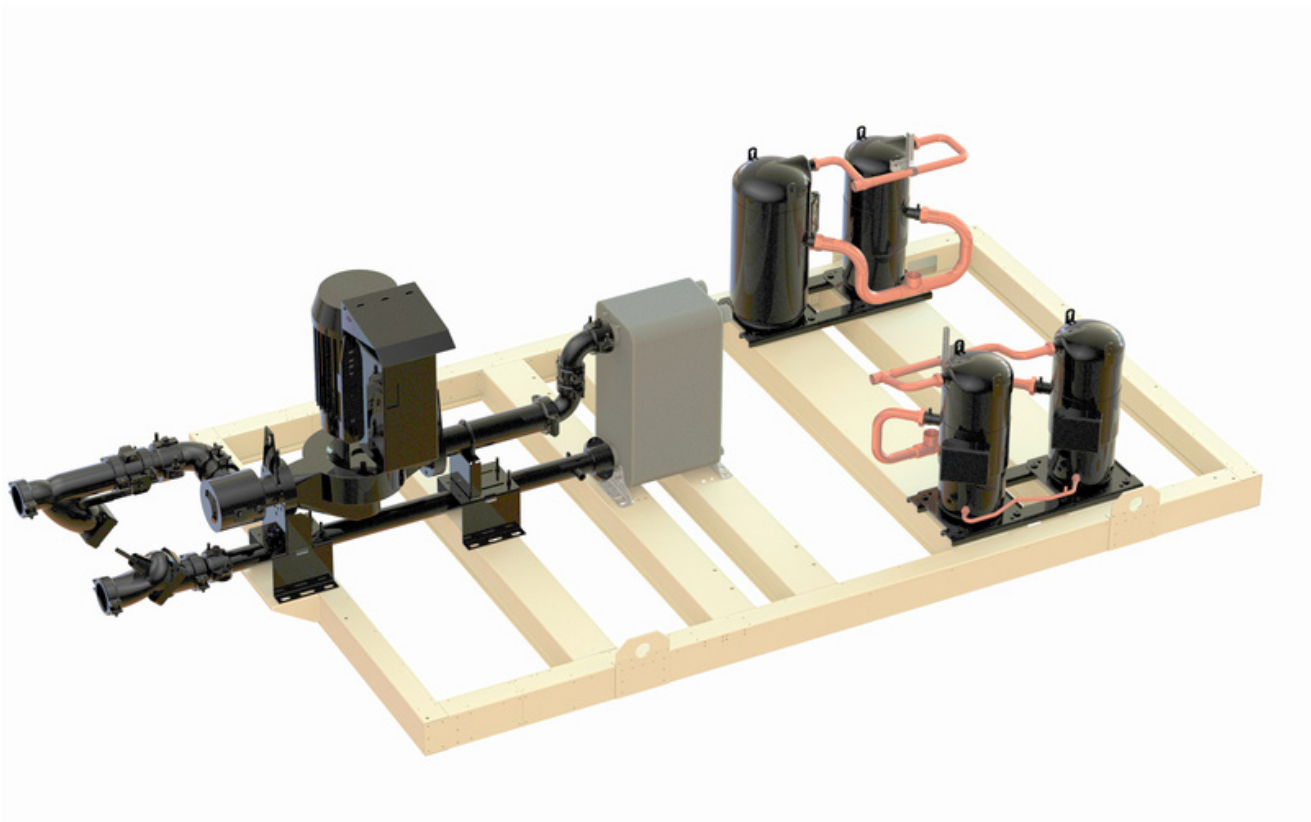
Installation, Operation and Maintenance Manual

IOM 1207-8

Group: **Chiller**
Part Number: **IOM1207-8**
Date: **February 2022**

Trailblazer®
Air-Cooled Scroll Chillers with Pump Package and Remote Evaporator Options

Model AGZ, E Vintage
30 to 241 Tons (100 to 840 kW)
HFC-410A Refrigerant
50/60 Hz



Manufactured in an ISO 9001 & ISO 14001 certified facility

AHRI CERTIFIED® www.ahridirectory.org Air-Cooled Water Chilling Packages AHRI Standards 550/590 and 551/591

Remote Evaporator option is outside the scope and Heat Recovery option is not optionally certified within AHRI ACCL Certification Program.

LONMARK 3.4

C ETL LISTED US Intertek

BACnet International

Pre-Start Checklist – Scroll Compressor Chillers

Must be completed, signed, and provided to Daikin Applied 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 and Condenser Water for Water-cooled Chiller	Yes	No	N/A	Initials
Piping Complete				
Water strainer(s) installed in piping per manual requirements				
Water System – flushed, filled, and vented; Water treatment in place				
Cooling tower flushed, filled, vented; Water treatment in place (if applicable)				
Pumps installed and operational (rotation checked, strainers cleaned)				
Controls operational (3-way valves, face/bypass dampers, bypass valves, etc.)				
Water system operated and tested; flow meets unit design requirements				
Flow switch(es) - installed, wired, and calibrated				
Vent installed on evaporator				
Glycol at design % (if applicable)				
Electrical	**Yes**	**No**	**N/A**	**Initials**
Building controls operational				
*Power leads connected to power block or optional disconnect				
Power leads have been checked for proper phasing and voltage				
All interlock wiring complete and compliant with Daikin specifications				
Power applied at least 12 hours before startup				
Oil heaters energized at least 12 hours before startup				
Chiller components (EXV Sensors Transducers) installed and wired properly.				
*Wiring complies with National Electrical Code and local codes (See Notes)				
Remote EXV wired with shielded cable				
Miscellaneous	**Yes**	**No**	**N/A**	**Initials**
Unit control switches all off				
Remote Evaporator / Condenser Piping factory reviewed				
All refrigerant components/piping leak tested, evacuated and charged				
Thermometers, wells, gauges, control, etc., installed				
Minimum system load of 80% capacity available for testing/adjusting controls				
Document Attached: Technical Breakdown from Selection Software				
Document Attached: Final Order Acknowledgement				
Document Attached: Remote piping approval				

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 sales representative*. State size, number and type of conductors and conduits installed:
   a. From Power supply to chiller _____

* Refer to NFPA 70-2017, Article 440.35

2. Remote Evaporator piping incomplete or incorrect. Provide approved piping diagrams.
3. Items on this list incorrectly acknowledged resulting in delayed start and possible extra expenses incurred by return trips.

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Contractor Representative

Signed: _____

Name: _____

Company: _____

Date: _____

Phone/Email: _____

Daikin Applied Sales Representative

Signed: _____

Name: _____

Company: _____

Date: _____

Phone/Email: _____

FOR PUMP PACKAGE UNITS ONLY

ARMSTRONG

FILE NO.:	TBA
DATE:	Apr 25, 2013
SUPERSEDES:	Sep 28, 2012
DATE:	N/A

IVS Sensorless Pump Commissioning Check Sheet

Project Name:			
Building Address:			
Contractor Name:			
Site Contact Name:		Site Contact Tel. #:	
Your Company:		Your Name:	
Pump Model:		Pump Tag #:	
Pump Serial #:		Sales Order #:	

NOTE:

For independent sensorless operation, go to Section 1.
For independent external sensor operation, go to Section 2.
For external controller, go to Section 3.

Section 1 - SENSORLESS Startup Procedure:

☐	1. Open up and bleed pump seal flush line to verify no air has travelled into seal / seal lines
☐	2. Change parameter 0-20 (default value is option 1601 – "Reference [Unit]") to option 1850 "Sensorless Readout" to display Sensorless flow readout on the top left corner of screen
☐	3. Change parameter 0-22 (default value is option 1610 – "Power [kW]") to option 1654 "Feedback 1 [Unit]" to display Sensorless pressure readout on the top right corner of screen
☐	4. Open the discharge valve and set the pump to the design duty speed and record the VFD Sensorless pressure and flow readout (include units). This is what the actual system flow and head are. SENSORLESS PRESSURE = SENSORLESS FLOW =
☐	5. Ramp the pump up or down to achieve the design flow. Record the VFD sensorless flow and pressure – this will be your new setpoint. SENSORLESS PRESSURE = SENSORLESS FLOW =
☐	6. Set parameter 20-21 to the Sensorless Pressure readout taken in previous step 7. Set parameter 22-89 to the Sensorless Flow readout taken in previous step
☐	8. Set parameter 22-87 to a value that is 40% of the value in 20-21. You have now readjusted the quadratic control curve to match actual site conditions.
☐	9. Change parameter 0-20 back to the default value of option 1601 – "Reference [Unit]"
☐	10. Change parameter 0-22 back to the default value of option 1610 – "Power [kW]"
☐	11. Put the VFD into AUTO mode. The pump will ramp up to get to the setpoint pressure and as the demand in the system decreases, the setpoint will also decrease to ride the control curve down to the minimum pressure set in parameter 22-87. As demand increases, it will ride back up the control curve to full design setpoint.

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Section 2- EXTERNAL SENSOR Startup Procedure:

NOTE: Sensor signal wire must be connected to analog input terminal 54

☐	1. Open up and bleed pump seal flush line to verify no air has travelled into seal / seal lines
☐	2a. If your sensor provides a voltage (V) signal, go to step 3. 2b. If your sensor provides a milliamp (mA) signal, make sure switch S202 for A54 (located behind the keypad) is pushed to the ON position (to the right) and go to step 5.
☐	3. Change parameter 6-20 to match the low end of voltage signal from the sensor (eg: if your sensor provides a 0-10V signal, enter 0). Go to step 4.
☐	4. Change parameter 6-21 to match the high end of voltage signal from the sensor (eg: if your sensor provides a 0-10V signal, enter 10). Go to step 7.
☐	5. Change parameter 6-22 to match the high end of current signal from the sensor (eg: if your sensor provides a 4-20mA signal, enter 4). Go to step 6.

☐	6. Change parameter 6-23 to match the high end of current signal from the sensor (eg: if your sensor provides a 4-20mA signal, enter 20). Go to step 7.
☐	7. Change parameter 20-00 (default value is option 105 – “Sensorless Pressure”) to option 2 “Analog input 54” to make drive look at sensor reading for feedback value
☐	8. Change parameter 20-12 to the unit that matches your sensor measurement units (eg: if you have a pressure sensor, it will be in units of pressure like psi)
☐	9. Change parameter 20-13 to the value that matches the bottom end of your sensor measurement scale (eg: if your pressure sensor measures from 2-100psi, you enter a value of 2)
☐	10. Change parameter 20-14 to the value that matches the high end of your sensor measurement scale (eg: if your pressure sensor measures from 2-100psi, you enter a value of 100)
☐	11. Set parameter 20-21 the setpoint you want the pump to maintain
☐	12. Change parameter 22-80 (default value is 1 “Enabled”) to option 0 “Disabled”
☐	13. Put the VFD into AUTO mode – it will now display the sensor reading in the center of the screen and the target setpoint on the top left of the screen. It will ramp up / down to meet the setpoint based on the sensor reading.

Section 3 – EXTERNAL CONTROLLER (BAS) Startup Procedure:

NOTE: Speed signal wire must be connected to analog input terminal 53

☐	1. Open up and bleed pump seal flush line to verify no air has travelled into seal / seal lines
☐	2. Change parameter 0-20 to option 1602 “Reference %” to show the percent speed signal on top left corner
☐	3. Change parameter 1-00 to option 0 “Open Loop” (drive will ‘listen’ for external speed reference)
☐	4. Change parameter 3-02 to “0” (this is the minimum speed signal)
☐	5. Change parameter 3-03 to “60” (this is the maximum speed signal)
☐	6. Change parameter 3-15 to option 1 “Analog Input 53”
☐	7. Put the VFD into AUTO mode – the VFD will now ramp up / down based on the analog speed signal it receives on terminal 53. You can check what the drive is seeing on the input by going to parameter 16-62.

This manual covers information specific to Daikin Trailblazer® air-cooled water chillers with the optional remote evaporator and pump package options using Microchannel coils. Information for air-cooled scroll compressor packaged chillers without either of these options can be found at www.DaikinApplied.com.

NOTE: 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 Chiller. Failure to follow this warning exactly can result in serious injury or death. 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® III control panel must be performed only by personnel that are knowledgeable in the operation of the equipment being controlled.

⚠ CAUTION

Static sensitive components. A static discharge while handling electronic circuit boards can cause damage to the components. Use a static strap while performing any service work. Never unplug any cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

⚠ CAUTION

When moving refrigerant to/from the chiller using an auxiliary tank, a grounding strap must be used. An electrical charge builds when halo-carbon refrigerant travels in a rubber hose. A grounding strap must be used between the auxiliary refrigerant tank and the chiller's grounded base (earth ground), which will safely take the charge to the ground. Damage to sensitive electronic components could occur if this procedure is not followed.

⚠ WARNING

Escaping refrigerant can displace air and cause suffocation. Immediately evacuate and ventilate the equipment area. If the unit is damaged, follow Environmental Protection Agency (EPA) requirements. Do not expose sparks, arcing equipment, open flame or other ignition source to the refrigerant.

⚠ WARNING

Polyolester Oil, commonly known as POE oil is a synthetic oil used in many refrigeration systems, and may be present in this Daikin 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.

HAZARD IDENTIFICATION INFORMATION

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

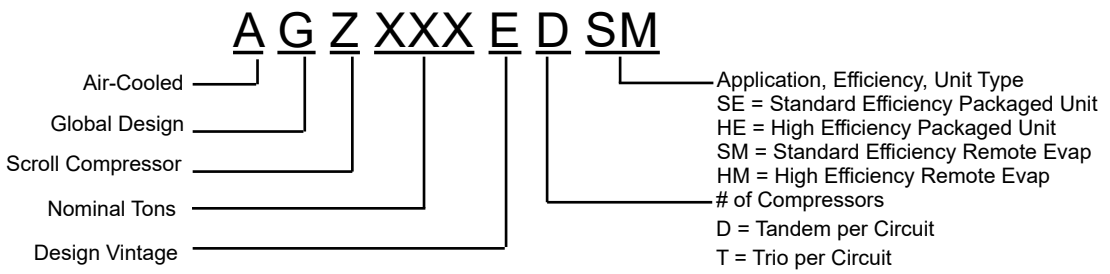
NOTE: Indicates important details or clarifying statements for information presented.

General Description

Daikin Trailblazer® air-cooled water chillers are complete, self-contained, automatic chillers designed for outdoor installation. Packaged units with pump option are completely assembled, factory wired, charged, and tested. The electrical control center includes all equipment protection and operating controls necessary for dependable automatic operation. Components housed in a centrally located, weather resistant control panel with hinged and tool-locked doors.

Trailblazer® units with the remote evaporator option will be shipped as two components, the outdoor condensing unit and the indoor evaporator on a separate skid.

NOMENCLATURE



Operating and Standby Limits

Table 1: Operating Limits for AGZ-E Chillers

Maximum standby ambient temperature	130°F (54°C)
Maximum operating standard ambient temperature	105°F (41°C)
-with optional high ambient package (see information under High Ambient Operation)	125°F (52°C)
Minimum operating ambient temperature (standard control)	32°F (0°C)
Minimum operating ambient temperature (with optional low-ambient control)	-10°F (-23°C)
Leaving chilled water temperature	40°F to 65°F (4°C to 18°C)
Leaving chilled fluid temperatures (with anti-freeze) - Note that in cases of high ambient temperature, the lowest leaving water temperature settings may be outside of the chiller operating envelope; consult Daikin Tools to ensure chiller is capable of the required lift.	15°F to 65°F (-9°C to 18°C)
Operating chilled water delta-T range	6°F to 16°F (3.3°C to 8.9°C)
Maximum evaporator operating inlet fluid temperature	81°F (27°C)
Maximum evaporator non-operating inlet fluid temperature	100°F (38°C)

Nameplates

Identification nameplates on the chiller:

- The unit nameplate is located on the exterior of the Unit Power 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.
- Evaporator data plate is under insulation and contains the serial number.
- Compressor nameplate is located on each compressor and gives pertinent electrical information.

⚠ WARNING

Installation is to be performed by qualified personnel who are familiar with local codes and regulations.

⚠ 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.

Inspection

Check all items carefully against the bill of lading. Inspect all units for damage upon arrival. Report shipping damage and file a claim with the carrier. Check the unit nameplate before unloading, making certain it agrees with the power supply available. Daikin Applied is not responsible for physical damage after the unit leaves the factory.

Handling

Be careful to avoid rough handling of the unit. Do not push or pull the unit from anything other than the base while sitting on appropriately-sized roller dollies.

To lift the unit, 2-1/2” (64mm) diameter lifting eyes are provided on the base of the unit. Arrange spreader bars and cables to prevent damage to condenser coils or cabinet (see Figure 1).

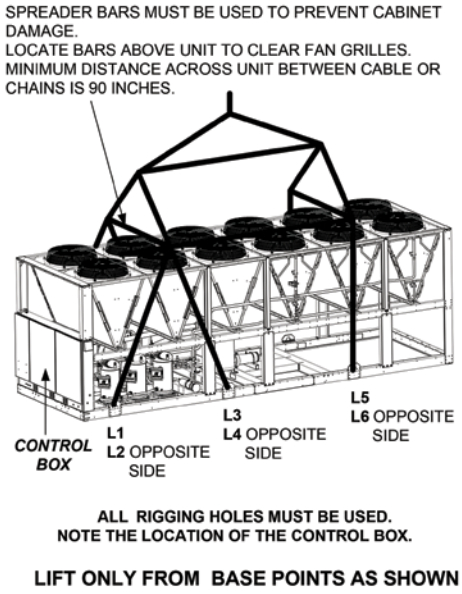
⚠ CAUTION

All lifting locations must be used to prevent damage to unit.

⚠ DANGER

Improper rigging, lifting or moving of a unit can result in property damage, severe personal injury or death. Follow rigging and moving instructions carefully. Do not stand beneath the unit while it is being lifted or installed.

Figure 1: Required Lifting Arrangement



NOTE: Number of fans and rigging holes may vary from this diagram. The lifting method will remain the same.

Unit Placement

Trailblazer® units - both packaged units with pump packages and condensing units for remote evaporator configurations - are for outdoor applications and can be mounted either on a roof or at ground level. For roof mounted applications, install the unit on a steel channel or I-beam frame to support the unit above the roof. For ground level applications, install the unit on a substantial base that will not settle. Use a one-piece concrete slab with footings extended below the frost line. Be sure the foundation is level within 0.5” (13 mm) over its length and width. The foundation must be strong enough to support the unit weight - see Dimensional Drawings for Remote Evaporator Units beginning on page 29 or see Dimensional Drawings for Pump Package Units beginning on page 45.

Mounting Hole Access

The inside of the base rail is open to allow access for securing mounting bolts, etc. Mounting location dimensions are given in Dimensional Drawings beginning on page 29 for remote evaporator units or page 45 for pump package units.

All compressor bolts, rubber grommets, and fasteners should be left in place on the base plate as shown in Figure 2. None of these fasteners are considered to be ‘temporary shipping bolts.’

Figure 2: Compresssor Base Plate Mounting

Operational Spacing Requirements

Sufficient clearance must be maintained between the unit and adjacent walls or other units to allow the required unit air flow to reach the coils. Failure to do so will result in a capacity reduction and an increase in power consumption. No solid obstructions are allowed above the unit at any height, see page 12 for details.

The clearance requirements shown are a general guideline and cannot account for all scenarios. Such factors as prevailing winds, additional equipment within the space, design outdoor air temperature, and numerous other factors may require more clearance than what is shown. Additional clearances may be required under certain circumstances.

Graphs on the following pages give the minimum clearance for different types of installations and also capacity reduction and power increase if closer spacing is used. The graphs are based on individual cases and should not be combined with other scenarios.

⚠ CAUTION

Unit performance may be impacted if the operational clearance is not sufficient.

Service Clearance

The control panels are located on the end of the chiller and require a minimum of four feet of clearance in front of the panels. Compressors, filter-driers, and liquid line shutoff valves are accessible on each side or end of the unit. Do not block access to the sides or ends of the unit with piping or conduit. These areas must be open for service access. Minimum service clearance is as follows:

Sides

- **4 Fan Models:** Minimum of 4 feet (1.2 meters)
- **6 to 14 Fan Models:** It is highly recommended to provide a minimum of 8 feet (2.4 meters) on one side to allow for coil replacement. Coils can be removed from

the top, allowing a minimum of 4 feet (1.2 meters) of side clearance; however, the unit performance may be derated.

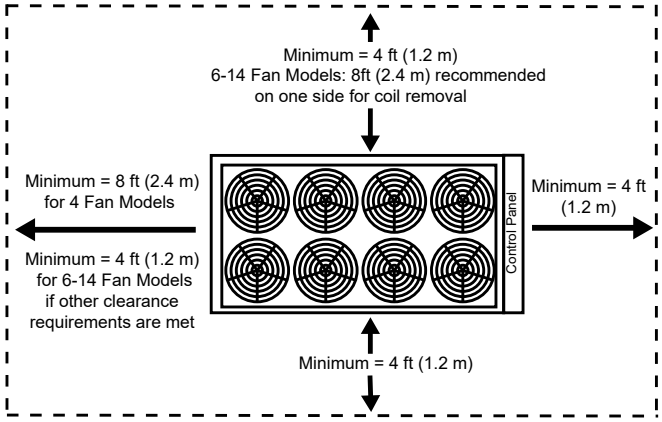
Control Panel End

- **All Models:** Minimum of 4 feet (1.2 meters)

Opposite Control Panel End

- **4 Fan Models:** Minimum of 8 feet (2.4 meters) for coil removal.
- **6 to 14 Fan Models:** Minimum of 8 feet (2.4 meters). Clearance may be reduced to 4 feet (1.2 meters) if side clearance is sufficient for evaporator service and removal.

Figure 3: Service Clearance



Case 1: Building or Wall on One Side of Unit

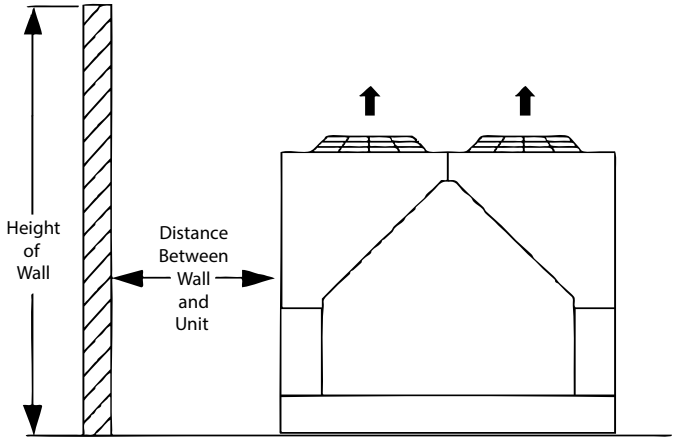
NOTE: Assumes a solid height wall taller than unit. Refer to Case 4 for partial wall openings.

For models AGZ030-101E, maintain a 4 feet minimum from a wall of any height.

For models AGZ110-130E, maintain a 6 feet minimum from a wall of any height.

For models AGZ140-241E, maintain a 8 feet minimum from a wall of any height.

Figure 4: Building or Wall on One Side of Unit



Case 2: Two Units, Side-by-Side

For models 030-180, there must be a minimum of 4 feet between two units placed side-by-side; however, performance may be affected at this distance. For models 191-241, the minimum is 6 feet as closing spacing may cause air recirculation and elevated condenser pressure. Assuming the requirement of one side having at least 8 feet of service clearance is met, Case 2 figures show performance adjustments as the distance between two units increases.

Figure 5: Two Units, Side-by-Side

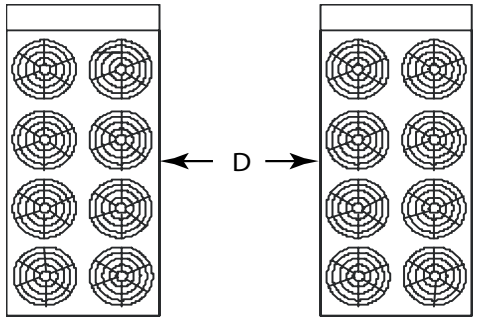


Figure 6: Case 2 - Full Load Capacity Reduction

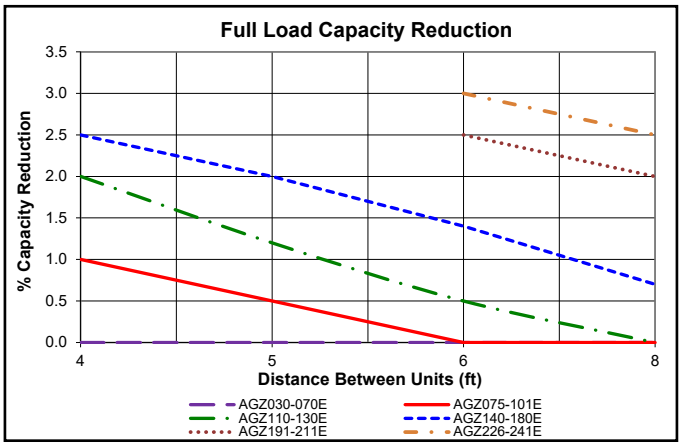
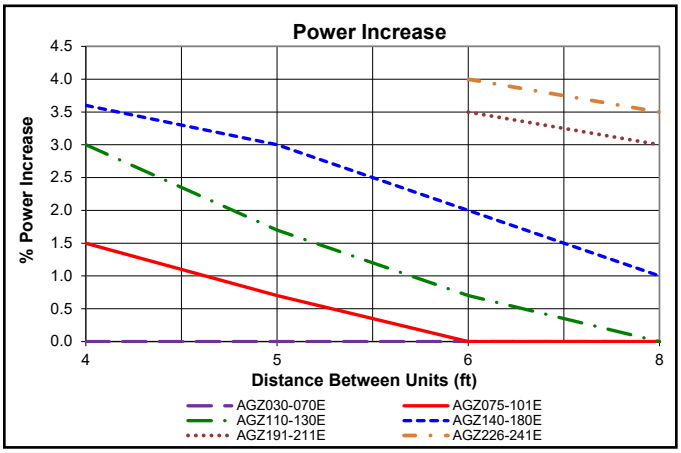


Figure 7: Case 2 - Power Increase



Case 3: Three or More Units, Side-by-Side

For all models, there must be a minimum distance between any units placed side-by-side; however, performance may be affected at this distance. Minimum distances are: models 030 to 070 - 4 feet, models 075 to 101 - 5 feet, models 110 to 241 - 6 feet. Figure 9 and Figure 10 depict Case 3 performance adjustments as the distance between units increases.

NOTE: Data in Figure 9 and Figure 10 is for the middle unit with a unit on each side. See Case 2 adjustment factors for the two outside units.

Figure 8: Three or More Units, Side-by-Side

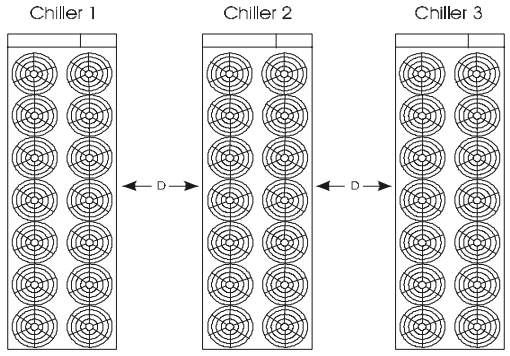


Figure 9: Case 3 - Full Load Capacity Reduction

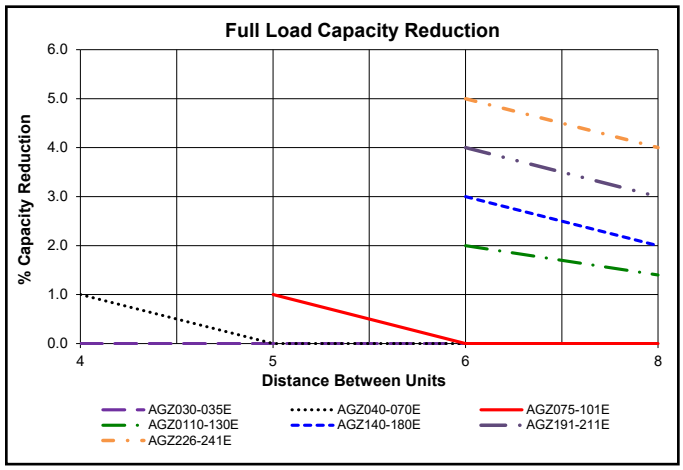
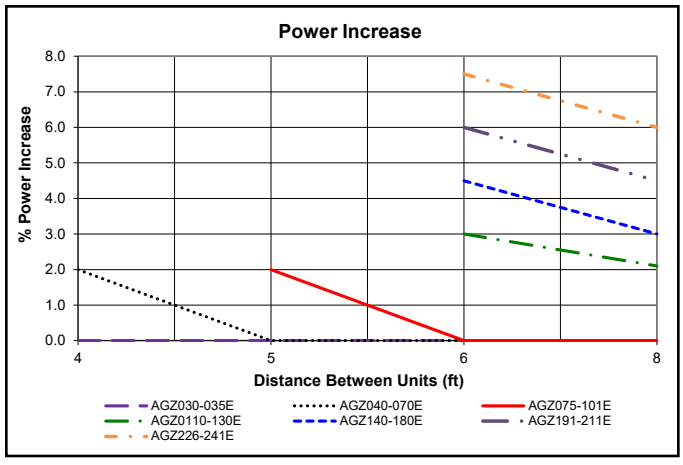


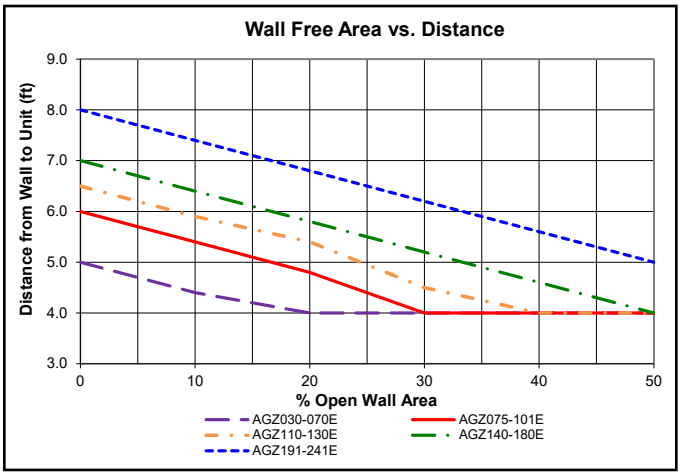
Figure 10: Case 3 - Power Increase



Case 4: Open Screening Walls

Decorative screening walls are often used to help conceal a unit either on grade or on a rooftop. When possible, design these walls such that the combination of their open area and distance from the unit (see Figure 11) do not require performance adjustment. If the wall opening percentage is less than recommended for the distance to the unit, it should be considered as a solid wall. It is assumed that the wall height is equal to or less than the unit height when mounted on its base support. If the wall height is greater than the unit height, see Case 5: Pit Installation for performance adjustment factors. The distance from the sides of the unit to the side walls must be sufficient for service, such as opening control panel doors. For uneven wall spacing, the distance from the unit to each wall can be averaged providing no distance is less than 4 feet. Values are based on walls on all four sides.

Figure 11: Case 4 - Allowable Wall Open Area



Case 5: Pit Installation

Pit installations can cause operating problems resulting from air recirculation and restriction and require care that sufficient air clearance is provided, safety requirements are met and service access is provided. A solid wall surrounding a unit is substantially a pit and this data should be used.

Steel grating is sometimes used to cover a pit to prevent accidental falls or trips into the pit. The grating material and installation design must be strong enough to prevent such accidents, yet provide abundant open area to avoid recirculation problems. Have any pit installation reviewed by the Daikin Applied sales representative prior to installation to ensure it has sufficient air-flow characteristics and approved by the installation design engineer to avoid risk of accident.

Models AGZ030-070E:

The Case 5 figures for models AGZ030-070E show adjustment factors for pit/wall heights of 4 feet, 5 feet, and 6 feet.

Figure 12: Case 5 - Full Load Capacity Reduction (AGZ030E-070E)

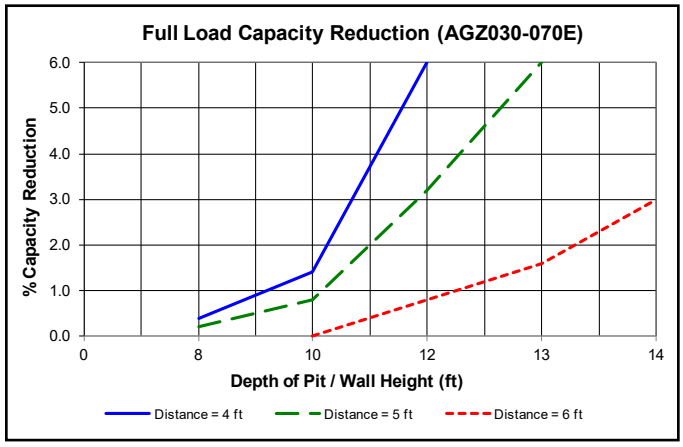


Figure 13: Case 5 - Power Increase (AGZ030-070E)

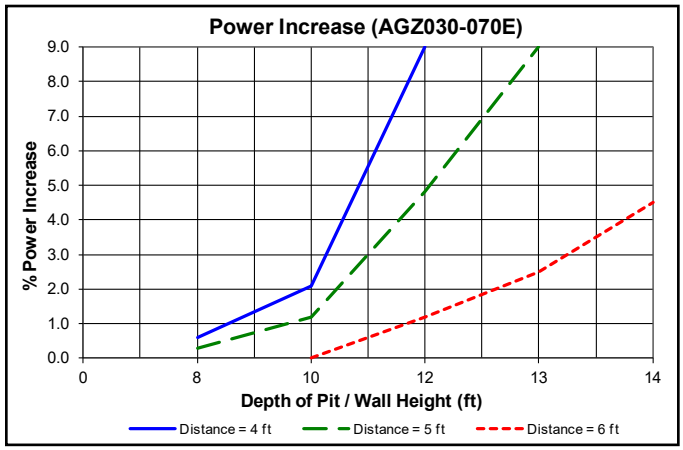
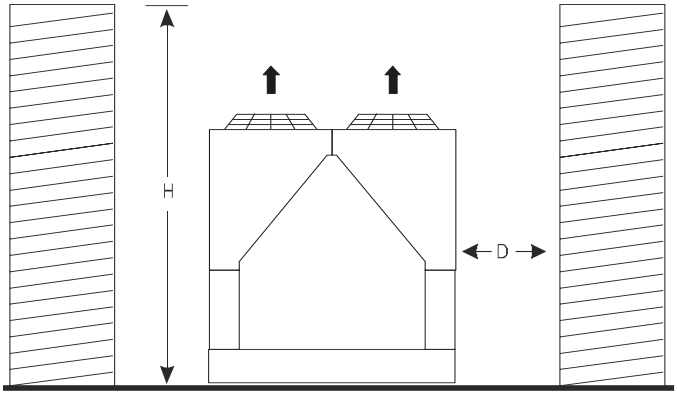


Figure 14: Case 5 - Pit Installation



Models AGZ075-130E:

The Case 5 figures for models AGZ075-130E show adjustment factors for pit/wall heights of 5 feet, 6 feet, and 8 feet.

Figure 15: Case 5 - Full Load Capacity Reduction (AGZ075-130E)

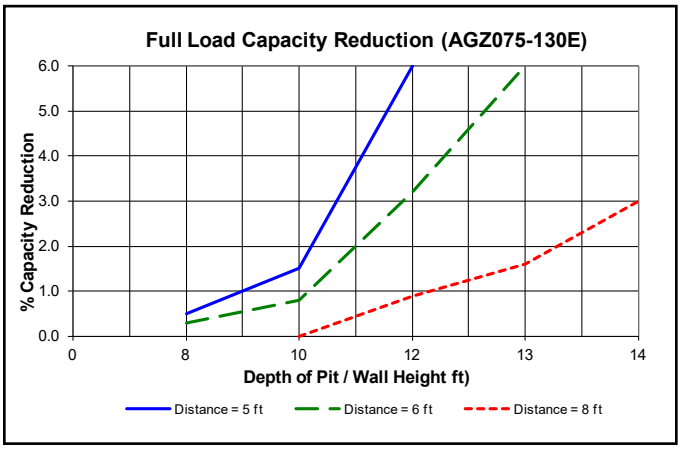
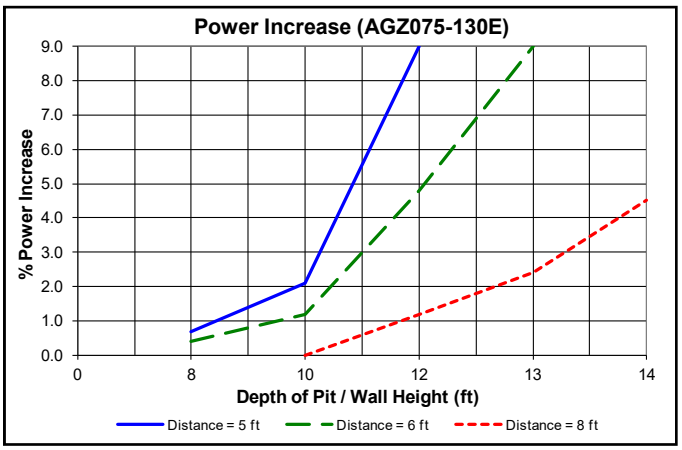


Figure 16: Case 5 - Power Increase (AGZ075-130E)



Models AGZ140-241E:

The Case 5 figures for models AGZ140-241E show adjustment factors for pit/wall heights of 6 feet, 8 feet, and 10 feet.

Figure 17: Case 5 - Full Load Capacity Reduction (AGZ140-180E)

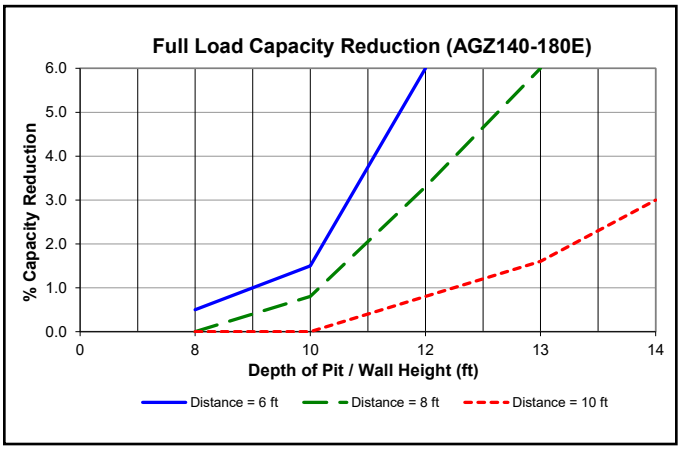


Figure 18: Case 5 - Full Load Capacity Reduction (AGZ191-241E)

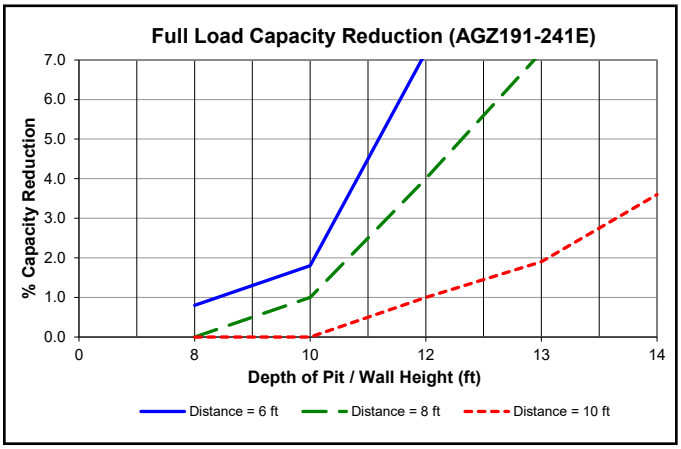


Figure 19: Case 5 - Power Increase (AGZ140-211E)

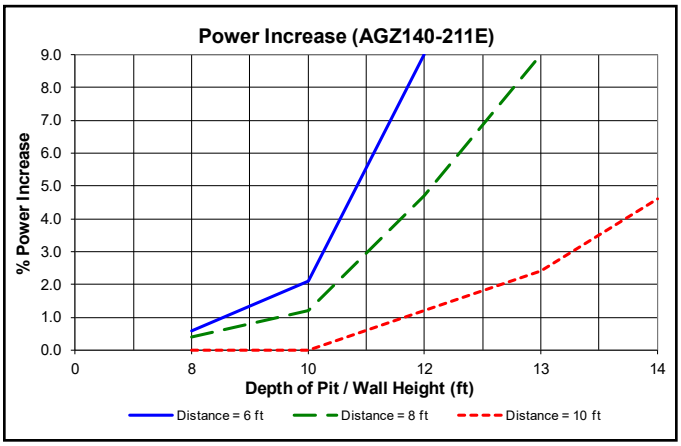
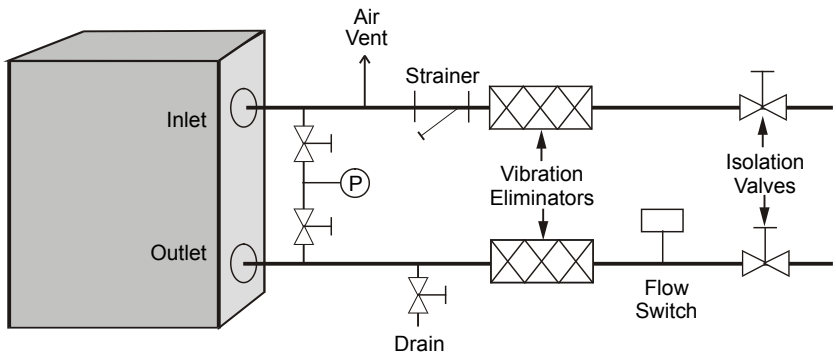


Figure 20: Case 5 - Power Increase (AGZ226-241E)

Figure 21: Typical Piping, Brazed-Plate Evaporator



Chilled Water Piping

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

⚠ WARNING

Polyolester Oil, commonly known as POE oil is a synthetic oil used in many refrigeration systems, and is present in this Daikin 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

To prevent damage to the evaporator and potential chiller failure, a supply strainer is required in the inlet water piping which connects to this evaporator. This strainer must be installed prior to operation of the chilled liquid pumps.

Field installed water piping to the chiller **must** include:

- A cleanable strainer installed at the water inlet to the evaporator to remove debris and impurities before they reach the evaporator. Install cleanable strainer within 5 feet (1500 mm) of pipe length from the evaporator inlet connection and downstream of any welded connections (no welded connections between strainer and evaporator).
- AGZ-E models 030-241 require a strainer with perforations no larger than 0.063" (1.6 mm) diameter. See the "Inlet Strainer Guidelines" for more information.
- A water flow switch must be installed in the horizontal piping of the supply (evaporator outlet) water line to avoid evaporator freeze-up under low or no flow conditions. The flow switch may be ordered as a factory-installed option, a field-installed kit, or may be supplied and installed in the field. See page 16 for more information.

  NOTE: Units with the optional pump package include the strainer and flow switch. See page 42 for pump package components.
- Piping for units with brazed-plate evaporators must have a drain and vent connection provided in the bottom of the lower connection pipe and to the top of the upper connection pipe respectively, see Figure 21. These evaporators do not have drain or vent connections due to their construction. Purge air from the water system before unit start-up to provide adequate flow through the evaporator.
- Adequate piping support, independent from the unit, to eliminate weight and strain on the fittings and connections.

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

- Thermometers at the inlet and outlet connections of the evaporator.
- Water pressure gauge connection taps and gauges at the inlet and outlet connections of the evaporator for measuring water pressure drop.
- Shutoff valves are necessary to isolate the unit from the piping during unit servicing.
- Minimum bends and changes in elevation to minimize pressure drop.
- An expansion tank or regulating and relief valve to maintain adequate water pressure
- Vibration eliminators in both the supply and return water lines to reduce transmissions to the building.
- Flush the system water piping thoroughly before making connections to the unit evaporator.
- Piping insulation, including a vapor barrier, helps prevent condensation and reduces heat loss.
- Regular water analysis and chemical water treatment for the evaporator loop is recommended immediately at equipment start-up.

NOTE: Failure to follow these measures may result in performance and reliability issues.

Inlet Strainer Guidelines

An inlet water strainer kit must be installed in the chilled water piping before the evaporator inlet. Several paths are available to meet this requirement:

1. All units with the pump package option include a strainer shipped loose for field mounting. Refer to Figure 21 on page 14
2. For remote evaporators - a field-installed kit shipped-loose with the unit is available for all unit sizes and consists of:
   - Y-type area strainer with 304 stainless steel perforated basket with perforations no larger than 0.063" (1.6 mm) diameter, groove type pipe connections and strainer cap.
   - Extension pipe with two Schrader fittings that can be used for a pressure gauge and thermal dispersion flow switch. The pipe provides sufficient clearance from the evaporator for strainer basket removal.
   - ½-inch blowdown valve
   - Two grooved clamps

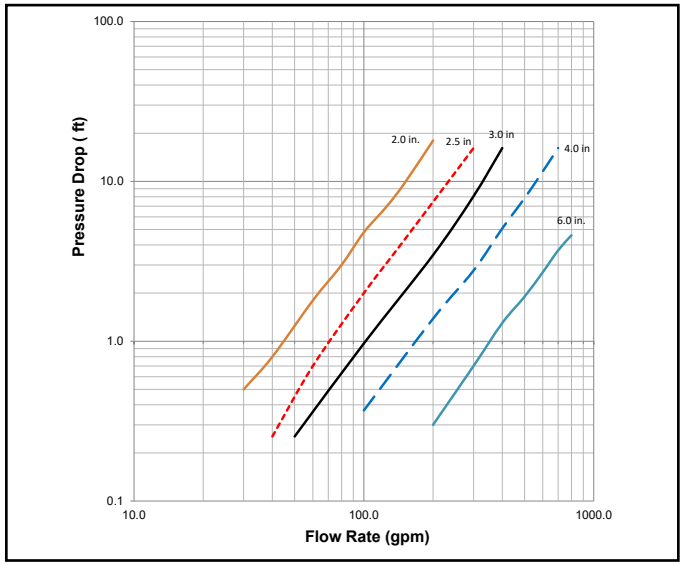
Both are sized per Table 2 and with the pressure drop shown in the Strainer Pressure Drop graph. Connection sizes are given in the Dimensions and Weights section on page 29 for units with remote evaporators and page 45 for pump package units.

3. A field-supplied strainer that meets specification and installation requirements of this manual.

Table 2: Strainer Data

Trailblazer® Model	Strainer Size in (mm)	Maximum perforation size in (mm)
030-070E	2.5 (64)	0.063 (1.6)
075-130E	3.0 (76)	0.063 (1.6)
140-180E	4.0 (102)	0.063 (1.6)
191-241E	6.0 (152)	0.063 (1.6)

Figure 22: Strainer Pressure Drop



Water Flow Limitations

Constant Evaporator Flow

The evaporator flow rates and pressure drops shown on Table 3 on page 19 for various system designs. The maximum flow rate and pressure drop are based on a 6°F temperature drop. Flow rates above the maximum values will result in unacceptable pressure drops and can cause excessive erosion, potentially leading to failure.

The minimum flow and pressure drop is based on a full load evaporator temperature drop of 16°F. Evaporator flow rates below the minimum values can result in laminar flow causing low pressure alarms, scaling and poor temperature control.

Variable Evaporator Flow

Reducing evaporator flow in proportion to load can reduce system power consumption. The rate of flow change should be a maximum of 10 percent of the flow per minute. For example, if the maximum design flow is 200 gpm and it will be reduced to a flow of 140 gpm, the change in flow is 60 gpm. Ten percent of 200 gpm equals 20 gpm change per minute, or a minimum of three minutes to go from maximum to desired flow. The water flow through the evaporator must remain between the minimum and maximum values listed in Table 3 on page 19. If flow drops below the minimum allowable, large reductions in heat transfer can occur. If the flow exceeds the maximum rate, excessive pressure drop and tube erosion can occur. See unit set point information in "Variable Evaporator Flow" on page 85.

System Water Volume Considerations

All chilled water systems need adequate time to recognize a load change, respond to the change and stabilize to avoid undesirable short cycling of the compressors or loss of temperature control. In air conditioning systems, 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. Some of the things the designer should consider when looking at water volume are the minimum cooling load, the minimum chiller plant capacity during the low load period and the desired cycle time for the compressors. 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. A storage tank may need to be added to the system to reach the recommended system volume. Refer to AG 31-003 for method of calculating "Minimum Chilled Water Volume".

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 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 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.

Evaporator Freeze Protection

Evaporator freeze-up can be a concern in the application of air-cooled water chillers in areas experiencing below freezing temperatures. To protect against freeze-up, insulation and an electric heater are furnished with the evaporator. Models 030 through 241 have an external plate heater and thermostat. These heaters help protect the evaporator down to -20°F (-29°C) ambient air temperature. The evaporator heater cable is factory wired to the 115 volt control circuit transformer in the control box. A 115V power source for the heater and controls may also be supplied from a separate power feed to maximize unit protection if desired. Refer to the field wiring diagram on page 65 for additional information on supplying a separate 115V power feed.

Operation of the heaters is automatic through the ambient sensing thermostat that energizes the evaporator heaters for protection against freeze-up. Unless the evaporator is drained in the winter or contains an adequate concentration of anti-freeze, the disconnect switch to the evaporator heater must not be open.

Although the evaporator is equipped with freeze protection, it does not protect water piping external to the evaporator itself if there is a power failure or heater burnout, or if the chiller is unable to control the chilled water pumps. Use one of the following recommendations for additional freeze protection:

1. If the unit will not be operated during the winter, drain the evaporator and chilled water piping and flush with glycol.
2. Add a glycol solution to the chilled water system. Burst protection should be approximately 10°F below minimum design ambient temperature.
3. Insulate the exposed piping.
4. Add thermostatically controlled heat by wrapping the lines with heat tape.
5. When glycol is added to the water system for freeze protection, the refrigerant suction pressure will be lower, cooling performance less, and water side pressure drop greater. If the percentage of glycol is high, or if propylene is used instead of ethylene glycol, the added pressure drop and loss of performance could be substantial. When Glycol or Ice are selected as Unit Mode, the MicroTech® III control will automatically reset the available range for the Leaving Water Temperature, Freezestat and Evaporator Pressure settings.

Chilled Water Pump

It is important that the chilled water pumps be wired to, and controlled by, the chiller's controller. When equipped with optional dual pump output, the chiller controller has the capability to selectively send the signal to a pump relay (by others) to start pump A or B or automatically alternate pump selection and also has standby operation capability. The controller will energize the pump whenever at least one circuit on the chiller is enabled to run, whether there is a call for cooling or not. This helps ensure proper unit start-up sequence. The pump will also be turned on when the water temperature goes below the Freeze Setpoint for longer than a specified time to help prevent evaporator freeze-up, provided the disconnect is not closed. Connection points are shown in the Field Wiring Diagram beginning on page 65.

⚠ CAUTION

Adding glycol or draining the system is the recommended method of freeze protection. If the chiller does not have the ability to control the pumps and the water system is not drained in temperatures below freezing, catastrophic evaporator failure may occur.

Failure to allow pump control by the chiller may cause the following problems:

1. If any device other than the chiller attempts to start the chiller without first starting the pump, the chiller will lock out on the No Flow alarm and require manual reset.
2. If the chiller evaporator water temperature drops below the "Freeze setpoint" the chiller will attempt to start the water pumps to avoid evaporator freeze. If the chiller does not have the ability to start the pumps, the chiller will alarm due to lack of water flow.
3. If the chiller does not have the ability to control the pumps and the water system is not to be drained in temperatures below freezing or contain glycol, the chiller may be subject to catastrophic evaporator failure due to freezing. The freeze rating of the evaporator is based on the evaporator heater and pump operation. The external brazed plate heater itself may not be able to properly protect the evaporator from freezing without circulation of water.

All chillers with the optional pump package are factory wired for control by the chiller.

Flow Switch

All chillers require a chilled water flow switch to check that there is adequate water flow through the evaporator and to shut the unit down if necessary to avoid evaporator freeze-up under low or no flow conditions. A factory-included thermal dispersion flow switch will be installed on packaged models. On remote evaporator models, the flow switch may be separately field-provided, or optionally shipped loose for field installation. Terminals are provided in the unit control center for field mounting and wiring of the water flow switch as shown on the field wiring diagrams, page 65 and page 66. Mount the flow switch in the leaving water line to shut down the unit when water flow is interrupted. A flow switch is an equipment protection control and should never be used to cycle a unit.

Installation should be per manufacturer's instructions included with the switch. Flow switches should be calibrated to shut off the unit when operated below the minimum listed flow rate for the unit as listed on page 19. Flow switch installation and calibration is further discussed on page 124.

There is also a set of normally closed contacts on the switch that can be used for an indicator light or an alarm to indicate when a "no flow" condition exists. Freeze protect any flow switch that is installed outdoors. Differential pressure switches are not recommended for outdoor installation. They can freeze and not indicate a no-flow condition.

Glycol Solutions

The use of glycol may impact system performance depending on its concentration and should be considered during initial system design. When glycol is added to the chilled water system for freeze protection, recognize that the refrigerant suction pressure will be lower, cooling performance less, and water side pressure drop will be higher. The reduction in performance depends upon the glycol concentration and temperature.

⚠ CAUTION

The installed glycol level must align with the rated glycol percentage indicated on the submitted chiller technical data sheet. Failure to adhere to the rated glycol percentage may result in unit damage and loss of unit warranty.

Test coolant with a clean, accurate glycol refractometer to determine the freezing point. Reset the freezestat setting to 6 °F (3.3 °C) below the leaving chilled water setpoint temperature after the glycol percentage is verified safe for the application.

⚠ CAUTION

Do not use an automotive-grade antifreeze. Industrial grade glycols must be used. Automotive antifreeze contains inhibitors which will cause plating on the copper tubes within the chiller evaporator. The type and handling of glycol used must be consistent with local codes.

Low Ambient Operation

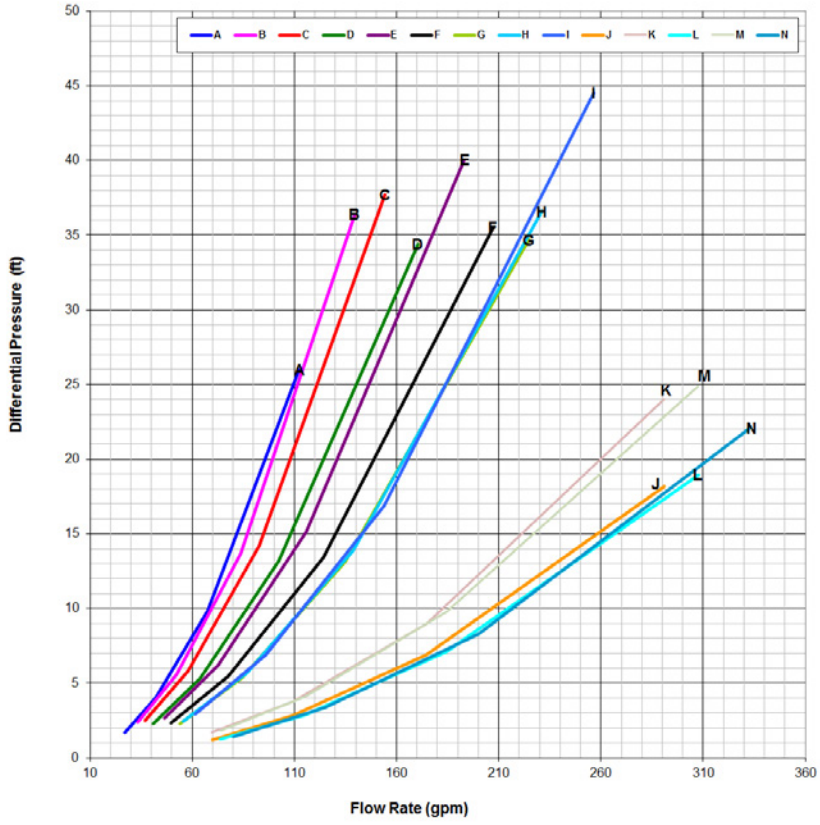
Compressor staging is adaptively determined by system load, ambient air temperature, and other inputs to the MicroTech® III control. The standard minimum ambient temperature is 32°F (0°C). A low ambient option with fan VFD allows operation down to -10°F (-23°C). The minimum ambient temperature is based on still conditions where the wind is not greater than 5 mph. Greater wind velocities will result in reduced discharge pressure, increasing the minimum operating ambient temperature. Field installed louvers are available and recommended to help allow the chiller to operate effectively down to the ambient temperature for which it was designed.

High Ambient Operation

Trailblazer® units for high ambient operation (105°F to 125°F, 41°C to 52°C) require the addition of the optional high ambient package that includes a small fan with a filter in the air intake to cool the control panel.

All units with the optional VFD low ambient fan control automatically include the high ambient option. Note that in cases of high ambient temperature, capacity could be reduced or the lowest leaving water temperature settings may be outside of the chiller operating envelope; consult Daikin Tools to ensure chiller is capable of the required lift.

Figure 23: Evaporator Pressure Drop Curves (refer to data table on following page)



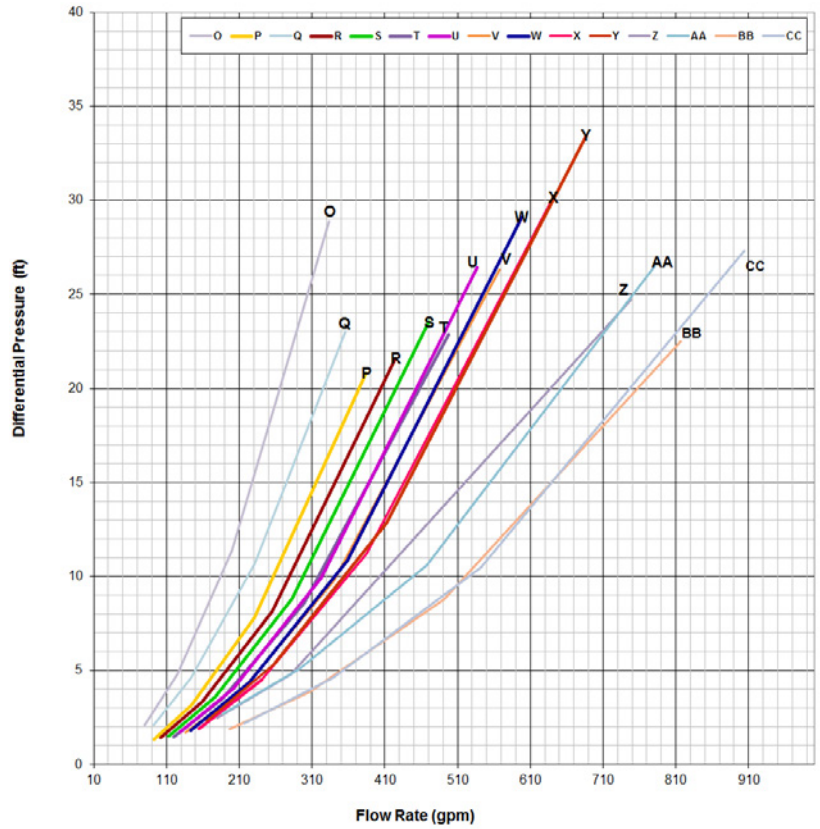


Table 3: Pressure Drop Data

Curve Ref.	Model	Part Load Flow System Only Minimum Flow Rate2				Full Load Flow System Only Minimum Flow Rate1				Fixed and Variable Flow Systems Nominal Flow Rate				Fixed and Variable Flow Systems Maximum Flow Rate			
		IP		SI		IP		SI		IP		SI		IP		SI	
		GPM	DP ft.	lps	DP kpa	GPM	DP ft.	lps	DP kpa	GPM	DP ft.	lps	DP kpa	GPM	DP ft.	lps	DP kpa
A	030E	29.4	2.0	1.9	6.0	45.9	4.7	2.9	14.1	73.4	11.6	4.6	34.5	122.4	30.6	7.7	91.5
B	035E	35.1	2.6	2.2	7.8	54.9	6.1	3.5	18.3	87.8	15.0	5.5	44.8	146.4	39.9	9.2	119.0
C	040E	39.2	2.7	2.5	8.2	61.2	6.4	3.9	19.2	97.9	15.8	6.2	47.2	163.2	41.9	10.3	125.2
D	045E	42.9	2.5	2.7	7.4	67.1	5.8	4.2	17.3	107.3	14.2	6.8	43.2	178.8	37.7	11.3	112.6
E	050E	49.9	3.1	3.1	9.1	78.0	7.1	4.9	21.3	124.8	17.4	7.9	52.1	208.0	46.1	13.1	137.6
F	055E	53.6	2.7	3.4	8.0	83.7	6.3	5.3	18.8	133.9	15.5	8.4	46.1	223.2	41.0	14.1	122.4
G	060E	57.7	2.6	3.6	7.8	90.2	6.1	5.7	18.3	144.2	14.9	9.1	44.6	240.4	39.4	15.2	117.7
H	065E	59.3	2.8	3.7	8.2	92.7	6.4	5.8	19.3	148.3	15.7	9.4	47.0	247.2	41.6	15.6	124.1
I	070E	65.9	3.4	4.2	10.1	102.9	7.9	6.5	23.5	164.6	19.2	10.4	57.3	274.4	50.7	17.3	151.3
J	075E	70.2	1.3	4.5	3.8	111.3	3.0	7.0	8.9	178.1	7.3	11.2	21.8	296.9	19.3	18.7	57.8
K	076E	72.3	1.8	4.6	5.4	113.0	4.2	7.1	12.7	180.7	10.5	11.4	31.4	301.3	28.5	19.0	85.1
L	080E	75.5	1.1	4.8	3.2	117.9	3.0	7.4	8.9	188.6	7.7	11.9	23.0	314.5	21.1	19.8	63.1
M	081E	76.8	2.2	4.8	6.7	120.0	4.6	7.6	13.8	192.0	10.2	12.1	30.5	320.1	25.3	20.2	75.5
N	090E	83.3	1.4	5.3	4.1	130.2	3.6	8.2	10.9	208.3	9.4	13.1	28.1	347.3	25.6	21.9	76.6
O	091E	84.2	2.6	5.3	7.8	131.6	5.4	8.3	16.0	210.5	12.0	13.3	35.7	350.9	29.9	22.1	89.2
P	100E	97.4	1.9	6.1	5.7	152.3	3.9	9.6	11.5	243.6	8.5	15.4	25.4	406.1	20.8	25.6	62.3
Q	101E	97.4	2.3	6.1	7.0	152.3	5.3	9.6	15.9	243.6	11.6	15.4	34.7	356.0	23.0	22.5	68.7
R	110E	107.1	1.6	6.8	4.8	167.4	3.7	10.6	10.9	267.8	8.7	16.9	26.0	446.5	22.6	28.2	67.6
S	120E	118.8	1.7	7.5	5.1	185.6	4.0	11.7	12.0	296.9	9.8	18.7	29.4	494.9	26.4	31.2	78.8
T	130E	125.7	1.6	7.9	4.9	196.4	3.9	12.4	11.6	314.2	9.5	19.8	28.3	523.7	25.2	33.0	75.4
U	140E	137.1	1.9	8.6	5.8	214.2	4.6	13.5	13.7	342.7	11.2	21.6	33.6	570.3	30.0	36.0	89.7
V	150E	143.8	1.8	9.1	5.5	224.7	4.4	14.2	13.2	359.5	10.9	22.7	32.6	599.3	29.4	37.8	87.8
W	161E	150.0	2.0	9.5	6.0	234.3	4.8	14.8	14.3	374.9	11.8	23.7	35.3	624.9	31.9	39.4	95.2
X	170E	156.6	1.9	9.9	5.8	244.7	4.6	15.4	13.9	391.4	11.5	24.7	34.4	652.5	31.1	41.2	92.9
Y	180E	174.6	2.6	11.0	7.7	272.9	6.0	17.2	17.9	436.6	14.3	27.5	42.9	727.7	37.6	45.9	112.3
Z	191E	183.1	2.5	11.6	7.5	286.1	4.8	18.0	14.4	457.7	10.3	28.9	30.8	763.0	25.2	48.1	75.3
AA	211E	189.5	2.6	12.0	7.9	296.1	5.1	18.7	15.2	473.8	10.9	29.9	32.7	789.8	26.8	49.8	80.1
BB	226E	203.6	2.0	12.8	5.9	318.2	4.1	20.1	12.3	509.0	9.4	32.1	28.1	848.6	24.2	53.5	72.4
CC	241E	220.8	2.3	13.9	6.7	345.0	4.7	21.8	14.1	552.0	10.9	34.8	32.6	920.2	28.2	58.1	84.3

NOTE: 1 Full load flow minimum is the minimum allowable flow at full load conditions, and/or for a constant flow system.

2 Part load flow minimum is the minimum allowable flow for a partially loaded unit, which is only applicable a variable flow system. Flow may only be reduced proportionally to load, i.e. a flow reduction of 25% from the design flow rate is only allowable if the chiller load is reduced by 25%.

3 Models 076E, 081E, 091E, and 101E apply to packaged chillers only.

Refrigerant Piping and Application

AGZ-E units have two circuits, each with either tandem or trio compressors. These circuits must be kept separate throughout the entire refrigerant piping system. Pipe all lines (suction, liquid, and hot gas bypass, if used) of each evaporator circuit to the corresponding circuit on the outdoor unit. Evaporator circuit #1 must be piped to the circuit #1 condensing unit. Evaporator circuit #2 must be piped to the circuit #2 condensing unit. Be careful not to cross-pipe any lines.

⚠ CAUTION

Refrigerant circuits must be kept isolated from each other throughout the entire system. Note that the connection locations vary by model size, see Figure 24 and Figure 25.

Braze connections on evaporator are stainless steel so a minimum of 40% silver braze rod must be used.

Figure 24: Connection Locations - AGZE Models 030-070

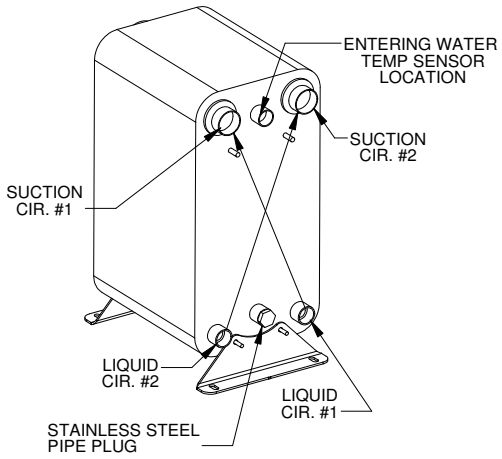
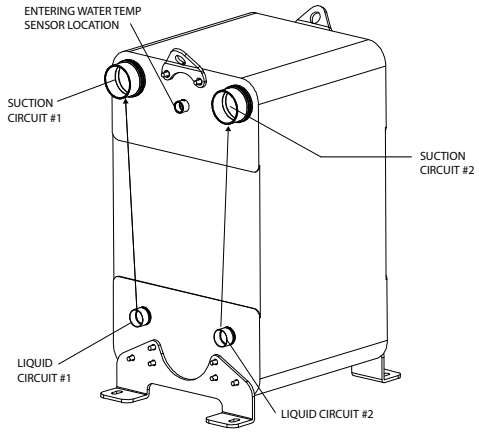


Figure 25: Connection Locations - AGZE Models 075-241



Performance Adjustments Due to Piping

Performance will be impacted by the equivalent feet of piping between the condensing unit and the evaporator. To determine the adjusted unit capacity, power, and efficiency, refer to DST Pathfinder selection software.

Piping Recommendations

IMPORTANT: Refrigerant piping information for this manual has changed to reflect only Microchannel coils.

New refrigerant piping must be used for all equipment installations. Refrigerant piping must be properly sized for the circuit capacity and unit refrigerant. Piping system must be brazed and have the proper lay out with all required components.

⚠ IMPORTANT NOTE

Service Form SF99006 (current version available from the local sales office) must be submitted to Daikin Technical Response Center and reviewed at least two weeks prior to beginning piping installation.

Refrigerant piping design must be provided by a qualified HVAC Design Engineer familiar with piping design, as well as local codes and regulations. The manufacturer recommendations provided here are to be used as a general guide, and do not replace system design by a qualified professional. All field piping, wiring, and procedures must be performed in accordance with ASHRAE, EPA, local codes, and industry standards.

Proper refrigerant piping can make the difference between a reliable system and an inefficient, problematic system. See the recommended field pipe sizes shown in Table 6 and Table 7 on page 23. For additional information about refrigerant piping techniques and sizing, see the Daikin Applied Refrigerant Piping Design Guide, AG 31-011, which is found on www.DaikinApplied.com.

The primary concerns related to piping are refrigerant pressure drop, an adequately subcooled liquid feed to the expansion valves, continuous oil return, and properly sized refrigerant specialties. AGZ-E unit performance is negatively affected by suction line pressure drop losses. The distance between the AGZ-E condensing unit and the remote evaporator should be kept as short as possible to minimize the performance derate. Underground refrigerant piping is not permitted.

⚠ WARNING

Improper installation can cause refrigerant migration, flood back, oil loss, line corrosion, or mechanical failures

⚠ CAUTION

Glycol is not allowed to be used in AGZ-E remote evaporator installations.

For installations where the evaporator is installed either above or below the unit - the following recommendations apply:

Evaporator installed below outdoor unit:

- 30 ft. maximum measured vertical distance, 75 ft. maximum vertical equivalent length
- Only single riser suction tubing is to be used - Double riser installations are not permitted
- A suction line trap must be installed at the bottom of the riser and a second trap at 20 ft. height

Evaporator installed above outdoor unit:

- 30 ft. maximum measured vertical distance, 75 ft maximum vertical equivalent length is required to prevent loss of liquid subcooling

Table 4: Remote Evaporator Piping Limitations

Piping Restriction	030-070	075-241
Maximum measured actual piping distance between the unit and the remote evaporator	90 ft.	150 ft.
Maximum total equivalent feet of distance between the unit and evaporator including friction losses of elbows and traps	150 ft.	300 ft.
Notes: Horizontal sections of the suction lines must be downward sloping toward the compressor with 1 inch slope per 10 foot of piping run to assist oil return. Field isolation of charge maximum piping lengths are located in Table 9 on page 25.		

Table 5: Fitting Losses Equivalent Feet of Pipe

Line Size In.OD	Angle Valve	Globe Valve	90° Std. Radius Elbow	90° Long Radius Elbow
7/8	9.0	22.0	2.0	1.4
1 1/8	12.0	29.0	2.6	1.7
1 3/8	15.0	38.0	3.3	2.3
1 5/8	18.0	43.0	4.0	2.6
2 1/8	24.0	55.0	5.0	3.3
2 5/8	29.0	69.0	6.0	4.1
3 1/8	35.0	84.0	7.5	5.0

SOURCE: ASHRAE 2014 Handbook Refrigeration

NOTE: TEL values for the filter-drier and solenoid valve are already included and should not be added to the liquid line drop.

Additional Piping Installation Guidelines

The brazed-plate evaporators have no charge and are not sealed. A holding charge of an inert gas, such as nitrogen, is provided for the outdoor condensing unit. Holding charges must be evacuated prior to the R-410a charging procedure. Interconnecting refrigerant piping and total system refrigerant charge are field supplied and installed.

The installer must leak test the remote piping with nitrogen at 150 psig maximum pressure, then properly evacuate the piping system to 500 microns or below and provide the correct operating charge of R-410a. Insulate the suction line to reduce excessive superheat build-up. Insulate the liquid line to prevent loss of subcooling and consequent liquid flashing.

The use of double risers for vertical gas risers is not allowed. Size the single vertical riser per Table 6. A small trap must be provided at the base of each major vertical gas riser to assist in the collection of oil. If vertical risers exceed more than 20 feet, install a second trap per guidelines above. Follow ASHRAE procedures and refrigerant piping guidelines. Exceeding these recommendations will decrease performance and could impact system reliability.

Use caution in sizing the liquid line in applications where the evaporator is above the outdoor section. The weight of the liquid refrigerant in the vertical column will decrease the pressure at the top of the riser (approximately 0.5 psi per foot of vertical rise) allowing some of the refrigerant to flash to a gas. Adequate refrigerant subcooling is needed at the outdoor section to prevent refrigerant gas at the expansion valve.

Care should be taken while designing piping system to avoid the draining of condensed refrigerant to the lower component when normal shut-down procedures do not occur (such as a power failure).

Field Installed Component Locations

The following components must be installed adjacent to the remote evaporator, see Figure 27 thru Figure 30.

The expansion valves must be installed within 12 inches of the evaporator inlet connection and the outlet piping of the expansion valve must go directly into the evaporator with no bends in between. See also “Wiring for Remote Evaporators” on page 24.

The liquid line solenoid valves must be installed within 3 ft. of the evaporator. The liquid line solenoid valve cable must be connected to the solenoid valve using a junction box to extend the wiring to the length required to reach the solenoid.

The liquid line filter drier must be installed at the remote evaporator - upstream of the liquid solenoid valve and expansion valve - as shown in Figure 27 on page 26 thru Figure 30 on page 28.

- Install a ball valve before and after the filter drier
- Install a charging valve at the filter drier inlet between the inlet ball valve and the filter drier
- Install a Schrader fitting after the filter drier to measure the pressure drop across the filter drier and the liquid subcooling leaving the filter drier.

Hot Gas Bypass Applications

Provide condenser fan VFDs for applications when operation below 32°F ambient is expected and hot gas bypass is desired. This is necessary to maintain adequate condensing pressures and liquid refrigerant at the expansion valve when condenser capacities are at their minimum.

Referencing Figure 27 and Figure 28 for refrigerant piping schematics, the solenoid valve and hot gas bypass valve need to be as close to the condensing unit as possible.

If at the same elevation or if evaporator is below the condensing unit, the hot gas bypass piping must be downward sloping toward the evaporator with a 1 inch drop per 10 foot of piping run in the direction of flow.

If the evaporator is above the condensing unit, add a check valve in the hot gas bypass piping at the evaporator to prevent refrigerant condensing in the line, which results in loss of subcooling.

Table 6: Recommended Horizontal or Downflow Suction Line Size, R-410A

AGZ-E Model Size Remote Evap	Nominal Tons Per Circuit	Tubing Conn. Size At Unit	Recommended Suction Line Sizes, OD Copper - based on Equivalent ft. Length								Max. Suct. Riser Line Size for Vertical Upflow to Compr.
			Up to 50 Ft	Up to 75 Ft	Up to 100 Ft	Up to 125 Ft	Up to 150 Ft	Up to 200 Ft	Up to 250 Ft	Up to 300 Ft	
AGZ030E	**16**	1 5/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	N/A	N/A	N/A	1 3/8
AGZ035E	**17.5**	1 5/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	N/A	N/A	N/A	1 3/8
AGZ040E	**19**	1 5/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8	N/A	N/A	N/A	1 3/8
AGZ045E	**21.5**	1 5/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8	N/A	N/A	N/A	1 3/8
AGZ050E	**24**	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8	N/A	N/A	N/A	1 5/8
AGZ055E	**26**	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	N/A	N/A	N/A	1 5/8
AGZ060E	**28**	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	N/A	N/A	N/A	1 5/8
AGZ065E	**29**	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	N/A	N/A	N/A	1 5/8
AGZ070E	**32**	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	N/A	N/A	N/A	1 5/8
AGZ075E	**36**	2 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	2 1/8
AGZ080E	**39**	2 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	2 1/8
AGZ090E	**42**	2 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 1/8
AGZ100E	**49**	2 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 1/8
AGZ110E	**54**	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 1/8
AGZ120E	**60**	2 5/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 1/8
AGZ130E	**63**	2 5/8	2 1/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8
AGZ140E	**69**	2 5/8	2 1/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	3 1/8	2 5/8
AGZ150E	**73**	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	3 1/8	2 5/8
AGZ161E	**77**	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	2 5/8
AGZ170E	**80**	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	2 5/8
AGZ180E	**88**	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	2 5/8
AGZ191E	**94**	3 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	2 5/8
AGZ211E	**98**	3 1/8	2 5/8	2 5/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	2 5/8
AGZ226E	**104**	3 1/8	2 5/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	2 5/8
AGZ241E	**114**	3 1/8	2 5/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8	2 5/8

NOTE: 1. For equivalent lengths between the table values, use the column higher than the determined length.

2. Nominal tons for units with slightly different capacities between Circuit #1 and Circuit #2 are averaged per Circuit.

3. N/A - not factory approved

Table 7: Recommended Liquid Line Size, R-410A

AGZ-E Model Size Remote Evap	Nominal Tons Per Circuit	Tubing Conn. Size at Unit	Recommended Liquid Line Sizes, OD Copper - based on Equivalent ft. Length							
			Up to 50 Ft	Up to 75 Ft	Up to 100 Ft	Up to 125 Ft	Up to 150 Ft	Up to 200 Ft.	Up to 250 Ft.	Up to 300 Ft.
AGZ030E	16	7/8	7/8	7/8	7/8	7/8	7/8	N/A	N/A	N/A
AGZ035E	17.5	7/8	7/8	7/8	7/8	7/8	7/8	N/A	N/A	N/A
AGZ040E	19	7/8	7/8	7/8	7/8	7/8	7/8	N/A	N/A	N/A
AGZ045E	21.5	7/8	7/8	7/8	7/8	7/8	7/8	N/A	N/A	N/A
AGZ050E	24	7/8	7/8	7/8	7/8	7/8	7/8	N/A	N/A	N/A
AGZ055E	26	7/8	7/8	7/8	7/8	7/8	7/8	N/A	N/A	N/A
AGZ060E	28	7/8	7/8	7/8	7/8	7/8	7/8	N/A	N/A	N/A
AGZ065E	29	7/8	7/8	7/8	7/8	7/8	7/8	N/A	N/A	N/A
AGZ070E	32	7/8	7/8	7/8	7/8	7/8	7/8	N/A	N/A	N/A
AGZ075E	36	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
AGZ080E	39	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
AGZ090E	42	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
AGZ100E	49	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
AGZ110E	54	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
AGZ120E	60	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8
AGZ130E	63	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8
AGZ140E	69	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8
AGZ150E	73	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8
AGZ161E	77	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8
AGZ170E	80	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
AGZ180E	88	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
AGZ191E	94	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
AGZ211E	98	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
AGZ226E	104	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
AGZ241E	113	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8

NOTE: 1. For equivalent lengths between the table values, use the column higher than the determined length.
2. Nominal tons for units with slightly different capacities between Circuit #1 and Circuit #2 are averaged per Circuit.
3. N/A - not factory approved

Table 8: Additional Line Charge

R-410A Line Charge			
Suction Line Diameter	**oz./ft.**	**Liquid Line Diameter**	**oz./ft.**
1/2	0.04	1/4	0.19
5/8	0.06	5/16	0.33
3/4	0.09	3/8	0.51
7/8	0.12	1/2	1.01
1-1/8	0.20	5/8	1.64
1-3/8	0.31	3/4	2.46
1-5/8	0.43	7/8	3.27
2-1/8	0.76	1-1/8	5.58
2-5/8	1.7	-	-

Wiring for Remote Evaporators

Condensing unit electrical information should be based on the packaged chiller and can be found beginning on page 64.

Refrigerant Specialties Kit

Remote evaporator units include a Refrigerant Specialties Kit which supplies the following field-installed components and are noted on page 28:

- Expansion Valves
- Liquid Line Solenoid Valve and DIN Connector
- Liquid Line Filter Drier with Filter Drier Core and Clamp
- Liquid Line Sight Glasses
- Liquid Line Ball Valves
- Charging Valve
- Suction Line Temperature Sensor Tube
- Schrader and Schrader Core for Suction Line Transducers
- Suction Pressure Transducer
- Check Valve for Hot Gas Bypass Line (specific installation requirements)

Sensor Wiring

The Remote Evaporator AGZ-E units come with long sensor wires for the remote evap installation. The sensor wires to the evaporator include the following:

- Evaporator Water Inlet and Outlet Temperature Sensor
- Suction Line Temperature Sensors for Piping at the Evaporator for both Circuit #1 and #2
- Suction Transducer Wiring for Installation on Evaporator Suction Piping for both Circuit #1 and #2

NOTE: When splicing is required, the connections must be soldered together and individually shrink wrapped to be made water resistant and shield maintained.

For all AGZ-E models with a remote evaporator, the leaving water temperature sensor is to be located in the well in the provided spool piece pipe. The 2 water temperature sensors supplied have 110 feet length of cable coiled behind the unit control panel, intended for extension to the evaporator.

There is one suction line refrigerant temperature sensor per circuit installed on suction line with 110 feet of cable coiled behind the unit control panel, intended for extension to the evaporator. Place the sensor in a brazed well (provided in kit, installed in the field) on the suction line in a straight-flat area, close to the suction line pressure transducer. Install with heat conductive compound and insulate well. If installed on a horizontal pipe run, locate between the 2-4 o'clock positions.

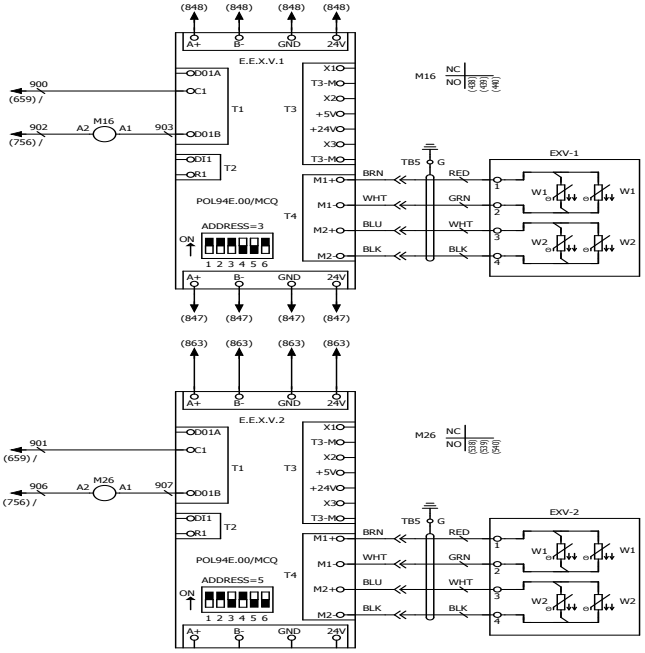
There is one suction line pressure transducer per circuit with approximately 90 feet of cable coiled for all unit models, installed on the suction line behind the unit control panel for extension to the evaporator. Mount the transducer in the suction line, 1-2 feet from the evaporator braze connections, on the top or side of the pipe. Connection is ¼-inch flare with a flare Schrader.

Expansion Valve Consideration

The expansion valves must be located within 12 inches of the evaporator inlet connection - see "Field Installed Component Locations" on page 21.

The electronic expansion valve has a 40 foot long cable attached and can be used, when the outdoor unit is less than 40 feet away. Beyond that, a junction box must be located within 40 feet of the evaporator, and an additional length of 14GA wire connected from the cable to the unit, allowing up to a total distance given in Table 4. The expansion valve wiring cannot run in conduit with other wiring that is over 24 volts. AC shielding must cover the wiring from the unit to the EXV, including the splice connection. Shielding must cover the entire length of wiring run and bonded at the chiller. NOTE: 14 AWG wire gauge sizes will use Beldon part number 83754 or equivalent.

Figure 26: EXV Field Wiring



Liquid Line Solenoid Valve

The liquid line solenoid valves are supplied as part of the Refrigerant Specialties Kit with a DIN connector. These 120 volt valves must be located within 3 feet of the evaporator. Field supplied wiring must be connected to the terminal block inside the AGZ-E control box via a field-supplied junction box and #14 ga. wiring. All wiring should be run in conduit as required by local and national code. See Field Wiring Diagram included in unit, or Typical Field Wiring Diagram on page 65 and page 66 for wiring schematic.

Service Pumpdown

The service pumpdown capacity of AGZ units with microchannel condenser coils is less than the previous model with tube and fin coils. Care should be exercised to include all equipment and lines when calculating the system charge relative to the unit's pumpdown (storage) capacity. While the AGZ-E remote evaporators have an insignificant operating charge, the amount of refrigerant in interconnecting refrigerant piping can be considerable. Due to the decreased refrigerant capacity of microchannel condenser coils, isolating refrigerant charge in the condenser is not recommended for remote evaporator applications with line sets exceeding the measured lengths in Table 9.

⚠ WARNING

Failure to follow condenser volume limits when isolating refrigerant charge in the condenser may result in unit damage, personal injury, and unintentional loss of refrigerant to atmosphere if condenser refrigerant volume exceeds published capacity limits.

It is mandatory that the liquid line solenoid valve be located close to the evaporator so that pumpdown does not have to remove and store a large quantity of liquid refrigerant from the liquid line.

Table 9: Maximum Line Set Length for Charge Isolation

Unit Models	Coil Type	Max. Measured Line Set Length for Field Charge Isolation
		Feet
030E	Microchannel	25
035E		25
040E		55
045E		55
050E		55
055E		50
060E		50
065E		50
070E		50
075E		70
080E		70
090E		70
100E		70
110E		70
120E		70
130E		70
140E		75
150E		75
161E		75
170E		75
180E		75
191E		90
211E		90
226E		105
241E		105

Figure 27: Refrigerant System Schematic, AGZ030-070E

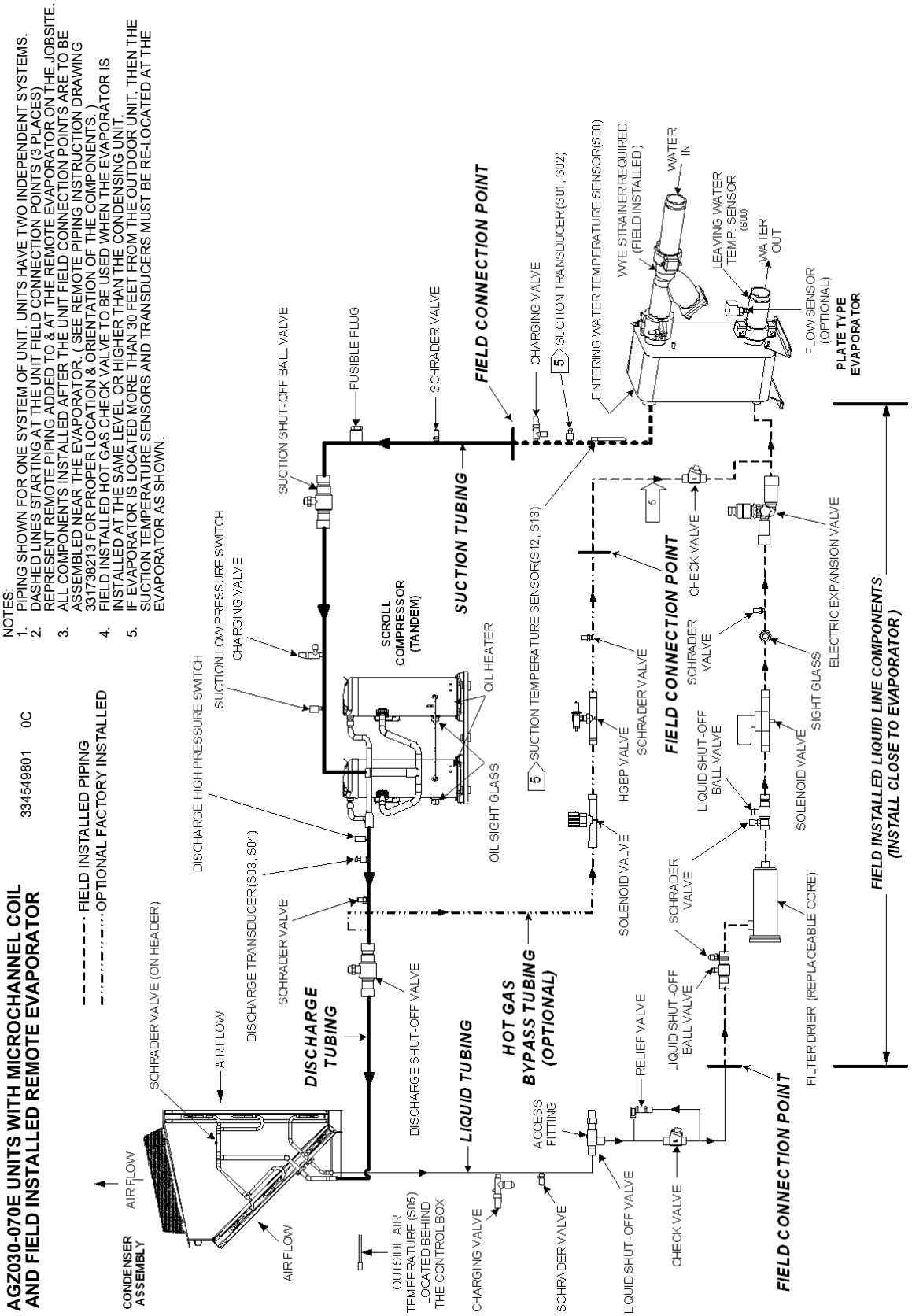


Figure 28: Refrigerant System Schematic, AGZ075-241E

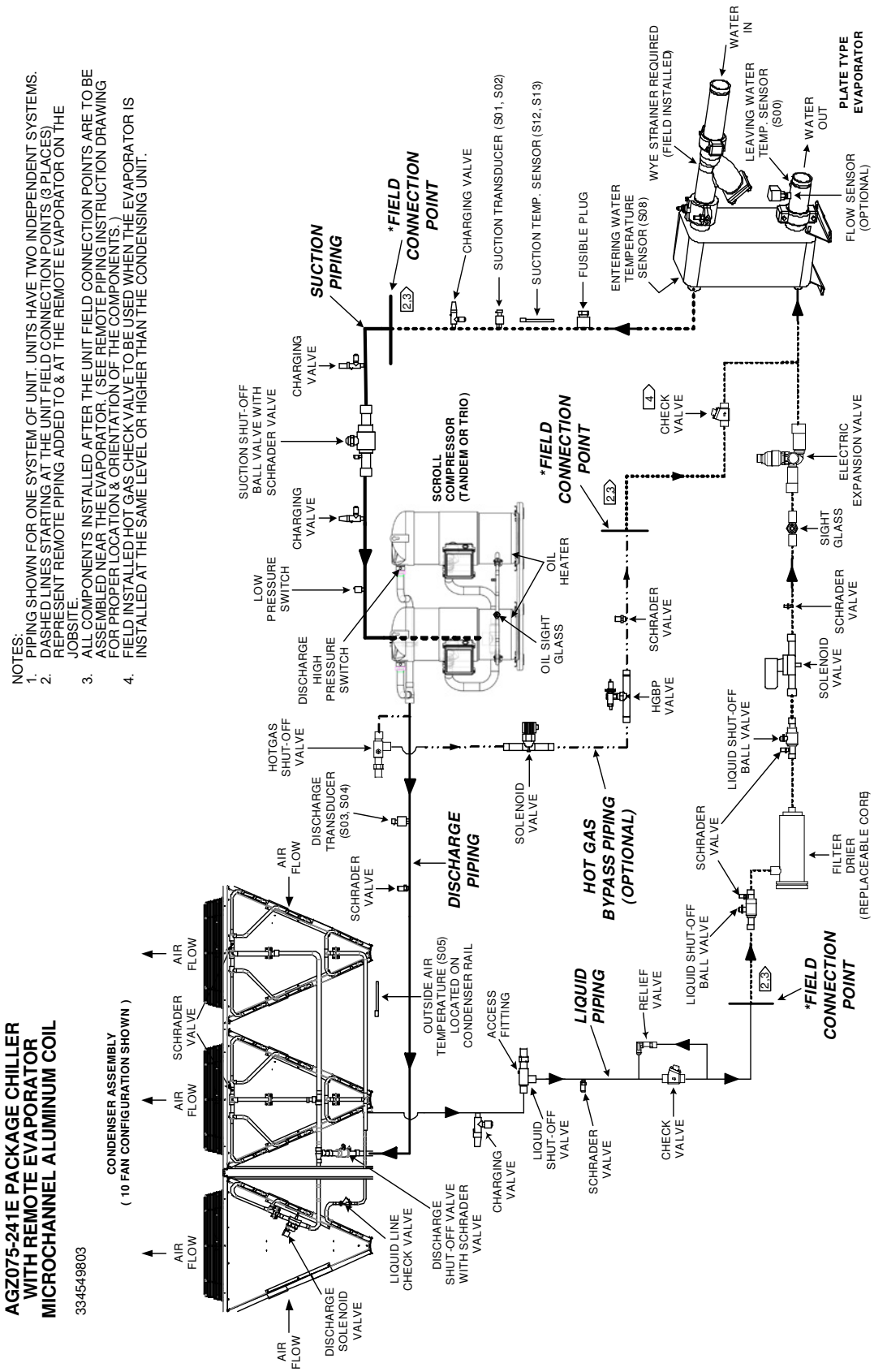


Figure 29: Remote Evaporator Piping Models 030-070

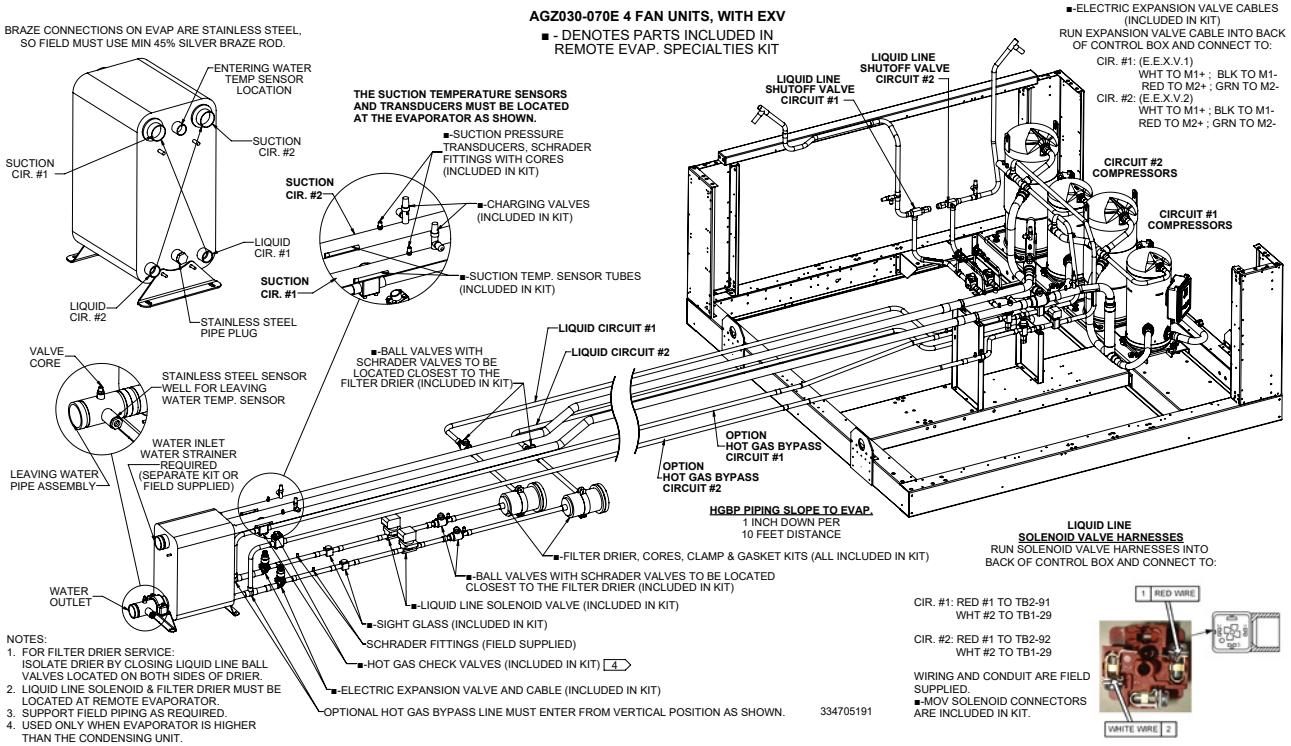


Figure 30: Remote Evaporator Piping Models 075-241

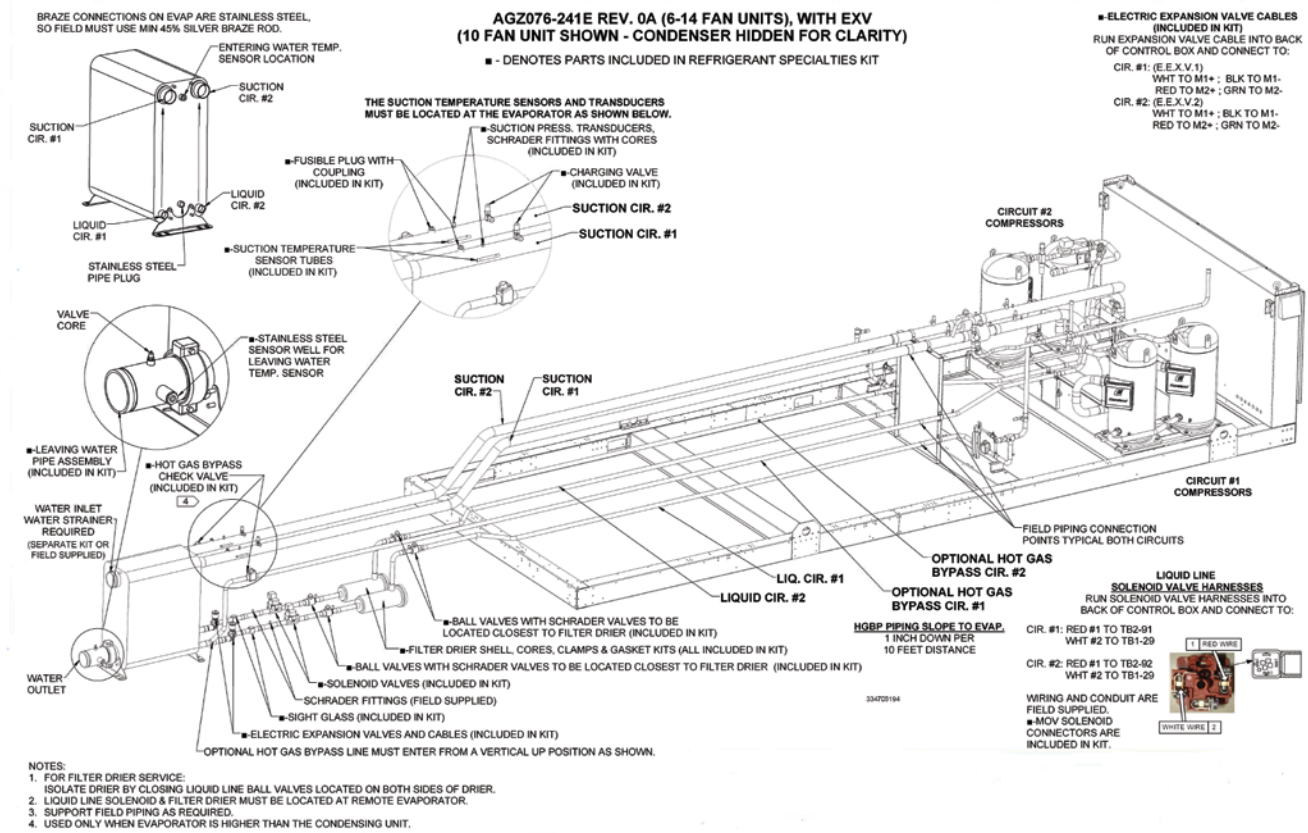
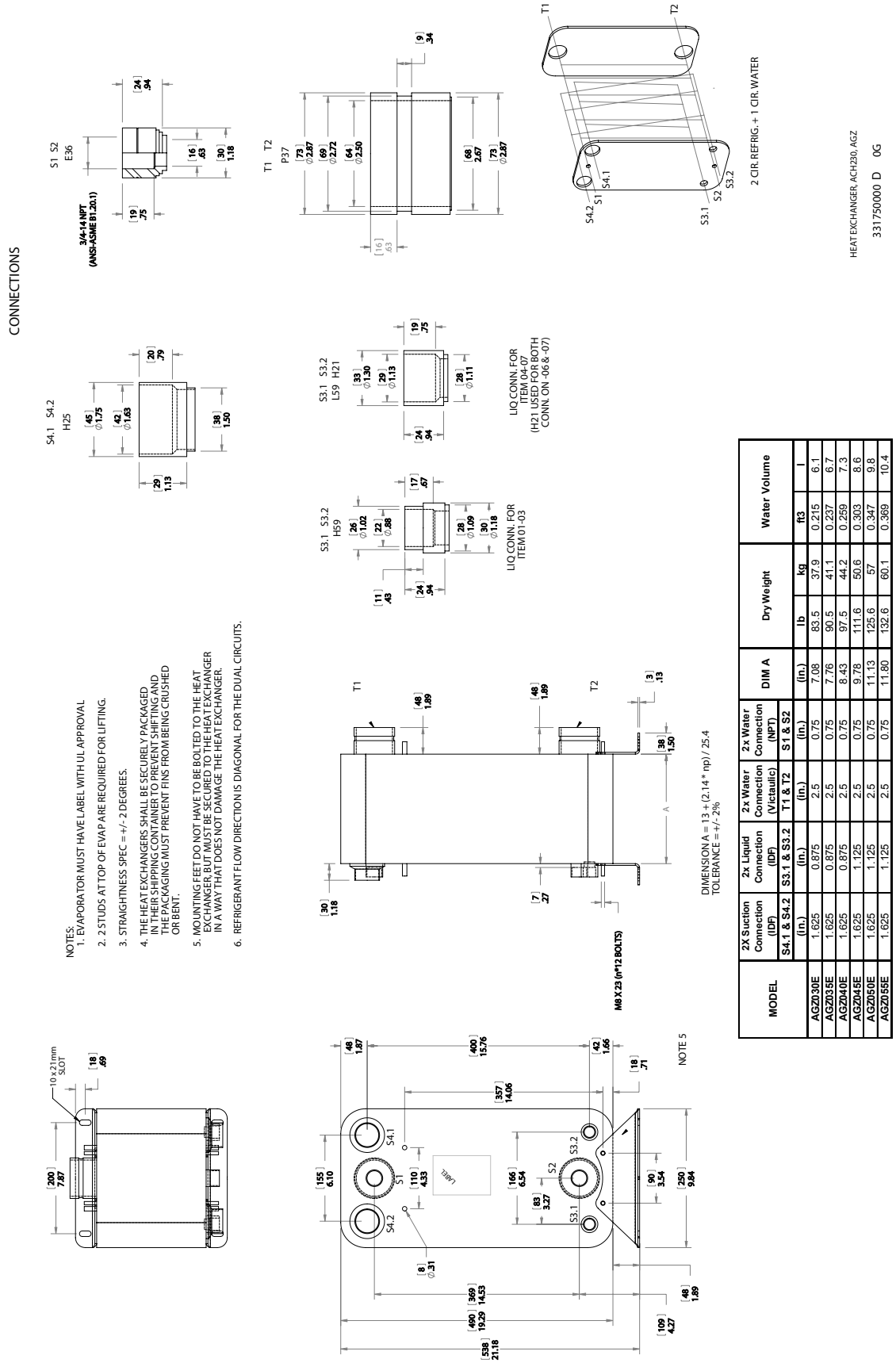
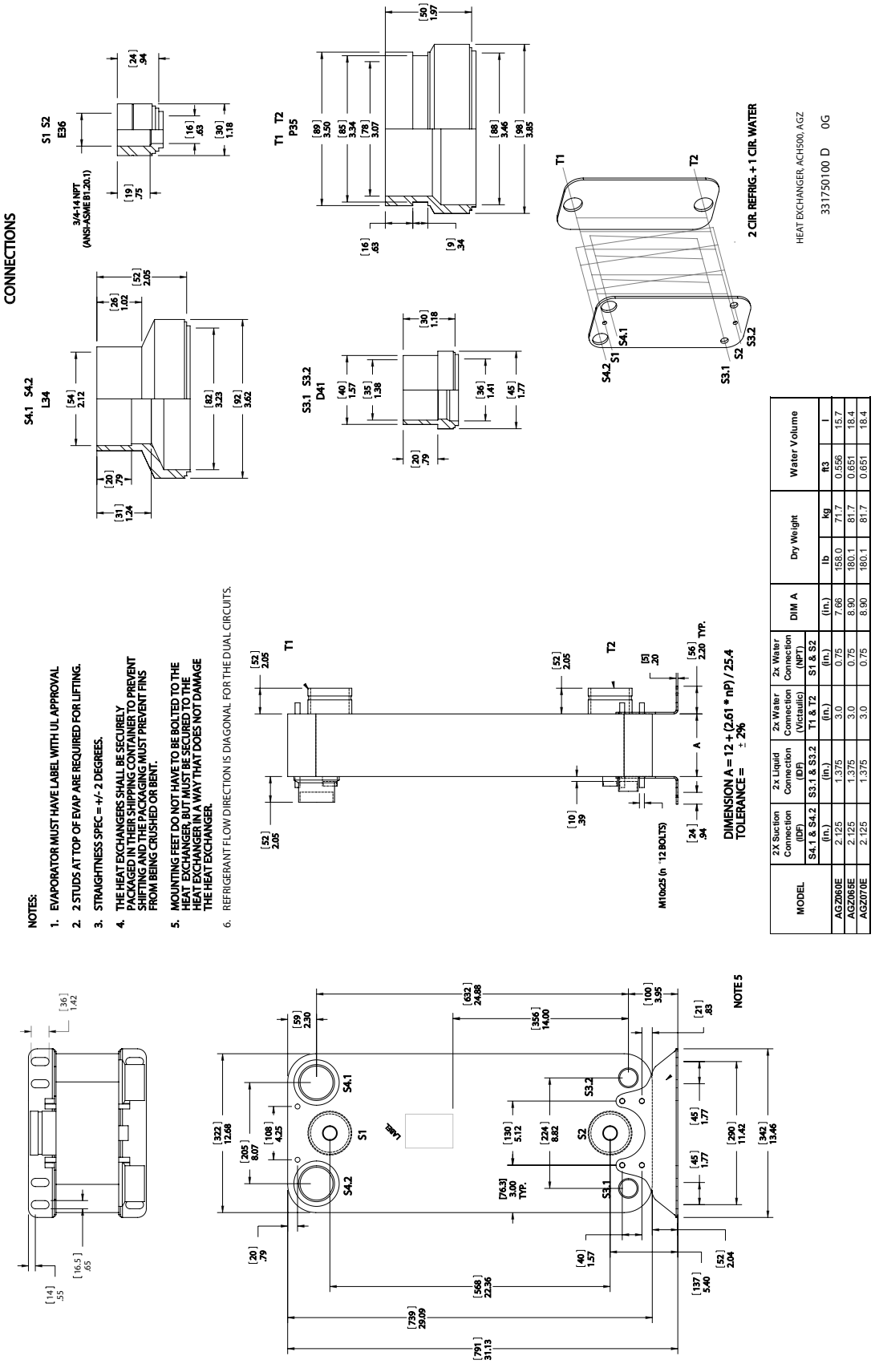


Figure 31: AGZ030E-055E Brazed Plate Evaporator Dimensions



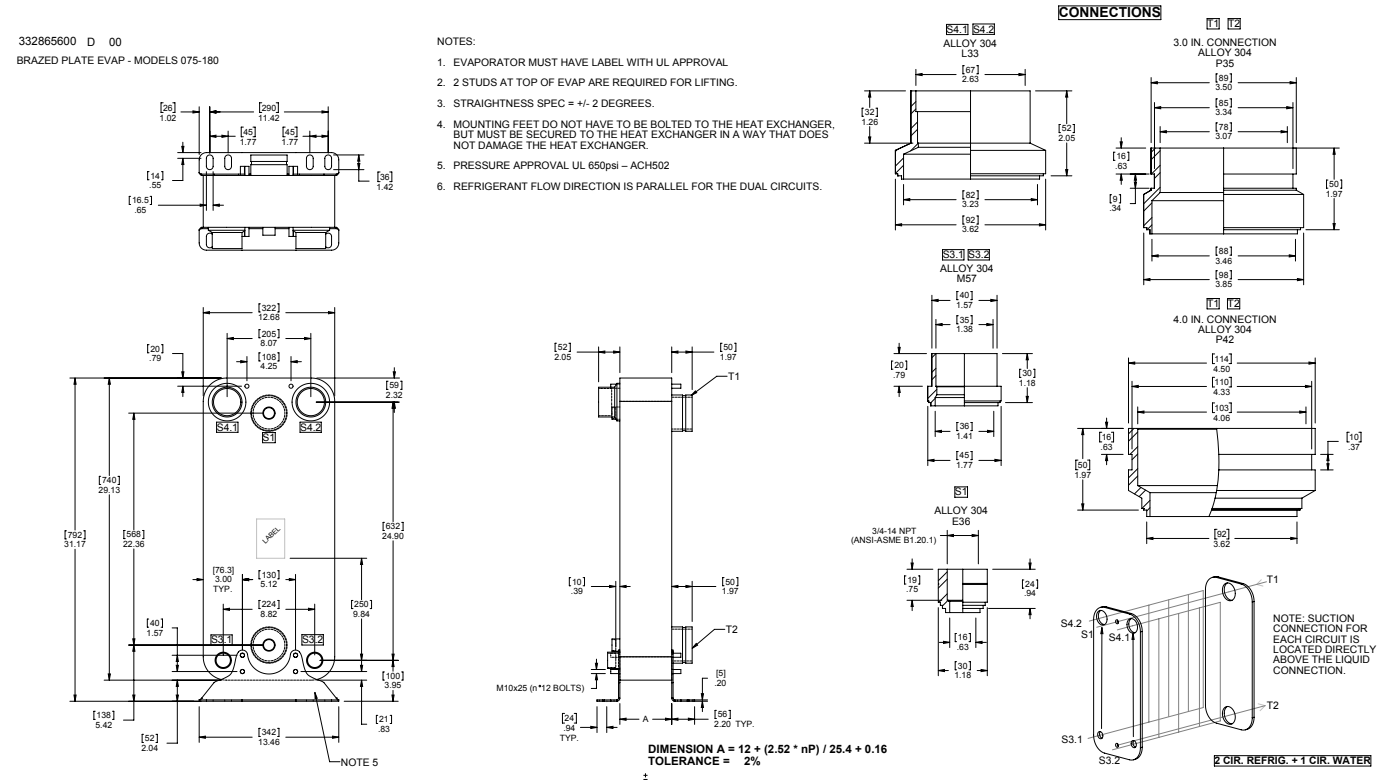
MODEL	2X Suction Connection (IDF)	2x Liquid Connection (IDF)	2x Water Connection (Victaulic)	2x Water Connection (NPT)	DIM A	Dry Weight		Water Volume	
	S4.1 & S4.2	S3.1 & S3.2	T1 & T2	S1 & S2					
	(in.)	(in.)	(in.)	(in.)	(in.)	lb	kg	ft3	l
AGZ030E	1.625	0.875	2.5	0.75	7.08	83.5	37.9	0.215	6.1
AGZ035E	1.625	0.875	2.5	0.75	7.76	90.5	41.1	0.237	6.7
AGZ040E	1.625	0.875	2.5	0.75	8.43	97.5	44.2	0.259	7.3
AGZ045E	1.625	1.125	2.5	0.75	9.78	111.6	50.6	0.303	8.6
AGZ050E	1.625	1.125	2.5	0.75	11.13	125.6	57	0.347	9.8
AGZ055E	1.625	1.125	2.5	0.75	11.80	132.6	60.1	0.369	10.4

Figure 32: AGZ060E - 070E Brazed Plate Evaporator Dimensions



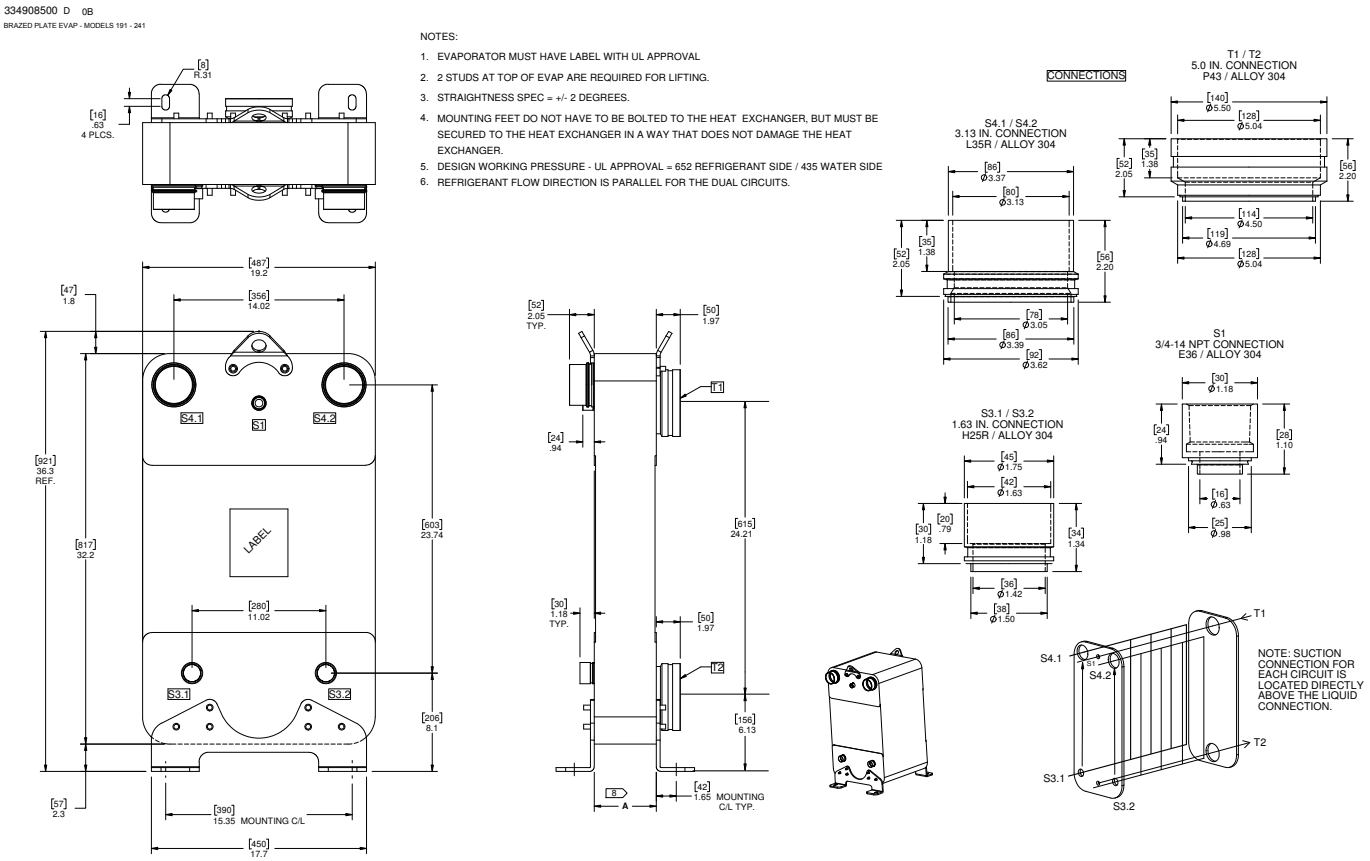
MODEL	2X Suction Connection (IDP)	2x Liquid Connection (IDP)	2x Water Connection (Victaulic)	2x Water Connection (NPT)	DIM A	Dry Weight		Water Volume	
	S4.1 & S4.2	S3.1 & S3.2	T1 & T2	S1 & S2					
	(in.)	(in.)	(in.)	(in.)	(in.)	lb	kg	ft3	l
AGZ060E	2.125	1.375	3.0	0.75	7.66	158.0	71.7	0.556	15.7
AGZ065E	2.125	1.375	3.0	0.75	8.90	180.1	81.7	0.651	18.4
AGZ070E	2.125	1.375	3.0	0.75	8.90	180.1	81.7	0.651	18.4

Figure 33: AGZ075E - 180E Brazed Plate Evaporator Dimensions



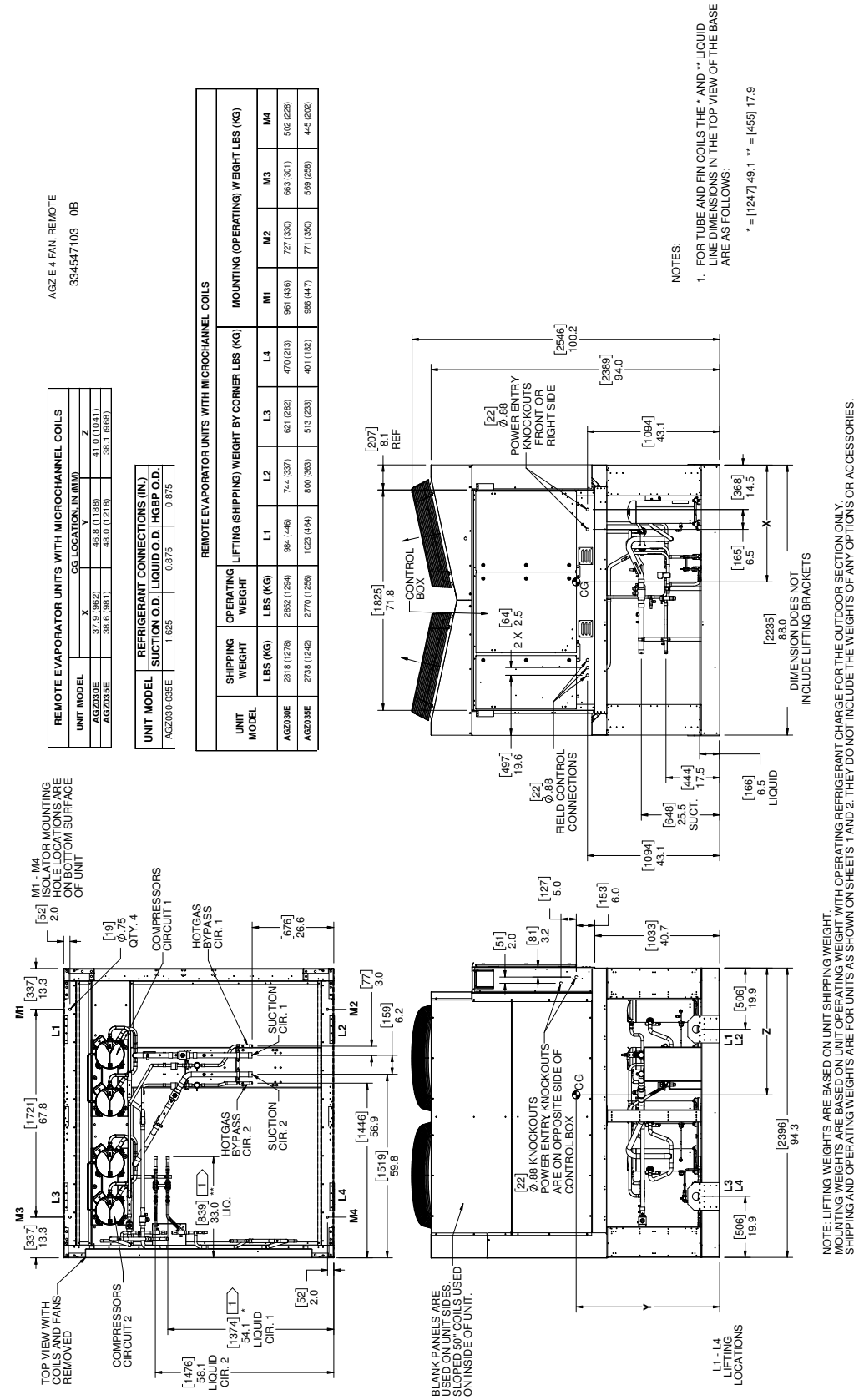
MODEL	2X Suction Connection (IDF)	2x Liquid Connection (IDF)	2x Water Connection (Victaulic)	Water Connection (NPT)	DIM A	Dry Weight		Water Volume	
	S4.1 & S4.2	S3.1 & S3.2	T1 & T2	S1					
	(in.)	(in.)	(in.)	(in.)	(in.)	lb	kg	ft3	l
AGZ075E	2.625	1.375	3.0 in	0.75 in	11.94	244	110.7	1.05	29.7
AGZ080E	2.625	1.375	3.0 in	0.75 in	13.13	266	120.7	1.16	32.8
AGZ090E	2.625	1.375	3.0 in	0.75 in	13.13	266	120.7	1.16	32.8
AGZ100E	2.625	1.375	3.0 in	0.75 in	15.91	317	143.8	1.41	39.9
AGZ110E	2.625	1.375	3.0 in	0.75 in	17.10	339	153.8	1.52	43.0
AGZ120E	2.625	1.375	3.0 in	0.75 in	18.69	369	167.4	1.67	47.2
AGZ130E	2.625	1.375	3.0 in	0.75 in	20.67	406	184.2	1.85	52.3
AGZ140E	2.625	1.375	4.0 in	0.75 in	22.26	435	197.3	2.00	56.5
AGZ150E	2.625	1.375	4.0 in	0.75 in	23.85	465	211.0	2.15	60.8
AGZ161E	2.625	1.375	4.0 in	0.75 in	23.85	465	211.0	2.15	60.8
AGZ170E	2.625	1.375	4.0 in	0.75 in	25.43	494	224.1	2.29	64.7
AGZ180E	2.625	1.375	4.0 in	0.75 in	27.42	531	240.9	2.48	70.1

Figure 34: AGZ191E - 241E Brazed Plate Evaporator Dimensions



MODEL	2X Suction Connection (IDF)	2x Liquid Connection (IDF)	2x Water Connection (Victaulic)	Water Connection (NPT)	DIM A	Dry Weight		Water Volume	
	S4.1 & S4.2	S3.1 & S3.2	T1 & T2	S1					
	(in.)	(in.)	(in.)	(in.)	(in.)	lb	kg	ft3	l
AGZ191E	3.125	1.625	5.0 in	0.75 in	18.4	670	303.9	2.40	67.8
AGZ211E	3.125	1.625	5.0 in	0.75 in	18.4	670	303.9	2.40	67.8
AGZ226E	3.125	1.625	5.0 in	0.75 in	22.5	806	365.6	3.00	84.8
AGZ241E	3.125	1.625	5.0 in	0.75 in	22.5	806	365.6	3.00	84.8

Figure 35: Remote Evap Condensing Unit - 4 Fan; AGZ030E-AGZ035E



REMOTE EVAPORATOR UNITS WITH MICROCHANNEL COILS

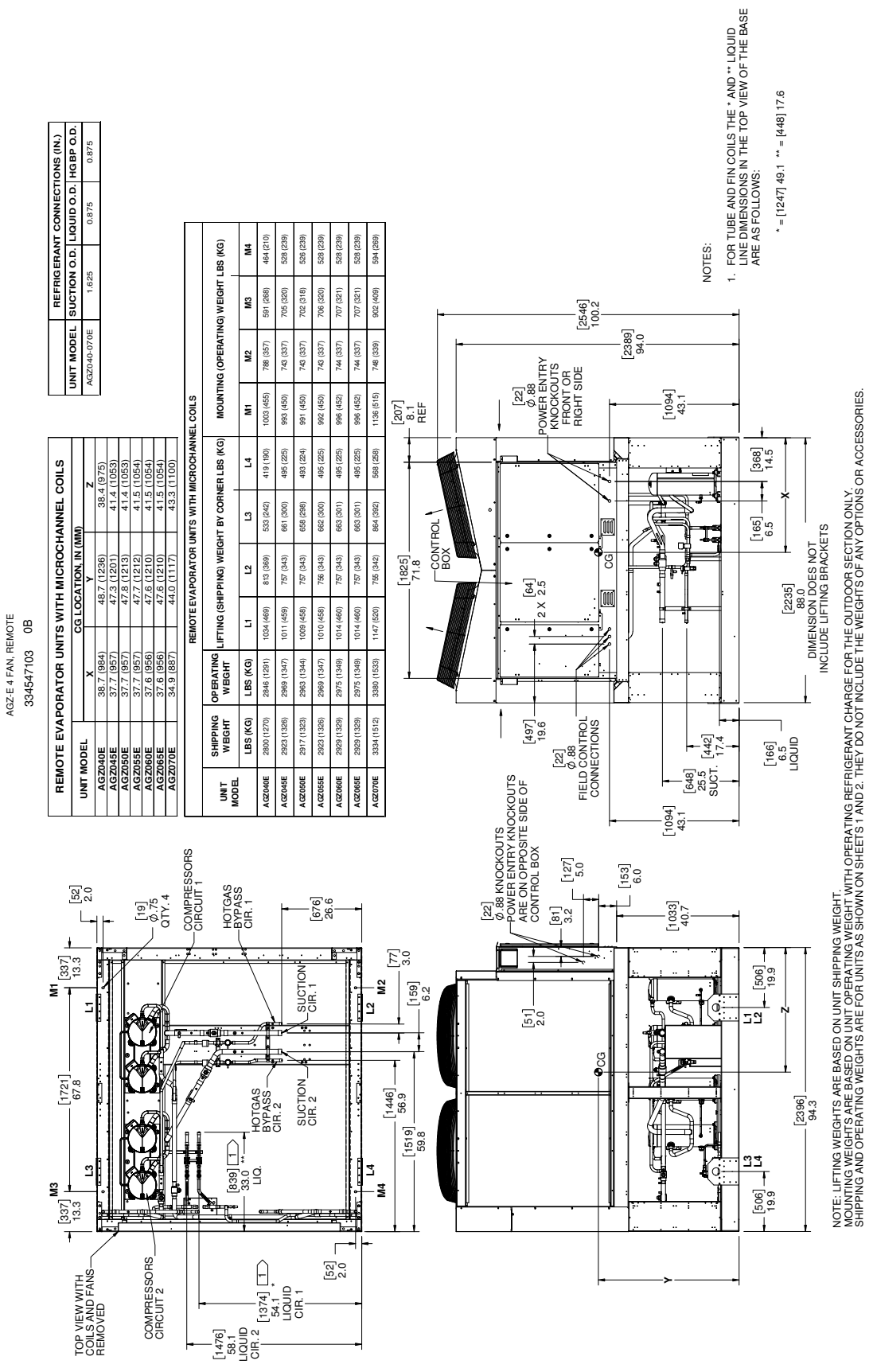
UNIT MODEL	CG LOCATION, IN (MM)		
	X	Y	Z
AGZ030E	37.9 (962)	46.8 (1188)	41.0 (1041)
AGZ035E	38.6 (981)	48.0 (1218)	38.1 (968)

UNIT MODEL	REFRIGERANT CONNECTIONS (IN.)		
	SUCTION O.D.	LIQUID O.D.	HGBP O.D.
AGZ030-035E	1.625	0.875	0.875

REMOTE EVAPORATOR UNITS WITH MICROCHANNEL COILS

UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING (SHIPPING) WEIGHT BY CORNER LBS (KG)				MOUNTING (OPERATING) WEIGHT LBS (KG)			
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4
AGZ030E	2818 (1278)	2852 (1294)	984 (446)	744 (337)	621 (282)	470 (213)	961 (436)	727 (330)	663 (301)	502 (228)
AGZ035E	2738 (1242)	2770 (1256)	1023 (464)	800 (363)	513 (233)	401 (182)	986 (447)	771 (350)	569 (258)	445 (202)

Figure 36: Remote Evap Condensing Unit - 4 Fan; AGZ040E-AGZ070E



REMOTE EVAPORATOR UNITS WITH MICROCHANNEL COILS			
UNIT MODEL	CG LOCATION, IN (MM)		
	X	Y	Z
AGZ040E	38.7 (984)	48.7 (1236)	38.4 (975)
AGZ045E	37.7 (957)	47.3 (1201)	41.4 (1053)
AGZ050E	37.7 (957)	47.8 (1213)	41.4 (1053)
AGZ055E	37.7 (957)	47.7 (1212)	41.5 (1054)
AGZ060E	37.6 (956)	47.6 (1210)	41.5 (1054)
AGZ065E	37.6 (956)	47.6 (1210)	41.5 (1054)
AGZ070E	34.9 (887)	44.0 (1117)	43.3 (1100)

REFRIGERANT CONNECTIONS (IN.)			
UNIT MODEL	SUCTION O.D.	LIQUID O.D.	HGBP O.D.
AGZ040-070E	1.625	0.875	0.875

REMOTE EVAPORATOR UNITS WITH MICROCHANNEL COILS										
UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING (SHIPPING) WEIGHT BY CORNER LBS (KG)				MOUNTING (OPERATING) WEIGHT LBS (KG)			
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4
AGZ040E	2800 (1270)	2846 (1291)	1034 (469)	813 (369)	533 (242)	419 (190)	1003 (455)	788 (357)	591 (268)	464 (210)
AGZ045E	2923 (1326)	2969 (1347)	1011 (459)	757 (343)	661 (300)	495 (225)	993 (450)	743 (337)	705 (320)	526 (239)
AGZ050E	2917 (1323)	2963 (1344)	1009 (458)	757 (343)	658 (298)	493 (224)	991 (450)	743 (337)	702 (318)	526 (239)
AGZ055E	2923 (1326)	2969 (1347)	1010 (458)	756 (343)	666 (300)	495 (225)	992 (450)	743 (337)	706 (320)	526 (239)
AGZ060E	2929 (1329)	2975 (1349)	1014 (460)	757 (343)	663 (301)	495 (225)	996 (452)	744 (337)	707 (321)	528 (239)
AGZ065E	2929 (1329)	2975 (1349)	1014 (460)	757 (343)	663 (301)	495 (225)	996 (452)	744 (337)	707 (321)	528 (239)
AGZ070E	3334 (1512)	3380 (1533)	1147 (520)	756 (342)	864 (392)	568 (258)	1136 (515)	748 (339)	902 (409)	594 (269)

Figure 37: Remote Evap Condensing Unit - 6 Fan; AGZ075E-AGZ100E

UNIT MODEL	CG LOCATION X IN.	X MM	Y IN.	Y MM	Z IN.	Z MM
AGZ075E	45.5	1156	43.0	1092	53.8	1367
AGZ080E	44.5	1130	43.3	1100	52.8	1341
AGZ090E	44.5	1130	43.2	1097	52.7	1339
AGZ100E	43.7	1110	42.0	1067	51.6	1311

UNIT MODEL	REFRIGERANT CONNECTIONS SUCT. O.D. IN.	SUCT. O.D. MM	LIQ. O.D. IN.	LIQ. O.D. MM	HGBP O.D. IN.	HGBP O.D. MM
AGZ075E AGZ080E AGZ090E AGZ100E	2.63	66.8	1.13	28.7	0.88	22.4

UNIT MODEL	SHIP WEIGHT LBS	SHIP WEIGHT KG	OPER. WEIGHT LBS	OPER. WEIGHT KG	LIFTING (SHIPPING) WEIGHT BY CORNER L1 LBS	L1 KG	L2 LBS	L2 KG	L3 LBS	L3 KG	L4 LBS	L4 KG	MOUNTING (OPERATING) WEIGHT M1 LBS	M1 KG	M2 LBS	M2 KG	M3 LBS	M3 KG	M4 LBS	M4 KG
AGZ075E	3916	1776	4100	1860	1243	564	1332	604	647	293	694	315	1125	510	1205	547	855	388	916	415
AGZ080E	4035	1830	4219	1914	1334	605	1364	619	661	300	676	307	1207	547	1233	559	880	399	899	408
AGZ090E	4061	1842	4253	1929	1345	610	1375	624	663	301	678	308	1219	553	1245	565	885	401	904	410
AGZ100E	4189	1900	4385	1989	1439	653	1419	644	670	304	661	300	1304	591	1286	583	904	410	891	404

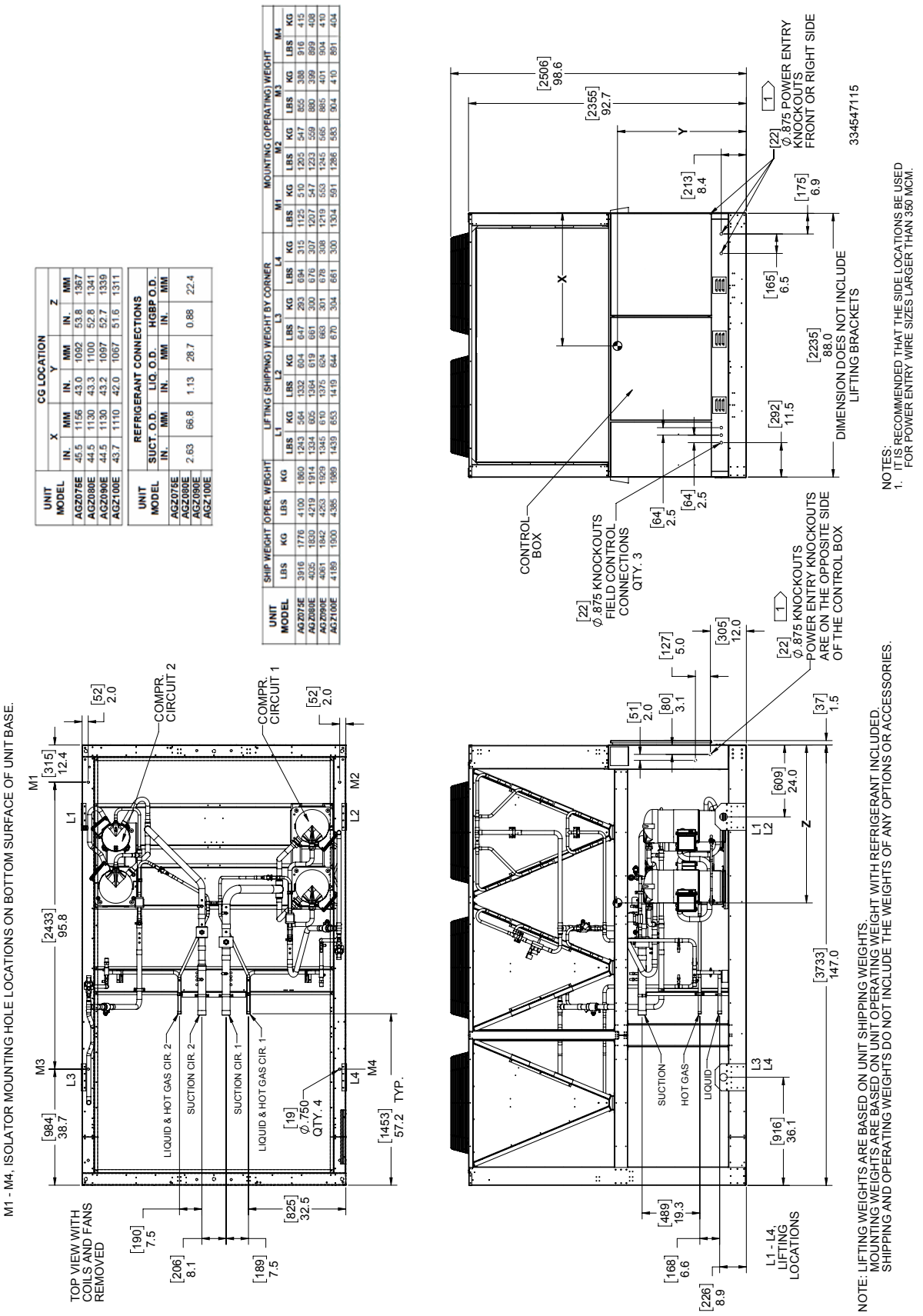
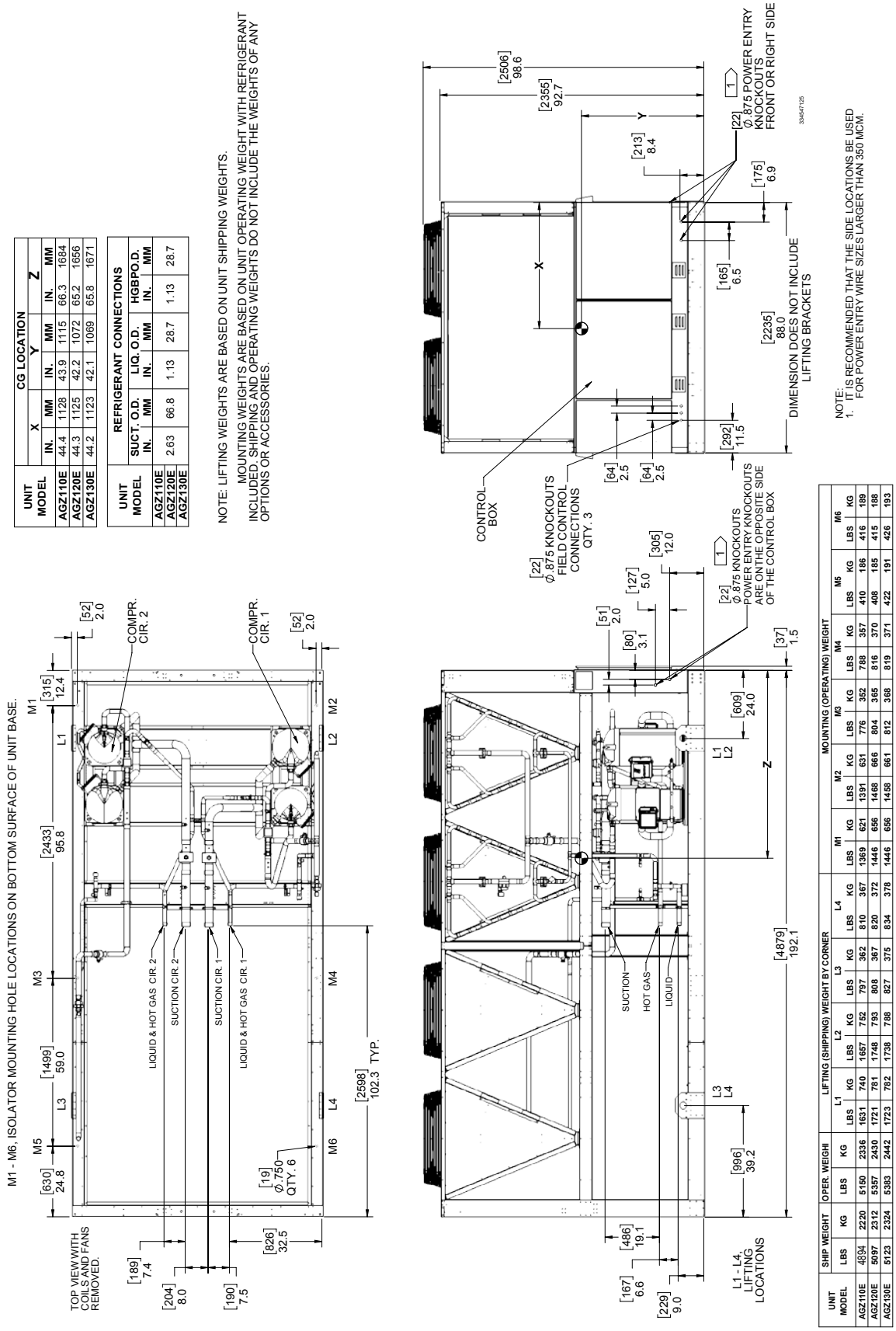


Figure 38: Remote Evap Condensing Unit - 8 Fan; AGZ110E-AGZ130E

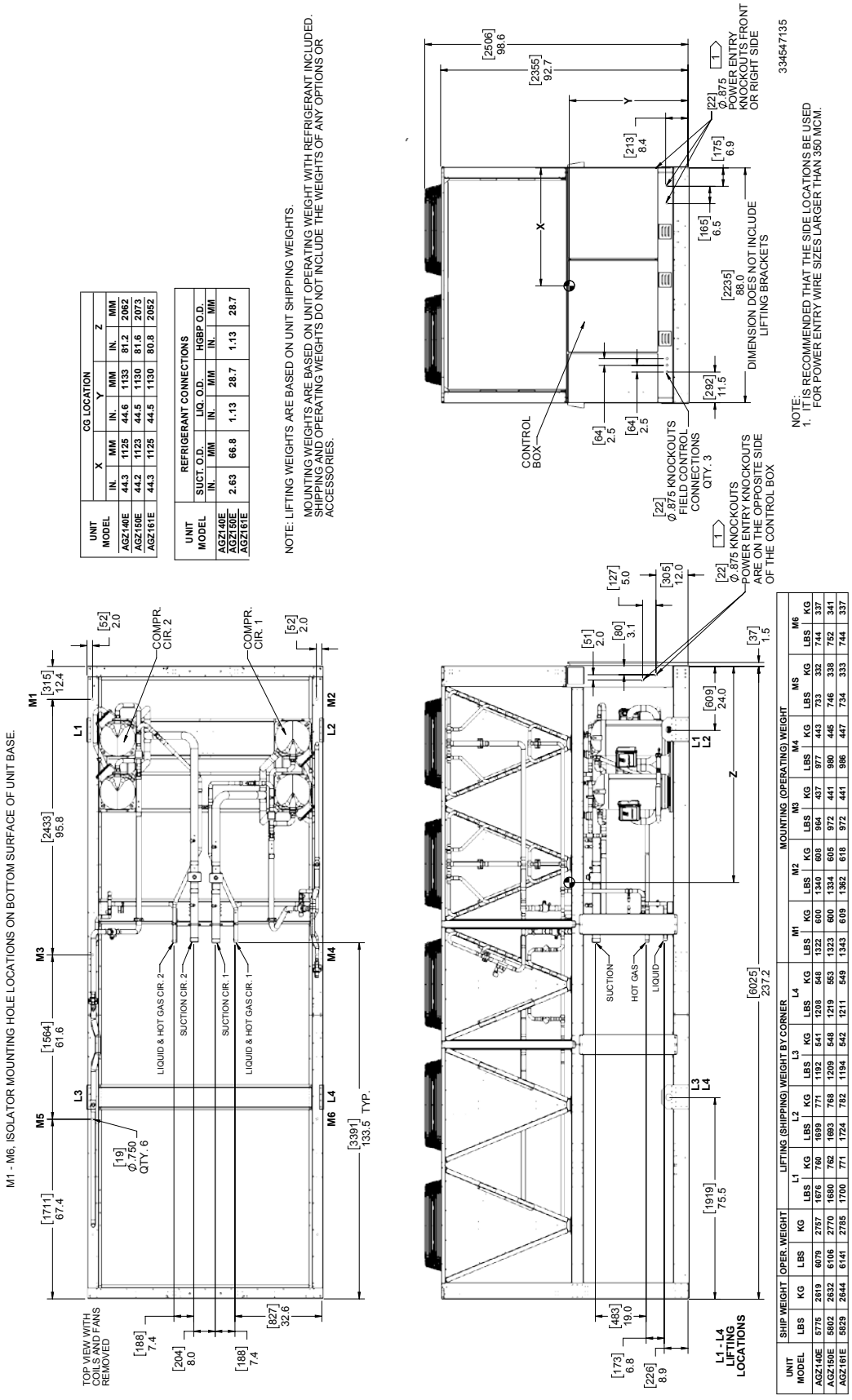


UNIT MODEL	CG LOCATION					
	X		Y		Z	
	IN.	MM	IN.	MM	IN.	MM
AGZ110E	44.4	1128	43.9	1115	66.3	1684
AGZ120E	44.3	1125	42.2	1072	65.2	1656
AGZ130E	44.2	1123	42.1	1069	65.8	1671

UNIT MODEL	REFRIGERANT CONNECTIONS					
	SUCT. O.D.		LIQ. O.D.		HGBPO.D.	
	IN.	MM	IN.	MM	IN.	MM
AGZ110E	2.63	66.8	1.13	28.7	1.13	28.7
AGZ120E						
AGZ130E						

UNIT MODEL	SHIP WEIGHT		OPER. WEIGHT		LIFTING (SHIPPING) WEIGHT BY CORNER								MOUNTING (OPERATING) WEIGHT											
					L1		L2		L3		L4		M1		M2		M3		M4		M5		M6	
	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
AGZ110E	4894	2220	5150	2336	1631	740	1657	752	797	362	810	367	1369	621	1391	631	776	352	788	357	410	186	416	189
AGZ120E	5097	2312	5357	2430	1721	781	1748	793	808	367	820	372	1446	656	1468	666	804	365	816	370	408	185	415	188
AGZ130E	5123	2324	5383	2442	1723	782	1738	788	827	375	834	378	1446	656	1458	661	812	368	819	371	422	191	426	193

Figure 39: Remote Evap Condensing Unit - 10 Fan; AGZ140E-AGZ161E



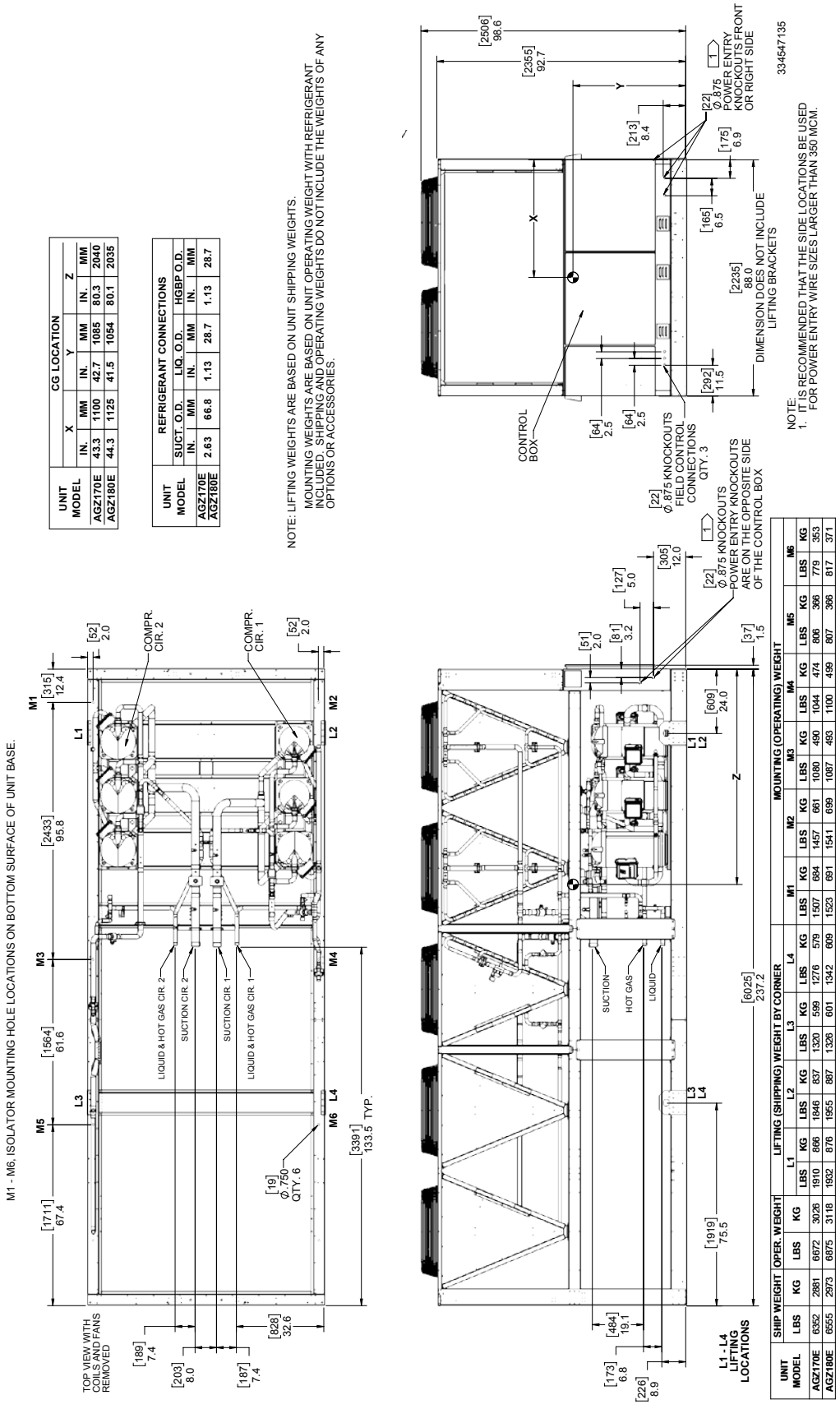
UNIT MODEL	CG LOCATION X IN.	X MM	Y IN.	Y MM	Z IN.	Z MM
AGZ140E	44.3	1125	44.6	1133	81.2	2062
AGZ150E	44.2	1123	44.5	1130	81.6	2073
AGZ161E	44.3	1125	44.5	1130	80.8	2052

UNIT MODEL	REFRIGERANT CONNECTIONS SUCT. O.D. IN.	SUCT. O.D. MM	LIQ. O.D. IN.	LIQ. O.D. MM	HGBP O.D. IN.	HGBP O.D. MM
AGZ140E AGZ150E AGZ161E	2.63	66.8	1.13	28.7	1.13	28.7

NOTE: LIFTING WEIGHTS ARE BASED ON UNIT SHIPPING WEIGHTS.
MOUNTING WEIGHTS ARE BASED ON UNIT OPERATING WEIGHT WITH REFRIGERANT INCLUDED. SHIPPING AND OPERATING WEIGHTS DO NOT INCLUDE THE WEIGHTS OF ANY OPTIONS OR ACCESSORIES.

UNIT MODEL	SHIP WEIGHT LBS	SHIP WEIGHT KG	OPER. WEIGHT LBS	OPER. WEIGHT KG	LIFTING (SHIPPING) WEIGHT BY CORNER L1 LBS	L1 KG	L2 LBS	L2 KG	L3 LBS	L3 KG	L4 LBS	L4 KG	MOUNTING (OPERATING) WEIGHT M1 LBS	M1 KG	M2 LBS	M2 KG	M3 LBS	M3 KG	M4 LBS	M4 KG	M5 LBS	M5 KG	M6 LBS	M6 KG
AGZ140E	5775	2619	6079	2757	1676	760	1699	771	1192	541	1208	548	1322	600	1340	608	964	437	977	443	733	332	744	337
AGZ150E	5802	2632	6106	2770	1680	762	1693	768	1209	548	1219	553	1323	600	1334	605	972	441	980	445	746	338	752	341
AGZ161E	5829	2644	6141	2785	1700	771	1724	782	1194	542	1211	549	1343	609	1362	618	972	441	986	447	734	333	744	337

Figure 40: Remote Evap Condensing Unit - 10 Fan; AGZ170E-AGZ180E

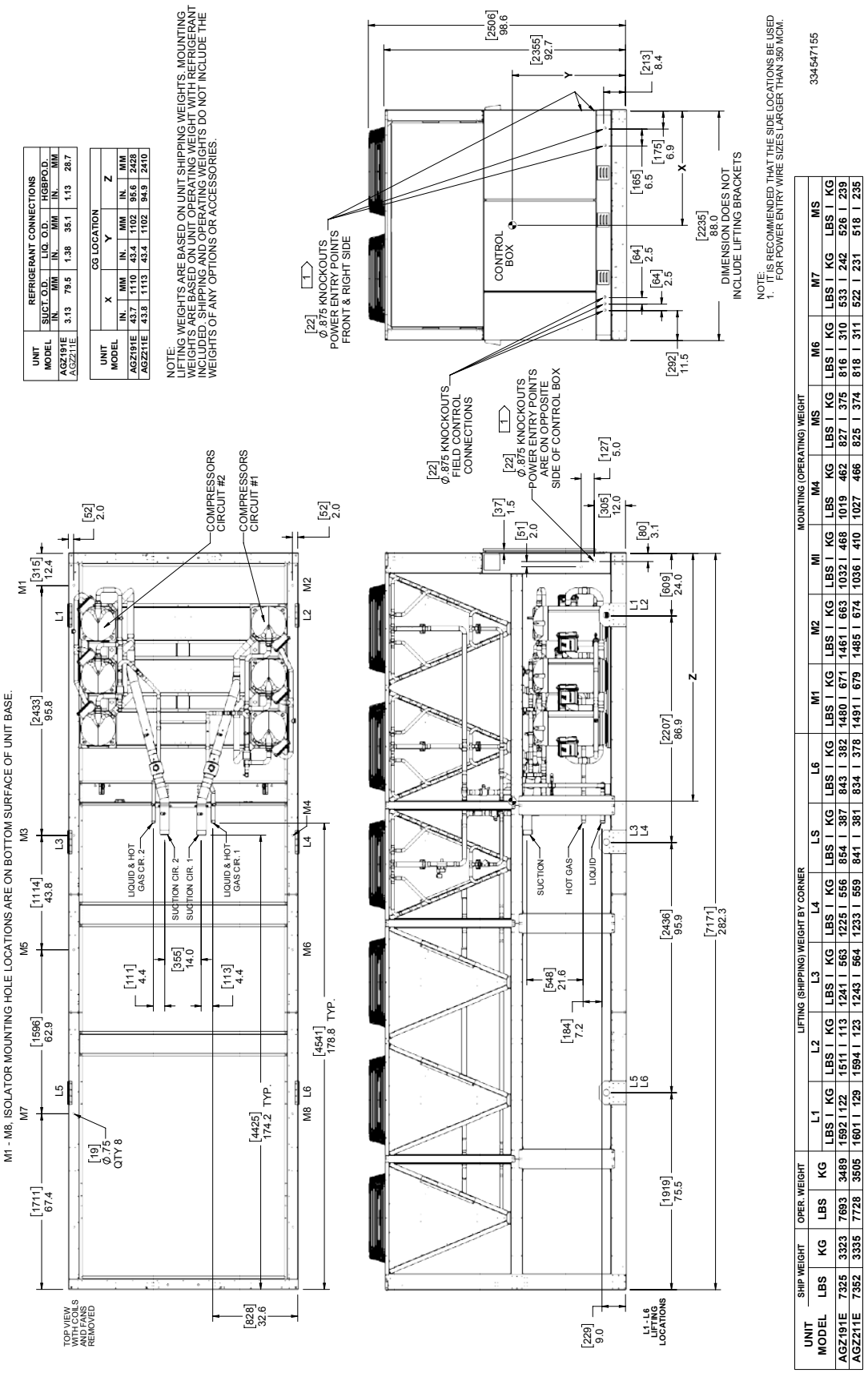


UNIT MODEL	CG LOCATION					
	X		Y		Z	
	IN.	MM	IN.	MM	IN.	MM
AGZ170E	43.3	1100	42.7	1085	80.3	2040
AGZ180E	44.3	1125	41.5	1054	80.1	2035

UNIT MODEL	REFRIGERANT CONNECTIONS					
	SUCT. O.D.		LIQ. O.D.		HGBP O.D.	
	IN.	MM	IN.	MM	IN.	MM
AGZ170E AGZ180E	2.63	66.8	1.13	28.7	1.13	28.7

UNIT MODEL	SHIP WEIGHT		OPER. WEIGHT		LIFTING (SHIPPING) WEIGHT BY CORNER								MOUNTING (OPERATING) WEIGHT											
					L1		L2		L3		L4		M1		M2		M3		M4		M5		M6	
	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
AGZ170E	6352	2881	6672	3026	1910	866	1846	837	1320	599	1276	579	1507	684	1457	661	1080	490	1044	474	806	366	779	353
AGZ180E	6555	2973	6875	3118	1932	876	1955	887	1326	601	1342	609	1523	691	1541	699	1087	493	1100	499	807	366	817	371

Figure 41: Remote Evap Condensing Unit - 12 Fan; AGZ191E-AGZ211E



UNIT MODEL	REFRIGERANT CONNECTIONS					
	SUCT. O.D.		LIQ. O.D.		HGBPO.D.	
	IN.	MM	IN.	MM	IN.	MM
AGZ191E AGZ211E	3.13	79.5	1.38	35.1	1.13	28.7

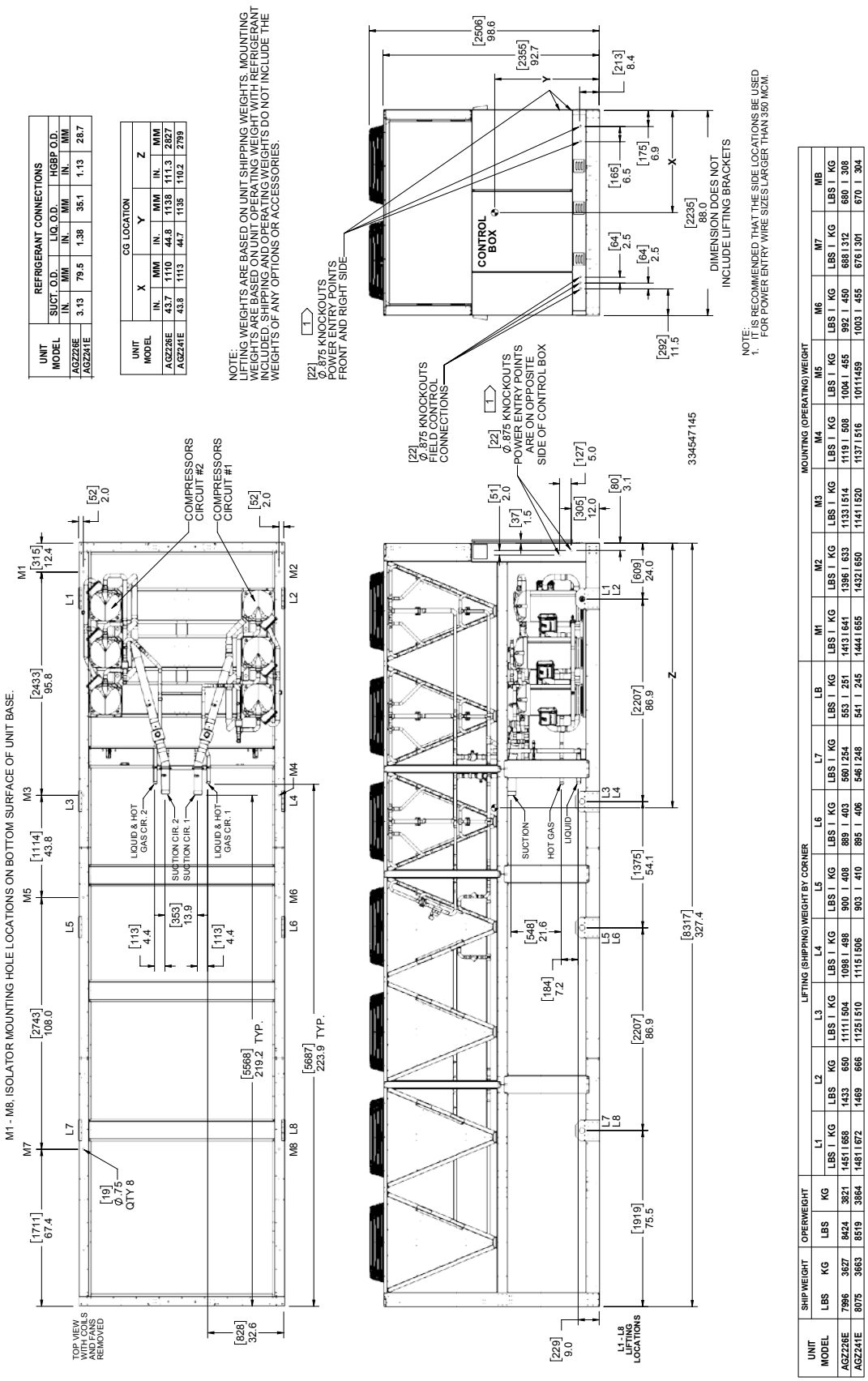
UNIT MODEL	CG LOCATION					
	X		Y		Z	
	IN.	MM	IN.	MM	IN.	MM
AGZ191E	43.7	1110	43.4	1102	95.6	2428
AGZ211E	43.8	1113	43.4	1102	94.9	2410

NOTE:
LIFTING WEIGHTS ARE BASED ON UNIT SHIPPING WEIGHTS. MOUNTING WEIGHTS ARE BASED ON UNIT OPERATING WEIGHT WITH REFRIGERANT INCLUDED. SHIPPING AND OPERATING WEIGHTS DO NOT INCLUDE THE WEIGHTS OF ANY OPTIONS OR ACCESSORIES.

NOTE:
1. IT IS RECOMMENDED THAT THE SIDE LOCATIONS BE USED FOR POWER ENTRY WIRE SIZES LARGER THAN 350 MCM.

UNIT MODEL	SHIP WEIGHT		OPER. WEIGHT	LIFTING (SHIPPING) WEIGHT BY CORNER												MOUNTING (OPERATING) WEIGHT											
				L1		L2		L3		L4		L5		L6		M1		M2		MI		M4		M5		M6		M7	
	LBS	KG	LBS	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
AGZ191E	7325	3323	7693	1592	722	1511	685	1241	563	1225	556	854	387	843	382	1480	671	1461	663	1032	468	1019	462	827	375	816	370	533	242	526	239
AGZ211E	7352	3335	7728	1601	726	1594	723	1243	564	1233	559	841	381	834	378	1491	676	1485	674	1036	470	1027	466	825	374	818	371	522	237	518	235

Figure 42: Remote Evap Condensing Unit - 14 Fan; AGZ226E-AGZ241E



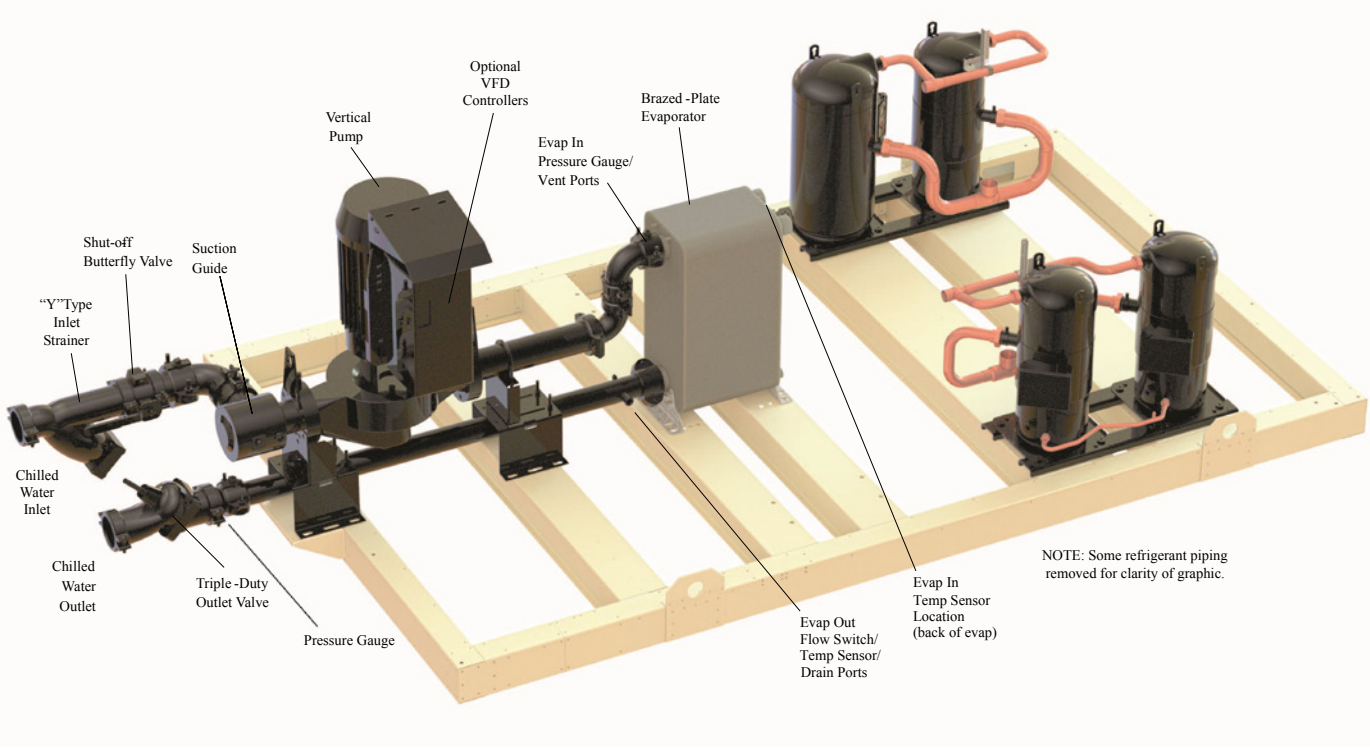
UNIT MODEL	REFRIGERANT CONNECTIONS					
	SUCT. O.D.		LIQ. O.D.		HGBP O.D.	
	IN.	MM	IN.	MM	IN.	MM
AGZ226E	3.13	79.5	1.38	35.1	1.13	28.7
AGZ241E						

UNIT MODEL	CG LOCATION					
	X		Y		Z	
	IN.	MM	IN.	MM	IN.	MM
AGZ226E	43.7	1110	44.8	1138	111.3	2827
AGZ241E	43.8	1113	44.7	1135	110.2	2799

UNIT MODEL	SHIP WEIGHT		OPERWEIGHT		LIFTING (SHIPPING) WEIGHT BY CORNER												MOUNTING (OPERATING) WEIGHT									
	LBS	KG	LBS	KG	L1		L2		L3		L4		L5		L6		L7		LB		M1		M2		M3	
					LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
AGZ226E	7996	3627	8424	3821	1451	658	1433	650	1111	504	1098	498	900	408	889	403	560	254	553	251	1413	641	1396	633	1133	514
AGZ241E	8075	3663	8519	3864	1481	672	1469	666	1125	510	1115	506	903	410	895	406	546	248	541	245	1444	655	1432	650	1141	520

UNIT MODEL	MOUNTING (OPERATING) WEIGHT													
	M4		M5		M6		M7		M8					
	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG				
AGZ226E	1119	508	1004	455	992	450	688	312	680	308				
AGZ241E	1137	516	10111459		1003	455	676	301	670	304				

Figure 43: Typical Pump Package Layout



Factory-installed pump packages provide important benefits:

- Simplify the chilled water system design and installation
- Provide installation savings by reducing field piping, wiring, and control costs
- Save valuable floor space inside the building
- Reduce project engineering content
- Greatly reduce pump operating cost with the optional variable flow pump Variable Frequency Drive (VFD)

Standard Components of Pump Packages

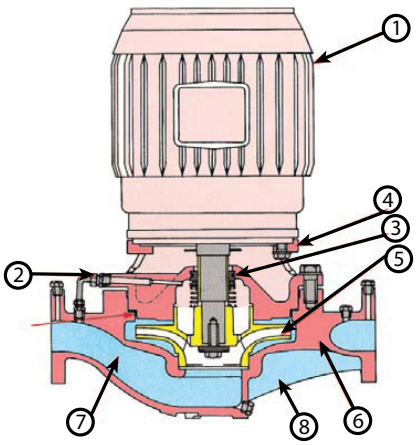
Figure 45 details the standard components included with a factory mounted pump package as well as additional items that may be factory mounted or field supplied.

Pumps

Pump Design Features

1. Industry standard face mounted motor.
2. Flush and vent connection removes entrained air and ensures liquid at seal face at all times.
3. Inside type mechanical seal with silicon carbide seat, serviceable without breaking pipe connections.
4. Heavy cylindrical bracket with 360° register on both flanges provides a rigid union of pump and motor.
5. Dynamically balanced impeller assures smooth vibration-free operation.

Figure 44: Pump Design Features



6. Radially split casing with equal suction and discharge flange sizes. Separate tapped openings for gauge, flush, and drain connections.
7. Liberal inlet passageways and straightening vanes provide optimum suction performance and quiet operation.
8. Ribs cast integral with casing. Machined surface to accept floor support when specified.
9. Confined casing gasket to meet stringent industrial temperature and pressure applications.

Pump packages may be single or dual pump arrangement. Each pump is a vertical, in-line, radially split-case pump with a single spring inside mechanical seal with carbon against silicon carbide faces. Each case is cast iron. Impellers are bronze, trimmed to design conditions and then balanced. The shaft sleeve is bronze, extending the full length of the seal area.

Dual pumps are mounted in a common casing with a common inlet connection and outlet connection. The pumps are designed for duty/standby, not parallel operation, and is capable of having one side running at one time. A flapper valve on the discharge side of the casing is flipped over to the side by the moving water to prevent recirculation when only one pump is operating.

The servicing of one side of the pump will require the following:

a. to stop running the pump
b. remove the one rotating head
c. install a gasket and blanking plate on one side of the pump casing
d. start the pump back up with the one rotating head and the defective one can be serviced.

For all pump arrangements, each pump is serviceable without breaking pipe connections. The motor and pump rotating assembly can be serviced without removing the pump casing from the line.

Pump performance curves are generated by Daikin Tools for the specific criteria of the installation. Contact a Daikin Applied representative for this information.

Pumps and pump package components are not heat traced and may require additional freeze protection measures, refer to page 16.

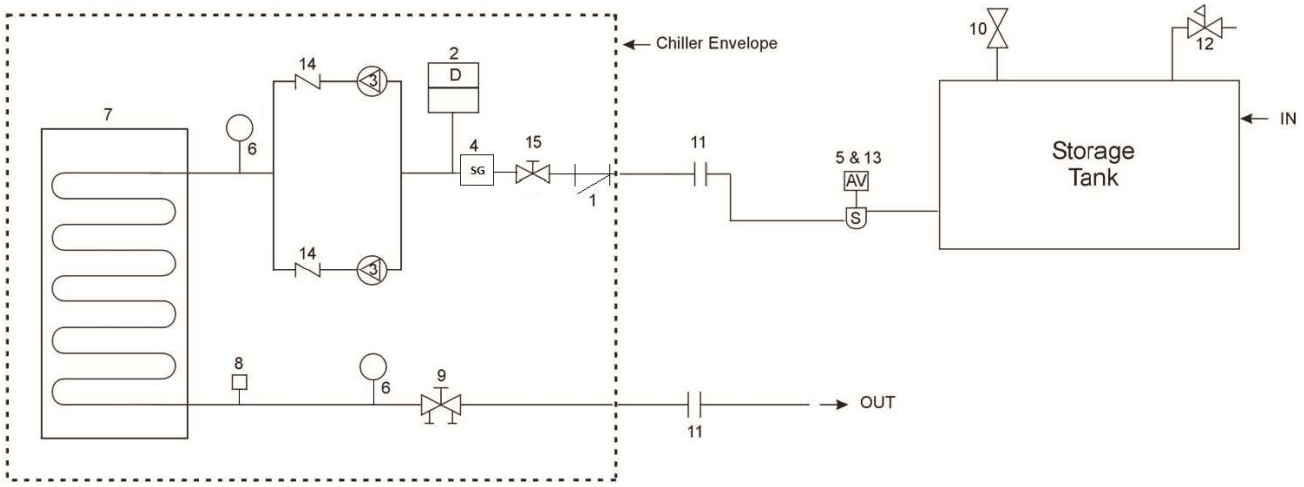
Additional factory provided components:

- "Y" type inlet strainer (shipped loose)
- Combination triple-duty outlet valve having a drip-tight discharge shutoff valve, non-slam check valve, and flow throttling valve (shipped loose)
- Combination suction guide with flow stabilizing outlet vanes and stainless steel strainer with a disposable fine-mesh strainer for start-up
- Factory power and control wiring from the AGZ-E chiller to the pump package control panel
- Flow switch mounted and wired
- Interconnecting piping with grooved couplings
- Insulation of all cold surfaces

Optional components that may be factory or field supplied:

- Water pressure gauges on pump suction and discharge
- Expansion tank with size increments from 4.4 to 90 gallons, field installed (some sizes can be factory mounted)
- Air separator with air vent, field installed
- Flex piping connections, field installed
- Storage tanks - vertical, insulated, (150, 300, 600, 1000 gallon sizes) with optional immersion heater, field installed.

Figure 45: Pump Package Standard Components



Included with all Pump Packages

1. Wye – Strainer
3. Pump
4. Suction Guide
7. Heat Exchanger
8. Flow Switch
9. Triple Duty Valve
15. Butterfly Valve
14. Internal to Pump Check Valves
*Only with dual pumps

Factory Mounted or Field Supplied

2. Expansion Tank
6. Pressure Gauges

Factory or Field Supplied but Field Mounted

5. Air Vent Connection Port
11. Flex Connections
13. Air Separator and Vent

Field Supplied and Mounted

10. Pressure Relief
12. Pressure Reducing / Fill Valve

Note: Pump Package insulation is included
Optional dual pump shown in diagram

Pump Operating Control

Constant Flow

The pumps will run at constant speed and will start and stop automatically with the chiller unit. When the chiller is enabled to run by having its MicroTech® III unit controller in the Auto state or by a signal from a BAS (not necessarily with compressors running based on availability of a cooling load), the pump panel will receive a signal to start from the chiller controller when either the chilled water leaving or entering temperature reaches the chiller freeze point setting to help prevent freeze up. When there is sufficient flow to close the flow switch within a timed period (recirc timer), a proof-of-flow signal is sent to the chiller and the pump is in the Run state. If there is a call for cooling based on the chilled water temperature, the chiller will commence its compressor startup procedure. If there is no call for cooling, the chiller will be on stand-by waiting for load.

If the flow switch does not see flow, the pump remains in the Start state until flow is established, at which time the pump will be in the Run state. Flow is recognized when the flow switch indicates flow for longer than the recirc timer setpoint.

The Run state is a control condition established by satisfying certain conditions. The Start state means that a digital signal has been sent to the pump for it to start running.

When starting the chiller, it is prudent to be sure there is flow so the chiller compressors will be able to start based on a call for cooling due to high chilled water temperature. Observing water pressure gauges can confirm flow.

Flow interruption will open the flow switch, sending a signal to the chiller to shut down and also de-energize the pump. If the chiller is turned off, the pump will shut off after a timed period to allow water circulation during refrigerant pumpdown.

Variable Flow with Pump VFD

The operating cost savings resulting from using variable chilled water flow via a pump VFD is well known. In the past, however, its usage has been somewhat limited by the cost and uncertainty of field installing the required system pressure differential sensors. Daikin Applied offers a variable chilled water flow system, completely self-contained within the pump package, by simply ordering the optional pump VFD and no external sensors are required when operating in Sensorless Pressure Control.

There are four pump operating modes available with the optional factory-installed variable flow VFD is selected on the pump package is equipped with the variable frequency drive (VFD) option:

1. Sensorless Pressure Control (default setting)
2. BAS Control
3. Remote Sensor Control
4. Locally Selected Constant Speed Control

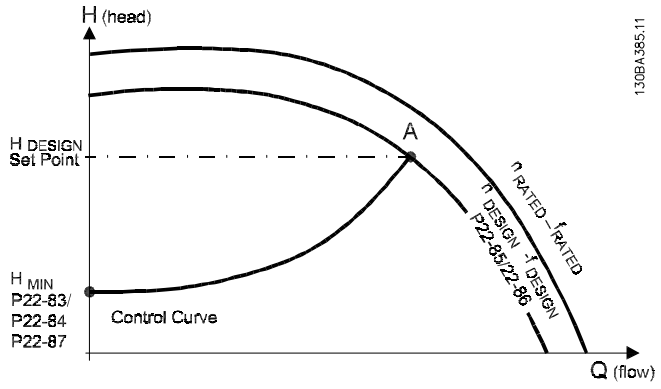
Sensorless Pressure Control

Onboard measurements allow control of the pump speed to optimize chilled water flow with respect to water system pressure. External pressure sensors are not required, eliminating design and installation effort. The unit is factory-configured for this mode.
NOTE: Sensorless operation is only allowed for single chiller systems. Systems with parallel chiller operation must use one of the other control methods.

The default control mode for Sensorless pumps is ‘Quadratic Pressure Control’ where the controller is set to control the speed according to a ‘control curve’ between max and min flow (see). The control curve is designed to replicate sensor positions at varying distances from the pump based on power, frequency, pressure, and flow across the flow range of the pump. Speed and pressure are adjusted to match the system load without the need for a sensor located at the most remote load point.

The quadratic measurements enable the pump to continuously identify the head and flow at any point in time which gives accurate pressure control without the need for external feedback signals such as a remote sensor. Incorporating the pump’s hydraulic data into the controller and removing sensors results in true integration of all components and removes the risk of remote sensor failure.

Figure 46: Pump Control Curve



Previously, a differential pressure sensor was placed at the most remote load, across the supply piping and return piping encompassing the valve and coil set, as common practice for system energy efficiency. Sensorless control can replicate this control without the need for that remote sensor. As the flow required by the system is reduced, the pump automatically reduces the head developed according to the pre-set control curve.

In systems with a remote sensor, it is often found that using a differential pressure sensor to sense the pressure across a remote load could theoretically result in loads close to the pump being under-pumped. The situation would be where the load at a loop extremity is satisfied and the control valve closes while a load close to the pump needs full flow. The probability of this occurring is remote but it is possible. One answer to this is to move the sensor closer to the pump (two-thirds of the way

out into the system is a popular recommendation) although physically re-positioning the sensor at commissioning stage can be a costly exercise. With Sensorless pump control it is possible to replicate the moving of a sensor by adjusting the head setting ‘Hmin’.

BAS Control

The pump speed will be controlled according to the voltage level from a BAS input signal. The pump control protocol is the same as ordered from the chiller unit. BAS inputs may be: BACnet® MS/TP, LONWORKS® or Modbus.
NOTE: BACnet® Ethernet/IP is currently unavailable.

Remote Sensor Control

The VFD is wired to pressure differential switch(s) mounted in the chilled water piping system. This is the standard VFD control when a sensorless VFD is not used.

Locally Selected Constant Speed Control

This mode is selected by pressing the Hand On key. Operation of the pump at a constant speed as selected on the VFD control panel. This mode allows selecting a pump speed to match the system curve.

Further details on the pump package VFD controller operation, alarms, and BAS integration can be found beginning on page 115.

Figure 47: Representative Refrigerant System Schematic

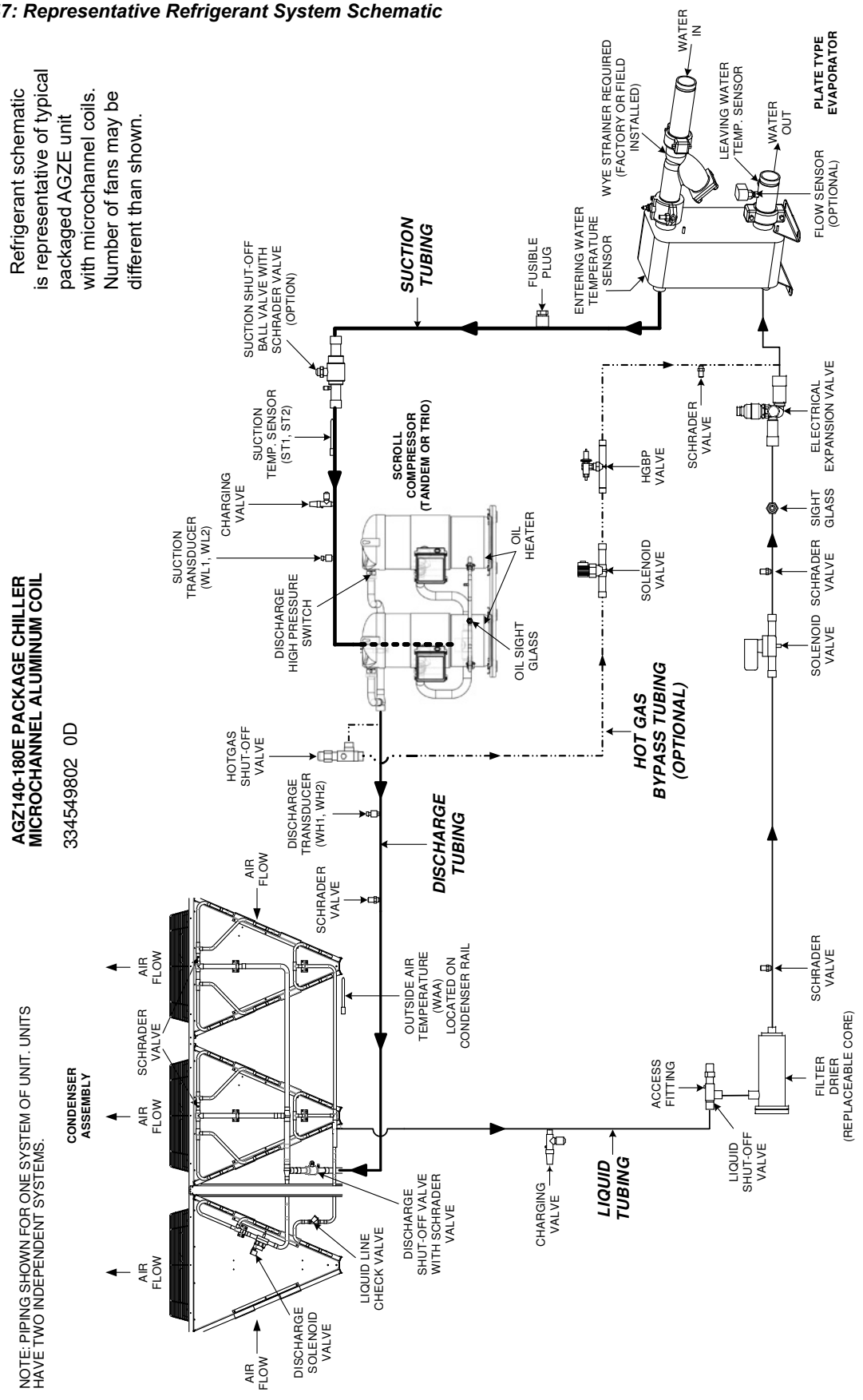


Figure 48: 4 Fan Units (AGZ030E-AGZ035E) with Dual Pumps

PUMP PACKAGE UNITS WITH MICROCHANNEL COILS									
UNIT MODEL	CG LOCATION								
	X		Y		Z				
	IN	MM	IN	MM	IN	MM			
AGZ030E	46.4	1179	38.8	986	43.8	1113			
AGZ035E	47.6	1209	39.1	993	42.0	1067			

NOTES:
1. SUCTION STRAINER, SHUT OFF VALVE AND TRIPLE DUTY VALVE WILL BE SHIPPED LOOSE FOR FIELD INSTALLATION.
2. DUE TO VARIATIONS IN PUMP SIZE, OPERATING WEIGHT WITH WATER MAY VARY UP TO ±5%. (LARGEST SIZE PUMP SHOWN)

PUMP PACKAGE UNITS WITH MICROCHANNEL COILS																					
UNIT MODEL	SHIPPING WEIGHT		OPERATING WEIGHT		LIFTING (SHIPPING) WEIGHT BY CORNER								MOUNTING (OPERATING) WEIGHT								
					L1		L2		L3		L4		M1		M2		M3		M4		
	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	
AGZ030E	3922	1779	3968	1800	1042	473	1164	528	811	368	906	411	1032	468	1154	523	842	382	940	426	
AGZ035E	3917	1777	3964	1798	1070	485	1259	571	730	331	858	389	1051	477	1236	561	771	350	907	411	

NOTE: LIFTING WEIGHTS ARE BASED ON UNIT SHIPPING WEIGHTS.
MOUNTING WEIGHTS ARE BASED ON UNIT OPERATING WEIGHT WITH EVAPORATOR WATER INCLUDED.
SHIPPING AND OPERATING WEIGHTS DO NOT INCLUDE THE WEIGHTS OF ANY OPTIONS OR ACCESSORIES.

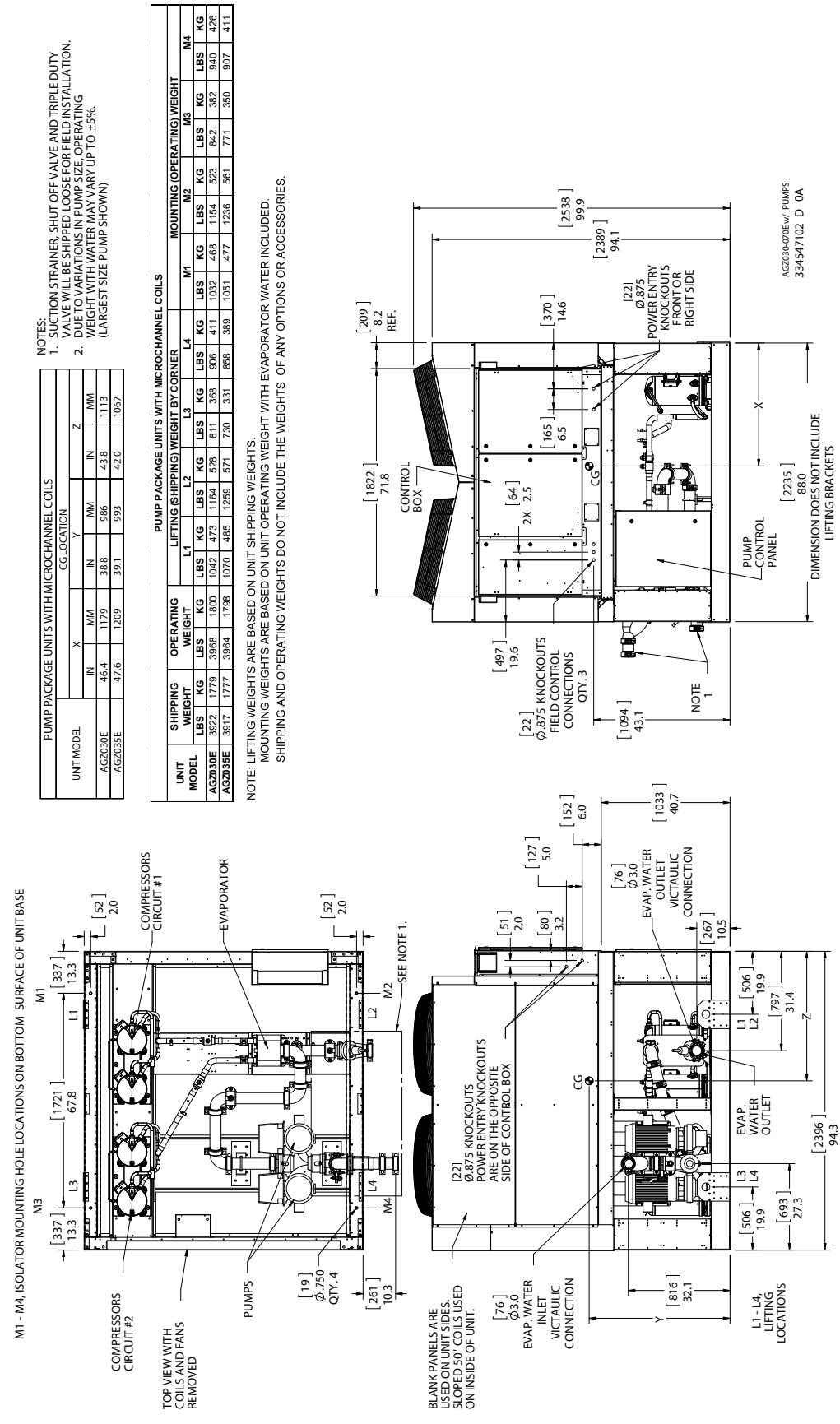
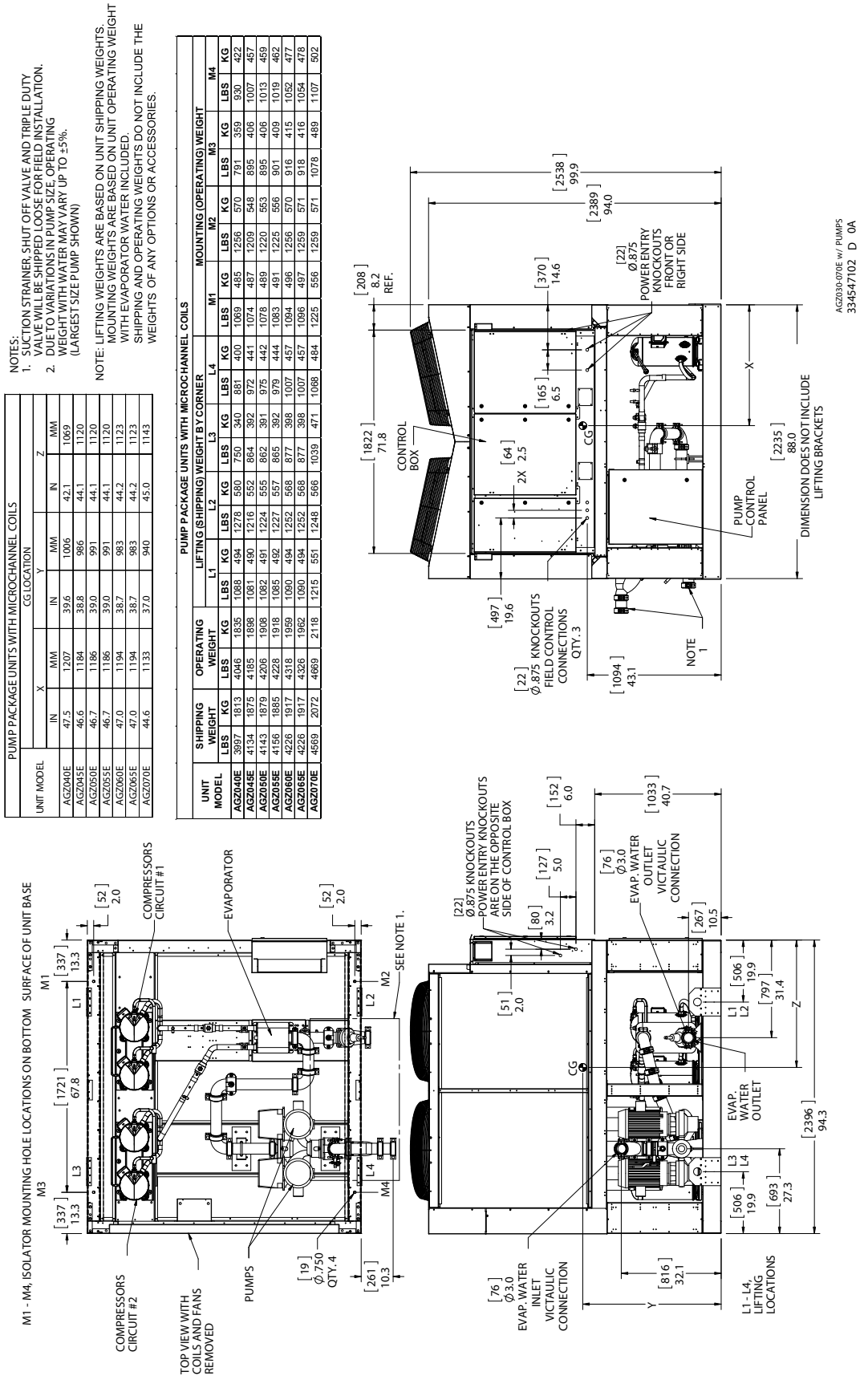


Figure 49: 4 Fan Units (AGZ040E-AGZ070E) with Dual Pumps



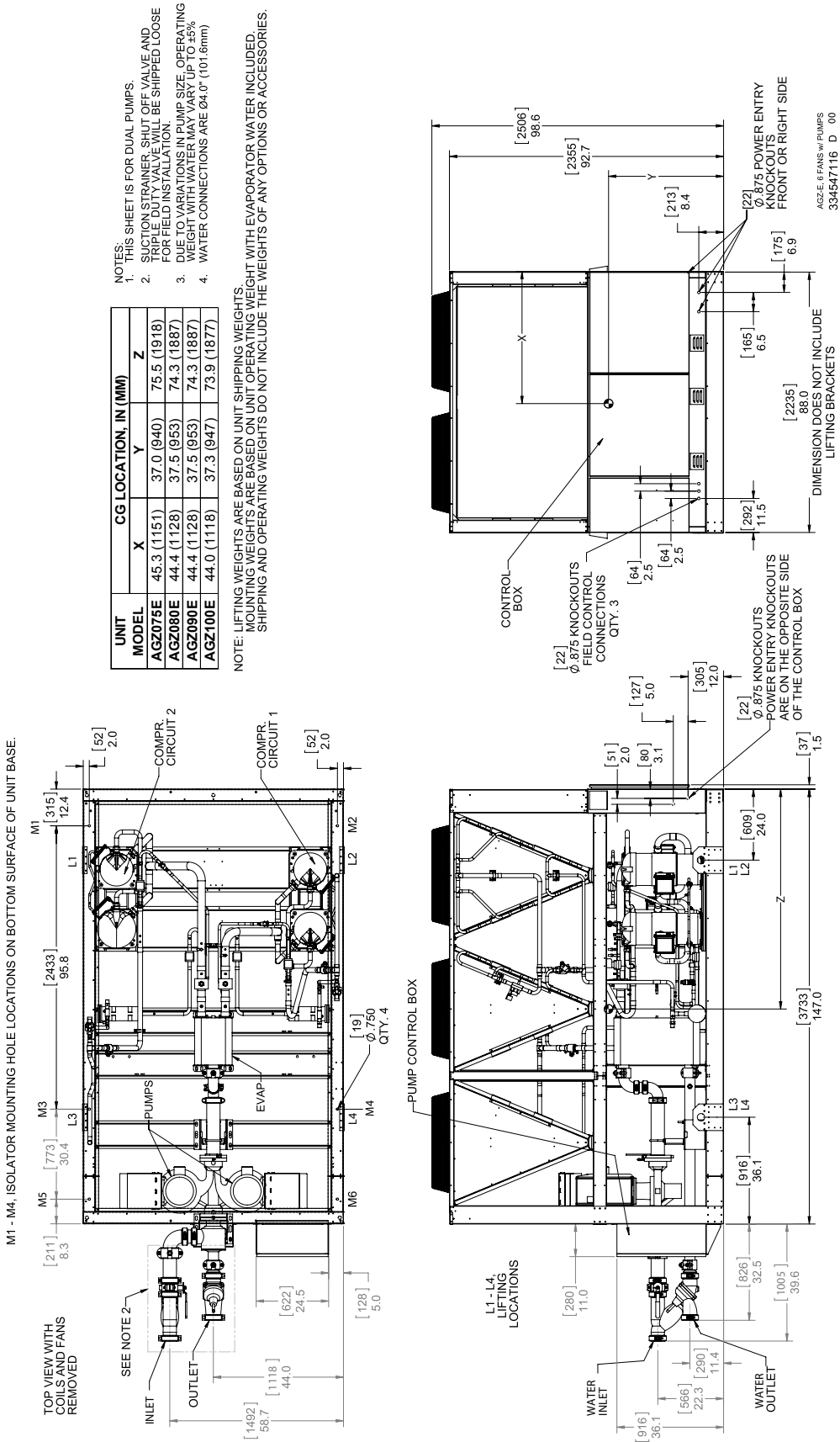
PUMP PACKAGE UNITS WITH MICROCHANNEL COILS													
UNIT MODEL	CG LOCATION												
	X			Y			Z						
	IN	MM		IN	MM		IN	MM					
AGZ040E	47.5	1207		39.6	1006		42.1	1069					
AGZ045E	46.6	1184		38.8	986		44.1	1120					
AGZ050E	46.7	1186		39.0	991		44.1	1120					
AGZ055E	46.7	1186		39.0	991		44.1	1120					
AGZ060E	47.0	1194		38.7	983		44.2	1123					
AGZ065E	47.0	1194		38.7	983		44.2	1123					
AGZ070E	44.6	1133		37.0	940		45.0	1143					

NOTES:
1. SUCTION STRAINER, SHUT OFF VALVE AND TRIPLE DUTY VALVE WILL BE SHIPPED LOOSE FOR FIELD INSTALLATION.
2. DUE TO VARIATIONS IN PUMP SIZE, OPERATING WEIGHT WITH WATER MAY VARY UP TO ±5%. (LARGEST SIZE PUMP SHOWN)

NOTE: LIFTING WEIGHTS ARE BASED ON UNIT SHIPPING WEIGHTS. MOUNTING WEIGHTS ARE BASED ON UNIT OPERATING WEIGHT WITH EVAPORATOR WATER INCLUDED. SHIPPING AND OPERATING WEIGHTS DO NOT INCLUDE THE WEIGHTS OF ANY OPTIONS OR ACCESSORIES.

PUMP PACKAGE UNITS WITH MICROCHANNEL COILS																															
UNIT MODEL	SHIPPING WEIGHT		OPERATING WEIGHT		LIFTING (SHIPPING) WEIGHT BY CORNER												MOUNTING (OPERATING) WEIGHT														
					L1		L2		L3		L4		M1		M2		M3		M4												
	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG
AGZ040E	3997	1813	4046	1835	1068	494	1278	580	750	340	881	400	1069	485	1256	570	791	359	930	422											
AGZ045E	4134	1875	4185	1898	1081	490	1216	552	864	392	972	441	1074	487	1209	548	895	406	1007	457											
AGZ050E	4143	1879	4206	1908	1082	491	1224	555	862	391	975	442	1078	489	1220	553	895	406	1013	459											
AGZ055E	4156	1885	4228	1918	1085	492	1227	557	865	392	979	444	1083	491	1225	556	901	409	1019	462											
AGZ060E	4226	1917	4318	1959	1090	494	1252	568	877	398	1007	457	1094	496	1256	570	916	415	1052	477											
AGZ065E	4226	1917	4326	1962	1090	494	1252	568	877	398	1007	457	1096	497	1259	571	918	416	1054	478											
AGZ070E	4569	2072	4669	2118	1215	551	1248	566	1039	471	1068	484	1225	556	1259	571	1078	489	1107	502											

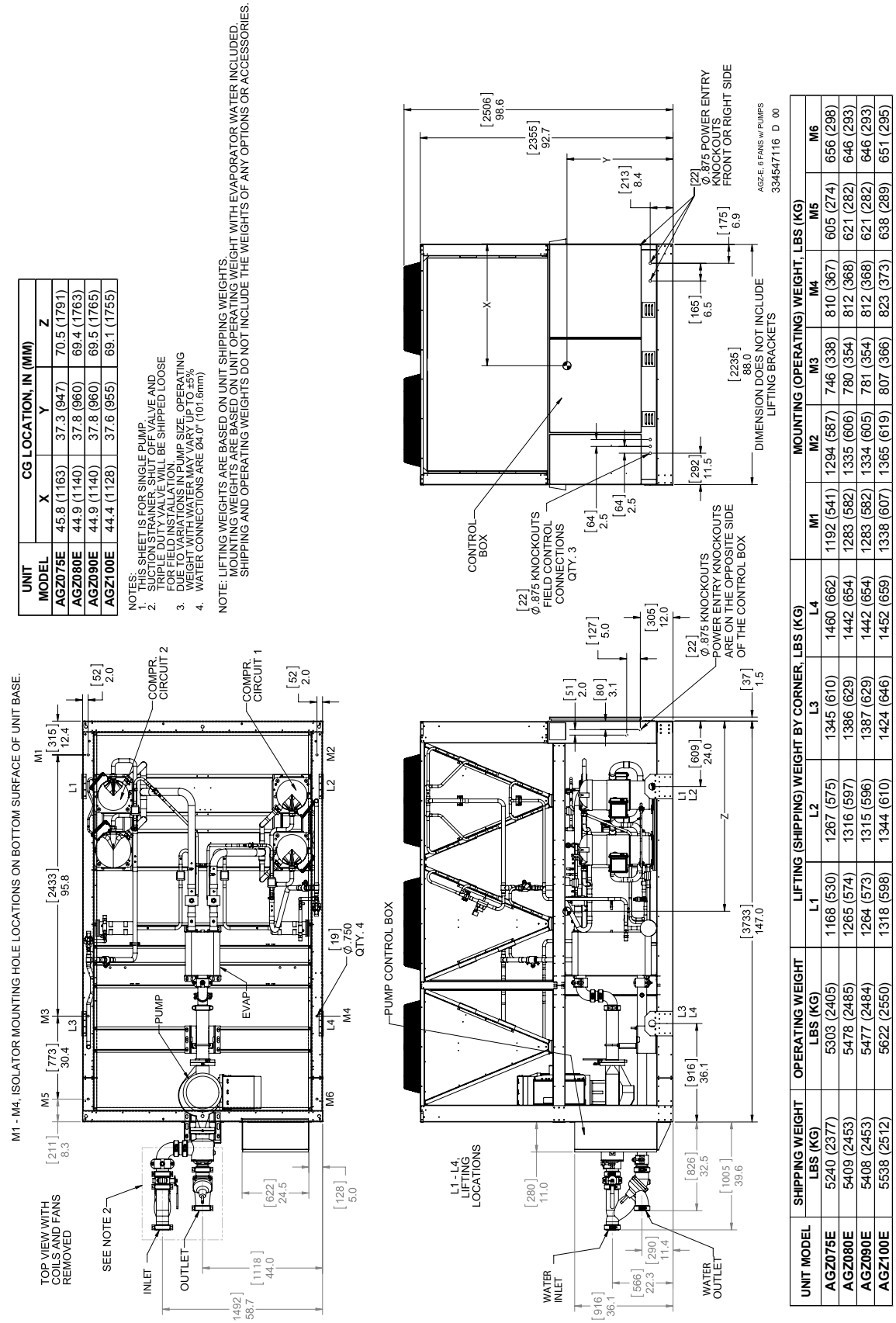
Figure 50: 6 Fan Units (AGZ075E-AGZ100E) with Dual Pumps



UNIT MODEL	CG LOCATION, IN (MM)		
	X	Y	Z
AGZ075E	45.3 (1151)	37.0 (940)	75.5 (1918)
AGZ080E	44.4 (1128)	37.5 (953)	74.3 (1887)
AGZ090E	44.4 (1128)	37.5 (953)	74.3 (1887)
AGZ100E	44.0 (1118)	37.3 (947)	73.9 (1877)

UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING (SHIPPING) WEIGHT BY CORNER, LBS (KG)				MOUNTING (OPERATING) WEIGHT, LBS (KG)				
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4	M5	M6
AGZ075E	5663 (2569)	5726 (2597)	1122 (509)	1188 (539)	1628 (738)	1724 (782)	1187 (538)	1257 (570)	850 (386)	901 (409)	744 (337)	788 (357)
AGZ080E	5833 (2646)	5902 (2677)	1217 (552)	1240 (562)	1672 (758)	1704 (773)	1276 (579)	1301 (590)	885 (401)	902 (409)	761 (345)	776 (352)
AGZ090E	5831 (2645)	5900 (2676)	1216 (552)	1238 (562)	1673 (759)	1704 (773)	1276 (579)	1299 (589)	886 (402)	902 (409)	762 (346)	776 (352)
AGZ100E	5961 (2704)	6045 (2742)	1268 (575)	1270 (576)	1710 (776)	1713 (777)	1329 (603)	1331 (604)	912 (414)	913 (414)	780 (354)	781 (354)

Figure 51: 6 Fan Units (AGZ075E-AGZ100E) with Single Pump



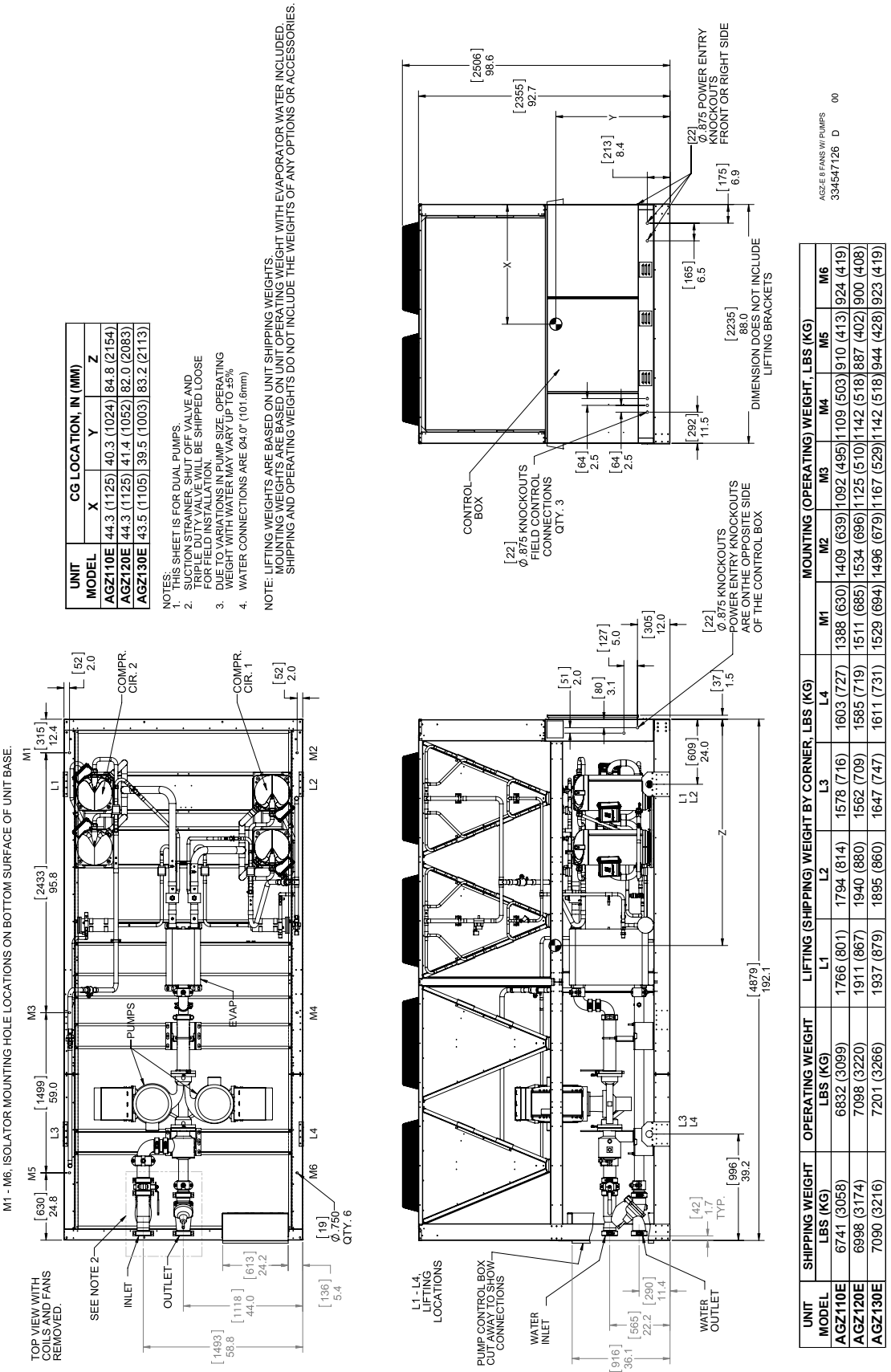
UNIT MODEL	CG LOCATION, IN (MM)		
	X	Y	Z
AGZ075E	45.8 (1163)	37.3 (947)	70.5 (1791)
AGZ080E	44.9 (1140)	37.8 (960)	69.4 (1763)
AGZ090E	44.9 (1140)	37.8 (960)	69.5 (1765)
AGZ100E	44.4 (1128)	37.6 (955)	69.1 (1755)

NOTES:
1. THIS SHEET IS FOR SINGLE PUMP.
2. SUCTION STRAINER, SHUT OFF VALVE AND TRIPLE DUTY VALVE WILL BE SHIPPED LOOSE FOR FIELD INSTALLATION.
3. DUE TO VARIATIONS IN PUMP SIZE, OPERATING WEIGHT WITH WATER MAY VARY UP TO ±5%
4. WATER CONNECTIONS ARE Ø4.0" (101.6mm)

NOTE: LIFTING WEIGHTS ARE BASED ON UNIT SHIPPING WEIGHTS.
MOUNTING WEIGHTS ARE BASED ON UNIT OPERATING WEIGHT WITH EVAPORATOR WATER INCLUDED.
SHIPPING AND OPERATING WEIGHTS DO NOT INCLUDE THE WEIGHTS OF ANY OPTIONS OR ACCESSORIES.

UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING (SHIPPING) WEIGHT BY CORNER, LBS (KG)				MOUNTING (OPERATING) WEIGHT, LBS (KG)					
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4	M5	M6
AGZ075E	5240 (2377)	5303 (2405)	1168 (530)	1267 (575)	1345 (610)	1460 (662)	1192 (541)	1294 (587)	746 (338)	810 (367)	605 (274)	656 (298)
AGZ080E	5409 (2453)	5478 (2485)	1265 (574)	1316 (597)	1386 (629)	1442 (654)	1283 (582)	1335 (606)	780 (354)	812 (368)	621 (282)	646 (293)
AGZ090E	5408 (2453)	5477 (2484)	1264 (573)	1315 (596)	1387 (629)	1442 (654)	1283 (582)	1334 (605)	781 (354)	812 (368)	621 (282)	646 (293)
AGZ100E	5538 (2512)	5622 (2550)	1318 (598)	1344 (610)	1424 (646)	1452 (659)	1338 (607)	1365 (619)	807 (366)	823 (373)	638 (289)	651 (295)

Figure 52: 8 Fan Units (AGZ0110E-AGZ130E) with Dual Pumps



UNIT MODEL	CG LOCATION, IN (MM)		
	X	Y	Z
AGZ110E	44.3 (1125)	40.3 (1024)	84.8 (2154)
AGZ120E	44.3 (1125)	41.4 (1052)	82.0 (2083)
AGZ130E	43.5 (1105)	39.5 (1003)	83.2 (2113)

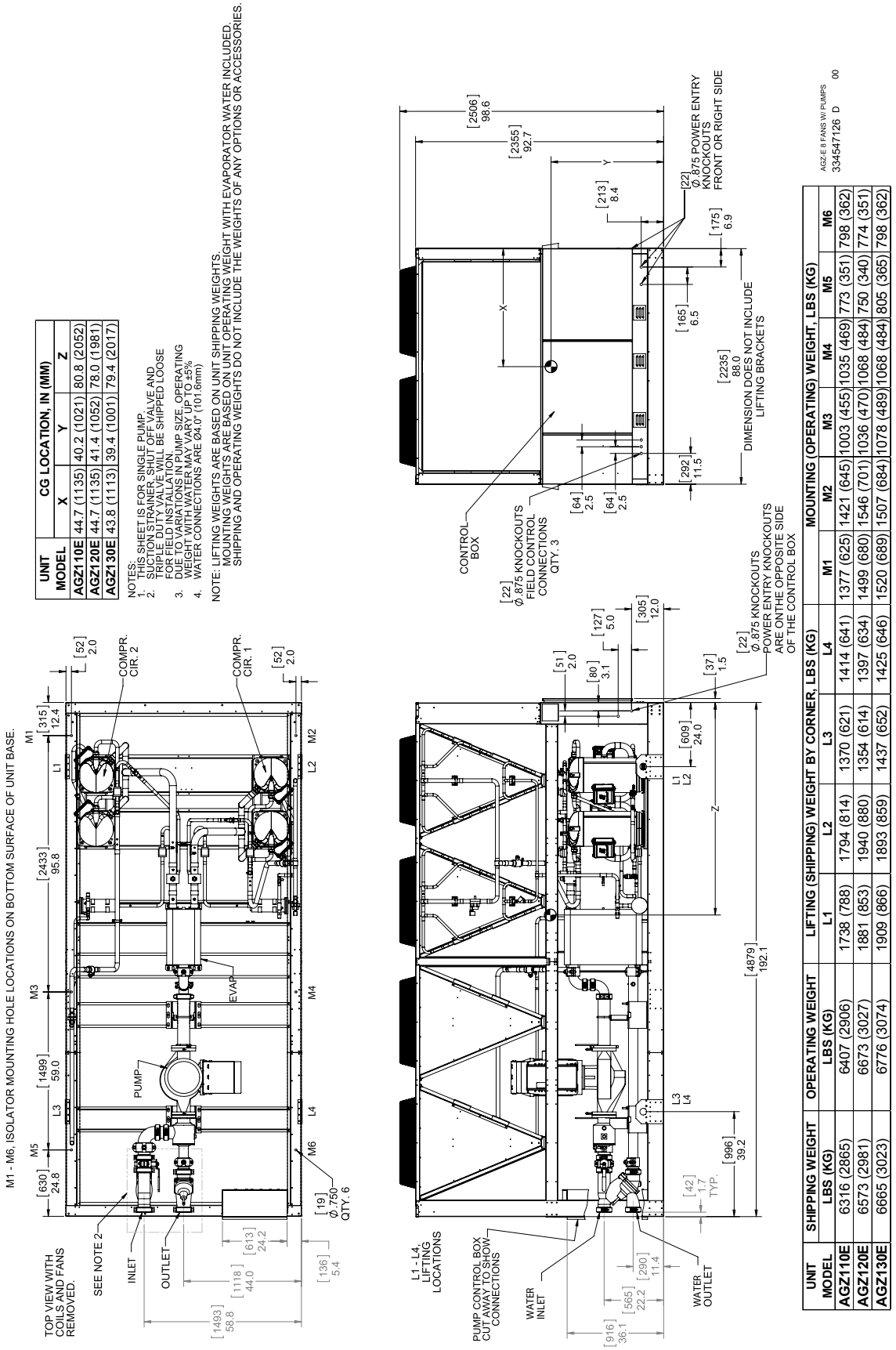
NOTES:
1. THIS SHEET IS FOR DUAL PUMPS.
2. SUCTION STRAINER, SHUT OFF VALVE AND TRIPLE DUTY VALVE WILL BE SHIPPED LOOSE FOR FIELD INSTALLATION.
3. DUE TO VARIATIONS IN PUMP SIZE, OPERATING WEIGHT WITH WATER MAY VARY UP TO ±5%
4. WATER CONNECTIONS ARE Ø4.0" (101.6mm)

NOTE: LIFTING WEIGHTS ARE BASED ON UNIT SHIPPING WEIGHTS.
MOUNTING WEIGHTS ARE BASED ON UNIT OPERATING WEIGHT WITH EVAPORATOR WATER INCLUDED.
SHIPPING AND OPERATING WEIGHTS DO NOT INCLUDE THE WEIGHTS OF ANY OPTIONS OR ACCESSORIES.

UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING (SHIPPING) WEIGHT BY CORNER, LBS (KG)				MOUNTING (OPERATING) WEIGHT, LBS (KG)					
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4	M5	M6
AGZ110E	6741 (3058)	6832 (3099)	1766 (801)	1794 (814)	1578 (716)	1603 (727)	1388 (630)	1409 (639)	1092 (495)	1109 (503)	910 (413)	924 (419)
AGZ120E	6998 (3174)	7098 (3220)	1911 (867)	1940 (880)	1562 (709)	1585 (719)	1511 (685)	1534 (696)	1125 (510)	1142 (518)	887 (402)	900 (408)
AGZ130E	7090 (3216)	7201 (3266)	1937 (879)	1895 (860)	1647 (747)	1611 (731)	1529 (694)	1496 (679)	1167 (529)	1142 (518)	944 (428)	923 (419)

AGZ-E 8 FANS W/ PUMPS
3345471126 D 00

Figure 53: 8 Fan Units (AGZ0110E-AGZ130E) with Single Pump



UNIT MODEL	CG LOCATION, IN (MM)		
	X	Y	Z
AGZ110E	44.7 (1135)	40.2 (1021)	80.8 (2052)
AGZ120E	44.7 (1135)	41.4 (1052)	78.0 (1981)
AGZ130E	43.8 (1113)	39.4 (1001)	79.4 (2017)

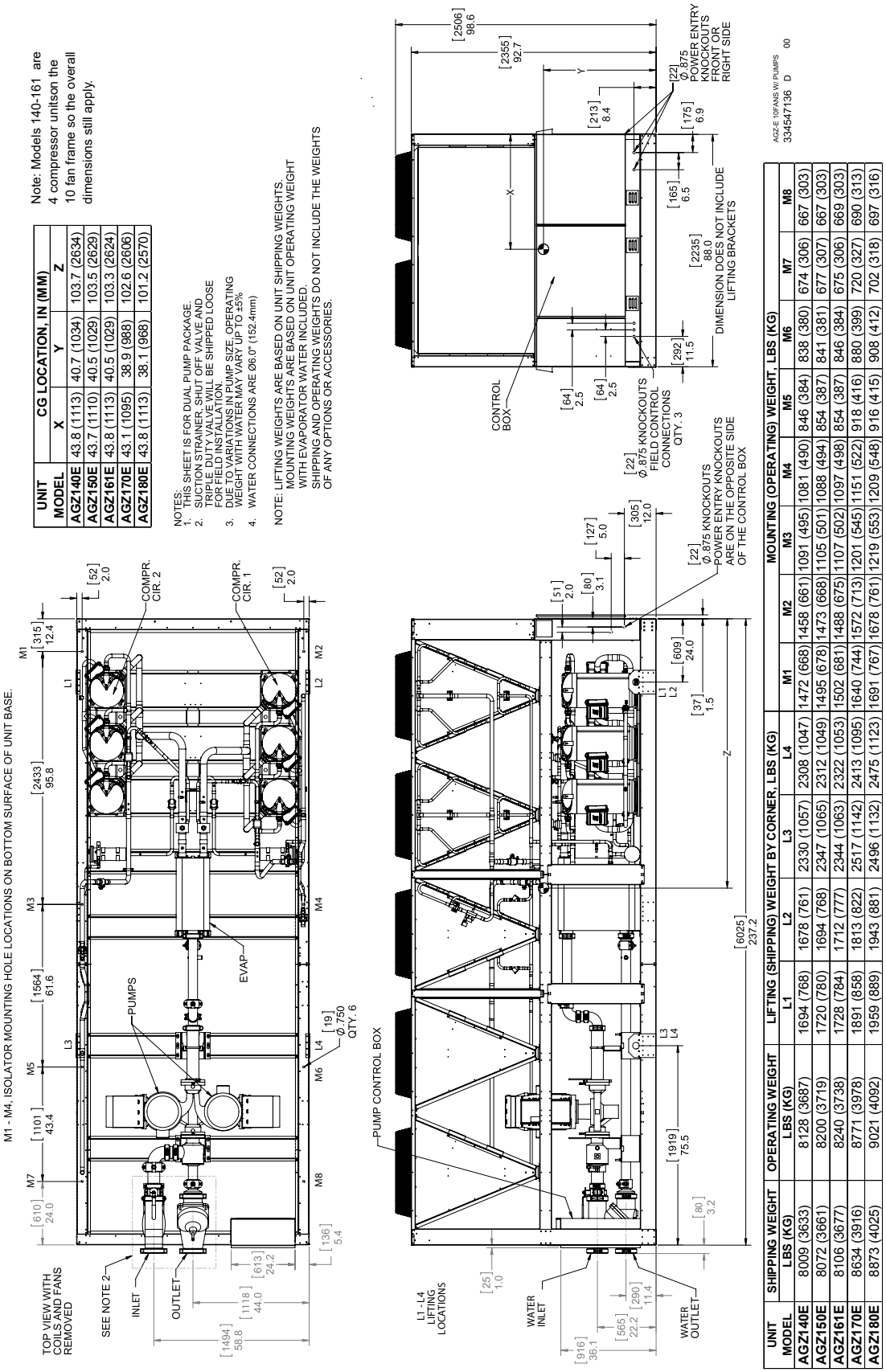
NOTES:
1. THIS SHEET IS FOR SINGLE PUMP.
2. SUCTION STRAINER, SHUT OFF VALVE AND TRIPLE DUTY VALVE WILL BE SHIPPED LOOSE FOR FIELD INSTALLATION.
3. DUE TO VARIATIONS IN PUMP SIZE, OPERATING WEIGHT WITH WATER MAY VARY UP TO ±5%
4. WATER CONNECTIONS ARE Ø4.0" (101.6mm)

NOTE: LIFTING WEIGHTS ARE BASED ON UNIT SHIPPING WEIGHTS. MOUNTING WEIGHTS ARE BASED ON UNIT OPERATING WEIGHT WITH EVAPORATOR WATER INCLUDED. SHIPPING AND OPERATING WEIGHTS DO NOT INCLUDE THE WEIGHTS OF ANY OPTIONS OR ACCESSORIES.

UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING (SHIPPING) WEIGHT BY CORNER, LBS (KG)				MOUNTING (OPERATING) WEIGHT, LBS (KG)					
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4	M5	M6
AGZ110E	6316 (2865)	6407 (2906)	1738 (788)	1794 (814)	1370 (621)	1414 (641)	1377 (625)	1421 (645)	1003 (455)	1035 (469)	773 (351)	798 (362)
AGZ120E	6573 (2981)	6673 (3027)	1881 (853)	1940 (880)	1354 (614)	1397 (634)	1499 (680)	1546 (701)	1036 (470)	1068 (484)	750 (340)	774 (351)
AGZ130E	6665 (3023)	6776 (3074)	1909 (866)	1893 (859)	1437 (652)	1425 (646)	1520 (689)	1507 (684)	1078 (489)	1068 (484)	805 (365)	798 (362)

AGZ-E 8 FANS W/ PUMPS
334547126 D 00

Figure 54: 10 Fan Units (AGZ0140E-AGZ180E) with Dual Pumps



UNIT MODEL	CG LOCATION, IN (MM)		
	X	Y	Z
AGZ140E	43.8 (1113)	40.7 (1034)	103.7 (2634)
AGZ150E	43.7 (1110)	40.5 (1029)	103.5 (2629)
AGZ161E	43.8 (1113)	40.5 (1029)	103.3 (2624)
AGZ170E	43.1 (1095)	38.9 (988)	102.6 (2606)
AGZ180E	43.8 (1113)	38.1 (968)	101.2 (2570)

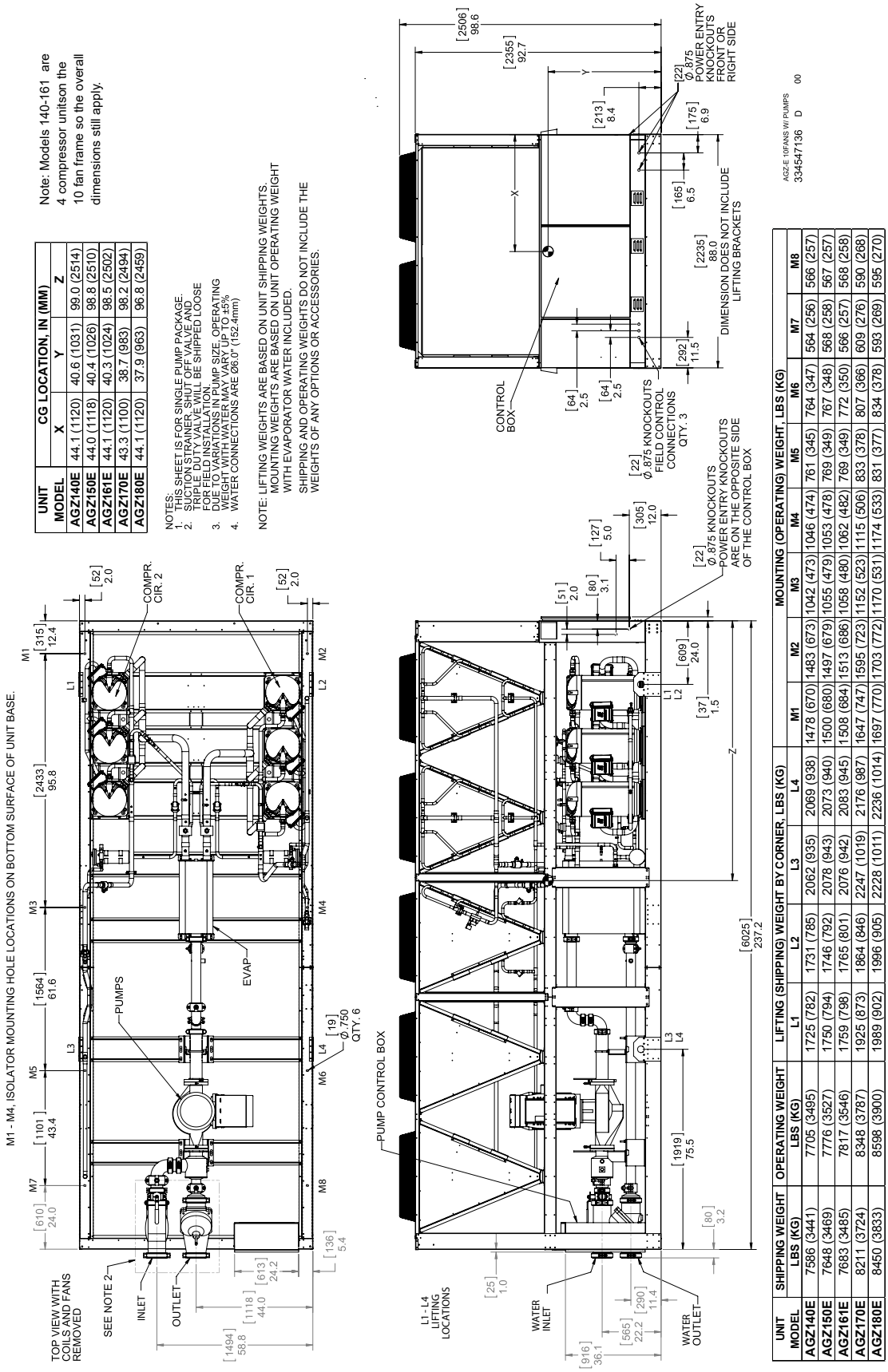
Note: Models 140-161 are 4 compressor unitson the 10 fan frame so the overall dimensions still apply.

NOTES:
1. THIS SHEET IS FOR DUAL PUMP PACKAGE.
2. SUCTION STRAINER, SHUT OFF VALVE AND TRIPLE DUTY VALVE WILL BE SHIPPED LOOSE FOR FIELD INSTALLATION.
3. DUE TO VARIATIONS IN PUMP SIZE, OPERATING WEIGHT WITH WATER MAY VARY UP TO ±5%
4. WATER CONNECTIONS ARE Ø6.0" (152.4mm)

NOTE: LIFTING WEIGHTS ARE BASED ON UNIT SHIPPING WEIGHTS. MOUNTING WEIGHTS ARE BASED ON UNIT OPERATING WEIGHT WITH EVAPORATOR WATER INCLUDED. SHIPPING AND OPERATING WEIGHTS DO NOT INCLUDE THE WEIGHTS OF ANY OPTIONS OR ACCESSORIES.

UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING (SHIPPING) WEIGHT BY CORNER, LBS (KG)				MOUNTING (OPERATING) WEIGHT, LBS (KG)							
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4	M5	M6	M7	M8
AGZ140E	8009 (3633)	8128 (3687)	1694 (768)	1678 (761)	2330 (1057)	2308 (1047)	1472 (668)	1458 (661)	1091 (495)	1081 (490)	846 (384)	838 (380)	674 (306)	667 (303)
AGZ150E	8072 (3661)	8200 (3719)	1720 (780)	1694 (768)	2347 (1065)	2312 (1049)	1495 (678)	1473 (668)	1105 (501)	1088 (494)	854 (387)	841 (381)	677 (307)	667 (303)
AGZ161E	8106 (3677)	8240 (3738)	1728 (784)	1712 (777)	2344 (1063)	2322 (1053)	1502 (681)	1488 (675)	1107 (502)	1097 (498)	854 (387)	846 (384)	675 (306)	669 (303)
AGZ170E	8634 (3916)	8771 (3978)	1891 (858)	1813 (822)	2517 (1142)	2413 (1095)	1640 (744)	1572 (713)	1201 (545)	1151 (522)	918 (416)	880 (399)	720 (327)	690 (313)
AGZ180E	8873 (4025)	9021 (4092)	1959 (889)	1943 (881)	2496 (1132)	2475 (1123)	1691 (767)	1678 (761)	1219 (553)	1209 (548)	916 (415)	908 (412)	702 (318)	697 (316)

Figure 55: 10 Fan Units (AGZ0140E-AGZ180E) with Single Pump



UNIT MODEL	CG LOCATION, IN (MM)		
	X	Y	Z
AGZ140E	44.1 (1120)	40.6 (1031)	99.0 (2514)
AGZ150E	44.0 (1118)	40.4 (1026)	98.8 (2510)
AGZ161E	44.1 (1120)	40.3 (1024)	98.5 (2502)
AGZ170E	43.3 (1100)	38.7 (983)	98.2 (2494)
AGZ180E	44.1 (1120)	37.9 (963)	96.8 (2459)

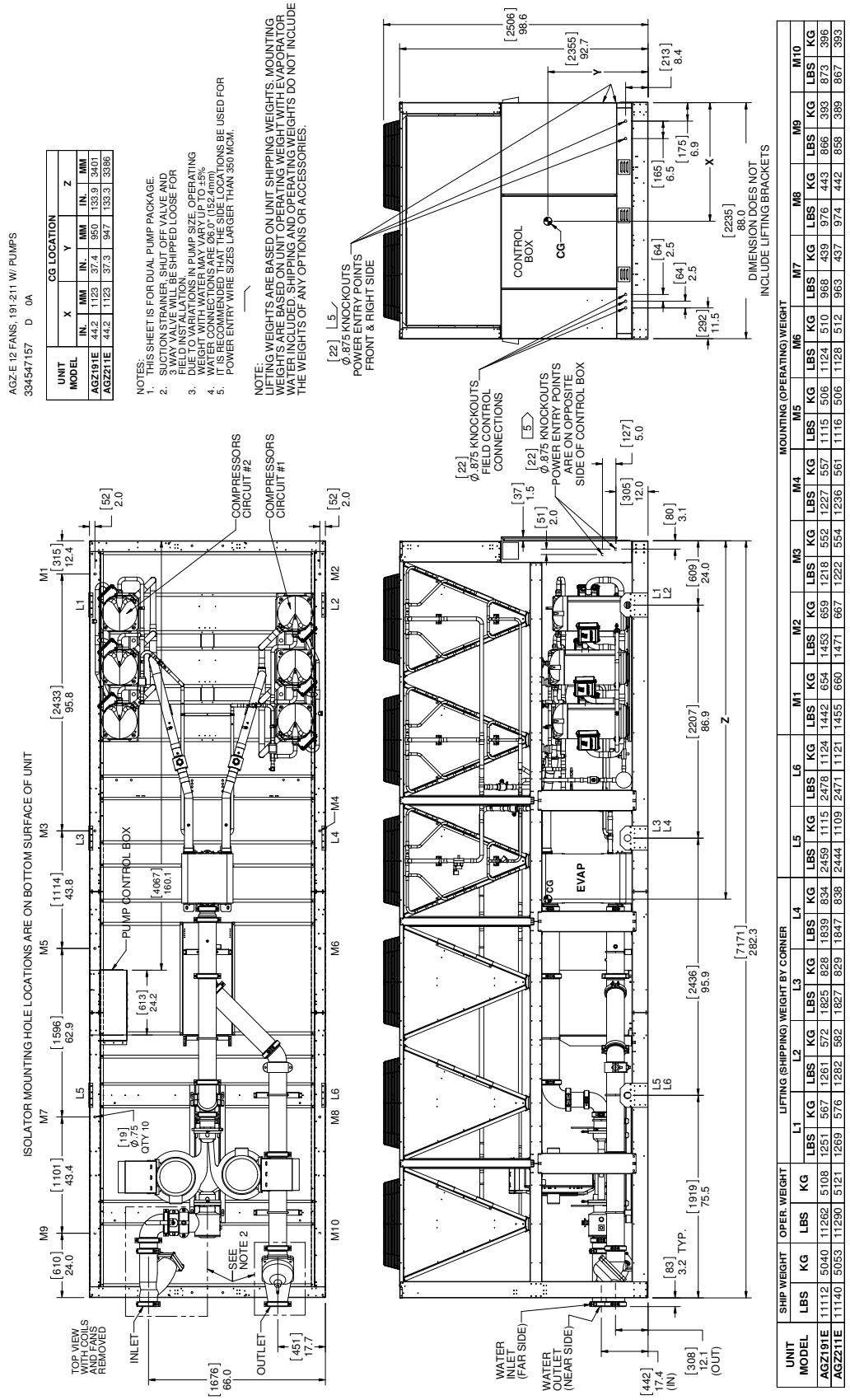
Note: Models 140-161 are 4 compressor unitson the 10 fan frame so the overall dimensions still apply.

NOTES:
1. THIS SHEET IS FOR SINGLE PUMP PACKAGE.
2. SUCTION STRAINER, SHUT OFF VALVE AND TRIPLE DUTY VALVE WILL BE SHIPPED LOOSE FOR FIELD INSTALLATION.
3. DUE TO VARIATIONS IN PUMP SIZE, OPERATING WEIGHT WITH WATER MAY VARY UP TO ±5%
4. WATER CONNECTIONS ARE Ø6.0" (152.4mm)

NOTE: LIFTING WEIGHTS ARE BASED ON UNIT SHIPPING WEIGHTS.
MOUNTING WEIGHTS ARE BASED ON UNIT OPERATING WEIGHT WITH EVAPORATOR WATER INCLUDED.
SHIPPING AND OPERATING WEIGHTS DO NOT INCLUDE THE WEIGHTS OF ANY OPTIONS OR ACCESSORIES.

UNIT MODEL	SHIPPING WEIGHT	OPERATING WEIGHT	LIFTING (SHIPPING) WEIGHT BY CORNER, LBS (KG)				MOUNTING (OPERATING) WEIGHT, LBS (KG)							
	LBS (KG)	LBS (KG)	L1	L2	L3	L4	M1	M2	M3	M4	M5	M6	M7	M8
AGZ140E	7586 (3441)	7705 (3495)	1725 (782)	1731 (785)	2062 (935)	2069 (938)	1478 (670)	1483 (673)	1042 (473)	1046 (474)	761 (345)	764 (347)	564 (256)	566 (257)
AGZ150E	7648 (3469)	7776 (3527)	1750 (794)	1746 (792)	2078 (943)	2073 (940)	1500 (680)	1497 (679)	1055 (479)	1053 (478)	769 (349)	767 (348)	568 (258)	567 (257)
AGZ161E	7683 (3485)	7817 (3546)	1759 (798)	1765 (801)	2076 (942)	2083 (945)	1508 (684)	1513 (686)	1058 (480)	1062 (482)	769 (349)	772 (350)	566 (257)	568 (258)
AGZ170E	8211 (3724)	8348 (3787)	1925 (873)	1864 (846)	2247 (1019)	2176 (987)	1647 (747)	1595 (723)	1152 (523)	1115 (506)	833 (378)	807 (366)	609 (276)	590 (268)
AGZ180E	8450 (3833)	8598 (3900)	1989 (902)	1996 (905)	2228 (1011)	2236 (1014)	1697 (770)	1703 (772)	1170 (531)	1174 (533)	831 (377)	834 (378)	593 (269)	595 (270)

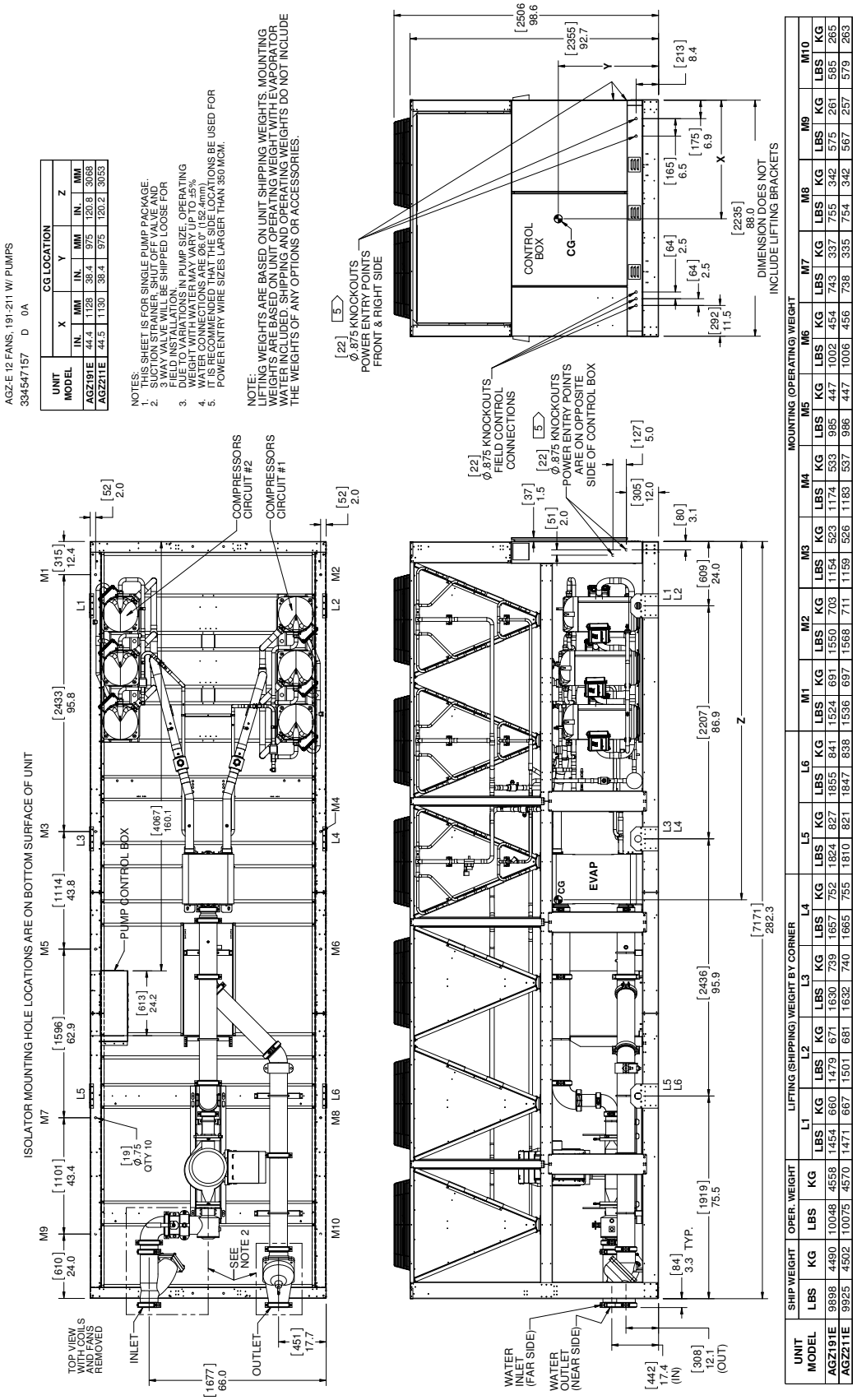
Figure 56: 12 Fan Units (AGZ0191E-AGZ211E) with Dual Pumps



UNIT MODEL	CG LOCATION X IN.	CG LOCATION X MM	CG LOCATION Y IN.	CG LOCATION Y MM	CG LOCATION Z IN.	CG LOCATION Z MM
AGZ191E	44.2	1123	37.4	950	133.9	3401
AGZ211E	44.2	1123	37.3	947	133.3	3386

UNIT MODEL	SHIP WEIGHT LBS	SHIP WEIGHT KG	OPER. WEIGHT LBS	OPER. WEIGHT KG	LIFTING (SHIPPING) WEIGHT BY CORNER L1 LBS	L1 KG	L2 LBS	L2 KG	L3 LBS	L3 KG	L4 LBS	L4 KG	L5 LBS	L5 KG	L6 LBS	L6 KG	MOUNTING (OPERATING) WEIGHT M1 LBS	M1 KG	M2 LBS	M2 KG	M3 LBS	M3 KG	M4 LBS	M4 KG	M5 LBS	M5 KG	M6 LBS	M6 KG	M7 LBS	M7 KG	M8 LBS	M8 KG	M9 LBS	M9 KG	M10 LBS	M10 KG
AGZ191E	11112	5040	11262	5108	1251	567	1261	572	1825	828	1839	834	2459	1115	2478	1124	1442	654	1453	659	1218	552	1227	557	1115	506	1124	510	968	439	976	443	866	393	873	396
AGZ211E	11140	5053	11290	5121	1269	576	1282	582	1827	829	1847	838	2444	1109	2471	1121	1455	660	1471	667	1222	554	1236	561	1116	506	1128	512	963	437	974	442	858	389	867	393

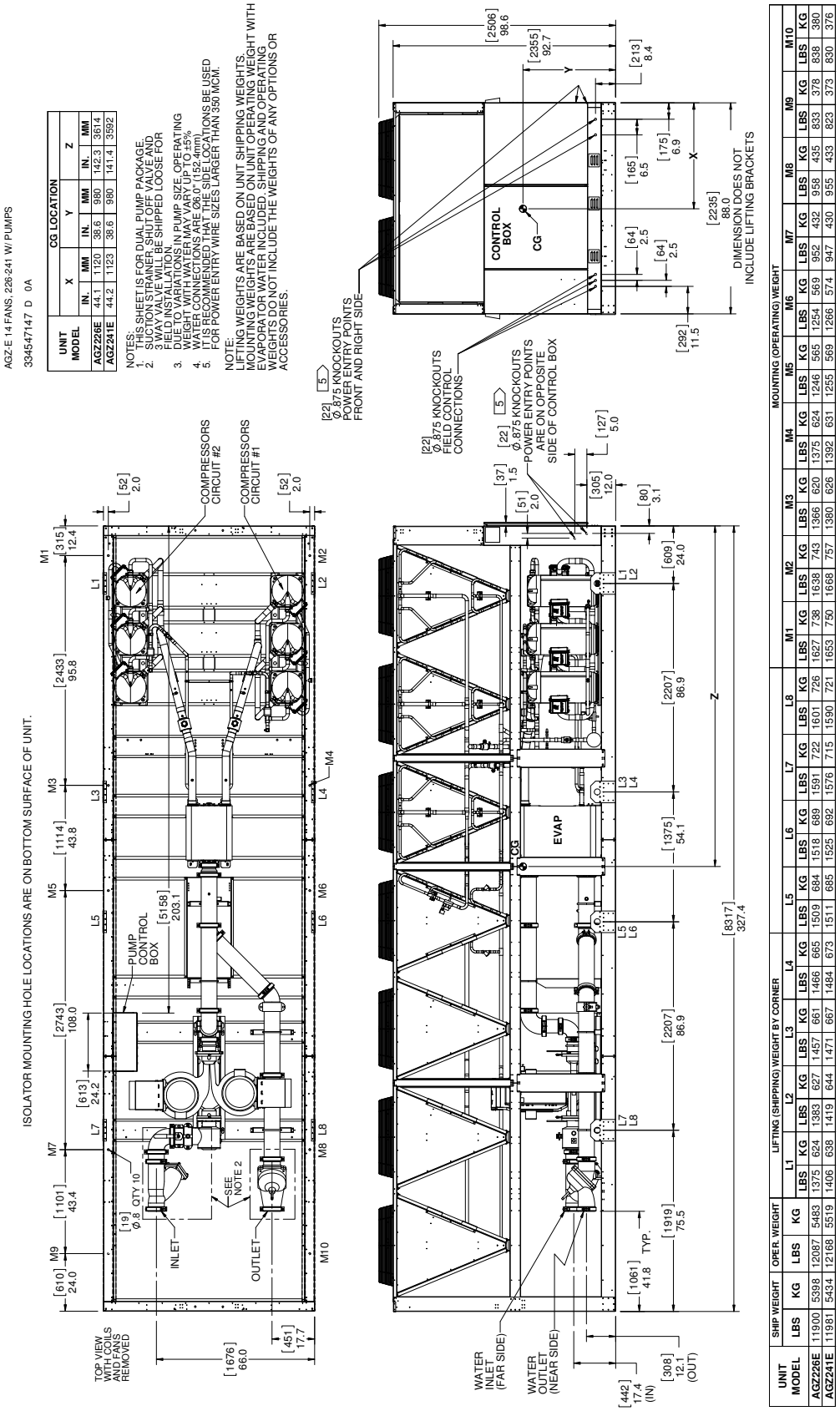
Figure 57: 12 Fan Units (AGZ0191E-AGZ211E) with Single Pump



UNIT MODEL	CG LOCATION X IN.	X MM	Y IN.	Y MM	Z IN.	Z MM
AGZ191E	44.4	1129	38.4	975	120.8	3068
AGZ211E	44.5	1130	38.4	975	120.2	3053

UNIT MODEL	SHIP WEIGHT LBS	SHIP WEIGHT KG	OPER. WEIGHT LBS	OPER. WEIGHT KG	LIFTING (SHIPPING) WEIGHT BY CORNER L1 LBS	L1 KG	L2 LBS	L2 KG	L3 LBS	L3 KG	L4 LBS	L4 KG	L5 LBS	L5 KG	L6 LBS	L6 KG	MOUNTING (OPERATING) WEIGHT M1 LBS	M1 KG	M2 LBS	M2 KG	M3 LBS	M3 KG	M4 LBS	M4 KG	M5 LBS	M5 KG	M6 LBS	M6 KG	M7 LBS	M7 KG	M8 LBS	M8 KG	M9 LBS	M9 KG	M10 LBS	M10 KG
AGZ191E	9898	4490	10048	4558	1454	660	1479	671	1630	739	1657	752	1824	827	1855	841	1524	691	1550	703	1154	523	1174	533	985	447	1002	454	743	337	755	342	575	261	585	265
AGZ211E	9925	4502	10075	4570	1471	667	1501	681	1632	740	1665	755	1810	821	1847	838	1536	697	1568	711	1159	526	1183	537	986	447	1006	456	738	335	754	342	567	257	579	263

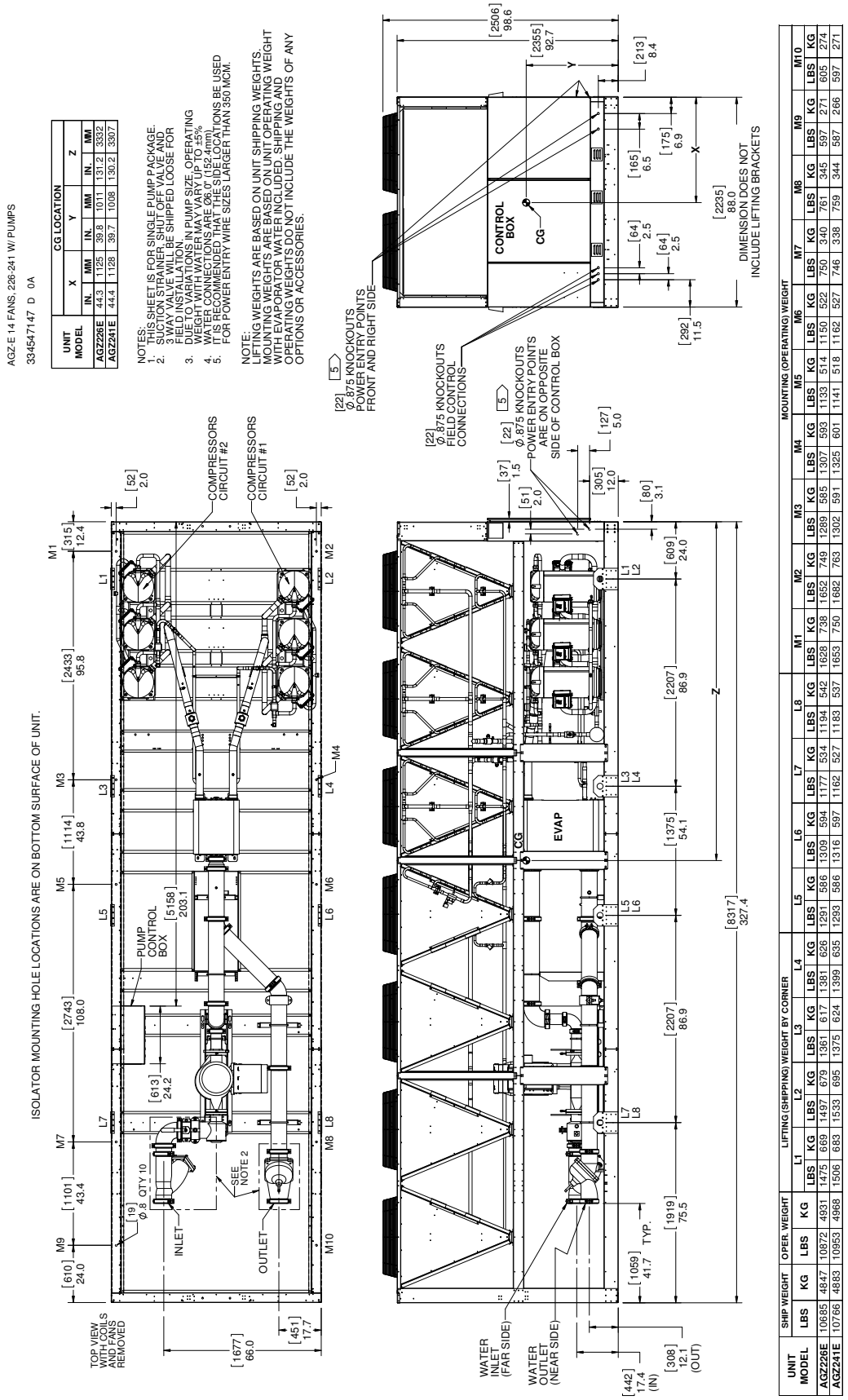
Figure 58: 14 Fan Units (AGZ226E-AGZ241E) with Dual Pumps



UNIT MODEL	CG LOCATION X IN.	CG LOCATION X MM	CG LOCATION Y IN.	CG LOCATION Y MM	CG LOCATION Z IN.	CG LOCATION Z MM
AGZ226E	44.1	1120	38.6	980	142.3	3614
AGZ241E	44.2	1123	38.6	980	141.4	3592

UNIT MODEL	SHIP WEIGHT LBS	SHIP WEIGHT KG	OPER. WEIGHT LBS	OPER. WEIGHT KG	LIFTING (SHIPPING) WEIGHT BY CORNER L1 LBS	L1 KG	L2 LBS	L2 KG	L3 LBS	L3 KG	L4 LBS	L4 KG	L5 LBS	L5 KG	L6 LBS	L6 KG	L7 LBS	L7 KG	L8 LBS	L8 KG	MOUNTING (OPERATING) WEIGHT M1 LBS	M1 KG	M2 LBS	M2 KG	M3 LBS	M3 KG	M4 LBS	M4 KG	M5 LBS	M5 KG	M6 LBS	M6 KG	M7 LBS	M7 KG	M8 LBS	M8 KG	M9 LBS	M9 KG	M10 LBS	M10 KG
AGZ226E	11900	5398	12087	5483	1375	624	1383	627	1457	661	1466	665	1509	684	1518	689	1591	722	1601	726	1627	738	1638	743	1366	620	1375	624	1246	565	1254	569	952	432	958	435	833	378	838	380
AGZ241E	11981	5434	12168	5519	1406	638	1419	644	1471	667	1484	673	1511	685	1525	692	1576	715	1590	721	1653	750	1668	757	1380	626	1392	631	1255	569	1266	574	947	430	955	433	823	373	830	376

Figure 59: 14 Fan Units (AGZ226E-AGZ241E) with Single Pump



UNIT MODEL	CG LOCATION X IN.	CG LOCATION X MM	CG LOCATION Y IN.	CG LOCATION Y MM	CG LOCATION Z IN.	CG LOCATION Z MM
AGZ226E	44.3	1125	39.8	1011	131.2	3332
AGZ241E	44.4	1128	39.7	1008	130.2	3307

UNIT MODEL	SHIP WEIGHT LBS	SHIP WEIGHT KG	OPER. WEIGHT LBS	OPER. WEIGHT KG	LIFTING (SHIPPING) WEIGHT BY CORNER L1 LBS	L1 KG	L2 LBS	L2 KG	L3 LBS	L3 KG	L4 LBS	L4 KG	L5 LBS	L5 KG	L6 LBS	L6 KG	L7 LBS	L7 KG	L8 LBS	L8 KG	MOUNTING (OPERATING) WEIGHT M1 LBS	M1 KG	M2 LBS	M2 KG	M3 LBS	M3 KG	M4 LBS	M4 KG	M5 LBS	M5 KG	M6 LBS	M6 KG	M7 LBS	M7 KG	M8 LBS	M8 KG	M9 LBS	M9 KG	M10 LBS	M10 KG
AGZ226E	10685	4847	10872	4931	1475	669	1497	679	1361	617	1381	626	1291	586	1309	594	1177	534	1194	542	1628	738	1652	749	1289	585	1307	593	1133	514	1150	522	750	340	761	345	597	271	605	274
AGZ241E	10766	4883	10953	4968	1506	683	1533	695	1375	624	1399	635	1293	586	1316	597	1162	527	1183	537	1653	750	1682	763	1302	591	1325	601	1141	518	1162	527	746	338	759	344	587	266	597	271

Table 10: Refrigerant Charge - Pump Package with Microchannel Coils

Unit Models	Microchannel Coil Unit Operating Charge - lbs (kg)			
	Packaged Units			
	Replaceable Core Filter Drier		Sealed Filter Drier	
	Circuit 1	Circuit 2	Circuit 1	Circuit 2
030E	17 (7.7)	17 (7.7)	15 (16.8)	15 (16.8)
035E	16 (7.3)	16 (7.3)	14 (6.4)	14 (6.4)
040E	23 (10.5)	23 (10.5)	21 (9.5)	21 (9.5)
045E	23 (10.5)	23 (10.5)	21 (9.5)	21 (9.5)
050E	23 (10.5)	23 (10.5)	21 (9.5)	21 (9.5)
055E	23 (10.5)	23 (10.5)	21 (9.5)	21 (9.5)
060E	23 (10.5)	23 (10.5)	21 (9.5)	21 (9.5)
065E	23 (10.5)	23 (10.5)	21 (9.5)	21 (9.5)
070E	23 (10.5)	23 (10.5)	21 (9.5)	21 (9.5)
075E	46 (20.9)	46 (20.9)		
076E	43 (19.6)	43 (19.6)		
080E	46 (20.9)	46 (20.9)		
081E	43 (19.6)	43 (19.6)		
090E	48 (21.8)	48 (21.8)		
091E	45 (20.5)	45 (20.5)		
100E	48 (21.8)	50 (22.7)		
101E	45 (20.5)	47 (21.4)		
110E	64 (29.1)	64 (29.1)		
120E	65 (29.5)	65 (29.5)		
130E	65 (29.5)	65 (29.5)		
140E	76 (34.5)	76 (34.5)		
150E	76 (34.5)	76 (34.5)		
161E	78 (35.4)	78 (35.4)		
170E	80 (36.3)	80 (36.3)		
180E	80 (36.3)	80 (36.3)		
191E	87 (39.5)	87 (39.5)		
211E	91 (41.3)	91 (41.3)		
226E	107 (48.6)	107 (48.6)		
241E	111 (50.4)	111 (50.4)		

Figure 60: Spring Isolator

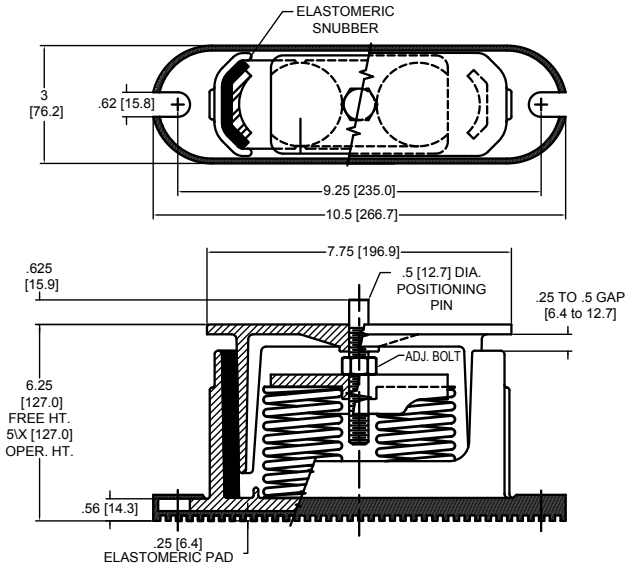
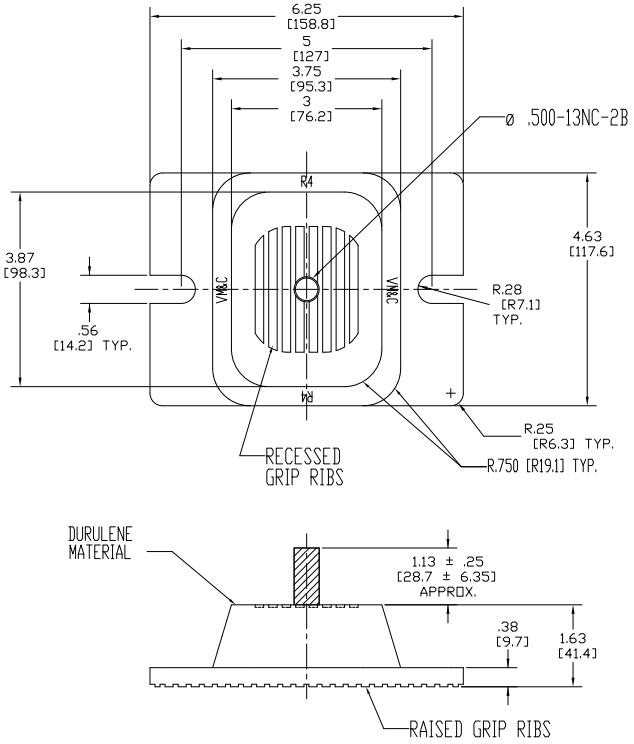


Figure 61: Rubber-in-Shear (RIS) Isolator



In all cases, set the unit in place and level. If antiskid pads are used, do not use hold down bolts. If hold down bolts are used, do not use anti-skid pads.

When spring isolators are required, install springs running under the main unit supports. Unit should be installed on blocks or shims at the listed free height. Isolator springs should not be loaded until the installation is complete, then adjust the springs to the vendor listed compression for the load point. When securing the isolator, do not over-tighten the mounting bolts. Over-tightening may result in cracking of the cast isolator housing and will have a negative impact on the isolation effect.

Installation of spring isolators requires flexible piping connections and at least three feet of flexible electrical conduit to avoid straining the piping and transmitting vibration and noise.

Mounting locations for each model can be found on the dimensional drawings starting on page 31 for units with remote evaporators and page 45 for pump package units.

Neoprene waffle pads, supplied by customers, should be mounted at the defined mounting point locations along the full rail length.

Contact a Daikin Applied sales representative for isolator information related to units with other fin materials.

Table 11: Spring Isolator Kits

AGZ-E Model	Pump Package/ Microchannel		Remote Evaporator
	Single Pump	Dual Pump	Microchannel
030	332320104	332320104	332320102
035	332320104	332320104	332320138
040	332320104	332320104	332320138
045	332320117	332320117	332320132
050	332320117	332320117	332320132
055	332320117	332320117	332320132
060	332320117	332320117	332320132
065	332320117	332320117	332320132
070	332320117	332320117	332320142
075	332320127	332320128	332320138
080	332320127	332320128	332320138
090	332320127	332320128	332320138
100	332320128	332320128	332320138
110	332320128	332320106	332320139
120	332320129	332320125	332320139
130	332320129	332320111	332320139
140	332320130	332320133	332320128
150	332320130	332320133	332320128
161	332320130	332320133	332320128
170	332320131	332320133	332320128
180	332320133	332320108	332320128
191	332320136	332320135	332320140
211	332320136	332320135	332320140
226	332320136	332320135	332320141
241	332320136	332320135	332320141

Table 12: RIS Isolator Kits

AGZ-E Model	Pump Package/ Microchannel		Remote Evaporator
	Single Pumps	Dual Pumps	Microchannel
030	332325101	332325101	332325129
035	332325101	332325101	332325129
040	332325101	332325101	332325129
045	332325101	332325101	332325130
050	332325101	332325101	332325130
055	332325101	332325101	332325130
060	332325101	332325101	332325130
065	332325101	332325101	332325130
070	332325108	332325108	332325130
075	332325505	332325505	332325101
080	332325505	332325505	332325101
090	332325505	332325505	332325102
100	332325505	332325505	332325102
110	332325113	332325113	332325128
120	332325115	332325113	332325128
130	332325113	332325115	332325128
140	332325114	332325114	332325113
150	332325114	332325114	332325113
161	332325114	332325114	332325113
170	332325114	332325114	332325113
180	332325114	332325114	332325113
191	332325117	332325117	332325114
211	332325117	332325117	332325114
226	332325118	332325118	332325114
241	332325118	332325118	332325114

Table 13: Isolator Information - Remote Condensing Units with Microchannel Coils

AGZ-E Model	Coil Type	Rubber-In-Shear (RIS) Mounts - RP-3 & RP-4 Models								Spring Isolator Mounts - CP-2 Models							
		M1	M2	M3	M4	M5	M6	M7	M8	M1	M2	M3	M4	M5	M6	M7	M8
030	Microchannel	Gray	Gray	Green	Green					Dk Green	Dk Purple	Black	Black				
035		Gray	Gray	Green	Green					Dk Green	Dk Green	Black	Black				
040		Gray	Gray	Green	Green					Dk Green	Dk Green	Black	Black				
045		Gray	Gray	Gray	Green					Dk Green	Dk Purple	Dk Purple	Black				
050		Gray	Gray	Gray	Green					Dk Green	Dk Purple	Dk Purple	Black				
055		Gray	Gray	Gray	Green					Dk Green	Dk Purple	Dk Purple	Black				
060		Gray	Gray	Gray	Green					Dk Green	Dk Purple	Dk Purple	Black				
065		Gray	Gray	Gray	Green					Dk Green	Dk Purple	Dk Purple	Black				
070		Gray	Gray	Gray	Green					Dk Green	Dk Purple	Dk Green	Black				
075		Brown	Brown	Brown	Brown					Dk Green	Dk Green	Black	Black				
080		Brown	Brown	Brown	Brown					Dk Green	Dk Green	Black	Black				
090		Red	Red	Brown	Brown					Dk Green	Dk Green	Black	Black				
100		Red	Red	Brown	Brown					Dk Green	Dk Green	Black	Black				
110		Red	Red	Brown	Brown	Green	Green			Dk Green	Dk Green	Black	Black	Red	Red		
120		Red	Red	Brown	Brown	Green	Green			Dk Green	Dk Green	Black	Black	Red	Red		
130		Red	Red	Brown	Brown	Green	Green			Dk Green	Dk Green	Black	Black	Red	Red		
140		Red	Red	Brown	Brown	Brown	Brown			Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
150		Red	Red	Brown	Brown	Brown	Brown			Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
161		Red	Red	Brown	Brown	Brown	Brown			Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
170		Red	Red	Brown	Brown	Brown	Brown			Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
180		Red	Red	Brown	Brown	Brown	Brown			Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
191		Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black	Red	Red
211		Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black	Red	Red
226		Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black	Black	Black
241		Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black	Black	Black

NOTE: Mounting locations are shown on dimensional drawings

Table 14: Isolator Information - Single Pump Packages with Microchannel

AGZ-E	Rubber-In-Shear (RIS) Mounts - RP- 4 Models										Spring Isolator Mounts - CP-2 Models									
Model	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
030	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Purple	Dk Purple						
035	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Purple	Dk Purple						
040	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Purple	Dk Purple						
045	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
050	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
055	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
060	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
065	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
070	Red	Red	Red	Red							Dk Green	Dk Green	Dk Green	Dk Green						
075	Brown	Brown	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Black	Black	Black	Black				
080	Brown	Brown	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Black	Black	Black	Black				
090	Brown	Brown	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Black	Black	Black	Black				
100	Brown	Brown	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black				
110	Red	Red	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black				
120	Brown	Red	Brown	Brown	Brown	Brown					Gray	Gray	Dk Green	Dk Green	Black	Black				
130	Red	Red	Brown	Brown	Brown	Brown					Gray	Gray	Dk Green	Dk Green	Black	Black				
140	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Black	Black	Black	Black		
150	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Black	Black	Black	Black		
161	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Black	Black	Black	Black		
170	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Dk Purple	Black	Black	Black		
180	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
191	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green	Black	Black	Black	Black
211	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green	Black	Black	Black	Black
226	Red	Red	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green	Black	Black	Black	Black
241	Red	Red	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green	Black	Black	Black	Black

NOTE: Mounting locations are shown on dimensional drawings

Table 15: Isolator Information - Dual Pump Packages with Microchannel

AGZ-E Model	Rubber-In-Shear (RIS) Mounts - RP- 4 Models										Spring Isolator Mounts - CP-2 Models									
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10
030	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Purple	Dk Purple						
035	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Purple	Dk Purple						
040	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Purple	Dk Purple						
045	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
050	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
055	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
060	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
065	Brown	Brown	Brown	Brown							Dk Green	Dk Green	Dk Green	Dk Green						
070	Red	Red	Red	Red							Dk Green	Dk Green	Dk Green	Dk Green						
075	Brown	Brown	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black				
080	Brown	Brown	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black				
090	Brown	Brown	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black				
100	Brown	Brown	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black				
110	Red	Red	Brown	Brown	Brown	Brown					Dk Green	Dk Green	Dk Green	Dk Green	Dk Purple	Dk Purple				
120	Red	Red	Brown	Brown	Brown	Brown					Gray	Gray	Dk Green	Dk Green	Dk Purple	Dk Purple				
130	Red	Brown	Brown	Brown	Brown	Brown					Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green				
140	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
150	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
161	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
170	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Dk Purple	Dk Purple	Black	Black		
180	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown			Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green	Black	Black		
191	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green
211	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green
226	Red	Red	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green
241	Red	Red	Red	Red	Brown	Brown	Brown	Brown	Brown	Brown	Gray	Gray	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green	Dk Green

NOTE: Mounting locations are shown on dimensional drawings

Electrical Connection

Trailblazer® units can be ordered with either standard multi-point power or optional single point power connections and with various disconnect and circuit breaker options.

Table 16: Power Connection Availability

Power Connection	Power Block	Disc. Switch.	Comp. Circuit Breakers	Panel High Short Circuit Current Rating
Opt. Single Point	Std.	Opt.	Std.	Opt.
Std. Multi-Point	Std.	Opt.	Not Avail.	Opt.

Required field wiring varies depending on unit conguration. See Figure 62 and Figure 63 for wiring diagram information. Voltage limitations are:

1. Within 10 percent of nameplate rating.
2. Voltage unbalance not to exceed 2%. Since a 2% voltage unbalance can cause a current unbalance of 6 to 10 times the voltage unbalance per the NEMA MG-1 Standard, it is important that the unbalance between phases be kept at a minimum.

⚠ DANGER

Qualified, licensed electricians must perform wiring. Electrical shock hazard exists that can cause severe injury or death.

Power wiring connections to the chiller may be done with either copper or aluminum wiring, provided the wire size and count fit in the chiller lugs provided. All wiring must be done in accordance with applicable local and national codes, including NECA/AA 10402012, Standard for Installing Aluminum Building Wire and Cable (ANSI). Wiring within the unit is sized in accordance with the NEC®. Refer to the unit nameplate and the unit selection report for the correct electrical ratings.

1. The control transformer is furnished and no separate 115V power is required. For both single and multi-point power connections, the control transformer is in circuit #1 with control power wired from there to circuit #2. In multi-point power, disconnecting power to circuit #1 disconnects control power to the unit.
2. Wire sizing supplied to the control panel shall be in accordance with field wiring diagram
3. Single-point power supply requires a single disconnect to supply electrical power to the unit. This power supply must either be fused or use a circuit breaker.
4. All field wire lug range values given unit selection report apply to 75°C rated wire per NEC.
5. Must be electrically grounded according to national and local electrical codes.

⚠ DANGER

Disconnect, lockout and tag all power to the unit before servicing condenser fan motors or compressors. Failure to do so can cause bodily injury or death.

⚠ CAUTION

A static discharge while handling circuit boards can cause damage to components. Use a static strap before performing any service work. Never unplug cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

Panel High Short Circuit Current Rating

The entire control panel is designed for short circuit current rating as shown in Table 17. In the event of a short circuit, the damage is contained within the control panel enclosure.

Table 17: Standard and HSCCR Panel Ratings

Panel Type	208V / 230V	380V / 400V / 460V	575V
Standard	5kA	5kA	5kA
HSCCR	65kA	65kA	25kA

Use with On-Site Generators

Switching from site grid power to generator power and vice versa requires that the chiller must either be powered down or the power must be off for more than five seconds to avoid sending out of phase voltage to the chiller. A properly installed, fully synchronized Automatic Transfer Switch must be used to transfer power if the chiller is running under load.

Generator Sizing

⚠ 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 chiller damage and must be used to ensure proper function of the unit.

⚠ 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 chiller 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, while keeping the chiller powered by the generator until the fully synchronized Automatic Transfer Switch properly hands over chiller power from the site.
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 the field wiring diagrams.

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

Figure 62: Typical Field Wiring Diagram (Single-Point Connection)

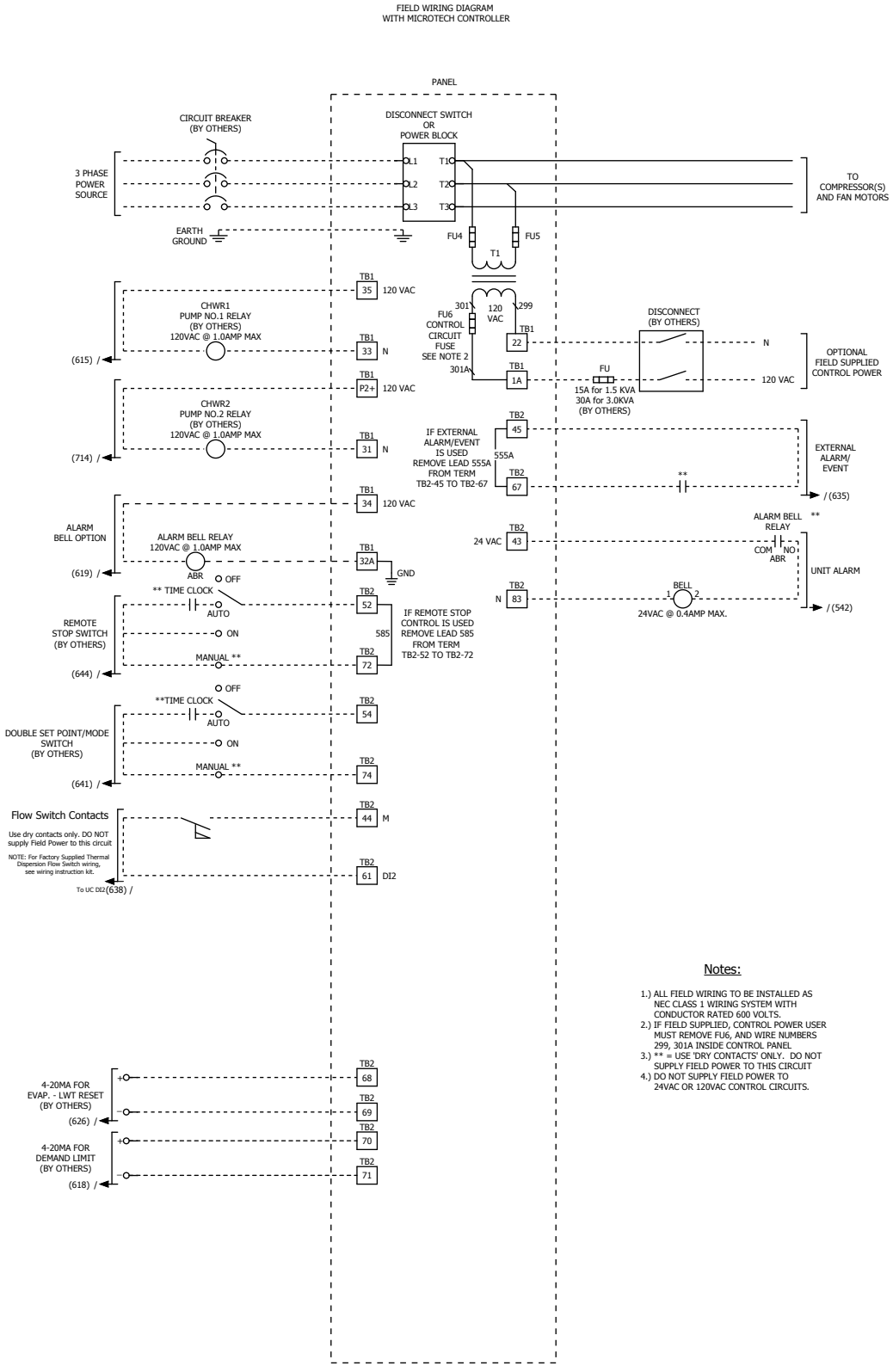
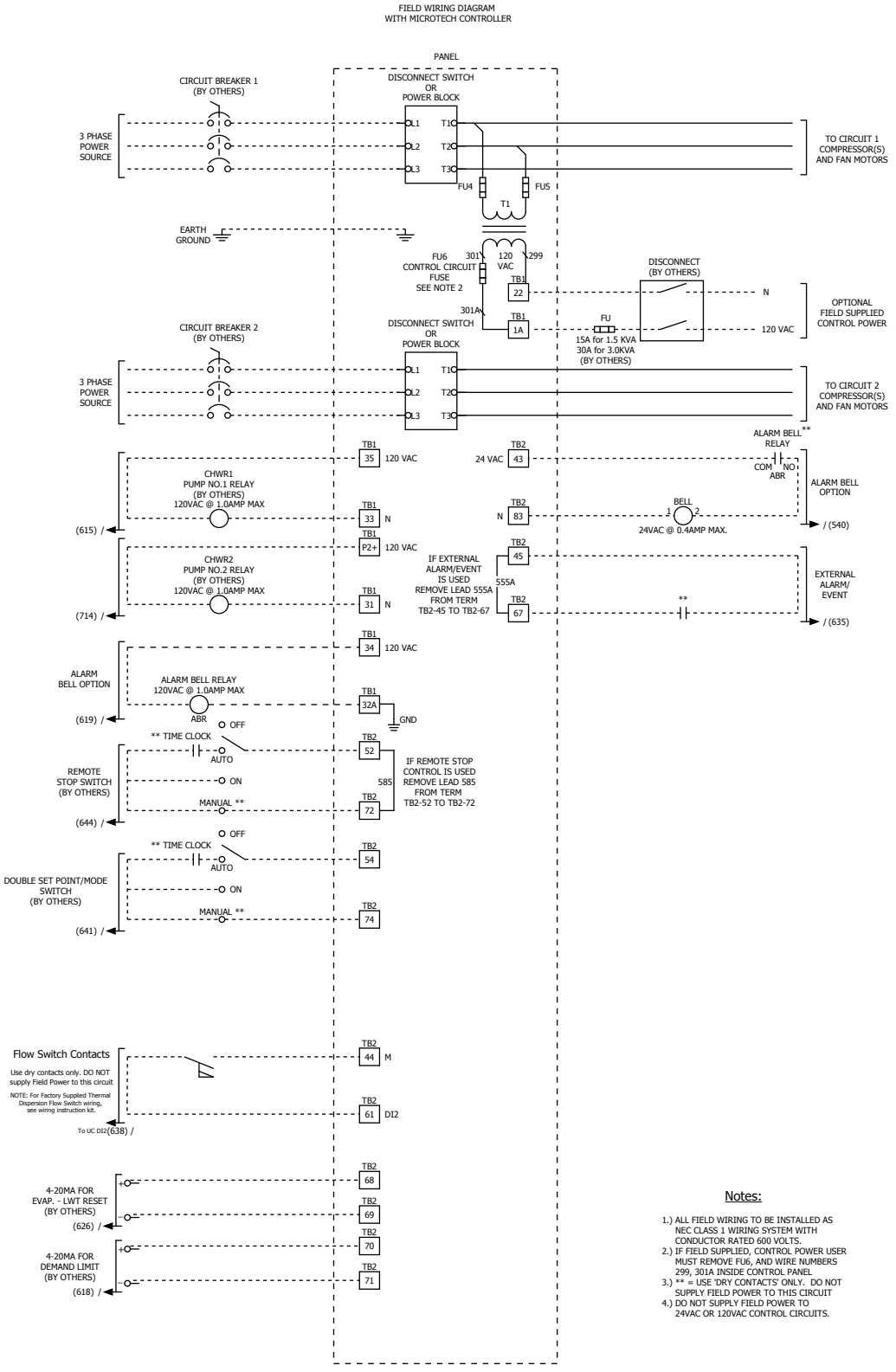


Figure 63: Typical Field Wiring Diagram (Multi-Point Connection)

Note: Separate grounding is required if fed from different transformers. Otherwise a single ground is acceptable.



General Description

The MicroTech® III controller's design not only permits the chiller to run more efficiently, but also can simplify troubleshooting if a system failure occurs. Every MicroTech® IIII controller is programmed and tested prior to shipment to facilitate start-up.

The controller menu structure is separated into three distinct categories that provide the operator or service technician with a full description of:

1. current unit status
2. control parameters
3. alarms

Security protection prevents unauthorized changing of the setpoints and control parameters.

MicroTech® III control continuously performs self-diagnostic checks, monitoring system temperatures, pressures and protection devices, and will automatically shut down a compressor or the entire unit should a fault occur. The cause of the shutdown will be retained in memory and can be easily displayed in plain English for operator review. The MicroTech® III chiller controller will also retain and display the date/time the fault occurred. In addition to displaying alarm diagnostics, the MicroTech® III chiller controller also provides the operator with a warning of limit (pre-alarm) conditions.

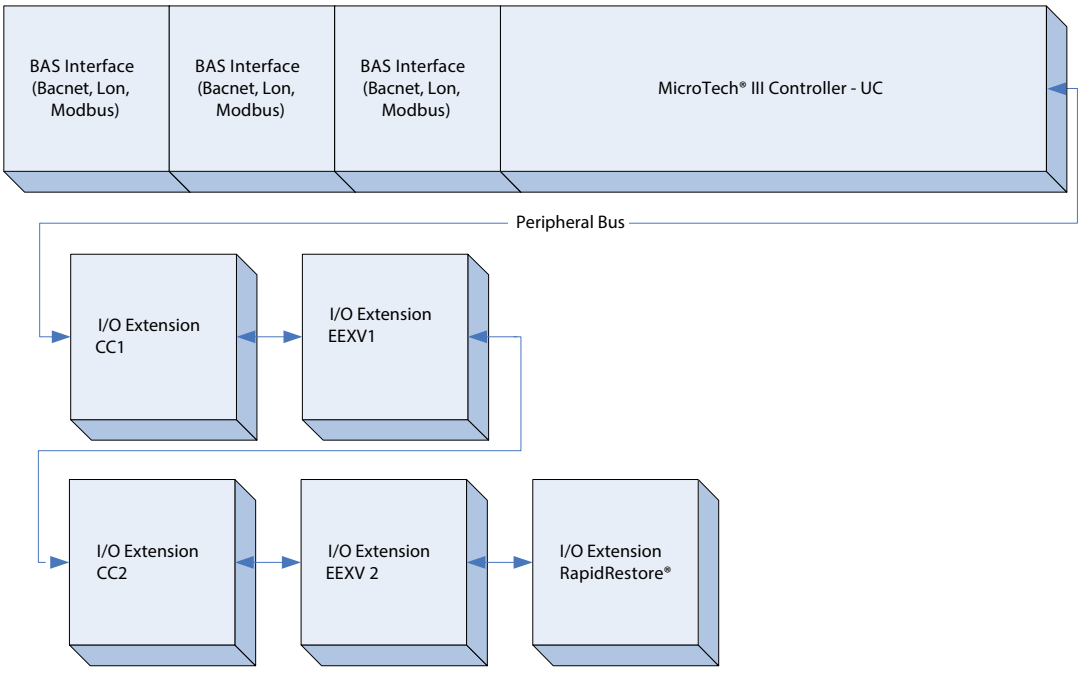
System Architecture

The overall controls architecture uses the following:

- One MicroTech® III unit controller
- I/O extension modules as needed depending on the configuration of the unit
- Communications interface(s) as needed based on installed options

Communication interface modules will connect directly to the left side of the unit controller. I/O extensions will connect via peripheral bus using the connection on the right side of the controller. All of the I/O extension modules can connect directly or using a wiring harness.

Figure 64: System Architecture



Controller Inputs and Outputs

Main Controller

Table 18: Analog Inputs

#	Description	Signal Type	Expected Range
AI1	Evaporator EWT	NTC 10k	340 to 300k Ω
AI2	Evaporator LWT	NTC 10k	340 to 300k Ω
AI3	Ambient Temp	NTC 10k	340 to 300k Ω
X1	Demand Limit	4-20 mA	1 to 23 mA
X4	LWT Reset	4-20 mA	1 to 23 mA

Table 19: Analog Outputs

#	Description	Signal Type	Range
X2	Circuit 1 Fan VFD Speed2	Voltage	0 to 10 volts
X3	Circuit 2 Fan VFD Speed2	Voltage	0 to 10 volts
X5	Circuit 1 Fan VFD Speed1	Voltage	0 to 10 volts
X6	Circuit 2 Fan VFD Speed1	Voltage	0 to 10 volts

Table 20: Digital Inputs

	Description	Signal Off	Signal On
DI1	External Alarm/Event	Ext. Fault	No Ext. Fault
DI2	Evaporator Flow Switch	No Flow	Flow
DI3	Double Set Point/ Mode Switch	See sections on Unit Mode Selection and LWT Target	
DI4	Remote Switch	Remote Disable	Remote Enable
DI5	Unit Switch	Unit Disable	Unit Enable

Table 21: Digital Outputs

	Description	Output Off	Output On
DO1	Evaporator Water Pump 1	Pump Off	Pump On
DO2	Alarm Indicator	Alarm Not Active	Alarm Active
DO3	Circuit 1 Fan Output 1	Fan(s) Off	Fan(s) On
DO4	Circuit 1 Fan Output 2	Fan(s) Off	Fan(s) On
DO5	Circuit 1 Fan Output 3	Fan(s) Off	Fan(s) On
DO6	Circuit 1 Fan Output 4	Fan(s) Off	Fan(s) On
DO7	Circuit 2 Fan Output 1	Fan(s) Off	Fan(s) On
DO8	Circuit 2 Fan Output 2	Fan(s) Off	Fan(s) On
DO9	Circuit 2 Fan Output 3	Fan(s) Off	Fan(s) On
DO10	Circuit 2 Fan Output 4	Fan(s) Off	Fan(s) On
X7	Circuit 1 Condenser SV 1	Solenoid Closed	Solenoid Open
X8	Circuit 2 Condenser SV 1	Solenoid Closed	Solenoid Open

Compressor Module 1

Table 22: Analog Inputs

	Description	Signal Type	Expected Range
X1	Circuit 1 Suction Temp	NTC 10k	340 to 300k Ω
X2	Circuit 1 Evaporator Press	Voltage	0.4 to 4.6 volts
X4	Circuit 1 Condenser Press	Voltage	0.4 to 4.6 volts

Table 23: Digital Inputs

	Description	Signal Off	Signal On
X6	Circuit 1 Switch	Circuit Disable	Circuit Enable
X7	Circuit 1 MHP Switch	Fault	No fault
X8	Circuit 1 Motor Protection	Fault	No fault
DI1	Circuit 1 (or Unit) PVM/ GFP	Fault	No fault

NOTE: The Motor Protection and MHP input signal are wired in series. If Motor Protection input is open, MHP Switch input will also be open.

Table 24: Digital Outputs

	Description	Output Off	Output On
DO1	Compressor #1	Compressor Off	Compressor On
DO2	Compressor #3	Compressor Off	Compressor On
DO3	Compressor #5	Compressor Off	Compressor On
DO4	Evaporator Water Pump 2	Pump Off	Pump On
DO5	Circuit 1 Hot Gas Bypass SV	Solenoid Closed	Solenoid Open
DO6	Circuit 1 Liquid Line SV	Solenoid Closed	Solenoid Open

Compressor Module 2

Table 25: Analog Inputs

	Description	Signal Type	Expected Range
X1	Circuit 2 Suction Temp	NTC 10k	340 to 300k Ω
X2	Circuit 2 Evaporator Press	Voltage	0.4 to 4.6 volts
X4	Circuit 2 Condenser Press	Voltage	0.4 to 4.6 volts

Table 26: Digital Inputs

	Description	Signal Off	Signal On
X6	Circuit 2 Switch	Circuit Disable	Circuit Enable
X7	Circuit 2 MHP Switch	Fault	No fault
X8	Circuit 2 Motor Protection	Fault	No fault
DI1	Circuit 2 PVM/GFP	Fault	No fault

NOTE: The Motor Protection and MHP input signal are wired in series. If Motor Protection input is open, MHP Switch input will also be open (not applicable to 030 and 045E models).

Table 27: Digital Outputs

	Description	Output Off	Output On
DO1	Compressor #2	Compressor Off	Compressor On
DO2	Compressor #4	Compressor Off	Compressor On
DO3	Compressor #6	Compressor Off	Compressor On
DO5	Circuit 2 Hot Gas Bypass SV	Solenoid Closed	Solenoid Open
DO6	Circuit 2 Liquid Line SV	Solenoid Closed	Solenoid Open

EXV Module 1 and 2

These modules will be used only when the expansion valve type is electronic.

Table 28: Digital Outputs

	Description	Output Off	Output On
DO1	Circuit 1 or 2 Fan Output 5	Fan(s) Off	Fan(s) On

Table 29: Stepper Motor Output

	Description
M1+, M1-	EXV Stepper Coil 1
M2+, M2-	EXV Stepper Coil 2

Condenser Fan Output Labels

All condenser fan output labels, both the digital outputs and analog speed signals, will be labeled according to which fans are connected to each one. The following tables show the fans connected to each output for each configuration.

Table 30: AGZ-E Models without VFDs

	Output Descr.	Physical Output	Number of Fans					
			4	6	8	10	12	14
Circuit 1	Speed 1	UC X5						
	Speed 2	UC X2						
	Fan Output 1	UC DO3	Fan 11	Fan 11	Fan 11	Fan 11	Fan 11	Fan 11/13
	Fan Output 2	UC DO4	Fan 12	Fan 12	Fan 12	Fan 12	Fan 12	Fan 12
	Fan Output 3	UC DO5		Fan 13	Fan 13	Fan 13	Fan 13	Fan 14/16
	Fan Output 4	UC DO6			Fan 14	Fan 14	Fan 14/16	Fan 15
	Fan Output 5	EEXV1 DO1				Fan 15	Fan 15	Fan 17
Circuit 2	Speed 1	UC X6						
	Speed 2	UC X3						
	Fan Output 1	UC DO7	Fan 21	Fan 21	Fan 21	Fan 21	Fan 21	Fan 21/23
	Fan Output 2	UC DO8	Fan 22	Fan 22	Fan 22	Fan 22	Fan 22	Fan 22
	Fan Output 3	UC DO9		Fan 23	Fan 23	Fan 23	Fan 23	Fan 24/26
	Fan Output 4	UC DO10			Fan 24	Fan 24	Fan 24/26	Fan 25
	Fan Output 5	EEXV2 DO1				Fan 25	Fan 25	Fan 27

Table 31: AGZ-E Models with 1 VFD per Circuit

	Output Descr.	Physical Output	Number of Fans					
			4	6	8	10	12	14
Circuit 1	Speed 1	UC X5	Fan 11	Fan 11	Fan 11/13	Fan 11/13	Fan 11/13	Fan 11/13
	Speed 2	UC X2						
	Fan Output 1	UC DO3					Fan 12	Fan 12
	Fan Output 2	UC DO4	Fan 12	Fan 12	Fan 12	Fan 12	Fan 14	Fan 14
	Fan Output 3	UC DO5		Fan 13			Fan 15	Fan 15
	Fan Output 4	UC DO6			Fan 14	Fan 14	Fan 16	Fan 16
	Fan Output 5	EEXV1 DO1				Fan 15		Fan 17
Circuit 2	Speed 1	UC X6	Fan 21	Fan 21	Fan 21/23	Fan 21/23	Fan 21/23	Fan 21/23
	Speed 2	UC X3						
	Fan Output 1	UC DO7					Fan 22	Fan 22
	Fan Output 2	UC DO8	Fan 22	Fan 22	Fan 22	Fan 22	Fan 24	Fan 24
	Fan Output 3	UC DO9		Fan 23			Fan 25	Fan 25
	Fan Output 4	UC DO10			Fan 24	Fan 24	Fan 26	Fan 26
	Fan Output 5	EEXV2 DO1				Fan 25		Fan 27

Table 32: AGZ-E Models with 2 VFDs per Circuit

	Output Descr.	Physical Output	Number of Fans				
			6	8	10	12	14
Circuit 1	Speed 1	UC X5	Fan 11	Fan 11/13	Fan 11/13	Fan 11/13	Fan 11/13
	Speed 2	UC X2	Fan 12/13	Fan 12/14	Fan 12/14	Fan 12/14/15/16	Fan 12/14/15/16
	Fan Output 1	UC DO3					
	Fan Output 2	UC DO4					
	Fan Output 3	UC DO5					
	Fan Output 4	UC DO6					
	Fan Output 5	EEXV1 DO1			Fan 15		Fan 17
Circuit 2	Speed 1	UC X6	Fan 21	Fan 21/23	Fan 21/23	Fan 21/23	Fan 21/23
	Speed 2	UC X3	Fan 22/23	Fan 22/24	Fan 22/24	Fan 22/24/25/26	Fan 22/24/25/26
	Fan Output 1	UC DO7					
	Fan Output 2	UC DO8					
	Fan Output 3	UC DO9					
	Fan Output 4	UC DO10					
	Fan Output 5	EEXV2 DO1			Fan 25		Fan 27

RapidRestore®

This module will be used only when the unit is equipped with the RapidRestore® option.

Table 33: Digital Inputs

	Description	Signal Off	Signal On
DI1	RapidRestore Enable	Disable RapidRestore	Allow RapidRestore Enabling
DI2	Backup Chiller Designation	Not Backup Chiller	Backup Chiller

Sensor Information

Pressure

Pressure inputs will be read using 0 to 5 volt ratiometric sensors. Nominal voltage range will be 0.5 to 4.5 volts.

Set Points

Set points are initially set to the values in the Default column, and can be adjusted to any value in the Range column. Set points are stored in permanent memory. Basic unit configuration set points will require the unit to be off in order to make a change and then require rebooting the controller in order to apply a change. If an option is not included on the unit, the respective set point may not be visible. Data and settings that only apply to a specific operation mode will only be visible if that mode is selected.

Table 34: Unit Level Set Point Defaults and Ranges

Description	Default	Range
Basic Unit Configuration		
Unit Model	AGZ000	Based on Unit Model Configuration
Evaporator Configuration	Not Set	Not Set, Packaged, Remote
Evaporator Glycol	No	No, Yes - must be Yes for Mode to be Cool/Ice or Ice.
Available Modes	Cool	Cool, Cool w/Ice, Ice
Condenser Type	Not Set	Not Set, Microchannel
Expansion Valve Type	Not Set	Not Set, Thermal, Electronic
Condenser Fan VFD Configuration	None	None, 1/cir, 2/cir
Power Connection Configuration	Single Point	Single Point, Multi Point
RapidRestore	No	No, Yes
Heat Recovery Control Type	None	None, Valve, VFD Pump
Mode/Enabling		
Unit Enable	Enable	Disable, Enable
Control source	Local	Local, Network
Unit Test Mode	Off	Off, On
Staging and Capacity Control		
Cool LWT 1	7°C (44.6°F)	See Dynamic Set Point Ranges
Cool LWT 2	7°C (44.6°F)	See Dynamic Set Point Ranges
Ice LWT	4.4°C (39.9°F)	-9.5 to 4.4 °C (14.9 to 39.9 °F)
Startup Delta T	5.6°C (10.1°F)	0.6 to 8.3 °C (1.1 to 14.9 °F)
Shut Down Delta T	0.3°C (0.5°F)	0.3 to 1.7 °C (0.5 to 3.1 °F)
Stage Up Delay	240 sec	120 to 480 sec
Stage Down Delay	30 sec	20 to 60 sec
Stage Delay Clear	No	No, Yes
Max Pulldown Rate	0.6°C/min (1.1°F/min)	0.1 to 2.7°C/min (0.2 to 4.9°F/min)
Full Capacity Evap Delta T	8.9 °C (16°F)	3.3 to 8.9 °C (5.9 to 16 °F)
Variable Evaporator Flow	No	No, Yes
Ice TimeCycle Delay	12	1-23 hours
Clear Ice Timer	No	No,Yes
RapidRestore	Disable	Disable, Enable
Rapid Restore Max Power Off Time	15 seconds	15 to 180 seconds
Evaporator Pump Control		
Evap Pump Control Configuration	#1 Only	#1 Only, #2 Only, Auto, #1 Primary, #2 Primary
Evap Recirc Timer	90	15 to 300 seconds
Evap Pump 1 Run Hours	0	0 to 999999 hours
Evap Pump 2 Run Hours	0	0 to 999999 hours
Power Conservation and Limits		
LWT Reset Enable	Disable	Disable, Enable
Demand Limit Enable	Disable	Disable, Enable
High IPLV Mode	Disable	Disable, Enable
IPLV Condensing Target	23.89°C (75°F)	21.11 to 32.22°C (70 to 90°F)
Sound Reduction Mode		
Sound Reduction Enable	Disable	Disable, Enable
Sound Reduction Priority	Capacity	Sound, Capacity
Sound Reduction Fan Speed Limit	50%	50%, 60%, 70%, 80%, 90%
Monday Start Time	22:00	00:00 to 23:00
Monday Duration	12 hrs	0 to 24 hrs
Tuesday Start Time	22:00	00:00 to 23:00
Tuesday Duration	12 hrs	0 to 24 hrs
Wednesday Start Time	22:00	00:00 to 23:00
Wednesday Duration	12 hrs	0 to 24 hrs
Thursday Start Time	22:00	00:00 to 23:00

Table 35: Unit Level Set Point Defaults and Ranges (continued)

Thursday Duration	12 hrs	0 to 24 hrs
Friday Start Time	22:00	00:00 to 23:00
Friday Duration	12 hrs	0 to 24 hrs
Saturday Start Time	22:00	00:00 to 23:00
Saturday Duration	12 hrs	0 to 24 hrs
Sunday Start Time	22:00	00:00 to 23:00
Sunday Duration	12 hrs	0 to 24 hrs
Unit Sensor Offsets		
Evap LWT Sensor Offset	0°C (0°F)	-5.0 to 5.0 °C (-9.0 to 9.0 °F)
Evap EWT Sensor Offset	0°C (0°F)	-5.0 to 5.0 °C (-9.0 to 9.0 °F)
OAT Sensor Offset	0°C (0°F)	-5.0 to 5.0 °C (-9.0 to 9.0 °F)
Circuit Configuration Timers (applies to both circuits)		
Compressor Start to Start Time Delay	15 min	10-60 minutes
Compressor Stop to Start Time Delay	5 min	3-20 minutes
Clear Cycle Timers	No	No, yes
Alarm and Limit Settings - Units		
Evaporator Water Freeze	2.2°C (36°F)	See Dynamic Set Point Ranges
Evaporator Flow Proof	5 sec	5 to 15 sec
Evaporator Recirculate Timeout	3 min	1 to 10 min
External Fault Configuration	Event	Event, Alarm
Low Ambient Lockout	1.7°C (35.1°F)	See Dynamic Set Point Ranges
Low Ambient Lockout BAS Alert	Off	Off, On
Alarm and Limit Settings - Circuits		
Low Evap Pressure Unload	689.5 KPA (100 PSI)	See Dynamic Set Point Ranges
Low Evap Pressure Hold	696.4 KPA (101 PSI)	See Dynamic Set Point Ranges
High Condenser Pressure	4240 KPA (615 PSI)	3310 to 4275 KPA (480 to 620 PSI)
High Condenser Pressure Unload	4137 KPA (600 PSI)	3241 to 4137 KPA (470 to 600 PSI)
Low OAT Start Time	165 sec	150 to 240 sec
BAS Control Inputs		
Network Unit Enable	Disable	Disable, Enable
Network Mode Command	Cool	Cool, Ice
Network Cool Set Point	7°C (44.6°F)	See Dynamic Set Point Ranges
Network Ice Set Point	4.4°C (39.9°F)	-9.5 to 4.4 °C (14.9 to 39.9 °F)
Network Capacity Limit	100%	0 to 100%
Network Alarm Clear Command	Normal	Normal, Clear Alarm

Dynamic Set Point Ranges

The following settings have different ranges of adjustment based on other settings.

Table 36: Cool LWT 1 and Cool LWT2 Set Point Ranges

Evaporator Glycol	Unit Vintage	Range
No	E vintage	4.4 to 18.34°C (39.9 to 65°F)
Yes	E vintage	-9.5 to 18.34°C (14.9 to 65°F)

Table 37: Evaporator Water Freeze

Evaporator Glycol	Range
No	2.2 to 5.6°C (36 to 42.1°F)
Yes	-28.89 to 5.6°C (-20 to 42.1°F)

Table 38: Low Ambient Lockout

Fan VFD Configuration	Range
None	0 to 15.6°C (32 to 60.1°F)
1/cir or 2/cir	-23.3 to 15.6°C (-9.9 to 60.1°F)

Table 39: Low Evaporator Pressure

Available Mode Selection	Range
Hold - Without Glycol	669 to 793 KPA (97 to 115 PSI)
Hold - With Glycol	317 to 793 KPA (46 to 115 PSI)
Unhold - Without Glycol	669 to 793 KPA (97 to 115 PSI)
Unhold - With Glycol	317 to 793 KPA (46 to 115 PSI)

Table 40: Design Conditions

Description	Default	Range
Design Evaporator EWT	0°C (32°F)	-9.5°C to 28.34°C (14.9°F to 83°F)
Design Evaporator LWT	0°C (32°F)	-9.5°C to 18.34°C (14.9°F to 65°F)
Design Evaporator Water Flow	0 lph (0 gpm)	0 to 908399 lph (0 to 4000 gpm)
Design Evaporator Approach Circuit 1/2	0°C (0°F)	0°C to 10°C (0°F to 18°F)
Design Ambient Temperature	0°C (32°F)	-28.89°C to 51.67°C (-20°F to 125°F)
Design Condenser Approach Circuit 1/2	0°C (0°F)	0°C to 40°C (0°F to 72°F)
Design Full Load Efficiency	0%	0 to 100%
Design IPLV	0	0 to 100
Design Rated Capacity	0 tons	0 to 1000 tons

Table 41: Administration and Service Support

Description	Default	Range
Unit G.O. Number	“Enter Data”	Alphanumeric string of up to 16 characters
Unit Serial Number	“Enter Data”	Alphanumeric string of up to 20 characters
Next Maintenance Month	January	January through December
Next Maintenance Year	2009	2009 - 2100
Service Support Reference	999-999-9999	Any 10 digit phone number
Controller Time	From Controller Timeclock	00:00:00 to 23:59:59
Controller Date	From Controller Timeclock	1/1/2000 to 12/31/2050
UTC Difference	-60 minutes	-3276 to 32767 minutes
Daylight Savings Time Enable	Yes	No, Yes
Daylight Savings Time Start Month	March	January through December
Daylight Savings Time Start Week	2nd Week	1st through 5th Week
Daylight Savings Time End Month	November	January through December
Daylight Savings Time End Week	1st Week	1st through 5th Week
Operator Password Disable	Off	Off, On
Apply Changes	No	No, Yes
Active Alarm Clear	Off	Off, On
Alarm Log Clear	No	No, Yes
Power Restore Event Log - Day Selection	Current	Current, 2nd Day, 3rd Day, 4th Day, 5th Day, 6th Day, 7th Day
Display Units	English	English, Metric

Table 42: Unit Test Mode Set Points

Description	Default	Range
Test Unit Alarm Output	Off	Off, On
Test Evaporator Pump Output 1	Off	Off, On
Test Evaporator Pump Output 2	Off	Off, On

NOTE: Unit test mode set points can be changed only when the unit mode is in Test. When the unit mode is no longer Test, all unit test mode set points will be changed back to the ‘off’ values.

Table 43: Communication Configuration

Description	Default	Range
Controller IP DHCP	On	Off, On
Controller IP Network Address	192.168.001.042	000.000.000.000 to 255.255.255.255
Controller IP Network Mask	255.255.255.000	000.000.000.000 to 255.255.255.255
Controller IP Network Gateway	192.168.001.001	000.000.000.000 to 255.255.255.255
Lon Module Maximum Send Time	0 seconds	0 to 6553.4 seconds
Lon Module Minimum Send Time	0 seconds	0 to 6553.4 seconds
Lon Module Receive Heartbeat	0 seconds	0 to 6553.4 seconds
BACnet Module Name		Alphanumeric string up to 15 characters long
BACnet Module Dev Instance	0	0 to 4194302
BACnet Module Unit Support	English	Metric, English
BACnet Module NC Dev 1	0	0 to 42949672
BACnet Module NC Dev 2	0	0 to 42949672
BACnet Module Reset Out of Service	Done	Done, False, True
BACnet IP Module UDP Port	0	0 to 65535
BACnet IP Module DHCP	Off	Off, On
BACnet IP Module Network Address		000.000.000.000 to 999.999.999.999
BACnet IP Module Network Mask		000.000.000.000 to 999.999.999.999
BACnet IP Module Network Gateway		000.000.000.000 to 999.999.999.999
BACnet MSTP Module Address	0	0 to 127
BACnet MSTP Module Baud Rate	38400	9600, 19200, 38400, 76800
BACnet MSTP Module Max Master	0	0 to 127
BACnet MSTP Module Max Info Frm	0	0 to 255
Modbus Module Address	1	1 to 247
Modbus Module Baud Rate	19200	4800, 9600, 19200, 38400
Modbus Module Parity	Even	Even, Odd, None
Modbus Module Two Stop Bits	No	No, Yes
Modbus Module Response Delay	0 milliseconds	0 to 30000 milliseconds
Modbus Module Comm LED Time Out	0 seconds	0 to 3600 seconds
AWM DHCP	Off	Off, On
AWM Network Address		000.000.000.000 to 999.999.999.999
AWM Network Mask		000.000.000.000 to 999.999.999.999
AWM Network Gateway		000.000.000.000 to 999.999.999.999

Circuit Level Set Points

The settings in this section all exist for each individual circuit.

Table 44: Set Points for Individual Circuits

Description	Default	Range
Mode/Enabling		
Circuit mode	Enable	Disable, Enable, Test
Compressor 1 Enable	Auto	Auto, Off
Compressor 2 Enable	Auto	Auto, Off
Compressor 3 Enable	Auto	Auto, Off
EXV Settings		
EXV control	Auto	Auto, manual
EXV position	See Special Setpoints	0% to 100%
Suction SH Target @50% (3)	4.44°C (8°F)	4.44 to 6.12 °C (8 to 11 °F)
Suction SH Target @100% (3)	5.56°C (10°F)	4.44 to 6.67 °C (8 to 12 °F)
Suction SH Target @33% (4)	See Special Setpoints	4.44 to 6.12 °C (8 to 11 °F)
Suction SH Target @66/100% (4)	5.56°C (10°F)	4.44 to 6.67 °C (8 to 12 °F)
Max Evap Pressure	1075.6 KPA(156 PSI)	979 to 1172 KPA (142 to 170 PSI)
Condenser Control		
Condenser Target 100%	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Condenser Target 67% (2)	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Condenser Target 50% (1)	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Condenser Target 50%, Unit 75% (1)	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Condenser Target 50%, Unit 50% (1)	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Condenser Target 50%, Unit 25% (1)	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Condenser Target 33% (2)	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
VFD Max Speed	100%	90 to 110%
VFD Min Speed	25%	25 to 60%
Fan Stage Up Deadband 1	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Fan Stage Up Deadband 2	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Fan Stage Up Deadband 3	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Fan Stage Up Deadband 4	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Fan Stage Down Deadband 1	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Fan Stage Down Deadband 2	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Fan Stage Down Deadband 3	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Fan Stage Down Deadband 4	See Dynamic Set Point Ranges	See Dynamic Set Point Ranges
Sensor Offsets		
Evap Pressure Offset	0 KPA (0 PSI)	-100 to 100 KPA (-14.5 to 14.5 PSI)
Cond Pressure Offset	0 KPA (0 PSI)	-100 to 100 KPA (-14.5 to 14.5 PSI)
Suction Temp Offset	0°C (0°F)	-5.0 to 5.0 °C (-9.0 to 9.0 °F)
BAS Control Inputs		
Network Compressor 1 Enable	Enable	Enable, Disable
Network Compressor 2 Enable	Enable	Enable, Disable
Network Compressor 3 Enable	Enable	Enable, Disable

NOTE: 1. Condenser Target 50% will be available only when the unit has 4 compressors.
2. Condenser Targets 33% and 67% will be available only when the unit has 6 compressors.
3. Suction SH Targets 50% and 100% will be available only when the unit has 4 compressors.
4. Suction SH Targets 33% and 66/100% will be available only when the unit has 6 compressors.

Dynamic Set Point Ranges and Defaults

Some settings have different ranges of adjustment based on other parameters and unit configuration. The condenser settings that follow are applicable to four configuration groups:

1 - Models 30 to 70

2 - Models 75 to 241 with no fan VFDs or one VFD per circuit

3 - Models from 75 to 161 with 2 fan VFDs per circuit

4 - Models 170 to 241 with 2 fan VFDs per circuit

Special Set Point Operation

EXV settings are only visible if the unit is configured with electronic expansion valves. The EXV position set point is not changeable unless the unit switch is off.

EXV Position set point on each circuit follows the actual EXV position while EXV Control = Auto. When EXV Control = Manual, the position set point will be changeable.

Table 45: Suction Superheat Target 33%

Unit Model	Default
Models 75 to 180	4.44°C (8°F)
Models 191 to 241	5.56°C (10°F)

Table 46: Configuration Group 1

Description	Default	Range
Condenser Target - 100% Circuit Capacity	37.78°C (100°F)	37.78 to 46.11°C (100 to 115°F)
Condenser Target - 67% Circuit Capacity	32.22°C (90°F)	32.22 to 46.11°C (90 to 115°F)
Condenser Target - 50% Circuit Capacity	32.22°C (90°F)	32.22 to 46.11°C (90 to 115°F)
Condenser Target - 33% Circuit Capacity	32.22°C (90°F)	32.22 to 40.56°C (90 to 105°F)
Fan Stage Up Deadband 1	11.11°C (20°F)	11.11 to 13.89°C (20 to 25°F)
Fan Stage Up Deadband 2	8.33°C (15°F)	8.33 to 11.11°C (15 to 20°F)
Fan Stage Up Deadband 3	5.56°C (10°F)	5.56 to 8.33°C (10 to 15°F)
Fan Stage Up Deadband 4	5.56°C (10°F)	5.56 to 8.33°C (10 to 15°F)
Fan Stage Down Deadband 4	5.56°C (10°F)	3.33 to 5.56°C (6 to 10°F)
Fan Stage Down Deadband 3	5.56°C (10°F)	3.33 to 5.56°C (6 to 10°F)
Fan Stage Down Deadband 2	5.56°C (10°F)	5.56 to 8.33°C (10 to 15°F)
Fan Stage Down Deadband 1	11.11°C (20°F)	8.33 to 11.11°C (15 to 20°F)

Table 47: Configuration Group 2

Description	Default	Range
Condenser Target - 100% Circuit Capacity	37.78°C (100°F)	37.78 to 46.11°C (100 to 115°F)
Condenser Target - 67% Circuit Capacity	32.22°C (90°F)	32.22 to 43.33°C (90 to 110°F)
Condenser Target - 50% Circuit Capacity	29.44°C (85°F)	29.44 to 32.22°C (85 to 90°F)
Condenser Target - 33% Circuit Capacity	29.44°C (85°F)	29.44 to 40.56°C (85 to 105°F)
Fan Stage Up Deadband 1	11.11°C (20°F)	11.11 to 13.89°C (20 to 25°F)
Fan Stage Up Deadband 2	8.33°C (15°F)	8.33 to 11.11°C (15 to 20°F)
Fan Stage Up Deadband 3	5.56°C (10°F)	5.56 to 8.33°C (10 to 15°F)
Fan Stage Up Deadband 4	5.56°C (10°F)	5.56 to 8.33°C (10 to 15°F)
Fan Stage Down Deadband 4	5.56°C (10°F)	3.33 to 5.56°C (6 to 10°F)
Fan Stage Down Deadband 3	5.56°C (10°F)	3.33 to 5.56°C (6 to 10°F)
Fan Stage Down Deadband 2	8.33°C (15°F)	8.33 to 11.11°C (15 to 20°F)
Fan Stage Down Deadband 1	8.33°C (15°F)	8.33 to 11.11°C (15 to 20°F)

Table 48: Configuration Group 3

Description	Default	Range
Condenser Target - 100% Circuit Capacity	40.56°C (105°F)	40.56 to 46.11°C (105 to 115°F)
Condenser Target - 50% Circuit Capacity, 75% Unit Capacity	40.56°C (105°F)	37.78 to 43.33°C (100 to 110°F)
Condenser Target - 50% Circuit Capacity, 50% Unit Capacity	32.22°C (90°F)	31.11 to 36.67°C (88 to 98°F)
Condenser Target - 50% Circuit Capacity, 25% Unit Capacity	26.67°C (80°F)	23.89 to 29.44°C (75 to 85°F)
Fan Stage Up Deadband 1	5.56°C (10°F)	2.78 to 8.33°C (5 to 15°F)
Fan Stage Up Deadband 2	2.78°C (5°F)	2.78 to 5.56°C (5 to 10°F)
Fan Stage Down Deadband 3	2.78°C (5°F)	2.78 to 5.56°C (5 to 10°F)
Fan Stage Down Deadband 2	2.78°C (5°F)	2.78 to 5.56°C (5 to 10°F)
Fan Stage Down Deadband 1	5.56°C (10°F)	5.56 to 8.33°C (10 to 15°F)

Table 49: Configuration Group 4

Description	Default	Range
Condenser Target - 100% Circuit Capacity	37.78°C(100 °F)	35 to 46.11°C (95 to 115°F)
Condenser Target - 67% Circuit Capacity	37.78°C(100 °F)	35 to 40.56°C (95 to 105°F)
Condenser Target - 33% Circuit Capacity	26.67°C (80°F)	23.89 to 29.44°C (75 to 85°F)
Fan Stage Up Deadband 1	5.56°C (10°F)	2.78 to 8.33°C (5 to 15°F)
Fan Stage Up Deadband 2	2.78°C (5°F)	2.78 to 5.56°C (5 to 10°F)
Fan Stage Up Deadband 3	2.78°C (5°F)	2.78 to 5.56°C (5 to 10°F)
Fan Stage Down Deadband 4	2.78°C (5°F)	2.78 to 5.56°C (5 to 10°F)
Fan Stage Down Deadband 3	2.78°C (5°F)	2.78 to 5.56°C (5 to 10°F)
Fan Stage Down Deadband 2	2.78°C (5°F)	2.78 to 5.56°C (5 to 10°F)
Fan Stage Down Deadband 1	2.78°C (5°F)	2.78 to 5.56°C (5 to 10°F)

Security

All set points are protected using passwords. A four-digit password provides operator access to changeable parameters. Service level passwords are reserved for authorized service personnel. See Passwords on page 108 for various levels of access.

Entering Passwords

Passwords are entered on the first screen on the unit controller.

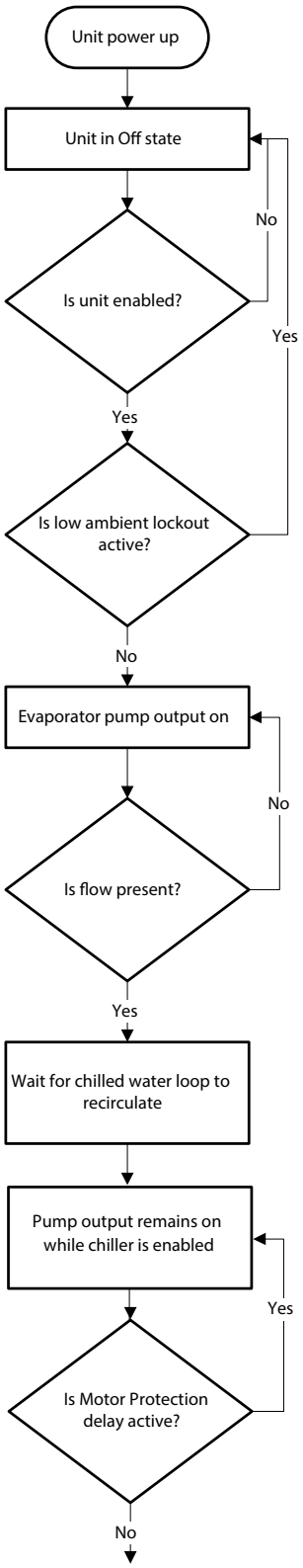
If the wrong password is entered, a message will temporarily appear stating this. If no valid password is active the active password level displays “none.”

Editing Setpoints

After a valid password has been entered at the unit controller, set points may be changed. If the operator attempts to edit a set point for which the necessary password level is not active, no action will be taken.

Once a password has been entered, it remains valid for 10 minutes after the last key-press on the unit controller.

Figure 65: Unit Sequence of Operation - Cool Mode



The chiller may be disabled via the unit switch, the remote switch, the keypad enable setting, or the BAS network. In addition, the chiller will be disabled if all circuits are disabled, or if there is a unit alarm. If the chiller is disabled, the unit status display will reflect this and also show why it is disabled.

If the unit switch is off, the unit status will be **Off:Unit Switch**. If the chiller is disabled due to network command, the unit status will be **Off:BAS Disable**. When the remote switch is open, the unit status will be **Off:Remote Switch**. When a unit alarm is active, the unit status will be **Off:Unit Alarm**. In cases where no circuits are enabled, the unit status will be **Off:All Cir Disabled**. If the unit is disabled via the Chiller Enable set point, the unit status will be **Off:Keypad Disable**.

Low ambient lockout will prevent the chiller from starting even if it is otherwise enabled. When this lockout is disabling the chiller, the unit status will be **Off:Low OAT Lock**.

If the chiller is enabled, then the unit will be in the Auto state and the evaporator water pump output will be activated.

The chiller will then wait for the flow switch to close, during which time the unit status will be **Auto:Wait for flow**.

After establishing flow, the chiller will wait some time to allow the chilled water loop to recirculate for an accurate reading of the leaving water temperature. The unit status during this time is **Auto:Evap Recirculate**.

If the chiller is waiting on the motor protection delay after powering up, the unit status will be **Off: Motor Protection Delay.**

Figure 66: Unit Sequence of Operation - Cool Mode (continue)

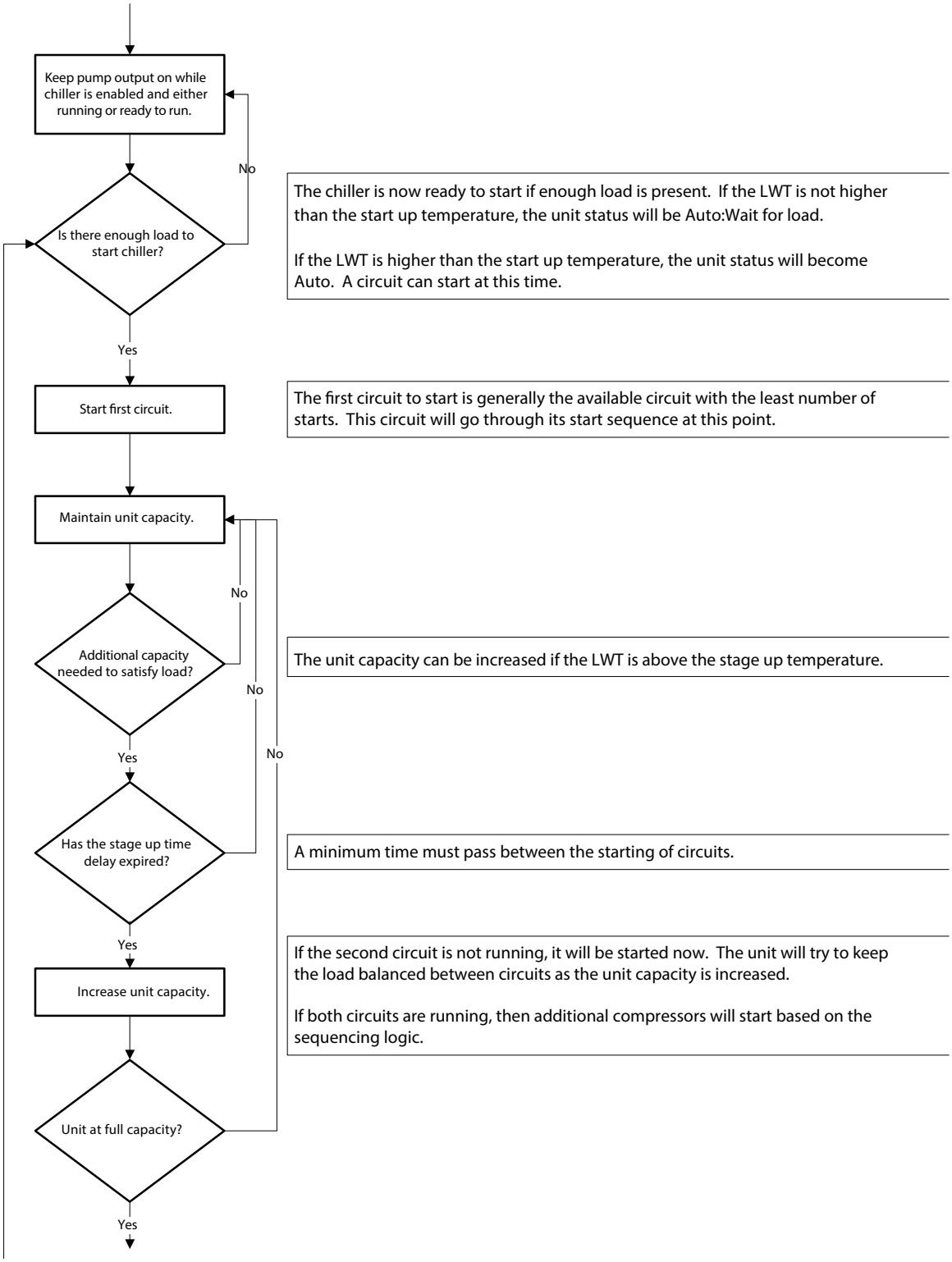


Figure 67: Unit Sequence of Operation - Cool Mode (continued)

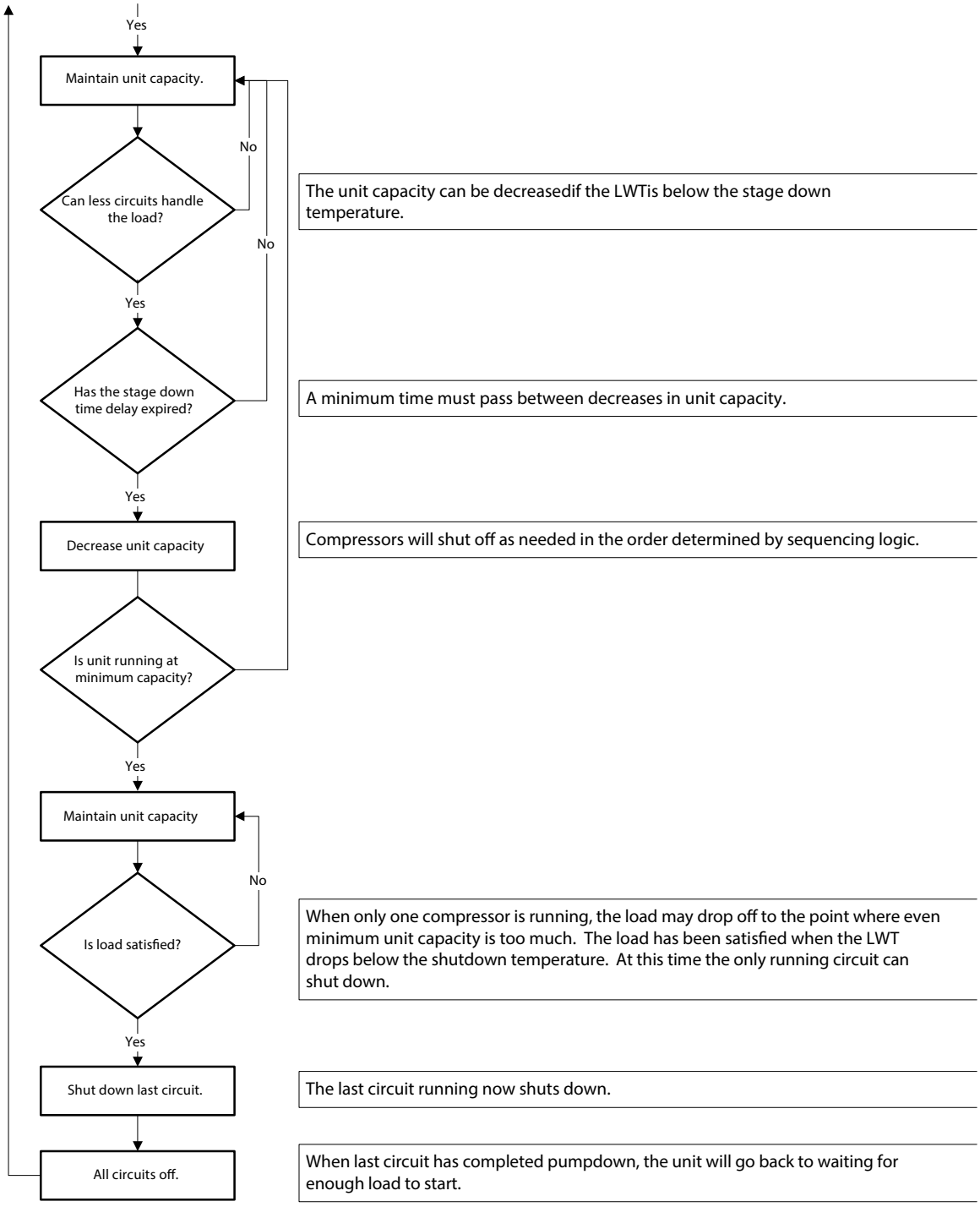


Figure 68: Unit Sequence of Operation - Ice Mode

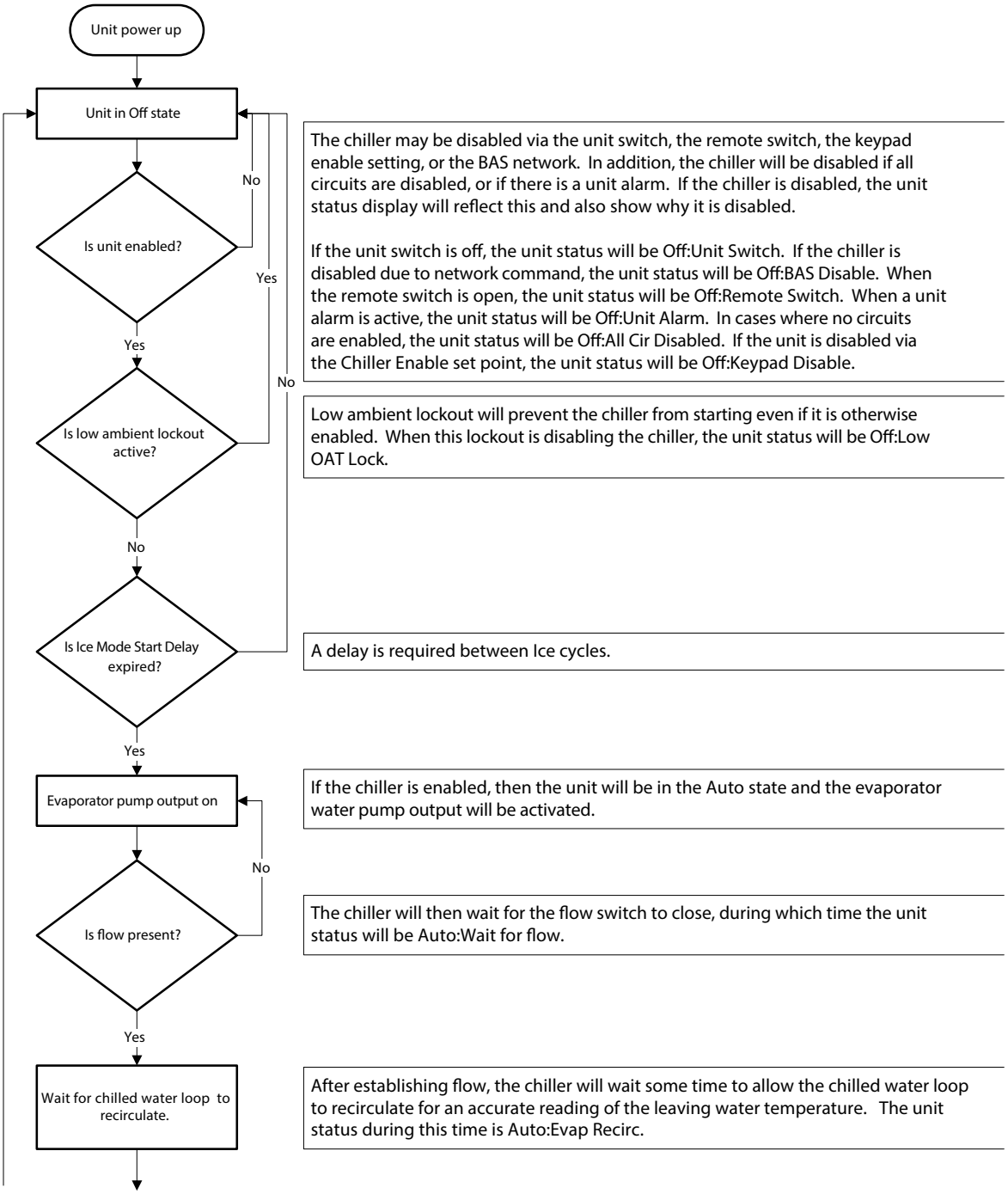
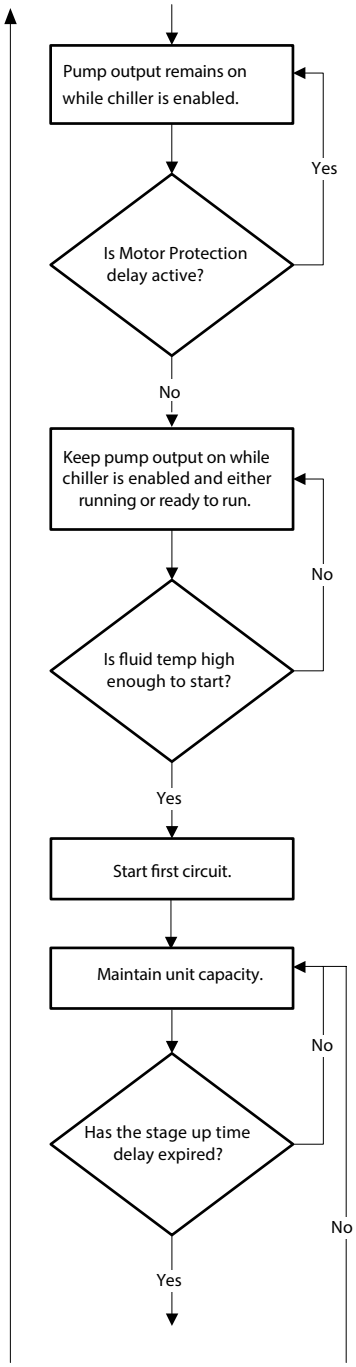


Figure 69: Unit Sequence of Operation - Ice Mode (continued)



If the chiller is waiting on the motor protection delay after powering up, the unit status will be Off:Motor Protection Delay.

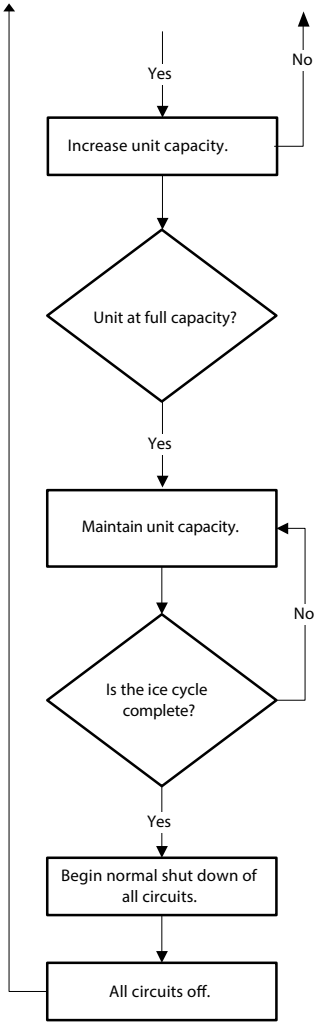
The chiller is now ready to start if enough load is present. If the LWT is not higher than the startup temperature, the unit status will be Auto:Wait for load.

If the LWT is higher than the startup temperature, the unit status will be Auto. A circuit can start at this time.

The first circuit to start is generally the circuit which contains the compressor with the least number of starts. This circuit will go through it's start sequence at this point.

A minimum time must pass between the starting of circuits.

Figure 70: Unit Sequence of Operation - Ice Mode (continued)



If the second circuit is not running, it will be started now. The unit will try to keep the load balanced between circuits as the unit capacity is increased.

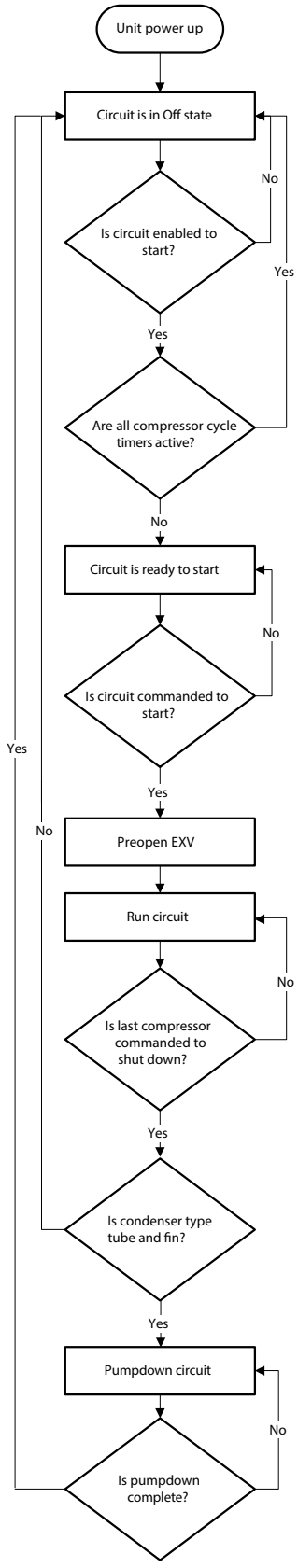
If both circuits are running, then additional compressors will start based on the sequencing logic.

Ice building is complete when LWT is less than the Active Setpoint.

All circuits begin the shut down sequence simultaneously.

When all circuits have completed shutdown, the unit will remain in the off state until the start conditions are satisfied again.

Figure 71: Circuit Sequence of Operation



When the circuit is in the Off state the EXV is in the closed position, compressors are off, solenoid valves are closed, and all condenser fans are off.

The circuit must be enabled before it can run. It might be disabled for several reasons. When the circuit switch is off, the status will be Off:Circuit Switch. If the circuit has an active stop alarm then the status will be Off:Alarm. If the circuit has been disabled via the circuit mode set point, the status will be Off:Keypad Disable. If all compressors are disabled via the settings, the circuit status will be Off:All Comp Disable.

A minimum time must pass between the previous start and stop of a compressor and the next start. If this time has not passed, a cycle timer will be active. If all compressors on the circuit have active cycle timers the circuit status will be Off:Cycle Timers.

If the circuit is ready to start when needed, the circuit status will be Off:Ready.

Capacity control logic at the unit level will determine when a circuit needs to start and issue a start command to the next circuit to start based on sequencing rules.

Before the first compressor on a circuit can start, the EXV performs a brief preopen. The circuit status during this time will be Preopen.

The first compressor will be started and the fans, solenoid valves, and other devices will be controlled as needed. The normal circuit status at this time will be Run:Normal. Additional compressors will be started as needed per the unit level capacity control.

Capacity control logic at the unit level will determine when a compressor needs to shut down and issue a stop command to the next compressor to stop based on sequencing rules. If this compressor is the last one on the circuit, the circuit will need to shut down.

When the circuit needs to shut down, a pumpdown of the circuit will NOT be performed if the condenser coil is Microchannel type. When the circuit needs to shut down and the condenser is Microchannel type, everything will turn off on the circuit at approximately the same time.

When the circuit needs to shut down, a pumpdown of the circuit will be performed if the condenser coil is tube and fin type. The circuit status during this time will be Run:Pumpdown.

Pumpdown is complete when the evaporator pressure drops to a certain point or the circuit has been pumping down for longer than the pumpdown time limit.

The calculations in this section are used in unit level control logic or in control logic across all circuits.

Evaporator Delta T

The evaporator water delta T is calculated as entering water temperature minus leaving water temperature.

LWT Slope

LWT slope is calculated such that the slope represents the estimated change in LWT over a time frame of one minute.

Pulldown Rate

The slope value calculated above will be a negative value as the water temperature is dropping. A pulldown rate is calculated by inverting the slope value and limiting to a minimum value of 0°C/min.

LWT Error

LWT error is calculated as LWT – LWT target.

Unit Capacity

For applying unit capacity limits, an estimate of total unit capacity is needed. Unit capacity will be based on the estimated circuit capacities.

The unit capacity is the number of compressors running (on circuits that are not pumping down) divided by the number of compressors on the unit.

Control Band

The Control Band defines the band in which unit capacity will not be increased or decreased.

Constant Evaporator Flow

If Variable Evaporator Flow set point is set to No, the control band is calculated as follows:

- Four compressor units: Control Band = Full Capacity Evap Delta T Set Point * 0.35
- Six compressor units: Control Band = Full Capacity Evap Delta T Set Point * 0.25

Variable Evaporator Flow

When the unit set point for Variable Evaporator Flow is set to Yes, the control band increases as capacity decreases to account for the decrease in flow. It is assumed that the flow will vary to maintain the full capacity evaporator temperature delta at part load conditions. The control band is limited at each capacity step to a maximum value that corresponds to the minimum flow for that capacity step.

Since evaporator flow is represented by the set point Full Capacity Evaporator Delta T, the calculations of the control band for variable flow applications are explained in terms of delta T also. The term ‘Effective Full Capacity Delta T’ means the approximate temperature delta that would be observed with the unit running at full capacity for the given flow. ‘Nominal flow’ means the flow that is needed for a 5.56°C (10°F) delta T at full unit capacity.

Table 50: Minimum Flows and Corresponding Maximum Effective Full Capacity Delta T with Variable Flow

Number of Compressors	Unit Capacity	Minimum Flow (nominal %)	Max Effective Full Capacity DT
4	100%	62.5%	8.9 °C (16 °F)
	75%	55%	10.1 °C (18.2 °F)
	50%	47.5%	11.7 °C (21.1 °F)
	25%	40%	13.9 °C (25 °F)
6	100%	62.5%	8.9 °C (16 °F)
	83.3%	58%	9.59 °C (17.3 °F)
	66.7%	53.5%	10.39 °C (18.7 °F)
	50%	49%	11.35 °C (20.4 °F)
	33.3%	44.5%	12.49 °C (22.5 °F)
	16.7%	40%	13.9 °C (25 °F)

For variable evaporator flow, the Control Band is calculated as follows:

1. Effective Full Capacity Delta T = (Full Capacity Evap Delta T* 100) /Unit Capacity
2. If above value is more than the Max Effective Full Capacity dT listed in the table above for the corresponding unit capacity, it is set equal to the value in the table.
3. Effective Full Capacity Delta T with the limit applied is then multiplied by 0.35 for units with four compressors and by 0.25 for units with six compressors. This gives the total control band for the unit configuration and actual unit capacity.

Staging Temperatures

If the unit is configured for use without glycol:

When the LWT target is more than half the Control Band above 3.9°C (39.0°F)

- Stage Up Temperature = LWT target + (Control Band/2)
- Stage Down Temperature = LWT target – (Control Band/2)

If the LWT target is less than half the Control Band above 3.9°C (39.0°F)

- Stage Down Temperature = LWT target – (LWT target - 3.9°C)
- Stage Up temperature = LWT target + Control Band – (LWT target – 3.9°C)

If the unit is configured for use with glycol, the compressor staging temperatures are calculated as shown below:

- Stage Up Temperature = LWT target + (Control Band/2)
- Stage Down Temperature = LWT target – (Control Band/2)

The Start up and Shutdown temperatures are referenced from

the Control Band:

- Start Up Temperature = Stage Up Temperature + Start Up Delta set point
- Shutdown Temperature = Stage Down Temperature – Shutdown Delta set point

Unit Enable

Enabling and disabling the chiller is accomplished using set points and inputs to the chiller. The unit switch, remote switch input, and Unit Enable Set Point all are required to be 'on' for the unit to be enabled when the control source is set to 'local.' The same is true if the control source is set to 'network,' with the additional requirement that the building automation system (BAS) Enable set point must be 'on'. The BAS should enable the chiller only when there is a demand for cooling.

Unit is enabled according to the following table:

Unit Switch	Control Source Set Point	Remote Switch Input	Unit Enable Set Point	BAS Enable Set Point	Unit Enable
Off					Off
			Off		Off
		Off			Off
On	Local	On	On		On
	Network			Off	Off
On	Network	On	On	On	On

Unit Mode Selection

The operating mode of the unit is determined by setpoints and inputs to the chiller. The Available Modes Set Point determines what modes of operation can be used. This set point also determines whether the unit is configured for glycol use. The Control Source Set Point determines where a command to change modes will come from. A digital input switches between cool mode and ice mode if they are available and the control source is set to 'local.' The BAS mode request switches between cool mode and ice mode if they are both available and the control source is set to 'network.'

The Available Modes Set Point should only be changeable when the unit switch is off. This is to avoid changing modes of operation inadvertently while the chiller is running.

Table 51: Unit Mode Settings

Control Source Set Point	Mode Input	BAS Request	Available Modes Set Point	Unit Mode
			Cool	Cool
			Cool w/ Glycol	Cool
Local	Off		Cool/Ice w/ Glycol	Cool
Local	On		Cool/Ice w/ Glycol	Ice
Network		Cool	Cool/Ice w/ Glycol	Cool
Network		Ice	Cool/Ice w/ Glycol	Ice
			Ice w/Glycol	Ice
			Test	Test

Glycol Configuration

If the Available Modes Set Point is set to an option 'w/Glycol,' then glycol operation should be enabled for the unit. Glycol operation should only be disabled when the Available Modes Set Point is set to 'Cool.'

Unit States

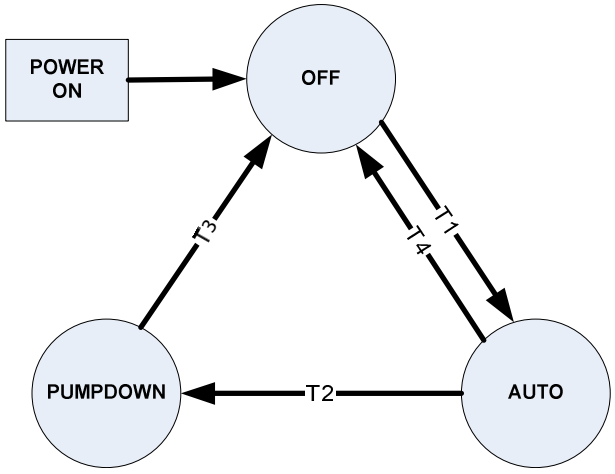
The unit will always be in one of three states:

Off – Unit is not enabled to run

Auto – Unit is enabled to run

Pumpdown – If a unit has microchannel coils, the individual refrigerant circuits will never do a pumpdown. So if the conditions for the Auto to Pumpdown transition occur, the unit state will transition from Auto to Pumpdown and then immediately to Off.

Transitions between these states are shown in the following diagram.



T1 - Off to Auto

All of the following are required:

- Unit Enable = On
- No Unit Alarm active
- A circuit is enabled to start
- If Unit Mode = Ice then Ice Delay not active
- Low Ambient Lockout is not active
- Unit configuration settings are valid

T2 - Auto to Pumpdown

Any of the following are required:

- Unit Enable = Off and Unit Switch is closed
- Unit Mode = Ice AND LWT target is reached
- Unit Pumpdown Alarm active
- Low Ambient Lockout is active

T3 - Pumpdown to Off

Any of the following are required:

- Unit rapid stop alarm active
- All circuits complete pumpdown
- Unit Switch open

T4 - Auto to Off

Any of the following are required:

- Unit rapid stop alarm active
- No circuit enabled and no compressors running
- Unit Switch open

Motor Protection Module Power Up Start Delay

After powering up the unit, the motor protection modules may not be engaged for a period of time. Therefore, after the control is powered up, no compressor can start for 150 seconds. In addition, the motor protect inputs are ignored during this time so as to avoid tripping a false alarm.

Ice Mode Start Delay

An adjustable start to start ice delay timer will limit the frequency with which the chiller may start in Ice mode. The timer starts when the first compressor starts while the unit is in ice mode. While this timer is active, the chiller cannot restart in Ice mode. The time delay is adjustable via the Ice Time Delay set point.

The ice delay timer may be manually cleared to force a restart in ice mode. A set point specifically for clearing the ice mode delay is available.

Low Ambient Lockout

The operation of the chiller in response to OAT dropping below the Low OAT Lockout set point is configurable if the chiller has condenser fan VFD's. In that case, there are three options:

- Lockout and Stop – chiller will shut down and lockout
- Lockout only – chiller does not shut down running circuits, will lock out circuits that are off
- Disabled – chiller does not shut down or lock out

For chillers without condenser fan VFD's, there is no configuration and the chiller will always operate according to the first option shown above. Descriptions of the operation for each option are in the following sections.

Lockout and Stop Operation

When the chiller is configured for lockout and stop, it will operate as described in this section.

If the OAT drops below the low ambient lockout set point and the OAT sensor fault is not active, low ambient lockout is triggered. The unit should go into the pumpdown state if any circuits are running. If no circuits are running the unit should go into the off state. This condition should clear when OAT rises to the lockout set point plus 2.5°C (4.5°F).

Lockout Only Operation

When the chiller is configured for lockout only, it will operate as described in this section.

If OAT drops below the low ambient lockout set point and any circuits are running, then those circuits will be allowed to remain running and the unit will not enter the low ambient lockout condition. Circuits that are not running will enter a circuit level lockout condition when OAT drops below the lockout set point. This condition will clear at the circuit level when OAT rises to the lockout set point plus 2.5°C (4.5°F).

If the OAT is below the low ambient lockout set point, the OAT sensor fault is not active, and neither circuit is running, low ambient lockout is triggered. The unit will go directly into the off state and will remain in the off state until the lockout has cleared. This condition will clear when OAT rises to the lockout set point plus 2.5°C (4.5°F).

Disabled Operation

When the chiller is configured to disable low ambient lockout, it will operate as described in this section.

Regardless of the OAT, the unit will not enter the low ambient lockout condition or shut down any running circuits.

BAS Annunciation

Low Ambient Lockout is not an alarm, but it can be annunciated to the BAS as if it is one. When the Low OAT Lockout BAS Alert set point is set to On and the low ambient lockout is active, the following will occur:

- Chiller alarm status parameter will show alarm state
- Active Problem Alarm Code will be set to 16642 (assuming no higher code is active)
- Active Problem Alarm Index will be set to 65 (assuming no higher index is active)

Unit Status

The displayed unit status should be determined by the conditions in the following table:

#	Status	Conditions
1	Auto	Unit State = Auto
2	Auto: Sound Reduction	Unit State = Auto and Sound Reduction is active
3	Off: Motor Prot Delay	Unit State = Auto and MP start up delay is active
4	Off: Ice Mode Timer	Unit State = Off, Unit Mode = Ice, and Ice Delay = Active
5	Off: Low OAT Lockout	Unit State = Off and Low OAT Lockout is active
6	Off: All Cir Disabled	Unit State = Off and both circuits unavailable
7	Off: Unit Alarm	Unit State = Off and Unit Alarm active
8	Off: Keypad Disable	Unit State = Off and Unit Enable Set Point = Disable
9	Off: Remote Switch	Unit State = Off and Remote Switch is open
10	Off: BAS Disable	Unit State = Off, Control Source = Network, and BAS Enable = false
11	Off: Unit Switch	Unit State = Off and Unit Switch = Disable
12	Off: Test Mode	Unit State = Off and Unit Mode = Test
13	Auto: Wait for load	Unit State = Auto, no circuits running, and LWT is less than the active set point + startup delta
14	Auto: Evap Recirculate	Unit State = Auto and Evaporator State = Start
15	Auto: Wait for flow	Unit State = Auto, Evaporator State = Start, and Flow Switch is open
16	Auto: Pumpdown	Unit State = Pumpdown
17	Auto: Max Pulldown Rate	Unit State = Auto, max pulldown rate has been met or exceeded
18	Auto: Unit Cap Limit	Unit State = Auto, unit capacity limit has been met or exceeded
19	Auto: High Amb Limit	Unit State = Auto and high ambient capacity limit is active
20	Auto:Rapid Restore	Unit State = Auto and unit is performing Rapid Restore operation
21	Off:Cond Type Not Set	Condenser type setting is set to 'Not Set'
22	Off:ExVlv Type Not Set	Expansion valve type setting is set to 'Not Set'
23	Off:Invalid Config	Unit model selected not valid
24	Cfg Chg, Rst Ctlr	A configuration change requiring a reboot occurred but controller has not been rebooted yet.

Evaporator Pump Control

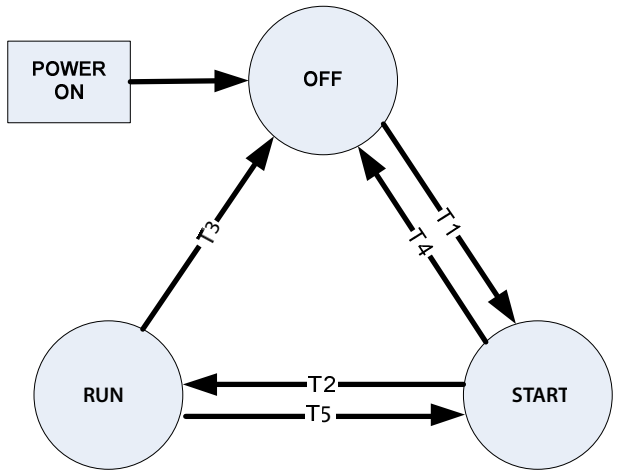
For control of the evaporator pumps, three evaporator pump control states should be used:

Off - No pump on.

Start – Pump is on, water loop is being recirculated.

Run – Pump is on, water loop has been recirculated and circuits can start if needed.

Transitions between these states are shown in the following diagram.



T1 – Off to Start

Requires any of the following

- Unit state = Auto
- Freeze protection started

T2 – Start to Run

Requires the following

- Flow ok for time longer than evaporator recirculate time set point

T3 – Run to Off

Requires all of the following

- Unit state is Off
- Freeze protection not active

T4 – Start to Off

Requires all of the following

- Unit state is Off
- Freeze protection not active

T5 – Run to Start

Flow switch input is low for longer than the flow proof set point.

Freeze Protection

To protect the evaporator from freezing, the evaporator pump will start if all of the following are true:

- LWT equal to or less than the Evap Freeze set point for at least three seconds
- LWT sensor fault isn't active
- manual reset flow loss alarm is not active

Freeze protection will end when any of the following are true:

- [LWT is at least 1.11°C (2°F) above the Evap Freeze set point OR LWT sensor fault is active] and pump has been in run state for at least 15 minutes
- manual reset flow loss alarm is active

Pump Selection

The pump output used will be determined by the Evap Pump Control set point. This setting allows the following configurations:

- #1 only – Pump 1 will always be used
- #2 only – Pump 2 will always be used
- Auto – The primary pump is the one with the least run hours, the other is used as a backup
- #1 Primary – Pump 1 is used normally, with pump 2 as a ackup
- #2 Primary – Pump 2 is used normally, with pump 1 as a backup

Primary/Standby Pump Staging

The pump designated as primary will start first. If the evaporator state is start for a time greater than the recirculate timeout set point and there is no flow, then the primary pump will shut off and the standby pump will start. When the evaporator is in the run state, if flow is lost for more than half of the flow proof set point value, the primary pump will shut off and the standby pump will start. Once the standby pump is started, the flow loss alarm logic will apply if flow cannot be established in the evaporator start state, or if flow is lost in the evaporator run state.

Auto Control

If auto pump control is selected, the primary/standby logic above is still used. When the evaporator is not in the run state, the run hours of the pumps will be compared. The pump with the least hours will be designated as the primary at this time.

LWT Target

The LWT Target varies based on settings and inputs.

The base LWT Target is selected as follows:

Control Source Set Point	Mode Input	BAS Request	Available Modes Set Point	Base LWT Target
Local	OFF	-	COOL	Cool Set Point 1
Local	ON	-	COOL	Cool Set Point 2
Network	-	-	COOL	BAS Cool Set Point
Local	OFF	-	COOL w/ Glycol	Cool Set Point 1
Local	ON	-	COOL w/ Glycol	Cool Set Point 2
Network		-	COOL w/ Glycol	BAS Cool Set Point
Local	OFF	-	COOL/ICE w/Glycol	Cool Set Point 1
Local	ON	-	COOL/ICE w/Glycol	Ice Set Point
Network	-	COOL	COOL/ICE w/Glycol	BAS Cool Set Point
Network	-	ICE	COOL/ICE w/Glycol	BAS Ice Set Point
Local	-	-	ICE w/ Glycol	Ice Set Point
Network	-	-	ICE w/ Glycol	BAS Ice Set Point

Leaving Water Temperature (LWT) Reset

The base LWT target may be reset if the unit is in Cool mode and LWT reset is enabled via the set point.

The reset amount is adjusted based on the 4 to 20 mA reset input. Reset is 0° if the reset signal is less than or equal to 4 mA. Reset is 5.56°C (10.0°F) if the reset signal equals or exceeds 20 mA. The amount of reset will vary linearly between these extremes if the reset signal is between 4 mA and 20 mA.

When the reset amount increases, the Active LWT Target is changed at a rate of 0.1°C every 10 seconds. When the active reset decreases, the Active LWT Target is changed all at once.

After the reset is applied, the LWT target can never exceed a value of 18.33°C (65°F).

Unit Capacity Control

Unit capacity control will be performed as described in this section. All unit capacity limits described in following sections must be applied as described.

Compressor Staging in Cool Mode

The first compressor on the unit should be started when evaporator LWT is higher than the Startup Temperature.

Additional compressors can be started when Evaporator LWT is higher than the Stage Up Temperature and the Stage Up Delay is not active.

When multiple compressors are running, one should shut down if evaporator LWT is lower than the Stage Down Temperature and the Stage Down Delay is not active.

All running compressors should shut down when the evaporator LWT is lower than the Shut Down Temperature.

Stage Up Delay

A minimum amount of time, defined by the Stage Up Delay set point, should pass between increases in the capacity stage. This delay should only apply when at least one compressor is running. If the first compressor starts and quickly shuts off for some reason, another compressor may start without this minimum time passing.

Stage Down Delay

A minimum amount of time, defined by the Stage Down Delay set point, should pass between decreases in the capacity stage. This delay should not apply when the LWT drops below the Shut Down Temperature (unit should immediately shut down).

Compressor Staging in Ice Mode

The first compressor on the unit should be started when evaporator LWT is higher than the Startup Temperature.

Additional compressors should be started as quickly as possible with respect to the Stage Up Delay.

The unit should shut down when evaporator LWT is less than the LWT target.

Stage Up Delay

A fixed stage up delay of one minute between compressor starts should be used in this mode.

Staging Sequence

This section defines which compressor is the next one to start or stop. In general, compressors with fewer starts will normally start first, and compressors with more run hours will normally stop first.

If possible circuits will be balanced in stage. If a circuit is unavailable for any reason, the other circuit shall be allowed to stage all compressors on. When staging down, one compressor on each circuit shall be left on until each circuit has only one compressor running.

Next To Start

If both circuits have an equal number of compressors running or a circuit has no compressors available to start:

- the available compressor with the least starts will be next to start
- if starts are equal, the one with the least run hours will be next to start
- if run hours are equal, the lowest numbered one will be next to start

If the circuits have an unequal number of compressors running, the next compressor to start will be on the circuit with the least compressors running if it has at least one compressor available to start. Within that circuit:

- the available compressor with the least starts will be next to start
- if starts are equal, the one with the least run hours will be next to start
- if run hours are equal, the lowest numbered one will be next to start

Next to Stop

If both circuits have an equal number of compressors running:

- the running compressor with the most run hours will be next to stop
- if run hours are equal, the one with the least starts will be next to stop
- if starts are equal, the lowest numbered one will be next to stop

If the circuits have an unequal number of compressors running, the next compressor to stop will be on the circuit with the most compressors running. Within that circuit:

- the running compressor with the most run hours will be next to stop
- if run hours are equal, the one with the least starts will be next to stop
- if starts are equal, the lowest numbered one will be next to stop

Unit Capacity Overrides

Unit capacity limits can be used to limit total unit capacity in Cool mode only. Multiple limits may be active at any time, and the lowest limit is always used in the unit capacity control.

Demand Limit

The maximum unit capacity 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 set point is set to ON. The maximum unit capacity stage is determined as shown in the following tables:

Table 52: Stage Limits - Four Compressors

Demand Limit Signal (%)	Demand Limit Range (mA)	Stage
Limit ≥ 75%	Limit ≥ 16 mA	1
75% > Limit ≥ 50%	16 mA > Limit ≥ 12 mA	2
50% > Limit ≥ 25%	12 mA > Limit ≥ 8 mA	3
25% > Limit	8 mA > Limit	4

Table 53: Stage Limits - Six Compressors

Demand Limit Signal (%)	Demand Limit Range (mA)	Stage
Limit ≥ 83.3%	Limit ≥ 17.3 mA	1
83.3% > Limit ≥ 66.7%	17.3 mA > Limit ≥ 14.7 mA	2
66.7% > Limit ≥ 50%	14.7 mA > Limit ≥ 12 mA	3
50% > Limit ≥ 33.3%	12 mA > Limit ≥ 9.3 mA	4
33.3% > Limit ≥ 16.7%	9.3 mA > Limit ≥ 6.7 mA	5
16.7% > Limit	6.7 mA > Limit	6

Network Limit

The maximum unit capacity can be limited by a network signal. This function is only enabled if the control source is set to network. The maximum unit capacity stage is based on the network limit value received from the BAS and is determined as shown in the following tables:

Table 54: Stage Limits - Four Compressors

Network Limit	Stage
Limit ≥ 100%	4
100% > Limit ≥ 75%	3
75% > Limit ≥ 50%	2
50% > Limit	1

Table 55: Stage Limits - Six Compressors

Network Limit	Stage
Limit ≥ 100%	6
100% > Limit ≥ 83.3%	5
83.3% > Limit ≥ 66.7%	4
66.7% > Limit ≥ 50%	3
50% > Limit ≥ 33.3%	2
33.3% > Limit	1

Maximum LWT Pulldown Rate

The maximum drop rate for the leaving water temperature shall be limited by the Maximum Pulldown Rate set point only when the unit mode is Cool.

If the rate exceeds the set point, no more compressors can be started until the pulldown rate is less than the set point. Running compressors will not be stopped as a result of exceeding the maximum pulldown rate.

High Ambient Limit

On units configured with single point power connections, the maximum load amps could be exceeded at high ambient temperatures. If the power connection is single point, and the outdoor air temperature OAT is greater than 46.6°C (115.9°F), the high ambient limit becomes active. This limit will be removed when the OAT drops back down to 45.56°C (114°F). The max operating ambient temperature is 51.6°C (125°F).

When the limit is active, the unit is allowed to run all but one compressor. So it will inhibit the unit from loading if all but one compressor is on, and it will shut down a compressor if all compressors are running.

RapidRestore® Option

RapidRestore® is an option that can be added to Trailblazer® chillers. The general purpose of the option is to allow the capability to restart more quickly and to load faster than normal operation.

Enabling

The RapidRestore® option shall be enabled via the RapidRestore® set point and requires the optional module. Doing so will require the following to be true:

- RapidRestore® module is present at address 22
- DI1 on the RapidRestore® module has a signal

If the DI1 input loses the signal or the RapidRestore® module is no longer communicating, then the option will be disabled in the chiller.

Operation Following Power Cycle

The chiller will enter RapidRestore® upon powering up when the following conditions are met:

- RapidRestore® is enabled
- Power failure lasts less than the value of the Max Power Failure Time set point
- Power failure lasts at least one second (shorter power loss may result in unpredictable operation)
- Unit is enabled

When RapidRestore® is triggered, the time value used for the evaporator recirculation time will be limited to 110 seconds or less. The evaporator recirculation time set point will not be changed. Only the value used in the evaporator state logic will be limited, and only if the set point exceeds the 110 second limit.

This action will ensure that the chiller is ready to start after the motor protection module delay has expired.

Time to Start

The compressor manufacturer requires a minimum two minute delay after power on until a compressor should be started, which is to ensure proper operation of the motor protection modules. Unit controller boot time is about 10 seconds, so a delay of 110 seconds will start upon completing boot up. After this delay, the two minute manufacturer requirement will be satisfied.

After the 110 second delay, the first circuit to start will enter the preopen state, which takes five seconds. The end result is that the first compressor should start approximately 125 seconds after power is restored to the chiller.

Current software has a delay of 150 seconds after bootup is complete before the first circuit can start. The software will be

changed to use the 110 second delay discussed above only when the chiller is performing the RapidRestore operation.

Fast Loading

Fast loading will be performed when the following conditions are met after the unit power up:

- Chiller enters RapidRestore® operation
- Current LWT > Start Up Temperature

For reference, Start Up Temperature is Stage Up Temperature + Start Up Delta T. Stage Up Temperature is calculated based on the Full Capacity Evaporator Delta T set point and the number of compressors on the chiller.

Fast loading should end if any of the following conditions occur:

- LWT < Stage Up Temperature
- Unit capacity = 100%
- All circuits become disabled for any reason
- Unit becomes disabled for any reason
- 10 minutes have passed since unit powered up

When fast loading ends, the RapidRestore® operation is considered complete.

Capacity Changes

Normally the delay between compressors staging on is determined by the Stage Up Delay setting. That setting defaults to 240 seconds and has a range of 120 to 480 seconds. During fast loading, a delay of 60 seconds between compressor starts within a circuit should be used. In addition, a delay of 30 seconds between compressor starts on different circuits should be used.

This change during RapidRestore® operation will allow for a faster time to full capacity while maintaining stable operation within each circuit. Assuming both circuits are able to run, the effective unit stage up delay will be 30 to 35 seconds, so it will load about four times faster during RapidRestore® than the fastest it possibly can during normal operation.

Max Pulldown Rate

Max pulldown rate will be ignored during fast loading so the chiller can reach full capacity as soon as possible.

Backup Chiller Operation

If DI2 on the RapidRestore® module has a signal and the unit has RapidRestore® enabled, then the chiller is considered a ‘backup chiller’. When a ‘backup chiller’ is enabled, it will use an evaporator recirculation time of 13 seconds regardless of what the evaporator recirculation time set point is. Then, fast loading will be used as outlined previously in the fast loading section.

This backup chiller sequence is safe for the unit if it has had power applied for the minimum time stated in the operation manual. Since this sequence does not have to wait on the compressor motor protection module delay, the unit can achieve full capacity even faster than during a power loss scenario.

Compressor Starting

During normal operation, chiller controls will limit compressor starts by enforcing the circuit configuration timers listed in Table 44 on page 75 These timers are further discussed on page 95. During RapidRestore operation, the compressor cycle timers are not maintained through power cycling. The following table shows the approximate best case scenario for start time and loading time with the RapidRestore® operation.

Table 56: RapidRestore® Mode Response Times

# of compressors		Maximum Restart Time	Time to Fully Loaded
Power lost and restored	4	125 sec.	220 sec.
	6		280 sec.
Backup chiller with constant power	4	20 sec.	115 sec.
	6		175 sec.

Sound Reduction

A special mode of operation is available for E vintage models with two fan VFD’s per circuit, which reduces sound levels by limiting condenser fan speeds. This mode can be enabled and disabled via the Sound Reduction Enable setting.

Scheduling

When enabled, sound reduction will become active based on a daily schedule. This schedule is configurable and allows a start time and duration to be selected for each day of the week. Start times can be set in one hour increments and duration can be set in hour increments.

Sound reduction will be active if the controller time is within the time block determined by the settings for the current day.

Operation When Active

When sound reduction is active, the condenser fans will be limited to the speed selected by the fan speed limit set point.

If the Sound Reduction priority is set to ‘sound’, the fan speed limit is applied at all times regardless of operating conditions. If conditions are such that condenser pressure is elevated a high pressure stage down may occur, which would effectively lower the pressure into a safe zone but capacity of the chiller would be limited.

When priority is set to ‘capacity’, the fan speed limit is in effect unless saturated condenser temperature rises to a certain value. That value is the high condenser pressure unload set point converted to saturated temperature, less 5.56°C (10°F). Once the condenser saturated temperature starts to exceed that value, the fans will speed up beyond the speed limit as needed to control the saturated temperature to that value.This action allows the chiller to maintain a higher operating capacity.

Calculations

Refrigerant Saturated Temperature

Refrigerant saturated temperature shall be calculated from the pressure sensor readings for each circuit.

Evaporator Approach

The evaporator approach shall be calculated for each circuit. The equation is as follows:

Evaporator Approach = LWT – Evaporator Saturated Temperature

Condenser Approach

The condenser approach shall be calculated for each circuit. The equation is as follows:

Condenser Approach = Condenser Saturated Temperature - OAT

Suction Superheat

Suction superheat shall be calculated for each circuit using the following equation:

Suction superheat = Suction Temperature – Evaporator Saturated Temperature

Pumpdown Pressure

The pressure to which a circuit will pumpdown is based on the Low Evaporator Pressure Unload set point. The equation is as follows:

Pumpdown pressure = Low Evap Pressure Unload set point – 103KPA (15 PSI)

Circuit Control Logic

Circuit Enabling

A circuit should be enabled to start if the following conditions are true:

- Circuit switch is closed
- No circuit alarms are active
- Circuit Mode set point is set to Enable
- At least one compressor is enabled to start (according to enable setpoints)

Compressor Availability

A compressor is considered available to start if all the following are true:

- The corresponding circuit is enabled
- The corresponding circuit is not in pumpdown
- No cycle timers are active for the compressor
- No limit events are active for the corresponding circuit
- The compressor is enabled via the enable setpoints
- The compressor is not already running

Circuit States

The circuit will always be in one of four states:

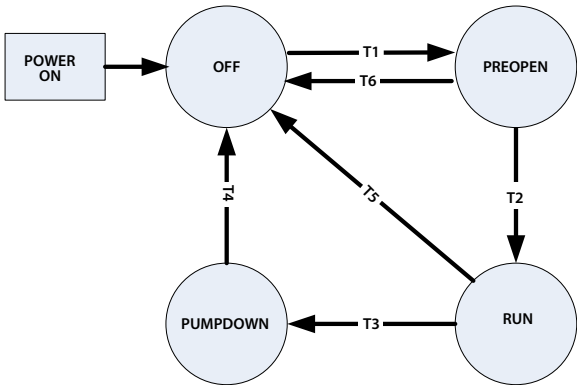
Off – Circuit is not running

Preopen – Circuit is preparing to start

Run – Circuit is running

Pumpdown – Circuit is doing a normal shutdown

Transitions between these states are shown in the following diagram.



T1 – Off to Preopen

- No compressors are running and any compressor on circuit is commanded to start (see unit capacity control)

T2 – Preopen to Run

- 5 seconds in Preopen state has passed

T3 – Run to Pumpdown

Any of the following are required:

- Last compressor on circuit is commanded to stop
- Unit State = Pumpdown
- Circuit switch is open
- Circuit mode is disable
- Circuit Pumpdown alarm is active

T4 – Pumpdown to Off

Any of the following are required:

- Evaporator Pressure < Pumpdown Pressure Value
- Unit State = Off
- Circuit Rapid Stop alarm is active

T5 – Run to Off

Any of the following are required:

- Unit State = Off
- Circuit Rapid Stop alarm is active
- A low ambient start attempt failed

T6 – Preopen to Off

Any of the following are required:

- Unit State = Off
- Unit State = Pumpdown
- Circuit switch is open
- Circuit mode is disable
- Circuit Rapid Stop alarm is active
- Circuit Pumpdown alarm is active

Pumpdown Procedure

Pumpdown is performed as follows:

- If multiple compressors are running, shut off the appropriate compressors based on sequencing logic and leave only one running
- Turn off hot gas output and liquid line output
- Keep running until evaporator pressure reaches the pumpdown pressure, then stop compressor
- If evaporator pressure does not reach pumpdown pressure within two minutes, stop compressor

Low Ambient Starts

A low OAT start is initiated if the condenser refrigerant saturated temperature is less than 29.5°C (85.1° F) when the first compressor starts. Once the compressor starts the circuit is in a low OAT start state for a time equal to the Low OAT Start Time set point. During Low OAT Starts, the freezestat logic for the low evaporator pressure alarm as well as the low evaporator pressure hold and unload alarms are disabled. The absolute limit for low evaporator pressure is enforced and the low evaporator pressure alarm should trigger if the evaporator pressure drops below that limit. In addition if the evaporator pressure is less than the Low Evap Pressure Unload set point during the low POAT start, no additional compressors can start on that circuit even though the hold and unload events are disabled at this time.

When the Low OAT Start Timer has expired, if the evaporator pressure is greater than or equal to the Low Evaporator Pressure Unload set point, the start is considered successful and normal alarm and event logic is reinstated. If the evaporator pressure is less than the Low Evaporator Pressure Unload set point when the Low OAT Start Timer expires, the start is unsuccessful and the compressor will shutdown.

Multiple Low Ambient Start attempts are allowed. On the third failed Low Ambient Start attempt, the Restart Alarm is triggered and the circuit will not attempt to restart until the Restart alarm has been cleared.

The restart counter should be reset when either a startup is successful, the Low OAT Restart alarm is triggered, or the unit time clock shows that a new day has started.

Circuit Status

The displayed circuit status should be determined by the conditions in the following table: If more than one status is enabled at the same time, the highest numbered status overrides the others and is displayed.

#	Status	Conditions
1	Off:Ready	Circuit is ready to start when needed.
2	Off:Cycle Timers	Circuit is off and cannot start due to active cycle timer on all compressors.
3	Off:All Comp Disable	Circuit is off and cannot start due to all compressors being disabled.
4	Off:Keypad Disable	Circuit is off and cannot start due to circuit enable set point.
5	Off:Circuit Switch	Circuit is off and circuit switch is off.
6	Off:Alarm	Circuit is off and cannot start due to active circuit alarm.
7	Off:Test Mode	Circuit is in test mode.
8	Preopen	Circuit is in preopen state.
9	Run:Pumpdown	Circuit is in pumpdown state.
10	Run:Normal	Circuit is in run state and running normally.
11	Run:Evap Press Low	Circuit is running and cannot load due to low evaporator pressure.
12	Run:Cond Press High	Circuit is running and cannot load due to high condenser pressure.

Compressor Control

Compressors should run only when the circuit is in a run or pumpdown state. They should not be running when the circuit is in any other state.

Starting a Compressor

A compressor should start if it receives a start command from the unit capacity control logic.

Stopping a Compressor

A compressor should be turned off if any of the following occur:

- Unit capacity control logic commands it off
- An unload alarm occurs and the sequencing requires this compressor to be next off
- Circuit state is pumpdown and sequencing requires this compressor to be next off

Cycle Timers

A minimum time between starts of the compressor and a minimum time between shutdown and start of the compressor shall be enforced. The time values are determined by the Start-start Timer and Stop-start Timer setpoints.

These cycle timers should not be enforced through cycling of power to the chiller. This means that if power is cycled, the cycle timers should not be active.

These timers may be cleared via a setting on the controller.

Condenser Fan Control

Condenser fan control should stage fans as needed any time compressors are running on the circuit. All fans and solenoid valves will be off when the circuit is in the off and preopen states. Condenser fan digital outputs will be turned on or off immediately for condenser stage changes. Condenser solenoid valve outputs will turn on immediately when a stage up requires the output to turn on, but will have a delay for turning off during a stage down. This delay is 20 seconds. If the circuit shuts off then the condenser solenoid valve outputs will turn off without a delay.

Condenser Staging

Condenser staging will use up to 5 digital outputs for control of condenser fans and a digital output for control of a condenser solenoid valve. When equipped with condenser fan VFDs, the speed signal(s) also starts and stops the fan that is connected to the VFD. The total number of fans on shall be adjusted with changes of one fan at a time. The tables below show the outputs energized for each stage.

Figure 72: 2 Fans per Circuit - Unit Numbering Schematic

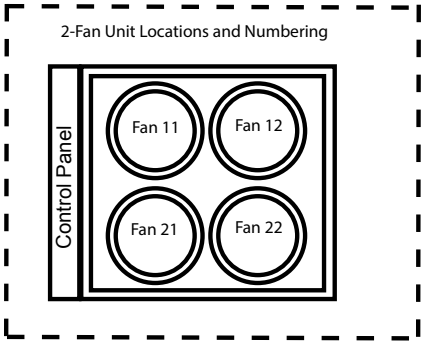


Table 57: 2 Fans per Circuit - Without Fan VFD

Circuit 1									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Fan Output 1	UC DO3	Fan 11	On	On	--	--	--	--
Fan Output 2	UC DO4	Fan 12		On	--	--	--	--
Circuit 2									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Fan Output 1	UC DO7	Fan 21	On	On	--	--	--	--
Fan Output 2	UC DO8	Fan 22		On	--	--	--	--

Table 58: 2 Fans per Circuit - With 1 Fan VFD per Circuit

Circuit 1									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X5	Fan 11	On	On	--	--	--	--
Fan Output 2	UC DO4	Fan 12		On	--	--	--	--
Circuit 2									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X6	Fan 21	On	On	--	--	--	--
Fan Output 2	UC DO8	Fan 22		On	--	--	--	--

Figure 73: 3 Fans per Circuit - Unit Numbering Schematic

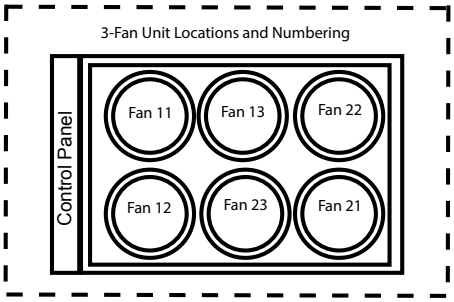


Table 59: 3 Fans per Circuit - Without Fan VFD

Circuit 1									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Fan Output 1	UC DO3	Fan 11	On	On	On	--	--	--
Fan Output 2	UC DO4	Fan 12		On	On	--	--	--
Fan Output 3	UC DO5	Fan 13			On			
Condenser SV	UC X7	SV 11			On			
Circuit 2									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Fan Output 1	UC DO7	Fan 21	On	On	On	--	--	--
Fan Output 2	UC DO8	Fan 22		On	On	--	--	--
Fan Output 3	UC DO9	Fan 23			On	--	--	--
Condenser SV	UC X8	SV 21			On	--	--	--

Table 60: 3 Fans per Circuit - With 1 Fan VFD per Circuit

Circuit 1									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X5	Fan 11	On	On	On	--	--	--
Fan Output 2	UC DO4	Fan 12		On	On	--	--	--
Fan Output 3	UC DO5	Fan 13			On			
Condenser SV	UC X7	SV 11			On			
Circuit 2									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X6	Fan 21	On	On	On	--	--	--
Fan Output 2	UC DO8	Fan 22		On	On	--	--	--
Fan Output 3	UC DO9	Fan 23			On	--	--	--
Condenser SV	UC X8	SV 21			On	--	--	--

Table 61: 3 Fans per Circuit - With 2 Fan VFDs per Circuit

Circuit 1								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X5	Fan 11	On		On	--	--	--
Speed Signal 2	UC X2	Fan 12/13		On	On	--	--	--
Condenser SV	UC X7	SV 11		On	On			
Circuit 2								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X6	Fan 21	On		On	--	--	--
Speed Signal 2	UC X3	Fan 22/23		On	On	--	--	--
Condenser SV	UC X8	SV 21		On	On			--

Figure 74: 4 Fans per Circuit - Unit Numbering Schematic

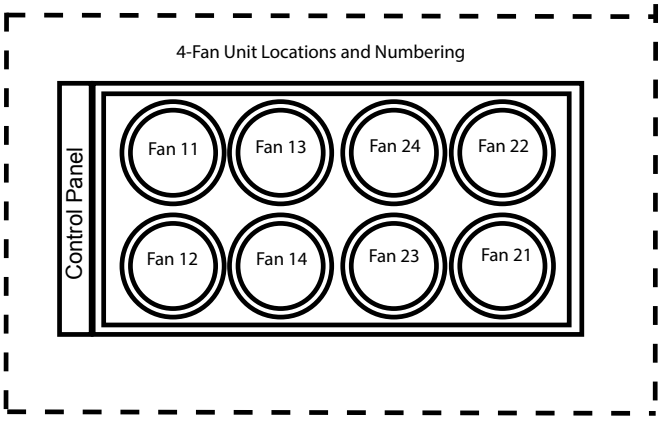


Table 62: 4 Fans per Circuit - Without Fan VFD

Circuit 1								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Fan Output 1	UC DO3	Fan 11	On	On	On	On	--	--
Fan Output 2	UC DO4	Fan 12			On	On	--	--
Fan Output 3	UC DO5	Fan 13		On	On	On	--	--
Fan Output 4	UC DO6	Fan 14				On	--	--
Condenser SV	UC X7	SV 11		On	On	On	--	--
Circuit 2								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Fan Output 1	UC DO7	Fan 21	On	On	On	On	--	--
Fan Output 2	UC DO8	Fan 22			On	On	--	--
Fan Output 3	UC DO9	Fan 23		On	On	On	--	--
Fan Output 4	UC DO10	Fan 24				On	--	--
Condenser SV	UC X8	SV 21		On	On	On	--	--

Table 63: 4 Fans per Circuit - With 1 Fan VFD per Circuit

Circuit 1								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X5	Fan 11/13	On	On	On	On	--	--
Fan Output 2	UC DO4	Fan 12			On	On	--	--
Fan Output 4	UC DO6	Fan 14				On	--	--
Condenser SV	UC X7	SV 11		On	On	On	--	--
Circuit 2								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X6	Fan 21/23	On	On	On	On	--	--
Fan Output 2	UC DO8	Fan 22			On	On	--	--
Fan Output 4	UC DO10	Fan 24				On	--	--
Condenser SV	UC X8	SV 21		On	On	On	--	--

Table 64: 4 Fans per Circuit - With 2 Fan VFDs per Circuit

Circuit 1								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X5	Fan 11/13	On	On	On	--	--	--
Speed Signal 2	UC X2	Fan 12/14			On	--	--	--
Condenser SV	UC X7	SV 11		On	On			
Circuit 2								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X6	Fan 21/23	On	On	On	--	--	--
Speed Signal 2	UC X3	Fan 22/24			On	--	--	--
Condenser SV	UC X8	SV 21		On	On			--

Figure 75: 5 Fans per Circuit - Unit Numbering Schematic

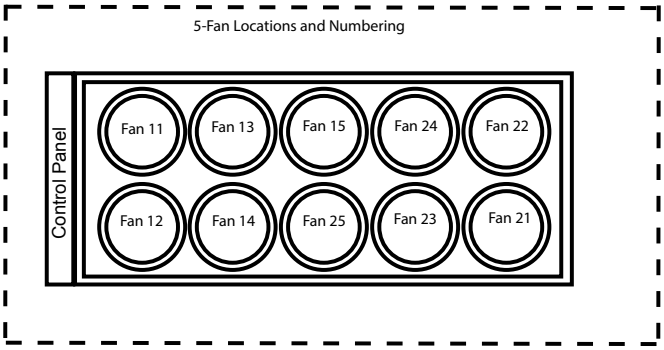


Table 65: 5 Fans per Circuit - Without Fan VFD

Circuit 1									
Description	Output	Fans	Stage						
			1	2	3	4	5	6	
Fan Output 1	UC DO3	Fan 11	On	On	On	On	On	--	
Fan Output 2	UC DO4	Fan 12			On	On	On	--	
Fan Output 3	UC DO5	Fan 13		On	On	On	On	--	
Fan Output 4	UC DO6	Fan 14				On	On	--	
Fan Output 5	EEXV1 DO1	Fan 15					On	--	
Condenser SV	UC X7	SV 11					On	--	
Circuit 2									
Description	Output	Fans	Stage						
			1	2	3	4	5	6	
Fan Output 1	UC DO7	Fan 21	On	On	On	On	On	--	
Fan Output 2	UC DO8	Fan 22			On	On	On	--	
Fan Output 3	UC DO9	Fan 23		On	On	On	On	--	
Fan Output 4	UC DO10	Fan 24				On	On	--	
Fan Output 5	EEXV2 DO1	Fan 25					On	--	
Condenser SV	UC X8	SV 21					On	--	

Table 66: 5 Fans per Circuit - With 1 Fan VFD per Circuit

Circuit 1									
Description	Output	Fans	Stage						
			1	2	3	4	5	6	
Speed Signal 1	UC X5	Fan 11/13	On	On	On	On	--	--	
Fan Output 2	UC DO4	Fan 12		On	On	On	--	--	
Fan Output 4	UC DO6	Fan 14			On	On	--	--	
Fan Output 5	EEXV1 DO1	Fan 15				On	--	--	
Condenser SV	UC X7	SV 11				On	--	--	
Circuit 2									
Description	Output	Fans	Stage						
			1	2	3	4	5	6	
Speed Signal 1	UC X6	Fan 21/23	On	On	On	On	--	--	
Fan Output 2	UC DO8	Fan 22		On	On	On	--	--	
Fan Output 4	UC DO10	Fan 24			On	On	--	--	
Fan Output 5	EEXV2 DO1	Fan 25				On	--	--	
Condenser SV	UC X8	SV 21				On	--	--	

Table 67: 5 Fans per Circuit - With 2 Fan VFDs per Circuit

Circuit 1									
Description	Output	Fans	Stage						
			1	2	3	4	5	6	
Speed Signal 1	UC X5	Fan 11/13	On	On	On	--	--	--	
Speed Signal 2	UC X2	Fan 12/14		On	On	--	--	--	
Fan Output 5	EEXV1 DO1	Fan 15			On				
Condenser SV	UC X7	SV 11			On				
Circuit 2									
Description	Output	Fans	Stage						
			1	2	3	4	5	6	
Speed Signal 1	UC X6	Fan 21/23	On	On	On	--	--	--	
Speed Signal 2	UC X3	Fan 22/24		On	On	--	--	--	
Fan Output 5	EEXV2 DO1	Fan 25			On	--	--	--	
Condenser SV	UC X8	SV 21			On			--	

Figure 76: 6 Fans per Circuit - Unit Numbering Schematic

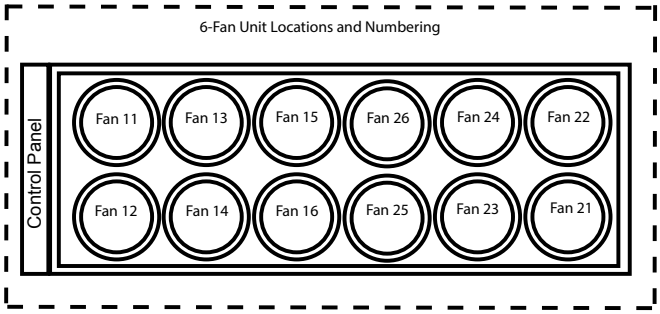


Table 68: 6 Fans per Circuit - Without Fan VFD

Circuit 1									
Description	Output	Fans	Stage						
			1	2	3	4	5	6	
Fan Output 1	UC DO3	Fan 11	On	On	On	On	On	On	
Fan Output 2	UC DO4	Fan 12				On		On	
Fan Output 3	UC DO5	Fan 13		On	On	On	On	On	
Fan Output 4	UC DO6	Fan 14/16					On	On	
Fan Output 5	EEXV1 DO1	Fan 15			On	On	On	On	
Condenser SV	UC X7	SV 11			On	On	On	On	
Circuit 2									
Description	Output	Fans	Stage						
			1	2	3	4	5	6	
Fan Output 1	UC DO7	Fan 21	On	On	On	On	On	On	
Fan Output 2	UC DO8	Fan 22				On		On	
Fan Output 3	UC DO9	Fan 23		On	On	On	On	On	
Fan Output 4	UC DO10	Fan 24/26					On	On	
Fan Output 5	EEXV2 DO1	Fan 25			On	On	On	On	
Condenser SV	UC X8	SV 21			On	On	On	On	

Table 69: 6 Fans per Circuit - With 1 Fan VFD per Circuit

Circuit 1									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X5	Fan 11/13	On	On	On	On	On	--
Fan Output 1	UC DO3	Fan 12			On	On	On	--
Fan Output 2	UC DO4	Fan 14				On	On	--
Fan Output 3	UC DO5	Fan 15		On	On	On	On	--
Fan Output 4	UC DO6	Fan 16					On	--
Condenser SV	UC X7	SV 11		On	On	On	On	--
Circuit 2									
Description	**Output**	**Fans**	**Stage**						
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X6	Fan 21/23	On	On	On	On	On	--
Fan Output 1	UC DO7	Fan 22			On	On	On	--
Fan Output 2	UC DO8	Fan 24				On	On	--
Fan Output 3	UC DO9	Fan 25		On	On	On	On	--
Fan Output 4	UC DO10	Fan 26					On	--
Condenser SV	UC X8	SV 21		On	On	On	On	--

Table 70: 6 Fans per Circuit - With 2 Fan VFDs per Circuit

Circuit 1								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X5	Fan 11/13	On		On	--	--	--
Speed Signal 2	UC X2	Fan 12/14/15/16		On	On	--	--	--
Condenser SV	UC X7	SV 11		On	On			
Circuit 2								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X6	Fan 21/23	On		On	--	--	--
Speed Signal 2	UC X3	Fan 22/24/25/26		On	On	--	--	--
Condenser SV	UC X8	SV 21		On	On			--

Figure 77: 7 Fans per Circuit - Unit Numbering Schematic

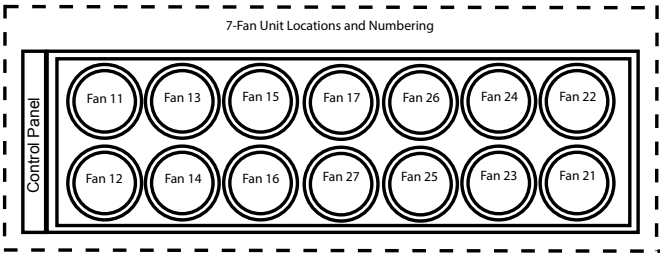


Table 71: 7 Fans per Circuit - Without Fan VFD

Circuit 1								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Fan Output 1	UC DO3	Fan 11/13	On	On	On	On	On	On
Fan Output 2	UC DO4	Fan 12			On		On	On
Fan Output 3	UC DO5	Fan 14/16				On	On	On
Fan Output 4	UC DO6	Fan 15		On	On	On	On	On
Fan Output 5	EEXV1 DO1	Fan 17						On
Condenser SV	UC X7	SV 11						On

Circuit 2								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Fan Output 1	UC DO7	Fan 21/23	On	On	On	On	On	On
Fan Output 2	UC DO8	Fan 22			On		On	On
Fan Output 3	UC DO9	Fan 24/26				On	On	On
Fan Output 4	UC DO10	Fan 25		On	On	On	On	On
Fan Output 5	EEXV2 DO1	Fan 27						On
Condenser SV	UC X8	SV 21						On

Table 72: 7 Fans per Circuit - With 1 Fan VFD per Circuit

Circuit 1								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X5	Fan 11/13	On	On	On	On	On	On
Fan Output 1	UC DO3	Fan 12			On	On	On	On
Fan Output 2	UC DO4	Fan 14				On	On	On
Fan Output 3	UC DO5	Fan 15		On	On	On	On	On
Fan Output 4	UC DO6	Fan 16					On	On
Fan Output 5	EEXV1 DO1	Fan 17						On
Condenser SV	UC X7	SV 11						On
Circuit 2								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X6	Fan 21/23	On	On	On	On	On	On
Fan Output 1	UC DO7	Fan 22			On	On	On	On
Fan Output 2	UC DO8	Fan 24				On	On	On
Fan Output 3	UC DO9	Fan 25		On	On	On	On	On
Fan Output 4	UC DO10	Fan 26					On	On
Fan Output 5	EEXV2 DO1	Fan 27						On
Condenser SV	UC X8	SV 21						On

Table 73: 7 Fans per Circuit - With 2 Fan VFDs per Circuit

Circuit 1								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X5	Fan 11/13	On		On	On	--	--
Speed Signal 2	UC X2	Fan 12/14/15/16		On	On	On	--	--
Fan Output 5	EEXV1 DO1	Fan 17				On		
Condenser SV	UC X7	SV 11				On		
Circuit 2								
Description	**Output**	**Fans**	**Stage**					
			1	**2**	**3**	**4**	**5**	**6**
Speed Signal 1	UC X6	Fan 21/23	On		On	On	--	--
Speed Signal 2	UC X3	Fan 22/24/25/26		On	On	On	--	--
Fan Output 5	EEXV2 DO1	Fan 27				On		
Condenser SV	UC X8	SV 21				On		--

Condenser Target

The condenser target is selected based on circuit capacity using the condenser target set points. There are set points that establish the condenser target for 33%, 50%, 67%, and 100% capacity. If the circuit has two compressors the set points for 50% and 100% will be used. If the circuit has three compressors then the set points for 33%, 67%, and 100% will be used.

A minimum condenser target should be enforced. This minimum will be calculated based on the evaporator LWT. As the LWT varies from 7.2°C (45°F) to 32.2°C (90°F), the minimum condenser target will vary from 23.9°C (75°F) to 48.9°C (120°F).

Staging Up

The first fan will not start until the evaporator pressure drop or condenser pressure rise requirement for the No Pressure Change After Start alarm is satisfied. Once that requirement is met, if there is no fan VFD then the first condenser stage should start when the saturated condenser temperature exceeds the condenser target. If there is a fan VFD, then the first stage should start when the saturated condenser temperature exceeds the condenser target less 5.56°C (10°F).

After this, the four stage up dead band settings will be used:

Stage Up Deadband 1 – used when active condenser stage is 1

Stage Up Deadband 2 – used when active condenser stage is 2

Stage Up Deadband 3 – used when active condenser stage is 3

Stage Up Deadband 4 – used when active condenser stage is 4, 5, or 6

When the saturated condenser temperature is above the target plus the active deadband, stage up error is

accumulated.

Stage Up Error Step = Saturated Condenser Temperature – (Target + Stage Up dead band)

The Stage Up Error Step is added to Stage Up Accumulator once every 5 seconds, only if the Saturated Condenser Refrigerant Temperature is not falling. When Stage Up Error Accumulator is greater than 11°C (19.8°F) another stage is added.

When a stage up occurs or the saturated condenser temperature falls back within the stage up dead band the Stage Up Accumulator is reset to zero.

For units configured with microchannel condenser coils, there are additional conditions which may cause the fan stage to increase:

- If circuit has two compressors, the second compressor on a circuit starts, the circuit is not already at the maximum condenser stage, and the condenser saturated temperature is higher than 37.78°C (100°F), then a condenser stage will be added immediately.
- If the condenser stage is not already at the maximum, the saturated condenser temperature exceeds 56.67°C (134°F), it has been at least 5 seconds since adding a condenser stage, and the saturated condenser temperature is not dropping, then a condenser stage will be added immediately.

In addition, if the circuit has 4 fans, or it has 6 fans and no fan VFD's, then the first condenser stage may be skipped at startup. This happens if the OAT is at least 21.11°C (70°F) when the first condenser stage would normally be started, in which case it will go directly to the second stage.

If the circuit has two fan VFDs and OAT is at least 10°C (50°F) when the first condenser stage would normally be started.

Both of these evaluation points are in place to address potential spikes in condenser pressure resulting from the lower volume of the microchannel coils.

Staging Down

Four stage down dead bands shall be used.

Stage Down Deadband 1 – used when active condenser stage is 1

Stage Down Deadband 2 – used when active condenser stage is 2

Stage Down Deadband 3 – used when active condenser stage is 3

Stage Down Deadband 4 – used when active condenser stage is 4, 5, or 6

When the saturated condenser refrigerant temperature is below the target – the active deadband, a stage down error is accumulated.

Stage Down Error Step = (Target - Stage Down dead band) - Saturated Condenser Temperature

The Stage Down Error Step is added to Stage Down Accumulator once every 5 seconds. When the Stage Down Error Accumulator is greater than 2.8°C (5°F) another stage of condenser fans is removed.

When a stage down occurs or the saturated temperature rises back above the target minus the Stage Down dead band, the Stage Down Error Accumulator is reset to zero.

Limiting Last Stage

For AGZE models with either 5 or 7 fans per circuit and two fan VFD's per circuit, the last fan stage on those configurations is a fixed speed fan. The last fan stage will be turned off and will not be allowed to activate when noise reduction is active.

The last fan stage will also be turned off if OAT is less than 23.89°C (75°F) and it will not be allowed to activate if OAT is less than 25.56°C (78°F).

VFD Control

Configurations can include a VFD on the first fan on the circuit, or two VFD's on the circuit with either all fans connected to those VFD's or all except one (leaving one fixed speed fan). The VFD's will vary fan speed to drive the saturated condenser temperature to a target value. The target value is normally the same as the saturated condenser temperature target.

Note that when there are two VFD's per circuit, there are two separate speed signals on each circuit. Staging logic will determine when each speed signal output should be something

other than 0vdc (meaning the connected fans should run), but any time both VFD's are to be running the speed signals will be the same (there is no independent speed control on the two VFD's within a circuit). The speed will normally be controlled between the minimum and maximum speed set points using a PID loop.

The optional VFD fan control will allow unit operation down to a minimum of -10°F (-23°C). For a discussion of the VFD controller and operation - See Fan VFD Controller on page 110.

VFD State

The VFD speed signals should always be 0 when the fan stage is 0.

When the condenser fan staging requires the fans connected to a VFD to run, the VFD speed signal should be enabled and control the speed as needed.

Stage Up Compensation

In order to create a smoother transition when another fan is staged on, the VFD speed compensates by slowing down initially. This is accomplished by adding the new fan stage up deadband to the VFD target. The higher target causes the VFD logic to decrease fan speed. Then, every 2 seconds, 0.1°C (0.18°F) is subtracted from the VFD target until it is equal to the saturated condenser temperature target set point.

Sound Reduction Operation

When Sound Reduction is active, the maximum speed of the VFD's will be limited to the Sound Reduction fan speed limit set point value...See Sound Reduction on page 92.

High IPLV Mode

When the High IPLV Mode setting is 'On' and one compressor is running on the unit, the condenser target setting for the running circuit may be overridden. In this case, rather than use the condenser target setting for 33% or 50% (depending on number of compressors), the condenser target will be forced to the value of the IPLV Condenser Target set point.

In addition, when high IPLV mode is active the calculation for the minimum allowed condenser target (based on LWT) will be changed. The minimum value will be changed from 23.9°C (75°F) to the value of the IPLV Condenser Target set point. No other changes to the operation are made when High IPLV mode is on.

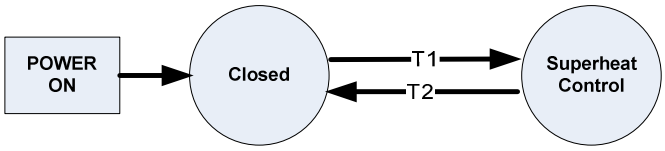
EXV Control

Control States

EXV control will always be in one of two states: Closed or Superheat Control.

Transitions between these states are shown in Figure 78.

Figure 78: EXV Control Transitions



T1 – Closed to Superheat Control

- Circuit state is preopen

T2 – Superheat Control to Closed

- Circuit state is off or pumpdown

Closed State Operation

When the EXV is in the Closed state the position command will be 0 and the EXV control state display will show 'Closed'.

Superheat Control State Operation

While in superheat control, the EXV controls suction superheat. A PID loop will be used to control the suction superheat to the target value. The EXV response is faster when the SSH is lower than 1.67°C (3°F) or higher than the SSH Target + 1.67°C (3°F). Normally during superheat control the EXV control state display will show 'Superheat'.

The EXV should also prevent the evaporator pressure from exceeding the Maximum Evaporator Pressure set point. This is done by using another PID function to control evaporator pressure to the maximum evaporator pressure. The EXV position should be the lesser position output from the two PID functions. If the EXV position is being limited due to exceeding the maximum evaporator pressure, then the EXV control state display will show 'MaxEvapPr'.

Superheat Target

The suction superheat target is selected per the set points depending on what capacity the circuit is running at.

- If the circuit has two compressors and one is running, the value used is the SSH Target at 50% set point. If both compressors are running the SSH Target at 100% set point is used.
- If the circuit has three compressors and one is running, the value used is the SSH Target at 33% set point. If either two or three are running the SSH Target at 66/100% set point is used.

If no compressors are running the target is set to the set point used when one compressor is running (this applies during EXV preopen).

Position Commands

In order to improve the reliability of the EXV positioning, the position commands that are issued to the stepper driver are limited in two ways:

1. Position commands are filtered so that the minimum change in position is 0.3%. Changes of less than this are ignored. This avoids unnecessary movement of the EXV and lowers the chances of losing steps as a result.

2. The position commands are issued once per program cycle with a maximum change of 0.7% each time. This allows the stepper to move the valve to the commanded position before the next position command is issued. Issuing commands in this way may also lower the chances of losing steps.

EXV Position Range

The minimum EXV position while the circuit is running will always be 8%. The maximum position will change as the number of compressors running on the circuit changes. These values are shown for each unit model in Table 74.

Table 74: Maximum Position Range

Model	# Compressors Running/Circuit		
	1	2	3
AGZ030E	50	100	n/a
AGZ035E	50	100	n/a
AGZ040E	50	100	n/a
AGZ045E	50	100	n/a
AGZ050E	50	100	n/a
AGZ055E	50	100	n/a
AGZ060E	50	100	n/a
AGZ065E	50	100	n/a
AGZ070E	50	100	n/a
AGZ075E	60	100	n/a
AGZ080E	60	100	n/a
AGZ090E	60	100	n/a
AGZ100E	60	100	n/a
AGZ110E	50	80	n/a
AGZ120E	50	80	n/a
AGZ130E	50	80	n/a
AGZ140E	70	100	n/a
AGZ150E	70	100	n/a
AGZ161E	80	100	n/a
AGZ170E	60	80	100
AGZ180E	60	80	100
AGZ191E	60	80	100
AGZ211E	60	80	100
AGZ226E	60	80	100
AGZ241E	60	80	100

Operation Considerations

For all units - the expansion valve maximum position may be increased if both the suction superheat is higher than the target and the expansion valve has been within 1% of its current maximum position for a minute. The maximum should increase at a rate of 0.1% every six seconds up to a total of an additional 10%. This addition to the maximum position should be reset when the EXV is no longer in the Superheat Control state, or a compressor on the circuit stages.

Manual Control

The EXV position can be set manually. Manual control can only be selected when the circuit is in the run state. At any other time, the EXV control set point is forced to auto.

When EXV control is set to manual, the EXV position is equal to the manual EXV position setting. If set to manual when the circuit state transitions from run to another state, the control setting is automatically set back to auto. When in manual control, the EXV control state displayed will be ‘Manual’.

Liquid Line Solenoid Valve

The liquid line solenoid output should be on when the circuit state is either Pre-open or Run. This output should be off at all other times.

Hot Gas Bypass Solenoid Valve

This output will be on when circuit state is Run for at least 30 seconds and one compressor on the unit is running. The output should be off at all other times unless the unit is a model 191-241. For these models, the hot gas bypass will also be activated for 10 minutes when a second or third compressor is started on the circuit.

Capacity Overrides – Limits of Operation

The following conditions shall override automatic capacity control as described. These overrides keep the circuit from entering a condition in which it is not designed to run.

Low Evaporator Pressure

If the Low Evaporator Pressure Hold or Low Evaporator Pressure Unload alarms are triggered, the circuit capacity may be limited or reduced. See the Circuit Events section for details on triggering, reset, and actions taken.

High Condenser Pressure

If the High Condenser Pressure Unload alarm is triggered, the circuit capacity may be limited or reduced. See the Circuit Events section for details on triggering, reset, and actions taken.

Situations may arise that require some action from the chiller or that should be logged for future reference. Alarms are classified in the following sections as Faults, Problems, or Warnings.

When any Unit Fault Alarm is active, the alarm digital output should be turned on continuously. If both circuits have a Circuit Fault Alarm active, the alarm digital output should be turned on continuously. If no Unit Fault Alarm is active and only one circuit has a Circuit Fault Alarm is active, the alarm digital output should alternate five seconds on and five seconds off continuously.

All alarms appear in the active alarm list while active. All alarms are added to the alarm log when triggered and when cleared. Entries in the log representing the occurrence of an alarm will be preceded by '+' while entries representing the clearing of an alarm will be preceded by '-'.

Unit Fault Alarms

PVM/GFP Fault

Trigger: Power Configuration = Single Point and PVM/GFP Input #1 is open for longer than one second.

Action Taken: Rapid stop all circuits

Reset: Auto reset when input is closed for at least 5 seconds or if Power Configuration = Multi Point.

Evaporator Flow Loss

Trigger:

1: Evaporator Pump State = Run AND Evaporator Flow Digital Input = No Flow for time > Flow Proof Set Point AND at least one compressor running

2: Evaporator Pump State = Start for time greater than Recirc Timeout Set Point and all pumps have been tried and Evaporator Flow Digital Input = No Flow

Action Taken: Rapid stop all circuits

Reset:

This alarm can be cleared at any time manually via the keypad or via the BAS clear alarm command.

If active via trigger condition 1:

When the alarm occurs due to this trigger, it can auto reset the first two times each day with the third occurrence being manual reset.

For the auto reset occurrences, the alarm will reset automatically when the evaporator state is Run again. This means the alarm stays active while the unit waits for flow, then it goes through the recirculation process after flow is detected. Once the recirculation is complete, the evaporator goes to the Run state which will clear the alarm. After three occurrences, the count of occurrences is reset and the cycle starts over if the manual reset flow loss alarm is cleared.

If active via trigger condition 2:

If the flow loss alarm has occurred due to this trigger, it is always a manual reset alarm.

Evaporator Water Freeze Protect

Trigger: Evaporator LWT drops below evaporator freeze protect set point and LWT sensor fault is not active for a time longer than the evaporator recirculation time set point.

Action Taken: Rapid stop all circuits

Reset: This alarm can be cleared manually via the keypad, but only if the alarm trigger conditions no longer exist.

Evaporator LWT Sensor Fault

Trigger: Sensor shorted or open for longer than one second

Action Taken: Normal stop all circuits

Reset: This alarm can be cleared manually via the keypad or BAS command, but only if the sensor is back in range.

Outdoor Air Temperature Sensor Fault

Trigger: Sensor shorted or open for longer than one second

Action Taken: Normal stop of all circuits.

Reset: This alarm can be cleared manually via the keypad or via BAS command if the sensor is back in range.

External Alarm

Trigger: External Alarm/Event opens for at least 5 seconds and external fault input is configured as an alarm.

Action Taken: Rapid stop of all circuits.

Reset: Auto clear when digital input is closed.

Compressor Module 1 Comm Failure

Trigger: Communication with I/O extension module has failed.

Action Taken: Rapid stop of circuit 1.

Reset: This alarm can be cleared manually via the keypad or BAS command when communication between main controller and the extension module is working for 5 seconds.

Compressor Module 2 Comm Failure

Trigger: Communication with I/O extension module failed.

Action Taken: Rapid stop of circuit 2.

Reset: This alarm can be cleared manually via the keypad or BAS command when communication between main controller and the extension module is working for 5 seconds.

EXV Module 1 Comm Failure

Trigger: Expansion Valve Type = Electronic and communication with the I/O extension module has failed.

Action Taken: Rapid stop of circuit 1.

Reset: This alarm can be cleared manually via the keypad or BAS command when communication between main controller and the extension module is working for 5 seconds or Expansion Valve Type = Thermal.

EXV Module 2 Comm Failure

Trigger: Expansion Valve Type = Electronic and communication with the I/O extension module has failed.

Action Taken: Rapid stop of circuit 2.

Reset: This alarm can be cleared manually via the keypad or BAS command when communication between main controller and the extension module is working for 5 seconds or Expansion Valve Type = Thermal.

Unit Problem Alarms

Evaporator Pump #1 Failure

Trigger: Unit is configured with primary and backup pumps, pump #1 is running, and the pump control logic switches to pump #2.

Action Taken: Backup pump is used.

Reset: This alarm can be cleared manually via the keypad or BAS command.

Evaporator Pump #2 Failure

Trigger: Unit is configured with primary and backup pumps, pump #2 is running, and the pump control logic switches to pump #1.

Action Taken: Backup pump is used.

Reset: This alarm can be cleared manually via the keypad or BAS command.

Unit Warning Alarms

External Event

Trigger: External Alarm/Event input is open for at least 5 seconds and external fault is configured as an event.

Action Taken: None.

Reset: Auto clear when digital input is closed.

Bad Demand Limit Input

Trigger: Demand limit input out of range and demand limit is enabled. For this alarm out of range is considered to be a signal less than 3mA or more than 21mA.

Action Taken: Cannot use demand limit function.

Reset: Auto clear when demand limit disabled or demand limit input back in range for 5 seconds.

Bad LWT Reset Input

Trigger: LWT reset input out of range and LWT reset is enabled. For this alarm out of range is considered to be a signal less than 3mA or more than 21mA.

Action Taken: Cannot use LWT reset function.

Reset: Auto clear when LWT reset is disabled or LWT reset input back in range for 5 seconds.

Evaporator EWT Sensor Fault

Trigger: Sensor shorted or open for longer than one second

Action Taken: None.

Reset: Auto clear when the sensor is back in range.

Circuit Fault Alarms

PVM/GFP Fault

Trigger: Power Configuration = Multi Point and circuit PVM/GFP input is open for longer than one second

Action Taken: Rapid stop circuit.

Reset: Auto reset when input is closed for at least 5 seconds or if Power Configuration = Single Point.

Low Evaporator Pressure

Trigger:

This alarm should trigger when Freeze time is exceeded, Low Ambient Start is not active, and Circuit State = Run. It should also trigger if Evaporator Press < 137.9 KPA (20 psi) and Circuit State = Run for longer than 1 second.

Freezestat logic allows the circuit to run for varying times at low pressures. The lower the pressure, the shorter the time the compressor can run. This time is calculated as follows:

Freeze error = Low Evaporator Pressure Unload – Evaporator Pressure

Freeze time =

60 – (freeze error/6.895), limited to a range of 20 to 60 seconds

When the evaporator pressure goes below the Low Evaporator Pressure Unload set point, a timer starts. If this timer exceeds the freeze time, then a freezestat trip occurs. If the evaporator pressure rises to the unload set point or higher, and the freeze time has not been exceeded, the timer will reset.

The alarm cannot trigger if the evaporator pressure sensor fault is active.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the keypad if the evaporator pressure is above 137.9 KPA (20 PSI).

High Condenser Pressure

Trigger: Condenser Pressure > High Condenser Pressure set point for longer than one second.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the controller keypad.

Mechanical Low Pressure Switch

Trigger: The alarm is triggered if all of the following are true for at least 40 seconds:

- Circuit State is Run and MLP Switch input is off

The alarm also requires Evaporator Configuration = Remote and Condenser Type = Microchannel to trigger.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the controller keypad if the MHP switch input is closed.

Mechanical High Pressure Switch

Trigger: Mechanical High Pressure switch input is open and Motor Protection input is closed for longer than one second, and power up start delay is not active.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the controller keypad if the MHP switch input is closed.

Motor Protection Fault

Trigger: Motor Protection input is open and power up start delay is not active for longer than one second.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the controller keypad if the input is closed.

Low OAT Restart Fault

Trigger: Circuit has failed three low OAT start attempts.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the keypad or via BAS command.

No Pressure Change After Start

Trigger: After start of compressor, at least a 7 KPA (1 PSI) drop in evaporator pressure OR 35 KPA (5.1 PSI) increase in condenser pressure has not occurred after 30 seconds. The actual alarm will not be triggered until the second occurrence. This counter should be reset every day at midnight.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the keypad or via BAS command.

Evaporator Pressure Sensor Fault

Trigger: Trigger any time sensor input voltage is less than 400mv and UC communication with CC module is OK, for at least one second.

Trigger when sensor input voltage is more than 4600mv and UC communication with CC module is OK, for at least one second. However, this trigger should only occur after circuit state is run or pumpdown for at least 90 seconds or the OAT is less than 40.56°C (105°F).

Trigger if the evaporator approach is less than -9.44°C (-17°F) for more than 30 seconds. This trigger should only be enabled after the circuit state is Run for 30 seconds. The purpose of this trigger condition is to prevent operation if the sensor is reading high but not out of range.

Action Taken: Rapid shutdown of circuit and lock out from running.

Reset: This alarm can be cleared manually via the controller HMI or BAS command if either of the following are true for at least five seconds:

- OAT ≥ 40.56°C (105°F) and sensor input voltage is at least 400mv OR
- OAT < 40.56°C (105°F) and sensor input voltage is from 400mv to 4600mv

Condenser Pressure Sensor Fault

Trigger: Sensor shorted or open for longer than one second.

Action Taken: Rapid stop circuit.

Reset: This alarm can be cleared manually via the keypad or BAS command, but only if the sensor is back in range.

Suction Temperature Sensor Fault

Trigger: Sensor shorted or open for longer than one second and Expansion Valve Type = Electronic.

Action Taken: Normal shutdown of circuit.

Reset: This alarm can be cleared manually via the keypad or BAS command, but only if the sensor is back in range.

Circuit Warning Alarm

Failed Pumpdown

Trigger: Circuit state = pumpdown for longer than 2 minutes.

Action Taken: Rapid stop circuit.

Reset: N/A.

Alarm Logs

Press the alarm button on the controller to go to the alarm section. Three alarm sub-sections will appear. Turn the navigating wheel to highlight among them and press the wheel to select. Reference for controller components.

Active Alarms

When an alarm or event occurs, it appears in the active alarm list. The active alarm list holds a record of all active alarms not yet cleared and includes the date and time each occurred. When cleared, the alarm transfers to the Alarm Log that contains an alarm history with time/date stamp. A (+) before an alarm indicates that it is active, a (-) indicates a cleared alarm. The Active Alarm list is only limited by the number of alarms since any given alarm cannot appear twice.

Alarm Log

An alarm log stores the last 50 occurrences or resets that occur. When an alarm or event occurs, it is put into the first slot in the alarm log and all others are moved down one, dropping the last entry. The date and time the alarm occurred are stored in the alarm log.

Event Log

An Event Log similar to the Alarm Log stores the last 50 event occurrences. Each Event Log entry includes an event description and a time and date stamp for the event occurrence plus the count of the event occurrences on the current day and for each of the last seven days. Events do not appear in the Active Alarm list.

Clearing Alarms

Active alarms can be cleared through the keypad/display or a BAS network. Alarms are automatically cleared when controller power is cycled. Alarms are cleared only if the conditions required to initiate the alarm no longer exist. All alarms and groups of alarms can be cleared via the keypad or network via LON using nviClearAlarms and via BACnet using the ClearAlarms object.

To use the keypad, follow the Alarm links to the Alarms screen, which will show Active Alarms and Alarm Log. Select Active Alarm and press the wheel to view the Alarm List (list of current active alarms). They are in order of occurrence with the most recent on top. The second line on the screen shows Alm Cnt (number of alarms currently active) and the status of the alarm clear function. Off indicates that the Clear function is off and the alarm is not cleared. Press the wheel to go to the edit mode. The Alm Clr (alarm clear) parameter will be highlighted with OFF showing. To clear all alarms, rotate the wheel to select ON and enter it by pressing the wheel.

An active password is not necessary to clear alarms.

If the problem(s) causing the alarm have been corrected, the alarms will be cleared, disappear from the Active Alarm list and be posted in the Alarm Log. If not corrected, the On will immediately change back to OFF and the unit will remain in the alarm condition.

Events

Situations may arise that require some action from the chiller or that should be logged for future reference, but aren't severe enough to track as alarms. These events are stored in a log separate from alarms. This log shows the time and date of the latest occurrence, the count of occurrences for the current day, and the count of occurrences for each of the previous 7 days.

Unit Events

Unit Power Restore

Trigger: Unit controller is powered up.

Action Taken: None

Reset: None

Circuit Events

Low Evaporator Pressure - Hold

Trigger:

This event is triggered if all of the following are true:

- circuit state = Run
- evaporator pressure <= Low Evaporator Pressure - Hold set point
- circuit is not currently in a low OAT start
- it has been at least 30 seconds since a compressor has started on the circuit.

Action Taken: Inhibit starting of more compressors on circuit.

Reset: While still running, the event will reset if evaporator pressure > Low Evaporator Pressure Hold SP + 90 KPA (13 PSI). The event is also reset if the circuit is no longer in the run state.

Low Evaporator Pressure - Unload

Trigger:

This event is triggered if all of the following are true:

- circuit state = Run
- more than one compressor is running on the circuit
- evaporator pressure <= Low Evaporator Pressure - Unload set point for a time greater than half of the current freezestat time
- circuit is not currently in a low OAT start
- it has been at least 30 seconds since a compressor has started on the circuit.

On units equipped with 6 compressors, electronic expansion valves, and 10 or more fans, when each compressors starts, there should be a 2 minute window during which the evaporator pressure must drop an additional 27 KPA (3.9 PSI) to trigger the alarm. After this 2 minute window, the trigger point should return to normal.

Action Taken: Stage off one compressor on the circuit every 10 seconds while evaporator pressure is less than the unload set point, except the last one.

Reset: While still running, the event will be reset if evaporator pressure > Low Evaporator Pressure Hold SP + 90 KPA(13 PSI). The event is also reset if the circuit is no longer in the run state.

High Condenser Pressure - Unload

Trigger:

This event is triggered if all of the following are true:

- circuit state = Run
- more than one compressor is running on the circuit
- condenser pressure > High Condenser Pressure – Unload set point

Action Taken: Stage off one compressor on the circuit every 10 seconds while condenser pressure is higher than the unload set point, except the last one. Inhibit staging more compressors on until the condition resets.

Reset: While still running, the event will be reset if condenser pressure <= High Condenser Pressure Unload SP – 862 KPA(125 PSI). The event is also reset if the circuit is no longer in the run state.

Compressor Communications

The CoreSense™ compressor communication module on model sizes 075-241 provides advanced diagnostics, protection, and communications that enhance compressor performance and reliability.

Features include motor temperature protection, scroll temperature protection, missing phase protection, reverse phase protection, low control circuit voltage protection, short cycling detection and alert, operational and fault history storage, and LED status display.

Warnings and Alerts

A solid green LED indicates the module is powered and operation is normal.

A solid red LED indicates an internal problem with the module.

A flashing green LED communicates Warning codes. Warning codes do not result in a trip or lockout condition.

A flashing red LED communicates Alert codes. Alert codes will result in a trip condition and possibly a lockout condition

Warning Codes (Flashing Green LED)

Code 1 – Loss of Communication: The module will flash the green Warning LED one time indicating the module has not communicated with the master controller for longer than 5 minutes.

Code 2 – Reserved For Future Use

Code 3 – Short Cycling: The module will flash the green Warning LED three times indicating the compressor has short cycled more than 48 times in 24 hours.

Code 4 – Open/Shorted Scroll Thermistor: The module will flash the green Warning LED four times indicating an open/ shorted

Alert/Lockout Codes (Flashing Red LED)

Code 1 – Motor High Temperature: The module will flash the red Alert LED one time indicating the motor is overheating . A code 1 Alert will open the M2-M1 contacts. The Alert will reset after 30 minutes. Five consecutive Code 1 Alerts will lockout the compressor. Once the module has locked out the compressor, a power cycle or Modbus reset command will be required for the lockout to be cleared.

Code 2 – Open/Shorted Motor Thermistor: The module will flash the red Alert LED two times indicating the motor PTC thermistor circuit has an open/shorted thermistor chain (see Table 2). A Code 2 Alert will open the M2-M1 contacts. The Alert will reset after 30 minutes and the M2-M1 contacts will close if the resistance of the motor PTC circuit is back in the normal range. The module will lockout the compressor and a power cycle or Modbus reset command will be required to clear the lockout.

Code 3 – Short Cycling: The module will flash the red Alert LED three times indicating the compressor is locked out due to short cycling. Once locked out the compressor, a power cycle or Modbus reset command will be required to clear the lockout.

Code 4 – Scroll High Temperature: The module will flash the red Alert LED four times indicating the over-temperature condition. A Code 4 Alert will open the M2-M1 contacts.The Alert will reset after 30 minutes. Once the module has locked out the compressor, a power cycle or Modbus reset command will be required to clear the lockout.

Code 5 – Reserved for Future Use

Code 6 – Missing Phase: The module will flash the red Alert LED six times indicating a missing phase. The Alert will reset after 5 minutes and the module will lockout the compressor after 10 consecutive Code 6 Alerts. Once locked out, a power cycle or Modbus reset is required.

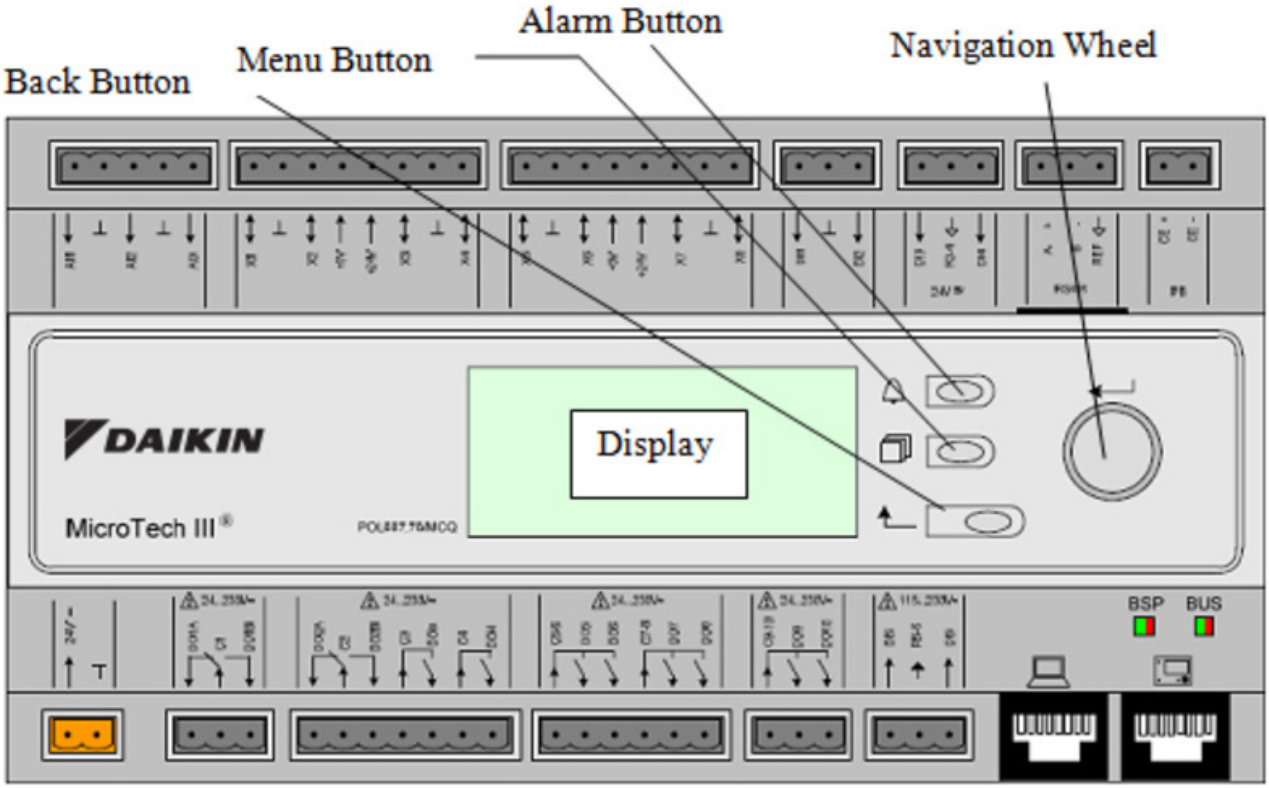
Code 7 – Reverse Phase: The module will flash the red Alert LED seven times indicating a reverse phase in two of the three compressor leads. The modules will lockout the compressor after one Code 7 Alert. A power cycle or Modbus reset command will be required to clear the lockout.

Code 8 – Reserved For Future Use

Code 9 – Module Low Voltage: The module will flash the red Alert LED nine times indicating low module voltage for more than 5 seconds. The Alert will reset after 5 minutes and the M2-M1 contacts will close if the T2-T1 voltage is above the reset value.

NOTE: If a compressor with CoreSense Communications fails in the field, the CoreSense module should remain with the failed compressor so the manufacturer's technicians can download the CoreSense data to assist with determining the root cause of compressor failure.

Figure 79: Schematic of Unit Controller



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

Figure 80: Typical Screen

•6	View/Set Unit	3
Status/Settings		>
Set Up		>
Temperature		>
Date/Time/Schedule		>

Generally, each line on the display contains a menu title, a parameter (such as a value or a setpoint), or a link (which will have an arrow in the right of the line) to a further menu.

The first line visible on each display includes the menu title and the line number to which the cursor is currently “pointing.” In the above screen, Temperature is highlighted.

The left most position of the title line includes an “up” arrow ▲ to indicate there are lines (parameters) “above” the currently displayed line; and/or a “down” arrow ▼ to indicate there are lines (parameters) “below” the currently displayed items or an “up/down” arrow • to indicate there are lines “above and below” the currently displayed line. The selected line is highlighted.

Each line on a screen can contain status-only information or include changeable data fields (setpoints).

When the cursor is on a line the highlights will look like this:

Evaporator Delta T= 10.0F

If line contains a changeable value-

Unit Status= Run

If the line contains status-only information-

Or a line in a menu may be a link to further menus. This is often referred to as a jump line, meaning pushing the navigation wheel will cause a “jump” to a new menu. An arrow (>) is displayed to the far right of the line to indicate it is a “jump” line and the entire line is highlighted when the cursor is on that line.

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

This manual includes information relative to the operator level of parameters; data and setpoints necessary for the every day operation of the chiller. There are more extensive menus available for the use of service technicians.

Navigating

When power is applied to the control circuit, the controller screen will be active and display the Home screen, which can also be accessed by pressing the Menu Button The navigating wheel is the only navigating device necessary, although the MENU, ALARM, and BACK buttons can provide shortcuts as explained later.

Passwords

There are 4 levels of access for the user interface:

- No password
- Operator level - 5321
- Technician/Manager level - 2526
- Daikin Applied service technician level

Enter passwords from the Main Menu:

- Enter Password links to the Entry screen which is an editable screen. So pressing the wheel goes to the edit mode where the password can be entered. The first (*) will be highlighted, rotate the wheel clockwise to the first number and set it by pressing the wheel. Repeat for the remaining three numbers. The password will time out after 10 minutes and is cancelled if a new password is entered or the control powers down.
- Not entering a password allows access to a limited number of parameters as shown in Figure 84.

Figure 81: Password Menu

Main Menu	1/3
Enter Password >	
Unit Status	
Off: Unit Sw	
ACTIVE SETPT 44.6°F	

Figure 82: Password Entry Page

Enter Password	1/1
Enter PW ****	

Entering an invalid password has the same effect as not entering a password.

Once a valid password has been entered, the controller allows further changes and access without requiring the user to enter a password until either the password timer expires or a different password is entered. The default value for this password timer is 10 minutes.

Navigation Mode

When the navigation wheel is turned clockwise, the cursor moves to the next line (down) on the page. When the wheel is turned counter-clockwise the cursor moves to the previous line (up) on the page. The faster the wheel is turned the faster the cursor moves. Pushing the wheel acts as an “Enter” button.

Three types of lines exist:

- Menu title, displayed in the first line as in Figure 81.
- Link (also called Jump) having an arrow (>) in the right of the line and used to link to the next menu.
- Parameters with a value or adjustable setpoint.

For example, “Time Until Restart” jumps from level 1 to level 2 and stops there.

When the Back Button is pressed the display reverts back to the previously displayed page. If the Back button is repeatedly pressed the display continues to revert one page back along the current navigation path until the “main menu” is reached.

When the Menu (Home) Button is pressed the display reverts to the “main page.”

When the Alarm Button is depressed, the Alarm Lists menu is displayed.

Edit Mode

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

A parameter with an “R” is read only; it is giving a value or description of a condition. An “R/W“ indicates a read and/or write opportunity; a value can be read or changed (providing the proper password has been entered).

Link and parameter access is indicated for the various password levels with one column for each level. Column headings for the password levels are as follows and shown in Figure 83:

N = No password

O = Operator level

T = Technician/Manager level

D = Daikin Applied factory service technician level

Screen navigational links:

- For each link on a screen, the linked screen is indicated in the rightmost column.
- For each screen, the screen(s) from which you can navigate to it is also shown in parentheses after the screen identifier.
- For most circuit or compressor level parameters, there is a link to a screen that shows the values for all circuits/ compressors which is indicated in the ‘Links to screen’ column as *.

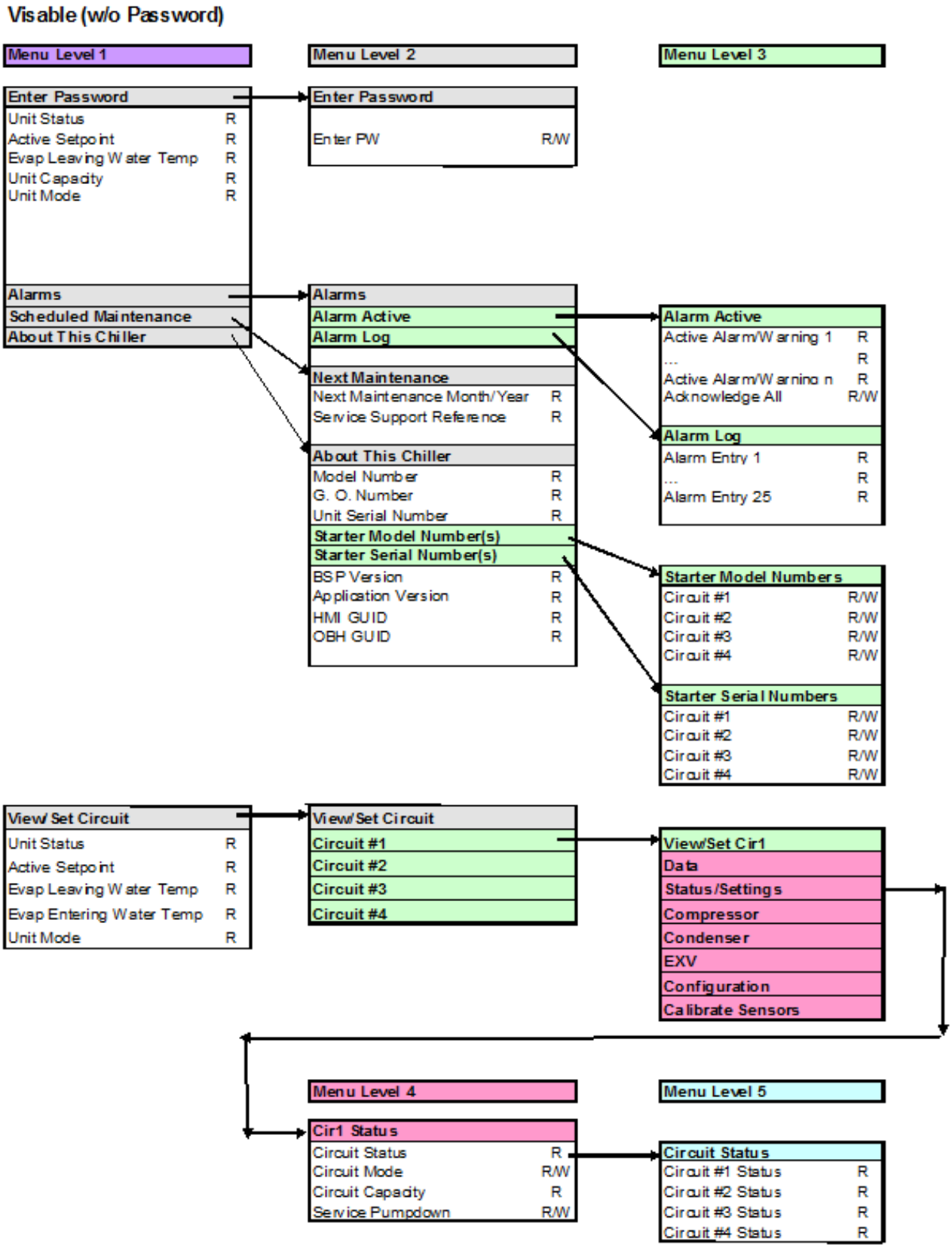
For many of the circuit level screens, only one screen will be shown in this section. The same set of screens exists for each circuit and compressor. These screens are the ones with ‘Cx’ and Cmpx’ identifiers.

Figure 83: Example of Screen Menu With Access Levels

U-1

Main Menu	N	O	T	D	To Screen
Enter Password	R	R	R	R	U-2
Quick Menu		R	R	R	U-3
View/Set Unit		R	R	R	U-4
View/Set Circuit		R	R	R	U-5
Unit Status	R	R	R	R	
Active Setpoint	R	R	R	R	

Figure 84: Controller Keypad Sample Navigation



VFD Interface

The VFD controller is located in the lower left-hand corner of the unit control panel. It is used to view data including fault and alarm information. No operator intervention on this control is required for normal unit operation.

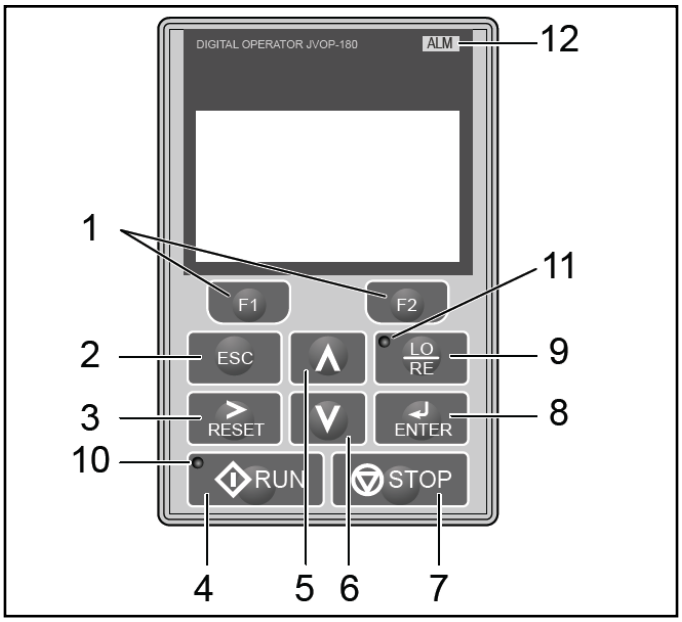


Table 75: Display Key Functions

No.	Display Name	Function
1	Function Key (F1, F2)	The functions assigned to F1 and F2 vary depending on the currently displayed menu. The name of each function appears in the lower half of the display window.
2, 3	ESC Key, RESET Key	• Returns to the previous display. • Moves the cursor one space to the left • Pressing and holding this button will return to the Frequency Reference display.
3	RESET Key	• Moves the cursor to the right. • Resets the drive to clear a fault situation
4	RUN Key	Starts the drive in LOCAL mode.
5	Up Arrow Key	Scrolls up to display the next item, select parameter numbers, and increment setting values.
6	Down Arrow Key.	Scrolls down to display the next item, select parameter numbers, and increment setting values
7	STOP Key	Stops drive operation.
8	ENTER Key	• Enters parameter values and settings. • Selects a menu item to move between displays
9	LO/RE Selection Key	Switches drive control between the operator (LOCAL) and an external source (REMOTE)for the Run command and frequency reference.
10	RUN Light	Lit while the drive is operating the motor.
11	LO/RE Ligh	Lit while the operator is selected to run the drive (LOCAL mode).
12	ALM LED Light	Refer to ALARM (ALM) LED Displays in Table 77

Figure 85: LCD Display

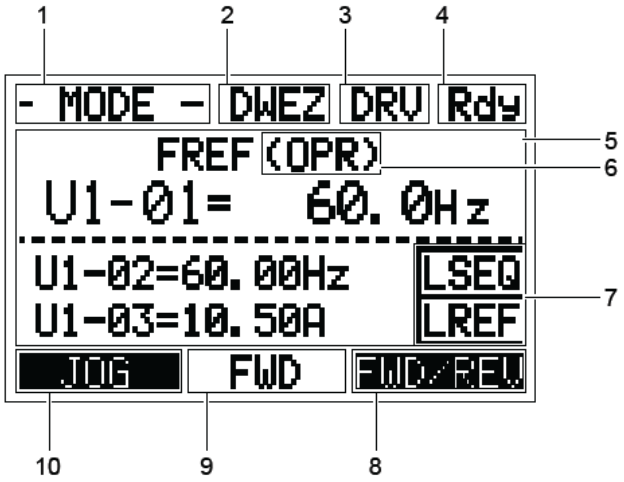


Table 76: Display Data

No	Name	Display	Content
1	Operation Mode Menus	MODE	Displayed when in Mode Selection.
		MONITR	Displayed when in Monitor Mode.
		VERIFY	Indicates the Verify Menu
		PRMSET	Displayed when in Parameter Setting Mode.
		A.TUNE	Displayed during Auto-Tuning.
		SETUP	Displayed when in Setup Mode.
2	DriveWorksEZ Function Selection	DWEZ	Displayed when DriveWorksEZ is set to enable. (A1-07 = 1 or 2)
3	Mode Display Area	DRV	Displayed when in Drive Mode.
		PRG	Displayed when in Programming Mode
4	Ready	Rdy	Indicates the drive is ready to run.
5	Data Display	—	Displays specific data and operation data.
6	Frequency Reference Assignment <1>	OPR	Displayed when the frequency reference is assigned to the LCD Operator Option
		AI	Displayed when the frequency reference is assigned to the Analog Input of the drive
		COM	Displayed when the frequency reference is assigned to the MEMOBUS/Modbus Communication Inputs of the drive
		OP	Displayed when the frequency reference is assigned to an Option Unit of the drive.
		RP	Displayed when the frequency reference is assigned to the Pulse Train Input of the drive
7	LO/RE Display <2>	RSEQ	Displayed when the run command is supplied from a remote source.
		LSEQ	Displayed when the run command is supplied from the operator keypad.
		RREF	Displayed when the run command is supplied from a remote source.
		LREF	Displayed when the run command is supplied from the operator keypad
8	Function Key 1(F1)	JOG	Pressing [F1} executes the Jog function.
		HELP	Pressing [F1] displays the Help menu.
		←	Pressing [F1] scrolls the cursor to the left.
		HOME	Pressing [F1] returns to the top menu (Frequency Reference).
		ESC	Pressing [F1] returns to the previous display
9	FWD/REV	FWD	Indicates forward motor operation.
		REV	Indicates reverse motor operation.
10	Function Key 2 (F2)	FWD/REV	Pressing [F2] switches between forward and reverse
		DATA	Pressing [F2] scrolls to the next display
			Pressing [F2] scrolls the cursor to the right
		RESET	Pressing [F2] resets the existing drive fault error

Table 77: Alarm Content

State	Content
Illuminated	When the drive detects an alarm or error
Flashing	When an alarm occurs
	When an oPE is detected
	When a fault or error occurs during Auto-Tuning
Off	Normal operation (no fault or alarm)

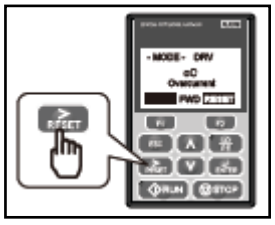
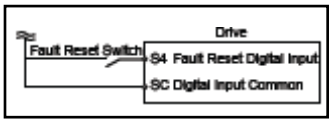
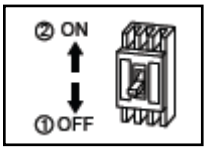
Table 78: LO/RE LED and RUN LED Indictors

LED	Lit	Flashing Slowly	Flashing Quickly	Off
LO/RE	When the operator is selected for Run command and frequency reference control (LOCAL)	--	--	When a device other than the operator is selected for Run command and frequency reference control (REMOTE)
RUN	During run	During deceleration to stop When a Run command is input and frequency reference is 0 Hz	While the drive was set to LOCAL, a Run command was entered to the input terminals then the drive was switched to REMOTE.	During stop
			A Run command was entered via the input terminals while the drive was not in the Drive Mode.	
			During deceleration when a Fast Stop command was entered.	
			The drive output is shut of by the Safe Disable function.	
			The STOP key was pressed while drive was running in REMOTE.	
			The drive was powered up with b1-17 = 0 (default) while the Run command was active.	

Table 79: Types of Alarms, Faults, and Errors

Type	Drive Response
Faults	When the drive detects a fault:
	• The digital operator displays text indicating the specific fault and the ALM indicator LED remains lit until the fault is reset.
	• The fault interrupts drive output and the motor coasts to a stop. • Some faults allow the user to select the stopping method when the fault occurs.
	• Fault output terminals MA-MC will close, and MB-MC will open.
	The drive will remain inoperable until the fault is cleared.
Minor Faults and Alarms	When the drive detects an alarm or a minor fault:
	• The digital operator displays text indicating the specific alarm or minor fault, and the ALM indicator LED flashes.
	• The drive continues running the motor, although some alarms allow the user to select a stopping method when the alarm occurs.
	• A multi-function contact output set to be tripped by a minor fault closes. If the output is set to be tripped by an alarm, the contact will not close.
	• The digital operator displays text indicating a specific alarm and the ALM indicator LED flashes.
	Remove the cause of the problem to reset a minor fault or alarm.
Operation Errors	An operation error occurs when parameter settings conflict or do not match hardware settings (such as with an option card).When the drive detects an operation error:
	• The digital operator displays text indicating the specific error. • Multi-function contact outputs do not operate.
	The drive will not operate the motor until the error has been reset. Correct the settings that caused the operation error to clear the error.
Tuning Errors	Tuning errors occur while performing Auto-Tuning. When the drive detects a tuning error:
	• The digital operator displays text indicating the specific error. • Multi-function contact outputs do not operate.
	• Motor coasts to stop.
	Remove the cause of the error and repeat the Auto-Tuning process.
Copy Function Errors	Copy Function Errors occur when using the digital operator or the USB Copy Unit to copy, read, or verify parameter settings.
	• The digital operator displays text indicating the specific error.
	• Multi-function contact outputs do not operate.
	Pressing any key on the digital operator will clear the fault. Investigate the cause of the problem (such as model incompatibility)and try again.

Table 80: Fault Reset Methods

After the Fault Occurs	Procedure
Fix the cause of the fault, restart the drive, and reset the fault	Press RESET on the controller. 
Resetting via Fault Reset Digital Input S4	Close then open the fault signal digital input via terminal S4. S4 is set for “Fault Reset” as default (H1-04 = 14) 
Turn off the main power supply if the above methods do not reset the fault. Reapply power after the controller display has turned off.	

NOTE: When a fault occurs, the cause of the fault must be removed and the drive must be restarted. The above table list the various ways to restart the drive. Remove the Run command before attempting to clear a fault. If the Run command is present, the control will disregard any attempt to reset the fault.

Optional BAS Interface

The AGZ chiller controller is configured for stand-alone operation or integration with BAS through an optional communication module.

The appropriate installation manual for optional BAS interface modules are shipped with the chiller. The current version of each document can also be found and downloaded from www.DaikinApplied.com.

- IM 966, BACnet® IP Communication Module
- IM 967, BACnet® Communication Module (MS/TP)
- IM 968, LONWORKS Communication Module
- IM 969, Modbus® Communication Module

Recommended Periodic Inspection

⚠ WARNING

Electrical Shock Hazard. Before servicing or inspecting the equipment, disconnect power to the unit.The internal capacitor remains charged after power is turned off. Wait at least the amount of time specified on the drive before touching any components.

Table 81: Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action
General	Inspect equipment including wiring, terminals, resistors, capacitors, diode and IGBT for discoloration from overheating or deterioration.	Replace damaged components.
	Inspect for dirt or foreign particles	Use dry air to clear away.
Relays and Contactors	Inspect contactors and relays for excessive noise.	Check for over or undervoltage
	Inspect for signs of overheating such as melted or cracked insulation	Replace damaged parts.

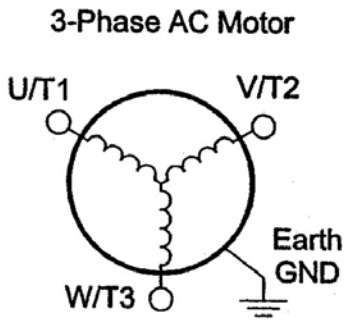
Inverter Output to the Motor

⚠ WARNING

Avoid swapping any 2 of the 3 motor lead connections which will cause reversal of the motor direction. In applications where reversed rotation could cause equipment damage or personnel injury, be sure to verify direction of rotation before attempting full-speed operation. For safety to personnel, the motor chassis ground must be connected to the ground connection at the bottom of the inverter housing.

The AC motor must be connected only to the inverter's output terminals. The output terminals are uniquely labeled (to differentiate them from the input terminals) with the designations U/T1, V/T2, and W/T3.

This corresponds to typical motor lead connection designations T1, T2, and T3. The consequence of swapping any two of the three connections is the reversal of the motor direction. This must not be done. In applications where reversed rotation could cause equipment damage or personnel injury, be sure to verify direction of rotation before attempting full-speed operation. For safety to personnel, the motor chassis ground must be connected to the ground connection at the bottom of the inverter housing.



Notice the three connections to the motor do not include one marked "Neutral" or "Return." The motor represents a balanced "Y" impedance to the inverter, so there is no need for a separate return. In other words, each of the three "Hot" connections serves also as a return for the other connections because of their phase relationship.

Do not to switch off power to the inverter while the motor is running (unless it is an emergency stop) to avoid equipment damage. Also, do not install or use disconnect switches in the wiring from the inverter to the motor (except thermal disconnect).

Pump Start Control (MicroTech® III)

The standard arrangement is for the MicroTech® III unit controller pump output signal to automatically start and stop the pump(s). The methods and settings are discussed in See Evaporator Pump Control on page 88.

Details on pump package installation and application considerations begin on page 41.

Pump VFD Operation

The VFD constantly monitors the chilled water system's state.

When the building cooling load drops, air side controls will start to close in order to control the space temperature. At that instant in time, the pump power draw will start to drop. The drive will notice this and slow down the pump (Hz output will decrease) which then triggers a decrease in flow and head since the pump impeller rpm is dropping.

The reverse is true when the load increases (valves open). The power draw will increase and the drive will speed up (Hz goes up) and the flow and head increases.

Both flow and head will fluctuate and since they are being read instantaneously, as opposed to an averaged value, even the slightest change is registered on the screen.

A building's cooling load tends to change slowly and it may be difficult to discern load changes by merely observing the VFD display. However, the pump rpm, Hz and kW can be noted over time and used for reference. A given building load will have a discrete reading.

Operating the VFD Controller

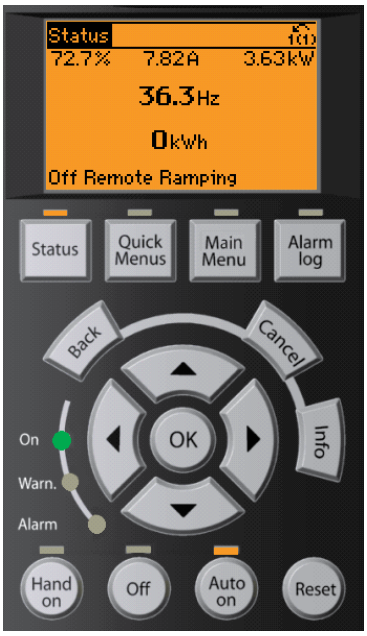
The VFD incorporates an integrated graphic local display and keypad to select mode, change parameters and view status and alarms.

The unit is shipped in the sensorless mode. If this mode is to be used, no programming is required.

Control Functions

1. Graphical display with Status lines.
2. Menu keys and indicator lights (LED's) - selecting mode, changing parameters, and switching between display functions.
3. Navigation keys and indicator lights (LEDs).
4. Operation keys and indicator lights (LEDs).

Figure 86: Graphical Local Control Panel (GLCP)



Graphical Display

The LCD-display is back-lit with a total of 6 alpha-numeric lines. All data is displayed on the LCP which can show up to five operating variables while in [Status] mode.

Status line (a): The status line is programmable with the normal setup displaying hertz on the left, Pump kw in the middle, and rpm on the right. Showing the status when in status mode or up to two variables when not in status mode and in the case of Alarm/ Warning. The number of the Active Set-up (Sensorless mode being setup 1) is shown.

Data Lines (b): Operator data lines displaying data and variables defined or chosen by the user. By pressing the [Status] key, up to one extra line can be added. It shows up to 5 variables with related unit regardless of status. In case of alarm/warning, the warning is shown instead of the variables. Normal setup is to show feet of head and gpm.

Status line (c): Status shows the state of the inverter such as Run OK, Running on Auto Remote Running

Operating variables on the data lines (b) will vary depending on the operating mode.

- Sensorless: displays gpm and head
- External Sensor: displays gpm and head
- BAS: configured by the BAS
- Hand: displays Hz

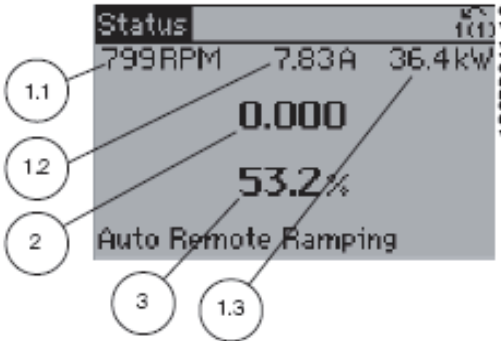
Status Display I

This read-out state is standard after start-up or initialization.

Status Display II

Use [INFO] to obtain information about the value/measurement linked to the displayed operating variables (1.1, 1.2, 1.3, 2, and 3) shown in the display in Figure 87.

Figure 87: Status Display II



In the example, Speed, Motor current, Motor power and Frequency are selected as variables in the first and second lines.

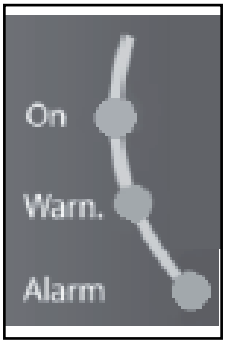
Display Contrast Adjustment

Press [status] and [▼] for darker display

Press [status] and [▲] for brighter display

Indicator Lights

Figure 88: LED Indicator Lights



If certain threshold values are exceeded, the alarm and/or warning LED lights up (See Figure 88). A status and alarm text appear on the control panel. The On LED is activated when the frequency converter receives power from mains voltage, a DC bus terminal, or an external 24V supply. At the same time, the back light is on.

- Green LED/On: Control section is working.
- Yellow LED/Warn: Indicates warning, may become Alarm.
- Flashing Red LED/Alarm: Indicates an alarm.

Control Keys

Menu Keys

The menu keys are divided into functions. The keys below the display and indicator lights are used for parameter set-up including choice of display indication during unit operation.

Figure 89: Menu Keys

Status

Three different readouts can be chosen by pressing the [Status] key repeatedly. Normal display is shown in Figure 87.

Quick Menu

Used for programming only.

Main Menu

Used for programming all parameters.

Alarm Log

Displays an Alarm list of the ten latest alarms (numbered A1-A10). To obtain additional details about an alarm, use the arrow keys to maneuver to the alarm number and press [OK]. Information is displayed about the condition of the frequency converter before it enters the alarm mode.

The Alarm log button on the LCP allows access to both Alarm log and Maintenance log.

Back/Cancel/Info Keys

These keys are only used for programming.

Figure 90: Back/Cancel/Info Keys

Navigation Keys

The four navigation arrows (up, down, right, and left) are used to navigate between the different screen choices. Use the keys to move the cursor.

Figure 91: Navigation Keys

OK Key

Is used for choosing a parameter marked by the cursor and for enabling the change of a parameter.

Pump Control Keys

Operation Control Keys for local control are found at the bottom of the control panel. The key in use will have an LED illuminated above it.

Figure 92: Pump Control Keys

Hand On

Enables control of the pump speed via the graphic keypad. It will over-ride any other mode setting. Raise or lower the frequency (speed) using the up and down arrow keys. The pump will run even without a start signal from the chiller. If selected when in the Auto mode, it will start operation at the current speed. When going back to Auto, it will be at the last Hand on speed, but quickly return to the correct automatic speed.

NOTE: The low water device (flow switch) input must be made for the pump to start in either hand mode or auto mode.

Off

Stops the pump in any operating mode.

Auto-On

Enables the pump to be controlled by either the sensorless control, the BAS or by the remote pressure sensor, depending on which operating mode is being used. When a start signal is applied on the control terminals the pump will start.

NOTE: For the pump to operate in either Sensorless mode or any other automatic control mode it is necessary to have pressed the [Auto on] button.

Reset

Used for resetting the frequency converter after an alarm (trip).

Warnings and Alarms

A warning or an alarm is signaled by the relevant LED on the front of the GLCP and indicated by a code on the display. A warning remains active until its cause is no longer present. Under certain circumstances operation of the pump may still be continued. Warning messages may be critical. Warnings should be attended to ASAP as they can revert to an Alarm-shutting down the unit.

Viewing Warnings & Alarms

To view the warning or alarm details, press the Alarm Log key in the middle of the GLCP. Press the ▲ or ▼ key to go to the Alarm Log line and press OK. Navigate to the appropriate alarm number, press OK and view the alarm description, number and date-time stamp. A detailed description with some corrective measures is below in the section titled Warning/Fault Messages.

Resetting Alarms

In the event of an alarm, the inverter will have tripped. Alarms must be reset to restart operation once their cause has been rectified. In many cases the auto reset function will restart the pump. Alternatively the [RESET] button on the control panel can be pressed.

NOTE: After a manual reset using the [RESET] button on the control panel, the [AUTO ON] button must be pressed to restart the pump.

If an alarm cannot be reset, the reason may be that its cause has not been rectified, or the alarm is trip-locked.

Alarms that are trip-locked offer additional protection, means that the mains supply must be switched off before the alarm can be reset. After being switched back on, the inverter is no longer blocked and may be reset as described above once the cause has been rectified.

Alarms that are not trip-locked can also be reset using the automatic reset function Reset Mode (Note: automatic wake-up is possible!)

Selected warning and fault messages follow.

Warning/Fault Messages

WARNING/ALARM 3 - No motor

No motor has been connected to the output of the inverter.

WARNING/ALARM 4 - Mains phase loss

A phase is missing on the supply side, or the mains voltage imbalance is too high. This message also appears in case of a fault in the input rectifier on the inverter. Check the supply voltage and supply currents to the inverter.

WARNING/ALARM 9 - Inverter overloaded

The inverter is about to cut out because of an overload (too high current for too long). The counter for electronic thermal inverter protection gives a warning at 98% and trips at 100%, while giving an alarm. You cannot reset the inverter until the counter is below 90%.The fault is that the inverter is overloaded by more than nominal current for too long.

WARNING/ALARM 10 - Motor ETR over temperature

According to the electronic thermal protection (ETR), the motor is too hot. You can choose if you want the inverter to give a warning or an alarm when the counter reaches 100% in programming par. 1-90 Motor Thermal Protection. The fault is that the motor is overloaded by more than nominal current for too long. Check that the motor in programming par. 1-24 Motor Current is set correctly.

WARNING/ALARM 11 - Motor thermistor over temp

The thermistor or the thermistor connection is disconnected. You can choose if you want the inverter to give a warning or an alarm in par. 1-90 Motor Thermal Protection. Check that the thermistor is connected correctly between terminal 53 or 54 (analog voltage input) and terminal 50 (+ 10 Volts supply), or

between terminal 18 or 19 (digital input PNP only) and terminal 50. If a KTY sensor is used, check for correct connection between terminal 54 and 55.

WARNING/ALARM 13 - Over Current

The inverter peak current limit (approx. 200% of the rated current) is exceeded. The warning will last approx. 8-12 sec, then the inverter trips and issues an alarm. Turn off the inverter and check if the motor shaft can be turned and if the motor size matches the inverter.

ALARM 14 - Earth fault

There is a discharge from the output phases to earth, either in the cable between the inverter and the motor or in the motor itself. Turn off the inverter and remove the earth fault.

ALARM 16 - Short-circuit

There is short-circuiting in the motor or on the motor terminals. Turn off the inverter and remove the short-circuit.

WARNING 23 - Internal fans

External fans have failed due to defective hardware or fans not mounted.

WARNING/ALARM 29 - Drive over temperature

If the enclosure is IP00, IP20/Nema1 or IP21/TYPE 1, the cutout temperature of the heat-sink is 95°C +5°C. The temperature fault cannot be reset until the temperature of the heatsink is below 70°C. The fault could be Ambient temperature too high or too long motor cable.

ALARM 30 - Motor phase U missing

Motor phase U between the frequency converter and the motor is missing. Turn off the frequency converter and check motor phase U.

ALARM 31 - Motor phase V missing

Motor phase V between the inverter and the motor is missing. Turn off the inverter and check motor phase V.

ALARM 32 - Motor phase W missing

Motor phase W between the inverter and the motor is missing. Turn off the frequency converter and check motor phase W.

ALARM 33 - Inrush fault

Too many power ups have occurred within a short time period.

WARNING/ALARM 36 - Mains failure

This warning/alarm is only active if the supply voltage to the inverter is lost and par. 14-10 Mains Failure is NOT set to OFF. Possible correction check the fuses to the frequency converter

WARNING/ALARM 37 - Phase Imbalance

There is a current imbalance between the power units.

WARNING 49 - Speed limit

The speed has been limited by range in par. 4-11 Motor Speed Low Limit [RPM] and par. 4-13 Motor Speed High Limit [RPM].

ALARM 50 - AMA calibration failed

Contact Daikin Applied service.

ALARM 51 - AMA check Unom and Inom

The setting of motor voltage, motor current, and motor power is presumably wrong. Check the settings.

WARNING 59 - Current limit

The current is higher than the value in par. 4-18 Current Limit.

WARNING 60 - External Interlock

External Interlock has been activated. To resume normal operation, apply 24 V DC to the terminal programmed for External Interlock and reset the inverter (via Bus, Digital I/O or by pressing [Reset]).

WARNING 66 - Heatsink Temperature Low

The heat sink temperature is measured as 0 °C. This could indicate that the temperature sensor is defective and thus the fan speed is increased to the maximum in case the power part or control card is very hot. If the temperature is below 15 °C the warning will be present.

ALARM 68 - Safe Stop

Safe Stop has been activated. To resume normal operation, apply 24 VDC to terminal 37 then send a Reset signal (via Bus, Digital I/O or by pressing [Reset]).

ALARM 69 - Pwr. Card Temp

Power card over temperature.

ALARM 92 - No Flow

A no load situation has been detected for the system. See parameter group 22-2*.

ALARM 93 - Dry Pump

A no flow and high speed indicates that the pump has run dry. See parameter group 22-2*.

ALARM 96 - Start Delayed

Start of the motor has been delayed due to short cycle protection is active. See parameter group 22-7*.

The pump VFD can be integrated to a BAS via BACnet® MS/TP, LONWORKS® or Modbus network protocols. The appropriate MicroTech® III communication module must be selected as a factory-installed option on the AGZ-E chiller. The VFD pump controller ships from the factory with an attahed communication card that matches the communication module selected with the chiller. The pump VFD controller is a native BACnet protocol device. The VFD controller comes with an additional communication card for Modbus and LonWorks. Note that while BACnet IP is offered as a factory-installed option on the AGZ-E chiller, BACnet IP is not offered on the VFD frequency converter. If a chiller unit is ordered with BACnet IP, the VFD will be provided with BACnet MS/TP.

Network parameters are set using the VFD controller graphical interface. The following sections describe the parameters that are required to enable communications from the VFD pump directly to the BAS via BACnet MS/TP, LONWORKS, or Modbus. Selecting a specific communication protocol changes various default parameter settings to match that protocol's specifications along with making additional protocol-specific parameters available from the BAS.

VFD Network Integration

Use the VFD controller's graphical interface to set unit parameters and factory defaults for unit setpoints. Network configuration involves: 1) selecting the Control Protocol for BACnet, LONWORKS, or Modbus, and 2) then setting the specific network parameters as required by each protocol.

The comprehensive set of network parameters available from the VFD pump to the BAS (i.e. point lists) are provided in separate AGZ-E VFD Pump Controller Operations Manuals for each protocol. These point lists can be found on www.DaikinApplied.com in MicroTech® III Controls literature. For questions regarding the VFD pump operation and set up, please contact the chiller Technical Response Center (TRC).

NOTE: AGZ-E chiller VFD controllers support only BACnet MS/TP, LONWORKS, and Modbus communications. Daikin Applied does not support other protocol options that may be offered by the VFD manufacturer.

Configuring the VFD Controller for BACnet MS/TP Communication

1. Set the basic BACnet MS/TP network parameters using the VFD graphical interface. These BACnet parameters are described in Table 48. It is recommended that additional parameters available in menu 8-* should remain at factory defaults. See VFD installation manual for further details (available on www.DaikinApplied.com).
2. Cycle power to the VFD controller for changes to take effect.
3. The VFD controller is now ready for network configuration from the BAS. Refer to the BACnet Operations Manual for the AGZ-E VFD Controller, which is available on www.DaikinApplied.com, for a complete points list and additional configuration information.

Table 82: BACnet MS/TP Network Configuration Parameters

Parameter	Setting for BACnet; Note	Default Value
8-02 Control Source	Option A [3]; During initial power-up, the frequency converter automatically sets this parameter to Option A [3] if it detects a valid fieldbus option installed in slot A	FC Port [1] Note: This parameter cannot be adjusted while the motor is running.
8-30 Protocol	BACnet	Digital and control word
8-31 Address	0-127; This value must be unique throughout the MSTP trunk	FC RS485
8-32 Baud Rate	9600/19,200/38,400/76,800 baud; All devices on the MSTP trunk must be set to the same baud rate	9600 baud
8-70 BACnet Device Instance	0-4194304; This value must be unique throughout the entire BACnet network.	1
8-72 MS/TP Max Masters	1-127; Dependent on the Number of Masters in the system	127
8-73 MS/TP Max Info Frames	1-65534; Defines how many info/data frames the device is allowed to send while holding the token	1

Configuring the VFD Control for LON-WORKS Communication

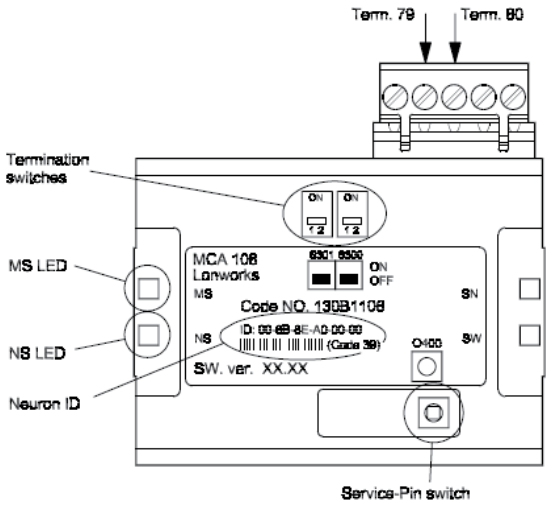
This following section assumes you are using a LONWORKS Option Card in conjunction with the AGZ-E pump package frequency converter (see Figure 93, LONWORKS Connection). The LONWORKS Option Card is LonMark 3.4 certified. It is designed to communicate with any system complying with the FTT-10A and 78kbps LONWORKS standard. Familiarity with this technology is assumed.

The LONWORKS communications structure is similar to that of a local area network (LAN) in that messages are continually exchanged between a number of processors. A LONWORKS system is a local operating network (LON). LON technology offers a means for integrating various distributed systems that perform sensing, monitoring, control, and other automated functions. A LON allows these intelligent devices to communicate with one another through a variety of communications media using a standard protocol. LON technology supports distributed peer-to-peer communications. Individual network devices can communicate directly with one another without the need for a central control system.

Data are transported by means of standard network variable types (SNVTs) which provide the interface for communication between devices from different manufacturers. LONWORKS-defined functional profiles determine the functionality and network variables for a particular family of devices (e.g. frequency converters, pumps etc.) are also available and supported by the LONWORKS option.

The VFD controller typically does not involve network addressing to enable BAS communication. However, there are several basic steps required for LONWORKS integration which are described in the following section. Additionally, the available network parameters are available via the graphical interface as shown in Table 83.

Figure 93: LONWORKS Connection



Light Emitting Diodes (LEDs)

Two LEDs indicate communication activity and status of the LonWorks Option Card. These indicators can be seen when the LonWorks Option Card is connected to the VFD pump controller. Descriptions of the Service LEDs are summarized in Table 84.

Service Pin Switch

The service pin generates a service-pin message that contains the Neuron® ID and the program code identification of the node. A service-pin message is a network message that is generated by a node and broadcast on the network. It can be used to commission the VFD controller to the LONWORKS network. The service pin switch is located on the lower right-hand corner of the LonWorks Option Card. See Figure 93 for location of the service pin.

Steps for LONWORKS Configuration

1. Commission the VFD controller by pressing the service pin (see Figure 93). Doing so generates a service-pin message, which is broadcast on the network and contains the Neuron ID and the program code identification of the node.
2. Cycle power to the unit controller after 1) commissioning a device, 2) de-commissioning an existing device, and 3) subsequent re-commissioning of an existing device.
3. Review the LONWORKS network parameters as described in Table 83. It is recommended that remaining items in menus 8-* and 11-* remain at factory defaults. See VFD installation manual available on www.DaikinApplied.com for further details.
4. Verify connection from VFD to BAS - terminals 79 (Net A) and 80 (Net B) on top of LONWORKS Option Card. See Figure 93 for terminal locations.
5. The VFD controller is now ready for network configuration from the BAS. Refer to the LONWORKS Operations Manual for the AGZ-E VFD Controller, available on www.DaikinApplied.com, for a complete points list and additional configuration information.

Table 83: LONWORKS Network Parameters

Parameter	Value (Range)/Definition		Default Value
8-02 Control Source	Option A [3]/During initial pow er-up, the frequency converter automatically sets this parameter to Option A [3] if it detects a valid fieldbus option installed in slot A		FC Port [1]
11-0 Neuron ID	Variable/This is the neuron ID of the Lonw orks module.		Variable/This item w ill be blank if the communication module is not commissioned.
11-10 Drive Profile	VSD Profile [0]/This parameter indicates the LONMARK functional profile		VSD Profile [0]
11-15 LON Warning Word	(0-FFFF)/This parameter contains LON specific w arnings.		
	Bit	Status	
	0	Internal Fault	
	1	Internal Fault	
	2	Internal Fault	
	3	Internal Fault	
	4	Internal Fault	
	5	Reserved	
	6	Reserved	N/A
	7	Reserved	
	8	Reserved	
	9	Invalid type change for changeable types	
	10	Initialization error	
	11	Internal communication error	
	12	Software revision mismatch	
	13	Bus not active	
	14	Option not present	
	15	LON input (nvi/nci) exceeds limits	
11-17 XIF Revision	0 N/A/This parameter contains the version of the external interface file on the Neuron C chip on the LON option		0 N/A
11-18 LonWorks Revision	0 N/A/This parameter contains the softw are version off the application program on the Neuron C chip on the LON option.		0 N/A
11-21 Store Data Values	Off [0] or Store all setups [2]/This parameter is used to activate storing of data in non-volatile memory.		When activated (set to [2] Store all setups), all parameters are stored in EEPROM; the value returns to [2] Off w hen all parameter values have been stored.

Table 84: MS Service LED - Red

Situation	LED Activity	Description
Configured state (normal operation)	½ sec. ON, then continuously OFF	The node is configures and running normally.
Non-configured state	Flashing ½ Hz	Node is not configures but has an application. Proceed w ith loading node.
Applicationless state	1 sec. ON, 2 sec. OFF, then continuously ON	Node has no application, the LonWorks option needs replacing or reprogramming
Watchdog resets	Short flash about each 3 sec.	Indicates problem w ith application. The LonWorks option needs replacing.
Faulty hardware	Steady ON or OFF	The LonWorks option needs replacing.

Configuring the VFD Controller for Modbus Communication

The VFD controller (frequency controller) is a native Modbus device. In other words, it does not require any additional communication card or other hardware for integration into a building automation system (BAS) via the Modbus network. The configuration process is described in the following section. It is assumed that the user is familiar with Modbus technology and terminology.

Standard Modbus network rules apply. The network is a daisy-chain of unit controllers including the master (in this case, the BAS) and all slaves (VFD controller). The Modbus standard recommends that the network be terminated on each end with the characteristic impedance of the network (about 120 ohms). Follow the guidelines stated in the Modbus specifications.

Steps for Modbus Configuration

Table 85 defines the network parameters of the Modbus Communication Module that are available via the graphical interface. The Modbus network address and data transmission rate (Baud Rate) are available via the local control panel. At a minimum, you must set the network address and verify the correct baud rate before establishing network communication between the VFD controller and the BAS. Change remaining parameters as required for your network.

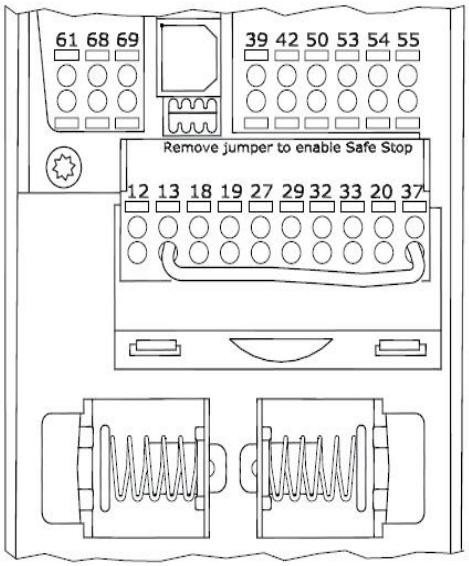
1. Set the Modbus network parameters as described in Table 85. It is recommended that remaining items in menus 8-* remain at factory defaults. See VFD installation manual, available on www.DaikinApplied.com for further details.
2. Cycle power to the VFD controller for changes to take effect.
3. Verify connection from BAS to VFD - terminals 68 (+) and 69 (-) on the main control board of the frequency converter.
4. The VFD controller is now ready for network configuration from the BAS. Refer to the Modbus Operations Manual for the AGZ-E VFD Controller, which is available on www.DaikinApplied.com, for a complete points list and additional configuration information.

Table 85: Modbus Network Parameters

Parameter	Value (Range)/Definition	Default Value
8-02 Control Source	FC Port [1]/ On-board RS-485 port	FC Port [1]
8-30 Protocol	Modbus RTU [2]/The protocol setting for the communication port	FC [0]
8-31 Address	1-247/The Modbus Address of VFD; this address must be unique throughout the entire Modbus network.	1
8-32 Baud Rate	2400 - 115200/This value should be set the same as all other devices on the trunk.	9600 baud [2]
8-33 Parity/ Stop Bits	Even parity, 1 stop bit [0]; Odd Parity, 1 Stop Bit [1]; No Parity, 1 Stop Bit [2]; No Parity, 2 Stop Bits [3]/Set to match the network settings	Even parity, 1 stop bit [0]

NOTE: Remaining items in menus 8-* should likely remain at factory defaults. See VFD installation manual for further details.

Figure 94: Modbus RTU Connection



⚠ DANGER

LOCKOUT/TAGOUT all power sources prior to starting, pressurizing, de-pressuring, or powering down the Chiller. Failure to follow this warning exactly can result in serious injury or death. Be sure to read and understand the installation, operation, and service instructions within this manual.

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

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. See the pre-startup section for the pump package on page 128 as well as the pump commissioning form at the front of this manual.

⚠ CAUTION

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

Pre-Startup Water Piping Checkout

1. Verify chilled water piping requirements from "Chilled Water Piping" on page 14 are met.
2. Check the pump operation and vent air from the system.
3. Circulate evaporator water, checking for proper system pressure and evaporator pressure drop. Compare the pressure drop to the evaporator water pressure drop curve.
4. Flush System and clean all water strainers before placing the chiller into service.
5. Check water treatment and proper glycol percent.
6. Pre-Startup Refrigerant Piping Checkout
7. Check all exposed brazed joints for evidence of leaks. Joints may have been damaged during shipping or when the unit was installed.
8. Check that all refrigerant valves are either opened or closed as required for proper operation of the chiller.
9. A thorough leak test must be done using an approved electronic leak detector. Check all valve stem packing for leaks. Replace all refrigerant valve caps and tighten.
10. Check all refrigerant lines to insure that they will not vibrate against each other or against other chiller components and are properly supported.
11. Check all connections and all refrigerant threaded connectors.
12. Look for any signs of refrigerant leaks around the condenser coils and for damage during shipping or installation.
13. Connect refrigerant service gauges to each refrigerant circuit before starting unit.

Pre-Startup Electrical Check Out

⚠ WARNING

Electrical power must be applied to the compressor crankcase heaters 8 hours before starting unit to eliminate refrigerant from the oil.

1. Open all electrical disconnects and check all power wiring connections. Start at the power block and check all connections through all components to and including the compressor terminals. These should be checked again after 3 months of operation and at least yearly thereafter.
2. Check all control wiring by pulling on the wire at the spade connections and tighten all screw connections. Check plug-in relays for proper seating and to insure retaining clips are installed.
3. Put System Switch (S1) to the Emergency Stop position.
4. Put both circuit #1 & #2 switches to the Pumpdown and Stop position.
5. Apply power to the unit. The panel Alarm Light will stay on until S1 is closed. Ignore the Alarm Light for the check out period. If you have the optional Alarm Bell, you may wish to disconnect it.
6. Check at the power block or disconnect for the proper voltage and proper voltage between phases. Check power for proper phasing using a phase sequence meter before starting unit.
7. Check for 120 Vac at the optional control transformer and at TB-2 terminal #1 and the neutral block (NB).
8. Check between TB-2 terminal #7 and NB for 120 Vac supply for transformer #2.
9. Check between TB-2 terminal #2 and NB for 120 Vac control voltage. This supplies the compressor crank case heaters.
10. Check between TB-3 terminal #17 and #27 for 24 Vac control voltage.

Startup

Refer to the MicroTech® III Controller information on page 67 to become familiar with unit operation before starting the chiller.

There should be adequate building load (at least 50 percent of the unit full load capacity) to properly check the operation of the chiller refrigerant circuits.

Be prepared to record all operating parameters required by the "Compressorized Equipment Warranty Form". Return this information within 10 working days to Daikin Applied as instructed on the form to obtain full warranty benefits.

Startup Steps

- Verify chilled water flow rate.
- Calibrate thermal dispersion flow switch (see page 124).
- Verify remote start / stop or time clock (if installed) has requested the chiller to start.
- Set the chilled water setpoint to the required temperature. (The system water temperature must be greater than the total of the leaving water temperature setpoint plus one-half the control band plus the startup delta-T before the MicroTech® III controller will stage on cooling.)
- Set the Evap Delta T based on a percent of unit nominal flow indicated on Table 3 and the Start Delta T as a starting point. Delta-T=Tons x 24 / gpm
- Check the controller setpoints to be sure that factory defaults are appropriate.
- Put both pumpdown switches (PS1 and PS2) to ON.
- Put system switch (S1) to ON position.

Table 86: Pumpdown and System Switch Positions

Switch	Switch Position	
	ON	OFF
PS1, PS2, Pumpdown Switches	Circuits will operate in the normal, automatic mode	Circuit will go through the normal pumpdown cycle and shut off.
S1, System Switch	Unit will operate in the normal automatic mode	Unit will shut off immediately without pumping down (emergency stop)

Post Startup

After the chiller has been operating for a period of time and has become stable, check the following:

- Compressor oil level. (Some scroll compressors do not have oil sight glasses).
- Refrigerant sight glass for flashing.
- Rotation of condenser fans.
- Complete the “Equipment Warranty Registration Form,” found at the end of this manual, within 10 days of start-up in order to comply with the terms of Daikin Limited Product Warranty.

Shutdown

Temporary Shutdown

1. Put both circuit switches to the OFF position (Pumpdown and Stop).
2. After compressors have stopped, put System Switch (S1) to OFF (emergency stop).
3. Turn off chilled water pump. Chilled water pump to operate while compressors are pumping down.
4. To start the chiller after a temporary shutdown, follow the startup instructions.

Extended Shutdown

1. Front seat both condenser liquid line service valves.
2. Put both circuit switches to the OFF position (Pumpdown and Stop position).
3. After the compressors have stopped, put System Switch (S1) to the OFF position (emergency stop).
4. Front seat both refrigerant circuit discharge valves (if applicable).
5. If chilled water system is not drained, maintain power to the evaporator heater to prevent freezing. Maintain heat tracing on the chilled water lines.
6. Drain evaporator and water piping to prevent freezing.
7. If electrical power to the unit is on, the compressor crankcase heaters will keep the liquid refrigerant out of the compressor oil. This will minimize startup time when putting the unit back into service. The evaporator heater will be able to function.
8. If electrical power is off, make provisions to power the evaporator heater (if chilled water system is not drained or is filled with suitable glycol). Tag all opened electrical disconnect switches to warn against startup before the refrigerant valves are in the correct operating position.

To start the chiller after an extended shutdown, follow the prestartup and startup instructions.

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 95, comes as a 2 part unit consisting of a flow switch and an adapter labeled E40242 by the supplier.

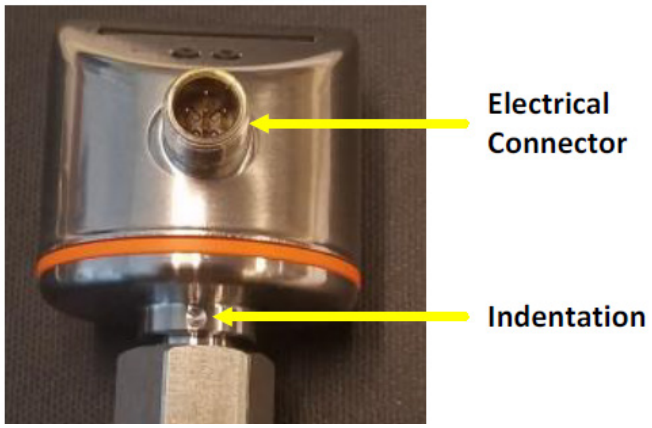
Figure 95: Thermal Dispersion Flow Switch and Adapter

IMPORTANT: 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

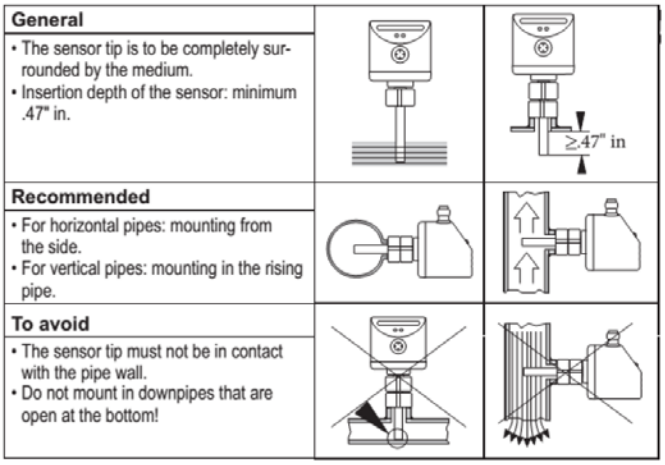
Figure 96 highlights the position of the electrical connector and indentation ‘mark’ on flow switch.

Figure 96: Flow Switch Details



It is commended, if possible, 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 97. It is important that the flow switch be mounted so that the probe is sufficiently inserted into the fluid stream. It may not be mounted directly on top or directly on the bottom of a horizontal pipe.

Figure 97: Remote Mounting Guidelines for Flow Switch



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, 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.

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

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.

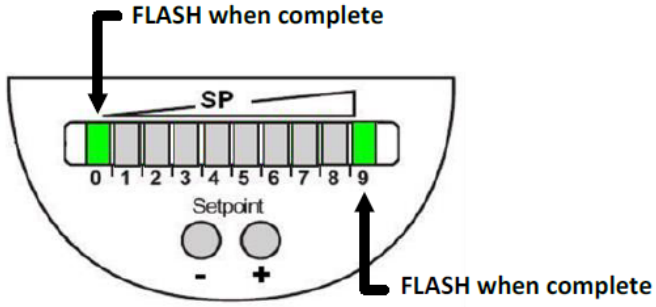
Flow Switch Setup

The flow switch comes from the factory set at a default velocity of 300 cm/s. This value is typically well below the minimum water flow specified for the unit's evaporator and condenser so field adjustment is required for adequate low flow protection. Table 87 are the calculated gallons per minute (gpm) for Schedule 40 steel pipe for various fluid velocities from 15 cm/s to 60 cm/s. The flow switch has a 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 98.

Figure 98: Automatic Teach of Setpoint



Step 3: After the 'Teach' function is completed and the outer LEDs flashed, the flow switch will indicate a new set point based upon the current flow which should still be at the steady state minimum desired operating flow. Figure 99 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 is 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.

Table 87: 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	1707.1	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	2700.9	3614.6	4518.2	5421.2	90.4
18	16.88	457.5	686.3	1143.8	1705.7	2287.6	3431.4	4575.2	5709.0	6862.1	114.4
20	18.81	572.4	853.0	1421.6	2132.4	2843.2	4264.8	5686.4	7008.0	8528.6	142.2

Figure 99: Teach Adjustment Complete

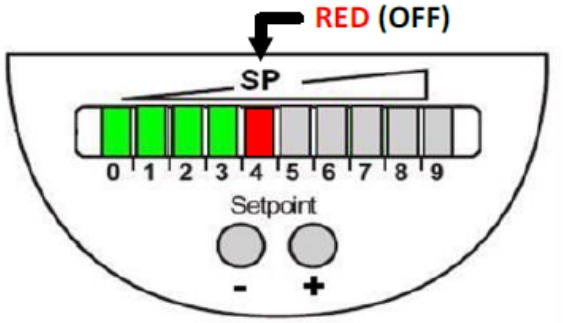
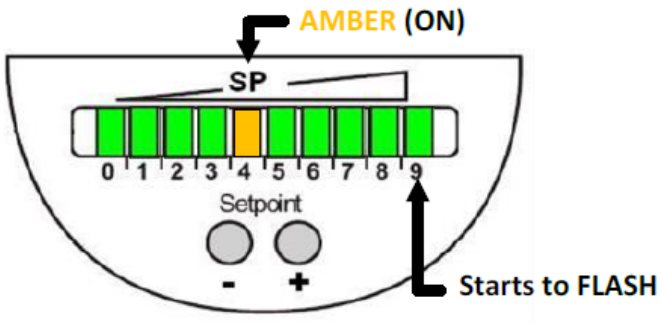


Figure 100: Upper Range of Minimum Flow



In Step 3, the 'Teach' function re-adjusted the flow switch set point (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 set point within the desired operating range. Additional 'manual' adjustment of set point 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 set point while pressing the '-' button increases the flow set point. Each button press, '+' or '-', changes the flow set point by 2.5 cm/s.

Step 4: Press the '+' button until LED '9' begins to flash, as shown in Figure 100. Opening of flow switch should now occur at approximately 80% to 90% 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 set point (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.

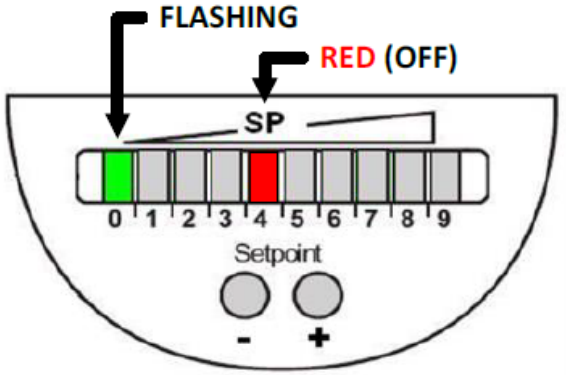
2. Each LED represents 5 cm/s, or two presses of the '+' or '-' buttons.

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 set point (SP), if no button is pressed for 2 seconds, the unit returns to the operating mode with the new set value.

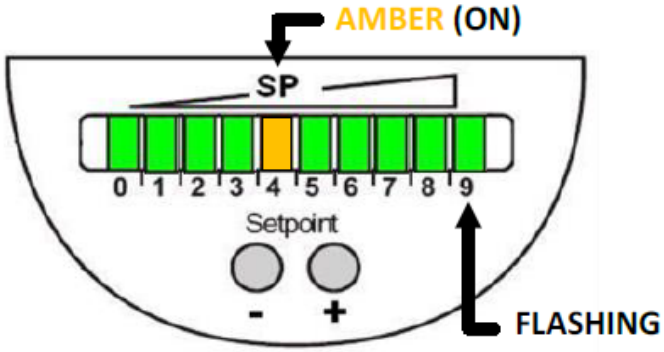
Flow <u>below</u> display range: The SP LED will be lit red and the left most LED will be flashing green. For example, if the SP was set to 200 cm/s, the flashing labeled '0' would indicate that the flow was below 180 cm/s. This would be shown if no flow through chiller or lowered than desired flow.

Figure 101: Display for Flow Below Range



Flow <u>above</u> display range: The SP LED will be lit amber, all LEDs to the left and right of the SP LED with be green with the right most 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 102: Display for Flow Above Range



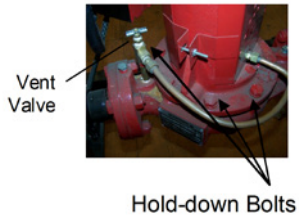
Pre-Startup

Follow the chiller startup procedure beginning on page 123 and complete the pre-start checklist for scroll compressor chillers found in the front of this manual as well as the pump commissioning startup form.

Other operational guidelines are as follows:

- Check rotation of the pump by bumping its power. It should be clockwise when viewed from the top of the motor looking down at the fan rotation.
- Do not run the pump without fluid in the system. Fluid is required to cool and lubricate the pump.
- Before starting pump(s) and with water in the pump, purge the seal flush line by cracking the vent valve until water appears. The valve will protrude from the pump insulation. The seal is the highest point in the pump and requires water for sealing and lubrication.

Figure 103: Location of Vent Valve



- VFD equipped pumps are shipped with the pump VFD controller in the AUTO mode. Confirm this by checking the VFD controller and pressing the Auto key if necessary. The AUTO ON button is located at the bottom of the controller.
- Check that the “Y” strainer valve is open (horizontal position) and the triple-duty valve is open.

In addition to making any settings required, it is often desirable to run the pumps without the chiller running to check the chilled water circuit. De-energize the compressors by turning off the three switches located in the unit left-hand control panel (SW1, PS1 and PS2). Energize the unit by closing the main disconnect located in the right-hand panel door. Non-VFD pumps can then be operated using the switch located on the door of the pump control panel. Use the display keypad on VFD unit for operation. Press the Hand on key and use the ▲ or ▼ key to regulate the pump speed and flow. The VFD should be changed to the Auto mode for normal operation.

Setting the Operating Mode

For convenience, the operating parameters for each of the three operating modes have pre-programmed setups.

Setup #1 Sensorless

The pump control is factory set for this mode and no field changes or programming is required.

NOTE: Sensorless operation is only allowed for single chiller systems. Systems with parallel chiller operation must use one of the other control methods.

Setup #2 External Sensor

Normally a differential pressure sensor.

Setup #3 BAS

See BAS Integration of Pumps on page 119.

Hand On

Manual operation - not programmed.

Change from the sensorless default setup #1 to setup #2 or #3 on the graphic keypad display as follows.

1. Press the OFF key. The keypad display will remain powered.
2. Press the MAIN MENU key. Should show parameter “0-** Operations/Display”.
3. Press OK.
4. Press ▼ key to 0-1 “Set UP Operations”.
5. Press “OK”. Display goes to 0-10 “Active Setup”
6. Press “OK”. Display will show boxed #1, #2, or #3
7. Press ▼ or ▲ key to select either mode #2 or #3. #1 is factory default.
8. Press OK. The upper right-hand corner of the display should show 2(2) or 3(3) depending on the choice.
9. Press AUTO for normal operation.
10. Press STATUS to return to the normal operating screen.

Startup

Occasionally the impeller may be temporarily bound up and will not turn at start up. If this is the case, loosen the insulation and loosen the hold-down bolts holding the motor assembly to the pump casing (do not remove them) and bump the pump.

The pump package is shipped with three strainers:

- A “Y” type strainer at the unit inlet connection
- A perforated strainer located in the inlet guide assembly at the inlet of the pump.
- A fine mesh temporary start-up strainer located in the inlet guide.

The “Y” strainer has a finer mesh than the inlet guide strainer and should catch most debris before it reaches the inlet guide strainer which also functions as suction flow direction device.

No special attention need be paid to the Suction Guide strainer at initial start-up. It will strain the pumped fluid and stabilize the flow into the pump suction automatically.

Removing Temporary Strainer

The temporary strainer **must** be removed following system clean up as follows:

After all debris has been removed from the system, or a maximum of 24 running hours, stop the pump and close the pump isolation valves. Drain the Suction Guide by removing the drain plug or opening the blowdown valve, if installed. Remove the insulation disc held on with Velcro (the disc has a “CAUTION Remove Startup Strainer After 24 Hours” sticker). Remove the suction guide cover and remove the strainer assembly from the valve body.

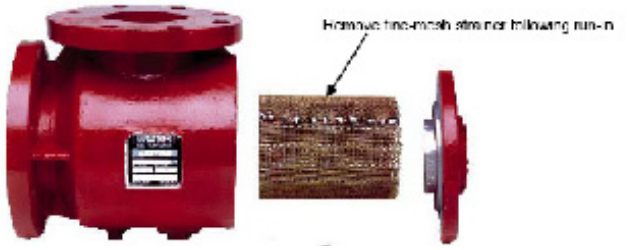
The temporary fine-mesh start-up strainer is tack-welded to the permanent stainless steel strainer, see Figure 104. This temporary strainer should now be removed from the permanent strainer. The fine-mesh strainer is designed to remove small particulate from new piping systems and could easily clog with debris if left in place. This will be detrimental to the operation of the pump.

Replace the permanent strainer into the fitting body once the temporary strainer is removed.

Inspect the cover O-ring and replace if necessary. Replace the cover into the body. Ensuring that the strainer is properly seated, tighten the cover bolts diagonally, evenly and firmly.

The seal may drip at initial start up as it breaks in. If the drip continues for more than a few hours, service may be required.

Figure 104: Temporary Strainer Removal



Seasonal Shutdown

Follow the instructions in the chiller unit for seasonal shutdown procedures.

In addition for the pump package:

No components or piping on the pump package are heat traced. If heat tracing is field installed, carefully remove the factory insulation, install the heat tracing and carefully replace the insulation, being careful to seal it against moisture penetration.

If draining the chilled water system, see diagrams beginning on page 15 for the location of drain points in the piping and pumps, both of which must be thoroughly drained.

General

On initial start-up and periodically during operation, it will be necessary to perform certain routine service checks. Among these are checking the liquid line sight glasses, taking condensing and suction pressure readings, and checking to see that the unit has normal superheat and subcooling readings. A recommended maintenance schedule is located at the end of this section.

Compressor

The scroll compressors are fully hermetic and require standard maintenance practices:

- Check oil level monthly
- Inspect electrical connections annually
- Test oil annually

Crankcase Heaters

The scroll compressors are equipped with externally mounted band heaters located at the oil sump level. The function of the heater is to keep the temperature in the crankcase high enough to prevent refrigerant from migrating to the crankcase and condensing in the oil during off-cycle.

Power must be supplied to the heaters 8 hours before starting the compressors.

Lubrication

No routine lubrication is required on AGZ units. The fan motor bearings are permanently lubricated and no further lubrication is required. Excessive fan motor bearing noise is an indication of a potential bearing failure.

POE type oil is used for compressor lubrication. Further details are listed in the Unit Service section on page 134.

⚠ WARNING

POE oil must be handled carefully using proper protective equipment (gloves, eye protection, etc.) The oil must not come in contact with certain polymers (e.g. PVC), as it may absorb moisture from this material. Also, do not use oil or refrigerant additives in the system.

⚠ WARNING

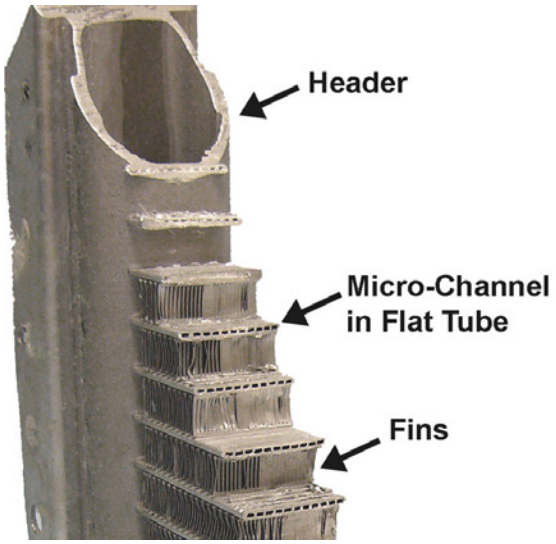
Polyolester Oil, commonly known as POE oil is a synthetic oil used in many refrigeration systems, and is present in this Daikin product. POE oil, if ever in contact with PVC/CPVC, will coat the inside wall of PVC/CPVC pipe causing environmental stress fractures. Although there is no PVC/CPVC piping in 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.

All-Aluminum Condenser Coils

The condenser coils are an all-aluminum design including the connections, microchannels, fins (an oven brazing process brazes the fins to the microchannel flat tube), and headers (see "Microchannel Coil Cross Section"), which eliminates the possibility of corrosion normally found between dissimilar metals of standard coils.

During the condensing process, refrigerant in the coil passes through the microchannel flat tubes, resulting in higher efficiency heat transfer from the refrigerant to the airstream. In the unlikely occurrence of a coil leak, contact Daikin Applied to receive a replacement coil module.

Figure 105: Microchannel Coil Cross Section



Cleaning Microchannel Aluminum Coils

Maintenance consists primarily of the routine removal of dirt and debris from the outside surface of the fins.

⚠ WARNING

Prior to cleaning the unit, turn off and lock out the main power switch to the unit and open all access panels.

Remove Surface Loaded Fibers

Surface loaded fibers or dirt should be removed prior to water rinse to prevent further restriction of airflow. If unable to back wash the side of the coil opposite that of the coils entering air side, then surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft non-metallic bristle brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges bent over) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

Periodic Clean Water Rinse

A monthly clean water rinse is recommended for all coils according to Table 88. Coils should be rinsed with water at a lower pressure such as from a hose. Pressure washers are not recommended as the higher pressure may damage the fins.

Regular water rinsing of epoxy coated coils that are applied in coastal or industrial environments will help to remove chlorides, dirt and debris. An elevated water temperature (not to exceed 130ºF) will reduce surface tension, increasing the ability to remove chlorides and dirt.

Table 88: Coil Cleaning Guidelines

Coating Option	Recommended Rinsing	Required Cleaning
Aluminun Coil Only	Monthly with low pressure water only	N/A
Epoxy Coated Coil	Monthly with low pressure water only - max 130ºF	Quarterly with approved cleaner, Chloride Remover is required - max 130°F

Cleaning Epoxy Coated Coils

The following cleaning procedures are recommended as part of the routine maintenance activities for epoxy coated coils. Documented routine cleaning of epoxy coated coils is required to maintain warranty coverage.

Routine Quarterly Cleaning of Epoxy Coated Coil Surfaces

Quarterly cleaning is essential to extend the life of an epoxy coated coil andshall be part of the unit's regularly scheduled maintenance procedures. Failure to clean an epoxy coated coil will void the warranty and may result in reduced efficiency and durability in the environment.

For routine quarterly cleaning, first clean the coil with a coil cleaner (see Table 89). After cleaning the coils with a cleaning agent, use the chloride remover to remove soluble salts and revitalize the unit.

Recommended Coil Cleaning Agents

The following cleaning agent, used in accordance with the manufacturer's directions on the container for proper mixing and cleaning, has been approved for use on epoxy coated coils to remove mold, mildew, dust, soot, greasy residue, lint and other particulate:

Table 89: Epoxy Coated Coil Recommended Cleaning Agents

Chemical Type	Cleaning Agent
Coil Cleaner	Enviro-Coil Concentrate
Coil Cleaner	GulfCoat™
Chloride Remover	CHLOR*RID®

Chloride remover should be used to remove soluble salts from epoxy coated coils, but the directions must be followed closely. This product is intended to remove chlorides and sulfates and not intended for use as a degreaser. Any grease or oil film should first be removed with the approved cleaning agent.

1. Remove Barrier - Soluble salts adhere themselves to the substrate. For the effective use of this product, the product must be able to come in contact with the salts. These salts may be beneath any soils, grease or dirt; therefore, these barriers must be removed prior to application of this product. As in all surface preparation, the best work yields the best results.
2. Apply CHLOR*RID DTS directly onto the substrate. Sufficient product must be applied uniformly across the substrate to thoroughly wet out surface with no areas missed. This may be accomplished by use of a pump-up sprayer. The method does not matter, as long as the entire area to be cleaned is wetted. After the substrate has been thoroughly wetted, the salts will be soluble and is now only necessary to rinse them off.
3. Rinse - It is highly recommended that a hose be used as a pressure washer will damage the fins. The water to be used for the rinse is recommended to be of potable quality, though a lesser quality of water may be used if a small amount of chloride remover is added.

Harsh Chemical and Acid Cleaners

Harsh chemicals, household bleach or acid cleaners should not be used to clean outdoor or indoor epoxy coated coils. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion and attack the epoxy coating. If there is dirt below the surface of the coil, use the recommended coil cleaners as described above.

High Velocity Water or Compressed Air

High velocity water or compressed air may damage the coil fins and must only be used at a pressure lower than 100 psig and 130°F to prevent fin and/ or coil damage. Nozzles must have a diffuse pattern, as a concentrated jet may damage the fins. Never use a pressure washer for coil cleaning. The force of the water or air jet may bend the fin edges and increase airside pressure drop. Reduced unit performance or nuisance unit shutdowns may occur.

Evaporator

On AGZ-E models 030 through 241, the evaporator is a compact, high efficiency, dual circuit, brazed plate-to-plate type heat exchanger consisting of parallel stainless steel plates. The evaporator is protected with an electric resistance heater and insulated with 3/4" (19mm) thick closed-cell polyurethane insulation. This combination provides freeze protection down to -20°F (-29°C) ambient air temperature. The water side working pressure of the brazed plate type of evaporator is 653 psig (4502 kPa). Evaporators are designed and constructed according to, and listed by, Underwriters Laboratories (UL). Other than cleaning and testing, no service work should be required on the evaporator.

Liquid Line Solenoid Valve

The liquid line solenoid valves that shut off refrigerant flow in the event of a power failure do not normally require any maintenance. The solenoids can, however, require replacement of the solenoid coil or of the entire valve assembly.

Battery

The controller has included with it a battery (BR2032) with a ~2 year life; therefor, it is recommended to include battery replacement every 2 years in your maintenance plan.

Electrical Terminals

⚠ DANGER

Electric shock hazard. Turn off all power before continuing with following service.

High Ambient Control Panel

This option consists of an exhaust fan with rain hood, two inlet screens with filters, necessary controls and wiring to allow operation to 125°F (52°C). The components can be factory or field installed as a kit.

- It must be supplied on units operating at ambient temperatures of 105°F (40.6°C) and above.
- It is automatically included on units with fan VFD (low ambient option).
- Check inlet filters periodically and clean as required. Verify that the fan is operational.

System Adjustment

To maintain peak performance at full load operation, the system superheat and liquid subcooling may require adjustment. Read the following subsections closely to determine if adjustment is required.

Liquid Line Sight Glass and Subcooling

The refrigerant sight glasses should be observed periodically. A clear glass of liquid indicates that there is subcooled refrigerant charge in the system. Bubbling refrigerant in the sight glass, during stable run conditions, may indicates that the system can be short of refrigerant charge. However, it is not unusual to see bubbles in the sight glass during changing load conditions. Refrigerant gas flashing in the sight glass could also indicate an excessive pressure drop in the liquid line, possibly due to a clogged filter-drier or a restriction elsewhere in the liquid line.

If the unit is at steady full load operation and bubbles are visible in the sight glass, then check liquid subcooling. If subcooling is low, add charge to clear the sight glass - see “Refrigerant Charging” on page 135. Once the subcooler is filled, extra charge will not lower the liquid temperature and does not help system capacity or efficiency. If subcooling is normal (15 to 20 degrees F at full load) and flashing is visible in the sight glass, check the pressure drop across the filter-drier.

An element inside the sight glass indicates the moisture condition corresponding to a given element color. Immediately after the system has been opened for service, the element may indicate a wet condition. If the sight glass does not indicate a dry condition after about 12 hours of operation, the circuit should be pumped down and the filter-drier changed or verify moisture content by performing an acid test on compressor oil.

Expansion Valve

The expansion valve’s function is to keep the evaporator supplied with the proper amount of refrigerant to satisfy the load conditions. Before adjusting superheat, check that unit charge is correct and liquid line sight glass is full with no bubbles and that the circuit is operating under stable, full load conditions. The suction superheat for the suction leaving the evaporator is set at the factory to 10°F @ full load, with the EXV set to 8°F @ 50% or less load.

Filter-Driers

Replace the filter-drier any time excessive pressure drop is read across the filter-drier and/or when bubbles occur in the sight glass with normal subcooling. The filter-drier should also be changed if the moisture indicating liquid line sight glass indicates excess moisture in the system.

Any residual particles from the condenser tubing, compressor and miscellaneous components are swept by the refrigerant into the liquid line and are caught by the filter-drier.

A condenser liquid line service valve is provided for isolating the charge in the condenser, but also serves as the point from which the liquid line can be pumped out. With the line free of refrigerant, the filter-drier core(s) can be easily replaced.

For units with replaceable core filter driers, the core assembly of the replaceable core drier consists of a filter core held tightly in the shell in a manner that allows full flow without bypass.

Hot Gas Bypass (Optional)

The hot gas bypass (HGBP) option allows the system to operate at lower loads without excessive on/off compressor cycling. HGBP is required to be on both refrigerant circuits because of the lead / lag feature of the controller. HGBP allows passage of discharge gas into the evaporator inlet (between the TX valve and the evaporator) which generates a false load to supplement the actual chilled water or air handler load.

NOTE: The hot gas bypass valve should not generate a 100% false load. For glycol applications, HGBP may not have full range of setting or turn down.

The pressure regulating valve is factory set to begin opening at 110 psig with R-410a and can be changed by changing the pressure setting. To raise the pressure setting, remove the cap and turn the adjustment screw clockwise. To lower the setting, turn the screw counterclockwise. Do not force the adjustment beyond the range it is designed for as this will damage the adjustment assembly. The regulating valve opening point can be determined by slowly reducing the system load while observing the suction pressure. When the bypass valve starts to open, the refrigerant line on the evaporator side of the valve will begin to feel warm to the touch.

A solenoid valve is located ahead of the bypass valve and is controlled by the MicroTech® III controller. It is active when only the first stage of cooling on a circuit is active.

⚠ WARNING

When performing valve checkout procedure the hot gas line can become hot enough in a short period of time to cause personal injury. Be sure to read and understand the installation, operation, and service instructions within this manual.

Table 90: Planned Maintenance Schedule

Operation	Weekly	Monthly (Note 1)	Quarterly	Annual (Note 2)
General				
Complete unit log and review (Note 3)	X			
Visually inspect unit for loose or damaged components		X		
Inspect thermal insulation for integrity				X
Clean and paint as required				X
Electrical				
Check terminals for tightness, tighten as necessary				X
Clean control panel interior				X
Visually inspect components for signs of overheating		X		
Verify compressor heater operation		X		
Test and calibrate equipment protection and operating controls				X
Verify Solenoid Plug(s) Tightness and Gasket Integrity				X
Refrigeration				
Leak test		X		
Check sight glasses for clear flow	X			
Check filter-drier pressure drop (see manual for spec)		X		
Perform compressor vibration test				X
Acid test oil sample				X
Condenser (air-cooled)				
Rinse condenser coils (Note 4)		X		
Clean epoxy coated condenser coils (Note 4)			X	
Check fan blades for tightness on shaft (Note 5)				X
Check fans for loose rivets and cracks				X
Check coil fins for damage			X	

Notes:

1. Monthly operations include all weekly operations.
2. Annual (or spring start-up) operations includes all weekly, monthly, and quarterly operations.
3. Log readings can be taken daily for a higher level of unit observation.
4. Coil rinsing and cleaning can be required more frequently in areas with a high level of airborne particles.
5. Be sure fan motors are electrically locked out.

R-410A Refrigerant

Terminology

Bubble Point: The temperature/pressure where bubbles first appear when heat is added to a liquid refrigerant. Used to measure sub-cooling.

Dew Point: The temperature/pressure where droplets first appear when heat is removed from a refrigerant gas. Used to measure superheat.

Fractionalization: A change in refrigerant composition due to the tendency of the higher pressure refrigerant to leak at a faster rate, should a system have leakage from a static two-phase region.

Glide: The total difference of Dew and Bubble Point at a specific condition. Mid-Point or Mean: Measurement half way between Dew and Bubble Points.

Miscibility: The ability of a refrigerant and oil to mix and flow together.

Solubility: The effect of refrigerant on the viscosity of a lubricant.

Safety

- ANSI/ASHRAE safety group A1.
- Always carry and be familiar with SDS information for R-410a.
- Store refrigerant in clean, dry area out of direct sunlight.
- Never heat or store cylinders above 125° F. Note vehicle precautions!
- Never tamper with cylinder valves or pressure relief valves. (Typical relief for R-410A is 525 psig).
- Never refill disposable cylinders.
- Verify cylinder hook-up.
- Verify cylinder label and color code match. R-410A is rose/light maroon. Must be DOT approved, R-410A with 400 psig rating. Open cylinders slowly.
- Avoid rough handling of cylinders and secure as appropriate. Cap when not in use.
- Do not overfill recovery cylinders or overcharge units.
- Check gauge calibration before every use and manifold set for leaks regularly.
- Be aware of pneumatic and possible hydrostatic pressure potentials.
- Never pressurize systems with oxygen or ref/air mix. R-410A, R-407C, R-134A, & R-22 are flammable with low air mix.
- Wear protective clothing. Impervious gloves and splash goggles should be worn.
- Avoid contact with liquid refrigerant (R-410A -60.8°F @ atms.) due to corrosion and freezing hazards.
- Avoid exposure to vapors. 1000 ppm/8 hr.
- Evacuate areas in cases of large releases. R-410A is heavier than air and can cause asphyxiation, narcotic and cardiac sensation effects.
- Evacuate systems and break vacuum (0 psig) with nitrogen before welding or brazing.
- Always ventilate work areas before using open flames. Exposure to open flames or glowing metal will form toxic hydrofluoric acid & carbonyl fluoride. No smoking!
- Make sure all tools, equipment, and replacement components are rated for the refrigerant used.

POE Lubricants

⚠ WARNING

POE oil must be handled carefully using proper protective equipment (gloves, eye protection, etc.) The oil must not come in contact with certain polymers (e.g. PVC), as it may absorb moisture from this material. Daikin Applied recommends against the use of PVC and CPVC piping for chilled water systems. In the event the pipe is exposed to POE oil used in the refrigerant system, the pipe can be chemically damaged and pipe failure can occur. Also, do not use oil or refrigerant additives in the system.

⚠ WARNING

Polyolester Oil, commonly known as POE oil is a synthetic oil used in many refrigeration systems, and is present in this Daikin 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.

POE type oil is used for compressor lubrication. This type of oil is extremely hydroscopic which means it will quickly absorb moisture if exposed to air and may form acids that can be harmful to the chiller. Avoid prolonged exposure of POE oil to the atmosphere to prevent this problem.

It is important that only the manufacturer's recommended oils be used. Acceptable POE oil types are:

- CPI/Lubrizol Emkarate RL32-3 MAF
- Copeland Ultra 32-3 MAF
- Parker Emkarate RL32-3MAF
- Virginia LE323MAF
- Nu Calgon 4314-66

Procedure Notes

- Use only new sealed metal containers of oil to insure quality.
- Buy smaller containers to prevent waste and contamination.
- Use only filter driers designed for POE and check pressure drops frequently.
- Test for acid and color at least annually. Change filter driers if acid or high moisture (> 200 ppm) is indicated (<

100 ppm typical).

- Evacuate to 500 microns and hold test to insure systems are dry.

Control and Alarm Settings

The software that controls the operation of the unit is factory-set for operation with R-410A .

Refrigerant Charging

If a unit is low on refrigerant, you must first determine the cause before attempting to recharge the unit. Locate and repair any refrigerant leaks. Soap works well to show bubbles at medium size leaks but electronic leak detectors are needed to locate small leaks.

⚠ DANGER

If refrigerant leaks from the unit, there's a potential danger of suffocation since refrigerant will displace the air in the immediate area. Be sure to follow all applicable industry related published standards and local, state and federal, statutes, regulations and codes if a refrigerant leak occurs. Avoid exposing refrigerant to an open flame.

Charging or check valves should always be used on charging hoses to limit refrigerant loss and prevent frostbite. Ball valve type recommended.

Charge to 80-85% of normal charge before starting the compressors.

Charging procedure

The units are factory-charged with R-410A. Use the following procedure if recharging in the field is necessary:

To prevent fractionalization, liquid must be charged from the refrigerant cylinder, unless charging the entire cylinder contents.

The charge can be added at any load condition between 25 to 100 percent load per circuit, but at least two fans per refrigerant circuit should be operating if possible.

Start the system and observe operation.

Trim the charge to the recommended liquid line sub-cooling (approximately 15-20°F typical @ full load, less at part load).

Verify the suction superheat (10 degrees F for EEVs and 10 – 12 degrees F for TXVs) at full load conditions.

Use standard charging procedures (liquid only) to top off the charge.

Check the sight glass to be sure there is no refrigerant flashing.

The AGZ units have a condenser coil design with approximately 15% of the coil tubes located in a subcooler section of the coil to achieve liquid cooling to within 5-10°F (2.8-5.6°C) of the outdoor air temperature when all condenser fans are operating. Subcooling should be checked at full load with 70°F (21.1°C) ambient temperature or higher, stable conditions, and all fans running. Liquid line subcooling at the liquid shut-off valve should be between 15 and 20 degrees F at full load.

It may be necessary to add refrigerant through the compressor suction. Because the refrigerant leaving the cylinder must be a liquid, exercise care to avoid damage to the compressor by using a flow restrictor. A sight glass can be connected between the charging hose and the compressor. It can be adjusted to have liquid leave the cylinder and vapor enter the compressor.

Overcharging of refrigerant will raise the compressor discharge pressure due to filling of the condenser tubes with excess refrigerant.

Service

With R-410A, fractionalization, if due to leaks and recharge has a minimal effect on performance or operation.

Special tools will be required due to higher refrigerant pressures with R-410A. Oil-less/hp recovery units, hp recovery cylinders (DOT approved w/525# relief), gauge manifold 30"-250 psi low/0-800 psi high, hoses w/800 psi working & 4,000 psi burst.

All filter driers and replacement components must be rated POE oils and for the refrigerant pressure (R-410A 600psig typical).

R-410A compressor internal relief is 600-650 psid.

Brazed connections only. No StayBrite or solder connections (solder should never be used with any refrigerant). K or L type refrigeration tubing only. Use nitrogen purge. Higher R-410A pressures and smaller molecule size make workmanship more critical.

R-410A must be charged from cylinder as a liquid unless entire cylinder is used. Use a Refrigerant flow restrictor if charging liquid to suction or to a system at pressure below a saturated temperature of 32° F.

EPA recovery and handling requirements for R-410A are the same as R-22.

Cooling the recovery cylinder will speed recovery and lessen stress on recovery equipment.

⚠ WARNING

Service on this equipment is to be performed by qualified refrigeration personnel familiar with equipment operation, maintenance, correct servicing procedures, and the safety hazards inherent in this work. Causes for repeated tripping of equipment protection controls must be investigated and corrected.

Disconnect all power before doing any service inside the unit.

Servicing this equipment must comply with the requirements set forth by the EPA in regards to refrigerant reclamation and venting.

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE STEPS
Compressor Will Not Run	1. Main or compressor disconnect switch open.	1. Close switch.
	2. Fuse blown. circuit breakers open	2. Check electrical circuits and motor windings for shorts or grounds. Investigate for possible overloading. Check for loose or corroded connections. Replace fuse or reset breakers after fault cause is corrected.
	3. Thermal overloads tripped	3. Overloads are auto-reset. Check voltages, cycle times and mechanical operations. Allow time for auto-reset.
	4. Defective contactor or coil.	4. Replace.
	5. System shutdown by equipment protection devices	5. Determine type and cause of shutdown and correct it before restarting equipment.
	6. No cooling required	6. None. Wait until unit calls for cooling.
	7. Liquid line solenoid will not open	7. Repair or replace solenoid. Check wiring.
	8. Motor electrical trouble	8. Check motor for opens, shorts, or burnout.
	9. Loose wiring	9. Check all wire junctions. Tighten all terminal screws.
Compressor Noisy Or Vibrating	1. Low lift, inverted start	1. Control issues or condenser fan VFDs needed.
	2. Compressor running in reverse	2. Check unit and compressor for correct phasing.
	3. Improper piping or support on suction or discharge	3. Relocate, add, or remove hangers.
	4. Worn compressor isolator bushing	4. Replace.
	5. Compressor mechanical failure	5. Replace.
High Discharge Pressure	1. Noncondensables in system	1. Extract noncondensables with approved procedures or replace charge.
	2. Circuit overcharged with refrigerant	2. Remove excess, check liquid subcooling.
	3. Optional discharge shutoff valve not open	3. Open valve.
	4. Condenser fan control wiring not correct	4. Correct wiring.
	5. Fan not running	5. Check electrical circuit and fan motor.
	6. Dirty condenser coil	6. Clean coil.
	7. Air recirculation	7. Correct.
Low Suction Pressure	1. Rapid load swings	1. Stabilize load.
	2. Lack of refrigerant	2. Check for leaks, repair, add charge. Check liquid sight glass.
	3. Fouled liquid line filter drier	3. Check pressure drop across filter drier. Replace.
	4. Expansion valve malfunctioning	4. Repair or replace and adjust for proper superheat.
	5. Condensing temperature too low	5. Check means for regulating condenser temperature.
	6. Compressors not staging properly	6. See corrective steps - Compressor Staging Intervals Too Low.
	7. Insufficient water flow	7. Correct flow.
	8. Excess or wrong oil used	8. Recover or change oil
	9. Evaporator dirty	9. Back flush or clean chemically.

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE STEPS
Compressor Will Not Stage Up	1. Defective capacity control	1. Replace.
	2. Faulty sensor or wiring	2. Replace.
	3. Stages not set for application	3. Adjust controller setting for application.
Compressor Staging Intervals Too Short	1. Control band not set properly	1. Adjust controller settings for application.
	2. Faulty water temperature sensor	2. Replace.
	3. Insufficient water flow	3. Correct flow.
	4. Rapid temperature or flow swings	4. Stabilize load.
	5. Oversized equipment	5. Evaluate equipment selection
	6. Chiller enabled with no load	6. Evaluate BAS sequence and settings
	7. Light loads	7. Evaluate need for HGBP or thermal inertia
Compressor Oil Level Too High Or Too Low	1. Oil hang-up in remote piping	1. Review refrigerant piping and correct.
	2. Low oil level	2. Verify superheat, add oil.
	3. Loose fitting on oil line	3. Repair.
	4. Level too high with compressor operating	4. Confirm correct superheat, remove oil.
	5. Insufficient water flow - Level too high	5. Correct flow, verify superheat.
	6. Excessive liquid in crankcase - Level too high	6. Check crankcase heater. Check liquid line solenoid valve operation.
	7. Short cycling	7. Stabilize load or correct control settings for application.
	8. HGBP valve oversize or improperly set-up	8. replace or adjust HGBP valve
	9. Expansion valve operation or selection	9. Confirm superheat at minimum and maximum load conditions
	10. Compressor mechanical issues	10. Replace compressor
	11. Wrong oil for application	11. Verify
Motor Overload Relays or Circuit Breakers Open	1. Voltage imbalance or out of range	1. Correct power supply.
	2. Defective or grounded wiring in motor	2. Replace compressor.
	3. Loose power wiring or burnt contactors	3. Check all connections and tighten, replace contactors.
	4. High condenser temperature	4. See corrective steps for High Discharge Pressure.
Compressor Thermal Protection Switch Open	1. Operating beyond design conditions	1. Correct so conditions are within allowable limits.
	2. Discharge valve not open	2. Open valve.
	3. Short cycling	3. Stabilize load or correct control settings for application
	4. Voltage range or imbalance	4. Check and correct.
	5. High superheat	5. Adjust to correct superheat.
	6. Compressor mechanical failure	6. Replace compressor.

DAIKIN

New Chiller Start-Up Form - Air-Cooled Scroll Compressor Equipment

AGZ and AMZ

This form must be completely filled out and returned to Daikin Applied (Warranty Department) within ten (10) days of start-up in order to comply with the terms of the Daikin **Limited Product Warranty**.
Complete and mail to: Daikin Applied, Attn: Warranty Department, PO Box 2510, Staunton, VA 20042-2510
Or email to: **stn.wty_startup_regi@DaikinApplied.com**

JOB INFORMATION

Job Name: _____

Start-Up Date: _____ **No. of units at site:** _____

Installation Address:

Daikin G.O.: _____

Daikin S.O.: _____

Purchasing Contractor Information:

UNIT INFORMATION

Unit Model No.: _____ **Serial No.:** _____

Component	Model Number	Serial Number
Compressor # 1:		
Compressor # 2:		
Compressor # 3:		
Compressor # 4:		
Compressor # 5:		
Compressor # 6:		

Benshaw/DRC Control Box M/M #: _____ **Benshaw/DRC Control Box S/N #:** _____

Before beginning, confirm that items on the Pre-Start Checklist have been completed and initial: _____
Note Discrepancies here or on Page 6.

PRE START-UP CHECKLIST

Pre Start-Up Checklist, All NO checks require an explanation under "Description". Please check YES or NO

	YES	NO
A. Is the unit free of visible shipping damage, corrosion or paint problems?	☐	☐
B. Is unit level and isolators installed?	☐	☐
C. Does the unit meet all location, installation and service clearances per IOM Bulletin?	☐	☐
D. Are all fan fastener nuts on the fans tights?	☐	☐
E. Does electrical service correspond to unit nameplate?	☐	☐
Nameplate: Volts _____ Hertz _____ Phase _____		
F. Has electrical service been checked for proper phasing at each circuit power terminal block?	☐	☐
G. Has unit been properly grounded and all field wiring confirmed to unit electrical specifications?	☐	☐
H. Has a fused disconnect and fuses or breaker been sized per product manual and installed per local code?	☐	☐
Number of conduits _____ Number of Wires _____ Wire Size _____		
I. Are all electrical power connections tight?	☐	☐
J. Been operating for 24 hours prior to start-up?	☐	☐
K. Does all field wiring conform to unit electrical specifications?	☐	☐
L. Are all service and liquid line valves per the IOMM in correct position?	☐	☐
M. Water Strainer installed? Brazed Plate Evaporator 0.063" (1.6mm) or smaller perforations	☐	☐
N. Has a flow switch been installed per the IOM manual?	☐	☐
O. Has the chill water circuit been cleaned, flushed, and water treatment confirmed?	☐	☐
P. Does the chiller water piping conform to the IOM manual?	☐	☐
Q. Are fans properly aligned and turn freely?	☐	☐
R. Is wind impingement against the air-cooled condenser a consideration?	☐	☐
S. Are the condenser coils coated?	☐	☐

Description of unit location with respect to building structures. Include measured distances.

Description:

_____

_____

_____

REFRIGERANT PIPING FOR REMOTE EVAPORATOR APPLICATIONS

	N/A	Yes	No
A. Has all field piping been leak tested at 150 psig (690 kPA)?	☐	☐	☐
B. Has system been properly evacuated and charged?	☐	☐	☐
C. Refrigerant R-_____Circuit 1 _____ lbs (kg) Circuit 2 _____ lbs. (kg)		☐	☐
D. Reviewed and confirmed piping is per the approved SF-99006 form submitted to the factory?	☐	☐	☐
E. Is a liquid line filter-drier installed in each circuit?	☐	☐	☐
F. Is a liquid line solenoid installed correctly in each circuit?	☐	☐	☐
G. Is Expansion Valve and associated sensors installed, insulated and wired correctly? (Including Entering water and Leaving water sensors.)		☐	☐

DESIGN CONTROLS

A. CHILLER
Water Pressure Drop: _____psig(kPa)_____Ft. (kPa)_____gpm (lps)
Water Temperatures: Entering _____ °F (°C) Leaving _____°F (°C)

B. CONDENSER
Design Ambient Temperatures: Entering _____°F (°C) Leaving _____ °F (°C)
Minimum Ambient Temperatures: Entering _____ °F (°C) Leaving _____ °F (°C)

START-UP

	Yes	No
A. Does unit start and perform per sequence of operation as stated in the IOM Manual?	☐	☐
B. Do condenser fans rotate in the proper directions?	☐	☐

MICROTECH STATUS CHECK-Each Reading Must be Verified with Field Provided Instruments of Known Accuracy?

		MicroTech	**Verification**
C. Water Temperatures:	Leaving Evaporator	_____°F (°C)	_____°F (°C)
	Entering Evaporator	_____°F (°C)	_____°F (°C)
D. Circuit #1 Refrigerant Pressures:			
	Evaporator	_____psig (kPa)	_____psig (kPa)
	Liquid Line pressure		_____psig (kPa)
	Condenser Pressure	_____psig (kPa)	_____psig (kPa)
E. Circuit #2 Refrigerant Pressures:			
	Evaporator	_____psig (kPa)	_____psig (kPa)
	Liquid Line Pressure		_____psig (kPa)
	Condenser Pressure	_____psig (kPa)	_____psig (kPa)
F. Circuit #1 Refrigerant Temperatures:			
	Saturated Evaporator Temperature	_____°F (°C)	_____°F (°C)
	Suction Line Temperature	_____°F (°C)	_____°F (°C)
	Suction Superheat	_____°F (°C)	_____°F (°C)
	Saturated Condenser Temperature	_____°F (°C)	
	Liquid Line Temperature		_____°F (°C)
	Subcooling		_____°F (°C)
	Discharge Temperature		_____°F (°C)

G. Circuit #2 Refrigerant Temperatures:

Saturated Evaporator Temperature	_____ °F (°C)	_____ °F (°C)
Suction Line Temperature	_____ °F (°C)	_____ °F (°C)
Suction Superheat	_____ °F (°C)	_____ °F (°C)
Saturated Condenser Temperature	_____ °F (°C)	
Liquid Line Temperature		_____ °F (°C)
Subcooling		_____ °F (°C)
Discharge Temperature		_____ °F (°C)

H.Ambient Air Temperature: ..... _____ °F (°C) _____ °F (°C)

NON-MICROTECH READINGS

I. Does the system contain glycol? ☐ Yes ☐ No
Percentage by weight _____ or by volume _____ Glycol Type _____

J. If the chilled water system include glycol, have the freeze protection, low pressure devices and settings been adjusted for the actual job requirements? ☐ Yes ☐ No **Detail these settings on page 8 - Remarks section**

Note: See operation manual for low temperature on ice bank applications.

K. Unit Voltage Across Each Phase: L1-L2 _____ V L2-L3 _____ V L1-L3 _____ V

L. Unit Current Per Phase: L1 amps _____ L2 amps _____ L3 amps _____

M. Compressor Current Per Phase:

Compressor #1: _____	L1 Amps _____	L2 Amps _____	L3 Amps _____
Compressor #2: _____	L1 Amps _____	L2 Amps _____	L3 Amps _____
Compressor #3: _____	L1 Amps _____	L2 Amps _____	L3 Amps _____
Compressor #4: _____	L1 Amps _____	L2 Amps _____	L3 Amps _____
Compressor #5: _____	L1 Amps _____	L2 Amps _____	L3 Amps _____
Compressor #6: _____	L1 Amps _____	L2 Amps _____	L3 Amps _____

MICROTECH SETPOINTS

	MICROTECH Setting
A. Leaving Evaporator	_____ °F (°C)
B. Reset Leaving	_____ °F (°C)
C. Reset Signal	_____ ma
D. Reset Option	_____
E. Maximum Chilled Water Reset	_____ °F (°C)
F. Return Setpoint	_____ °F (°C)
G. Maximum Pulldown	_____ °F (°C)
H. Evaporator Full Load Delta T	_____ °F (°C)
I. Evap Recirc Timer	_____ sec.
J. Start-to-Stop Delay	_____ min.
K. Stop-to-Stop Delay	_____ min.
L. Stage Up Delay	_____ sec.
M. Stage Down Delay	_____ sec.

ALARM SETPOINTS MUST BE VERIFIED WITH INSTRUMENTS OF KNOWN ACCURACY

N. Low Pressure Hold …… _____psig (kPa)
O. Low Pressure Unload…… _____psig (kPa)
P. Evaporator Water Freeze…… _____psig (kPa)
Q. High Pressure Cut-Out…….. _____psig (kPa)
R. Unit Type = _____
S. Number of Compressors = _____
T. Number of Stages = _____
U. Number of Fan Stages = _____
V. Software Version = _____

GENERAL

	YES	NO
A. Are all control lines secure to prevent excess vibration and wear? ……	☐	☐
B. Are all gauges shut off, valve caps, and packings tight after startup? ……	☐	☐
C. Has the chiller been leak tested? Detail refrigerant leaks and repairs below ……	☐	☐

Refrigerant Leaks:

_____

Repairs Made

_____

Items not installed per IOM Manual and/or recommended corrective actions

_____

_____

Performed By: _____ Title: _____

Company Name: _____

Address: _____

City/State/Zip Code: _____ Telephone: _____

Modem Number: _____

Signature: _____ Date: _____

Contractor's Signature _____

RETURN COMPLETED FORM TO: DAIKIN, WARRANTY DEPT., PO BOX 2510, STAUNTON, VA 24402

IVS SENSORLESS PUMP COMMISSIONING CHECK SHEET

FOR PUMP PACKAGE UNITS ONLY

Project Name: _____
Building Address: _____
Contractor Name: _____
Site Contact Name: _____ Site Contact #: _____
Your Company: _____ Your Name: _____
Pump Model: _____ Pump Tag #: _____
Pump Serial #: _____ Sales Order #: _____

Note: For independent sensorless operation, go to Section 1.
For independent external sensor operation, go to Section 2.
For external controller, go to Section 3.

SECTION 1 - SENSORLESS STARTUP PROCEDURE:

1. Open up and bleed pump seal flush line to verify no air has travelled into seal / seal lines ☐
2. Change parameter 0-20 (default value is option 1601 – "Reference [Unit]") to option 1850 "Sensorless Readout" to display Sensorless flow readout on the top left corner of screen ☐
3. Change parameter 0-22 (default value is option 1610 – "Power [kW]") to option 1654 "Feedback 1 [Unit]" to display Sensorless pressure readout on the top right corner of screen ☐
4. Open the discharge valve and set the pump to the design duty speed and record the VFD Sensorless pressure and flow readout (include units). This is what the actual system flow and head are. ☐
SENSORLESS PRESSURE = _____
SENSORLESS FLOW = _____
5. Ramp the pump up or down to achieve the design flow. Record the VFD sensorless flow and pressure –this will be your new setpoint. ☐
SENSORLESS PRESSURE = _____
SENSORLESS FLOW = _____
6. Set parameter 20-21 to the Sensorless Pressure readout taken in previous step ☐
7. Set parameter 22-89 to the Sensorless Flow readout taken in previous step ☐
8. Set parameter 22-87 to a value that is 40% of the value in 20-21. You have now readjusted the quadratic control curve to match actual site conditions. ☐
9. Change parameter 0-20 back to the default value of option 1601 – "Reference [Unit]" ☐
10. Change parameter 0-22 back to the default value of option 1610 – "Power [kW]" ☐
11. Put the VFD into AUTO mode. The pump will ramp up to get to the setpoint pressure and as the demand in the system decreases, the setpoint will also decrease to ride the control curve down to the minimum pressure set in parameter 22-87. As demand increases, it will ride back up the control curve to full design setpoint. ☐

SECTION 2- EXTERNAL SENSOR STARTUP PROCEDURE:

Note: Sensor signal wire must be connected to analog input terminal 54

1. Open up and bleed pump seal flush line to verify no air has travelled into seal / seal lines ☐
2a. If your sensor provides a voltage (V) signal, go to step 3. ☐
2b. If your sensor provides a milliamp (mA) signal, make sure switch S202 for A54 (located behind the keypad) is pushed to the ON position (to the right) and go to step 5.
3. Change parameter 6-20 to match the low end of voltage signal from the sensor (eg: if your sensor provides a 0-10V signal, enter 0). Go to step 4. ☐
4. Change parameter 6-21 to match the high end of voltage signal from the sensor (eg: if your sensor provides a 0-10V signal, enter 10). Go to step 7. ☐
5. Change parameter 6-22 to match the high end of current signal from the sensor (eg: if your sensor provides a 4-20mA signal, enter 4). Go to step 6. ☐

(CONT'D) SECTION 2- EXTERNAL SENSOR STARTUP PROCEDURE:

6. Change parameter 6-23 to match the high end of current signal from the sensor (eg: if your sensor provides a 4-20mA signal, enter 20). Go to step 7. ☐
7. Change parameter 20-00 (default value is option 105 – "Sensorless Pressure") to option 2 "Analog input 54" to make drive look at sensor reading for feedback value ☐
8. Change parameter 20-12 to the unit that matches your sensor measurement units (eg: if you have a pressure sensor, it will be in units of pressure like psi)
9. Change parameter 20-13 to the value that matches the bottom end of your sensor measurement scale (eg: if your pressure sensor measures from 2-100psi, you enter a value of 2) ☐
10. Change parameter 20-14 to the value that matches the high end of your sensor measurement scale (eg: if your pressure sensor measures from 2-100psi, you enter a value of 100) ☐
11. Set parameter 20-21 the setpoint you want the pump to maintain ☐
12. Change parameter 22-80 (default value is 1 "Enabled") to option 0 "Disabled" ☐
13. Put the VFD into AUTO mode – it will now display the sensor reading in the center of the screen and the target setpoint on the top left of the screen. It will ramp up / down to meet the setpoint based on the sensor reading. ☐

SECTION 3 – EXTERNAL CONTROLLER (BAS) STARTUP PROCEDURE:

Note: Speed signal wire must be connected to analog input terminal 53

1. Open up and bleed pump seal flush line to verify no air has travelled into seal / seal lines ☐
2. Change parameter 0-20 to option 1602 "Reference %" to show the percent speed signal on top left corner ☐
3. Change parameter 1-00 to option 0 "Open Loop" (drive will 'listen' for external speed reference) ☐
4. Change parameter 3-02 to "0" (this is the minimum speed signal) ☐
5. Change parameter 3-03 to "60" (this is the maximum speed signal) ☐
6. Change parameter 3-15 to option 1 "Analog Input 53" ☐
7. Put the VFD into AUTO mode – the VFD will now ramp up / down based on the analog speed signal it receives on terminal 53. You can check what the drive is seeing on the input by going to parameter 16-62. ☐

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

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

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

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

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

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

EXCEPTIONS

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

ASSISTANCE

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

SOLE REMEDY

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

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

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

Daikin Applied Training and Development

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

Warranty

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

Aftermarket Services

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

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to www.DaikinApplied.com.

Products manufactured in an ISO Certified Facility.