INSTALLATION, OPERATION & MAINTENANCE

IOM 1389

AUGUST 2025

MAGNITUDE® WMC-E

MAGNETIC BEARING OIL-FREE CENTRIFUGAL CHILLERS

- MODEL WMC-E
- 180 TO 270 TONS
- R-515B REFRIGERANT

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Safety Information 3
Hazard Identification 3
Introduction. 4
General Description 4
Nomenclature 4
The Control System 5
Installation. 6
Operating Limits 6
Nameplates 6
Receiving and Handling 6
Transit 6
Location. 6
Storage 7
Long Term Storage 7
Mounting 7
Lifting Guidance 7
Clearance 9
Water Piping 9
Condenser Water Temperature Control 11
Relief Valves 12
Field Insulation 13
Electrical 14
Field Wiring 14
Physical Data 19
Unit Dimensions 19
Retrofit Knockdown 20
Type A Knockdown (Bolt-Together Construction) . . . 20
Type B Knockdown (Partial Disassembly) 21
Operation. 26
Operator Responsibilities 26
Operator Schools 26
Sequence of Operation 26
Unit Enabling/Disabling and Overrides 27
Unit Control Logic 27
Navigation Summary 29
Human Machine Interface (HMI) 29
Cooling Tower Control 41
Alarms 52
Pre-Startup 58
Maintenance 62
Service Programs 62
Seasonal Shutdown 62
Seasonal Startup 62
Maintenance Schedule 63
Appendix 64
Pre-start Checklist. 64
Limited Product Warranty 65

Safety Information

This manual provides installation, operation, and maintenance information for a Daikin Applied Magnitude WMC-E chiller with a MicroTech™ controller.

NOTICE

Installation and maintenance are to be performed only by licensed, if required by local codes and regulations, or qualified personnel who are familiar with local codes and regulations and are experienced with this type of equipment.

⚠ DANGER

LOCKOUT/TAGOUT all power sources prior to service, pressurizing, de-pressuring, or powering down the unit. Failure to follow this warning exactly can result in serious injury or death. Disconnect electrical power before servicing the equipment. More than one disconnect may be required to denergize the unit. Be sure to read and understand the installation, operation, and service instructions within this manual.

⚠ 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.

⚠ WARNING

Polyolester Oil, commonly known as POE oil is a synthetic oil used in many refrigeration systems, and may be present in this Daikin Applied product. POE oil, if ever in contact with PVC/CPVC, will coat the inside wall of PVC/CPVC pipe causing environmental stress fractures. Although there is no PVC/CPVC piping in this product, please keep this in mind when selecting piping materials for your application, as system failure and property damage could result. Refer to the pipe manufacturer's recommendations to determine suitable applications of the pipe.

⚠ 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.

Hazard Identification

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

Notice indicates practices not related to physical injury.

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

Introduction

General Description

Daikin Applied Magnitude chillers are complete, self-contained, automatically controlled, liquid-chilling units featuring oil-free, magnetic bearing centrifugal 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.

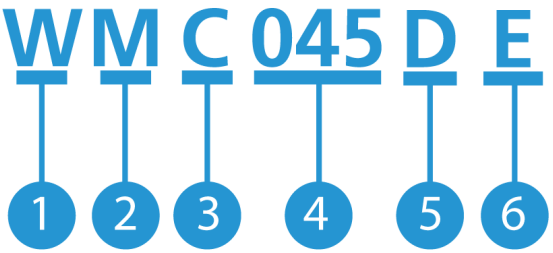
Magnitude chillers are designed for indoor, non-freezing installation only. The chillers use refrigerant R-515B that operates at a positive pressure over the entire operation range, so no purge system is required.

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.

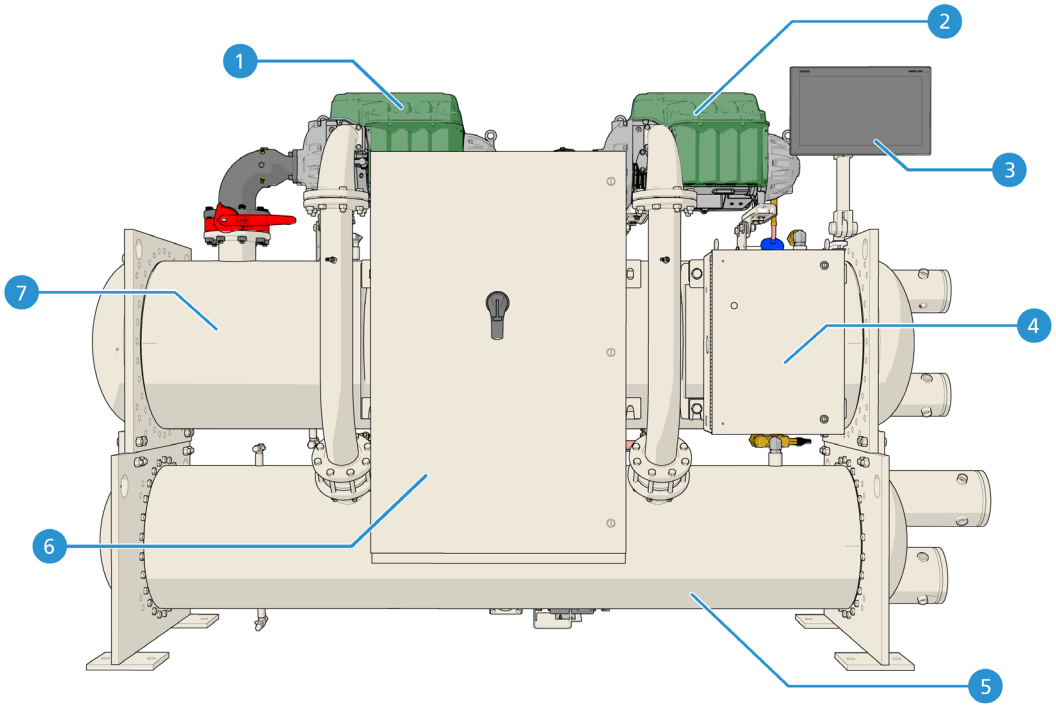
Nomenclature



No.	Description
1	W = Water-cooled
2	M = Magnetic Bearing
3	C = Centrifugal Compressor
4	Model Code
5	D = Dual
6	Design Vintage

Figure 1: WMC-E Major Component Locations

LEGEND	
1	Compressor #1
2	Compressor #2
3	Human Machine Interface (HMI)
4	Control Panel
5	Condenser
6	Power Panel
7	Evaporator



NOTICE
Unit shown with right-hand water connections. Water connection orientation is based on facing the unit power panel.

The Control System

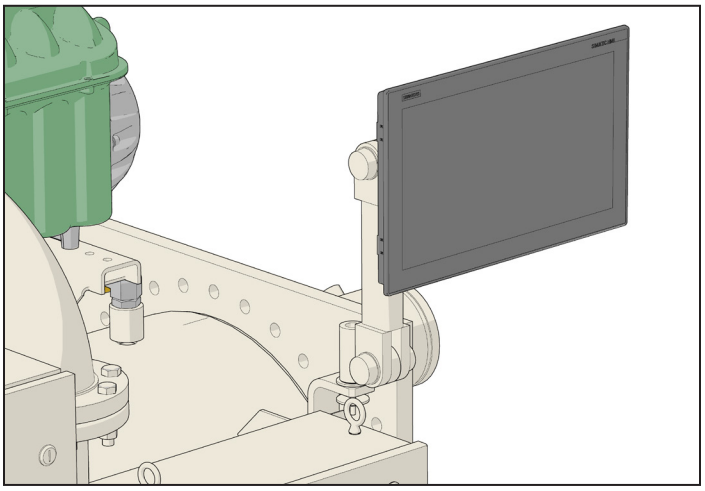
The centrifugal MicroTech control system consists of a human machine interface (HMI) touch screen, a microprocessor-based unit controller, and compressor on-board controllers, providing monitoring and control functions required for the efficient operation of the chiller.

Human Machine Interface

The HMI screen, (see Figure 2 for an example of a screen display), is the primary device for viewing unit operation information and entering commands and entries into the control system. Select information from the HMI panel can be downloaded via a USB port located on the HMI PC.

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 PC is located in the Control Panel, as shown in Figure 3. For more information, see page 29.

Figure 2: Machine Interface Touch Screen

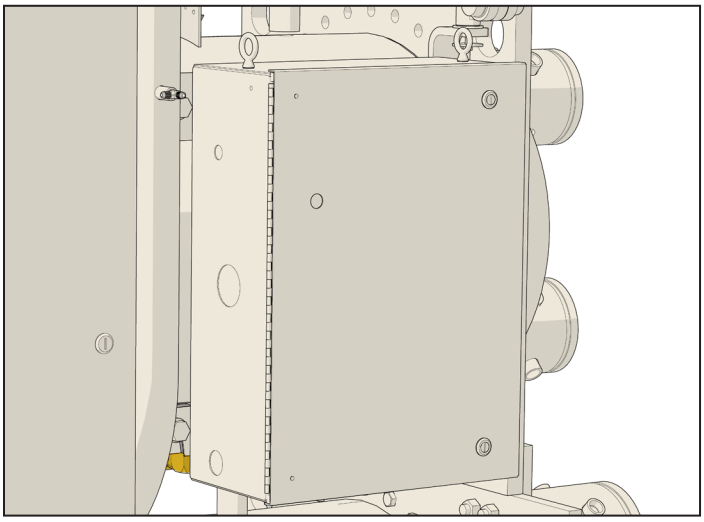


Unit Controller

The purpose of the MicroTech unit controller is to acquire and process data relating to chiller operation, issue instructions to various components of the chiller, and maintain controlled operation of the chiller. As a part of operating the chiller successfully, the unit controller offers necessary condenser water control. See “Condenser Water Temperature Control” on page 11 for more information.

The controller is located in the control panel, as shown in Figure 3. The controller sends information to the HMI touch screen for graphic display.

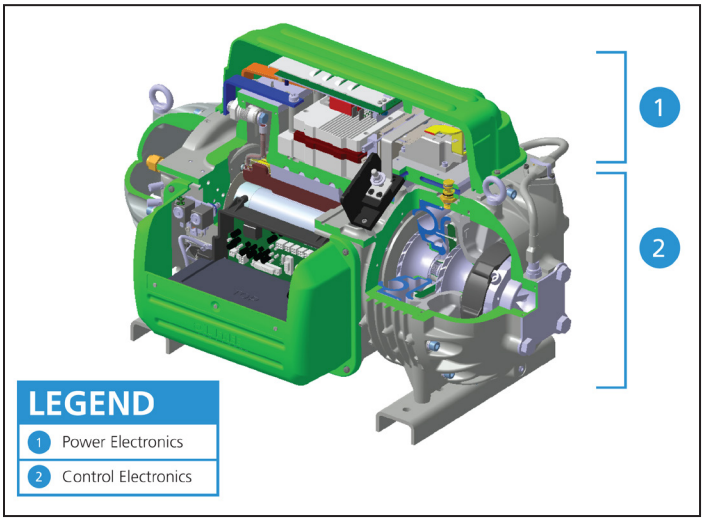
Figure 3: Unit Control Panel



Compressor On-Board Controllers

Each compressor is equipped with microprocessor controllers and sensors that provide control and data acquisition. The data is transmitted to other controllers and the HMI via the multi-unit communication network. The on-board controllers control compressor functionality and the motor/bearing system.

Figure 4: Compressor Cutaway



Installation

Operating Limits

Table 1: Operating/Standby Limits

Acceptable Temperatures[1]			R-515B	
Condition	**Component**	**Description**	**Min Temp °F (°C)**	**Max Temp °F (°C)**
Standby	Evaporator	Water	40 (4.4)	140 (60)
		Water w/ Anti-freeze[2]	40 (4.4)	140 (60)
	Equipment Room	Air w/ Water in Vessels[4]	40 (4.4)	104 (40)
		Air w/ no Water in Vessels[4]	0 (-17.8)	104 (40)
Startup	Evaporator	Water	40 (4.4)	90 (32)
		Water w/ Anti-freeze[2]	40 (4.4)	90 (32)
	Condenser	Water	40 (4.4)	130 (54)
	Equipment Room	Air[4]	40 (4.4)	104 (40)
Operating	Evaporator	Entering Water	40 (4.4)	75 (24)
		Leaving Water[3]	38 (3.3)	55 (12.8)
		Entering Water w/ Antifreeze[2]	40 (4.4)	75 (24)
		Leaving Water w/ Antifreeze[2,3]	38 (3.3)	55 (12.8)
	Condenser	Entering Water	55 (13)	135 (57)
		Leaving Water[3]	57 (14)	142 (61)
	Equipment Room	Air[4]	40 (4.4)	104 (40)

1 Contact a Daikin Applied representative for performance at specific operating conditions, as some limits depend on unit configuration
2 Antifreeze temperature limits must have appropriate glycol concentration
3 Allowable leaving fluid temperatures depend on Saturation Temperature
4 5%-95% relative humidity, non-condensing

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

Carefully check equipment against the bill of lading to ensure all items have been received. Before unloading any unit, check the nameplate to make sure the voltage complies with the power supply available.

Inspect all units for damage upon arrival. If a unit has become dirty during shipment, carefully clean it prior to completing the inspection. Daikin Applied is not responsible for physical damage after the unit leaves the factory unless the contract with Daikin Applied states otherwise.

NOTICE

All units should be carefully inspected for damage when received. Report all loss or shipping damage using a claim form supplied by Daikin Applied.

VISIBLE LOSS OR DAMAGE: Any external evidence of loss or damage must be noted on the freight bill or carrier's receipt, and signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusal to honor a damage claim.

CONCEALED LOSS OR DAMAGE: Concealed loss or damage means loss or damage which does not become apparent until the unit has been unpacked or unwrapped. The contents may be damaged in transit due to rough handling even though the exterior may not show damages. When the damage is discovered, make a written request for inspection by the carrier's agent within **five (5) days** of the delivery date and file a claim with the form provided by Daikin Applied. Refer to the Daikin Applied Freight Policy for further information.

Transit

When the unit is being tied down for transit, the maximum allowable attachment angle from the vertical is 30 degrees in the opposite direction of lifting in Figure 6. Shimming of the unit under the lifting brackets or tie-down points must be used to ensure even contact along the length of the base rail.

Location

WMC 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).

WMC chillers must be installed in a space that complies with ANSI/ASHRAE 15 (USA) or CSA B52 (Canada).

NOTICE

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.

NOTICE

The maximum allowable altitude for WMC chillers is 3000 m above sea level.

Storage

If the unit is stored for an intermediate period before installation or moved to a different location, take these additional precautions:

1. Support the unit well along the length of the base foot plate.
2. Level the unit (no twists or uneven ground surface).
3. Provide proper drainage around the unit to prevent flooding of the equipment.
4. Provide adequate protection from vandalism, mechanical contact, etc.
5. Securely close the doors and lock the handles.

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 a 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 ambient temperature of the storage location is expected to exceed 140°F (60°C), then the refrigerant must be removed.

It is necessary to observe some precautions during storage.

- Do not keep the machine near a heat source and/or open flame.
- Humid environments may cause condensate corrosion on steel surfaces. Consider adding a desiccant material to alleviate corrosion concerns.
- For units previously installed, ensure water has been drained from the unit or sufficient glycol has been added if ambient temperature may be lower than 40°F (4.4°C).

For additional tasks required, contact a Daikin Applied service representative.

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

Lifting Guidance

Daikin Applied equipment is designed to withstand the loads of the lifting and rigging process resulting from ASME Standard P30.1 - Planning for Load Handling Activities or equivalent. Lifting guidance is intended for installations of newly delivered equipment. If moving previously installed equipment for re-location or disposal, consideration should be given to unit condition. Equipment should also be drained as unit weight and center of gravity values do not reflect the addition of water for lifting.

⚠ DANGER

Improper rigging, lifting, or moving of a unit can result in unit damage, property damage, severe personal injury, or death. See the as-designed, certified dimensioned 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.

Installation is to be performed only by qualified personnel who are familliar with local codes and regulations, and experienced with this type of equipment. Lifting equipment and mechanisms must be determined by the Lifting Director per the current version of ASME Standard P30.1 or equivalent and must be suited for the load capacity. Daikin Applied is not a licensed nor certified rigging specialist. Therefore it is the customer's responsibility to consult a certified rigging contractor to rig, lift, and move components and subcomponents properly and safely as needed.

⚠ CAUTION

Forklifts may not be used to lift or move Magnitude WMC-E units as the method may result in unit damage.

⚠ CAUTION

When around sharp edges, wear appropriate Personal Protective Equipment (PPE), such as gloves, protective clothing, foot wear, eye protection, etc. to prevent personal injury.

Lifting Holes

Lifting bracket or hole designs vary from product to product. Rules of engagement with the lifting point are the same regardless of the attachment type. For Magnitude WMC-E units, a typical lifting hole measuring 2" (51 mm) in diameter is found on each corner of the unit tubesheets as illustrated in Figure 5. See the as-designed certified drawings for specific lifting points on this product model.

Engagement with each lifting hole is to be as close to vertical as possible. The maximum allowable lift angle from the vertical is 30 degrees as shown in Figure 6. If the lift angle shifts beyond 30° from vertical on any of the lift points, the lift shall not proceed until a plan and rigging can be secured that will correct the angle of lift.

⚠ WARNING

The lifting angle must not go beyond 30 degrees from vertical or the unit can become unstable which may result in unit damage, property damage, severe personal injury, or death.

Figure 5: Illustration of Lifting Hole and Allowed Angle for Lifting

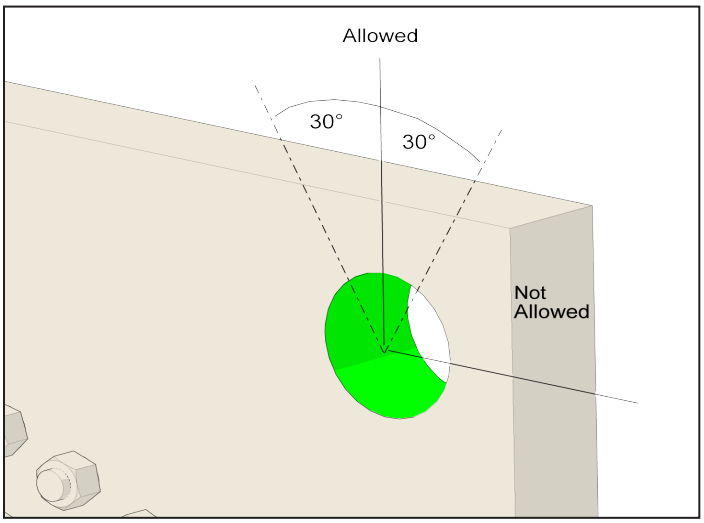
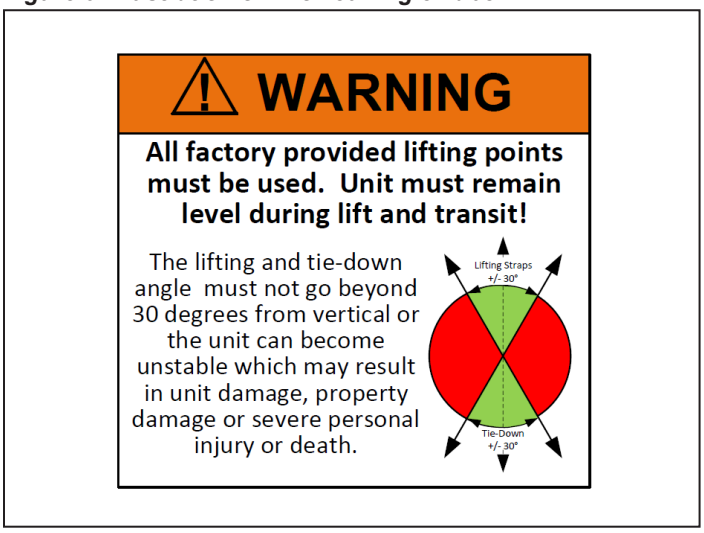


Figure 6: Illustration of Allowed Angle Label



Lifting Equipment

Lifting equipment is supplied by the user or their designate. This is typically selected around the unit certified information of the equipment to be lifted and the available lifting equipment planned to be at the site where the lift is to take place. It is the responsibility of the Lifting Director to follow a standard practice of lift planning and equipment selection, like that found in the ASME P30 series of standards. Lifting plan and equipment must ensure that the only contact with the unit is at that lifting brackets.

⚠ CAUTION

Lifting mechanisms must not make contact with the unit beyond the lifting bracket. Extreme care must be used when rigging the unit to prevent damage to the control panels, unit handles, unit piping, and unit frame.

Lifting Points

Lifting points are predetermined by design. When lifting, all factory installed lifting holes must be used. Figure 7 illustrates typical 4 point lifting configuration. Unit must remain level throughout the entire lifting event. Level is defined as one end being no more than 0.25” per foot of unit length to the opposite end.

⚠ WARNING

Be aware that the center of gravity may not necessarily be in the geometric center of the unit. No additional items can be added to a lift with the unit as it may affect the center of gravity and cause unit damage, property damage, severe personal injury, or death. Refer to as-designed, certified drawings for weight, center of gravity location and details specific to unit configuration.

Figure 7: Typical Lifting Points Locations

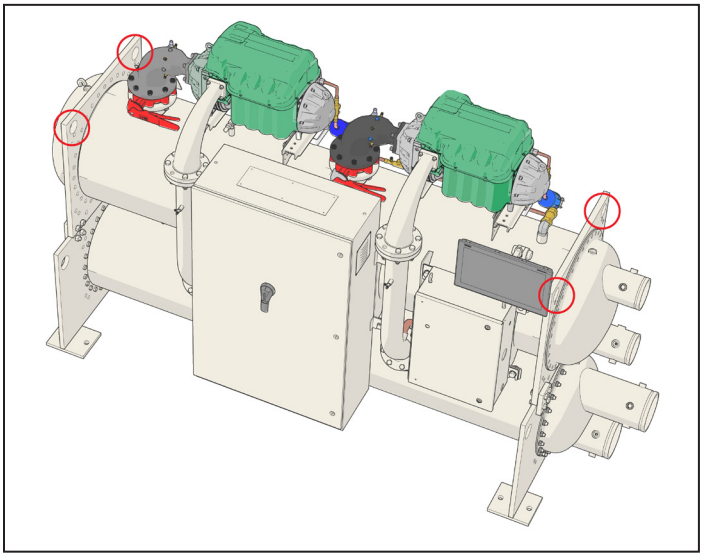
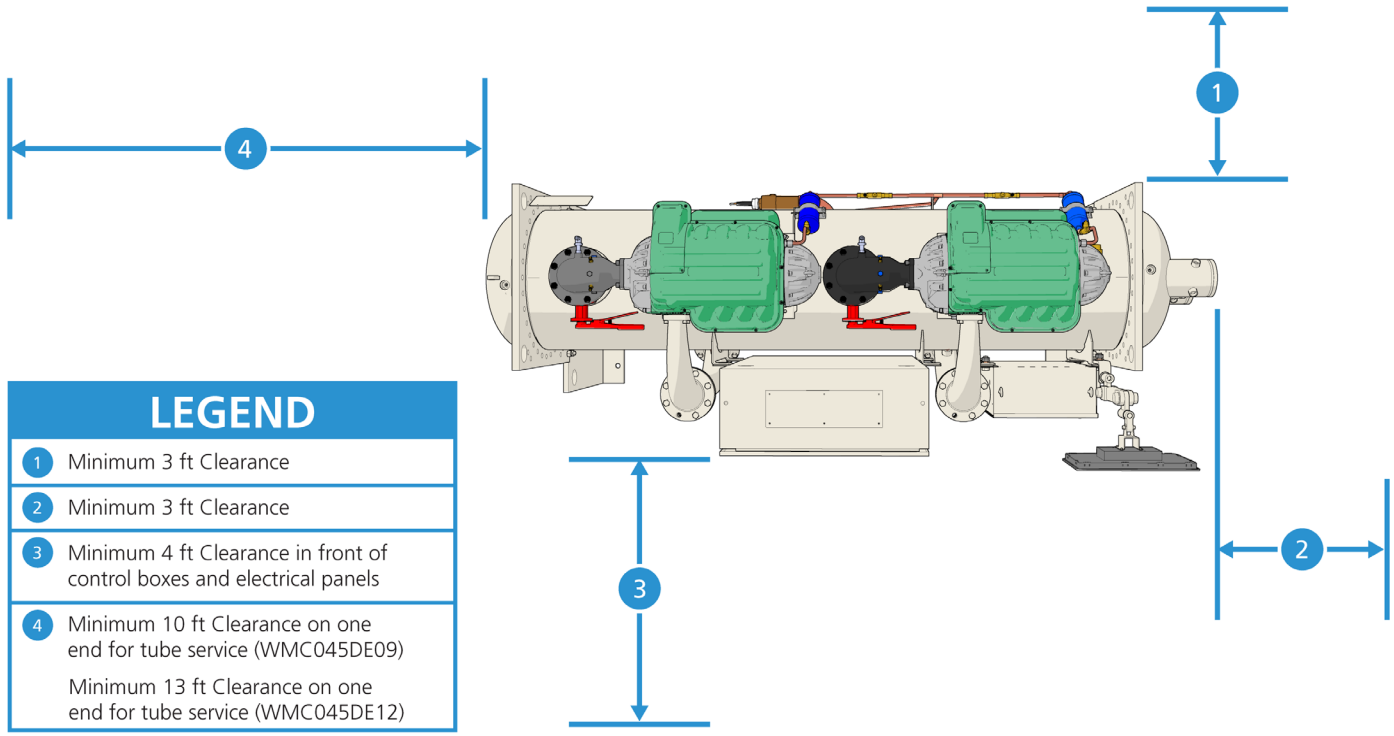


Figure 8: Minimum Clearances Based on Standard Waterboxes



Clearance

The unit must be placed in an area that allows for adequate clearance around the unit. See Figure 8 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.

NOTICE

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

Water Piping

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

⚠ CAUTION

Polyolester Oil, commonly known as POE oil is a synthetic oil used in many refrigeration systems, and may be present in this Daikin Applied product. POE oil, if ever in contact with PVC/ CPVC, will coat the inside wall of PVC/CPVC pipe causing environmental stress fractures. Although there is no PVC/ CPVC piping in this product, please keep this in mind when selecting piping materials for your application, as system failure and property damage could result.

⚠ 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 thermal dispersion flow switches are factory installed as standard. 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 CF1 and CF2, shown in "Figure 14: WMC-E Control Box Schematic" starting on page 16. Calibration of thermal dispersion flow switches is discussed on page 58.
- 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.
- piping must be supported to eliminate weight and strain on the fittings and connections.
- chilled water piping must be adequately insulated.

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.

⚠ 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 values listed in "Table 1: Operating/Standby Limits" on page 6. Water above these limits can damage controls or cause the relief valve to discharge refrigerant.

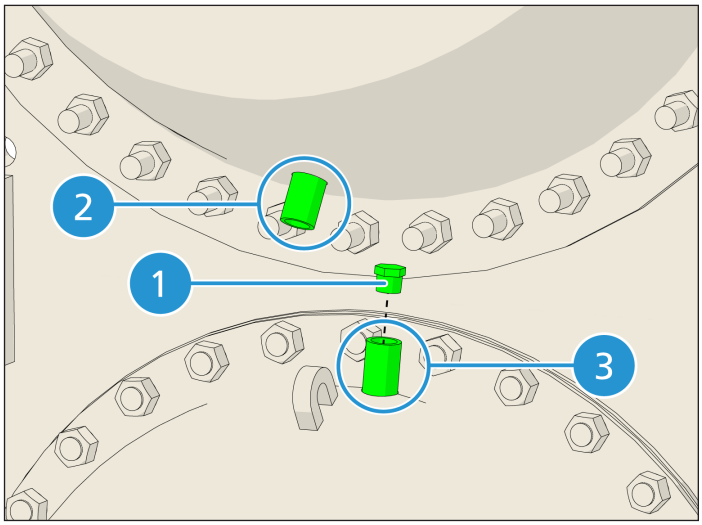
Circuit Piping and Venting Air

After the water piping is completed tighten and torque to maintain between 30 and 60 ft. lbs. (41 and 81 N•m) the nuts on the liquid head flanges on both the evaporator and condenser. It is recommended that the evaporator head not be insulated until this is completed. Gasket shrinkage and handling during transit cause nuts to loosen. If water pressure is applied before tightening is done, the gaskets may be damaged and have to be replaced. Fill the chilled and condenser water circuits, operate the pumps manually and carefully check the evaporator and condenser water heads and piping for leaks. Repair leaks as necessary. Before initial operation of the unit both water circuits should be thoroughly vented of all air at the high points.

Vessel Drains at Startup

The unit is drained of water at the factory. Drain plugs for each vessel head are shipped separately in the control 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 9.

Figure 9: Drain Plug Installation



No.	Description
1	Plug
2	Drain Hole (Under Insulation)
3	Vent Hole (Air Purge)

Water Quality Guidelines

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. Strainers must be used to protect the chiller systems from water-borne debris. Daikin Applied will not be responsible for any water-borne debris damage or water side damage to the chiller heat exchangers due to improperly treated water.

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).

⚠ CAUTION

The improper 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.

Variable Fluid Flow Rates

Both excessively high and low fluid flow rates should be avoided. Extremely high fluid flow rates and high tube velocities will result in high fluid pressure drops, high pumping power, and potential tube erosion or corrosion damage. Extremely low fluid flow rates and low velocities should also be avoided as they will result in poor heat transfer, high compressor power, sedimentation and tube fouling. If it is decided to vary the evaporator or condenser water flow rate, the flow rate should not exceed the minimum or maximum limits. Additionally, the rate of change for the evaporator flow rate should not exceed 10% of the current value per minute.

Water Volume

All chilled water systems need adequate time to recognize a load change to avoid short cycling of the compressors or loss of control. The potential for short cycling usually exists when the building load falls below the minimum chiller plant capacity or on close-coupled systems with very small water volumes. Assuming that there are no sudden load changes and that the chiller plant has reasonable turndown, a rule of thumb of “gallons of water volume equal to two to three times the chilled water gpm flow rate” is often used. For a more accurate determination of minimum system volume, consult Chiller Plant Design Application Guide, AG 31-003.

A properly designed storage tank should be added if the system components do not provide sufficient water volume.

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 WMC chiller provides several options to assist the chiller plant designer in providing the optimum control of condenser water temperature.

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 unit controller.

Acceptable methods include the following **(Each of these options 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.

NOTICE

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.

NOTICE

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.

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 unit 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.

Condenser Pump Sequencing

It is recommended to utilize the logic built into the MicroTech controller to start the condenser pump and maintain condenser head pressure control. 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.

Lenient Flow Operation

For chiller startup, the condenser control systems can reduce the flow to low rates, which can make operation of a flow sensing device unreliable. The MicroTech controller has a “lenient flow” feature that acts as an override of the flow sensor while protecting the chiller by monitoring a condenser pressure setting that is below the high pressure cutout. See “Lenient Flow Logic” on page 27 for detailed information.

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, evaporator, and compressor suction line(s) for the purpose of relieving excessive refrigerant pressure (caused by equipment malfunction, fire, etc.) to the atmosphere.

Table 2: Relief Valve Data

Relief Valve	Evaporator	Condenser	Suction Line
Location	Top of evaporator	Top of condenser	Each suction line
Pressure Setting (psi)	200	225	200
Discharge Cap.(lb/min air)	75.5	84.4	6.9
Qty	1	2	1 per compressor
Connection Size	1.0-inch female NPT	1.0-inch female NPT	3/8-inch flare

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

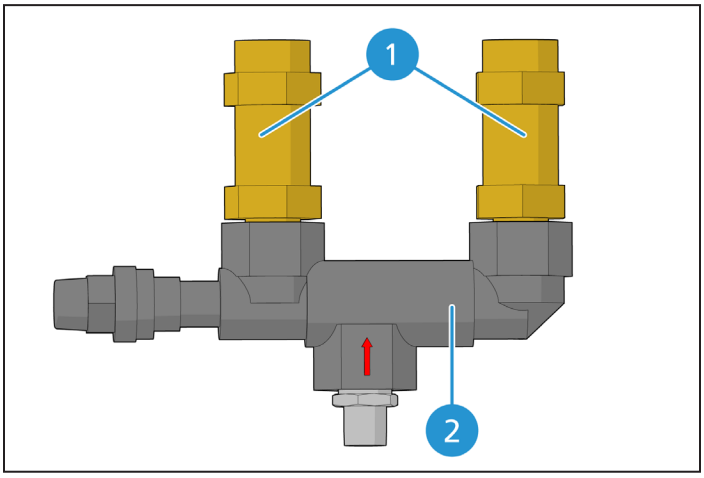
Units are shipped with refrigerant valves closed to isolate the refrigerant in the unit condenser. Valves must remain closed until startup by the factory service technician.

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 11. 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 12.

Figure 10: Three-Way Relief Valve



No.	Description
1	Relief Valves
2	Three-Way Valve

Figure 11: Three-Way Valve, Front Seated Position

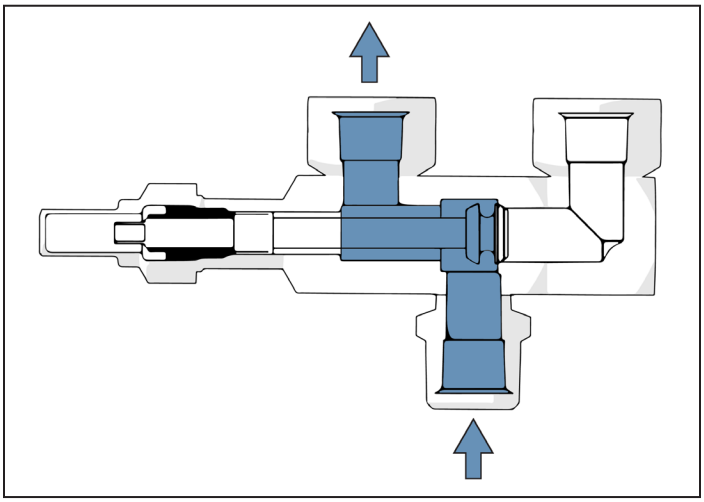
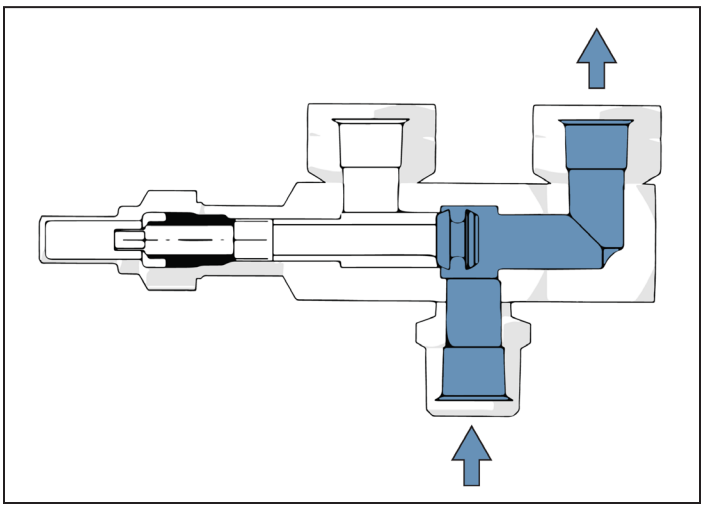


Figure 12: Three-Way Valve, Back Seated Position

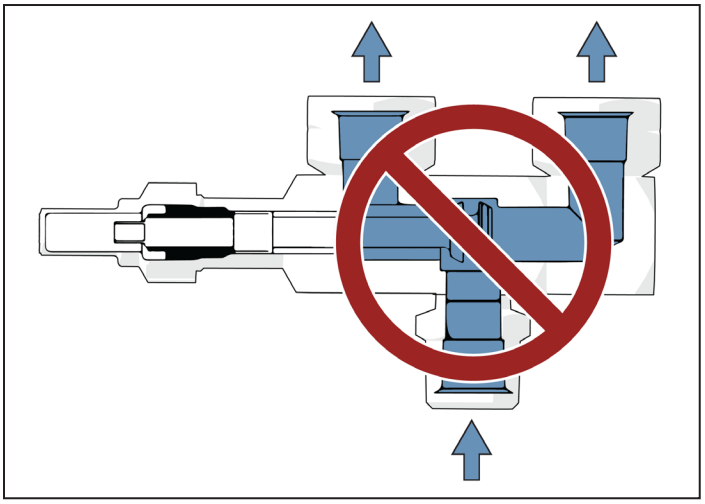


When the valve stem is not turned forward or turned back completely, the valve is in “Mid Position,” as shown in Figure 13.

⚠ CAUTION

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

Figure 13: Three-Way Valve, Mid Position



Sizing Vent Piping (ASHRAE Method)

Relief valve pipe sizing is based on the discharge capacity for the given evaporator or condenser and the length of piping to be run. Discharge capacity for vessels is calculated using a complicated equation that accounts for equivalent length of pipe, valve capacity, Moody friction factor, pipe ID, outlet pressure and back pressure. The formula and tables are contained in ASHRAE Standard 15. Using the ASHRAE formula and basing calculations on the 225 psi design yields a conservative pipe size. According to ASHRAE Standard 15, the pipe size cannot be less than the relief valve outlet size.

Common Piping

The discharge from more than one relief valve can be run into a common header, the area of which cannot be less than the sum of the areas of the connected pipes. For further details, refer to ASHRAE Standard 15.

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 balancing valve to the evaporator.

Approximate total square footage of insulation surface required for individual packaged chillers is tabulated by evaporator code.

Table 3: Insulation Area Required for WMC Models

WMC Model	Evaporator Code	Insulation Area sq. ft. (m2)
045D	E2609	92 (8.5)
045D	E2612	122 (11.3)

Electrical

Field Wiring

The standard power wiring connection to Magnitude chillers is single point to a common disconnect switch, which is then factory-wired to individual disconnect switches for each compressor. 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.

The field power wiring required varies depending on unit model. See Figure 14, for wiring information. These wiring diagrams are also provided with the chiller. Factory-mounted and wired line reactors are standard, but not included when the optional combo harmonic filters are included.

NOTICE

Wiring, fuse and wire size must be in accordance with the National Electric Code (NEC). The supply voltage to these units must be within minimum and maximum range per the following table. Also, the voltage unbalance between phases must not exceed 2%.

WMC Nameplate Voltage	Minimum Voltage to Unit	Maximum Voltage to Unit
380	360 (5%)	440 (15%)
460	414 (10%)	506 (10%)
575	518 (10%)	632 (10%)

⚠ CAUTION

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

Chiller Control Power

For proper operation on standby power, the chiller control power must remain as factory-wired from a unit-mounted transformer. Do not supply chiller control power from an external power source because the chiller may not sense a loss of power and may fail to perform a normal shutdown sequence.

Use with On-Site Generators

Magnitude Model WMC chillers have their total tonnage divided between the number of compressors on the chiller. The compressor(s) are operated with variable frequency drives and if the unit has two compressors, the compressors start sequentially. 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 compressor's locked-rotor characteristics when the chillers start up. Use the electrical data supplied with the performance output sheet, obtained from the Daikin Applied sales office, for generator sizing purposes. The chiller data sheet will show the RLA, which is for each compressor. Refer to Electrical Data to determine the LRA, which is based on the RLA. It is important to size the generator to handle the LRA at startup.

⚠ WARNING

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

Transfer Back to Grid Power

Proper transfer from stand-by generator power back to grid power is essential to avoid compressor damage.

⚠ WARNING

Stop the chiller before transferring supply power from the generator back to the utility power grid. Transferring power while the chiller is running can cause severe compressor damage.

The necessary procedure for reconnecting power from the generator back to the utility grid is as follows:

1. Set the generator to always run five minutes longer than the unit start-to-start timer, which can be set from two to sixty minutes. The actual setting for the start-to-start timer can be viewed on the HMI on the TIMERS Setpoint Screen.
2. Configure the transfer switch provided with the generator to automatically shut down the chiller before transfer is made. The automatic shut-off function can be accomplished through a BAS interface or with the "remote on/off" wiring connection shown in "Figure 16: WMC-E Power Box Schematic" on page 18.

It is not necessary to shutdown the chiller if pumps are not directly controlled by the chiller. Doing so, however, provides a more coordinated restart. Please note an unsynchronized transfer switch may result in an alarm shutdown of the chiller.

A start signal can be given anytime after the stop signal since the start-to-start timer will be in effect.

Building Automation Systems

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

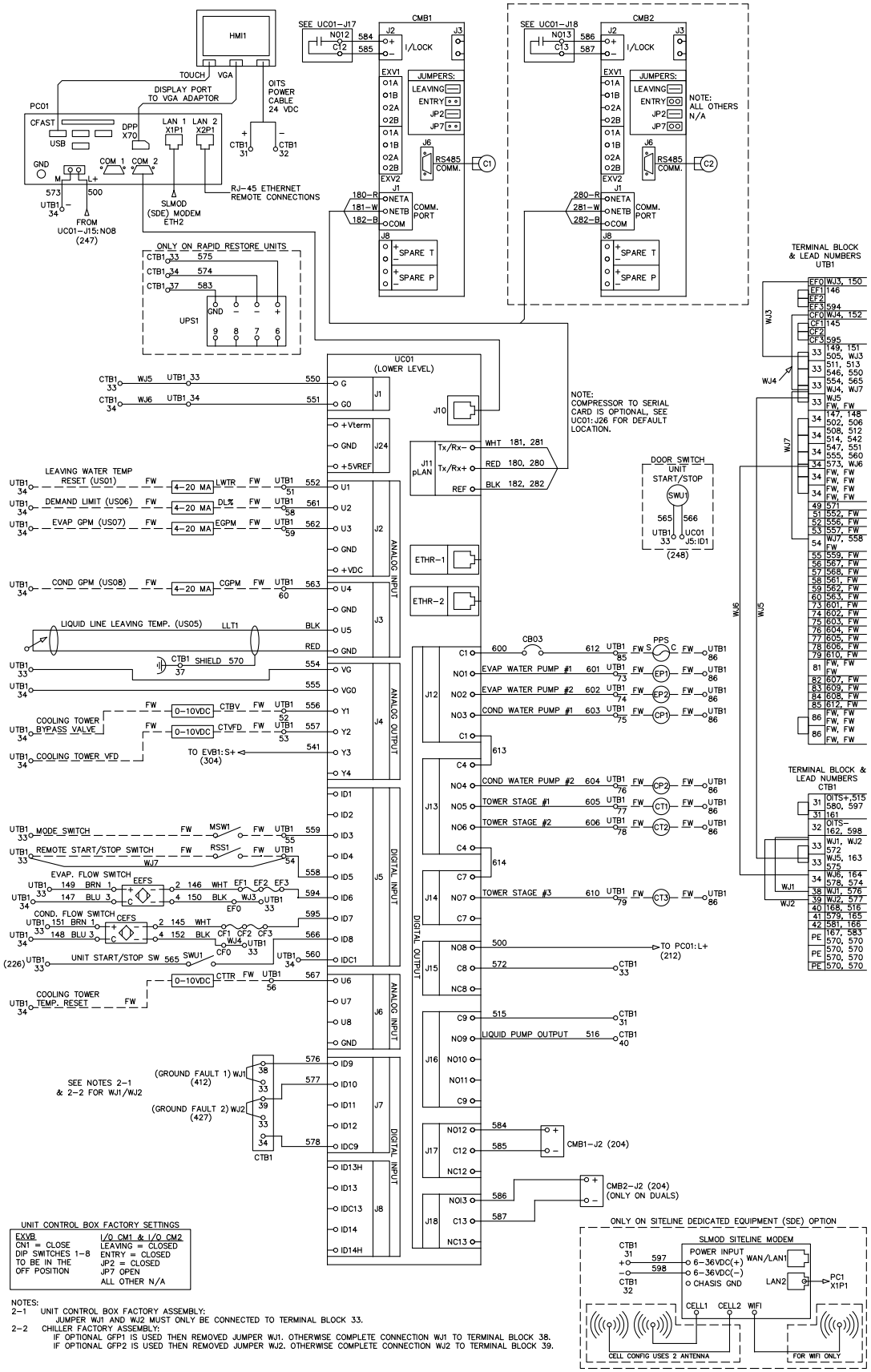
The following protocol options are available:

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

The BAS communication module can be factory-mounted with the chiller or can be field-mounted at any time after the 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.

Figure 14: WMC-E Control Box Schematic



UNIT CONTROL BOX FACTORY SETTINGS

EXVB	I/O CM1 & I/O CM2
CN1 = CLOSE	LEAVING = CLOSED
DIP SWITCHES 1-8	ENTRY = CLOSED
TO BE IN THE	JP2 = CLOSED
OFF POSITION	JP7 OPEN
	ALL OTHER N/A

NOTES:
2-1 UNIT CONTROL BOX FACTORY ASSEMBLY:
JUMPER WJ1 AND WJ2 MUST ONLY BE CONNECTED TO TERMINAL BLOCK 33.
2-2 CHILLER FACTORY ASSEMBLY:
IF OPTIONAL GFP1 IS USED THEN REMOVED JUMPER WJ1. OTHERWISE COMPLETE CONNECTION WJ1 TO TERMINAL BLOCK 38.
IF OPTIONAL GFP2 IS USED THEN REMOVED JUMPER WJ2. OTHERWISE COMPLETE CONNECTION WJ2 TO TERMINAL BLOCK 39.

Figure 15: WMC-E Control Box Schematic (Continued)

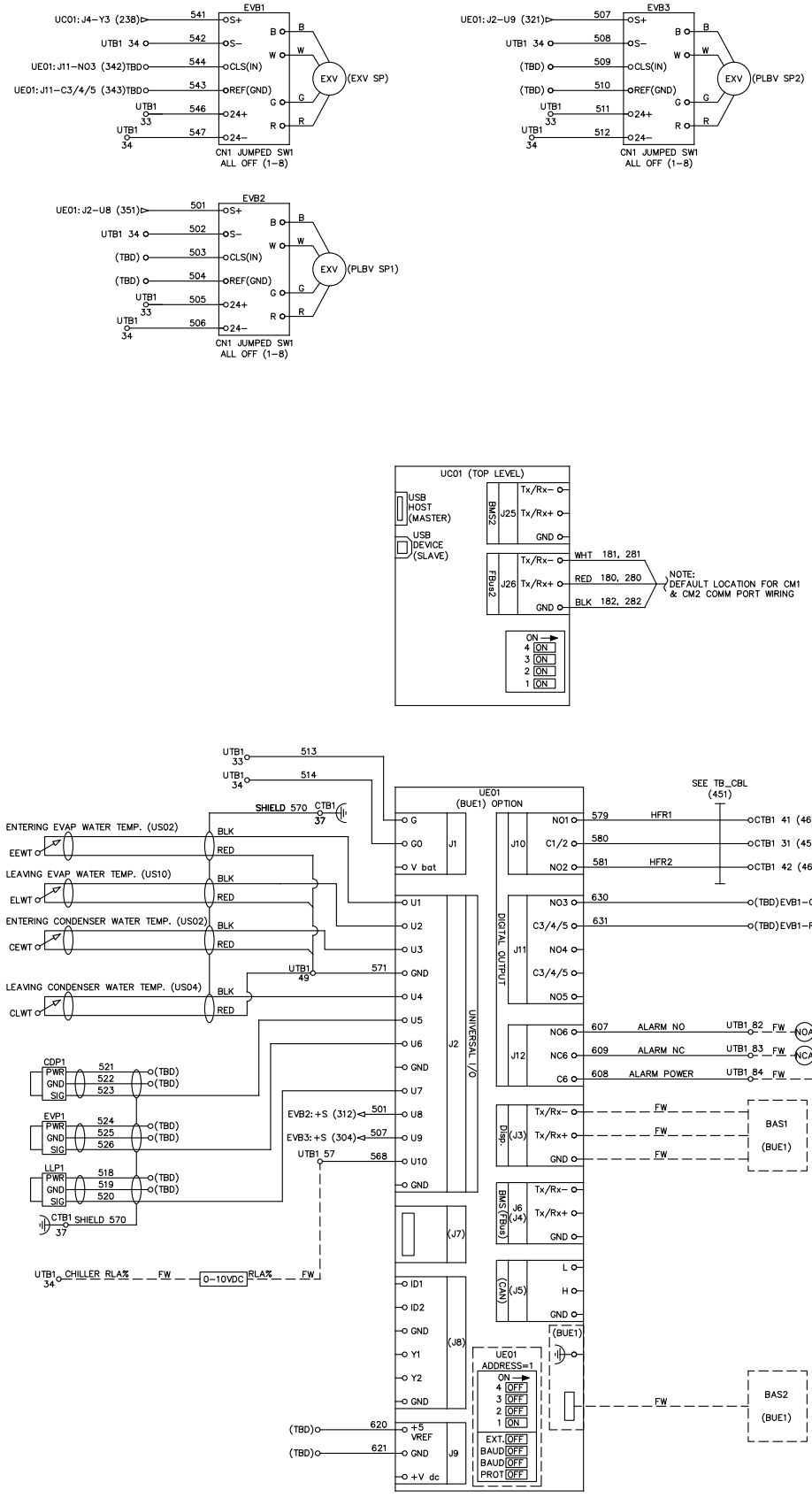
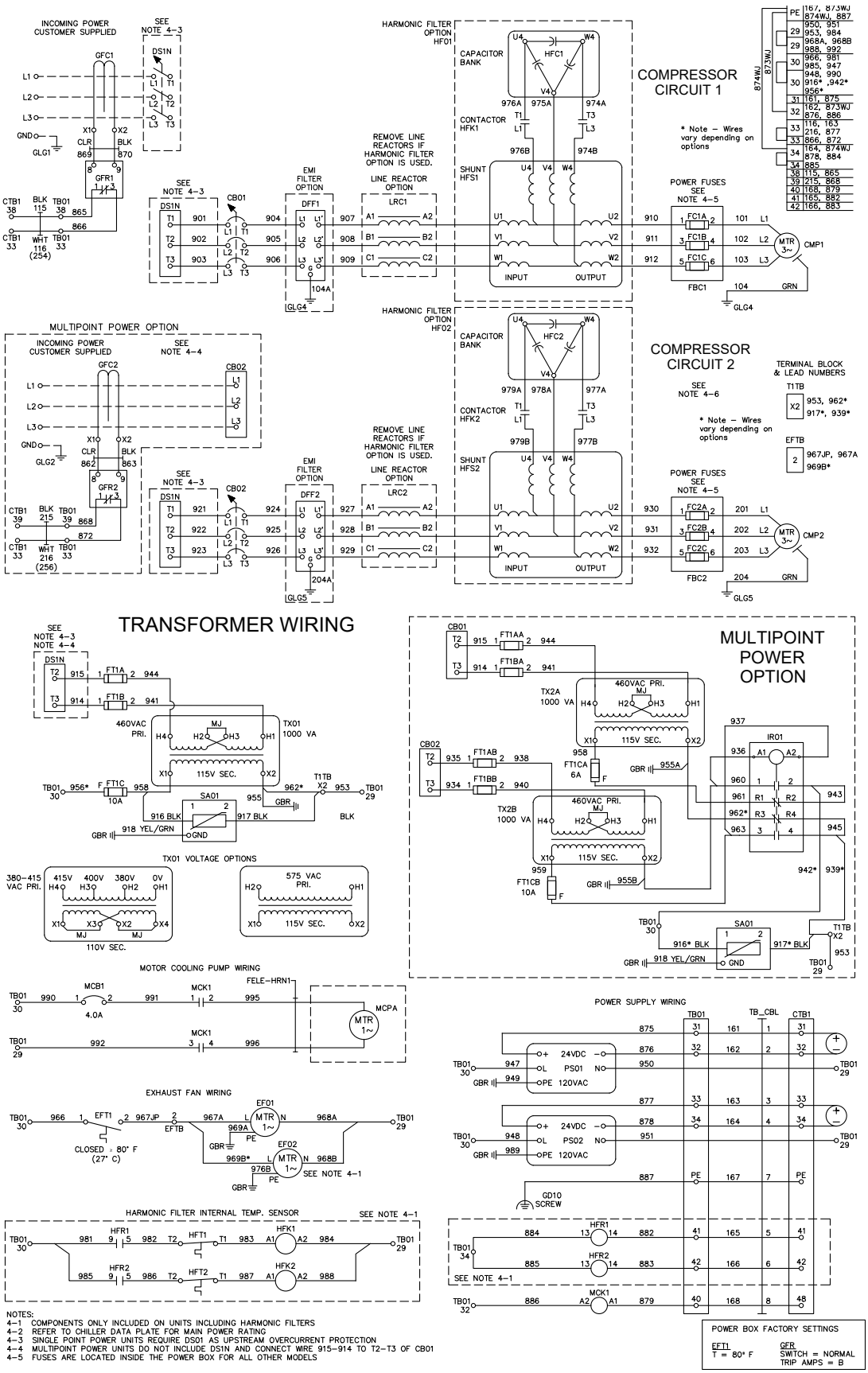


Figure 16: WMC-E Power Box Schematic



Physical Data

Unit Dimensions

NOTICE

Drawings, dimensional values, and other information may change depending on options or configurations selected. Refer to the as-built submittal drawings provided by a Daikin Applied sales representa-tive for configuration-specific details.

Figure 17: WMC Dual Compressor Unit (2-pass, right-hand configuration, with grooved connections)

WMC 045D
09/12

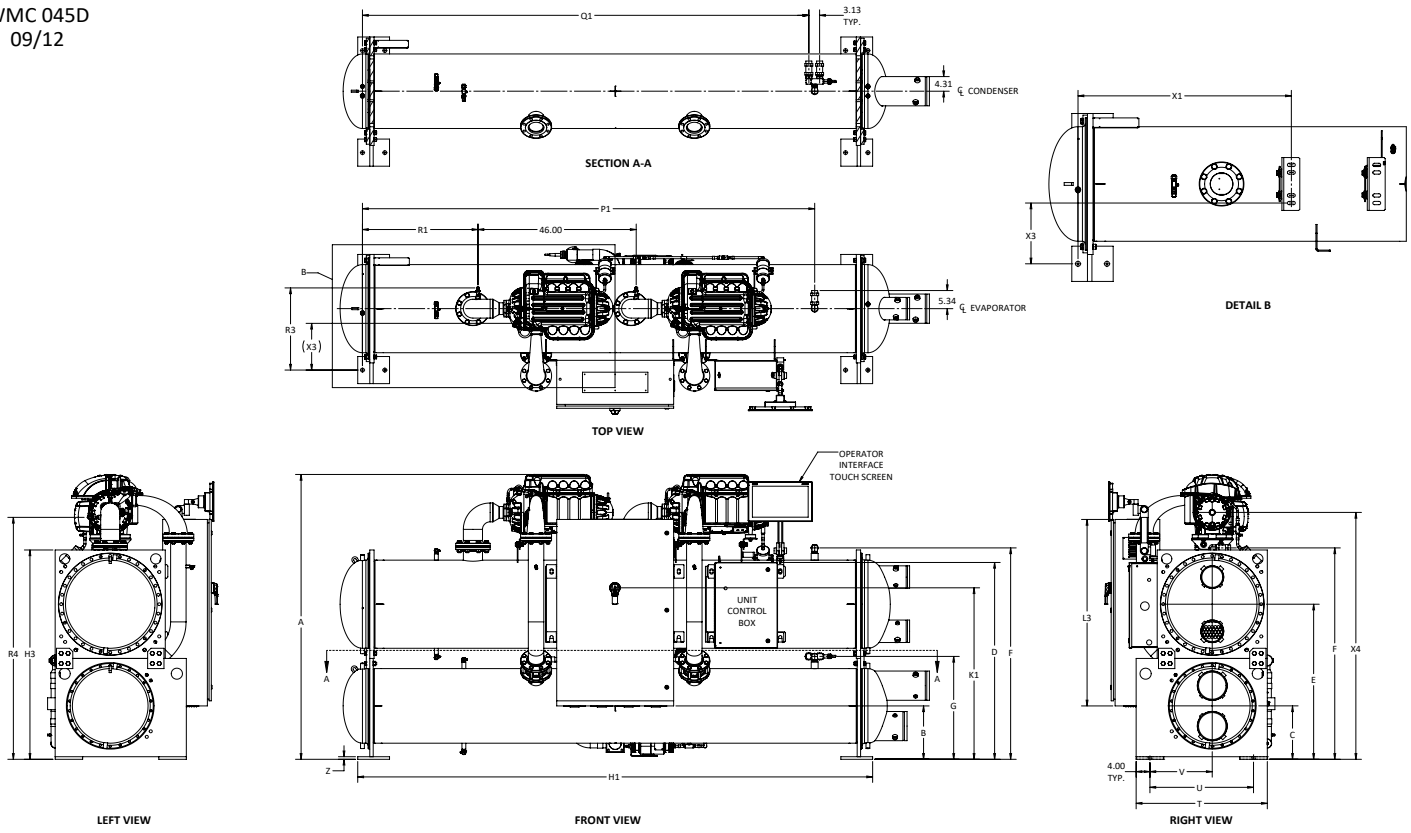


Table 4: WMC Dual Dimensions

Model	Heat Exchanger	Length in (mm)	Width * in (mm)	Height in (mm)
WMC045D09	**E2609/C2209**	114.8 (2916)	47.2 (1199)	84.02 (2134)
WMC045D12	**E2612/C2212**	149.7 (3802)	47.2 (1199)	84.02 (2134)

* Width is based on unit without optional harmonic filters.

** Denotes unit with economizer

NOTE: See as-built submittal drawings for additional dimensional data and weight information

Retrofit Knockdown

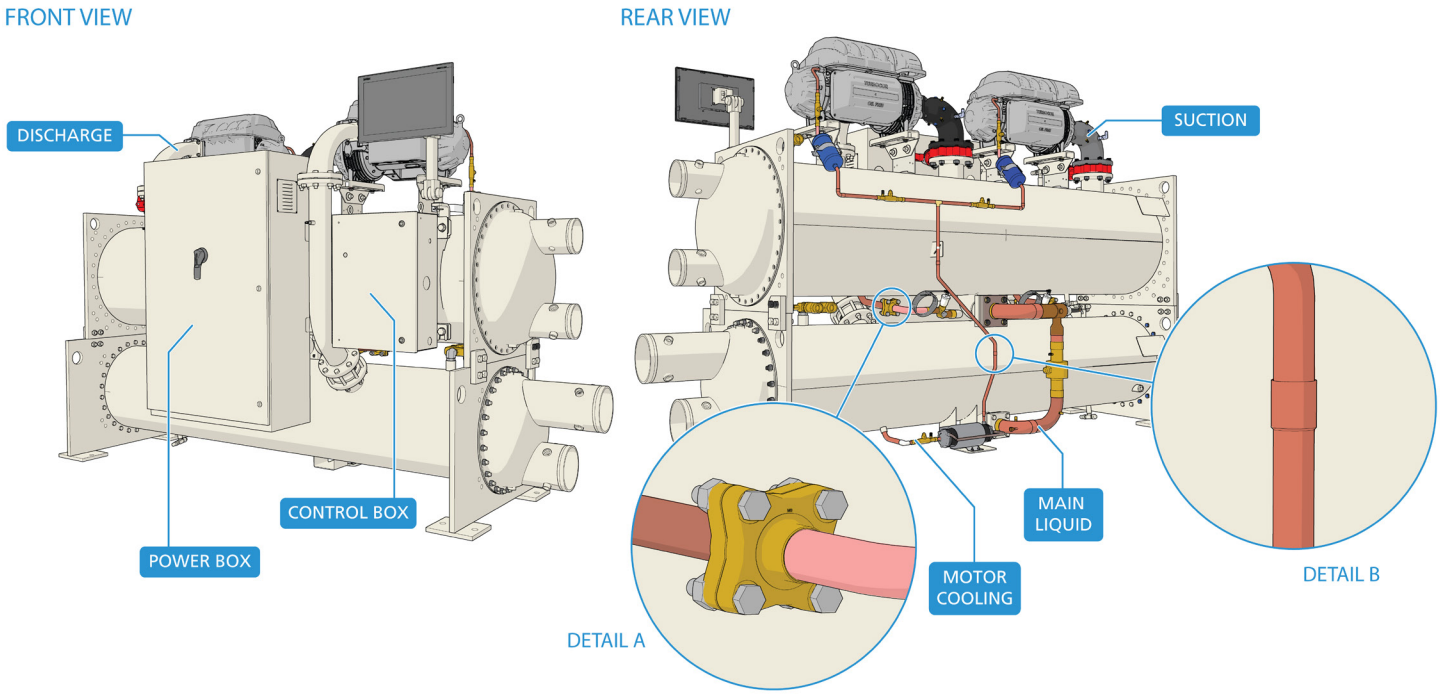
It is estimated that fifty percent of retrofit applications require partial or complete disassembly of the chiller. Magnitude WMC chillers are relatively easy to disassemble due to the small compressor size, simplified refrigerant piping, and the absence of a lubrication system with its attendant components and piping. Two knockdown arrangements, Type A shown in Figure 18 and Type B shown in Figure 19, are available as options.

NOTICE
The knockdown figures are for reference only. Drawings, dimensional values, and other information may change depending on options or configurations selected. Refer to the as-built submittal drawings provided by a Daikin Applied sales representative for configuration-specific details.

Type A Knockdown (Bolt-Together Construction)

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

Figure 18: Type A Knockdown



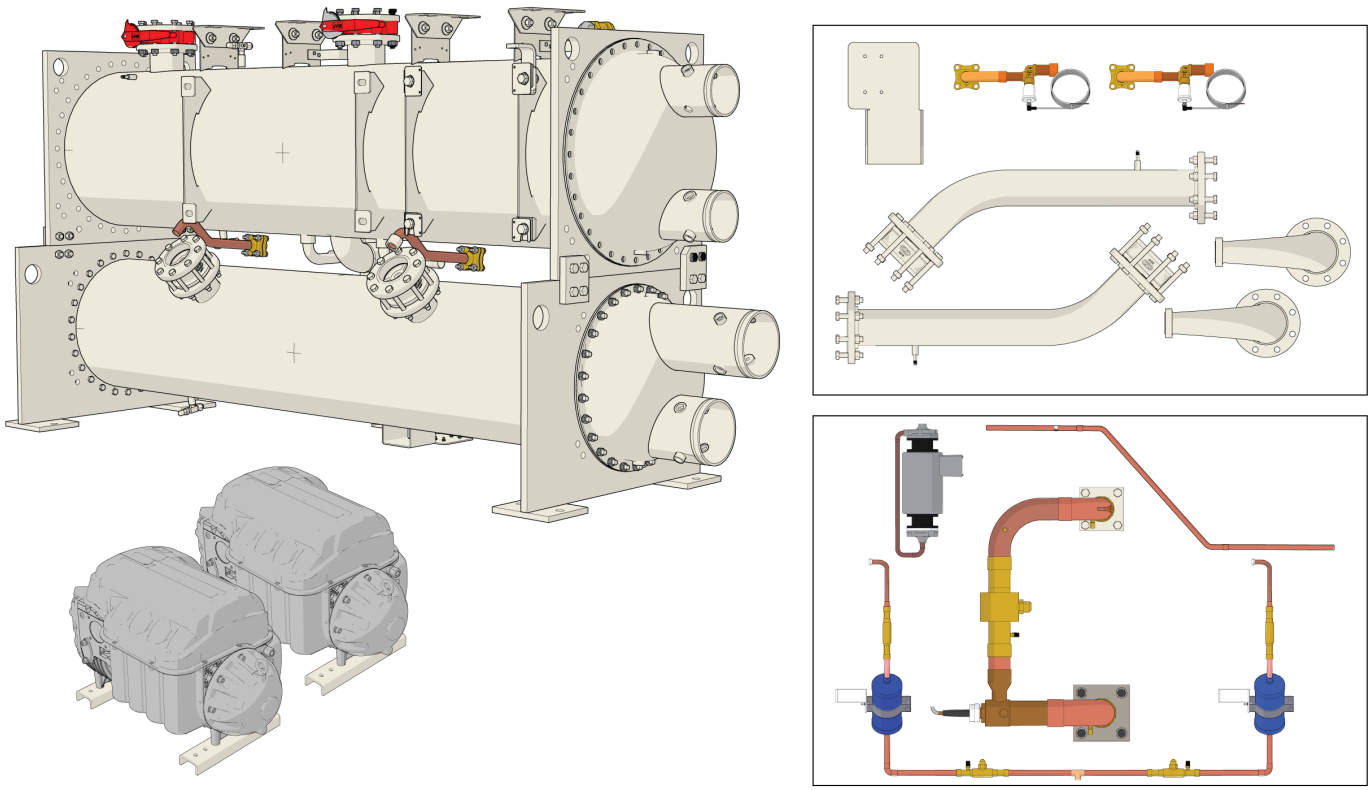
Type A Scope:

- Chiller components are manufactured with bolt-together construction designed for field disassembly and reassembly on-site.
- Unit ships completely assembled to the jobsite.
- Suction and discharge lines have bolt-on flanges.
- Motor cooling line is brazed at mechanical connections (see Detail B in Figure 18).
- Unit ships with vessel and/or head insulation, **if ordered.**
- Unit ships with full factory refrigerant charge in the chiller.
- Unit ships with replacement refrigerant gaskets and O-rings, stick-on wire ties, and touch-up paint.
- Unit is fully tested at the factory prior to shipment.
- Site disassembly and reassembly must be supervised or completed by Daikin Applied service personnel.
- Blockoff plates are required to cover any refrigerant connection left open for extended periods of time. Contact Daikin Applied service to obtain these parts.
- Ideal for retrofit applications where site disassembly is needed due to installation clearances.

Type B Knockdown (Partial Disassembly)

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

Figure 19: Type B Knockdown



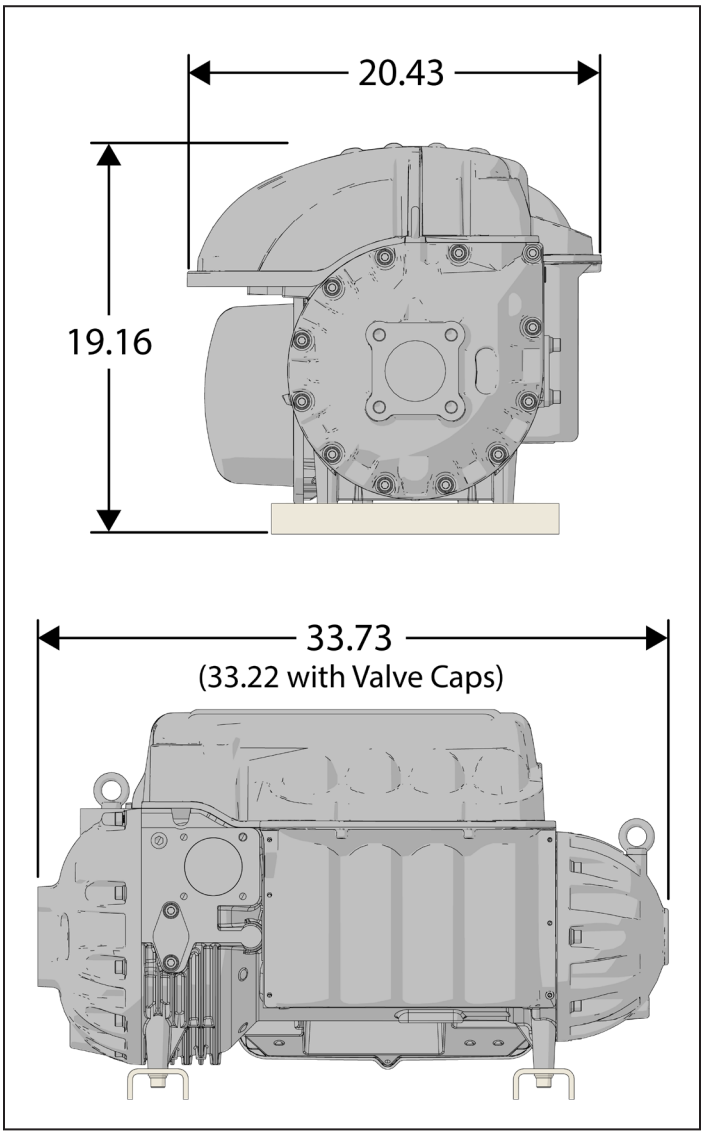
Type B Scope:

- Compressor(s), power box, control box and optional economizer **are removed** (at the factory) and shipped on separate skids; vessel stack is shipped as a complete sub-assembly.
- All associated piping and wiring remain attached, if possible.
- Suction and discharge lines have bolt-on flanges and, if possible, remain attached.
- All free piping ends are capped.
- Unit ships with vessel and/or head insulation, **if ordered**.
- Refrigerant will **not** be shipped with the chiller and must be procured by others.
- Compressor(s) and vessels receive an inert gas holding charge.
- Unit ships with replacement refrigerant gaskets and O-rings, stick-on wire ties, and touch-up paint.
- Unit is fully tested at the factory prior to shipment.
- 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.
- Ideal for retrofit applications where it is desired that the compressor(s), power box, and control box be removed at the factory, prior to shipment, and where refrigerant may be secured by others.

Compressor Dimensions

The compressor dimensions on all WMC models are the same. The dimensions are shown in Figure 20

Figure 20: Compressor Dimensions for all WMC Models



NOTICE

Compressor mounting bolts are removable.

Component	Dry Weight*	
	LBS	KG
E2609 Evaporator	3210	1454
C2209 Condenser	2511	1137
E2612 Evaporator	3880	1758
C2212 Condenser	3031	1373

* Component weights based on unit with standard tube configuration

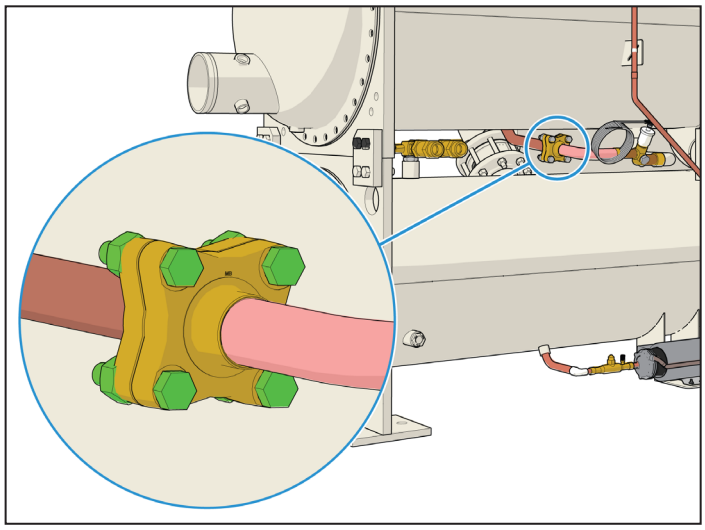
Removal and Re-Attachment Instructions

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

Compressor Removal Preparation

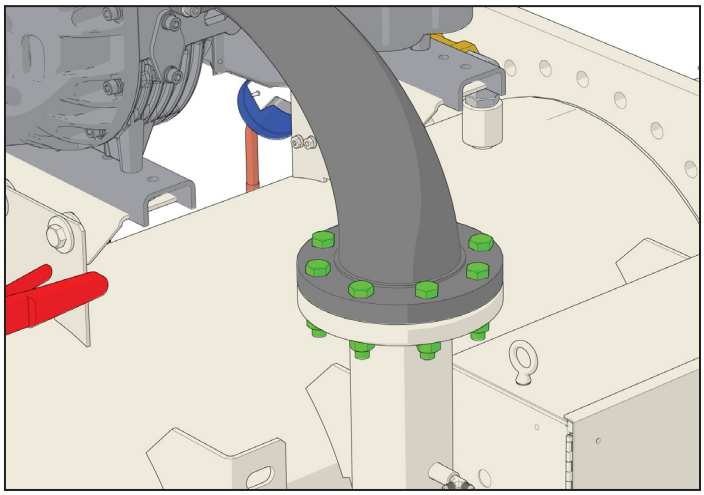
1. Ensure that the charge has been removed from the unit.
2. Close shut-off (ball valve at main liquid line of condenser).
3. Close all other related shut-off valves.
4. Loosen and remove bolts at hot gas bypass flange.

Figure 21: Hot Gas Bypass Flange Bolts



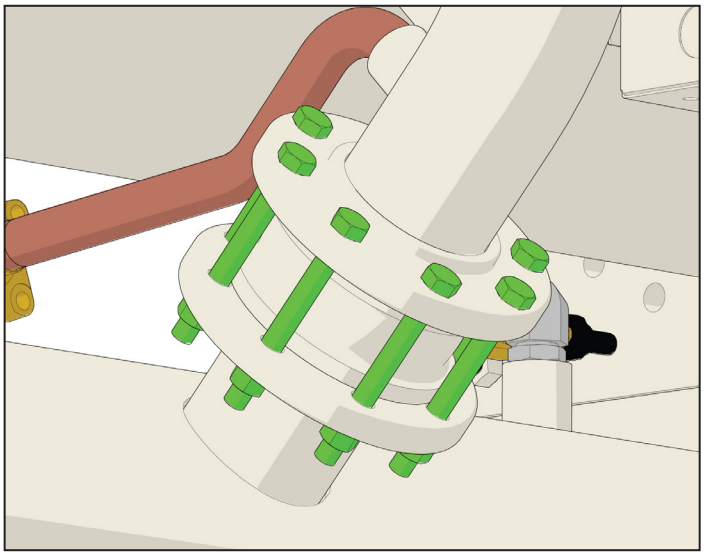
5. Loosen and remove bolts on the top side of the compressor discharge nozzle.

Figure 22: Compressor Discharge Nozzle Bolts



6. Loosen and removed bolts at flange on condenser and remove discharge piping.

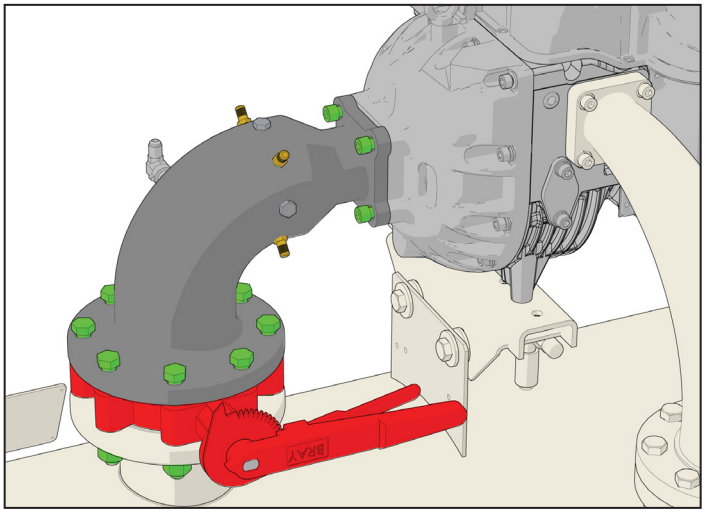
Figure 23: Condenser Flange Bolts



Compressor Removal

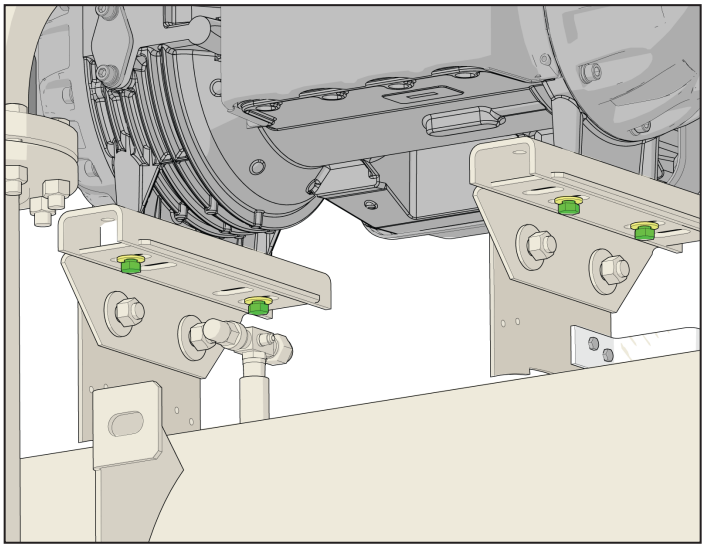
1. Loosen and remove screws and bolts securing either side of the cast suction elbow.

Figure 24: Cast Suction Elbow Screws



2. Remove rotor cooling return line on the underside of the compressor motor housing along with both rotor cooling supply lines.
3. The following wires coming from the vfd will need to be removed:
   - Power leads on the top of the motor housing.
   - Ground wire.
4. The compressor i/o cable coming from the unit control box will need to be removed.
5. Remove the wireway box assembly from the compressor to the back of the starter.
6. Loosen the four (4) bolts from the compressor's bottom mounting feet.

Figure 25: Compressor Mounting Feet Bolts



NOTICE

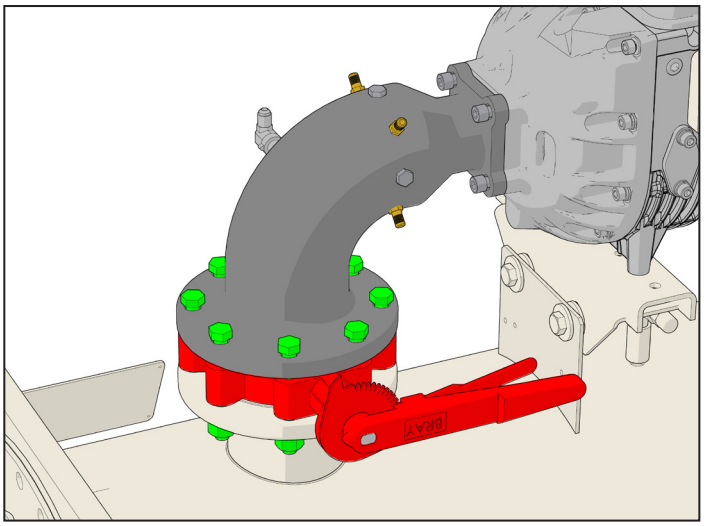
Do not loosen or remove bolts securing the compressor brackets as height is preset from the factory.

7. Mount two (2) lifting eyes with spreader bar to the front tapped lifting hole on the comp motor housing. Note: compressor weight = 500 lbs.

Compressor Re-Attachment

1. Set the suction elbow back on top of the evaporator and install the screws loosely at the evap flange (be sure to install the new o-ring that was shipped with the unit).

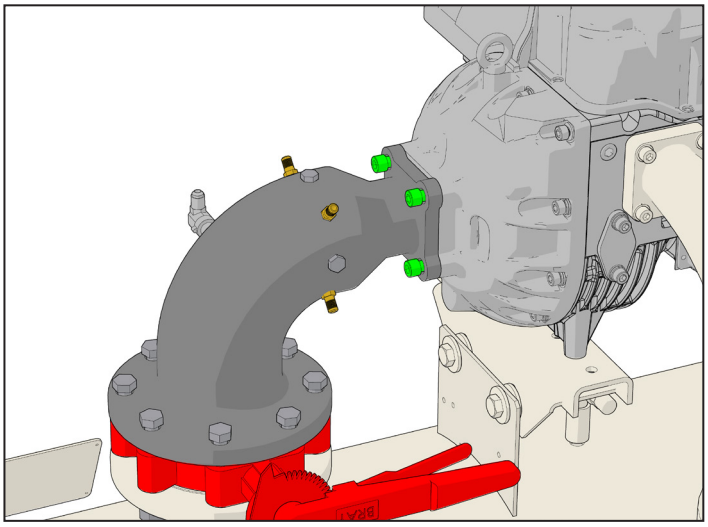
Figure 26: Suction Elbow to Evaporator Flange



2. Set the discharge piping back on top of the condenser and install the bolts loosely at the condenser flange (be sure to install the new gasket that was shipped with the unit).

3. Set compressor on mounting brackets and install the four (4) mounting bolts loosely (During this step you will need to install the new o-rings at discharge nozzle & the suction elbow).
4. Install four (4) screws at elbow to compressor and torque to 55 ft-lbs. Max. (do not over tighten).

Figure 27: Suction Elbow to Compressor



5. Torque sixteen (16) screws at evap flange to 70-75 ft-lbs. Max (do not over tighten).
6. Install & torque the eight (8) bolts at the discharge nozzle to 110-120 ft-lbs then torque the eight (8) bolts to 110-120 ft-lb at the condenser flange to the same.
7. Torque the four (4) compressor mounting bolts to 25 ft-lbs (do not over tighten).
8. Re-install the four (4) flange bolts at the hot gas bypass line.
9. Re-install the wireway between the compressor and vfd.
10. Re-attach all associated power wiring & ethernet cable.
11. Open all valves.
12. Perform refrigerant leak check to ensure all connections and fittings are securely fastened.
13. Perform refrigerant leak check with trace gas and nitrogen to ensure all connections and fittings are securely fastened, then pull vacuum at 300 microns (Not to allow rise of 300 microns within 1 hour).

Knockdown Disassembly and Reassembly Instructions

Type A

Type A units are designed for a wide range of disassembly and the degree of knockdown varies. Observe the following recommendations:

1. The chiller is shipped with the full refrigerant charge, which must be recovered before breaking any refrigerant connection. Before attempting any disassembly, assume the condenser isolation valves may have leaked and that any component of the chiller may be pressurized with refrigerant. Use the proper precautions with this caveat in mind.
2. Check that power has been removed from the unit. Before disconnecting any wire, it is prudent to label its function and connection point to facilitate reconnection.
3. The refrigerant charge must be removed from the unit if the vessels are to be separated.
4. Some insulation repair and touch-up painting may be required.
5. See Type B instructions for reassembly of components.

Type B

Disassembly

Type B Knockdown units are shipped disassembled except for the vessel stack and are shipped less refrigerant. 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. The vessels and compressors have an inert gas holding charge that must be released prior to attempting to open any connection.

Reassembly

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

1. Reassemble the vessel stack, if disassembled, and reconnect any wiring and tubing.
2. Mount the compressor(s) on the stack. Be careful to avoid damaging lines already mounted on the unit. Mounting bolts, washers and nuts are shipped loose. Leave the mounting bolts loose until the suction and discharge lines are installed and aligned.

   During assembly, bolts holding block off plates (suction connection, for example), are used for reassembly of the component. See Figure 19 on page 21 for the location of the blockoffs.

3. Do not remove blockoffs until ready to install piping. The compressor and vessels have a Schrader valve on their block off plates to be used for relieving the inert gas holding charge.

⚠ 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 personal injury.

4. Install the suction and discharge piping. The piping is shipped in a crate, as shown in Figure 19 on page 21. Assemble as shown in Figure 18 on page 20. Tighten bolts after the entire line has been installed and aligned. Insulate the suction line with the insulation and glue provided.
5. Install the liquid line and motor cooling lines. These lines are shipped in a crate, as shown in Figure 19 on page 21. Assemble as shown in Figure 18 on page 20.
6. Install control panel and compressor power panels by bolting to the horizontal support members.
7. If the unit has single-point power, connect the power leads from the terminal box under the control panel to each power panel line side connection.
8. If unit is equipped with an economizer, connect piping to compressor interstage point and flanges located on the evaporator and condenser.
9. Connect any loose wiring.
10. Pressure (leak) test, evacuate, and charge with field supplied R-515B using standard refrigeration practice.

Operation

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 throughout the year at the Daikin Learning Institute in Verona, Virginia. The school curriculum includes instruction on basic refrigeration, MicroTech controllers and troubleshooting, enhancing chiller efficiency and reliability, 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 manual for contact information.

Sequence of Operation

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

Dual Compressor Units

The following sequence of operation applies to Magnitude Model WMC 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, auto lead-lag logic will determine which compressor to start as the Lead.

3. **Compressor shaft levitation and start**

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

4. **Condenser pump start**

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

5. **Lead compressor operation**

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

6. **Lag compressor start**

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

7. **Dual compressor loading**

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

8. **Dual compressor unloading**

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

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

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

10. **Chiller shutdown**

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

Unit Enabling/Disabling and Overrides

There are multiple options that will override normal operation of the chiller and its compressors:

1. External Manual Button - Located on the outside front of the control panel. Button needs to be engaged for unit to run. When disengaged, unit will perform rapid stop. For a controlled shutdown sequence, use the HMI Enable Button, BAS command, or Remote Enable signal. This button is the only method to override other “Control Sources.”
2. Remote Switch - Optional. Replaces a jumper between Field Terminals 54 and 70 (see “Figure 14: WMC-E Control Box Schematic” on page 16).

The switches listed above work in conjunction with the “Control Source” that is selected in the HMI via the MODES Setpoint Screen (Table 12 on page 38) The three options for “Control Source” are:

1. **HMI Enable Button (Local)** - 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. If the “Control Source” is set to “HMI Enable Button” and a remote switch is being used, the position of the Remote Enable switch will be ignored. In that case, only the Manual Button need to be closed. Once the Manual Button is engaged, press the AUTO button on the HMI to enable the chiller in “User” mode. It will also ignore BAS Network commands.

   To disable the chiller, press the STOP button on the HMI screen.
2. **Switches** - This mode will ignore BAS enable and disable commands and requires a physical switch. To enable the chiller and its compressors, the Manual Button needs to be closed in the ON position. To disable the unit, this switch will initiate a normal controlled sequence and will stop each compressor that is running.
3. **BAS** - This mode allows BAS to enable or disable the chiller over a BAS network. To enable the chiller and its compressors, the Manual Button needs to be closed in the ON position. When a BAS Network command to disable is given, the chiller will shutdown the chiller in a normal controlled sequence and will stop each compressor that is running.

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

Unit Control Logic

Lenient Flow Logic

This option affords the chiller the maximum tolerance to intermittent water flow loss detection, and reduces nuisance chiller trips. Momentary loss of flow detection can be a result of valve changes in the primary loop, as when staging another chiller, or sudden changes in water temperature around the flow sensor. Variable speed pumps operating at minimum flow rates can exacerbate these flow issues.

Enabled, this logic detects a loss of flow signal (>5 sec) in either the condenser or evaporator and sets an internal logic flag. Chiller operation is allowed to continue as long as the vessel pressures and surge detection remain valid. If condenser flow is lost and the pressure rises to within 5 psi of the condenser pressure trip point the chiller will shut down on condenser flow loss alarm. If evaporator flow is lost and the evap pressure drops to the EP-Unload set point the chiller will shut down on evaporator flow loss alarm. If either flow signal is lost and the surge logic is tripped, the chiller will shut down and generate a flow loss alarm for whichever flow was missing.

The default setting for Lenient Flow logic in the WMC code is On. Turning it off converts the flow loss alarms to timer based. Evap flow loss is adjustable from 12s down to 3s (default 12s), and the condenser flow loss is adjustable from 20s to 3s (default 20s).

Compressor Capacity Control

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

Capacity Overrides

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

Low Suction Pressure

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

Demand Limit

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

Network Limit

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

Minimum Amp Limit

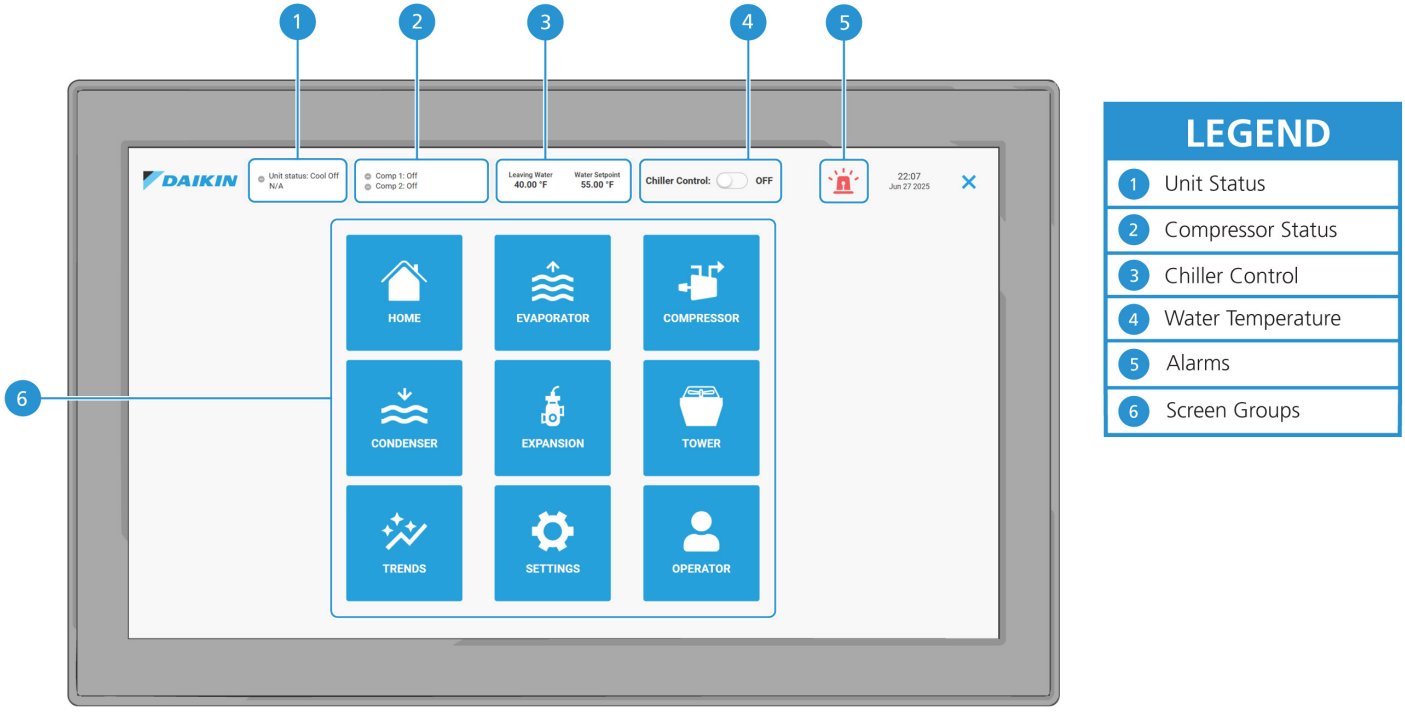
The minimum amp draw of the compressor can be limited by the Minimum Amps setpoint. If the amp draw drops below the limit value, the unit will load capacity to maintain minimum amps.

Maximum Amp Limit

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

Navigation Summary

Figure 28: Navigation Summary Screen



Human Machine Interface (HMI)

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

The HMI will display the Navigation Summary screen at startup. The Navigation Summary screen shows the unit status, compressor status, the Chiller Control toggle switch, and the alarms indicator icon.

From the Navigation Summary screen you can access the other screen groups by selecting the button that corresponds to that screen.

NOTICE

An initial startup step may be to select the Operator icon on the bottom right of the HMI to access the Operator screen to set display language and unit of measure preferences as well 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 button to recalibrate the screen. The Calibrate button is oversized to make it easier for the non-calibrated cursor to select.

Unit Status

The Unit Status is defined by Mode followed by State. If the unit is stopped, the Source would be listed after State.

Figure 29: **Chiller Control**

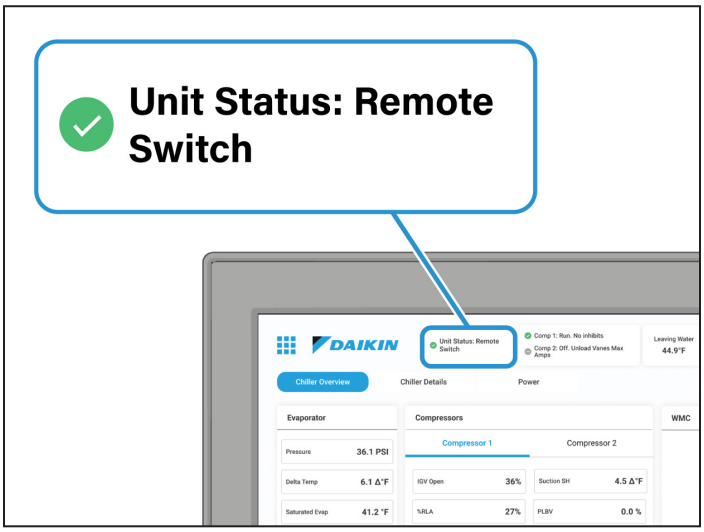


Table 5: UNIT STATUS Possibilities

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

Compressor Status

The Compressor Status is shown for each compressor. The available status possibilities are shown in the table below.

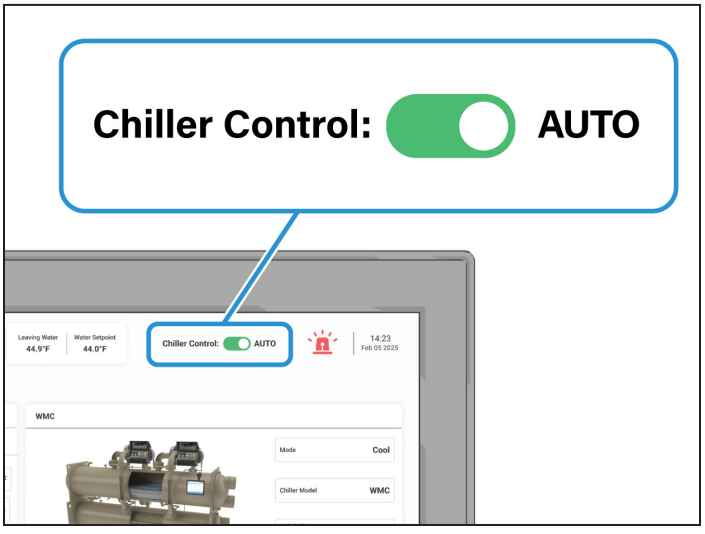
Table 6: Compressor Status Possibilities

Priority Sequence	Complete STATUS Text
1	Off
2	Pre-Start
3	Starting
4	Running
5	Run IGV
6	Run Speed
7	Run Hold
8	Lead Staging
9	Run IGV/Speed
10	Tandem Staging
11	Power Fail Detection
12	Pre-Shutdown
13	Shutting Down

Chiller Control

The chiller control toggle switch allows you to switch the chiller control from Off to Auto.

Figure 30: **Chiller Control**



Alarm

The ALARM icon will turn red and begin flashing should an alarm occur. This red ALARM button will appear on all screens in case of an alarm. See Figure 31 for an example of an active alarm alert. For more information on alarms, see page 47.

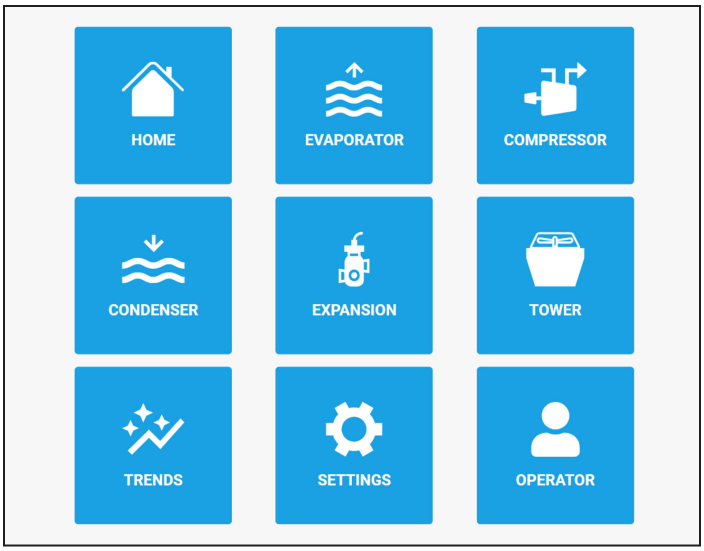
Figure 31: **Active Alarm Icon**

Screen Groups

Selecting one of the available screen groups will take to a screen with additional information about the specific group you selected.

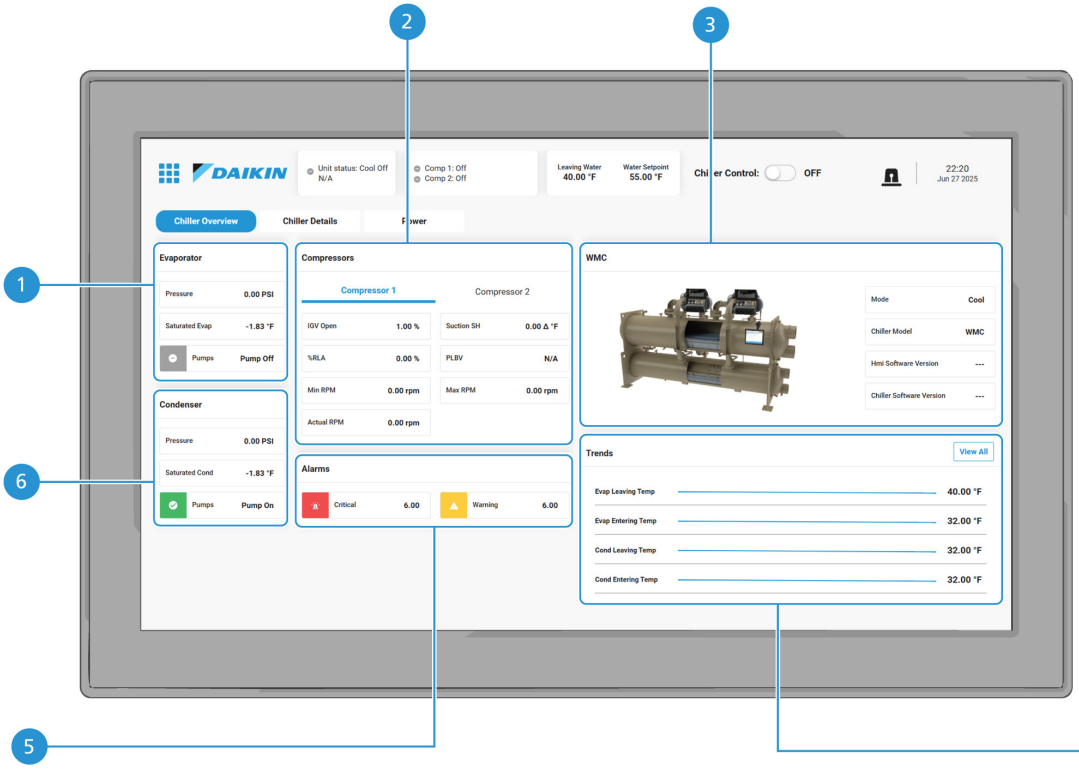
Selecting the HOME button will take you to the Chiller Overview page. For more information see “Chiller Overview” on page 31.

Figure 32: Screen Groups



Chiller Overview

Figure 33: Chiller Overview Screen



LEGEND

1	Evaporator Overview
2	Compressor Overview
3	WMC Unit Overview
4	Trends Overview
5	Alarms Overview
6	Condenser Overview

The Chiller Overview screen shows the basic operating condition of the chiller. From the Chiller Overview screen you can view the following:

Table 7: Chiller Overview Screen

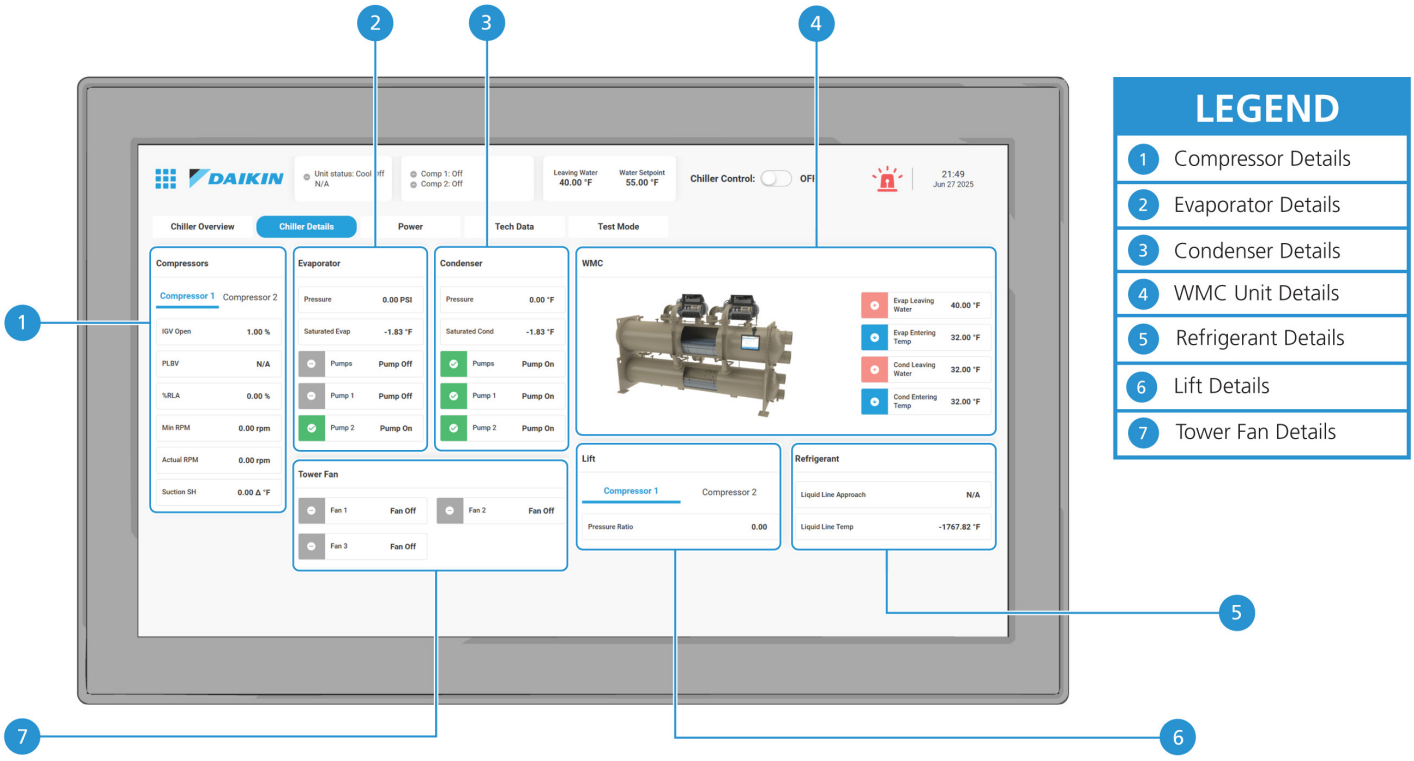
Evaporator
Pressure
Saturated Evap
Pumps
Compressor 1 & 2
IGV Open
%RLA
Min RPM
Max RPM
Actual RPM
Suction SH
Discharge SH
PLBV
Unit
Mode
Chiller Model
HMI Software Version
Chiller Software Version
Trends
Evap Leaving Temp
Evap Entering Temp
Con Leaving Temp
Cond Entering Temp
Alarms
Critical
Warning
Condenser
Pressure
Saturated Cond
Pumps

NOTICE

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.

Chiller Details

Figure 34: Chiller Details Screen



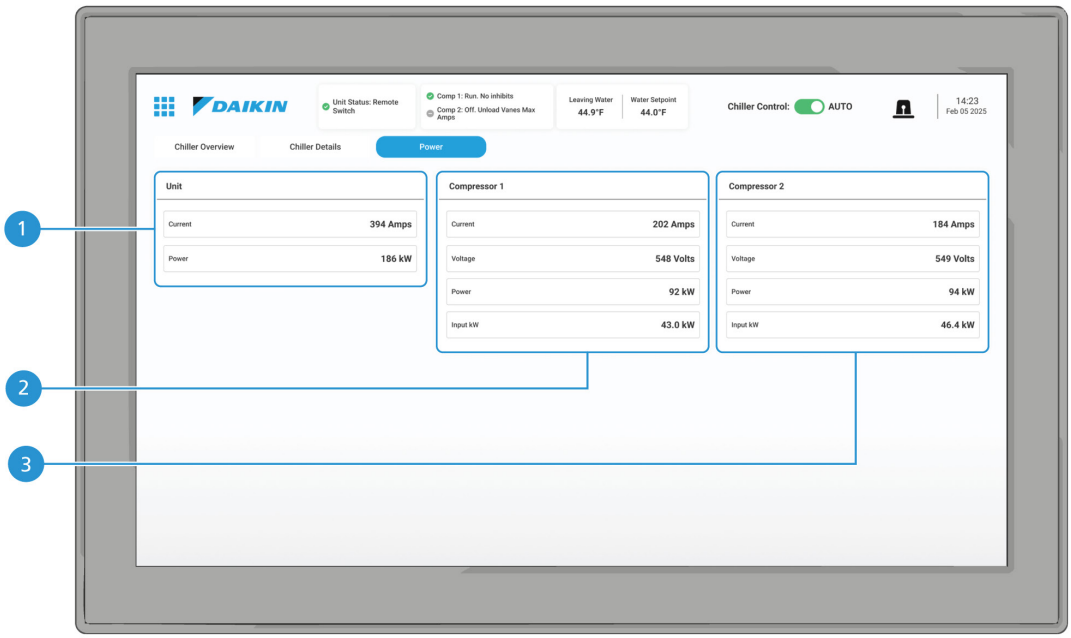
The Chiller Details screen displays information for each of the chiller's main components, as well as the cooling tower, and highlights the relevant information pertaiing to chiller operation.

Table 8: Chiller Detail Screen

Compressors 1 & 2
IGV Open
PLBV
%RLA
Min RPM
Actual RPM
Suction SH
Evaporator
Pressure
Superheat
Saturated Evap
Pumps
Pump 1
Pump 2
Condenser
Pressure
Saturated Cond
Pumps
Pump 1
Pump 2
Unit
Evap Leaving Water
Evap Entering Temp
Cond Leaving Water
Cond Entering Temp
Refrigerant
Liquid Line Approach
Liquid Line Temp
Lift (Compressor 1 & 2)
Pressure Ratio
Tower Fan
Fan 1
Fan 2
Fan 3

Power Screen

Figure 35: Power Screen



LEGEND

1. Unit Power
2. Compressor 1 Power
3. Compressor 2 Power

The Power screen shows power usage information for the chiller. From the Power screen you can view the following:

Table 9: Power Screen

Unit
Current
Power
Compressor 1
Current
Voltage
Power
Input kW
Compressor 2
Current
Voltage
Power
Input kW

Settings Screens

The Settings screen is used to input the many setpoints associated with equipment of this type. MicroTech provides a simple method for accomplishing this. Appropriate setpoints are factory set and checked 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.

A typical setpoint screen is displayed in Figure 36. The various setpoints are grouped together by similar content. The WATER tab, for example, contains various setpoints relating to water temperature setpoints. The possible range of input values for a particular setpoint, as well as the required password level, will appear in the box at the top of the screen. Setpoints that have a technician level password can only be changed by a Daikin Applied technician. Contact a Daikin Applied service representative for more information.

NOTICE

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

NOTICE

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

Figure 36: A Typical Setpoint Screen

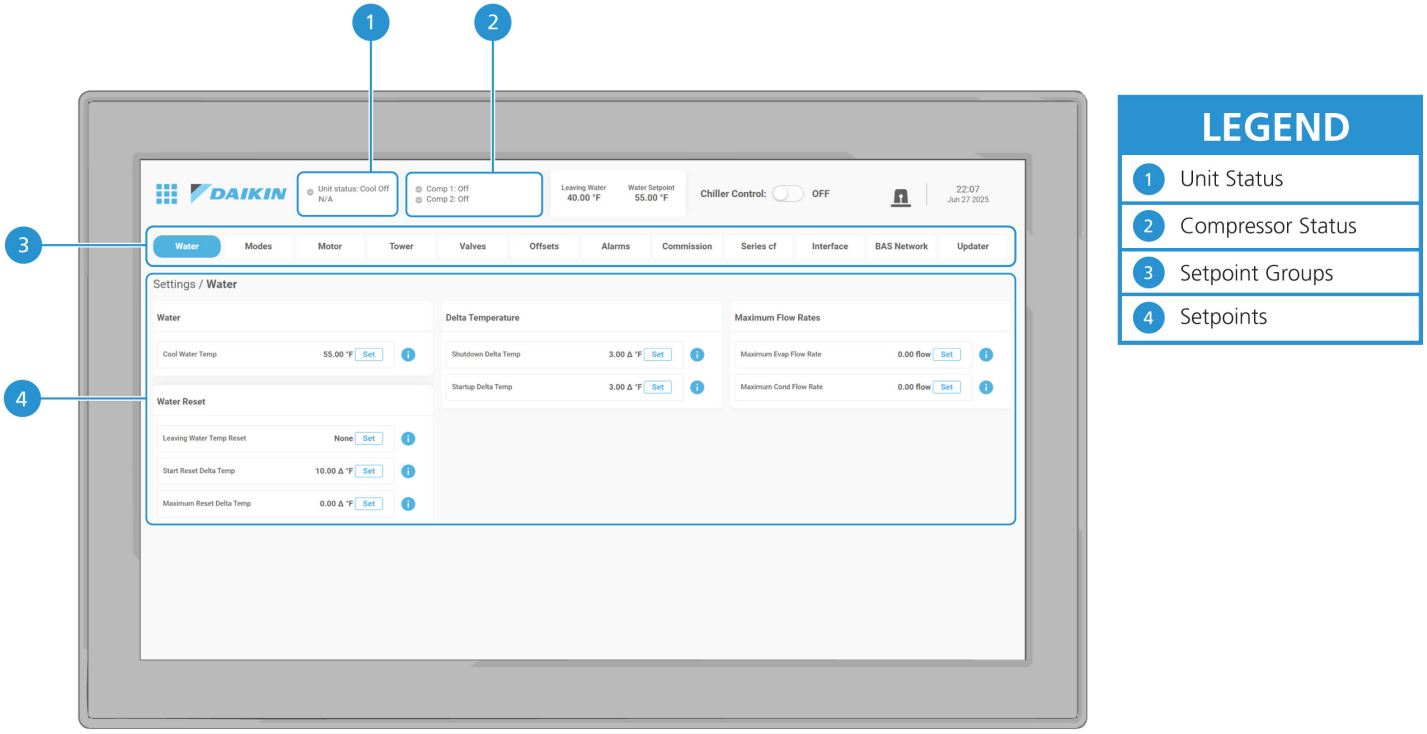


Table 10: Set Point Group Descriptions

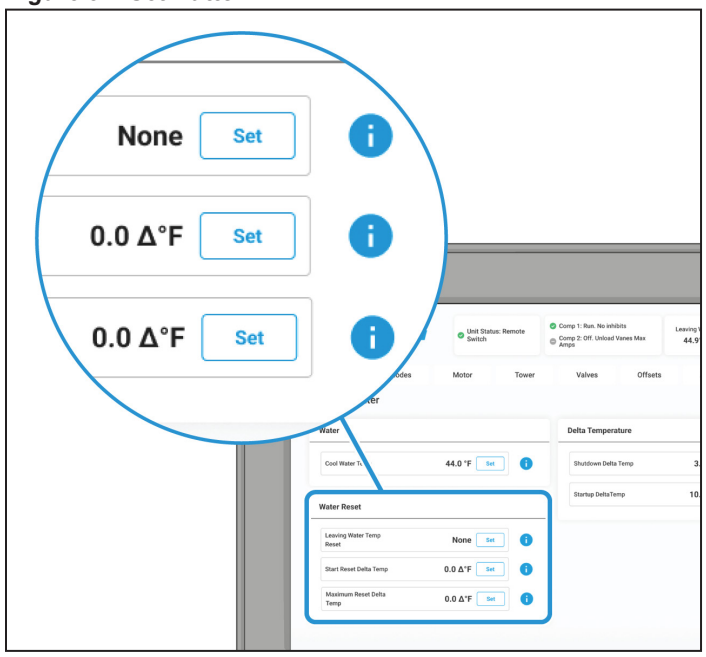
Setpoint Group	Description
Water	Set leaving water temperature setpoint, start and stop delta-T, resets, Templifier settings, etc.
Modes	Select various modes of operation such as control source, multiple compressor staging, pump staging, BAS protocol, etc.
Motor	Select motor related setpoints such as amp limits.
Tower	Select the method of controlling the cooling tower and sets the parameters for fan staging/VFD.
Valves	Set EXV capacity control setpoints, such as EXV gain, EXV evaporator weight, EXV control ratio, etc.
Offsets	Select offsets setpoints for pressure and temperature offsets.
Economizer	Sets available options for economizer if unit is equipped.
Alarms	Select alarms setpoints for pressure, water flow, and freeze protection.
Commission	Set commission setpoints, such as PC sound IP, PC source Port, refrigerant type,IGV maximum position, etc.
Series cf	Set series counterflow setup.
Interface	Set the network protocol and associated options.
BAS Network	Set BAS network settings, such as BAS network protocol, BAS remote enable, baud rate, etc.
Updater	Allow upload of software file updates.

How to Change a Setpoint

To change a setpoint, perform the following steps:

1. Press the applicable Setpoint Group tab.
2. Press the “Set” button located to the right of the setpoint you wish to edit.

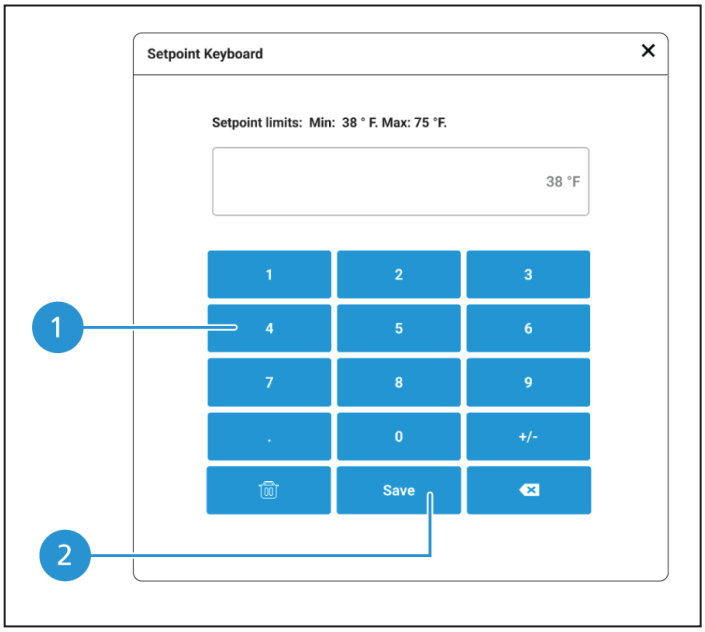
Figure 37: Set Button



3. A password must be entered before changing any setpoint value. A keypad prompt will appear automatically to enter the password. Input the appropriate password number. 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.

   After inputting the password on the Keyboard Screen, press ENTER to return to the Setpoint Screen. The password will remain active for 15 minutes after initiation and does not need to be re-entered during this period.

Figure 38: Keypad Prompt



No.	Description
1	Numeric Keypad
2	Action/Save Button

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 ENTER to enter the value or CANCEL to cancel the change.
   - Press the UP or DOWN button to increase or decrease the value displayed. Press ENTER to enter the value or CANCEL to cancel the transaction.

   Some setpoints are selectable text rather than numeric values. Select the desired option using the dropdown menu that appears for that particular setpoint. The selection can be made by toggling between choices using the UP or DOWN button. If dashed lines appear in the setpoint window it means that toggling in that direction can go no further, so reverse direction. Press ENTER to enter the choice or CANCEL to cancel the change.

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

Figure 39: Settings - Water

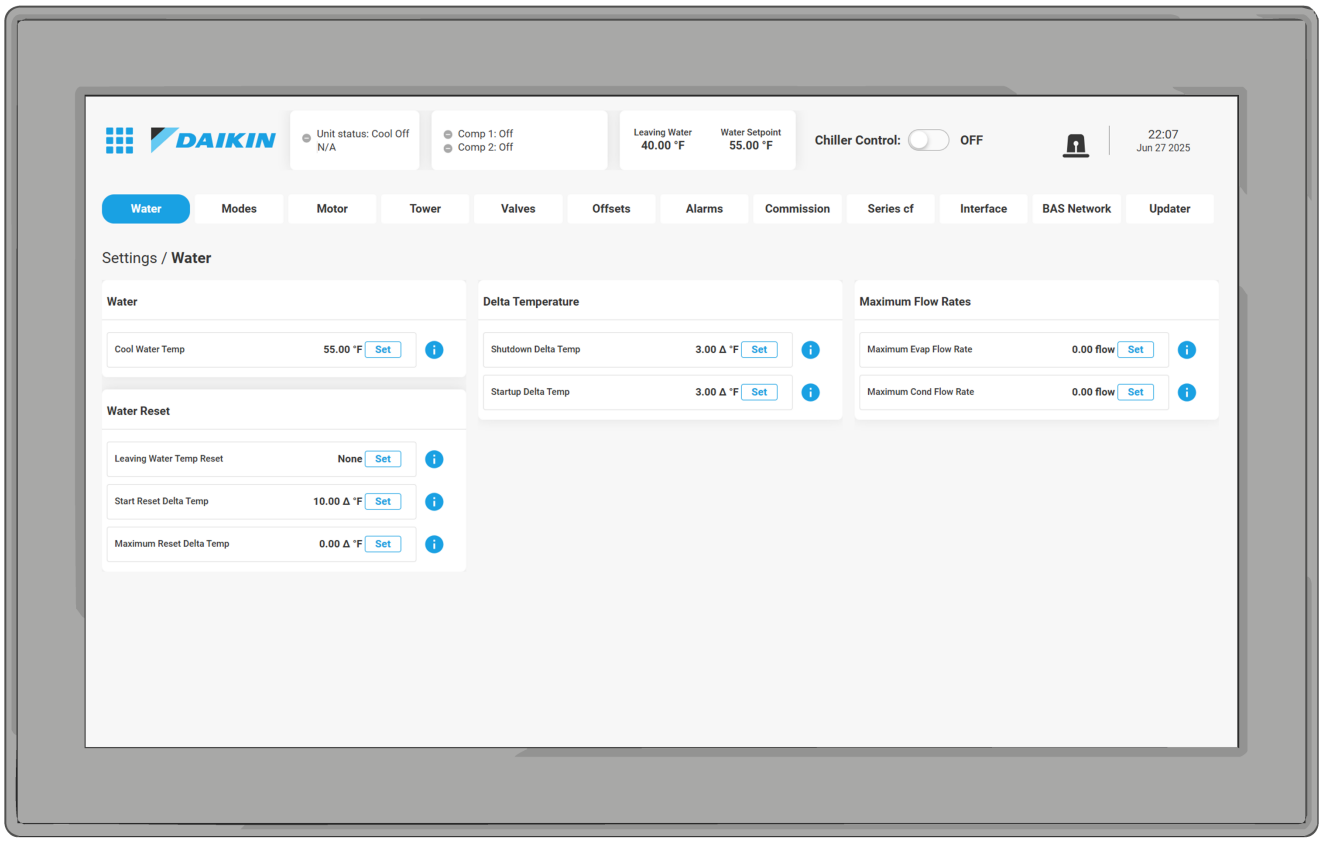


Table 11: Water Setpoint Settings

Description	Default	Range	PW	Comments
Water				
Cool Water Temp	44.0°F	36.0 to 55.0°F	O	Sets control target for evaporator leaving water temperature in COOL mode. 36 °F is lowest setpoint for shutdown.
Water Reset-				
LWT Reset Type	NONE	NONE, RETURN, 4-20 mA	O	Select reset type, NONE for none, RETURN for resetting chilled water based on the entering water, or 4-20 mA for external analog signal.
Start Reset Delta T	10.0°F	0.0 to 20.0 °F	O	Sets the evap delta-T above which Return reset begins.
Maximum Reset Delta T	0.0°F	0.0 to 20.0 °F	O	Set the maximum reset that can occur, in degrees F if LWT reset is selected or max reset at 20 mA input if 4-20 mA is selected in for LWT Reset Type.
Delta Temperature				
Shutdown Delta Temp	3.0°F	0.0 to 6.0 °F	O	Degrees below setpoint for chiller to stop.
Startup Delta Temp	3.0°F	0.0 to 10.0 °F	O	Degrees above setpoint for chiller to start.
Maximum Flow Rates				
Maximum Evap Flow Rate	0.00 Flow	-	O	Sets maximum evaporator flow rate.
Maximum Cond Flow Rate	0.00 Flow	-	O	Sets maximum condenser flow rate.

Leaving Water Temperature (LWT) Reset

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

Reset Type – NONE

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

Reset Type – RETURN (Cool Mode)

The Active Leaving Water variable is adjusted by the return water temperature.

When the chiller mode = COOL, the Active Leaving Water variable is reset using the following parameters:

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

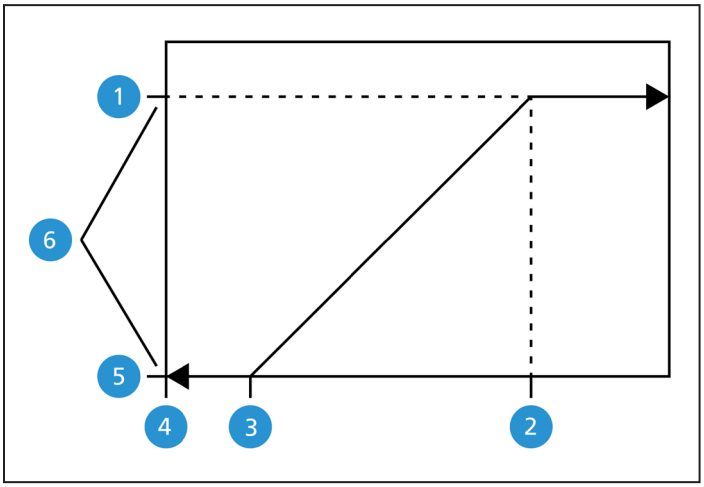
For example, a reset is accomplished by changing the Active Leaving Water variable from the (Cool LWT setpoint) to the (Cool LWT setpoint + Max Reset Delta T setpoint) when the evaporator (return – leaving) water temperature delta varies from the (Start Reset Delta T setpoint) to 0.

To prevent a possible surge at startup, the compressor will not start if the evaporator LWT is lower than Templifier No Start set point.

Reset Type – 4-20 mA (Cool Mode)

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

Figure 40: LWT Reset - Cool Mode



No.	Description
1	54.0°F
2	20 ma
3	4 ma
4	0 ma
5	Cool LWT Setpoint (44.0°F)
6	Max Reset Delta T (10.0°F)

NOTICE

Temperatures in above figures are examples only.

Figure 41: Settings - Modes

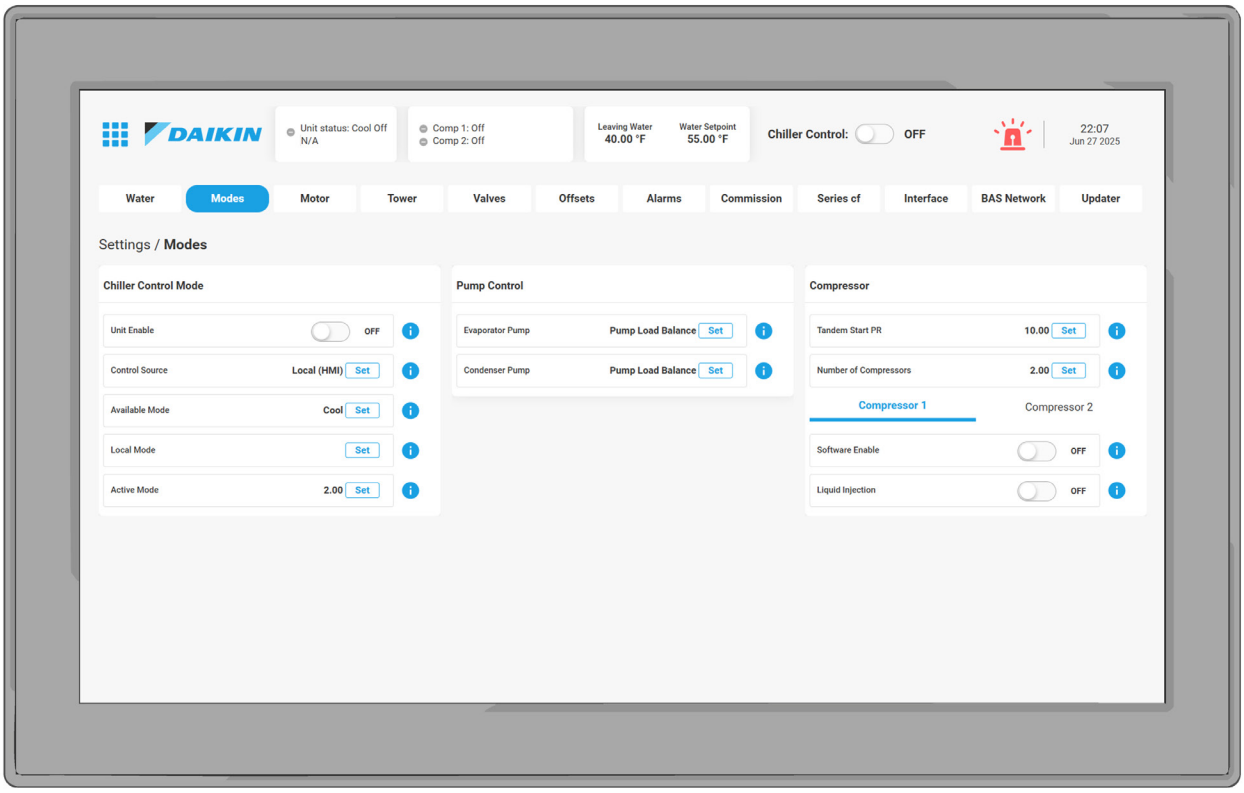


Table 12: Modes Setpoint

Description	Default	Range	PW	**Comments**
Chiller Control Mode				
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.
Control Source	Local (HMI)	Remote Switch, Local (HMI), BAS	O	Sets control source. See “” on page 26.
Available Mode	COOL	COOL	O	COOL
Pump Control				
Evaporator Pump	Pump Load Balance	None, Pump Load Balance, Pump #1 Only, Pump #2 Only, Pump #1 Primary, Pump #2 Primary	M	Pump Load Balance - balances hours between #1 and #2 pumps, Pump #1 Only, Pump #2 Only - use only specified pump Pump #1 Primary and Pump #2 Primary - if primary pump fails, other pump is used.
Condenser Pump	Pump Load Balance	None, Pump Load Balance, Pump #1 Only, Pump #2 Only, Pump #1 Primary, Pump #2 Primary	M	Pump Load Balance - balances hours between #1 and #2 pumps, Pump #1 Only, Pump #2 Only - use only specified pump Pump #1 Primary and Pump #2 Primary - if primary pump fails, other pump is used.
Compressor				
Tandem Start Pressure Ratio	-	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	Set number of compresser.
Software Enable	Enabled	Enabled, Disabled	O	Enable or disbale software.

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

Figure 42: Settings - Motor

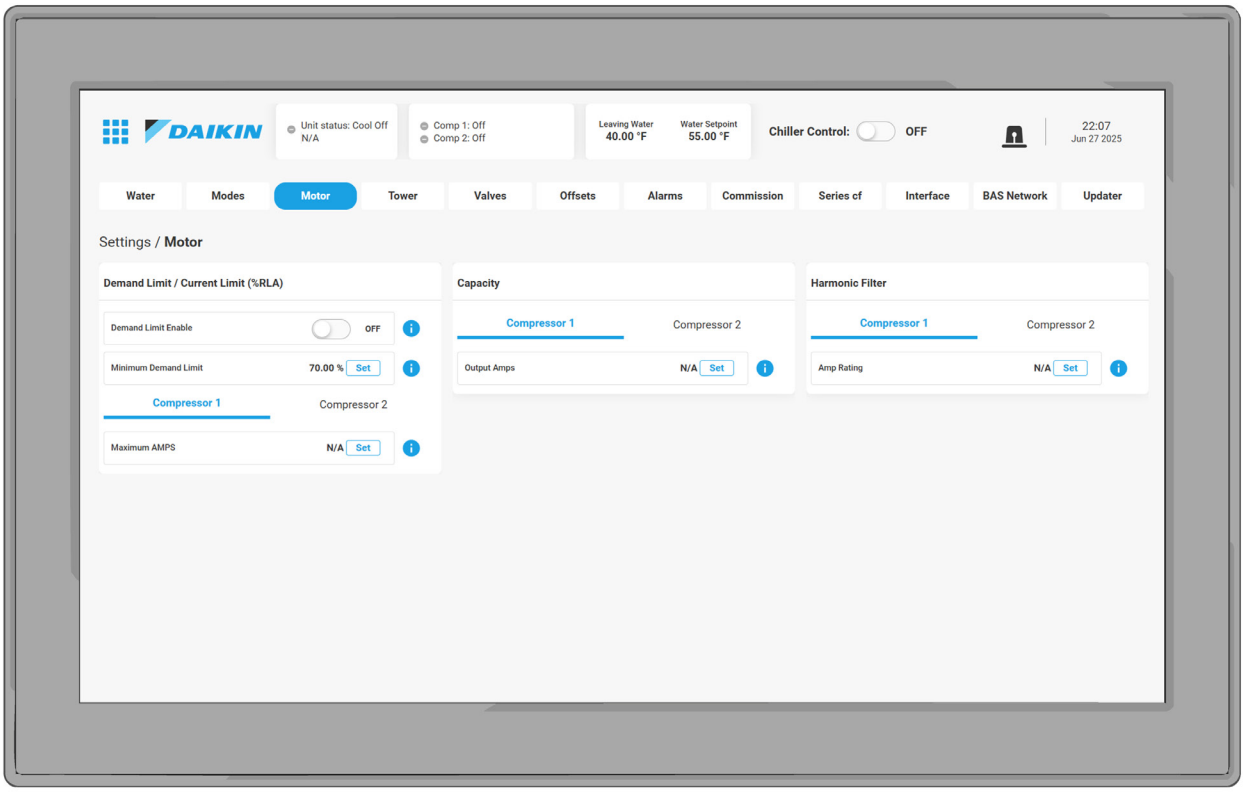


Table 13: Motor Setpoints

Description	Default	Range	PW	Comments
Demand Limit/Current Limit (%RLA)				
Demand Limit Enable	OFF	ON, OFF	O	ON: Limits % RLA to a value set by the Demand Limit analog input. Where: 4 mA = 100% RLA 20 mA = Minimum Demand Limit Setpoint OFF: The Demand Limit input is ignored.
Minimum Demand Limit	100%	40 to 100%	O	Set Minimum Demand Limit
Maximum Amps	100%	70 to 100%	O	Inhibits capacity increase above %RLA. Unloading forced at 5% above value.
Capacity				
VFD Output Amps	Factory set	Model dependent	T	Sets the Rated Load Amps (RLA) per compressor phase as given on the chiller nameplate - Load Side Phase Data.
Harmonic Filter				
Amp Rating	Factory set	Model dependent	T	Based on model of harmonic filter.

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

Figure 43: Settings - Tower

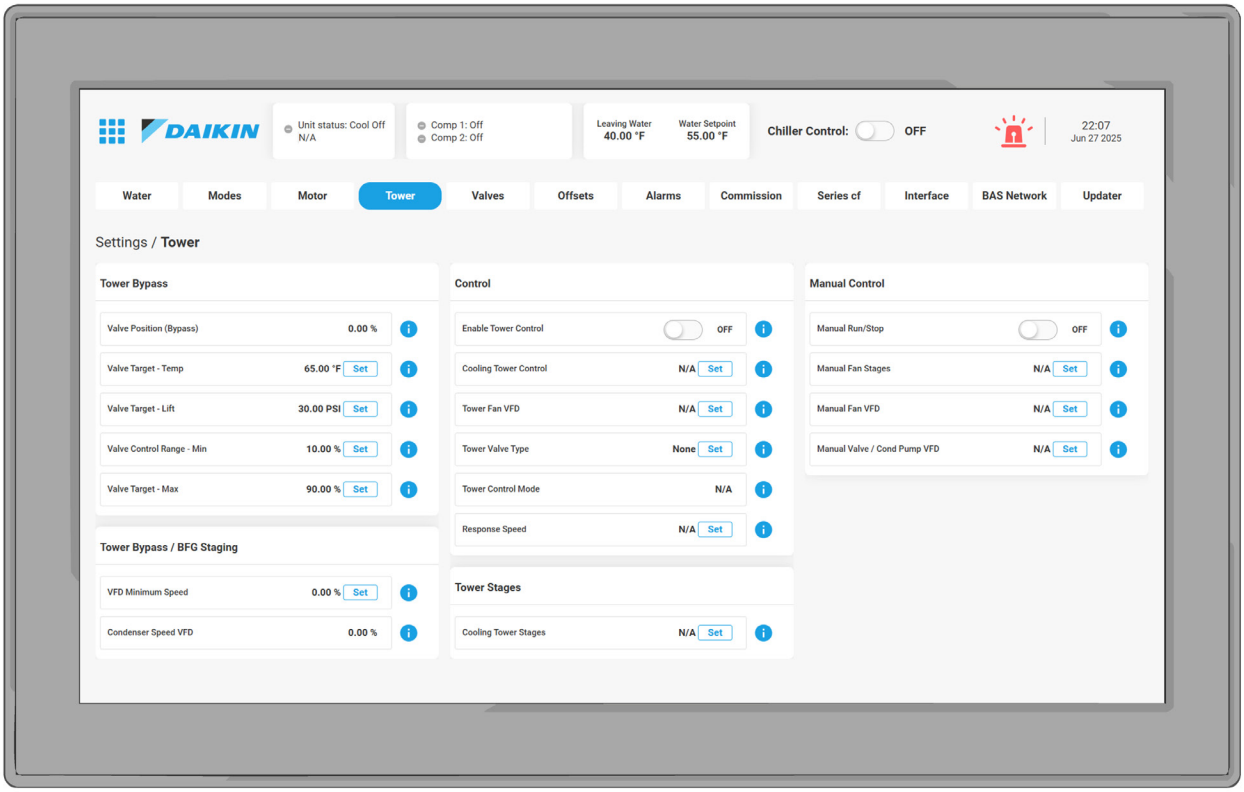


Table 14: Tower Setpoints

Description	Default	Range	PW	Comments
Tower Bypass				
Valve Target -Temp	65	40 – 120	O	Target value for entering condenser water temperature
Valve Target - Lift	30	10 – 100	O	Target value for lift pressure
Valve Control Range - Min	10	0 – 100%	O	Minimum bypass valve position
Valve Control Range - Max	90	0 – 100%	O	Maximum bypass valve position
Tower Bypass/VFD Staging				
VFD Minimum Speed	0	0 – 70%	O	Minimum tower fan VFD speed
Control				
Enable Tower Control	Disabled	Disabled, Enabled	O	Tower control enable/disable
Cooling Tower Control	Temp	None, Temp, Lift	O	Selects target for tower bypass and fan control
Tower Fan VFD	None	None, VFD Stage 0, VFD Stage 1, VFD all stages	O	None: No VFD Control VFD Stage 0: VFD independent of fan stage outputs VFD Stage 1: VFD on stage 1 only VFD all stages: VFD on all fan stages
Tower Valve Type	None	None, Normally Closed (NC), Normally Open (NO), VFD	O	None: No bypass valve NC: Valve is normally closed to tower NO: Valve is normally open to tower VFD: bypass valve output controls condenser pump VFD

Description	Default	Range	PW	Comments
Tower Control Mode	Auto Efficiency	Manual, Auto, Auto Efficiency	O	Manual: Activate manual control of tower control outputs Auto: Set tower control outputs to reach set point Auto Efficiency: When set point can not be reached, reduce fan output if possible
Response Speed	Slow	None, Slow, Medium, Fast		Tower control output rate of change when not on set point
Tower Stages				
Cooling Tower Stages	2	1 – 3	O	Number of available tower fan stages
Manual Control				
Manual Fan Stages	1	0 – 3	O	Set the number of running fan stages when Manual Control is enabled
Manual Fan VFD	50	0 – 100	O	Set fan VFD speed when Manual Control is enabled
Manual Valve / Cond Pump VFD	90	0 – 100	O	Set bypass valve / cond pump VFD when Manual Control is enabled

Cooling Tower Control

There are five possible tower control strategies: (I) **NONE**, (II) **VALVE SP**, (III) **VALVE STAGE**, (IV) **VFD STAGE**, and (V) **VALVE SP / VFD STAGE**. These control strategies are selected from the TOWER Setpoint Screen (see Figure 43). An explanation of each control strategy is given along with 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, up to four digital outputs of Tower Staging along with three analog outputs (0-10 VDC) are available. The three analog outputs are as follows:

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

Setup for any tower control will be accomplished on the HMI using the TOWER Setpoint Screen (see Figure 43 on page 40). Select options for the following:

- **Cooling Tower Control** - NONE is selected as default. Choose TEMP for entering condenser water control or LIFT to define the lift pressure between the Suction pressure and the Discharge pressure.
- **Cooling Tower Stages** - sets the number of tower stages that the tower has.
- **Tower Bypass Valve / Fan VFD** - defines if and how the first two MicroTech analog outputs (Bypass Valve signal and Tower Fan VFD signal) will be used with the Staging selected for the tower. A BAS or other control may monitor these outputs to understand when or how much the MicroTech would recommend for proper head control on the WMC unit. The third Analog Output (Tower Reset) is only configurable from the MicroTech controller. Commissioning setup of this 0-10 VDC signal, that will represent the MicroTech recommending increased head pressure by a reset voltage, is typically done by the Daikin Applied startup technician. Setup instructions for each of the five tower control strategies are provided next.

(I) NONE: Tower Fan Staging Only

This control strategy is tower fan staging only. ***This is not a recommended strategy.*** In this mode the tower fan staging (up to four stages) is controlled by either the condenser Entering Water Temperature (EWT) or LIFT pressure (difference between the condenser and suction pressure). Tower bypass or fan speed are not controlled. See Figure 44 and Figure 45.

Figure 44: TOWER Setpoint - (I) NONE

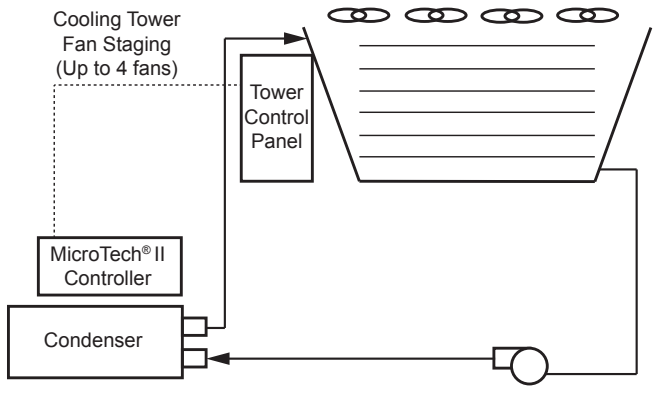
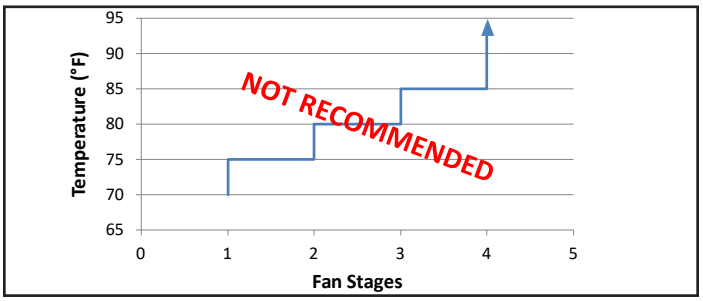


Figure 45: Temperature vs. Fan Stages



The setpoints should be selected as follows:

1. Cooling Tower Control = TEMP if control is based on condenser EWT or LIFT if based on compressor lift expressed in pressure.
2. Tower Bypass Valve/Fan VFD = NONE for no bypass valve or fan VFD control.
3. Select one to four fan outputs depending on the number of fan stages. More than one fan can be used per stage through the use of relays.
4. Select FAN STAGE UP TIME. The default value is 2 minutes. The value may need to be adjusted depending on actual system operation.
5. Select FAN STAGE DOWN Time. The default value is 5 minutes and may need to be adjusted later depending on actual system operation.
6. If TEMP is selected for Cooling Tower Control, use:
   a. STAGE DIFFERENTIAL in TEMP. Start with default of 3°F.
   b. Set the STAGE ON (Temp) consistent with the temperature range over which the condenser EWT is desired to operate. The default values of 70°F, 75°F, 80°F and 85°F are a good place to start in climates with moderate wet bulb temperatures. The number of STAGE ON setpoints used must be the same as the number of tower stages.
7. If LIFT is selected for Cooling Tower Control, use:
   a. STAGE DIFFERENTIAL in Lift. Start with default of 6.0 PSI.
   b. Set the STAGE ON (Lift) and start with default setpoints. The number of STAGE ON setpoints used must be the same as the number of tower stages.

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

This control strategy is tower staging with a low-limit controlled bypass valve. The tower fans are controlled as in (I), plus a tower bypass valve is controlled to provide a minimum condenser EWT. There is no interconnection between the fan control and the valve control. See Figure 46 and Figure 47.

Figure 46: TOWER Setpoint (II) VALVE SP

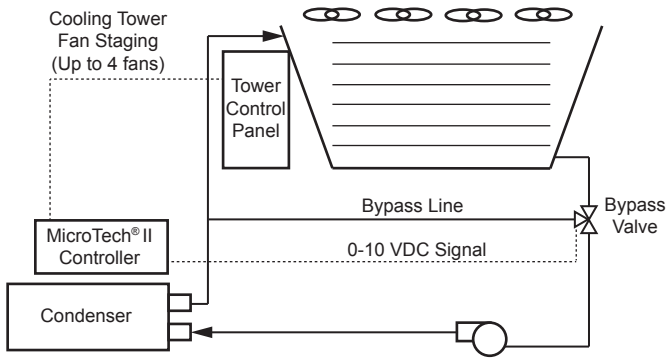
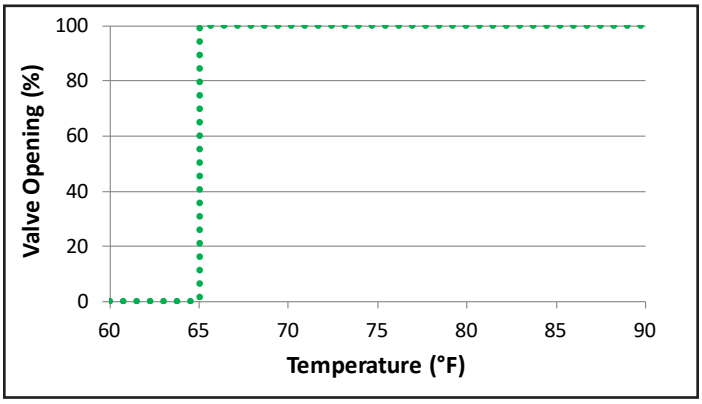


Figure 47: VALVE SP - Valve Opening vs. Temperature



As shown in Figure 47, the default temperature at which the valve opens completely is 65°F. This temperature is the Valve Target and is adjustable.

Use all of the same setpoint settings as those outlined in section (I) except select VALVE SP for control of the bypass valve based on temperature or lift.

1. Select open or closed for the valve position when there is no control power.
2. If TEMP was selected for Cooling Tower Control:
   a. Set the VALVE TARGET (Temp). This setpoint is usually 5°F below the minimum fan stage setpoint established by Minimum Start Position. This keeps full flow through the tower until the last fan is staged off. The default for Valve Target (Temp) is 65°F.
   b. Set VALVE DEADBAND. The default is 1.0°F is a recommended initial setting.

3. If LIFT was selected for fan control, use:
   a. Set the VALVE TARGET. This setpoint is usually 5 psi below the minimum fan stage setpoint established in by Minimum Start Position. This keeps full flow through the tower until the last fan is staged off. The default for Valve Target (Lift)is 30 psi.
   b. Set VALVE DEADBAND, the default of 1.0 psi is a recommended initial setting.
4. Set the remaining values:
   a. Set the Minimum Position to which the valve can go. The default is 10%.
   b. Set the Maximum Position to which the valve can go. The default is 100%.
   c. Set the Valve Control Gain Error. The default is 20.
   d. Set the Valve Control Gain Slope. The default is 1.

⚠ CAUTION

Valve Control Gain for Error and Slope are site specific, dealing with system fluid mass, component size, and other factors affecting the reaction of the system to control inputs. To avoid possible equipment damage, these setpoints should be set by personnel experienced with setting up this type of control.

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

This control strategy is tower staging 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 48 and Figure 49.

Figure 48: TOWER Setpoint - (III) VALVE STAGE

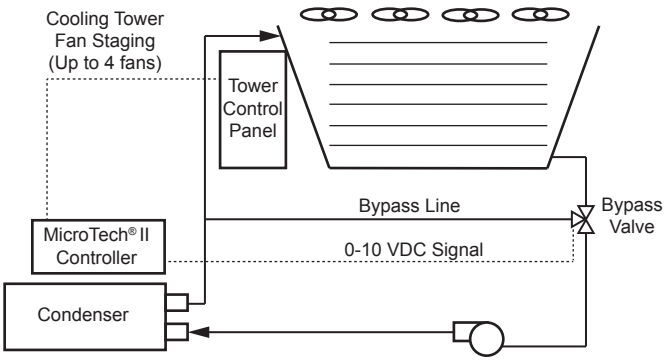
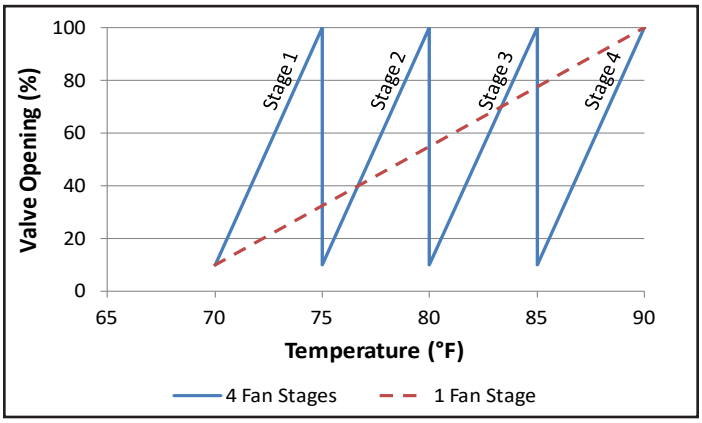


Figure 49: (III) VALVE STAGE - Valve Opening vs. Temperature



As shown in Figure 49, the default minimum and maximum valve opening positions are 10% and 100%, respectively. These minimum and maximum positions are adjustable anywhere between 0% and 100%. Additional fans stage on when the valve opening position reaches the maximum value that was set.

Use all of the same setpoint settings as those outlined in section (II) except select VALVE STAGE for Tower Bypass Valve/Fan VFD and then continue settings based on temperature or lift for Cooling Tower Control. In addition, set the following:

   a. Set Stage Up (valve position % open) above which the first fan can stage on. Fan Stage #X On (Temp) and Fan Stage Up Time must also be met. The default for Stage Up is 80%.
   b. Set Stage Down (valve position % closed) below which the first fan can stage off. Fan Stage #X On (Temp) and Fan Stage Down Time must also be met. The default for Stage Down is 20%.

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

In this mode, a VFD controls the first fan. Up to three more fans are staged on and off and there is no bypass valve. See Figure 50 and Figure 51.

Figure 50: TOWER Setpoint - (IV) VFD STAGE

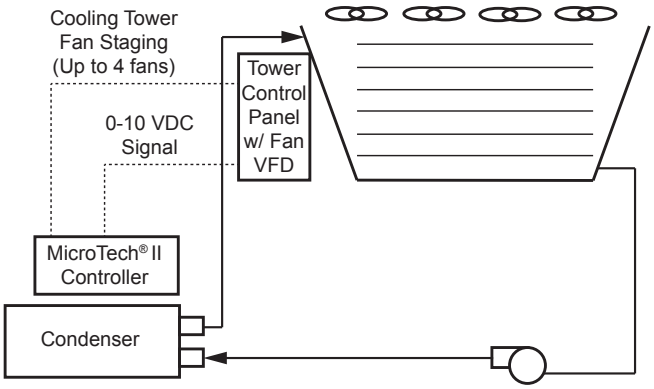
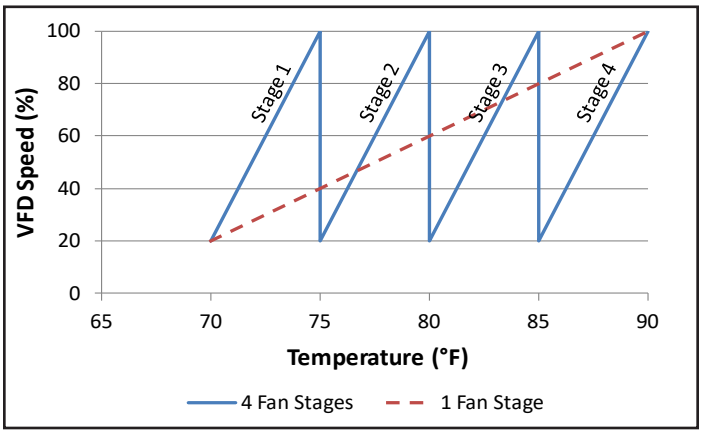


Figure 51: (IV) VFD STAGE - VFD Speed vs. Temperature



As shown in Figure 51, 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.

Use all of the same setpoint settings as those outlined in section (I) except select VFD STAGE for control of the VFD speed based on temperature or lift.

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

This control strategy is tower fan control with a VFD and bypass valve control. See Figure 52 and Figure 53.

Figure 52: TOWER Setpoint - (V) VALVE / VFD STAGE

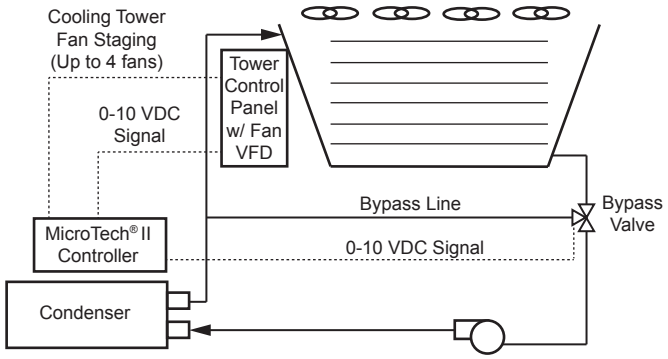
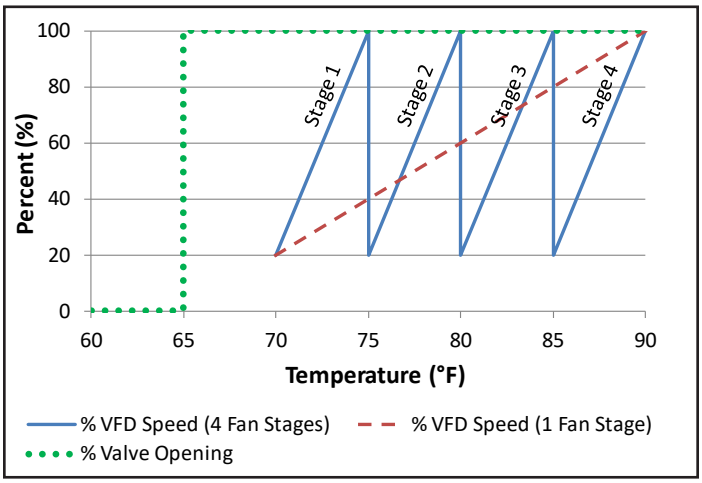


Figure 53: (V) VALVE / VFD STAGE - % vs. Temperature



As shown in Figure 53, 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 53 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.

Use all of the same setpoint settings as those outlined in section (I) except select VALVE SP/VFD STAGE.

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 54.

Figure 54: BAS Alternate

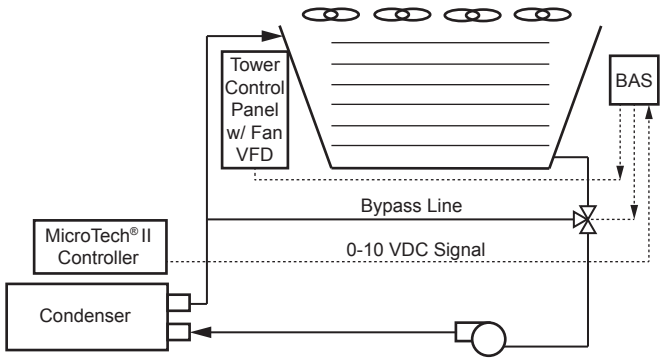


Figure 55: Settings - Valves

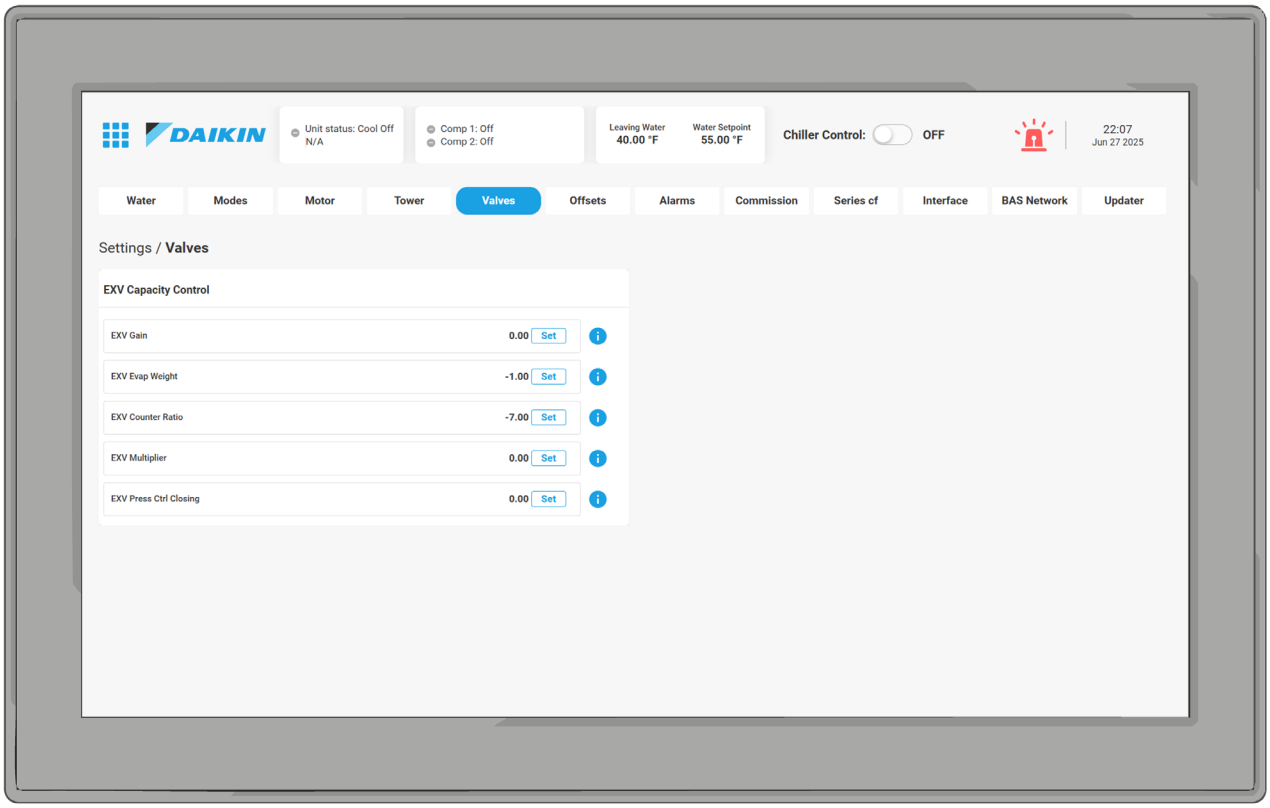


Table 15: Valves Setpoints

Description	Default	Range	PW	Comments
EXV Capacity Control				
EXV Gain	0	20-400	T	Gain selection based on chiller size and valve type.
EXV Evap Weight	-1	-100 to 100	T	Weight selection based on chiller size and valve type.
EXV Counter Ratio	-7	-9.0 to 9.0	T	Setpoint used to increase or decrease the amount of time it takes the valve to move.
EXV Multiplier	0	-1.9 to 1.9	T	Setpoint used to increase or decrease the amount of balance error applied to the exv position.
EXV Press Ctrl Closing	0	-0.9 to 0.9	T	Setpoint used to increase or decrease the amount of closing under pressure control.

Figure 56: Settings - Offsets

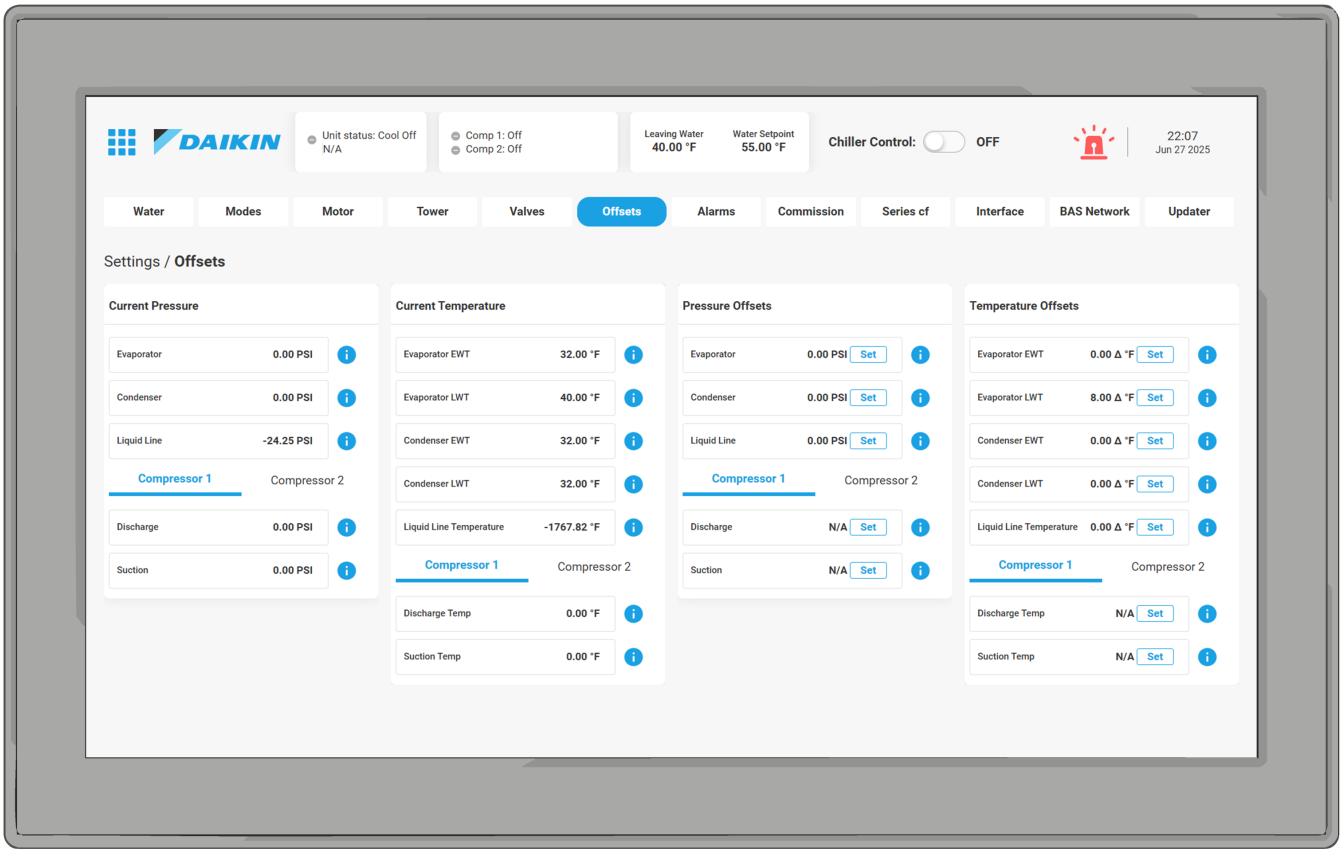


Table 16: Offsets Setpoints

Description	Default	Range	PW	Comments
Pressure Offsets				
Evaporator	0.0	-2 to 2	T	Sets the offset for the sensor listed based upon jobsite calibrations.
Condenser	0.0	-2 to 2	T	
Liquid Line	0.0	-2 to 2	T	
Compressor Discharge	0.0	-2 to 2	T	
Compressor Suction	0.0	-2 to 2	T	
Temperature Offsets				
Evaporator EWT	0.0	-1.5 to 1.5	T	Sets the offset for the sensor listed based upon jobsite calibrations.
Evaporator LWT	0.0	-1.5 to 1.5	T	
Condenser EWT	0.0	-1.5 to 1.5	T	
Condenser LWT	0.0	-1.5 to 1.5	T	
Liquid Line Temp	0.0	-1.5 to 1.5	T	
Compressor Discharge Temp	0.0	-1.5 to 1.5	T	
Compressor Suction Temp	0.0	-1.5 to 1.5	T	

Figure 57: Settings - Alarms

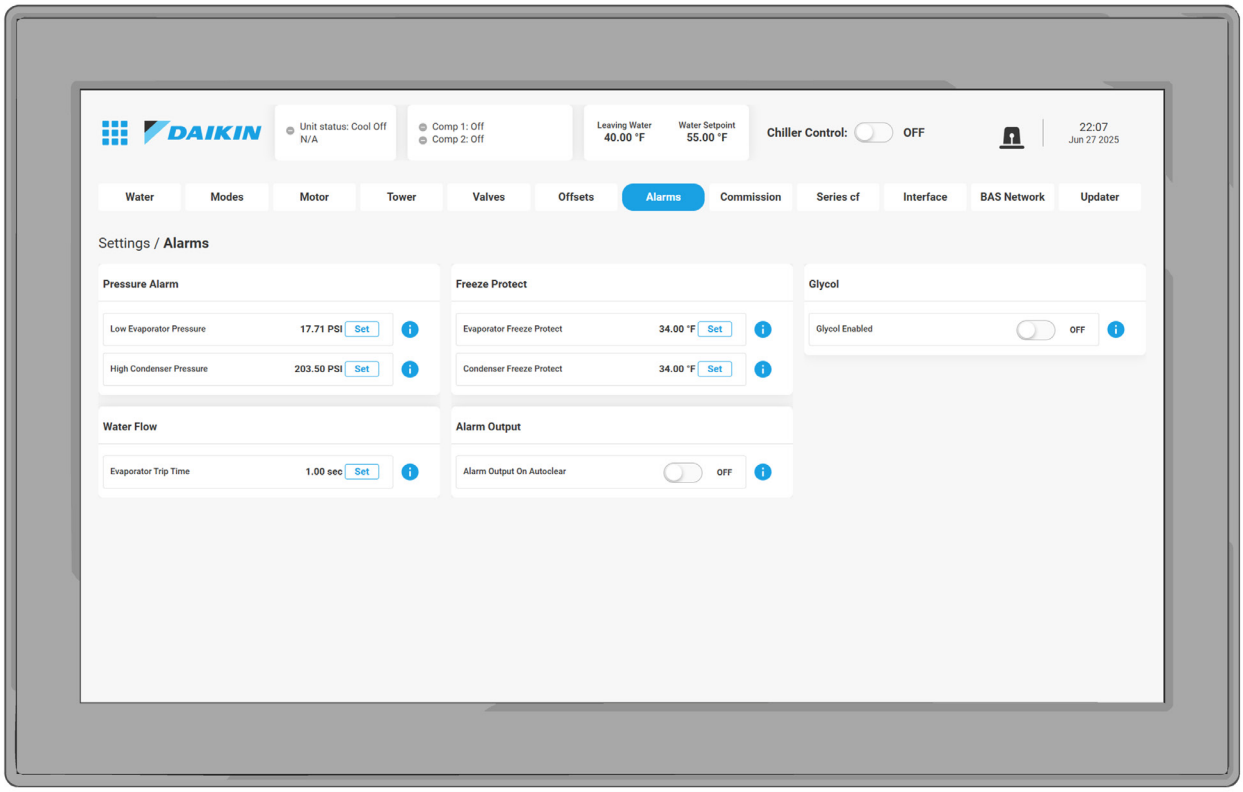


Table 17: ALARMS Setpoint

Description	Default	Range	PW	Comments
Pressure Alarm				
Low Evaporator Pressure	17.7 psi	16.7 to 29.4 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. If Glycol Enabled is selected, minimum may be set as low as 10.7 psi.
High Condenser Pressure	190 psi	120 to 200 psi	T	Sets the condenser pressure limit R-515B.
Water Flow				
Evaporator Trip Time	1 sec	0 to 5 sec	T	-
Freeze Protect				
Evaporator Freeze Protect	34.0°F	34.0 to 45.0°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.
Evaporator Freeze Protect (Glycol Enabled)	34.0°F	34.0 to 45.0°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.
Condenser Freeze Protect	34.0°F	34.0 to 45.0°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.
Condenser Freeze Protect (Glycol Enabled)	34.0°F	34.0 to 45.0°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.

NOTE: The setpoints listed in Table 17 should only be changed by a Daikin Applied technician. Contact a Daikin Applied service representative for more information.

Figure 58: Settings - Commission

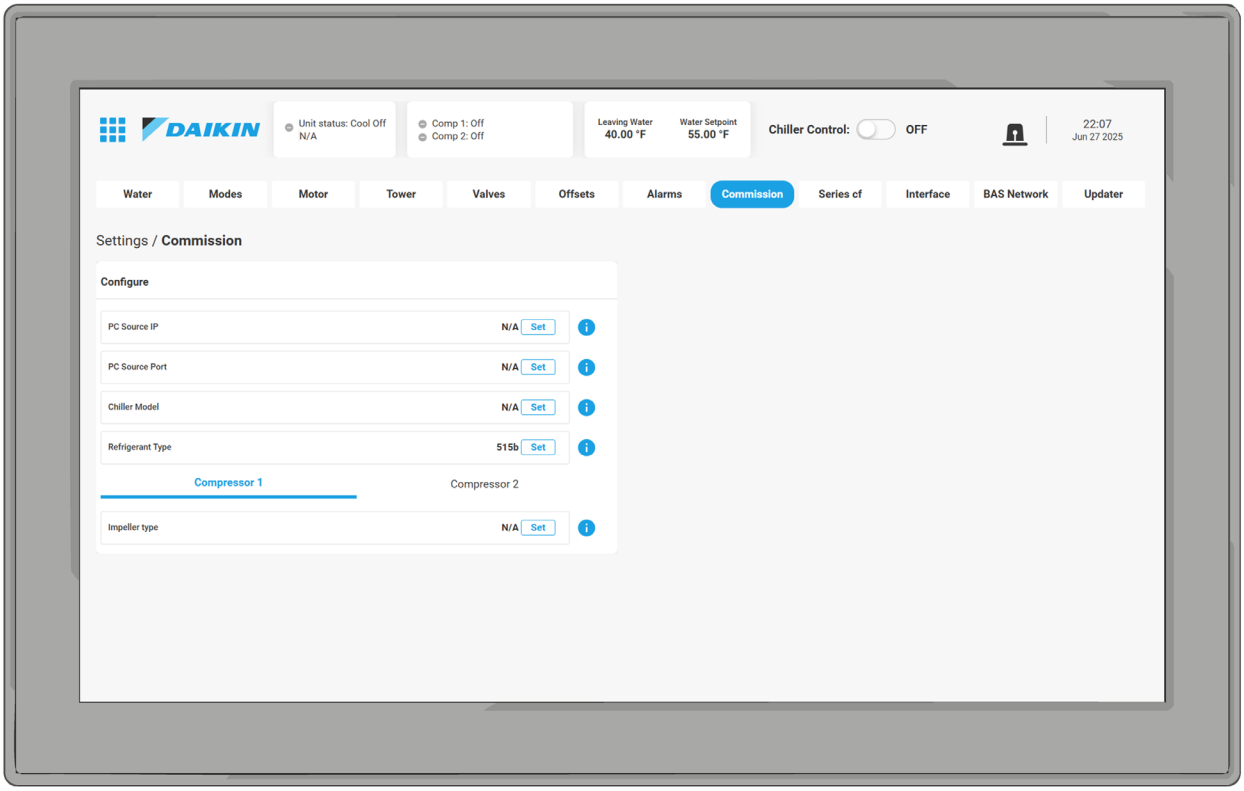


Table 18: Commission Setpoints

Description	Default	Range	PW	Comments
Configure				
PC Source IP	127.0.0.1	-	T	PC local source IP
PC Source Port	80	-	T	PC local source port
Chiller Model	WMC-E	-	T	Unit model and vintage
Refrigerant Type	R515B	-	T	Unit refrigerant type
Compressor				
Impeller Type	Factory set	045	T	Size of compressor and impeller type

Figure 59: Settings - Series Counterflow

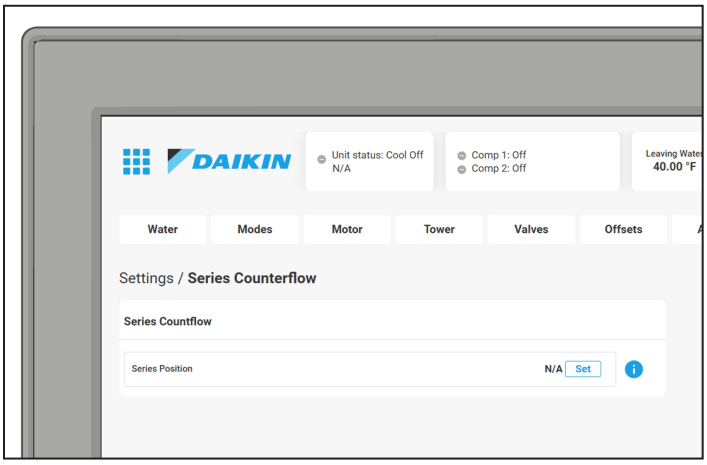


Table 19: Series Counterflow Setpoints

Description	Default	Range	PW	Comments
Series Counterflow				
Series Position	-	-	T	Set series position

Figure 60: Settings - Interface

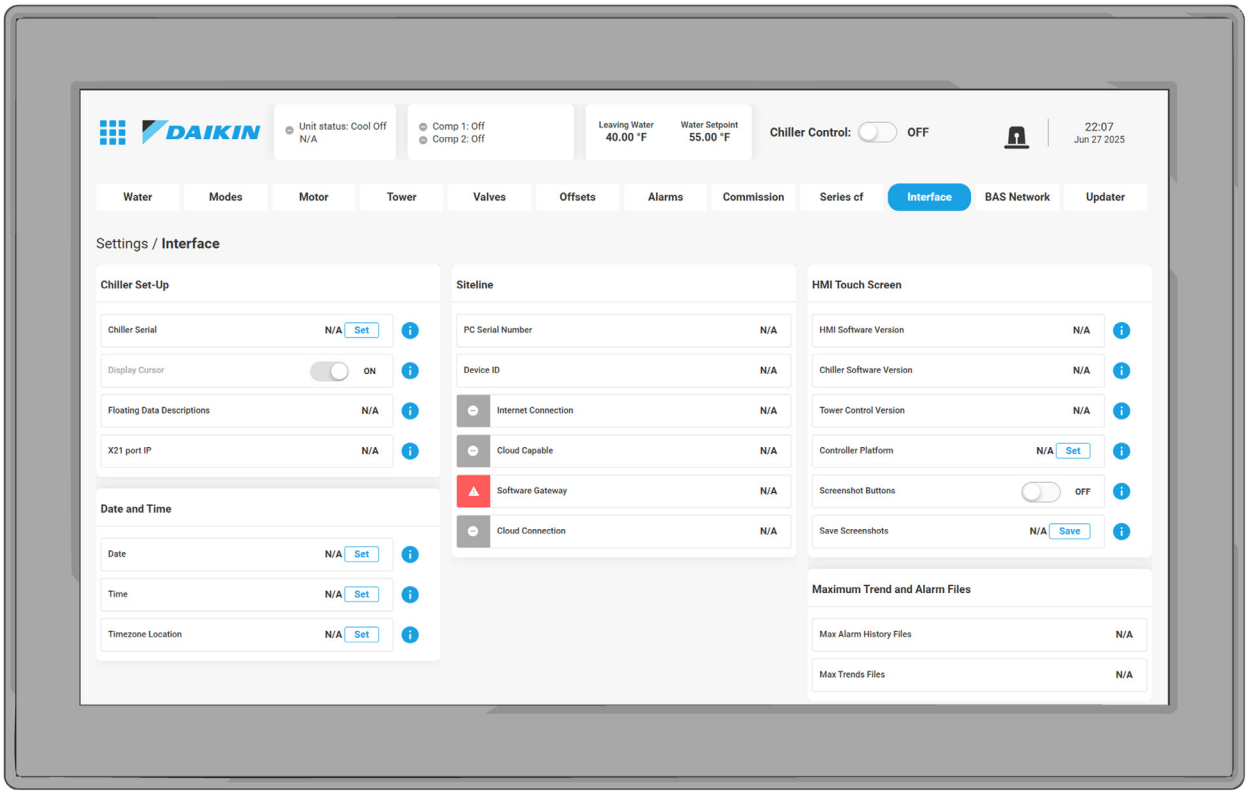


Table 20: Interface Setpoints

Description	Default	Range	PW	Comments
Chiller Set-Up				
Chiller Serial	-	-	O	Chiller serial number will be shown here
Display Cursor	-	-	O	To select if the display cursor should be ON or OFF
X2P1 port IP	-	-	O	The IP address of X2P1 port
Date and Time				
Date	-	-	O	Sets/Shows current date
Time	-	-	O	Sets/Shows current Time
Timezone Location	-	-	O	Sets/Shows Timezone location
HMI Touch Screen				
HMI Software Version	-	-	O	Shows installed HMI software version
Chiller Software Version	-	-	O	Shows installed Chiller software version
Tower Control Version	-	-	O	Shows installed tower control software version
Controller Platform	-	-	O	Shows/Sets controller platfrom
Screenshot Buttons	-	-	O	Enables/Disables screenshot buttons on the screen
Save Screenshots	-	-	O	Saves the screenshots taken

Figure 61: Settings - BAS Network

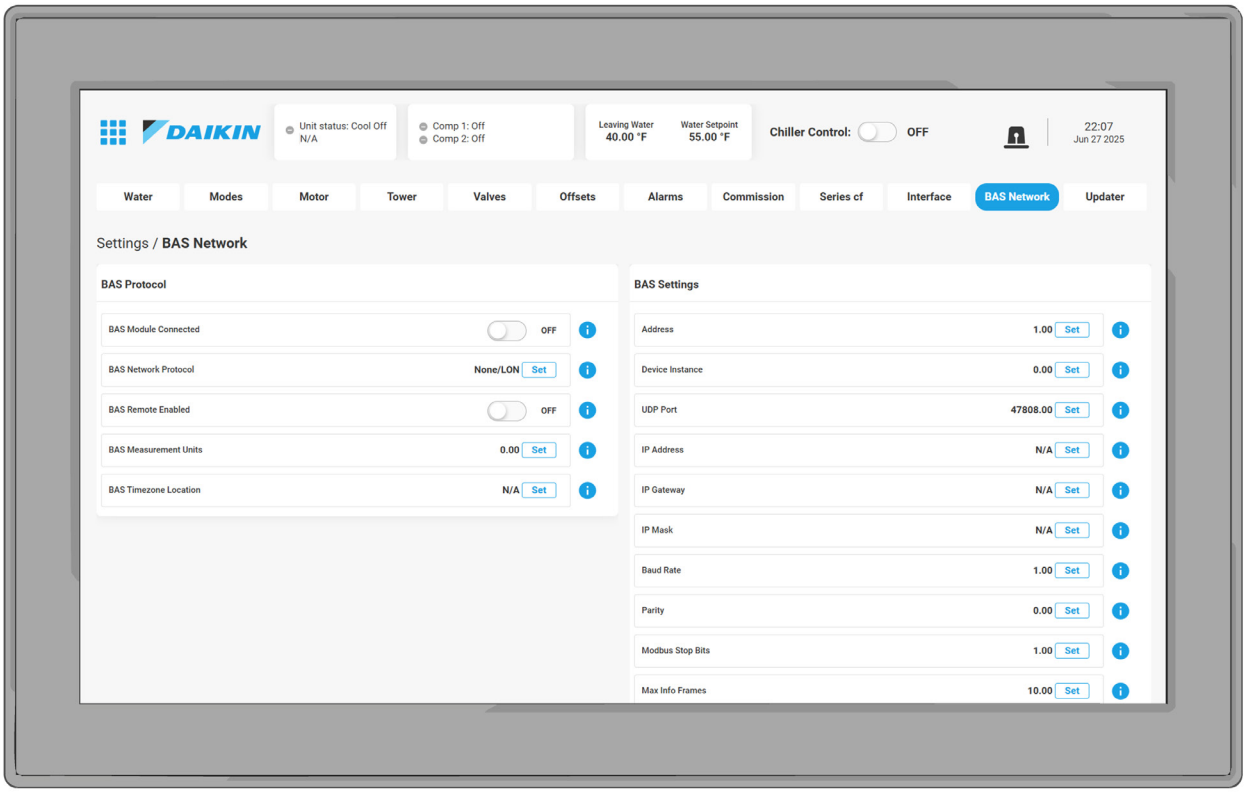
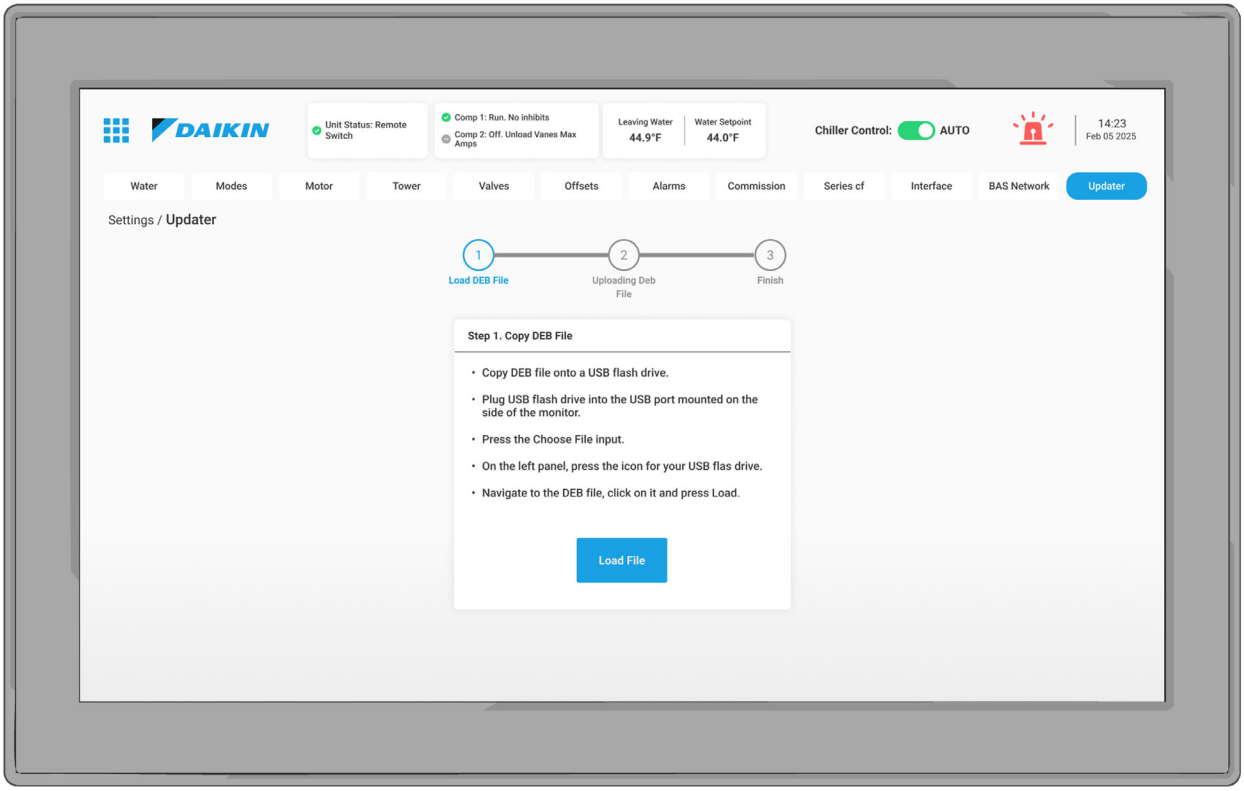


Table 21: BAS Network Setpoint

Description	Default	Range	Comments
BAS Settings			
Address	FC RS485	0-127	This value must be unique throughout the MSTP trunk.
Device Instance	1	0-4194304	This value must be unique throughout the entire BACnet network.
Baud Rate	9600 baud	9600/19, 200/38, 400/76, 800 baud;	All devices on the MSTP trunk must be set to the same baud rate.
Max Info Frames	1	1-65534	Defines how many info/data frames the device is allowed to send while holding the token.
Max Master=	127	1-127	Dependent on the Number of Masters in the system.

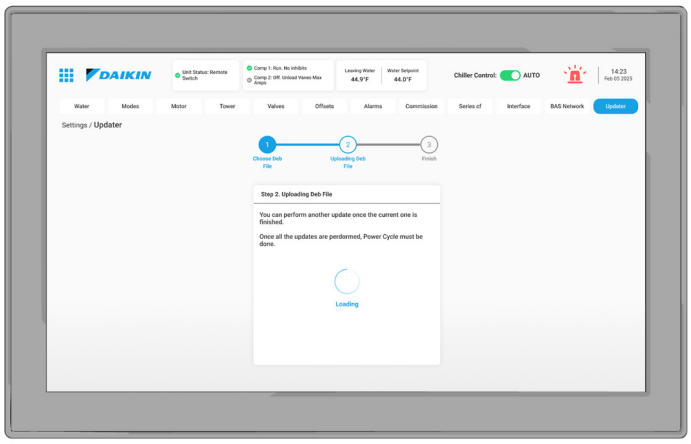
Figure 62: Settings - Updater Step 1



Step 1: Copy DEB File

- Copy DEB file onto a USB flash drive.
- Plug USB flash drive into the USB port mounted on the side of the monitor.
- Press the Choose File input.
- On the left panel, press the icon for your USB flash drive.
- Navigate to the DEB file, click on it and press Load.

Figure 63: Settings View - Updater Step 2



Step 2: Uploading DEB File

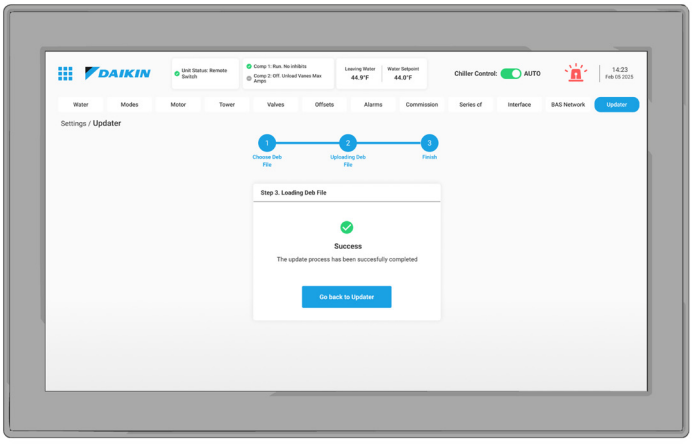
You can perform another update once the current one is finished.

Once all the updates are performed, Power Cycle must be done.

Step 3: Load DEB File

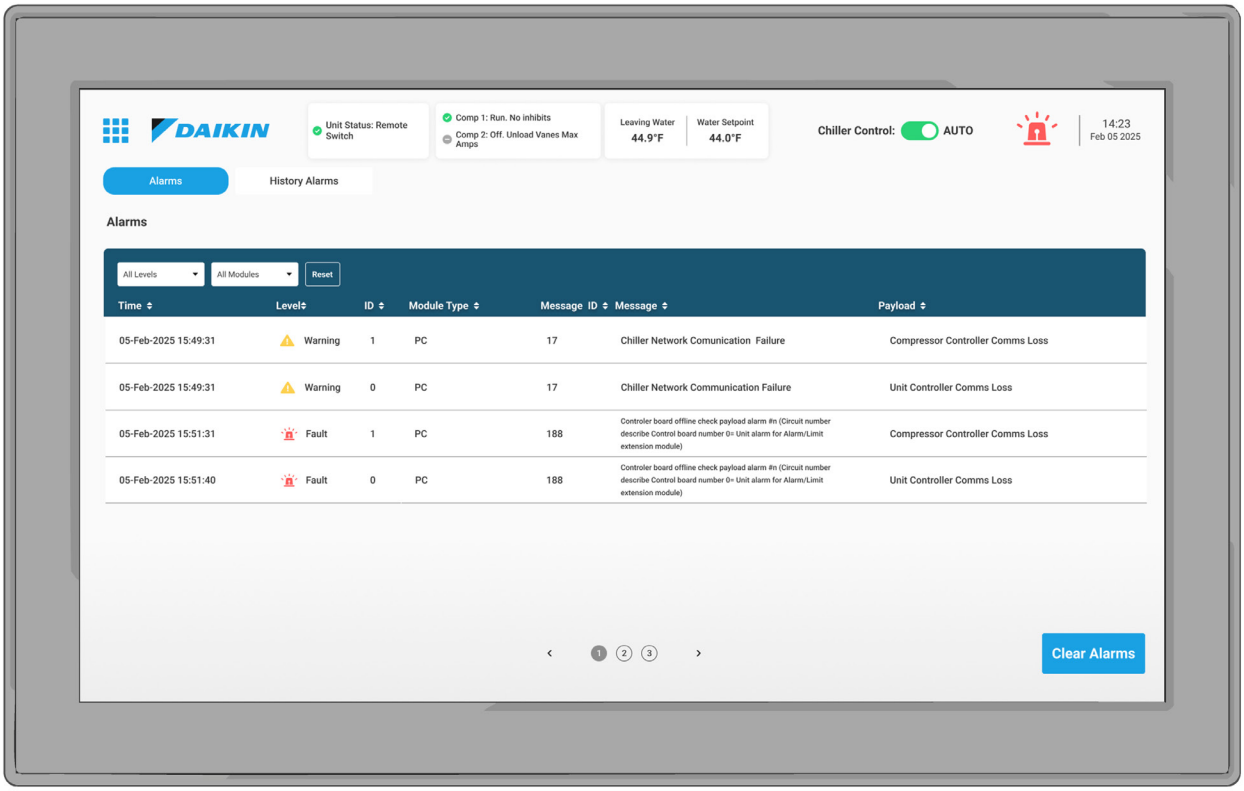
The update process has been completed.

Figure 64: Settings View - Updater Step 3



Alarms

Figure 65: Alarm Screen



The Alarms Screen is only accessible when an active alarm exists on the unit. Pressing the ALARM button on any screen will access the Alarms Screen.

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

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

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

The Alarm History Screen is accessed from the Alarm button, then by pressing the HISTORY tab as shown.

Use the date button to choose the desired date. Use the Copy button to extract the desired alarm log to a USB stick. An example of the date and copy buttons is shown in the adjacent figure. There are three types of alarms:

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

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

Although the Alarm History Screen only displays the most current alarms, a record of ALL alarms is stored in the HMI PC. Note that this record may include alarms that occurred when the chiller was in the factory. This record is maintained even if the HMI PC is powered off.

When the HMI is powered back on, the last eight alarms will show back up on the Alarm History Screen and all alarm history will still be available for download. (The download process is described next.) If an alarm both occurs and is cleared when the HMI PC is powered off, it will not be recorded in the alarm history.

The Alarm History Screen can be used to download the alarm history via USB. In order to download the trend or alarm history, first insert a USB drive into the HMI PC.

NOTICE

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

To Download Trend History:

- Make sure that the "History File" text field on the right side of the Alarm History Screen shows a date. If it shows "ALARMS" rather than a date, press either the PREV or NEXT button. (Pressing the PREV button when the "History File" text field shows "ALARMS" will bring up yesterday's date. Pressing the NEXT button when the "History File" text field shows "ALARMS" will bring up today's date.)
- Use the PREV or NEXT button to change the date in the "History File" text field to the desired date. The dates will stop scrolling when the last file in that direction has been reached. (The HMI PC will store 30 days of history at a minimum. More days might be stored depending on the trend history file sizes. The HMI PC will automatically delete old trend history files as needed to make room for new trend history files.)
- Take note of the file size of that date's history by viewing the "Size" text field. Press the COPY to USB button and watch the file size in the "Size" text field count up to the noted file size. Once this text field has stopped counting and has reached its actual file size, the download of that file to the USB is complete.
- Repeat this process for each desired day of trend history. Each day must be downloaded individually. It is not possible to download multiple days of trend history at once.

To Download Alarm History:

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

Viewing/Using Trend History and Alarm History Files:

- To download trends press the Trends button and then "Copy Customer Trends". There will be a folder created called "Trend_Files". Trend history file names will be displayed as "TrendXXXXXX", where the first two X's will be numbers to indicate the year, the second two X's will be numbers to indicate the month, and the last two X's will be numbers to indicate the day. For example, if there is a file called Trend140510, it indicates that the file contains trend history from 5/10/2014.
- To download alarms, click "Copy". The alarm history file name will be displayed as "AlarmXXXXXXXX."
- All trend history and alarm history files are saved from the HMI PC as .csv files. These files can be opened on a normal PC and manipulated using Microsoft Excel for personal use.

Requesting Tech Support:

- If tech support is requested, the original unmanipulated files (Trend.csv and Alarm.csv) must be sent together to Daikin Applied. Any other file formats are NOT accepted.

Possible Alarms and Events

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

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

Fault Alarms

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

Table 22: Unit Fault Alarms

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

Table 23: Compressor Fault Alarms

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

Description	HMI Alarm Message	Alarm Reset
No Starter Transition Comp 2	COMPR STOP - Compressor Comm Loss (previously used for compressor communication error)	Auto-clears
General Compressor Fault 1	COMPR STOP - Compressor Fault	Reset is dependent on specific alarm
General Compressor Fault 2	COMPR STOP - Compressor Fault	Reset is dependent on specific alarm
Communication Fault 1	COMPR STOP - Compressor Comm Loss	Auto-clears
Communication Fault 2	COMPR STOP - Compressor Comm Loss	Auto-clears
Interlock Fault	NO START - Interlock Fault	Auto-clears
Interlock Fault 2	NO START - Interlock Fault	Auto-clears

Problem Alarms

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

Table 24: Unit Problem Alarms

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

Warning Alarms

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

Table 25: Unit Warning Alarms

Description	HMI Alarm Message	Alarm Reset
Entering Condenser Water Temperature Sensor Fault	NO ACTION - Condenser EWT Out of Range	Auto-clears
Liquid Line Refrigerant Temperature Sensor Fault	NO ACTION - Liquid Line Temp Out of Range	Auto-clears
Leaving Condenser Water Temperature Sensor Fault	NO ACTION - Condenser LWT Out of Range	Auto-clears
Condenser Pump #1 Fault	No Alert shown on HMI panel	No Alarm
Condenser Pump #2 Fault	No Alert shown on HMI panel	No Alarm
High Discharge Temperature Comp 1	No Alert shown on HMI panel	No Alarm
High Discharge Temperature Comp 2	No Alert shown on HMI panel	No Alarm
Chiller Running with Limited Capacity	No Alert shown on HMI panel	No Alarm
Load Balance Valve Fault 1	COMPR WARNING - Flooded Compressor	Operator Cleared Only
Load Balance Valve Fault 2	COMPR WARNING - Flooded Compressor	Operator Cleared Only

Table 26: Compressor Warning Alarms

Description	HMI Alarm Message	Alarm Reset
Repower After Power Loss 1	COMPR STOP - Line Voltage Low	Auto-clears
Repower After Power Loss 2	COMPR STOP - Line Voltage Low	Auto-clears

Events

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

Table 27: Unit Events

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

Table 28: Compressor Events

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

Controller Inputs and Outputs

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

Table 29: Controller, Analog Inputs

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

NOTE: "Sensor Range" in Table 29 indicates the range of the input, NOT the operating range of the chiller.

Table 30: Controller, Digital Inputs

#	Description	Signal	Signal
1	Unit OFF Switch	0 VAC (Stop)	24 VAC (Auto)
2	Remote Off/ Enable	0 VAC (Stop)	24 VAC (Enable)
3	Mode Switch	0 VAC (Normal)	24 VAC (Alternate)
4	Manual Off	0 VAC (Off)	24 VAC (Enable)
5	Manual Off2	0 VAC (Off)	24 VAC (Enable)
6	Manual Off3	0 VAC (Off)	24 VAC (Enable)
7	Manual Off4	0 VAC (Off)	24 VAC (Enable)
8	Quick Off (All Off)	0 VAC (Quick Stop)	24 VAC (Enable)
9	Ground Fault	0 VAC (Alarm)	24 VAC (Off)
10	Ground Fault2	0 VAC (Alarm)	24 VAC (Off)
12	HATS Switch	0 VAC (Off)	24 VAC (Enable)
13	External Fault	Configurable	Configurable

#	Description	Signal	Signal
17	Evaporator Water Flow Switch	0 VAC (No Flow)	24 VAC (Flow)
18	Condenser Water Flow Switch	0 VAC (No Flow)	24 VAC (Flow)

Table 31: Controller, Analog Outputs

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

NOTE: "Sensor Range" in Table 31 indicates the range of the output, NOT the operating range of the chiller.

Table 32: Controller, Digital Outputs

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

Pre-Startup

Inspect the chiller to ensure no components became loose or damaged during shipping or installation including leak test and wiring check. Complete the pre-start checklist at the front of this manual and return to Daikin Applied prior to startup date.

NOTICE

Daikin Applied service personnel or factory authorized service agency must perform initial startup in order to activate warranty. They must return the "WMC Centrifugal Equipment Warranty Form" within 10 working days to Daikin Applied as instructed on the form to obtain full warranty benefits.

⚠ CAUTION

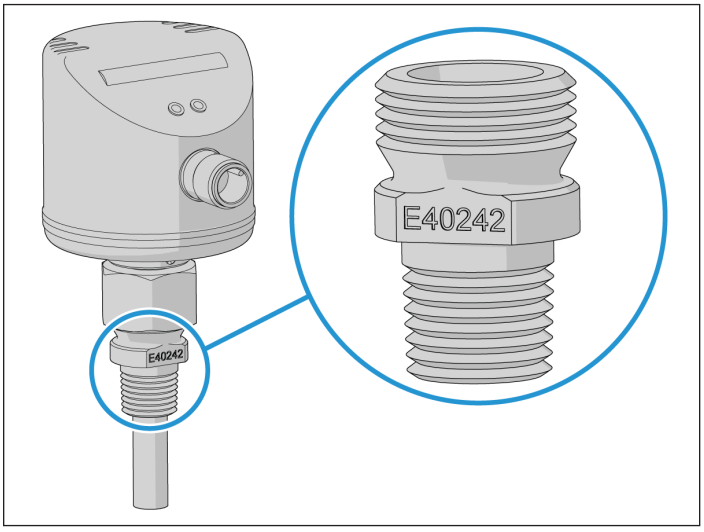
Dyes used for refrigerant leak detection are not tested or recommended for use in Daikin Applied chillers. Use of these products may damage and/or degrade the performance of the equipment and will void the manufacturer warranty.

Flow Switch Installation and Calibration

A thermal dispersion flow switch uses heat to determine flow and therefore must be calibrated during system startup. A thermal dispersion flow switch can be an acceptable replacement for paddle type flow switches and differential pressure switches, but care must be taken regarding wiring.

The thermal dispersion flow switch supplied by Daikin Applied, shown in Figure 66, comes as a two part unit consisting of a flow switch and an adapter labeled E40242 by the supplier.

Figure 66: Thermal Dispersion Flow Switch and Adapter



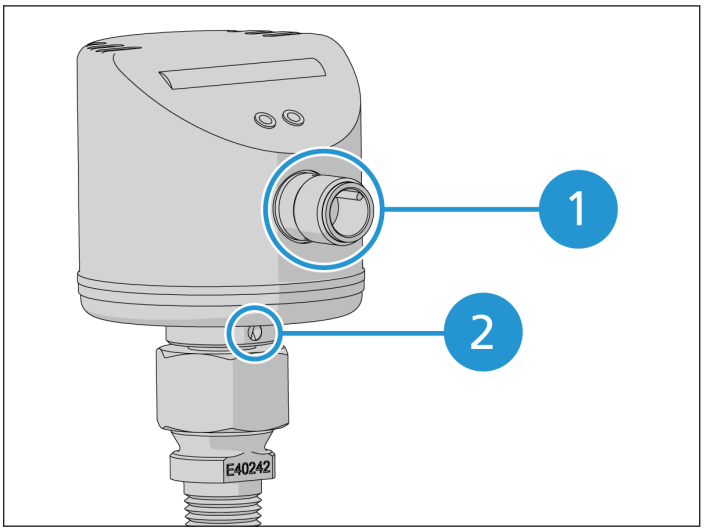
NOTICE

Flow switch MUST be calibrated before chiller operation. Failure to properly calibrate the switch may result in severe chiller damage and/or void warranty.

Mounting

Figure 67 highlights the position of the electrical connector and indentation 'mark' on flow switch.

Figure 67: Flow Switch Details

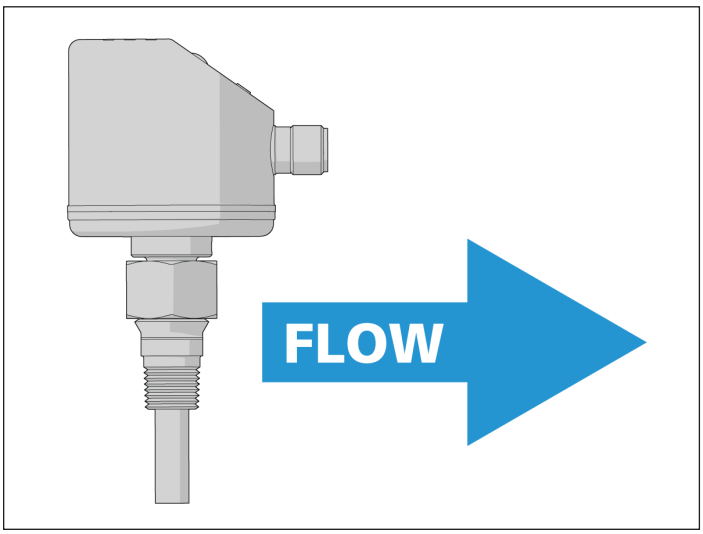


No.	Descriptions
1	Electrical Connector
2	Indentation

It is required that the flow switch be mounted such that the electrical connection and indentation 'mark' are pointed in the direction of flow as shown in Figure 68.

If the flow sensor is to be mounted away from the unit, the sensor should be mounted on the wall of the outlet pipe of evaporator and condenser, or in a run of straight pipe that allows 5 to 10 pipe diameters prior to the sensor and 3 to 5 pipe diameters of straight pipe after the sensor. Flow switch is placed in outlet pipe to reflect flow leaving the barrel. If installation on the inlet pipe is necessary, contact Chiller Technical Response at TechResponse@DaikinApplied.com to review the jobsite details.

Figure 68: Mount in Direction of Flow

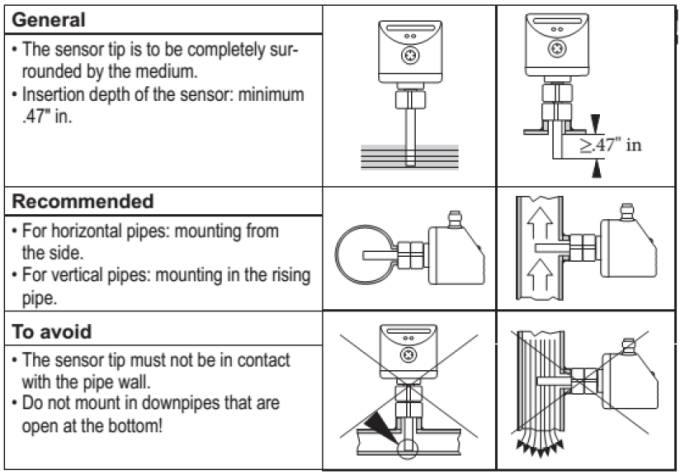


It is important that the flow switch be mounted so that the probe is sufficiently inserted into the fluid stream. Figure 69 illustrates the recommended orientation of the sensor. It may not be mounted directly on top or directly on the bottom of a horizontal pipe.

NOTICE

DO NOT alter or relocate factory installed flow switch. If issues exist, contact Chiller Technical Response at TechResponse@DaikinApplied.com.

Figure 69: Remote Mounting Guidelines for Flow Switch



If needed, the adapter is threaded into the pipe using pipe sealant appropriate for the application. The flow sensor is mounted onto the adapter using silicone grease. Carefully apply lubricant to the inside threads and O-ring so temperature probe does not become coated with lubricant. Torque the adapter/sensor connection to 18.5 ft/lbs.

Wiring

Refer to wiring diagram in the unit control panel.

Either AC or DC is used to power the flow switch. The unit controller's digital input is a DC signal which is supplied through the switch output of the flow switch for flow indication. It is required that the AC and DC commons of power be separated. Contact Chiller Technical Response for alternate wiring scenarios.

Flow Switch Setup

The flow switch comes from the factory set at a default velocity of 20 cm/s. This value is typically well below the minimum water flow specified for the unit evaporator and condenser so field adjustment is required for adequate low flow protection. Table 33 shows the calculated gallons per minute (gpm) for Schedule 40 steel pipe for various fluid velocities from 20 cm/s to 300 cm/s. The flow switch has an overall range of adjustment from 3 cm/s to 300 cm/s.

Step 1: Adjust flow through the evaporator to the minimum desired operating gpm. Maintain this flow throughout the setup procedure.

Step 2: Once steady state minimum desired operating flow is obtained, perform the 'Teach' function on the flow switch. The 'Teach' function is initiated by holding down the minus '-' button on the face of the flow switch for 15 seconds. During this 15 second period, LEDs '0' and '9' will be lit green. Once the 'Teach' function is completed, the outer LEDs will flash green as shown in Figure 70.

Figure 70: Automatic Teach of Setpoint

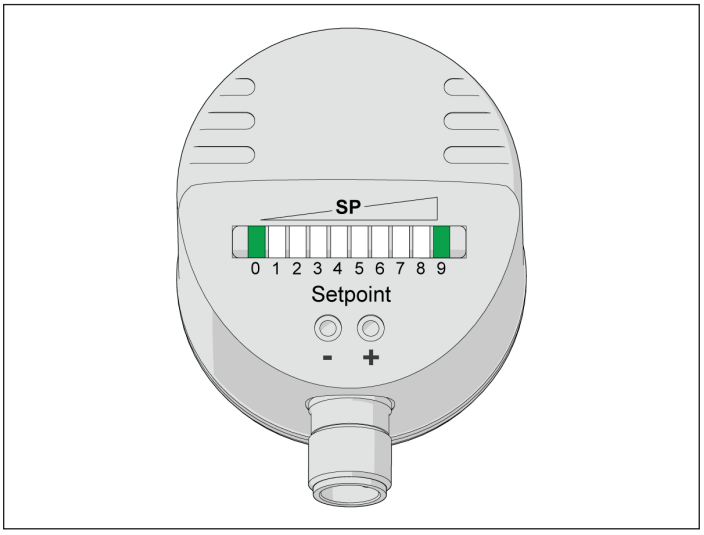
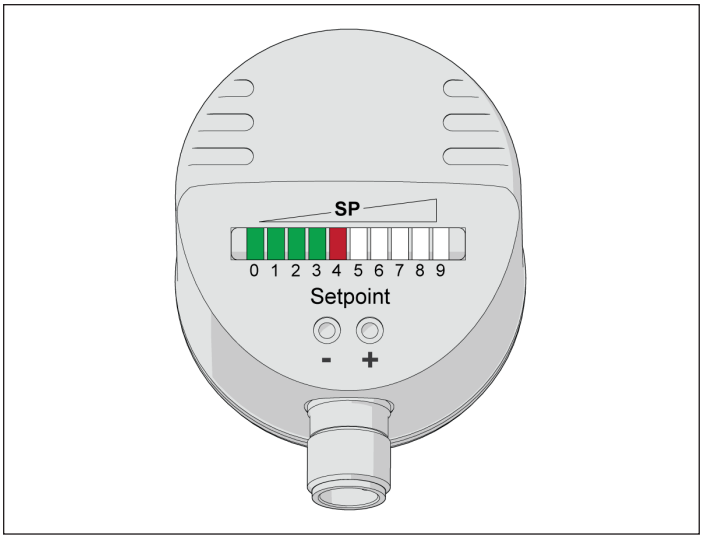


Table 33: Flow Volume Calculation

Pipe Size (inch)	Inside Pipe Diameter (inch)	US GPM at the velocities indicated below									GPM adjustment per '+' or '-' key input
		Default 20 cm/sec	30 cm/sec	50 cm/sec	75 cm/sec	100 cm/sec	150 cm/sec	200 cm/sec	250 cm/sec	300cm/sec	
2	2.06	6.86	10.3	17.2	25.7	34.3	51.5	68.6	85.8	102.9	1.72
2.5	2.46	9.79	14.7	24.5	36.7	49.0	73.4	97.9	122.4	146.9	2.42
3	3.07	15.1	22.7	37.8	56.7	75.6	113.4	151.2	189.0	226.8	3.78
3.5	3.55	20.2	30.3	50.6	75.8	101.1	151.7	202.2	252.8	303.3	5.06
4	4.03	26.0	39.1	65.1	97.7	130.2	195.3	260.4	325.5	390.5	6.51
5	5.05	40.9	61.4	102.3	153.5	204.6	306.9	409.2	511.5	613.7	10.2
6	6.07	59.1	88.6	147.7	221.6	295.5	443.2	590.9	738.7	886.3	14.8
8	7.98	102.3	153.5	255.8	383.7	511.6	767.5	1023.3	1279.1	1534.7	25.6
10	10.02	161.3	241.9	403.2	604.8	806.5	1209.7	1612.9	2016.2	2419.1	39.0
12	11.94	229.0	343.4	572.4	858.6	1144.7	1717.1	2289.5	2861.9	3433.8	57.2
14	13.13	276.8	415.2	692.0	1037.9	1383.9	2075.9	2767.8	3459.8	4151.3	69.2
16	15.00	361.5	542.2	903.6	1355.5	1807.3	2710.9	3614.6	4518.2	5421.2	90.4
18	16.88	457.5	686.3	1143.8	1715.7	2287.6	3431.4	4575.2	5719.0	6862.1	114.4
20	18.81	572.4	853.0	1421.6	2132.4	2843.2	4264.8	5686.4	7108.0	8528.6	142.2

Step 3: After the 'Teach' function is completed and the outer LEDs have flashed, the flow switch will indicate a new setpoint based upon the current flow which should still be at the steady state minimum desired operating flow. Figure 71 shows a typical display for this condition. All LEDs to the left of the SP LED are lit green. The SP LED is lit RED (or may toggle amber) which indicates that the flow switch is OPEN. Typically, an increase in fluid flow between 15% to 30% above the 'Teach' function flow is required for the SP LED to turn AMBER and the flow switch to CLOSE indicating acceptable flow.

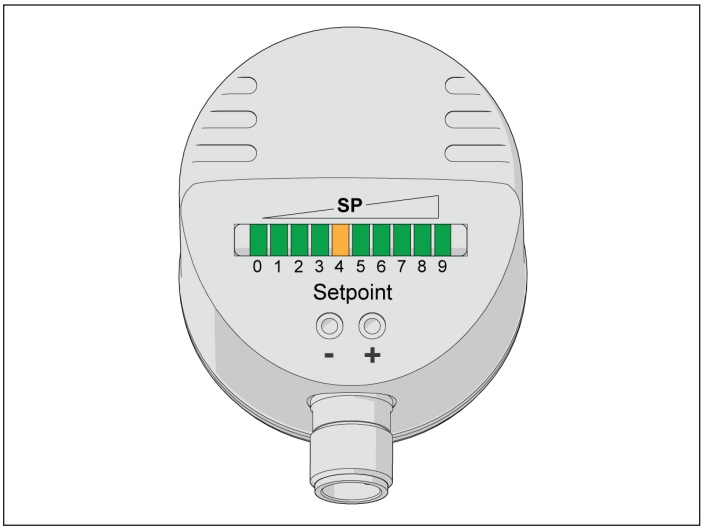
Figure 71: Teach Adjustment Complete



In Step 3, the 'Teach' function re-adjusted the flow switch SP while flow was at the minimum desired operating flow. The chiller will not operate at this flow because the flow switch is OPEN after performing the 'Teach' function. The benefit of the 'Teach' function is to quickly set the setpoint within the desired operating range. Additional 'manual' adjustment of setpoint is required in order to allow for chiller operation at this minimum flow. The '+' and '-' buttons on the face of the flow switch allow for the manual adjustment of the SP. Pressing the '+' button reduces the flow setpoint while pressing the '-' button increases the flow setpoint. Each button press, '+' or '-', changes the flow setpoint by 2.5 cm/s.

Step 4: Press the '+' button until LED '9' begins to flash. Opening of flow switch should now occur at approximately 80% to 90% of minimum flow.

Figure 72: Upper Range of Minimum Flow



Step 5: Once the SP is set, it is recommended that the sensor be locked to avoid inadvertent readjustment. This can be performed by pressing both the '+' and '-' buttons simultaneously for 10 seconds. The indication goes out momentarily indicating the unit is locked. To unlock, the same procedure is performed to toggle to unlocked.

NOTE: 1. The LED window display on flow switch represents a velocity range of 50 cm/s. The window centers on the SP. For example, if the SP was set to 200 cm/s, then the LED labeled '0' would represent a velocity of 180 cm/s when lit and the LED labeled 9 would represent a velocity of 230 cm/s when lit.

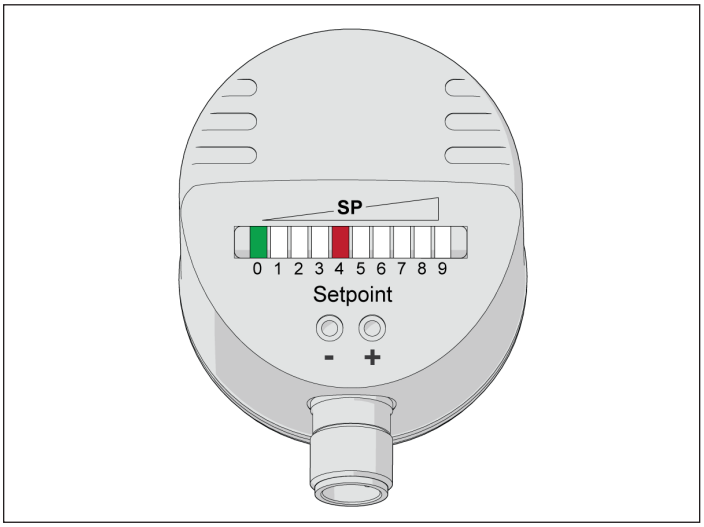
2. Each LED represents 5 cm/s, or two presses of the '+' or '-' buttons.

3. When power is initially applied to the flow switch, all green LEDs light and go out step by step. During this time, the output is closed. The unit is in the operating mode.

4. When making manual adjustments to the SP, if no button is pressed for two seconds, the unit returns to the operating mode with the newly set value.

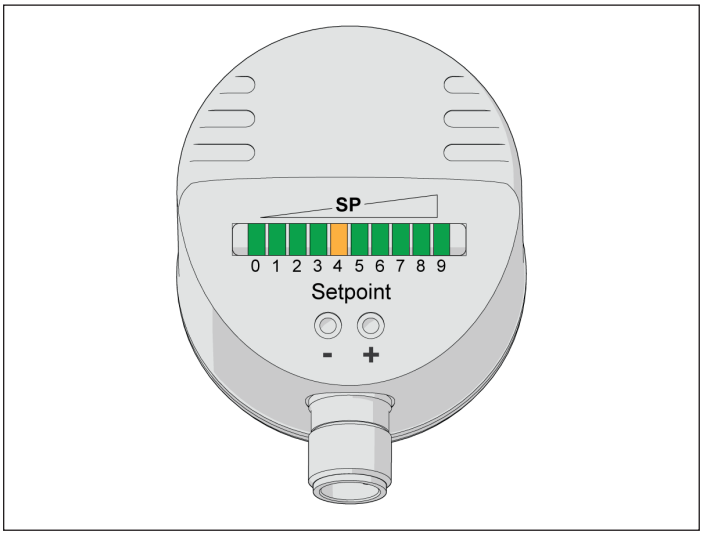
Flow below display range: The SP LED will be lit red and the leftmost LED will be flashing green. For example, if the SP was set to 200 cm/s, the flashing labeled '0' would indicate that the flow was below 180 cm/s. This would be shown if no flow through chiller or lowered than desired flow.

Figure 73: Display for Flow Below Range



Flow above display range: The SP LED will be lit amber, all LEDs to the left and right of the SP LED will be green with the rightmost LED flashing green. For example, if the SP was set to 200 cm/s, the flashing LED labeled '9' would indicate that the flow was above 230 cm/s. This may be a normal display depending on range by which flow varies through chiller.

Figure 74: Display for Flow Above Range



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, personal injury, or death.

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.

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.

Seasonal Shutdown

⚠ CAUTION

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

Table 34: 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			
D. Perform moisture-prevention measures per compressor service manual				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 unit controller 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

Appendix

Pre-start Checklist

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 requirement				
Flow switch installed, wired, and calibrated				
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 requirement				
Flow switch installed, wired, and calibrated				
Electrical	**Yes**	**No**	**N/A**	**Initials**
All interlock wiring complete and compliant with Daikin Applied specifications				
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**
Relief valve piping complete (per local codes)				
Thermometers, wells, gauges, control, etc., installed				
Minimum system load of 80% capacity available for testing/adjusting controls				
SiteLine™ cloud-connected controls included and needs to be commissioned				
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. 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.
3. Refer to NEC Article 430-22 (a)

Contractor Representative

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

Daikin Applied Sales Representative

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

Limited Product Warranty

WARRANTY

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

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

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

EXCLUSIONS

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

SOLE REMEDY AND LIMITATION OF LIABILITY

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

ASSISTANCE

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

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