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Operating Manual
D-EOMWC00804-14_03EN

DWSC/DWDC Centrifugal Chillers – Vintage B

Original Instructions

Contents

1 GENERAL INFORMATION

This manual provides installation, operation, and maintenance information for Daikin DWSC/DWDC centrifugal chillers with the MicroTech® controller.

⚠ WARNING
Electric shock hazard. Improper handling of this equipment can cause personal injury or equipment damage. This equipment must be properly grounded. Connections to and service of the MicroTech® control panel must be performed only by personnel that are knowledgeable in the operation of the equipment being controlled.
⚠ 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 control panel before performing any service work. Never unplug any cables, circuit board terminal blocks, or power plugs while power is applied to the panel.
⚠ CAUTION
When moving refrigerant to/from the chiller from an auxiliary tank, a grounding strap must be used. An electrical charge builds when halo-carbon refrigerant travels in a rubber hose. A grounding strap must be used between the auxiliary refrigerant tank and the chiller's end sheet (earth ground), which will safely take the charge to the ground. Damage to sensitive electronic components could occur if this procedure is not followed.

This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with this instruction manual, it may cause interference with radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the owner will be required to correct the interference at the owner's own expense.
Daikin Applied disclaims any liability resulting from any interference or for the correction thereof.

HAZARD IDENTIFICATION INFORMATION

⚠ DANGER
Dangers indicate a hazardous situation, which will result in death or serious injury if not avoided.
⚠ WARNING
Warnings indicate potentially hazardous situations, which can result in property damage, severe personal injury, or death if not avoided.
⚠ CAUTION
Cautions indicate potentially hazardous situations, which can result in personal injury or equipment damage if not avoided.

2 THE CONTROL SYSTEM

The centrifugal MicroTech® control system consists of a human machine interface touch screen (HMI), a microprocessor-based unit controller, and compressor onboard controllers, providing monitoring and control functions required for the efficient operation of the chiller.

2.1 Human Machine Interface

The human machine interface screen (HMI), see picture below for an example of a screen display, is the primary device for viewing unit operation information and entering commands and entries into the control system. Select information from the HMI panel can be downloaded via a USB port located on the side of the touchscreen panel.
A single HMI is used per unit. The HMI panel is mounted on a moveable arm to allow placement in a convenient position for the operator. The HMI PC is located in the Control Panel. For more information on the HMI, see the "Machine Interface Screen (HMI)" section.

Figure 1: Operator Interface Touch Screen

3 UNIT CONTROLLER

The purpose of the MicroTech® unit controller is to acquire and process data relating to chiller operation, issue instructions to various components of the chiller, and maintain controlled operation of the chiller. As a part of operating the chiller successfully, the unit controller offers necessary condenser water control.
The controller is located in the control panel. It has a 4x20 LCD display and keys for accessing data and changing setpoints. The controller sends information to the machine interface touch screen (HMI) for graphic display. If the HMI should become inoperable, the controller LCD can display most of the same information as the HMI and can be used to operate the chiller independently of the HMI.

4 OPERATOR RESPONSIBILITIES

It is important that the operator become familiar with the equipment and the system before attempting operation. During the initial startup of the chiller, the Daikin Applied technician will be available to answer any questions and instruct the proper operating procedures. It is recommended that the operator maintain an operating log for each individual chiller unit. In addition, a separate maintenance log should be kept of the periodic maintenance and servicing activities.

5 SEQUENCE UNIT OPERATION

A general chiller sequence of operation is outlined below for DWSC/DWDC chillers. A separate sequence is provided for single and dual compressor units. Certain conditions and chiller alarms may alter this sequence, but the chiller's objective is to achieve the target temperature of the leaving water.

6 SINGLE COMPRESSOR UNITS

The following sequence of operation applies to Model DWSC chillers with a single compressor.

6.1 Chiller enabled

With the chiller enabled via its onboard interlocks and selected external control source, it will start the evaporator pump and check for flow and chiller load.

6.2 Water flow and load proven

Once evaporator flow has been confirmed and the chiller load proven, the sequence for starting the compressor will begin.

6.3 Compressor Start

The shaft rotation begins, as fault monitoring continues. The compressor moves into run state and ramps its speed, which is defined by the load. The compressor maintains its speed between the calculated minimum and maximum speed, while the Inlet Guide Vanes (IGV) modulate to full open. Speed modulation may not be available if VFD option is not installed.

6.4 Condenser pump start

As positive Lift is developed, the condenser pump is commanded to start and water flow is confirmed.

6.5 Compressor loading

As building load increases, the compressor will load up maximizing the Inlet Guide Vane (IGV) position and impeller speed. Maximum capacity at a given operating condition can be found either when the compressors have reached their maximum speed limit (Mechanical limitation) or when the compressors have reached the chiller's Rated Load Amperage (Electrical limitation).

6.6 Compressor unloading

As load decreases, the compressor will unload to sustain the water temperature setpoint by reducing speed until the minimum speed limit has been reached. If further unloading is required, the IGV assemblies will close as required to maintain stable compressor operation.

6.7 Chiller shutdown

The compressor will adjust capacity to manage the chiller load and will shut off when the stop delta temperature is acquired. Anytime the chiller is disabled, it will perform an orderly unload and compressor shutdown.

7 DUAL COMPRESSOR UNITS

The following sequence of operation applies to Model DWDC chillers with dual compressors.

7.1 Chiller enabled

With the chiller enabled via its onboard interlocks and selected external control source, it will start the evaporator pump and check for flow and chiller load.

7.2 Water flow and load proven

Once evaporator flow has been confirmed and the chiller load proven, auto lead-lag logic will determine which compressor to start as the Lead.

7.3 Compressor start

The shaft rotation begins, as fault monitoring continues. The compressor moves into run state and ramps its speed, which is defined by the load. The compressor maintains its speed between the calculated minimum and maximum speed, while the Inlet Guide Vanes (IGV) modulate to full open.

7.4 Condenser pump start

As positive Lift is developed, the condenser pump is commanded to start and water flow is confirmed.

7.5 Lead compressor operation

The Lead compressor will adjust capacity to manage the chiller load. As the Lead compressor approaches its maximum capacity it will assess the need for the Lag compressor. If the Lag compressor is needed, the Lead compressor will signal the Lag compressor to start, and may adjust its capacity to assist the Lag compressor from start to vanes fully open.

7.6 Lag compressor start

Once started and the vanes have fully opened, the Lag compressor will quickly ramp up to balance the chiller load between the two compressors.

7.7 Dual compressor loading

As building load increases, the compressors will load up maximizing the Inlet Guide Vane (IGV) position and impeller speed. Maximum capacity at a given operating condition can be found either when the compressors have reached their maximum speed limit (Mechanical limitation) or when the compressors have reached the chiller's Rated Load Amperage (Electrical limitation).

7.8 Dual compressor unloading

As load decreases, the compressors will unload to sustain the water temperature setpoint by reducing speed until the minimum speed limit has been reached. If further unloading is required, the IGV assemblies will close as required to satisfy the load.

7.9 Staging down to one compressor running

With the chiller running two compressors and the building load reducing to the point that one compressor can carry the load, auto lead-lag logic will again determine which compressor to shutdown. However, the shutdown will not occur until the water temperature is more than a degree below setpoint.

7.10 Chiller shutdown

The remaining compressor will adjust capacity to manage the chiller load until the load increases to the point where another compressor is needed, or the load reduces below the minimum capacity of one compressor and the leaving water temperature goes below setpoint and reaches the stop delta temperature. Anytime the chiller is disabled, it will perform an orderly unload and shutdown both compressors.

8 UNIT ENABLING/DISABLING

There are multiple switches that will enable and disable the chiller and its compressors (see Figure 3 on page 5 for location of the switch bracket):

1. Unit Switch - The top switch on the switch bracket that is mounted inside the control panel.
2. Compressor 1 Switch - Located underneath the Unit Switch on the switch bracket.
3. Compressor 2 Switch - Located underneath the Compressor 1 Switch on the switch bracket. On dual compressor units only.
4. External Switch - Located on the outer, left side of the control box.
5. Remote Switch - Optional. Replaces a jumper between Field Terminals as per wiring diagram.

The switches listed above work in conjunction with the “Control Source” that is selected in the HMI via the MODES Setpoint Screen using Setpoint button #3.

The three options for “Control Source” are:

1. Switches - This is the default mode. This mode will ignore BAS commands.
2. Local - When this mode is set, a STOP button and an AUTO button will appear at the top of the HMI screens. **This mode will ignore all functionality of a connected Remote Switch**. It will also ignore BAS commands.
3. BAS - This mode adds BAS capability to the Switches functionality.

Enabling and disabling the unit and its compressors using the switches in conjunction with the selected “Control Source” are discussed next.

8.1 Enabling

To enable the chiller and its compressors when the “Control Source” is “Switches” or “BAS,” all rocker switches (three rocker switches for single compressor units, four rocker switches for dual compressor units) and the Remote Switch, if included, need to be closed (in the ON position).

If the “Control Source” is set to “Local” and a remote switch is being used, the position of the remote switch is not ignored. This means the rocker switches and remote switch need to be closed. Once these rocker switches are closed, press the AUTO button on the HMI to enable the chiller in “Local” mode.

8.2 Disabling

Each of the four switches located on the unit have a different functionality in terms of disabling. The descriptions below apply if the “Control Source” on the HMI MODES Setpoint Screen is set to “Switches” or “BAS.”

1. Unit Switch- When placed in the OFF position while the chiller is running, the Unit Switch will shutdown the chiller in a normal controlled sequence and will stop each compressor that is running. This switch will leave the entire chiller disabled until it is set in the ON position.
2. Compressor 1 Switch - When placed in the OFF position, this switch prevents Compressor 1 from being used in the normal auto-sequencing of the compressors. If Compressor 1 is running when this switch is placed in the OFF position, the compressor will perform a “rapid stop” different from the stop caused from placing the Unit Switch in the OFF position.
3. Compressor 2 Switch - This switch functions in the same manner as the Compressor 1 Switch but it controls Compressor 2 instead. This switch is only applicable to dual compressor units.
4. External Switch - If placed in the OFF position, this switch will cause both compressors to do a “rapid stop” together. In other words, putting this switch in the OFF position has the same effect as placing both the Compressor 1 Switch and the Compressor 2 Switch in the OFF position. The External Switch will leave the unit disabled until it is placed in the ON position.
5. Remote Switch - This switch will disable the chiller in a similar manner as the Unit Switch.

If the “Control Source” on the HMI MODES Setpoint Screen is set to “Local,” press the STOP button on the HMI to disable the chiller. This method of disabling will cause the chiller to act in a similar manner as when it is disabled using the Unit Switch in the “Switches” or “BAS” mode.

9 MACHINE INTERFACE SCREEN (HMI)

The following sections outline the operation of the HMI panel.

9.1 HMI On/Off

The HMI is turned on/off with a switch located at the lower front of the display panel. Screen control buttons are located to either side of it and elicit on-screen prompts when pressed. The HMI is equipped with a screen saver that can be configured to initiate at 10,30 and 60 second increments. If the screen is black, touch it first to be sure it is on before using the ON/OFF button.

9.2 Chiller Operation Without the HMI

The Human Machine Interface touch screen (HMI) communicates with the controller, displaying data and transmitting touch screen inputs to the controllers. It does no actual controlling and the chiller can operate without it. Should the touch screen become inoperable, no commands are necessary for continuing unit operation. All normal inputs and outputs will remain functional. The unit controller can be used to view operational data, to clear alarms, and to change setpoints, if necessary.

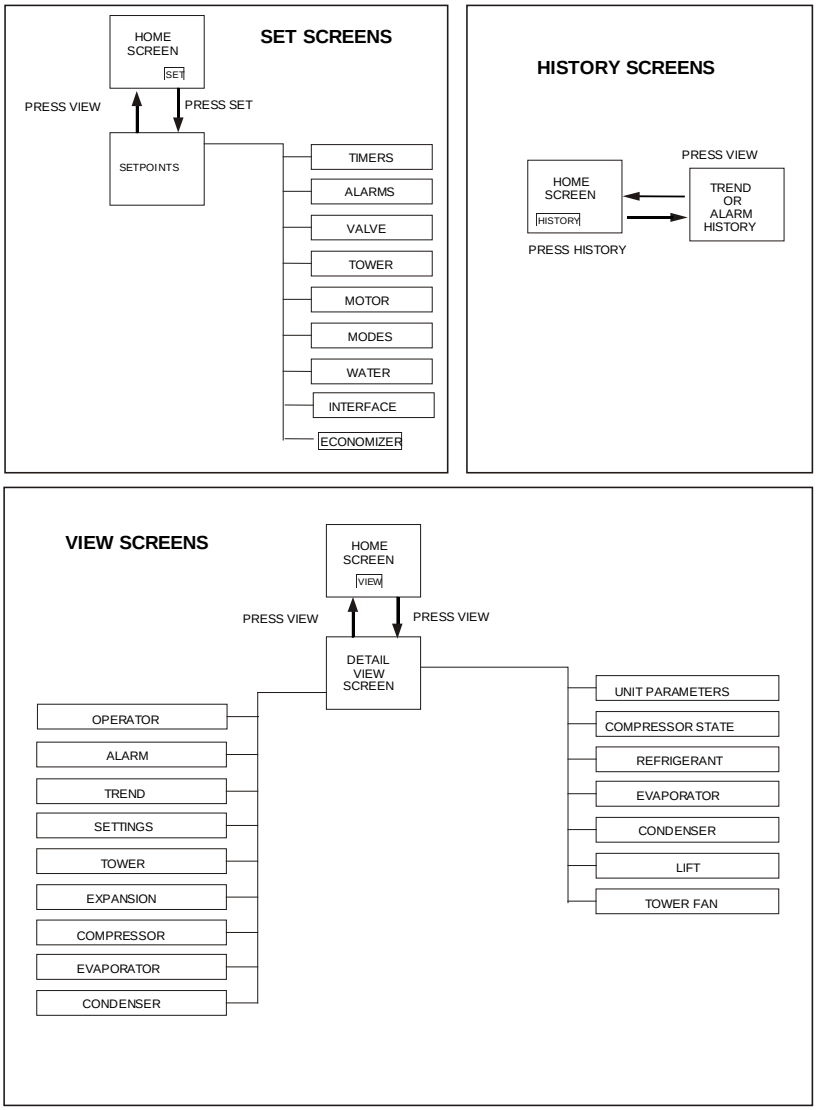
9.3 Navigation Summary

The Home View Screen is usually left on. This screen contains the AUTO and STOP buttons used to start and stop the unit when in “Local” control mode. Other groups of screens can be accessed from the Home View Screen by pressing one of ten buttons on the bottom of every screen:

- EVAPORATOR
- COMPRESSOR
- CONDENSER
- EXPANSION
- TOWER
- SETTINGS
- TREND
- ALARM
- OPERATOR

Additional details and screen captures can be found on following pages.

Figure 2: HMI Screen Layout



9.4 VIEW Screens

View screens are used for looking at unit status and conditions.

9.4.1 Home View Screen

The Home View Screen shows the basic operating condition of the chiller and is the screen that is normally left on. Note that the chiller displayed on this screen, as well as on all other screens that display an image of the chiller, will show either one or two compressors depending on the chiller model.

Figure 3: Home View Screen

Superimposed on the Home View Screen is:

(I) Alarm

- An ALARM button will display a red dot should an alarm occur. This ALARM button will appear on most screens in the case of an alarm. The ALARM button is displayed on the bottom of the screen.
- Any type of alarm will cause the ALARM button to highlight. Pressing the ALARM button will bring up the Active Alarms Screen to view the alarm details. For more information on alarms.

(II) Information

- Chilled water setpoint (ACTIVE LWT SETPOINT)
- Entering and leaving evaporator water temperatures
- Entering and leaving condenser water temperatures
- Percent unit RLA
- UNIT STATUS, which is MODE followed by STATE followed by the SOURCE that is the device or signal that created the STATE. The possible combinations are shown in Table 1.

UNIT STATUS Possibilities

MODE	STATE	SOURCE
COOL	OFF	Manual Switch
	SHUTDOWN	Remote Switch
	AUTO	Local
		BAS Network

COMPRESSOR STATUS, shown for each unit compressor (#1 only for single compressor units, both #1 and #2 for dual compressor units), is MODE followed by STATE followed by the SOURCE that is the device or signal that created the STATE.

COMPRESSOR STATUS Possibilities

Complete STATUS Text (in priority sequence)	Notes
OFF Manual Switch	Reason for the compressor being off
OFF Compressor Alarm	
OFF Unit State	
OFF Evap Flow/Re-circulate	
OFF Start to Start Timer=xxx	
OFF Stop to Start Timer=xxx	
OFF Staging (Next ON)	
OFF Awaiting Load	
RUN Unload Vanes-Max Amps	Overrides water temperature command
RUN Hold Vanes-Max Amps	
RUN Load	Normal operation
RUN Hold	
RUN Unload	
SHUTDOWN Unload	Unloading during the shutdown sequence

NOTE: Timer countdown values will be shown where “xxx” is shown.

(III) Action Buttons

- Chiller Control: AUTO button (normal start) and STOP button (normal shutdown). **These buttons are only visible and active when the control is in the “Local” mode.** For display purposes, the rest of the screen images presented in this manual will not show the AUTO and STOP buttons.
- TREND button: Toggles between the Trend History Screen and the Alarm History Screen.
- DETAIL tab: Shows details about the unit status and conditions. Pressing this button will toggle between the Home View Screen and the Detail View Screen.
- SETTINGS button: Toggles between the Setpoint Screens that are used for changing setpoints and the Service Screen.

9.4.2 Detail View Screen

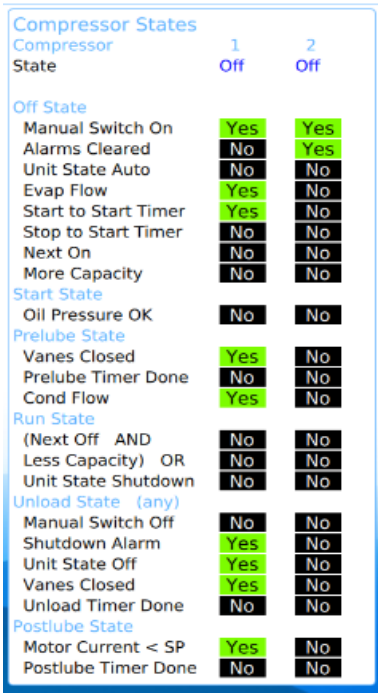
Detail View Screen can also be accessed by pressing the VIEW button from any other screen that contains the VIEW.

Pressing the DETAIL tab on the top of the Home View Screen button. accesses the Detail View Screen, The Data for all compressors is shown simultaneously on the Detail View Screen. If the unit is a dual compressor unit, pressing the COMP button in the lower-left hand corner of the screen will generate additional statuses.

Various information will appear on the right side of the Detail View Screen by pressing available buttons. For example, pressing the COMP button will bring up a display of the Compressor State Information on the right side of the Detail View Screen. Use the COMP button to toggle between the two compressors' data.

Figure 4: Detail View Screen

9.4.2.1 Compressor State Information

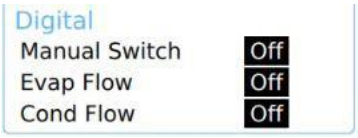


The Compressor State Information is basically a compilation of the events that the chiller sequences through at startup. A green light indicates that a particular sequence requirement has been satisfied. It is recommended that this information be viewed during the startup sequence. One can see the requirements light up as they are met and quickly see why a non-start may have occurred. For instance, the “Evap Flow OK” item will light when the evaporator flow switch is closed by flow. The bottom sections (from “RUN” down) of the Compressor State Information are in effect during the shut down process. The sequence transitions back to OFF at this point and the OFF light will be illuminated.

Pressing the COMP button on the Detail View Screen displays the status of the compressor digital inputs and outputs.

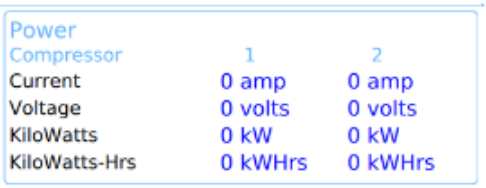
For dual compressor units, use the COMP button to toggle between the two compressors’ data. Many of the inputs and outputs shown in the Compressor Inputs/Outputs Information will also appear under the Compressor State Information since they are part of the startup sequence and define the compressor state at any given time.

Compressor Inputs/Outputs Information

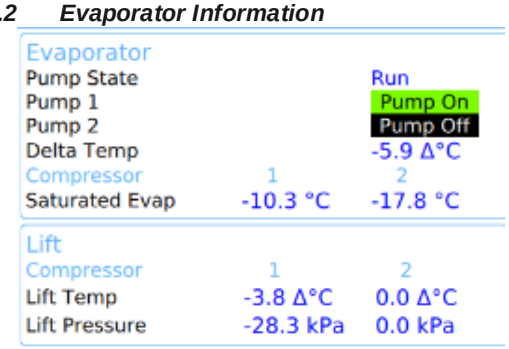


The Power screen can be accessed by pressing the COMP button and will display the current, voltage, and power of the chiller. Pressing the EVAP or COND buttons on the Detail View Screen will display pertinent vessel temperatures and pressures. The Evaporator Information and Condenser.

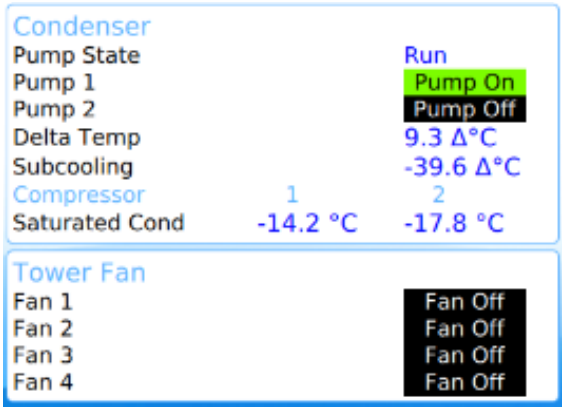
Power Information



9.4.2.2 Evaporator Information



9.4.2.3 Condenser Information



Pressing the COND or EVAP button on the Detail View Screen displays the unit digital inputs, digital outputs, and analog outputs. Note that operation of the condenser and evaporator water pumps and operation of the tower constitute most of the data flow. An illuminated block indicates that either an input or output signal exists.

9.4.3 View Menu Screen

As with the Detail View Screen, information will appear on the right side of the View Menu Screen by pressing available buttons. Much of the available information is the same as what is found on the Detail View Screen. For example, pressing the Compressor STATE, Compressor I/O, Unit I/O, EVAP, or COND buttons will display the same information as what is available from the Detail View Screen.

9.5 SET Screens

The Setpoint Screens on the Machine interface Touch Screen (HMI) are used to input the many setpoints associated with equipment of this type. MicroTech® provides a simple method for accomplishing this. (Note that if the HMI is unavailable, the controller can be used to change setpoints.) Appropriate setpoints are factory set and checked by a Daikin Applied service representative during commissioning; however, adjustments and changes are often required to meet job.

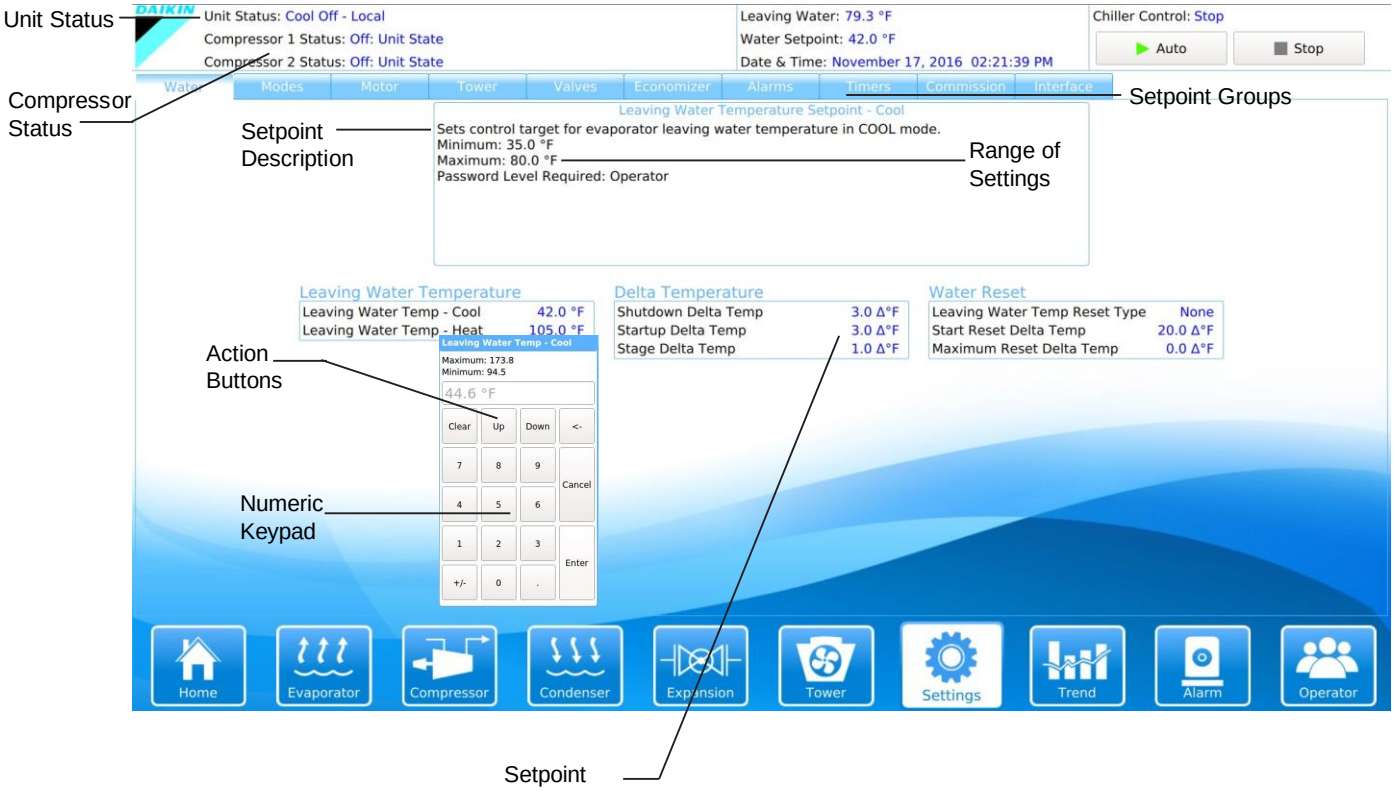
9.5.1 Typical Setpoint Screen

Certain settings involving pumps and tower operation are field set.

Pressing the Settings button found on almost every screen accesses the last Setpoint Screen used or the Service Screen, whichever of the two was used last. When in any Setpoint.

Screen, pressing the SET button again will toggle to the Service Screen. A typical Setpoint Screen is displayed below.

Figure 5: Water Setpoint Screen



The various setpoint groups are in a column on the right side of the screen. Each button contains a number of setpoints grouped together by similar content. The WATER button, for example, contains various setpoints relating to water temperature setpoints.

NOTE: Some setpoints that do not apply to a particular unit application may still be listed on the screen but will be grayed out. They will be inactive and can be ignored.

The numbered Setpoint Selection buttons are pressed to select a particular setpoint. The selected setpoint will appear in blue on the screen and a description of it (with the range of available settings) will appear in the upper left-hand box.

9.5.2 Procedure for Changing a Setpoint

A list of setpoints along with their default value, available setting range, and password authority can be found in the tables under each Setpoint Screen. Follow the steps listed below in order to change a setpoint.

⚠ CAUTION

Many setpoints are interactive. Changes may have an adverse effect on chiller operation. Only trained operators should be allowed to change chiller setpoints.

1. Press the applicable Setpoint Group. (A complete explanation of setpoint content of each group follows this section.)
2. Select the desired setpoint by pressing the numbered Setpoint Selection button.
3. Press the CHANGE button to change a setpoint value. The Keyboard Screen will be turned on automatically to facilitate entering the password.
4. Input the appropriate password number. (Use 100 for operator level or 2001 for manager level. The technician level password is only provided to Daikin Applied technicians) There is a small delay between pressing the keypad and recording the entry. Be sure that an asterisk appears in the window before pressing the next number.
5. After inputting the password on the Keyboard Screen, press ENTER to return to the Setpoint Screen. The password will remain active for 15 minutes after initiation and does not need to be re-entered during this period.
6. Press CHANGE again on the Setpoint Screen. The right side of the screen will become inactive (the background will turn blue). The Numeric Keypad and Action buttons in the lower left-hand corner of the screen will become active (the background will turn green).
7. Setpoints with numeric values can be changed in two ways:
   - Select the desired value by pressing the numbered buttons on the Numeric Keypad. Press ENTER to enter the value or CANCEL to cancel the transaction.
   - Press the UP or DOWN button to increase or decrease the value displayed. Press ENTER to enter the value or CANCEL to cancel the transaction.

   Some setpoints are selectable text rather than numeric values. For example, LWT Reset Type (Setpoint 7) on the WATER Setpoint Screen can be “None” or “4-20 ma.” The selection can be made by toggling between choices using the UP or DOWN button. If dashed lines appear in the setpoint window it means that toggling in that direction can go no further, so reverse direction. Press ENTER to enter the choice or CANCEL to cancel the transaction.

   Once CHANGE is selected, the CANCEL or ENTER buttons must be pressed before another setpoint can be selected.
8. Additional setpoints can be changed by selecting another setpoint on the screen using the Setpoint Selection buttons or by selecting an entirely new group of setpoints using the Setpoint Group buttons.

9.5.3 Description of Setpoints

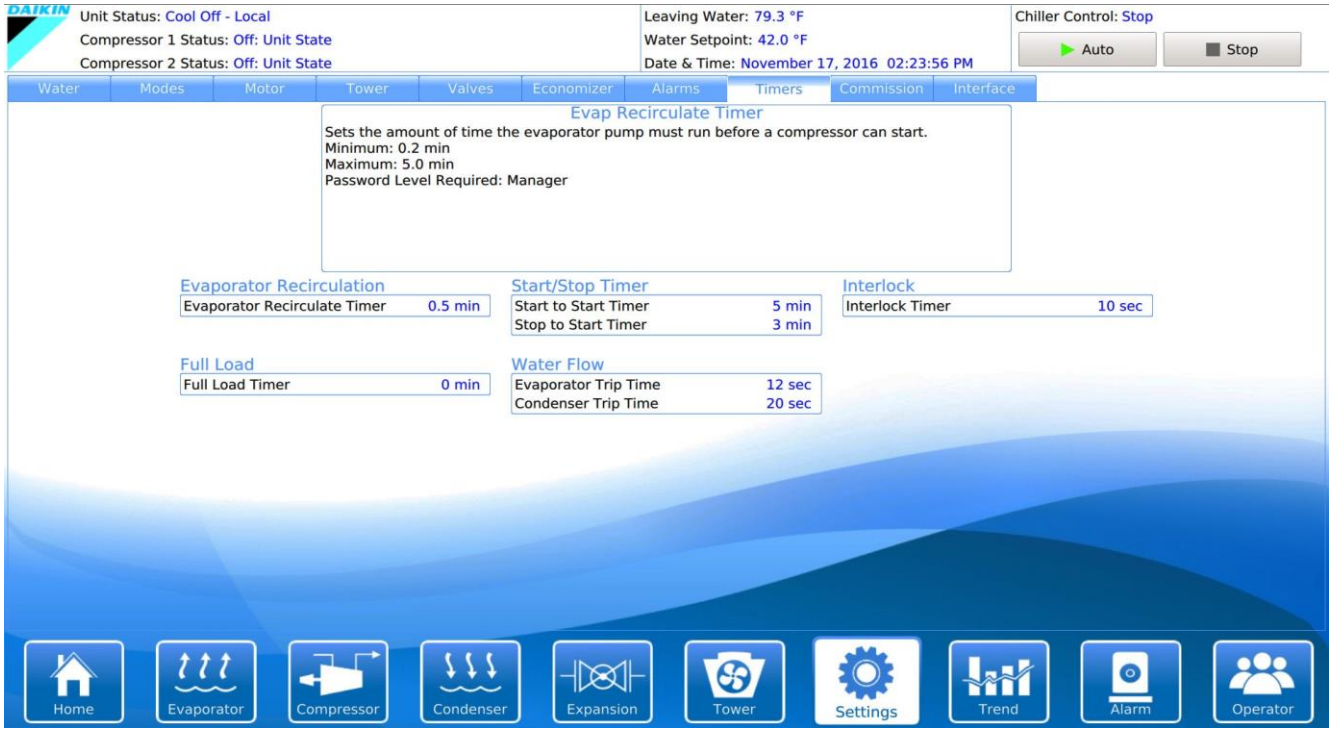
There are ten setpoint groups shown on the Setpoint Screens:

1. TIMERS, sets timers such as start-to-start, etc.
2. ALARMS, sets the limit and shutdown alarms.
3. VALVE, sets the parameters for operation of an optional field-installed tower bypass valve.
4. TOWER, selects the method of controlling the cooling tower and sets the parameters for fan staging/VFD.
5. MOTOR, selects motor related setpoints such as amp limits. Also has maximum and minimum rate of change of chilled water temperature.
6. MODES, selects various modes of operation such as control source, multiple compressor staging, pump staging, BAS protocol, etc.
7. WATER, sets leaving water temperature setpoint, start and stop delta-T, resets, Templifier settings, etc.
8. INTERFACE, sets software and administrative options.
9. COMMISSION, sets parameters and component configurations.

Each of the ten setpoint groups are detailed in the following pages.

9.5.4 TIMERS Setpoints

Figure 6: TIMERS Setpoint Screen



TIMERS Setpoint Settings

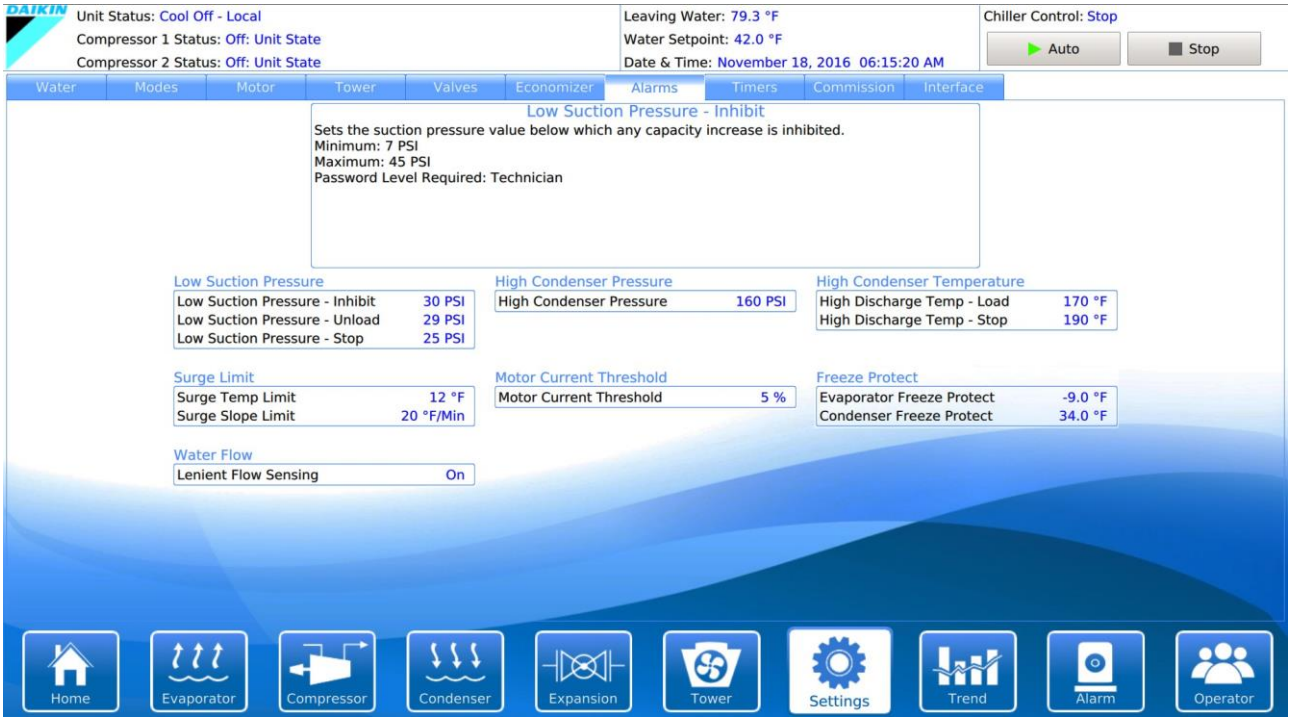
Description	Default	Range	Password	Comments
Full Load Timer	300 sec	0 to 999 sec	M	Time compressor must load (without unloading) before vanes are considered fully open. This setpoint does not apply to this model chiller.
Interlock Timer	10 sec	10 to 240 sec	T	Maximum time allowed before interlock confirmation from compressor
Stop-Start Timer	3 min	1 to 20 min	M	Time from when compressor stops to when it can restart
Start-Start Timer	5 min	2 to 60 min	M	Time from when compressor starts to when it can start again
Evap Recirculate Timer	30 sec	0.2 to 5 min	M	Time that evaporator pump must run before compressor start
Evaporator Trip Time	12 sec	1 to 20 sec	M	Sets the suction pressure trip point if the pressure rises within 5psi
Condenser Trip Time	20 sec	1 to 20 sec	M	Sets the discharge pressure trip point if the pressure rises within 5psi

NOTE: the Password column refer to the following:

- O = Operator Level (The password number for operator level is 100.)
- M = Manager Level (The password number for manager level is 2001.)
- T = Technician Level (the password number for technician level is only provided to technicians who have completed Service training with the Daikin Learning Institute.)

9.5.5 ALARMS Setpoints

Figure 7: ALARMS Setpoint Screen



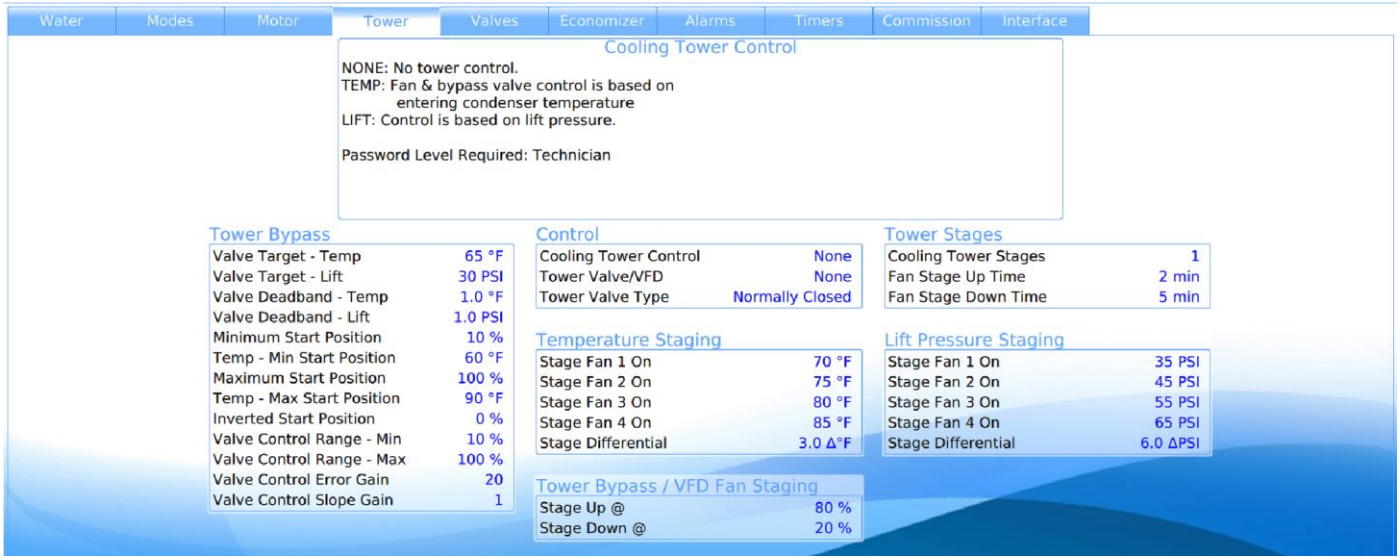
ALARMS Setpoint Settings

Description	Default	Range	Password	Comments
Condenser Freeze Protect	34.0 °F	-9.0 to 45.0 °F	T	Minimum condenser saturated temperature to start pump
Evaporator Freeze Protect	34.0 °F	-9.0 to 45.0 °F	T	Minimum evaporator saturated temperature to start pump
Motor Current Threshold	10%	1 to 20%	T	Min %RLA to consider that the is motor off
Surge Slope Limit	20 °F/min	1 to 99 deg F/min	T	Surge temperature (ST) slope value above which alarm occurs. Active only if ST>SP7 at start
Surge Temperature Limit	50 °F	2 to 45 °F	T	At start, Surge Temp (ST) is compared to this SP. Alarm at ST>2x SP.
High Discharge Temp-Stop	190 °F	120 to 240 °F	T	Max discharge temp to shut down compressor
High Discharge Temp-Load	170 °F	120 to 240 °F	T	Sets discharge temp above which a forced capacity increase occurs
High Discharge Pressure	140 psi	120 to 240 psi	T	Max discharge pressure, stop compressor
Low Suction Pressure, Stop	25 psi	5 to 45 psi	T	Min suction pressure – stop compressor
Low Suction PressureUnload	29 psi	6 to 45 psi	T	Min suction pressure – unload compressor
Low Suction Pressure-Inhibit	30 psi	7 to 45 psi	T	Min suction pressure – inhibit loading
Lenient Flow Sensing	On	Off/On	T	On- reduction in unit trips by detecting a loss of flow signal (>5 Sec)
EXV Gain	78	Configurable	T	Gain selection based on chiller size and valve type. Alternate Mode – Gain based on chiller function (Cool/Ice/Heat).
EXV Offset	700	Configurable	T	Offset selection based on chiller size and valve type. Alternate Mode – Offset based on chiller function.
SH Dropout Temp	10°F	10-50	T	Selected temperature that the EXV transitions from Pull-down control, to running on condition.

NOTE: The setpoints listed above should only be changed by a Daikin Applied technician. Contact a Daikin Applied service representative for more information.

9.5.6 Cooling Tower Fan Setpoints

Figure 8: TOWER Fan and Valve Setpoint Screen



TOWER Fan and Valve Setpoint Settings

Description	Default	Range	Password	Comments
Valve Deadband (Lift) [SP5]	1.0 psi	0 to 20.0 psi	T	Control deadband, Tower SP1 =Lift
Valve Deadband (Temp) [SP4]	1.0 °F	0 to 10.0 °F	T	Control deadband, Tower SP1=Temp
Valve Target (Lift)	30 psi	10 to 130 psi	T	Target for lift pressure (Tower SP1= Lift), Works with SP5
Valve Target (Temp) [SP2]	65 °F	40 to 120 °F	T	Target for condenser EWT (Tower SP1= Temp), Works with SP4
Maximum Start Position [SP10]	100%	0 to 100%	T	Initial valve position when condenser EWT is at or above SP11
Temp - Min Position [SP9]	60 °F	0 to 100 °F	T	Condenser EWT at which initial valve position is set to SP8
Minimum Start Position [SP8]	10%	0 to 100%	T	Initial position of valve when condenser EWT is at or below SP9
Inverted Start Position	0%	0 to 100%	T	Selects the EXV position for an inverted chiller start.
Valve Control Slope Gain	1	0 to 99	T	Control gain for temperature (or lift) slope
Valve Control Error Gain	20	0 to 99	T	Control gain for temperature (or lift) error
Valve Control Range (Max)	100%	0 to 100%	T	Maximum valve position, overrides all other settings
Valve Control Range (Min)	10%	0 to 100%	T	Minimum valve position, overrides all other settings
Stage Down @	20%	0 to 100%	T	Valve position below which the fans can stage down (Tower - SP2 = Valve Stage Down VFD speed below which the next fan speed can turn off (Tower - SP2 = valve/VFD. (Valve position % closed)
Stage Up @	80%	0 to 100%	T	Valve position above which the fans can stage up (Tower - SP2 = Valve Stage Down VFD speed above which the next fan speed can turn on (Tower - SP2 = valve/VFD. (Valve position % open)
Stage #4 On (Lift)	65 psi	10 to 130 psi	M	Lift pressure for fan stage #4 on
Stage #3 On (Lift)	55 psi	10 to 130 psi	M	Lift pressure for fan stage #3 on

Stage #2 On (Lift)	45 psi	10 to 130 psi	M	Lift pressure for fan stage #2 on
Stage #1 On (Lift)	35 psi	10 to 130 psi	M	Lift pressure for fan stage #1 on
Stage #4 On (Temp)	85 °F	40 to 120 °F	M	Temperature for fan stage #4 on
Stage #3 On (Temp)	80 °F	40 to 120 °F	M	Temperature for fan stage #3 on
Stage #2 On (Temp)	75 °F	40 to 120 °F	M	Temperature for fan stage #2 on
Stage #1 On (Temp)	70 °F	40 to 120 °F	M	Temperature for fan stage #1 on
Stage Differential (Lift)	6.0 psi	1.0 to 20.0 psi	M	Fan staging deadband with SP1=Lift

Stage Differential (Temp)	3.0 °F	1.0 to 10.0 °F	M	Fan staging deadband with SP1=Temp
Fan Stage Down Time	min	to 60 min	M	Time delay between stage up/down event and next stage down
Fan Stage Up Time	min	to 60 min	M	Time delay between stage up/down event and next stage up
Cooling Tower Stages	2	to 4	M	Number of fan stages used
Twr Bypass Valve/Fan VFD [SP2]	None	None, Valve SP, Valve Stage, VFD Stage, Valve SP/ VFD Stage	M	None: No tower valve or VFD Valve SP: Valve controls to VALVE SP2(4) & 3(5) Valve Stage: Valve control setpoint changes to fan stage setpoint VFD Stage: 1st fan is VFD controlled, no valve Valve SP/VFD Stage: Both valve and VFD
Cooling Tower Control [SP1]	None	None, Temperature, Lift	M	None: No tower fan control Temperature: Fan and valve controlled by EWT Lift: Fan and valve controlled by lift pressure
Tower Valve Type	NC (To Tower)	NC, NO	T	Normally closed (NC) or normal open (NO) to tower

Description of Tower Control Settings

There are five possible tower control strategies: (I) **NONE**, (II) **VALVE SP**, (III) **VALVE STAGE**, (IV) **VFD STAGE**, and (V) **VALVE SP / VFD STAGE**. These control strategies are selected from the TOWER Setpoint Screen using Setpoint 2. (In the following pages, “SP” means “Setpoint.”) An explanation of each control strategy follows this paragraph. Along with each explanation is a diagram and graph to help illustrate the control strategy. Note that these graphs illustrate the default conditions for each strategy.

(I) **NONE:** This control strategy is tower fan staging only. ***This is not a recommended strategy***. In this mode the tower fan staging (up to four stages) is controlled by either the condenser Entering Water Temperature (EWT) or LIFT pressure (difference between the condenser and suction pressure). Tower bypass or fan speed are not controlled.

9.5.6.1 TOWER Setpoint - SP2 - (I) NONE (I) NONE

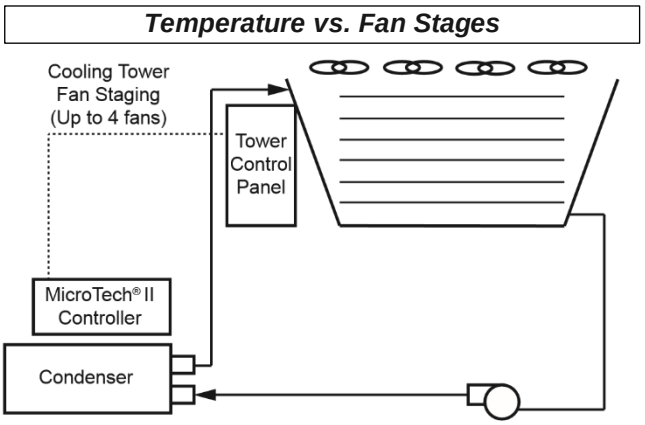
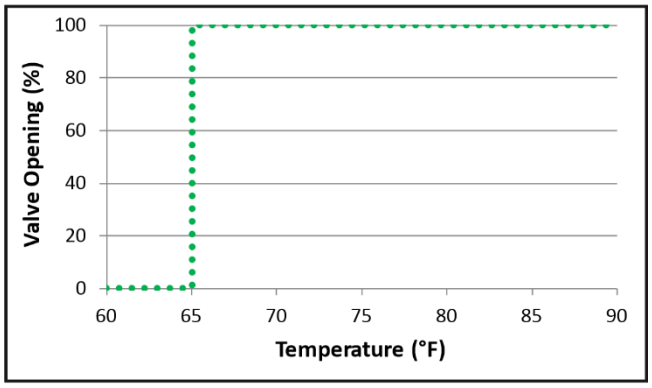
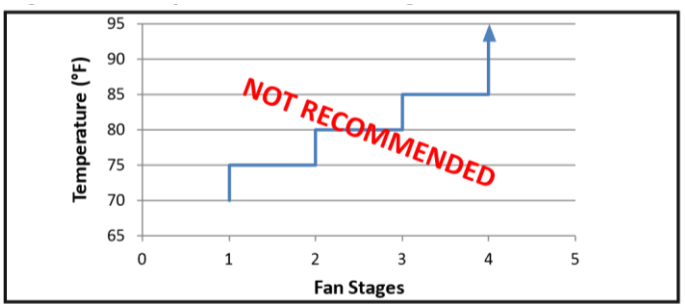


Figure 9: VALVE SP - Valve opening VS Temperature



As shown the default temperature at which the valve opens completely is 65°F. This temperature is the Valve SP (also called valve target) and is adjustable

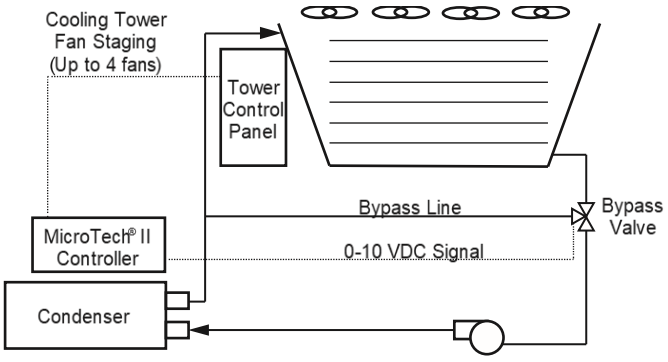
Figure 10: Temperature VS Fan stages



(II) **VALVE SP:** This control strategy is tower staging (up to four stages) with a low-limit controlled bypass valve. The tower fans are controlled as in (I), plus a tower bypass valve is controlled to provide a minimum condenser EWT. There is no interconnection between the fan control and the valve control. See Figure 38 and Figure 38.

(III) **VALVE STAGE:** This control strategy is tower staging (up to four stages) with a stage-controlled bypass valve. In this mode, the bypass valve controls between fan stages.

9.5.6.2 TOWER Setpoint - SP2 - (II) VALVE SP (II)



to smooth the control and reduce fan cycling.

9.5.6.3 TOWER Setpoint - SP2 - (III) VALVE STAGE

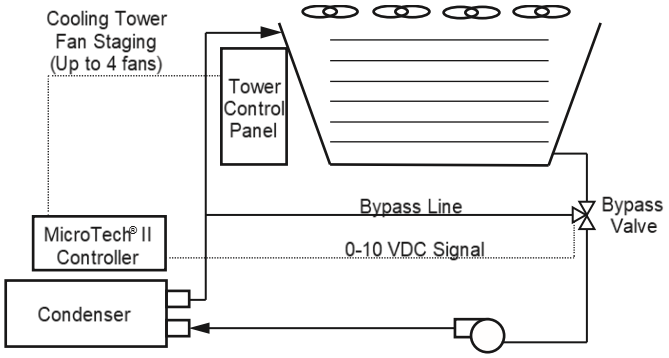
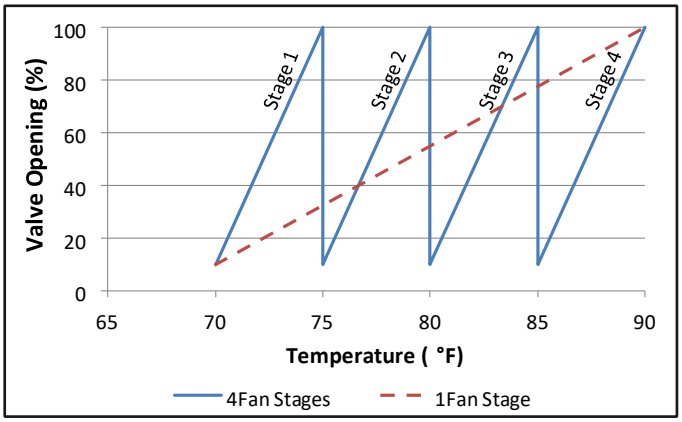


Figure 11: VALVE STAGE - Valve opening VS Temperature



As shown in Figure 11, the default minimum and maximum valve opening positions are 10% and 100%, respectively. These minimum and maximum positions are adjustable. Anywhere between 0% and 100%. Additional fans stage on when the valve opening position reaches the maximum value that was set.

9.5.6.4 TOWER Setpoint – SP2 – (IV) VFD STAGE

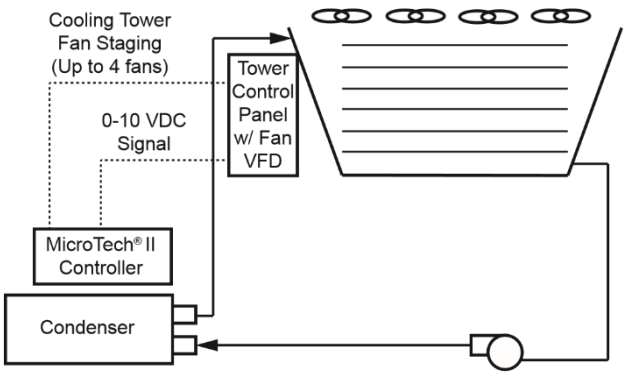
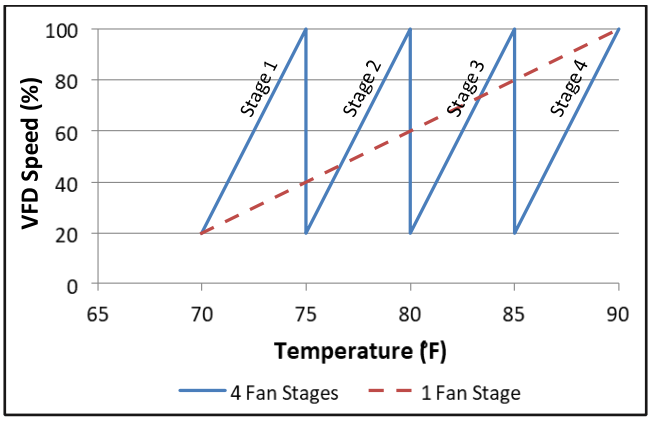


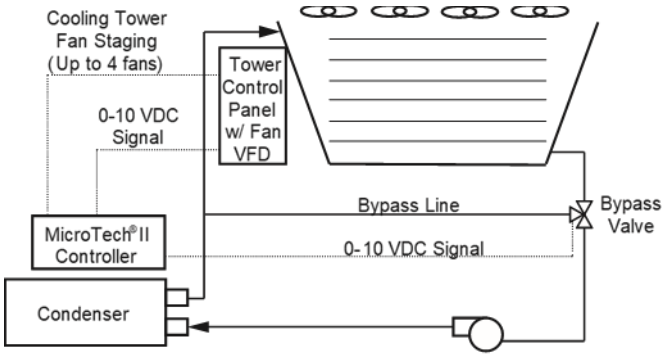
Figure 12: VFD STAGE - VFD Speed VS Temperature



(IV) **VFD STAGE:** In this mode, a VFD controls the first fan. Up to three more fans are staged on and off and there is no bypass valve.

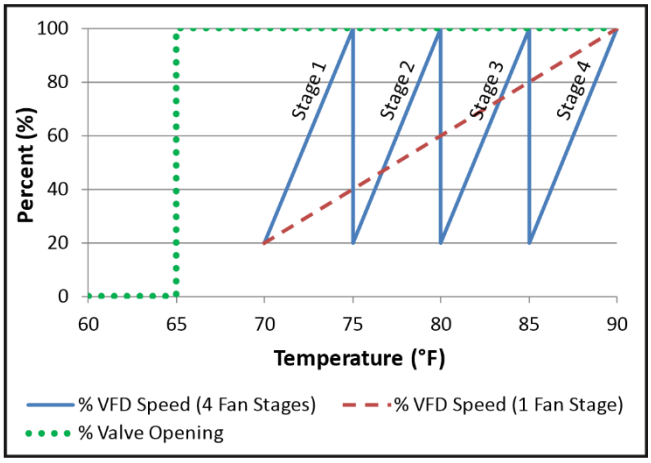
The default minimum and maximum VFD speeds are 20% and 100%, respectively. These minimum and maximum values are adjustable anywhere between 0% and 100%. Additional fans stage on when the VFD speed reaches the maximum value that was set.

9.5.6.5 TOWER Setpoint - SP2 - (V) VALVE SP / VFD STAGE



(V) **VALVE SP / VFD STAGE:** This control strategy is tower fan control with a VFD and bypass valve control.

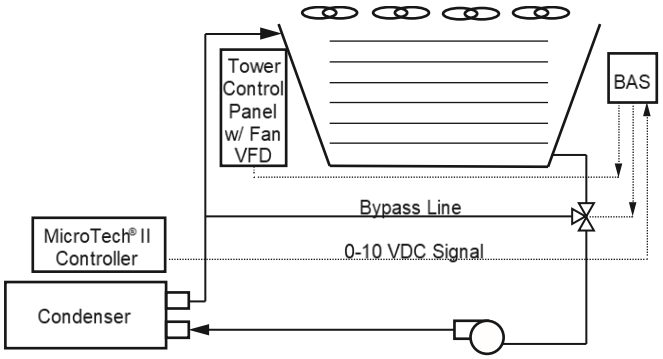
Figure 13: Percent VS Temperature VALVE SP / VFD STAGE



The default minimum and maximum VFD speeds are 20% and 100%, respectively. These minimum and maximum values are adjustable anywhere between 0% and 100%. Additional fans stage on when the VFD speed reaches the maximum value that was set. In addition, Figure 45 shows that the default temperature at which the valve opens completely is 65°F. This temperature is the Valve SP (also called Valve Target) and is adjustable.

9.5.6.6 BAS Alternate

In control strategies (I) through (V), the chiller MicroTech® is directly controlling the cooling tower fan staging, variable frequency drives, and bypass valves. As an alternative, a BAS can control these components based on a signal from the MicroTech® controller.



9.5.6.7 Setting Tower Control Using the HMI Panel

MicroTech® may assist in the head control either directly or through inputs to a BAS to optimize performance and efficiency. Using the MicroTech®, up to four Digital Outputs of Tower Staging along with three Analog Outputs (0-10 VDC) are available. The three Analog Outputs are as follows:

1. Bypass Valve signal
2. Tower Fan VFD signal
3. Tower Reset signal: Defined by a voltage to offset the tower control setting. If the MicroTech® is controlling the tower, this signal is not used.

Setup for any tower control will be accomplished on the HMI using the TOWER Setpoint Screen and the VALVE Setpoint Screen.

Setpoint 1 (Cooling Tower Control) on the TOWER Setpoint Screen sets the type of control. NONE is selected as default. Choose TEMP for entering condenser water control or LIFT to define the lift pressure between the Suction pressure and the Discharge pressure.

Setpoint 3 (Cooling Tower Stages) on the TOWER Setpoint Screen sets the number of tower stages that the tower has.

Setpoint 2 (Tower Bypass Valve / Fan VFD) on the TOWER Setpoint Screen defines if and how the first two MicroTech® Analog Outputs (Bypass Valve signal and Tower Fan VFD signal) will be used with the Staging selected for the tower. A BAS or other control may monitor these outputs to understand when or how much the MicroTech® would recommend for proper head control on the WMC unit. The third Analog Output (Tower Reset) is only configurable from the MicroTech® controller. Commissioning setup of this 0-10 VDC signal, that will represent the MicroTech® recommending increased head pressure by a reset voltage, is typically done by the Daikin Applied startup technician. Setup instructions for each of the five tower control strategies are provided next.

(I) NONE: Tower Fan Staging Only (This is the default setting but it is NOT a recommended control strategy).

The following settings are used for the Tower Fan Staging Only mode, (SP = setpoint)

A. TOWER Setpoint Screen
   1. SP1. Select TEMP if control is based on condenser EWT or LIFT if based on compressor lift expressed in pressure.
   2. SP2. Select NONE for no bypass valve or fan VFD control.
   3. SP3. Select one to four fan outputs depending on the number of fan stages to be used. More than one fan can be used per stage through the use of relays.
   4. SP4. Select FAN STAGE UP TIME from 1 to 60 minutes. The default value of 2 minutes is probably a good starting point. The value may need to be adjusted later depending on actual system operation.
   5. SP5. Select FAN STAGE DOWN TIME from 1 to 60 minutes. The default value of 5 minutes is probably a good starting point. The value may need to be adjusted later depending on actual system operation.
   6. If TEMP is selected in SP1, use
      a. SP6. Select STAGE DIFFERENTIAL in degrees F. Start with default of 3°F.
      b. SP8-11. Set the STAGE ON temperatures consistent with the temperature range over which the condenser EWT is desired to operate. The default values of 70°F, 75°F, 80°F and 85°F are a good place to start in climates with moderate wet bulb temperatures. The number of STAGE ON setpoints used must be the same as SP3.
   7. If LIFT is selected in SP1, use
      a. SP7. Select STAGE DIFFERENTIAL in PSI. Start with default of 6.0 PSI.
      b. SP12-15. Start with default setpoints. The number of STAGE ON setpoints used must be the same as SP3.

(II) VALVE SP: Tower Fan Staging With Bypass Valve Controlling Minimum EWT

A. TOWER Setpoint Screen
   1. Use all of the same setpoint settings as those outlined in section I.A [the TOWER Setpoint Screen section for control strategy (I) NONE] except for SP2. For SP2, select VALVE SP for control of the bypass valve based on temperature or lift.

B. VALVE Setpoint Screen
   1. SP1. Select NC or NO depending if valve is *normally closed* to the tower with no control power or *normally open* to the tower with no control power.
   2. If TEMP was selected for SP1 on the TOWER Setpoint Screen, use the following on the VALVE Setpoint Screen:
      a. SP2. Set the VALVE TARGET. This setpoint is usually 5°F below the minimum fan stage setpoint established in SP8 of the TOWER Setpoint Screen.
      b. This keeps full flow through the tower until the last fan is staged off. The default for SP2 is 65°F.
      c. SP4. Set VALVE DEADBAND. The default of 1.0°F is a good place to start.
      d. SP12. Set the minimum position to which the valve can go. The default is 10%.

e. SP13. Set the maximum position to which the valve can go. The default is 100%.
f. SP14. Set the control gain for error. The default is 20.
g. SP15. Set the control gain for slope.

> **⚠ CAUTION**
> Setpoints 14 and 15 on the VALVE Setpoint Screen are site specific, dealing with system fluid mass, component size, and other factors affecting the reaction of the system to control inputs. To avoid possible equipment damage, these setpoints should be set by personnel experienced with setting up this type of control.

3. If LIFT was selected for fan control, use:
   a. SP3. Set the VALVE TARGET. This setpoint is usually 5 psi below the minimum fan stage setpoint established in SP12 of the TOWER Setpoint Screen. This keeps full flow through the tower until the last fan is staged off. The default for SP3 is 30 psi.
   b. SP5. Set VALVE DEADBAND, the default of 1.0 psi is a recommended initial setting.
   c. SP12. Set the minimum position to which the valve can go. The default is 10%.
   d. SP13. Set the maximum position to which the valve can go. The default is 100%.
   e. SP14. Set the control gain for error. The default is 20.
   f. SP15. Set the control gain for slope. The default is 1.

> **⚠ CAUTION**
> Setpoints 14 and 15 on the VALVE Setpoint Screen are site specific, dealing with system fluid mass, component size, and other factors affecting the reaction of the system to control inputs. To avoid possible equipment damage, these setpoints should be set by personnel experienced with setting up this type of control.

(III) VALVE STAGE: Tower staging with bypass valve controlled by fan stage

A. TOWER Setpoint Screen
   1. Use all of the same setpoint settings as those outlined in section I.A [the TOWER Setpoint Screen section for control strategy (I) NONE] except for SP2. For SP2, select VALVE STAGE.

B. VALVE Setpoint Screen
   1. Use all of the same setpoint settings as those outlined in section II.B [the VALVE Setpoint Screen section for control strategy (II) VALVE SP]. In addition, set the following:
      a. SP6. Set STAGE UP (valve position % open) above which the first fan can stage on. Fan STAGE#X ON temperature from SP8-11 on the TOWER Setpoint Screen and FAN STAGE UP TIME from SP4 on the TOWER Setpoint Screen must also be satisfied. The default for SP6 is 80%.
      b. SP7. Set STAGE DOWN (valve position % closed) below which the first fan can stage off. Fan STAGE#X ON temperature from SP8-11 on the TOWER Setpoint Screen and FAN STAGE DOWN TIME from SP5 on the TOWER Setpoint Screen must also be satisfied. The default for SP7 is 20%.

(IV) VFD STAGE: Fan VFD, no bypass valve

A. TOWER Setpoint Screen
   1. Use all of the same setpoint settings as those outlined in section I.A [the TOWER Setpoint Screen section for control strategy (I) NONE] except for SP2. For SP2, select VFD STAGE for control of the VFD speed based on temperature or lift.

(V) VALVE SP/VFD STAGE: Fan VFD, no bypass valve

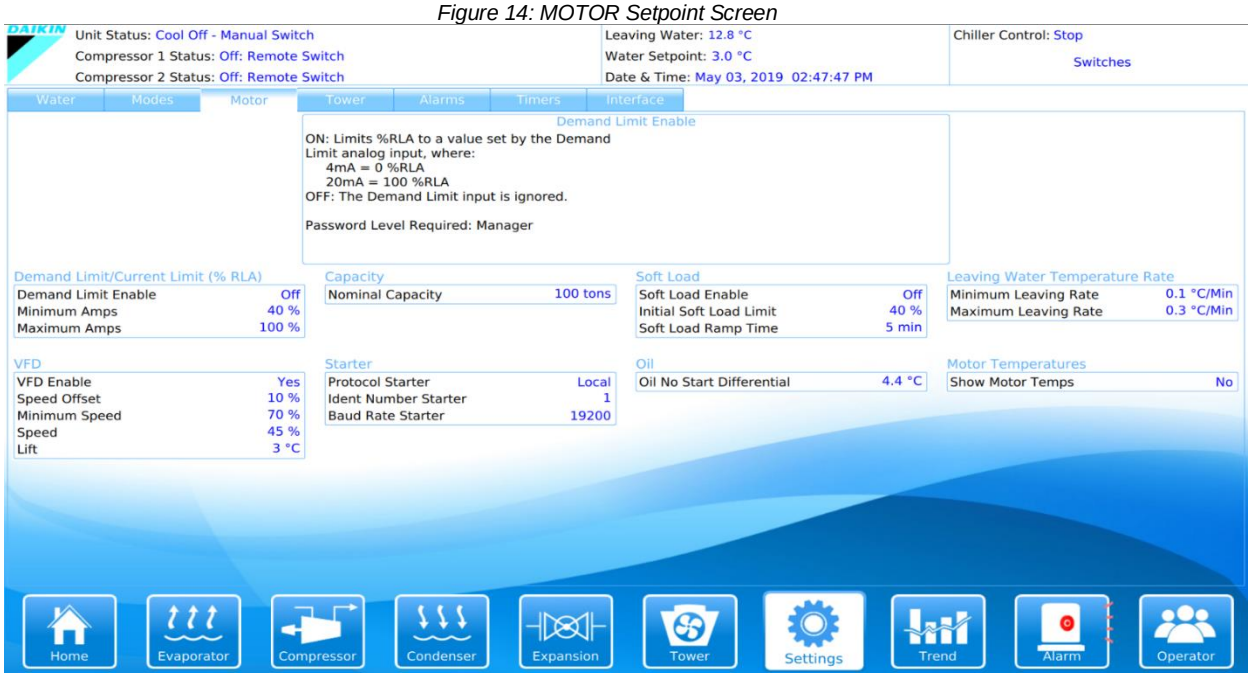
A. TOWER Setpoint Screen
   1. Use all of the same setpoint settings as those outlined in section I.A [the TOWER Setpoint Screen section for control strategy (I) NONE] except for SP2. For SP2, select VALVE SP/VFD STAGE.

B. VALVE Setpoint Screen

1. Use all of the same setpoint settings as those outlined in section II.B [the VALVE Setpoint Screen section for control strategy (II) VALVE SP].

9.5.7 MOTOR Setpoint Screen

Figure 14: MOTOR Setpoint Screen



MOTOR Setpoint Settings

Description	Default	Range	Password	Comments
Nominal Capacity	100	0 to 9999 Tons	T	Determines when to shut off a compressor. ONLY applies to multi-chiller setup.
Maximum LWT Rate	0.5 °F/min	0.1 to 5.0 °F/min	M	Inhibits loading if LWT change exceeds the setpoint value
Minimum LWT Rate	0.1 °F/min	0.1 to 5.0 °F/min	M	Additional compressor can start if LWT change is below setpoint
Soft Load Ramp Time [SP7]	5 min	1 to 60 min	M	Time period to go from initial load point (% RLA) set in SP5 to 100% RLA
Initial Soft Load Limit [SP6]	40%	10 to 100%	M	Initial amps as % of RLA, Uses SP4 & 6
Soft Load Enable [SP5]	OFF	OFF, ON	M	Soft load on or off, Uses SP6 & 7
Nameplate RLA * [SP4][	Dependent on dataplate		T	RLA value from compressor nameplate
Maximum Amps	100%	10 to 100%	T	% RLA above which loading is inhibited (Load Limit) SP + 5% unloads compressor
Minimum Amps	40%	5 to 80%	T	% RLA below which unloading is inhibited
Demand Limit Enable	OFF	OFF, ON	O	ON sets %RLA at 0% for 4 mA external signal and at 100% RLA for 20 mA signal OFF – signal is ignored

NOTE: Setpoints that have a technician level password (T) should only be changed by a Daikin Applied technician. Contact a Daikin Applied service representative for more information.

⚠ CAUTION

* Chiller Nameplate RLA **MUST** match chiller dataplate per compressor.

Compressor Capacity Control

Compressor capacity is determined by the status of the leaving chilled water temperature (LWT), which is a direct indicator of whether the chiller is producing enough cooling to satisfy the cooling load. The LWT is compared to the active chilled water setpoint, and compressor loading or unloading ensues, considering any capacity overrides that may be in effect.

Capacity Overrides

The conditions described in the following subparagraphs override normal capacity control when the chiller is in the COOL mode. Of the following limits, the one creating the lowest amp limit is in effect. The resulting present limit value for compressor current is stored in the Active Demand Limit variable.

Low Suction Pressure

If the suction pressure drops below the Low Suction pressure – Inhibit setpoint, the unit will inhibit capacity increases. If the suction pressure drops below the Low Suction pressure - Unload setpoint, the unit will begin capacity decreases.

High Discharge Temperature - Load

If the discharge temperature rises above the High Discharge Temperature - Load setpoint and the Suction SuperHeat is < 15.0 °F, the unit will begin capacity increases.

Maximum LWT Rate

The maximum rate at which the leaving water temperature can drop (chiller mode = COOL) is limited at all times by the Maximum Rate setpoint. If the rate exceeds this setpoint, capacity increases are inhibited.

Demand Limit

The maximum amp draw of the compressor can be limited by a 4 to 20 mA signal on the Demand Limit analog input. This function is only enabled if the Demand Limit setpoint is set to ON. The amp limit decreases linearly from the Maximum Amp Limit setpoint (at 4 mA) to the Minimum Amp Limit setpoint (at 20mA). If the amp draw rises above the limit value, the unit will inhibit capacity increases. If the amp draw rises to 3% or more above this value, the unit will begin capacity decreases.

Network Limit

The maximum amp draw of the compressor can be limited by a value sent through a BAS network connection and stored in the Network Limit variable. If the amp draw rises above the limit value, the unit will inhibit capacity increases. If the amp draw rises to 3% or more above this value, the unit will begin capacity decreases.

Minimum Amp Limit

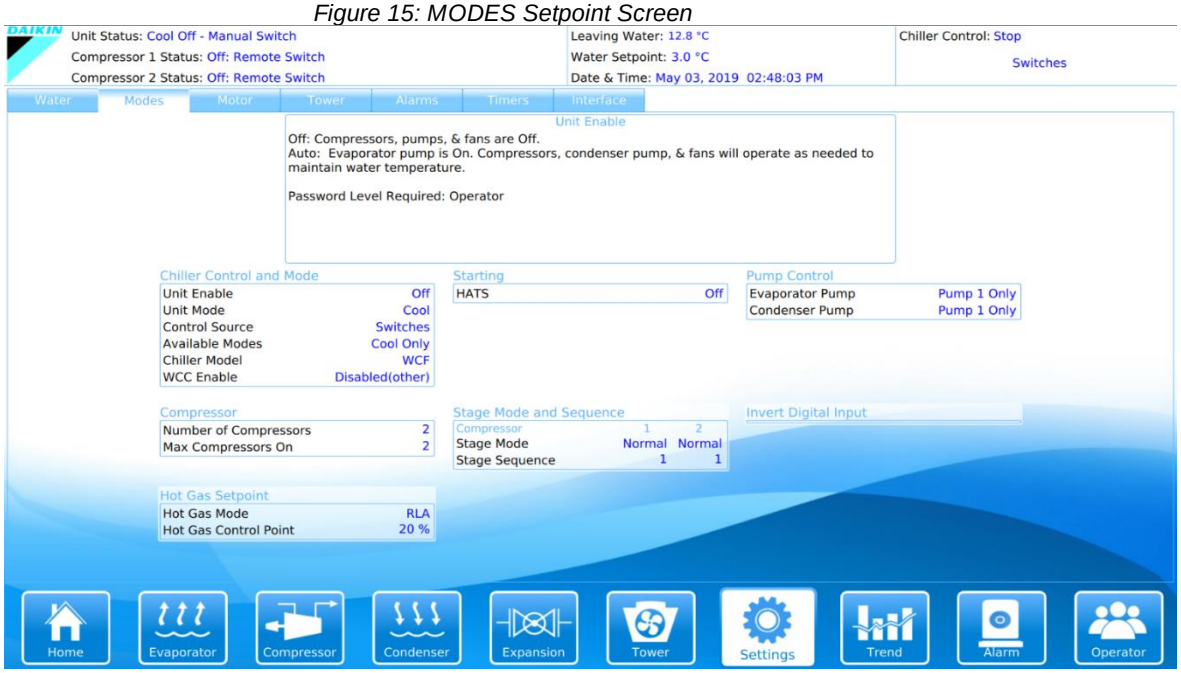
The minimum amp draw of the compressor can be limited by the Minimum Amps setpoint. If the amp draw drops below the limit value, the unit will load capacity to maintain minimum amps.

Maximum Amp Limit

The maximum amp draw of the compressor is always limited by the Maximum Amps setpoint. This limit has priority over all other functions including manual capacity control. If the amp draw rises above the limit value, the unit will inhibit capacity increases. If the amp draw rises to > 3% or more above this value, the unit will begin capacity decreases.

9.5.8 MODES Setpoints

Figure 15: MODES Setpoint Screen



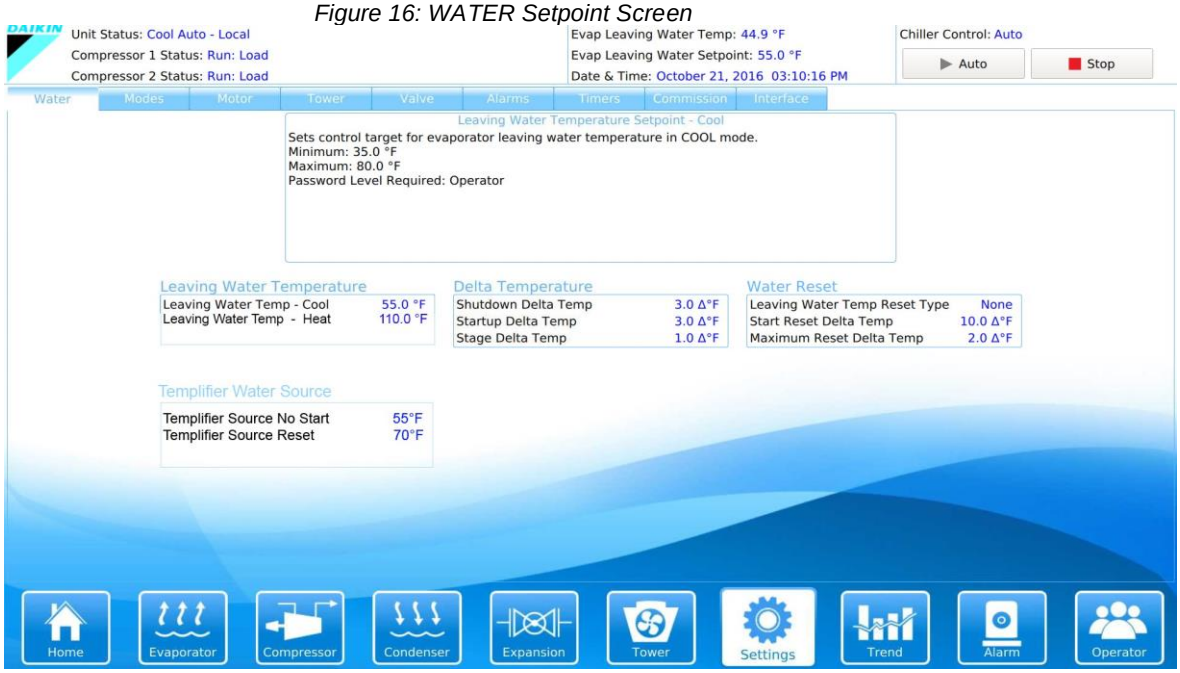
MODES Setpoint Settings

Description	Default	Range	Password	Comments
Compr # 2 Stage Sequence #	1	1,2, … (# of Compressors)	M	Sets sequence number for # 2 compressor. If set to 1, it is always first to start. If set to 2, it is always second to start. (Note 1)
Compr # 2 Staging Mode	Normal	Normal, Efficiency, Pump, Standby	M	Normal uses standard sequencing, Efficiency starts one compressor on each unit, Pump starts all compressors on one chiller first, Standby uses this compressor only if another fails
Compr #1 Stage Sequence #	1	1,2, … (# of Compressors)	M	Sets sequence number for # 1 compressor. If set to 1, it is always first to start. If set to 2, it is always second to start. (Note 1)
Compr #1 Staging Mode	Normal	Normal, Efficiency, Pump, Standby	M	Normal uses standard sequencing, Efficiency starts one compressor on each unit, Pump starts all compressors on one chiller first, Standby uses this compressor only if another fails
Maximum Compressors ON	2	1-8	M	Total number of compressors allowed to run at one time
BAS Network Protocol	MODBUS	None, Local, BACnet, LonWorks, MODBUS, Remote	M	Sets BAS Standard Protocol to be used, or LOCAL if none
Condenser Pump	Pump #1 Only	Pump #1 Only, Pump #2 Only, Auto Lead, #1 Primary, #2 Primary	M	Pump #1 Only, Pump #2 Only, use only these pumps AUTO, balance hours between #1 and #2 #1 Primary, #2 Primary, if primary fails, use other
Evaporator Pump	Pump #1 Only	Pump #1 Only, Pump #2 Only, Auto Lead, #1 Primary, #2 Primary	M	Pump #1 Only, Pump #2 Only, use only these pumps AUTO, balance hours between #1 and #2 #1 Primary, #2 Primary, if primary fails, use other
Control Source	Switches	Switches, Local, BAS	O	Sets control source. See "Unit Enabling/Disabling" on page 27.
Unit Enable	OFF	OFF, AUTO	O	OFF: everything is off. AUTO: Evap pump on, comp, cond pump and tower on as required to meet LWT
Unit Mode	COOL	COOL, HEAT	O	COOL, HEAT [Templifier]: Maintains LWT at WATER-SP.
Power Loss Re-Start	OFF	ON, OFF	O	ON= clears timers, enables pumps, and clears power loss alarms
Invert Digital Input	No	No Invert	M	Quick Off (All Off)= 0-24 VAC. External Unit Fault Input= Configurable
Analog Output	Tower Reset	Bypass Valve, Tower Fan VFD, Tower Reset	M	Sets tower control using 0-10 VDC
Relay #1 and #2	Configurable		M	Relay #1: Evap Water Pump #2, Relay #2: Cond Water Pump #1

NOTE: If both compressors have the same sequence number, they will automatically balance starts and run-hours.

9.5.9 WATER Setpoints

Figure 16: WATER Setpoint Screen



WATER Setpoint Settings

Description	Default	Range	Password	Comments
Maximum Reset Delta T	0.0°F	0.0 to 20.0 °F	M	Set the maximum reset that can occur, in degrees F if LWT reset is selected or max reset at 20 mA input if 4-20 mA is selected in SP7
Start Reset Delta T	10.0°F	0.0 to 20.0 °F	M	Sets the evap delta-T above which Return reset begins
LWT Reset Type [SP7]	NONE	NONE, RETURN, 4-20mA	M	Select reset type, NONE for none, RETURN for resetting chilled water based on the entering water, or 4-20 mA for external analog signal
Templifier Source Reset:	55°F	50 to 100°F	M	Sets maximum Delta T allowed between active LWT SP and evaporator LWT. Active LWT SP is lowered as necessary to prevent exceeding this value.
Templifier Source No Start:	70°F	30 to 100°F	M	Entering evaporator water temp below which Templifier will not start.
Stage Delta T	1.0	0.5 to 5°F	M	Sets the temperature the leaving water must be above setpoint for next compressor to start
Startup Delta T	3.0°F	0.0 to 10.0 °F	M	Degrees above setpoint for chiller to start
Shutdown Delta T	3.0°F	0.0 to 3.0 °F	M	Degrees below setpoint for chiller to stop
Leaving Water Temp - Cool	44.0°F	35.0 to 80.0 °F	M	Evaporator LWT setpoint in COOL mode
Leaving Water Temp - Heat	135.0°F	110 to 135°F	M	Condenser LWT setpoint in HEAT mode

9.5.10 Leaving Water Temperature (LWT) Reset

The Active Leaving Water variable shall be set to the current Leaving Water Temperature (LWT) setpoint unless modified by one of the reset methods below. (The current LWT setpoint is Cool LWT as determined by the chiller mode.) The type of reset in effect is determined by the LWT Reset Type setpoint (Setpoint 7 of the WATER Setpoint Screen). It is important to note that all reset functions are designed with a filter to prevent chiller shutdown in the case of a sudden delta change.

Reset Type – NONE

The Active Leaving Water variable is set equal to the current LWT setpoint, determined by the Unit mode.

Reset Type – RETURN (Cool Mode)

The Active Leaving Water variable is adjusted by the return water temperature.
When the chiller mode = COOL, the Active Leaving Water variable is reset using the following parameters:

1. Cool LWT setpoint
2. Max Reset Delta T setpoint
3. Start Reset Delta T setpoint

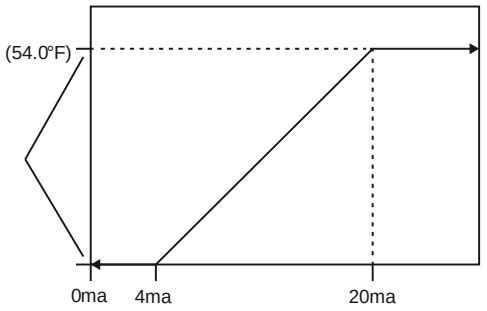
For example, a reset is accomplished by changing the Active Leaving Water variable from the (Cool LWT setpoint) to the (Cool LWT setpoint + Max Reset Delta T setpoint) when the evaporator (return – leaving) water temperature delta varies from the (Start Reset Delta T setpoint) to 0.
To prevent a possible surge at startup, the compressor will not start if the evaporator LWT is lower than Templifier No Start set point.

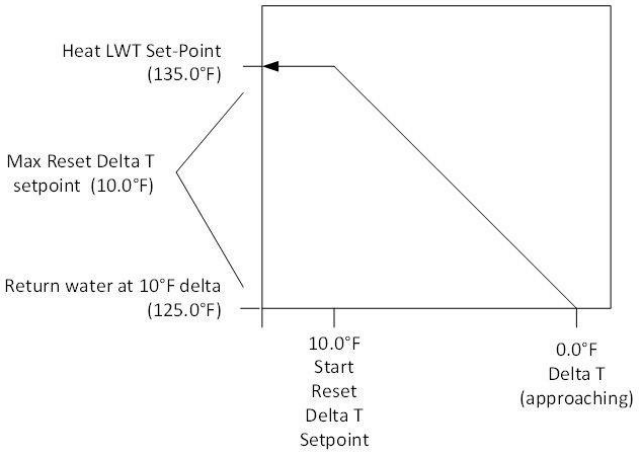
Reset Type – 4-20mA (Cool Mode)

The Active Leaving Water variable is set equal to the Cool LWT setpoint if the reset signal is less than or equal to 4 mA. It is set equal to (Cool LWT setpoint + Max Reset Delta T setpoint) if the reset signal equals or exceeds 20 mA. The Active Leaving Water variable will vary linearly between these extremes if the reset signal is between 4 mA and 20 mA.

Reset Type – 4-20mA (Heat Mode)

The Active LWT Target variable is set equal to the Heat LWT set point if the reset signal is less than or equal to 4 mA. It is set equal to (Heat LWT [BAS] set point - Max Reset Delta T set point) if the reset signal equals or exceeds 20 mA. The Active LWT Target variable will vary linearly between these extremes if the reset signal is between 4 mA and 20 mA. An example of this action is shown below.





NOTE: Temperatures in above figures are examples only.

Reset Type – RETURN (Heat Mode)

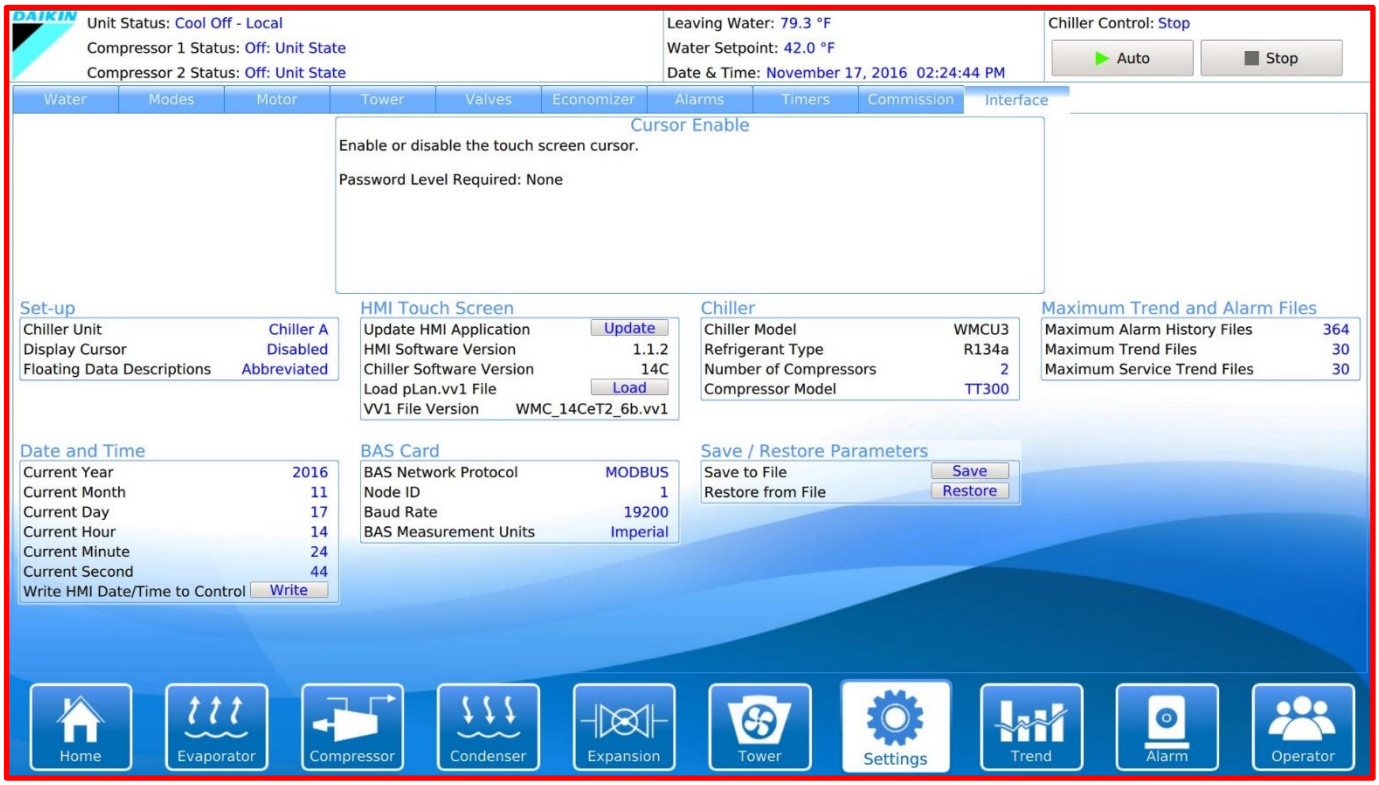
The Active Leaving Water variable is adjusted by the return water temperature. When the chiller mode = HEAT, the active Leaving Water variable is reset using the following parameters:

1. Heat LWT setpoint
2. Max Reset Delta T setpoint
3. Start Reset Delta T setpoint

Reset is accomplished by changing the Active Leaving Water variable from the (Heat LWT Setpoint) to the (Heat LWT setpoint – Max Reset Delta T setpoint) when the condenser (leaving – return) water temperature delta varies from the (Start Reset Delta T setpoint) to 0. Note, it will in reality it only approaches 0.0 therefore you only approach Max Reset. The reset is filtered to not allow sudden changes in the Active setpoint, which may cause sudden stops in leaving water satisfied. Choosing this option can also in effect give you return water control.

9.5.1 Interface Screen

Figure 17: Interface Screen

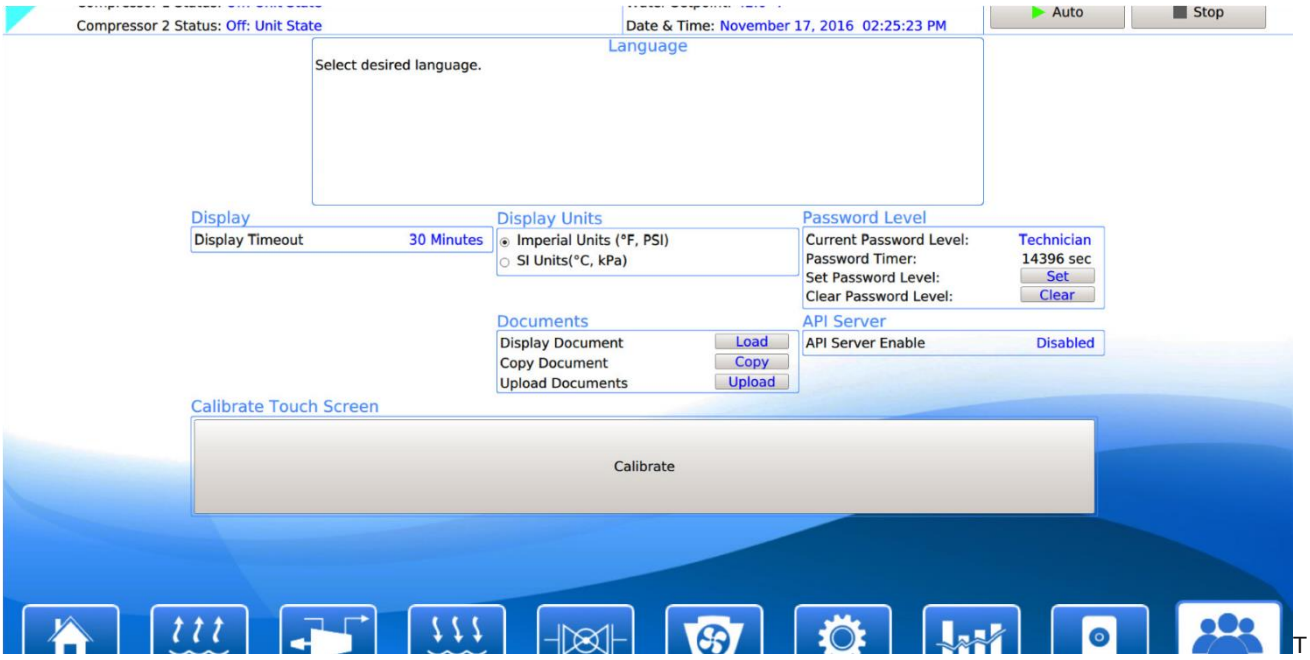


The Service Screen is accessed by pressing the Interface button from any SET screen. While containing information and activity buttons for the service technician, it also has valuable information for the operator.
The upper left corner of the Service Screen contains compressor information such as operating hours and number of starts for each compressor. “Spare Capacity” is used to set the compressor stopping increments.
Pressing the Date/Time window on the left side of the Service Screen opens the Date and Time Properties Window, shown in Figure 52. Change the date and time on the “Date & Time” tab. To change the date, use the drop down menu to choose the correct month, use the up and down arrows to scroll to the correct year, and then select the correct day on the calendar shown. To change the time, highlight the time in the text field below the analog clock and use the up and down arrows to scroll to the correct time. Use the drop down menu in the “Time Zone” tab to change the time zone to the correct area.

NOTE: It is likely that the chiller will contain the factory settings for date, time, and time zone; therefore, it is important to verify or change these settings when the chiller is first used on the job-site. Failure to do so will result in incorrectly labeled History files.

The Display Units button on the Operator Screen allows selection of Inch-Pounds or Metric units of measure on the HMI.
The OPERATING MANUAL button displays the manual in Adobe.
SELECT LANGUAGE is accessed on the Operator Screen (Figure 54) and allows toggling between the available languages. The language can be set separately for display or history, which is used for alarm and trend files. In order to change the language displayed on the HMI, scroll to the correct language using the left and right arrow buttons and then press the DISPLAY button. In order to change the language stored in the history files, scroll to the correct language and then press the HISTORY button. Note that the DISPLAY and HISTORY buttons must be pressed in order to make the selected language active in these respective areas.
Also on the Operator screen, the PASSWORD SET button is used to access the Keyboard to enter a password. The version numbers shown under the pLAN Nodes matrix are the controllers’ software identification. The number in the upper right corner is the HMI software identification number. These numbers may be required by Daikin Applied to answer questions about unit operation or to assist in possible future upgrades of software.

Figure 18: Operator screen



T

9.6 HISTORY Screens

The HMI is capable of storing two types of history: trend history and alarm history. These two types are described in the following sections.

9.6.1 Trend History Screen

The Trend History Screen is accessed by clicking the TREND button at the bottom of any screen that contains this button

Figure 19: Trend History Screen

The Trend History Screen allows the user to view the various parameters listed on the right side of the screen. The temperature scale in °F is on the left. Pressure in psi and % RLA are represented by the right-hand scale. The COMP button toggles between compressor #1 and compressor #2.

Notice that three separate red lines are displayed on the Trend History Screen. Two of those red lines will be thinner than the other. The thin red line on the bottom of all the red lines represents the minimum motor speed. The thin red line on the top of all the red lines represents the maximum motor speed. The thick red line, which should be somewhere between the minimum and maximum motor speed lines, represents the actual motor speed.

The Trend History Screen can display history for 24-hour, 4-hour, 1-hour, or 15-minute periods by pressing 24, 4, 1, or 1/4, respectively. Pressing the NOW button for any time period will start the display for the current time beginning on the right of the screen with history flowing to the left. The arrow buttons scroll the time period forward or backward.

When the HMI PC is powered on after being off, the Trend History Screen will only display the history starting from the time the HMI PC was powered on. Previous trend history can be downloaded but there will be a gap in the data from when the HMI PC was off. Trend history is not affected if only the HMI screen (not the HMI PC) is off or in sleep mode.

9.6.2 Alarm History Screen

Figure 20: Alarm History Screen

The Alarm History Screen (Figure 56) is accessed from the Alarm button shown highlighted, then by pressing the HISTORY tab as shown. Use the date button to choose the desired date. Use the Copy button to extract the desired alarm log to a USB stick. An example of the date and copy buttons is shown in the adjacent figure. There are three types of alarms:

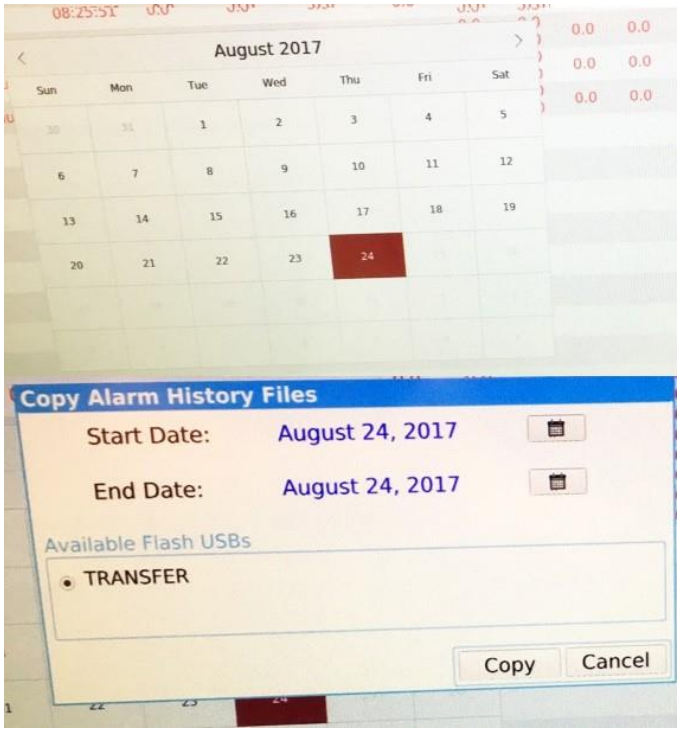
1. **Fault (Red text)**- This is an equipment protection alarm that shuts a unit or compressor off.
2. **Problem (Yellow text)**- This is a limit alarm that limits compressor loading in response to an out-of-normal condition. If the condition that caused a limit alarm is corrected, the alarm light will be cleared automatically.
3. **Warning (Dark Blue text)**- This is a notification only. The controller takes no action in response to this alarm.

Each alarm displays the date stamp, action taken, and the cause of the alarm. Clicking on a listed alarm will bring up more details about that particular alarm at the top of the screen.

Although the Alarm History Screen only displays the eight most current alarms, a record of ALL alarms is stored in the HMI PC. Note that this record may include alarms that occurred when the chiller was in the factory. This record is maintained even if the HMI PC is powered off. When the HMI is powered back on, the last eight alarms will show back up on the Alarm History Screen and all alarm history will still be available for download. (The download process is described next.) If an alarm both occurs and is cleared when the HMI PC is powered off, it will not be recorded in the alarm history.

9.6.3 Date and Copy Pop-Up Windows

Figure 21: Date and Copy Pop-Up Windows



The Alarm History Screen can be used to download the trend history or the alarm history via USB. In order to download the trend or alarm history, first insert a USB drive into the left side of the monitor as seen in the following figure.

Figure 22: USB Port HMI screen

NOTE: In order to prevent viruses from being transferred from the USB drive to the HMI, it is important that a clean USB drive is used. Do NOT use a USB drive that contains any auto-executable files.

If a directory screen opens when the USB drive is inserted, close out of that screen and continue with the directions instructed below.

To Download Trend History:

- Make sure that the “History File” text field on the right side of the Alarm History Screen shows a date. If it shows “ALARMS” rather than a date, press either the PREV or NEXT button. (Pressing the PREV button when the “History File” text field shows “ALARMS” will bring up yesterday’s date. Pressing the NEXT button when the “History File” text field shows “ALARMS” will bring up today’s date.)
- Use the PREV or NEXT button to change the date in the “History File” text field to the desired date. The dates will stop scrolling when the last file in that direction has been reached. (The HMI PC will store 30 days of history at a minimum. More days might be stored depending on the trend history file sizes. The HMI PC will automatically delete old trend history files as needed to make room for new trend history files.)

- Take note of the file size of that date's history by viewing the "Size" text field. Press the COPY to USB button and watch the file size in the "Size" text field count up to the noted file size. Once this text field has stopped counting and has reached its actual file size, the download of that file to the USB is complete.
- Repeat this process for each desired day of trend history. Each day must be downloaded individually. It is not possible to download multiple days of trend history at once.

To Download Alarm History:

- Make sure that the "History File" text field on the right side of the Alarm History Screen shows "ALARMS." If it shows a date instead, press the ALARMS button.
- Take note of the file size of the alarm history by viewing the "Size" text field. Press the COPY to USB button and watch the file size in the "Size" text field count up to the noted file size. Once this text field has stopped counting and has reached its actual file size, the download of the alarm history to the USB is complete. (Note that unlike the trend history files, alarm history only has one file.)

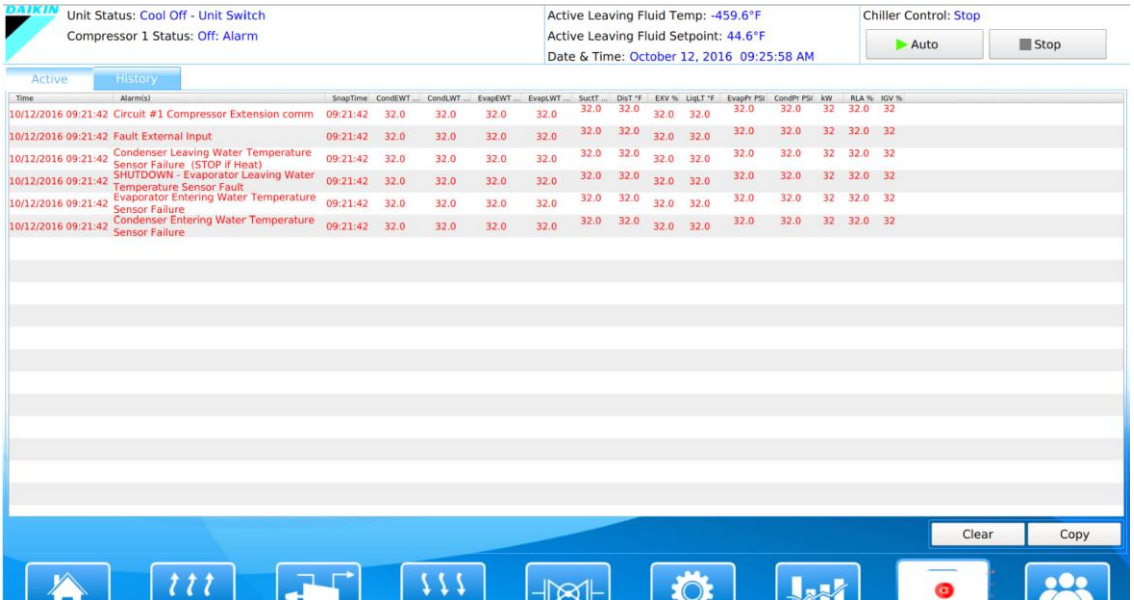
Viewing/Using Trend History and Alarm History Files:

- To download trends press the Trends button and then "Copy Service Trends". There will be a folder created called "Trend_Files". Trend history file names will be displayed as "TrendXXXXXX", where the first two X's will be numbers to indicate the year, the second two X's will be numbers to indicate the month, and the last two X's will be numbers to indicate the day. For example, if there is a file called Trend140510, it indicates that the file contains trend history from 5/10/2014.
- To download alarms, click "Copy". The alarm history file name will be displayed as "AlarmXXXXXXXX."
- All trend history and alarm history files are saved from the HMI PC as .csv files. These files can be opened on a normal PC and manipulated using Microsoft Excel for personal use. ***If tech support is requested, the original (un-manipulated) .csv files must be sent to Daikin Applied. Any other file formats are NOT accepted.***

9.7 Active Alarms Screen

The Active Alarms Screen (Figure 59) is only accessible when an active alarm exists on the unit. Pressing the red ALARM button on any screen will access the Active Alarms Screen.

Figure 23: Active Alarms Screen



The current active alarms (there may be more than one) will be displayed on the Active Alarms Screen. Alarms are arranged in order of occurrence, with the most recent on top. The date/ time and cause of the alarm are displayed. See the "Possible Alarms and Events" section for specifics on alarms that may occur.

After eliminating the cause of the alarm, clear the alarm by pressing the CLEAR button. This will clear the alarm from the register and allow the unit to restart after going through the start sequence. The alarm notice will be deleted from the screen.

If the cause of the alarm is not remedied, the alarm is still active and the alarm message will remain open. The unit will not begin its starting sequence.

10 POSSIBLE ALARMS AND EVENTS

There are three types of alarms: faults, problems, and warnings. In addition to these three alarms, there are also "events." See the following tables for examples of faults, problems, warnings, and events that can occur. Separate tables are shown based on whether the alarm source is the unit or the compressor.

NOTE: In the "Alarm Reset" column of the following tables, italics indicate special alarm conditions or severity. If the "Alarm Reset" says "Auto-clears," it indicates that the alarm will auto-clear after the condition is resolved and the normal condition returns.

10.1 Fault Alarms

Equipment protection faults cause rapid compressor shutdown. The compressor is stopped immediately (if the compressor was running).

10.1.1 Unit Fault Alarms

Description	HMI Alarm Message	Alarm Reset
Low Motor Current Comp 1	COMPR STOP - Motor Current Low	Auto-clears
Low Motor Current Comp 2	COMPR STOP - Motor Current Low	Auto-clears
No Condenser Water Flow	COMPR STOP - Condenser Water Flow Loss	Auto-clears
No Compressor Stop Comp 1	COMPR STOP - Current High with Compr OFF	Auto-clears
No Compressor Stop Comp 2	COMPR STOP - Current High with Compr OFF	Auto-clears
No Evaporator Water Flow	COMPR STOP - Evaporator Water Flow Loss	Auto-clears
Low Suction pressure Comp 1	COMPR STOP - Suction pressure Low	Auto-clears
Low Suction pressure Comp 2	COMPR STOP - Suction pressure Low	Auto-clears
Leaving Evaporator Water Temperature Sensor Fault Comp 1	COMPR STOP - Evap LWT Sensor Out of Range	Auto-clears
Surge High Suct SH-Running Comp 1	COMPR STOP - Surge Temperature	Auto-clears
Surge High Suct SH-Running Comp 2	COMPR STOP - Surge Temperature	Auto-clears
Expansion Alarm – FAULT (external alarm)	COMPR STOP - Control Fault (External Input)	Auto-clears
Check Valve Fault 1	CHILLER STOP - Check Valve Failure	*Locked off (requires local reset)*
Check Valve Fault 2	CHILLER STOP - Check Valve Failure	*Locked off (requires local reset)*

10.1.2 Compressor Fault Alarms

Description	HMI Alarm Message	Alarm Reset
Compressor Current Overload Trip #1	COMPR STOP - Motor Current Overload	Auto-clears
Compressor Current Overload Trip #2	COMPR STOP - Motor Current Overload	Auto-clears *Locked off if UL Limit is exceeded*
High Motor Temperature Comp 1	COMPR STOP - High Motor Temperature	Auto-clears
High Motor Temperature Comp 2	COMPR STOP - High Motor Temperature	Auto-clears *Locked off if Tripped 3x in 50 min*
Overvoltage On Compressor 1	COMPR STOP - Line Voltage High	Auto-clears
Overvoltage On Compressor 2	COMPR STOP - Line Voltage High	Auto-clears
Undervoltage On Compressor 1	COMPR STOP - Line Voltage Low	Auto-clears
Undervoltage On Compressor 2	COMPR STOP - Line Voltage Low	Auto-clears
High Discharge pressure Comp 1	COMPR STOP - Discharge pressure High	Auto-clears *Locked off if Tripped 3x in 50 min*
High Discharge pressure Comp 2	COMPR STOP - Discharge pressure High	Auto-clears *Locked off if Tripped 3x in 50 min*
High Discharge Temperature Comp 1	COMPR STOP - Discharge Temperature High	Auto-clears *Locked off if Tripped 3x in 50 min*
High Discharge Temperature Comp 2	COMPR STOP - Discharge Temperature High	Auto-clears *Locked off if Tripped 3x in 50 min*
Starter Fault Compressor 1	COMPR STOP - Compressor Fault (previously used for WMC general compressor fault)	Reset is dependent on specific alarm
Starter Fault Compressor 2	COMPR STOP - Compressor Fault (previously used for WMC general compressor fault)	Reset is dependent on specific alarm
No Starter Transition Comp 1	COMPR STOP - Compressor Comm Loss (previously used for compressor communication error)	Auto-clears
No Starter Transition Comp 2	COMPR STOP - Compressor Comm Loss (previously used for compressor communication error)	Auto-clears
General Compressor Fault 1	COMPR STOP - Compressor Fault	Reset is dependent on specific alarm
General Compressor Fault 2	COMPR STOP - Compressor Fault	Reset is dependent on specific alarm
Communication Fault 1	COMPR STOP - Compressor Comm Loss	Auto-clears
Communication Fault 2	COMPR STOP - Compressor Comm Loss	Auto-clears

10.2 Problem Alarms

Problems do not cause compressor shutdown but do limit operation of the chiller.

10.2.1 Unit Problem Alarms

Description	HMI Alarm Message	Alarm Reset
Condenser Water Freeze Protect Comp 1	COND PUMP ON - Discharge pressure Low (Freeze)	Auto-clears
Condenser Water Freeze Protect Comp 2	COND PUMP ON - Discharge pressure Low (Freeze)	Auto-clears
Low Suction pressure - Inhibit Loading Comp 1	NO LOAD - Suction pressure Low	Auto-clears
Low Suction pressure - Inhibit Loading Comp 2	NO LOAD - Suction pressure Low	Auto-clears
Low Suction pressure - Unload Comp 1	UNLOAD - Suction pressure Low	Auto-clears
Low Suction pressure - Unload Comp 2	UNLOAD - Suction pressure Low	Auto-clears
Ground Fault Protection 1	COMPR STOP - Ground Fault	*Locked off (requires local reset)*
Ground Fault Protection 2	COMPR STOP - Ground Fault	*Locked off (requires local reset)*

10.3 Warning Alarms

Warnings only generate a warning message to the operator. Chiller operation is not affected.

10.3.1 Unit Warning Alarms

Description	HMI Alarm Message	Alarm Reset
Repower After Power Loss 1	COMPR STOP - Line Voltage Low	Auto-clears
Repower After Power Loss 2	COMPR STOP - Line Voltage Low	Auto-clears
Entering Condenser Water Temperature Sensor Fault	NO ACTION - Condenser EWT Out of Range	Auto-clears
Entering Evaporator Water Temperature Sensor Fault	NO ACTION - Evaporator EWT Out of Range	Auto-clears
Liquid Line Refrigerant Temperature Sensor Fault	NO ACTION - Liquid Line Temp Out of Range	Auto-clears
Leaving Condenser Water Temperature Sensor Fault	NO ACTION - Condenser LWT Out of Range	Auto-clears
Condenser Pump #1 Fault	No Alert shown on HMI panel	No Alarm
Condenser Pump #2 Fault	No Alert shown on HMI panel	No Alarm
High Discharge Temperature Comp 1	No Alert shown on HMI panel	No Alarm
High Discharge Temperature Comp 2	No Alert shown on HMI panel	No Alarm
Entering Evap Temperature Sensor Fault (EWT reset active)	No Alert shown on HMI panel	No Alarm
Chiller Running with Limited Capacity	No Alert shown on HMI panel	No Alarm

10.3.2 Compressor Warning Alarms

Events do not generate a warning message to the operator but they may notify the BAS, if used. Chiller operation may be affected by events.

10.3.3 Unit Events

Description	HMI Alarm Message	Alarm Reset
High Motor Current On Compressor #1	No Alert shown on HMI panel	No Alarm
High Motor Current On Compressor #2	No Alert shown on HMI panel	No Alarm
Evaporator Freeze Protect Comp 1	EVAP PUMP ON - Suction pressure Low (Freeze)	Auto-clears
Evaporator Freeze Protect Comp 2	EVAP PUMP ON - Suction pressure Low (Freeze)	Auto-clears
Evaporator Pump #1 Fault	No Alert shown on HMI panel	No Alarm
Evaporator Pump #2 Fault	No Alert shown on HMI panel	No Alarm
Re-Start Fault	No Alert shown on HMI panel	No Alarm
Re-Start Fault Comp 1	No Alert shown on HMI panel	No Alarm
Re-Start Fault Comp 2	No Alert shown on HMI panel	No Alarm

10.3.4 Compressor Events

Description	HMI Alarm Message	Alarm Reset
Bearing Fault 1	COMPR STOP - Compressor Fault	Auto-clears *Pauses 20 min after 3rd alarm in 50 min*
Bearing Fault 2	COMPR STOP - Compressor Fault	Auto-clears *Pauses 20 min after 3rd alarm in 50 min*
Motor Fault 1	COMPR STOP - Compressor Fault	Auto-clears *Pauses 20 min after 3rd alarm in 50 min*
Motor Fault 2	COMPR STOP - Compressor Fault	Auto-clears *Pauses 20 min after 3rd alarm in 50 min*
Drive Fault 1	COMPR STOP - Compressor Fault	Auto-clears
Drive Fault 2	COMPR STOP - Compressor Fault	Auto-clears
Internal Control Fault 1	COMPR STOP - Compressor Fault	Auto-clears
Internal Control Fault 2	COMPR STOP - Compressor Fault	Auto-clears

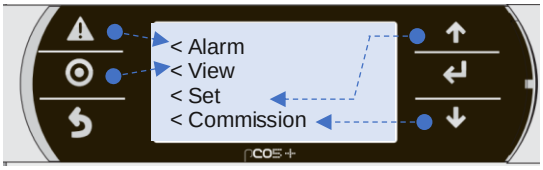
11 THE CONTROLLER

The controller is located in the control panel (see Figure 3 on page 5) adjacent to the HMI (see Figure 1 on page 4). Unit, compressor, evaporator, and condenser information is viewable on it, and all setpoints can be accessed from it. It is encouraged to use the controller to change setpoints only when the HMI is unavailable. The controller LCD screens read only in IP units of measure (inch-pounds and degrees Fahrenheit). SI units of measure can be selected with the appropriate controller setpoint screen but will appear only on the HMI.

11.1 Keypad

A 4-line by 20-character/line liquid crystal display and 6-button keypad is mounted on the controller, as shown in Figure 60.

Figure 24: Controller Keypad



The four arrow keys (UP, DOWN, LEFT, RIGHT) have three modes of use:

1. Select a specific data screen in the menu matrix using dynamic labels such as ALARM, VIEW, SET, etc. This mode is entered by pressing the MENU key. *For ease of use, a pathway connects the appropriate button to its respective label on the screen.*
2. Navigate through the different screens.
3. Increase and decrease value fields.

11.2 Controller Inputs and Outputs

The following tables list the controller inputs and outputs, both analog and digital.

11.2.1 Controller, Analog Inputs

#	Description	Signal Source	Sensor Range
1	Reset of Leaving Water Temperature	4-20 mA Current	0 to 20°F
2	Entering Evaporator Water Temperature	NTC Thermistor (10k@25°C)	-58 to 212°F
3	Entering Condenser Water Temperature	NTC Thermistor (10k@25°C)	-58 to 212°F
4	Leaving Condenser Water Temperature	NTC Thermistor (10k@25°C)	-58 to 212°F
5	Liquid Line Refrigerant Temperature	NTC Thermistor (10k@25°C)	-58 to 212°F
6	Demand Limit	4-20 mA Current	0-100 %RLA
7	Evaporator Water Flow	4 to 20 mA Current	0 to 10,000 gpm
8	Condenser Water Flow	4 to 20 mA Current	0 to 10,000 gpm
9	Optional Tower Sump Temperature	NTC Thermistor (10k@25°C)	-58 to 212°F
10	Leaving Evaporator Water Temperature	NTC Thermistor (10k@25°C)	-58 to 212°F

NOTE: “Sensor Range” indicates the range of the input, NOT the operating range of the chiller.

11.2.2 Controller, Digital Inputs

#	Description	Signal	Signal
1	Unit OFF Switch	0 VAC (Stop)	24 VAC (Auto)
2	Remote Off/Enable	0 VAC (Stop)	24 VAC (Enable)
3	Mode Switch	0 VAC (Normal)	24 VAC (Alternate)
4	Manual Off	0 VAC (Off)	24 VAC (Enable)
5	Manual Off2	0 VAC (Off)	24 VAC (Enable)
6	Manual Off3	0 VAC (Off)	24 VAC (Enable)
7	Manual Off4	0 VAC (Off)	24 VAC (Enable)
8	Quick Off (All Off)	0 VAC (Quick Stop)	24 VAC (Enable)
9	Ground Fault	0 VAC (Alarm)	24 VAC (Off)
10	Ground Fault2	0 VAC (Alarm)	24 VAC (Off)
12	HATS Switch	0 VAC (Off)	24 VAC (Enable)
13	External Fault	Configurable	Configurable
17	Evaporator Water Flow Switch	0 VAC (No Flow)	24 VAC (Flow)
18	Condenser Water Flow Switch	0 VAC (No Flow)	24 VAC (Flow)

11.2.3 Controller, Analog Outputs

#	Description	Output Signal	Sensor Range
1	Cooling Tower Bypass Valve Position	0 to 10 VDC	0 to 100% Open
2	Cooling Tower VFD Speed	0 to 10 VDC	0 to 100%
3	EXV signal to IB Valve Control Bd.	0 to 10 VDC	0 to 100%
4	Tower Control Reset	0 to 10 VDC	0 to 100% Mask Reset
5	% Unit Load	0 to 10 VDC	0 to 125% (8V = 100%)

NOTE: “Sensor Range” indicates the range of the output, NOT the operating range of the chiller.

11.2.4 Controller, Digital Outputs

#	Description	Load	Output OFF	Output ON
1	Evaporator Water Pump #1	Pump Contactor	Pump OFF	Pump ON
2	Evaporator Water Pump #2	Pump Contactor	Pump OFF	Pump ON
3	Condenser Water Pump #1	Pump Contactor	Pump OFF	Pump ON
4	Condenser Water Pump #2	Pump Contactor	Pump OFF	Pump ON
5	Tower Fan #1	Fan Contactor	Fan OFF	Fan ON
6	Tower Fan #2	Fan Contactor	Fan OFF	Fan ON
7	Expansion Valve Calibration	Digital Input (50K Ohms)	Normal	Calibration
8	Alarm	Alarm Indicator	Alarm OFF	Alarm ON
9	Tower Fan #3	Fan Contactor	Fan OFF	Fan ON
10	Tower Fan #4	Fan Contactor	Fan OFF	Fan ON
11	Alarm Output	User Defined	Alarm OFF	Alarm ON

11.2.5 Controller Setpoints

Table 28 groups setpoints that relate to the entire unit operation and are stored in the controller. For a complete list of setpoints.

Standard settings are made through the HMI. The Password (PW) column indicates the password that must be active in order to change the setpoint. The letters in the Password column refer to the following:

O = Operator (the password number for operator level is 100)

M = Manager (the password number for manager level is 2001)

T = Technician (the password number for technician level is only provided to Daikin Applied technicians)

Controller Setpoints

Description	Default	Range	PW
Unit			
Unit Enable	OFF	OFF, ON	O
Control Source	SWITCHES	Switches, Local (Touch Screen), BAS Network	O
Display Units	°F/psi	°F/psi, °C/kPa	O
Language	ENGLISH	ENGLISH, (TBD)	O
BAS Protocol	Modbus	NONE, BACnet, LonWorks, Modbus	M
Motor Amps			
Demand Limit	OFF	OFF, ON	M
Minimum Amps	3%	1 to 80%	M
Maximum Amps	100%	10 to 100%	M
Soft Load	OFF	OFF, ON	M
Begin Amp Limit	20%	10 to 100%	M
Soft Load Ramp	5 min	1 to 60 min	M
Maximum Rate	1.0 °F/min	0.1 to 5.0 °F/min	M
Minimum Rate	0.4 °F/min	0.1 to 5.0 °F/min	M
Staging			
Mode	Pump	Normal, Efficiency, Pump, Standby	M

Sequence #	1	1,2, … (# of Compressors)	M
Maximum Compressors ON	2	1-16	M
Stage Delta T	1.0 °F	0 to 9.9 °F	M
Nominal Capacity	100 Tons	0 to 2000 Tons	T
Description	**Default**	**Range**	**PW**
Leaving Water			
Cool LWT	44. 0°F	35.0 to 80.0 °F	M
Heat LWT	135. 0°F	110.0 to 135.0 °F	M
Templifier No Start	70. 0°F	30.0 to 100.0 °F	M
Templifier Reset	55. 0°F	50 to 100.0 °F	M
Startup Delta T	3.0°F	0.0 to 10.0 °F	T
Stop Delta T	3.0°F	0.0 to 3.0 °F	T
LWT Reset Type	NONE	NONE, RETURN, 4-20mA	T
Max Reset Delta T	0.0°F	0.0 to 20.0 °F	T
Start Reset Delta T	10. 0°F	0.0 to 20.0 °F	T
Timers			
Evap Recirculate	0.5 min	0.2 min to 5 min	M
Start-Start	5 min	2 to 60 min	M
Stop-Start	3 min	1 to 20 min	M
Source No Start	70 °F	50 to 99 °F	T
Pumps			
Evap Pump	Pump #1 Only	Pump #1 Only, Pump #2 Only, Auto Lead, #1 Primary, #2 Primary	M
Cond Pump	Pump #1 Only	Pump #1 Only, Pump #2 Only, Auto Lead, #1 Primary, #2 Primary	M
Cooling Tower			
Tower Control	None	None, Temperature, Lift	T
Tower Stages	1	1 to 4	T
Stage Up Time	2 min	1 to 60 min	T
Stage Down Time	5 min	1 to 60 min	T
Stage Differential (Temp)	3.0 °F	1.0 to 10.0 °F	T
Stage Differential (Lift)	6.0 psi	1.0 to 20.0 psi	T
Stage #1 On (Temp)	70 °F	40 to 120 °F	T
Stage #2 On (Temp)	75 °F	40 to 120 °F	T
Stage #3 On (Temp)	80 °F	40 to 120 °F	T
Stage #4 On (Temp)	85 °F	40 to 120 °F	T
Stage #1 On (Lift)	35 psi	10 to 130 psi	T
Stage #2 On (Lift)	45 psi	10 to 130 psi	T
Stage #3 On (Lift)	55 psi	10 to 130 psi	T
Stage #4 On (Lift)	65 psi	10 to 130 psi	T

Cooling Tower Valve / VFD			
Valve/VFD Control	None	None, Valve Setpoint, Valve Stage, VFD Stage, Valve SP/VFD Stage	T
Valve Setpoint (Temp)	65 °F	40 to 120 °F	T
Valve Setpoint (Lift)	30 psi	10 to 130 psi	T
Valve Deadband (Temp)	1.0 °F	0.0 to 10.0 °F	T
Valve Deadband (Lift)	1.0 psi	0.0 to 20.0 psi	T
Stage Down @	20%	0 to 100%	T
Stage Up @	80%	0 to 100%	T
Valve Control Range (Min)	10%	0 to 100%	T
Valve Control Range (Max)	100%	0 to 100%	T
Valve Type	NC	Normally Closed, Normally Open (To Tower)	T
Minimum Start Position	10%	0 to 100%	T
Minimum Position @	60 °F	0 to 100 °F	T
Maximum Start Position	100%	0 to 100%	T
Maximum Position @	90 °F	0 to 100 °F	T
Description	**Default**	**Range**	**PW**
Bypass Valve, Step and Wait Control			
Step	6 sec	0 to 999 sec	T
Derivative	1	0 to 99	T
Gain	20	0 to 99	T
Dead Band (D-Band)	1.0	0 to 200	T
Tower Fan, PID Control			
Integral	600 sec	0 to 999 sec	T
Derivative	1 sec	0 to 999 sec	T
Proportional Gain (K)	80	0 to 999 sec	T
Dead Band (DB)	0	0 to 9.9 UOM	T
Update Period (TC)	500 ms	0 to 9999 ms	T
Additional WMC Tower Reset			
Tower Reset (Temp)	10 psi	0 to 20.0 psi	T
Tower Reset (Lift)	5.0 °F	0 to 10.0 °F	T
Sensor Selection	ECWT-B3	ECWT-B3 (provided) or EHRT-B9 (not provided)	T
Alarms			
Evaporator Freeze	34.0 °F	-9.0 to 45.0 °F	T
Condenser Freeze	34.0 °F	-9.0 to 45.0 °F	T
Low Suction pressure - Stop	25 psi	5 to 45 psi	T
Low Suction pressure - Inhibit	30 psi	7 to 45 psi	T
Low Suction pressure - Unload	29 psi	6 to 45 psi	T

High Discharge Temperature - Shutdown	190 °F	120 to 240 °F	T
High Discharge Temperature - Load	170 °F	120 to 240 °F	T
High Discharge pressure	140 psi	120 to 240 psi	T
Motor Current Threshold	5%	1 to 20%	T
Surge High Suction SH - Start	20 °F	1 to 99 °F	T
Surge High Suction SH - Run	12°F	2 to 25 °F	T
Service			
Unload Timer	120 sec	5 to 300 sec	T
Interlock Timer	10 sec	1 to 240 sec	T

12 BULDING AUTOMATION SYSTEMS (BAS)

All MicroTech® controllers with Open Choices™ are capable of BAS communications, providing easy integration and comprehensive monitoring, control, and two-way data exchange with open standard protocols such as LonWorks®, Modbus® or BACnet®.

Daikin Applied unit controllers strictly conform to the interoperability guidelines of the LonWorks® Interoperability Association and BACnet® International. They have received LonWorks ® certification with optional LonWorks® communication module.

12.1 Protocol Options

The following protocol options are available:

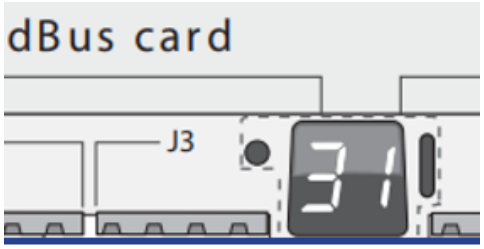
- BACnet® MS/TP
- BACnet® IP
- Modbus® RTU

The BAS communication module can be ordered with the chiller and factory-mounted or can be field-mounted at any time after the chiller unit is installed. Connection to the chiller for all BAS protocols will be at the unit controller. An interface card, depending on the protocol being used, will have been factory installed in the unit controller if so ordered, or it can be field installed.

If an interface module was ordered, the appropriate BAS interface installation manual was shipped with the unit. If necessary, contact your local Daikin Applied sales office for a replacement manual or obtain one from www.DaikinApplied.com. These documents can be easily found on the website using the “Search Literature” feature.

13 MULTI-CHILLER CONTROL

Interconnecting MicroTech pLAN RS485 wiring should be installed by Daikin. The Daikin Engineer will check the connections and make the necessary set point settings.
pLAN address can be changed using the service pin in the bottom part of the controller as shown in the picture below (see dashed circle):



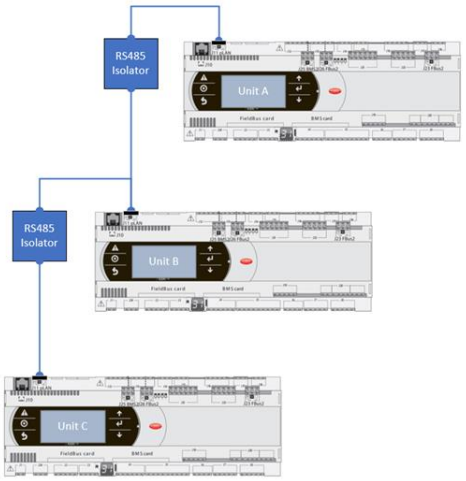
1. With no pLAN connections between chillers, disconnect chiller control power and set the DIP switches as shown in Table 9.
2. Verify correct nodes on each OITS Service Screen.
3. Connect chillers together (pLAN, RS485 wiring) as shown in Figure 3. The first chiller in the connection can be designated as Chiller A. The isolation board is attached to the DIN rail adjacent to the Chiller A unit controller. The isolation board has to be plugged into J11 on the controller. Next, interconnecting wiring is needed between Chiller A and Chiller B.

Two Chillers: If only two chillers are to be connected, Belden M9841 (RS 485 Spec Cable) or equivalent is wired from the 485OPDR solation board (terminals A, B, and C) on Chiller A to the J11 port on the unit controller of Chiller B. At J11, the shield connects to GND, the blue/white wire to the (+) connection, and the white/blue to the (-) connection. If a cable different from Belden is used, respect the same color/pin connection scheme.
Note that Chiller B does not have an isolation board. The last chiller (B in this case) to be connected does not need an isolation board.
Three or Four Chillers: If three or more chillers are to be connected, the interconnecting wiring is still made to Chiller B's J11 port. The second chiller (Chiller B) must have a 485OPDR isolator board that will be plugged into Chiller B's J11 port. Chiller B will look like Chiller A.
The wiring from Chiller B to Chiller C will be the same as A to B. That is, Belden cable connects from A, B, and C on B's 485OPDR board to chiller C's J11 port. Chiller C has no 485OPDR isolation board.
The procedure is repeated to the fourth chiller if four chillers are interconnected.

UNIT	Unit Controller	Compressor #1	Compressor #2
A	5	1	2
B	13	9	10
C	21	17	18
D	29	25	26

In the below picture the interconnection scheme is shown:

Figure 25: Multichiller control



14 DEFINITIONS

Active Amp Limit
Active amp limit is the actual amp limit imposed by an outside signal such as the load limit function.

Active Capacity Limit
The active capacity setpoint is the setting in effect at any given moment. Any one of several external inputs can limit a compressor's capacity below its maximum value.

Active Setpoint
The active setpoint is the parameter setting in effect at any given moment. This variation can occur on setpoints that can be altered during normal operation. Resetting the chilled water leaving temperature setpoint by one of several methods such as return water temperature is an example.

Condenser Recirc (Recirculation) Timer
A timing function, with a 30-second default after start, that holds off tower fan control for the duration of the timing setting.

Dead Band

The dead band is a set of values associated with a setpoint such that a change in the variable occurring within the dead band causes no action from the controller. For example, if a temperature setpoint is 44°F and it has a dead band of ± 2.0°F, nothing will happen until the measured temperature is less than 42°F or more than 46°F.

Demand

Signal between 0 & 1000 sent from the compressor controller to the compressor. This directs where the compressor needs to be with capacity: increasing, stable, or decreasing.

Discharge Superheat

Discharge superheat is calculated using the following equation:
Discharge Superheat = Discharge Temperature – Condenser Saturated Temperature

ELWT

Evaporator leaving water temperature. The "water" is any fluid used in the chiller circuit.

ELWT Error

Error in the controller context is the difference between the value of a variable and the setpoint. For example, if the ELWT setpoint is 44°F and the actual temperature of the water at a given moment is 46°F, the ELWT error is +2 degrees.

ELWT Slope

The ELWT slope is an indication of the trend of the chilled water temperature. It is calculated by taking readings of the temperature every few seconds and subtracting them from the previous value over a rolling one-minute interval.

Error

In the context of this manual, "Error" is the difference between the actual value of a variable and the target setting or setpoint.

Evaporator/Condenser Approach

The evaporator/condenser approach is calculated for each vessel. The equations are as follows:

Evap Approach = LWT – Saturated Temperature
Cond Approach = Saturated Temperature – LWT

Evap Hold-loading

This is a setpoint that establishes the minimum evaporator pressure to which the chiller is allowed to go. It signals that the unit is at full load so the no further loading will occur that would lower the pressure even further.

Evap Recirc (Evaporation Recirculation) Timer

A timing function, with a 30-second default, that holds off any reading of chilled water for the duration of the timing setting. This delay allows the chilled water sensors to take a more accurate reading of the chilled water temperature.

EXV

Electronic expansion valve, used to control the flow of refrigerant to the evaporator, controlled by the unit microprocessor.

Lenient Flow Logic

This option affords the chiller the maximum tolerance to intermittent water flow loss detection, and reduces nuisance chiller trips. Momentary loss of flow detection can be a result of valve changes in the primary loop, as when staging another chiller, or sudden changes in water temperature around the flow sensor. Variable speed pumps operating at minimum flow rates can exacerbate these flow issues.
Enabled, this logic detects a loss of flow signal (>5 Sec) in either the condenser or evaporator and sets an internal logic flag. Chiller operation is allowed to continue as long as the vessel pressures and surge detection remain valid. If condenser flow is lost and the pressure rises to within 5psi of the condenser pressure trip point the chiller will shut down on condenser flow loss alarm. If evaporator flow is lost and the evap pressure drops to the EP-Unload set point the chiller will shut down on evaporator flow loss alarm. If either flow signal is lost and the surge logic is tripped, the chiller will shut down and generate a flow loss alarm for whichever flow was missing.
The default setting for Lenient Flow logic in the WMC code is On. Turning it off converts the flow loss alarms, to timer based. Evap flow loss is adjustable from 12 down to 3s (default 12s), and the condenser flow loss is adjustable from 20 to 3s (default 20s).

Load Balance

Load balance is a technique that equally distributes the total unit load between two or more running compressors.

Load Limit

An external signal from the keypad, the BAS, or a 4-20 ma signal that limits the compressor loading to a designated percent of full load. Used to limit unit power input.

Low Pressure Hold (Inhibit) Setpoint

The psi evaporator pressure setting at which the controller will not allow further compressor loading. “Hold” and “Inhibit” are used interchangeably.

Low Pressure Unload Setpoint

The psi evaporator pressure setting at which the controller will unload the compressor in an effort to maintain the minimum setting.

LRA

Locked rotor amps.

Minimum and Maximum Compressor Speeds

The (respective) Surge and Choke speeds, determined by the compressor software, are based on suction and discharge pressures.

Offset

Offset is the difference between the actual value of a variable (such as temperature or pressure) and the reading shown on the microprocessor as a result of the sensor signal.

HMI

Machine interface Touch Screen, one screen per unit provides operating data visually and accommodates setpoint entry.

Part Load Balance Valves

These valves open before compressor start, to allow gas flow through the compressor, which stabilizes the impeller as it ramps up in speed. pLAN Pico Local Area Network is the proprietary name of the network connecting the control elements.

Refrigerant Saturated Temperature

Refrigerant saturated temperature is calculated from the pressure sensor readings. The pressure is fitted to an HFC134a temperature/pressure curve to determine the saturated temperature.

RLA

Run load amps.

SP

Setpoint

Stageup Delay

The time delay from the start of the first compressor to the start of the second.

Stageup/Stagedown Delta-T

Staging is the act of starting or stopping a compressor or fan when another is still operating. Startup and Stop is the act of starting the first compressor or fan and stopping the last compressor or fan. The Delta-T is the “dead band” on either side the setpoint in which no action is taken.

Startup Delta-T

Number of degrees above the LWT setpoint required to start the first compressor.

Stop Delta-T

Number of degrees below the LWT setpoint required for the last compressor to stop.

Suction Superheat

Suction superheat is calculated for each compressor using the following equation:
Suction Superheat = Suction Temperature – Evaporator Saturated Temperature

VDC

Volts, Direct Current; sometimes noted as vdc.

VFD

Variable Frequency Drive, a device located on the compressor used to vary the compressor speed.

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