status
SAF2 MB Status	-	Fault OK	SAF2 MB Status is a status only item that displays the current Modbus Device Status
SAF3 MB Status	-	Fault OK	SAF3 MB Status is a status only item that displays the current Modbus Device Status
SAF4 MB Status	-	Fault OK	SAF4 MB Status is a status only item that displays the current Modbus Device Status
RFEF1 MB Status	-	Fault OK	RFEF1 MB Status is a status only item that displays the current Modbus Device Status
RFEF2 MB Status	-	Fault OK	RFEF2 MB Status is a status only item that displays the current Modbus Device Status
RFEF3 MB Status	-	Fault OK	RFEF3 MB Status is a status only item that displays the current Modbus Device Status
RFEF4 MB Status	-	Fault OK	RFEF4 MB Status is a status only item that displays the current Modbus Device Status
ER MB Status	-	Fault OK	ER MB Status is a status only item that displays the current Modbus Device Status
OAF1 MB Status	-	Fault OK	OAF1 MB Status is a status only item that displays the current Modbus Device Status
OAF2 MB Status	-	Fault OK	OAF2 MB Status is a status only item that displays the current Modbus Device Status
MGas MB Status	-	Fault OK	MGas MB Status is a status only item that displays the current Modbus Device Status
VCmp1 MB Status	-	Fault OK	VCmp1 MB Status is a status only item that displays the current Modbus Device Status
VCmp2 MB Status	-	Fault OK	VCmp2 MB Status is a status only item that displays the current Modbus Device Status
PwrMtrMBStatus	-	No Com Comm	PwrMtrMBStatus is a status only item that displays the current Modbus Device Status
MB Resistance	-	No Pol1 Pol2 Pol12 Term2 T2P1 T2P2 T2P1P2	MB Resistance is a status only item that displays the current MB Resistance State
DefaultECMSts	-	Fault OK	DefaultECMSts is a status only item that displays the current Modbus Device Status



Menu Display Name	Default	Range	Description
ECM Chg From	Default	Default	ECM Chg From is an adjustable item that sets which master
		SAFM1	fan address will be changed from during the field addressing
		SAFM2	
		SAFM3	
		SAFM4	
		RFEFM1	
		RFEFM2	
		RFEFM3	
		RFEFM4	
ECM Chg To	Default	Default	ECM Chg To is an adjustable item that sets which master fan
		SAFM1	address will be changed to during the field addressing process
		SAFM2	
		SAFM3	
		SAFM4	
		RFEFM1	
		RFEFM2	
		RFEFM3	
		RFEFM4	
ECM Cfg	Done	Done	ECM Cfg is an adjustable item that applys an ECM Master
		ApplChg	Address configuration change.

Unit Configuration

🖄 WARNING

Operational settings should only be made with the advisement of a qualified person; changing key configurations away from factory settings may result in damage equipment or surrounding property. Recommended settings may vary based on application specific requirements.

Unit Configuration String

After the main control board application software is loaded into the MCB, it must be "configured" for the specific control application. This consists of setting the value of 30 configuration variables within the MCB. These variables define things such as the type of cooling, number of compressors, cooling stages, and the type of heat. If all of these items are not set appropriately for the specific unit, the unit will not function properly. The correct settings for these parameters are defined for a given unit by the unit "Software Configuration Code." The "Software Configuration Code" consists of a 30-character string of numbers and letters. The code can be found on the unit software Identification label located on the back side of the control panel door.

The table below lists the configuration code variables, including the position within the code, description of the parameter, and the applicable settings for each. The default values are shown in bold font. The unit is configurated at the factory however may also be configured in the field by accessing the **Unit Configuration** menu. Once changes have been made to the Unit Configuration menu, the Apply Changes flag must be changed from no to yes in order for the controller to recognize the changes. Setting the Apply Changes Flag to Yes will automatically reset the controller.

Configuration Code Position	Description	Values (Default in Bold)	Notes
1	Control Type	0= Zone Temperature Control (ZTC)	
		1= Discharge Temperature Control (DTC)	
		2= Single Zone VAV Control (1ZnVAV)	
		3= Refrigeration Only Control (RefOnly)	
2	Fixed Compressors	0-6	The number of fixed compressors on the unit
3	Variable Compressors		The number of variable compressors on the unit.
4	Cooling Circuits	0-4	The number of cooling circuits on the unit.
5	OAFanCfg	0=None	The Type of Condenser Fan Control The unit is
		1=OnOffT	equipped for.
		2= OnOffP	
		3=VarVFD	
		4=VarECM1	
		5=VarECM2	
6	Damper Type	0=None	The Type of Outdoor Air Damper on the
		1=Single Position 0-30% (30OA)	equipment.
		2=Single Position 100% (100OA)	
		3=Modulating Economizer Airside (Econ)	
		4= Modulating Economizer Airside with FDD (EconFDD)	

Table 79: Main Menu \ Service Menus \ Modbus Status

Configuration Code Position	Description	Values (Default in Bold)	Notes
7	Heating Type	0=None 1=F&BP Control (F&BP) 2=Steam or Hot Water (HW_Stm) 3=Modulated Gas, 200 5-1 (L200) 4=Modulated Gas, 400 5-1 (L400) 5=Modulated Gas, 600 5-1 (L600) 6=Modulated Gas, 600 10-1 (H400) 7=Modulated Gas, 600 10-1 (H600) 8=Modulated Gas, 800 10-1 (L800) 9=Modulated Gas, 1200 10-1 (L1200) A=Modulated Gas, 1200 20-1 (H1200) C=2 Stage Electric (2StgE) D=2 Stage Gas, 2/400 (S2/400) E=4 Stage Electric (4StgE) F=4 Stage Gas, 600 (S600) G=SCR Electric (SCR)	The Type of Heat the unit is equipped for.
8,9,10	Max Heat Rise	Three Digits (Default = 100, Range 0-100))	Temperature rise of the heat configuration. Do not change.
11	SAFType	0=Analog (Anlg) 1= 1 ECM Modbus Fan (1ECMMB) 2= 2 ECM Modbus Fans (2ECMMB) 3= 3 ECM Modbus Fans (3ECMMB) 4= 4 ECM Modbus Fans (4ECMMB)	The quantity of Master VFD or ECM Supply Fans in the unit
12	RFEFType	0=None 1=RF Analog (RFAnlg) 2=EF Analog (EFAnlg) 3= 1 ECM Modbus Return Fan (1ECMRF) 4= 2 ECM Modbus Return Fans (2ECMRF) 5= 3 ECM Modbus Return Fans (3ECMRF) 6= 4 ECM Modbus Return Fans (4ECMRF) 7= 1 ECM Modbus Exhaust Fans (4ECMEF) 8= 2 ECM Modbus Exhaust Fans (2ECMEF) 9= 3 ECM Modbus Exhaust Fans (3ECMEF) A= 4 ECM Modbus Exhaust Fans (4ECMEF) B= Return Fan VFD Modbus (RFVFD) C= Exhaust Fan VFD Modbus (EFVFD)	The quantity of Master VFD or ECM Return or Exhaust Fans in the unit
13	ER Config	0=None 1=Constant Speed Wheel (CS) 2=Constant Speed Wheel w/ RH (CSRH) 3=1 ECM Modbus (1ECM) 4=2 ECM Modbus (2ECM) 5=VFD Modbus (VFD) 6=Analog (Anlg)	The energy recovery configuration in the unit.

Configuration Code Position	Description	Values (Default in Bold)	Notes
14	Reheat Type	0=None 1=Primary Heat Reheat (PriHtg) 2=Primary Heat Reheat w/DXBP (PriHtBP) 3=Modulating Hot Gas (MHG) 4=Modulating Hot Gas w/DXBP (MHGBP) 5=Modulating Hot Gas & Liquid Subcooling Reheat (HG_LSC) 6=Modulating Hot Gas & Liquid Subcooling Reheat w/DXBP(HGLSCBP) 7=DX Bypass Only (DXBP) 8=Modulating Liquid Subcooling Reheat (MLSC)	The type of reheat the unit is equipped with. Note: Config 1 requires a modulating primary heat source. Configuration 4 and 6 require OA Damper Type to be equal to 2
15	ExtOA Input	0=None 1=ExtVDC 2=ExtmA 3=CO2VDC 4=CO2mA 5=CO2QMX+	The ExtOA Input sets the Source Type for the External OA Damper Reset which is either a external signal, CO2 Sensor or a Network CO2 Sensor (QMX+)
16	OA Flow Input	0=None 1=VDC 2=mA	The OA Flow Input sets the single received for the OA Flow Measuring Station
17	SA Flow Input	0=None 1=1Fan 2=2Fan 3=3Fan 4=4Fan 5=6Fan 6=8Fan 7=9Fan 8=12Fan 9=16Fan	The SA Flow Input sets the quantity of Fans used with supply fan air flow measuing.
18	RFEF Flow Input	0=None 1=1Fan 2=2Fan	The RFEF Flow Input sets the quantity of Fans used with Return Fan or Exhaust fan air flow measuing.
19	StaticPCfg	SAFSPS:RFEFSPS 0=NA:NA 1=DSP:NA 2=DSP:DSP 3=DSP:BSP 4=BSP:NA 5=NA:DSP 6=NA:BSP	StaticPCfg sets the quantity and type of static pressure sensors the unit is equipped with for purposes of supply and exhaust or return fan control.

Configuration Code Position	Description	Values (Default in Bold)	Notes	
20	SpaceTConfig	0=None	SpaceT Config sets the quantity and type	
		1=1 Sensors (1AI)	of space temperature sensors the unit is configured to use	
		2=2 Sensors (2AI)	configured to doc.	
		3=3 Sensors (3AI)		
		4=1 Sensors Space Temp Only (1QMXS)		
		5=2 Sensors Space Temp Only (2QMXS)		
		6=3 Sensors Space Temp Only (3QMXS)		
		7=1 Sensors Space/Hum/CO2 (1QMX+)		
		8=2 Sensors Space/Hum/CO2 (2QMX+)		
		9=3 Sensors Space/Hum/CO2 (3QMX+)		
21,22,23	Unit Size	Three digits (default 050, Range 0-999)	The unit model size.	
24	MonitorPkgs	0=None	Monitor Pkgs indicates which monitoring	
		1=Refrig System Only (RefSys)	sensors the unit has been equipped with.	
		2=Power Monitor (Pwr)		
		3=Refrig System and Power Monitor (Ref&Pwr)		
25	EHGBPCfg	0=None	EHGBPCfg shows which circuits have an	
		1=Circ12	electronically controlled Hot Gas Bypass Valve.	
		2=Circ1		
		3=Circ2		
26	Refrig Type	0=None	The Type of Refrigerant the unit is shipped with	
		1=R410A		
27	Unit Voltage	0=208/60Hz	The Voltage of the equipment	
	_	1=230/60Hz		
		2=460/60Hz		
		3=575/60Hz		
28	Preheat Type	0=None	The type of heat mounted in the preheat	
		1=HW_Stm	position; upstream of the cooling coil.	
		2=F&BP		
29	Not Used			
30	Not Used			

Unit Set-Up

Rapid Start Operation

The user may elect to initiate a **Rapid Start** sequence at unit power up by setting the rapid start flag to Yes. When this flag is set to Yes, the Rapid Start timer and Service Timer is set to 10 min whenever the power is reset to the controller. When the service timer is not zero, the times for the Cooling Stage Time, Heating Stage Time, Start Initial Time, Recirculation Time, and ZeroOATime are set to the Service time value (SrvcTime Inc = default 30s) instead of running through the normal values. This allows the unit to be run thorugh its operating states without having to wait for the normal time delays to expire. These times revert to the standard values when the Service Timer Count Down is zero.

Table	80·	Main	Menu	\ Advanced	Menu	Unit	Set-Un
lable	00.	mann	menu	Auvanceu	menu	Unit	361-0p

Menu Display Name	Default	Range	Description
Rapid Start	No	No Yes	Rapid Start is an adjustable item that allows the user to select to initate a rapid startup sequence at unit power up
Rapid Start Tm	10min	0-20 min	Rapid Start Tm is an adjustable item that allows the user to set the Rapid Start timing whenever the power is reset to the controller and the controller finishes its startup sequence.
Aux Out Cfg	FanOp	FanOp VAVBox	Aux Out Cfg is an adjustable item that defines the functional it of the digital output (DO10) on the main control board. The output is either a supply fan operation output indication or a VAV box signal depending on how this parameter is set.

Advanced Timers

WARNING Operational settings should only be made with the advisement of a qualified person; changing key configurations away from factory settings may result in damage equipment or surrounding property. Recommended settings may vary based on application specific requirements.

Table	81:	Main	Menu	\ Advanced	Menu	\ Advanced	Timers
	• • • •				mona		

Menu Display Name	Default	Range	Description
Pwd Timeout	10min	3-30min	Pwd Timeout is an adjustable item that sets the amount of time in minutes that the controller will allow access to applicable menus without re-entering the necessary password. If the keypad display remains idle for this time period the display will revert to the "main menu" requiring a re-entering of the password.
Airflow Ign	120s	0-999s	Air Flw Ign is an adjustable item that sets the amount of time the air proving signal from the fans is ignored after the supply fan is started.
GasHtWrmupTm	60s	0-999s	GasHtWmupTim is an adjustable item which is used to set the amount of time the gas burner will remain at a low fire position on 100% OA units.
HtgHldPeriod	240s	0-999s	HtgHldPeriod is an adjustable item which is used to set the amount of time the gas heating valve remains at its calculated value on units equipped as 100% OA (default 240s). This is to allow the temperature to approach equilibrium with the modulating gas heating valve at a fixed position.



Menu Display Name	Default	Range	Description	
Srvc Time Inc	30s	30-300s	Srvc Time Inc is an adjustable item used to set the internal stage time delay when the Aux is not zero, the times listed below are to set to the Service Time (Default = 30s) instead of the normal values.	
			Cooling Stage Timer	
			Heating Stage Timer	
			• Start Initial Timer	
			Recirculation	
			• Zero OA Timer	
OffHtClDelay	120s	0-999s	OffHtClDelay is an adjustable item that sets a delay in turning off the supply air fan when the unit is shut off while cooling or heating operation is active.	
MinExStartTm	120s	60-300s	MinExStartTm is an adjustable item that sets the minimum exhaust fan on time (Default = 120 seconds)	
MinExStopTm	120s	60-300s	MinExStopTm is an adjustable item that sets the minimum exhaust fan stop time (Default = 120 seconds).	
ERWhI Stg Tm	5min	1-100min	ERWhI Stg Tm is an adjustable item used to set a minimum tim period for operating at either the minimum or maximum speed before action is taken to change speed during the frost protect mode of operation.	
ERWhl Off Tm	20min	1-100min	ERWhI Off Tm is an adjustable item used to set the minimum amount of time the energy wheel will remain off after being turned off due to a frosting/condensation condition.	
SAF Ctrl Dly	60s	60-300s	SAF Ctrl Dly is an adjustable item that sets the duration of time that the minimum speed signal is sent to the variable speed supply air fan after the supply fan is started via a modbus or digital output. Control reverts to either duct pressure or speed after the fan has been on for the SAF CtrlDelay (default 30 seconds)	
RFEF Ctrl Dly	60s	60-300s	RFEF Ctrl Dly is an adjustable item that sets the duration of time that the minimum speed signal is sent to the variable speed return or exhust air fan after the return or exhaust fan is started via a modbus or digital output. Control reverts to either duct pressure or speed after the fan has been on for the SAF CtrlDelay (default 30 seconds)	
Frz Delay Tm	30s	0-180s	Frz Delay Tm is an adjustable item that is used to set the freeze alarm delay time.	
LP Delay	2s	0-10s	LP Delay is an adjustable item used to set the low pressure switch delay time.	
LP Comp Delay	5s	0-60s	LP Comp Delay is an adjustable item that is used to set the low pressure compressor delay time.	
Sens Alm Dly	30s	0-300s	Sens Alm Dly is an adjustable item that is used to set the sensor alarm delay time	
Tmp Alm Dly	35s	0-300s	Tmp Alm Dly is an adjustable item is an adjustable item used to set the temperature alarm delay time.	

Supply Fans

SAF Set-Up

Table 82: Main Menu \ Advanced Menu \ Supply Fans

Menu Display Name	Default	Range	Description
SAF Ctrl Dly	30s	0-999s	SAF Ctrl Dly is an adjustable item that sets the duration of time that the minimum speed signal is sent to the variable speed supply air fan after the supply fan is started via a modbus or digital output. Control reverts to either duct pressure or speed after the fan has been on for the SAF CtrlDelay (default 30 seconds)
SAFCtrlDlyCap	33.0%	0-100.0%	SAFCtrlDlyCap is an adjustable item that sets the capacity that the fan will stay during the SAF Ctrl Dly Timer.
HtgClgOffCap	33.0%	33.0-100.0%	HtgClgOffCap is an adjustable item that sets the capacity the supply fan will operate at when the unit state is off but the fan is running due to the Htg/ClgOffDelay being true or if an compressorized cooling circuit state is Pumpdown.
SAFVentCap	100%	0-100%	SAFVentCap is an adjustable item that sets the supply fan speed with the external ventilation override input to the supply fan is present.
Min Fan Nmbr	1	1-9	Min Fan Nmbr is the Minimum number of fans that are allowed to be operating on the unit. Less than this number and the unit will give an airflow fault.
SAFCapInType	VDC	VDC mA	SAFCapInType is the signal input type for units with analog controlled fans.
SAFCapMinSig	0.0V	0.0-20.0 V/mA	SAFCapMinSig is the minimum signal input corresponding to 0% fan capacity for units with analog controlled fans.
SAFCapMaxSig	10.0V	0.0-20.0 V/mA	SAFCapMaxSig is the maximum signal input corresponding to 100% fan capacity for units with analog controlled fans.
SAF DSP Control			
1 Zone VAV Contro	ol		
OAFlow Control			
SAFlow Control			
SAF BSP Control			

SAF DSP Control

Table 83: Main Menu \ Advanced Menu \ SAF Set-Up \ DSP Control

Menu Display Name	Default	Range	Description
SAF Ramp Time	60s	0-999s	SAF Ramp Time is an adjustable item that sets the amount of time it will take for the variable speed fan to drive from its minimum to maximum speed as well as its maximum to minimum speed. The SAF Ramp Time= value on the keypad must be changed whenever the ramp time of the variable speed fan is changed. The ramp up time must equal the ramp down time, and both must equal the SAF RampTime value to provide stable operation.
Min SAF Period	5s	0-999s	Min SAF Period is an adjustable item that sets the duration of the sample time between speed changes. The sample time must be long enough to allow the static pressure to get very close to its steady state value before another calculation is made.
Max SAF Chg	15%	0-100%	Max SAF Chg is an adjustable item that sets the maximum valve for a speed increase or decrease (either positive or negative value) is added to the current fan speed whenever the control setpoint (example duct pressure) is outsize of the deadband and the Min Period time has passed since the last speed change.

1 Zone VAV Control

Menu Display Name	Default	Range	Description
1ZnVAV Period	60s	0-999s	1ZnVAV Period is an adjustable item that sets the "sampling time" used in the PI control function to vary the supply fan speed when 1ZnVAV supply fan control is selected.
1ZnVAV Gain	0.8	0.0-100.0s	1ZnVAV Gain is an adjustable item that sets the "gain" used in the PI control function to vary the supply fan speed when 1ZnVAV supply fan control is selected.
1ZnVAV PAT	400s	0-999s	1ZnVAV PAT is an adjustable item that sets the "project ahead time" used in the PI control function to vary the supply fan speed when 1ZnVAV supply fan control is selected.
1ZnVAVMax Chg	10%	0-100%	1ZnVAVMax Chg is an adjustable item that sets the maximum value of increase or decrease of the supply fan speed each period used in the PI control function to vary the supply fan speed when 1ZnVAV supply fan control is selected

Table 84: Main Menu \ Advanced Menu \ SAF Set-Up \ 1ZnVAV Control

OAFlow Control

Table 85: M	lain Menu \ Ad	vanced Menu	SAF Set-Up \	OAFlow Control
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Menu Display Name	Default	Range	Description	
Min OA Flow	0CFM	0-60000CFM	Min OA Flow is an adjustable item that sets the minimum CFM value of the airflow station input signal.	
Max OA Flow	10000CFM	0-60000CFM	Max OA Flow is an adjustable item that sets the maximum CFM value of the airflow station input signal.	
V/A@MinOAFlw	0.0/V	0.0-20.0V/mA	V/A@MinOAFIw is an adjustable item that sets the DC voltage or mA value at the minimum CFM value of the airflow station input signal.	
V/A@MaxOAFlw	10.0/V	0.0-20.0V/mA	V/A@MaxOAFIw is an adjustable item that sets the DC voltage or mA value at the maximum CFM value of the airflow station input signal.	
Flow DB	3%	0-100%	Flow DB is an adjustable item that sets the "deadband" used in the PI control function to vary the supply fan speed when airflow (CFM) supply fan control is selected.	
Flw Period	30s	0-999s	Flow Period is an adjustable item that sets the "sample time" used in the PI control function to vary the supply fan speed when airflow (CFM) supply fan control is selected.	
Flw Gain	0.1	0.0-100.0	Flow Gain is an adjustable item that sets the "gain" used in the PI control function to vary the supply fan speed when airflow (CFM) supply fan control is selected.	
Flow MaxChg	5%	0-100%	Flow MxChg is an adjustable item that sets the maximum value of increase or decrease of the supply fan speed each period used in the PI control function to vary the supply fan speed when airflow (CFM) supply fan control is selected.	

SAF Flow Control

Table 86: Main Menu \ Advanced Menu \ SAF Set-Up \ SAF Flow Control

Menu Display Name	Default	Range	Description
Flow DB	3%	0-100%	Flow DB is an adjustable item that sets the "deadband" used in the PI control function to vary the supply fan speed when airflow (CFM) supply fan control is selected.
Flow Period	30s	0-999s	Flow Period is an adjustable item that sets the "sample time" used in the PI control function to vary the supply fan speed when airflow (CFM) supply fan control is selected.
Flow Gain	0.1	0.0-100.0	Flow Gain is an adjustable item that sets the "gain" used in the PI control function to vary the supply fan speed when airflow (CFM) supply fan control is selected.
Flow MxChg	5%	0-100%	Flow MxChg is an adjustable item that sets the maximum value of increase or decrease of the supply fan speed each period used in the PI control function to vary the supply fan speed when airflow (CFM) supply fan control is selected.

SAF BSP Control

Table 87: Main Menu \ Advanced Menu \ SAF Set-Up \ SAF BSP Control

Menu Display Name	Default	Range	Description
BSP Period	5s	0-999s	BSP Period is an adjustable item that sets the "sample time" used in the PI control function to vary the supply fan speed when building static pressure (BSP) supply fan control is selected.
BSP Gain	0.2	0.0-100.0	BSP Gain is an adjustable item that sets the "gain" used in the PI control function to vary the supply fan speed when building static pressure (BSP) supply fan control is selected.
BSP Max Chg	4%	0-100%	BSP Max Chg is an adjustable item that sets the maximum value of increase or decrease of the supply fan speed each period used in the PI control function to vary the supply fan speed when building static pressure (BSP) supply fan control is selected.

Return/Exhaust Fans/Relief Damper

RFEF Set-Up

Table 88: Main Menu \ Advanced Menu \ RFEF Set-Up

Menu Display Name	Default	Range	Description			
RFEF Ctrl Dly	30s	0-999s	RFEF Ctrl Dly is an adjustable item that sets the duration of time that the minimum speed signal is sent to the variable speed return or exhaust air fan after the Return or Exhaust fan is started via a modbus or digital output. Control reverts to either normal control type after the fan has been on for the SAF CtrlDelay (default 30 seconds)			
RFEFVentCap	100%	0-100%	RFEFVentCap is an adjustable item that sets the return or exhaust fan speed with the external ventilation override input to the return or exhaust fan is present. Included with the Ventilation Override controls sequence.			
MinExStrtTm	120s	60-300s	MinExStrtTm is an adjustable item that sets the minimum exhaust fan on time (default 120s)			
MinExStopTm	120s	60-300s	MinExStopTm is an adjustable item that sets the minimum exhaust fan off time (default 120s)			
RFEFCapInType	VDC	VDC mA	RFEFCapInType is the signal input type for units with analog controlled fans.			
RFEFCapMinSig	0.0V	0.0-20.0 V/mA	RFEFCapMinSig is the minimum signal input corresponding to 0% fan capacity for units with analog controlled fans.			
RFEFCapMaxSig	10.0V	0.0-20.0 V/mA	RFEFCapMaxSig is the maximum signal input corresponding to 100% fan capacity for units with analog controlled fans			
Cap Diff Control						
RFEF BSP Control						
RAF DSP Control						
RFEF Flow Control	RFEF Flow Control					
Flow Diff Control						
RFEF OAD Contro	I					

Cap Diff Control

Table 89: Main Menu \ Advanced Menu \ RFEF Set-Up \ Cap Diff Control

Menu Display Name	Default	Range	Description
Lo Fan Diff	100%	0-100%	Lo Fan Diff is an adjustable setting used to se the differential value between he supply fan capacity and return fan capacity. The return fan will not modulate below the current supply fan capacity minus the Lo fan differential.
Hi Fan Diff	100%	0-100%	Hi Fan Diff is an adjustable setting used to set the differential value between the supply fan capacity and the return fan capacity. The return fan will not modulate above the current supply fan capacity + the low fan differential.

RFEF BSP Control

Table 90: Main Menu \ Advanced Menu \ RFEF Set-Up \ RFEF BSP Control

Menu Display Name	Default	Range	Description
BSP Period	5s	0-999s	BSP Period is an adjustable item that sets the "sample time" used in the PI control function to vary the return or exhaust fan capacity when building static pressure (BSP) RFEF control is selected.
BSP Gain	0.2	0.0-100.0	BSP Gain is an adjustable item that sets the "gain" used in the PI control function to vary the return or exhaust fan capacity when building static pressure (BSP) RFEF control is selected.
BSP Max Chg	4%	0-100%	BSP Max Chg is an adjustable item that sets the maximum value of increase or decrease of the return or exhaust fan capacity each period used in the PI control function to vary the return or exhaust fan capacity when building static pressure (BSP) RFEF control is selected.

RAF DSP Control

Table 91: Main Menu \ Advanced Menu \ RFEF Set-Up \ RAF DSP Control

Menu Display Name	Default	Range	Description
RAF DSP Period	5s	0-999s	RAF DSP Period is an adjust able item that sets the "sample time" used in the PI control function to vary the return or exhaust fan capacity when duct static pressure (DSP) RFEF control is selected.
RAF DSP Gain	0.2	0.0-100.0	RAF DSP Gain is an adjustable item that sets the "gain" used in the PI control function to vary the return or exhaust fan capacity when duct static pressure (DSP) RFEF control is selected.
RAF DSP PAT	30s	0-999s	RAF DSP PAT is an adjustable item that sets the "project ahead time" used in the PI control function to vary the return or exhaust fan speed when RAF DSP Control is selected.
RAF DSP MaxChg	4%	0-100%	RAF DSP MaxChg is an adjustable item that sets the maximum value of increase or decrease of the return or exhaust fan capacity each period used in the PI control function to vary the return or exhaust fan capacity when duct static pressure (DSP) RFEF control is selected.

RFEF Flow Control

Table 92: Main Menu \ Advanced Menu \ RFEF Set-Up \ RFEF DSP Control

Menu Display Name	Default	Range	Description
RFEF FlwPeriod	30s	0-999s	RFEF FlwPeriod is an adjustable item that sets the "sample time" used in the PI control function to vary the return or exhaust fan capacity when RFEF Flw Control is selected.
RFEF Flw Gain	0.1	0.0-100.0	RFEF Flw Gain is an adjustable item that sets the "gain" used in the PI control function to vary the return or exhaust fan capacity when Return Fan and Exhaust Fan Flow Control is selected.
RFEF Flw PAT	60s	0-999s	RFEF Flw PAT is an adjustable item that sets the "project ahead time" used in the PI control function to vary the return or exhaust fan speed when RFEF Flow Control is selected .
RFEF Flw MxChg	5%	0-100%	RFEF Flw MxChg is an adjustable item that sets the maximum value of increase or decrease of the return or exhaust fan capacity each period used in the PI control function to vary the return or exhaust fan capacity when RFEF Flw Control) RFEF control is selected.

Flow Diff Control

Table 93: Main Menu \ Advanced Menu \ RFEF Set-Up \ Flow Diff Control

Menu Display Name	Default	Range	Description	
FlwDiff Period	30s	0-999s	FlwDiff Period is an adjustable item that sets the "sample time" used in the PI control function to vary the return or exhaust fan capacity when RFEF Flow Diff Control is selected.	
FlwDiff Gain	0.1	0.0-100.0	FlwDiff Gain is an adjustable item that sets the "gain" used in the PI control function to vary the return or exhaust fan capacity when Return Fan and Exhaust Fan Flow Diff Control is selected.	
FlwDiff PAT	60s	0-999s	FlwDiff PAT is an adjustable item that sets the "project ahead time" used in the PI control function to vary the return or exhaust fan speed when RFEF Flow Diff Control is selected	
FlwDiff MxChg	5%	0-100%	FlwDiff MxChg is an adjustable item that sets the maximum value of increase or decrease of the return or exhaust fan capacity each period used in the PI control function to vary the return or exhaust fan capacity when RFEF Flw Diff Control RFEF control is selected.	

RFEF OAD Control

Table 94: Main Menu \ Advanced Menu \ RFEF Set-Up \ RFEF OAD Control

Menu Display Name	Default	Range	Description
ExhMinOAPos	5%	0-100%	ExhMinOAPos is an adjustable item that sets the OA position where the exhaust fan turns on when the RFEF control is set to Outdoor air damper.
ExhMinSAFCap	10%	0-100%	ExhMinSAFCap is an adjustable item that sets the minimum exhaust or return SAF capacity. The supply air fan speed must be higher than this value for exhaust operation.

Relief Damper Set-Up

Table 95: Main Menu \ Advanced Menu \ Relief Damper Set-Up

Menu Display Name	Default	Range	Description	
RelDmpr Period	5s	0-999s	.999s RelDmpr Period is an adjustable item that sets the "sample time used in the PI control function to vary the relief damper capacity when modulating relief damper control is equipped.	
RelDampr Gain	0.2	0.0-100.0	RelDampr Gain is an adjustable item that sets the "gain" used in the PI control function to vary the relief damper capacity when modulating relief damper control is equipped.	
RelDmpr PAT	0.0s	0.0-999.0s	RelDmpr PAT is an adjustable item that sets the "project ahead time" used in the PI control function to vary relief damper capacity when modulating relief damper control is equipped.	
RelDmprMaxChg	4%	0-100%	ReIDmprMaxChg is an adjustable item that sets the maximum value of increase or decrease of the relief damper capacity each period used in the PI control function to vary the return or exhaust fan capacity when the unit is equipped with modulating relief damper control.	

Heating and Cooling Change Over

Operational settings should only be made with the advisement of a qualified person; changing key configurations away from factory settings may result in damage equipment or surrounding property. Recommended settings may vary based on application specific requirements.

Project Ahead

This section describes the projected control temperature used to turn On and Off stages of heating and cooling for Zone Control units. It is not used for DAT control units.

In Zone Control cooling and heating operation, the Projected Control Temperature reduces overshoot as the zone temperature approaches a setpoint after start up. It does this by causing stages to stop increasing before the actual control temperature reaches the setpoint. The rate of change to the control temperature is calculated once per minute by the controller and equals the change during the last 60 seconds. This rate of change is multiplied by the Effective Project Ahead Time and is added to the current control temperature. The rate of change may be negative or positive, so the Projected Control Temperature may be higher or lower than the actual control temperature. This value, the Projected Control Temperature, is the temperature that would exist after the Project Ahead time passes if the control temperature were to continue to change at the same rate for the Effective Project Ahead Time. The Effective Project Ahead time is set equal to the Cooling Project Ahead Time when the unit is in the Cooling state. The Effective Project Ahead Time is set equal to the Heating Project Ahead time when in the Heating State. It is set equal to zero under all other conditions, causing the projected Control Temperature to equal the actual control temperature.

HtgClg ChangOvr Set-up

Table 96: l	Main Menu \	Advanced I	Menu \ HtgClgC	hngOvr Set-Up
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Menu Display Name	Default	Range	Description
PA Ctrl Temp	-	-50.0-200.0°F	PA Ctrl Temp
ClgSptPeriod	60s	0-999s	ClgSptPeriod is an adjustable item which sets the "sampling time" used in the PI control function to vary the DAT Clg Spt in zone control applications
ClgSptGain	0.1	0.0-100.0	ClgSptGain is an adjustable item which sets the "gain" used in the Pl control function to vary the DAT Clg Spt in zone control applications.
ClgSptPAT	600s	0.0-999s	ClgSptPAT is an adjustable item which sets the "project ahead time" used in the PI control function to vary the DAT Clg Spt in zone control applications.
MaxClgSptChg	5.0°F	0.0-50.0°F	MaxClgSptChg is an adjustable item that sets the maximum value for an increase or decrease of the DAT Clg Spt in zone control applications.
HtSptPeriod	60s	0-999s	HtSptPeriod is an adjustable item which sets the "sampling time" used in the PI control function to vary the DAT Htg Spt in zone control applications.
HtgSptGain	0.1	0.0-100.0	HtgSptGain is an adjustable item which sets the "gain" used in the PI control function to vary the DAT Htg Spt in zone control applications.
HtgSptPAT	600s	0.0-999s	HtgSptPAT is an adjustable item which sets the "project ahead time" used in the PI control function to vary the DAT Htg Spt in zone control applications.
MaxHtgSptChg	5.0°F	0.0-50.0°F	MaxHtgSptChg is an adjustable item that sets the maximum value for an increase or decrease of the DAT Htg Spt in zone control applications.
EcoSptPeriod	60s	0-999s	EcoSptPeriod is an adjustable item which sets the "sampling time" used in the PI control function to vary the DAT Econo Spt in zone control applications.
EcoSptGain	0.1	0.0-100.0	EcoSptGain is an adjustable item which sets the "gain" used in the PI control function to vary the DAT Econo Spt in zone control applications.
EcoSptPAT	600s	0.0-999s	EcoSptPAT is an adjustable item which sets the "project ahead time" used in the PI control function to vary the DAT Econo Spt in zone control applications.
MaxEcoSptChg	5.0°F	0.0-50.0°F	MaxEcoSptChg is an adjustable item that sets the maximum value for an increase or decrease of the DAT Econo Spt in zone control applications.

DX Cooling Operation-Staged Compressors

When mechanical cooling is operational, the current cooling stage (CurrClgStg) will be increased or decreased between 0 and the effective maximum cooling stages (MaxClgStg) subject to the cooling stage timer (ClgStgTm).

Compressor Circuit State: The MicroTech 4 manages the compressor capacity control start, ramp up, ramp down, stop automatically, and uses the CurrClgStg and manual control compressor start/stop commands to initiate and terminate circuit operation (Circ1OnOffCmd, Circ2OnOffCmd, Circ3OnOffCmd and Circ4OnOffCmd). As compressors are operated, there are several operating states (CircState) for each compressor circuit. These states will be Off, PreStart, Initialization, Normal, Pumpdown, and Standby for Restart.

Compressor Accumulated Run Hours: When there is a choice between starting or stopping identical fixed capacity compressors on a circuit, compressor accumulated run hours (FCmp1Hrs, FCmp2Hrs, FCmp3Hrs, FCmp4Hrs)will be used to determine which compressor is next started or stopped (NextFSOn1, NextFSOn2, NextFSOff1 and NextFSOff2)

Cross Load and Lead Load: When there is a choice between staging up or down cooling circuits or turning on or off compressors, circuit lead/lag rules will apply (Circ1Lead, Circ2Lead, Circ3Lead or Circ4Lead) and will be used to determine the next circuit up or down (NextCircUp and NextCircDown)

- Cross Load: The Load Method Parameter will not be allowed to be set to CrossLoad unless either of the following is true: Dehum Method = None or Reheat Type= None
 - Stage 1: During a call for mechanical cooling, if HP1 is closed, then DO1 on expansion module C closes, energizing the M1 compressor contactor, compressor #1 and circuit 1. The M1 auxiliary brings on the required condenser fans, liquid line solenoid valve and de-energizes the M1 compressor contactor.
 - Stage 2: The second stage of cooling is controlled by DO1 on expansion module D. Compressor 2 is on circuit 2 and is brought on in the same manner as compressor #1, as well as the condenser fans, solenoid valve and crankcase heater on circuit 2.
 - Stage 3: The 3rd stage of cooling is controlled by DO2 on expansion module C and brings on compressor # 3 on circuit 1.
 - Stage 4: The 4th stage of cooling is controlled by DO2 is controlled by expansion module D and brings on compressor #4 on circuit 2.
- Lead Load:
 - Stage 1: During a call for mechanical cooling, if HP1 is closed, then DO1 on expansion module C closes, energizing the M1 compressor contactor, compressor #1 and circuit 1. The M1 auxiliary brings on the required condenser fans, liquid line solenoid valve and de-energizes the M1 compressor contactor.
 - **Stage 2:** The second stage of cooling is controlled

by DO2 on expansion module C. Compressor 3 is on circuit 1 and is brought on in the same manner as compressor #1

- Stage 3: The 3rd stage of cooling is controlled by DO1 on expansion module D and brings on compressor # 2 on circuit 2. Compressor 2 is on circuit 2 and is brought on in the same manner as compressor #1, as well as the condenser fans, solenoid valve and crankcase heater on circuit 2.
- Stage 4: The 4th stage of cooling is controlled by DO2 is controlled by expansion module D and brings on compressor #4 on circuit 2.

Compressor Circuit Lead/Lag

- **Cross Load:** The Load Method Parameter will not be allowed to be set to CrossLoad unless either of the following is true: Dehum Method = None or Reheat Type= None
 - Stage 1: During a call for mechanical cooling, if HP1 is closed, then DO1 on expansion module C closes, energizing the M1 compressor contactor, compressor #1 and circuit 1. The M1 auxiliary brings on the required condenser fans, liquid line solenoid valve and de-energizes the M1 compressor contactor.
 - Stage 2: The second stage of cooling is controlled by DO1 on expansion module D. Compressor 2 is on circuit 2 and is brought on in the same manner as compressor #1, as well as the condenser fans, solenoid valve and crankcase heater on circuit 2.
 - Stage 3: The 3rd stage of cooling is controlled by DO2 on expansion module C and brings on compressor # 3 on circuit 1.
 - Stage 4: The 4th stage of cooling is controlled by DO2 is controlled by expansion module D and brings on compressor #4 on circuit 2.
- · Lead Load:
 - Stage 1: During a call for mechanical cooling, if HP1 is closed, then DO1 on expansion module C closes, energizing the M1 compressor contactor, compressor #1 and circuit 1. The M1 auxiliary brings on the required condenser fans, liquid line solenoid valve and de-energizes the M1 compressor contactor.
 - Stage 2: The second stage of cooling is controlled by DO2 on expansion module C. Compressor 3 is on circuit 1 and is brought on in the same manner as compressor #1
 - Stage 3: The 3rd stage of cooling is controlled by DO1 on expansion module D and brings on compressor # 2 on circuit 2. Compressor 2 is on circuit 2 and is brought on in the same manner as compressor #1, as well as the condenser fans, solenoid valve and crankcase heater on circuit 2.
 - Stage 4: The 4th stage of cooling is controlled by DO2 is controlled by expansion module D and brings on compressor #4 on circuit 2.

High Ambient Limiting

A Control Algorithm is included with the MicroTech 4 that is intended to prevent nuisance high pressure trips during **High Ambient** excursions by staging down fixed speed compressor(s) to allow the unit to operate in a partial capacity state. This High Pressure Unloading protection can be disabled in the Cooling menu. Units that are equipped with Ambient based FanTrol will hold compressor staging (Up) if the OAT is greater than 115°F and will stage down a compressor if the OAT is greater than 118°F for five minutes. Units that are equipped with Pressure based FanTrol or SpeedTrol will hold compressor stage (Up) based on Tc>140°F for 30 seconds and will stage down when Tc > 148°F for 30 seconds.

Electronic Hot Gas Bypass

Units that are equipped with **Electronic Hot Gas Bypass** will be control an electronically modulated hot gas bypass valve to maintain a 110 psig (36°F Sat) Control Setpoint. The maximum amount of modulation each valve will be allowed to vary is limited by ASHRAE Standard 90.1 to 10% of the unit capacity. The table below shows the maximum modulation based on the unit size.

Table 97: Main Menu \ Advanced Menu \ Relief Damper Set-Up

Unit Model	Total Gross Capacity (Tons)	Max Bypass Capacity (Tons)	Max Modulation %	Signal (Vdc)
31T	34.1	3.4	35%	3.5V
35T	41.8	4.2	44%	4.4V
40T	47	4.7	50%	5.0V
50T	52.5	5.3	56%	5.6V
52T	56.3	5.6	60%	6.0V

Important notes about electronic HGBP operation:

- HGBP will only operate if one compressor is operating on the served circuit.
- HGBP will not operate on Circuit 1 when MHGRH is active. HGBP on Circuit 2 is available if one compressor is active on Circuit 2.
- The Hot Gas Bypass Valves will automatically Re-Sync their position every 168 hours of operation.

DX Cooling Operation – Condenser Fan Control

Figure 48: Condenser Fan Control



DX Cooling Operation – Condenser FanTrol

There are up to two fans per circuit. The first fan on each circuit is always turned On when any compressor on the circuit is turned On through auxiliary switches on the compressor contactors. The second fan on each circuit is controlled by outputs from the refrigeration expansion module for each circuit; Expansion module D, E, F, or G depending on configuration. These are controlled via the condenser fan outputs.

Daikin's **FanTrol**, based on Ambient Temperature, will cycle the fans based on the ambient temperature. As the Ambient Temperature Decreases, a fan will cycle Off at the cutout temperature, and as the Ambient temperature increases above the cut in setpoint, the condenser fans will turn On. FanTrol minimum Ambient operation for mechanical cooling is 50°F.

Figure 49: Fantrol Setpoints



Condenser Fan Setpoints

Table 98: Condenser Fan Setpoints

Model	Condenser Fan	Ambient (°F) Cut Out	Ambient (°F) Cut In	Diff (°F)
031	Cond Fan #12/#22	75°	80°	5°
035	Cond Fan #12/#22	75°	80°	5°
040	Cond Fan #12/#22	75°	80°	5°
050	Cond Fan #12/#22	70°	75°	5°
052	Cond Fan #12/#22	70°	75°	5°

Fantrol with Pressure Transducer

FanTrol with Pressure Transducer staging uses actual Discharge Pressure Reading and stages the condenser fans to maintain the discharge pressure between 225 PSIG and 600 PSIG. As the discharge pressure increases or decreases, the condenser fans will cycle On and Off based on the respective Cut In and Cut Out setpoints.

Table 99: Fantrol Discharge Pressure

Model	Condenser Fan	Discharge Pressure (PSIG) Cut Out	Discharge Pressure (PSIG) Ambient (°F) Cut In	°F Sat Diff
031	Cond Fan #12/#22	250 psig (83°F Sat)	450 psig (125°F Sat)	42°F
035	Cond Fan #12/#22	250 psig (83°F Sat)	450 psig (125°F Sat)	42°F
040	Cond Fan #12/#22	250 psig (83°F Sat)	450 psig (125°F Sat)	42°F
050	Cond Fan #12/#22	250 psig (83°F Sat)	475 psig (130°F Sat)	47°F
052	Cond Fan #12/#22	250 psig (83°F Sat)	475 psig (130°F Sat)	47°F

SpeedTrol

Daikin's **SpeedTrol** head pressure control operates by modulating the motor speed of all the condenser fans on their respective refrigeration circuit in response to the condenser pressure.

This option allows for mechanical cooling operation down to 25°F for the standard ambient package and -10°F (-23C) when equipped as a Low ambient unit. In a SpeedTrol equipped unit, MicroTech 4 senses refrigerant head pressure and varies the condenser fan speed accordingly. When the pressure rises, the SpeedTrol increases the speed of the fan. When the pressure falls, SpeedTrol decreases the speed of the fan.

The VFD throttling range is 250 to 400 psig, fixed, with a corresponding fan speed range of 10Hz to 60Hz. The fan motor is a three-phase motor, identical to the unit voltage (208V to 575V) and is controlled by a variable frequency drive. The variable frequency drive receives a signal from the MicroTech 4, which reads a pressure transducer and varies the speed of the condenser fan accordingly. As condenser fan speed reaches its minimum, fans will be staged Off, or cycled to keep a minimum dead pressure of 250 psig.

SpeedTrol Low Ambient

SpeedTrol with Low Ambient control will operate the same as SpeedTrol. However, Low Ambient units are equipped with a Condenser Coil Splitter Solenoid Valve. This feature assists in maintaining head pressure during low ambient/low modulating operation. A solenoid valve on each circuit is controlled by a digital output from the MicroTech 4 controller.

The coil splitter solenoid valve is controlled based on the average discharge line pressure equivalent saturation temperature, determined from the corresponding discharge pressure transducer (PTD) via the MicroTech 4 controller.

The splitter solenoid valve on each circuit is normally open (digital output energized). The splitter valve on a circuit is closed (energized) when that circuit's saturation temperature remains below 83.0° F (250 psig) continuously for 60 seconds, the condenser fan is at minimum speed, and the OAT is less than, or equal to, 80.0° F. The solenoid valve is re-opened when the saturation temperature rises above 105.0° F (350 psig) continuously for 60 seconds, or the OAT rises above 80° F, or when all the compressors on the circuit are OFF.

Cooling Set-Up

Table 100: Main Menu \ Advanced Menu \ Cooling Set-Up

Menu Display Name	Default	Range	Description	
Lead Circuit	Circ1	Circ1 Circ2 Auto	Lead Circuit is an adjustable item that sets which circuit is considered the lead circuit. If a unit is equipped with modulating hot gas reheat, Circuit 1 will always function as the lead circuit during dehumidification operation.	
LoadMethod	CrossLoad	LeadLoad CrossLoad	LoadMethod is an adjustable item that sets if the compressors will be staged based on circuit	
DT Above Spt	-	0.0-250.0 F	DT Above Spt is a read only item	
DT Below Spt	-	0.0-250.0 F	DT Below Spt is a read only item	
HiAmbLimiting	On	Off On	HiAmbLimiting is an adjustable item that sets if HiAmbinent Limiting turned on.	
DXBP Period	60s	0-999s	DXBP Period is an adjustable item which sets the "sampling time" used in the PI control function to vary the DX BP damper.	
DXBP Gain	0.8	0.0-100.0	DXBP Gain is an adjustable item which sets the "gain" used in the PI control function to vary the DX BP Damper	
DXBP PAT	120s	0-999s	DXBP PAT is an adjustable item which sets the "project ahead time" used in the PI control function to vary the DX BP Damper.	
DXBP Max Chg	10%	0-100%	DXBP Max Chg is an adjustable item that sets the maximum value for an increase or decrease of the DXBP Damper Position.	
Curr Clg Stg	-	0-8	Curr Clg Stg is a read only item that displays the current cooling stage.	
REFRIG CIRCUIT	1/2			
C1/2: EHGBP Spt		100.0-120.0 psi	C1/2: EHGBP Spt is an adjustable item that sets the suction line refrigerant pressure setpoint that the Electronic Hot Gas Bypass Valve will modulate to maintain.	
C1/2: EHGBP DB		4.0-10 psi	C1/2: EHGBP DB is an adjustable item that sets the dead band for the suction line refrigerant pressure setpoint that the Electronic Hot Gas Bypass Valve will modulate to maintain.	
C1/2: EHGBP		Based on Unit Size:	C1/2: EHGBP Max is that maximum modulation allowed for each	
Max		031: 35.0%	model size based on ASHRAE Standard 90.1. This value is adjustable.	
		035: 44.0%		
		040: 50.0%		
		050: 56.0%		
		052: 60.0%		
PIS1/2		0-725.2psi	PTS1 is a status only item that displays the current suction line refrigerant pressure for circuit #1	
PTD1/2		0-725.29psi	PTD1 is a status only item that displays the current discharge line refrigerant pressure for circuit #1	
SSH1/2		-100.0-100.0°F	SSH1 is a status only item that displays the current suction super heat for circuit #1	
DSH1/2		-100.0-100.0°F	DSH1 is a status only item that displays the current discharge super heat for circuit # 1	
Subcooling1/2		-100.0-100.0°F	Subcooling1/2 is a status only item that displays the current calculated subcooling for each circuit.	
Teg1/2	-	-50.0-212.0°F	Teg1 is a status only item that displays the circuit average suction pressure equivalent saturation temperature	

Menu Display Name	Default	Range	Description
Tc1/2	-	-50.0-212.0°F	TC1 is a status only item that displays the circuit average discharge line pressure equivalent saturation temperature. Calculated from PTD1 using the standard ASHRAE conversion for R410A.
DRT1/2	-	-50.0-392.0°F	DRT1 is a status only item that displays the current discharge line refrigerant temperature
SRT1/2	-	-50.0-392.0°F	SRT1 is a status only item that displays the current suction line refrigerant temperature

OAF Circ1, 2 Set-Up

Table 101: Main Menu \ Advanced Menu \ OAF Circ1,2 Set-Up

Menu Display Name	Default	Range	Description
FAN STATUS			
OAF1	-	Off	OAF1 is a status only item that indicates if the OAF1 is on or off
		On	
OAF2	-	Off	OAF2 is a status only item that indicates if the OAF2 is on or off
		On	
OA Fans	-	Off	OA Fans is a status only item that indicates of any OA Fan is on
		On	
OAF2 Ovrd	-	Off	OAF2 Ovrd is a status only item that indicates if OAF2 is being
		On	
OA Fan Cmd	-	0-100%	OAF Fan Cmd is a status only item that indicates the commanded OAF Capacity
OA Fan Cap	-	0-100%	OAF Fan Cap is a status only item that indicates the actual OA fan capacity
Cond Sol	-	Off	Cond Sol is a status only item that indicates if the Low Ambient
		On	condenser splitter solenoid is active or not.
REFRIG CIRCUI	T STATUS		
PTS1	-	0.0-725.29psi	PTS1 is a status only item that displays the current suction line refrigerant pressure for circuit #1
PTD1	-	0.0-725.29psi	PTD1 is a status only item that displays the current discharge line refrigerant pressure for circuit #1
SSH1	-	-100.0-100.0°F	SSH1 is a status only item that displays the current suction super heat for circuit #1
DSH1	-	-100.0-100.0°F	DSH1 is a status only item that displays the current discharge super heat for circuit # 1
Teg1	-	-50.0-212.0°F	Teg1 is a status only item that displays the circuit average suction pressure equivalent saturation temperature
Tc1	-	-50.0-212.0°F	TC1 is a status only item that displays the circuit average discharge line pressure equivalent saturation temperature. Calculated from PTD1 using the standard ASHRAE conversion for R410A.
DRT1	-	-50.0-392.0°F	DRT1 is a status only item that displays the current discharge line refrigerant temperature
FAN CONTROL			
Tc1 Spt	-	-4.0-392.0°F	Tc1 is a status only item that displays the current Tc setpoint on circuit 1
Tc1 DB	2°F	2.0-10.0°F	Tc1 DB is an adjustable item that sets the deadband around the Tc1 setpoint to modulate the condenser fan capacity. If Tc1 is within this deadband, no action is taken.

Menu Display Name	Default	Range	Description
OAF1 Spt	Depends on unit size	0-105°F	OAF1 Spt is the current outdoor air temperature setpoint for staging OAF 1 on/off. This is for ambient based fan cycling control only. The setpoint varies with unit size
OAF2 Spt	Depends on unit size	0-105°F	OAF2 Spt is the current outdoor air temperature setpoint for staging OAF 2 on/off. This is for ambient based fan cycling control only. The setpoint varies with unit size
OAF Diff	5°F	0.0-10.0°F	OAF Diff is the Outdoor air temperature differential that the OAT must drop below or raise above the setpoint for the condenser fans to stage

Economizer and Outside Air Damper

Building Pressure Override

The minimum position determined by any method described below may be overridden for a variable speed return fan or exhaust fan controlled by building static pressure when the return fan speed is at minimum, or the exhaust fan has been stopped due to low building static pressure if the building pressure remains negative. If the user elects to use this function and the return fan has been at the minimum speed, or the exhaust fan has been stopped for a minimum return/ exhaust fan off time (default = 120 seconds), a PI_Loop will begin modulating the Min OA Pos setpoint upward to maintain the building static pressure at the building static pressure setpoint.

Limiting Control

The user has the option of setting a low temperature limit that will override all the outdoor air reset functions described in this section, except the Return Fan Capacity Override function if the discharge air temperature or entering fan temperature gets too cold as a result of the reset. The user can choose the override sensor by setting the Reset Temperature Limit to None, DAT, or EFT. When set to None the Reset Temperature Limit function is disabled. A Reset Temperature Limit PI_Loop will be used to reset the minimum outside air damper setpoint downward when the selected temperature input drops below the Reset Temperature Limit.

Econo Set-Up

Table 102: Main Menu \ Advanced Menu \ Econo Set-Up

Menu Display Name	Default	Range	Description
Econo Period	30s	0-999s	Econo Period is an adjustable item which sets the "sampling time" used in the PI control function to vary the Economizer Damper
Econo Gain	10.0	0.0-100.0	Econo Gain is an adjustable item which sets the "gain" used in the PI control function to vary the Economizer Damper
Econo PAT	60s	0-999s	Econo PAT is an adjustable item which sets the "project ahead time" used in the PI control function to vary the Economizer Damper.
Econo Max Chg	10%	0-100%	Econo Max Chg is an adjustable item that sets the maximum value for an increase or decrease of the Economizer Damper Position.

OA Damper Set-Up

Table 103: Main Menu \ Advanced Menu \ OA Damper Set-Up

Menu Display Name	Default	Range	Description			
Ext Reset Control	Ext Reset Control					
Flow Reset Control	Flow Reset Control					
Fan Diff Control						
BSP Ovrd Control						
Limiting Control						

OA Damper Set-Up - Ext Reset Control

Table 104: Main Menu \ Advanced Menu \ OA Damper Set-Up \ Ext Reset Control

Menu Display Name	Default	Range	Description
Min V/mA	0.0 / V	0.0-20.0 V/mA	Min V/mA is the minimum value of the voltage or mA range for the externally controlled reset input on the controller
Max V/mA	10.0 / V	0.0-20.0 V/mA	Max V/mA is the maximum value of the voltage or mA range for the externally controlled reset input on the controller

OA Damper Set-Up - Flow Reset Control

Table 105: Main Menu \ Advanced Menu	OA Damper Set-Up \ F	Flow Reset Control
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Menu Display Name	Default	Range	Description
Min OAFlow	0 CFM	0-60000CFM	Min OAFlow is the minimum OA flow that corresponds to the V/A@MinOAFlw Voltage or amperage for the Flow Reset
Max OAFlow	10000CFM	0-60000CFM	Max OAFlow is the maximum OA flow that corresponds to the V/A@MaxOAFlw Voltage or amperage for the Flow Reset
V/A@MinOAFlw	0.00 /V	0.0-20.0 V/mA	V/A@MinOAFIw is the minimum value of the voltage or mA range for the flow controlled reset input on the controller
V/A@MaxOAFlw	10.00/V	0.0-20.0 V/mA	V/A@MaxOAFIw is the maximum value of the voltage or mA range for the flow controlled reset input on the controller
Flow DB	3%	0-100%	Flow DB is an adjustable item that sets the "deadband" used in the PI control function to vary the OA Damper.
Flow Period	30s	0-999s	Flow Period is an adjustable item which sets the "sampling time" used in the PI control function for the OA Flow Damper Reset Control
Flow Gain	0.1	0.0-100.0	Flow Gain is an adjustable item which sets the "project ahead time" used in the PI control function for the OA Flow Damper Reset Control
Flow Mx Chg	5%	0-100%	Flow Mx Chg is an adjustable item that sets the maximum value for an increase or decrease of the Flow Reset Control Damper Position.

OA Damper Set-Up – Fan Diff Control

Table 106: Main Menu \ Advanced Menu \ OA Damper Set-Up \ Fan Diff Control

Menu Display Name	Default	Range	Description
Min Fan Diff	20%	0-100%	Min Fan Diff is an adjustable item which sets a differential between the discharge and return fan capacities above which the minimum allowable Min OA Pos= begins to be reset upwards from the Demand Control Ventilation Limit toward the Ventilation Limit.
Max Fan Diff	50%	0-100%	Max Fan Diff is an adjustable item which sets a differential between the discharge and return fan capacities at which the minimum allowable Min OA Pos= is fully reset up to the Ventilation Limit.
Max Fan DiffOA	20%	0-100%	Max Fan DiffOA is and adjustable item which sets the maximum value for an increase or decrease of the outside air damper position due to the Max Fan Diff Control function.

OA Damper Set-Up – BSP Ovrd Control

Table 107: Main Menu \ Advanced Menu \ OA Damper Set-Up \ BSP Ovrd Control

Menu Display Name	Default	Range	Description
BSPOvrdPeriod	5s	0-999s	BSPOvrdPeriod is an adjustable item which sets the "sampling time" used in the PI control function used for the building static pressure override feature
BSPOvrdGain	0.2	0-100.0	BSPOvrdGainis an adjustable item which sets the "Gain" used in the PI control function used for the building static pressure override feature.
BSPOvrdMxChg	4%	0-100%	BSPOvrdMxChg is an adjustable item that sets the maximum value for an increase or decrease of the outside air damper position due to the building static pressure override feature
BSPOvrdTime	120s	60-300s	BSPOvrdTime is an adjustable item used to set the time period for which the return/exhaust fan must operate at the minimum speed before the building static pressure override function is activated.

OA Damper Set-Up – Limiting Control

Menu Display Name	Default	Range	Description
Max OA Pos	100%	0-100%	Max OA Pos is an adjustable item used to set the maximum outside air damper position.
Min Inc Rate	0.15%/s	0.00-100.00%/s	Min Inc Rate is an adjustable item used to set the minimum increase rate for the outside air damper "cold start" sequence
Max Inc Rate	1.00%/s	0.00-100.00%/s	Max Inc Rate is an adjustable item used to set the maximum increase rate for the outside air damper "cold start" sequence
Rst Limt Snsr	None	None	Rst Limt Snsr is an adjustable item used to set the sensor to be
		DAT	used in conjunction with the OA reset limit function.
		EFT	
		ER_LWT	
Rst T Lmt	48.0°F	0-100°F	Rst T Lmt is an adjustable item which sets a temperature low limit which overrides functions that reset the outside air damper position if the temperature gets too cold.
RstT Period	5s	0-999s	RstT Period an adjustable item which sets the "sampling time" used in the PI control function used for the Reset Temperature Limit feature.
RstT Gain	0.2	0-100.0	RstT Gain is an adjustable item which sets the "Gain" used in the PI control function used for the Reset Temperature Limit feature.
RstT PAT	60s	0-999s	RstT PAT is an adjustable item which sets the "project ahead time" used in the PI control function used for the Reset Temperature Limit feature.
RstT MaxChg	4%	0-100%	RstT MaxChg is an adjustable item that sets the maximum change value PI loop used for the Reset Temperature Limit feature.

Table 108: Main Menu \ Advanced Menu \ OA Damper Set-Up \ Limiting Control

Heating

Gas Furnace Operation - Heating Set-Up

Table 109: Main Menu \ Advanced Menu \ Heating Set-Up

Menu Display Name	Default	Range	Description
Occ HtgEnable	Yes	No Yes	Occ HtgEnable is an adjustable item which enables and disables the "daytime" heating mode of operation. If the Occ Heating parameter is set to No, the unit will only go into heating during the initial morning warm-up cycle. If the Occ Heating parameter is set to Yes, the unit can go into the heating mode of operation any time during the day
Htg Warmup Tm	60s	0-999s	Htg Warmup Tm is an adjustable item which is used to set the amount of time the gas burner will remain at a low fire position on 100% OSA units (default 60 seconds) during the special cold start sequence
Htg HldPeriod	240s	0-999s	Htg HldPeriod is an adjustable item used to set the amount of time that the gas heating valve remains at its calculated value on units equipped with 100% OA (default 240 seconds) during the special cold start sequence. This is to allow the temperature to approach equilibrium with the modulating gas heating valve at a fixed position.
FrzHtgVlvPos	100%	0-100%	FrzHtgVlvPos is an adjustable item that sets the valve position the hot water or steam heating valve will hold during a freeze event. The valve will hold this position for a freeze timer.
Htg Period	60s	0-999s	Htg Period an adjustable item which sets the "sampling time" used in the PI control function that modulates the heating valve or face & bypass dampers.
Htg Gain	0.8	0.0-100.0	Htg Gain is an adjustable item which sets the "Gain" used in the PI control function that modulates the heating valve or face & bypass dampers.
Htg PAT	120s	0-999s	Htg PAT is an adjustable item which sets the "project ahead time" used in the PI control function that modulates the heating valve or face & bypass dampers.
Htg Max Chg	10%	0-100%	Htg Max Chg is an adjustable item that sets the maximum value for an increase or decrease of the heating valve or face& bypass damper position.
ModGasSCREna	No	No Yes	ModGasSCREna is an adjustable item that sets if the unit is equipped to perform a combination SCR electric and natural gas heating sequence.
Curr Htg Stg	0	0-4	Curr Htg Stg is a read only item that displays the current heating stage.

Reheat

Reheat Compressor Limiting

Reheat Compressor Limiting is a function that limits the compressor capacity when a unit with refrigerant reheat, modulating hot gas, or liquid subcool reheat cannot produce enough capacity to meet the reheat requirements. When this function is active, the controller will act to reduce the capacity of the circuit opposite the reheat circuit by turning Off a fixed capacity compressor in an attempt to increase the leaving coil temperature, and therefore, the discharge air temperature.

Reheat Set-Up

Table 110: Main Menu \ Advanced Menu \ Reheat Set-Up

Standard Heat BackUp Reheat

When a unit is equipped with either a modulating gas, hot water, or steam primary heat, this heat may be used as a secondary **Backup Reheat** source. When the unit is equipped with refrigerant reheat and cannot product enough capacity to meet reheat the requirements, the primary heating source can be activated to maintain the discharge air temperature setpoint. For this feature to be activated, the BackupRhtEna flag needs to be set to Yes.

Menu Display Name	Default	Range	Description
Reheat Timer	10min	2-60min	Reheat Timer is an adjustable item that sets the amount of time the controller will hold the liquid subcool coil valve at 100% before modulating the hot gas reheat valve for additional capacity.
Rht Cmp Lmtg	Yes	No Yes	Rht Cmp Lmtg is an adjustable item that sets if Reheat Compressor Limiting function is allowed or not. When set to Yes, compressor capacity will be reduced to increase the discharge air temperature.
MHG Min Pos	10%	0-100%	MHG Min Pos is an adjustable item used to set the minimum position of the hot gas reheat valve when the PI loop is active.
MHG Max Pos	85%	0-100%	MHG Max Pos is an adjustable item used to set the maximum position of the hot gas reheat valve when the PI loop is active.
LSC Min Pos	15%	0-100%	LSC Min Pos is an adjustable item used to set the minimum position of the liquid subcool reheat valve when the PI loop is active.
LSC Max Pos	100%	0-100%	LSC Max Pos is an adjustable item used to set the maximum position of the liquid subcool reheat valve when the PI loop is active.
Rht Dec Rate	1.00%/s	0-10.0%/s	Rht Dec Rate is an adjustable item used to set the rate of decrease for the reheat valve, where the unit leaves the dehumidification operation.
MHGRht1Status	-	OK VlvConn EMIHi EMHdw EMComm	MHGRht1Status is a status only item that shows if status of control on the Modulating Hot Gas Reheat Valve.
BackupRhtEna	No	No Yes	BackupRhtEna is an adjustable item that sets if the unit is allowed to use its primary modulating heater as a secondary reheat source for cases where the primary refrigerant reheat cannot satisfy the discharge air temperature setpoint.
RhtPeriod	30s	0-999s	RhtPeriod is an adjustable item which sets the "sampling time" used in the PI control function for controlling the reheat valve.
Rht Gain	1.0	0.0-100.0	Rht Gain is an adjustable item which sets the "Gain" used in
			the PI control function for controlling the reheat valve.
LSC Lo Gain	0.2	0.0-100.0	LSC Lo Gain is an adjustable item which sets the "Gain" used in the PI control function for controlling the liquid subcooling reheat valve.

Menu Display Name	Default	Range	Description
Rht PAT	30s	0-999s	Rht PAT is an adjustable item which sets the "project ahead time" used in the PI control function for controlling the reheat valve.
Rht Max Chg	10%	0-100%	Rht Max Chg an adjustable item that sets the maximum value for an increase or decrease for controlling the reheat valve
PriHtgRstOAT	65.0°F	50.0-80.0°F	PriHtgRstOAT
Curr Htg Stg	-	0-8	Curr Htg Stg is a status only item that displays the current heating stage of the unit.

Energy Recovery

Energy Rec Set-Up

Table 111: Main Menu \ Advanced Menu \ Energy Rec Set-Up

Menu Display Name	Default	Range	Description
Min ExhT Diff	2°F	1.0-20.0°F	Min Exh T Diff is an adjustable item that sets a differential below the calculated potential energy recovery exhaust air frosting point. When the ER Exh T falls below the calculated frosting point by more that this value, the energy wheel will be driven to its minimum speed, or turned OFF, to prevent frosting.
Max ExhT Diff	6°F	1.0-20.0°F	Max Exh T Diff is an adjustable item that sets a differential above the calculated potential energy recovery exhaust air frosting point. Once the wheel is driven to minimum speed, or turned off, to prevent frosting, it is driven back to maximum speed, or turned ON, only when ER Exh T rises back above the calculated frosting point by more that this value.
ERWhI Stg Tm	5min	1-100min	ER WhI Stg Tm is an adjustable item used to set a minimum time period for operating at either the minimum or maximum speed before action is taken to change speed during the frost protect mode of operation.
ER Whel Off Tm	20min	1-100min	ER WhI Off Tm is an adjustable item used to set the minimum amount of time the energy wheel will remain off after being turned OFF due to a frosting/condensation condition.
ERWhl Min Cap	15%	10-100%	ERWhleMinCap is the minimum allowed energy wheel capacity
Intersect Pt	-	-146.2-150.0°F	Intersect Pt is the calculated intersection point with saturation line for the process line between the OAT at 95% RH and the actual return air temperature and return air humidity
RARelHum	-	0-100	RARelHum is a status only item of the current sensor return air relative humidity reading
FstMgmt Meth	None	None Timed WhISpd Preheat	FstMgmtMeth is the selected frost management method.
OA Frst Temp	-5.0 °F	-40-100.0°F	OA Fst Temp is an adjustable item used to set the outside air frost temperature.
Defrost Time	5min	0-60min	Defrost Time is an adjustable item used to set the duration of a defrost cycle.
Defrst Period	60min	0-1440min	Defrst Period is an adjustable item used to set how often a defrost cycle will be initiated.
Defrst On Tm	1s	0-999s	Defrst On Tm is an adjustable item used to select how long the constant speed energy wheel is energized during defrost.
Defrost Off Tm	24s	0-999s	Defrst Off Tm is an adjustable item used to select how long the constant speed energy wheel is de-energized during defrost.
Cap Limiting	Yes	No Yes	Capacity Limiting is an adjustable item used to turn ON and OFF the energy wheel capacity limiting function.
ERWhl Period	30.0s	0-999s	ER WhI Period an adjustable item which sets the "sampling time" used in the PI control function.
ERWhl Gain	1.0	0.0-100.0	ER WhI Gain is an adjustable item which sets the "Gain" used in the PI control function.
ER WhI PAT	30.0s	0-999s	ER WhI PAT is an adjustable item which sets the "project ahead time" used in the PI control function.
ERWhI Max Chg	10%	0-100%	ERWhI Max Chg is an adjustable item that sets the maximum value for an increase or decrease of the energy recovery wheel speed.
EWTFrost Spt	32.0°F	23.0-41.0°F	EWTFrost Spt is an adjustable item that sets a minimum entering wheel temp that frost prevention will be allowed at.
Menu Display Name	Default	Range	Description
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SCRPreheat Cap	-	0-100%	SCRPreheatCap is status only item which displays the current SCR preheat capacity
SCRPreheat Period	60.0s	0.0-999.0s	SCRPreheatPeriod is an adjustable item which sets the "sampling time" used in the PI control function.
SCRPrht Gain	0.8	0.0-100.0	SCRPrht Gain is an adjustable item which sets the "Gain" used in the PI control function.
SCRPrht PAT	120.0s	0.0-999.0s	SCRPrht PAT is an adjustable item which sets the "project ahead time" used in the PI control function.
SCRPrht Max Chg	10%	0-100%	SCRPrht Max Chg is an adjustable item that sets the maximum value for an increase or decrease of the SCR Preheat capacity

Sensors

CO2 Sensor Set-Up

Table 112: Main Menu \ Advanced Menu \ CO2 Sensor Set-Up

Menu Display Name	Default	Range	Description
Min PPM	0ppm	0-5000ppm	Min PPM is an adjustable item that sets the minimum PPM value of the field supplied CO2 input signal
Max PPM	2000ppm	0-5000ppm	Max PPM is an adjustable item that sets the maximum PPM value of the field supplied CO2 input signal
V/A @ Min PPM	0.0/V	0.0-20.0/V mA	V/A @ Min PPM is an adjustable item that sets the DC voltage or mA value at the minimum PPM value of the field supplied CO2 input signal
V/A @ Max PPM	10.0/V	0.0-20.0/V mA	V/A @ Max PPM is an adjustable item that sets the DC voltage or mA value at the maximum PPM value of the field supplied CO2 input signal

Power Monitor

Table 113: Main Menu \ Advanced Menu \ Power Monitor

Menu Display Name	Default	Range	Description
kWhAccumReset	No	No	kWhAccumReset is an adjustable item that allows the user to
		Yes	
AvgkWPeriod	60.0min	0.0-1440.0 min	AvgkWPeriod sets the period used to calculate the average kW.

Sensor Offsets

Table 114: Main Menu \ Advanced Menu \ Sensor Offsets

Menu Display Name	Default	Range	Description
Disch Air			
0.0	-10.0- 10.0°F	Disch Air is an adjustable setting that sets the sensor offset for the sensor.	
Return Air	0.0	-10.0-10.0°F	Return Air is an adjustable setting that sets the sensor offset for the sensor.
OA Temp	0.0	-10.0-10.0°F	OA Temp is an adjustable setting that sets the sensor offset for the sensor.
Space Temp 1	0.0	-10.0-10.0°F	Space Temp 1 is an adjustable setting that sets the sensor offset for the sensor.
Space Temp 2	0.0	-10.0-10.0°F	Space Temp 2 is an adjustable setting that sets the sensor offset for the sensor.
Space Temp 3	0.0	-10.0-10.0°F	Space Temp 3 is an adjustable setting that sets the sensor offset for the sensor.
EF/LC Temp	0.0	-10.0-10.0°F	EF/LC Temp is an adjustable setting that sets the sensor offset for the sensor.
ER EWT	0.0	-10.0-10.0°F	ER EWT is an adjustable setting that sets the sensor offset for the sensor.
ER LWT	0.0	-10.0-10.0°F	ER LWT is an adjustable setting that sets the sensor offset for the sensor.
DRT1	0.0	-10.0-10.0°F	DRT1 is an adjustable setting that sets the sensor offset for the sensor.
DRT2	0.0	-10.0-10.0°F	DRT2 is an adjustable setting that sets the sensor offset for the sensor.
SRT1	0.0	-10.0-10.0°F	SRT1 is an adjustable setting that sets the sensor offset for the sensor.
SRT2	0.0	-10.0-10.0°F	SRT2 is an adjustable setting that sets the sensor offset for the sensor.
LRT1	0.0	-10.0-10.0°F	LRT1 is an adjustable setting that sets the sensor offset for the sensor.
LRT2	0.0	-10.0-10.0°F	LRT2 is an adjustable setting that sets the sensor offset for the sensor.

Gas Furnace Controller Diagnostic Codes

Modulating Gas Heat Controller (VB1285) Modbus Addresses

The following **Modbus** points in the modulating gas heat control board will be mapped to the main control board to allow for control and monitoring.

Modbus Addresses							
Functions	Modbus Ref	Fnctn Code	Modbus Value	Ctlr Values			
Firing Rate	40006	16	16#FF00: Off	ModGasCmd: 0-100			
			16#FE01 to 16#37C8:				
			Minimum Fire- Maximum Fire				
			(note: msb must be the one's complement of the lsb)				
Burner State	40003	03	Bit	Value	ModCtrlState		
			7	0/1	Flame Detected		
			5	0/1	Pressure Switch Closed		
			0-3	8-15	Reserved (0)		
				7	Run (1)		
				6	Warm-Up (2)		
				5	Gas On (3)		
				4	Igniter On (4)		
				3	Pre-Purge (5)		
				2	Off (6)		
				1	Retry (Interpurge) (7)		
				0	Lockout (8)		

Table 115: Modulating Gas Heat Controller Addresses

Modbus Addresses										
Functions	Modbus Ref	Fnctn Code	Modbus Value	Ctlr Values						
Burner Status (Diagnostic/ Error Codes)	40005	03	Bit	Code Value	Text Display MSV	Burner Module LED Display MSV	Description			
	Lockout		8-15	0	None (0)	000 (0)	No Codes			
	Error Code			3	UnExpMFIm1 (1)	E08 (1)	Unexpected flame, main burner			
				4	UnExpMFIm2 (2)	E08 (2)	Unexpected flame, main burner			
				6	OpnFuse (3)	E13 (3)	Open fuse			
				7	PriLmt (4)	E02 (4)	Primary limit failure (or open fuse)			
				8	ModVFail (5)	E03 (5)	Modulation valve failure			
				9	SafeStrt13 (6)	E03 (6)	Safe start failure (Diagnostic Code 13 prior to light off)			
					SafeStrt14 (7)	E04 (7)	Safe start failure (Diagnostic Code 14 prior to light off)			
					SafeStrt15 (8)	E05 (8)	Safe start failure (Diagnostic Code 15 prior to light off)			
				10	IDErr (9)	EiD (9)	Invalid ID plug installed			
				18	UnExpSFIm (10)	E18 (10)	Unexpected flame, split manifold			
				22	IgFailM (11)	E01 (11)	Failed ignition after retries			
				26	RWEnaFail (12)	E09 (12)	No R/W enable signal during call for heat			
				28	AirPLow (13)	E04 (13)	Air pressure sensor reading low (pressure switch failed to open or insufficient air/blocked vent)			
								29	AirPHi (14)	E05 (14)
				Other	Other (15)	*** (15)	Board failure			
	Diagnostic		0-7	0	None (0)	000 (0)	No codes			
	Code			1	BrdFail (1)	*** (1)	Board failure			
				2	Off (2)	OFF (2)				
				3	Start (3)	*** (3)	Startup sequence active			
				4	IgnFail (4)	A01 (4)	Failed ignition attempt			
				5	FImLoss (5)	A02 (5)	Lost flame			

Modbus Addre	esses																																						
Functions	Modbus Ref	Fnctn Code	Modbus Value	Ctlr Values	;																																		
Burner Status (Diagnostic/	Diagnostic Code		0-7	6	CombAir (6)	A03 (6)	Insufficient combustion air																																
Error Codes)				7	LoFLmtd (7)	A04 (7)	Limited low fire																																
				8	WkFlmM (8)	A05 (8)	Weak flame signal main burner																																
				9	NA (9)	A06 (9)	NA																																
				10	WkFlmS (10)	A15 (10)	Weak flame signal split burners(s)																																
				11	IgnFailM (11)	E01 (11)	Failed ignition after retries, main burner																																
				12	LmtFail (12)	E02 (12)	Primary limit failure (or open fuse)																																
				13	ModVlv (13)	E03 (13)	Modulation valve failure																																
				14	AirPLow (14)	E04 (14)	Air pressure sensor reading low (pressure switch failed to open or insufficient air/blocked vent)																																
				15	AirPHi (15)	E05 (15)	Air pressure sensor reading high (pressure switch failed to close)																																
				16	NA (16)	NA (16)	NA																																
				17	NA (17)	NA (17)	NA																																
				18	UexpFIM (18)	E08 (18)	Unexpected flame, main burner																																
									19	NoR/W (19)	E09 (19)	No R/W enable signal during call for heat																											
				20	IDErr (20)	EiD (20)	Invalid ID plug installed																																
					21	NA (21)	NA (21)	NA																															
																																						22	UexpFIS (18)
				23	OpnFuse (19)	E13 (23)	Open fuse																																
				24	IgFailS (20)	A11 (24)	Failed ignition after retries, split burner(s)																																
				33	AirFail (21)	A07 (33)	Air modulation failure (inducer fan not ramping down)																																
				34	AirPSns (22)	A08 (34)	Air pressure sensor null pressure check (out of tolerance)																																

Staged Gas Heat Controller (VB1287) Modbus Addresses

The following **Modbus** points in the slave gas heat control board will be mapped to the main control board to allow for control and monitoring:

Table	116.	Staged	Gas	Heat	Controller	Modbus	Addresses
lane	110.	Slayeu	Gas	ineat	Controller	woubus	Audiesses

Daikin VFD Modbus Addresses								
Functions	Modbus Ref	Fnctn Code	Modbus Value	Ctlr Values				
Firing Rate	40302	16	0: Off	ModGasCm	nd: 0-100			
			1-100:					
			Minimum Fire- Maximum Fire					
Primary Burner State	40285	03			ModCtrlState			
Dumer State			Bit	Value	PrimaryState			
			0-3	8-15	NA			
			0-3	7	Run (8)			
				6	Warm-Up (6)			
				5	Gas On (5)			
				4	Igniter On (4)			
				3	Pre-Purge (3)			
				2	Off (2)			
				1	Retry (Interpurge) (1)			
				0	Lockout (0)			
					Lockout (8)			
Split Burner State	40288	03	Bit	Value	SplitState	Burner Module LED Display MSV	Description	
	Lockout		0-3	8-15	NA	000 (0)	No Codes	
	Error Code			7	Run (8)	E08 (1)	Unexpected flame, main burner	
				6	Warm-Up (6)	E08 (2)	Unexpected flame, main burner	
				5	Gas On (5)	E13 (3)	Open fuse	
				4	Igniter On (4)	E02 (4)	Primary limit failure (or open fuse)	
				3	Pre-Purge (3)	E03 (5)	Modulation valve failure	
				2	Off (2)	E03 (6)	Safe start failure (Diagnostic Code 13 prior to light off)	
				U	Retry (Interpurge) (1)	E04 (7)	Safe start failure (Diagnostic Code 14 prior to light off)	
					Lockout (0)	E05 (8)	Safe start failure (Diagnostic Code 15 prior to light off)	

Daikin VFD Modbus Addresses							
Functions	Modbus Ref	Fnctn Code	Modbus Value	Ctir Values			
Split Burner State	Lockout Error		0-3	10	IDErr (9)	EiD (9)	Invalid ID plug installed
	Code			18	UnExpSFIm (10)	E18 (10)	Unexpected flame, split manifold
				22	IgFailM (11)	E01 (11)	Failed ignition after retries
				26	RWEnaFail (12)	E09 (12)	No R/W enable signal during call for heat
				28	AirPLow (13)	E04 (13)	Air pressure sensor reading low (pressure switch failed to open or insufficient air/ blocked vent)
				29	AirPHi (14)	E05 (14)	Air pressure sensor reading high (pressure switch failed to close)
				Other	Other (15)	*** (15)	Board failure
	Diagnostic Code	stic	0-7	0	None (0)	000 (0)	No codes
				1	BrdFail (1)	*** (1)	Board failure
				2	Off (2)	OFF (2)	
				3	Start (3)	*** (3)	Startup sequence active
				4	IgnFail (4)	A01 (4)	Failed ignition attempt
				5	FImLoss (5)	A02 (5)	Lost flame
				6	CombAir (6)	A03 (6)	Insufficient combustion air
				7	LoFLmtd (7)	A04 (7)	Limited low fire
				8	WkFlmM (8)	A05 (8)	Weak flame signal main burner
				9	NA (9)	A06 (9)	NA
				10	WkFlmS (10)	A15 (10)	Weak flame signal split burners(s)
				11	IgnFailM (11)	E01 (11)	Failed ignition after retries, main burner
				12	LmtFail (12)	E02 (12)	Primary limit failure (or open fuse)
				13	ModVlv (13)	E03 (13)	Modulation valve failure
					14	AirPLow (14)	E04 (14)
				15	AirPHi (15)	E05 (15)	Air pressure sensor reading high (pressure switch failed to close)

Daikin VFD Mo	Daikin VFD Modbus Addresses									
Functions	Modbus Ref	Fnctn Code	Modbus Value	Ctlr Values						
Split Burner	Diagnostic		0-7	16	NA (16)	NA (16)	NA			
State	Code			17	NA (17)	NA (17)	NA			
				18	UexpFIM (18)	E08 (18)	Unexpected flame, main burner			
				19	NoR/W (19)	E09 (19)	No R/W enable signal during call for heat			
				20	IDErr (20)	EiD (20)	Invalid ID plug installed			
				21	NA (21)	NA (21)	NA			
				22	UexpFIS (18)	E18 (22)	Unexpected flame, split manifold			
				23	OpnFuse (19)	E13 (23)	Open fuse			
					24	IgFailS (20)	A11 (24)	Failed ignition after retries, split burner(s)		
				33	AirFail (21)	A07 (33)	Air modulation failure (inducer fan not ramping down)			
				34	AirPSns (22)	A08 (34)	Air pressure sensor null pressure check (out of tolerance)			

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Wiring Diagram Example:

This wiring diagram is for reference only. Actual unit wiring diagram will vary based on the features equipped.

Figure 50: Typical Rebel Wiring Diagram



Figure 51: Typical Rebel Wiring Diagram (continued)



Figure 52: Typical Rebel Wiring Diagram (continued)



Figure 53: Typical Rebel Wiring Diagram (continued)











Figure 56: Typical Rebel Wiring Diagram (continued)



Figure 57: Typical Rebel Wiring Diagram (continued)



Figure 58: Typical Rebel Wiring Diagram (continued)



Figure 59: Typical Rebel Wiring Diagram (continued)





Figure 61: Typical Rebel Wiring Diagram (continued)



ModBus

Modbus I/O

A large number of devices in the unit are controlled via a RS-485 bus built into the unit controller using **Modbus** protocol. These devices are.

- One or more ECM Supply Fans
- One or more ECM Return/Exhaust Fans
- Energy Recovery Wheel ECM
- Gas heat Controller
- Variable Capacity Compressor Control Boards

Figure 62: Modbus Network Configuration



Data Snapshot Tables

The following tables show the data snapshots that are taken at the time of an alarm or event.

MCB = Main Control Board

EM = Expansion Module.

+ = Denotes the 96UE version of the Expansion Module

Table 117: Data Set 1-5

Data Set 1	Data Set 2	Data Set 3	Data Set 4	Data Set 5
UnitState	ActiveAlarmEnu	SAFDSP	UnitState	UnitState
UnitStatus	ActiveEvents	MinOASrc	PACtrlTemp	Circuit1.HMIState
ClgStatus	nviEconEnaS	AirFlwStatus	ER EWT	Circuit2.HMIState
HtgStatus	nviEconEnaV	FilterSw	ER LWT	EVI1Pos
DehumStatus	OADEndSwIn	FilterSw2	MinSAFCap	EVI2Pos
EconStatus	ClosedDmpSw%	ERWStatusSw	MaxSAFCap	PTS1Avg
ClgCapacity	OpenDmpSw%	PassVentActv	SAF1CommStatus	PTS2Avg
HtgCapacity	EcoLoLimit	NetPassVent	SAF2CommStatus	Teg1
ReheatCapacity	EcoHiLimit	LowPress1	SAF3CommStatus	Teg2
OADmprOut	MinSwDiff	LowPress2	SAF4CommStatus	PTD1Avg
CtrlTempSrc	MaxSwDiff	HiPress1	ECM_SAF1Status	PTD2Avg
ControlTemp	NtwkDmdShed	HiPress2	ECM_SAF2Status	Tc1
DAT	OAFlow	FreezeStat	ECM_SAF3Status	Tc2
RAT	ERCapFbk	DHL	ECM_SAF4Status	Tp1
SpaceTemp1	ExtOAInput	EmrgncyOff	VFDAnlg_SAFStatus	Tp2
SpaceTemp2	FilterPress1	nviEmrgOvrd	VFD_SAFStatus	DRT1
SpaceTemp3	FilterPress2	ReheatSpt	RFEF1CommStatus	DRT2
EffOAT	FilterPress3	nviPrmClgEnS	RFEF2CommStatus	SRT1
EFT_LCT	PriStateStgG	nviPrmClgEnV	RFEF3CommStatus	SRT2
SpaceRelHum1	SplStateStgG	nviPrmHtgEnS	RFEF4CommStatus	VCmp1Temp
SpaceRelHum2	PriStateModG	nviPrmHtgEnV	ECM_RFEF1Status	VCmp2Temp
SAFCapOut'	DiagCodeStgG	RARelHum	ECM_RFEF2Status	SSH1
SAFCapFbk	DiagCodeModG	OARelHu'	ECM_RFEF3Status	SSH2
Anlg_SAFCapFbk	ErrCodeModG		ECM_RFEF4Status	DSH1
			VFDAnlg_RFEFStatus	DSH2
			VFD_RFEFStatus	

Table 118: Data Set 6-10

Data Set 6	Data Set 7	Data Set 8	Data Set 9	Data Set 10
UnitState	UnitState	I/O MCB X1	UnitState	UnitState
PTS1	VCmpMB1. VcmpAlarmDec	I/O MCB X2	I/O EM C X1	I/O EM A X4
PTS2	VCmpMB2. VcmpAlarmDec	I/O MCB X3	I/O EM C X2	I/O EM A X5
PTD1	IFB1CommStatus	I/O MCB X4	I/O EM C X3	I/O EM A X6
PTD2	IFB2CommStatus	I/O MCB X4 Reliability	I/O EM C X4	I/O EM A X7
VCmp1SSOut	HDRT1	I/O MCB X5	I/O EM C X4 Reliability	I/O EM A X7 Reliability
VCmp2SSOut	HDRT2	I/O MCB X6	I/O EM C X5	I/O EM A X8
VCmp1RPSOut	OAF1VFDStatus	I/O MCB X7	I/O EM D X1	I/O EM A X8 Reliability
VCmp2RPSOut	OAF2VFDStatus	I/O MCB X8	I/O EM D X2	I/O EM A+ X4
FCmp1SSOut	VCmp1FinTemp	I/O MCB X9	I/O EM D X3	I/O EM A+ X5
FCmp2SSOut	VCmp2FinTemp	I/O MCB X9 Reliability	I/O EM D X3 Reliability	I/O EM A+ X6
FCmp3SSOut	Circuit1.OAFanCtrl. OAFanCtrl_Var.TcMax	I/O MCB X10	I/O EM D X4	I/O EM A+ X7
FCmp4SSOut	Circuit2.OAFanCtrl. OAFanCtrl_Var.TcMax	I/O MCB X10 Reliability	I/O EM D X4 Reliability	I/O EM A+ X7 Reliability
FCmp5SSOut	VCmp1. VCmpOAFanCtrl. TcUnload	I/O MCB X11	I/O EM D DI1	I/O EM A+ X8
FCmp6SSOut	VCmp2. VCmpOAFanCtrl. TcUnload	I/O MCB X11 Reliability	I/O EM E+ X1	I/O EM A+ X8 Reliability
VCmp1PriAmps	EHGBP1CapOut	I/O MCB DI1	I/O EM E+ X2	I/O EM H X1
VCmp1SecAmps	EHGBP2CapOut	I/O MCB DI2	I/O EM E+ X3	I/O EM H X2
VCmp2PriAmps	RhtBldVlvOut	I/O MCB DI3	I/O EM E+ X3 Reliability	I/O EM H X3
VCmp2SecAmps	MCB Circ 1 EV Command	I/O MCB DI4	I/O EM E+ X4	I/O EM H X6
Circuit1.EffSSHSpt	MCB Circ 1 EV State	I/O MCB DI5	I/O EM E+ X4 Reliability	I/O EM H X8
Circuit1.EffPTSSpt	MCB Circ 2 EV Command	I/O MCB DI6	I/O EM E+ X8	I/O EM H DI1
Circuit2.EffSSHSpt	MCB Circ 2 EV State		I/O EM E+ X8 Reliability	I/O EM I X1
Circuit.EffPTSSpt			I/O EM E+ DI1	I/O EM I X2
			I/O EM E+ EV Command	I/O EM I X3
			I/O EM E+ EV State	I/O EM I X5
			I/O EM F+ X1	I/O EM I X6
			I/O EM F+ X2	I/O EM I X8
			I/O EM F+ X3	I/O EM I DI1
			I/O EM F+ X3 Reliability	I/O EM J X2
			I/O EM F+ X4	I/O EM J X4
			I/O EM F+ X4 Reliability	I/O EM J X5
			I/O EM F+ X8	I/O EM J X6
			I/O EM F+ X8 Reliability	
			I/O EM F+ DI1	
			I/O EM F+ EV Command	
			I/O EM F+ EV State	



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