OPERATION MANUAL

OM 1387

NOVEMBER 2024

MICROTECH® UNIT CONTROLLER

FOR MAVERICK® II COMMERCIAL ROOFTOP SYSTEMS

- MODEL MPS
- R-32 REFRIGERANT

LEARN MORE AT **DAIKINAPPLIED.COM**

Safety Information

Hazard Identification

⚠ DANGER

Danger indicates a hazardous situation, which will result in death or serious injury if not avoided.

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

Notice indicates practices not related to physical injury.

NOTE: Indicates important details or clarifying statements for information presented in Figures or Tables.

Safety Considerations

⚠ WARNING

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

⚠ WARNING

Excessive moisture in the control panel can cause hazardous working conditions and improper equipment operation. When servicing this equipment during rainy weather, the electrical components in the main control panel must be protected from the rain.

⚠ WARNING

Warning indicates potentially hazardous situations for PVC (Polyvinyl Chloride) and CPVC (Clorinated Polyvinyl Chloride) piping in chilled water systems. In the event the pipe is exposed to POE (Polyolester) oil used in the refrigerant system, the pipe can be chemically damaged and pipe failure can occur.

⚠ CAUTION

Extreme temperature hazard. Can cause damage to system components. The MicroTech Unit Controller is designed to operate in ambient temperatures from -20°F to 125°F (-28.9°C to 51.7°C). It can be stored in ambient temperatures from -40°F to 140°F (-40°C to 60°C). It is designed to be stored and operated in relative humidity up to 95% (non-condensing).

⚠ CAUTION

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

⚠ CAUTION

Miswiring the MicroTech controller will damage the unit. Daikin Applied Americas, Inc. is not responsible for mishandling of our equipment in the field.

As noted in IM 919, install technicians should use caution to not ground a transformer for a field signal to chassis ground. The same ground as the MicroTech unit should be used to prevent any voltage potential from damaging the internal components of the controller.

NOTICE

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user is required to correct the interference at his own expense. **Daikin Applied disclaims any liability resulting from any interference or for the correction thereof.**

Introduction

This manual provides information regarding the MicroTech control system. It specifically describes the operation and programmable options for units with constant air volume (CAV) control and variable air volume (VAV) control.

The MicroTech Unit Controller is a self contained device that is capable of complete, standalone operation. Information in the controller can be displayed and modified by using the keypad/display in the units main control panel. For installation and startup instructions and general information regarding a particular unit, refer to the applicable model-specific installation and maintenance manual.

For installation and startup instructions and general information regarding a particular rooftop unit, refer to the applicable model-specific installation and maintenance manual (Table 1).

⚠ 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
MicroTech Applied Rooftop Unit Controller Network Integration Guide	ED 19117
MicroTech Unit Controller	IM 919
MicroTech Remote Unit Interface	IM 1005
Maverick II Commercial Packaged Rooftop Systems	IM 1390
MT6210 Leak Mitigation Controller for Units Equipped with A2L Refrigerant	IM 1365

MicroTech Fundamentals

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
- DSP Setpoint
- BSP Setpoint
- Heat/Cool Changeover (Zone Setpoints)
- DAT Clg Setpoint
- DAT Htg Setpoint
- Clg Enable (OAT/EWT lockout)
- Htg Enable (OAT lockout)
- Econo Enable (Changeover temp/Enthalpy switch)
- Ventilation Limit/OA damper

Using the Keypad/Display

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 1: 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**.

NOTICE

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 this 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.

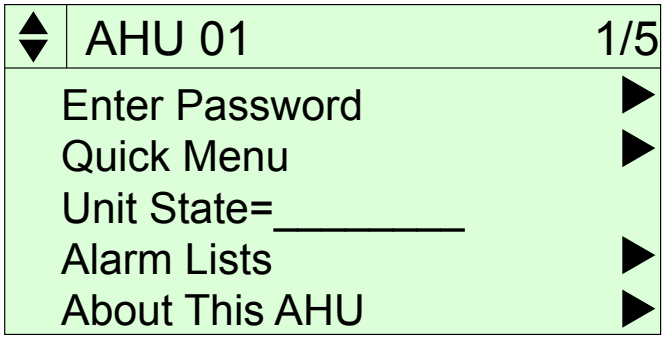
Passwords

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**.

NOTICE
Alarms can be acknowledged without entering a password.

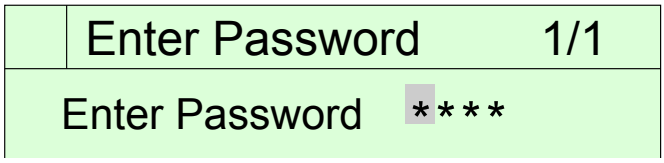
The main page is displayed when the keypad/display is first accessed, the **Home Key** is pressed, the **Back Key** is pressed multiple times, or if the keypad/display has been idle longer than the **Password Timeout** (default 10 minutes). The main page provides access to enter a password, access the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

Figure 2: Main Page



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 3: Password Entry Page



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 cause 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.

Manual Control

A user may manually control outputs to check operation of components when **Manual Control** is set to ManCtrl. When Manual Control is set to ManCtrl, the unit is disabled and the unit is shut down in the normal manner if it is operating. Outputs listed in the Manual Control menu of the Keypad/Display section can then be controlled directly until Manual Control is set to Normal.

NOTICE

Manual Control will be set to No automatically after 240 minutes so that a person could not put the unit into Manual Mode control and walk away from the unit and let it run at the manual settings.

When Manual Control is set to Yes, the Control Mode is set to Off so that the unit will not restart automatically.

When Manual Control is set to Normal all digital outputs in the Manual Control menu are set to Off and all the analog outputs are set to 0.0% so that all outputs are in the Off or minimum position when Manual Control is set to ManCtrl.

All alarms except those listed below are overridden during Manual Control.

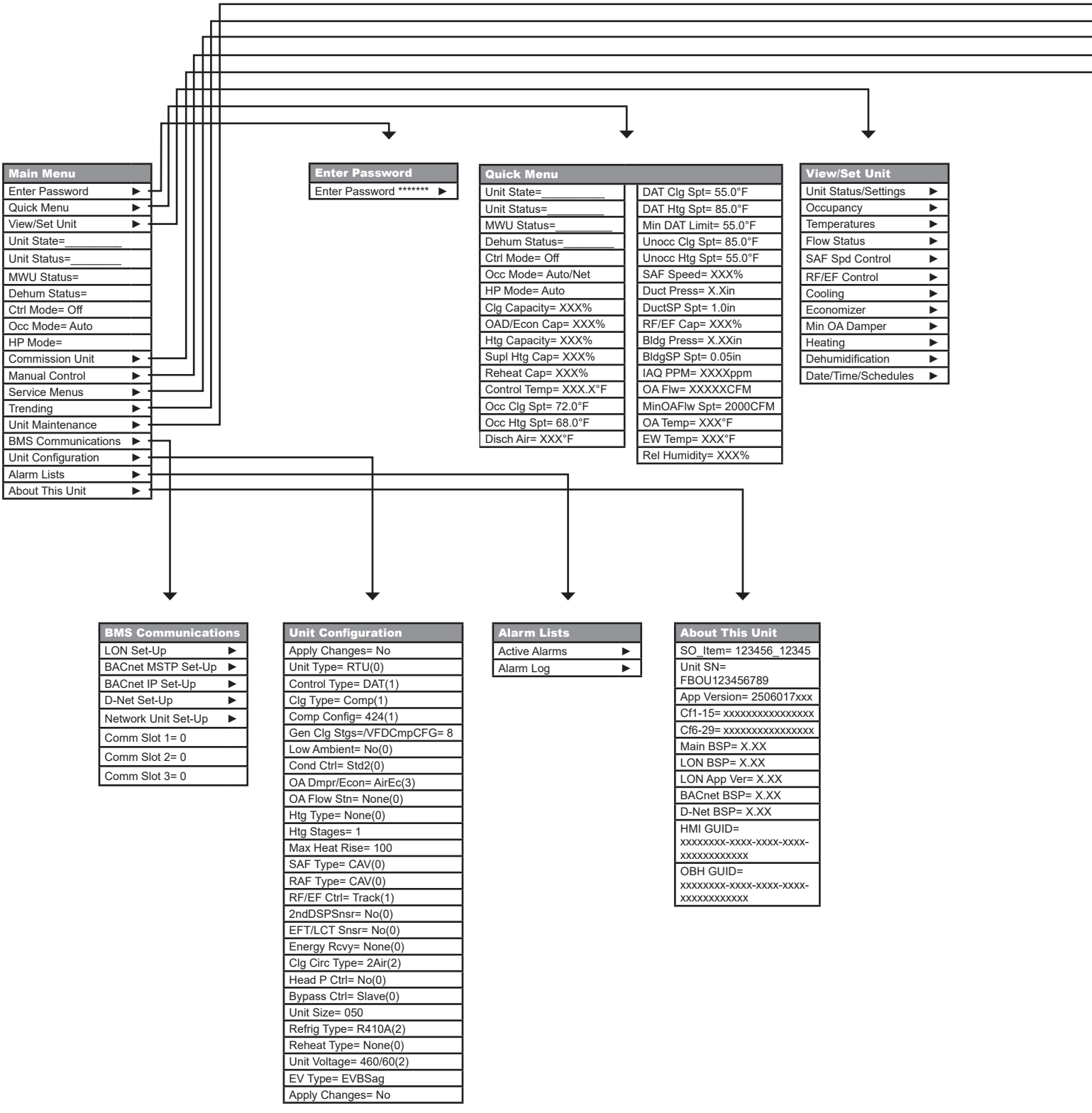
During Manual Control, the unit will respond in the normal manner to the following alarms:

- Emergency Stop Fault
- Duct High Limit
- High Return Temperature
- High Discharge Temperature
- Low Discharge Temperature
- High Pressure - Circuit # 1
- High Pressure - Circuit # 2
- Low Pressure - Circuit # 1
- Low Pressure - Circuit # 2

Keypad/Display Menu Structure

The following is a description of the MicroTech 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 4: Main Menu *– Keypad/Display Menu Structure*



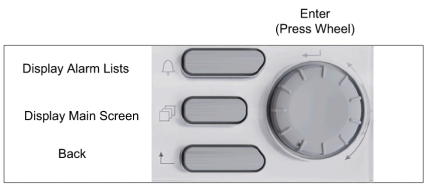
Commission Unit
Unit Set-Up ▶
Timer Settings ▶
SAF Set-Up ▶
RF/EF Set-Up ▶
Htg/Clg ChgOvr Set-Up ▶
Cooling Set-Up ▶
INV Cmp Set-Up ▶
Var Cmp Set-Up ▶
Econo Set-Up ▶
Min OA Set-Up ▶
Heating Set-Up ▶
OA Fan Set-Up ▶
Exp Valve Set-Up ▶
Defrost Set-Up ▶
Dehum Set-Up ▶
Energy Rec Set-Up ▶
Head Pressure Set-Up ▶
Evap Cond Set-Up ▶
D3 Set-Up ▶
Alarm Configuration ▶

Manual Control	
Manual Ctrl= Normal	CFan Outpt 2= Off
Supply Fan= Off	CFan Outpt 3= Off
SAF Spd Cmd= 0%	ExhFan Out 1= Off
INV/OF Ena= Off	ExhFan Out 2= Off
INV Cmp= Off	EC Dm Valve= Close
INV Cmp Cmd= 0%	Gas Htg On/Off= Off
Comp 3= Off	Htg Valve= 0%
OA Fan= Off	SCR Out= 0%
OA Fan Cmd= 0%	Htg Stg 1= Off
4 Way Valve= Off	SCR Ena 1= Off
RcvSol Valve=Off	Htg Stg 2= Off
BP Sol Valve= Off	SCR Ena 2= Off
EVI Cmd= 0%	Htg Stg 3= Off
EVO Cmd= 0%	Htg Stg 4= Off
RF/EF Fan= Off	Htg Stg 5= Off
RF/EF Spd Cmd= 0%	Htg Stg 6= Off
OAD/Econo= 0%	Reheat Valve= 0%
OAD OpCl= Close	RH Output= Off
Var Cmp= Off	ERec Wheel= Off
Var Cmp Cmd= 0%	ER Whl Cmd= 0%
VCmp Emg Stop= Nrml	ERBP Dmpr Cl= Off
Comp 1= Off	ERBP Dmpr Op= Off
Comp 2= Off	Alm Output= Off
Comp 3= Off	Fan Op Out= Off
Comp 4= Off	
Comp 5= Off	
Comp 6= Off	
Comp 7= Off	
Comp 8= Off	
CFan Outpt 1= Off	

Service Menus
Timer Settings ▶
Operating Hours ▶
Save/Restore Settings ▶
Active Alarms ▶
Alarm Log ▶
Event Log ▶
Data Snapshots ▶
Alarm/Event Configuration ▶
Analog Input Status ▶
Universal I/O Status ▶
Digital Input Status ▶
Digital Output Status ▶
Network Input Status ▶
Modbus Status ▶
IP Set Up ▶
D3 Status ▶
Sensor Offsets ▶
HMI Set Up
Reset Counter= XXXX
LastResetInfo

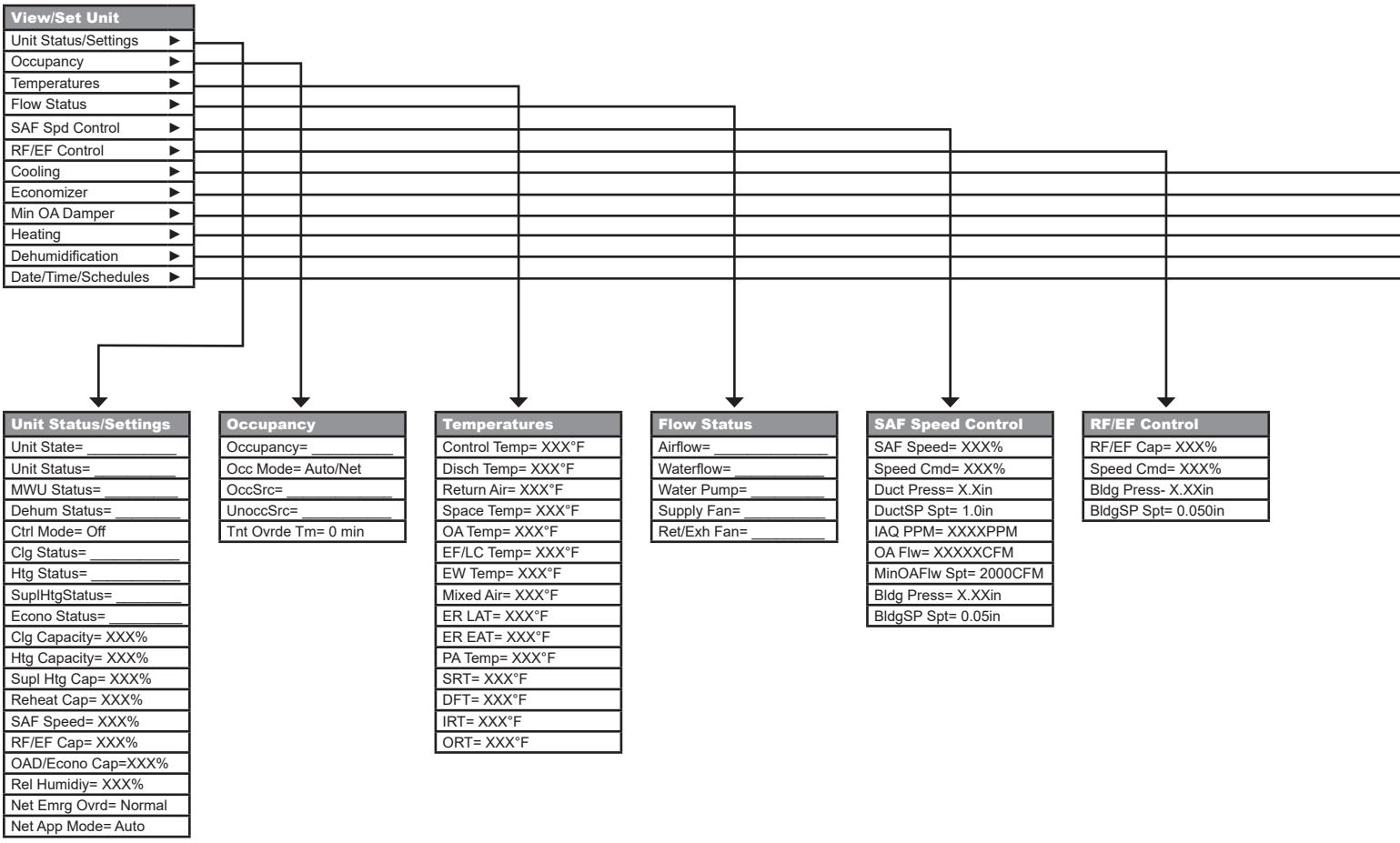
Trending
Trending Ena= No
Apply Chgs= No
Sample Time= 300s
TrendOnOff= Off
AutoExpTime= 1440m
Export Data= No
Clear Trend= Done
Trend Full= Wrap
Default Trend= No
Points 1–5 ▶
Points 6–10 ▶
Points 11–15 ▶
Points 16–20 ▶
Points 21–25 ▶
Points 26–30 ▶

Unit Maintenance
Operating Hours



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.

***Figure 5: View/Set Unit** – Keypad/Display Menu Structure*



Cooling
Occ Clg Spt= 72.0°F
Unocc Clg Spt= 85.0°F
DAT Clg Spt= 55.0°F

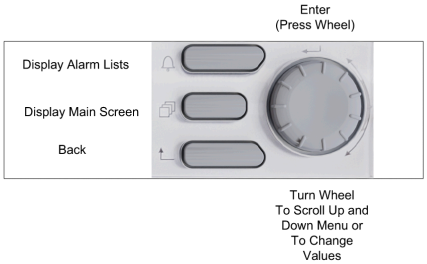
Economizer
OAD/Econo Pos= XXX%
DAT Clg Spt= 55.0°F
Min OA Pos= XXX%
FreeClgStatus = _____
Occ Clg Spt= 72.0°F
Unocc Clg Spt= 85.0°F

Min OA Damper
Min OA Pos= XXX%
Vent Limit= 20%
LoFlo V Lmt= 30%
DCV Limit= 10%
Min OA Src= _____

Heating
Occ Htg Spt= 68.0°F
Unocc Htg Spt= 55.0°F
MWU Spt= 70.0°F
DAT Htg Spt= 85.0°F

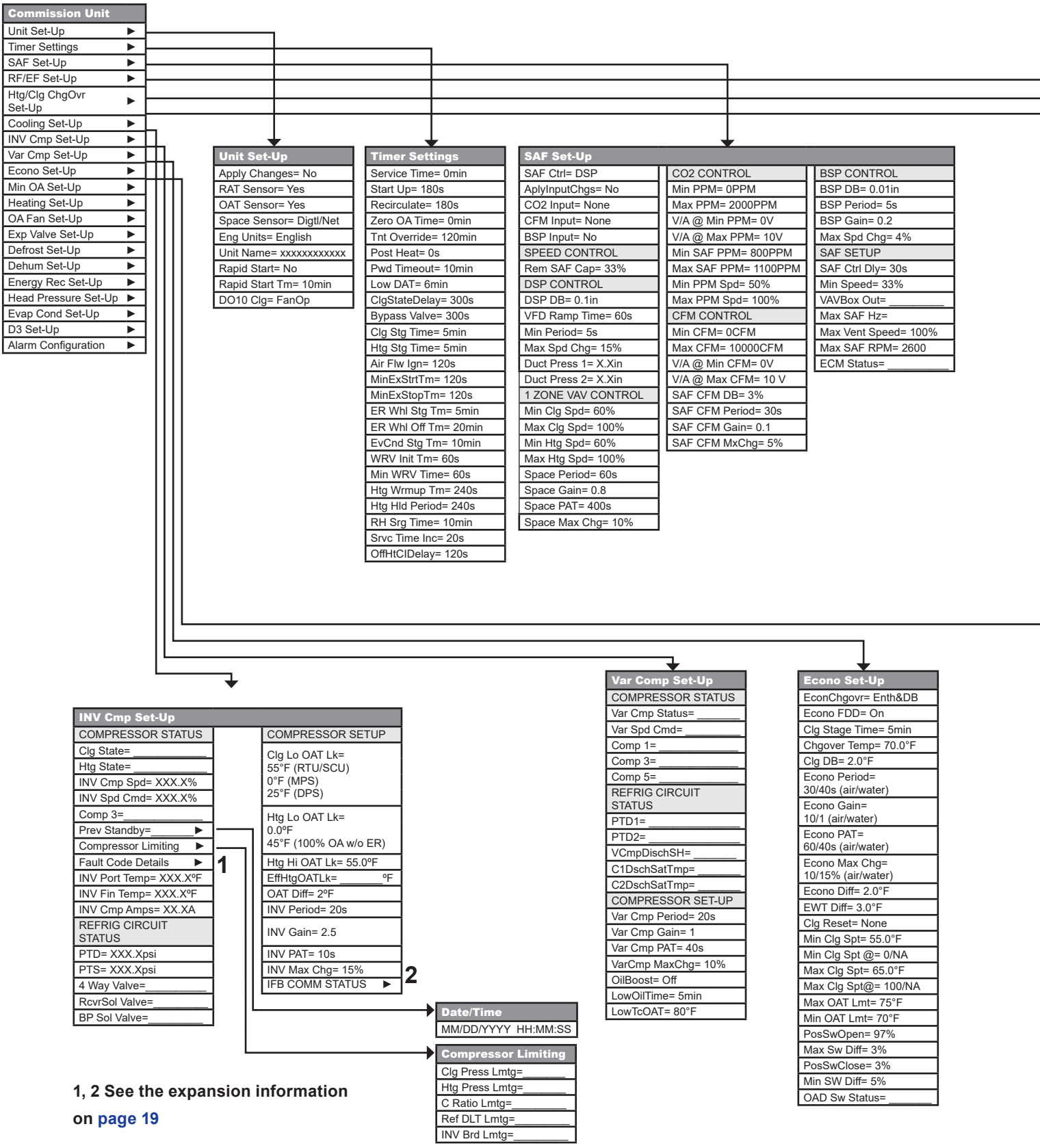
Dehumidification
Dehum Status= _____
Rel Humidity= XXX%
Dewpoint= XXX°F
Dehum Method= None
RH Setpoint= 50%
Dewpoint Spt= 50°F
Reheat Spt= XXX°F
Reheat Cap= XXX%

Date/Time/Schedules
Time= hh:mm:ss
Date= MM/DD/YY
UTC Diff= -60min
DAILY SCHEDULE
Mon= HH:MM-HH:MM
Tue= HH:MM-HH:MM
Wed= HH:MM-HH:MM
Thu= HH:MM-HH:MM
Fri= HH:MM-HH:MM
Sat= HH:MM-HH:MM
Sun= HH:MM-HH:MM
Hol= HH:MM-HH:MM
HOLIDAY DATES
Hol 1=MMMDD/YY-MMMDD/YY
Hol 2=MMMDD/YY-MMMDD/YY
Hol 3=MMMDD/YY-MMMDD/YY
Hol 4=MMMDD/YY-MMMDD/YY
Hol 5=MMMDD/YY-MMMDD/YY
Hol 6=MMMDD/YY-MMMDD/YY
Hol 7=MMMDD/YY-MMMDD/YY
Hol 8=MMMDD/YY-MMMDD/YY
Hol 9=MMMDD/YY-MMMDD/YY
Hol 10=MMMDD/YY-MMMDD/YY
ONE EVENT SCHEDULE
Beg= MMMDD/YY@HH:MM
End= MMMDD/YY@HH:MM
OPTIMAL START
Enable= No
Htg Range= 0.4 °F/min
Htg OAT= 35 °F
Des Htg OAT= 0 °F
Clg Rate= 0.4 °F/min
Clg OAT= 85 °F
Des Clg OAT= 95 °F
DAYLIGHT SAVINGS
DLS Strt Mon= Mar
DLS Strt Wk= 2nd Week
DLS End Mon= Nov
DLS End Wk= 1st Week
DLS Enable= Auto
PURGE
Max Purge= 0min



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.

***Figure 6: Commission Unit** – Keypad/Display Menu Structure*



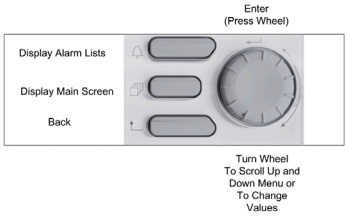
1, 2 See the expansion information on page 19

RF/EF Set-Up	
RF/EF Ctrl= Tracking	MinExSAFCap= 10%
Rem ExhF Cap= 5%	ExhOnOAPos= 40%
BSP DB= 0.01in	ExhMxOAPos= 100%
BSP Period= 5s	Exh Stg 1 On= 40%
BSP Gain= 0.2s	Exh Stg 1 Off= 30%
Max Spd Chg= 4%	Exh Stg 2 On= 55%
Sup Fan Max= 100%	Exh Stg 2 Off= 40%
Sup Fan Min= 30%	Exh Stg 3 On= 70%
RFEF Ctrl Dly= 30s	Exh Stg 3 Off= 50%
Min Speed= 5% (with Exhaust Fan)	Max RF/EF Hz= 60Hz
	Max Vent Spd= 100%
MinExStrtTm= 120s	Max RFEF RPM= 2600
MinExStopTm= 120s	ECM Status= _____
MinExOAPos= 5%	

Htg/Clg ChgOvr Set-Up
Ctlr Temp Src= RAT
AplyTstatchg= No
Use Tstat Spt= No
Occ Clg DB= 2.0°F
Clg Period= 60s
Clg Gain= 0.1
Clg PAT= 600s
Max Clg Chg= 5.0°F
Occ Htg DB= 2.0°F
Htg Period= 60s
Htg Gain= 0.1
Htg PAT= 600s
Max Htg Chg= 5.0°F
CalDRemSpt@10°C= No
CalDRemSpt@50°F= No
CalDRemSpt@30°C= No
CalDRemSpt@86°F= No
DemandShed= Ena
ClgDmdShdInc= 4°F
HtgDmdShdInc= 4°F
ClgShedRate= 2.0°F/hr
HtgShedRate= 2.0°F/hr

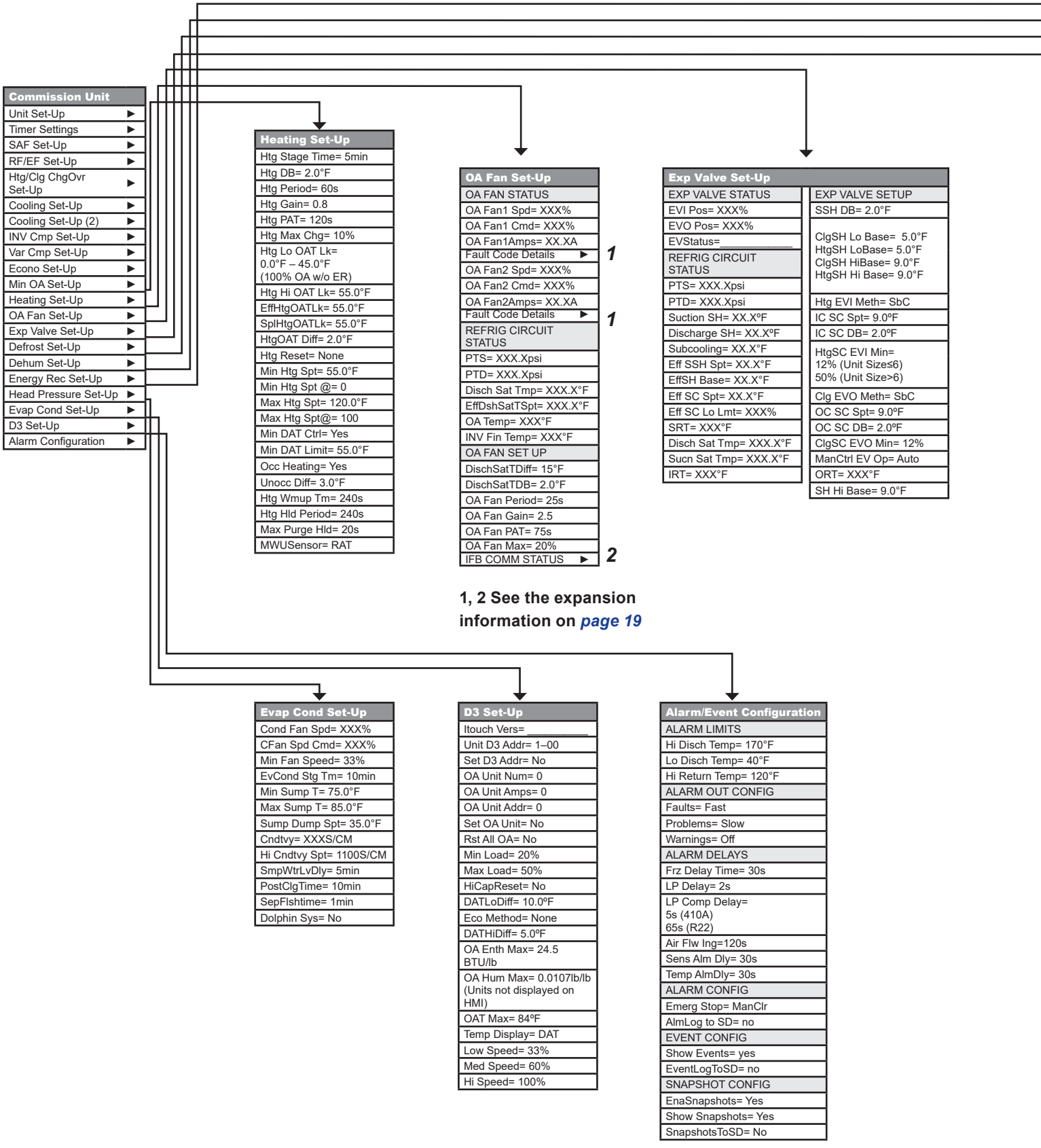
Cooling Set-Up
Clg Stage Time= 5min
RHTBleedDwn=
Clg DB= 2.0°F
Clg Period= 20s
Clg Gain= 1
Clg PAT= 40s
CW Max Chg= 15%
Clg Lo OAT Lk= 55ºF (RTU/SCU) 0°F (MPS) 25°F (DPS or RTU w/ VFD Cmps)
Clg OAT Diff= 2.0°F
Min EWT= 55°F
Clg Reset= None
Min Clg Spt= 55.0°F
Min Clg Spt @= 0/NA
Max Clg Spt= 65.0°F
Max Clg Spt@= 100/NA
Lead Circuit= #1
Staging Type= Std
CFanOut1 Spt= 55°F
CFanOut2 Spt= 65°F
CFanOut3 Spt= 75°F
Cond Fan Diff= 5°F
Unocc Diff= 3°F
DT Above Spt= _____
DT Below Spt= _____

Min OA Set-Up		
AplyMinOAChg= No (Uses MinOAT Type Instance Name)	CFM RESET	FAN SPEED RESET
	OA Flow= XXXXXCFM	Min Fan Diff= 20%
Min OA Reset= None	MinOAFlwSpt= 2000CFM	Max Fan Diff= 50%
BSPOAOvrd= No	Field Stn Rst= No	Min Clg Spd= 40%
RstLmtSnsr= None	Field Stn Cfg= VDC	Des Clg Spd= 100%
EXTERNAL RESET	Min CFM= 0 CFM	BSP RESET
OA @ MinV/mA= 0%	Max CFM= 10000 CFM	MinRFEFTm= 120s
OA @ MaxV/mA= 100%	V/A @Min CFM= 0.0/V	BSP OvdST= 5s
Min V/mA= 0.0/V	V/A @Max CFM= 10.0/V	BSP OvdGain= 0.2
Max V/mA= 10.0/V	OA CFM DB= 3%	BSP OvdMaxChg= 4%
CO2 RESET	OA CFM Period= 30s	DAMPER LIMITING
IAQ Reset= Yes	OA CFM Gain= 0.1	RstTLmt= 32.0ºF
PPM@DCVLmt= 800PPM	OA CFM Max Chg= 5%	RstTSmplTm= 5s
PPM@VntLmt= 1000PPM	Des Flo DB= 3%	RstTGain= 0.2
IAQ PPM= XXXXPPM	DF Period= 30s	RstPAT= 60s
Min PPM= 0 PPM	Des Flo Gain= 0.1	RstTMaxChg= 4%
Max PPM= 2000 PPM	DF Max Chg= 5%	0–30% OA Max= 30%
V/A @Min PPM= 0.0/V	RH Lvl Pos= _____	Min Inc Rate= 0.03
V/A @Max PPM= 10.0/V	LH Lvl Pos= _____	Max Inc Rate= 2.0



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.

Figure 6 continued*: *Commission Unit* – *Keypad/Display Menu Structure



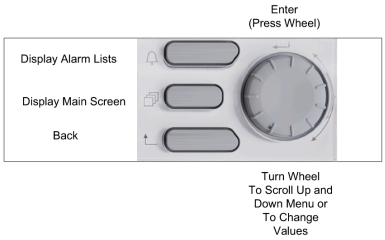
1, 2 See the expansion information on *page 19*

Defrost Set-Up
Defrost State=_____
Manual DF= No
MinCmpOpTm= 10min
MinAccCmpTm= 40min
MaxFrostTm= 120min
Defrost Temp= XXºF
Tdef Adj= 0.0ºF
CmpOpTm= XXXmin
AccCmpOpTm= XXXmin
LoFrstAccTm= XXXmin
HiFrstAccTm= XXXmin

Dehum Set-Up
Dehum Method= None
RH DB= 6%
Dewpoint DB= 2°F
RH Period= 30s
RH Gain= 1
LSC Lo Gain= 0.2
RH PAT= 30s
RH Max Chg= 10%
RH Stg Time= 10min
Stg Rht DB= 5.0°F
Unoccupied Dehum= No
Sensor Loc= Return
Mn LCT= 45.0°F (RTU &MPS) 52.0°F (DPS)
Mx Lvg Coil T= 52.0°F
Rht Cmp Lmtg= Yes
Min Rheat Spt= 55.0°F
Max Rheat Spt= 65.0°F
RH Sens Type= VDC
RH Min Sig= 0.0V
RH Max Sig= 10.0V
Min Dehum Spd= 33%
Max Dehum Spd= 100%
Rht Min Pos= 10% (RPS) 15% (MPS) 5% (DPS/DPH)
RH Dec Rate= 1
RHOutMaxV= 8.5V (MPS & DPS) 10.0V RTU
BackupRHEna= No

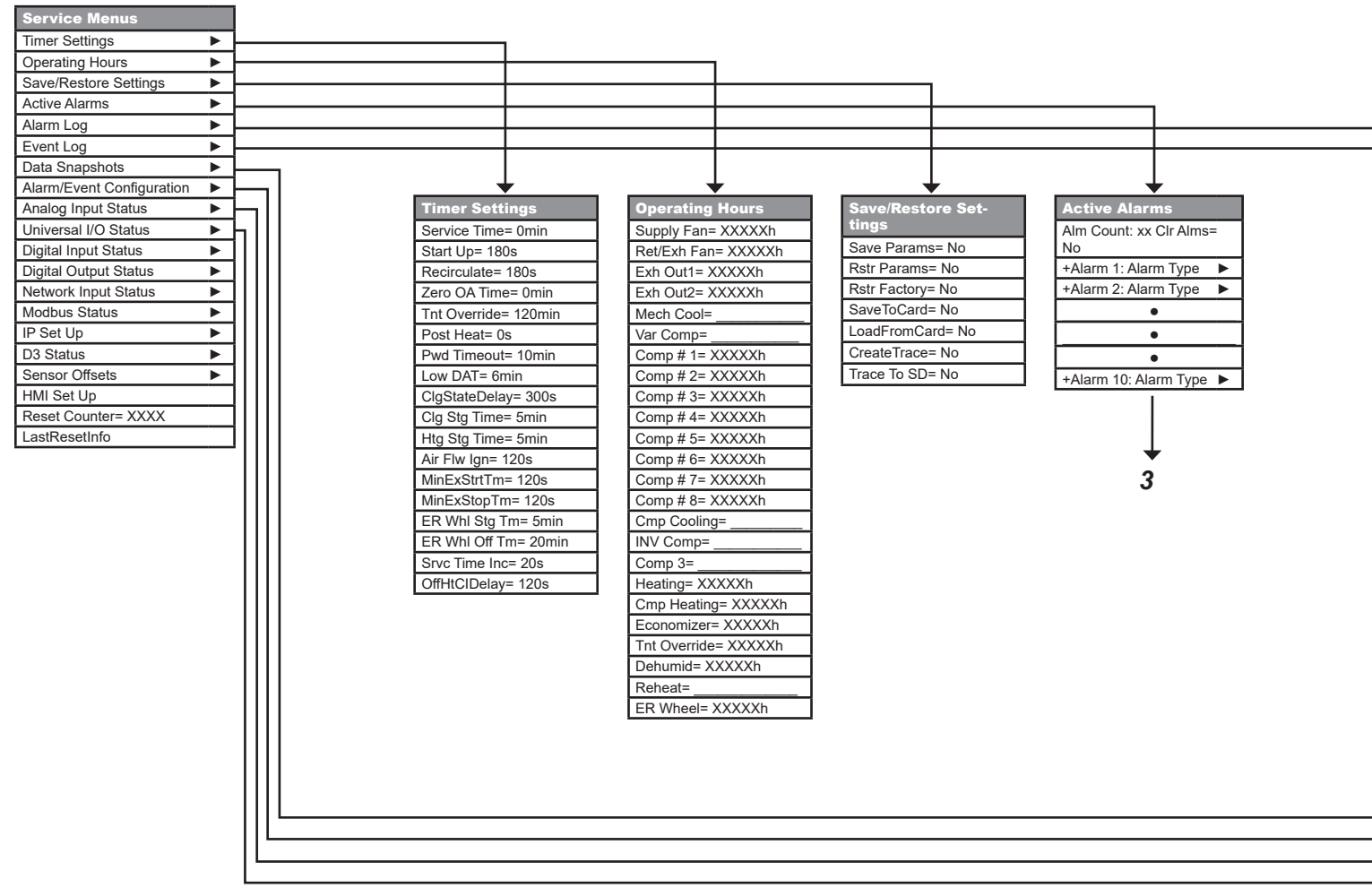
Energy Rec Set-Up
Energy Rcvy= Yes
ER Wheel=_____
Wheel Speed= XXX%
Whl Spd Cmd= XXX%
ER LAT= XXX°F
ER EAT= XXX°F
Min ExhT Diff= 2.0°F
Max ExhT Diff= 6.0°F
ER Whl Stg Tm= 5min
ER Whl Off Tm= 20min
Rel Humidity= XXX%
Min Whl Spd= 5%
Intersect Pt= XXX.XºF
Fst Mgnt Meth= Timed
OA Frst Temp= -5°F
Defrost Time= 5min
Defrost Period= 60min
Defrst On Tm= 1s
Defrst Off Tm= 24s
ER Whl Period= 30s
ER Whl Gain= 1.0
ER Whl PAT= 30s
ER Max Chg= 10%
LoERLATCmpLk= 45.0°F
Cap Limiting= Yes

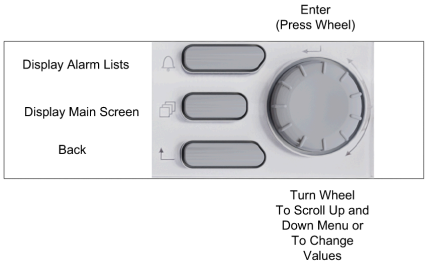
Head Pressure Set-Up
Wtr Reg Vlv= XXX%
Head P Circ 1= XXXPSI
Head P Circ 2= XXXPSI
Setpoint= 260PSI
Head Press DB= 10PSI
WRV Period= 10s
WRV Gain= 3.6
WRV PAT= 10s
WRV Max Chg=7%
WRV Init Tm= 60s
Min WRV Pos=10%
Min WRV Tmp= 58°F
Max WRV Tmp= 150°F
WRV Act Time= 60s
Min WRV Time= 60s



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.

***Figure 7: Service Menu** – Keypad/Display Menu Structure*





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.

Alarm Log
Log Count: xx Clr Log= No ▶
+/-Alarm 1: Alarm Type ▶
+/-Alarm 2: Alarm Type ▶
•
•
•
+/-Alarm 10: Alarm Type ▶
•
•
•
+/-Alarm 50: Alarm Type ▶

4

Alarm/Event Configuration
ALARM LIMITS
Hi Disch Temp= 170°F
Lo Disch Temp= 40°F
Hi Return Temp= 120°F
ALARM OUT CONFIG
Faults= Fast
Problems= Slow
Warnings= Off
ALARM DELAYS
Frz Delay Time= 30s
LP Delay= 2s
LP Comp Delay= 5s (410A) 65s (R22)
Air Flw Ing=120s
Sens Alm Dly= 30s
Temp AlmDly= 30s
ALARM CONFIG
Emerg Stop= ManClr
AlmLog to SD= No
EVENT CONFIG
Show Events= Yes
EventLog to SD= No
SNAPSHOT CONFIG
EnaShapshots= Yes
SHow Snapshots= Yes
Snapshots to SD= No

3, 4 See connection on *page 19*

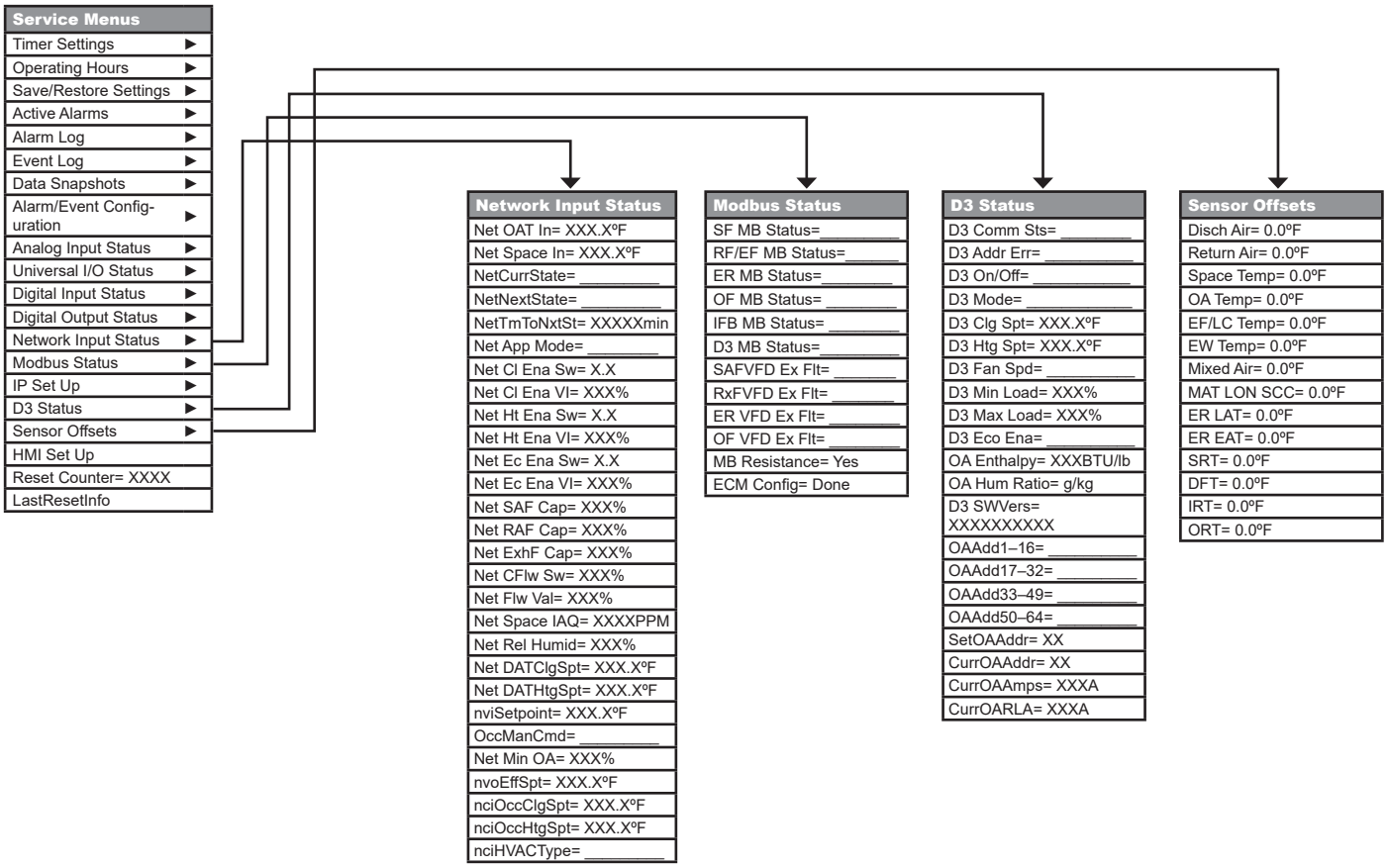
Analog Input Status
MCB AI1= XXXXXXXX
MCB AI2= XXXXXXXX
MCB AI3= XXXXXXXX

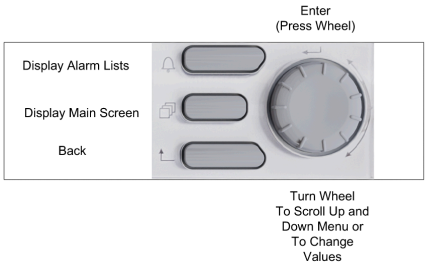
Universal I/O Status	
MCB X1= XXXXXXXX	EMC X1= XXXXXXXX
MCB X2= XXXXXXXX	EMC X2= XXXXXXXX
MCB X3= XXXXXXXX	EMC X3= XXXXXXXX
MCB X4= XXXXXXXX	EMC X4= XXXXXXXX
MCB X5= XXXXXXXX	EMC X5= XXXXXXXX
MCB X6= XXXXXXXX	EMC X6= XXXXXXXX
MCB X7= XXXXXXXX	EMC X7= XXXXXXXX
MCB X8= XXXXXXXX	EMC X8= XXXXXXXX
EMA X1= XXXXXXXX	EMD X1= XXXXXXXX
EMA X2= XXXXXXXX	EMD X2= XXXXXXXX
EMA X3= XXXXXXXX	EMD X3= XXXXXXXX
EMA X4= XXXXXXXX	EMD X4= XXXXXXXX
EMA X5= XXXXXXXX	EMD X5= XXXXXXXX
EMA X6= XXXXXXXX	EMD X6= XXXXXXXX
EMA X7= XXXXXXXX	EMD X7= XXXXXXXX
EMA X8= XXXXXXXX	EMD X8= XXXXXXXX
EMB X1= XXXXXXXX	EME X1= XXXXXXXX
EMB X2= XXXXXXXX	EME X2= XXXXXXXX
EMB X3= XXXXXXXX	EME X3= XXXXXXXX
EMB X4= XXXXXXXX	EME X4= XXXXXXXX
EMB X5= XXXXXXXX	EME X5= XXXXXXXX
EMB X6= XXXXXXXX	EME X6= XXXXXXXX
EMB X7= XXXXXXXX	EME X7= XXXXXXXX
EMB X8= XXXXXXXX	EME X8= XXXXXXXX

Digital Input Status
MCB DI1= _____
MCB DI2= _____
MCB DI3= _____
MCB DI4= _____
MCB DI5= _____
MCB DI6= _____
EMD DLA1= _____

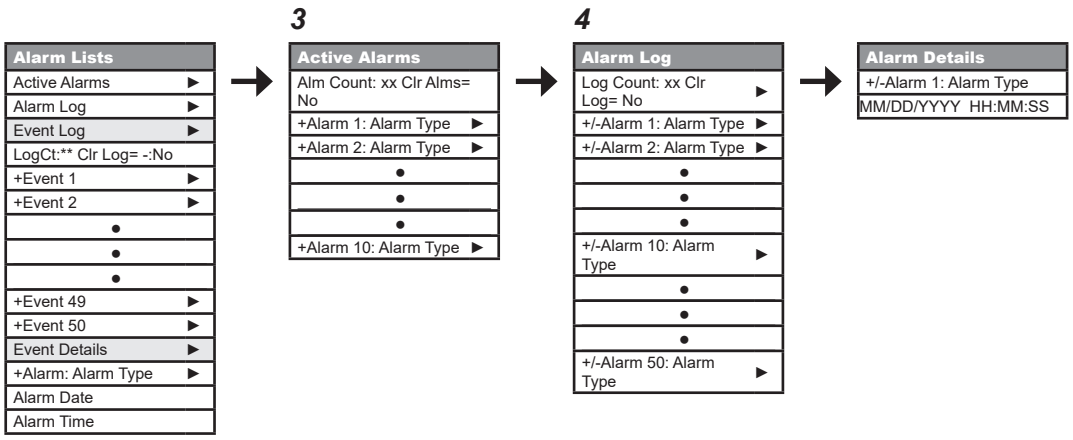
Digital Output Status	
MCB DO1= _____	EMC DO1= _____
MCB DO2= _____	EMC DO2= _____
MCB DO3= _____	EMC DO3= _____
MCB DO4= _____	EMC DO4= _____
MCB DO5= _____	EMC DO5= _____
MCB DO6= _____	EMC DO6= _____
MCB DO7= _____	EMD DO1= _____
MCB DO8= _____	EMD DO2= _____
MCB DO9= _____	EMD DO3= _____
MCB DO10= _____	EMD DO4= _____
EMA DO1= _____	EMD DO5= _____
EMA DO2= _____	EMD DO6= _____
EMA DO3= _____	EME DO1= _____
EMA DO4= _____	EME DO2= _____
EMA DO5= _____	EME DO3= _____
EMA DO6= _____	EME DO4= _____
EMB DO1= _____	EME DO5= _____
EMB DO2= _____	EME DO6= _____
EMB DO3= _____	
EMB DO4= _____	
EMB DO5= _____	
EMB DO6= _____	

***Figure 7 continued: Service Menu** – Keypad/Display Menu Structure*





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.



Expansion Information

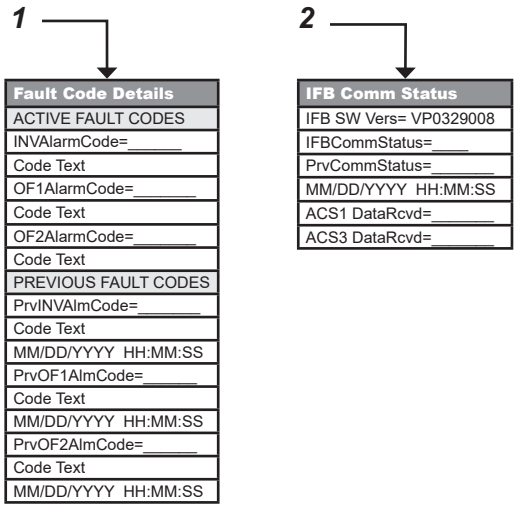


***Figure 8: BMS Communications** – Keypad/Display Menu Structure*

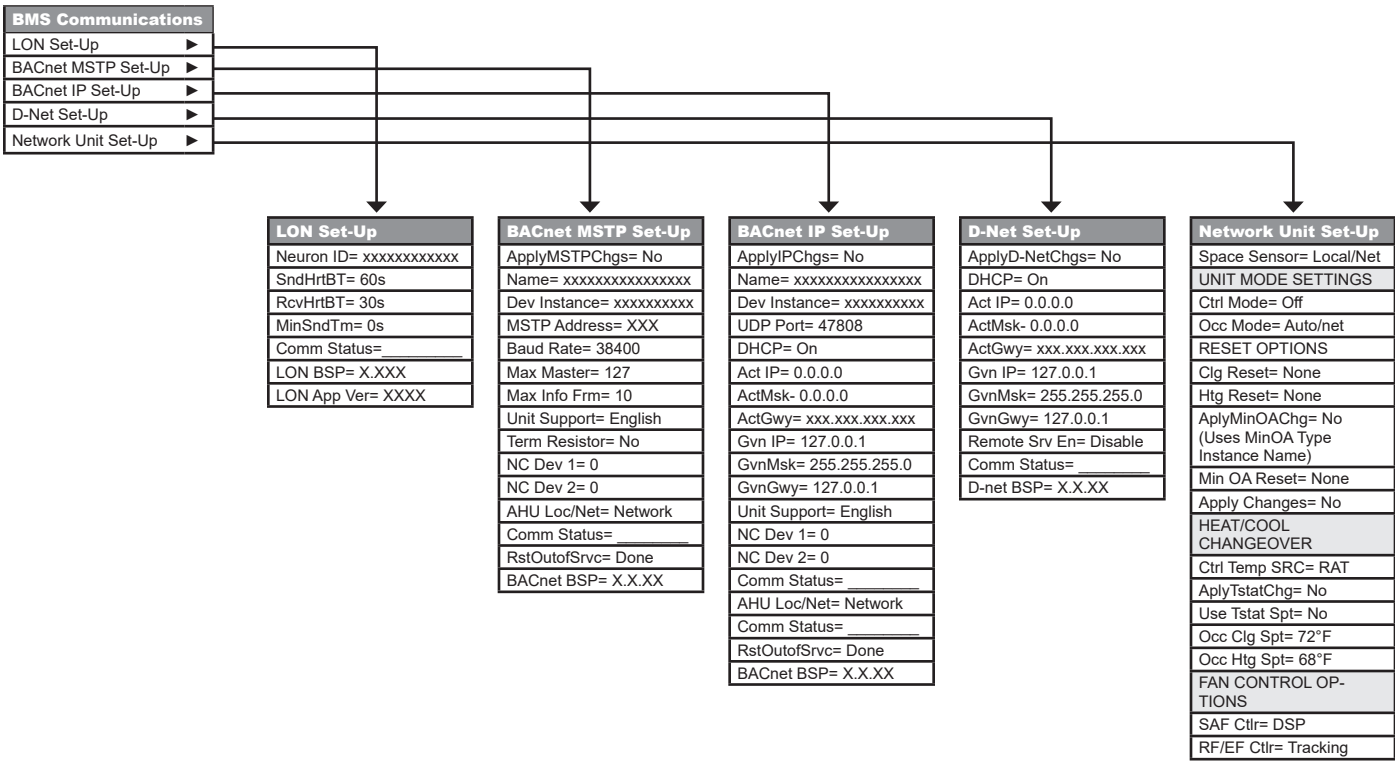
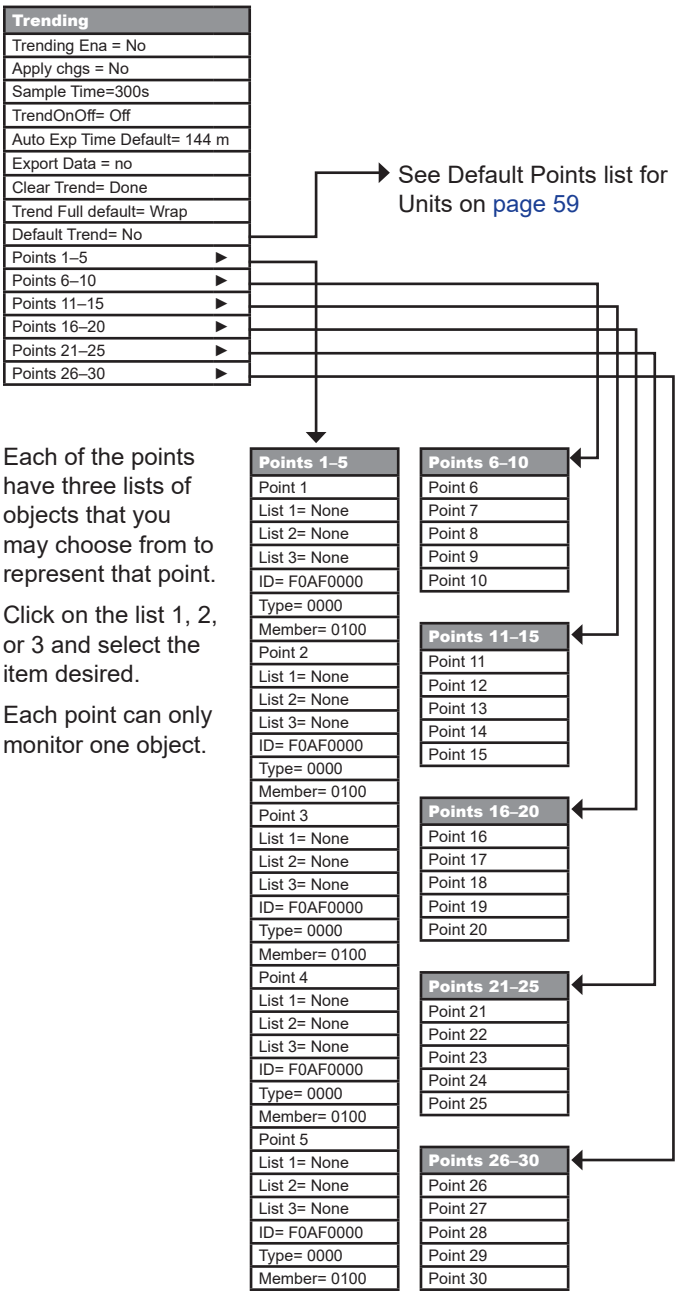


Figure 9: Trending *– Keypad/Display Menu Structure*



Each of the points have three lists of objects that you may choose from to represent that point.

Click on the list 1, 2, or 3 and select the item desired.

Each point can only monitor one object.

After selecting the object to represent that point you must also enter the ID number. When the ID is selected the first four letters will highlight turn the radial knob to select the matching ID number from the list below, hit enter, the rest of the entries for the ID number are done individually until the object ID matches the one associated with the object in the list to the right matches. It is the same procedure for the object type. The member number will always be 0100 when trending the present value.

Points list 1

Enum Text	Object ID	Type
ACS1	0xF0AFC5F0	0x230B
ACS3	0xF0AF08FE	0x230B
ActEvnt	0xF0AFA993	0x230A
AFSts	0xF0AFB26D	0x2204
Alm	0xF0AFCF76	0x230A
BSP	0xF0AFC4BB	0x2203
Clg%	0xF0AFF4B5	0x230A
ClgSt	0xF0AF3991	0x230B
ClgSts	0xF0AFF6A6	0x230B
CO2	0xF0AF7F77	0x2203
CtlCrdT	0xF0AFE952	0x2203
CtrlT	0xF0AF3701	0x2203
DAClgSp	0xF0AF64FD	0x2300
DAHtgSp	0xF0AF6054	0x2300
DAT	0xF0AF538E	0x2203
DeHmSts	0xF0AF56EA	0x230B
Dewpt	0xF0AF532C	0x230A
DewptSp	0xF0AF75C1	0x2300
DFSt	0xF0AFBD68	0x230B
DFT	0xF0AFCA19	0x2203
DRT1	0xF0AFD8D7	0x2203
DRT3	0xF0AFF895	0x2203
DSH	0xF0AF33F2	0x230A
DSP	0xF0AF143C	0x230A
EcoSts	0xF0AFC1AB	0x230B
EFMBSts	0xF0AFAB24	0x230B
EfMnlNV	0xF0AF3D0A	0x230A
EfMxlNV	0xF0AFB58E	0x230A
EFT/LCT	0xF0AF356B	0x2203
EREAT	0xF0AF0DBB	0x2203
ERLAT	0xF0AFFD44	0x2203
ERWhl%	0xF0AF101D	0x2203
EVI%	0xF0AF3028	0x2203
EVICmd	0xF0AF2EAF	0x2206
EVO%	0xF0AF17B1	0x2203
EVOCmd	0xF0AF0936	0x2206

Points list 2

Enum Text	Object ID	Type
Htg%	0xF0AFF01C	0x230A
HtgSt	0xF0AF4BE8	0x230B
HtgSts	0xF0AFD173	0x230B
HtSnkT	0xF0AFF487	0x2203
IFBCom	0xF0AF6D75	0x230B
INV%	0xF0AFDA3E	0x2203
INVAmps	0xF0AFA7E2	0x2203
INVCmd	0xF0AFEC72	0x2206
INVFC	0xF0AF3BDA	0x230A
INVFT	0xF0AF88A8	0x2203
INVTmp	0xF0AFE60D	0x2203
IRT	0xF0AFE8B8	0x2203
MinOA%	0xF0AFEEC9	0x230A
OAD%	0xF0AF6259	0x230A
OAFCmd	0xF0AF9E45	0x2206
OAFlw	0xF0AFF10A	0x230A
OAFlwSp	0xF0AF6B95	0x2300
OAT	0xF0AFA37F	0x2203
OcClgSp	0xF0AFF8A8	0x2300
OcHtgSp	0xF0AF8A33	0x2300
OcSrc	0xF0AFF838	0x230B
OF1FC	0xF0AFC9EB	0x230A
OF2FC	0xF0AFE4AF	0x230A
OF1Spd	0xF0AFB55B	0x2203
OF2Spd	0xF0AF2E87	0x2203
OilMng	0xF0AF2D66	0x2302
OilSts	0xF0AF1150	0x2204
ORT	0xF0AF6559	0x2203
PTD	0xF0AF229A	0x2203
PTS	0xF0AF404C	0x2203

Points list 3

Enum Text	Object ID	Type
RAT	0xF0AFA24D	0x2203
ReHt%	0xF0AF00F8	0x230A
RemEF%	0xF0AF1969	0x2300
RemRF%	0xF0AF57A7	0x2300
RemSF%	0xF0AF211F	0x2300
RFEF%	0xF0AFAECF	0x2203
RH	0xF0AF1DDC	0x2203
RHSp	0xF0AFFA18	0x2300
RhtSp	0xF0AF335D	0x230A
SAF%	0xF0AF5BDF	0x2203
SbClg	0xF0AF842E	0x230A
SBEvnt	0xF0AFCB3E	0x230B
SFMBSts	0xF0AF2BDE	0x230B
SpaceT	0xF0AFF74A	0x2203
SpHtSts	0xF0AF7D21	0x230B
SRT	0xF0AFC35D	0x2203
SSH	0xF0AFB846	0x230A
SSHSpt	0xF0AF3144	0x230A
STD3	0xF0AF03CC	0x2207
SupHt%	0xF0AF1FEA	0x230A
Tc	0xF0AF19E9	0x230A
TcSpt	0xF0AF7FC1	0x230A
TDef	0xF0AF45E1	0x230A
Teg	0xF0AFDCFF	0x230A
Tp	0xF0AF3BBB	0x230A
UnOcSrc	0xF0AFF6B4	0x230B
UnitSt	0xF0AF9E60	0x230B
UntSts	0xF0AF4FF0	0x230B
VFDSts	0xF0AF64EC	0x230B

Menu Descriptions

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 2: Quick Menu

Menu Display Name	Default Setting	Range	Description
Unit State=	—	Off Start Recirc FanOnly MinDAT Htg Econo Clg	A status only item which indicates the state of operation in which the unit is currently operating. The unit can be in any of the operating states shown.
Unit Status=	—	Enable OffMan OffMnCtl OffNet OffAlm OffFnRty	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	A status only item that indicates whether or not the unit is in the heating state due to MWU function.
Dehum Status=	—	Active/Inactive	A status only item which indicates the status of operation of the dehumidifier. The dehumidifier can be active or inactive.
Ctrl Mode=	Off	Off HeatOnly CoolOnly FanOnly HeatCool Auto/Net	An adjustable item which sets the operating mode of the unit. The unit can be in any of the modes shown.
Occ Mode=	Auto/Net	Occ Unocc TntOvrd Auto/Net	An adjustable item which sets the occupancy mode of the unit. The unit can be in occupied, unoccupied, tenant override, or auto modes.
Clg Capacity=	—	0% – 100%	A status only item which indicates the percentage of the unit maximum cooling capacity currently operating.
OAD/Econo Cap=	—	0% – 100%	A status only item which indicates the percentage that the outdoor damper or economizer valve is currently open.
Htg Capacity=	—	0% – 100%	A status only item which indicates the percentage of the unit maximum heating capacity currently operating.
Reheat Capacity=	—	0% – 100%	A status only item which indicates the percentage of the unit maximum reheat capacity currently operating.
Control Temp=	—	-50.0°F – 200.0°F	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°F – 100.0°F	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°F – 100.0°F	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.

Menu Display Name	Default Setting	Range	Description
Disch Air=	—	-50.0°F – 250.0°F	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 Clg Spt=	55.0°F	40.0°F – 100.0°F	A status only item which indicates the temperature that the 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 adjustable item.
DAT Htg Spt=	85.0°F	40.0°F – 140.0°F	A status only item which indicates the temperature that the DAT should be maintained at when in the heating mode of operation. Once a valid password has been entered this item becomes an adjustable item.
Min DAT Limit=	55.0°F	0.0°F – 70.0°F	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.
SAF Capacity=	—	0% – 100%	A status only item which indicates the capacity of the supply air fan.
DSP	—	0.2 inH2O – 4.0 inH2O	A status only item which displays the current duct static pressure reading.
DuctSP Spt=	1.0 inH2O	0.2 inH2O – 4.0 inH2O	A status only item which indicates the duct static pressure set point used for controlling the VFD for the supply air fan. The VFD is modulated to maintain the duct pressure at this value. Once a valid password has been entered this item becomes an adjustable item.
RF/EF Capacity=	—	0% – 100%	A status only item indicating the capacity of the return fan/exhaust air fans.
BSP=	—	-0.25 inH2O – 0.25 inH2O	A status only item which displays the current building static pressure reading.
BldgSP Spt=	0.050 inH2O	-0.25 inH2O – 0.25 inH2O	A status only item which indicates the building static pressure set point used for controlling the return/exhaust fan VFD. The return/exhaust fan VFD is modulated to maintain the building static pressure sensor input to this value. Once a valid password has been entered this item becomes an adjustable item.
OA Temp=	—	-50.0°F – 200.0°F	A status only item which displays the current temperature reading from the unit mounted outdoor air temperature sensor. This sensor is standard on all units.
Rel Humidity=	—	0% – 100%	A status only item that displays the current relative humidity reading from the optional humidity sensor.

View/Set Unit Menus

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 3: Unit Status/Settings

Item Display Name	Default Setting	Range	Description
Unit State=	—	Off	A status only item which indicates the state of operation in which the unit is currently operating. The unit can be in any of the operating states shown.
		Start	
		Recirc	
		FanOnly	
		MinDAT	
		Htg	
		Econo	
		Clg	
Unit Status=	—	Enable	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.
		OffMan	
		OffMnCtl	
		OffNet	
		OffAlm	
		OffFnRty	
MWU Status=	—	Inactive	A status only item that indicates whether or not the unit is in the heating state due to MWU function.
		Active	
Dehum Status	—	Active/Inactive	A status only item which indicates the status of operation of the dehumidifier. The dehumidifier can be active or inactive.

Item Display Name	Default Setting	Range	Description
Ctrl Mode=	Off	Off HeatOnly CoolOnly FanOnly HeatCool Auto	An adjustable item which sets the operating mode of the unit. The unit can be in any of the modes shown.
Clg Status=	—	Enabled None OffAmb OffAlarm OffNet OffMan	A status only item which indicates whether or not mechanical cooling is currently allowed. If cooling is disabled, the reason is indicated.
Htg Status=	—	Enabled None OffAmb OffAlarm OffNet OffMan	A status only item which indicates whether or not heating is currently allowed. If heating is disabled, the reason is indicated.
Econo Status=	—	Enabled None OffAmb OffAlarm OffNet OffMan OffDehum	A status only item which indicates whether or not the economizer is currently enabled. If economizer is enabled, the reason is indicated.
Clg Capacity=	—	0% – 100%	A status only item which indicates the percentage of the unit maximum cooling capacity currently operating.
Htg Capacity=	—	0% – 100%	A status only item which indicates the percentage of the unit maximum heating capacity currently operating.
Reheat Cap	—	0% – 100%	A status only item which indicates the percentage of the unit maximum reheat capacity currently operating.
SAF Capacity=	—	0% – 100%	A status only item which indicates the capacity of the supply air fan.
RF/EF Capacity=	—	0% – 100%	A status only item indicating the capacity of the return fan/exhaust air fans.
Rel Humidity=	—	0% – 100%	A status only item that displays the current relative humidity reading from the optional humidity sensor.
Net Emrg Ovrd=	Normal	Normal, Off	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 Auto	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.”

Occupancy

Menus in the Occupancy menu contain status and control items that relate to unit occupied/unoccupied operation.

Table 4: Occupancy Menu

Item Display Name	Default Setting	Range	Description
Occupancy=		Occ Unocc TntOvrd	A status only item which indicates whether the unit is currently in an occupied, unoccupied, or tenant override mode of operation.
Occ Mode=	Auto/Net	Occ UnOcc TntOvrd Auto/Net	An adjustable item which allows the unit to be set for manual occupied or unoccupied operation, automatic operation based on a time schedule input or manual tenant override operation.

Item Display Name	Default Setting	Range	Description
OccSrc=	-	None	A status only item which indicates the input source or function that is responsible for setting the Occupancy parameter to “Occ” or “TntOvrd.”
		NetSchd	
		IntSchd	
		OneEvnt	
		RemoteSw	
		OccManCmd	
		OccMode	
		TStatTO	
		ManTO	
UnoccSrc=	-	UnoccDehum	A status only item which indicates the input source or function that is responsible for running the unit while the Occupancy parameter to “Unocc.”
		UnoccClg	
		UnoccHtg	
		IntOptStrt	
		NetOptStrt	
		None	
Tnt Ovrde Time=	0	0–300min	An adjustable item which indicates the amount of time remaining for unit operation since tenant override operation was activated.

Temperatures

Menus in the Temperatures menu contain unit temperature status information.

Table 5: Temperature Menu

Item Display Name	Default Setting	Range	Description
Control Temp=	—	-50.0°F – 200.0°F	A status only item which indicates the current Control Temperature value.
Disch Air=	—	-50.0°F – 250.0°F	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=	—	-20.0°F – 200.0°F	A status only item which displays the current temperature reading from the unit’s return air temperature sensor (RAT).
Space Temp=	—	0.0°F – 150.0°F	A status only item which displays the current space (or zone) temperature reading from the optional unit space air temperature sensor input. If an optional space temperature sensor is not installed and space temperature value is not supplied by a network, the SpaceT Present= item in the Setup menu should be set to “No” to disable the alarm function associated with an open circuit at the space temperature sensor input.
OA Temp=	—	-50.0°F – 200.0°F	A status only item which displays the current temperature reading from the unit mounted outdoor air temperature sensor.
EF/LC Temp=	—	-50.0°F – 250.0°F	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.
Mixed Air=	—	-50.0°F – 250.0°F	A status only item that displays the current temperature reading from the unit mounted mixed air temperature sensor. The sensor is standard on all Self Contained units.
ER LAT	—	-50.0°F – 200.0°F	A status only item which displays the current discharge air temperature leaving the optional energy recovery wheel.
ER EAT	—	-50.0°F – 200.0°F	A status only item which displays the current exhaust air temperature leaving the optional energy recovery wheel.
PA Temp	—	-50.0°F – 200.0°F	The value of the latest calculated PA Temperature.

Flow Status

Table 6: Flow Status Menu

Item Display Name	Default Setting	Range	Description
Airflow=	—	NoFlow Flow	A status only item that indicates whether or not discharge airflow is detected. Airflow status is sensed by a binary input delivered to the controller by a differential pressure switch (PC7). On VAV units duct static pressure is also a factor in the indication of airflow.
Supply Fan=	—	Off On	A status only item which indicates whether or not the controller is commanding the unit supply fan on.
RET/EXH Fan	—	Off On	A status only item which indicates whether or not the controller is commanding the unit RF/EF fan on.

SAF Speed Control

Table 7: Supply Fan Speed Menu

Item Display Name	Default Setting	Range	Description
SAF Speed=	—	0% – 100%	A status only item that indicates the current supply fan speed.
Speed Cmd=	—	0% – 100%	A status only item that indicates the current supply fan VFD commanded speed.
Duct Press=	—	0.0 inH2O – 5.0 inH2O	A status only item which indicates the current pressure of the supply air ductwork. The duct pressure is measured at the location in which the duct static pressure tap was field installed. This device is not factory installed.
DuctSP Spt=	1.0 inH2O	0.2 inH2O – 4.0 inH2O	An adjustable item which sets the duct static pressure set point used for controlling the VFD for the supply air fan. The VFD is modulated to maintain the duct pressure at this value.
IAQ PPM =	—	0ppm – 5,000ppm	A status only item that indicates the current CO2 level when the supply fan control method is set to CO2. **Note:** CO2 option only available on 100% OA units that have the unit control type set to Zone or DAC.
OA Flow =	—	0 CFM – 60,000 CFM	A status only item that indicates the current CFM value when the supply fan control method is set to CFM. **Note:** CFM option only available on 100% OA units that have the unit control type set to Zone or DAC.
Bldg Press =	—	-0.25 inH2O – 0.25 inH2O	A status only item which indicates the current building static pressure when the supply fan control method is set to BSP. **Note:** BSP option only available on 100% OA units that have the unit control type set to Zone or DAC.
BldgSP Spt	0.050 inH2O	-0.25 inH2O – 0.25 inH2O	An adjustable item which sets the building static pressure set point used for controlling the VFD when the supply fan control method is set to BSP. **Note:** BSP option only available on 100% OA units that have the unit control type set to Zone or DAC.

RF/EF Control

Table 8: Return/Exhaust Fan Speed Menu

Item Display Name	Default Setting	Range	Description
RF/EF Speed=	-	0% – 100%	A status only item that indicates the current return/exhaust fan VFD speed.
Speed Cmd=	-	0% – 100%	A status only item that indicates the current return/exhaust fan VFD commanded speed.
Bldg Press=	-	-0.25 inH2O – 0.25 inH2O	A status only item which indicates the building static pressure at the building static pressure sensor location.
BldgSP Spt=	0.050 inH2O	-0.25 inH2O – 0.25 inH2O	An adjustable item which sets the building static pressure set point used for controlling the VFD for the return/exhaust air fan. The VFD is modulated to maintain the building pressure at this value.

Cooling

Table 9: Cooling Menu

Item Display Name	Default Setting	Range	Description
Occ Clg Spt =	72.0°F	0.0°F – 100.0°F	An adjustable item which sets the temperature above which the unit will go into the cooling mode of operation.
Unocc Clg Spt=	85.0°F	40.0°F – 100.0°F	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 unoccupied cooling.
DAT Clg Spt=	55.0°F	40.0°F – 100.0°F	An adjustable item used by the controller to set the DAT cooling setpoint. This value is adjustable only on DAC units when it is not being set by a reset schedule. It is not adjustable on CAV units.

Economizer

Table 10: Economizer Menu

Item Display Name	Default Setting	Range	Description
OAD/Econo Pos=	—	0% – 100%	A status only item that is used to indicate percentage that the economizer dampers/water-side economizer valve is open.
DAT Clg Spt=	55.0°F	40.0°F – 100.0°F	An adjustable item used by the controller to set the DAT cooling setpoint. This value is adjustable only on DAC units when it is not being set by a reset schedule. It is not adjustable on CAV units.
Min OA Pos=	—	0% – 100%	A status only item which indicates the current minimum position of the outdoor air damper.
FreeClgStatus=	—	Unavail Avail	A status only item that indicates whether airside economizer free cooling is available or unavailable based on a definable ambient temperature range.
Occ Clg Spt =	72.0°F	0.0°F – 100.0°F	An adjustable item which sets the temperature above which the unit will go into the cooling mode of operation.
Unocc Clg Spt=	85.0°F	40.0°F – 100.0°F	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 unoccupied cooling.

Min OA Damper

Table 11: Min OA Damper Menu

Item Display Name	Default Setting	Range	Description
Min OA Pos=	-	0% – 100%	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. On CAV units the Ventilation Limit and the Demand Control Ventilation Limit are fixed values set equal to the Vent Limit= and DCV Limit= parameters. On VAV units the OA Damper Position increases from the Vent Limit= value to the LoFloVent Limit= value as the VFD speed goes from 100% down to the Min Clg Spd= value. The Demand Control Ventilation Limit in this VAV case is determined by the Ventilation Limit X DVC Limit=/Vent Limit=. When the Min OA Reset= parameter is set to “None” the Min OA Pos= value is set to the Ventilation Limit. If Min OA Reset= is set to Network, Ext VDC, Ext mA, IAQ VDC, or IAQ mA, the Min OA Pos= varies between the Ventilation Limit and the Demand Control Ventilation Limit as the reset signal varies from its maximum to minimum value.
Vent Limit=	20%	0% – 100%	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 V Lmt=	30%	0% – 100%	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 Spd value.
DCV Limit=	10%	0% – 100%	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 “Min OA Reset=” is set to something other than “None.”

Item Display Name	Default Setting	Range	Description
Min OA SCR=	—	VentLmt DesFlw FldFlw Network Ext VDC Ext mA IAQ VDC BSPOvrd FanDiff DCVLmt ZeroOA	A status only item that indicates the action that is winning for control of the OA damper position.

Heating Menu

The Heating menu provides a summary of the control parameters for units with heating. The unit's heating mode of operation is controlled by the control temperature and the heating setpoint temperature. The unit goes into the heating mode of operation by analyzing the control temperature. The control temperature can be return temperature, space temperature or outside air temperature. The unit goes into the heating mode of operation when the control temperature is below the heating setpoint by more than ½ the deadband.

Table 12: Heating Menu

Item Display Name	Default Setting	Range	Description
Occ Htg Spt =	68.0°F	0.0°F – 100.0°F	An adjustable item which sets the control temperature below which the unit will go into the heating mode of operation.
Unocc Htg Spt=	55.0°F	40.0°F – 100.0°F	An adjustable item which sets the zone temperature below which the unit starts up and provides unoccupied heating (night setback) during unoccupied periods.
MWU Spt=	70.0°F	40.0°F – 100.0°F	An adjustable item which sets the heating setpoint to be used during morning warm up on a discharge temperature control unit. CAV units use the Occ Htg Spt for morning warmup operation.
DAT Htg Spt=	85.0°F	40.0°F – 140.0°F	An adjustable parameter which sets the heating discharge set point.

Dehumidification

Table 13: Dehumidification Menu

Item Display Name	Default Setting	Range	Description
Dehum Status=	—	Disabled Enabled	A status only item that indicates whether dehumidification is enabled or disabled.
Rel Humidity=	—	0% – 100%	A status only item that indicates the current relative humidity reading of the sensor.
Dewpoint=	—	-50°F – 150°F	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".
Dehum Method=	None Always	None Red Hum DewPt	An adjustable item used to set the dehumidification method to either "RH" or "DewPt." When this parameter is set to "RH," dehumidification operation is controlled to maintain the Rel Humidity= value at the RH Setpoint=. When this parameter is set to "DewPt," dehumidification operation is controlled to maintain the Dew Point value at the Dewpoint Spt=. When this parameter is set to "Always" dehumidification will be active as long as mechanical cooling is not disabled.
RH Setpoint=	50%	0% – 100%	An adjustable item used to set the relative humidity value at which the relative humidity will be controlled to during dehumidification operation.
Dewpoint Spt=	50°F	0°F – 100°F	An adjustable item used to set the dewpoint value at which the dewpoint with will be controlled to during dehumidification operation.
Reheat Spt=	—	40.0°F – 100.0°F	A status only item which is used to indicate the DAT temperature to which the HGRH valve will be controlled in the Cooling and Fan Only operating states while dehumidification operation is active. The Reheat Spt= equals the DAT Cooling Setpoint for DAT controlled units and will vary in between the Min Reheat Spt= and Max Reheat Spt= for Zone Controlled units.

Item Display Name	Default Setting	Range	Description
Reheat Cap=	—	0–100%	A status only item that indicates the current reheat capacity value.

Date/Time/Schedules

Time/Date

Table 14: Time/Date

Item Display Name	Default Setting	Range	Description
Time=	—	HH:MM:SS	An adjustable item that sets the current time.
Date=	—	MM/DD/YYYY	An adjustable item that sets the current date.
UTC Diff=	-60	—	An adjustable parameter that can be set to indicate how the local time where the unit is situated differs from the Coordinated Universal Time (UTC).

Daily Schedule Menu

The Daily Schedule sets the start and stop times for each of the days of the week. One start and one stop time can be set for each day.

Table 15: Daily Schedule Menu

Item Display Name	Default Setting	Range
Mon=	HH:MM — HH:MM	00:00 — 23:59
Tue=	HH:MM — HH:MM	00:00 — 23:59
Wed=	HH:MM — HH:MM	00:00 — 23:59
Thu=	HH:MM — HH:MM	00:00 — 23:59
Fri=	HH:MM — HH:MM	00:00 — 23:59
Sat=	HH:MM — HH:MM	00:00 — 23:59
Sun=	HH:MM — HH:MM	00:00 — 23:59
Hol=	HH:MM — HH:MM	00:00 — 23:59

Holiday Schedule Menu

The Holiday Schedule is used to set the start and stop times for up to 10 different holidays.

Table 16: Holiday Schedule Menu

Item Display Name	Default Setting	Range
Hol 1=	MMMDD/99–MMMDD/99	00/00/00–12/31/99
Hol 2=	MMMDD/99–MMMDD/99	00/00/00–12/31/99
Hol 3=	MMMDD/99–MMMDD/99	00/00/00–12/31/99
Hol 4=	MMMDD/99–MMMDD/99	00/00/00–12/31/99
Hol 5=	MMMDD/99–MMMDD/99	00/00/00–12/31/99
Hol 6=	MMMDD/99–MMMDD/99	00/00/00–12/31/99
Hol 7=	MMMDD/99–MMMDD/99	00/00/00–12/31/99
Hol 8=	MMMDD/99–MMMDD/99	00/00/00–12/31/99
Hol 9=	MMMDD/99–MMMDD/99	00/00/00–12/31/99
Hol 10=	MMMDD/99–MMMDD/99	00/00/00–12/31/99

One Event Schedule Menu

The One Event Schedule is used to set the start and stop times for one event.

Table 17: One Event Schedule Menu

Item Display Name	Default Setting	Range
Beg=	MMMDD/99 @ HH:MM	00/00/00-12/31/99 @ 00:00 – 23:59
End=	MMMDD/99 @ HH:MM	00/00/00-12/31/99 @ 00:00 – 23:59

Optimal Start Menu

The Optimal Start menu is used to set up the unit so it starts at the most efficient time before building occupancy.

Table 18: Optimal Start Menu

Item Display Name	Default Setting	Range	Description
Enable=	No	No, Yes	An adjustable item that turns on the optimal start feature. Setting the value to yes will activate this function.
Htg Rate=	0.4°F/min	0.0°F – 1.0°F/ min	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°F – 60°F	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.”
Des Htg OAT=	0°F	-40°F – 60°F	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°F – 1.0°F/ min	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	-60°F – 140°F	An adjustable item that sets the outdoor air temperature when the unit was last started optimally in cooling.
Des Clg OAT=	95°F	-60°F – 140°F	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.

Daylight Savings Menu

Table 19: Daylight Savings Menu

Item Display Name	Default Setting	Range	Description
DLS Strt Mon=	Mar	NA	An adjustable item that sets the month for daylight savings time to begin.
		Jan-Dec	
DLS Strt Wk=	2ndWeek	1stSun	An adjustable item that sets the week of the month for daylight savings time to begin.
		2ndSun	
		3rdSun	
		4thSun	
		5thSun	
DLS End Mon=	Nov	NA	An adjustable item that sets the month for daylight savings time to end.
		Jan-Dec	
DLS End Week=	1stWeek	1stSun	An adjustable item that sets the week of the month for daylight savings time to end.
		2ndSun	
		3rdSun	
		4thSun	
		5thSun	
DLS Enable=	Auto	Off/Auto	An adjustable item that sets whether or not daylight savings time is enabled.

Commission Unit

Unit Setup

Table 20: Unit Setup Menu

Item Display Name	Default Setting	Range	Description
Apply Changes=	No	No, Yes	A flag that must be changed from no to yes, for the controller to recognize any changes made.
RAT Sensor=	Yes	No, Yes	A status only item that indicates the current value of the RAT sensor.
100% OA SCU	Yes	No, Yes	An adjustable item used to select whether or not a self contained unit will be configured for 100% outside air operation. Flag must be changed from no to yes, in order for the controller to recognize any changes made.
OAT Sensor=	Yes	No, Yes	A status only item that indicates the current value of the OAT sensor.

Item Display Name	Default Setting	Range	Description
Space Sensor	Digtl/Net	None Anlog/Net Digtl/Net	An adjustable item to indicate if a space sensor is connected to the unit controller, or provided via a network signal.
Eng Units=	English	English, SI	An adjustable item to indicate if the unit is to display English or Metric units of measure.
Unit Name=	—	—	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.
Rapid Start=	No	No, Yes	An adjustable item that allows the user to select to initiate a rapid startup sequence at unit power up.
Rapid Start Tm=	10 min	0–20 min	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.
DO10 Cfg=	FanOp	FanOp VAVBox	An adjustable item that redefines the functionality of the digital output (DO10) on the main control board. The output is either a supply fan operation indication or a VAV box signal depending on how this parameter is set.

Timer Settings Menu

Table 21: Timer Settings Menu

Item Display Name	Default Setting	Range	Description
Service Time	0min	0min – 240min	An adjustable item that sets the amount of time the internal control timers can be temporarily sped up.
Start Up	180s	1800s	An adjustable item that sets the time in seconds that the unit will perform its startup operation.
Recirculate	180s	3600s	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.
Zero OA Time	0min	0min – 240min	An adjustable item that sets the time in minutes that the outdoor air damper stays at a zero position upon unit start up.
Tnt Override	120min	0min – 300min	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	0s – 180s	An adjustable item that sets the duration of the post heat function available on VAV units.
Pwd Timeout	10min	3min – 30min	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-enter of the password.
Low DAT	6min	0min – 60min	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.
ClgStateDelay	300s	0s – 600s	An adjustable item that sets the amount of time between the fan only operating state and the mechanical cooling state. The unit will not enter the mechanical cooling state until this time has passed. This only applies on discharge control units following morning warm up heating operation.
Clg Stg Time	5min	5min – 60min	An adjustable item used to set a minimum time period between compressor stage changes.
Clg Stg Time (INV)	5min	2min – 60min	An adjustable item used to set a minimum time period between inverter controlled compressor stage changes.
Htg Stg Time	5min	2min – 60min	An adjustable item used to set a minimum time period between heating stage changes.
Min Ex Strt Tm	120s	60s – 300s	An adjustable item that sets the minimum exhaust fan on time (Default = 120 seconds).
Min Ex Stop Tm	120s	60s – 300s	An adjustable item that sets the minimum exhaust fan stop time (Default = 120 seconds).
ER Whl Stg Tm	5min	1min – 100min	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 Whl Off Tm	5min	1min – 100min	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.
Air Flw Ign	120s	0s – 999s	An adjustable item that sets the amount of time the air proving switch is ignored after the supply fan is started.
Htg Wrmup Tm	240s	0s – 999s	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 240 seconds).

Item Display Name	Default Setting	Range	Description
Htg Hld Period	240s	0s – 999s	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). This is to allow the temperature to approach equilibrium with the modulating gas heating valve at a fixed position.
Srvc Time Inc	20s	0s – 300s	An adjustable item used to set the internal stage time delay when the Service Timer is not zero, the times listed below are set to the ServiceTime (Default = 20 seconds) instead of the normal values. Cooling Stage Time Heating Stage Time Start Initial Time Recirculation ZeroOATime
Off HtCl Delay	120s	0s – 999s	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.

SAF Set-up

Table 22: Supply Fan Speed Menu

Item Display Name	Default Setting	Range	Description
SAF Ctrl=	DSP	DSP Spd/Net 1ZnVAV BSP CO2 CFM	An adjustable parameter used to select how the supply fan is to be controlled. The supply fan can normally be controlled by duct pressure, space temperature (single zone VAV or 1ZnVAV) or by a percentage of supply air fan speed from 33% to 100%. On 100% OA unit applications the fan can be controlled to maintain building static pressure, space carbon dioxide level or and airflow based on a field supply airflow station. The speed option is typically used with a building automation system. When single zone VAV control is selected, the supply fan is controlled with a PI_Loop to maintain the Control Temperature input at the Occupied Cooling Set Point or Occupied Heating Set Point. When BSP is selected the supply fan is controlled with a PI_Loop to maintain the building static pressure at a building static pressure Set Point. When CO2 is selected the supply fan is controlled to maintain the CO2 ppm between adjustable limits by varying the supply fan speed between an adjustable range. When CFM is selected the supply fan is controlled with a PI_Loop to maintain the measured CFM at a CFM set point.
AplyInputChgs=	No	No Yes	The Apply Input Changes flag must be changed from no to yes in order for the controller to recognize the changes. Setting the Apply Input Changes flag to YES will automatically reset the controller.
CO2 Input=	None	None VDC MA	An adjustable item used to select the type of input for a field installed CO2 sensor. If this is set to None the controller ignores any CO2 sensor input. If CO2 control and/or monitoring is desired this parameter is set to VDC or mA to match the input type of the field supplied CO2 sensor input. This parameter applies only to 100% OA unit configurations.
CFM Input=	None	None VDC MA	An adjustable item used to select the type of input for a field installed airflow station. If this is set to None the controller ignores any field airflow station input. If CFM control and/or monitoring is desired this parameter is set to VDC or mA to match the input type of the field supplied airflow input. This parameter applies only to 100% OA unit configurations.
BSP Input=	No	No Yes	An adjustable item used to select whether on not a building static pressure sensor is connected to the unit controller. If this is set to No the controller ignores any building static pressure input. If BSP control of the supply fan is desired this parameter must be set to Yes. This parameter applies only to 100% OA unit configurations.
SPEED CONTROL			
Rem SAF Cap=	33%	0% – 100%	An adjustable item for setting the supply fan speed by the keypad or by a network control signal.
DSP CONTROL			
DSP DB=	0.1in	0in – 0.5in	An adjustable item which sets a dead band around the DuctSP Spt= parameter. No duct static pressure control action is taken when the current duct static pressure input is within this dead band.
SAF Ramp Time=	60s	0s – 999s	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 Period=	5s	0s – 999s	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.

Item Display Name	Default Setting	Range	Description
Max Spd Chg=	15%	0% – 100%	An adjustable item that sets the maximum value for a speed increase or decrease. This speed change (either a positive or negative value) is added to the current fan speed whenever the duct static pressure is outside of the deadband, and the Min Period time has passed since the previous speed change.
DuctPress1=	—	0.0in – 5.0in	A status only item that indicates the current value for the duct status pressure sensor.
DuctPress2=	—	0.0in – 5.0in	A status only item that indicates the current value for the duct status pressure sensor If a second pressure sensor is used configuration spot 18 should indicate yes, the controller will use the lower reading of the two sensors installed.
1 ZONE VAV CONTROL			
Min Clg Spd=	40%	0% – 100%	An adjustable item that sets the minimum supply fan speed used for cooling operation when 1ZnVAV is selected as the method of supply fan control.
Max Clg Spd=	100%	0% – 100%	An adjustable item that sets the maximum supply fan speed used for cooling operation when 1ZnVAV is selected as the method of supply fan control.
Min Htg Spd=	40%	0% – 100%	An adjustable item that sets the minimum supply fan speed used for heating operation when 1ZnVAV is selected as the method of supply fan control.
Max Htg Spd=	100%	0% – 100%	An adjustable item that sets the maximum supply fan speed used for heating operation when 1ZnVAV is selected as the method of supply fan control.
Space Period=	60s	0s – 999s	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.
Space Gain=	0.8	0.0s – 100.0s	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.
Space PAT=	400s	0s – 999s	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.
Space Max Chg=	10%	0% – 100%	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 1Zn-VAV supply fan control is selected.
CO2 CONTROL			
Min PPM=	0ppm	0ppm – 5000ppm	An adjustable item that sets the minimum PPM value of the field supplied CO2 input signal.
Max PPM=	2,000ppm	0ppm – 5,000ppm	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/V – 20.0/V/ mA	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/V – 20.0/V/ mA	An adjustable item that sets the DC voltage or mA value at the maximum PPM value of the field supplied CO2 input signal.
Min SAF PPM=	800	0ppm – 5,000ppm	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=	1,100	0ppm – 5,000ppm	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 Spd=	50	0% – 100%	An adjustable item that sets the supply fan speed when the CO2 input signal is at minimum when CO2 supply fan control is selected.
Max PPM Spd=	100	0% – 100%	An adjustable item that sets the supply fan speed when the CO2 input signal is at maximum when CO2 supply fan control is selected.
CFM CONTROL			
Min CFM=	0 CFM	0 CFM – 60,000 CFM	An adjustable item that sets the minimum CFM value of the field supplied airflow station input signal.
Max CFM=	10,000 CFM	0 CFM – 60,000 CFM	An adjustable item that sets the maximum CFM value of the field supplied airflow station input signal.
V/A @Min CFM=	0.0/V	0.0/V – 20.0/V/ mA	An adjustable item that sets the DC voltage or mA value at the minimum CFM value of the field supplied airflow station input signal.
V/A @Max CFM=	10.0/V	0.0/V – 20.0/V/ mA	An adjustable item that sets the DC voltage or mA value at the maximum CFM value of the field supplied airflow station input signal.
SAF CFM DB=	3%	0% – 100%	An adjustable item that sets the “deadband” used in the PI control function to vary the sup-ply fan speed when airflow (CFM) supply fan control is selected.
SAFCFM Period=	30s	0s – 999s	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.
SAF CFM Gain=	0.1	0.0 – 100.0	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.
SAF CFM MxChg=	5%	0% – 100%	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.
BSP CONTROL			
BSP DB=	0.01in	0.0in – 0.1in	An adjustable item that sets the “deadband” used in the PI control function to vary the sup-ply fan speed when building static pressure (BSP) supply fan control is selected.
BSP Period=	5s	0s – 999s	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.

Item Display Name	Default Setting	Range	Description
BSP Gain=	0.2	0.0s – 100.0s	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.
Max Spd Chg=	4%	0% – 100%	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.
SAF SETUP			
SAF Ctrl Dly=	30s	0s – 999s	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 digital output. Control reverts to either duct pressure or speed after the fan has been on for the DSPCtrlDelay (default 30 seconds).
Min Speed=	33%	0% – 100%	An adjustable item which is used to set the minimum supply fan speed (default 33%).
VAVBox Out=	—	Heat Cool	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.
MaxVentSpd=	100%	0% – 100%	An adjustable item that sets the supply fan speed when an external ventilation override input to the supply fan is present.
Max SAF RPM=	2,600	0–5,000	An adjustable item that sets the maximum RPM value for the supply air fan. **Note:** This is set based on the supply fan model size and the system specifications.

CFM monitoring and Airflow CFM Reset for 100%OA Applications

Airflow supply fan control is available on 100% OA units that have the Control Type set to Zone (0) or DAT (1). Airflow supply fan control is not available if the Control Type is set to 1ZnVAV (2).

If CFM Input= is set to None then no monitoring or supply fan control based on CFM is possible. All menu items related to CFM control and scaling are removed from the HMI in this case. If CFM Input= is set to VDC then the CFM input is available for control and/or monitoring purposes and the sensor scaling parameters are in terms of volts DC.

From the Main Menu select Commission Unit then SAF Set-Up, set the CFM Input setting to VDC and Apply Input Changes. To access OA flow readings from the main menu, scroll to Quick Menu and enter to view “OA Flow” in CFM and MinOAFlw Spt.

To access the CFM control settings: From the main menu scroll down to “Commission” unit then “SAF Set-up” Scroll down further under CFM control to view minimum and maximum CFM settings.

RF/EF Set-Up

Table 23: Return/Exhaust Fan Set-up Menu

Item Display Name	Default Setting	Range	Description
RE/EF Ctrl=	Tracking	None Tracking BldgP Spd/Net OA Damper	An adjustable parameter used to select how the return/exhaust fans are to be controlled. The exhaust fans can be controlled by the building pressure or by a percentage of return/exhaust air fan speed from 5% to 100%. The speed option is typically used with a building automation system.
Rem ExhF Cap=	5%	0% - 100%	An adjustable item for setting the exhaust fan speed by the keypad or by a network control signal.
BSP DB=	0.01in	0.0in - 0.1in	An adjustable item which sets a dead band around the BldgSP Spt parameter. No building static pressure control action is taken when the current building static pressure input is within this dead band.
BSP Period=	5s	0s - 999s	An adjustable item which sets the building static pressure return air or exhaust fan speed. Adjustable supply air fan building static pressure sample time. Adjustable from 5s to 0-999s if configuration for space 16 is 1,2,3,4,5,6,7,8,9, or A.
BSP Gain=	0.2s	0.0s - 100.0s	An adjustable item “Gain” in the “building static pressure control PI loop.
Max Spd Chg=	4%	0% - 100%	An adjustable item that sets the maximum value for a exhaust speed increase or decrease. This speed change (either a positive or negative value) is added to the current fan speed whenever the building static pressure is outside of the deadband, and the BSP Period= time has passed since the previous speed change.
Sup Fan Max=	100%	0% - 100%	An adjustable item used to set the supply fan maximum speed when the RF/EF control method is set to tracking.
Sup Fan Min=	30%	0% - 100%	An adjustable item used to set the supply fan minimum speed when the RF/EF control method is set to tracking.
RFEF Ctrl Dly=	30s	0s - 999s	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 return fan is started via a digital output. Control reverts to either building pressure or speed after the fan has been on for the BSPCtrlDelay (default 30 seconds).

Item Display Name	Default Setting	Range	Description
Min Speed=	5% With Exhaust Fan	0% - 100%	An adjustable item the sets the minimum of the RF/EF fan.
MinExStrtTime=	120s	60s - 300s	
MinExStopTime=	120s	60s - 300s	An adjustable item that sets the Minimum Exhaust Fan Stop Time (Default = 120 seconds). Once stopped, the exhaust fan must remain off for a minimum of this time before it can be re-started.
MinExhOAPos=	5%	0% - 100%	An adjustable item that sets the Minimum Exhaust OA Position (default 5%). The outdoor air dampers must be open more that this value for prop exhaust fan operation.
MinExhSAFCap=	10%	0% - 100%	An adjustable item that sets the Minimum Exhaust SAF capacity (default 10%). The supply air fan speed must be higher than this value for prop exhaust fan operation.
ExhOnOAPos=	40%	0% - 100%	An adjustable item that turns on the exhaust fan when the OA damper position reaches this setting.
ExhMxOAPos=	100%	0% - 100%	An adjustable item that sets the OA damper position at which the exhaust fan will be at is maximum speed.
Exh Stg 1 On=	40%	0% - 100%	An adjustable setting that sets the damper positions at which point the staged exhaust fans are turned ON.
Exh Stg 1 Off=	30%	0% - 100%	An adjustable setting that sets the damper positions at which point the staged exhaust fans are turned OFF.
Exh Stg 2 On=	55%	0% - 100%	An adjustable setting that sets the damper positions at which point the staged exhaust fans are turned ON.
Exh Stg 2 Off=	40%	0% - 100%	An adjustable setting that sets the damper positions at which point the staged exhaust fans are turned OFF.
Exh Stg 3 On=	70%	0% - 100%	An adjustable setting that sets the damper positions at which point the staged exhaust fans are turned ON.
Exh Stg 3 Off=	50%	0% - 100%	An adjustable setting that sets the damper positions at which point the staged exhaust fans are turned OFF.
Max RF/EF Hz=	60Hz	0Hz - 100Hz	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.
MaxVentSpd=	100%	0% - 100%	An adjustable item that sets the exhaust fan speed when an external ventilation override input to the exhaust fan is present.
Max RFEF RPM=	2600	0-5000	An adjustable item that sets the maximum RPM value for the exhaust air fan. **Note:** This is set based on the exhaust fan model size.
ECM Status=	—	OK	A status only item that indicates the current status of the return/exhaust fan motor.

Heat/Cool Changeover Set-Up

Table 24: Heat/Cool Changeover Setup Menu

Item Display Name	Default Setting	Range	Description
Ctrl Temp Src=	RAT	RAT Space MAT OAT None	An adjustable item which selects the temperature sensor input to be used for the unit heating/cooling changeover or occupied cooling and heating capacity change decisions. For example, if the CtrlTemp Src parameter is set to "Return," then the Control Temp parameter reads the same value as the Return Air parameter.
Use Tstat Spt=	No	No, Yes	An adjustable item used to set whether or not to use the Tstat set point adjustment value for the Occ Clg Spt and Occ Htg Spt.
Occ Clg DB=	2.0°F	0.0°F – 10.0°F	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 75ºF and the Clg Deadband parameter is set to 2ºF the dead band around the set point would be from 76.0ºF to 74.0ºF.
Clg Period=	60s	0s – 999s	An adjustable item which sets the "sampling time" used in the PI control function to vary the DAT Clg Spt in zone control applications.
Clg Gain=	0.1	0.0–100.0	An adjustable item which sets the "gain" used in the PI control function to vary the DAT Clg Spt in zone control applications.
Clg PAT=	600s	0s – 999s	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.
Max Clg Chg=	5.0°F	0.0°F – 50.0°F	An adjustable item that sets the maximum value for an increase or decrease of the DAT Clg Spt in zone control applications.
Occ Htg DB=	2.0°F	0.0°F – 10.0°F	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 70ºF and the Htg Deadband parameter is set to 2ºF the dead band around the set point would be from 69.0ºF to 71.0ºF.

Item Display Name	Default Setting	Range	Description
Htg Period=	60s	0s – 999s	An adjustable item which sets the “sampling time” used in the PI control function to vary the DAT Htg Spt in zone control applications.
Htg Gain=	0.1	0.0–100.0	An adjustable item which sets the “gain” used in the PI control function to vary the DAT Htg Spt in zone control applications.
Htg PAT=	600s	0s – 999s	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.
Max Htg Chg=	5.0°F	0.0°F – 50.0°F	An adjustable item that sets the maximum value for an increase or decrease of the DAT Htg Spt in zone control applications.
AplyTstatChg=	No	No, Yes	An adjustable item that resets the controller. This is required to affect changes to the Use TstatSpt parameter.
CalRemSpt@10°C=	No	No, Yes	An adjustable item used to calibrate the digital space sensor minimum setpoint input when the engineering units set to SI.
CalRemSpt@50°F=	No	No, Yes	An adjustable item used to calibrate the digital space sensor minimum setpoint input when the engineering units set to English.
CalRemSpt@30°C=	No	No, Yes	An adjustable item used to calibrate the digital space sensor maximum setpoint input when the engineering units set to SI.
CalRemSpt@86°F=	No	No, Yes	An adjustable item used to calibrate the digital space sensor maximum setpoint input when the engineering units set to English.

Cooling Set-Up

Table 25: Cooling Set-up Menu

Item Display Name	Default Setting	Range	Description
Clg Stage Time=	5min	5min – 60min	An adjustable item used to set a minimum time period between compressor stage changes.
Clg DB=	2.0°F	1.0°F – 10.0°F	An adjustable item which sets a dead band around the discharge cooling set point parameter. For example, if the discharge cooling set point parameter is set to 55ºF and the Clg Db parameter is set to 2ºF the dead band around the set point would be from 56.0ºF to 54.0ºF.
Clg Lo OAT Lk=	55°F	0°F – 100°F	An adjustable item which sets the low outdoor air temperature mechanical cooling lock-out point. Mechanical cooling operation is disabled when the outdoor air temperature sensor input falls below this set point.
OAT Diff=	2°F	0°F – 10°F	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 Ntwrk Space Return OAT ExtmA ExtV Airflow	An adjustable item that is used to set the type of cooling reset to be used.
Min Clg Spt=	65.0°F	40.0°F – 100.0°F	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/NA	0–100/ NA °F °C mA %	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°F – 100.0°F	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/NA	0–100/ NA °F °C mA %	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.
Unocc Diff=	3°F	0°F – 10°F	An adjustable item that sets the temperature differential for the unit operation below or above the unoccupied set points.

Item Display Name	Default Setting	Range	Description
DT Above Spt	DTA	0-250	DTA & DTB: Current DTA and DTB values will be modified and displayed in real time. Degree time control of cooling stages will be based on the running totals of the degree time above setpoint and the degree time below setpoint. The difference between the actual discharge air temperature and the DAT Clg SPT will be added to either the DTA or DTB every ten seconds. This will cause the unit to operate longer at the cooling stage that produces the discharge air temperature that is closer to the setpoint which will result in an average discharge air temperature that is very close to the DATClgSpt. **Note:** This is applicable only if the unit is supplied with fixed speed compressors ONLY.
DT Below Spt	DTB	0-250	

Econo Set-Up

Table 26: Economizer Setup Menu

Item Display Name	Default Setting	Range	Description
EconChgovr=	Enth&DB	None OAT OAT/RAT Enth&OAT	An adjustable item used to set how economizer operation will be enabled.
Econo FDD=	ON	OFF ON	An adjustable item used to enable or disable the Economizer Fault Detection and Diagnostics function.
Clg Stg Time1=	5min	5min – 60min	An adjustable item used to set a minimum time period between compressor stage changes.
Clg Stg Time2=	5min	2min – 60min	An adjustable item used to set a minimum time period between inverter compressor stage changes. Config string #3 must equal 4.
Chgover Temp=	70.0°F	0.0°F – 100.0°F	An adjustable item which sets the OA dry bulb temperature at which the units changes over to the economizer operation.
Clg DB=	2.0°F	1.0°F – 10.0°F	An adjustable item which sets a dead band around the discharge cooling setpoint parameter. For example, if the discharge cooling setpoint parameter is set to 55ºF and the Clg DB parameter is set to 2ºF the dead band around the set point would be from 56.0ºF to 54.0ºF.
Econo Period=	30/40s (air/water)	0s - 999s	An adjustable item which sets the “sampling time” used in the PI control function of the economizer actuator.
Econo Gain=	1-Oct (air/water)	0.0–100.0	An adjustable item which sets the “Gain” used in the PI control function of the economizer actuator.
Econo PAT=	60/40s (air/water)	0s – 999s	An adjustable item which sets the “project ahead time” used in the PI control function of the economizer actuator.
Econo Max Chg=	10/15% (air/water)	0% – 100%	An adjustable item that sets the maximum value for an increase or decrease of the economizer actuator.
Econo Diff=	2°F	0°F – 10°F	An adjustable item which sets a differential above the EconChgovrT parameter. Economizer operation is disabled when the OA Temp parameter indicates a value above the EconChgovrT= parameter by more than this differential.
EWT Diff=	3.0°F	0.0°F – 10.0°F	An adjustable item that sets a differential below the MAT at which waterside economizer operation is enabled based on entering water temperature.
Clg Reset=	None	None Network Space Return OAT ExtmA ExtV Airflow	A status only item that is used to display the device that is in control of the economizer reset.
Min Clg Spt=	55.0°F	40.0°F – 100.0°F	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/NA	0–100/ NA °F °C mA %	An adjustable item which sets the value of the sensor input, selected with the Cooling Reset parameter, at which the DAT cooling setpoint parameter is reset to the minimum DAT cooling setpoint value.
Max Clg Spt=	65.0°F	40.0°F – 100.0°F	An adjustable item which sets the maximum cooling discharge set point for use with a cooling discharge air temperature set point reset schedule.

Item Display Name	Default Setting	Range	Description
Max Clg Spt @=	100/NA	0–100/ NA °F °C mA %	An adjustable item which sets the value of the sensor input, selected with the Cooling Reset parameter, at which the DAT cooling setpoint parameter is reset to the maximum DAT cooling setpoint value.
Max OAT Lmt=	75.0°F	50.0°F – 100.0°F	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=	70.0°F	50.0°F – 100.0°F	An adjustable item which sets the minimum outdoor air temperature for the applicable climate zone below which economizer should be enabled.
PosSwOpen=	97%	0% – 100%	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%	An item that indicates the captured switch differential at the open (maximum) end of the damper modulation. This parameter can also be manually adjusted.
PosSwClose=	3%	0% – 100%	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%	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	A status only item that indicates the current condition of the damper end switch position input (Open/Closed).

Min OA Set-Up

Table 27: Min OA Damper Menu

Item Display Name	Default Setting	Range	Description
Apply Changes	No	No, Yes	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.
Min OA Reset=	None	None Network Ext VDC Ext mA IAQ VDC IAQ mA	An adjustable item that sets the type of minimum OA damper position reset to be used. When this is set to “None” the Min OA Pos= parameter is set to the Ventilation Limit. When this is set to “Network,” “Ext VDC,” “Ext mA,” “IAQ VDC,” or “IAQ mA” then the Min OA Pos= parameter varies from the Ventilation Limit down to the Demand Control Ventilation Limit as the reset signal goes from its maximum to minimum value. **Note:** When the Min OA Reset type is set to Network and the Apply changes flag is set to yes, the value of the Vent Limit is automatically set to 100%, the value of the DCV limit is set to 0% and the LoFlo V Lmt is set to 0%.
BSP OA Ovrd	No	No/Yes	An adjustable item used to enable/disable the building static pressure override feature.
Rst Lmt Snsr	None	None DAT EFT MAT	An adjustable item used to set the sensor to be used in conjunction with the OA reset limit function.
OA @ MinV/mA=	0%	0% – 100%	An adjustable item used when Min OA Reset= is set to “Ext VDC” or “Ext mA” 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%	An adjustable item used when Min OA Reset= is set to “Ext VDC” or “Ext mA” 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.
Min V/mA=	0.0/ V	0.0/V – 20.0/V mA	An adjustable item used to set the minimum value of the field input signal.
Max V/mA=	10.0/ V	0.0–20.0/V mA	An adjustable item used to set the maximum value of the field input signal.
PPM @DCV Lmt=	800ppm	0ppm – 5,000ppm	An adjustable item used when Min OA Reset= is set to “IAQ VDC” or “IAQ mA” to define at what PPM value the Min OA Pos= is to be at the Demand Control Ventilation Limit value.
PPM @Vnt Lmt=	1,000ppm	0ppm – 5,000ppm	An adjustable item used when Min OA Reset= is set to “IAQ VDC” or “IAQ mA” to define at what PPM value the Min OA Pos= is to be at the Ventilation Limit value.
IAQ PPM=	-	0ppm – 5,000ppm	A status only item which indicates the current reading from the CO2 sensor.

Item Display Name	Default Setting	Range	Description
Min PPM=	0ppm	0ppm – 5,000ppm	An adjustable item that sets the minimum PPM value.
Max PPM=	2,000ppm	0ppm – 5,000ppm	An adjustable item that sets the maximum PPM value.
V/A @Min PPM=	0.0/ V	0.0/V – 20.0/V mA	An adjustable item that sets the minimum PPM value at the minimum DC voltage or mA value of the CO2 sensor used when Min OA Reset= is set to “IAQ VDC” or “IAQ mA.”
V/A @Max PPM=	10.0/ V	0.0/V – 20.0/V mA	An adjustable item that sets the maximum PPM value at the maximum DC voltage or mA value of the CO2 sensor used when Min OA Reset= is set to “IAQ VDC” or “IAQ mA.”
Min CFM	0 CFM	0 CFM – 60,000 CFM	An adjustable item that sets the minimum CFM value of the field supplied flow station.
Max CFM	10,000 CFM	0 CFM – 60,000 CFM	An adjustable item that sets the maximum CFM value of the field supplied flow station.
V/A @ Min CFM	0.0/ V	0.0/V – 20.0/V mA	An adjustable item that sets the sensor input value at minimum CFM reading.
V/A @ Max CFM	10.0/ V	0.0/V – 20.0/V mA	An adjustable item that sets the sensor input value at maximum CFM reading.
Min Fan Diff=	20%	0% – 100%	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%	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.
Min Clg Spd=	40%	0% – 100%	An adjustable item that sets the discharge fan speed on a VAV unit at which the Ventilation Limit reaches the LoFloVent= value.
Des Clg Spd	100%	0% – 100%	An adjustable item used to adjust the design cooling speed setpoint.
Field AO Stn	None	None VDC mA	An adjustable item used to turn the optional field supplied outdoor airflow measuring station function ON and OFF.
OA Flow=	-	0 CFM – 60,000 CFM	A status only item which indicates the current outdoor airflow based on an optional OA airflow sensor input used when the unit is equipped the DesignFlow OA control feature, or a field supplied OA measuring station.
Min OA Flw Spt=	2,000 CFM	0 CFM – 60,000 CFM	An adjustable item that is used to set the minimum design flow CFM’s when the unit is equipped with the optional DesignFlow OA control feature, or a field supplied OA measuring station.
OA CFM DB	3%	0% – 100%	An adjustable item which sets the “deadband” used in the control function that modulates Min OA Pos parameter to maintain the OA Flow parameter at the MinOA Flow set point when a unit is equipped with the optional DesignFlow outdoor airflow measuring feature, or a field supplied OA measuring station.
OA CFMPerod	30s	0s – 999s	An adjustable item which sets the “sampling time” used in the PI control function that modulates the Min OA Pos parameter to maintain the OA Flow parameter at the MinOA Flow set point when a unit is equipped with the optional DesignFlow outdoor airflow measuring feature, or a field supplied OA measuring station.
OA CFM Gain	0.1	0.0–100.0	An adjustable item which sets the “Gain” used in the PI control function that modulates the Min OA Pos parameter to maintain the OA Flow parameter at the MinOA Flow set point when a unit is equipped with the optional DesignFlow outdoor airflow measuring feature, or a field supplied OA measuring station.
OA CFM Max Chg	5%	0% – 100%	An adjustable item which sets the “maximum step” used in the control function that modulates the Min OA Pos parameter to maintain the OA Flow parameter at the MinOA Flow set point when a unit is equipped with the optional DesignFlow outdoor airflow measuring feature, or a field supplied OA measuring station.
LH Lvl Pos=	-	0.00% – 100.00%	A status item which is used to calibrate the left-hand side (unit opposite drive side) of the optional DesignFlow outdoor measuring apparatus. For details regarding calibration of the DesignFlow apparatus, refer to the applicable model-specific installation and maintenance manual.
RH Lvl Pos=	-	0.00% – 100.00%	A status item which is used to calibrate the right-hand side (unit drive side) of the optional DesignFlow outdoor measuring apparatus. For details regarding calibration of the DesignFlow apparatus, refer to the applicable model-specific installation and maintenance manual.
MinRFEFTm=	120s	0s – 3600s	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.
BSPOvdST=	5s	0s – 999s	An adjustable item which sets the “sampling time” used in the PI control function used for the building static pressure override feature.
BSPOvdGain=	0.2	0–999	An adjustable item which sets the “Gain” used in the PI control function used for the building static pressure override feature.
BSPOvdMxChg=	4%	0% – 100%	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.
ResetTLmt=	32.0°F	0°F – 100°F	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.
RstTSmplT=	5s	0s – 999s	An adjustable item which sets the “sampling time” used in the PI control function used for the Reset Temperature Limit feature.

Item Display Name	Default Setting	Range	Description
RstTGain=	0.2s	0s – 999s	An adjustable item which sets the “Gain” used in the PI control function used for the Reset Temperature Limit feature.
RstTPAT=	60s	0s - 999s	An adjustable item which sets the “project ahead time” used in the PI control function used for the Reset Temperature Limit feature.
RstTMaxChg=	4%	0% – 100%	An adjustable item that sets the maximum change value PI loop used for the Reset Temperature Limit feature.
Min Inc Rate=	0.03	0.0–100.0	An adjustable item used to set the minimum increase rate for the outside air damper “cold start” sequence.
Max Inc Rate=	1.0	0.0–100.0	An adjustable item used to set the maximum increase rate for the outside air damper “cold start” sequence.
0-30% OA Max=	30%	0% – 100%	An adjustable item used to set the maximum outside air damper position when the unit is configured for a 30% damper.

Heating Set-Up

The Heating menu provides a summary of the control parameters for units with heating. The unit’s heating mode of operation is controlled by the control temperature and the heating setpoint temperature. The unit goes into the heating mode of operation by analyzing the control temperature. The control temperature can be return temperature, space temperature or outside air temperature. The unit goes into the heating mode of operation when the control temperature is below the heating setpoint by more than ½ the deadband.

Table 28: Heating Set-Up Menu

Item Display Name	Default Setting	Range	Description
Htg Stage Time	5min	2min – 60min	An adjustable item used to set a minimum time period between heating stage changes.
Htg DB	2.0°F	1.0°F – 10.0°F	An adjustable item which sets a dead band around the discharge heating setpoint parameter. For example, if the discharge heating setpoint parameter is set to 100ºF and the Htg DB= parameter is set to 2ºF, the dead band around the set point would be from 101.0ºF to 99.0ºF.
Htg Period=	60s	0s – 999s	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=	0.1	0.0 – 100.0	An adjustable item which sets the “Gain” used in the PI control function that modulates the heating valve or face & bypass dampers.
Htg PAT=	600s	0s – 999s	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%	An adjustable item that sets the maximum value for an increase or decrease of the heating valve or face & bypass damper position.
Htg Hi OAT Lock	55°F	0°F – 100°F	An adjustable item which sets the high outdoor air temperature heating lockout point. Heating operation is disabled when the outdoor air temperature sensor input rises above this set point.
Htg Lo OAT Lock	0°F 45°F if 100% OA unit w/o ER	-20°F – 50°F 45°F – 50°F	An adjustable item which sets the Low outdoor air temperature heating lockout point. Compressor Heating operation is disabled when the outdoor air temperature sensor input falls below this set point. (heat pump operation).
OAT Diff	2°F	0°F – 10°F	An adjustable item which sets a differential below the OATHtg Lock parameter. Heating operation is re-enabled when the outdoor air temperature sensor input falls below the OATHtg Lock value by more than this differential.
Htg Reset=	None	None Ntwrk Space Return OAT ExtmA ExtV	An adjustable item used to set the type of heating reset to be used.
Min Htg Spt=	55.0°F	40.0°F – 140.0°F	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/NA	0–100/ NA °F °C mA	An adjustable item which sets the value of the sensor input, selected with the heating reset parameter, at which the heating setpoint is reset to the Min Htg Spt value.
Max Htg Spt=	55.0°F	40.0°F – 140.0°F	An adjustable item which sets the maximum heating discharge set point for use with a heating discharge air temperature set point reset schedule.

Item Display Name	Default Setting	Range	Description
Max Htg Spt @	100.0°F	0–100/ NA °F °C mA	An adjustable item which sets the value of the sensor input, selected with the heating reset parameter, at which the heating setpoint is reset to the Max Htg Spt value.
Min DAT Ctrl=	Yes	Yes, No	An adjustable item used on VAV or CAV discharge control units to activate or deactivate the low discharge temperature limit function available on units equipped with modulating or multistage heat.
Min Dat Limit	55.0°F	0.0°F – 70.0°F	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.
Occ Heating=	Yes	Yes, No	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.
Unocc Diff=	3°F	0°F – 10°F	An adjustable item that sets the unoccupied heating differential.
Htg Warmup Tm=	240s	0s – 999s	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 240 seconds) during the special cold start sequence.
Htg Hld Period=	240s	0s – 999s	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.
Max Purge Hld=	20s	10s – 180s	An adjustable item that sets the value of the maximum purge hold timer.
MWU Sensor	RAT	RAT Space None	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.

Dehum Set-Up

Table 29: Dehumidification Menu

Item Display Name	Default Setting	Range	Description
Dehum Method=	None	None Rel Hum DewPt Always	An adjustable item used to set the dehumidification method to either “RH” or “DewPt.” When this parameter is set to “RH,” dehumidification operation is controlled to maintain the Rel Humidity value at the Relative Humidity Set Point. When this parameter is set to “DewPt,” dehumidification operation is controlled to maintain the Dew Point= value at the Dew Point Set Point. When this parameter is set to “Always” dehumidification will be active as long as mechanical cooling is not disabled.
RH DB=	6%	0% – 10%	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°F – 10°F	An adjustable item that sets a dead band around the dew point set point. For example, if the DewPoint Spt parameter is set to 50ºF and the DewPntDb parameter is set to 2ºF the dead band around the set point would be from 49ºF to 51ºF.
RH Period=	30s	0s – 999s	An adjustable item which sets the “sampling time” used in the PI control function for controlling the reheat valve.
RH Gain=	1	0.0–100.0	An adjustable item which sets the “Gain” used in the PI control function for controlling the reheat valve.
RH PAT=	30s	0s – 999s	An adjustable item which sets the “project ahead time” used in the PI control function for controlling the reheat valve.
RH Max Chg=	10%	0% – 100%	An adjustable item that sets the maximum value for an increase or decrease for controlling the reheat valve.
LSC Lo Gain=	0.2	0.0 – 100.0	An adjustable item which sets the “Gain” used in the PI control function for controlling the liquid subcooling reheat valve.
RH Stg Time=	10min	0min – 60min	An adjustable item is an adjustable item which sets a stage time period for controlling reheat on units equipped with a single stage of hot gas reheat.
Stg Rht DB=	5°F	0°F – 20°F	An adjustable item which sets a dead band around the reheat setpoint parameter.
Unocc Dehuml=	No	No Yes	An adjustable item to select whether dehumidification is allowed during off or unoccupied cycle times.

Item Display Name	Default Setting	Range	Description
Sensor Loc=	Return	Return OAT Space	An adjustable item which is used to select the location of the humidity sensor. The location is selected by setting the Sensor Location value on the keypad to Return, Space, or OAT. The significance of the sensor location is that this determines which temperature sensor is use to calculate the Dewpoint. OAT can only be selected for units with DAT control.
Mn Lvg Coil T=	45.0°F RTU or MPS 52.0°F DPS	40°F – 100°F	An adjustable item which is used to set the minimum leaving coil temperature (Default = 45°F).
Mx Lvg Coil T=	52.0°F	40°F – 100°F	An adjustable item which is used to set the maximum leaving coil temperature (Default = 52°F).
Rht Cmp Lmtg=	Yes	No Yes	an adjustable item used to enable or disable the Compressorized Reheat Cooling Capacity Limiting Function.
Min Rheat Spt=	55.0°F	40.0°F – 100.0°F	An adjustable item which is used to set the minimum DAT during dehumidification.
Max Rheat Spt =	65.0°F	40.0°F – 100.0°F	An adjustable item which is used to set the maximum DAT during dehumidification.
RH Sens Type=	VDC	VDC mA	An adjustable item used to define the field supplied humidity sensor input signal type.
RH Min Sig=	0.0V	0.0 – 20.0 V/mA	An adjustable item used to define the minimum value of the field supplied humidity sensor current or voltage signal.
RH Max Sig=	8.5V (MPS/DPS) 10.0V (RTU)	0.0–20.0 V/mA	An adjustable item used to define the maximum value of the field supplied humidity sensor current or voltage signal.
Min Dehum Spd=	33%	0% – 100%	An adjustable item used to set the minimum supply fan VFD speed during dehumidification.
Max Dehum Spd=	100%	0% – 100%	An adjustable item used to set the maximum supply fan VFD speed during dehumidification.
Rht Min Pos=	10% (RPS) 15% MPS 5% (DPS, DPH)	0% – 100%	An adjustable item used to set the minimum position of the reheat valve when the PI loop is active.
RH Dec Rate=	1	0% – 10.00%/s	An adjustable item used to set the rate of decrease for the reheat valve, where the unit leaves the dehumidification operation.
Backup RH Enable=	No	No Yes	A selectable item that will enable or disable supplement gas heat reheat. Re-heat must be active at 100% for 5 min to enable operation.

Energy Recovery Set-Up

The Energy Recovery Set-up menu contains parameters that relate to or are used to control the enthalpy wheel and exhaust fan when a unit is equipped with an optional energy recovery wheel system.

Table 30: Energy Recovery

Item Display Name	Default Setting	Range	Description
Energy Rvcy=	Yes	Yes, No	An adjustable item which turns the optional energy recovery system ON / OFF.
ER Wheel=	—	On, Off	A status only item used to indicate whether the energy recovery wheel is currently ON or OFF.
Wheel Speed=	—	0% – 100%	A status only item that indicates the energy wheel variable speed supply air fan speed.
Whl Spd Cmd=	—	0% – 100%	A status only item that indicates the current energy wheel variable speed supply air fan commanded speed.
ER LAT=	—	-50.0°F – 200.0°F	A status only item which displays the current discharge air temperature leaving the optional energy recovery wheel.
ER EAT=	—	-50.0°F – 200.0°F	A status only item which displays the current exhaust air temperature leaving the optional energy recovery wheel.
Min ExhT Diff=	2.0°F	1.0°F – 20.0°F	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=	6.0°F	1.0°F – 20.0°F	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.

Item Display Name	Default Setting	Range	Description
ER Whl Stg Tm=	5min	1min – 100min	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 Whl Off Tm=	20min	1min – 100min	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.
Rel Humidity=	—	0% – 100%	A status only item that indicates the current relative humidity reading of the sensor.
Min Whl Spd	5%	0% – 100%	An adjustable item used to set the energy recovery minimum wheel speed.
Intersect Pt=	—	-146.2°F – 150.0°F	A status only item used to indicate the current intersection point value from the psychometric chart where potential for wheel frosting exists.
Fst Mgmt Meth=	Timed	Timed ExhAir	An adjustable item used to select the frost protection method to be used on a constant speed energy wheel application.
OA Fst Temp=	5°F	-40.0°F – 99.86°F	An adjustable item used to set the outside air frost temperature.
Defrost Time=	5min	0min – 60min	An adjustable item used to set the duration of a defrost cycle.
Defrst Period=	60min	0min – 1440min	An adjustable item used to set how often a defrost cycle will be initiated.
Defrst On Tm=	1s	0s – 999s	An adjustable item used to select how long the constant speed energy wheel is energized during defrost.
Defrst Off Tm=	24s	0s – 999s	An adjustable item used to select how long the constant speed energy wheel is de-energized during defrost.
ER Whl Period=	30.0s	0s – 999.0s	An adjustable item which sets the “sampling time” used in the PI control function.
ER Whl Gain=	1.0	0–100	An adjustable item which sets the “Gain” used in the PI control function.
ER Whl PAT=	30.0s	0s – 999.0s	An adjustable item which sets the “project ahead time” used in the PI control function.
ER Max Chg=	10%	0% – 100%	An adjustable item that sets the maximum value for an increase or decrease of the energy recovery wheel speed.
Capacity Limiting	Yes	Yes No	An adjustable item used to turn ON and OFF the energy wheel capacity limiting function.

Alarm Configuration

Alarm Limits Menu

The Alarm Limits menu is used to set the limits of the discharge air temperature sensor and the return air temperature sensor.

Table 31: Alarm Limits Setup Menu

Item Display Name	Default Setting	Range	Description
Hi Disch Temp=	170°F	90°F – 250°F	An adjustable item that sets the high temperature limit for the DAT sensor. When the discharge air temperature sensor reaches this set point the unit will go into the high discharge air alarm.
Lo Disch Temp=	40°F	-50°F – 50°F	An adjustable item that sets the low temperature limit for the DAT sensor. When the discharge air temperature sensor reaches this set point the unit will go into the low discharge air alarm.
Hi Return Temp=	120°F	90°F – 150°F	An adjustable item that sets the high temperature limit for the return air temperature. When the RAT sensor reaches this set point the unit will go into the high return air temperature alarm.

Alarm Output Config Menu

Table 32: Alarm Out Configuration Setup Menu

Item Display Name	Default Setting	Range
Faults=	Fast	ON
		OFF
		Fast
		Slow
Problems=	Slow	ON
		OFF
		Fast
		Slow

Item Display Name	Default Setting	Range
Warnings=	OFF	ON
		OFF
		Fast
		Slow

The digital alarm output indicates the alarm group that contains the highest priority active alarm. This output is ON when no alarms are active. The options for the action of this output when an alarm in a group occurs are ON, Fast Blink, Slow Blink, or OFF. These can be edited via the keypad/display. The default values for the three groups of alarms are:

- Warnings - OFF
- Problems - Slow Blink
- Faults - Fast Blink

A user could eliminate any signal of a particular group of alarms through this output by selecting ON for that alarm group in the keypad/display.

Alarm Delays Menu

The Alarm Delays Setup Menu can be accessed when a level 2 password has been entered. The default settings are the result of many years of testing and should not be changed.

Table 33: Alarm Delays Setup Menu

Item Display Name	Default Setting	Range	Description
Frz DelayTime=	30s	0s – 180s	An adjustable item used to set the freeze alarm delay time.
LP Delay=	2s	0s – 10s	An adjustable item used to set the low pressure switch delay time.
LP Comp Delay=	5s (410A)	0s – 300s	An adjustable item used to set the low pressure compressor delay time.
	65s (R22/407C)		
Aflw Ignr Tm=	120s	0s – 999s	An adjustable item that sets the amount of time the air proving switch is ignored after the supply fan is started.
Sens Alm Dly=	30s	0s – 300s	An adjustable item used to set the sensor alarm delay time.
Temp Alm Dly=	30s	0s – 300s	An adjustable item used to set the temperature alarm delay time.
Alarm Config			
Emerg Stop=	Man Clr	Man Clr	An adjustable item used to set the emergency shutdown to either manual or automatic restart.
		Auto Clr	

Manual Control

The manual control of operation is a function that is used for operating the unit during a service call only. The unit must not be operated in this mode for any extended period of time.

Table 34: Manual Control Menu

Item Display Name	Default Setting	Range	Description
Manual Ctrl=	Normal	Normal	An adjustable item that puts the unit into manual control. Major components of the unit are turned on and off by this control. The units normal control sequences are overridden in this state with the exception of all the “fault” alarms and the cooling circuit high pressure and low pressure alarms.
		ManCtrl	
Supply Fan=	OFF	OFF	An adjustable item that turns on the supply fan.
		ON	
SAF Spd Cmd=	0%	0% – 100%	An adjustable item only on VAV units that sets the speed of the supply air fan.
RF/EF VFD=	OFF	OFF	An adjustable item that turns ON the return/exhaust fan.
		ON	
RF/EF Spd Cmd=	0%	0% – 100%	An adjustable item for units with VFD on the return/exhaust fans that sets the speed of the return/exhaust fan.
OAD/Econo=	0%	0% – 100%	An adjustable item which is used to set the economizer damper position.
OAD OpCl=	Close	Close	An adjustable item which is used to turn the OA damper output ON. This output is available only on self contained units.
		Open	
Var Cmp=	OFF	OFF	An adjustable item used in manual control to turn on the variable speed compressor.
		ON	
Var Cmp Cmd=	0%	0% – 100%	An adjustable item used in manual control to sets the speed of the variable speed compressor.
VCmp Emg Stop=	Nrml	Stop	An adjustable item used in manual control to test the variable speed compressor Emergency Stop function.
		Normal	

Item Display Name	Default Setting	Range	Description
Comp 1 =	OFF	OFF ON	An adjustable item that turns on compressor #1.
Comp 2 =	OFF	OFF ON	An adjustable item that turns on compressor #2.
Comp 3 =	OFF	OFF ON	An adjustable item that turns on compressor #3.
Comp 4 =	OFF	OFF ON	An adjustable item that turns on compressor #4.
Comp 5 =	OFF	OFF ON	An adjustable item that turns on compressor #5.
Comp 6 =	OFF	OFF ON	An adjustable item that turns on compressor #6.
Comp 7 =	OFF	OFF ON	An adjustable item that turns on compressor #7.
Comp 8 =	OFF	OFF ON	An adjustable item that turns on compressor #8.
Cfan Outpt 1=	OFF	OFF ON	An adjustable item that turns ON the condenser fan output #1.
Cfan Outpt 2=	OFF	OFF ON	An adjustable item that turns ON the condenser fan output #2.
Cfan Outpt 3=	OFF	OFF ON	An adjustable item that turns ON the condenser fan output #3. **Note:** Turning on any one of the compressors will automatically turn ON the first condenser fan on the circuit. Other condenser fans must be manually turned ON to control the head pressure of the unit. Refrigerant gauges must be connected to the unit for observation of the head pressure in the manual control mode of operation. Additional condenser fans must be turned ON to maintain the head pressure.
ExhFan Out 1=	OFF	OFF ON	An adjustable item that turns ON Exhaust fan output # 1.
ExhFan Out 2=	OFF	OFF ON	An adjustable item that turns ON Exhaust fan output # 2.
GasHtg OnOff=	OFF	OFF ON	An adjustable item used to manually turn the main gas valve output ON/OFF.
Htg Valve=	0%	0% – 100%	An adjustable item used to manually drive the modulating heating valve open and closed.
SCR Out=	0%	0% – 100%	An adjustable item used to manually drive the output signal to the SCR.
Htg Stg 1=	OFF	OFF ON	An adjustable item that turns on the first stage of heat on units equipped with staged heating.
SCR Ena 1=	OFF	OFF ON	An adjustable item that enables the SCR heater.
Htg Stg 2=	OFF	OFF ON	An adjustable item that turns on the second stage of heat on units equipped with staged heating.
SCR Ena 2=	OFF	OFF ON	An adjustable item that enables the SCR heater.
Htg Stg 3=	OFF	OFF ON	An adjustable item that turns on the third stage of heat on units equipped with staged heating.
Htg Stg 4=	OFF	OFF ON	An adjustable item that turns on the fourth stage of heat on units equipped with staged heating.
Htg Stg 5=	OFF	OFF ON	An adjustable item that turns on the fifth stage of heat on units equipped with staged heating.
Htg Stg 6=	OFF	OFF ON	An adjustable item that turns on the sixth stage of heat on units equipped with staged heating.
Reheat Valve=	0%	0% – 100%	An adjustable item used to manually drive the reheat valve open and closed.
RH Output=	OFF	OFF ON	An adjustable output that turns on the Reheat valve output.
ERec Wheel=	OFF	OFF ON	An adjustable item which is used to turn on/off the energy recovery wheel output.
ER Whl Cmd=	0%	0% – 100%	An adjustable item is an adjustable item which is used to set the energy recovery wheel VFD speed.
ERBP Dmpr Cl=	OFF	OFF ON	An adjustable item which is used to close the energy recovery bypass damper.
ERBP Dmpr Op=	OFF	OFF ON	An adjustable item which is used to open the energy recovery bypass damper.
Alm Output=	OFF	OFF ON	An adjustable item which is used to turn on/off the alarm output.

Item Display Name	Default Setting	Range	Description
Fan Op Out=	OFF	OFF	An adjustable item which is used to turn on/off the fan operation output.
		ON	**Note:** When Manual Control is set to ManCtrl, the Control Mode is set to OFF so that the unit will not restart automatically. When Manual Control is set to Normal all digital outputs in the Manual Control menu are set to OFF and all the analog outputs are set to 0.0% so that all outputs are in the OFF or minimum position when Manual Control is set to ManCtrl.

Service Menus

Timer Settings Menu

The Timer Settings Menu is also available from the Commission Unit Menu, and is described on page 31.

Save/Restore Menu

The Save/Restore menu can be used to save or restore the user configured parameters as well as reset the controller back to the factory default parameters.

Table 35: Save/Restore Menu

Item Display Name	Default Setting	Range	Description
Save Params=	No	No/Yes	An adjustable item used to save the current parameters and configuration.
Rstr Params=	No	No/Yes	An adjustable item used to restore the current parameters and configuration.
Rstr Factory=	No	No/Yes	An adjustable item used to restore the factory parameters and configuration.
SaveToCard=	No	No/Yes	An adjustable item used to save the current parameters and configuration to an SD card.
LoadFromCard	No	No/Yes	An adjustable item used to restore the current parameters and configuration from an SD card. **Note:** The controller will automatically perform a reset when the value of Load From Card is changed from No to Yes and the enter button is pushed.

Active Alarms Menu

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 group priority: Faults first, Problems second, and Warnings last. Within each group, alarms are displayed in the order that they were detected.

Table 36: Active Alarm Menu

Item Display Name	Default Setting	Range
Active Alm Count=	—	0–10
ClrAlms=	No	No ClrFlts ClrPrblms ClrWrngs ClrAllAlms
+Alarm 1:Alarm Type	—	
+Alarm 2:Alarm Type	—	

Event Log Menu

The last fifty events (such as variable compressor unloading events, both detection and return to normal) as well as the date and times that they were detected are displayed on the Event Log menu. These events are displayed in the order that they were detected. The event that was detected most recently is displayed first. Multiple occurrences of the same event may appear.

Table 37: Possible Standby Events

Standby Event Enumeration	Enumeration Text	Description	
0	None	No Active Standby Events	
1	ClgLP	Cooling Low Pressure Unloading Control Standby	A standby event that will take place when the PTS < 9.957 PSI.
2	ClgHP	Cooling High Pressure Unloading Control Standby	A standby event that will take place when the PTD > 579 PSI. continuously for 10 minutes or PTD> 579 PSI and OAT < 45°F.
3	HtgLP	Heating Low Pressure Unloading Control Standby	A standby event that will take place when the PTS < 9.67 PSI while in heating mode and not in defrost mode.

Standby Event Enumeration	Enumeration Text	Description	
4	HtgHP	Heating High Pressure Unloading Control Standby	A standby event that will take place when the PTD > 527.6 PSI.
5	ClgLoDP	Cooling Low Differential Pressure Protection Control Standby	A standby event that will take place when the PTD-PTS <73.9 PSI continuously for stage time plus 40 seconds.
6	HtgLoDP	Heating Low Differential Pressure Protection Control Standby	A standby event that will take place when the PTD-PTS <73.9 PSI continuously for stage time plus 40 seconds, in the heating mode.
8	OfanFlt	Outdoor Fan Fault Standby	A standby event that will take place when the controller receives a condenser fan fault from the VFD.

Alarm Log Menu

The last fifty alarm events (alarm detection and return to normal) as well as the date and times that they were detected are displayed on the Alarm Log menu. These alarm events are displayed in the order that they were detected. The alarm event that was detected most recently is displayed first. Multiple occurrences of the same alarm may appear.

Table 38: Alarm Log Menu

Item Display Name	Default Setting	Range	Password Level
Log Alm Count=	—	0–50	None
ClrLog=	No	No Yes	None
+Alarm 1:Alarm Type	—		None
+Alarm 2:Alarm Type	—		None

Once an alarm is cleared there will be two entries in the Alarm Log. A (+) sign will be shown next to the entry added when the alarm became active and a (-) sign will be shown next to the entry added when the alarm has been cleared.

Alarm Configuration Menu

The Alarm Configuration menu is also available under the Commission Unit menu. Refer to page 43.

Table 39: Alarm Configuration Menu

Item Display Name	Default	Range	Description
Alarm Config			
Emerg Stop=	Man clr	Man clr / Auto Clr	A selectable item to allow the emergency stop to clear automatically upon resolution or require a manual clearing of the fault.
AlmLogToSD=	No	No / English / SI	A selectable item that will enable the transfer of the alarm log to the controllers SD Card reader in English or SI units or not at all.
Event Config			
Show Events=	Yes	No / Yes	A selectable item to allow for masking the HMI display of events. Controller reset is required when “show events” is changed.
EventLogToSD=	No	No / English / SI	A selectable item that will enable the transfer of the event log to the controllers SD Card reader in English or SI units or not at all.
Snapshot Config			
Ena Snapshots=	Yes	No / Yes	A selectable item to enable or disable the recording of certain unit operating conditions at the moment of an alarm or event occurance.
Show Snapshots	Yes	No / Yes	A selectable item to allow for masking the HMI display of snapshots. Controller reset is required when “show snapshots” is changed.
Snapshots to SD	No	No / English / SI	A selectable item that will enable the transfer of the snapshots to the controllers SD Card reader in English or SI units or not at all.

Analog Input Status Menu

The Analog Input Status Menu provides diagnostic information to qualified service personnel. The items listed in this menu will provide current status information of the unit’s analog inputs. The value shown is the input resistance shown in 1/10th of an ohm scale. Example: MCB-AI1 (DAT sensor) shows a value of 181380, the actual resistance would be 18,138 ohms. This would translate to a temperature of 53.5 ºF.

Table 40: Analog Input Status Menu

Item Display Name	Default Setting	Range
MCB-AI1=	—	0–99999999
MCB AI2=	—	0–99999999
MCB AI3=	—	0–99999999

Universal I/O Status Menu

The Universal I/O Status Menu provides diagnostic information to qualified service personnel. The items listed in this menu will provide current status information of the Universal inputs and outputs. If the universal I/O is configured for resistance, the value will be displayed in 1/10th ohm scale. If the I/O is configured for mA, the value will be displayed in micro amps (1 mA = 1000 micro amps). If I/O is configured for voltage, the value is displayed in 1/1000th volt scale. Example: MCB-X7 (OA Damper analog output) shows a value of 3000, this would translate into 3 VDC.

Table 41: Universal I/O Status Menu

Item Display Name	Default Setting	Range	Password Level		Item Display Name	Default Setting	Range	Password Level
MCB X1=	—	0–9999999	2		EMC X1=	—	0–9999999	2
MCB X2=	—	0–9999999	2		EMC X2=	—	0–9999999	2
MCB X3=	—	0–9999999	2		EMC X3=	—	0–9999999	2
MCB X4=	—	0–9999999	2		EMC X4=	—	0–9999999	2
MCB X5=	—	0–9999999	2		EMC X5=	—	0–9999999	2
MCB X6=	—	0–9999999	2		EMC X6=	—	0–9999999	2
MCB X7=	—	0–9999999	2		EMC X7=	—	0–9999999	2
MCB X8=	—	0–9999999	2		EMC X8=	—	0–9999999	2
EMA X1=	—	0–9999999	2		EMD X1=	—	0–9999999	2
EMA X2=	—	0–9999999	2		EMD X2=	—	0–9999999	2
EMA X3=	—	0–9999999	2		EMD X3=	—	0–9999999	2
EMA X4=	—	0–9999999	2		EMD X4=	—	0–9999999	2
EMA X5=	—	0–9999999	2		EMD X5=	—	0–9999999	2
EMA X6=	—	0–9999999	2		EMD X6=	—	0–9999999	2
EMA X7=	—	0–9999999	2		EMD X7=	—	0–9999999	2
EMA X8=	—	0–9999999	2		EMD X8=	—	0–9999999	2
EMB X1=	—	0–9999999	2		EME X1=	—	0–9999999	2
EMB X2=	—	0–9999999	2		EME X2=	—	0–9999999	2
EMB X3=	—	0–9999999	2		EME X3=	—	0–9999999	2
EMB X4=	—	0–9999999	2		EME X4=	—	0–9999999	2
EMB X5=	—	0–9999999	2		EME X5=	—	0–9999999	2
EMB X6=	—	0–9999999	2		EME X6=	—	0–9999999	2
EMB X7=	—	0–9999999	2		EME X7=	—	0–9999999	2
EMB X8=	—	0–9999999	2		EME X8=	—	0–9999999	2

Digital Input Status Menu

The Digital Input Status Menu provides diagnostic information to qualified service personnel. The items listed in this menu will provide current status information of the controller's digital inputs.

Table 42: Digital Input Status Menu

Item Display Name	Default Setting	Range	Password Level
MCB DI1=	OFF	OFF/ON	2
MCB-DI2=	OFF	OFF/ON	2
MCB DI3=	OFF	OFF/ON	2
MCB DI4=	OFF	OFF/ON	2
MCB DI5=	OFF	OFF/ON	2
MCB DI6=	OFF	OFF/ON	2

Digital Output Status Menu

The Digital Output Status Menu provides diagnostic information to qualified service personnel. The items listed in this menu will provide current status information of the controller's digital outputs.

Table 43: Digital Output Status Menu

Item Display Name	Default Setting	Range	Password Level
MCB DO1=	OFF	OFF/ON	2
MCB DO2=	OFF	OFF/ON	2
MCB DO3=	OFF	OFF/ON	2
MCB DO4=	OFF	OFF/ON	2
MCB DO5=	OFF	OFF/ON	2
MCB DO6=	OFF	OFF/ON	2
MCB DO7=	OFF	OFF/ON	2
MCB DO8=	OFF	OFF/ON	2
MCB DO9=	OFF	OFF/ON	2
MCB DO10=	OFF	OFF/ON	2
EMA DO1=	OFF	OFF/ON	2
EMA DO2=	OFF	OFF/ON	2
EMA DO3=	OFF	OFF/ON	2
EMA DO4=	OFF	OFF/ON	2
EMA DO5=	OFF	OFF/ON	2
EMA DO6=	OFF	OFF/ON	2
EMB DO1=	OFF	OFF/ON	2
EMB DO2=	OFF	OFF/ON	2
EMB DO3=	OFF	OFF/ON	2
EMB DO4=	OFF	OFF/ON	2
EMB DO5=	OFF	OFF/ON	2
EMB DO6=	OFF	OFF/ON	2

Item Display Name	Default Setting	Range	Password Level
EMC DO1=	OFF	OFF/ON	2
EMC DO2=	OFF	OFF/ON	2
EMC DO3=	OFF	OFF/ON	2
EMC DO4=	OFF	OFF/ON	2
EMC DO5=	OFF	OFF/ON	2
EMC DO6=	OFF	OFF/ON	2
EMD DO1=	OFF	OFF/ON	2
EMD DO2=	OFF	OFF/ON	2
EMD DO3=	OFF	OFF/ON	2
EMD DO4=	OFF	OFF/ON	2
EMD DO5=	OFF	OFF/ON	2
EMD DO6=	OFF	OFF/ON	2
EME DO1=	OFF	OFF/ON	2
EME DO2=	OFF	OFF/ON	2
EME DO3=	OFF	OFF/ON	2
EME DO4=	OFF	OFF/ON	2
EME DO5=	OFF	OFF/ON	2
EME DO6=	OFF	OFF/ON	2

Network Input Status Menu

The Network Input Status Menu provides diagnostic information to qualified service personnel. The items listed in this menu will provide current status information of the controller's network inputs.

Table 44: Network Input Status Menu

Item Display Name	Default Setting	Range (No Network value in Bold)	Password Level
Net OAT In=	—	-50.0°F – 200.0°F **(621.8°F)**	2
Net SpaceT In=	—	0.0°F – 150.0°F **(621.8°F)**	2
NetCurrState=	—	Occ	2
		Unocc	
		TntOvrd	
		Standby	
		Auto	
		(NULL)	
NetNextState=	—	Occ	2
		Unocc	
		TntOvrd	
		Standby	
		Auto	
		(NULL)	
NetTmToNxtSt=	—	0min – 65534min **(65535min)**	2
Net App Mode=	—	Off	2
		HeatOnly	
		CoolOnly	
		FanOnly	
		Auto	
		(Auto)	
Net Cl Ena Sw=	—	-1.0 – 1.0 **(-1.0)**	2

Item Display Name	Default Setting	Range (No Network value in Bold)	Password Level
Net Cl Ena Vl=	—	0% – 255% **(255%)**	2
Net Ht Ena Sw=	—	-1.0 – 1.0 **(-1.0)**	2
Net Ht Ena Vl=	—	0% – 255% **(255%)**	2
Net Ec Ena Sw=	—	-1.0–1.0 **(-1.0)**	2
Net Ec Ena Vl=	—	0% – 255% **(255%)**	2
Net SAF Cap=	—	0% – 100% **(164%)**	2
Net ExhF Cap=	—	0% –100% **(164%)**	2
Net Space IAQ=	—	0ppm – 5000ppm **(65535ppm)**	2
Net Rel Humid=	—	0% – 100% **(164%)**	2
Net DATClgSpt=	—	40.0°F – 100.0°F	2
Net DATHtgSpt=	—	40.0°F – 140.0°F	2
nviSetpoint=	—	0.0°F – 100.0°F **(621.8°F)**	2
OccManCmd=	—	Occ	2
		Unocc	
		TntOvrd	
		Standby	
		Auto	
Net MinOA=	—	0% – 100%	2
nvoEffSpt=	—	0.0°F – 100.0°F	2
nciOccClgSpt=	—	0.0°F – 100.0°F	2
nciOccHtgSpt=	—	0.0°F – 100.0°F	2
nciHVACType=	—	HVT_GEN	2

Modbus Status Menu

The Modbus Status Menu provides diagnostic information to qualified service personnel. The items listed provide the status of the Modbus communications with the various devices controlled by the internal Modbus network.

Table 45: Modbus Status Menu

Item Display Name	Default Setting	Range	Description
SF MB Status=	—	Fault/OK	A status only item which indicates the status of the Modbus communications between the main controller and the supply fan motor.
RFEF MB Status=	—	Fault/OK	A status only item which indicates the status of the Modbus communications between the main controller and the return/exhaust fan motor.
ER MB Status=	—	Fault/OK	A status only item which indicates the status of the Modbus communications between the main controller and the energy recover wheel variable speed supply air fan.
IFB MB Status=	—	Fault/OK	A status only item which indicates the status of the ModBus communication between the IFB board and the main controller.
D3 MB Status=	—	Fault/OK	A status only item which indicates the status of the ModBus communication between the D3 Gateway and the main controller.
MB Resistance=	Yes	Yes/No	Status of the terminating resistors for the ModBus line.
ECM Config=	Done	Set Add 1	The area in which you are able to change addressing of any one of the ECB motors contained in the unit.
		Set Add 2	
		Set AICtl	

D3 Status Menu

The D3 Status menu is provided for viewing the status of an interface with the unit via a D3 gateway. Refer to IM 1133 – DIII-Net Communication Gateway for detailed information.

Table 46: D3 Status Menu

Item Display Name	Default Setting	Range	Password Level
D3 Comm Sts=	—	OK	2
		Error	
D3 Addr Err=	—	OK	2
		Error	
D3 On/Off=	—	On	2
		Off	
D3 Mode=	—	Auto	2
		Cooling	
		Heating	
		Fan	
D3 Clg Spt=	—	0–100ºF	2
D3 Htg Spt=	—	0–120ºF	2
D3 SAF Spd=	—	NA	2
		Low	
		Med	
		High	
D3 Min Load=	—	0–100%	2
D3 Max Load=	—	0–100%	2
D3 Eco Ena=	—	Enabled	2
		Disabled	
OA Enthalpy=	—	0–86 BTU/lb	2
OA Hum Ratio= g/kg	—	0–30 g/Kg	2
D3 SWVers=	—	XXXXXXXXXX	2
OAAdd1–16=	—	XXXXXXXX	2
OAAdd17–32=	—	XXXXXXXX	2
OAAdd33–49=	—	XXXXXXXX	2
OAAdd50–64=	—	XXXXXXXX	2
SetOAAddr=	0	0–64	2
CurrOAAddr=	—	0–64	2
CurrOAAmps=	—	0–200A	2
CurrOARLA=	—	0–200A	2

Sensor Offsets Menu

The Sensor Offsets Menu provides a means of calibrating the various temperature sensor inputs to the unit. Each sensor can be “biased” by as much as +/- 10.0°F.The number of the sensors that appear are dependent on the configuration of the unit.

Table 47: Sensor Offset Menu

Item Display Name	Default Setting	Range	Password Level
Disch Air=	0.0°F	0.0°F – 10.0°F	2
Return Air=	0.0°F	0.0°F – 10.0°F	2
SpaceTemp=	0.0°F	0.0°F – 10.0°F	2
OA Temp=	0.0°F	0.0°F – 10.0°F	2
ER LAT=	0.0°F	0.0°F – 10.0°F	2
ER EAT=	0.0°F	0.0°F – 10.0°F	2

Sensor Offsets Menu

The HMI set up menu provides the means of defining the viewing of the information on the HMI being used, including contrast of the information displayed and the color of the back light. **Note:** Each HMI has it own individual contrast and backlight settings.

Item Display Name	Default Setting	Range	Password Level
Contrast	0	-40 - +40	2
BackLight	White	White / Blue	2
PBusPwrSply	On	On / Off	2

Unit Maintenance

Operating Hours

The Operating Hours menu gives a summary of the hours of operation for each of the supply fans, return/exhaust fans, compressors, heating and economizer operation.

Table 48: Operating Hours Menu

Item Display Name	Default Setting	Range	Description
Supply Fan=	—	0H – 50000H	A status item which gives the number of hours the supply fan has operated.
Ret/Exh Fan=	—	0H – 50000H	A status item which gives the number of hours the return/exhaust fans have operated.
Mech Cool=	—	0H – 50000H	A status item which gives the number of hours that mechanical cooling has operated.
Comp # 1=	—	0H – 50000H	A status item which gives the number of hours that compressor #1 has operated.
Comp # 2=	—	0H – 50000H	A status item which gives the number of hours that compressor #2 has operated.
Comp # 3=	—	0H – 50000H	A status item which gives the number of hours that compressor #3 has operated.
Comp # 4=	—	0H – 50000H	A status item which gives the number of hours that compressor #4 has operated.
Comp # 5=	—	0H – 50000H	A status item which gives the number of hours that compressor #5 has operated.
Comp # 6=	—	0H – 50000H	A status item which gives the number of hours that compressor #6 has operated.
Comp # 7=	—	0H – 50000H	A status item which gives the number of hours that compressor #7 has operated.
Comp # 8=	—	0H – 50000H	A status item which gives the number of hours that compressor #8 has operated.
Heating=	—	0H – 50000H	A status item which gives the number of hours that the heating mode has operated.
Economizer=	—	0H – 50000H	A status item which gives the number of hours that the economizer has operated.
Tnt Override=	—	0H – 50000H	A status item which gives the number of hours that the unit has operated in the Tenant Override mode of operation.
Dehumid=	—	0H – 50000H	A status item which gives the number of hours that the dehumidification has operated.
ER Wheel=	—	0H – 50000H	A status item which gives the number of hours that the energy recovery wheel has operated.
Exh Out 1=	—	0H – 50000H	A status item which gives the number of hours the first stage exhaust fan has operated.
Exh Out 2=	—	0H – 50000H	A status item which gives the number of hours the second stage exhaust fan has operated.
Reheat=	—	0H – 50000H	A status item which gives the number of hours the Reheat has operated.
Comp Cooling=	—	0H – 50000H	A status item which gives the number of hours that a compressor has operated during cooling.

BMS Communications Menu

LON/BACnetIP/BACnetMSTP Setup Menu

See the Installation & Maintenance Manuals for detailed instructions

- IM 916, IM 917, IM 918 manuals have been condensed into one manual for all protocols ED 15112

Network Unit Set-up Menu

The Network Unit Set-up menu provides one location for the Set-up of items that can be controlled via a network BMS system.

Table 49: Network Unit Set-up Menu

Item Display Name	Default Setting	Range	Password Level
Space Sensor=	Digtl/Net	None	2
		Anlog/Net	
		Digtl/Net	
Unit Mode Settings			
Ctrl Mode=	OFF	OFF	2
		Heat Only	
		Cool Only	
		Fan Only	
		Heat/Cool	
		Auto/Net	
Occ Mode=	Auto/Net	Occ	2
		Unocc	
		TntOvrd	
		Auto/Net	
Reset Options			
Clg Reset=	None	None	2
		Network	
		Space	
		Return	
		OAT	
		ExtmA	
		ExtV	
		Airflow	
Htg Reset=	None	None	2
		Network	
		Space	
		Return	
		OAT	
		ExtmA	
		ExtV	
		Airflow	
AplyMinOAChg=	No	No, Yes	2
Min OA Reset=	None	None	2
		Network	
		Ext VDC	
		Ext mA	
		IAQ VDC	
		IAQ mA	

Item Display Name	Default Setting	Range	Password Level
Heat/Cool Changeover			
Ctrl Temp Src=	RAT	RAT	2
		Space	
		MAT	
		OAT	
		None	
AplyTstatChg=	No	No	2
		Yes	
UseTstatSpt=	No	No	2
		Yes	
Oc c Clg Spt=	72.0°F	0.0°F – 100.0°F	2
Occ Htg Spt=	68.0°F	0.0°F – 100.0°F	2
Fan Control Options			
SAF Ctrl=	DSP	DSP	2
		Spd/Net	
		1ZnVAV	
		BPS	
		CO_2	
		CFM	
RFEF	BldgP	None	2
		Tracking	
		BldgP	
		Spd/Net	
		OA Damper	

Unit Configuration

Unit Configuration Setup Menu

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 25 configuration variables within the MCB. These variables define things such as the type of cooling, number of compressors and 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 29-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.

Table 50 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 configured 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 rest the controller.

Table 50: Unit Configuration Menu

Configuration Code Position	Description	Values (Default in Bold)	Special Condition	Applicable for MPS
1	Unit Type	**0=Applied Rooftop (RTU)**		•
		1=Self-Contained (SCU)		
		2=Commercial Rooftop (MPS)		
		3=Rebel Cool Only (DPS)		
		4=Rebel Heat Pump (DPH)		
2	Control Type	0=Zone Control		•
		1=DAT Control		
		2=1ZoneVAV		
3	Cooling Type	0 = None		•
		1=Standard Compressorized Clg		
		2=Chilled Water		
		4=Variable Comp Circuit 1		
		5=Variable Comp Circuit 2		
		6=NA		
		7=NA		
		8=NA		
		9=Digital Comp 1 Circuit		
		10=Digital Comp 2 Circuits		

Configuration Code Position	Description	Values (Default in Bold)	Special Condition	Applicable for MPS
4	Compressorized Cooling Configuration	0=None		•
		1=Generic Condenser		
		2=2Cmp/2Circ/3Stg		
		3=3Cmp/2Circ/4Stg		
		4=2Cmp/2Circ/2or6StgorVar (6 stg if 7=2,3,4or5)		
		5=3Cmp/3Circ/3Stg_NoWRV		
		6=3Cmp/3Circ/3Stg_WRV		
		7=4Cmp/2Circ/4StgorVar		
		8=4Cmp/4Circ/4Stg_NoWRV		
		9=4Cmp/4Circ/4Stg_WRV		
		A=6Cmp/2Circ/6StgorVar		
		B=6Cmp/6Circ/6Stg_NoWRV		
		C=6Cmp/6Circ/6Stg_WRV		
		D=3Cmp/2Circ/5StgorVar		
		E=4Cmp/2Circ/5or8Stg) (8 stg if 7=2,3,4or5)		
		F=8Cmp/4Circ/8Stg		
		G=8Cmp/8Circ/8Stg		
		H=6Cmp/3Circ/6Stg		
		I=Not Used		
		J=3 Cmp/3Circ/4Stg		
		K=Spare		
		L=1Var/1Circ		
		M=Var/1STD/1Circ		
5	Generic Condenser Stages/VFD Comp Cfg	1 – 8 Stages **(default = 8)**/ 0=NA		• **(if 4 = 4, 5, or 6)**
		1=Single		
		2=Tandom		
		3=Trio		
6	Low Ambient	**0 = No**	This position currently has no effect on unit operation.	•
		1 = Yes		
7	Condenser Control	0=Std Method 1		•
		1=Std Method 2		
		2=Evap ABB		
		3=Evap MD2		
		4=Evap MD3		
		5=Evap DF		
		6=Not Used		
		7=EBM		
		8=INV		
		9=INV w/MicroC OA Coil		
8	Damper Type	0=None	Values 1, 2, 5 & 7 only apply if Position 1 = 2 (MPS)	•
		1=Single Position 30%		
		2=Single Position 100%		
		3=Economizer Airside		
		4=Economizer Waterside		
		5=100%OA_D3		
		6=AirEcon_D3		
		7=30%_DOAS		
		8=EconoAirsideFDD		
		9=D3EconFDD		
9	OA Flow Station	**0=None**		•
		1=DF_015-030 (800)		
		2=DF_036-042 (802)		
		3=DF_045-075 (047)		
		4=DF_080-135 (077)		
		5=Generic Flow Station		
		6=Generic Flow Station w/CO2		
		7=Ebtron MB		

Configuration Code Position	Description	Values (Default in Bold)	Special Condition	Applicable for MPS
10	Heating Type	**0=None**		•
		2=Staged		
		3=Modulated Gas, 3-1		
		4=Modulated Gas 20-1		
		5=Steam or Hot Water		
		6=SCR Electric		
		7=MPSLoGas		
		8=MPSHiGas		
11	Max Heating Stages	1-8 Stages **(Default = 1)**		•
12, 13, 14	Max Heat Rise	Three Digits (**Default = 100**)		•
15	Supply Fan Type	**0=Constant Volume**		•
		1=VFD/ABB		
		2=VFD/DF		
		3=VFD/MD2		
		4=VFD/MD3		
		5=VFD/MD6		
		6=EBMVAV		
		7=EBMCAV		
16	Return Fan Type	**0=CAV**		•
		1=RF_EF VFD/ABB		
		2=RF_EF VFD/DF		
		3=RF_EF VFD/MD2		
		4=RF_EF VFD/MD3		
		5=RF_EF VFD/MD6		
		6=PrpEx VFD/ABB		
		7=PrpEx VFD/DF		
		8=PrpEx VFD/MD2		
		9=PrpEx VFD/MD3		
		A=PrpEx VFD/MD6		
		B=None		
		C=1StageExh		
		D=2StageExh		
		E=3StageExh		
		F=EBMVAV		
		G=EBMCAV		
17	Return/Exhaust Fan Capacity Control Method	0=None		•
		1=Tracking		
		2=Building Pressure		
		3=Speed		
		4=OADamper		
18	Second Duct Pressure Sensor	**0=No**		
		1= Yes		
19	Entering Fan Temp Sensor	**0=No**		•
		1=Yes		
20	Energy Recovery	**0=None**		•
		1=ConstSpdWhl/NoRH		
		2=VarSpdWhl/Danfoss		
		3=VarSpdWhl/MD2		
		4=VarSpdWhl/MD3		
		5=VarSpdWhl/ABB		
		6=ConstSpdWhl/wRH		
21	Cooling Circuit Type	**0=Individual**		•
		1=2,3 or 4 Circ. Water Condenser 2=2 Circ. Air Condenser		
22	Head Pressure Control	**0=No**		
		1=Yes		
23	Bypass Valve Control	**0=Slave**		
		1=Bypass		
24, 25, 26	Unit Size	Three digits **(default 050)**		•
27	Refrigerant Type	**0=R22**		•
		1=R407C		
		2=R410A		
		3=R32		

Configuration Code Position	Description	Values (Default in Bold)	Special Condition	Applicable for MPS
28	Reheat Type	**0=None**		•
		1=StgHG		
		2=ModHG		
		3=StdHtRht		
		4=ModLSC		
		5=ModHG&LSC		
29	Unit Voltage	0=208/60Hz		•
		1=230/60Hz		
		2=460/60Hz		
		3=575/60Hz		
		4=208/50Hz		
		5=230/50Hz		
		6=460/50Hz		
		7=575/50Hz		
30	EVType	**0=None**		
		1=EVB_Sag		
		2=EVB_DF		
		3=MTIII_Sag		
		4=MTIII_DF		
		5=MTIII_Sag_DF		
		6=MTIII_DF_Sag		

Trending Menus

The Trending Menus allow for setting up and managing onboard trending of up to 30 data points within the controller. This data can then be exported to an SD card. The trending memory will begin over-writing the oldest existing data in the controller's memory when the allocated trending memory fills up. If an SD card is installed in the controllers SD card reader slot, an automatic export of the data will occur every night at midnight.

Table 51: Trending Menu

Item Display Name	Default Setting	Range	Description
Trending Ena=	No	No Yes	An adjustable item which enables and disables the on board trending function.
Apply Chgs=	No	No Yes	An adjustable item which must be set to make changes to trending point definitions and sampling rate take effect.
Sample Time=	300s	1s – 3,600s	An adjustable item used to the sampling rate for trending data points.
TrendOnOff=	Off	Off On	An adjustable item which starts and stops the on board trending function.
AutoExpTime=	1440m	0m – 1440m	An adjustable item that determines when the trends are loaded onto the SD card. If left at the default 1440 trends data is exported to the SD card once a night at 11:59 PM. If set at something other than 1440 all accumulated trend data will be transfered to the SD card at that interval.
Export Data=	No	No Yes	An adjustable item which initiates a manual export of the current on board trend data to an SD card.
Clear Trend=	Done	Done ClrData ClrCfg	An adjustable item used to either clear only the current trend data or the entire trend configuration.
Trend Full=	Wrap	Stop Wrap	A changeable item that determines when the trend data is full does it wrap the data or stop.
Default Trend=	No	No Yes	A selectable item that will select a predetermined set of data to be trended 30 points for all units, if selected to Yes.

Selection of Trending Points

There are 97 individual points that can be monitored. Trending allows the user to select 30 points to record. The technician can chose between three ways to set up Trending:

1. Manual selection of the points desired to monitor.
2. Selection of the Default Trending list.
3. Selection of the Default list and modifying that list.

Manual Selection

Points 1 through 30 are divided into six groups of five points each.When entering a group the point will be listed and below that will be three lists, list 1, list 2, and list 3, to choose from. List one contains 36 items to choose from along with the Object ID andType. List 2 contains 32 items with Object ID's and type, and List 3 contains 29 items with Object ID's and type. Refer to Table 52 to see the chart of the three points lists.

Entering the trend points 1-5 for manual input the screen should like the example below.

Example

Points 1-5	
Point 1	
List 1=	None
List 2=	None
List 3=	None
ID	F0AF0000
Type	0000
Member	0100

Using the three points list grids on the next page work through the selection of the two points below. For point 1 select supply fan capacity and point 2 select discharge air temp. By finding the corresponding reference on one of the three points lists provided you also have the object ID and Type; Supply fan capacity (points list 3) SAF%, Discharge Air Temp (points list 1) DAT. The screens should look like:

Points 1-5	
Point 1	
List 1=	None
List 2=	None
List 3=	SAF%
ID	F0AF5BDF
Type	230B
Member	0100

Points 1-5	
Point 2	
List 1=	DAT
List 2=	None
List 3=	None
ID	F0AF538E
Type	2203
Member	0100

Table 52: Trending Points Lists for MPS Units

Trend Point List 1			
Enum Text	**Object Name**	**Object ID**	**Object Type**
ActEvnt	ActiveEvents	0xF0AFA993	0x230A
AFSts	Airflow	0xF0AFB26D	0x2204
Alm	Alarm Enumeration	0xF0AFCF76	0x230A
BSP	Bldg Press	0xF0AFC4BB	0x2203
Clg%	ClgCapacity	0xF0AFF4B5	0x230A
ClgSts	Clg Status	0xF0AFF6A6	0x230B
CO2	IAQ PPM	0xF0AF7F77	0x2203
Comp1	Comp 1	0xF0AFAC75	0x2207
Comp2	Comp 2	0xF0AF9C16	0x2207
Comp3	Comp 3	0xF0AF8C37	0x2207
Comp4	Comp 4	0xF0AFFCD0	0x2207
Comp5	Comp 5	0xF0AFECF1	0x2207
Comp6	Comp 6	0xF0AFDC92	0x2207
Comp7	Comp 7	0xF0AFCCB3	0x2207
Comp8	Comp 8	0xF0AF3D5C	0x2207
CtrlT	ControlTemp	0xF0AF3701	0x2203
DAClgSp	DAT Clg Spt	0xF0AF64FD	0x2300
DAHtgSp	DAT Htg Spt	0xF0AF6054	0x2300
DAT	DAT	0xF0AF538E	0x2203
DeHmSts	Dehum Status	0xF0AF56EA	0x230B
Dewpt	Dewpoint	0xF0AF532C	0x230A
DewptSp	Dewpoint Spt	0xF0AF75C1	0x2300
DRT1	Comp1DRT	0xF0AF8C90	0x2203
DRT2	Comp2DRT	0xF0AF174C	0x2203
DSH	Discharge SH	0xF0AF3AF5	0x230A
DSP	Duct Press	0xF0AF143C	0x230A

Trend Point List 2			
Enum Text	**Object Name**	**Object ID**	**Object Type**
EcoSts	Econo Status	0xF0AFC1AB	0x230B
EFMBSts	RFEF MB Status	0xF0AFAB24	0x230B
EFT/LCT	EF/LC Temp	0xF0AF356B	0x2203
EREAT	ER EAT	0xF0AF0DBB	0x2203
ERLAT	ER LAT	0xF0AFFD44	0x2203
EWT	EW Temp	0xF0AFCD6B	0x2203
ERWhl%	Wheel Speed	0xF0AF101D	0x2203
HdPr1	Head P Circ 1	0xF0AFD3C4	0x2203
HdPr2	Head P Circ 2	0xF0AFE3A7	0x2203
Htg%	HtgCapacity	0xF0AFF01C	0x230A
HtgSts	Htg Status	0xF0AFD173	0x230B
MAT	Mixed Air	0xF0AFCD1F	0x2203
MinOA%	Min OA Pos	0xF0AFEEC9	0x230A
OAD%	OAD_Econ-CapOut	0xF0AF6259	0x230A
OAFlw	OA Flow	0xF0AFF10A	0x230A
OAFlwSp	MinOAFlw Spt	0xF0AF6B95	0x2300
OAT	OAT	0xF0AFA37F	0x2203
OcClgSp	Occ Clg Spt	0xF0AFF8A8	0x2300
OcHtgSp	Occ Htg Spt	0xF0AF8A33	0x2300
OcSrc	OccSrc	0xF0AFF838	0x230B
OilMng	OilManagement	0xF0AF2D66	0x2302
OilSts	VCmpOilStatus	0xF0AF1150	0x2204
PTD1	C1DischRefPres-sure	0xF0AF888A	0x2203
PTD2	C2DischRefPres-sure	0xF0AFB9AC	0x2203

Trend Point List 3			
Enum Text	**Object Name**	**Object ID**	**Object Type**
RAT	Return Air	0xF0AFA24D	0x2203
ReHt%	Reheat Cap	0xF0AF00F8	0x230A
RemEF%	Rem ExhF Cap	0xF0AF1969	0x2300
RemRF%	Rem RF Cap	0xF0AF57A7	0x2300
RemSF%	Rem SAF Cap	0xF0AF211F	0x2300
RFEF%	RF/EF Cap	0xF0AFAECF	0x2203
RH	Rel Humidity	0xF0AF1DDC	0x2203
RHSp	RH Setpoint	0xF0AFFA18	0x2300
RhtSp	Reheat Spt	0xF0AF335D	0x230A
SAF%	SFCapFbk	0xF0AF5BDF	0x2203
SBEvnt	Standb-yEvents	0xF0AFCB3E	0x230B
SFMBSts	SF MB Status	0xF0AF2BDE	0x230B
SpaceT	Space Temp	0xF0AFF74A	0x2203
SumpT	Sump Temp	0xF0AF503D	0x2203
Tc1	Tc1	0xF0AF4C6A	0x230A
Tc2	Tc2	0xF0AF7C09	0x230A
UnOcSrc	UnoccSrc	0xF0AFF6B4	0x230B
UnitSt	UnitState	0xF0AF9E60	0x230B
UntSts	Unit Status	0xF0AF4FF0	0x230B
VCmp1%	Comp1Analog	0xF0AFEBE7	0x2206
VCmp2%	Comp2Analog	0xF0AF3365	0x2206
VCmpSts	Var Cmp Status	0xF0AFD3CE	0x230B
WFSts	Waterflow	0xF0AF2B89	0x2204

Table 53: Default Trend List for MPS

ao Trend number	Default Trend Set			
	Enum Text	Object Name	Object ID	Object Type
1	UnitSt	UnitState	0xF0AF9E60	0x230B
2	Clg%	ClgCapacity	0xF0AFF4B5	0x230A
3	Htg%	HtgCapacity	0xF0AFF01C	0x230A
4	SAF%	SFCapFbk	0xF0AF5BDF	0x2203
5	OAD%	OAD_EconCapOut	0xF0AF6259	0x230A
6	CtrlT	HtgCapacity	0xF0AF3701	0x2203
7	DAT	DAT	0xF0AF538E	0x2203
8	OAT	OAT	0xF0AFA37F	0x2203
9	DAClgSp	DAT Clg Spt	0xF0AF64FD	0x2300
10	DAHtgSp	DAT Htg Spt	0xF0AF6054	0x2300
11	OcClgSp	Occ Clg Spt	0xF0AFF8A8	0x2300
12	OcHtgSp	Occ Htg Spt	0xF0AF8A33	0x2300
13	MinOA%	Min OA Pos	0xF0AFEEC9	0x230A
14	UntSts	Unit Status	0xF0AF4FF0	0x230B
15	VCmp1%	Comp1Analog	0xF0AFEBE7	0x2206
16	VCmp2%	Comp2Analog	0xF0AF3365	0x2206
17	RH	Rel Humidity	0xF0AF1DDC	0x2203
18	ReHt%	Reheat Cap	0xF0AF00F8	0x230A
19	ClgSts	Clg Status	0xF0AFF6A6	0x230B
20	HtgSts	Htg Status	0xF0AFD173	0x230B
21	Comp1	Comp 1	0xF0AFAC75	0x2207
22	Comp2	Comp 2	0xF0AF9C16	0x2207
23	Comp3	Comp 3	0xF0AF8C37	0x2207
24	Comp4	Comp 4	0xF0AFFCD0	0x2207
25	Comp5	Comp 5	0xF0AFECF1	0x2207
26	Comp6	Comp 6	0xF0AFDC92	0x2207
27	DeHmSts	Dehum Status	0xF0AF56EA	0x230B
28	EFT/LCT	EF/LC Temp	0xF0AF356B	0x2203
29	OilMng	OilManagement	0xF0AF2D66	0x2302
30	OilSts	VCmpOilStatus	0xF0AF1150	0x2204

To modify the default trending list for any unit simply select yes for the Default trend. Then proceed to the point you wish to change and select “none” for the point listed then chose the list of the point desired, then select the the desired point. You must also enter the ID and type and Member number. Remember the member number is always 100 when trending the present value.

About This Unit

Table 54: About this Unit Menu

Menu Display Name	Item Display Name	Description
About this Unit	SO_Item=	An adjustable item which can be used to store the sales order number of the unit for reference purposes.
	Unit SN=	An adjustable item which can be used to store the serial number of the unit for reference purposes.
	App Version=	The version of application code loaded into the controller.
	Cf1-15=	Describe positions 1-15 of the unit configuration string.
	Cf16-30=	Describe positions 16-30 of the unit configuration string.
	Main BSP=	The current version of firmware in the main controller.
	LON BSP=	A status only item which indicates the current version of firmware in the LON communication module connected to the main controller.
	LON App Ver=	A status only item which indicates the current version of application code in the LON communication module connected to the main controller.
	BACnet BSP=	A status only item which indicates the current version of firmware in the BACnet communication module connected to the main controller.
	D-Net BSP=	A status only item which indicates the current version of firmware in the D-Net communication module connected to the main controller.
	HMI GIUD=	The HMI software identifier number unique to each application code version.
	OBH GIUD=	The OBH software identifier number unique to each application code version.

Alarms

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

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 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 fifty 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.

Alarm Clearing

Active alarms can be cleared through the keypad/display or a BAS network. Alarms are automatically cleared when power is cycled. Alarms are cleared only if the conditions required to initiate the alarm do not exist. All alarms and groups of alarms can be cleared via the network or keypad by setting the ClearAlms variable to a non-zero value as indicated in the table below. Emergency Off Faults can be set to automatically clear once the condition that caused the alarm is corrected. This can be accomplished by navigating to Commission Unit/Alarm Configuration/Emerg Stop and changing the default ManClr value to AutoClr.

NOTICE

The enumeration text is what shows up on the keypad/display not the number. The value of this variable automatically reverts to zero when the alarms are cleared. This variable may be set through the keypad in the Active Alarm menu. It may be set via LON using nviClearAlarms and via BACnet using the ClearAlarms object.

Table 55: Alarm Clearing

Value	Action
0	None
1	Clear All Faults
2	Clear All Problems
3	Clear All Warnings
4	Clear All Alarms

Warnings

Over Economizing

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 75°F). 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.

NOTICE

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.

Under Economizing

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 70°F). 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 70°F) 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.

NOTICE

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.

Excess OA

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 75°F). 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.

NOTICE

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.

The previous four warnings; Over Economizing, Under economizing, Excess OA and OAD stuck, for these warnings to become active EconFDD under Commission unit\Econo Set up menu has to be selected “ON”, This Economizer function FDD was to provide criteria requirements to meet California title 24 which requires fault detection and diagnostic requirements warning alarm indication of these conditions.

OAD Stuck

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.

The previous four warnings, Over Economizing, Under economizing, Excess OA and OAD stuck, for these warnings to become active EconFDD under Commission unit\Econo Set up menu has to be selected “ON.” This Economizer function FDD was to provide criteria requirements to meet California title 24 which requires fault detection and diagnostic requirements warning alarm indication of these conditions.

Dirty Filter - (Dirty Filter: Warning)

If the pressure drop across the filter section in the unit exceeds the setting of the differential pressure switch the Dirty Filter warning occurs. When the Dirty Filter warning occurs, unit operation is not affected. The Dirty Filter warning must be manually cleared through the unit keypad or via a network signal.

Airflow Switch - (Airflow Sw: Warning)

If the unit has been in the Off operating state for at least thirty minutes and the PC7 airflow switch input to the main controller indicates airflow, the Airflow Switch warning occurs. This normally indicates a problem with the PC7 airflow switch. When the Airflow Switch warning occurs, unit operation is not affected. When the alarm condition is corrected, the Airflow Switch warning must be manually cleared through the unit keypad or via a network signal.

Return/Exh Fan Warning

When the unit is equipped with a Return/Exhaust fan VFD or ECM motor and a loss of Modbus communications for longer than 10 seconds a Return/Exhaust fan warning alarm occurs. The alarm is automatically clears when the condition causing the alarm is corrected.

Problems

Low Pressure - Circuit 1, 2 - (Lo Press 1, 2: Problem)

When a unit is equipped with individual cooling circuits, the Low Pressure Circuit 1 problem occurs when the compressor on circuit #1 has been running longer than the low pressure alarm delay and the low pressure switch LP1 remains open. The alarm also occurs any time afterward if the low pressure switch opens up while the compressor on the circuit is running. **Note:** The Low Pressure Circuit 2 problems occur in the same manner for cooling circuits 2. Compressor #1 (2) remains disabled for at least one cooling stage time period. After the cooling stage time period expires, the alarm automatically clears and the circuit is re-enabled. If the alarm occurs three times between 2:00 a.m. of one day and 2:00 a.m. of the next, the alarm does not automatically clear the third time but must be manually cleared through the unit keypad or via a network signal.

High Pressure - Circuit 1, 2 - (Hi Press 1, 2: Problem)

This alarm occurs on units equipped with compressorized cooling only. If the high pressure switch opens indicating a high refrigerant pressure situation, the High Pressure Circuit 1, 2 problems occurs.

When the High Pressure Circuit 1, 2 problem occurs, the unit continues to operate but the cooling circuit is disabled.

NOTICE

The Circuit remains disabled until the high pressure switch closes and the High Pressure Circuit problem is manually cleared through the unit keypad or via a network signal.

Entering Fan Temperature/Leaving Coil Temperature Sensor Problem (EFT/LCT Snsr: Problem)

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.

Return Air Temperature Sensor Problem - (RAT Sensor: Problem)

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 Reset revert to none if they are set to Return
- Control temperature source reverts from return to space if a space temperature sensor is present and reliable

When the alarm condition is no longer present, the RAT Sensor problem automatically clears.

Space Temperature Sensor Problem - (Space Sensor: Problem)

If the Space Sensor Present setting is set to Yes, a valid Space Temperature value is not provided via a network signal and the local space sensor is shorted or open circuited longer than the Sensor Alarm Delay (default is 30 seconds), the Space Temperature Sensor problem occurs. When the Space Temperature Sensor problem occurs, the unit continues to operate with the following modifications:

- Cooling Reset and Heating Reset revert to none they are set to Space.
- Control temperature source reverts from space to return if a return air sensor is present and reliable.

When the alarm condition is no longer present, the Space Temperature Sensor problem automatically clears.

OAT Temperature Sensor Problem - (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
- Economizer is locked out due to high OAT

When the alarm condition is no longer present, the OAT Sensor problem automatically clears.

Freeze Problem - (Freeze: Problem)

When a unit is equipped with a waterside economizer, 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 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) and allows the system to start normally when an occupied command is received.

Heat Fail Problem - (Heat Fail: Problem)

If an RPS unit is equipped with a Daikin Applied gas furnace and the burner flame safeguard (FSG) control enters the “safety lockout” state after a call for heat, a digital input is provided to EXP B-X4 on the controller. When this digital input is present the Heat Fail problem occurs. When the Heat Fail problem occurs, the unit continues to operate with the heating system disabled by the FSG. Heating remains disabled until the flame safeguard control is manually reset. The heat fail problem clears automatically when the FSG control is reset.

Faults

Airflow Fault - (Airflow: Fault)

If differential pressure switch PC7 fails to detect airflow for longer than the airflow timer (default = 120 seconds) and on VAV units the current duct static pressure indication is less than half the static pressure setpoint after the unit leaves the Startup operating state or any time afterward, while the unit is running, the Fan Fail fault occurs. When the Fan Fail fault occurs, the unit is shut down. It remains shut down until the Fan Fail fault is manually cleared through the unit keypad or via a network signal. On units equipped with a discharge fan VFD, the Fan Fail fault only occurs if the Fan Retry condition described above has first occurred twice within the previous twenty-four hour period. The conditions that cause the Fan Retry and the action taken are the same as for the Fan Fail fault with the difference being that the Fan Retry is automatically reset once the unit is shut off. This allows the unit to attempt to restart up to three times within a twenty-four hour period.

NOTICE

There is no Fan Retry function or three retry function when a unit has a CAV supply fan. If Modbus communication is lost between the MCB and the supply fan VFD the duct static pressure is not considered in the Fan Fail logic.

Low Discharge Air Temperature - (Lo Disch Temp: Fault)

If the unit is in an 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.

High Discharge Air Temperature - (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.

High Return Air Temperature - (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.

Duct High Limit Fault - (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.

Discharge Air Sensor Fault - (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.

Control Temperature Fault - (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.

Emergency Stop Fault - (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
- The Net Emrg Ovrd input is set to Off via a network signal or the keypad/display

Freeze Fault - (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.

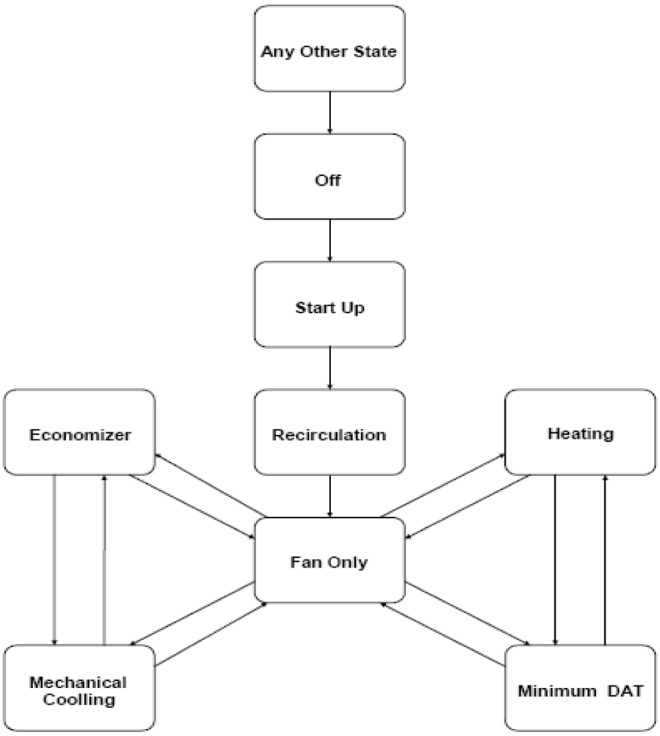
When the Freeze fault occurs, the controller shuts down the fans, opens the chilled water, economizer, and heating valves and set a 10-minute timer. If the unit is equipped with a waterside economizer, the pump output is also turned on. When the 10-minute timer expires, the controller checks the freezestat 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.

NOTICE
Water valves remain open and Pump output remains on for 10 minutes after alarm conditions disappear.

Operator's Guide

The following "Operator's Guide" sections provide information regarding the day-to-day operation of the MicroTech Unit Controller. Topics covered are such common tasks as scheduling, displaying and clearing alarms, and setting the controller for manual operation.

Figure 10: State Diagram



The transition from any operating state to another is graphically represented in this figure. With a "start up" command from an OFF State the unit will always go into the "Start Up" state of operation for 3 minutes (adjustable). Next, it will transition into the "Recirculation" state of operation for another 3 minutes (adjustable) before finally going into the Fan Only state of operation. Then, based on sensor inputs it will go into any of the 4 remaining states of operation - heating, cooling, economizer, or minimum discharge air heating.

Determining Unit State

The unit will operate in one of eight operating states. The current state will be displayed by the Unit State parameter in the system summary menu.

In the OFF state, all heating, cooling, and fans are OFF. The alarm output indicates the type of alarm, if any, that is active.

In the start up state, the Fan Operation output is turned ON to allow shut OFF dampers to be opened before any the supply fan is turned ON. The outdoor air dampers remain closed.

The supply fan is turned ON when the unit enters the Recirculation state. The supply fan in VAV units is controlled as described in the "Supply Fan Capacity Control (VAV)" on page 89. The outdoor dampers remain closed.

A separate morning warm-up state is not provided, but an edited ZeroOATime is used to keep the outside air damper closed when the unit first starts. The Minimum OA Position is set to zero as long as the as the fan has been on for less than the ZeroOATime.

DAT Control units have a MWU setpoint available.

The Minimum OA Position is set to zero as long as the as the fan has been on for less than the ZeroOATime. This allows the Return Air type units to cool down the space with mechanical cooling or to warm up the space with the dampers closed. If the ZeroOATime is set correctly, the OA dampers will be open only during occupied periods. When Optimal Start is used Zero OA Time is set equal to the time to occupancy when the unit starts so that the OA dampers will open at occupancy time.

Neither heating nor cooling is provided when the unit is in the fan only state, with the exception of when dehumidification is active. The outdoor dampers are opened to the minimum position in this state when the fan on time exceeds the Zero OA Time.

In the other four states, temperature is controlled as describe in the appropriate sections of this document. These states are Minimum DAT, Heating, Economizer, and Cooling. The outdoor dampers are opened to at least the minimum position in these states when the fan on time exceeds the Zero OA Time.

OFF Operating State

In the Off operating state the fans are off, the outside air dampers are closed and any VFD's are driven to 0%. Cooling and heating are disabled. The unit is in the off state when it is not enabled, or when it is in the unoccupied mode with no call for unoccupied operation. refer to "Determining Unit Status" on page 68 for reasons the unit can be disabled.

Start Up Operating State

When a unit is commanded to start it will always enter the Startup operating state from the OFF operating state. The unit remains in the Startup operating state for an adjustable time period (default 180 seconds) before entering the Recirculating operating state.

During the Start up operating state the fans remain OFF, the outdoor air dampers are driven closed, and VFD's remain at 0%. Cooling and heating are disabled, except for 100% OA heating start sequences.

Recirculating Operating State

Units with return air always enter the Recirculating operating state after the completion of the Startup operating state. In the Recirculating operating state fans are started and operate 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 Recirculating operating state until the Recirculate State Timer (default 180 seconds) expires.

NOTICE

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 into the Fan Only operating state. Once entering the Fan Only state of operation the unit will then, based on sensor inputs transition into any of the 4 remaining states of operation - heating, cooling, economizer, or minimum discharge air heating.

Min DAT

If heating is enabled and there is no heating load (normally FanOnly 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 Control Flag is set to yes via the Heating menu (Commission Unit/Heating/MinDAT Ctrl). 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 the this minimum discharge temperature 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.

NOTICE

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 parameter in the Heating menu acts as the minimum discharge temperature limit.

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% open if the unit is a 100% outdoor air unit or controlled to the minimum outside air position. Cooling is disabled.

Economizer

If the unit is equipped with a 0-100% modulating economizer (waterside or airside) and the conditions are suitable for free cooling, the unit attempts to satisfy the cooling load by using either outdoor air or the waterside economizer before using mechanical cooling.

If the unit is configured for Zone Temperature Control the transition to economizer operation will occur if all the following are true:

- The control temperature rises above the occupied or unoccupied cooling setpoint by more that ½ the occupied or unoccupied cooling high 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

If the unit is configured for Discharge Air Temperature Control the transition to Mechanical cooling will occur if all the following are true:

- The control temperature rises above the occupied or unoccupied cooling setpoint by more that ½ the occupied or unoccupied cooling deadband
- The discharge air temperature is greater than the DAT cooling setpoint
- The Ambient air temperature is below the Change Over Temperature set point, (Chgover temp) Default of 70° F Range: 0 to 100°F.
- If the system incorporates an enthalpy control the control does not sense the enthalpy of the outside air is too high.

Mechanical Cooling

The unit enters the mechanical cooling operating state when cooling is required and the economizer is disabled, not present, or already fully open.

If the unit is configured for Zone Temperature Control the transition to Mechanical cooling will occur if all the following are true:

- The control temperature rises above the occupied or unoccupied cooling setpoint by more that 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
- Mechanical cooling is enabled

If the unit is configured for Discharge Air Temperature Control the transition to Mechanical cooling will occur if all the following are true:

- The control temperature rises above the occupied or unoccupied cooling setpoint by more that ½ the occupied or unoccupied cooling deadband
- The discharge air temperature is greater than the DAT cooling setpoint by more than ½ the DAT cooling deadband
- Post heat operation is complete
- Economizer operation is disabled
- Mechanical cooling is enabled

Determining Unit Status

Unit Status is a status only item which indicates whether or not the unit is enabled and if not why.

Enabled

Unit operation has not been disabled for any of the following reasons.

Off Manual

The unit operating state is OFF and the unit status is OffMan when the control mode is set to OFF via the keypad. The control mode can only be changed via the System menu on the keypad/display.

OffManCtrl

The unit operating state is OFF and the unit status is OffManCtl when the controller is set to manual control via the Manual Control menu.

Off Network

The unit operating state is OFF and the unit status is OffNet when the control mode is set to Auto via the System menu and the network Net App Mode is set to OFF.

Off Alarm

The unit operating state is OFF and the unit status is OffAlm when an active alarm of the "fault" type has the unit shutdown.

Off Fan Retry

The unit operating state is OFF and the unit status is OffFnRty when The fan retry conditions below indicate that the unit should be shutdown and restarted after airflow is lost.

- The supply fan is controlled by a VFD
- The airflow switch (PC7) is open AND the duct static pressure is less than ½ the duct static pressure setpoint
- There are no active faults that would shut down the unit

Determining Control Mode

The unit cooling and heating can be set up for automatic heat/cool, cool only, heat only, fan only, or network cool/heat operation by setting the Control Mode. The unit can also be manually disabled via the Control Mode. The following are descriptions of the six available Control Mode selections.

OFF

When the Control Mode is set to "OFF," the Unit Status is "Off Man" and the unit is completely disabled.

Heat Only

When the Control Mode is set to "Heat Only," heating operation is allowed to operate to maintain the heating set points. Cooling operation is disabled (Cooing Status is "Off Man").

Cool Only

When the Control Mode is set to "Cool Only," cooling operation is allowed to operate to maintain the cooling set points. Heating operation is disabled (Heating Status is "Off Man").

Fan Only

When the Control 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 Man").

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 Control Mode is set to "Auto," the heat/cool, cool only, heat only, and fan only decision is determined by the network application mode parameter, which is set via a network signal as described below. The NetApp Mode parameter has no effect on unit operation unless the Control Mode is set to "Auto."

Determining Cooling Status

Clg Status is a status item which indicates whether or not mechanical cooling is currently allowed. If cooling is disabled, the reason is indicated.

The following are descriptions of cooling status states.

Enabled

Mechanical cooling is enabled if all the following are true:

- Cooling capability is provided
- Control mode is not set via the keypad to fan only or heat only
- Control mode is set via the keypad to auto and not disabled via a network command
- The outdoor air temperature (OAT) on air cooled units or the entering water temperature (EWT) on water cooled units is high enough for operation
- Compressor operation is not disabled by an alarm condition

None

Cooling capability is not provided.

Off Ambient

The outdoor air temperature (OAT) on air cooled units or the entering water temperature (EWT) on water cooled units is too low for operation.

The OAT becomes too low for operation when it drops below the OAT cooling lockout setting. OAT becomes high enough for operation when it rises above the OAT cooling lockout setting by more than 2°F (adjustable - OAT Diff). The EWT becomes too low for operation when it drops below the minimum EWT set point. EWT becomes high enough for operation when it rises above the

minimum EWT set point by more than 2°F (adjustable - Econo Diff).

NOTICE

The OAT cooling lockout cannot be set lower than 40°F when the unit is equipped with an evaporative condenser and should not be set lower than 50°F unless the unit is equipped with low ambient capability.

Off Alarm

Compressor operation is disabled by an alarm condition. This happens when all circuits are disabled when one of the following applicable alarms are active: high or low pressure; water flow switch; or water regulating valve.

Off Network

Control mode is set via the keypad to auto and cooling is disabled via a network command.

Off Manual

Control mode is set to Fan Only or Heat Only via the keypad display.

Determining Heat Status

Htg Status is a status item which indicates whether or not heating is currently allowed. If heating is disabled, the reason is indicated.

The following are descriptions of heating status states:

Enabled

Heating is enabled if all the following are true:

- Heating capability is provided
- Control mode is not set via the keypad to fan only or cool only
- Control mode is set via the keypad to auto and not disabled via a network command
- The outdoor air temperature (OAT) is low enough for operation

None

Heating capability is not provided.

Off Ambient

The OAT is too high for operation. The OAT becomes too high for operation when the OAT rises above the OAT heating lockout set point. OAT becomes low enough for operation when the OAT drops below the OAT heating lockout set point by more than the Heating Lockout Differential.

Off Network

Control mode is set via the keypad to auto and the unit is disabled via a network command.

Off Manual

Control mode is set to Fan Only or Cool Only via the keypad.

Determining Economizer Status

If the unit is equipped with a 0-100% modulating economizer (waterside or airside) and the conditions are suitable for free cooling, the unit attempts to satisfy the cooling load by using either outdoor air or the waterside economizer before using mechanical cooling.

The following are descriptions of Economizer Status states:

Off Ambient

- Unit is an SCU configured for waterside economizer and the Entering Water Temperature (EWT) sensor is unreliable.
- Unit is an SCU configured for waterside economizer and the EWT exceeds (Mixed Air Temperature – EWT Differential). It is enabled if EWT drops below (Mixed Air Temperature – EWT Differential).
- Unit is configured for airside economizer and the outdoor air temperature (OAT) sensor is unreliable.
- Economizer Changeover is set to Enthalpy and OAT and the Enthalpy Input is in the High (Open) position.
- Economizer Changeover is set to Enthalpy and OAT and the OAT rises above the Economizer Changeover Temperature by a fixed 2°F differential. (OAT becomes low enough for operation when the OAT drops to or below the Economizer.
- Economizer Changeover is set to Enthalpy and OAT and the OAT rises above the Economizer Changeover Temperature by a fixed 2°F differential. (OAT becomes low enough for operation when the OAT drops to or below the Economizer Changeover Temperature).
- Economizer Changeover is set to OAT_RAT and the OAT rises above the RAT by a fixed 2°F differential. (OAT becomes low enough for operation when the OAT drops below the RAT a fixed 2°F differential).

Off Network

- A network signal is set to OFF

Off None

- Economizer Changeover is set to None
- Economizer capability is not provided
- Unit is not configured for an airside or waterside economizer

NOTICE

Economizer is not disabled based on Control Mode or Application Mode.

Economizer operation is disabled via a network command.

Off Dehumidification

Economizer operation is disabled if dehumidification operation is enabled.

Determining Cooling Capacity

Clg Capacity is a status item which indicates the percentage of the unit maximum cooling capacity currently operating. When the

unit is equipped with chilled water cooling, 0-100% is displayed as the cooling valve actuator strokes from the closed to open position. When the unit is equipped with compressorized cooling, the percentage value changes incrementally based on the number of operating cooling stages.

Determining Heating Capacity

Htg Capacity is a status item which indicates the percentage of the unit maximum heating capacity currently operating. When the unit is equipped with modulating heat, 0-100% is displayed as the heating valve actuator strokes from the closed to open position. When the unit is equipped with staged heat, the percentage value changes incrementally based on the number of operating heating stages.

Determining Supply Air Fan Capacity

SAF Speed is a status only item which indicates the supply air fan capacity. 0-100% of VFD maximum speed is indicated if the unit is equipped with a supply air fan VFD. 100% is indicated if the supply fan is constant volume and is running.

Determining RF/EF Capacity

RF/EF capacity is a status only item which indicates the current return or exhaust fan capacity. 0-100% of VFD maximum speed is indicated if the unit is equipped with a modulating return or exhaust fan VFD. 100% is indicated if the return/exhaust fan is constant volume and is running. When the unit is equipped with staged exhaust fans, the percentage value changes incrementally based on the number of operating exhaust fan stages.

Determining Outside Air Damper Position

OAD/Econo Cap is a status only item which indicates the current outdoor air damper or economizer valve position.

Determining Emergency Mode

Emergency Mode is an adjustable item which is normally used by a network system to shutdown the unit in an emergency situation.

Determining Application Mode

The unit heating and cooling can be set up for automatic heat/cool, heat 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, and fan only decision is determined by the Net App Mode. The Net App Mode is set by a network signal. The following sections describe the five available Net App Mode selections.

NOTICE
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").

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.

Determining Occupancy Status

Occupancy is a status item which indicates whether the unit is in an occupied, unoccupied or tenant override mode of operation.

The following are descriptions of the various "Occupancy" states.

Occ

The Occupancy parameter indicates "Occ" when the unit is in the occupied mode. In this mode, the unit starts and runs continuously, cooling and heating as required to maintain the occupied temperature set points. The unit is in the occupied mode if any of the following conditions are true:

- The Occ Mode entry on the keypad is set to occupied
- The Occ Mode entry on the keypad is set to Auto, and a manual network occupancy command is sent to the controller
- The Occ Mode entry on the keypad is set to Auto, a manual network occupancy command is set to Auto, and any of the following is true:
- The External Start/Stop switch is closed
- A network schedule signal is set to Occupied or Standby
- The internal schedule function is in the Occupied condition

Unocc

The Occupancy parameter indicates "Unocc" when the unit is in the unoccupied mode. In this mode, the unit remains off unless unoccupied operation becomes active. When unoccupied operation is active the unit operates normally except that Minimum OA Position is set to zero. See Unoccupied Operation,

page 71 for information regarding when unoccupied operation is activated.

TntOvrd

The Occupancy parameter indicates "TntOvrd" when the unit is in the tenant override mode. In this mode, the unit starts and runs continuously, cooling and heating as required to maintain the occupied temperature.

Tenant override operation is initiated when the Tenant Override Timer is greater than zero. The Tenant Override Timer is set equal to the Local Tenant Override Time (Timer Settings menu) if the unit is enabled and any of the following is true:

- The Space Temperature sensor is present and its tenant override button is pressed for less than 10 seconds. Nothing happens if the button is pushed for more than 10 seconds but less than the time required to initiate a shorted sensor alarm (30 seconds). Subsequent presses on the button resets the Tenant Override Timer to the Local Tenant Override Time, i.e. the max time.
- The Occ Mode entry on the keypad is set to Tenant Override. After the Tenant Override Timer is set, the Occ Mode entry on the keypad reverts to auto after a 2 second time delay.
- The Occ Mode entry on the keypad is set to Auto or Unocc, and a manual network occupancy command is set to Bypass. After the Tenant Override Timer is set, the network occupancy command reverts to Auto Subsequent presses on the button, setting of the keypad occupancy entry to Tenant Override again, or setting of the network occupancy command to Bypass again resets the Tenant Override Timer to the Local Tenant Override Time.

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 Occupancy Mode

Occ Mode is an adjustable item which sets the unit for manual occupied, unoccupied, tenant override or automatic operation.

Occ

When Occ Mode is set to "Occ," the unit is manually placed in the occupied mode of operation.

Unocc

When Occ Mode is set to "Unocc," the unit is manually placed in the unoccupied mode of operation.

TntOvrd

When Occ Mode is set to "TntOvrd," the unit is manually placed in the tenant override mode of operation.

NOTICE

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

Auto

When Occ Mode is set to "Auto" the automatically changes between occupied, unoccupied and tenant override operation.

Determining Occupancy Source

When the Occupancy parameter indicates Occ, the occupancy source is set to one of the following values to indicate the function responsible for placing the unit into the occupied mode of operation.

None The Occ Src= parameter indicates "None" when the Occupancy= parameter indicates "Unocc" or "Tnt Ovrd."

NetSchedule The Occ Src= parameter indicates "Net Schd" when the Occupancy= parameter indicates "Occ" due to a network schedule indicating an occupied period.

IntSchedule The Occ Src= parameter indicates "Int Sched" when the Occupancy= parameter indicates "Occ" due to the unit internal schedule.

OneEventSchedule The Occ Src= parameter indicates "Int Sched" when the Occupancy= parameter indicates "Occ" due to the unit one event schedule.

RemoteSwitch The Occ Src= parameter indicates "Remote Sw" when the Occupancy= parameter indicates "Occ" due to a field supplied external time clock or a tenant override switch signal in the form of a set of dry contacts is closed across terminals 101 and102 for MPS, RPS, and Rebel units 3 to 15 tons terminals. Larger Rebel units' 16 to 28 tons terminals 200 and 201, on the unit field terminal block TB2.

OccManCmd The Occ Src= parameter indicates "OccManCmd" when OccMode is set to Auto and the network manual occupancy command is set to Occupied.

OccMode The Occ Src= parameter indicates "Occ Mode" when the Occupancy= parameter indicates "Occ" due to the Occupancy Mode being manually set to "Occ."

TStatTO The Occ Src = parameter indicates "TStatTO" when the Occupancy= parameter indicates "TntOvrd" due to the tenant override button on the zone thermostat being pushed. The button must be held for at least 1 second but not more than 10 seconds.

ManTO The TntOvrd Src = parameter indicates "ManTO" when the Occupancy= parameter indicates "Occ" due to the being manually set via the keypad/display. When the Tenant Override Timer is set to a non-zero value, the unit starts and runs in the tenant override mode regardless of any scheduling features. The unit stops when the timer expires. The Tenant Override Timer can be set from 0-300 minutes.

Unoccupied Operation

During unoccupied operation the unit operates normally except that Min OA Pos is set to zero so that the damper is closed to the

outdoor air.

Unoccupied Dehumidification

Dehumidification may be initiated in the unoccupied mode only if Unocc Dehum is set to yes 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 "Required".

Unoccupied Cooling (Night Setup)

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 (Night Setback)

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 Unoocupied 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."

None

The Unoccupied Source is set to "None" when Unoccupied operation is inactive.

Scheduling

The Air Handling 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: "Setting 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 use with internal scheduling and network scheduling. This is followed by two sections that describe the external time scheduling and network time scheduling functions.

Setting Controller 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 clock and date are settable 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 the MicroTech Unit Controller 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 Schedule

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 by 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 "12/24/08 - 12/25/08."

One Event Scheduling

A One-Event Schedule 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, 2008 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 "3/12/08 @ 17:00:00" and the One Event Ending Date/Time to "3/12/08 @ 22:00:00."

Optimal Start

When Optimal Start is active (Optimal Start = Yes), an early start time is determined before each scheduled start. The schedule must be based on an internal schedule or a signal via a connected network that indicates time to occupancy. 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 scheduled occupancy time. Optimal start based on heating operates when the space temperature is below the Occupied or Unoccupied Heating Spt by ½ the Zone Htg Deadband. Optimal start based on cooling operates when the space temperature is above the Occupied or Unoccupied Cooling Spt by ½ the Cooling Deadband. If space temperature is between the above two points, the unit starts at the occupancy time.

External Time Scheduling

An external time 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).

Temperature Control Configurations

Temperature control is based on a Control Type that may be set to Zone, DAT, or Single Zone VAV.

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.

When the Control Type is set to DAT, 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.

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.

Heat/Cool Changeover

In general, a unit configured for discharge air temperature control either operates to deliver the cooling discharge temperature set point using economizer and/or mechanical cooling or the heating discharge air temperature set point using the heating equipment. Cooling and heating never operate simultaneously. A unit configured for zone (or space comfort) control either operates to maintain the Occupied or Unoccupied Cooling Set Point using economizer and/or mechanical cooling or the Occupied or Unoccupied Heating Set Point using the heating equipment.

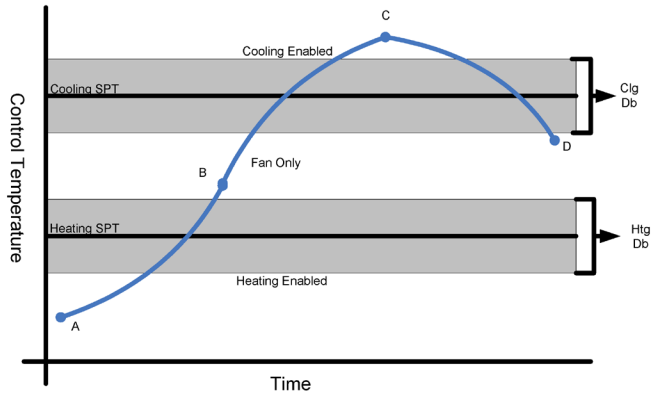
The occupied or unoccupied cooling/occupied or unoccupied heating setpoints can be set via the keypad/display or based on a signal from an optional space temperature sensor with set point adjustment capability. The following sections describe the unit heat/ cool changeover function.

Illustrative Heat/Cool Changeover Sequence

The following is an illustration of the heat/cool changeover function.

When the control temperature is below the occupied or unoccupied heating setpoint by more than ½ 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 ½ 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 ½ 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 ½ the deadband (point D), at which point the unit returns or fan only (or Min DAT) operating state.

Figure 11: Heat/Cool Changeover



Control Temperature

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 user may select Space Temperature, Return Temperature, Outdoor Air Temperature or None for DAT units. Normally either the Return or Space Temperature is selected as the control temperature. Outdoor Air Temperature may be used as the control temperature for DAT units, but not for Zone Control units.

When the Control Temperature Source is set to 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 set point. The unit will only enter the Heating operating

state and control to the discharge heating set point for morning warm up purposes.

The Control Temperature Source automatically reverts from Return to Space if both of the following are true:

- The Return Air Sensor is not present and reliable
- A network or local Space Sensor is present and reliable

The Control Temperature Source automatically reverts from Space to Return if both of the following are true:

- The space sensor is not reliable (a valid space temperature value is not provided via the network and the space temperature sensor is either in alarm or not present)
- The return air sensor is reliable (present and not in alarm)

The Control Temperature Source automatically reverts from either Outdoor Air or Mixed Air to Return if the Control Type is Zone (Not DAT). If the return air temperature is not reliable, the control temperature may then revert to space as described above.

The Control Temperature Source automatically reverts from Mixed Air to Outdoor Air if Unit Type is not SCU.

A Control Temperature Fault that shuts down the unit is initiated if any of the following are true:

- The return air sensor is not present and reliable and Return Air is selected as the control temperature and a space sensor is not available
- A network or local space sensor is not present and reliable and Space is selected as the control temperature and a return temperature sensor is not available
- The OAT Sensor is not present and reliable and Outdoor Air is selected as the control temperature
- The mixed air temperature sensor is not present or reliable and Mixed Air is selected as the control temperature

Occupied Temperature Set Points

When the Use Tstat set point parameter is set to No, the Occupied Cooling Set Point and the Occupied Heating Set Point may be set through the keypad or via a network signal. In this case these set points are changed whenever the network or keypad value changes. When the Use Tstat set point parameter is set to Yes these set points can only be adjusted through the zone thermostat. Heating and cooling set points must not overlap. The Occupied Heating Set Point must be equal to or less than the Occupied Cooling Set Point. If a conflict occurs from values entered via the keypad or network, the Occupied Heating Set Point is automatically adjusted down to eliminate the conflict. When the Occupied Cooling Set point is changed by more than 0.5 degrees through the wall mounted sensor, the Occupied Heating Set Point is raised or lowered the same amount so that the difference between the Cooling and Heating set points does not change.

OA/EWT 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.

Tenant Override

The tenant-override button provided with the optional zone temperature sensor packages is used to override unoccupied operation for a pre programmed time period. This time period is set with the Tenant Override Time Increment. This value can be adjusted from 0 to 300 minutes (default is 120 minutes). When an occupant presses and releases the tenant override button on the zone temperature sensor (ZNT1), the Tenant Override Timer is set equal to the Tenant Override Time Increment. (The button must be held for at least 1 second but not more than 10 seconds.) The unit then starts and runs in the tenant override mode which is the same as occupied mode except that it is temporary. The Tenant Override Timer begins timing out and the unit runs until the timer expires. If the tenant override button is pressed again while the unit is operating in tenant override mode, the Tenant Override Timer is reset to the Tenant Override Time Increment and the unit continues to operate. For example, assume that the Tenant Override Time Increment is 120 minutes. One press of the override button provides at least 120 minutes of unit operation. If the button is pressed again 60 minutes later, the Tenant Override Timer is reset to 120 minutes, and a total of 180 minutes of uninterrupted operation results.

NOTICE

The same operation occurs if, instead of pressing the override button on a zone temperature sensor, the Occupancy Mode is set to "Tnt Ovrd." Once set to "Tnt Ovrd", the Occupancy Mode automatically reverts to the "Auto" setting once the Tnt Ovrd Timer is set to the Tnt Ovrd Time Increment. The same operation will also occur if the network occupancy manual command it set to bypass.

Zero OA Time (Morning Warm-up)

A separate Morning Warm-up operating state is not provided, but an editable ZeroOATime is used to keep the Outside Air damper closed when the unit first starts. The Minimum OA Position is set to zero as long as the as the fan has been on for less than the ZeroOATime. This allows the Return Air type units to cool down the space with mechanical cooling or to warm up the space with the dampers closed. If the ZeroOATime is set correctly, the OA dampers will be open only during occupied periods. When Optimal Start is used ZeroOATime is set equal to the time to occupancy when the unit starts so that the OA dampers will open at occupancy time.

Post Heat Operation

After leaving the Recirc or Heating operating state and entering

either the Fan Only or Min DAT operating state, the unit performs "post heat" operation if the Post Heat Timer is set to a non zero value. "Post heat" operation occurs within the Fan Only or MinDAT operating state. During "post heat" operation, the VAV Box Output remains open (heat) while the discharge fan capacity is forced to a minimum value (default 33% speed for VFD). By forcing the discharge fan capacity to a minimum value before the VAV Box Output closes (cool), "post heat" operation is designed to prevent duct over-pressurization by decreasing the duct pressure before the VAV boxes can close.

"Post heat" operation remains active until either the discharge fan capacity reaches the minimum value or until the Post Heat Timer expires, whichever occurs first. When "post heat" operation ends, normal duct static pressure or position control resumes.

NOTICE

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 the Fan Only or Min DAT operating state while the airflow switch input is being ignored. The VAV output is only available to the field via network communications.

Dehumidification

In the dehumidification mode, mechanical cooling is used to cool air low enough to wring moisture out of it. Hot Gas Reheat or the standard unit heating equipment (Gas, SCR Electric or Steam/ Hot water) is used to raise the temperature of this cooled air to a desirable value.

Dehumidification Initiation

An analog sensor is mounted in the return duct, the space, or outdoor to sense relative humidity. The location is selected by setting the Sensor Location value on the keypad to Return, Space, or OAT.

NOTICE

This setting is used to dictate which temperature sensor is used to calculate the dewpoint. OAT can only be selected for units with DAT control. The relative humidity and a calculated dewpoint temperature are both displayed on the keypad. The calculated dewpoint temperature is based on the relative humidity and Return, Space, or OAT value depending on the location of the humidity sensor. Humidity control is disabled if cooling is disabled for any reason. Dehumidification operation is initiated when Humidity Control is set to either relative humidity or dewpoint and that value rises above the appropriate setpoint by more than half its deadband.

Dehumidification Termination

Dehumidification is terminated if the selected variable, Relative Humidity or Dew Point, drops below the appropriate humidity setpoint by more than half its deadband. Dehumidification is also terminated if cooling is disabled for any reason. Other ways that dehumidification may be terminated are if Dehum Method is set to "None" on the keypad, or if the unit goes to Off Net, Off Sw, Off Alm, or Off Man Ctrl.

When Dehumidification is terminated, all mechanical cooling is turned off except when the unit is in the Cooling state. Modulated cooling reverts to normal control when dehumidification is terminated in the Cooling state. For units with compressors, the number of cooling stages is reduced by one and control reverts to normal control when dehumidification is terminated in the Cooling state. Another compressor stage change could then occur after one Cooling Stage Time has elapsed.

Dehumidification Mechanical Cooling Control

During dehumidification, control of mechanical cooling is based on the following two editable values of the Leaving Coil Temperature setpoint:

- Mx Lvg Coil T (Default = 52°F)
- Mn Lvg Coil T, 45°F (RTU/MPS); 52°F (DPS)

For compressorized units, the number of compressor stages increases when all of the following are true:

- The time since the last stage change exceeds the Clg Stage Time
- Leaving Coil Temperature is greater than the Mx Lvg Coil T
- The current cooling stage is less than the available number of stages

During the dehumidification mode, the number of compressor stages decreases when all of the following are true:

- The time since the last stage change exceeds the Clg Stage Time
- Leaving Coil Temperature is less than Mn Lvg Coil T Spt
- The current cooling stage is greater than zero

Units with modulated cooling are controlled by a PI Loop to maintain the temperature leaving the coil at the Mn Lvg Coil T. The normal DAT Cooling Deadband and PI Loop parameters are used in this PI Loop.

MPS HGBP Valve

When the Unit Type is MPS and the unit is equipped with modulating hot gas reheat control an HGBP valve output (MCB-DO6) is controlled to make sure hot gas is not flowing through both the hot gas bypass and hot gas reheat circuits simultaneously.

The HGBP Valve Output is ON (energized) whenever Unit State is Cooling and dehumidification operation is inactive. The HGBP Valve Output is OFF (de-energized) any other time.

Dehumidification Reheat Control

During dehumidification control either an analog or digital Hot Gas Reheat (HGRH) output or the standard modulating heating output is controlled to maintain the current Reheat Setpoint. If Reheat Type software configuration parameter is set to Staged Hot Gas, then a digital HGRH output is controlled to maintain the Reheat Setpoint. If the Reheat Type software configuration parameter is set to Modulating Hot Gas, then an analog HGRH output is controlled to maintain the Reheat Setpoint. If the Reheat Type software configuration parameter is set to Standard Heat, then the normal heating analog output is controlled to maintain the Reheat Setpoint.

- **Cooling/Fan Only:** In the Cooling and Fan Only states, a PI Loop is used to control the HGRH valve to maintain the

Discharge Air Temperature at the Dehumidification Reheat Setpoint. The deadband for this loop is the same one used for other control of heating to maintain the DAT Heating setpoint.

- **Cooling:** In the Cooling state, the Dehumidification Reheat Setpoint equals the DAT Cooling Setpoint. For DAT units, this is the normal DAT setpoint resulting from any reset. For Zone Control units, this setpoint is the result of a PI Loop based on the control temperature as is done in the Economizer state or with modulated cooling in the Cooling state.
- **Fan Only:** In the Fan Only state, the Dehumidification 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.

This means that no matter what the Control Temperature is, including OAT, the temperature leaving the unit is at a maximum just before the unit needs to go into heating and at a minimum just before the unit needs to go into cooling. This reduces opportunity for unit to go into heating or cooling during dehumidification.

Modulating HGRH Control

In the Cooling and Fan Only states, a PI Loop is used to control the HGRH valve to maintain the discharge air temperature at the Dehumidification Reheat Setpoint. The PI Loop is enabled when the unit is in the Cooling or Fan Only operating state and dehumidification becomes active.

NOTICE

When configured for modulating hot gas reheat the reheat valve is stroked open and then closed every day at 2:00 AM as long as dehumidification is inactive and the unit is not in the Cooling operating state at the time.

Reheat Compressor Limiting Control

A special cooling capacity limiting function is used when a unit is configured for Hot Gas and/or Liquid subcooling control types of reheat. During dehumidification, if the unit cannot provide enough reheat to meet the discharge temperature setpoint this limiting function will act to reduce the cooling capacity of the circuit opposite the reheat circuit in an attempt to increase the leaving coil temperature and therefore the reheat temperature. An Event will also be logged.

Reheat compressor limiting is allowed during dehumidification operation if the following are true for longer than the cooling stage time:

- Reheat compressor limiting is set to Yes
- Reheat type equals ModHGRH, ModLSC or ModHG & LSC
- A fixed compressor in the circuit opposite the reheat circuit in ON
- The Reheat capacity equals 100%
- The DAT is less than the Reheat set point-1/2 DB

If all of the above items are true for longer than the cooling stage timer setting, the limiting function would reduce the cooling capacity of the circuit opposite the reheat circuit by one stage. This reduction in cooling capacity would continue until all compressors opposite the reheat circuit have been staged off as long as all of the above remained true.

The limiting function will remain active until the following are true for longer than the cooling stage time:

- Reheat capacity is less than or equal to the minimum reheat capacity
- The DAT is greater than the Reheat set point-1/2 DB
- All of the fixed stages have been staged back ON

Energy Recovery

Energy recovery is provided by drawing outside air across half of an enthalpy wheel and drawing exhaust air across the other half. Latent and sensible heat is transferred from the hotter, moister exhaust air to the colder dryer outside air in winter. Latent and sensible heat is transferred from the hotter more moist outside air to the cooler dryer exhaust air in summer. Control consists of starting and stopping an exhaust fan, modulating the speed of the exhaust fan, starting and stopping the enthalpy wheel, and optionally controlling the speed of the enthalpy wheel. The outdoor dampers are controlled in the normal manner. The current statuses as well as editable parameters associated with energy recovery are located in the Energy Rec Setup menu.

Enthalpy Wheel

The enthalpy wheel is turned on when all of the following are true. The speed of the enthalpy wheel is set to the maximum speed for units with a VFD controlling the speed of the enthalpy wheel.

- The exhaust fan is ON
- The OA Dampers are at the minimum position
- The unit is not in the Economizer operating state
- The enthalpy wheel has not been turned OFF due to frost prevention (variable or constant speed wheels)
- The enthalpy wheel has not been turned OFF due to defrost control (constant speed wheels only)
- The wheel has not been turned OFF due to Variable Effectiveness Operation

The enthalpy wheel is turned OFF when any of the following is true:

- The exhaust fan is OFF
- The OA Damper Position is driven above the Minimum OA Damper Position by more than 3%
- Either of the frost prevention functions dictate that the wheel be OFF
- The constant speed wheels defrost function dictates the wheel is to be OFF

Enthalpy Wheel Frost Prevention

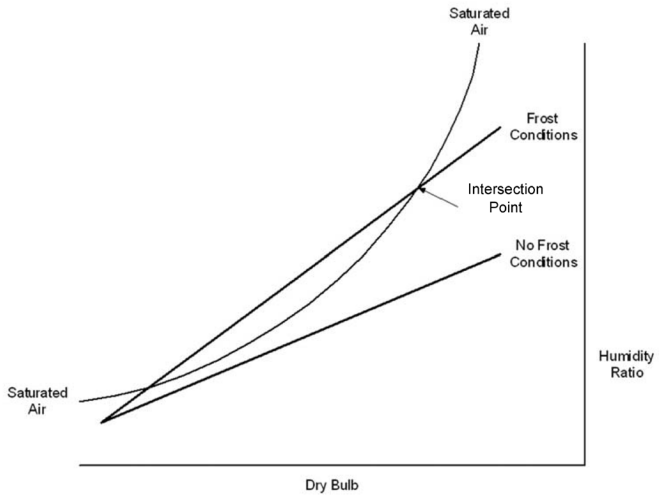
Two different frost protection methods are provided depending on whether or not the enthalpy wheel is controlled by a VFD.

When there is a threat of frost or condensation on the enthalpy wheel, a variable speed wheel may be first slowed down and then stopped and a constant speed wheel may be stopped so that less enthalpy transfer occurs and frosting or condensation on the enthalpy wheel is avoided. In either case the frost control is based on an Intersection Point described as follows:

Condensation and frosting can occur on the enthalpy wheel when the exhaust air leaving the wheel is saturated. This condition will occur when two lines intersect on a psychometric chart, and it will not occur when these two lines do not intersect. One of these lines is the Humidity Ratio versus the dry bulb for saturated air. The other line is the Humidity Ratio versus the dry bulb temperature of the exhaust air leaving the enthalpy wheel. The two ends of this second straight line on a psychometric chart are the OAT at 95% RH and the return air temperature at the return air relative humidity. One line showing frosting conditions and another line showing no frost conditions are shown on the sketch of a psychometric chart shown.

A continuous calculation determines if and at what temperatures these two lines intersect. If they do intersect they intersect at two points. The higher of the two points is referred to as the "Intersection Point". When they do not intersect, the enthalpy wheel runs at full speed. When they do intersect, the variable speed enthalpy wheel may be slowed to its minimum speed as described above to maintain the dry bulb temperature of the exhaust air leaving the enthalpy wheel high enough to eliminate the Intersection Point and therefore the threat of frosting conditions. If slowing the wheel does not eliminate the Intersection Point after a stage time period, the wheel may be stopped. A constant speed wheel is stopped when an Intersection Point exists.

Figure 12: Exhaust Air Psychometric Chart



Constant Speed Wheel Frost Prevention Control

The enthalpy wheel is stopped when both of the following are true:

- The enthalpy wheel has been ON for longer than the edited Wheel Stage Time
- The exhaust air temperature leaving the enthalpy wheel is below the Intersection Point plus an edited minimum temperature difference
- Defrost Method=ExhAir
- Enthalpy wheel is constant speed

The enthalpy wheel is turned back ON when the wheel has been OFF due to Frosting/Condensation for longer than an edited Minimum Off Time and the exhaust air temperature leaving the enthalpy wheel is above the Intersection Point plus an edited Maximum Temperature Difference.

Variable Speed Wheel Frost Prevention Control

The enthalpy wheel VFD speed is set to a minimum wheel speed (default 5%) value when all of the following are true:

- The enthalpy wheel has been operating at maximum speed for longer than the edited Wheel Stage Time
- The exhaust air temperature leaving the enthalpy wheel is below the Intersection Point plus an edited Minimum Temperature Difference
- Enthalpy wheel is variable speed

To prevent Frosting/Condensation ON the enthalpy wheel, the enthalpy wheel is turned OFF when both of the following are true:

- The exhaust air temperature leaving the enthalpy wheel is below the Intersection Point plus an edited Minimum Temperature Difference
- The wheel has been operating at the minimum wheel speed for longer than an edited Wheel Stage Time

The enthalpy wheel is turned ON at minimum speed when both of the following are true:

- The enthalpy wheel has been OFF due to Frosting/ Condensation for longer than an edited Minimum Off Time
- The exhaust air temperature leaving the enthalpy wheel is above the Intersection Point plus an edited Maximum Temperature Difference

The Enthalpy Wheel speed will be increased to its maximum speed when both of the following are true:

- The exhaust air temperature leaving the enthalpy wheel is above the Intersection Point plus an edited Maximum Temperature Difference (MaxExhTDiff)
- The wheel has been operating at the minimum speed for longer than the edited Wheel Stage Time

Enthalpy Wheel Defrost Control (Constant Speed Wheels Only)

In lieu of the frost prevention method described above, a constant speed enthalpy wheel can be set for a simpler timed defrost method of frost management. With this method the enthalpy wheel is stopped periodically for a defrost time duration when the outdoor air temperature is below an outdoor frost temperature threshold setpoint.

Defrost operation becomes enabled when all of the following are true:

- Defrost Method = Timed
- Energy wheel is constant speed

- OAT is less than the OA frost temperature setpoint.
- Normal wheel operation has the enthalpy wheel ON

When defrost operation is enabled, the wheel is stopped for the Defrost Time (default 5 minutes) every Defrost Period (default 60 minutes).

When the wheel is stopped due to defrost operation the wheel must be slowly rotated so that both halves of the wheel are allowed to be defrosted by the relative warm exhaust air leaving the wheel. This is accomplished by alternately turning the wheel off for the editable Defrost Off Time (default 24 seconds) and on for the editable Defrost On time (default 1 second) during defrost operation.

Enthalpy Wheel Capacity Limiting

Enthalpy wheel capacity limiting control is a means to limit the capacity of an energy wheel during part load conditions. Normally wheels are sized for worst case winter/summer load and, therefore, at part load the wheel may be oversized. Capacity limiting control is allowed when the energy recovery wheel leaving air temperature (ERDAT) sensor is present and reliable and the outdoor air temperature (OAT) is colder than the returning air temperature.

Capacity limiting control is not allowed during dehumidification operation or when either the wheel frost prevention or defrost operation are active.

Capacity limiting operation differs depending on whether the energy recovery wheel is constant or variable speed.

Constant Speed Wheel

The conditions that cause the energy recovery wheel to turn due to capacity limiting are different depending on the unit operation state as follows:

Fan Only

When the unit is operating in the Fan Only state, the energy recovery wheel is stopped due to capacity limiting whenever the discharge air temperature (DAT) is above the MinDATLimit setpoint by more than ½ the discharge air heating deadband. The wheel is re-started when the DAT falls back to or below the MinDATLimit setpoint plus ½ the discharge air heating deadband.

Heating

When the unit is operating in the Heating state, the energy recovery wheel is stopped 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 is re-started 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 stopped due to capacity limiting whenever the energy recovery wheel leaving air temperature (ER LAT) is above the discharge cooling setpoint by more than ½ the discharge air cooling deadband. The wheel is re-started when the ER LAT falls back to or below the discharge cooling setpoint plus ½ the discharge air cooling deadband.

Variable Speed Wheel

When the enthalpy wheel is variable speed and the Variable Effectiveness Control PI_Loop is active the ER LAT is controlled to the current effective discharge temperature setpoint.

Exhaust Fan

A variable speed exhaust fan controlled by a VFD is provided for all Economizer units with either constant volume or VAV supply fans and on 100% Outside Air units with VAV supply fans. Either a constant volume exhaust fan or a variable speed exhaust fan controlled by a VFD may be provided on 100% Outside Air units with constant volume supply fans.

The exhaust fan is turned ON when any of the following sets of conditions is true:

All four of the following are true:

- The Exhaust Fan is controlled by a VFD
- The OA Dampers are at least open to the Minimum OA Position
- The Minimum OA Position is greater than 0%
- The building static pressure is above the building static pressure setpoint by more than the deadband for longer than the Minimum Exhaust Fan Start Time (Default = 120 seconds)

All four of the following are true:

- The exhaust fan is controlled by a VFD
- The OA Dampers are at least open to the Minimum OA Position
- The Minimum OA Position is greater than 0%
- The exhaust fan capacity is commanded to a value above the minimum value (Default = 5%) by a BAS for longer than the Minimum Exhaust Fan Start Time (Default = 120 seconds)

Both of the following are true:

- The exhaust fan is constant volume
- The supply fan has been commanded on for at least 4 seconds

The exhaust fan is turned OFF when any of the following sets of conditions is true:

All three of the following are true:

- The exhaust fan is controlled by a VFD
- The building static pressure is below the building static pressure setpoint by more than the deadband
- The exhaust fan capacity is at or below its minimum value (Default = 5%) for longer than the Min Exhaust Fan Stop Time (Default = 120 seconds)

Both of the following are true:

- The exhaust fan is controlled by a VFD
- The exhaust fan capacity is commanded to less than or equal to its minimum value (Default = 5%) by the BAS for

longer than the Minimum Exhaust Fan Stop Time (Default = 120 seconds)

The exhaust fan is OFF when the supply fan is OFF.

Whenever a variable speed exhaust fan is ON, its capacity will be modulated using a VFD. The speed of the fan will be either (1) modulated to maintain the building static pressure at a desired value or (2) set at a fixed speed provided by a Building Automation System via a network.

Bypass Dampers (Not Applicable for 100% OA Units)

The bypass dampers are driven closed (Bypass Damper Closed output is energized) whenever the OA Damper position is less than or equal to the Minimum OA Position.

The Bypass dampers are driven open (Bypass Damper Open output is energized) whenever the OA Damper Position exceeds the Minimum OA Damper Position by more that 3%.

Outside Air Damper Control

Minimum Outside Air Damper Control

Control of the dampers in the Economizer state is described in the Economizer Control section. The outdoor air dampers are driven open in the cooling operating state if economizer operation is enabled and to the Minimum OA Position if economizer operation is disabled. For all other operating conditions, the outdoor air dampers are set to the Minimum OA Position. The Minimum OA Position is set to zero or 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.

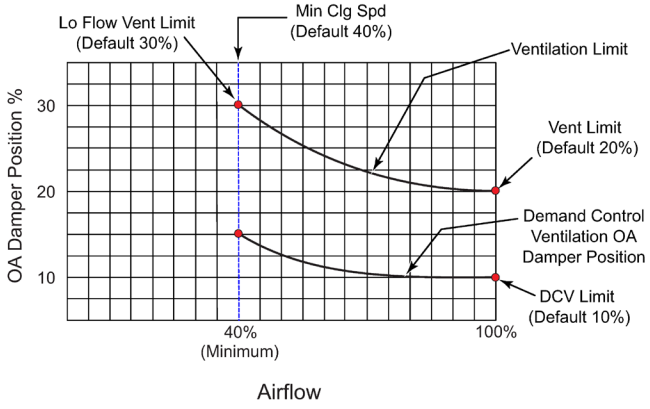
As a result, the OA dampers are driven closed in night setback, night setup, morning warm-up, and morning cool down situations unless economizer operation is required. In all other conditions the Minimum OA Position is equal to or below a Ventilation Limit and equal to or above a Demand Control Ventilation limit. For CAV units, the Ventilation Limit equals the keypad editable Vent Limit and the Demand Control Ventilation Limit equals the keypad editable DCV Limit. For VAV units, the Ventilation Limit varies with VFD speed between the editable Vent Limit at 100% Supply Fan speed and the editable LoFlo Vent Limit at the Min Clg Spd, as shown in Figure 13. For VAV units, the Demand Control Ventilation Limit varies as the Ventilation Limit value changes so that the ratio between them remains constant. In the example shown in Figure 13 the Demand Control Ventilation Limit would always be 1/2 the Ventilation Limit since the DCV Limit= parameter (10%) is half of the Vent Limit= parameter (20%).

The editable parameters are to be determined when the airflow for the unit is balanced and are located in the Min OA Set-up menu.

NOTICE

The MinClgSpd is prevented from being set equal to the Design Cooling Speed. The DCV Limit is prevented from being set greater than the Vent Limit. If the VentLimit or the LoFloVent Limit is set to 0, the Ventilation Limit is overridden to 0.

Figure 13: Damper Position versus Fan Speed Chart



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 Hot water/Steam 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. This "cold start" sequence is initiated if the following conditions are all true:

- OAT is below the current LoDATLimit
- The unit is equipped with an Airside Economizer
- The current Unit State is beyond the Recirc
- The current Minimum Outdoor Damper Position set point is greater than 0%

When the sequence is active the dampers will move more slowly the colder it is outdoors. The minimum and maximum ramp rates are adjustable via the keypad by navigating to the Commission Unit/Min OA Set-up menu. The effective ramp rate will vary from the 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.

Minimum Outside Air Reset - None

If None is selected as the Min OA Reset Type, the Minimum OA Position is set equal to the Ventilation Limit. The Demand Control Ventilation Limit value is ignored when Min OA reset is set to None.

Minimum Outside Air Reset - 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 current values. If Network is selected as the Min OA Reset Type and a valid value for the minimum position is not provided, the Min OA position is set equal to the Ventilation Limit.

Minimum Outside Air Reset - External Control

If ExtV is selected as the Min OA Reset Type, the Minimum OA Position is calculated based on an external 0-10 VDC signal. If ExtmA is selected as the Min OA Type, the Minimum OA Position is calculated based on an external 0-20 mA signal. This calculated Minimum OA Position varies linearly from zero % at the editable minimum external signal to the maximum value at the editable maximum external signal, but it is set no lower than the Demand Control Ventilation Limit and no higher than the Ventilation Limit.

Minimum Outside Air Reset - IAQ

If either IAQV or IAQ mA is selected as the Min OA Type, the Minimum OA Position is calculated based on a 0-10V or 0-20 mA CO2 sensor input. The CO2 level is expressed as Parts Per Million. The minimum and maximum sensor input values (0-10V or 0-20 mA) and the corresponding minimum and maximum PPM values are user defined. This calculated Minimum OA Position varies linearly from the Demand Control Ventilation Limit at the "PPM @ DCV Limit" to the Ventilation Limit at the "PPM @ VentLimit". The "PPM @ DCV Limit" is not allow to be set equal to or greater than the "PPM @ VentLimit."

Examples of Typical Min OA Reset Schedules

If IAQ VDC is selected as the Min OA Type, the Minimum OA Position is calculated based on a 0-10V CO2 sensor input. The CO2 level is expressed as PPM (Parts Per Million). The minimum and maximum sensor input values (0-10V) and the corresponding minimum and maximum PPM values are user changeable. This calculated Minimum OA Position varies linearly from the Demand Control Ventilation Limit at the value labeled "PPM @ DCV Limit" to the Ventilation Limit at the value labeled "PPM @ VentLimit." The "PPM @ DCV Limit" is not allow to be set equal to or greater than the "PPM @ VentLimit."

Example #1 Min OA Reset Type = IAQ VDC

If the requirement is to have the OA damper be at its minimum (Demand Control Ventilation Limit) when the CO2 levels are less than 800 PPM and to be at its maximum (Ventilation Limit) when the CO2 levels are greater than 1000 PPM, the controller would be set up as follows:

- Vent Limit = 100%
- Lo Flow Vent Limit = 100%
- DCV Limit = 0%
- Min OA reset type = IAQ VDC
- PPM@DCV Limit = 800
- PPM@Vent Limit = 1000
- IAQ PPM = Current PPM
- Min PPM = 0 (From CO2 transducer)
- Max PPM = 2000 (From CO2 transducer)
- V/A @ Min PPM = 0 VDC
- V/A @ Max PPM = 10 VDC

In this example the Minimum OA Position would vary linearly from 0% outside air at 800 PPM or less to 100% outside air at 1000 PPM or greater.

Examples of typical Min OA Reset Schedules

If EXT VDC is selected as the Min OA Type, the Minimum OA Position is calculated based on an external 0-10 VDC signal. This calculated Minimum OA Position varies linearly from zero % at the changeable minimum external signal to 100% at the changeable maximum external signal, but it is set no lower than the Demand Control Ventilation Limit and no higher than the Ventilation Limit.

Example #2 Min OA Reset Type = EXT VDC

If the requirement is to have the OA damper be at its minimum (Demand Control Ventilation Limit) when the field supplied signal is at its minimum (0 VDC) and to be at its maximum (Ventilation Limit) when the field supplied signal is at its maximum (10 VDC), the controller would be set up as follow:

- Vent Limit = 100%
- Lo Flow Vent Limit = 100%
- DCV Limit = 0%
- Min OA reset type = EXT VDC
- OA@MinV/mA = 0%
- OA@MaxV/mA = 100%
- Min V/mA = 0 VDC
- Max V/mA = 10 VDC

In this example the Minimum OA Position would vary linearly from 0% outside air at 0 VDC to 100% outside air at 10 VDC.

Reset Temperature Limit

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.

Minimum Position Control - Field Supplied Outdoor Airflow Station Input

When the OA Flow Station parameter in the Software Configuration Code is set to Field Station and the Field Station parameter on the keypad is set to VDC or mA, the Minimum OA Position value is adjusted based on the measured amount of outdoor air being brought into the unit from a field supplied airflow monitoring station. If the airflow is below the desired value, the Minimum OA Position is increased and if the airflow is above the desired value, Minimum OA Position is decreased.

The field airflow signal will be in the form of a 0-10V or 0-20 mA input. The minimum and maximum sensor input values (0-10V or 0-20 mA) and the corresponding minimum and maximum CFM values are user editable.

NOTICE

The Minimum OA Position is reset up and down between the Ventilation Limit and the Demand Control Ventilation Limit by a PI_Loop function to maintain the field OA CFM value at an adjustable OA CFM Setpoint.

When the MinOAType is set to Ext or IAQ and the Field OA Station parameter is set to VDC or mA, the OA flow input is assigned to a specially added I/O expansion module (EXPE) position X1. When the MinOAType is not set to Ext or IAQ and the Field OA Station parameter is set to VDC or mA, the OA flow input is assigned to the main control board(MCB) position X1.

Minimum Position Control - Design Flow (RPS Airside Economizer Units Only)

When the OA Flow Station parameter in the Unit configuration menu is set to Design Flow and the Design Flow control flag is set to Yes, the minimum outside air damper position is controlled to maintain the minimum OA flow setpoint. Design Flow is only available when for RTU units with Airside Economizers.

When the DesignFlow control flag is set to Yes, the Minimum OA Position value is adjusted based on the measured amount of outdoor air being brought into the unit using a PI_Loop function. If the airflow is below the desired value, the Minimum OA Position is increased and if the airflow is above the desired value, Minimum OA Position is decreased.

If design flow is used settings for the min OA damper should be: Vent limit = 100%, Loflow V limit = 100%, and DCV limit = 0%

NOTICE

The factory default for Min OA Reset is set to none however changes may be made by accessing the Min OA Set-Up menu. Once changes have been made to the Min OA Reset type, 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.

0-30%OA Units

A two position 0-30% 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 driven closed when the OA damper analog output is at its minimum value. The desired minimum open position between 0% and 30% normally is set by an editable keypad menu item (Vent Limit). If a valid value is provided via the network, that position is used as the desired minimum open position instead of the keypad value.

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 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 night setback, night setup, morning warm-up, and morning cool down situations. The two position damper is driven to the desired minimum open position in all other conditions.

The Ventilation Limit equals the keypad editable Vent Limit and the Demand Control Ventilation Limit equals the keypad editable DCV Limit. The Vent Limit cannot be set higher than the 0-30%OAMax value. The DCV Limit cannot be set higher than the Vent Limit.

Table 56: Outdoor Air Damper Minimum Position Reset Schedule

Discharge Fan Speed – Return Fan Speed	<= 20% Min Fan Differential	Between Min and Max Differential	>= 50% Max Fan Differential
Outdoor Air Damper Minimum Position	Demand Control Ventilation Limit	Linear Interpolation	Ventilation Limit

NOTICE

If the supply fan is a constant volume fan, the Supply Fan Speed is assumed to be 100% when the discharge fan is on. If the Min Fan Differential is set equal to the Max Fan Differential, the return fan capacity override value reverts to the Ventilation Limit. This capability is not provided for exhaust fans.

Building Static Pressure Override (Airside Economizer Units Only)

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.

100% Outside Air Damper Control, Two Position

100% OA two position actuators are controlled by a digital output for SCU unit and by a modulating analog output for RTU units.

- Digital Output - The OA damper is driven fully open when the digital output is On and fully closed when the digital output is OFF
- Analog Output (100% OA Units) - The OA damper is driven to its 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

The OA damper is open during the Start Initial 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 Switch digital input indicates loss of airflow. This keeps the outside air dampers open in case there is a failure or external override that keeps the fan running after it is turned OFF by controller logic. If the fan is turned ON by bypassing the controls that have it OFF, the Damper Output is NOT turned ON.

Airside Economizer

If a unit is equipped with a 0-100% modulating economizer, and the outdoor air is suitable for free cooling, the unit attempts to satisfy the cooling load by using outdoor air before using mechanical cooling. When the control temperature is above the Occupied or Unoccupied Cooling Set Point by more than half the Occupied or Unoccupied Cooling Dead Band and the discharge air temperature is above the Discharge Cooling Set Point by more than half the Discharge Cooling Dead Band, the controller enters the Econo state. When the unit is in the Econo operating state, the outdoor air dampers are modulated as required to maintain the Discharge Cooling Set Point.

Economizer to Cooling Operating 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 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.

Cooling: Multistage

Entering the Cooling Operating State

The unit enters the Cooling operating state from the Fan Only operating state when the control temperature rises above the Occupied or Unoccupied Cooling Set Point by more than half the Cooling Dead Band and the discharge air temperature is above the discharge cooling setpoint by more than half the cooling Dead Band. The unit transitions from Cooling to Fan only when the control temperature falls below the Occupied or Unoccupied Cooling Set Point by more than half the Occupied or Unoccupied Cooling Dead Band. The unit will also transition from the Cooling to Fan only operating state if Cooling operation is disabled due to OA ambient lockout.

Staging - DAT Control

In the Cooling state, compressor stages are turned on and off to maintain an average Discharge Air Temperature near the Discharge Cooling Setpoint. When the load is such that cooling capacity is being staged up and down between two stages, this control sequence causes the unit to operate longer at the stage that produces the discharge air temperature that is closer to the setpoint over time which results in an average discharge air temperature that is very close to the Discharge Cooling Setpoint.

This setpoint may be fixed or reset as described in the Cooling DAT Reset section. External devices such as VAV boxes maintain the desired space conditions. The unit may be a Constant Volume unit, but it is normally a Variable Air Volume unit. If the Discharge Air Temperature is approaching the setpoint, the number of stages continues to increase or decrease until the actual temperature gets within half the deadband. Control of cooling stages is based on two values, the Degree Time Above and the Degree Time Below the Discharge Cooling Setpoint. The difference between the actual discharge air temperature and the Discharge Cooling Setpoint is added to one of the Degree Time values every ten seconds.

If the Discharge Air Temperature exceeds Discharge Cooling Setpoint, the difference is added to the Degree Time Above value. If the Discharge Air Temperature is below the Discharge Cooling Setpoint, the difference is added to the Degree Time Below value. These values are limited to a maximum value of 250 to prevent remaining too long in one stage because one value or the other became very large.

When the unit enters the Cooling state the first compressor is turned on immediately.

With DAT staging control, there are four possible staging transitions; Stage up after stage up, stage up after stage down, stage down after stage down, and stage down after stage up. These are described in the following paragraphs:

Stage Up After Stage Up:

If the time since the last stage change exceeds the cooling stage timer, the discharge air temperature is greater than the Discharge Cooling Setpoint by more than half the deadband, the last stage change was a stage up, and dehumidification is not active; cooling capacity is increased by one stage

Stage Up After Stage Down:

If the time since the last stage change exceeds the cooling stage timer, the discharge air temperature is greater than the Discharge Cooling Setpoint by more than half the deadband, the last stage change was a stage down, the Degree Time Above value is greater than or equal to the Degree Time Below value, and the dehumidification is not active; cooling capacity is increased one stage.

Stage Down After Stage Down:

If the time since the last stage change exceeds the cooling stage timer, the discharge air temperature is less than the Discharge Cooling Setpoint by more than half the deadband, the last stage change was a stage down, and dehumidification is not active; cooling capacity is decreased one stage.

Stage Down After Stage Up:

If the time since the last stage change exceeds the cooling stage timer, discharge air temperature is less than the Discharge Cooling Setpoint by more than half the deadband, the last stage change was a stage up, the Degree Time Below value is greater than or equal to the Degree Time Above value, and dehumidification is not active; cooling capacity is decreased one stage.

The Degree Time Below and Degree Time Above values change whenever a stage change occurs. If the previous stage change was a stage up and the number of stages increases again, both Degree Time Above and Degree Time Below are set to zero.

If the last stage change was a stage up and the stage decreases due to the Degree Time Below exceeding the Degree Time Above, the Degree Time Below is reduced by an amount equal

to Degree Time Above and then the Degree Time Above is set to zero.

If the last stage change was a stage down and the stage increases due to the Degree Time Above exceeding the Degree Time Below, the Degree Time Above is reduced by an amount equal to Degree Time Below and then the Degree Time Below is set to zero.

Degree Time logic is not used when dehumidification is active. When dehumidification is active, cooling capacity is increased if the time since the last stage change exceeds the cooling stage timer and the Leaving Coil Temperature (LCT) is greater than the Maximum Leaving Coil Setpoint. When dehumidification is active, cooling capacity is decreased if the time since the last stage change exceeds the cooling stage timer amd the leaving coil temperature is less than the minimum leaving coil setpoint.

Average Discharge Control Method Illustration

On page 84 is an illustration of the "Degree Time" compressor staging control method and is meant to show a variety of staging possibilities not normal unit operation. Figure 14 shows nine points on a graph of the discharge air temperature changing with time. The Cooling Interstage Timer setting is 5 minutes.

Point 1 Assume that the controller has just staged up and that DTA and DTB are zero. As a result, the discharge air temperature drops and the Cooling Interstage Timer is reset.

Point 2 DTA (Area A) equals DTB (Area B). The discharge air temperature is below the Effective Discharge Cooling Set Point by more than half the Discharge Cooling Dead Band. However, since the Cooling Interstage Timer has not yet expired, no staging action occurs.

Point 3 The Cooling Interstage Timer has expired. DTB (Area B + Area C) is greater than DTA (Area A) and the discharge air temperature is below the Effective Discharge Cooling Set Point by more than half the Discharge Cooling Dead Band. Therefore, cooling is staged down. As a result, the discharge air temperature rises, the Cooling Interstage Timer is reset, and DTA is subtracted from both DTA and DTB. This zeros DTA and leaves DTB equal to Area C.

Point 4 The Cooling Interstage Timer has expired. The discharge air temperature is above the Effective Discharge Cooling Set Point by more than half the Discharge Cooling Dead Band. However, since DTA (Area E) is not yet equal to DTB (Area C + Area D), no staging action occurs and the discharge air temperature continues to rise.

Point 5 The Cooling Interstage Timer has expired. The discharge air temperature is above the Effective Discharge Cooling Set Point by more than half the Discharge Cooling Dead Band and DTA (Area E + Area F) is equal to DTB (Area C + Area D). Therefore, cooling is staged up. As a result, the discharge air temperature drops, the Cooling Interstage Timer is reset, and DTB is subtracted from both DTB and DTA. This zeros both DTA and DTB since they are equal. Note that the elapsed time since the last stage change in Figure 14 is 6.3 minutes.

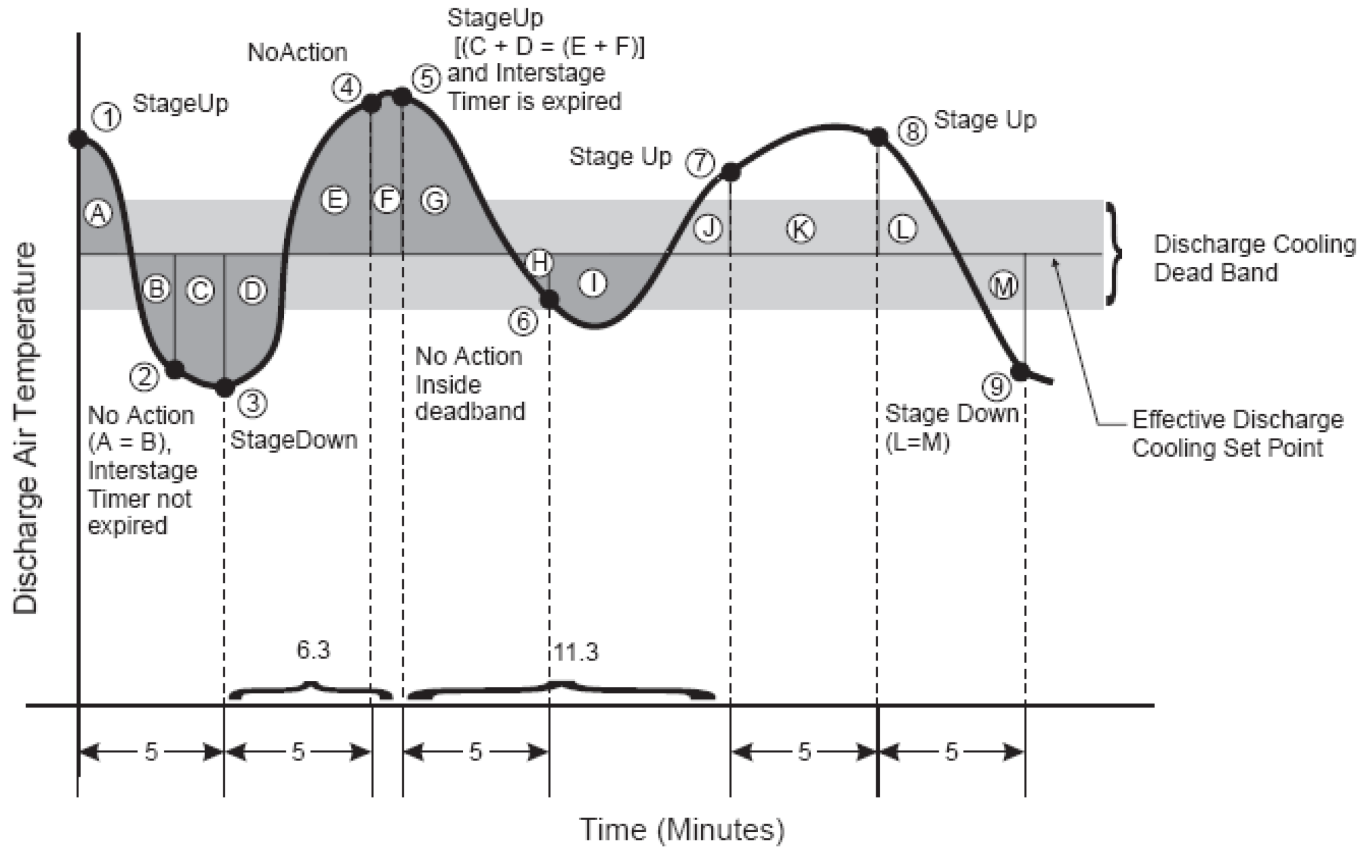
Point 6 The Cooling Interstage Timer has expired. Because the cooling load is now increasing, the discharge air temperature does not fall below the Effective Discharge Cooling Set Point by more than half the Discharge Cooling Dead Band. No staging action occurs for two reasons: (1) the discharge air temperature is within the Discharge Cooling Dead Band and (2) DTB (Area H) is not yet equal to DTA (Area G). Even if the discharge air temperature falls below the Effective Discharge Cooling Set Point by more than half the Discharge Cooling Dead Band (as shown just after Point 6), a stage down does not occur because DTB remains less than DTA. The discharge air temperature starts rising again because the load is increasing.

Point 7 The discharge air temperature is again above the Effective Discharge Cooling Set Point by more than half the Discharge Cooling Dead Band. Since the Cooling Interstage Timer expired at Point 6, cooling is staged up. As a result, both DTA and DTB are zeroed and the Cooling Interstage Timer is reset. Note that DTA and DTB are both zeroed since two consecutive stage increase actions occurred. The discharge air temperature continues to rise, however, because the cooling load is still increasing. Note that the elapsed time since the last stage change in this illustration is 11.0 minutes.

Point 8 The Cooling Interstage Timer has expired. Since the discharge air temperature is still above the Effective Discharge Cooling Set Point by more than half the Discharge Cooling Dead Band, another stage-up occurs. As a result, DTA (Area K) is again zeroed out (DTB remains zeroed) and the Cooling Interstage Timer is reset. The cooling load has leveled out, and the discharge air temperature drops.

Point 9 The Cooling Interstage Timer has expired at the same time that DTB (Area M) becomes equal to DTA (Area L). Therefore, cooling is staged down, the Cooling Interstage Timer is reset and DTA is subtracted from both DTA and DTB. This zeros both DTA and DTB since they are equal.

Figure 14: Average Discharge Control Method



Staging - Zone Control

In the Cooling state, compressor stages are turned ON and OFF to maintain the control temperature close to the Occupied or Unoccupied Cooling Setpoint. Use of the Projected Control Temperature reduces overshoot during cool down. See the Project Ahead section for a description of how the Project Ahead Temperature is calculated.

When the unit enters the Cooling state or dehumidification operation begins 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 the last stage change exceeds the Cooling stage timer, Projected Control Temperature is greater than the Occupied or Unoccupied Cooling Setpoint by more than half the deadband, the Control Temperature is greater than the Occupied or Unoccupied Cooling Setpoint by more than half the deadband, and the Discharge Air Temperature is greater than the minimum DAT cooling setpoint.

During normal cooling operation the number of compressor stages decreases when the time since the last stage change exceeds the cooling stage timer, the Projected Control Temperature is less than the Occupied or Unoccupied Cooling Setpoint by more than half the deadband, the Control Temperature is less than the Occupied or Unoccupied Cooling setpoint by more than half the deadband.

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

When Dehumidification is active, compressor stages are controlled to maintain the leaving coil temperature between the minimum leaving coil setpoint and the maximum leaving coil DAT setpoint.

During dehumidification on operation, the number of compressor stages increases if the time since the last stage change exceeds the cooling stage timer and the leaving coil temperature is greater than the Maximum Leaving Coil Setpoint. During dehumidification operation, the number of compressor stages decreases if the time since the last stage change ecxeeds the cooling stage timer and the leaving coil temperature is less than the Minimum Leavaing Coil Setpoint.

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 in DAT Control units.

In Zone Control cooling and heating operation, the Projected Control Temperature, reduces overshoot as the zone temperature approaches a setpoint after startup. It does this by causing stages to stop increasing before the actual control temperature

reaches the setpoint. The rate of change of the control temperature is calculated once per minute by the controller and equals the change during the last sixty 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 the unit is 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

Discharge Air Temperature Setpoint Reset - Cooling

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

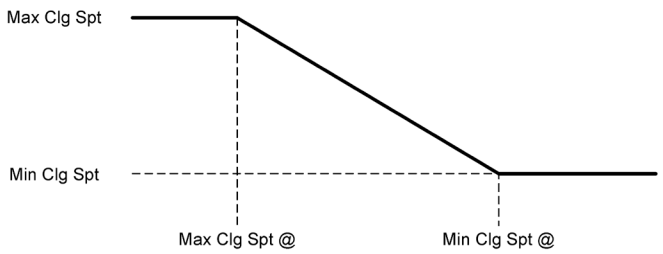
- **None:** Discharge Cooling Spt is user adjustable
- **Network:** Discharge Cooling Spt is equal to the Network DAT Clg Setpoint when it is valid
- **Space:** Discharge Cooling Spt is based on the Space Sensor
- **Return:** Discharge Cooling Spt is based on the Return Air Sensor
- **OAT:** Discharge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

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, Ext mA, or Ext V 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 Space, Return, OAT, 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 15: Cooling Setpoint



When Airflow is selected, the values "Min Clg Spt @" and "Max Clg Spt @" are entered as percentage values. When Ext mA is selected, the values "Min Clg Spt @" and "Max Clg Spt @" are entered as mA values. When Ext VDC is selected, the values "Min Clg Spt @" and "Max Clg 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 signal increase.

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.

When ever the Clg Reset Type or Engineering Units is changed, the Min Clg Spt @ and Max Clg Spt @ values revert to default values as follows:

- None: Min Clg Spt @=0NA, Max Clg Spt @=100NA
- Network: Min Clg Spt @=0NA, Max Clg Spt @=100NA
- Space, Return: Min Clg Spt @=73.0F, Max Clg Spt @=71.0F
- OAT: Min Clg Spt @=90.0F, Max Clg Spt @=70.0F
- ExtmA: Min Clg Spt @=4.0mA, Max Clg Spt @=20.0mA
- ExtVDC: Min Clg Spt @=0.0V, Max Clg Spt @=10.0V
- Airflow: Min Clg Spt @=33%, Max Clg Spt @=100%

Standard Condenser Fan Control

Two, three or four condenser fans are provided. Three condenser fans are provided on 26, 30 and 35 ton units. Four condenser fans are provided on 40 and 50 ton units. The first condenser fan is always turned ON when any compressor is turned ON using compressor contactor auxiliary switches external to the controller.

When two condenser fans are provided, the second condenser fan (CondFanOutA) is turned ON when the OAT rises above the Condenser Fan 1 Set Point. This fan is turned OFF when the OAT drops below the setpoint by more than the Condenser Fan Differential (Default = 5°F).

When three condenser fans are provided, the second condenser fan is turned ON when the OAT rises above the Condenser Fan 1 Set Point and the third fan is turned ON when the OAT rises above the Condenser Fan 2 Set Point. These fans are turned OFF when the OAT drops below that corresponding setpoint by more than the Condenser Fan Differential (Default = 5°F).

Table 57: Fan Staging

Operating Fans (Stage)	Fan 1 (On with any compressor)	Fan 2 (Cond Fan Out A)	Fan 3 and 4 (Cond Fan Out B)	On Condition
1	On	Off	Off	Any Comp On
2	On	On	Off	Cond Fan 1 Spt
3	On	Off	On	Cond Fan 2 Spt
4	On	On	On	Cond Fan 3 Spt

When four condenser fans are provided, the "new" method is used (Condenser Control=Standard Method 2), where the condenser fan control is circuit specific. The first fan on each circuit is turned ON using compressor contactor auxiliary switches. The second fan on each circuit is turned ON if a compressor in the circuit is ON and the OAT is above the corresponding condenser fan setpoint and is turned off when the OAT drops below the corresponding setpoint by more than the Condenser Fan Differential (Default = 5°F). Condense Fan 1 Setpoint corresponds to the second fan on Circuit 1 and Condenser Fan 2 Setpoint corresponds to the second fan on Circuit 2.

The default condenser fan setpoints vary by unit size as indicated in Table 58:

Table 58: Condenser Fan Setpoints

Unit Size	Condenser Fan Setpoints		
	Cond Fan 1 Spt	Cond Fan 2 Spt	Cond Fan Spt
30	40°F/4.44°C	60°F/15.56°C	—
35	35°F/1.67°C	60°F/15.56°C	—
40 (Cond Ctrl= Std Method 1)	25°F/-3.89°C	45°F/7.22°C	60°F/15.56°C
50 (Cond Ctrl= Std Method 1)	35°F/1.67°C	45°F/7.22°C	55°F/12.78°C
40 (Cond Ctrl= Std Method 2)	70°F/21.11°C	70°F/21.11°C	N/A
50 (Cond Ctrl= Std Method 2)	70°F/21.11°C	70°F/21.11°C	N/A

Heating Control

Entering Heating Operating State

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 Dead Band. 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.

Morning Warmup Control

The unit does not enter a specific morning warmup operating state to accomplish the morning warmup function. Instead the unit enters the Heating operation state when morning warmup operation is required. The dampers are held at zero percent open for Zero OA Timer after the SAF starts. The Zero OA Timer should be set long enough to accomplish morning warmup with the dampers closed to minimize energy usage during the warmup period.

Zone Control Units

When a Zone Control Unit (Ctrl Typ=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.

Heating: Staged 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 Contro Temperature are greater then the Occ Htg Spt (plus ½ the deadband).

The number of heating stages also decreases when the time since the last stage change exceeds the stage time, and the DAT is greater than the MaxDATHtgSpt.

Heating DAT Staging or MinDAT Staging

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 number of heating stages decreases when the time since 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.

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

Entering Heating Operating State

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 Dead Band. The unit transitions from heating to Fan only 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. When the unit is in the Heating operating state, heating capacity is modulated to maintain the discharge air temperature at the Discharge Heating Set Point.

There are several different modulating heating types available with this equipment. There are some differences in the control sequence depending on the heat type installed. The different types 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.

MPS Gas Heating

Sequence of Operation (Staged Control)

2-Stage Control

The following details the sequence of operation for the low heat option:

- Unit controller calls for heat
- Furnace DDC control module receives a call for heat
- High limit switch is checked for safe condition
- Proof of airflow switch is checked for combustion airflow
- 60 second prepurge cycle starts
- Spark ignitor is activated for 3 seconds
- Gas valve receives a command for stage 1 of heat
- Burner is ignited
- Unit controller calls for stage 2 of heat
- Furnace DDC controller receives a stage 2 heat command
- Gas valve receives a command for stage 2 of heat

4-Stage Control

For a unit with the optional high heat the above sequence is followed for the first two stages. For the remaining 2 stages the above procedure is repeated on the second furnace module.

Sequence of Operation (Modulating Burner)

5–1 Gas Burner

The following details the sequence of operation for the low heat option:

- Unit DDC controller calls for heat
- Furnace DDC control module receives a call for heat
- Furnace safety switches and DDC control are checked for safe conditions
- 45 second prepurge cycle starts. Proof of airflow switch is checked for combustion airflow
- Spark ignitor is activated
- Gas valve receives a signal to open fully
- Burner is ignited and runs for 20 seconds in high fire

NOTICE

If call for heat is interrupted during this timing, the furnace will be locked in for the 20 seconds cycle.

- Gas valve and induction blower motor receives a signal to modulate burner output to match the unit discharge air temperature setting

10-1 Gas Burner

- Unit controller calls for heat
- Top furnace DDC receives call for heat
- Steps 3-9 from Low Heat Option are followed
- If top furnace is unable to meet the unit controllers DAT heating setpoint then the furnace DDC calls for 3rd stage of heating
- Top furnace is reduced to low fire
- Bottom furnace receives a call for heat and sequences similar to steps 3-9 from Low Heat Option
- Staged burner gas valve receives a signal to open 50%
- Top furnace receives a signal to modulate the gas valve to meet the unit controllers DAT heating setpoint
- If stage 3 and modulating furnace are unable to meet DAT heating setpoint then stage 4 heat initiates
- The bottom furnace stages up to high fire and the top furnace reduces to low fire
- Mod gas valve and inducer blower motor receive a signal to modulate to match the unit controllers DAT heating setpoint

Discharge Air Temperature Setpoint Reset - Heating

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 mA:** Discharge Heating Spt is determined by a 0-20 or 4-20 mA signal
- **Ext V:** Discharge Heating Spt is determined 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.

Whenever the Clg Reset Type or Engineering Units is changed, the Min Clg Spt @ and Max Clg Spt @ values revert to default values as follows:

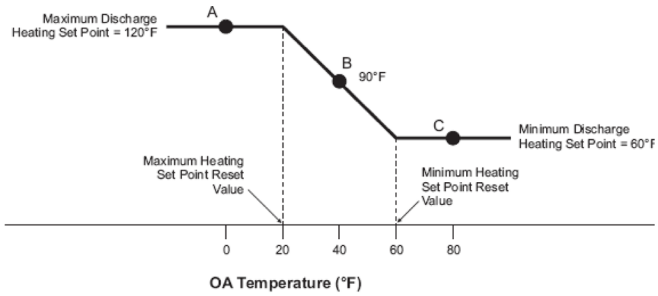
- **None:** Min Clg Spt @=0NA, Max Clg Spt @=100NA
- **Network:** Min Clg Spt @=0NA, Max Clg Spt @=100NA
- **Space, Return:** Min Clg Spt @=73.0F, Max Clg Spt @=71.0F
- **OAT:** Min Clg Spt @=90.0F, Max Clg Spt @=70.0F
- **ExtmA:** Min Clg Spt @=4.0mA, Max Clg Spt @=20.0mA
- **ExtVDC:** Min Clg Spt @=0.0V, Max Clg Spt @=10.0V

An example of discharge temperature reset based on outdoor air temperature is illustrated in Figure 16 (Cooling Reset Type Flag is set to "OAT" in this example). When the current outdoor air temperature is greater than or equal to the Minimum Cooling Set Point Reset Value (90°F in this example), the Discharge Cooling Set Point is set equal to the Minimum Discharge Cooling Set Point (55°F in this example). This is shown as Point C in Figure 16.

When the current outdoor air temperature is less than or equal to the Maximum Cooling Set Point Reset Value (70°F in this example), the Discharge Cooling Set Point is set equal to the Maximum Discharge Cooling Set Point (65°F in this example). This is shown as Point A in Figure 16.

When the current outdoor air temperature is between the Minimum Cooling Set Point Reset Value and the Maximum Cooling Set Point Reset Value, the Discharge Cooling Set Point varies linearly between the Minimum Discharge Cooling Set Point and Maximum Discharge Cooling Set Point. This is shown as Point B in Figure 16.

Figure 16: Discharge Temperature Reset Based on Temperature



Whenever the Htg Reset Type or Engineering Units is changed, the Min Htg Spt @ and Max Htg Spt @ values revert to default values as follows:

- **None:** Min Htg Spt @=0NA, Max Htg Spt @=100NA
- **Network:** Min Htg Spt @=0NA, Max Htg Spt @=100NA
- **Space, Return:** Min Htg Spt @=69.0°F, Max Htg Spt @=67.0°F
- **OAT:** Min Htg Spt @=60.0°F, Max Htg Spt @=20.0°F
- **ExtmA:** Min Htg Spt @=4.0mA, Max Htg Spt @=20.0mA
- **ExtVDC:** Min Htg Spt @=0.0V, Max Htg Spt @=10.0V

An example of discharge temperature reset based on outdoor air temperature is illustrated in Figure 16 (Heating Reset Type Flag is set to "OAT" in this example).When the current outdoor air temperature is greater than or equal to the Minimum heating Set Point Reset Value (60°F in this example), the Discharge Heating Set Point is set equal to the Minimum Discharge Heating Set Point (60°F in this example).This is shown as Point C in Figure 16.

When the current outdoor air temperature is less than or equal to the Maximum Heating Set Point Reset Value (20°F in this example), the Discharge Cooling Set Point is set equal to the Maximum Discharge Heating Set Point (120°F in this example). This is shown as Point A in Figure 16.

When the current outdoor air temperature is between the Minimum Heating Set Point Reset Value and the Maximum Heating Set Point Reset Value, the Discharge Heating Set Point varies linearly between the Minimum Discharge Heating Set Point and Maximum Discharge Heating Set Point. This is shown as Point B in Figure 16.

Indoor Air Fan - ON/OFF Control

A supply fan is provided on every unit. That may be the only fan, but either a return fan or an exhaust fan, or fans, can be provided also. The start/stop signal and the speed signal for fans that are controlled by variable frequency drives are provided via an internal ModBus network. Constant volume supply and return fans are started and stopped through digital outputs.

Supply Fan

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 it stays on for a OffHtClDelayTime (Default- 120 seconds) if the unit is turned OFF while DX cooling or staged heating is active. The OffHtClDelayTime function is overridden when and Emergency Off or Duct High Limit fault is active.

Return Fan

A return fan driven by a variable frequency drive is started four seconds after the supply fan is started to reduce the amp draw peak on startup. A constant volume return fan is turned ON through the same output as the supply fan. An external Fan Delay Relay is used to provide a delay between startups if required.

Supply Fan Capacity Control (VAV)

The speed of a modulating supply fan is controlled by a 0-100% signal provided to the VFD via an internal Modbus network. Supply Fan Capacity Control for a modulating fan is controlled to either maintain the duct static pressure at a desired value or maintain a fixed speed based on a signal provided via a network.

The choice of control method, SF Cap Ctrl, may be set to Duct Pressure or Speed via the keypad. After the supply fan is started, a speed signal of 33% is sent to the variable frequency drive for the DSPCtrlDelay (Default=30 seconds). Control reverts to either duct pressure or speed after the fan has been on for the duration of the DSPCtrlDelay time. The VFD speed is not controlled below the minimum SAF speed setting (default 33%) while the fan is operating.

NOTICE

Units supplied with Daikin Applied MD2, MD3, and MD6 drives will have a user editable maximum supply fan hertz setpoint (default 60 Hz) located in the SAF Set Up menu. This parameter can be changed when job site conditions require the speed of the drive to be above 60 Hz.

Duct Static Pressure Control

The supply air fan speed is controlled by a VFD. The control parameter for the fan speed is the duct static pressure setpoint. If the duct static pressure is below the duct static pressure setpoint by more than ½ the deadband, the fan speed will increase. Likewise if the duct static pressure is above the duct static pressure setpoint by more than ½ the deadband the fan speed will decrease. **Example** - if the duct static pressure setpoint is 1.2" and the deadband is 0.1",the duct static pressure must reach 1.14 before the fan will increase in speed. The Duct Static Pressure setpoint may be set through the keypad or via a network signal. The active setpoint is changed whenever either of these values changes so it equals whichever value was changed most recently.

Speed/Network

When speed control is selected, the fan operates at the larger of its minimum speed or a value provided via a connected network or the keypad/display.

Single Zone VAV Control (1ZnVAV)

When space temperature control is selected, the supply fan VFD is controlled with a PI_Loop to maintain the Control Temperature input at the Occupied or Unoccupied Cooling Setpoint or Occupied or Unoccupied Heating Setpoint. This control choice is designed for DAC control type and will be used in applications where the unit will act as a single VAV box to control space temperature. Cooling and heating discharge air temperature control and outside air damper control will function in the normal manner as with VAV units.

Cooling/Economizer

When the Unit State is Cooling or Econo the Single Zone VAV Control PI_Loop will be set for direct acting control to modulate the supply fan VFD to maintain the Control Temperature at the Occupied Cooling Setpoint. As the Control Temperature rises, the VFD speed will be increased and as the Control Temperature falls, the VFD speed will be decreased. An adjustable Minimum Cooling Speed and Maximum Cooling Speed value limits the range of modulation of the VFD.

Heating

When the Unit State is Heating the Single Zone VAV Control PI_Loop will be set to reverse acting control to modulate the supply fan VFD to maintain the Control Temperature at the Occupied Heating Setpoint. As the Control Temperature falls, the VFD speed will be increased and as the Control Temperature rises, the VFD speed will be decreased. An adjustable Minimum Heating Speed and Maximum Heating Speed value limits the range of modulation of the VFD.

Fan Only/MinDat

When the Unit State is FanOnly or MinDat, the supply fan speed will be held fixed at the speed the VFD was operating upon entering the FanOnly or MinDat state. This will be either the Minimum Cooling Speed or the Minimum Heating Speed depending on the state from which the unit enters FanOnly/ MinDat.

Building Static Pressure Control (BSP)

Building static pressure supply fan control is available on 100% OA units that have the Control Type set to Zone or DAC. Building static pressure supply fan control is not available if the Control Type set to 1ZnVAV (2). When BSP is selected as the SAF capacity control method, the supply fan VFD is controlled to maintain a building static pressure input at a building static pressure setpoint using a PI Loop.

A BSP Input parameter allows for selecting No or Yes for supply

fan building static pressure control. If BSP Input is set to No then no monitoring or control based on BSP is possible. All menu items related to BSP control are removed from the HMI in this case. If BSP Input is set to Yes then the building static pressure input is available for control and monitoring purposes.

Carbon Dioxide Control (CO2)

CO2 supply fan control is available on 100% OA units that have the Control Type set to Zone or DAC.

CO2 supply fan control is not available if the Control Type set to 1ZnVAV. When CO2 is selected as the SAF capacity control method, the supply fan VFD is controlled based on a CO2 input. The supply fan speed varies linearly between the Minimum PPM Speed and the Maximum PPM Speed value as the PPM input varies from the Minimum SAF PPM and the Maximum SAF PPM value. A CO2 Input parameter allows for selecting None, VDC or mA as the type of input for the CO2 sensor in this case.

If CO2 Input is set to None then no monitoring or control based on CO2 is possible. All menu items related to CO2 control and scaling are removed from the HMI in this case. If CO2 Input is set to VDC then the CO2 input is available for control and/or monitoring purposes and the sensor scaling parameters are in terms of volts DC. If CO2 Input is set to mA then the CO2 input is available for control and/or monitoring purposes and the sensor scaling parameters are in terms of milliamps.

Airflow Control (CFM)

Airflow supply fan control is available on 100% OA units that have the Control Type set to Zone or DAC. Airflow supply fan control is not available if the Control Type set to 1ZnVAV. When CFM is selected as the SAF capacity control method, the supply fan VFD is controlled to maintain a CFM input at a Minimum Outside Air CFM Setpoint using a PI Loop.

A CFM Input parameter allows for selecting None, VDC or mA as the type of input for the CFM sensor in this case.

If CFM Input= is set to None then no monitoring or control based on CFM is possible. All menu items related to CFM control and scaling are removed from the HMI in this case. If CFM Input is set to VDC then the CFM input is available for control and/or monitoring purposes and the sensor scaling parameters are in terms of volts DC. If CFM Input is set to mA then the CFM input is available for control and/or monitoring purposes and the sensor scaling parameters are in terms of milliamps.

Modulating Exhaust Fan Control (RTU, MPS)

Three different approaches may be used to maintain the building static pressure at acceptable levels. An analog signal is provided to the VFD to control exhaust fan to:

- Maintain the building static pressure at a desired value
- Maintain a fixed speed based on a signal provided by a Building Automation System via a network
- Vary the speed of an exhaust fan based on OA Damper position

Building Static Pressure, Speed, or OA Damper may be selected for an exhaust fan.

When the unit is in the OFF or Startup state, the variable frequency drive for the return or exhaust is driven to 0%.

After the exhaust fan is started, a speed signal of 5% for exhaust fan or 33% for return fan is sent to the variable frequency drive for the BSPCtrlDelay (Default=30 seconds) and the VFD will increase its speed to 5% (or 33%). Control reverts to one of the methods below after the fan has been on for the BSPCtrlDelay. The VFD speed is not controlled below 5% (or 33%) while the fan is operating.

NOTICE

Units supplied with Daikin Applied MD2, MD3, and MD6 drives will have a user editable maximum return fan/exhaust fan hertz setpoint (default 60 Hz) located in the RF/EF Set Up menu. This parameter can be changed when job site conditions require the speed of the drive to be above 60 Hz.

To set the three parameters as described, the airflow and return vane positions are adjusted until maximum airflow and proper indoor conditions are met. The return fan is adjusted using the Remote RF/EF setting on the keypad. The user then uses the key to set the Supply Fan Max values and Return Fan @ Supply Fan Max to the observed values. The process is repeated at minimum airflow to set Supply Fan Min and Return Fan @ Supply Fan Min values.

Building Static Pressure Control

A PI control loop is used to modulate the variable frequency drive of the exhaust fans to maintain a measured building static pressure at a setpoint. The BSP Gain, Project Ahead Time, and Sample Time are editable via the keypad.

The Building Static Pressure setpoint may be set through the keypad or via a network signal. The active setpoint is changed whenever either of these values changes so it equals whichever value was changed most recently.

Speed/Network Control

Single zone VAV control is available when the unit Control Type is Single Zone VAV (1ZnVAV). When single zone VAV control is selected as the SAF capacity control method, the supply fan VFD or ECM motor is controlled with a PI_Loop to maintain the Control Temperature input at the Occupied Cooling Setpoint or Occupied Heating Setpoint. This option is designed for discharge control applications where the unit will act as a single VAV box to control space temperature. OAT is not allowed as the Control Temperature when SAF capacity control method is set to 1ZnVAV. Cooling and heating discharge air temperature control and outside air damper control will function in the normal manner as with VAV units.

NOTICE

Single zone VAV control of SAF is not available when the Control Temperature Source is set to None.

Exhaust Fan - Speed Control

The exhaust fan is turned ON when the OA Dampers are at least open to the Minimum Exhaust OA Position (default 5%), the SAF capacity is above the Minimum Exhaust SAF capacity (default 10%), and the Remote Exhaust Fan capacity is commanded to

a value above the minimum value (Default = 5%) by a BAS for longer than the Minimum Exhaust Fan On Time (Default = 120 seconds).

The exhaust fan is turned OFF when the Supply Fan is turned OFF when the Remote Exhaust Fan capacity is commanded to less than or equal to its minimum value (Default = 5%) for longer than the MinExhStopTime (Default = 120 seconds).

Modulating Propeller Exhaust - OA Damper Control

When the unit is equipped with a modulating propeller exhaust fan arrangement and the Return/Exhaust Fan Capacity Control Method is set to OA Damper, the exhaust fan is turned on at an adjustable outdoor air damper position (default 40%), and is turned back off when the dampers are below this setting for more that the minimum exhaust stop time (Default = 120 seconds). When on the fan is modulated linearly between the minimum exhaust fan speed and 100% as the dampers vary between the Exhaust On OA Position and the Exhaust Maximum OA Position.

Exhaust Fan - Building Static Pressure Control

An exhaust fan, or fans, driven by a variable frequency drive is started based on building static pressure. A constant volume exhaust fan is turned ON through the same output as the supply fan. An external Fan Delay Relay is used to provide a delay between startups if required.

A VAV exhaust fan is turned ON when the OA Dampers are at least open to the Minimum Exhaust OA Position (default 5%), the SAF capacity is above the Minimum Exhaust SAF capacity (default 10%), and the building static pressure is above the building static pressure setpoint by more than the deadband for longer than the Minimum Exhaust Fan Start Time (Default = 120 seconds).

A VAV exhaust fan is turned OFF when the supply fan is turned off or when the building static pressure is below the building static pressure setpoint by more than the deadband, or the OA Dampers are open less than the Minimum Exhaust OA Position (default 5%), or the SAF capacity is below the Minimum Exhaust SAF capacity (default 10%), and the Exhaust Fan capacity is at or below its minimum value (Default = 5%) for longer than the Min Exhaust Fan Stop Time (Default = 120 seconds).

Exhaust Fan - Speed Control

When speed control is selected, the fan operates at the larger of its minimum speed or a value provided via a connected network or the keypad/display.

The exhaust fan is turned ON when the OA Dampers are at least open to the Minimum Exhaust OA Position (default 5%), the SAF capacity is above the Minimum Exhaust SAF capacity (default 10%), and the Remote Exhaust Fan capacity is commanded to a value above the minimum value (Default = 5%) by a BAS for longer than the Minimum Exhaust Start Time (Default = 120 seconds).

The exhaust fan is turned OFF when the supply fan is turned off when the Remote Exhaust Fan capacity is commanded to less than or equal to its minimum value (Default = 5%) for longer than the Minimum Exhaust Stop Time (Default = 120 seconds).

Staged Exhaust Exhaust Fan - OA Damper Control

When the Return Fan Type is set to 1StgExh, 2StgExh or 3StgExh and the Return/Exhaust Fan Capacity Control Method is set to OA Damper, one, two or three exhaust fans are turned on and off based on the outdoor air damper position. Refer to Table 59 for the number of fans versus unit size.

Table 59: Fan Configuration

MPS Unit Size	Number of Fans
30	2
35	2
40	3
50	3

The default exhaust fan ON and OFF values are as follows:

Table 60: Fan Settings

Action	Default OA Setting	Adjustable Range
Exh Fan Stg 1 ON	40%	0% – 100%
Exh Fan Stg 1 OFF	30%	0% – 100%
Exh Fan Stg 2 ON	55%	0% – 100%
Exh Fan Stg 2 OFF	40%	0% – 100%
Exh Fan Stg 3 ON	70%	0% – 100%
Exh Fan Stg 3 OFF	50%	0% – 100%

Troubleshooting

Fan Failure Codes

HLL = Hall Sensor Error

First occurrence:

Power fluctuations may be responsible.

Corrective: Reset the failure; re-start the motor and observe it. If applicable, filter out the source of the disturbing voltage.

Repeated occurrence:

Question: Do other fans show the same failure?

- ***Yes:*** Systematically search for voltage peaks.
- ***No:*** It seems to be a hardware problem of the fan. Fan need to be replaced.

TFEI = Electronics Interior Overheated

First occurrence:

Too high ambient temperature may be responsible.

Question:

- Could ambient temperature have been too high?
- Is it possible to connect the fan to EC Control in order to display the temperature? If so, is the displayed temperature within the expected temperature range?

Corrective:

- If the displayed temperature is above 95°C (the electronics switches off at 105°C), double-check the ambient temperature in each operating mode.
- Reset the failure; re-start the motor and observe it.

Repeated occurrence:

Question: Do other fans show the same failure?

- ***Yes:*** Systematically search for the cause of excessive ambient temperature. Perhaps use a data logger or read out the electronics temperature via EC Control.
- ***No:*** It seems to be a hardware problem of the fan. Fan need to be replaced.

TFM = Motor Overheated

First occurrence:

Excessive ambient temperature may be responsible.

Question:

- Could ambient temperature have been too high? Or is the motor overloaded?
- Is it possible to connect the fan to EC Control in order to display the motor temperature?
- Is the displayed temperature within the expected temperature range?

Corrective: If the displayed temperature is too high:

- Double-check the motor temperature in each operating mode.
- Check of the fan load: Measure the input power at max. load/ operating point and compare the measured value with nominal data on the label. Is there any discrepancy?
- Reset the failure; re-start the motor and observe it.

Repeated occurrence:

Question: Do other fans show the same failure?

- ***Yes:*** systematically search for the cause of excessive ambient temperature. Perhaps use a data logger or read out the electronics temperature via EC Control.
- ***No:*** It seems to be a hardware problem of the fan. Fan need to be replaced.

TFE = Power Mod Overheated

First occurrence:

Excessive ambient temperature may be responsible.

Question:

- Do other fans (temporarily) show the same failure within the arrangement? Could ambient temperaturehave been too high? Or is the motor overloaded?
- Is it possible to connect the fan to EC Control in order to display the temperature?
- Is the displayed temperature within the expected temperature range?

Corrective: If the displayed temperature is too high:

- Check the module temperature during operation in each operating mode (Tmodule <110°C; switching-off temperature 115°C)
- Check the fan load and supply voltage: Measure the input power at max. load/ operating point and compare the measured value with nominal data on the label. Is there any discrepancy?
- Reset the failure; re-start the motor and observe it.

Repeated occurrence:

Question: Do other fans show the same failure?

- ***Yes:*** Systematic search for the reason of too high ambient temperature, overload, overvoltage or low voltage. Perhaps use a data logger.
- ***No:*** It seems to be a hardware problem of the fan. Fan need to be replaced.

BLK = Locked Motor

First occurrence:

Question:

- Is it possible that the motor was locked by an obstruction or ice?
- Do other fans show the same behavior?

Corrective: Remove the reason for blocking.

- Caused by ice: activate the shake-loose functionality (starting with ModBus 5) or increase the starting phase control factor.

Repeated occurrence:

Question: Does increasing the starting phase control factor improve the situation?

- ***No:*** It seems to be a hardware problem of the fan. Fan need to be replaced.

SKF = Communication Error

First occurrence:

Power fluctuations may be responsible.

Corrective: Reset the failure; re-start the motor and observe it. If applicable, filter out the source of the disturbing signal.

Repeated occurrence:

Question: Do other fans show the same failure?

- ***Yes:*** systematic search for peaks of disturbance voltage
- ***No:*** It seems to be a hardware problem of the fan. Fan need to be replaced.

PHA = Phase failure

UzLow = DC-Link Undervoltage

UzHigh = DC-Link Overvoltage

UeHigh = Mains Overvoltage

UeLow = Mains Undervoltage

Question: Can the main voltage be measured at any spot; a data logger may be helpful.

- ***No:*** Measure the voltage at the power supply input of the concerned fan.

Corrective:

- Reset the failure; re-start the motor and observe it.
- If applicable, filter out the source of disturbing signal.

Repeated occurrence:

Question:

- Do other fans show the same failure?
- How often does the failure occur?
- Get big electrical consumer loads switched at the same time when the failure occurs in the surrounding area?
- Are compressors or large asynchronous motors applied within the arrangement?
  - ***Yes:*** Systematic search for external disturbance voltage peaks; If applicable, usage of data logger for a longer period and analysis of the measured values.
- Are the voltage values within the specified range?
  - ***No:*** It seems to be a hardware problem of the fan. Fan need to be replaced.

A2L Detection and Mitigation

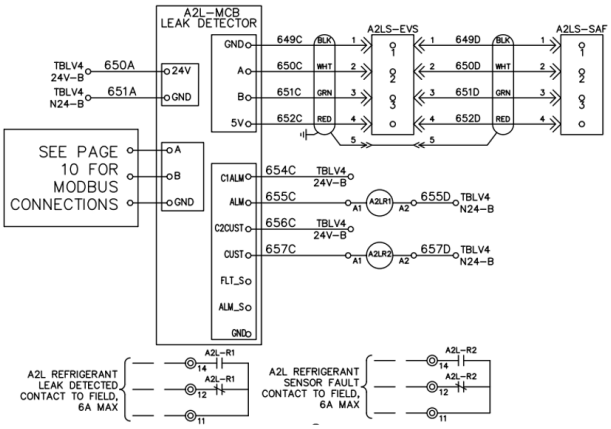
A2L Leak Detection System

Daikin Applied Rooftop units that use an A2L refrigerant have a factory installed leak detection system. The A2L leak detection system consists of the following parts:

- Refrigerant Sensor(s) (quantity 1 – 8)
  Part Number: 910419801
- A2L Leak Detection Control Board (quantity 1)
  Part Number: 910419225

The sensors, if more than one, are wired in a daisy chain configuration and terminated at the mitigation board. The A2L Main Control board communicates the leak detection system status to the MicroTech controller via Modbus. The MicroTech controller will communicate alarms based on this system status in the same way as any other alarm. In addition, 2 alarm relays are provided for the field to connect to directly, as an alternative method to receive the alarm status. See schematic example shown in Figure 17.

Figure 17: A2L Leak Detector Schematic Sample



Alarms

- Refrigerant Leak:
  - The leak detection control board will trigger a leak alarm when at least 1 sensor detects a refrigerant concentration above 15% of the refrigerant Lower Flammability Level (LFL).
  - Upon detection of a leak, the A2L-R1 and A2L-R2 contactors are energized and the alarm is communicated via Modbus to the MicroTech unit controller.
- Refrigerant Sensor Fault:
  - The leak detection control board will trigger a fault alarm when any connected sensor is determined to be faulty (self-test failure, loss of communications, etc.).
  - Upon detection of a sensor fault, the fault is communicated via Modbus to the MicroTech unit controller.

A2L Leak Mitigation

The MicroTech controller performs the following mitigation sequences to maintain safe operation in the event of an alarm condition:

Refrigerant Leak Detected

1. When unit is enabled:

   Upon notification from the leak detection system that a leak was detected, the MicroTech controller continues to operate the unit normally (conditioning the air: heating, cooling, humidifying, ventilating, and cleaning) with the following exceptions:

   - Refrigerant leak alarm is triggered and will remain on until manually cleared.
   - All compressors are deactivated and locked-out.
   - Supply fan minimum speed controls are overridden to prevent the fan from operating below a predetermined speed to maintain adequate airflow through the system to dilute any of the leaked refrigerant.
   - If the unit state is off, the unit will start up in the typical unoccupied mode of operation.
   - Manual Control operation is disabled.
   - The gas or electric heat Cold Start feature is disabled.
   - Specific Refrigeration Only Controls (ROC):
     - The field compressor cooling/heating control signal is ignored.
     - Compressors are deactivated and locked-out.
     - Supply fan minimum speed controls are overridden to prevent the fan from operating below a predetermined speed to maintain adequate airflow through the system to dilute any of the leaked refrigerant.
     - The field supplied outside air damper signal on a DOAS unit without a return air opening is ignored and the dampers are overridden to 100%.
     - The field controls are responsible for opening any isolation dampers to allow for airflow through the system.
     - The field controls are responsible for sending cooling and heating capacity signals.
   - The mitigation controls continue to monitor the refrigerant sensors in the system and notifies the MicroTech unit controller when no refrigerant has been detected for five minutes, allowing the unit to resume normal operation. Although, the leak detection alarm will continue to be active and keep the refrigeration system locked out until the alarm is manually cleared.
2. When unit is disabled (see Table 61 on page 96 for typical causes of disabled units):

   Upon notification from the leak detection system that a leak was detected, the MicroTech controller performs the following tasks:

   - Refrigerant leak alarm is triggered and will remain on until manually cleared.

- Compressor operation remains locked-out.
- Supply fan is turned on and supply fan minimum speed controls are overridden to prevent the fan from operating below a predetermined speed to maintain adequate airflow through the system to dilute any of the leaked refrigerant.
- Outside air damper will continue to be closed, with the exception of a DOAS unit without a return air path.
- The outside air damper in a DOAS unit without a return air path will be opened to 100%.
- Manual Control operation is disabled.
- Fan operation digital output closes.
- VAV box digital output opens (to open boxes).
- Heating and cooling are disabled.

Exceptions (MicroTech will not activate mitigation steps):

- If unit is disabled due to supply fan alarm, the fan will not operate.
- E-Stop circuit is open. E-Stop takes priority over A2L leak alarm.
- High Discharge or Return Air temperature (>170°F) alarms are triggered.

The mitigation controls continue to monitor the refrigerant sensors in the system and notifies the MicroTech unit controller when no refrigerant has been detected for five minutes, allowing the unit to revert to previous Disabled operation

Table 61: Typical Causes for Disabled Units

Unit Status Enumeration	Description	Conditions
0	Enabled	Conditions for Unit Status Enumerations 1-7 are all false.
1	OffMan	Control Mode is set to Off.
2	OffManCtrl	ManCtrActv flag is true.
3	Off Net	Both of the following are true: • Control Mode is set to Auto. • NetApplicMode is set to Off.
4	OffAlm	A fault alarm is active.
5	OffRetry	Fan Retry flag is true.
6	OffPassVnt	PassVentActv flag is true.
7	OffSnsrCfg	All of the following are true: • CtlrTempSrc is set to Space. Either of the following is true: • QMX sensor configuration is in progress. • EffSpcTRel is false. • Control Temperature fault is inactive.

Leak Detection Board Detects a Sensor Fault

A fault can be caused by a leak sensor malfunctioning or being disconnected, an A2L board malfunction or a loss of Modbus communication between the MicroTech unit controller and the A2L board.

1. When unit is enabled:

   Upon notification from the leak detection system that a sensor fault is detected, the MicroTech controller continues to operate the unit normally (conditioning the air: heating, cooling, humidifying, ventilating, and cleaning) with the following exceptions:

   - Refrigerant Sensor Fault alarm is triggered and will remain on until manually cleared
   - Supply fan minimum speed controls are overridden to prevent the fan from operating below a predetermined speed to maintain adequate airflow through the system to dilute any of the leaked refrigerant.
   - If the unit state is off, the unit will start up in the typical unoccupied mode of operation.
   - The gas or electric heat Cold Start feature is disabled.
   - Specific Refrigeration Only Controls (ROC):
     - Supply fan minimum speed controls are overridden to prevent the fan from operating below a predetermined speed to maintain adequate airflow through the system to dilute any of the leaked refrigerant.
     - The field supplied outside air damper signal on a DOAS unit without a return air opening is ignored and the dampers are overridden to 100%.
     - The field controls are responsible for opening any isolation dampers to allow for airflow through the system.
     - The field controls are responsible for sending cooling and heating capacity signals.

   The mitigation controls will continue until the fault is remedied and the alarm is manually cleared.

2. When unit is disabled:

   Upon notification from the leak detection system that a sensor fault was detected, the MicroTech controller performs the following tasks:

   - Refrigerant Sensor Fault alarm is triggered and will remain on until manually cleared
   - Compressor operation remains locked-out.
   - Supply fan is turned on and supply fan minimum speed controls are overridden to prevent the fan from operating below a predetermined speed to maintain adequate airflow through the system to dilute any of the leaked refrigerant.
   - The outside air damper will continue to be closed, with the exception of a DOAS unit without a return air path.
   - The outside air damper in a DOAS unit without a return air path will be opened to 100%.
   - Fan operation digital output closes.
   - VAV box digital output opens (to open boxes).
   - Heating and cooling are disabled.

   Exceptions (MicroTech will not activate mitigation steps):

   - If unit is disabled due to supply fan alarm, the fan will not operate.
   - E-Stop circuit is open. E-Stop takes priority over A2L Sensor Fault.
   - High Discharge or Return Air temperature (>170°F) alarms are active.
   - Control Mode is set to Off.
   - Duct High Limit Alarm is active.
   - Freeze-stat alarm is active (DOAS units only).

The mitigation controls will continue until the fault is remedied and the alarm is manually cleared.

A2L Leak Detection Sensor and Board Service

- The sensors are not considered “Limited Life Sensors” and therefore, under normal operation, are not expected to be replaced within the life expectancy of the unit.
- The sensors have self-reporting diagnostics, which are monitored by the mitigation board. In the event that the sensor fails, the mitigation board will trigger a “Fault” alarm.
- There are no servicing nor maintenance requirements for the sensor(s) and board.

A2L Leak Detection Sensor and Board Troubleshooting and Diagnostics

At power up, the Leak Detection Control Board display shows what sensors are detected (SX = 1 , sensor X is active and communicating), and what sensors are not detected (SX = 0, sensor X is not communicating or inactive). Where X, is the sensor number (from 1 to 8).

By pressing and holding the push button for:

- *Less than 2 seconds*
  The Leak Detection Control Board display shows the last 10 sensor faults (can be loss of communication or faulted state reported by a specific sensor). General configuration fault (Flt CFG) is also shown when the expected number of sensors does not match the number of sensors detected online.
- *More than 2 seconds and less than 5 seconds*
  The display shows sensor(s) status info:
  - The current LFL level.
  - Loss of communication or faulted state reported by a specific sensor.
- *More than 5 seconds and less than 10 seconds*
  The Leak Detection Control Board starts a mitigation test. The board will go into alarm mode and the MicroTech controller will begin the mitigation sequence. The mitigation test will last approximately 5 minutes.
- *More than 10 seconds*
  The display shows all the GID values supported by the sensor board as shown in Table 62 on page 98.

Table 62: GID Descriptions

GID id	Name	Min Limit	Max Limit	Default	Description
1	Number of Sensors	1	8	2	Number of sensors configured.
2	LFL Fault Threshold	1	10000	500	LFL Threshold for setting a fault.
3	LFL ALARM Threshold	1	1000	150	LFL Threshold setting an alarm. 150 = 15%.
4	USB Baud Rate	19200	115200	115200	Baud Rate used for communicating with an external terminal.
5	MODbus Client Baud	19200	38400	38400	Baud Rate used for communicating with the sensors.
6	MODbus Server Baud	9600	115200	19200	Baud Rate used for communicating with an external controller.
7	Test Mitigation Time	10	300	300	Test Mitigation time in seconds.
8	Sensor Warm Up Time	5	180	30	Sensor warm up time during power up in seconds.
9	Mitigation Time	120	1200	300	Mitigation time in seconds after LFL alarm has disappear.
10	Num of Sensors Online	1	8	1	Number of sensors detected online.
11	A2L State	0	5	0	A2L System State. Value = 1, A2L State is "run."
12	Last Fault	0	2	0	Recent Fault, Fault_Codes_e.
13	Modbus Server Address	1	10	9	A2L Modbus Address used in Modbus Server Network.
14	Sensor Addr Min	45	50	48	Minimum address assigned to a recent discovered sensor.
15	EETbl Save Now	0	1	0	Command to save data on non volatile memory.
16	System Test	0	1	0	System Test Mitigation Request.
17	Display LFL	0	1	0	Display LFL Levels.
18	EETbl LoadDefaults	0	1	0	Load Defaults values for those non volatile parameters.
19	EETbl Rev	1	1	1	EE Table Revision.
20	Sensor 1 Address	GID14	GID14 + 7	0	Sensor 1 Address.
21	Sensor 1 Level	0	65535	0	Sensor 1 LFL reported value. For instance value = 200, then LFL is 20%.
22	Sensor 1 State	1	65535	0	Sensor 1 current state. Value = 2, then state is "run."
23	Sensor 1 Faults	0	65535	0	Sensor 1 internal faults reported. For instance value = 0, then no faults.
24	Sensor 1 Temperature	-400	940	0	Sensor 1 Temperature reported value. For instance value = 250, then Temp = 25 C.
25	Sensor 1 Humidity	0	1000	0	Sensor 1 Humidity reported value. For instance value = 400, then Humidity = 40%.
26	Sensor 1 Pressure	0	4000	0	Sensor 1 Pressure reported value. Not available for now.
27	Sensor 2 Address	GID14	GID14 + 7	0	Sensor 2 Address.
28	Sensor 2 Level	0	65535	0	Sensor 2 LFL reported value. For instance value = 200, then LFL is 20%.
29	Sensor 2 State	1	65535	0	Sensor 2 current state. Value = 2, then state is "run".
30	Sensor 2 Faults	0	65535	0	Sensor 2 internal faults reported. For instance value = 0, then no faults.
31	Sensor 2 Temperature	-400	940	0	Sensor 2 Temperature reported value. For instance value = 250, then Temp = 25 C.
32	Sensor 2 Humidity	0	1000	0	Sensor 2 Humidity reported value. For instance value = 400, then Humidity = 40%.
33	Sensor 2 Pressure	0	4000	0	Sensor 2 Pressure reported value. Not available for now.
34	Sensor 3 Address	GID14	GID14 + 7	0	Sensor 3 Address.
35	Sensor 3 Level	0	65535	0	Sensor 3 LFL reported value. For instance value = 200, then LFL is 20%.
36	Sensor 3 State	1	65535	0	Sensor 3 current state. Value = 2, then state is "run".
37	Sensor 3 Faults	0	65535	0	Sensor 3 internal faults reported. For instance value = 0, then no faults.
38	Sensor 3 Temperature	-400	940	0	Sensor 3 Temperature reported value. For instance value = 250, then Temp = 25 C.
39	Sensor 3 Humidity	0	1000	0	Sensor 3 Humidity reported value. For instance value = 400, then Humidity = 40%.
40	Sensor 3 Pressure	0	4000	0	Sensor 3 Pressure reported value. Not available for now.
41	Sensor 4 Address	GID14	GID14 + 7	0	Sensor 4 Address.
42	Sensor 4 Level	0	65535	0	Sensor 4 LFL reported value. For instance value = 200, then LFL is 20%.

GID id	Name	Min Limit	Max Limit	Default	Description
43	Sensor 4 State	1	65535	0	Sensor 4 current state. Value = 2, then state is "run."
44	Sensor 4 Faults	0	65535	0	Sensor 4 internal faults reported. For instance value = 0, then no faults.
45	Sensor 4 Temperature	-400	940	0	Sensor 4 Temperature reported value. For instance value = 250, then Temp = 25 C.
46	Sensor 4 Humidity	0	1000	0	Sensor 4 Humidity reported value. For instance value = 400, then Humidity = 40%.
47	Sensor 4 Pressure	0	4000	0	Sensor 4 Pressure reported value. Not available for now.
48	Sensor 5 Address	GID14	GID14 + 7	0	Sensor 5 Address.
49	Sensor 5 Level	0	65535	0	Sensor 5 LFL reported value. For instance value = 200, then LFL is 20%.
50	Sensor 5 State	1	65535	0	Sensor 5 current state. Value = 2, then state is "run."
51	Sensor 5 Faults	0	65535	0	Sensor 5 internal faults reported. For instance value = 0, then no faults.
52	Sensor 5 Temperature	-400	940	0	Sensor 5 Temperature reported value. For instance value = 250, then Temp = 25 C.
53	Sensor 5 Humidity	0	1000	0	Sensor 5 Humidity reported value. For instance value = 400, then Humidity = 40%.
54	Sensor 5 Pressure	0	4000	0	Sensor 5 Pressure reported value. Not available for now.
55	Sensor 6 Address	GID14	GID14 + 7	0	Sensor 6 Address.
56	Sensor 6 Level	0	65535	0	Sensor 6 LFL reported value. For instance value = 200, then LFL is 20%.
57	Sensor 6 State	1	65535	0	Sensor 6 current state. Value = 2, then state is "run."
58	Sensor 6 Faults	0	65535	0	Sensor 6 internal faults reported. For instance value = 0, then no faults.
59	Sensor 6 Temperature	-400	940	0	Sensor 6 Temperature reported value. For instance value = 250, then Temp = 25 C.
60	Sensor 6 Humidity	0	1000	0	Sensor 6 Humidity reported value. For instance value = 400, then Humidity = 40%.
61	Sensor 6 Pressure	0	4000	0	Sensor 6 Pressure reported value. Not available for now.
62	Sensor 7 Address	GID14	GID14 + 7	0	Sensor 7 Address.
63	Sensor 7 Level	0	65535	0	Sensor 7 LFL reported value. For instance value = 200, then LFL is 20%.
64	Sensor 7 State	1	65535	0	Sensor 7 current state. Value = 2, then state is "run."
65	Sensor 7 Faults	0	65535	0	Sensor 7 internal faults reported. For instance value = 0, then no faults.
66	Sensor 7 Temperature	-400	940	0	Sensor 7 Temperature reported value. For instance value = 250, then Temp = 25 C.
67	Sensor 7 Humidity	0	1000	0	Sensor 7 Humidity reported value. For instance value = 400, then Humidity = 40%.
68	Sensor 7 Pressure	0	4000	0	Sensor 7 Pressure reported value. Not available for now.
69	Sensor 8 Address	GID14	GID14 + 7	0	Sensor 8 Address.
70	Sensor 8 Level	0	65535	0	Sensor 8 LFL reported value. For instance value = 200, then LFL is 20%.
71	Sensor 8 State	1	65535	0	Sensor 8 current state. Value = 2, then state is "run".
72	Sensor 8 Faults	0	65535	0	Sensor 8 internal faults reported. For instance value = 0, then no faults.
73	Sensor 8 Temperature	-400	940	0	Sensor 8 Temperature reported value. For instance value = 250, then Temp = 25 C.
74	Sensor 8 Humidity	0	1000	0	Sensor 8 Humidity reported value. For instance value = 400, then Humidity = 40%.
75	Sensor 8 Pressure	0	4000	0	Sensor 8 Pressure reported value. Not available for now.
76	DF Saving Time	15	120	15	Data Flash saving time in minutes. How frequent data is saved on non volatile memory.
77	Nominated Sensor Addr	48	55	55	Sensor address to be reset to the default value.
78	Sensor Reset Command	0	1	0	Command to invoke sensor function reset, value = 1 then this command is invoked.
79	Sen Func Reset Result	0	1	0	Final result of the sensor reset function operation. Value = 0, the operation was successful.

Limited Product Warranty

DAIKIN APPLIED AMERICAS INC.
LIMITED PRODUCT WARRANTY
(**United States and Canada**)

WARRANTY

Daikin Applied Americas Inc. dba Daikin Applied ("Company") warrants to contractor, purchaser and any owner of the product (collectively "Owner") that, subject to the exclusions set forth below Company, at its option, will repair or replace defective parts in the event any product manufactured by Company, including products sold under the brand name Daikin and used in the United States or Canada, proves defective in material or workmanship within twelve (12) months from initial startup or eighteen (18) months from the date shipped by Company, whichever occurs first. Authorized replacement parts are warranted for the remainder of the original warranty. All shipments of such parts will be made FOB factory, freight prepaid and allowed. Company reserves the right to select carrier and method of shipment. In addition, Company provides labor to repair or replace warranty parts during Company normal working hours on products with rotary screw compressors or centrifugal compressors. Warranty labor is not provided for any other products.

Company must receive the Registration and Startup Forms for products containing motor compressors and/or furnaces within ten (10) days of original product startup, or the ship date and the startup date will be deemed the same for determining the commencement of the warranty period and this warranty shall expire twelve (12) months from that date. For additional consideration, Company will provide an extended warranty(ies) on certain products or components thereof. The terms of the extended warranty(ies) are shown on a separate extended warranty statement.

No person (including any agent, sales representative, dealer or distributor) has the authority to expand the Company's obligation beyond the terms of this express warranty or to state that the performance of the product is other than that published by Company.

EXCLUSIONS

1. If free warranty labor is available as set forth above, such free labor does not include diagnostic visits, inspections, travel time and related expenses, or unusual access time or costs required by product location.
2. Refrigerants, fluids, oils and expendable items such as filters are not covered by this warranty.
3. This warranty shall not apply to products or parts : (a) that have been opened, disassembled, repaired, or altered, in each case by anyone other than Company or its authorized service representative; (b) that have been subjected to misuse, abuse, negligence, accidents, damage, or abnormal use or service; (c) that have not been properly maintained; (d) that have been operated or installed, or have had startup performed, in each case in a manner contrary to Company's printed instructions; (e) that have been exposed, directly or indirectly, to a corrosive atmosphere or material such as, but not limited to, chlorine, fluorine, fertilizers, waste water, urine, rust, salt, sulfur, ozone, or other chemicals, contaminants, minerals, or corrosive agents; (f) that were manufactured or furnished by others and/or are not an integral part of a product manufactured by Company; or (g) for which Company has not been paid in full.
4. This warranty shall not apply to products with rotary screw compressors or centrifugal compressors if such products have not been started, or if such startup has not been performed, by a Daikin Applied or Company authorized service representative.

SOLE REMEDY AND LIMITATION OF LIABILITY

THIS WARRANTY CONSTITUTES THE SOLE WARRANTY MADE BY COMPANY. COMPANY'S LIABILITY TO OWNER AND OWNER'S SOLE REMEDY UNDER THIS WARRANTY SHALL NOT EXCEED THE LESSER OF: (i) THE COST OF REPAIRING OR REPLACING DEFECTIVE PRODUCTS; AND (ii) THE ORIGINAL PURCHASE PRICE ACTUALLY PAID FOR THE PRODUCTS. COMPANY MAKES NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, REGARDING PREVENTION OF MOLD/MOULD, FUNGUS, BACTERIA, MICROBIAL GROWTH, OR ANY OTHER CONTAMINATES. THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT AND UNDER NO CIRCUMSTANCE SHALL COMPANY BE LIABLE TO OWNER OR ANY THIRD PARTY FOR INCIDENTAL, INDIRECT, SPECIAL, CONTINGENT, CONSEQUENTIAL, DELAY OR LIQUIDATED DAMAGES FOR ANY REASON, ARISING FROM ANY CAUSE WHATSOEVER, WHETHER THE THEORY FOR RECOVERY IS BASED IN LAW OR IN EQUITY, OR IS UNDER A THEORY OF BREACH CONTRACT OR WARRANTY, NEGLIGENCE, STRICT LIABILITY, OR OTHERWISE. THE TERM "CONSEQUENTIAL DAMAGE" INCLUDES, WITHOUT LIMITATION, THOSE DAMAGES ARISING FROM BUSINESS INTERRUPTION OR ECONOMIC LOSS, SUCH AS LOSS OF ANTICIPATED PROFITS, REVENUE, PRODUCTION, USE, REPUTATION, DATA OR CROPS.

ASSISTANCE

To obtain assistance or information regarding this warranty, please contact your local sales representative or a Daikin Applied office.

Form No. 933-430285Y-01-A (11/2023)
Part No. 043028500 Rev.0F

Notes / Comments

Notes / Comments

Notes / Comments

COMPLETE HVAC SYSTEM SOLUTIONS

SELF-CONTAINED | ROOFTOPS | COILS | CONDENSING UNITS
AIR HANDLERS | WATER-COOLED CHILLERS | AIR-COOLED CHILLERS
MODULAR CENTRAL PLANTS | SITELINE BUILDING CONTROLS
UNIT HEATERS | FAN COILS | AIR PURIFIERS | WATER SOURCE HEAT PUMPS
VARIABLE AIR VOLUME UNITS | UNIT VENTILATORS

13600 INDUSTRIAL PARK BLVD. | MINNEAPOLIS, MN 55441
1-800-432-1342 | 763-553-5330

LEARN MORE AT
DAIKINAPPLIED.COM

PART NUMBER: OM1387