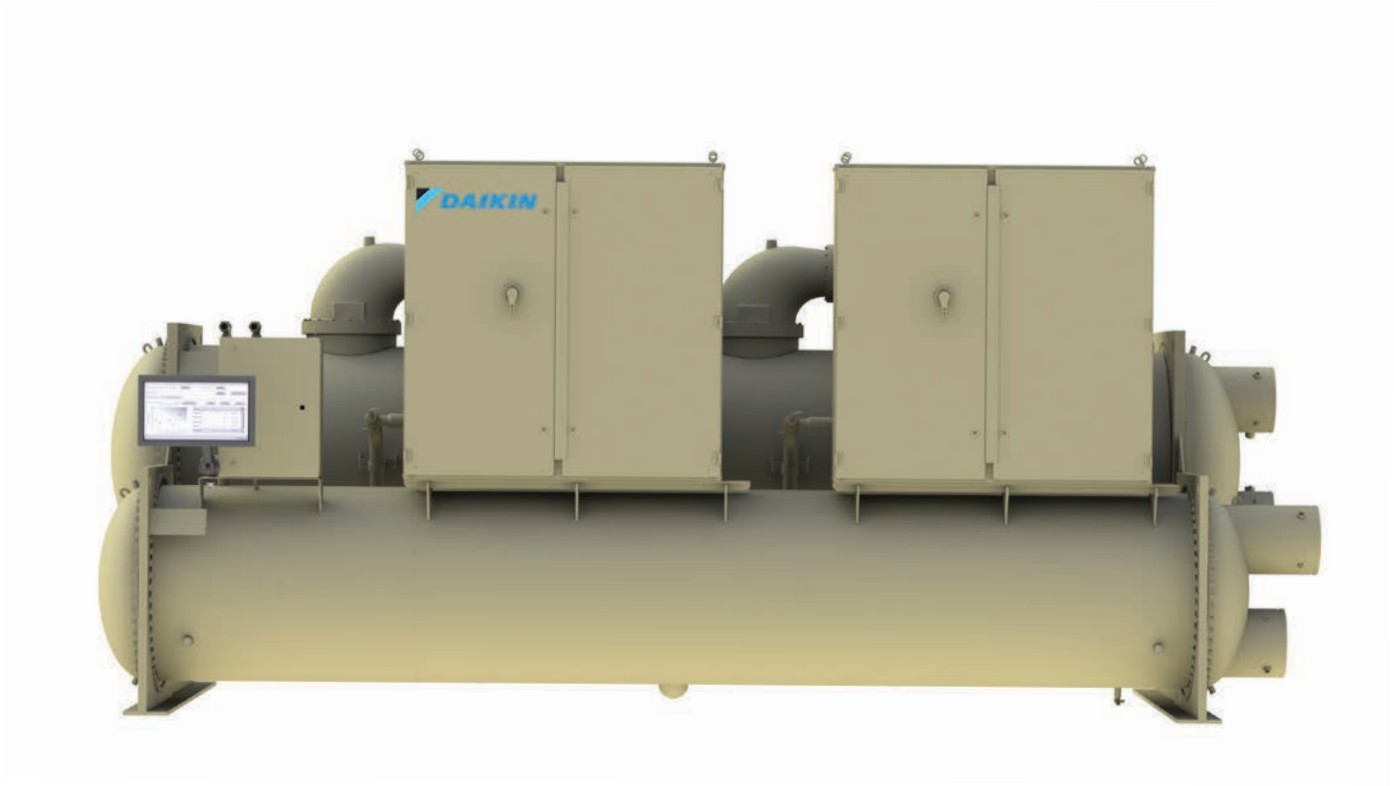
Installation, Operation, and Maintenance Manual

IOM 1266

Group: **Chiller**
Part Number: **IOM1266**
Date: **June 2018**
Supercedes IOM 1257

Magnitude®
Magnetic Bearing Centrifugal Chillers

Model WME, C-vintage
800 to 1500 Tons (2800 to 5300 kW)
HFC-134a Refrigerant



Manufactured in an ISO 9001 & ISO 14001 certified facility

Pre-Start Checklist – Centrifugal Chillers

Must be completed, signed and returned to Daikin Applied service dept. at least 2 weeks prior to requested start date.

Job Name	
Installation Location	
Customer Order Number	
Model Number(s)	
G.O. Number(s)	

Chilled Water	**Yes**	**No**	**N/A**	**Initials**
Piping Complete	☐	☐	☐	
Water System – flushed, filled, vented; Water treatment in place	☐	☐	☐	
Pumps installed and operational (rotation checked, strainers installed and cleaned)	☐	☐	☐	
Controls operational (3-way valves, face/bypass dampers, bypass valves, etc.)	☐	☐	☐	
Water system operated and tested; flow meets unit design requirements	☐	☐	☐	
Condenser Water	**Yes**	**No**	**N/A**	**Initials**
Cooling tower flushed, filled, vented; Water treatment in place	☐	☐	☐	
Pumps installed and operational (rotation checked, strainers installed and cleaned)	☐	☐	☐	
Controls (3-way valves, bypass valves, etc.) operable per IM/IOM	☐	☐	☐	
Water system operated and flow balance to meet unit design requirements	☐	☐	☐	
Electrical	**Yes**	**No**	**N/A**	**Initials**
115 volt service completed, but not connected to control panel (remote mounted starters)	☐	☐	☐	
Line Power Leads connected to starter; load leads(b) run from starter to compressor, ready for connection by Service (Do not connect load leads to starter or compressor terminals). (See Notes 1 & 4)	☐	☐	☐	
All interlock wiring complete and compliant with Daikin Applied specifications	☐	☐	☐	
Starter complies with Daikin Applied specifications	☐	☐	☐	
*Oil cooler solenoid wired to control panel as shown on wiring diagram (See Notes)	☐	☐	☐	
Pump starter and interlocks wired	☐	☐	☐	
Cooling tower fans and controls wired	☐	☐	☐	
Wiring complies with National Electrical Code and local codes (See Note 4)	☐	☐	☐	
Condenser pump starting relay (CP1,2) installed and wired (See Note 3)	☐	☐	☐	
Miscellaneous	**Yes**	**No**	**N/A**	**Initials**
*Oil cooled water piping complete. (Units with water-cooled oil coolers only)	☐	☐	☐	
Relief valve piping complete (per local codes)	☐	☐	☐	
Thermometers, wells, gauges, control, etc., installed	☐	☐	☐	
Minimum system load of 80% capacity available for testing/adjusting controls	☐	☐	☐	
Document Attached: Technical Breakdown from Daikin Tools	☐	☐	☐	
Document Attached: Final Order Acknowledgement	☐	☐	☐	

Notes: The most common problems delaying start-up and affecting unit reliability are:

1. Field installed compressor motor power supply leads too small. Questions: Contact the local Daikin Applied sales representative. State size, number and type of conductors and conduits installed:
   a. From Power supply to starter _____
   b. From starter to chiller unit (remote mounted)_____
2. Centrifugal chillers with water cooled oil coolers must have a 115 volt normally closed water solenoid valve installed in the oil cooler water supply line. Daikin Applied recommends ASCO Type 8210B27 solenoid valve or approved equal and 40-mesh strainer. Daikin Applied does not supply these components.
3. A 115-volt field-supplied relay (CP1,2) must be used to start/stop condenser water pump on most applications. Cold condenser water must not flow through condenser during compressor off cycle. Provisions have been made in control center for connecting CP relay, but must not have a rating in excess of 100 VA.
4. Refer to NEC Article 430-22 (a)

***Does Not Apply to Magnetic Bearing Chillers (WMC/WME)**

Contractor Representative

Signed: _____
Name: _____
Company: _____
Date: _____
Phone/Email: _____

Daikin Applied Sales Representative

Signed: _____
Name: _____
Company: _____
Date: _____
Phone/Email: _____

Cut Here ✂

This manual provides installation, operation, and maintenance information for Daikin WME Magnitude® centrifugal chillers with the MicroTech® controller.

NOTE: Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations, and experienced with this type of equpuipment.

⚠ 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.

⚠ WARNING

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.

General Description

Daikin Magnitude® Centrifugal Chillers are complete, self-contained, automatically controlled, liquid-chilling units featuring oil-free, magnetic bearing compressors. All Magnitude® chillers are equipped with a single evaporator and a single condenser along with either one or two compressors depending on the model.

Magnitude® chillers are designed for indoor, non-freezing installation only. The chillers use refrigerant HFC-134a that operates at a positive pressure over the entire operation range, so no purge system is required.

Only normal field connections such as water piping, relief valve piping, electric power, and control interlocks are required, thereby simplifying installation and increasing reliability. Necessary equipment protection and operating controls are included.

All Daikin Applied centrifugal chillers must be commissioned by a factory-trained Daikin Applied service technician. Failure to follow this startup procedure can affect the equipment warranty.

The standard limited warranty on this equipment covers parts that prove defective in material or workmanship. Specific details of this warranty can be found in the warranty statement furnished with the equipment.

NOMENCLATURE

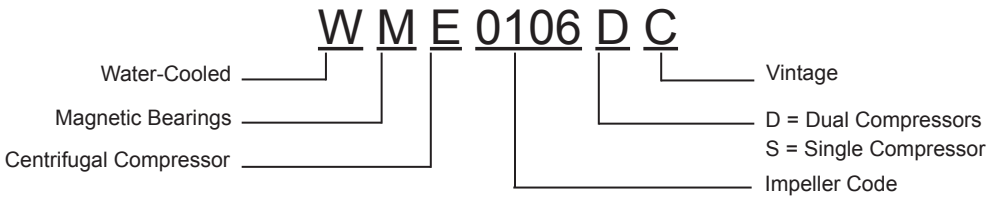
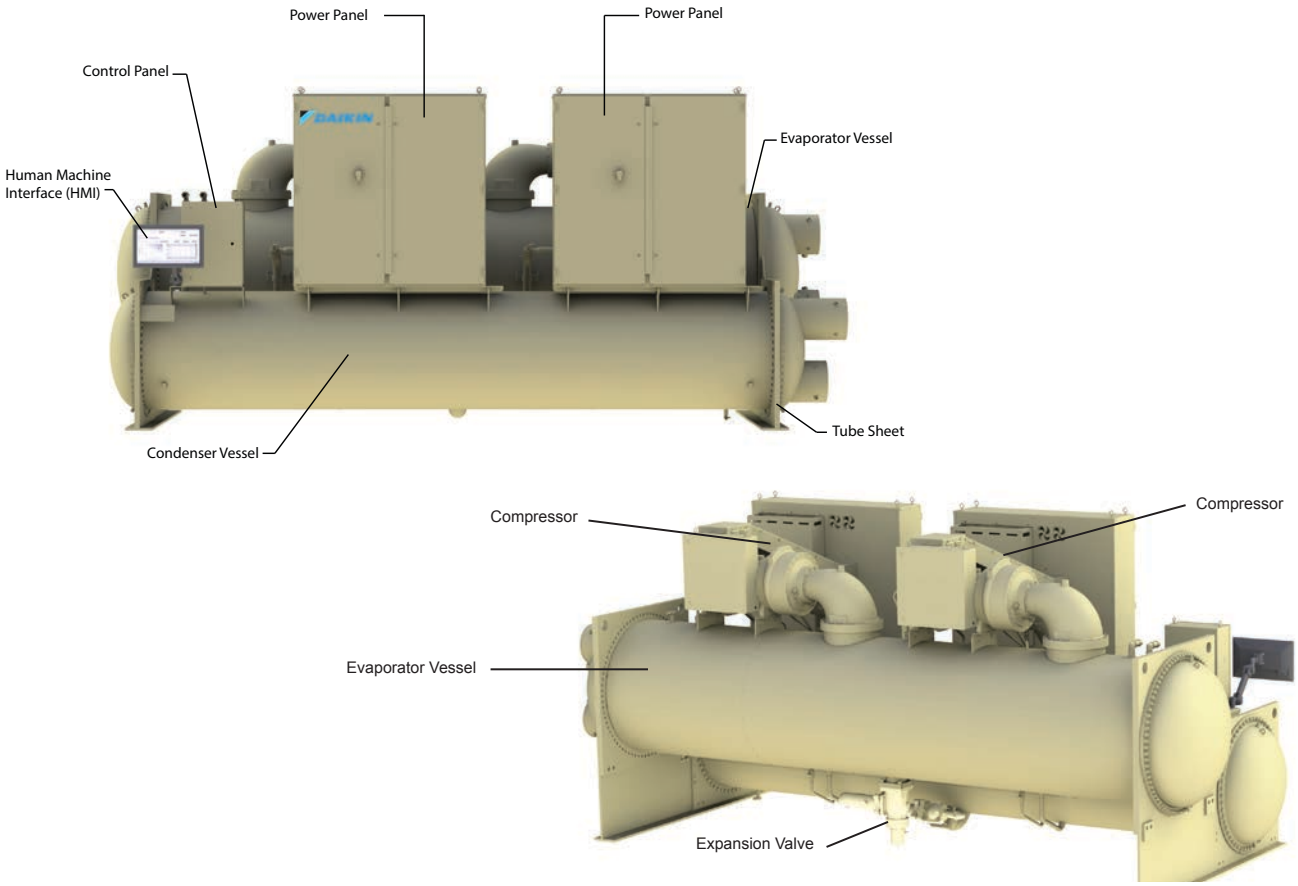


Figure 1: WME Major Component Locations



NOTE: Unit shown with right-hand condenser water connections and right-hand evaporator water connections. Water connection orientation is based on facing the unit power panel.

The Control System

The MicroTech® control system consists of a Human Machine Interface (HMI), a microprocessor-based unit controller, and compressor on-board controllers, providing monitoring and control functions required for efficient chiller operation.

The MicroTech® controllers acquire and process data related 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. See "Condenser Water Temperature Control" on page 17 for more information.

The MicroTech unit controller also communicates with the HMI for graphic display and is located in the unit control panel, as shown in Figure 4. The on-board compressor controllers are located in each compressor control panel, shown in Figure 3.

A single HMI is used per unit. The HMI panel, see Figure 1, is mounted on a moveable arm to allow placement in a convenient position for the operator. The HMI, see Figure 2 for an example of a screen display, is the device used for viewing unit information and entering setpoints into the control system. Select information from the HMI panel can be downloaded via a USB port located on the left side of the panel. For more information on the HMI, see "Human Machine Interface (HMI)" on page 24.

Figure 2: Representative HMI Screen

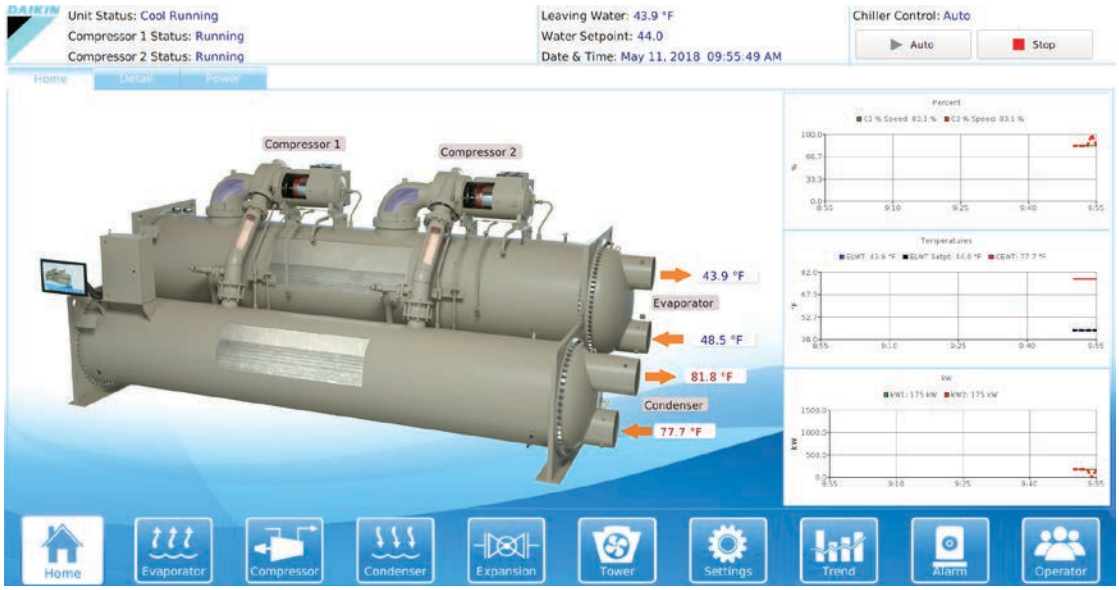


Figure 3: Compressor Control Panel

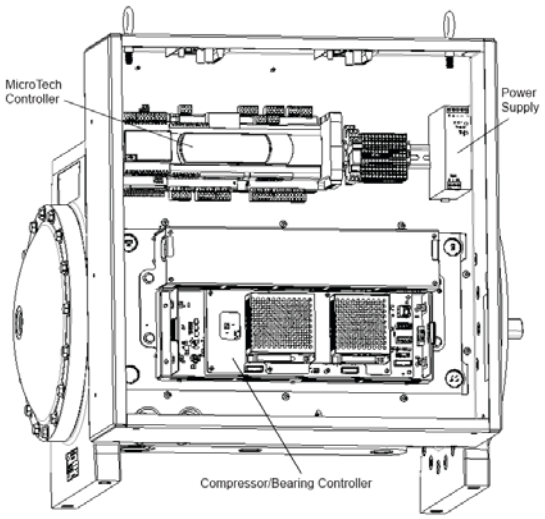
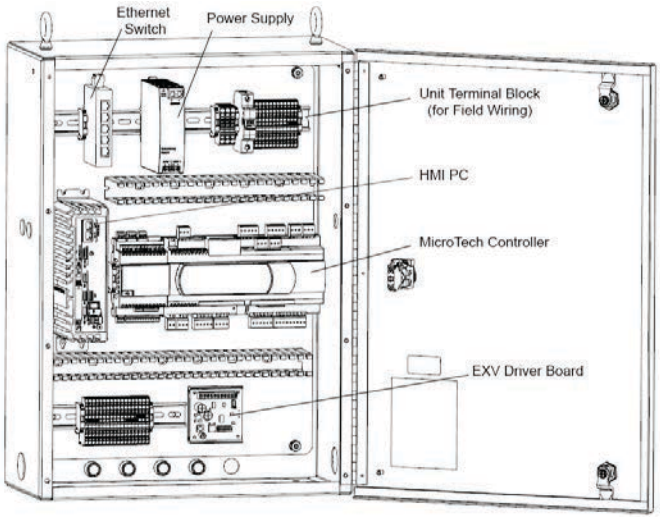


Figure 4: Unit Control Panel



Nameplates

There are several identification nameplates on the chiller:

- The unit nameplate is located on the exterior of the Unit Control Panel. Both the Model No. and Serial No. are located on the unit nameplate; the Serial No. is unique to the unit. These numbers should be used to identify the unit for service, parts, or warranty questions. This plate also has the unit refrigerant charge and electrical ratings.
- Vessel nameplates are located on the evaporator and condenser. They have a National Board Number (NB) and a serial number, either of which identify the vessel (but not the entire unit).

Receiving and Handling

The unit should be inspected immediately after receipt for possible damage. All Daikin Applied centrifugal water chillers are shipped FOB factory and all claims for handling and shipping damage are the responsibility of the consignee.

On units with factory-installed insulation, the insulation is removed from the vessel lifting hole (also used for transportation tie-downs) locations and is shipped loose. It should be secured in place after the unit is finally placed. Neoprene vibration isolation pads are shipped loose in the power panel. If the unit is equipped with a shipping skid, leave the skid in place until the unit is in its final position. This will aid in handling the equipment.

⚠ CAUTION

Extreme care must be used when rigging the unit to prevent damage to the control panels and refrigerant piping. See the certified dimension drawings included in the job submittal for the weights and center of gravity of the unit. If the drawings are not available, consult the local Daikin Applied sales office for assistance.

The unit can be lifted by fastening the rigging hooks to the four corners of the unit where the rigging eyes are located — see Figure 5. A spreader bar must be used between the rigging lines to prevent damage to the control panels, piping, and electrical panels. The spreader-bar length should be equal to, or no more than 1-foot shorter than, the distance between the lifting holes located at opposite ends of the chiller. The unit will require a single spreader-bar of this length capable of supporting 1.5 times the shipping weight of the unit. Separately, all cables and hooks by themselves must also be capable of supporting 1.5 times the shipping weight of the unit.

NOTE: The spreader bars in Figure 5 are a representation only and may not reflect the appearance of the actual spreader bars needed.

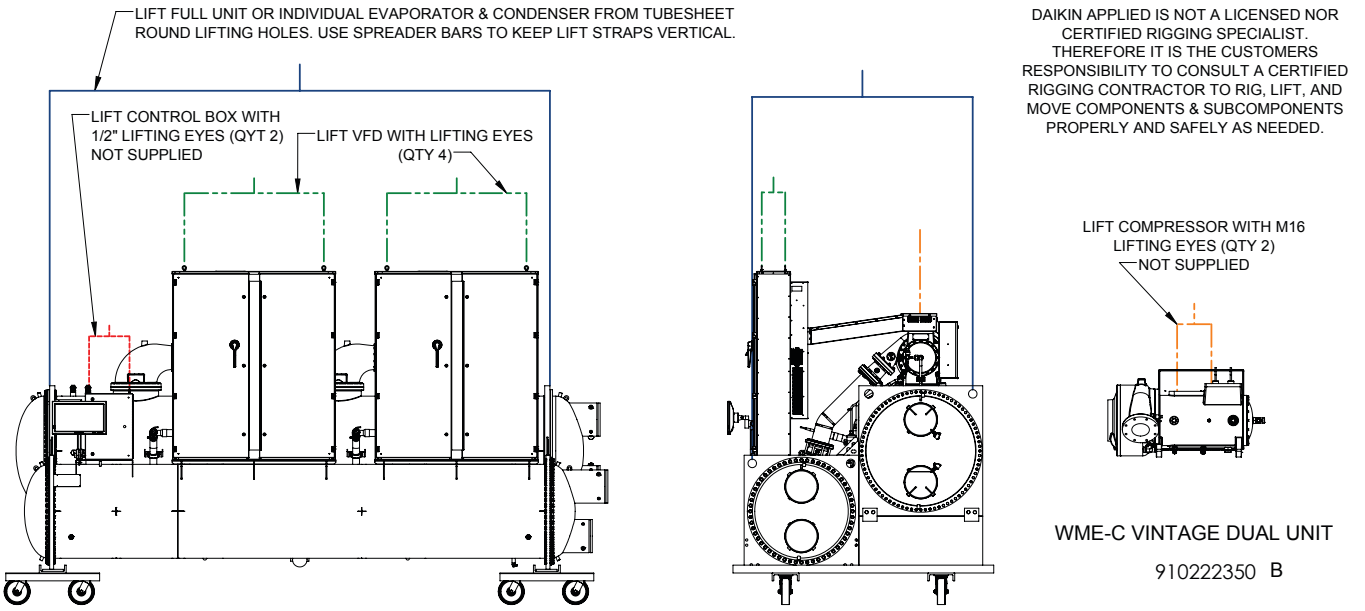
If a knockdown option was ordered on the unit, reference the "Retrofit Knockdown" section starting on page 11 for more information.

Location

WME chillers are intended only for installation in an indoor or weather protected area consistent with the NEMA 1 rating on the chiller, controls, and electrical panels. Equipment room temperature for operating and standby conditions is 40°F to 104°F (4.4°C to 40°C).

NOTE: Excessive humidity in the mechanical room should be avoided. Excessive humidity in the mechanical room can potentially lead to premature component wear on/near all cool surfaces which can condense water. If possible the mechanical room should be conditioned which can extend the useful lifetime for all mechanical room equipment.

Figure 5: WME Unit Rigging



Clearance

The unit must be placed in an area that allows for adequate clearance around the unit. See Figure 6 for clearance requirements around the sides of the chiller. Doors and removable wall sections can be utilized to meet these clearance requirements. There must be a minimum 3-feet clearance above the top of the chiller. The U.S. National Electric Code (NEC) or local codes can require more clearance in and around electrical components and must be checked for compliance.

Mounting

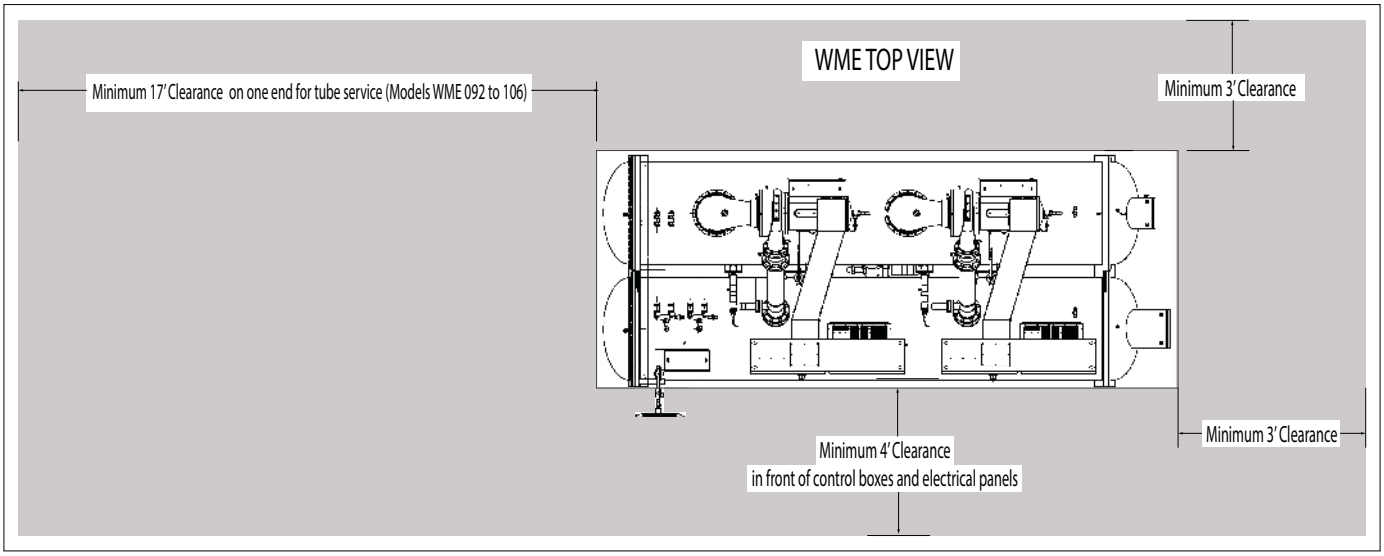
The unit must be mounted on a concrete or steel base. Make sure that the floor or structural support is adequate to support the full operating weight of the complete unit.

The neoprene vibration pads (shipped loose in the power panel) should be placed under the corners of the unit (unless the job specifications state otherwise). They must be installed so that they are flush with the edges of the unit feet.

It is not necessary to bolt the unit to the mounting slab or framework. Should this be required by local codes, 1-1/8 inch (28.5 mm) mounting holes are provided in the unit supports at the four corners.

When mounted, the base pad of the unit must be level to within ± 1/2 inch (12.7 mm) across the length and width of the unit.

Figure 6: Minimum Clearances Based on Standard Waterboxes



NOTE: Hinged type waterboxes may require more clearance. Consult a Daikin Applied sales representative for details.

Unit Dimensions and Shipping Weight

Figure 7: WME Dual Compressor Models (2-pass, right-hand configuration, with grooved connections)

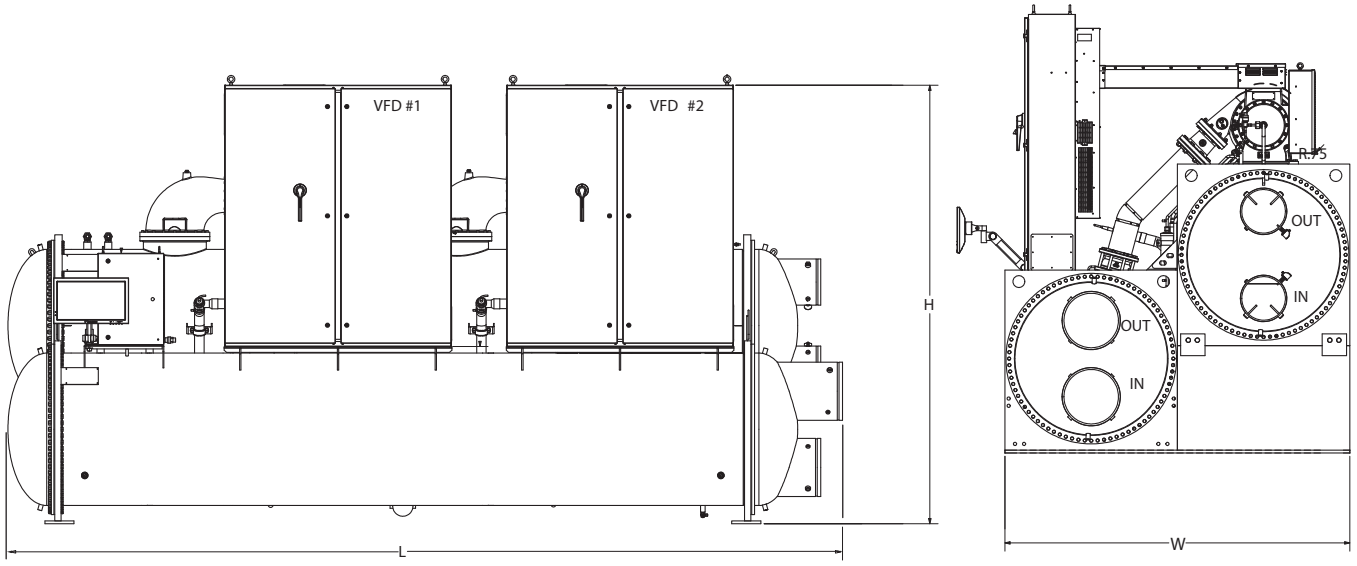


Table 1: WME1000-1500 Dimensions and Shipping Weights

Model	Heat Exchanger	Dished Waterbox Heads Length in (mm)	Marine Waterbox Heads Length in (mm)	Width in (mm)	Height[1] in (mm)
WME092*D	**E4216 / C3616**	229.4 (5828)	290.3 (7373)	91.50 (2324)	111.24 (2825)
WME092*D	**E4216 / C4216**			95.00 (2413)	110.94 (2818)
WME106*D	**E4216 / C4216**			95.00 (2413)	108.82 (2764)
WME106*D	**E4816 / C4216**	231.9 (5891)	298.8 (7589)	101.00 (2565)	115.06 (2923)

1 Unit height does not include height of removable eye bolt. Height indicated is with tallest possible unit option configuration as overall unit height is dependent on multiple options.

Drawing Notes

1. Final connections must allow for 0.5-inch +/- (12.7 mm) manufacturing tolerances.
2. 1.00-inch FPT (25.4 mm) evaporator and condenser relief valves must be piped per ANSI / ASHRAE 15. See Relief Valves on page 18 for more information.
3. Minimum Clearances (See Figure 6):
   - Check local codes for any additional clearance requirements.
   - Installation layout should be designed by qualified personnel familiar with local codes.
4. 3.25-inch (83 mm) diameter lifting holes are provided. See Figure 5 for lifting details.
5. Unit shown has standard right-hand water connections. Left-hand connections are available for either vessel. For right hand evaporator the inlet and outlet nozzles are reversed. ANSI-flanged nozzle connections are available upon request. When using ANSI-flanged connections add 0.5 inch (13 mm) to each flanged end. Dimensions shown are for units (evaporator / condenser) with standard design pressures. The waterside design pressure is 150 psi (1034 kPa). Consult the factory for unit dimensions with higher design pressures.
6. Unit vibration isolator pads are provided for field installation and when fully loaded are 0.25 inches (6 mm) thick.
7. The shipping skid adds 4.00 inches (105 mm) to the overall unit height.
8. If main power wiring is brought up through the floor, this wiring must be outside the envelope of the unit.
9. The unit is shipped with a full operating charge of refrigerant except with the “Partial Disassembly” knockdown option.
10. Power landing panel is on top of the cabinet; multiple point power will have two separate landing panels as shown in Figure 6.
11. Units with 575V and/or the optional harmonic filter will require additional panels than shown in Figure 7.

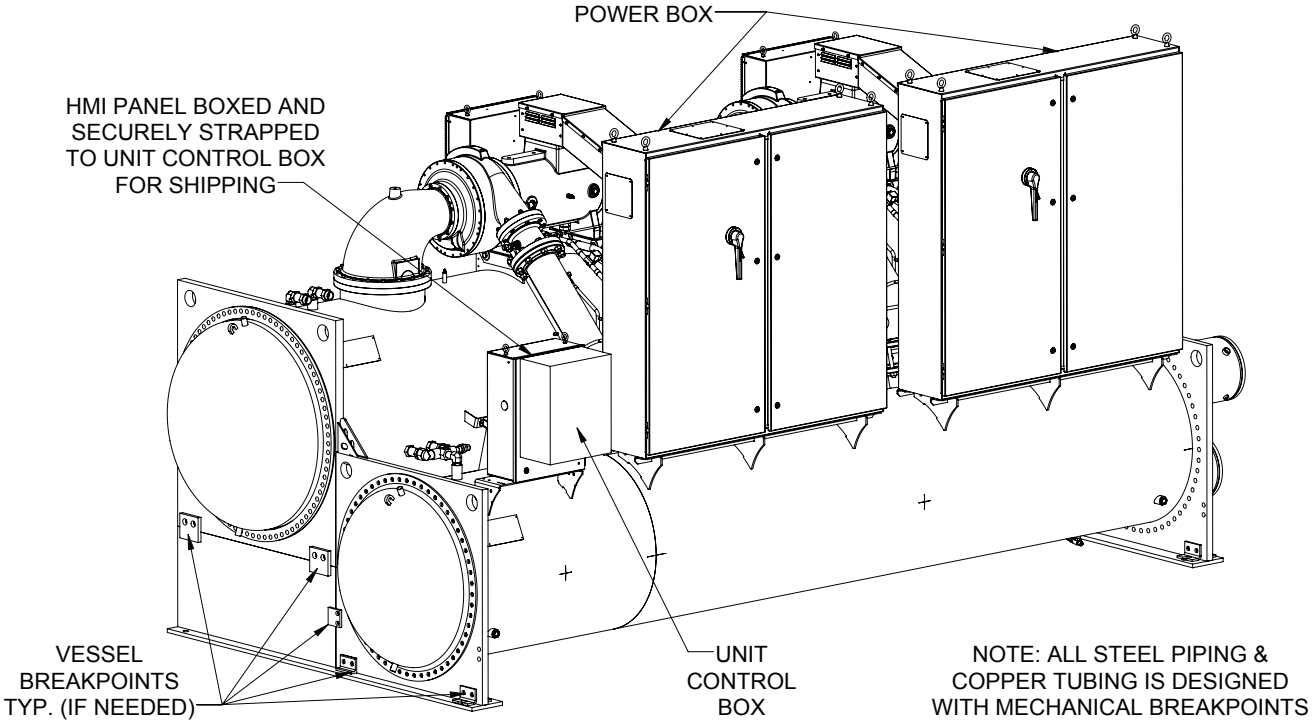
Retrofit Knockdown

Magnitude® WME chillers are relatively easy to disassemble due to the small compressor size, simplified refrigerant piping, and the absence of a lubrication system with its attendant components and piping. Various knockdown arrangements are available as options and are ideal for retrofit applications with tight installation clearances.

Bolt-Together Construction - Type A

Chillers are built and shipped completely assembled with bolt-together construction on major components for field disassembly and reassembly on the job site.

Figure 8: Bolt-Together Construction Option - Representative Schematic



Scope:

- Site disassembly and reassembly must be supervised or completed by Daikin Applied service personnel.
- Unit is fully tested at the factory prior to shipment.
- The chiller is shipped completely assembled with the full refrigerant charge, which must be recovered before breaking any refrigerant connection.
- The refrigerant charge must be removed from the unit if the vessels are to be separated. Exert the proper precautions before attempting any disassembly, assume the condenser isolation valves may have leaked and that any component of the chiller may be pressurized with refrigerant.
- Suction and discharge lines have bolt-on flanges.
- Motor cooling line is brazed at mechanical connections.
- Blockoff plates are required to cover any refrigerant connection left open for extended periods of time. Contact Daikin Applied service to obtain these parts.
- Check that no power is being applied to the unit. Before disconnecting any wire, it is prudent to label its function and connection point to facilitate reconnection.
- Unit ships with vessel and/or head insulation, if ordered.
- Unit ships with replacement refrigerant gaskets and O-rings, stick-on wire ties, and touch-up paint. Some insulation repair and touch-up painting may be required.

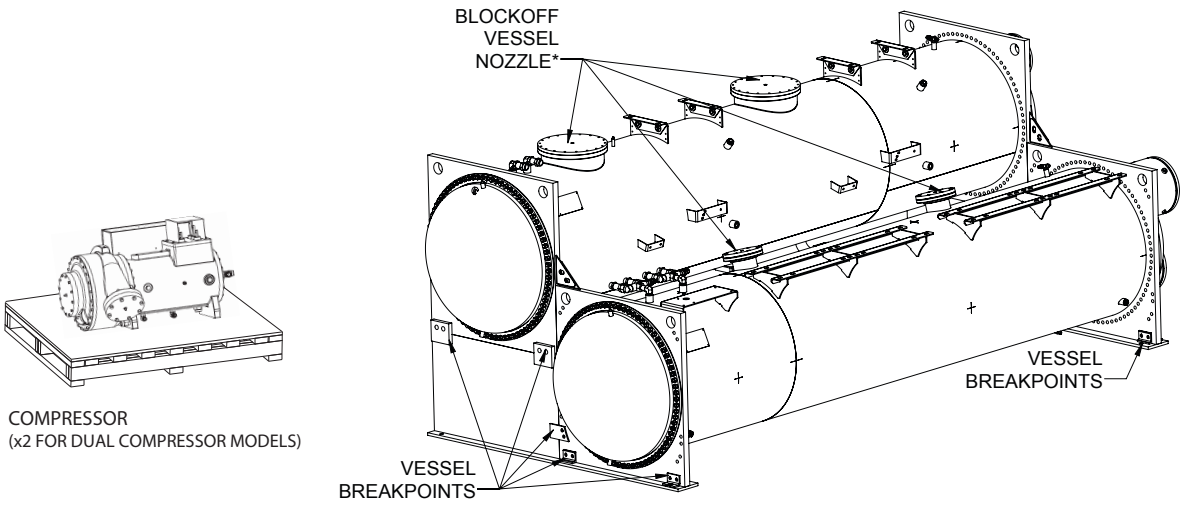
⚠ CAUTION

Standard torque specs must be followed when re-installing bolts. Contact Daikin Applied service for this information.

Partial Disassembly Construction - Type B

Compressor(s), power box(es), and control box are removed at the factory and shipped on separate skids; combined vessel stack is shipped together as a sub-assembly.

Figure 9: Partial Disassembly Construction Option - Representative Schematic



Scope:

- Site reassembly must be supervised or completed by Daikin Applied service personnel. Cost for unit reassembly and supervision by Daikin Applied service is not included in the purchase price of the equipment. Contact Daikin Applied service for pricing.
- Unit is fully tested at the factory prior to disassembly and shipment.
- All associated piping and wiring remain attached, if possible. Suction and discharge lines have bolt-on flanges and, if possible, remain attached. If the stack size or weight dictates further disassembly, the vessels can be separated by disconnecting any interconnecting wiring and tubing and then unbolting them.
- Refrigerant will not be shipped with the chiller and must be procured by others. Compressor(s) and vessels receive an inert gas holding charge that must be released prior to attempting to open any connection.
- All free piping ends are capped, blockoffs will cover all compressor and vessel openings.
- Unit ships with vessel and/or head insulation, if ordered.
- Unit ships with replacement refrigerant gaskets and O-rings, stick-on wire ties, and touch-up paint.

⚠ CAUTION

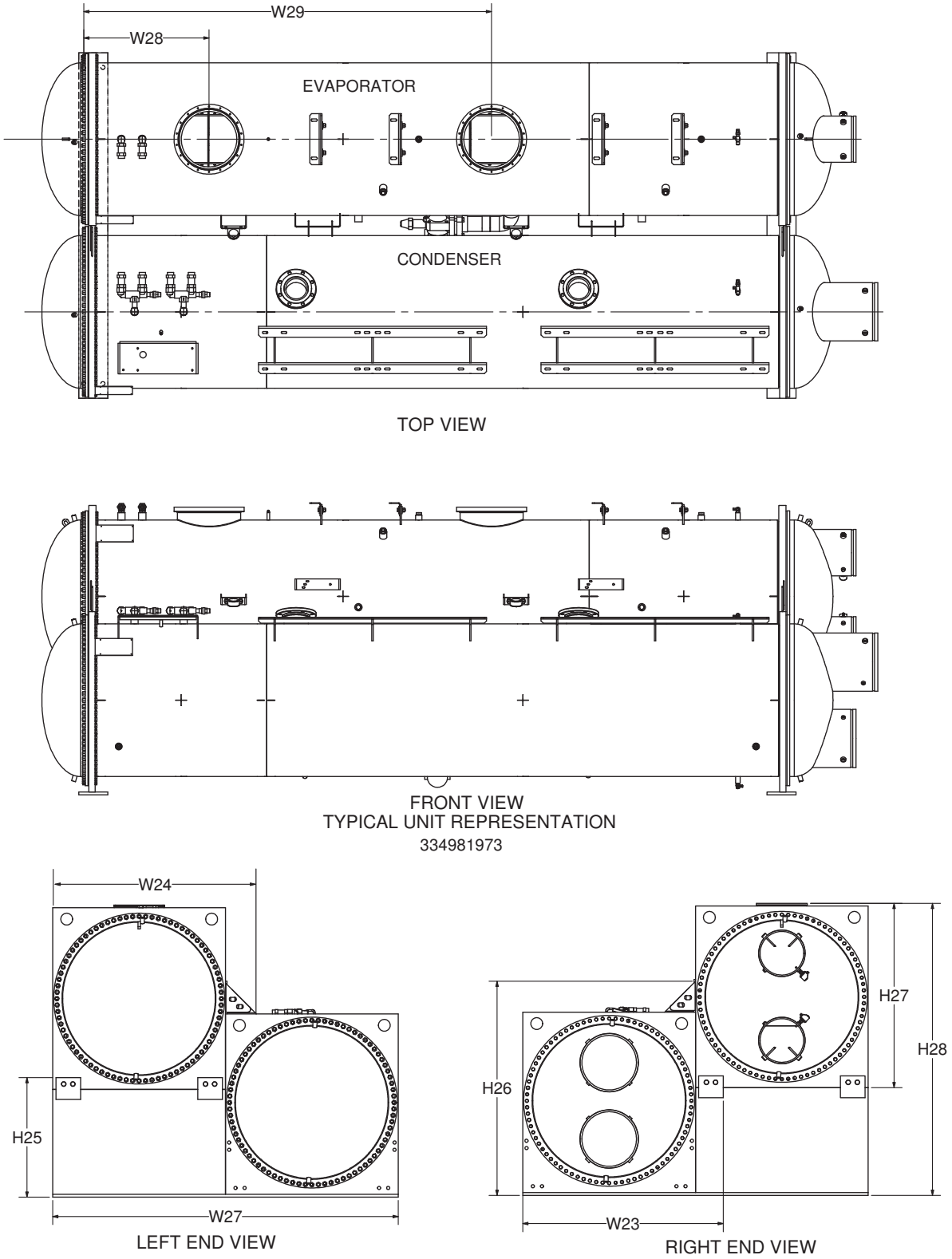
Standard torque specs must be followed when re-installing bolts. Contact Daikin Applied service for this information.

⚠ WARNING

Remove compressor, piping or vessel holding charge through the Schrader valve in the block off plates before attempting to loosen any fittings on them. Failure to do so can cause severe bodily injury.

Unit Knockdown Dimensions

Figure 10: Unit Dimensional Diagram for Typical WME Knockdown



NOTE: See page 10 for overall unit length, width, and height dimensions for WME models.

Table 2: Label Descriptions for Unit Dimensional Diagram

Label	Description
W23	Width (Condenser Tubesheet with Mounting Brackets)
W24	Width (Evaporator Tubesheet with Mounting Brackets)
W27	Width (Mounting Foot with Mounting Brackets)
W28	Width (Center of Outside Foot Mounting Hole to Center of Suction #1)
W29	Width (Center of Outside Foot Mounting Hole to Center of Suction #2)
H25	Height (Mounting Foot with Mounting Brackets)
H26	Height (Condenser Tubesheet with Mounting Brackets)
H27	Height (Evaporator Tubesheet with Mounting Brackets)
H28	Height (Unit Height from Bottom of Foot to Top of Suction)

Table 3: WME Knockdown Dimensions (in)

Label	Dimensions - inches (mm)			
	WME092*D		WME106*D	
	E4216/C3616	E4216/C4216	E4216/C4216	E4816/C4216
W23	51.0 (1295)	55.1 (1400)	55.1 (1400)	55.1 (1400)
W24	56.0 (1422)	56.0 (1422)	56.0 (1422)	62.0 (1575)
W27	91.5 (2324)	95.0 (2413)	95.0 (2413)	101.0 (2565)
W28	35.8 (909.)	35.8 (909.)	35.2 (896.)	35.2 (896.)
W29	113.5 (2883)	113.5 (2883)	112. (2869)	112.9 (2869)
H25	24.1 (613)	32.8 (834.)	32.8 (834.)	33.0 (840)
H26	51.4 (1306)	58.8 (1495)	58.8 (1495)	59.1 (1501)
H27	50.0 (1270)	50.0 (1270)	0.01 (0.25)	54.5 (1384)
H28	71.1 (1807)	79.5 (2021)	79.5 (2021)	84.3 (2141)

Table 4: Component Weights

Component	Dry Weight	
	lbs	kg
E4216 Evaporator	12671	5747
E4816 Evaporator	12765	5790
C3616 Condenser	12801	5806
C4216 Condenser	13181	5979
Power Panel	3100	1406

* Component weights based on largest unit with standard tube configuration.

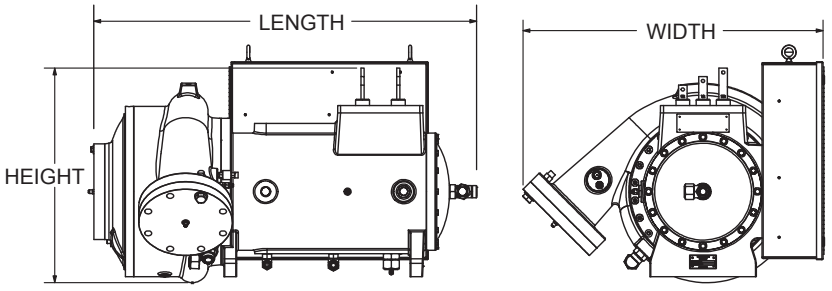
Compressor Dimensions

The compressor dimensions vary by model. All dimensions and weights per compressor are listed in Figure 11.

Table 5: Dimensions for WME Compressors

Model	Length in (mm)	Width in (mm)	Height in (mm)	Weight* lb (kg)
WME092*D	44.8 (1139)	32.9 (835)	24.5 (622)	893 (405)
WME106*D	44.9 (1141)	35.2 (894)	25.1 (639)	1050 (476)

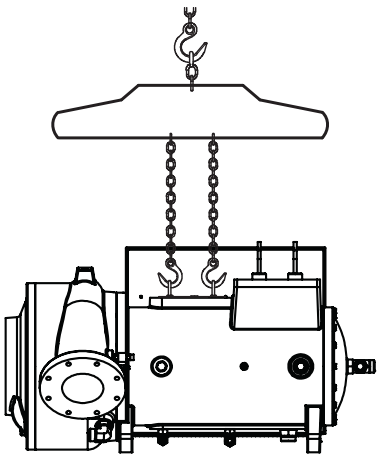
Figure 11: Representation - WME Compressor Dimensions



Compressor Rigging Requirements

To properly rig the compressor, install swivel lifting eye-bolts in the 2 holes on the top of the compressor, see Figure 14, flag #9. Use a spreader bar between the two chain hoists, as shown in Figure 12, to safely lift the compressor. Note compressor weights and dimensions in Table 5 and unit rigging instructions in Figure 5 on page 8.

Figure 12: WME Compressor Rigging Setup



NOTE: The spreader bar in Figure 12 is a representation only and may not reflect the appearance of the actual spreader bar needed.

Compressor Removal and Re-Attachment Instructions

Follow the steps listed to remove and re-attach the compressor.

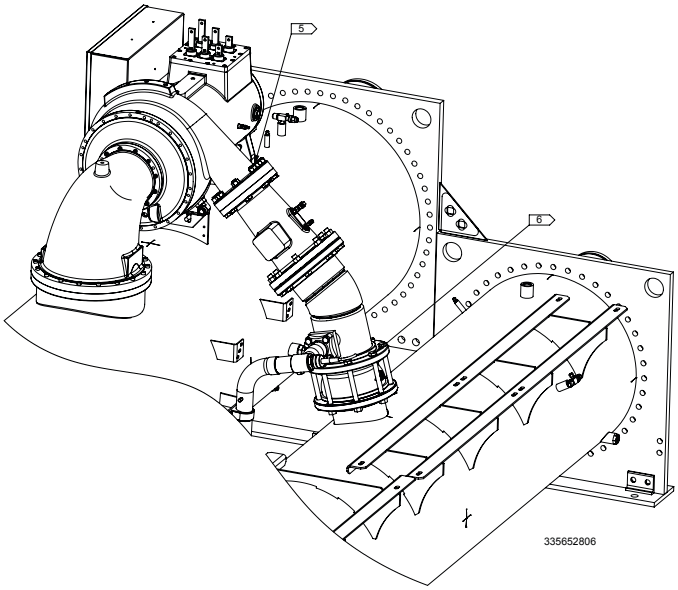
Compressor Removal Preparation

1. Close shut-off king valve at condenser liquid line outlet.
2. Close all other related shut-off valves.
3. Pump the refrigerant charge down into the condenser.
4. Ensure that the charge has been removed from the compressor and evaporator and that the discharge check valve is holding the charge in the condenser.
5. Loosen and remove bolts on the top side of the compressor discharge nozzle (see Figure 13, flag #5).
6. Loosen and remove botls at flange on condenser and remove discharge piping.
7. Cover openings to prevent foreign objects entering.

⚠ WARNING

Improper rigging, lifting, or moving of a unit can result in property damage, severe personal injury or death. Follow rigging and moving instructions carefully.

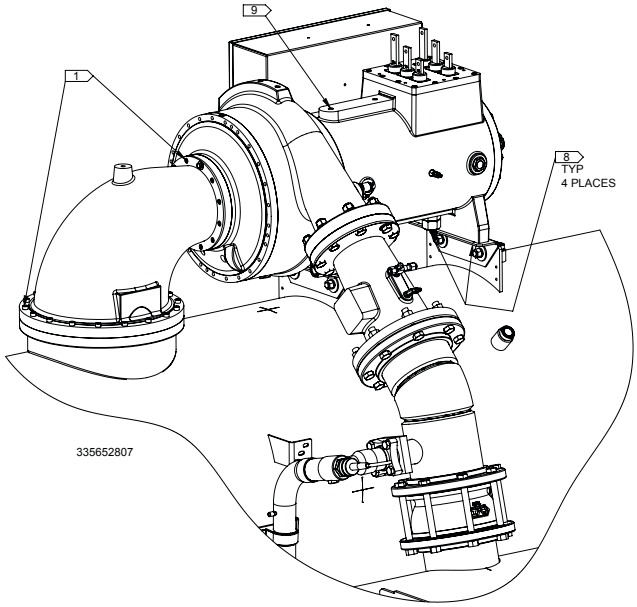
Figure 13: Compressor Removal Preparation



Compressor Removal

1. Loosen and remove bolts/screws on either side of the cast suction elbow (see Figure 14, flag #1).

Figure 14: Compressor Removal / Re-Attachment



2. Remove rotor cooling return line on the underside of the compressor motor housing along with both rotor cooling supply lines.
3. Remove (2) DIN connectors from the solenoid coils along refrigerant piping.
4. Remove rotor stepping valve control wire. The wire ties will have to be cut away during this process.

5. Remove the following wires coming from the VFD:
   - 300V DC power supply (gray cable)
   - power leads on the top of the motor housing
6. Remove the Ethernet cable coming from unit control box.
7. Remove the wireway box assembly from the compressor to the back of the starter.
8. Loosen the (4) bolts from the compressor's bottom mounting feet (see Figure 14, flag #8).

   NOTE: Do not loosen or remove bolts securing the compressor brackets as height is pre-set from the factory.
9. Use front tapped lifting hole on the compressor motor housing (see Figure 14, flag #9) to rig compressor for removal as shown in Figure 12, note weights from Table 5 and unit rigging instructions in Figure 5 on page 8.

Compressor Re-Attachment

1. Set the suction elbow back on top of the evaporator and install the bolts/screws loosely at the evaporator flange. Use new O rings provided.
2. Set the discharge piping back on top of the condenser and install the bolts loosely at the condenser flange. Use the new gasket supplied with the unit.
3. Set compressor on mounting brackets and install the (4) mounting bolts loosely. Reconnect the discharge nozzle with new o-rings provided and also at the suction elbow.

NOTE: For steps 4-6, all bolts need to be installed loosely first before final torque is applied.

4. Install (12) bolts/screws at suction elbow to compressor and torque to 25 ft-lbs max; do not over-tighten.
5. Install (18) bolts at evaporator flange to the suction line and torque to 62 ft-lbs max; do not over-tighten.
6. Install and torque the (8) bolts at the discharge nozzle to 205 ft-lbs, then torque the (8) bolts at the condenser flange to the same.
7. Torque the (4) compressor mounting bolts to 25 ft-lbs max, do not over-tighten.
8. Re-install the (4) flange bolts at the hot gas bypass line.
9. Re-install the wireway between compressor and VFD.
10. Re-attach all associated power wiring & Ethernet cable.
11. Re-attach rotor cooling return line on the underside of the compressor motor housing along with both liquid injection lines.
12. Pull vacuum at evaporator and compressor to 300 microns and perform a standing hold to verify no moisture or leaks - do not allow rise of 300 microns within 1 hour.
13. After verifying that pumps are running and water flow has been established on both evaporator and condenser, add vapor refrigerant to bring the saturated temperature above freezing. Open all valves.
14. Perform refrigerant leak check to ensure all connections and fittings are securely fastened.

Water Piping

All evaporators and condensers have OGS-type grooved water connections (adhering to Standard AWWA C606) or optional flange connections. The installing contractor must provide matching mechanical connections. PVC piping should not be used. Be sure that water inlet and outlet connections match certified drawings and nozzle markings.

⚠ CAUTION

If welding is to be performed on the mechanical or flange connections:

1. Remove the solid-state temperature sensor, thermostat bulbs, and nozzle mounted flow switches from the wells to prevent damage to those components.
2. Properly ground the unit or severe damage to the MicroTech® unit controller can occur.

NOTE: ASME certification will be revoked if welding is performed on a vessel shell or tube sheet.

The water heads can be interchanged (end for end) so that the water connections can be made at either end of the unit. If this is done, use new head gaskets and relocate the control sensors.

Field installed water piping to the chiller must include:

- air vents at the high points.
- a cleanable water strainer upstream of the evaporator and condenser inlet connections.
- a flow proving device for both the evaporator and condenser to prevent freeze up. Flow switches, thermal dispersion switches, or Delta-P switches can be used. Note that flow switches are factory installed. Additional flow switches can be used only if they are connected in series with the ones already provided. Connect additional flow switches in series between original flow switch inputs.
- sufficient shutoff valves to allow vessel isolation. The chiller must be capable of draining the water from the evaporator or condenser without draining the complete system.

It is recommended that field installed water piping to the chiller include:

- thermometers at the inlet and outlet connections of both vessels.
- water pressure gauge connection taps and gauges at the inlet and outlet connections of both vessels for measuring water pressure drop.

The piping must be supported to eliminate weight and strain on the fittings and connections. Piping must also be adequately insulated. Sufficient shutoff valves must be installed to permit draining the water from the evaporator or condenser without draining the complete system.

⚠ CAUTION

When common piping is used for both building heating and cooling modes, care must be taken to provide that water flowing through the evaporator cannot exceed 110°F. Water this hot can damage controls or cause the relief valve to discharge refrigerant.

⚠ CAUTION

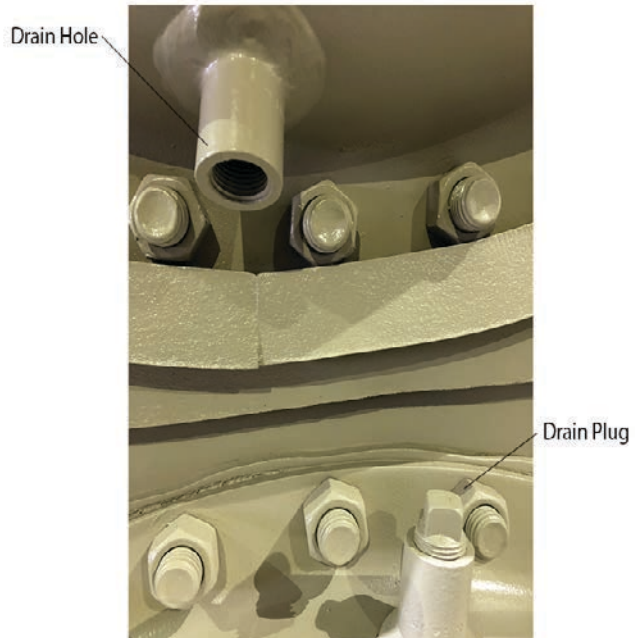
The water quality provided by the owner/occupant/operator/user to a chiller system should minimize corrosion, scale buildup, erosion, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment. Water systems should be cleaned and flushed prior to the chiller installation. Water testing and treatment should be verified during initial chiller installation/commissioning and maintained on a continuous basis by water treatment professionals (see Limited Product Warranty).

The use of detergents, chemicals, and additives in the chiller system water may adversely affect chiller performance and potentially lead to repair costs not covered by warranty. Any decision to use these products is at the discretion of the owner/occupant/operator/user as such they assume full liability/responsibility for any damage that may occur due to their use.

Vessel Drains at Startup

The unit is drained of water at the factory. Drain plugs for each vessel head are shipped separately in the contorl box. Units are shipped with the drain plug in the top water box drain hole and no plug in the bottom drain hole. Be sure to install the bottom drain plugs prior to filling the vessel with fluid. See Figure 15.

Figure 15: Drain Plug Installation



Condenser Water Temperature Control

Condenser water control is an important consideration in chiller plant design since condenser water temperature will directly impact chiller operation and efficiency. When the ambient wet bulb temperature is lower than peak design, the entering condenser water temperature from the cooling tower can be allowed to fall, improving chiller performance. However, operational issues may occur when the condenser water temperatures are either too high or too low. The WME chiller provides several options to assist the chiller plant designer in providing the optimum control of condenser water temperature.

Cooling Tower Control

Control of the cooling tower is required to maintain stability and avoid operational issues. This can be achieved through a BAS or by using the MicroTech® controller. For systems utilizing a common condenser water loop for multiple purposes, the BAS contractor must provide the control but use of the MicroTech® output signal is still recommended.

The preferred cooling tower control utilizes a variable speed fan. MicroTech® will provide a control signal to determine the proper fan speed. It can also control up to three stages of fan cycling. Note that fan cycling can cause cooling tower water temperature to fluctuate as fans stage on/off, potentially adding instability to the system.

Special consideration must be given to starting the chiller when cold condenser water is present, such as with inverted starts or changeover from free (tower) cooling to mechanical cooling. It is required that some method be used to control the condenser water to maintain proper head pressure as indicated by the MicroTech® controller.

Each of the following acceptable methods can be controlled by the MicroTech® or through a BAS utilizing the MicroTech® output signals:

1. Three-Way Bypass Valve Operation

   A traditional method for building condenser pressure at startup with colder condenser water is with the use of a three-way bypass valve. The device blends warmer water leaving the condenser with cooler water from the cooling tower at the condenser inlet. The bypass valve position will change until full flow from the tower to the condenser is obtained. The MicroTech® provides only the valve position control signal. Main power to drive the valve's actuator must be provided by the installer. The three-way valve should be located close to the chiller within the equipment room to minimize the volume of water.

2. Two-Way Valve Operation

   Another condenser control method is to use a modulating two-way control valve located on the outlet connection of the condenser. The valve will be nearly closed at startup to restrict water flow, which keeps generated heat in the condenser until an acceptable minimum condenser

pressure is reached. As heat builds, the valve will open slowly until a full flow condition from the cooling tower is established. A separate power source is required to provide power to the valve actuator.

NOTE: To ensure proper operation, caution should be used when utilizing the two-way valve option.

3. VFD Operating with a Condenser Water Pump

   A third method of condenser control for startup is utilizing a variable frequency drive with the condenser water pump. The speed will change as directed by the MicroTech® output signal until design flow is reached. Speed adjustments may be required during the initial chiller startup as determined by the service technician.

NOTE: Not using the MicroTech® logic to control valves and variable frequency drives may result in system instability, capacity reduction, and issues starting the chiller with cold condenser water temperature.

Condenser Pump Sequencing

It is recommended to utilize the logic built into the MicroTech® controller to start the condenser pump. MicroTech® has the capability to operate a primary pump and a secondary standby pump. The condenser water flow should be stopped when the chiller shuts off. This will conserve energy and prevent refrigerant from migrating to the condenser. Moisture in the air can condenser on the cooler surfaces of the un-insulated condenser barrel if flow is present when the chiller is idle.

Water Side Economizer Cycle Operation

Water side economizers are commonly used for ASHRAE 90.1 compliance and energy savings. This system utilizes a heat exchanger external to the chiller when cold cooling tower water is available to provide cooling. The most common system has a heat exchanger used in conjunction with the chiller's evaporator.

The BAS contractor will need to provide controls for the heat exchanger including isolation valves and temperature control. The BAS contractor will also need to control the isolation valves for the chiller. It is important to use slow-acting type valves to prevent rapid changes in system flows. Changeover from economizer cooling to mechanical cooling requires one of the methods previously mentioned to maintain suitable condenser head pressure.

Contact your local Daikin Applied representative for more information on this application.

Relief Valves

As a safety precaution and to meet code requirements, each chiller is equipped with pressure relief valves located on the condenser and evaporator for the purpose of relieving excessive refrigerant pressure (caused by equipment malfunction, fire, etc.) to the atmosphere.

Table 6: WME, C-vintage Relief Valve Data

	Evaporator	Condenser
Location	Top of evap	Top of condenser
Pressure Setting (psi)	200	225
Discharge Capacity (lb/min air)	75.5	75.5
Qty	2	2 for 36 inch diameter shells 4 for 42 inch diameter shells
Connection Size	1.0-inch female NPT	

Most codes require that relief valves be vented to the outside of a building. Relief piping connections to the relief valves must have flexible connectors.

⚠ CAUTION

Units are shipped with refrigerant valves closed to isolate the refrigerant in the unit condenser. Valves must remain closed until startup by the factory service technician.

Remove plastic shipping plugs (if installed) from the inside of the valves prior to making pipe connections. Whenever vent piping is installed, the lines must be in accordance with local code requirements; where local codes do not apply, the latest issue of ANSI/ASHRAE Standard 15 code recommendations must be followed.

Condenser Relief Valves

In order to ensure proper installation, it is important to know how the three-way relief valve functions. One valve remains active at all times and the second valve acts as a standby. When the stem of the three-way valve is pushed into the valve completely, the valve is in "Front Seated Position" and all refrigerant will flow through the back outlet port, as shown in Figure 17. When the stem of the three-way valve is pulled back completely, the valve is in "Back Seated Position" and all refrigerant will flow through the front outlet port, as shown in Figure 18.

Figure 16: Condenser Three-Way Relief Valve

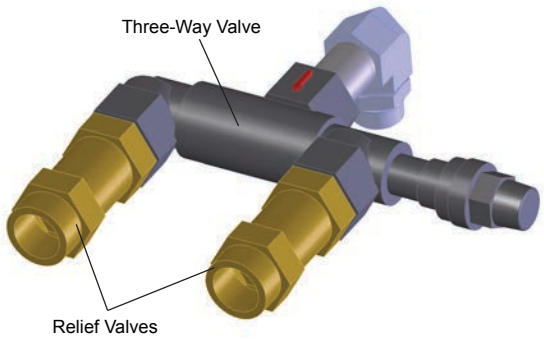


Figure 17: Three-Way Valve, Front Seated Position

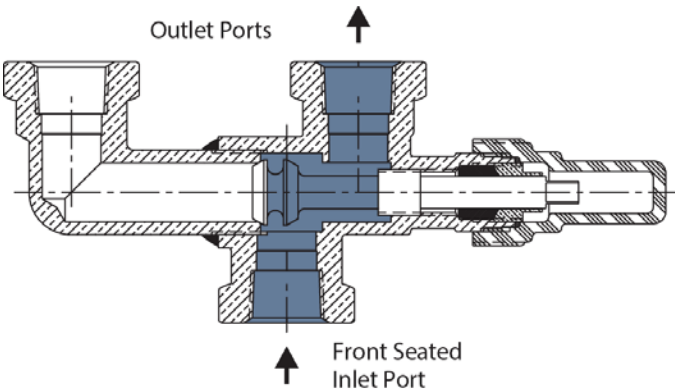
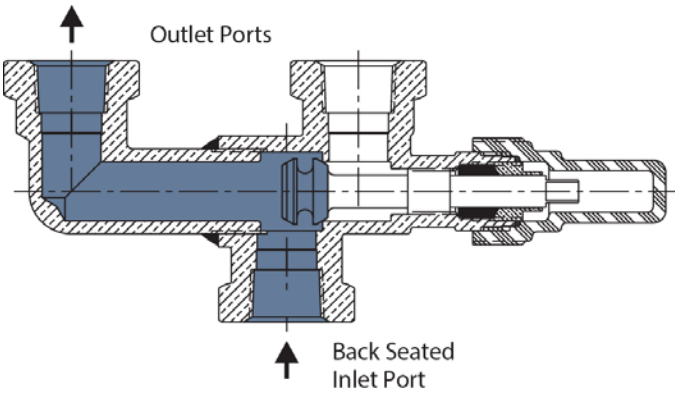


Figure 18: Three-Way Valve, Back Seated Position

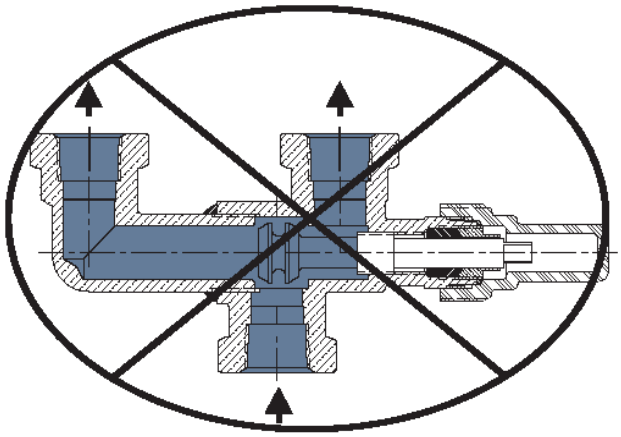


When the valve stem is not pushed forward or pulled back completely, the valve is in "Mid Position," as shown in Figure 19.

⚠ CAUTION

Do not operate the system with the three-way valve stem in the Mid Position.

Figure 19: Three-Way Valve, Mid Position



Field Power Wiring

The standard power wiring connection to Magnitude® chillers is multi-point for dual compressor WME models. Refer to the unit nameplate and the Daikin Tools selection report for the correct electrical ratings.

⚠ DANGER

Qualified and licensed electricians must perform wiring. An electrical shock hazard exists that can cause severe injury or death.

Factory-mounted and wired line reactors are standard. The field control wiring required varies depending on unit model. See "Figure 20: WME Dual Compressor Wiring Schematic" on page 22 for wiring information. These wiring diagrams are also provided with the chiller.

NOTE: Wiring, fuse, and wire size must be in accordance with the National Electric Code (NEC). The voltage to these units must be within ±10% of nameplate voltage (415V units must have voltage within -13% and +6% of nameplate voltage) and the voltage unbalance between phases must not exceed 2%. Since a 2% voltage unbalance will cause a current unbalance of 6 to 10 times the voltage unbalance per the NEMA MG-1 Standard, it is most important that the unbalance between phases be kept at a minimum.

⚠ CAUTION

Do not use power factor correction capacitors with WME chillers. Doing so can cause harmful electrical resonance in the system. Correction capacitors are not necessary since VFDs inherently maintain high power factors.

See Use with On-Site Generators on page 49 for additional information on Generator Sizing and Transferring Power.

Chiller Control Power

In all cases of power operation except when with RapidRestore®, the chiller control power must remain as factory-wired from a unit-mounted transformer.

Field Insulation

If the optional factory-installation of thermal insulation is not ordered, insulation should be field installed to reduce heat loss and prevent condensation from forming. Insulation should cover:

- the evaporator barrel, tube sheet, and waterboxes.
- the suction line from the top of the evaporator to the compressor inlet flange.
- the compressor support brackets welded to the evaporator.
- the liquid line from the expansion valve to the evaporator inlet, including the expansion valve.
- the part load balance valve to the evaporator.

Approximate total square footage of insulation surface required for individual packaged chillers is tabulated by evaporator code and can be found in Table 7.

Table 7: Insulation Area Required for WME Models

Evaporator Code	Insulation Area sq. ft. (m^2)
E4216	263 (24.4)
E4816	302 (28.1)

Long Term Storage

This information applies to new units being stored waiting for startup or to existing units that may be inoperative for an extended period of time.

The chiller must be stored in a dry location indoors and protected from any damage or sources of corrosion. A Daikin Applied service representative must perform an inspection and leak test of the unit on minimum quarterly schedule, to be paid by the owner or contractor. Daikin Applied will not be responsible for any refrigerant loss during the storage time or for repairs to the unit during the period of storage, or while moving the unit from the original location to a storage facility and back to any new installation location. If there is concern about the possibilities of damage and loss of charge during storage, the customer can have the charge removed and stored in recovery cylinders.

⚠ CAUTION

If the temperature of where the chiller is located is expected to exceed 113°F (45°C), then the refrigerant must be removed.

For additional tasks required, contact Daikin Applied service.

DAIKIN

Pre-Start Checklist – Centrifugal Chillers

Must be completed, signed and returned to Daikin Applied service dept. at least 2 weeks prior to requested start date.

Job Name	
Installation Location	
Customer Order Number	
Model Number(s)	
G.O. Number(s)	

Chilled Water	Yes	No	N/A	Initials
Piping Complete	☐	☐	☐	
Water System – flushed, filled, vented; Water treatment in place	☐	☐	☐	
Pumps installed and operational (rotation checked, strainers installed and cleaned)	☐	☐	☐	
Controls operational (3-way valves, face/bypass dampers, bypass valves, etc.)	☐	☐	☐	
Water system operated and tested; flow meets unit design requirements	☐	☐	☐	
Condenser Water	**Yes**	**No**	**N/A**	**Initials**
Cooling tower flushed, filled, vented; Water treatment in place	☐	☐	☐	
Pumps installed and operational (rotation checked, strainers installed and cleaned)	☐	☐	☐	
Controls (3-way valves, bypass valves, etc.) operable per IM/IOM	☐	☐	☐	
Water system operated and flow balance to meet unit design requirements	☐	☐	☐	
Electrical	**Yes**	**No**	**N/A**	**Initials**
115 volt service completed, but not connected to control panel (remote mounted starters)	☐	☐	☐	
Line Power Leads connected to starter; load leads(b) run from starter to compressor, ready for connection by Service (Do not connect load leads to starter or compressor terminals). (See Notes 1 & 4)	☐	☐	☐	
All interlock wiring complete and compliant with Daikin Applied specifications	☐	☐	☐	
Starter complies with Daikin Applied specifications	☐	☐	☐	
*Oil cooler solenoid wired to control panel as shown on wiring diagram (See Notes)	☐	☐	☐	
Pump starter and interlocks wired	☐	☐	☐	
Cooling tower fans and controls wired	☐	☐	☐	
Wiring complies with National Electrical Code and local codes (See Note 4)	☐	☐	☐	
Condenser pump starting relay (CP1,2) installed and wired (See Note 3)	☐	☐	☐	
Miscellaneous	**Yes**	**No**	**N/A**	**Initials**
*Oil cooled water piping complete. (Units with water-cooled oil coolers only)	☐	☐	☐	
Relief valve piping complete (per local codes)	☐	☐	☐	
Thermometers, wells, gauges, control, etc., installed	☐	☐	☐	
Minimum system load of 80% capacity available for testing/adjusting controls	☐	☐	☐	
Document Attached: Technical Breakdown from Daikin Tools	☐	☐	☐	
Document Attached: Final Order Acknowledgement	☐	☐	☐	

Notes: The most common problems delaying start-up and affecting unit reliability are:

1. Field installed compressor motor power supply leads too small. Questions: Contact the local Daikin Applied sales representative. State size, number and type of conductors and conduits installed:
   a. From Power supply to starter _____
   b. From starter to chiller unit (remote mounted)_____
2. Centrifugal chillers with water cooled oil coolers must have a 115 volt normally closed water solenoid valve installed in the oil cooler water supply line. Daikin Applied recommends ASCO Type 8210B27 solenoid valve or approved equal and 40-mesh strainer. Daikin Applied does not supply these components.
3. A 115-volt field-supplied relay (CP1,2) must be used to start/stop condenser water pump on most applications. Cold condenser water must not flow through condenser during compressor off cycle. Provisions have been made in control center for connecting CP relay, but must not have a rating in excess of 100 VA.
4. Refer to NEC Article 430-22 (a)

***Does Not Apply to Magnetic Bearing Chillers (WMC/WME)**

Contractor Representative

Signed: _____
Name: _____
Company: _____
Date: _____
Phone/Email: _____

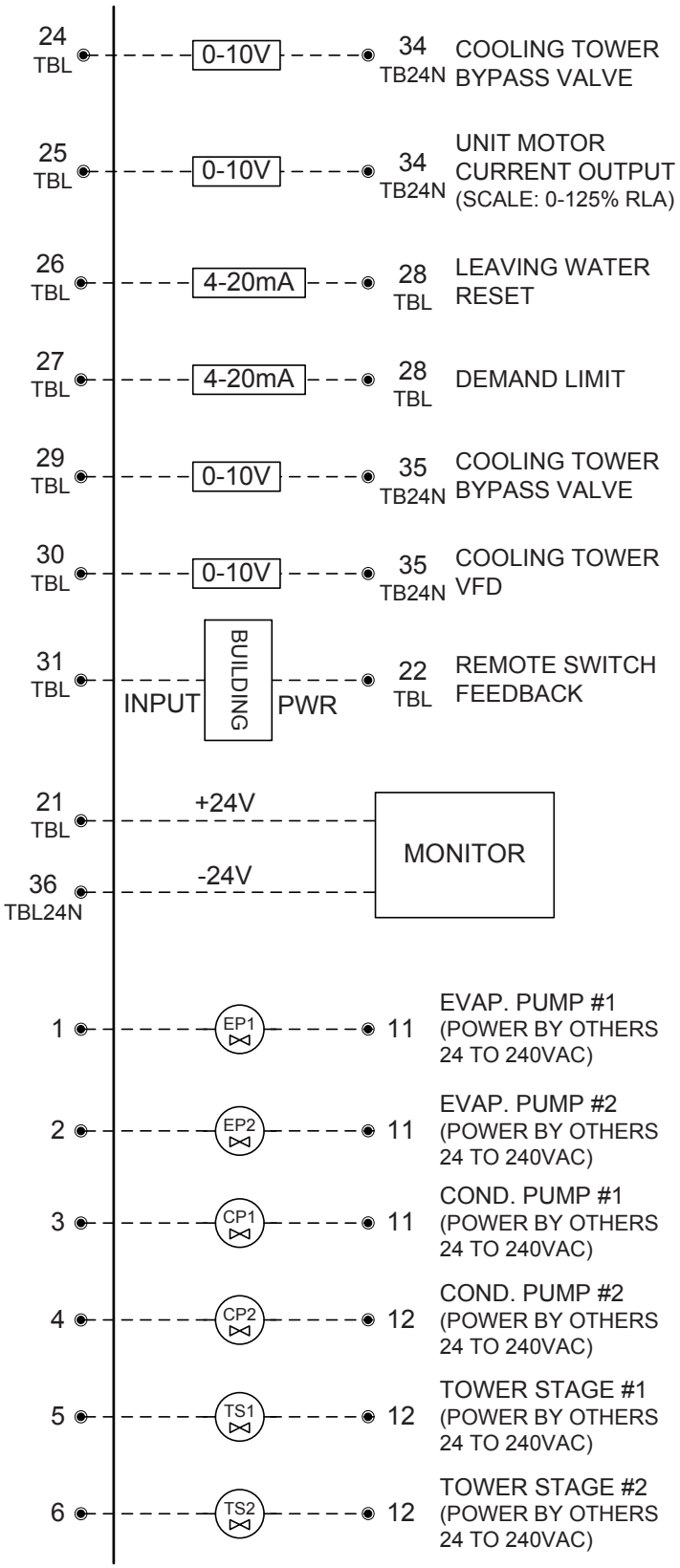
Daikin Applied Sales Representative

Signed: _____
Name: _____
Company: _____
Date: _____
Phone/Email: _____

Form SF01017

05AUG2014

Figure 20: WME Dual Compressor Wiring Schematic



Electrical Notes

1. Units are available for 60Hz, 460 or 440 to 480V.
2. Wiring, fuse and wire size must be in accordance with the National Electric Code (NEC).
3. Important: Voltage unbalance not to exceed 2% with a resultant current unbalance of 6 to 10 times the voltage unbalance per NEMA MG-1, 1998 Standard. This is an important restriction that must be adhered to.

Power Wiring

Use only copper supply wires with ampacity based on 75°C conductor rating. (Exception: for equipment rated over 2000 volts, 90°C or 105°C rated conductors should be used). Connections to terminals must be made with copper lugs and copper wire.

Short Circuit Current Ratings

The standard short circuit rating is 35kA for 460 V. Optional high short circuit current ratings are available for 65kA, and 100kA with a matching circuit breaker.

The optional circuit breaker must be sized to meet these ratings.

Notes for field wiring diagram

1. All line-side wiring must be in accordance with the NEC and be made with copper wire and copper lugs only. Power wiring connection is in the VFD panel located at the rear of the unit.
2. Minimum control wire size for 115 VAC is 12 ga. for a maximum length of 50 feet. If greater than 50 feet, contact your Daikin representative for recommended wire size minimum. Wire size for 24 VAC is 18 ga. All wiring to be installed as NEC Class 1 wiring system. All 24 VAC wiring must be run in separate conduit from 115 VAC wiring. Wiring must be wired in accordance with NEC and connection to be made with copper wire and copper lugs only.
3. Voltage unbalance not to exceed 2% with a resultant current unbalance of 6 to 10 times the voltage unbalance per NEMA MG-1, 1998 Standard. Voltage variation is +/- . 10% of nameplate voltage.
4. A customer furnished 24 or 240 Vac power for alarm relay coil may be connected at J18. The alarm is operator programmable. Maximum rating of the alarm relay coil is 25 VA.
5. Remote on/off control of unit can be accomplished by installing a set of dry contacts at J31.
6. If field supplied pressure differential flow switches are used, they must be installed across the vessel and not the pump. They must be suitable for 24vac and low current application.
7. Optional customer supplied 25 VA maximum coil rated, chilled water pump relay may be wired as shown. This option will cycle the chilled water pump in response to chiller demand.
8. The condenser water pump must cycle with the unit. A customer supplied 25 VA maximum coil rated, condenser water pump relay must be wired as shown.
9. Optional customer supplied 25 VA maximum coil rated cooling tower fan relays may be wired as shown. This option will cycle the cooling tower fans in order to maintain unit head pressure.
10. 4-20 mA external signal for chilled water reset are wired to J26; demand limit is wired to J27.

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.

Operator Schools

Training courses for Magnitude® Centrifugal Maintenance and Operation are held through the year at the Daikin Learning Institute in Verona, Virginia. The school urriculum includes instruction on basic refrigeration, MicroTech® controllers, enhancing chiller efficiency and reliability, MicroTech® troubleshooting, system components, and other related subjects. For more information, visit us at www.DaikinApplied.com and click on Training or call the Training Department. Refer to the back cover of this document for contact information.

Sequence of Unit Operation

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

Dual Compressor Units

The following sequence of operation applies to Magnitude® Model WME chillers with dual compressors.

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.

2. **Water flow and load proven**

   Once evaporator flow has been confirmed and the chiller load proven, the sequence for starting the Lead compressor will begin. If the normal staging option has been selected, auto lead-lag logic will determine which compressor to start first based on number of starts.

3. **Compressor shaft levitation**

   The magnetic bearings are activated and correct shaft position is verified.

4. **Condenser pump start**

   The condenser pump is commanded to start and water flow is confirmed. EXV must be 50% open or greater.

5. **Lead compressor start**

   The Lead compressor is started and the shaft speed is increased to the calculated Minimum RPM. From this point the vanes are opened and then speed is increased to match the cooling load. When the Lead compressor reaches an operating point where it would be more efficient to operate two compressors, it signals the Lag to initiate a start sequence and may adjust its capacity to assist the Lag compressor start. In many cases the Lag will start before the Lead reaches 100% of RLA.

6. **Lag compressor start**

   Once started, the Lag compressor will quickly ramp up to balance the chiller load between the two compressors. If a lag does not start, a Tandem start will occur on the next lag request.

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 when the compressors reach their Maximum RPM, maximum allowed %RLA or power limitation. While maintaining the desired evaporator leaving water temperature, the two compressors will balance load based on power.

8. **Dual compressor unloading**

   As load decreases, the compressors will unload to sustain the water temperature set point 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. Further capacity reduction is accomplished by opening the Part Load Balance valve.

9. **Staging down to one compressor running**

   With the chiller running two compressors on condition and the building load reducing to the point that one compressor can carry the load more efficiently than two can, one compressor will be shut down based on compressor run hours.

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 set point and reaches the stop delta temperature. Anytime the chiller is disabled, it will perform an orderly unload and shutdown both compressors.

Unit Enabling/Disabling

There are multiple options that will enable and disable the chiller and its compressors:

1. Unit Button - Located on the upper right hand corner of the HMI as shown in Figure 2 on page 7.
2. Compressor 1 or 2 Enable Seting - Located in the Settings menu, Modes tab in the HMI.
3. Manual Button - Located on the outside, front of the control panel.
4. Remote Enable - Optional signal from a remote physical switch or BAS signal. Replaces a jumper located on terminal connection J31 (see "Figure 20: WME Dual Compressor Wiring Schematic" on page 22).

The switches listed above work in conjunction with the “Control Source” that is selected in the HMI via the Settings/Modes Screen. (See Figure 37 and Table 11 on page 33.) The three options for “Control Source” are:

1. User - This is the default mode. When this mode is set, a STOP button and an AUTO button will appear at the top of the HMI screens, as shown in Figure 22 on page 25. **This mode will ignore all functionality of a connected Remote Switch**. It will also ignore BAS commands.
2. Digital Input - This mode will ignore BAS commands.
3. BAS - This mode adds BAS capability to the Digital Input functionality.

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

Enabling

To enable the chiller and its compressors when the “Control Source” is “Digital Input” 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 “User” and a Remote Switch is being used, the position of the Remote Switch will be ignored. In that case, only the rocker switches need to be closed. Once these rocker switches are closed, press the AUTO button on the HMI to enable the chiller in “User” mode.

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 “Digital Input” 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 - This switch will disable the chiller in a similar manner as the Unit Switch.
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 “User,” 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 “Digital Input” or “BAS” mode.

Human Machine Interface (HMI)

The HMI is turned on/off with a switch located at the lower right-hand edge 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 (a blank, black screen). If the screen is black, touch it first to be sure it is on before using the ON/OFF button.

Chiller Operation Without the HMI

The Human Machine Interface (HMI) communicates with the Unit Control Processor, 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. A PC monitor and USB mouse can be connected to the Unit Control Processor via its VGA and USB ports and can be used to view operational data, to clear alarms, and to change setpoints, if necessary. See "Controller Inputs and Outputs" section starting on page 47 for more information.

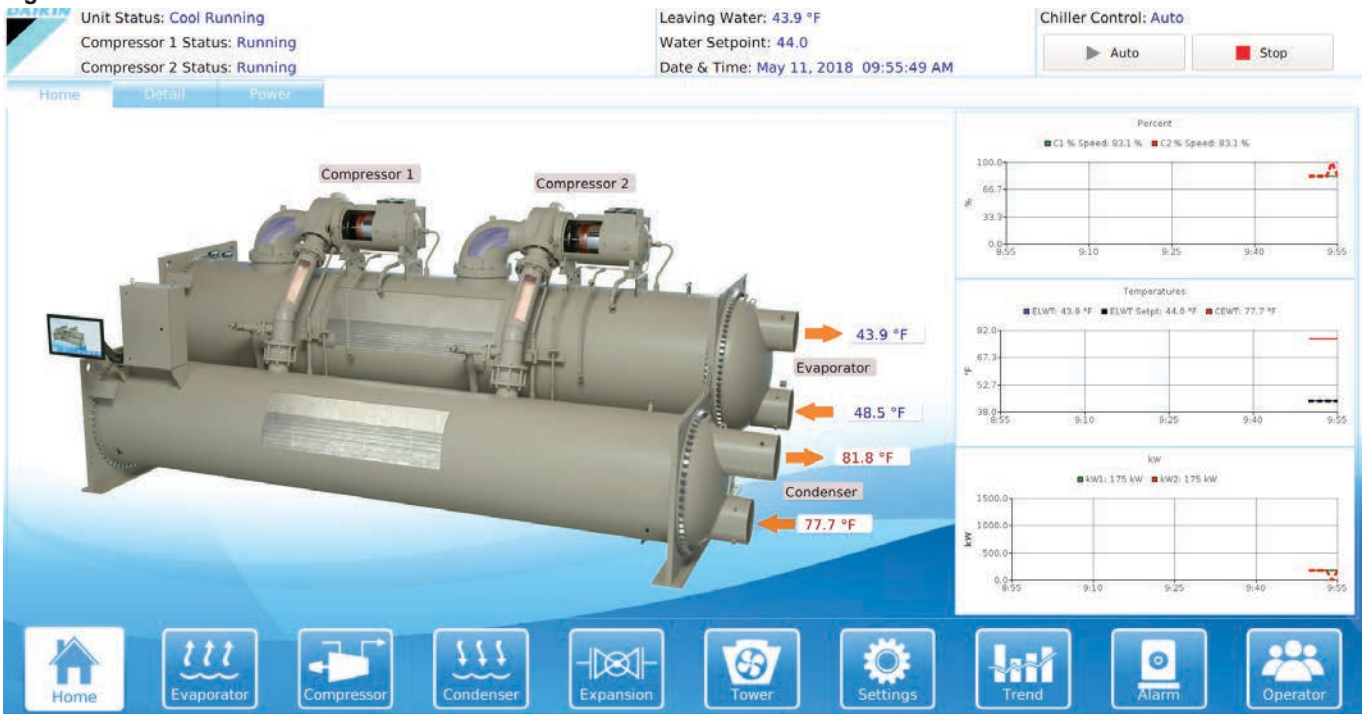
Navigation Summary

The Home View Screen, see Figure 22, is the main information page for the chiller. This screen contains the AUTO and STOP buttons in the upper right hand corner, which are used to start and stop the unit when in “User” control mode. Other groups of screens can be accessed from the Home View Screen by pressing one of the icons on the bottom of the screen.

An initial startup step may be to select the Operator icon on the bottom right of the HMI to access the Operator screen (Figure 21) to set display language and unit of measure preferences as weill as input the appropriate level of password for making unit adjustments going forward. Should the touch screen cursor not respond to where the screen is being pressed, use the Calibrate buttton to reclibrate the screen. The bar was made longer to make it easier for the non-calibrated cursor to select.

Figure 21: Operator View Screen

Figure 22: Home View Screen



Home View Screen

The Home View Screen (Figure 22) shows the basic operating condition of the chiller. Note that the chiller displayed on all screens will be representative of the actual chiller, showing either one or two compressors depending on the chiller model. Other unit options and order details are not specific to the HMI image.

(I) Consistent Information The top banner across all screens will always show the following:

- Actual leaving water temperature
- Chilled water setpoint
- Date and Time
- Chiller Control Source
- Unit Status - the possible status combinations are shown in Table 8 and discussed below.

Table 8: UNIT STATUS Possibilities

MODE	STATE	SOURCE (for stop)
COOL	OFF	Mechanical Switch
	SHUTDOWN	Digital Remote Switch
	AUTO	Local Unit
	RUNNING	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 device or signal. The possible combinations are shown in Table 9.

Table 9: 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 Evaporator Flow	
OFF Stop to Start Timer = xxx	
OFF Staging (Next ON)	
OFF Awaiting Load	
FLOAT Levitation	Confirming levitation
START Condenser Flow	Waiting for condenser flow
RUN Load [method]	Normal operation
RUN Hold [method]	
RUN Unload [method]	
RUN [capacity] [method] RLA Limit	Overrides water temperature control
RUN [capacity] [method] Lag Start	
RUN [capacity] [method] Evaporator Pressure	
RUN [capacity] [method] Pull Down Rate	
RUN [capacity] [method] Demand Limit	
UNLOAD	Unloading during shutdown
SHUTDOWN Awaiting Zero Current	Motor coasting to a stop
SHUTDOWN Coasting	

NOTE: Timer countdown values will be shown in place of "xxx". [capacity] will be Load, Hold, or Unload. [method] can be IGV, VFD, or REV.

The bottom icon bar will be visible on all screens with the active screen highlighted in white.

(II) Unit Status Modes - Defined by Mode followed by State. If the unit is stopped, the Source would be listed after State. Various unit states and control sources are shown as examples in Figure 23 to Figure 25.

Figure 23: Mechanical Switch Source

Figure 24: Digital Remote Switch Source

Figure 25: BAS Network Source

(III) Additional Home View Trend Data Graphs

- Entering and leaving evaporator water temperatures
- Entering and leaving condenser water temperatures
- Percent compressor speed
- Compressor kW

(IV) Alarm

- The ALARM icon will turn red and begin flashing should an alarm occur. This red ALARM button will appear on all screens in the case of an alarm. See Figure 26 for an example of an active alarm alert. For more information on alarms, see page 43 through page 46.

Figure 26: Active Alarm Icon

Additional HMI View Screens

Pressing the Detail Tab on the top of the Home View Screen provides specific unit operating parameters shown in Figure 27. Similarly, the Power Tab will show current, voltage, and power information for each compressor as well as the unit, see Figure 28.

The HMI screens for the four main components will highlight the relevant portion of the chiller (see to Figure 32) and provide additional information not found on the Home screens. Similarly, the cooling tower information is shown on .

To make setpoint adjustments or change operating parameters, tap on the Settings icon at the bottom of the screen; Figure 34 on page 31.

Figure 27: Unit Detail View Screen

Figure 28: Power Information

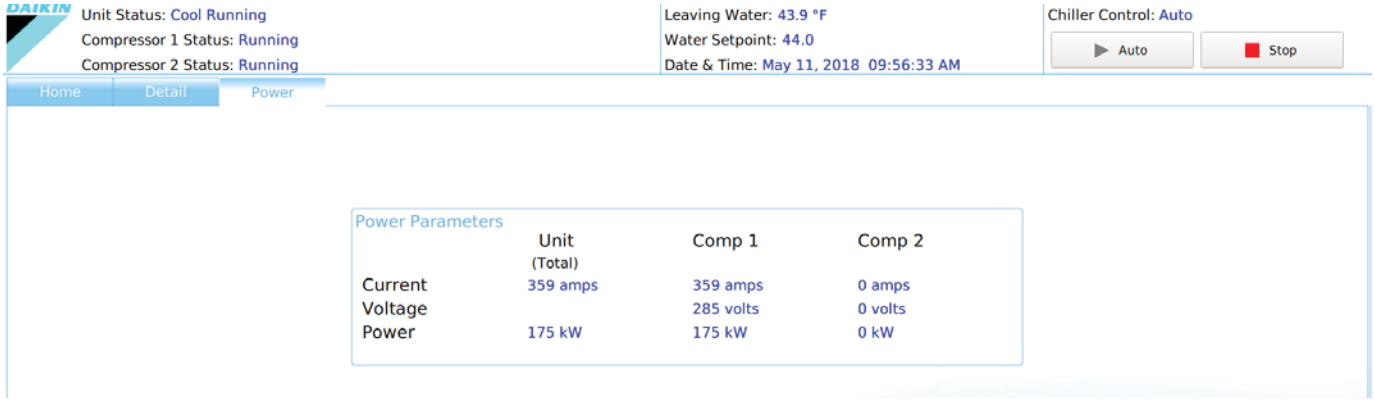


Figure 29: Evaporator Information

Figure 30: Compressor Details

The Compressor State Information on the right side of the screen is 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 also determine why a non-start may have occurred. Similarly during the shut down process, the sequence transitions back to "Off" and the highlight color will switch to black.

The left side information displays the status of the compressor inputs and outputs in greater detail than on the Home Detail screen (Figure 27). Compressor related setpoint adjustments can be made within the Settings screen on the Modes and Motor tabs.

Figure 31: Condenser Information

Figure 32: Expansion Valve Information

Figure 33: Cooling Tower Information

NOTE: Selection and setup of cooling tower control methods is in the Settings icon, Tower tab, see Figure 39 on page 34.

SET Screens

The Setpoint Screens on the Human Machine Interface (HMI) are used to input the various setpoints associated with equipment of this type. (Note that if the HMI is unavailable, setpoints can be changed by connecting a laptop or by remote access.) 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 conditions. Certain settings involving pumps and tower operation are field set.

Pressing the Settings icon found at the bottom of every screen accesses the last Setpoint tab used. There are nine setpoint tabs accessible across the top of the Settings screen:

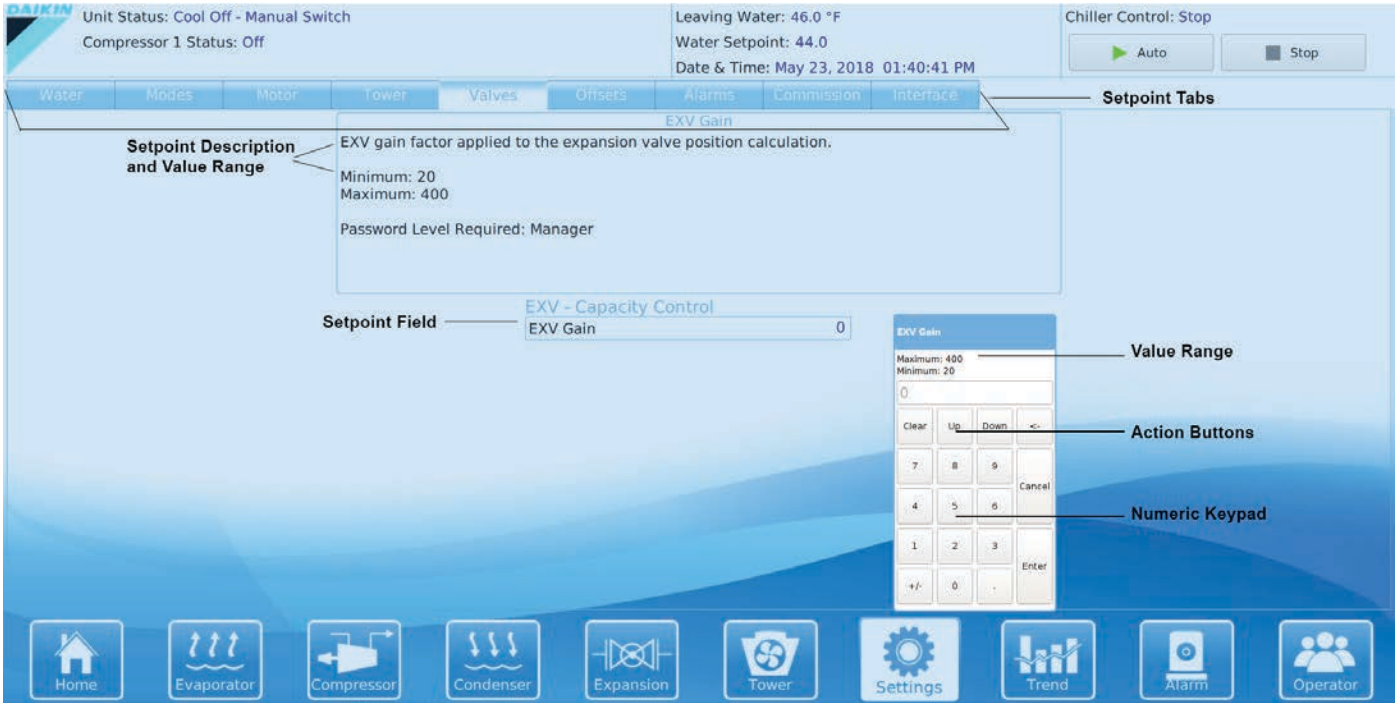
1. WATER, sets leaving water temperature setpoint, start and stop delta-T, resets, etc.
2. MODES, selects various unit parameters such as liquid injection, timers, pump staging, control source, unit mode, etc.
3. MOTOR, selects power related setpoints such as amp limits.
4. TOWER, selects the method of controlling the cooling tower and sets the parameters for fan staging/VFD.
5. VALVE, sets the parameters for operation of the expansion valve.
6. OFFSETS, adjustment values based on calibration.
7. ALARMS, sets the limit and shutdown alarms.
8. COMMISSION, sets parameters and component configurations.
9. INTERFACE, sets the network protocol and associated options.

A typical Setpoint Screen is displayed in . A list of setpoints along with their default value, available setting range, and password authority can be found in the tables after each Setpoint Screen, starting on page 32. The WATER button, for example, contains various setpoints relating to water temperature setpoints.

In Table 10 and in the rest of the Setpoint tables on the following pages, the letters in the Password column refer to the following:

- M = Manager Level (The password number will be supplied by Daikin Applied service at startup.)
- O = Operator Level (The password number for operator level is 100.)
- T = Technician Level (The password number for technician level is only provided to Daikin Applied technicians.)

Figure 34: A Typical Setpoint Screen



Procedure for Changing a Setpoint

1. Press the applicable Setpoint Group.
2. Select the desired setpoint by pressing the numbered Setpoint Field.
3. A password must be entered before changing any setpoint value. A keypad prompt will appear to enter a password and then the keypad or drop down menu will appear to make the desired change. .

   Input the appropriate password number. (Use 100 for operator level. The technician level password number 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.
4. Setpoints with numeric values can be changed in two ways:
   - Select the desired value by pressing the numbered buttons on the Numeric Keypad.
   - Press the UP or DOWN button to increase or decrease the value displayed.

   Some setpoints are selectable text menus rather than numeric values. Select the desired option using the dropdown menu that appears on that particular setpoint. Toggle 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.

   For all of the methods listed above, press ENTER on the Setpoint Screen to enter the value or CANCEL to cancel the transaction. The CANCEL or ENTER buttons must be pressed before another setpoint can be selected.
5. 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.

⚠ CAUTION

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

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.

Figure 35: Settings View - Water

Table 10: Water Setpoints

Description	Default	Range	PW	Comments
Maximum Reset Delta-T	0.0 °F	0.0 to 20.0 °F	O	Reset Type = Return: Sets the maximum LWT reset that can occur. Reset Type = 4-20mA: Sets amount of reset at 20mA input.
Start Reset Delta-T	10 °F	0.0 to 20.0 °F	O	Sets evaporator delta-T above which Return reset begins.
LWT Reset Type	None	None Return 4-20mA	O	Reset raises LWT setpoint Return (uses start Reset Delta T & Max Reset Delta T) 4-20mA (4mA=None, 20mA=Max as set by Max Reset Delta T)
Maximum LWT Rate	5.0 °F/min	0.1 to 10.0 °F/min	O	If the LWT rate is above this value, capacity increase is inhibited.
Minimum LWT Rate	0.1 °F/min	0.1 to 5.0 °F/min	O	Sets the value below which an additional compressor can stage on.
Startup Delta-T	3.0 °F	2 to 10.0 °F	O	Sets amount leaving water must go above for first compressor to start.
Shutdown Delta-T	3.0 °F	2 to 6.0 °F	O	Sets amount leaving water must drop below setpoint for last compressor to stop.
Leaving Water Temp - Cool	44.0 °F	38.0 to 75.0 °F	O	Sets control target for evaporator leaving water temperature in COOL mode. 36 °Fis lowest setpoint for shutdown.

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 6 of the WATER Setpoint Screen).

Reset Type – NONE

The Active Leaving Water variable is set equal to the current LWT setpoint.

Reset Type – RETURN

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

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.

Reset Type – 4-20mA

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. An example of this action is shown in Figure 36; temperatures are examples only.

Figure 36: LWT Reset (Cool Mode)

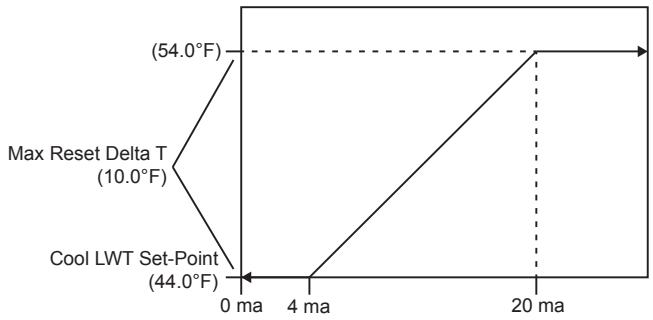


Figure 37: Settings View - Modes

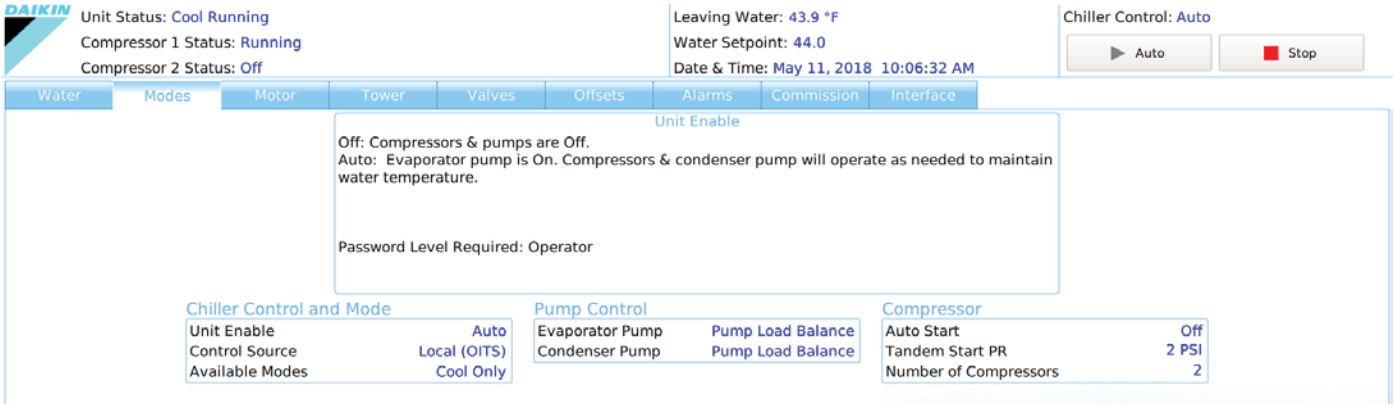


Table 11: Modes Setpoints

Description	Default	Range	PW	Comments
Tandem Pressure Ratio Limit	2.0 for WME092 1.7 for WME106	1-3.5	O	Max pressure ratio for which a lead-lag start will be performed. A higher pressure ratio will trigger a tandem start
No. of Compressors	1	1 to 2	O	For a standby system, normally set to: (total # of compressors) minus (# of standby compressors).
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	Local	Remote Switch, Local, BAS	O	Sets control source. See "Unit Enabling/Disabling" on page 24.
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
Available Mode	COOL	COOL	O	COOL

Figure 38: Settings View - Motor

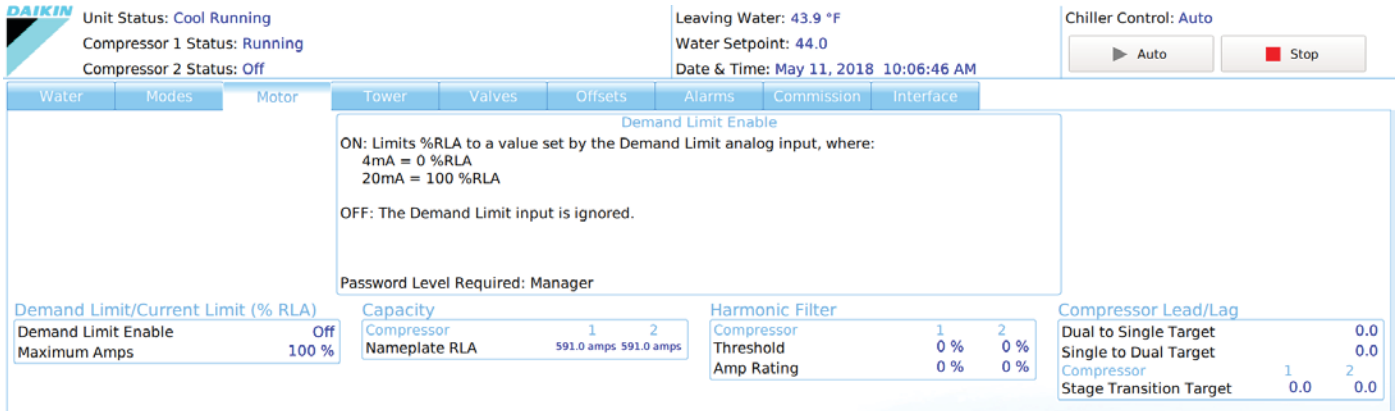


Table 12: Motor Setpoints

Description	Default	Range	PW	Comments
Dual to Single Target	-30	-5 to -100 kW	T	Turns off compressor if unit power can be reduced
Single to Dual Target	30	5 to 100 kW	T	Turns on compressof if unit power can be reduced
Stage Transition Target	1.0	.8 to 1.2	T	Scaling factor for transitioning compressors based on efficiency curves
Nameplate RLA (VFD Load Side)	Factory set	Model dependent	T	Sets the Rated Load Amps (RLA) per compressor phase as given on the chiller nameplate - Load Side Phase Data.
Maximum Amps	100%	70 to 100 %	O	Inhibits capacity increase above %RLA. Unloading forced at 5% above value.
Demand Limit Enable	OFF	ON, OFF	O	ON: Limits %RLA to a value set by the Demand Limit analog input, where: 4mA = 70 %RLA 20mA = 100 %RLA OFF: The Demand Limit input is ignored.
Harmonic Filter On Threshold	30%	10-100%	T	Min %RLA that the harmonic filter disables capacitors
Harmonic Filter Amp Rating	Factory set	Model dependent	T	Bsed on model of harmonic filter

⚠ CAUTION

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

Figure 39: Settings View - Tower

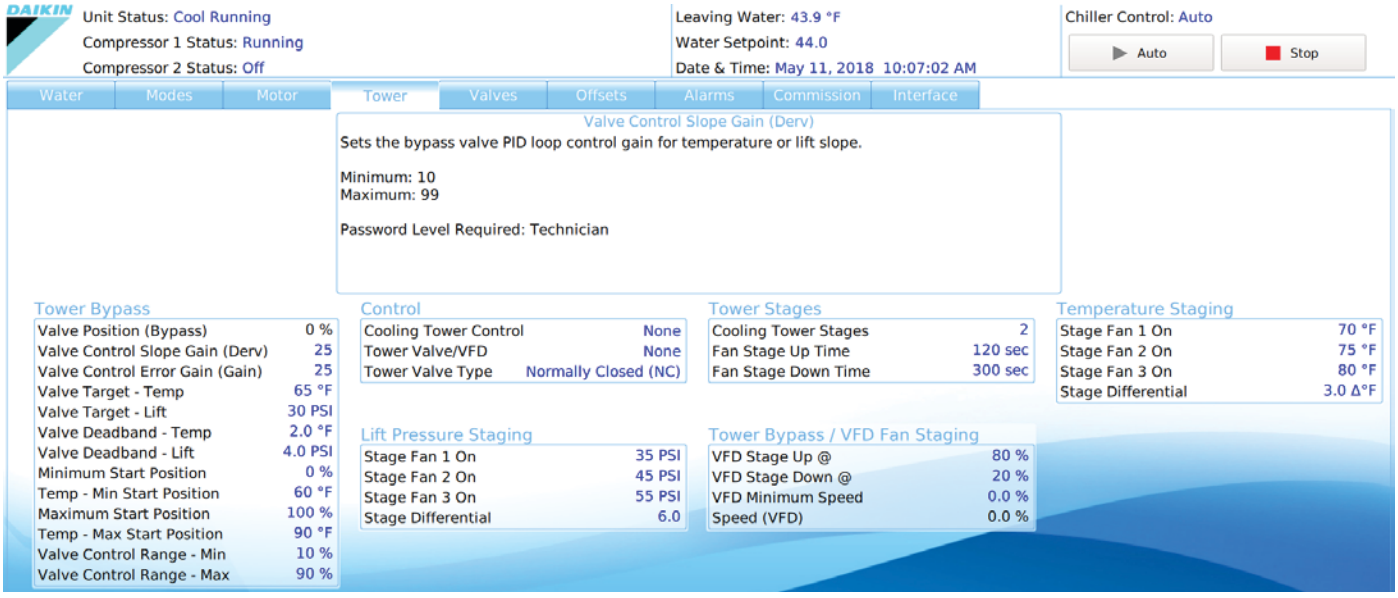


Table 13: Tower Setpoint Settings

Description	Default	Range	PW	Comments
Valve Control Slope Gain	25	10 to 99	O	Control gain for temperature (or lift) slope
Valve Control Error Gain	25	10 to 99	O	Control gain for temperature (or lift) error
Valve Control Range (Max)	90%	0 to 100%	O	Maximum valve position, overrides all other settings
Valve Control Range (Min)	10%	0 to 100%	O	Minimum valve position, overrides all other settings
Temp–Max. Start Position	90 °F	0 to 100 °F	O	Condenser EWT at which initial valve position is set to max start position
Maximum Start Position	100%	0 to 100%	O	Initial valve position when condenser EWT is at or above Temp-Max Start Position
Temp – Min. Start Position	60 °F	0 to 100 °F	O	Condenser EWT at which initial valve position is set to minimum start position
Minimum Start Position	0%	0 to 100%	O	Minimum position of valve when condenser EWT is at or below Temp-Min Start Position
Stage Down @	20%	0 to 100%	O	Valve position below which the fans can stage down (Tower Valve/Fan VFD Strategy = Valve Stage) VFD speed below which the fans can stage down (Tower Valve/Fan VFD Strategy = VFD stage or valve SP/VFD stage)
Stage Up @	80%	0 to 100%	O	Valve position above which the fans can stage up (Tower Valve/Fan VFD Strategy = Valve Stage) VFD speed above which the fans can stage up (Tower Valve/Fan VFD Strategy = VFD or valve SP/VFD stage)
VFD Minimum Speed	70%	0-100%		Minimum VFD speed for tower fan
Valve Deadband (Lift)	4.0 psi	1.0 to 20.0 psi	O	Sets control deadband, Cooling Tower Control =Lift
Valve Deadband (Temp)	2.0 °F	1.0 to 10.0 °F	O	Sets control deadband, Cooling Tower Control =Temp
Valve Target (Lift)	30 psi	10 to 130 psi	O	Target for lift pressure (Cooling Tower Control = Lift), Works with Fan Stage Down Time
Valve Target (Temp)	65 °F	40 to 120 °F	O	Target for condenser EWT (Cooling Tower Control = Temp), Works with Fan Stage Up Time
Tower Valve Type	NC (To Tower)	NC, NO	O	Normally closed or normally open to tower
Stage #2 On (Lift)	45 psi	10 to 130 psi	O	Lift pressure for fan stage #2 on
Stage #1 On (Lift)	35 psi	10 to 130 psi	O	Lift pressure for fan stage #1 on
Stage #2 On (Temp)	75 °F	40 to 120 °F	O	Temperature for fan stage #2 on
Stage #1 On (Temp)	70 °F	40 to 120 °F	O	Temperature for fan stage #1 on
Stage Differential (Lift)	6.0 psi	1.0 to 20.0 psi	O	Fan staging deadband with Cooling Tower Control=Lift
Stage Differential (Temp)	3.0 °F	1.0 to 10.0 °F	O	Fan staging deadband with Cooling Tower Control=Temp
Fan Stage Down Time	5 min	1 to 60 min	O	Time delay between stage up/down event and next stage down
Fan Stage Up Time	2 min	1 to 60 min	O	Time delay between stage up/down event and next stage up
Cooling Tower Stages	2	1 to 2	O	Number of fan stages used
Tower Valve/Fan VFD Strategy	None	None, Valve SP, Valve Stage, VFD Stage, Valve SP/VFD Stage	O	None: No tower valve or VFD Valve Setpoint: Valve controls to Valve Target and Valve Deadband Valve Stage: Valve controls between fan stages VFD Stage: 1st fan is VFD controlled, no valve Valve SP/VFD Stage: Both valve and VFD
Cooling Tower Control	None	None, Temperature, Lift	O	None: No tower fan control Temperature: Fan and valve controlled by condenser EWT Lift: Fan and valve controlled by lift pressure

Tower Control Settings

There are five possible tower control strategies: (I) **VFD STAGE**, (II) **VALVE SP**, (III) **VALVE STAGE**, (IV) **NONE**, and (V) **VALVE SP / VFD STAGE**. These control strategies are selected from the TOWER Setpoint Screen (see Figure 39 on page 34) using the Tower Valve/Fan VFD Strategy setting. (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.

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® controller, up to three Digital Outputs of Tower Staging along with two Analog Outputs (0-10 VDC) are available. The two Analog Outputs are as follows:

1. Bypass Valve signal
2. Tower Fan VFD signal

Setup for any tower control will be accomplished on the HMI using the TOWER Setpoint Screen (see Figure 39 on page 34 and see Table 13 on page 35).

Setpoint for Cooling Tower Control on the TOWER Setpoint Screen sets the type of control. NONE is selected as default. Choose TEMPERATURE for entering condenser water control or LIFT to define the lift pressure between the Evaporator Pressure and the Condenser Pressure.

Setpoint for Tower Valve / Fan VFD Strategy on the TOWER Setpoint Screen defines if and how the 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 WME unit. Setup instructions for each of the five tower control strategies are provided next.

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

Strategy (I) VFD STAGE (Default): In this mode, a VFD controls the first fan. Up to two more fans are staged on and off and there is no bypass valve. See Figure 40 and Figure 41.

To set up in HMI,

A. The TOWER Setpoint setting for Cooling Tower Control strategy should be NONE. Tower Valve/VFD should be changed to VFD STAGE for control of the VFD speed based on temperature or lift.

Figure 40: Strategy (I) - VFD STAGE

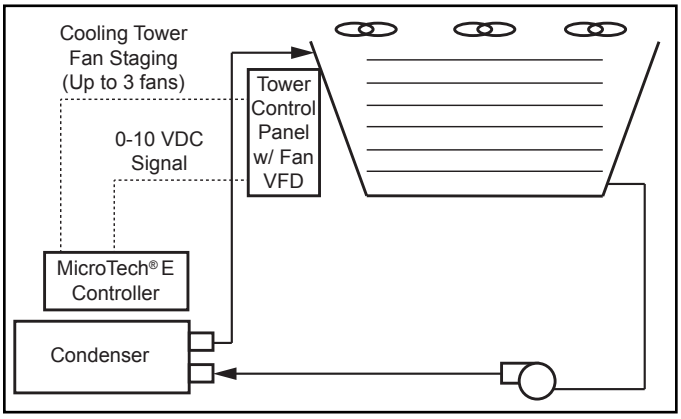
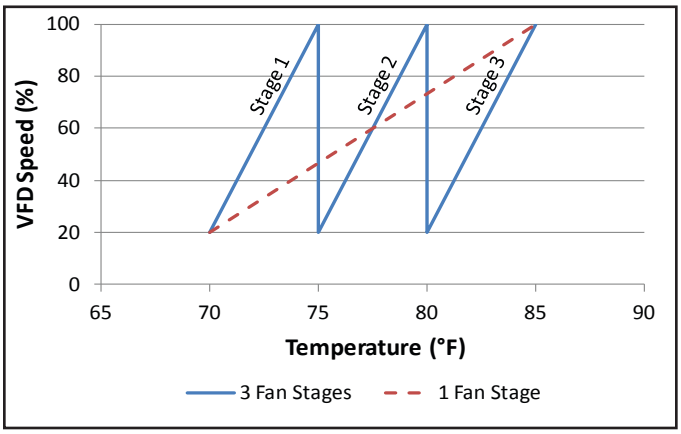


Figure 41: Strategy (I) VFD STAGE - VFD Speed vs. Temp



As shown in Figure 41, 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.

Strategy (II) VALVE SP: This control strategy is tower staging (up to three stages) with a low-limit controlled bypass valve. The tower fans are controlled as in method (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 42 and Figure 43.

To set up in HMI,

A. The TOWER Setpoint setting for Cooling Tower Control strategy should be NONE. Tower Valve/VFD should be changed to VALVE SP for control of the bypass valve based on temperature or lift.

   Tower Valve Type. 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.

B. If TEMP was selected for Cooling Tower Control, set the Valve Target Temperature - default is 65°F. This setpoint is usually 5°F below the minimum fan stage setpoint established with Stage #1 setting. This keeps full flow through the tower until the last fan is staged off. Other settings when TEMP is selected:

1. Set Valve Deadband - Temp. The default of 2.0°F is a good place to start.
2. Set the Valve Control Range to the minimum position to which the valve can go. The default is 10%.
3. Set the Valve Control Range to the maximum position to which the valve can go. The default is 90%.
4. Set the Valve Control Error Gain. The default is 25.
5. Set the Valve Control Slope Gain. The default is 25.

C. If LIFT was selected for Cooling Tower Control, set the Valve Target - Lift; default is 30 psi. This setpoint is usually 5 psi below the minimum fan stage setpoint established by Stage #1 On (Lift) setpoint. This keeps full flow through the tower until the last fan is staged off.

1. Set Valve Deadband - Lift. The default of 4.0 psi is a recommended initial setting.
2. Set the Valve Control Range to the minimum position to which the valve can go. The default is 10%.
3. Set the Valve Control Range to the maximum position to which the valve can go. The default is 90%.
4. Set the Valve Control Error Gain. The default is 25.
5. Set the Valve Control Slope Gain. The default is 25.

⚠ CAUTION

Valve Control Error Gain and Slope Gain setpoints 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.

Figure 42: Strategy (II) - VALVE SP

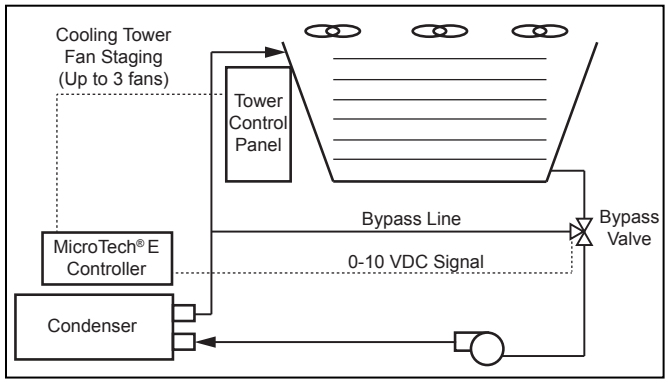
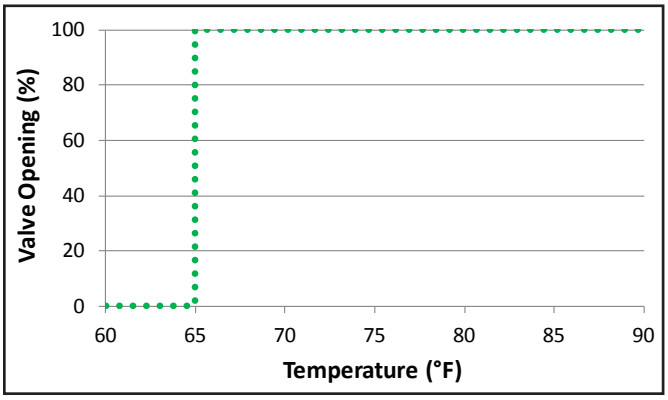


Figure 43: Strategy (II) VALVE SP - Valve Opening vs. Temp



As shown in Figure 43, 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.

Strategy (III) VALVE STAGE: This control strategy is tower staging (up to three stages) with a stage-controlled bypass valve. In this mode, the bypass valve controls between fan stages to smooth the control and reduce fan cycling. See Figure 44 and Figure 45.

To set up in HMI,

A. The TOWER Setpoint setting for Cooling Tower Control strategy should be NONE. Tower Valve/VFD should be changed to VALVE STAGE.

Tower Valve Type. 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.

B. Use all of the same setpoint settings as outlined in Strategy (II) - section B for Temp or section C for Lift. In addition, set the following:

a. Set VFD Stage Up (valve position % open) above which the first fan can stage on; the default is 80%. Fan Stage #X On temperatures and Fan Stage Up Time must also be satisfied.

b. Set Stage Down (valve position % closed) below which the first fan can stage off; the default is 20%. Fan Stage #X On temperature and Fan Stage Down Time must also be satisfied.

Figure 44: Strategy (III) - VALVE STAGE

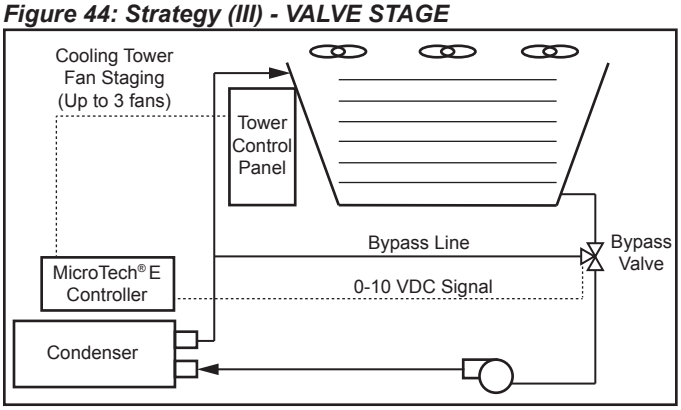
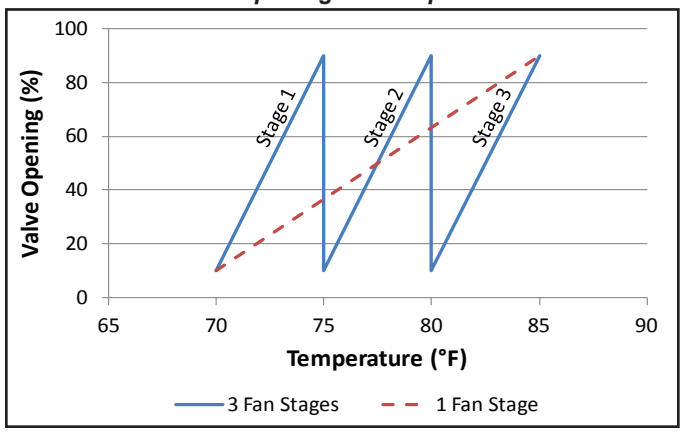


Figure 45: Strategy (III) VALVE STAGE - Valve Opening vs. Temperature



As shown in Figure 45, the default minimum and maximum valve opening positions are 10% and 90%, 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.

Strategy (IV) NONE: This control strategy is tower fan staging only. ***This is not a recommended strategy.*** In this mode the tower fan staging (up to three stages) is controlled by either the condenser Entering Water Temperature (EWT) or LIFT pressure (difference between the condenser and evaporator pressure). Tower bypass or fan speed are not controlled. See Figure 46 and Figure 47.

To set up in HMI,

The following settings are used for the Tower Fan Staging Only mode:

1. Select TEMP if Cooling Tower Control is based on condenser EWT or LIFT if based on compressor lift expressed in pressure.
2. Set Tower Valve/VFD as NONE for no bypass valve or fan VFD control.
3. Set Cooling Tower Stages as one to three 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. Select Fan Stage Up Time from 1 to 60 minutes. The default value of 2 minutes is a good starting point. The value may need to be adjusted later depending on actual system operation.
5. Select Fan Stage Down Time from 1 to 60 minutes. The default value of 5 minutes is a good starting point. The value may need to be adjusted later depending on actual system operation.

If TEMP is selected for Cooling Tower Control, use:

a. Set Stage Differential in degrees F; default is 3°F.

b. Set the Stage Fan On temperatures consistent with the temperature range over which the condenser EWT is desired to operate. The default values of 70°F, 75°F, and 80°F are a good place to start in climates with moderate wet bulb temperatures. The number of Stage Fan On setpoints used must be the same as the number of Cooling Tower Stages.

If LIFT is selected for Cooling Tower Control, use

a. Set Stage Differential in PSI; default is 6.0 PSI.

b. Set the Stage Fan On pressures starting with default setpoints. The number of Stage Fan On setpoints used must be the same as the number of Cooling Tower Stages.

Figure 46: Strategy (IV) - NONE

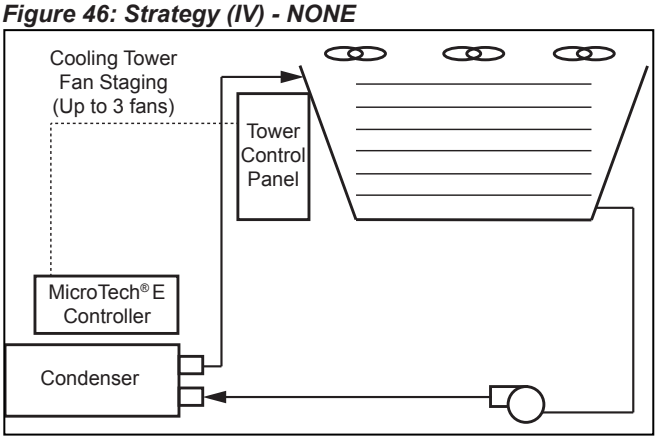
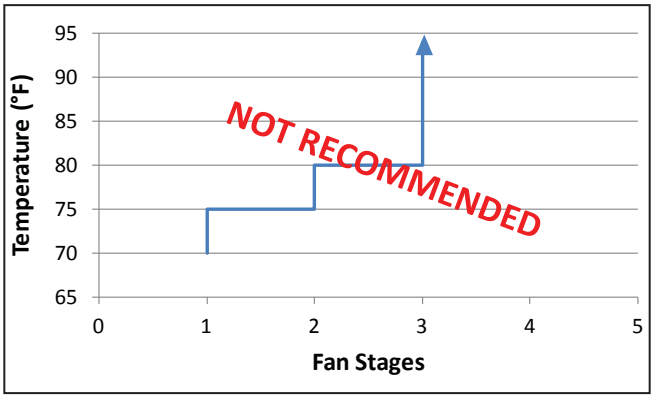


Figure 47: Strategy (IV) NONE - Temp vs. Fan Stages



Strategy (V) VALVE SP /VFD STAGE: This control strategy is tower fan control with a VFD and bypass valve control. See Figure 48 and Figure 49.

To set up in HMI,

A. The TOWER Setpoint setting for Cooling Tower Control strategy should be NONE. Tower Valve/VFD should be changed to VALVE SP/VFD STAGE.

B. Use all of the same setpoint settings as outlined in Strategy (II) - section B for Temp or section C for Lift. .

Figure 48: Strategy (V) - VALVE SP/VFD STAGE

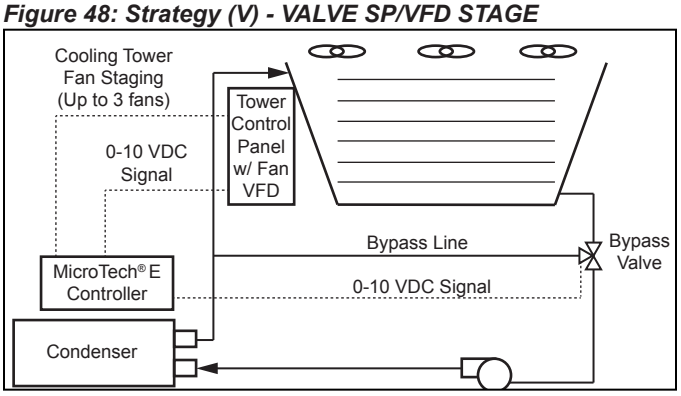
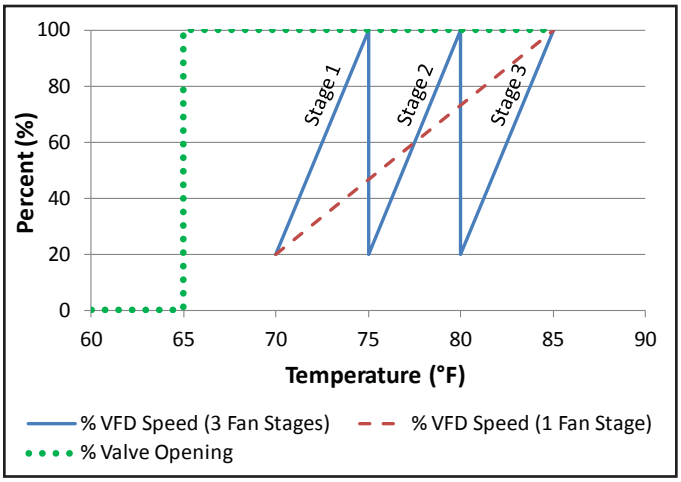


Figure 49: Strategy (V) VALVE SP / VFD STAGE - Percent vs. Temperature



As shown in Figure 49, 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 49 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.

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. See Figure 50.

Figure 50: BAS Alternate

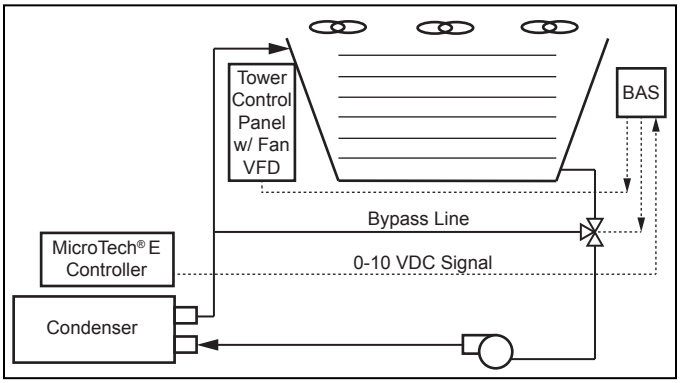


Figure 51: Settings View - Valves

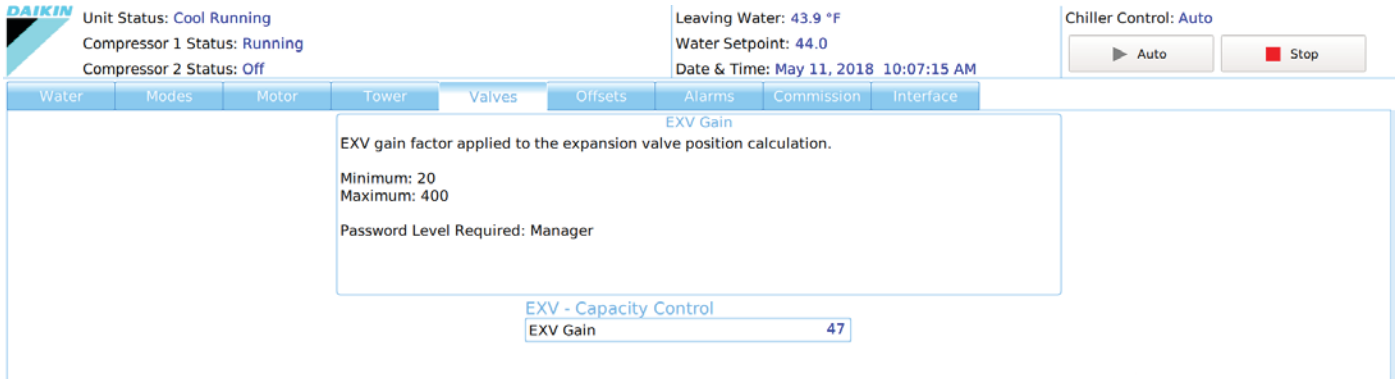


Table 14: Valve Setpoint Settings

Description	Default	Range	PW	Comments
EXV Gain	78	20-400	T	Gain selection based on chiller size and valve type.

Figure 52: Settings View - Offsets

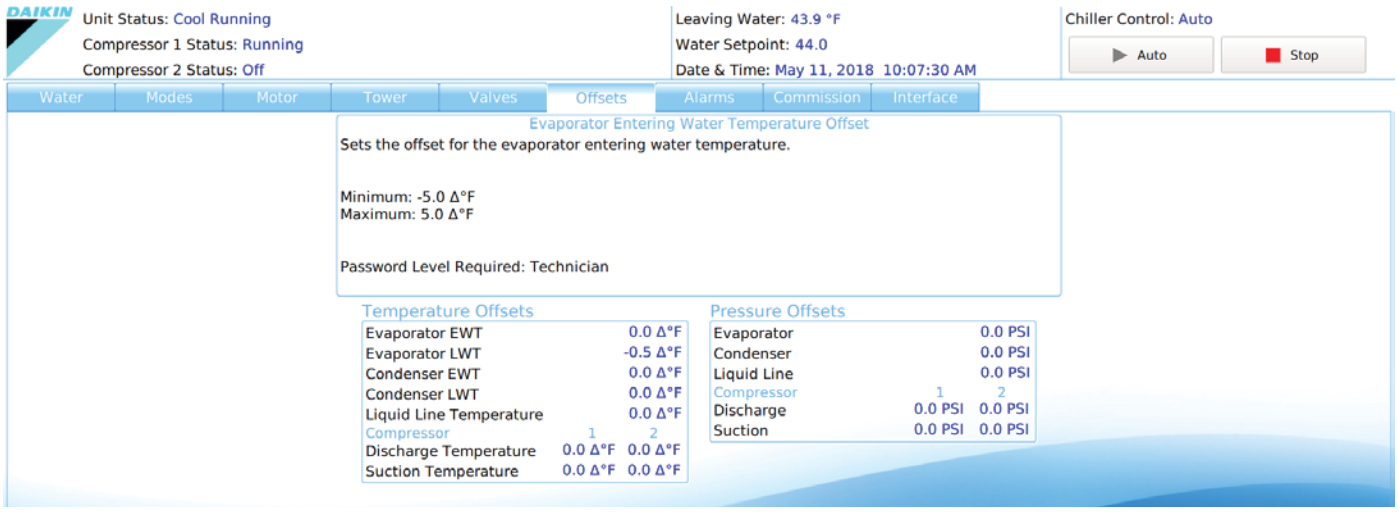


Table 15: Offsets Setpoint Settings

Description	Default	Range	PW	Comments
Evap EWT	0.0	-1.5 to 1.5	T	Sets the offset for the sensor listed based upon jobsite calibrations.
Evap LWT	0.0	-1.5 to 1.5	T	
Cond EWT	0.0	-1.5 to 1.5	T	
Cond LWT	0.0	-1.5 to 1.5	T	
Liquid Line Temp	0.0	-1.5 to 1.5	T	
Comp Discharge Temp	0.0	-1.5 to 1.5	T	
Comp Suction Temp	0.0	-1.5 to 1.5	T	
Evap Pressure	0.0	-2 to 2	T	
Cond Pressure	0.0	-2 to 2	T	
Liquid Line Pressure	0.0	-2 to 2	T	
Comp Discharge Press	0.0	-2 to 2	T	
Comp Suction Press	0.0	-2 to 2	T	

Figure 53: Settings View - Alarms

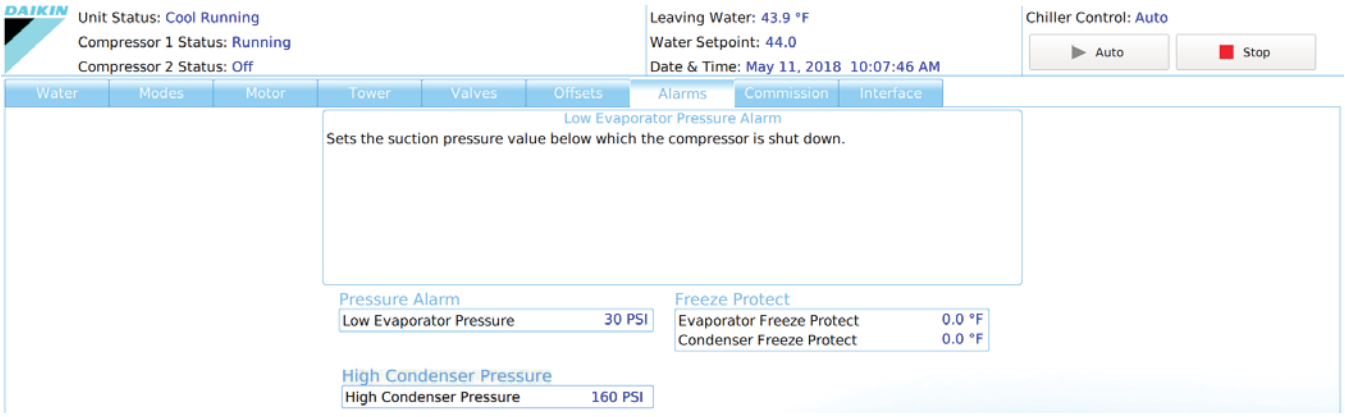


Table 16: ALARMS Setpoint Settings

Description	Default	Range	PW	Comments
Condenser Freeze Protect	34.0 °F	34.0 to 38.0 °F	T	Sets the value of condenser saturated temperature below which the condenser pump is forced ON - occurs when unit is off and chiller senses need to provide flow to address a chiller limit alarm - see "Table 20: Limit Alarms" on page 46
Evaporator Freeze Protect	34.0 °F	34.0 to 38.0 °F	T	Sets the value of evaporator saturated temperature below which the evaporator pump is forced ON - occurs when unit is off and chiller senses need to provide flow to address a chiller limit alarm - see "Table 20: Limit Alarms" on page 46.
High Condenser Pressure	160 psi	140 to 160 psi	T	Sets the condenser pressure above which the compressor is shut down.
Low Evaporator Pressure	30 psi	26 to 36 psi	T	Sets the evaporator pressure value below which the compressor is shut down - may need to be lowered if glycol is added to the system. Similarly, changing setpoint below 30 psi default requires glycol to be added to the system otherwise there is a risk of freezing the evaporator.

Figure 54: Settings View - Commission

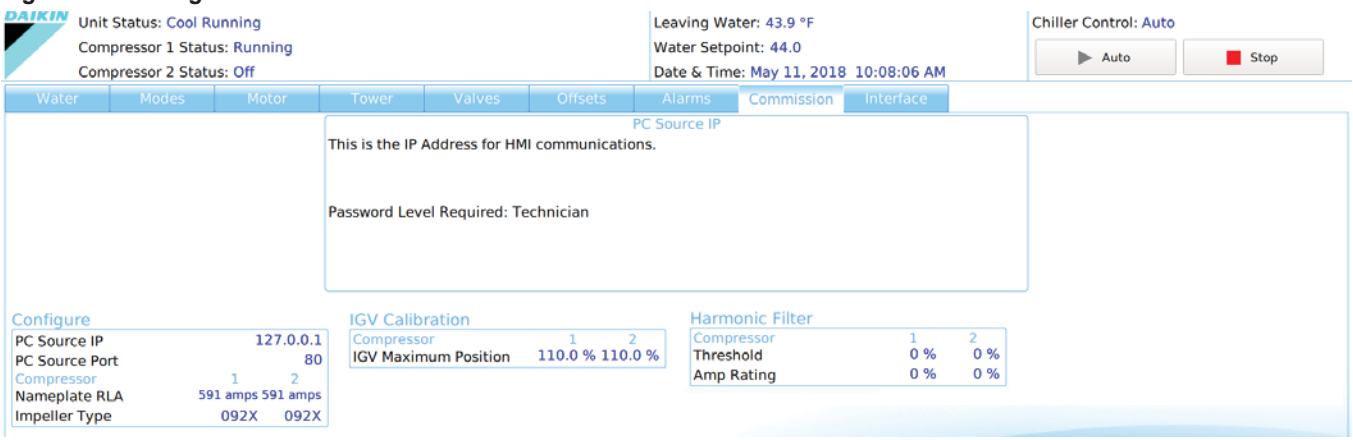


Table 17: Commission Setpoint Settings

Description	Default	Range	PW	Comments
Harmonic Filter On Threshold	30%	10-100%	T	Min %RLA that the harmonic filter shuts off - Also located on Motor tab
Harmonic Filter Amp Rating	Factory set	Model dependent	T	Based on model of harmonic filter - Also located on Motor tab
Nameplate RLA (VFD Load Side)	Factory set	Model dependent	T	Sets the Rated Load Amps (RLA) per compressor phase as given on the chiller nameplate - Load Side Phase Data; also located on Motor tab
Impeller Type	Factory set	092X, 092Y, 106X, 106Y	T	Size of compressor and impeller type
IGV Maximum Position	100%	90-110%	T	100% indicates vanes are straight

NOTE: If both compressors have the same sequence number, they will automatically balance starts and run-hours. User cannot manually stage compressors as this is an internal process.

⚠ CAUTION

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

Figure 55: Settings View - Interface

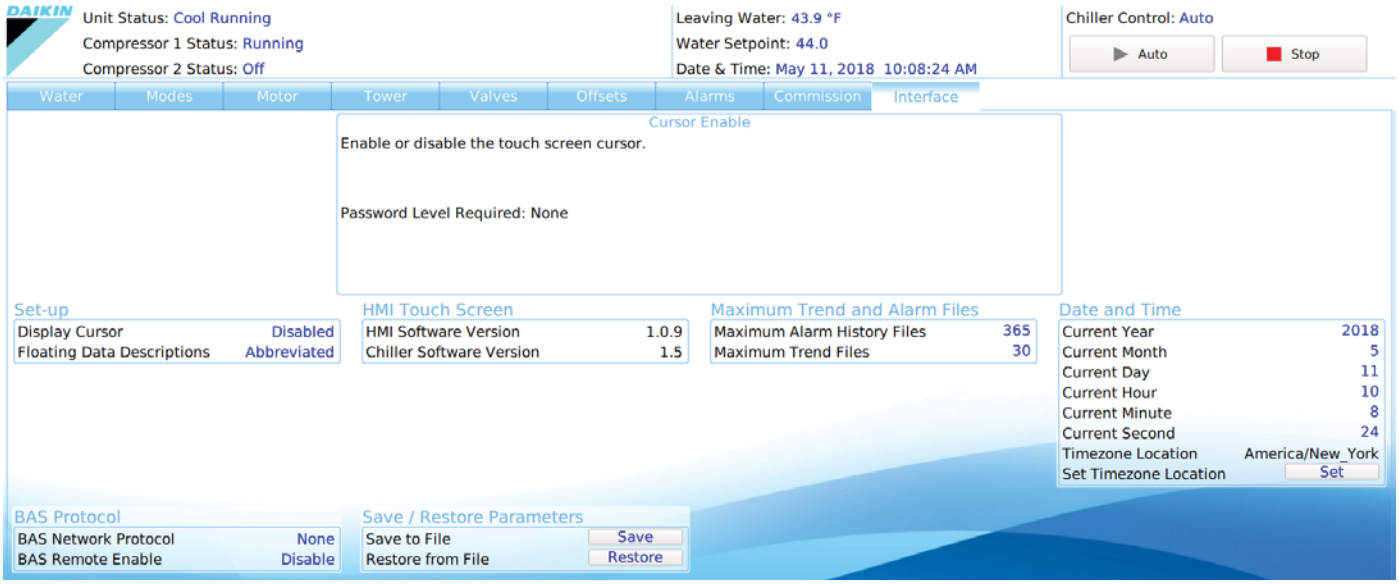


Table 18: Unit Interface Settings

Description	Default	Range	PW	Comments
BAS Network Protocol	NONE	NONE, MODBUS, LONWORKS, BACnet IP, BACnet Ethernet, BACnet MS/TP	O	NONE: No BAS network; MODBUS: RTU - RS485 LONWORKS: LONtalk - FTT-10A BACnet IP: IP - Ethernet BACnet Ethernet: Ethernet BACnet MS/TP: RS485

NOTE: It is likely that the chiller will contain the factory settings for date and time; 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 version numbers shown towards the bottom left of the screen are the controllers' software identification. These numbers may be required by Daikin Applied to answer questions about unit operation or to assist in possible future upgrades of software.

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. Of the following limits, the one creating the lowest capacity limit is in effect.

Low Evaporator Pressure

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

High Motor Temperature

If the highest motor stator temperature is above the limit, the unit will adjust capacity to keep the temperature within the limits.

Demand Limit

The maximum amp draw of the compressor(s) 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 Enable 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). While this override is in effect, chiller capacity is continuously adjusted to keep the % RLA near the requested demand limit.

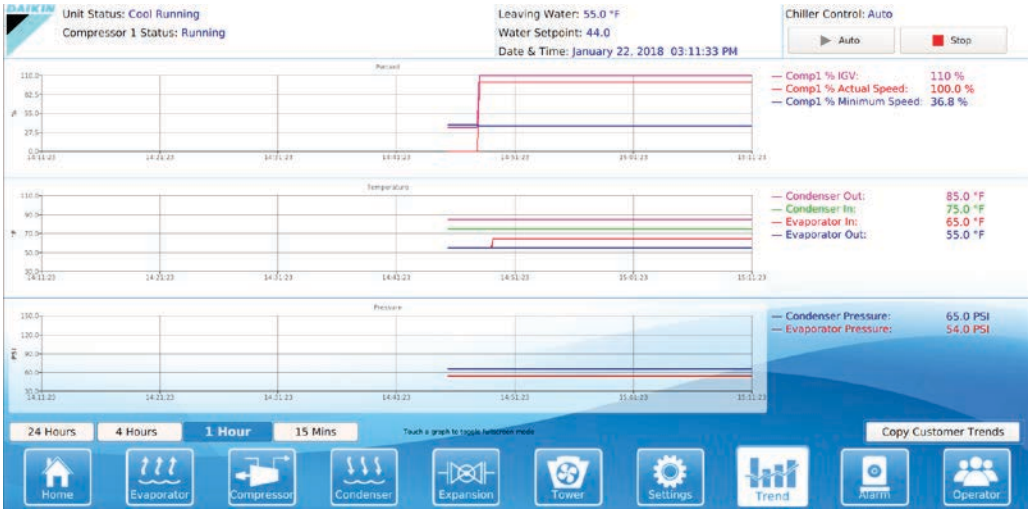
Network Limit

The maximum amp draw of the compressor (s) can be limited by a value sent through a BAS network connection and stored in the Network Limit variable. While this override is in effect, chiller capacity is continuously adjusted to keep the % RLA near the requested demand limit.

Maximum Amp Limit

The maximum amp draw of the compressor(s) is always limited by the Maximum Amps setpoint. This limit has priority over all other functions including manual capacity control. While this override is in effect, chiller capacity is continuously adjusted to keep the % RLA near the limit value.

Figure 56: Trend History Screen



Trend History Screen

The Trend History Screen (Figure 56) is accessed by clicking the TREND button at the bottom of any screen. The Trend History Screen allows the user to view the various parameters listed on the right side of the screen.

The Trend History Screen can display history for 24-hour, 4-hour, 1-hour, or 15-minute periods by pressing the appropriate button, respectively. For any time period, the trend will display the current time beginning on the right of the screen with history flowing to the left.

When the Unit Control Processor is powered on after being off, the Trend History Screen will only display the history starting from the time the Unit Control Processor was powered on. Previous trend history can be downloaded but there will be a gap in the data from when the Unit Control Processor was off. Trend history is not affected if only the HMI screen (not the Unit Control Processor) is off or in sleep mode. For details on how to download the trend history, reference the "Alarms" section starting.

Alarms

The Alarm information (Figure 57 and Figure 58) is accessed by touching the ALARM icon at the bottom of the HMI and then the Active or History tabs at the top of the screen. As noted on page 26, an active alarm will turn the icon flashing red.

The Alarm Active and History Screens display a maximum of 18 alarms for the current date with the most current alarms listed on top. Each alarm displays the date stamp, action taken, and the cause of the alarm. See the "Possible Alarms" section starting on page 45 for specifics on alarms that may occur. Alarm history data is held for 365 days as shown on the Interface tab in Figure 55.

There are two types of alarms:

1. **Shutdown Alarm (Red)**- This is an equipment protection alarm that shuts a unit or compressor off.
2. **Limit Alarm (Yellow)**- This alarm limits compressor loading in response to an out-of-normal condition or may only be a notification to indicate that the condition requires attention. This alarm will not cause a shutdown. If the condition that caused a limit alarm is corrected, the alarm light will often be cleared automatically.

Figure 57: Active Alarm View Screen

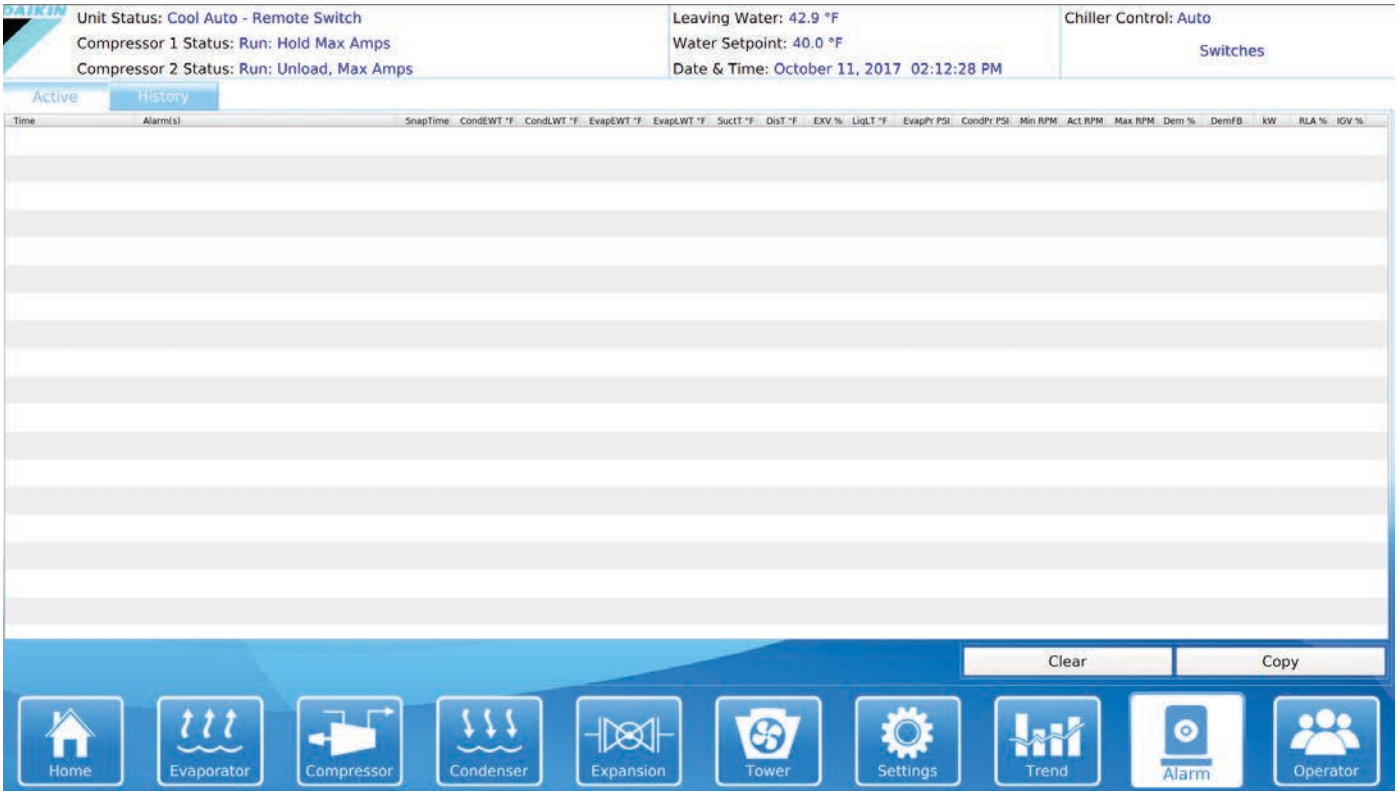
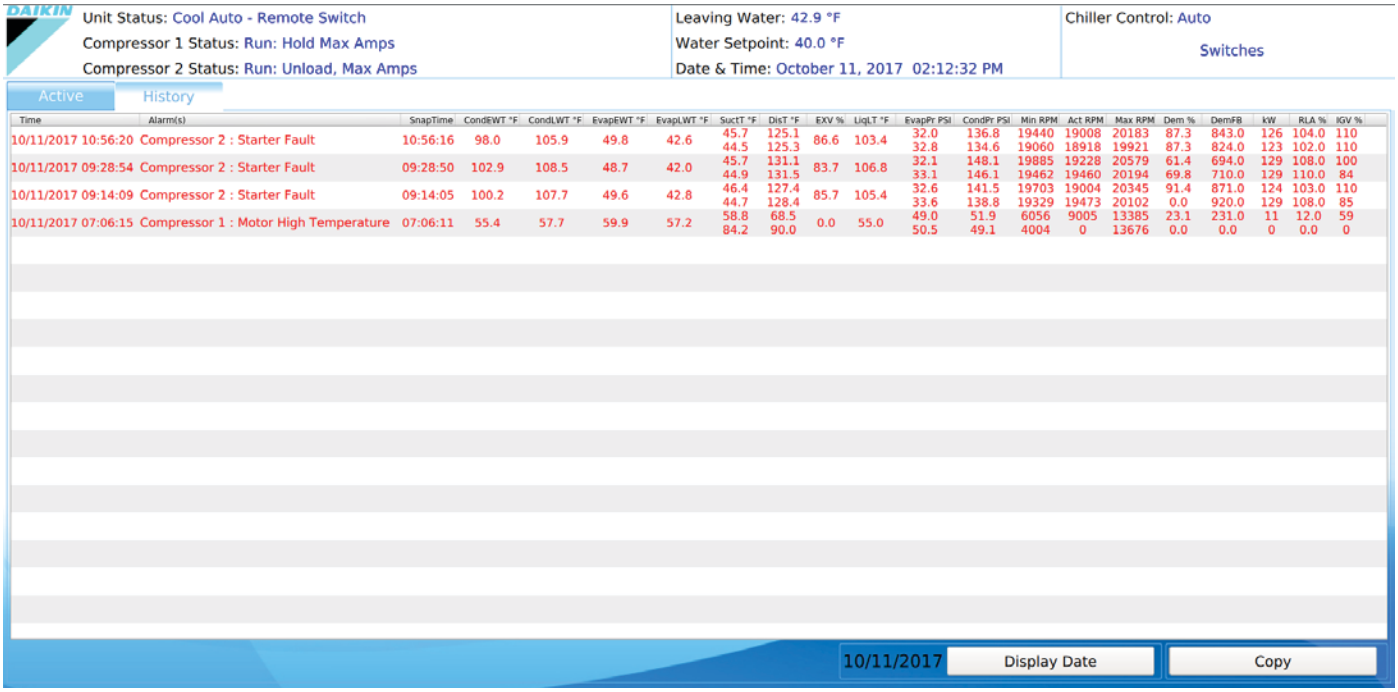


Figure 58: Alarm History Screen



After eliminating the cause of an active alarm, clear it by pressing the CLEAR button. This will change the color of the alarm description from red (indicating active) to black (indicating inactive/cleared). If there are no remaining active alarms, the unit will restart after going through the start sequence. If the cause of an alarm is not remedied, the alarm description will remain red and the unit will not begin its starting sequence.

Although the Alarm History Screen only displays the most current alarms, a record of ALL alarms is stored in the Unit Control Processor. Note that this record may include alarms that occurred when the chiller was in the factory. This record is maintained even if the Unit Control Processor is powered off. When the HMI is powered back on, the last 18 alarms for the current date will show on the Alarm History Screen and all alarm history will still be available for download. (The download process is described next.)

Downloading Trend History and Alarm History

The Copy button on the Trend History and Alarm History screens can be used to download the data via USB. In order to download the trend and alarm history:

1. Insert a USB drive into the left side of the HMI panel or download via laptop or remote access.

NOTE: Thirty MB per day should be available on the USB drive that is inserted for the download of the trend and alarm history. There is no warning of insufficient space.

2. If an error message that states “Error mounting the USB drive” appears on the HMI, remove and re-install the USB drive. If the problem persists, try a different USB drive. Name brand USB drives are recommended.

NOTE: Often times, this error message is due to not allowing sufficient time between inserting the USB drive and pressing the Copy button (see Step 4 below).

3. After clicking on the "Display Date" button, choose the desired date.
4. Press the Copy button. This will download the trend and alarm history for the selected day. (The Unit Control Processor will store 30 days of history at a maximum. The Unit Control Processor will automatically delete old trend history files as needed to make room for new trend history files. Old alarm history files are not deleted.) The HMI will display "download complete" once the history files have been successfully transferred to the USB drive.
5. Repeat this process for each desired day of history. Each day must be downloaded individually. It is not possible to download multiple days of history at once.

Viewing/Using Trend History Files:

Trend history files can be recognized by “trend.log” at the end of the file name. The front of the file name will contain the date and hour. For example, if there is a file called “2018-06-23-08-UTC_trnd.log,” it indicates that the file contains trend history from 6/23/2018. The “08” in the example represents the eighth hour of the day (8:00 am) and “UTC” represents the time zone. When the history is downloaded, there will be one trend history file per hour of the day. Therefore, if the history is downloaded for any previous day, there will be twenty-four trend history files. If the history is downloaded for the current day, there will only be trend history files for each hour up until the current hour. For example, if the history was downloaded at 8:00 am, there will be eight trend history files.

NOTE: This assumes that the chiller was powered on for at least some portion of every hour. No hourly trend history file is created when the chiller is powered off.

Trend history files can only be opened by a Daikin Applied technician. Contact a Daikin Applied service representative for more information.

Viewing/Using Alarm History Files:

Alarm history files can be recognized by “alarms.csv” at the end of the file name. The front of the file name will contain the date. For example, if there is a file called “2018-06-23_alarms.csv,” it indicates that the file contains alarm history from 6/23/2018. When the history is downloaded, there will only be one alarm history file per day (unlike the trend history where there is one file per hour of the day). This one alarm history file will contain all of the alarms from the selected day. If there were no alarms that day, no alarm history file will appear when the history is downloaded.

All alarm history files are saved from the Unit Control Processor as .csv files. These files can be opened on a normal PC and manipulated using Microsoft Excel for personal use.

Requesting Tech Support:

When the trend and alarm history is downloaded for a desired day, there will be two additional file types that are downloaded as well: **events.log** and **gblCom.csv**.

If tech support is requested, ALL of the original (un-manipulated) files (trnd.log, alarms.csv, events.log, and gblCom.csv) must be sent together to Daikin Applied. Any other file formats are NOT accepted.

Possible Alarms

There are two types of alarms: shutdowns and limits. Shutdown alarms are equipment protection alarms that shut a unit or compressor off. Limit alarms limit compressor loading in response to an out-of-normal condition or may only be a notification to indicate that the condition requires attention. A limit alarm will not cause a shutdown. See the following tables for examples of shutdowns and limits that can occur.

NOTE: In the "Clear" column of the following tables, "Auto" indicates that the alarm will auto-clear after the condition is resolved and the normal condition returns.

Table 19: Shutdown Alarms

Screen Text	Occurs When	Troubleshooting	Clear
Evaporator Pressure Low	Evaporator Press < Low Evap Pressure-Stop SP for 60 sec. Delay reduces linearly to 10 sec at 10 psi below SP, then drops to 0 below 10 psi below SP	Causes: Low or No Evaporator Water Flow. Low refrigerant level in evaporator. Incorrect setpoint value for leaving water temperature.	Manual
Discharge Pressure High	Discharge pressure > High Discharge Temperature SP	Causes: Low or No Condenser Water Flow	Manual
Discharge Temperature High	Temperature > High Discharge Temp-Stop SP	Causes: Low or No Condenser Water Flow	Manual
Motor Stator Temperature High	Analog Motor Temp (any sensor) > 300°F	Rotor and/or stator cooling circuit fault Causes: Motor stator cooling solenoid not open, rotor cooling stepper motor not functioning correctly, motor rotor superheat or gain setpoints incorrect (contact factory)	Manual
Motor Gap Temperature High	Motor Gap Temperature > 130°F	Rotor and/or stator cooling circuit fault. Causes: Motor stator cooling solenoid not open, motor rotor cooling stepper motor not opening, motor rotor superheat or gain setpoints incorrect (contact factory)	Manual
VFD Fault	VFD Fault AND Compressor State = FLOAT, START, RUN, or UNLOAD	General VFD fault. Normally accompanied by another fault.	Manual
Compressor Surge/ Bearing Orbit	Mag bearings exceed allowable orbit or sensor fault	Causes: Compressor dynamic load change, compressor surge, improperly set stall/surge line setpoints, bearing controller fault or bearing amplifier fault. Contact factory if persistent.	Manual
Evaporator Water Flow Loss	Evaporator Flow DI = No Flow for > Evap Flow Loss Delay SP **OR** (No Flow **AND** shutdown due to low evap pressure **OR** bearing fault) with compressor running. (Alarm is masked during power fail — timer restarts after power returns)	Causes: Loss of evaporator flow, evaporator pump off, evap head gasket leaking or missing, sensor wiring fault, evaporator flow sensor failure	Manual
Condenser Water Flow Loss	Condenser Flow DI = No Flow for > Cond Flow Loss Delay SP **OR** (No Flow **AND** shutdown due to high Cond pressure **OR** bearing fault) with compressor running. (Alarm is masked during power fail — timer restarts after power returns)	Causes: Loss of condenser flow, condenser pump off, condenser head gasket leaking or missing, sensor wiring fault, condenser flow sensor failure	Manual

Table 20: Limit Alarms

Screen Text	Occurs When	Troubleshooting	Clear
Evaporator Pressure Low (Freeze)	Saturated Suction Temp < Evaporator Freeze Protect SP	Causes: Low evaporator water flow rate, low refrigerant in chiller, setpoints incorrect for operating conditions	Auto
Condenser pressure Low (Freeze)	Saturated Cond Temp < Condenser Freeze Protect SP	Causes: Low evaporator water flow rate, low refrigerant in chiller, setpoints incorrect for operating conditions	Auto
Evaporator Pump #1 Fault	No flow indicated for (5 sec) with Evaporator Pump #1 ON AND [the other pump is available (per the Evap Pump SP) AND has not faulted]	Evaporator flow not detected. Causes: improper pump wiring	Manual
Evaporator Pump #2 Fault	No flow indicated for (5 sec) with Evaporator Pump #2 ON AND [the other pump is available (per the Evap Pump SP) AND has not faulted]	Evaporator flow not detected. Causes: improper pump wiring	Manual
Condenser Pump #1 Fault	No flow indicated for (5 sec) with Condenser Pump #1 ON AND [the other pump is available (per the Evap Pump SP) AND has not faulted]	Condenser flow not detected. Causes: improper pump wiring	Manual
Condenser Pump #2 Fault	No flow indicated for (5 sec) with Condenser Pump #2 ON AND [the other pump is available (per the Evap Pump SP) AND has not faulted]	Condenser flow not detected. Causes: improper pump wiring	Manual

Controller Inputs and Outputs

As outlined below, inputs and outputs vary between the unit controller and the compressor controller.

Unit Controller Inputs and Outputs

The following tables list the unit controller inputs and outputs, both analog and digital, as well as the stepper motor outputs.

Table 21: Unit Controller, Analog Inputs

Description	Wiring	Source	Signal	Sensor Range
Entering Evaporator Water Temperature	Chiller	NTC Thermistor	10k @ 25°C	-40 to 125°C
Leaving Evaporator Water Temperature	Chiller	NTC Thermistor	10k @ 25°C	-40 to 125°C
Entering Condenser Water Temperature	Chiller	NTC Thermistor	10k @ 25°C	-40 to 125°C
Leaving Condenser Water Temperature	Chiller	NTC Thermistor	10k @ 25°C	-40 to 125°C
Liquid Line Refrigerant Temperature	Chiller	NTC Thermistor	10k @ 25°C	-40 to 125°C
Liquid Line Refrigerant Pressure	Chiller	Sealed Gage Transducer	0.5 to 4.5 VDC nominal	0 to 410 psi
Condenser Refrigerant Pressure	Chiller	Sealed Gage Transducer	0.5 to 4.5 VDC nominal	0 to 410 psi
Evaporator Water Flow Rate	Field	Water Flow Sensor	4 to 20 mA Current	0 to 10,000 gpm
Condenser Water Flow Rate	Field	Water Flow Sensor	4 to 20 mA Current	0 to 10,000 gpm
Reset of Leaving Water Temperature	Field	BAS	4 to 20 mA Current	0 to 100%
Demand Limit	Field	BAS	4 to 20 mA Current	0 to 100%

NOTE: "Sensor Range" in Table 21 indicates the range of the input, NOT the operating range of the chiller.

Table 22: Unit Controller, Digital Inputs

Description	Wiring	Signal Source	States (Open / Closed)
Front Panel "Stop/Auto" Switch	Chiller	Isolated Switch Contacts	Stop / Auto
Remote Start/Stop	Field	Isolated Switch or Relay Contacts	Stop / Auto
Evaporator Water Flow Switch	Chiller & Field (in series)	Isolated Flow Switch Contacts	No Flow / Flow
Condenser Water Flow Switch	Chiller & Field (in series)	Isolated Flow Switch Contacts	No Flow / Flow

Table 23: Unit Controller, Analog Outputs

Description	Output Signal	Sensor Range
Cooling Tower Bypass Valve Position	0 to 10 VDC	0 to 100% Open
Cooling Tower VFD Speed	0 to 10 VDC	0 to 100%

NOTE: "Sensor Range" in Table 23 indicates the range of the output, NOT the operating range of the chiller.

Table 24: Unit Controller, Digital Outputs

Description	Load	Rating
Alarm	Indicator Light	240 VAC
Evaporator Water Pump #1	Pump Contactor	240 VAC
Evaporator Water Pump #2	Pump Contactor	240 VAC
Condenser Water Pump #1	Pump Contactor	240 VAC
Condenser Water Pump #2	Pump Contactor	240 VAC
Cooling Tower Fan #1	Fan Contactor	240 VAC
Cooling Tower Fan #2	Fan Contactor	240 VAC
Cooling Tower Fan #3	Fan Contactor	240 VAC

Table 25: Unit Controller, Stepper Motor Outputs

#	Description	Motor Type
1	Electronic Expansion Valve	2 Phase Bipolar
2	Part Load Balancing Valve	2 Phase Bipolar

Compressor Controller Inputs and Outputs

The following tables list, for each compressor controller, analog inputs and digital outputs as well as the stepper motor outputs.

Table 26: Compressor Controller, Analog Inputs

#	Description	Source	Signal	Sensor Range
1	Compressor Suction Temperature	NTC Thermistor	10k @ 25°C	-40 to 125°C
2	Compressor Discharge Temperature	NTC Thermistor	10k @ 25°C	-40 to 125°C
3	Suction Refrigerant Pressure	Sealed Gage Transducer	0.5 to 4.5 VDC nominal	0 to 132 psi
4	Discharge Refrigerant Pressure	Sealed Gage Transducer	0.5 to 4.5 VDC nominal	0 to 410 psi
5	Rotor Pump Temperature	NTC Thermistor	10k @ 25°C	-40 to 125°C
6	Inlet Guide Vane Position	Rotary Transducer	1.5 to 2.6 VDC nominal	Closed to Open
7	Motor Winding Temperature 1	NTC Thermistor	10k @ 25°C	-40 to 150°C
8	Motor Winding Temperature 2	NTC Thermistor	10k @ 25°C	-40 to 150°C
9	Motor Winding Temperature 3	NTC Thermistor	10k @ 25°C	-40 to 150°C
10	Motor Case Temperature	NTC Thermistor	10k @ 25°C	-40 to 125°C
11	Motor Gap Temperature	NTC Thermistor	10k @ 25°C	-40 to 125°C

Table 27: Compressor Controller, Digital Outputs

#	Description	Load	Output OFF	Output ON
1	VFD Enable	VFD	Compressor OFF	Compressor ON
2	Liquid Injection	Solenoid (24 VDC, 20 VA max)	No Injection	Injection
3	Stator Cooling	Solenoid (24 VDC, 20 VA max)	Cooling OFF	Cooling ON

Table 28: Compressor Controller, Stepper Motor Outputs

#	Description	Load
1	Inlet Guide Vane Position	2 Phase Bipolar
2	Rotor Cooling	2 Phase Bipolar

Building 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 LonTalk®, Modbus® or BACnet®.

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

Protocol Options

The following protocol options are available:

- BACnet® MS/TP
- BACnet® IP
- BACnet® Ethernet
- LONWORKS®
- 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.

Use with On-Site Generators

All Magnitude® Model WME chillers have their compressors operated with variable frequency drives and, if the unit has two compressors, the compressors start sequentially in the normal start/load sequence. These features make Magnitude® chillers especially appropriate for use in applications where they may be required to run with on-site electrical generators. This is particularly true when the generators are used for temporary power when the utility power is lost.

Generator Sizing

Natural gas and diesel generators are sensitive to the peak current loads of the chiller. Although the normal VFD start sequence does not require these peak values of current, certain dynamic conditions such as changes in water flow and temperature or momentary power interruptions can cause high peak electrical currents. Use the electrical data either on the VFD data plate or supplied with the chiller performance rating sheet – obtained from the Daikin Applied sales office – for generator sizing purposes. The referenced data will show the RLA and LRA, which is for each compressor. It is important to size the generator to handle the LRA value.

⚠ WARNING

Generator must be sized by an electrical engineer familiar with generator applications.

Transfer Back to Grid Power

Due to the special VFD incorporated in all WME chillers and the system’s inherent ride-through capabilities, transfer from grid power to stand-by generator power and back to grid power can be done at any time. The duration of power interruption during the transfer process will determine how the chiller will respond. While the compressor rotor is still spinning at adequate speed, power is generated internally to keep the bearings and all control electronics operating. Power interruptions of various durations will cause different restart scenarios as described below.

1. **Short:** Interruptions of only a few seconds will allow a running compressor to return to operating speed almost immediately. (NOTE: If the operating pressure ratio is high at the time of interruption, there may be a short delay in return to operating speed.)
2. **Medium:** For interruptions that cause the compressor to coast down below about 3500 rpm (but still generating control power), the compressor will continue coasting to a stop, and then restart.
3. **Long:** Once the compressor coasts nearly to a stop, control power is lost and the controllers must reboot normally when either grid power or emergency generator power is reinstated. (NOTE: If the RapidRestore® option is installed, the time required to restart is reduced to only a few seconds.)

Service Programs

It is important that an air conditioning system receive adequate maintenance if the full equipment life and full system benefits are to be realized. Maintenance should be an ongoing program from the time the system is initially started. A full inspection should be made after 3 to 4 weeks of normal operation on a new installation and on a regular basis thereafter.

Daikin Applied offers a variety of maintenance services through the local Daikin Applied service office and can tailor these services to suit the needs of the building owner. Most popular among these services is the Daikin Applied Comprehensive Maintenance Contract. For further information concerning the many services available, contact your local Daikin Applied service office.

Chiller Maintenance

⚠ DANGER

Use approved Lock Out / Tag Out procedures to disconnect power from the unit. Wait 20 minutes after disconnecting power from the unit before opening any compressor access covers. The DC link capacitors store enough energy to cause electrocution.

Electrical System

Maintenance of the electrical system involves the general requirement of keeping connections clean and tight. Pump interlocks and flow switches should be checked to be sure they interrupt the control circuit when tripped.

Cleaning and Preserving

A common cause of service calls and equipment malfunction is dirt. This can be prevented with normal maintenance. The system components most subject to dirt are:

1. Strainers: Remove and clean strainers in the chilled water system and condenser water system at every inspection.
2. Condenser Tubes: Inspect the condenser tubes annually for fouling and clean if required. The standard waterboxes should be removed with care due to their weight. One method for handling standard waterboxes follows (only qualified service personnel should perform these tasks):
   - After draining water, remove all but two head bolts at roughly 10 and 2 o'clock.
   - Loosen the remaining two bolts to enable the head to be separated from the tube sheet sufficiently for a clevis pin or hook to be inserted into an open bolt hole at the top of the head.
   - Attach a hoist to the pin or hook, lift the head to remove weight from the two remaining bolts, remove the bolts, and carefully remove the head.
   - Do not try to install a machine thread eyebolt into the head vent fitting, which has pipe threads.
   - Reverse this procedure to mount the head, using a new gasket.
3. Condenser Flow Sensor: The condenser sensor should be cleaned anytime the condenser is opened. This should typically be performed at the annual inspection; however, more frequent cleaning may be required depending on the conditions of the jobsite. Recommended maintenance includes the following:
   - Check the sensor tip for buildup.
   - Clean the tip using a soft cloth. Stubborn buildup — such as lime — can be removed using a common vinegar cleaning agent.

Water Treatment

Special care must be taken when utilizing open system water that is usually not treated (such as lakes, rivers, and ponds). The use of untreated water will result in corrosion, erosion, slime buildup, scaling, or algae formation. Water treatment service must be used. Special tube and water head material may be required to reduce damage from corrosion. Daikin Applied is not responsible for damage or faulty operation from untreated or improperly treated water. See Water Piping on page 16 for caution statement on water quality.

Seasonal Shutdown

⚠ WARNING

The condenser and evaporator are not self-draining. Where the chiller can be subject to freezing temperatures, the condenser and evaporator must be drained of all water. Water permitted to remain in the piping and vessels can rupture these parts if subjected to freezing temperatures. Dry air blown through the vessels will aid in forcing all water out.

Except for freezing conditions, it is desirable to leave water in the vessels to avoid long term exposure to air.

Continuous forced circulation of antifreeze through the vessels is one method of avoiding freeze up.

Seasonal Startup

Seasonal startup procedures are as follows:

1. Leak test the unit.
2. Check and tighten all electrical connections.
3. Replace the drain plugs (including cooling tower pump and tower drain) if they were removed at shutdown the previous season.

Maintenance Schedule

Table 29 provides an overview of recommended maintenance procedures along with how frequently these procedures should be performed.

Table 29: Recommended Maintenance Schedule

	Monthly	Quarterly	Semi-Annually	Annually	As Required By Performance	During Seasonal Shutdown	During Seasonal Startup
I. Compressor							
A. Analyze Compressor Fault Log		X					
B. Check IGV operation		X					
C. Check and tighten compressor electrical connections				X			
II. MicroTech® Controls							
A. Check for proper settings		X					
B. Verify transducers and sensors for accuracy		X					
C. Retrieve and archive HMI Trend Logs	O						
D. Perform MicroTech® check, log, and last fault analysis		X					
III. Condenser							
A. Confirm correct water flow and pressure drop	O	X					
B. Confirm appropriate water treatment	O						
C. Clean and Leak Test condenser tubes				X	X	X	
D. Eddy Current Test - tube wall thickness					X		
E. Seasonal Protection					X		
F. Clean Flow Sensor				X	X		
IV. Evaporator							
A. Confirm correct water flow and pressure drop	O	X					
B. Confirm appropriate water treatment	O						
C. Clean and Leak Test evaporator tubes					X		
D. Eddy Current Test - tube wall thickness					X		
E. Seasonal Protection					X		
F. Clean Flow Sensor				X			
V. Chiller Unit							
A. Run Test / Performance Evaluation		X					
B. Leak Test entire unit		X				X	X
C. General Appearance:							
1. Paint / Corrosion					X		
2. Insulation					X		
VII. Electrical							
A. Check and record line voltage		X					
B. Inspect power components for signs of overheating		X					
C. Check and tighten unit electrical components				X			X

Key: O = Performed by owner personnel X = Performed by qualified service personnel

Definitions

Active Amp Limit

Active amp limit is the actual amp limit in effect at any given time. It is the lowest value of any active external inputs and internal setpoints.

Active LWT Setpoint

The active LWT (leaving water temperature) setpoint is the actual target value for leaving water temperature in effect at any given time. It is the Leaving Water Temp - Cool setpoint as modified by any active LWT reset input.

Dead Band

The dead band is a range of values for a controlled variable over which no action is taken by the controller.

Demand Limit

A signal from the User Interface or the BAS that limits the compressor loading to a designated percent of full load. This function limits the %RLA value.

Discharge Superheat

Discharge superheat is calculated using the following equation:

Discharge Superheat = Discharge Temperature – Discharge 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 shows whether the temperature is increasing or decreasing and how quickly.

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 as follows:

Evap Approach = LWT – Saturated Temperature

Cond Approach = Saturated Temperature – LWT

Evap Recirc (Evaporator Recirculation) Timer

A timing function, with a 30-second default, that holds off starting the chiller until the building/evaporator loop has had time to settle to a good indication of the actual temperature. This delay helps prevent false decisions by the start logic regarding the need for cooling.

EXV

Electronic expansion valve, used to control the flow of refrigerant from condenser to evaporator.

HMI

Human Machine Interface, one screen per unit provides operating data visually and accommodates setpoint entry

Load Balance

Load balance is a technique that equally distributes the total unit load between two or more running compressors. On the WME, this function uses compressor power.

Low Pressure Delta Setpoint

Chiller logic attempts to prevent low pressure shutdowns by keeping evaporator pressure above the shutdown limit. The target low pressure limit is the Low Evap Pressure Stop setpoint plus the Low Evap Pressure Delta setpoint.

LRA

Locked rotor amps.

Maximum Compressor Speed

The maximum compressor speed is a fixed value based on the impeller size.

Minimum Compressor Speed

The minimum compressor speed is a dynamically calculated value based on operating conditions that is further limited on the low side by the VFD Minimum Speed setpoint.

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.

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RapidRestore® Function

This capability uses an optional power supply running from a facilities uninterruptable power source that keeps the unit and compressor controllers powered during a power interruption. This option allows the chiller to restart quickly when power returns.

Refrigerant Saturated Temperature

Refrigerant saturated temperature is calculated from the pressure sensor readings. The pressure is fitted to an HFC-134a temperature/pressure curve to determine the saturated temperature. The WME uses sealed gage transducers so that barometric pressure compensation is not required.

RLA

Rated load amps.

Soft Load

Soft Load is a control sub-routine that allows the chiller to load up gradually.

SP

Setpoint

Stage Delay

The time delay from the start of the first compressor to the start of the second or from the start of the second until the time it can shut down.

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 using the following equation:

Suction Superheat = Suction Temperature – Suction Saturated Temperature

VDC

Volts, Direct Current; sometimes noted as vdc.

VFD

Variable Frequency Drive, a power conversion device used to vary the compressor speed.

Temperature / Pressure Chart

Table 30: R-134a Temperature / Pressure Chart

R-134a Temperature / Pressure Chart							
°F	PSIG	°F	PSIG	°F	PSIG	°F	PSIG
6	9.7	46	41.1	86	97.0	126	187.3
8	10.8	48	43.2	88	100.6	128	192.9
10	12.0	50	45.4	90	104.3	130	198.7
12	13.2	52	47.7	92	108.1	132	204.5
14	14.4	54	50.0	94	112.0	134	210.5
16	15.7	56	52.4	96	115.9	136	216.6
18	17.1	58	54.9	98	120.0	138	222.8
20	18.4	60	57.4	100	124.1	140	229.2
22	19.9	62	60.0	102	128.4	142	235.6
24	21.3	64	62.7	104	132.7	144	242.2
26	22.9	66	65.4	106	137.2	146	249.0
28	24.5	68	68.2	108	141.7	148	255.8
30	26.1	70	71.1	110	146.3	150	262.8
32	27.8	72	74.0	112	151.1	152	270.0
34	29.5	74	77.1	114	155.9	154	277.3
36	31.3	76	80.2	116	160.9	156	284.7
38	33.1	78	83.4	118	166.0	158	292.2
40	35.0	80	86.7	120	171.1	160	299.9
42	37.0	82	90.0	122	176.4	162	307.8
44	39.0	84	93.5	124	181.8	164	315.8

DAIKIN APPLIED AMERICAS INC.
LIMITED PRODUCT WARRANTY
(North America)

Daikin Applied Americas Inc. dba Daikin Applied ("Company") warrants to contractor, purchaser and any owner of the product (collectively "Owner") that Company, at it's option, will repair or replace defective parts in the event any product manufactured by Company, including products sold under the brand name Daikin and used in the United States or Canada, proves defective in material or workmanship within twelve (12) months from initial startup or eighteen (18) months from the date shipped by Company, whichever occurs first. Authorized replaced parts are warranted for the duration of the original warranty. All shipments of such parts will be made FOB factory, freight prepaid and allowed. Company reserves the right to select carrier and method of shipment.

In addition, labor to repair or replace warranty parts is provided during Company normal working hours on products with rotary screw compressors and centrifugal compressors. Warranty labor is not provided for any other products.

Company's liability to Owner under this warranty shall not exceed the lesser of the cost of correcting defects in the products sold or the original purchase price of the products.

PRODUCT STARTUP ON CENTRIFUGAL AND SCREW COMPRESSOR PRODUCTS IS MANDATORY and must be performed by a Daikin Applied or a Company authorized service representative.

It is Owner's responsibility to complete and return the Registration and Startup Forms accompanying the product to Company within ten (10) days of original startup. If this is not done, the ship date and the startup date will be deemed the same for warranty period determination, and this warranty shall expire twelve (12) months from that date.

EXCEPTIONS

1. If free warranty labor is available as set forth above, such free labor does not include diagnostic visits, inspections, travel time and related expenses, or unusual access time or costs required by product location.
2. Refrigerants, fluids, oils and expendable items such as filters are not covered by this warranty.
3. This warranty shall not apply to products or parts which (a) have been opened, disassembled, repaired, or altered by anyone other than Company or its authorized service representative; or (b) have been subjected to misuse, negligence, accidents, damage, or abnormal use or service; or (c) have been operated, installed, or startup has been provided in a manner contrary to Company's printed instructions, or (d) were manufactured or furnished by others and which are not an integral part of a product manufactured by Company; (e) have been exposed to contaminates, or corrosive agents, chemicals, or minerals, from the water supply source, or (f) have not been fully paid for by Owner.

ASSISTANCE

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

SOLE REMEDY

THIS WARRANTY CONSTITUTES THE OWNER'S SOLE REMEDY. IT IS GIVEN IN LIEU OF ALL OTHER WARRANTIES. THERE IS NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT AND UNDER NO CIRCUMSTANCE SHALL COMPANY BE LIABLE FOR INCIDENTAL, INDIRECT, SPECIAL, CONTINGENT OR CONSEQUENTIAL DAMAGES, WHETHER THE THEORY BE BREACH OF THIS OR ANY OTHER WARRANTY, NEGLIGENCE OR STRICT LIABILITY IN TORT.

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

For additional consideration, Company will provide an extended warranty(ies) on certain products or components thereof. The terms of the extended warranty(ies) are shown on a separate extended warranty statement.

Form No. 933-430285Y-01-A (05/17)

Daikin Applied Training and Development

Now that you have made an investment in modern, efficient Daikin Applied equipment, its care should be a high priority. For training information on all Daikin Applied HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 and ask for the Training Department.

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All Daikin Applied equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied representative for warranty details. To find your local Daikin Applied representative, go to www.DaikinApplied.com.

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To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787). To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.

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