Installation and Maintenance Manual IM 1059-15

Group: **WSHP**
Part Number: **910394842**
Date: **June 2022**

Enfinity™ Large Capacity Vertical Water Source Heat Pumps

LVC Standard Range & LVW Extended Range

Unit Sizes 072 – 290 (6 to 25 Tons) – R-410A Refrigerant

Hazard Identification Information

⚠ WARNING

This Installation and Maintenance bulletin is intended to provide the proper procedures for installing a Daikin Water Source Heat Pump. Failure to follow these procedures can cause property damage, severe personal injury or death. Additional, failure to follow these procedures can cause premature failure of this equipment or cause erratic unit operation, resulting in diminished unit performance. Disregarding these directions may further lead to suspension or revocation of the manufacturer's warranty.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

Note: *Indicates important details or clarifying statements for information presented.*

Category	Code Item	Code Position	Code Designation & Description
Product Category	**01**	**1**	W = Water Source Heat Pump
Product Identifier	**02**	**2-4**	LVC = R-410A, Floor Mounted, Standard Range LVW = R-410A, Floor Mounted, Geothemal Range
Design Series (Vintage)	**03**	**5**	1 = Design Series 1
Nominal Capacity	**04**	**6-8**	072 = 72,000 Btuh Nominal Cooling 096 = 96,000 Btuh Nominal Cooling 120 = 120,000 Btuh Nominal Cooling 180 = 180,000 Btuh Nominal Cooling 215 = 215,000 Btuh Nominal Cooling 290 = 290,000 Btuh Nominal Cooling
Control Board Option	**05**	**9**	B = MicroTech® III Unit Controller A = DDC-Less Board (Alerton Rep Option)
Network Module Option	**06**	**10**	L = Lon Module B = BACnet F = BACnet - WSHP System Y = None
Condensate Overflow Protection	**07**	**11**	S = Standard Overflow Sensor
Freeze Fault Protection	**09**	**13**	F = Freeze Fault Protection
Voltage	**11**	**15**	D = 208-60-3 H = 230-60-3 K = 460-60-3 L = 575-60-3
Options	**12**	**16**	Y = None P = Phase Monitor
Return Air	**13**	**17**	Y = Front Return
Discharge Air	**14**	**18**	T = Top Horizontal Discharge U = Upblast Rear F = Upblast Front
Blower Motor	**15**	**19-20**	01 = Belt Drive – Integral HP Motor 02 = High Static 03 = Ultra High Static 11 = Standard with VFD 12 = High Static with VFD 13 = Ultra High Static with VFD
Construction Type	**17**	**23**	A = Standard 1/2" Fiberglass Insulation B = Closed Cell Foam Insulation F = Standard 1/2" Fiberglass Insulation w/Compressor Sound Blankets G = Closed Cell Foam Insulation w/Compressor Sound Blankets
Water To Refrigerant Heat Exchanger Construction	**18**	**24**	C = Copper Inner Tube - Steel Outer Tube S = Cupro-nickel Inner Tube - Steel Outer Tube
Secondary Heating/Cooling Option	**19**	**25**	W = Waterside Economizer *(Not to be combined with HGRH)*
Options	**20**	**26-27**	AA = Hot Gas Reheat *(Not to be combined with WSE)* AB = Hot Gas Bypass YY = None
Piping Hand	**21**	**28**	L = Left Side Pipe Connections R = Right Side Pipe Connections
Filter Options	**23**	**32-34**	SD1 = Standard 1" Disposable filter M08 = Merv 8 in 2" frame M13 = Merv 13 in 4" frame N02 = No Filter with 2" Filter Rack (Low Leak) N00 = No Filter-No Filter Rack
Condensate Drain Pan	**27**	**41-42**	GL = Galvanized Steel SS = Stainless Steel
Control Transformer Option	**29**	**44-46**	050 = 50VA Control Transformer 075 = 75VA Control Transformer

Receiving and storage

⚠ CAUTION

Sharp edges can cause personal injury. Avoid contact with them. Use care and wear protective clothing, safety glasses and gloves when handling parts and servicing heat pumps.

Upon receipt of the equipment, check carton for visible damage. Make a notation on the shipper's delivery ticket before signing. If there is any evidence of rough handling, immediately open the cartons to check for concealed damage. If any damage is found, notify the carrier within 48 hours to establish your claim and request their inspection and a report. The Warranty Claims Department should then be contacted.

Do not stand or transport the machines on end. For storing, each carton is marked with "up" arrows.

In the event that elevator transfer makes up-ended positioning unavoidable, do not operate the machine until it has been in the normal upright position for at least 24 hours.

Temporary storage at the job site must be indoor, completely sheltered from rain, snow, etc. High or low temperatures naturally associated with weather patterns will not harm the units. Excessively high temperatures, 140°F (60°C) and higher, may deteriorate certain plastic materials and cause permanent damage.

IMPORTANT

This product was carefully packed and thoroughly inspected before leaving the factory. Responsibility for its safe delivery was assumed by the carrier upon acceptance of the shipment. Claims for loss or damage sustained in transit must therefore be made upon the carrier as follows:

VISIBLE LOSS OR DAMAGE

Any external evidence of loss or damage must be noted on the freight bill or carrier's receipt, and signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusal to honor a damage claim. The form required to file such a claim will be supplied by the carrier.

CONCEALED LOSS OR DAMAGE

Concealed loss or damage means loss or damage which does not become apparent until the product has been unpacked. The contents may be damaged in transit due to rough handling even though the carton may not show external damages. When the damage is discovered upon unpacking, make a written request for inspection by the carrier's agent within fifteen (15) days of the delivery date and file a claim with the carrier.

Pre-installation

⚠ CAUTION

The installer must determine and follow all applicable codes and regulations. This equipment presents hazards of electricity, rotating parts, sharp edges, heat and weight. Failure to read and follow these instructions can result in property damage, severe personal injury or death. This equipment must be installed by experienced, trained personnel only.

1. To prevent damage, do not operate this equipment for supplementary heating and cooling during the construction period.
2. Inspect the carton for any specific tagging numbers indicated by the factory per a request from the installing contractor. At this time the voltage, phase and capacity should be checked against the plans.
3. Check the unit size against the plans to verify that the unit is being installed in the correct location.
4. Before installation, check the available ceiling height versus the height of the unit.
5. Note the location and routing of water piping, condensate drain piping, and electrical wiring. The locations of these items are clearly marked on submittal drawings.
6. The installing contractor will find it beneficial to confer with piping, sheet metal, and electrical foremen before installing any unit.

Note: *Check the unit data plate for correct voltage with the plans before installing the equipment. Also, make sure all electrical ground connections are made in accordance with local code.*

7. The contractor shall cover the units to protect the machines during finishing of the building. This is critical while spraying fireproofing material on bar joists, sandblasting, spray painting and plastering. If plastic film is not available, the shipping carton may be modified to cover the units during construction.
8. Remove all shipping blocks in the fan wheel.

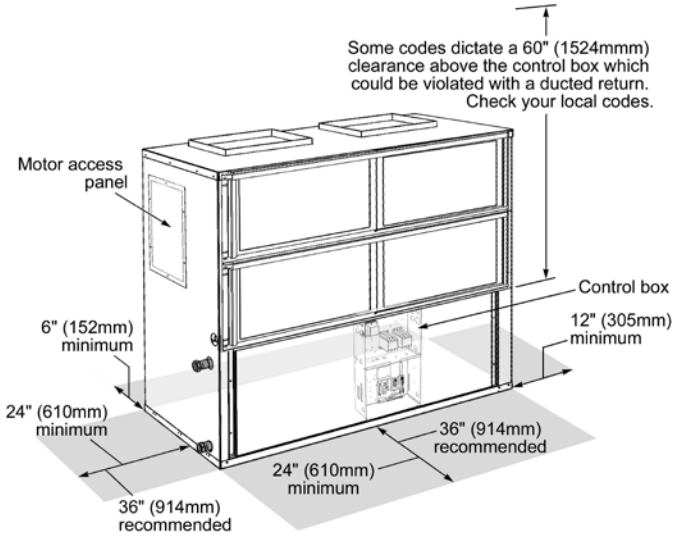
Unit location

Large Vertical Water Source Heat Pump units are easily located in equipment rooms or floor-by-floor installations.

They can be applied to all building types where it is advantageous to extend the water source heat pump concept to larger or core areas.

Locate the unit in an area that allows for easy removal of the filter and access panels, and has enough space for service personnel to perform maintenance or repair. Provide sufficient room to make water, electrical and duct connections.

Figure 1: Service clearances



Notes
1. *A 12" (305 mm) minimum clearance is required on the side opposite the pipe connection side to gain access to panel to remove locking collar for shaft removal.*
2. *Top clearance is required for fan shaft removal.*

The contractor should make sure that access has been provided including clearance for 2" (51 mm) thick filter brackets, duct collars and fittings at water and electrical connections. Allow adequate room around the unit for a condensate trap. The unit can be installed “free standing” in an equipment room. Generally, the unit is located in a separate room with the non-ducted return air facing the return air intake.

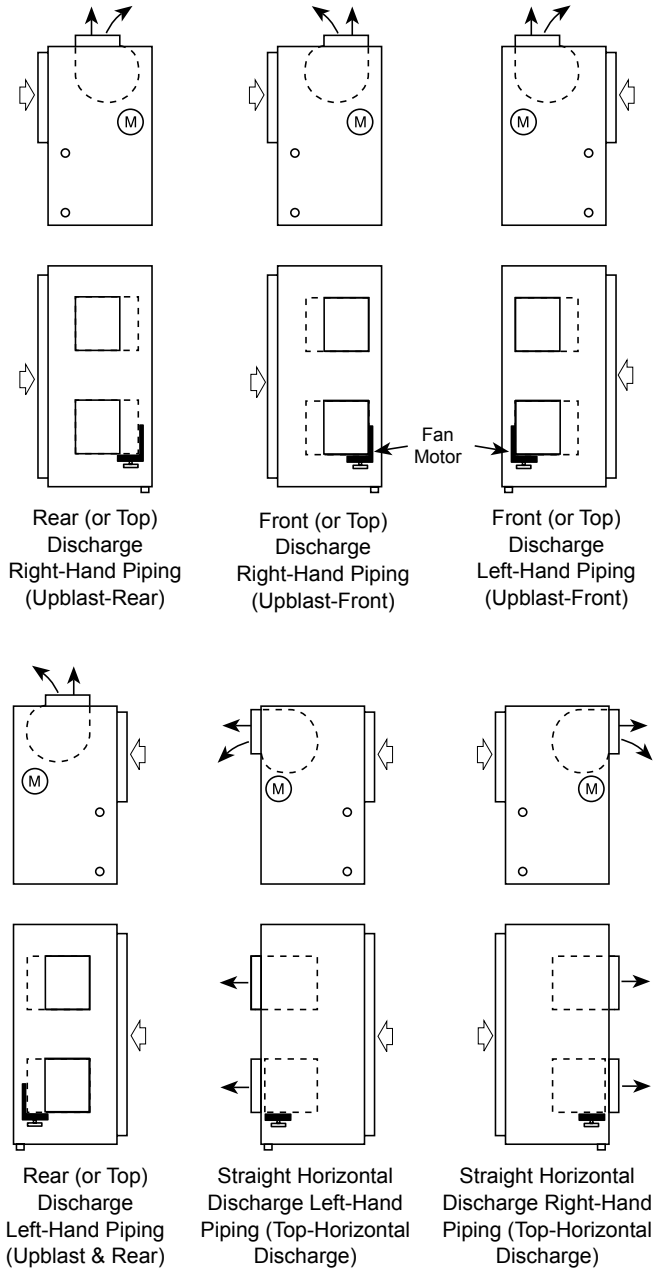
Alternatively, the unit can have a ducted return air. It is recommended that the unit be located on vibration isolators to reduce any vibration (see Figure 3 on page 6).

Fan deck arrangements

Six fan discharge arrangements and two piping arrangements are available. With the return air side defined as the “front” of the unit, the water piping connections may be right-hand (side) or left-hand. All units have a single supply and return water connection with a copper FPT type fitting that protrudes through the unit casing for easy connection. The condensate connection is also a copper FPT type and is located on both sides of the unit. The unused connection is plugged.

The main control panel is located in the center front of the unit. The fan discharge is top front, and the fan motor is always located at the piping end. Unit sides opposite the control panel and opposite the piping side may be up against walls and still allow for service and maintenance through the remaining access panels.

Figure 2: Fan deck arrangements



Notes:
1. *The hand of unit is determined by looking at the return air (filter) side. The piping and electrical connections are always made on the “hand” side of the unit. The return air (filter) side is considered the “front” of the unit.*
2. *The fan motor is always located at the piping/ electrical connection (hand) side of the unit.*

Vibration isolators

For minimum sound and vibration transmission, it is recommended that the unit be mounted on vibration isolators.

Holes are provided in the bottom panel to facilitate connection of isolators (see Figure 4 & 5 for hole locations).

Isolators supplied by the manufacturer are the type shown in Figure 3. Four white isolators are used for single compressor units and six green isolators are used for dual compressor units. The holes in the bottom of the unit allow for a 3⁄8" (10 mm) bolt to be secured to the isolator.

Figure 3: Vibration isolator dimensions

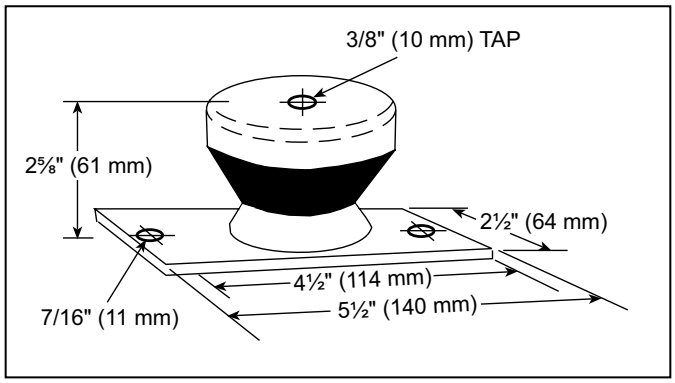


Figure 4: Vibration isolators locations - single compressor unit

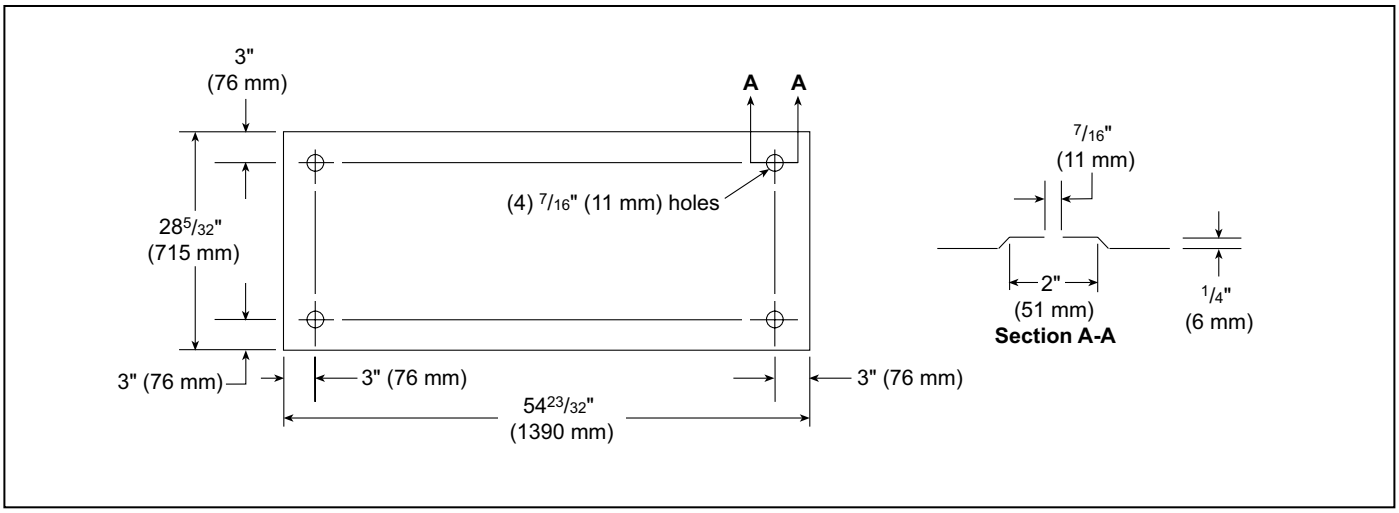
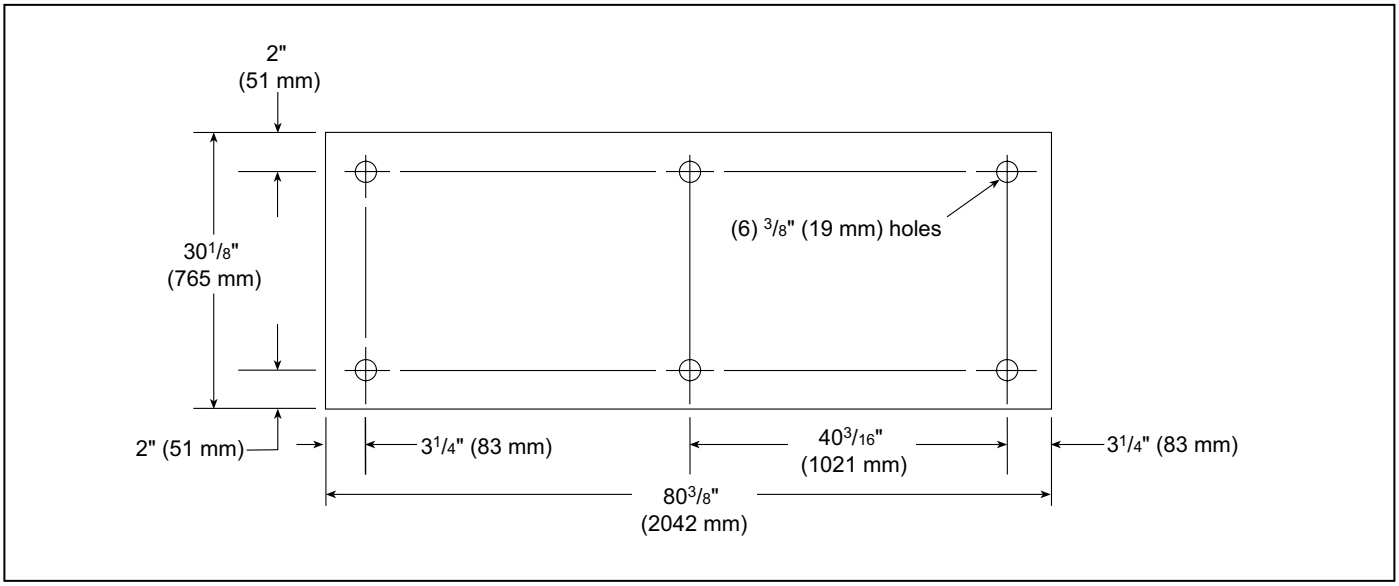


Figure 5: Vibration isolators locations - dual compressor unit



Air balancing

Unit sizes 072 thru 290 are supplied with a variable pitch motor sheave to aid in airflow adjustment.

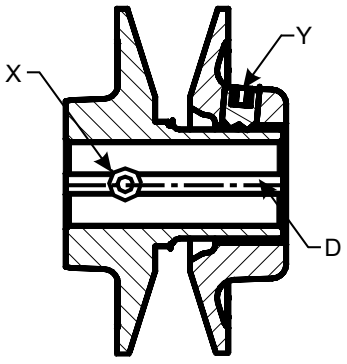
When the final adjustments are complete, the current draw of the motors should be checked and compared to the full load current rating of the motors. The amperage must not exceed the service factor stamped on the motor nameplate.

Sheave Adjustment

Adjusting Single Groove Sheave

1. All sheaves should be mounted on the motor or driving shaft with the setscrew “X” toward the motor
2. Fit shaft key “D” between sheave and shaft, and lock setscrew “X” in place. Wrench torque 110 in.-lb. minimum - 130 in.-lb. maximum.
3. Be sure both driving and driven sheaves are in alignment and that shafts are parallel. Total axial and parallel misalignment must not exceed 1/4°
4. Loosen setscrew “Y” in moving flange of sheave until movable flange is free to rotate.
5. Adjust sheave pitch diameter for desired speed by opening rotating parts by half or full turn increments from closed position. Do not open more than five full turns.
6. Tighten setscrew "Y" to 110 in.-lb. to 130 in.-lb. with setscrew "Y" located over center of casts flats on barrel of sheaves fixed component.
7. Put on belts and adjust tension. (Do not force belts over grooves.) Check setscrews and belt tension after 24 hours of operation.

Figure 6: Sheave adjustment detail - single groove



Adjusting 2-Groove Sheaves

1. All sheaves should be mounted on the motor or driving shaft with the setscrew “X” toward the motor
1. Loosen setscrews “Y” in moving flanges and pull out key “E”. (This key projects a small amount to provide a grip for removing).
2. Rotate both movable flanges inward until they touch the center flange.
3. Open each movable flange until its notch is adjacent to the notch on the center flange. Be certain that neither movable flange is opened more than one full turn.
4. Open each movable flange the same number of full or half turns until the desired number of turns is obtained. Do not open more than five full turns.

⚠ CAUTION

Failure to adjust both equally may cause excessive vibration and blower assembly failure.

5. Replace key “E” and tighten setscrews “Y”. Wrench torque 110 in.-lb. minimum - 130 in.-lb. maximum.
6. Put on belts and adjust belt tension.(Do not force belts over flanges).
7. Be sure that all keys are in place and that all setscrews are torqued properly before starting drive. Check setscrews and belt tension after 24 hours of operation.

Figure 7: Sheave adjustment detail - two groove

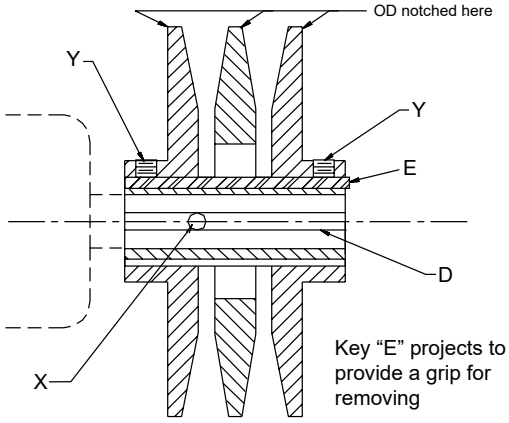
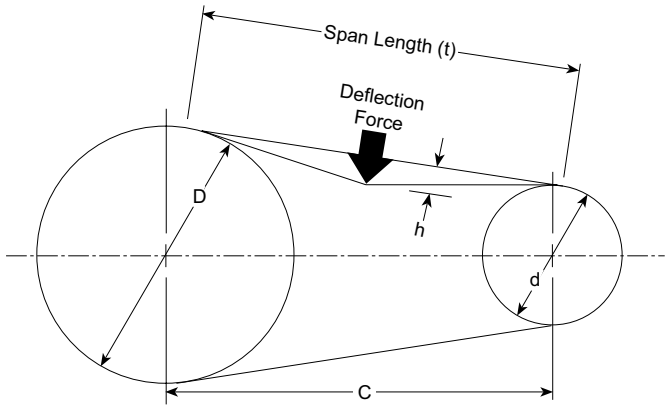


Figure 8: Drive belt adjustment



$$h = \frac{t}{64}$$

$$t = \sqrt{C^2 - \left(\frac{D-d}{2}\right)}$$

Where: t = Span length, inches (mm)
C = Center distance, inches (mm)
d = Smaller sheave diameter, inches (mm)
h = Deflection height, inches (mm)

Note: The ratio of deflection to belt span is 1:64.

Table 1: Sheave adjustment settings

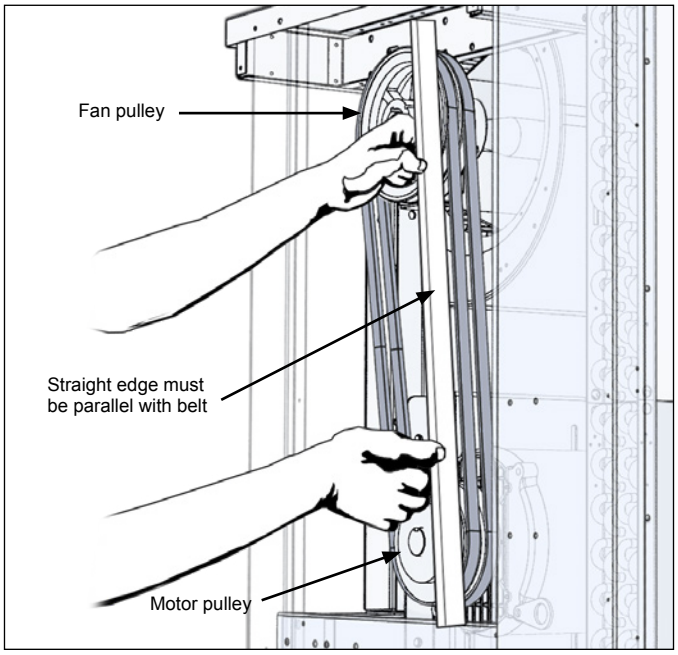
Unit Size	Motor HP	Motor Shaft Diameter	Motor RPM	0 Turns	1 Turn	2 Turns	2.5 Turns	3 Turns	4 Turns	5 Turns	6 Turns
072	1.5	0.625	1750	770	**735**	700	683	665	630	595	
	2.0	0.875	1750		1329	1264	1231	1199	**1134**	1069	1005
	3.0	1.125	1765		1340	1275	1242	1209	**1144**	1079	1013
096	1.5	0.625	1750	960	**903**	847	819	790	734	677	
	2.0	0.875	1750		1329	1264	1231	1199	**1134**	1069	1005
	3.0	1.125	1765		1406	1346	1316	1286	**1227**	1167	1107
120	2.0	0.875	1750	1242	**1185**	1129	1101	1073	1016	960	
	3.0	1.125	1765		1340	1275	1242	1209	**1144**	1079	1013
	5.0	1.125	1750		1394	1335	1305	1275	**1216**	1157	1097
180	3.0	1.125	1765		1108	1070	**1051**	1033	995	958	920
	5.0	1.125	1750		1307	1263	**1241**	1218	1174	1130	1085
	7.5	1.375	1750	1462	1418	1373	**1351**	1329	1285	1241	1196
215	3.0	1.125	1765		1001	967	**950**	933	899	866	832
	5.0	1.125	1750		1160	1121	**1101**	1081	1042	1003	963
	7.5	1.375	1750	1462	1418	1373	**1351**	1329	1285	1241	1196
290	7.5	1.375	1750	1229	1191	1154	**1136**	1117	1080	1043	1005
	10.0	1.375	1765		1407	1360	**1336**	1312	1264	1216	1169

Note: *Bold numbers denote factory setting*

Aligning the fan and motor pulleys

1. Loosen the fan pulley setscrew and motor pulley setscrew. Refer to letter "X" in Figure 7 on page 7.
2. Slide the pulleys along the shafts so that when a straight edge is pressed against the two pulleys they align, and the belt is parallel with the straight edge.
3. To make an angular alignment, loosen the motor mounting bolts and align the motor pulley. Tighten the fan and motor pulley setscrews and the motor mounting bolts to torque specifications.
4. Recheck the belt tension.

Figure 9: Aligning the fan and motor pulleys



Factory mounted Variable Frequency Drive (VFD)

Unit sizes 072 thru 290 may be supplied with an optional Variable Frequency Drive (VFD). All VFDs are factory programmed to operate at a constant speed of 60 Hz. To adjust this speed, consult the literature of the VFD manufacturer.

Note: *it is not recommended to exceed 60 Hz.*

Ductwork and attenuation

Discharge ductwork is normally used with these conditioners. Return air ductwork may also be required but will require field installation of a return air duct collar.

All ductwork should conform to industry standards of good practice as described in ASHRAE Systems Guide.

The discharge duct system will normally consist of a flexible connector, a transition piece to the final duct size, a short run of duct, an elbow without vanes and a trunk duct tee'd into branch ducts with discharge diffusers. Transformation duct must not have angles totalling more than 30 degrees or severe loss of air performance can result.

All units have multiple fan outlets. The preferred method for minimum static pressure loss would be individual ducts at each outlet connected to a larger main duct downstream (Figure 10).

For minimum noise transmission, the metal duct material should be internally lined with acoustic fibrous insulation. The ductwork should be laid out so that there is no line of sight between the conditioner discharge and the distribution diffusers.

Return air ducts can be brought in adjacent to the return air of the conditioner. Typically, the equipment room becomes the common return air plenum.

Do not insert sheet metal screws directly into the unit cabinet for connection of supply or return air ductwork, especially return air ductwork which can hit the drain pan or the air coil.

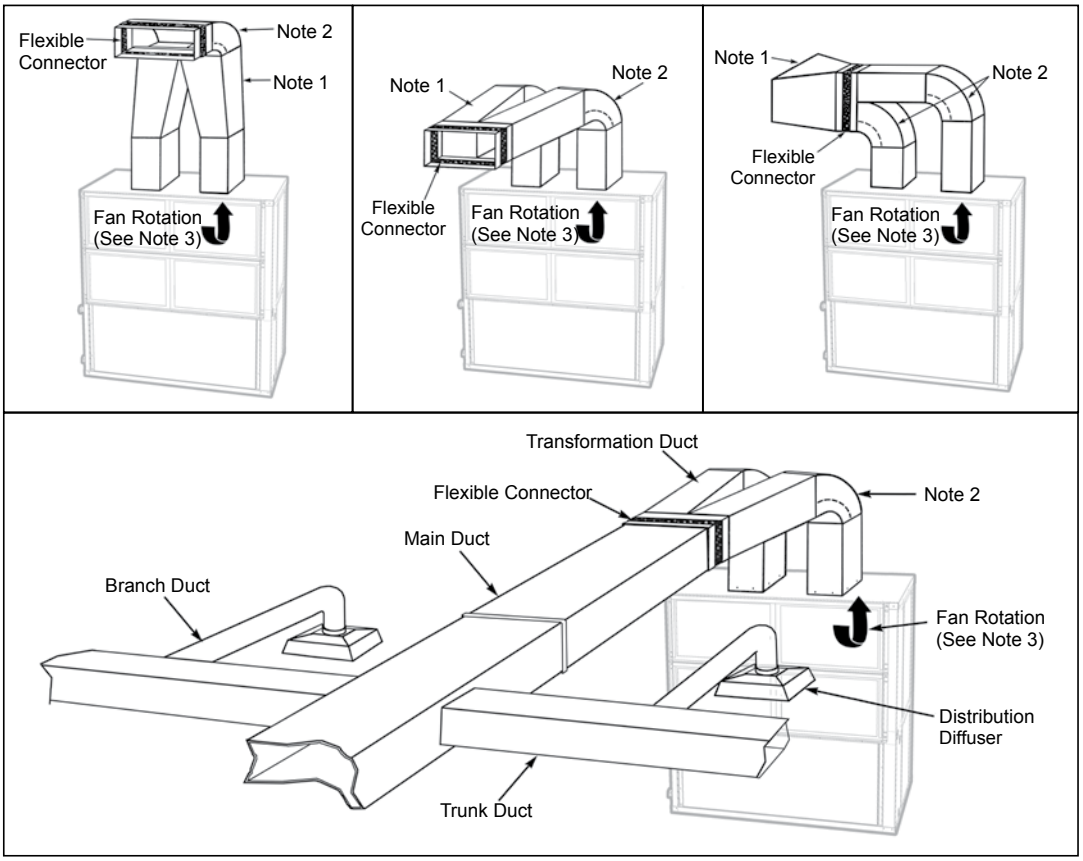
Ventilation air

Outside air may be required for ventilation. The temperature of the ventilation air must be controlled so that mixture of outside air and return air entering the conditioner does not exceed conditioner application limits. It is also general practice to close off the ventilation air system during unoccupied periods (night setback).

The ventilation air system is generally a separate building subsystem with distribution ductwork. Simple introduction of the outside air into each return air plenum chamber reasonably close to the conditioner air inlet is not only adequate, but recommended. Do not duct outside air directly to the conditioner inlet. Provide sufficient distance for thorough mixing of outside and return air.

Notes:
1. *Transformations to supply duct have maximum slope of 1" to 7".*
2. *Square elbows with double thickness vanes may be substituted.*
3. *Do not install ducts so that the air flow is counter to fan rotation. If necessary, turn fan deck assembly and motor.*
4. *Transformations and units shall be adequately supported so no weight is on the flexible connection.*

Figure 10: Suggested supply ducting per ASHRAE and SMACNA publications



Accessory 2" deep filter rack kit with return air duct flange

The (field- installed) accessory 2" filter rack with duct flange allows for connection of return air ducting to the unit. Unit sizes 072 through 120 require four filters, and six filters for unit sizes 180 through 290.

The kits are installed as follows:

1. Remove all filters, filter racks and brackets. Save all screws. Discard bracket end.
2. Attach top duct collar in conjunction with top filter rack with truss head screws.
3. Attach bottom duct collar and filter rack.
4. On single compressor units, attach two flanges using four (4) #8 truss head screws provided.
5. Attach center support in original location.
6. Locate and attach center filter racks using screw provided.
7. Attach duct collar sides using eight (8) #10 sheet metal
8. No point in the drain system may be above the drain connection of any unit.
9. Automatic flow controlled devices must not be installed prior to system cleaning and flushing.
10. A high point of the piping system must be vented.
11. Check local code for the need of dielectric fittings.

Figure 11: Field-installed accessory 2" deep filter rack kit with return air duct flange – sizes 072-120

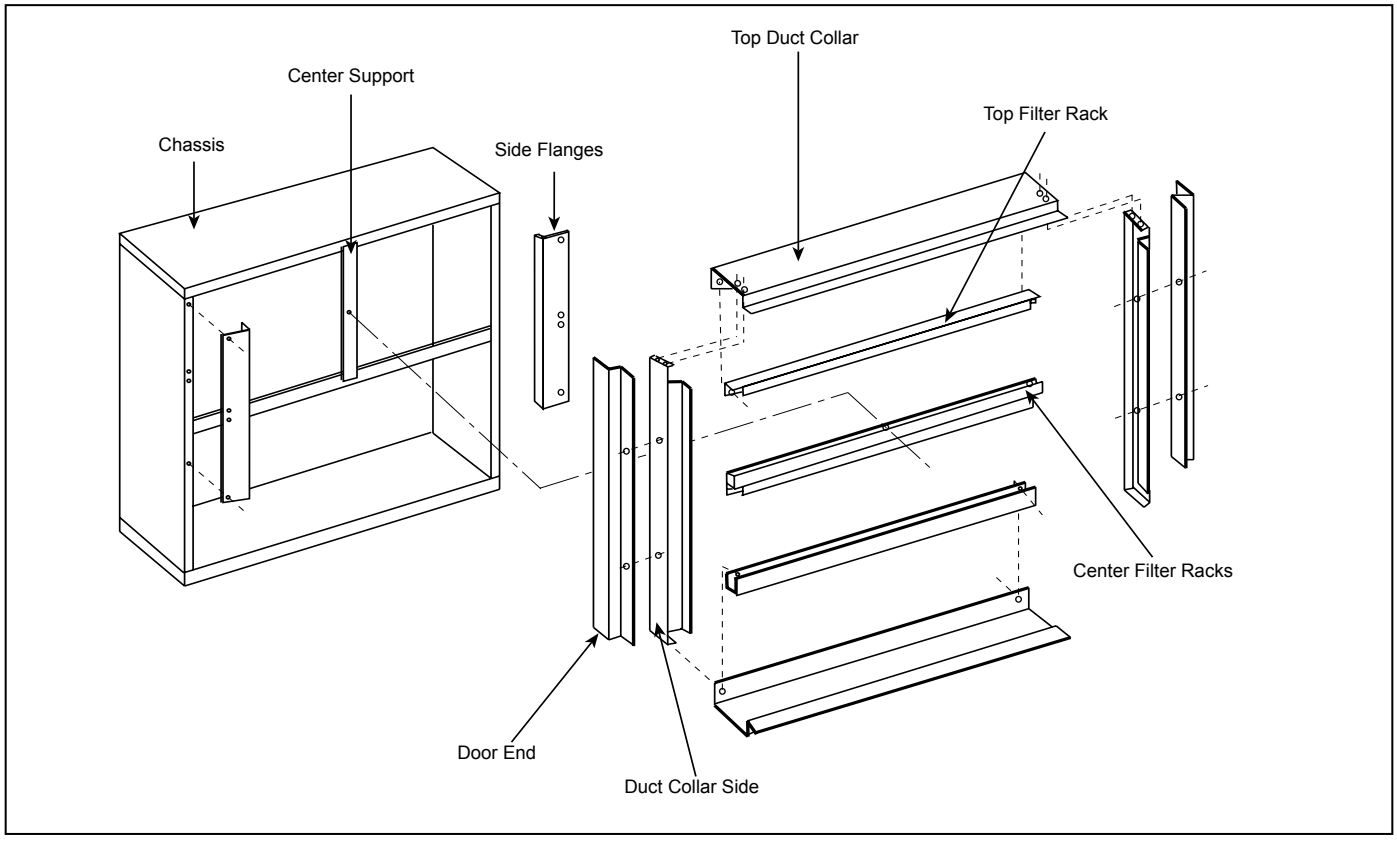
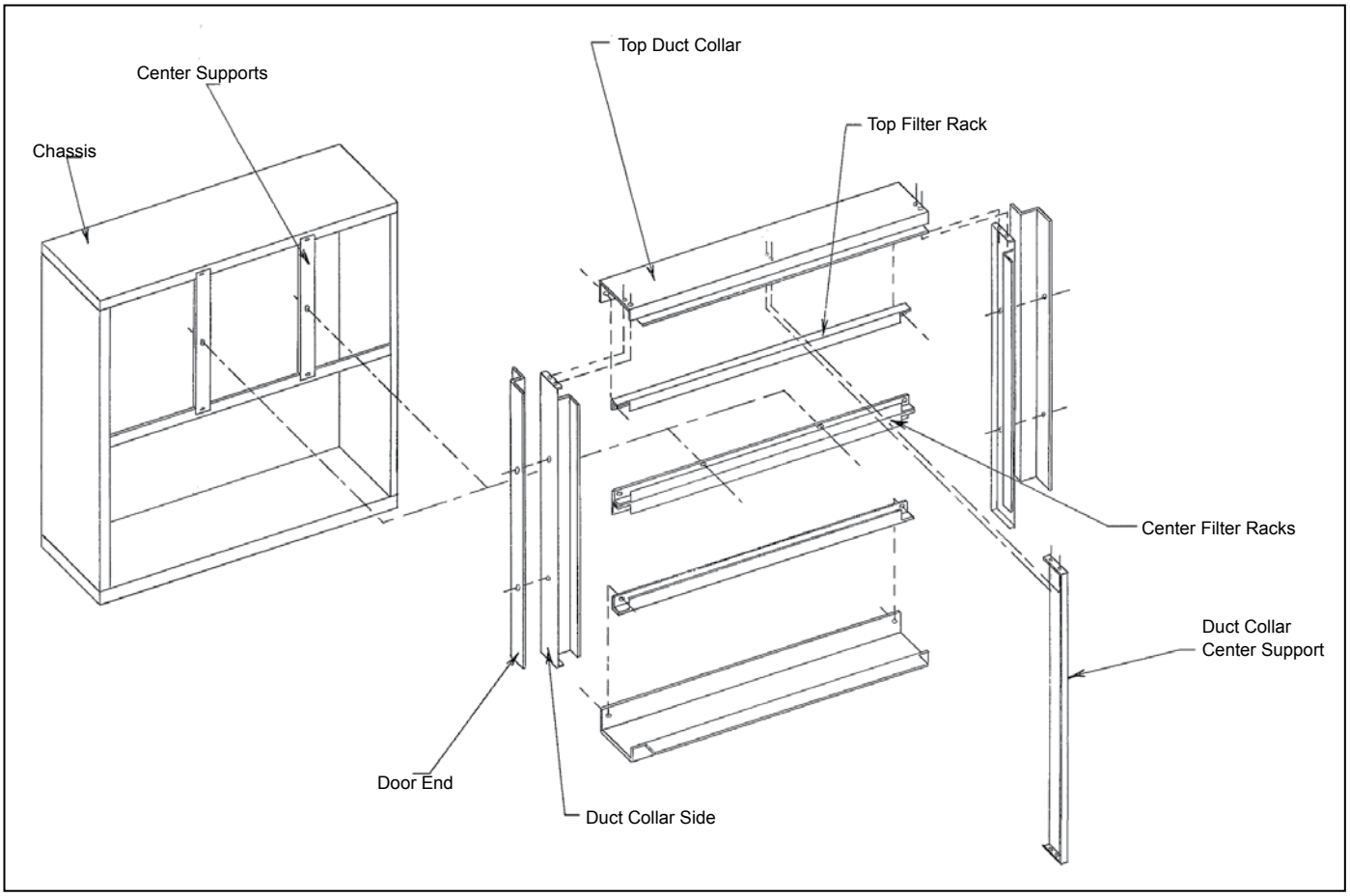


Figure 12: Field-installed accessory 2" deep filter rack kit with return air duct flange – sizes 180-290



Piping

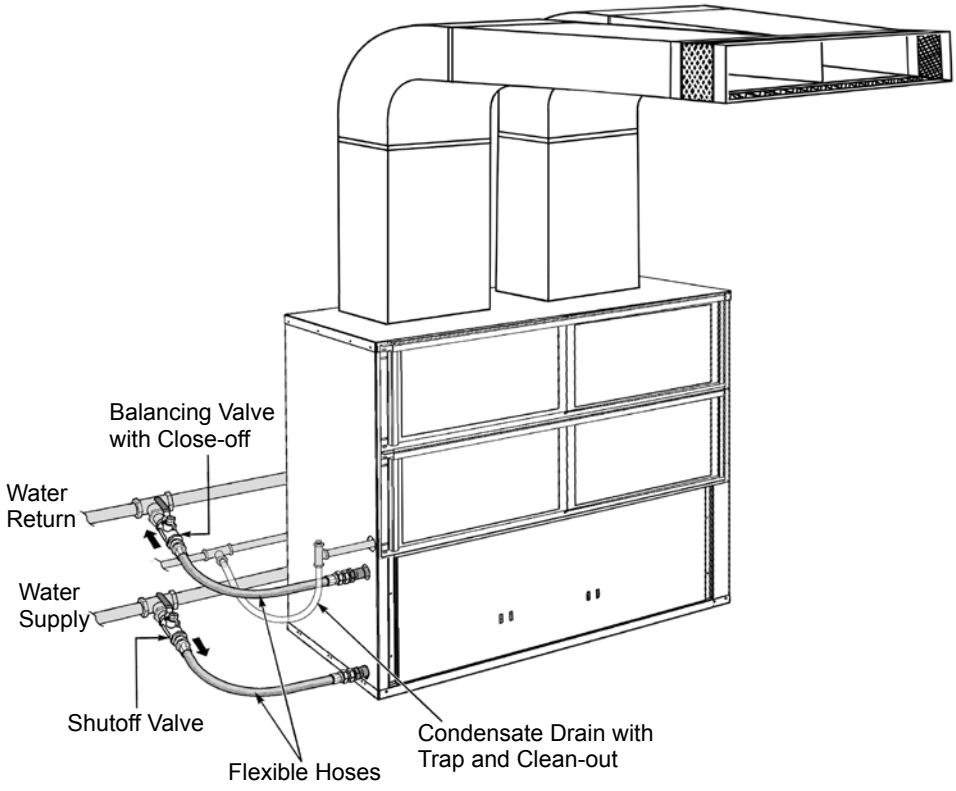
1. All units should be connected to supply and return piping in a two-pipe reverse return configuration. A reverse return system is inherently self-balancing and requires only trim balancing where multiple quantities of units with different flow and pressure drop characteristics exist in the same loop. Check for proper water balance by measuring differential temperature reading across the water connections. To insure proper water flow, the differential flow should be 10°F to 14°F (5°C to 8°C) for units in cooling mode. A direct return system may also work acceptably, but proper water flow balancing is more difficult to achieve and maintain.
2. The piping must comply with local codes.

⚠ 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.

3. Supply and return run-outs usually join the unit via short lengths of high pressure flexible hose which are sound attenuators for both unit operating noise and hydraulic pumping noise. One end of the hose should have a swivel fitting to facilitate removal for service. Hard piping can also be brought directly to the unit. This option is not recommended since no vibration or noise attenuation can be accomplished. The hard piping must have unions to facilitate unit removal. See Figure 13 for typical piping setup.
4. Some flexible hose threaded fittings are supplied with sealant compound. If not, apply Teflon tape to assure a tight seal.
5. Supply and return shutoff valves are required at each conditioner. The return valve is used for balancing and should have a “memory stop” so that it can always be closed off but can only be reopened to the proper position for the flow required.
6. No unit should be connected to the supply and return piping until the water system has been cleaned and flushed completely. After the cleaning and flushing has taken place, the initial connection should have all valves wide open in preparation for water system flushing.
7. Condensate piping should be installed per local codes. Each unit includes a condensate connection.

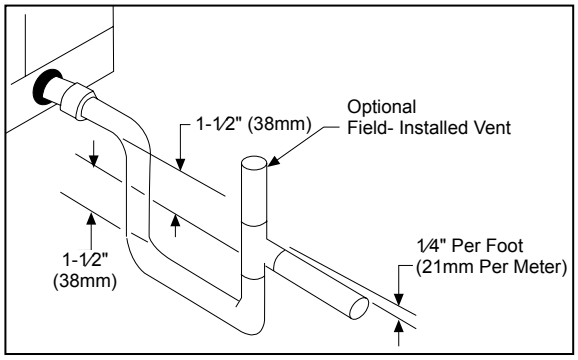
Figure 13: Typical piping



Condensate Drain Connection

A field provided condensate trap must be installed on each water source heat pump. Condensate removal piping must be pitched away from the unit not less than 1/4" per foot. The vent should extend at least 1-1/4" above the unit condensate fitting. A vent is required after the trap so that the condensate will drain away from the unit. The vent can also act as a clean out if the trap becomes clogged. To avoid having waste gases entering the building, the condensate drain should not be directly piped to a drain/waste/vent stack. See local codes for the correct application of condensate piping to drains

Figure 14: Unit condensate drain pipe trap detail



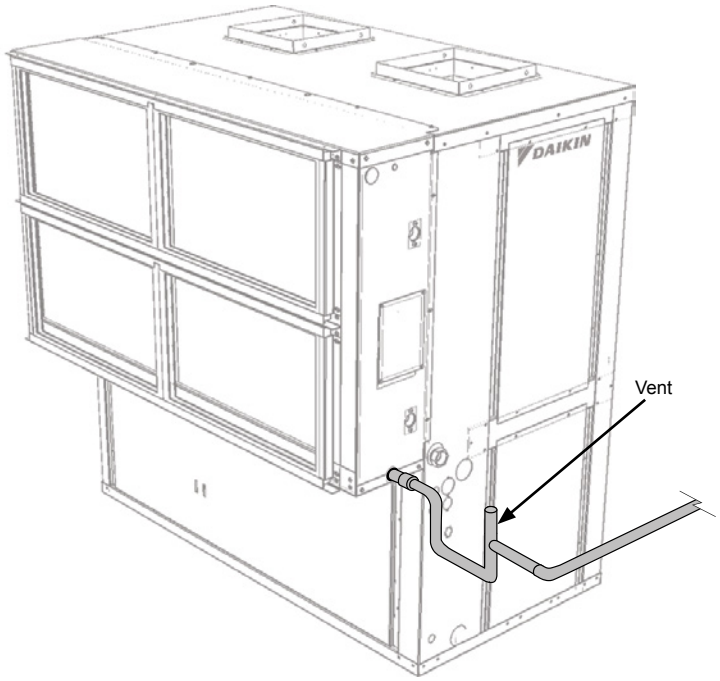
Note: *Improper trapping can lead to several problems. If the trap is too tall, negative pressure will prevent drainage, causing condensate backup. If the trap is too short the seal will be destroyed or nonexistent, producing the same effect as a non-trapped system.*

1. Each water source heat pump is provided with a 3/4" FPT flush mount fitting for connection of a condensate drain. A complete steel or copper condensate system can be used. Steel or copper condensate piping should be insulated to prevent sweating.
2. Do not locate any point in the drain system above the condensate drain connection of any unit.

It may be necessary to manually fill the trap at system startup, or to run the unit for sufficient time to build a condensate seal. The condensate trap and condensate piping drainage should be free of any foreign debris. Debris can prevent proper drainage and unit operation and result in condensate buildup.

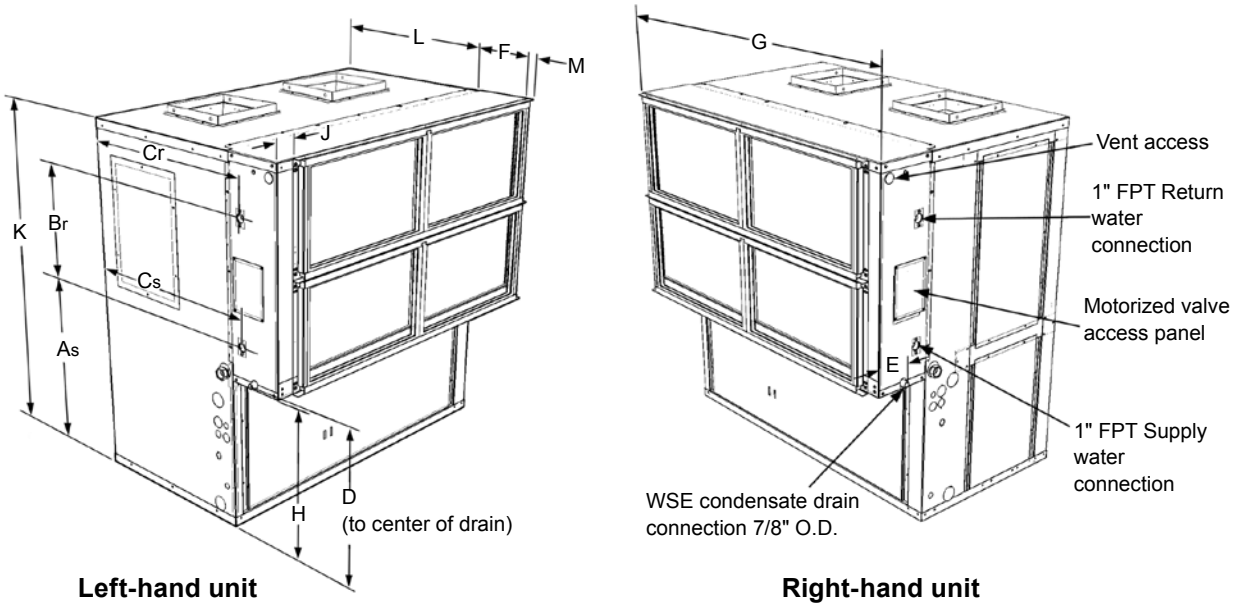
3. Do not locate any point in the drain system above the drain connection of any unit.
4. Automatic flow controlled devices must not be installed prior to system cleaning and flushing.
5. A high point of the piping system must be vented.
6. Check local code for the need for dielectric fittings.

Figure 15: WSE condensate drain pipe detail



Typical Piping With Optional Waterside Economizer

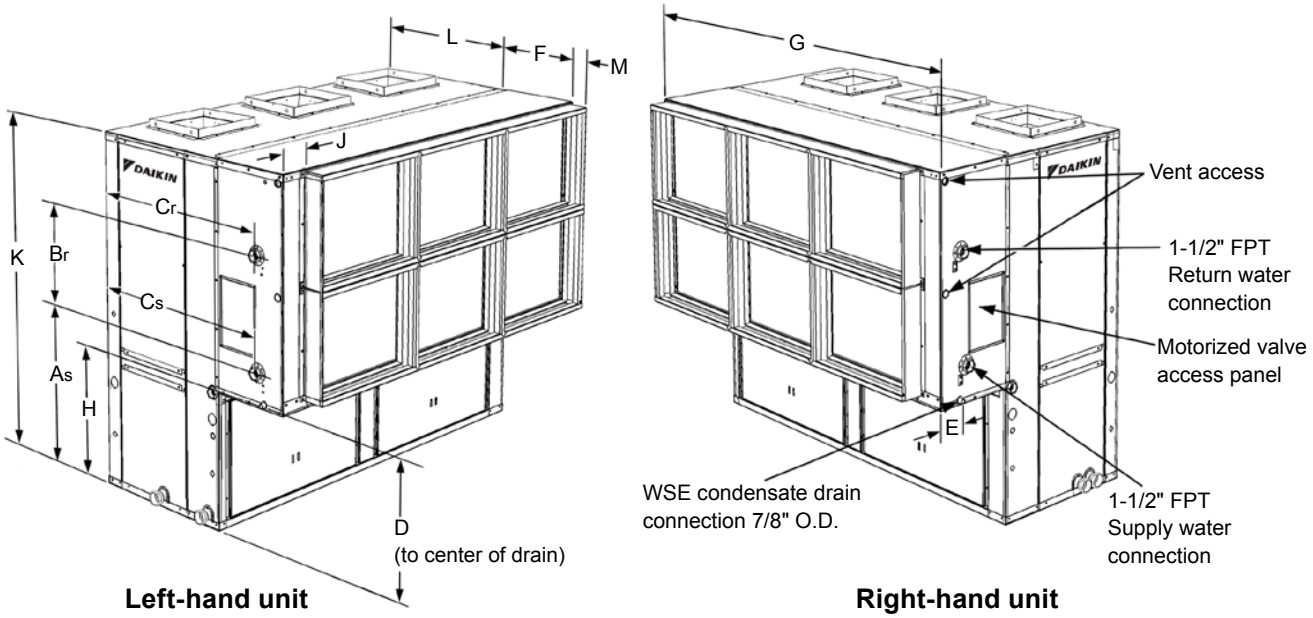
WSE piping location dimensions – sizes 072-120



Left-hand unit **Right-hand unit**

Note: *Piping connections from WSE return to unit supply to be field installed*

WSE piping location dimensions – sizes 180-290



Left-hand unit **Right-hand unit**

Note: *Piping connections from WSE return to unit supply to be field installed*

Unit Size	Supply & Return Connections					Condensate Drain 7/8" O.D.		F	G	H	J	K	L	M (filter rack)	
		As	Br	Cs	Cr	D	E							Stan-dard	Op-tional
072 – 120[1]	Left & right-hand	28.80	18.27	30.00	30.00	24.00	4.50	9.00	54.90	23.15	3.80	55.75	28.00	1.13"	2.13" or 4.13"
180 – 290[2]	Left-hand	31.53	20.66	39.92	39.75	26.18	4.50	16.00	80.63	25.33	5.10	67.25	30.00		
	Right-hand	32.13	20.39	39.92	41.16										

Notes: *[1] Supply and return piping connections = 1-1/4" FPT.*
[2] Supply and return piping connections = 1-1/2" FPT.

Factory installed filter rack without duct flange (options) for large vertical units

- Standard 1" disposable filter
- Merv 8 in 2" frame
- Merv 13 in 4" frame
- No filter with 2" filter rack (low leak)
- No filter-no filter rack

Field installed filter rack with return air duct flange (accessory) for large vertical units

- 2" filter rack with return air duct flange

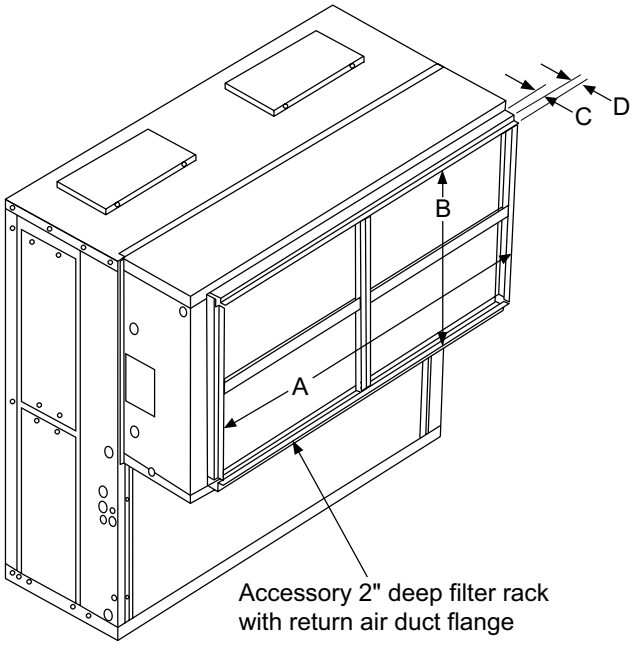
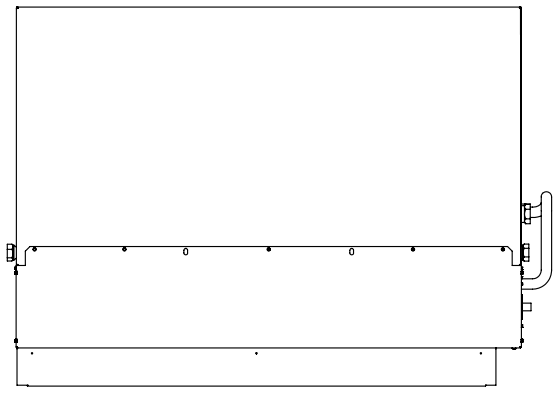


Table 2: Accessory filter rack with return air duct flange dimensions

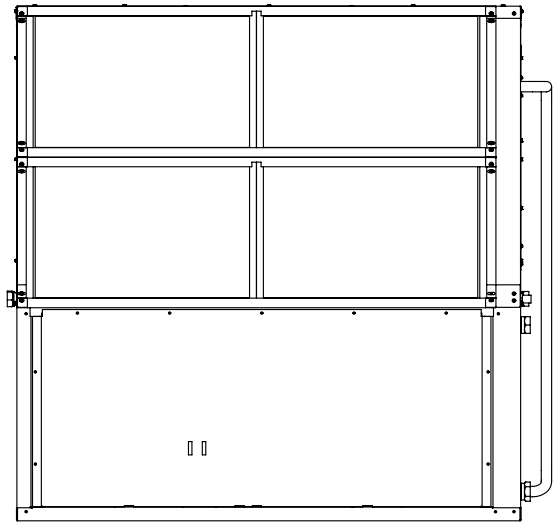
Unit Size	A	B	C	D	Filters (quantity)
			2" deep		
072-120	50.10"	30.90"	2.29"	1"	4
180-290	74.10"	38.90"			6

Note: *Dimensions are to outside edge of filter rack flange.*

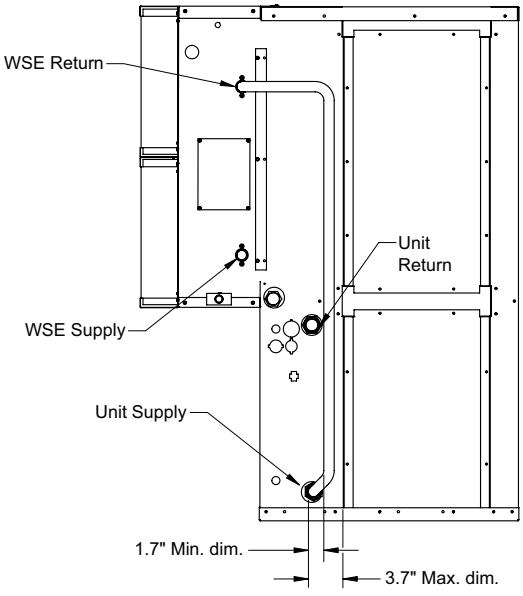
Typical WSE field provided and installed jumper piping routing details – LVC/LVW– sizes 072-120, right-hand



Top View

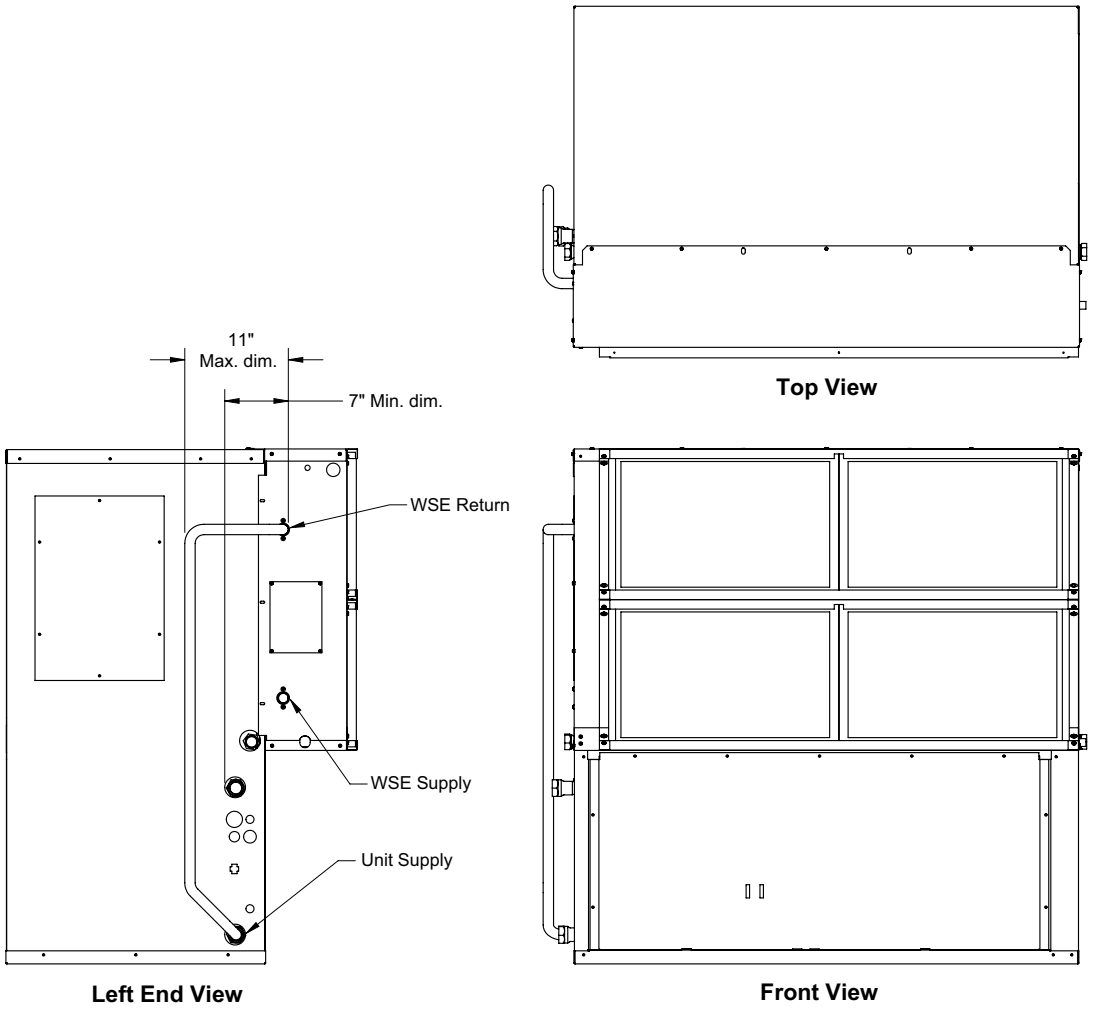


Front View



Right End View

LVC/LVW – sizes 072-120, left-hand

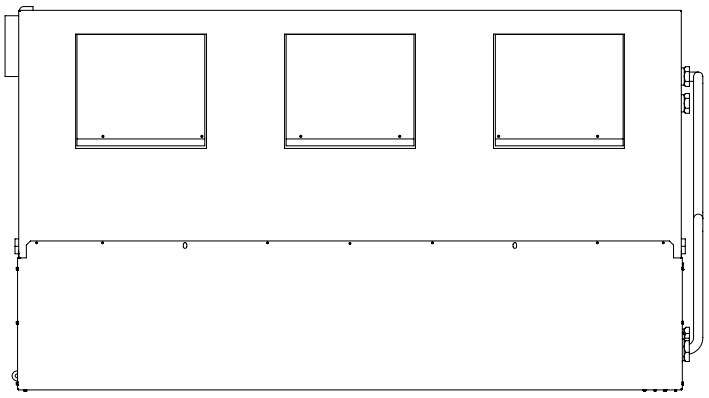


Top View

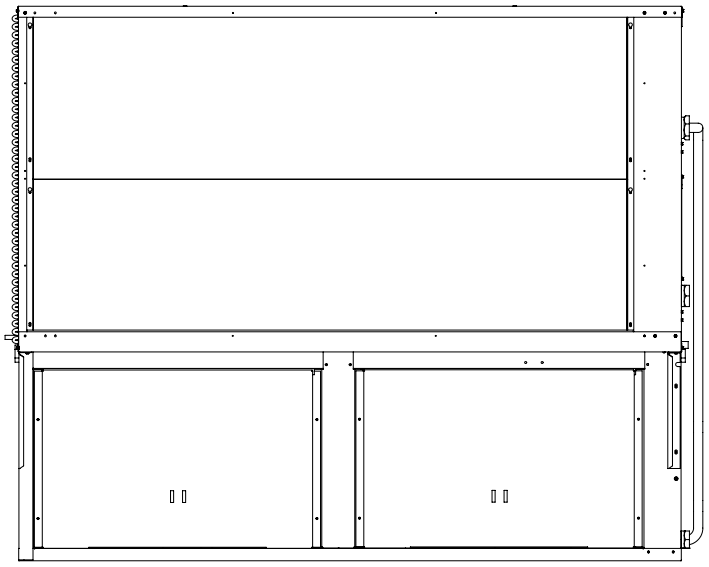
Left End View

Front View

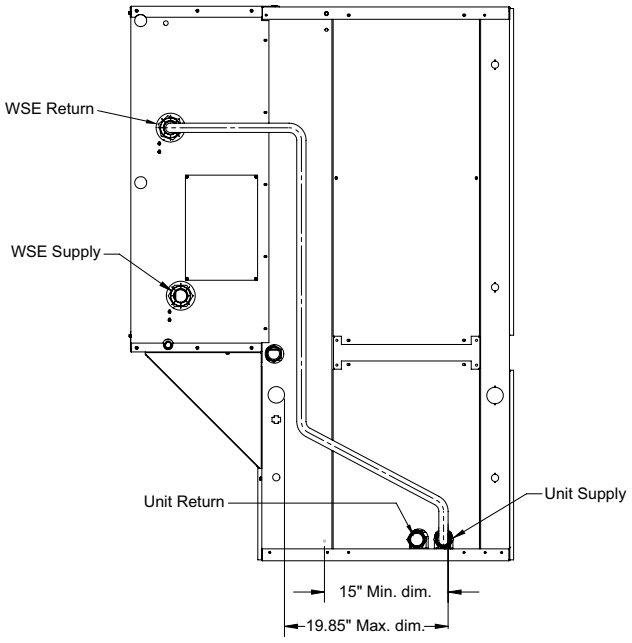
Typical WSE field provided and installed jumper piping routing details – LVC/LVW– sizes 180-290, right-hand



Top View

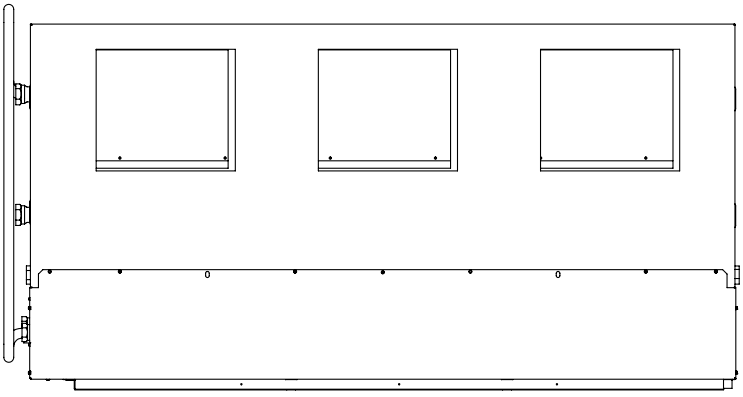


Front View

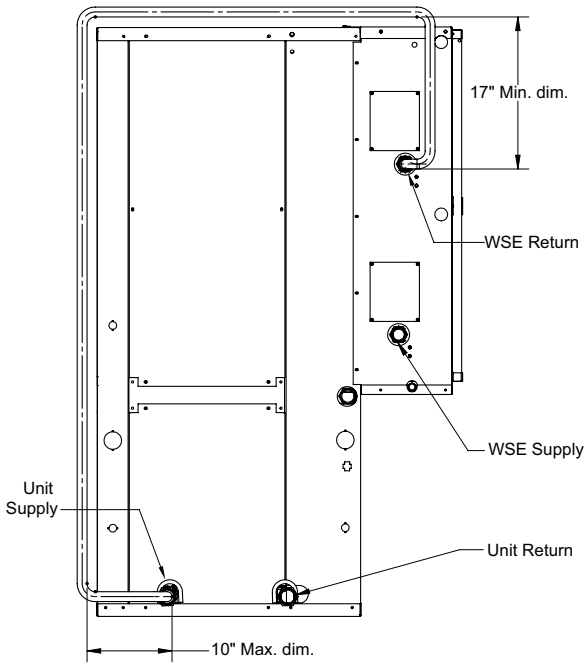


Right End View

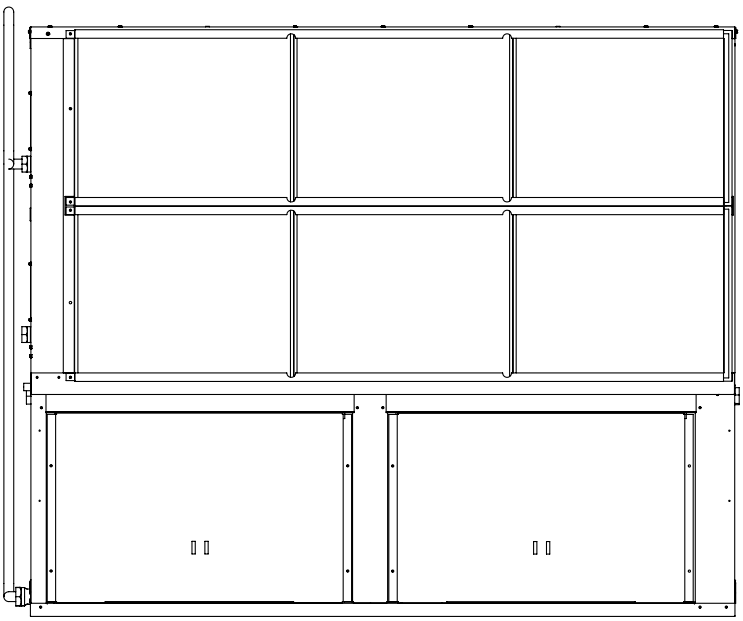
LVC/LVW – sizes 180-290, left-hand



Top View



Left End View



Front View

Water System Quality

The cleaning, flushing and chemical treatment of a water source heat pump system is fundamental to efficient operation and the life expectancy of the system.

Potential system problems produced by the use of water fall into three general categories:

- **Scale formation –** Mineral deposits which result from the crystallization and precipitation of dissolved salts in the water. The deposits form an insulating barrier, reducing the heat transfer rate and impeding the circulation of fluids due to increased pressure drop.
- **Corrosion –** Decomposition of the metal caused by absorption of gases from the air. Corrosion may occur in any metal component of the system.
- **Organic growths –** Slime and algae which form under certain environmental conditions, and can reduce the heat transfer rate by forming an insulating coating or can promote corrosion by pitting.

The system water should be evaluated for degrees of impurity, with testing available from independent testing labs, health departments or state agencies.

Table 3 is a list of water characteristics, the potential impurities and their results and the recommended treatment.

Avoiding Potential Problems

As shown in Table 3, all water contains some degree of impurities which may affect the performance of a heat pump system. The use of a cupro-nickel coil can help avoid potential problems. Water flow rates should:

- Be high enough that the temperature rise through the heat exchanger does not exceed 10° F when operating in the cooling mode.
- Not exceed 4 GPM per nominal ton. Flow rates that have velocities of 10 feet per second or more may cause pipe erosion and heat exchanger failure.

Table 3: Water quality conditions & applications

Potential Problem	Chemical(s) or Condition	Range for Copper Heat Exchangers	Range of Cupronickel Heat Exchanger
Scaling	Calcium & Magnesium Carbonate	Less than 350 ppm	Less than 350 ppm
Corrosion	pH Range	7 – 9	5 – 9
	Total Dissolved Solids	Less than 1000 ppm	Less than 1500 ppm
	Ammonia, Ammonium Hydroxide	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonium Chloride, Ammonium Nitrate	Less than 0.5 ppm	Less than 0.5 ppm
	Calcium Chloride/ Sodium Chloride	Less than 125 ppm	Less than 125 ppm - Note 4
	Chlorine	Less than 0.5 ppm	Less than 0.5 ppm
	Hydrogen Sulfide	None Allowed	None Allowed
Biological Growth	Iron Bacteria	None Allowed	None Allowed
	Iron Oxide	Less than 1 ppm	Less than 1 ppm
Erosion	Suspended Solids	Less than 10 ppm	Less than 10 ppm
	Water Velocity	Less than 8 ft./s	Less than 12 ft./s

Notes: *1. Water hardness in ppm is equivalent to hardness in mg/L.*

2. Grains/gallon = ppm divided by 17.1.

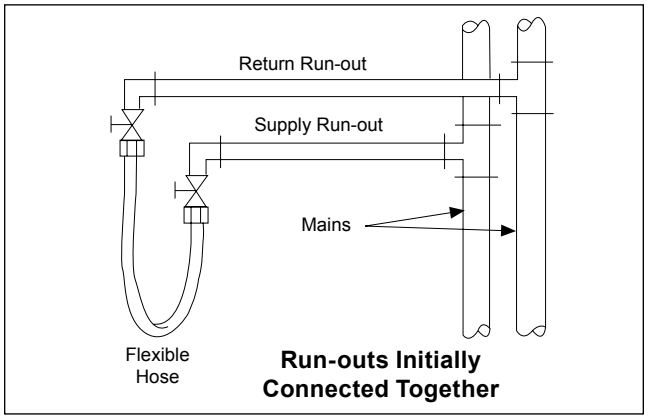
3. Copper and cupronickel heat exchangers are not recommended for pool applications for water outside the range of the table. Secondary heat exchangers are required for applications not meeting the requirements shown above.

4. Salt water applications (approx. 25,000 ppm) require secondary heat exchangers due to copper piping between the heat exchanger and the unit fittings.

Cleaning & flushing system

1. Prior to first operation of any conditioner, the water circulating system must be cleaned and flushed of all construction dirt and debris.
   If the conditioners are equipped with water shutoff valves, either electric or pressure operated, the supply and return run-outs must be connected together at each conditioner location. This will prevent the introduction of dirt into the unit (Figure 16).

Figure 16: Supply & return run-outs connected together



2. Fill the system at the city water makeup connection with all air vents open. After filling, close all air vents. The contractor should start main circulator with the pressure reducing valve open. Check vents in sequence to bleed off any trapped air, ensuring circulation through all components of the system. Power to the heat rejector unit should be off, and the supplementary heat control set at 80°F (27°C).While circulating water, the contractor should check and repair any leaks in the piping. Drains at the lowest point(s) in the system should be opened for initial flush and blowdown, making sure city water fill valves are set to make up water at the same rate. Check the pressure gauge at pump suction and manually adjust the makeup to hold the same positive steady pressure both before and after opening the drain valves. Flush should continue for at least two hours, or longer if required, to see clear, clean drain water.

3. Shut off supplemental heater and circulator pump and open all drains and vents to completely drain down the system. Short circuited supply and return run-outs should now be connected to the conditioner supply and return connections. Do not use sealers at the swivel flare connections of hoses.

4. Trisodium phosphate was formerly recommended as a cleaning agent during flushing. However, many states and localities ban the introduction of phosphates into their sewage systems. The current recommendation is to simply flush longer with warm 80°F (27°C) water.

5. Refill the system with clean water. Test the water using litmus paper for acidity, and treat as required to leave the water slightly alkaline (pH 7.5 to 8.5). The specified percentage of antifreeze may also be added at this time. Use commercial grade antifreeze designed for HVAC systems only. Do not use automotive grade antifreeze.
   Once the system has been filled with clean water and antifreeze (if used), precautions should be taken to protect the system from dirty water conditions. Dirty water will result in system wide degradation of performance and solids may clog valves, strainers, flow regulators, etc. Additionally, the heat exchanger may become clogged which reduces compressor service life or causes premature failure.

6. Set the loop water controller heat add setpoint to 70°F (21°C) and the heat rejection setpoint to 85°F (29°C). Supply power to all motors and start the circulating pumps. After full flow has been established through all components including the heat rejector (regardless of season) and air vented and loop temperatures stabilized, each of the conditioners will be ready for check, test and start-up, air balancing, and water balancing.

Operating limits

Information for initial start-up only

Standard range units:

Units are designed to start in an ambient of 50ºF (10ºC), with entering air at 50ºF (10ºC), with entering water at 70ºF (21ºC), with both air and water at the flow rates used in the ISO 13256-1 rating test, for initial start-up in winter.

Note: *This is not a normal or continuous operating condition. It is assumed that such a start-up is for the purpose of bringing the building space up to occupancy temperature.*

Extended range units:

Extended range heat pump conditioners are designed to start in an ambient of 40ºF (5ºC), with entering air at 40ºF (5ºC), with entering water at 40ºF (5ºC), with both air and water at the flow rates used in the ISO 13256-1 rating test, for initial start-up in winter.

Note: *This is not a normal or continuous operating condition. It is assumed that such a start-up is for the purpose of bringing the building space up to occupancy temperature.*

Table 4: Water source heat pump operating temperature limits (for continuous duty)

Operating Mode	Entering Air °F				Entering Water °F			
	Minimum		Maximum		Standard Range		Extended Range	
	DB	WB	DB	WB	Minimum	Maximum	Minimum	Maximum
Cooling	65	55	85	71	55	110	50	110
Ambient	50	–	100	–	–	–	–	–
Heating	50	–	80	–	55	90	20	90
Ambient	50	–	85	–	–	–	–	–

Notes: *1. In the heating mode, the sum of the entering air + entering water must be ≥ 100°F.*

2. MINIMUM WATER FLOW = 1.5 GPM/Ton.

3. Maximum and minimum values may not be combined. If one value is at maximum or minimum, the other two conditions may not exceed the normal condition for standard units. Extended range units may combine any two maximum conditions, but not more than two, with all other conditions being normal conditions.

Table 5: Water source heat pump operating temperature limits at start-up (not for continuous duty)

Operating Mode	Entering Air °F				Entering Water °F			
	Minimum		Maximum		Standard Range		Extended Range	
	DB	WB	DB	WB	Minimum	Maximum	Minimum	Maximum
Cooling	50	40	105	87	45	120	30	120
Ambient	45	–	110	–	–	–	–	–
Heating	40	–	85	–	40	95	20	100
Ambient	40	–	85	–	–	–	–	–

Environment

This equipment is designed for indoor installation only. Sheltered locations such as attics, garages, etc., generally will not provide sufficient protection against extremes in temperature and/or humidity, and equipment performance, reliability, and service life may be adversely affected.

Power supply

A voltage variation of +/-10% of nameplate voltage is acceptable. Three-phase system imbalance shall not exceed 2%.

Electrical data

General

1. Verify the compatibility between the voltage and phase of the available power and that shown on the unit serial plate. Line and low voltage wiring must comply with local codes or the National Electrical Code, whichever applies.

2. Apply correct line voltage to the unit. A 7⁄8" (22mm) hole and/or a 1-1⁄8" (29 mm) knockout is supplied on the side of the unit. A disconnect switch near the unit is required by code. Power to the unit must be sized correctly and have dual element (Class RK5) fuses or an HACR circuit breaker for branch circuit over-current protection. See the nameplate for correct ratings.

3. Three phase 50 cycle units require a neutral wire for 230/50-1 power to the fan circuit.

4. Connect the thermostat/subbase wiring with the power “off ” to the unit.

5. Field supplied relays installed on the input terminals W1, W2, Y1, Y2 or G may introduce electrical noise. Never install relay coils in series with the inputs.

Operating voltages

208/230-60-1 .....197 volts min.; 253 volts max.
265-60-1 .....238 volts min.; 292 volts max.
230-50-1 .....197 volts min.; 253 volts max.
460-60-3 .....414 volts min.; 506 volts max.
575-60-3 .....515 volts min.; 632 volts max.

Note: *Voltages listed are to show voltage range. However, units operating with over-voltage and under-voltage for extended periods of time will experience premature component failure. Three phase system unbalance should not exceed 2%.*

Additional information for initial start-up standard range units LVC

Units are designed to start-up in an ambient of 50°F (10°C), with entering air at 50°F (10°C), with entering water at 70°F (21°C), with both air and water flow rates used in the ISO 13256-1 rating test, for initial start-up in winter.

Note: *This is not a normal or continuous operating condition. It is assumed that such a start-up is for the purpose of bringing the building space up to occupancy temperature.*

Extended range LVW units

Extended range heat pump units are designed to start-up in an ambient of 50°F (10°C), with entering air at 40°F (10°C), with entering water at 25°F (-4°C), with both air and water at flow rates used in the ISO 13256-1 rating test, for initial start-up in winter.

Note: *This is not a normal or continuous operating condition. It is assumed that such a start-up is for the purpose of bringing the building space up to occupancy temperature.*

Antifreeze correction factors

Table 6: Ethylene glycol

	10%	20%	30%	40%	50%
Cooling Capacity	0.9950	0.9920	0.9870	0.9830	0.9790
Heating Capacity	0.9910	0.9820	0.9770	0.9690	0.9610
Pressure Drop	1.0700	1.1300	1.1800	1.2600	1.2800

Table 7: Propylene glycol

	10%	20%	30%	40%	50%
Cooling Capacity	0.9900	0.9800	0.9700	0.9600	0.9500
Heating Capacity	0.9870	0.9750	0.9620	0.9420	0.9300
Pressure Drop	1.0700	1.1500	1.2500	1.3700	1.4200

Table 8: Methanol

	10%	20%	30%	40%	50%
Cooling Capacity	0.9980	0.9720	–	–	–
Heating Capacity	0.9950	0.9700	–	–	–
Pressure Drop	1.0230	1.0570	–	–	–

Table 9: Ethanol

	10%	20%	30%	40%	50%
Cooling Capacity	0.9910	0.9510	–	–	–
Heating Capacity	0.9950	0.9600	–	–	–
Pressure Drop	1.0350	0.9600	–	–	–

Start-up

1. Open all valves to full open position and turn on power to the conditioner.
2. Jumpers must be configured prior to connecting supply power. See Table 10 and Table 11 on page 25.

Note: *The settings of the hardware configuration jumpers are read when the controller is powered. Any changes to the jumper settings require cycling power to the controller or sending a controller a reboot command through the network communications.*

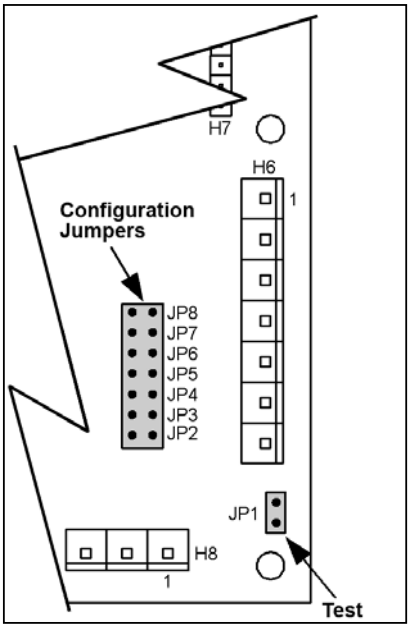
Table 10: MicroTech III controller configuration jumper settings

Baseboard Description	Jumper(s)	Jumper Setting	Function
Normal / Test Mode	JP1	Open	Normal Operation
		Shorted	Service / Test Mode
Fan Operation	JP2	Open	Continuous Fan Operation (On), when not operating in the unoccupied mode.
		Shorted	Cycling Fan Operation (Auto)
Loop Fluid	JP3 (see warning)	Open	Water Loop Fluid - Water freeze protection (factory default setting)
		Shorted	Glycol Loop Fluid - Systems with anti-freeze protection
Freeze Fault Protection	JP4	Open	None
		Shorted	Freeze fault protection enabled
Room Sensor Setpoint Potentiometer Range	JP5	Open	Short Range: -5 to +5 ºF (-2.78 to +2.78 ºC)
		Shorted	Long Range: 55 to 95ºF (12.78 to 35ºC)
Thermostat / Room Sensor	JP6	Open	Thermostat Control
		Shorted	Room Sensor Control
Compressor Availability	JP7 & JP8	JP7 Open	Both Compressors Available (default)
		JP8 Open	
		JP7 Shorted	One Compressor Available
		JP8 Open	
		JP7 Open	No Compressors Available
		JP8 Shorted	

⚠ WARNING

Jumper JP3 is factory provided in the open position. Extended range units require freeze protection down to 15 degrees. Jumper JP3 must be field configured.

Figure 17: Location of configuration jumpers on the MicroTech III unit controller

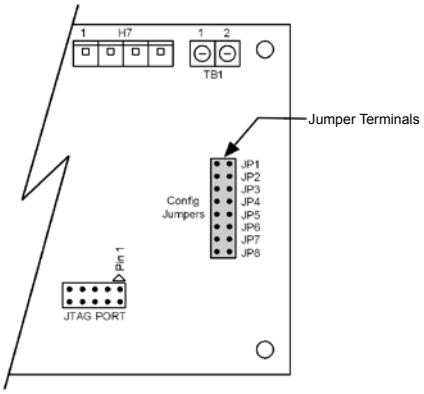


Note: *The settings of the hardware configuration jumpers are read when the controller is powered. Any changes to the jumper settings require cycling power to the controller or sending a controller a reboot command through the network communications.*

Table 11: I/O expansion module jumper settings

I/O Expansion Description	Jumper(s)	Jumper Setting		Model
Not Used	JP1	JP1	Open	–
Not Used	JP2	JP2	Open	–
Secondary Heating Options	JP3 & JP4	JP3	Open	None
		JP4	Open	
		JP3	Shorted	Supplemental Electric Heat
		JP4	Open	
		JP3	Open	Boilerless Electric Heat
		JP4	Shorted	
Cooling / Dehumidification Options	JP5 & JP6	JP5	Shorted	Without Hydronic Cooling
		JP6	Open	
		JP5	Open	Hydronic Cooling (Waterside Economizer)
		JP6	Shorted	
Not Used	JP7	JP7	Open	–
Lead Compressor Option	JP8	JP8	Open	Compressor #1 is Lead (factory default setting)
		JP8	Shorted	Compressor #2 is Lead

Figure 18: I/O expansion module configuration jumper terminals



3. Set thermostat to “Cool”. If the thermostat is an automatic changeover type, simply set the cooling temperature to the coolest position. On manual changeover types additionally, select “Cool” at the system switch.
Again, many conditioners have time delays which protect the compressor(s) against short cycling. After a few minutes of operation, check the discharge grilles for cool air delivery. Measure the temperature difference between entering and leaving water. It should be approximately 1½ times greater than the heating mode temperature difference. For example, if the cooling temperature difference is 15°F (8°C), the heating temperature difference should have been 10°F (5°C).
Without automatic flow control valves, target a cooling temperature difference of 10°F to 14°F (5°C to 8°C). Adjust the combination shutoff/balancing valve in the return line to a water flow rate which will result in the 10˚F to 14°F (5°C to 8°C) difference.

4. Set thermostat to “Heat.” If the thermostat is the automatic changeover type, set system switch to the “Auto” position and depress the heat setting to the warmest selection. Some conditioners have built-in time delays which prevent the compressor from immediately starting. With most control schemes, the fan will start immediately. After a few minutes of compressor operation, check for warm air delivery at discharge grille. If this is a “cold building” start-up, leave unit running until return air to the unit is at least 65°F (18°C). Measure the temperature difference between entering and leaving air and entering and leaving water. With entering water of 60°F to 80°F (16°C to 27°C), leaving water should be 6°F to 12°F (3.3°C to 6.6°C) cooler (under full load conditions) and the air temperature rise through the machine should not exceed 35°F (19°C). If the air temperature exceeds 35°F (19°C), then the water flow rate is inadequate.

5. Check the elevation and cleanliness of the condensate line. If the air is too dry for sufficient dehumidification, slowly pour enough water into the condensate pan to ensure proper drainage.

6. If the conditioner does not operate, check the following points:

a. Is supply voltage to the machine compatible?

b. Is thermostat type appropriate?

c. Is thermostat wiring correct?

7. If the thermostat operates but stops after a brief period:
   a. Is there proper airflow? Check for dirty filter, incorrect fan rotation (3-phase fan motors only), or incorrect ductwork.
   b. Is there proper water flow rate within temperature limits? Check water balancing; back-flush unit if dirt-clogged.
8. Check for vibrating refrigerant piping, fan wheels, etc.
9. Do not lubricate the fan motor during the first year of operation as it is pre-lubricated at the factory.
10. Field supplied relays installed on the input terminals W1, W2, Y1, Y2 or G may introduce electrical noise. Never install relay coils in series with the inputs.

Control options

The control enclosure houses the major operating electrical controls including the MicroTech III controller and I/O expansion module, control transformer, compressor relays and fan relay. Each component is easily accessed for service or replacement.

Three unique control choices are offered with the MicroTech III control system:

- Standalone operation using a MicroTech III controller and I/O expansion module
- MicroTech III controller with I/O expansion module and LonWorks® communication module
- MicroTech III controller with I/O expansion module and BACnet® communication module

Each option features direct quick-connect wiring to all unit-controlled components for “clean” wiring inside the control box. Each control circuit board receives power from a 75 VA transformer.

Figure 19: Control options

Control	Description	Application	Protocol
MicroTech III  (Standalone) Unit Controller with I/O Expansion Module 	The MicroTech III controller is a standalone microprocessor-based control board conveniently located in the unit control enclosure for easy accessibility. The board is designed to provide thermostat control of a Water Source Heat Pump using a two-stage wall thermostat. The unit controller provides unit-wide control of the WSHP and control of the first refrigerant circuit.	Each unit controller is factory programmed, wired, and tested for complete control of single zone, standalone operation of your Daikin Water Source Heat Pump.	Unit-mounted or wall-mounted thermostat or room sensor
	The I/O Expansion Module is an extension of the Microtech III controller and provides control of the second refrigerant circuit. External LED status lights display fault conditions to provide easy troubleshooting and diagnosis of the second circuit.	Allows for: Control of second refrigeration circuit, secondary heating options and cooling/dehumidification options.	
LonWorks  Communication Module	The MicroTech III control system accepts a plug-in LonWorks communication module to provide network communications and added functionality to easily integrate with an existing BAS. The communication module can be factory- or field-installed and is tested with all logic required to monitor and control the unit.	LonTalk application protocol is designed for units that are integrated into a LonWorks communication network for centralized scheduling and management of multiple heat pumps.	LonMark 3.4 Certified
BACnet  Communication Module	The MicroTech III controller accepts a plug-in BACnet communication module to provide network communications and added functionality to easily integrate with an existing BAS. The communication module can be factory- or field-installed and is tested with all logic required to monitor and control the unit.	Designed to be linked with a centralized building automation system (BAS) through a BACnet communications network for centralized scheduling and management of multiple heat pumps.	BACnet MS/TP

MicroTech® III controller

⚠ DANGER

To avoid electrical shock, personal injury or death, be sure that field wiring complies with local and national fire, safety, and electrical codes, and voltage to the system is within the limits shown in the job-specific drawings and unit electrical data plate(s). Power supply to unit must be disconnected when making field connections. To avoid electrical shock, personal injury or death, be sure to rigorously adhere to field wiring procedures regarding proper lockout and tagout of components.

General use and information

All Microtech III controller inputs must be operated by dry contacts powered by the control board's power terminals. No solid state devices (Triacs) may be used to operate the Microtech III controller inputs. No outside power source may be used to operate the Microtech III controller inputs.

The MicroTech III control system includes two microprocessor-based control boards conveniently located in the unit control box for easy access through a removable access panel. The standalone controls are a hard wired interface and provides all the necessary field connections. The board can be wired for 24-volt AC output to the wall thermostat by using terminals R & C. Two sets of LED annunciators are located on the front of the unit chassis to allow quick check of the unit operating status.

MicroTech III unit protections & LED fault status annunciation

Assumes cycle fan operation-not continuous fan operation:

- **Start-up –** The unit will not operate until all the inputs and safety controls are checked for normal conditions.
- **Cooling mode** – On an initial call for stage 1 cooling, the fan will energize, the pump request will energize, and the 45 second flow timer will start. When the compressor minimum off, and random startup timers are expired, the lead compressor will start the stage 1 cooling settings. If room setpoint conditions are not satisfied, the lag compressor will start, which is stage 2 cooling settings. When the room setpoint conditions are satisfied, the lag compressor will shut off first followed by the lead compressor when all cooling requests are satisfied. If fan cycling is enabled, the fan will turn off once room setpoint conditions are satisfied.
- **Waterside economizer –** This mode requires the optional factory-installed waterside economizer. A hydronic economizer coil, 3-way water valve and temperature sensor are added to the unit. The purpose of this mode is to satisfy some or all of the cooling demand by using the loop water, which is often reduced to 50°F or less via the cooling tower to achieve sufficient cooling performance.

  When a call for 1st stage cooling is engaged, with the entering loop water below the economizer changeover temperature, the H8 output on the MicroTech III board is activated to open the motorized valve allowing water flow to the equipment. The compressor is locked out, the 3-way water valve opens to allow cool loop water to flow through the economizer coil. The fan starts after 30 seconds (unless it is already on thru activation of the G terminal by the thermostat fan switch "on"). On a further demand for cooling, stage 2; the 1st compressor will start in the cooling mode and the waterside economizer will be disabled. On a further demand for cooling the second compressor will energize. The waterside economizer mode will not be activated if the entering water temperature is below 35°F and an alarm (fault) signal will be generated.
  When the room setpoint conditions are satisfied, the compressor will shut off, the 3-way valve will close and the fan will either shut off (fan switch "auto") or continue to run (fan switch "on"). The minimum off timer of 360 seconds starts. If the loop temperature increases above the changeover temperature, waterside economizer mode will be suspended and the unit will resume normal mechanical cooling mode with stage 1 of the thermostat now starting the compressor.
- **Dehumidification mode –** Uses hot gas reheat with a 2-stage thermostat and humidistat for precise humidity control.
- **Hot gas reheat with temperature control –** If the space temperature setpoint is satisfied, but the space humidity is above the humidity setpoint, the dehumidification mode is activated. The fan will energize, the pump request will energize, the 45 second flow timer will start, the compressor minimum off, and random startup timers expire, the hot gas reheat valve opens sending hot gas to the reheat coil, the lead compressor energizes, and after 180 seconds the lag compressor energizes. Return air is cooled and reheated to near space temperature. A call for cooling will close the hot gas reheat valve and the unit will resume normal cooling operation. If the space cooling and heating temperature setpoints are satisfied, but the humidity falls below the space humidity setpoint, the dehumidification mode is suspended.
- **Heating mode** – On an initial call for heating, the fan will energize, the pump request will energize, the 45 second flow timer will start. After the flow, compressor minimum off, and random startup timers are expired, the lead compressor will start at stage 1 heating settings; the reversing valve shall energize 5 seconds after the lead compressor turns on. If room setpoint conditions are not satisfied, the lag compressor will operate at stage 2 heating settings. When the room setpoint conditions are satisfied, the compressor will shut off. If fan cycling is enabled, the fan will turn off, once room setpoint conditions are satisfied.

Supplemental electric heat control

The supplemental electric heating option provides additional stages of heating that can be used in conjunction with compressor heating, or exclusively if the compressor is not available for heating.

General rules

- Supplemental electric heater and the compressor may operate simultaneously.
- Minimum compressor ON and OFF timers do not apply to electric heat control.

Operation

Fan main output: will turn ON when:

- Any auxiliary heat output is energized.
- For 30 fixed seconds after all auxiliary heat outputs have been de-activated.

Electric heat outputs: are allowed to energize when either condition exists:

- Inter-stage ON timer must be expired.
- Compressor is not available for heating.

When compressor is available

- Auxiliary heat stage #1 output energizes upon activation of heating – stage #3.
- Auxiliary heat stage #2 output energizes upon activation of heating – stage #4.

When compressor is unavailable

- Auxiliary heat stage #1 output energizes upon activation of heating – stage #1.
- Auxiliary heat stage #2 output energizes upon activation of heating – stage #3.

■ **Boilerless heat control** –Turns on the heater when the entering water temperature is less than setpoint (default is 55°F), the temperature set point is adjustable through the network.
For geothermal applications the heater turns on when the entering water temperature is less than setpoint (default 28°F).

Note: *In both cases the compressor is shut down.*

■ **Short cycle protection & random start –** After power cycle or deactivation of certain alarms, or when leaving the unoccupied mode, a new random compressor start-delay time between 300 and 360 seconds is generated. The random start timer prevents compressors in different units from starting simultaneously. Compressor minimum OFF 360 sec) and compressor minimum ON (180 sec) timers prevent compressor short cycling.

■ **Unoccupied mode –** A simple “grounded” signal between terminals U and C (no power source required), puts the unit into the unoccupied mode for night setback operation.

■ **Inter-staging timer –** A default value of 5 minutes between staging of compressors, this feature minimizes short cycling of compressors and improves comfort.

■ **Override mode –** A switch on the deluxe automatic changeover thermostat can be activated during the unoccupied mode to put the unit back into the occupied mode for two hours for after-hours heating or cooling.

■ **Motorized valve/pump restart –** The IV/PR (H8) terminals on the The MicroTech III unit controller are used to energize (open) a motorized valve or start a water pump to get water circulating prior to starting the compressor on call for heating or cooling. Lead compressor operation shall be delayed a minimum of 45 seconds, after the motorized valve/isolation valve output energizes to allow for supply water flow.

■ **Brownout protection –** The MicroTech III unit controller measures the input voltage and will suspend compressor and fan operation if the voltage falls below 80% of the unit nameplate rated value. Two external LED status are generated and an output is available to a "fault" LED at the thermostat.

■ **Emergency unit shutdown** – A simple grounded signal puts the unit into the shutdown mode. Remote shutdown is provided so that when properly connected to a water loop controller or remote switch, the emergency shutdown input can be used to shut down the water source heat pump. Compressor and fan operations are suspended, and an a unique two external LED status is generated.

■ **Condensate overflow protection (cooling & dehumidification modes only)** – The MicroTech III unit controller incorporates a liquid sensor at the top of the drain pan. When the unit senses a high condensate water level for 60 consecutive seconds while in the cooling or dehumidification modes the unit enters the "Off Alarm" machine state. The dehumidification or cooling mode operation will immediately be de-energized as well as the pump output.

- **Thermostat fault reset (preferred method) –** A feature to reset some lockouts like high pressure and/or low temperature remote from the unit is available. When the cause of the fault condition has been fixed, repaired or resolved, the unit can be reset from the thermostat. To reset the fault, move the system switch on the thermostat from its current position (Heat/Auto/Cool) to the Off position and back to its original position two times within 30 seconds. The unit will now be reset. The intelligent reset counter and the 24 hour timer are cleared.

  ⚠ CAUTION

  Some thermostats have internal timers greater than 30 seconds that delay their switching capabilities. Defeating their internal timers may be required to reset the fault using the thermostat.

  Alternatively, thermostats as shown in Figure 26 on page 39 have an optional “reset” feature, by activating the reset feature and adding a wire from terminal O to terminal TB1, pin 4, on the MicroTech III board.

- **Reset of automatic lockouts (alternate method) -** A feature to reset some lockouts like high pressure and/or low temperature at the unit is available. When the cause of the fault condition has been fixed, repaired or resolved, the unit can be reset at the unit. Apply a grounded signal to the tenant override input (screw terminal connection at TB1, pin 4) for a minimum of 10 seconds. The unit will now be reset. Alternatively, dropping power to the unit from the disconnect switch and re-applying power will reset the unit.

- **Intelligent alarm reset** – The Intelligent Reset feature helps to minimize nuisance trips of automatic lockouts caused by low-temperature faults. This feature clears faults the first two times they occur within a 24-hour period and triggers an automatic lockout on the 3rd fault. The fault remains active until the alarm is manually cleared. At the end of the 24 hour period, all counts for that specific intelligent reset alarm are cleared to zero only if the occurrence counter is presently less than the value of three. The 24-hour period and alarm counts are stored in memory that is cleared when power is cycled.

- **Selectable lead compressor** – The lead compressor selection provides a method to utilize circuit 2 if repairs are required on circuit 1. This is not intended for normal equipment operation. The jumper setting JP8 in the I/O expansion board is used to configure the “Lead Compressor” settings.

- **Lead compressor fail replacement** – Upon detection of a lead compressor fault and the lag compressor is available, the selected lead compressor will be “failed replaced” by the lag compressor. Lead compressor will immediately be de-energized by ignoring the compressor minimum ON timer. Lag compressor will energize in place of the failed lead compressor, when the lag compressor minimum OFF timer has expired. Reversing valve for the lag compressor will be positioned, if necessary, 5 seconds after the lag compressor starts up.

- **Equipment protection control –** The MicroTech III controller receives separate input signals from the refrigerant high-pressure switch and the low suction line temperature sensor. In a high-pressure situation, compressor operation is suspended. In a low temperature situation, the unit goes into a defrost cycle where the unit is put into cooling operation for 60 seconds until the coaxial heat exchanger is free of ice. Each switch generates its own unique LED status.

MicroTech III unit controller and I/O expansion module terminals, locations and descriptions

Table 12: MicroTech III unit controller terminals locations and descriptions

H1 – 1	24	24 VAC Power Input
H1 – 2	C	24 VAC common
H2 – 1	SL1	Fan Main Output – Switched L1
H2 – 2		Blank Terminal
H2 – 3	N	Fan Main Output – Neutral
H3 – 1	HP1-1	Comp High Pressure Switch (HP1) Input Terminal 1
H3 – 2	HP1-2	Comp High Pressure Switch (HP1) Input Terminal 2
H4 – 1	1	Discharge Air Temp Sensor – Common
H4 – 2		Discharge Air Temp Sensor – Signal
H4 – 3		Leaving Water Temp Sensor – Common
H4 – 4		Leaving Water Temp Sensor – Signal
H5 – 1	1	I/O Expansion Module Common (Gnd)
H5 – 2		I/O Expansion Module Common (Gnd)
H5 – 3		I/O Expansion Module +5 VDC
H5 – 4		I/O Expansion Module SPI CE1
H5 – 5		I/O Expansion Module SPI CLK
H5 – 6		I/O Expansion Module SPI OUT
H5 – 7		I/O Expansion Module SPI IN
H5 – 8		I/O Expansion Module +12 VDC
H5 – 9		I/O Expansion Module 24 VAC
H5 – 10		I/O Expansion Module 24 VAC
H5 – 11		No Connection
H5 – 12		No Connection
H6 – 1	1	Condensate Overflow Signal Input
H6 – 2		Compressor Suction Temp Sensor (LT1) – Common
H6 – 3		Compressor Suction Temp Sensor (LT1) – Signal
H6 – 4		Compressor Low Pressure Switch (LP1) – Source Voltage
H6 – 5		Compressor Low Pressure Switch (LP1) – Signal
H6 – 6		Reversing Valve – Common
H6 – 7		Reversing Valve – Output
H7 – 1	1	No Connection
H7 – 2		No Connection
H7 – 3		Red LED Output
H7 – 4		Green LED Output
H7 – 5		Yellow LED Output
H7 – 6		Red-Green-Yellow LED Common
H8 – 1	1	Isolation Valve/Pump Request Relay N/O
H8 – 2		Isolation Valve/Pump Request Relay N/C
H8 – 3		24 VAC Common
H9 – 1	1	Return Air Temp – Signal
H9 – 2		Return Air Temp* – Common
TB1 – 1	1	Room Sensor – Status LED Output
TB1 – 2	2	Room Sensor – Fan Mode & Unit Mode Switches
TB1 – 3	3	Room Sensor – Setpoint Adjust Potentiometer
TB1 – 4	4	Room Sensor – Room Temp Sensor & Tenant Override
TB1 – 5	5	Room Sensor – DC Signal Common
TB2 – 1	R	24 VAC
TB2 – 2	A	Alarm Output
TB2 – 3	W2	Thermostat – Heat Stage #2 (W2) Input
TB2 – 4	W1	Thermostat – Heat Stage #1 (W1) Input
TB2 – 5	Y2	Thermostat – Cool Stage #2 (Y2) Input
TB2 – 6	Y1	Thermostat – Cool Stage #1 (Y1) Input
TB2 – 7	G	Thermostat – Fan Input
TB2 – 8	O	Thermostat – Heat Stage #3 (W3) Input
TB2 – 9	C	24 VAC Common
TB3 – 1	E	Emergency Shutdown Input
TB3 – 2	U	Unoccupied Input
L1 – 1	L1 - 1	24 VAC Power in
L1 – 2	L1 - 2	
L1 – 3	L1 - 3	
N1	N1	24 VAC Common
N2	N2	
N3	N3	
CN_LON1 – 1	CN_LON1	GND
CN_LON1 – 2		+ 5 VDC
CN_LON1 – 3		SPI CE (SPI Select To Communications Board)
CN_LON1 – 4		SPI CLK (Master Clock)
CN_LON1 – 5		SPI OUT (MOSI)
CN_LON1 – 6		SPI IN (MISO)
CN_LON1 – 7		INT0 (SPI Ready To Baseboard)
CN_LON1 – 8		No Connection

** Can not have return air temperature sensor connected at H9 while the room sensor is connected to TB1, pin 4 (room temp sensor and tenant override)*

Note: *A random start delay time between 300 and 360 seconds is generated at power up.*

Figure 20: MicroTech III unit controller terminal locations

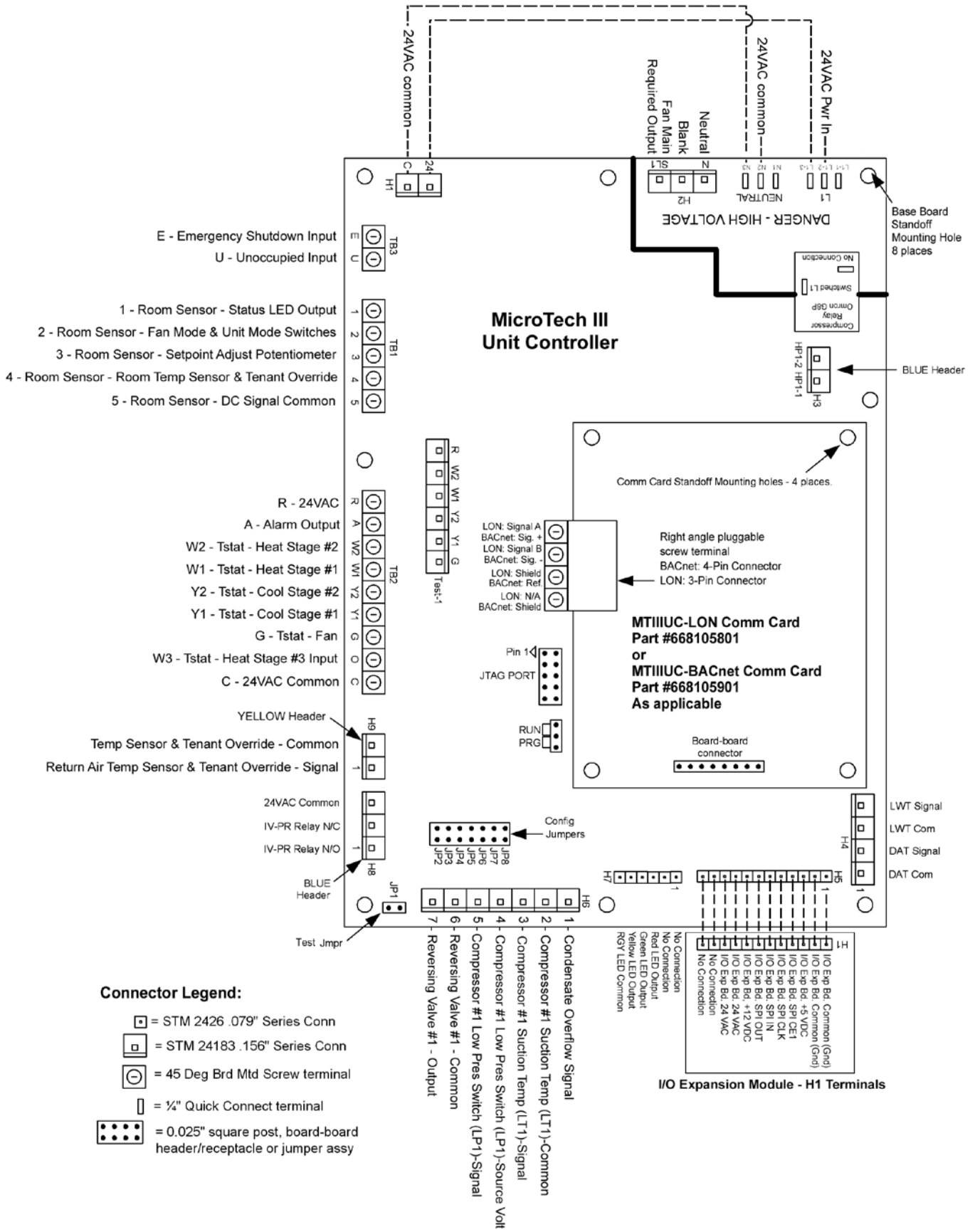
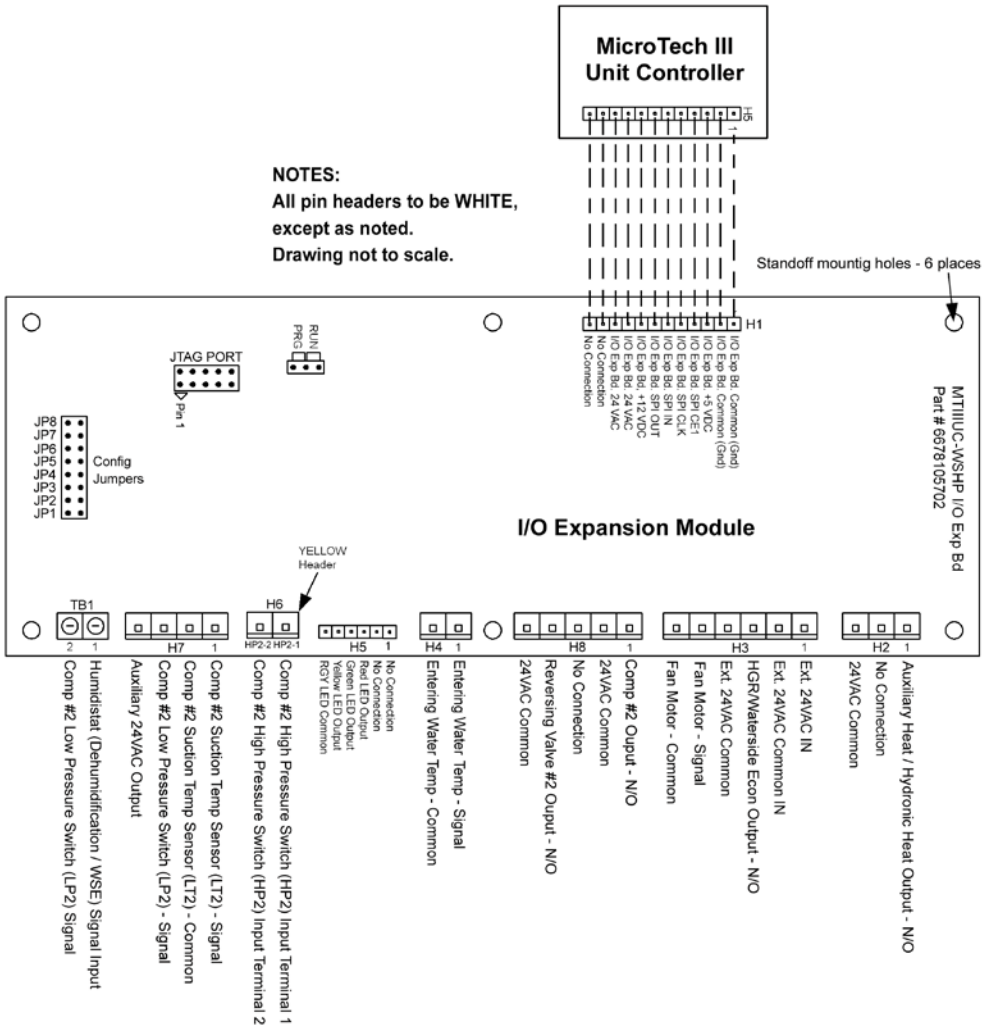


Table 13: I/O expansion module terminals locations and descriptions

H1 – 1	1	I/O Expansion Board Common (Gnd)
H1 – 2		I/O Expansion Board Common (Gnd)
H1 – 3		I/O Expansion Board +5 VDC
H1 – 4		I/O Expansion Board SPI CE1
H1 – 5		I/O Expansion Board SPI CLK
H1 – 6		I/O Expansion Board SPI IN
H1 – 7		I/O Expansion Board SPI OUT
H1 – 8	1	I/O Expansion Board +12 VDC
H1 – 9		I/O Expansion Board 24 VAC
H1 – 10		I/O Expansion Board 24 VAC
H1 – 11		No Connection
H1 – 12		No Connection
H2 – 1	1	Auxiliary Heat / Hydronic Heat Output – N/O
H2 – 2		No Connection
H2 – 3		24 VAC Common
H3 – 1	1	Ext. 24 VAC In
H3 – 2		Ext. 24 VAC Common In
H3 – 3		HGR / Waterside Economizer Output – N/O
H3 – 4		Ext. 24 VAC Common
H3 – 5		Fan Motor – Signal
H3 – 6		Fan Motor – Common
H4 – 1	1	Entering Water Temp Sensor – Signal
H4 – 2		Entering Water Temp Sensor – Common
H5 – 1	1	No Connection
H5 – 2		No Connection
H5 – 3		Red LED Output
H5 – 4		Green LED Output
H5 – 5		Yellow LED Output
H5 – 6		Red-Green-Yellow LED Common
H6 – 1	HP2-1	Comp #2 High Pressure Switch (HP2) Input Terminal 1
H6 – 2	HP2-2	Comp #2 High Pressure Switch (HP2) Input Terminal 2
H7 – 1		Comp #2 Suction Temp Sensor (LT2) – Signal
H7 – 2		Comp #2 Suction Temp Sensor (LT2) – Common
H7 – 3		Comp #2 Low Pressure Switch (LP2) – Signal
H7 – 4		Auxiliary 24VAC Output
H8 – 1	1	Compressor #2 Output – N/O
H8 – 2		24 VAC Common
H8 – 3		No Connection
H8 – 4		Reversing Valve #2 Output – N/O
H8 – 5		24 VAC Common
TB1 – 1	1	Humidistat (Dehumidification / WSE) Signal Input
TB1 – 2	2	Comp #2 Low Pressure Switch (LP2) – Signal

Figure 21: I/O expansion module terminals locations



MicroTech® III controller with LONWORKS® or BACnet® communication module

Each Enfinity Large Horizontal Water Source Heat Pump can be equipped with a LonWorks or BACnet communication module. The LONWORKS module is LONMARK 3.4 certified and designed to communicate over a LONWORKS communications network to a Building Automation System (BAS). The BACnet module is designed to communicate over a BACnet MS/TP communications network to a building automation system. Both communication modules are microprocessor-based and can be factory or field-installed.

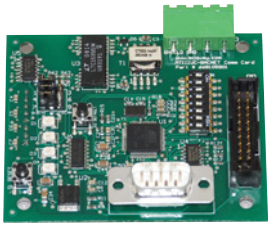
The communication modules are programmed and tested with all the logic required to monitor and control the unit. Optional wall sensors may be used with the communication modules to provide limited local control of the Horizontal Water Source Heat Pump. The MicroTech III controller monitors water and air temperatures and passes information to the communication module. The module communicates with the BAS, to provide network control of the Water Source Heat Pump.

MicroTech III LONWORKS communication module

The LONWORKS communication module is designed for units that are integrated into a LONWORKS communication network for centralized scheduling and management of multiple heat pumps.

MicroTech III BACnet communication module

Designed to be linked with a centralized building automation system (BAS) through a BACnet communications network for centralized scheduling and management of multiple heat pumps.



MicroTech III controller with communication modules features

The MicroTech III Controller with LONWORKS or BACnet Communication Module orchestrates the following unit operations:

- Enable heating and cooling to maintain space temperature setpoint based on a room sensor setting
- Enable fan and compressor operation
- Monitors all equipment protection controls
- Monitors room and discharge air temperatures
- Monitors leaving water temperature
- Relays status of all vital unit functions

An on-board status LED indicates the status of the MicroTech III LONWORKS or BACnet module.

The MicroTech III unit controller with communication module includes:

- Return Air Temperature sensor (RAT) (field-installed)
- Discharge Air Temperature sensor (DAT) (field-installed)
- Leaving Water Temperature sensor (LWT) (factory installed)

⚠ CAUTION

When an optional wall-mounted room temperature sensor is connected to the unit controller, the Return Air Temperature (RAT) sensor must not be installed. A wall-mounted room temperature sensor and the return air temperature sensor must not be connected simultaneously or the unit will not operate properly.

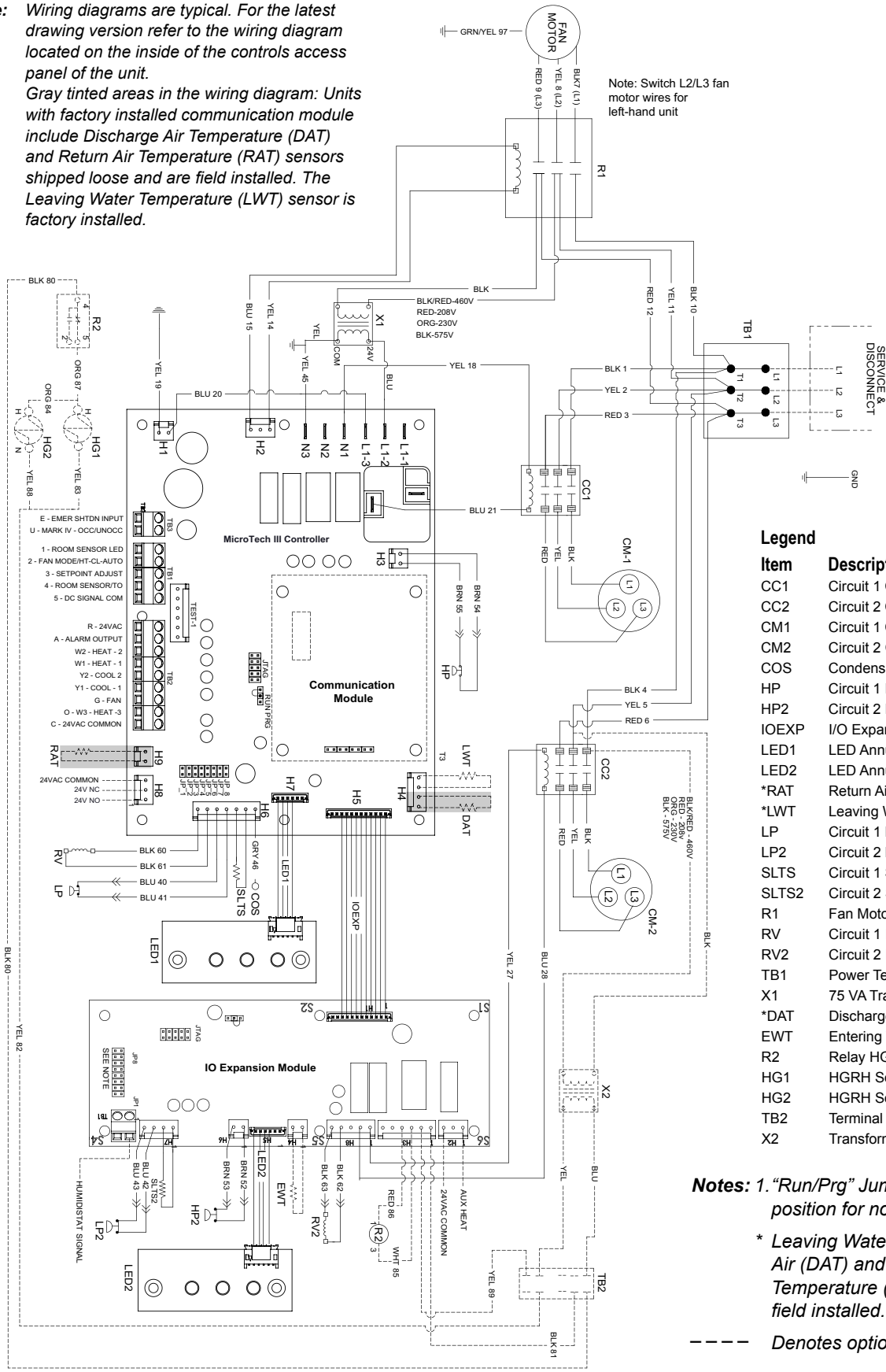
The communication modules provide network access to setpoints for operational control

Available wall sensors include:

- Room sensor
- Room sensor with LED status and tenant override button
- Temperature sensor with LED status, timed-override button; ±5°F setpoint adjustment
- Room sensor with LED status, timed-override button, 55° to 95°F setpoint adjustment
- Room sensor with digital display, timed override button, occupancy button; ±5°F setpoint adjustment or 55 to 95°F temperature setpoint and dehumidification control

MicroTech III controller with I/O expansion module with hot gas reheat (HGRH) 208/230, 460, 575-60-3 (1.5 hp or less)

Note: *Wiring diagrams are typical. For the latest drawing version refer to the wiring diagram located on the inside of the controls access panel of the unit.*
Gray tinted areas in the wiring diagram: Units with factory installed communication module include Discharge Air Temperature (DAT) and Return Air Temperature (RAT) sensors shipped loose and are field installed. The Leaving Water Temperature (LWT) sensor is factory installed.



Legend

Item	Description
CC1	Circuit 1 Compressor Contactor
CC2	Circuit 2 Compressor Contactor
CM1	Circuit 1 Compressor
CM2	Circuit 2 Compressor
COS	Condensate Overflow Sensor
HP	Circuit 1 High Pressure Switch
HP2	Circuit 2 High Pressure Switch
IOEXP	I/O Expansion Board / Harness
LED1	LED Annunciator / Harness
LED2	LED Annunciator / Harness
*RAT	Return Air Temp Sensor
*LWT	Leaving Water Temp Sensor
LP	Circuit 1 Low Pressure Switch
LP2	Circuit 2 Low Pressure Switch
SLTS	Circuit 1 Suction Line Temp Sensor
SLTS2	Circuit 2 Suction Line Temp Sensor
R1	Fan Motor Starter
RV	Circuit 1 Reversing Valve Solenoid
RV2	Circuit 2 Reversing Valve Solenoid
TB1	Power Terminal Block
X1	75 VA Transformer
*DAT	Discharge Air Temp Sensor
EWT	Entering Water Temp Sensor
R2	Relay HGRH
HG1	HGRH Solenoid 1
HG2	HGRH Solenoid 2
TB2	Terminal Block
X2	Transformer 24VAC Output

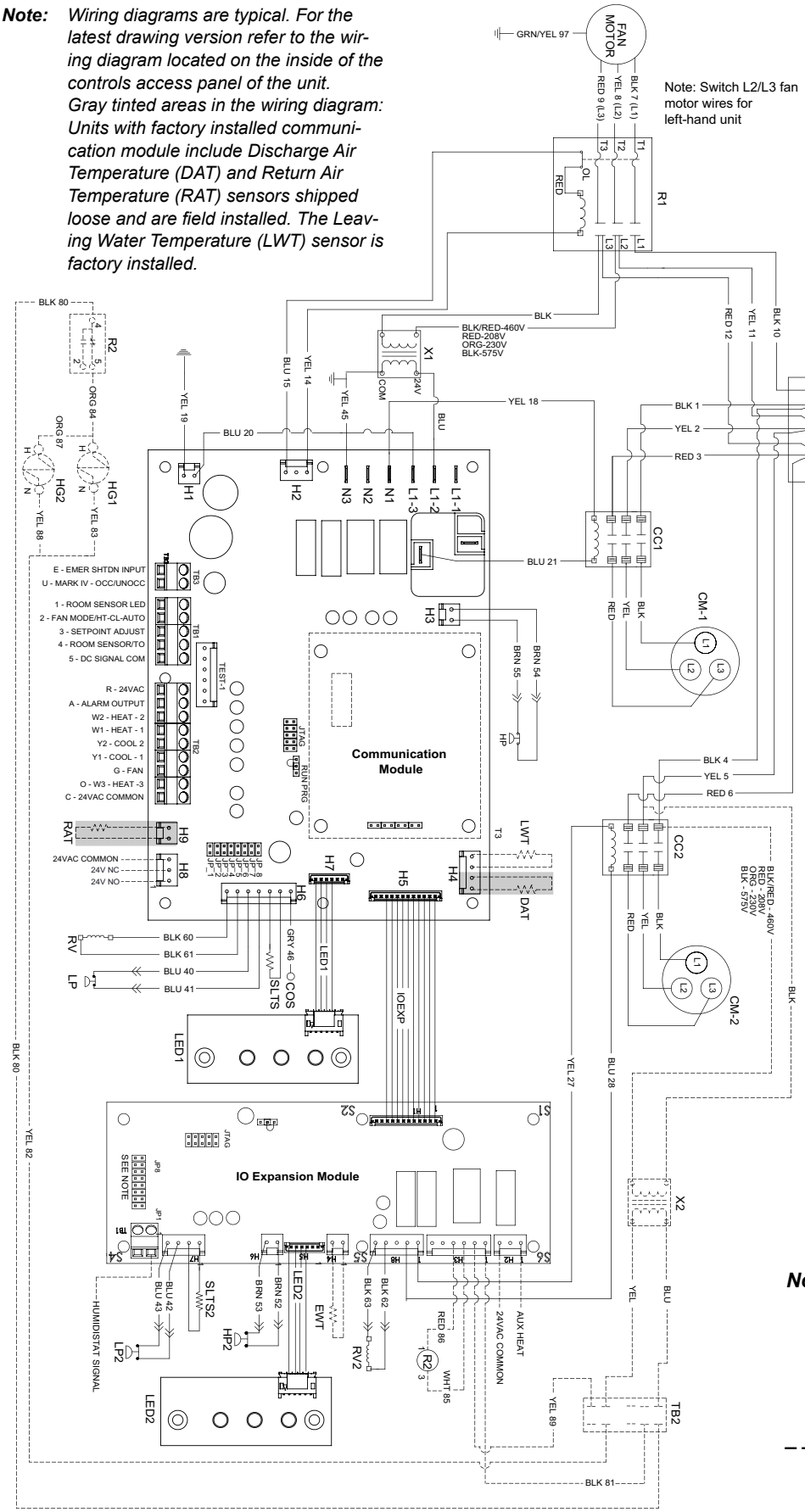
Notes: *1. "Run/Prg" Jumper to be in "Run" position for normal operation*

** Leaving Water (LWT), Discharge Air (DAT) and Return Air Temperature (RAT) sensors are field installed.*

– – – – *Denotes optional feature*

MicroTech III controller with I/O expansion module with hot gas reheat (HGRH) 208/230, 460, 575-60-3 (greater than 1.5 hp)

Note: *Wiring diagrams are typical. For the latest drawing version refer to the wiring diagram located on the inside of the controls access panel of the unit. Gray tinted areas in the wiring diagram: Units with factory installed communication module include Discharge Air Temperature (DAT) and Return Air Temperature (RAT) sensors shipped loose and are field installed. The Leaving Water Temperature (LWT) sensor is factory installed.*



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Item	Description
CC1	Circuit 1 Compressor Contactor
CC2	Circuit 2 Compressor Contactor
CM1	Circuit 1 Compressor
CM2	Circuit 2 Compressor
COS	Condensate Overflow Sensor
HP	Circuit 1 High Pressure Switch
HP2	Circuit 2 High Pressure Switch
IOEXP	I/O Expansion Board / Harness
LED1	LED Annunciator / Harness
LED2	LED Annunciator / Harness
*RAT	Return Air Temp Sensor
*LWT	Leaving Water Temp Sensor
LP	Circuit 1 Low Pressure Switch
LP2	Circuit 2 Low Pressure Switch
SLTS	Circuit 1 Suction Line Temp Sensor
SLTS2	Circuit 2 Suction Line Temp Sensor
R1	Fan Motor Starter
RV	Circuit 1 Reversing Valve Solenoid
RV2	Circuit 2 Reversing Valve Solenoid
TB1	Power Terminal Block
X1	75 VA Transformer
*DAT	Discharge Air Temp Sensor
EWT	Entering Water Temp Sensor
R2	Relay HGRH
HG1	HGRH Solenoid 1
HG2	HGRH Solenoid 2
TB2	Terminal Block
X2	Transformer 24VAC Output

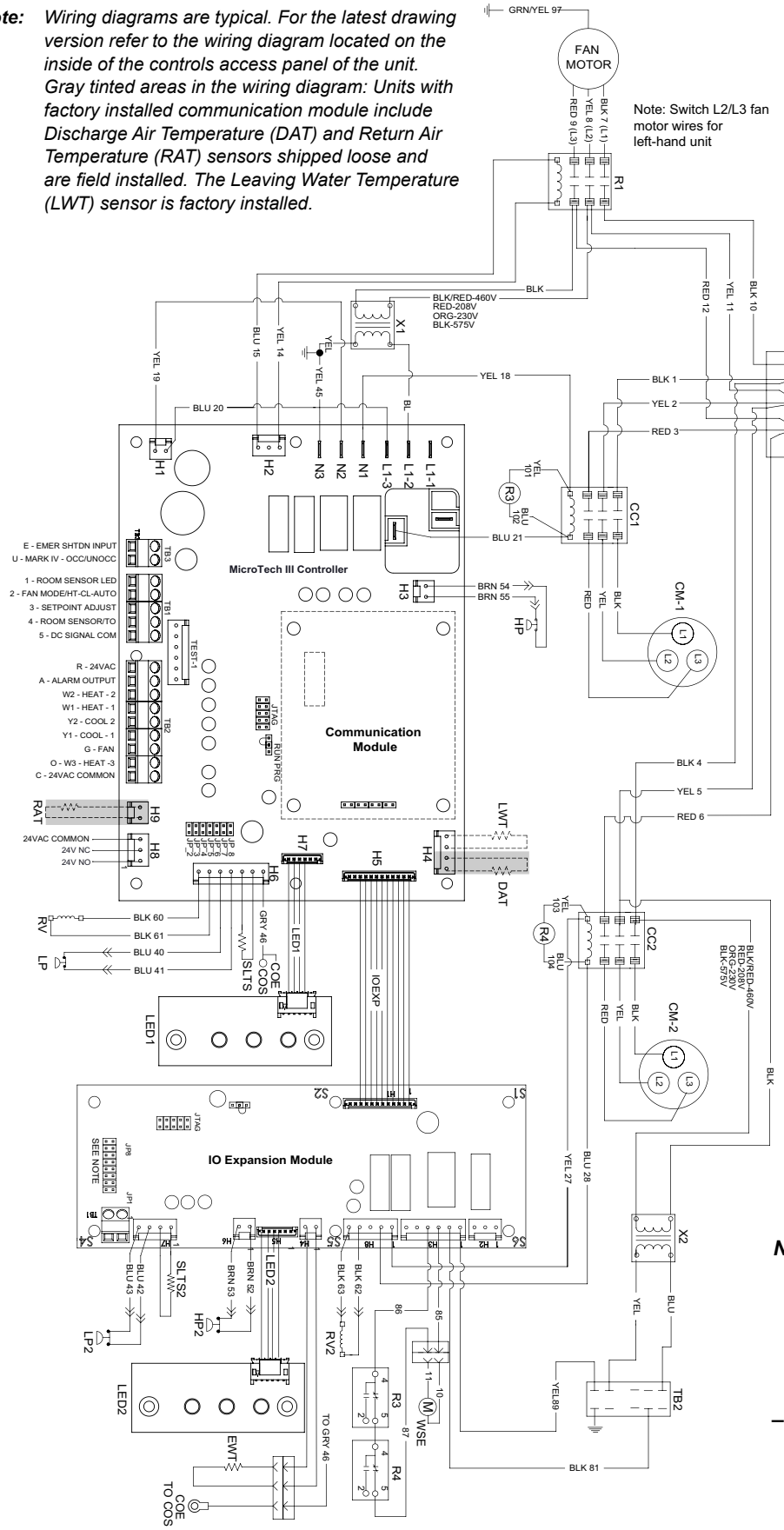
Notes: *1."Run/Prg" Jumper to be in "Run" position for normal operation*

** Leaving Water (LWT), Discharge Air (DAT) and Return Air Temperature (RAT) sensors are field installed.*

– – – – *Denotes optional feature*

MicroTech III controller with I/O expansion module – with waterside economizer (WSE) 208/230, 460, 575-60-3

Note: *Wiring diagrams are typical. For the latest drawing version refer to the wiring diagram located on the inside of the controls access panel of the unit. Gray tinted areas in the wiring diagram: Units with factory installed communication module include Discharge Air Temperature (DAT) and Return Air Temperature (RAT) sensors shipped loose and are field installed. The Leaving Water Temperature (LWT) sensor is factory installed.*



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Item	Description
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CC2	Circuit 2 Compressor Contactor
CM1	Circuit 1 Compressor
CM2	Circuit 2 Compressor
COS	Condensate Overflow Sensor
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HP2	Circuit 2 High Pressure Switch
IOEXP	I/O Expansion Board / Harness
LED1	LED Annunciator / Harness
LED2	LED Annunciator / Harness
*RAT	Return Air Temperature
*LWT	Leaving Water Temp Sensor
LP	Circuit 1 Low Pressure Switch
LP2	Circuit 2 Low Pressure Switch
SLTS	Circuit 1 Suction Line Temp Sensor
SLTS2	Circuit 2 Suction Line Temp Sensor
MTIII	MicroTech III Main Board
R1	Fan Motor Starter
RV	Circuit 1 Reversing Valve Solenoid
RV2	Circuit 2 Reversing Valve Solenoid
TB1	Power Terminal Block
X1	75 VA Transformer
X2	50 VA Transformer
*DAT	Discharge Air Temp Sensor
*EWT	Entering Water Temp Sensor
WSE	Waterside Economizer
TB2	Power Terminal Block

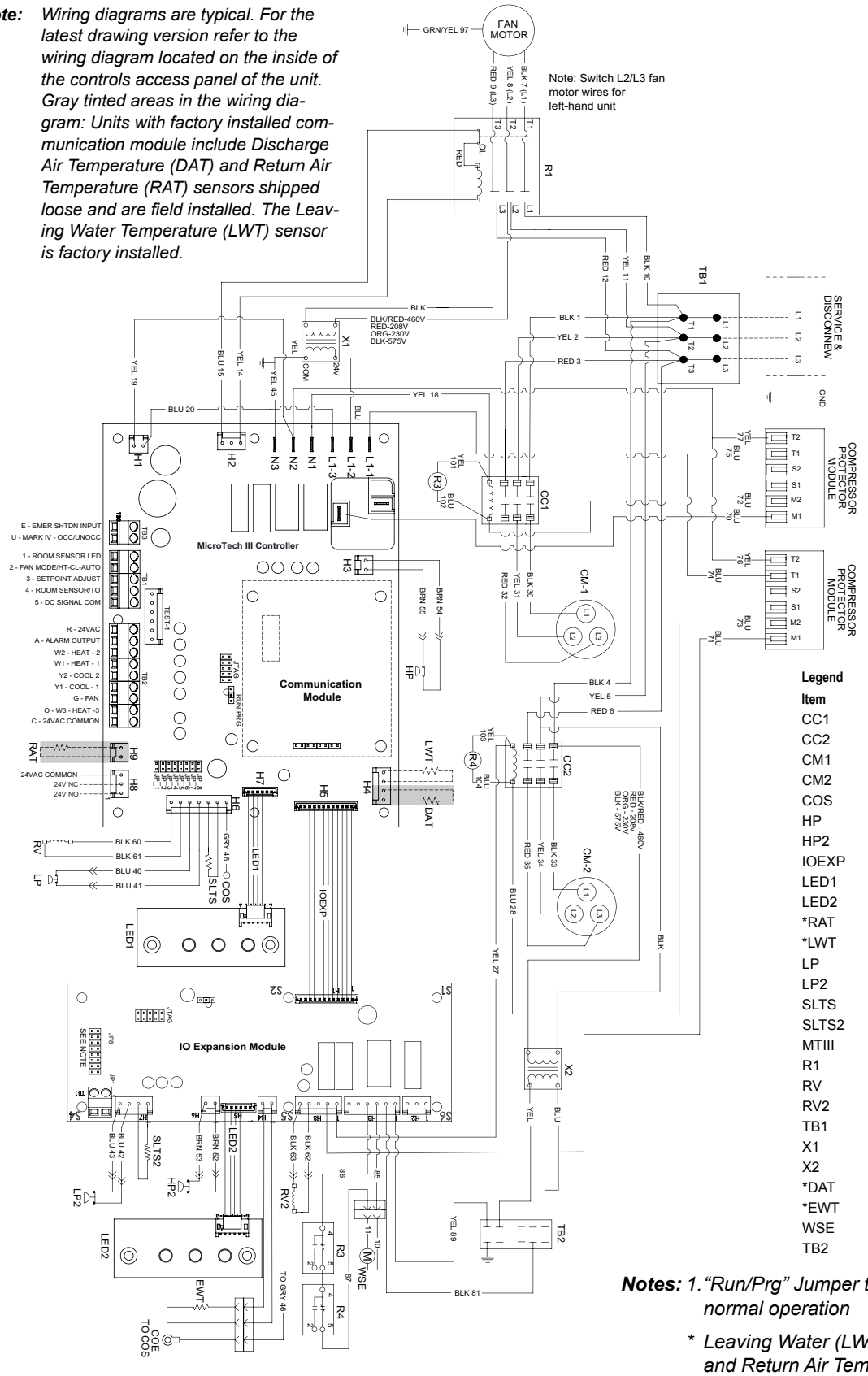
Notes: *1. "Run/Prg" Jumper to be in "Run" position for normal operation*

** Leaving Water (LWT), Discharge Air (DAT) and Return Air Temperature (RAT) sensors are field installed.*

– – – – *Denotes optional feature*

MicroTech III controller with I/O expansion module – with waterside economizer (WSE) 208/230, 460, 575-60-3

Note: *Wiring diagrams are typical. For the latest drawing version refer to the wiring diagram located on the inside of the controls access panel of the unit. Gray tinted areas in the wiring diagram: Units with factory installed communication module include Discharge Air Temperature (DAT) and Return Air Temperature (RAT) sensors shipped loose and are field installed. The Leaving Water Temperature (LWT) sensor is factory installed.*



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COS	Condensate Overflow Sensor
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IOEXP	I/O Expansion Board / Harness
LED1	LED Annunciator / Harness
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LP	Circuit 1 Low Pressure Switch
LP2	Circuit 2 Low Pressure Switch
SLTS	Circuit 1 Suction Line Temp Sensor
SLTS2	Circuit 2 Suction Line Temp Sensor
MTIII	MicroTech III Main Board
R1	Fan Motor Starter
RV	Circuit 1 Reversing Valve Solenoid
RV2	Circuit 2 Reversing Valve Solenoid
TB1	Power Terminal Block
X1	75 VA Transformer
X2	50 VA Transformer
*DAT	Discharge Air Temp Sensor
*EWT	Entering Water Temp Sensor
WSE	Waterside Economizer
TB2	Power Terminal Block

Notes: *1."Run/Prg" Jumper to be in "Run" position for normal operation*

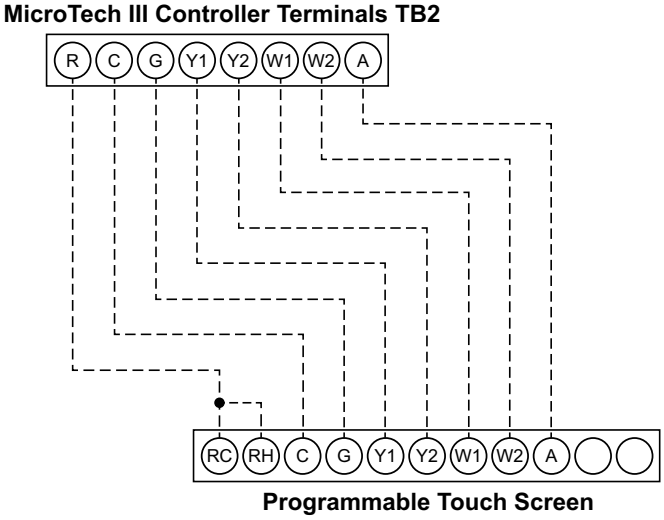
* *Leaving Water (LWT), Discharge Air (DAT) and Return Air Temperature (RAT) sensors are field installed.*

– – – – *Denotes optional feature*

Typical connections for thermostats and temperature sensors

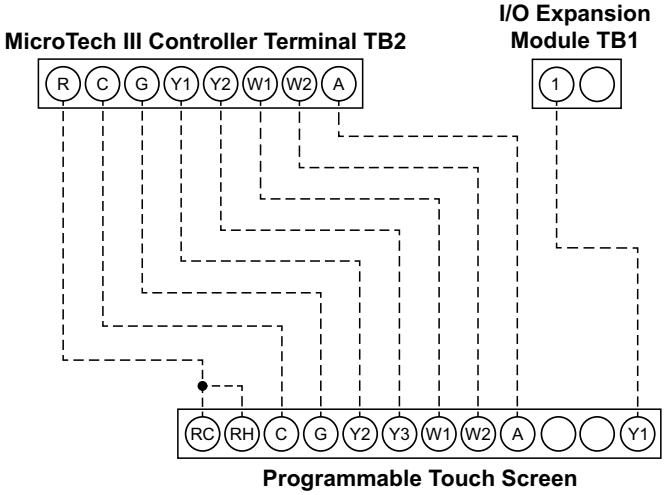
Thermostats and remote sensors used with MicroTech III –standalone operation

Figure 22: Programmable Electronic Thermostat 2 Heat/2 Cool, 7-Day Programmable, Auto Changeover, Hardwired – P/N 910193126 & Wi-Fi P/N 910193131



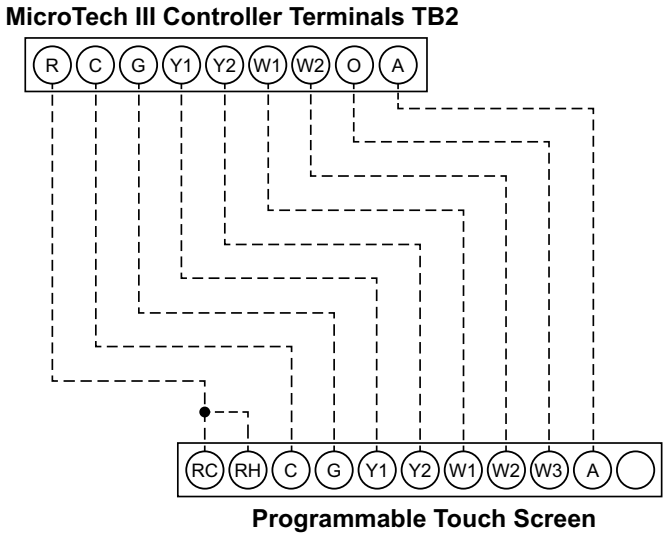
Notes: *Includes thermostat and wall plate Refer to IO manual 910193126*

Figure 23: Programmable Electronic Thermostat 2 Heat/3 Cool, 7-Day Programmable, Auto Changeover, Hardwired – P/N 910193127 & Wi-Fi P/N 910193132



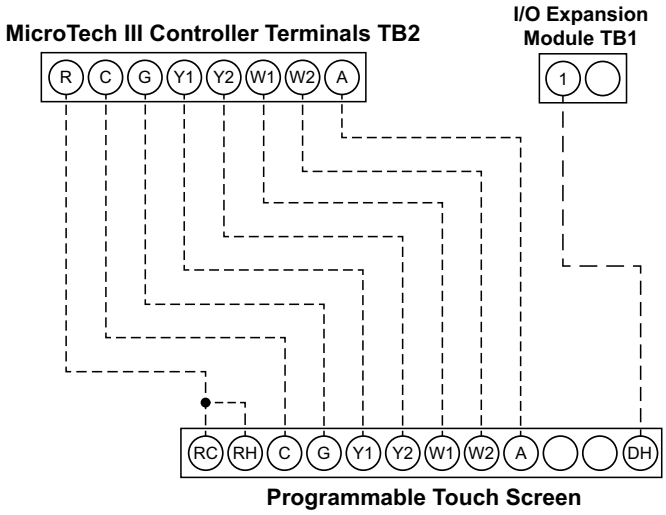
Notes: *Includes thermostat and wall plate Refer to IO manual 910193127*

Figure 24: Programmable Electronic Thermostat 3 Heat/2 Cool, 7-Day Programmable, Auto Changeover, Hardwired – P/N 910193128 & Wi-Fi P/N 910193133



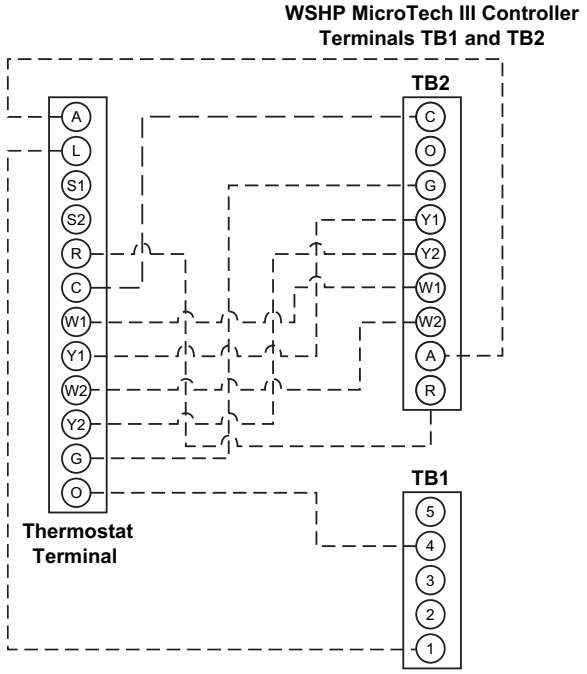
Notes: *Includes thermostat and wall plate Refer to IO manual 910193128*

Figure 25: Programmable Electronic Thermostat 2 Heat/2 Cool, 7-Day Programmable, Dehumidification, Auto Changeover, Hardwired – P/N 910193129 & Wi-Fi P/N 910193134



Notes: *Includes thermostat and wall plate Refer to IO manual 910193129*

Figure 26: Programmable & Non-Programmable Electronic Thermostats 2 Heat/2 Cool, Auto Changeover, Hardwired – P/N 910121746 & P/N 910121748



Notes: *Includes thermostat and wall plate. Refer to 910121746 or 910121748 Install Manual.*

Figure 27: Remote Room Sensor Used With Thermostats 910121746 & 910121748 – P/N 107096010

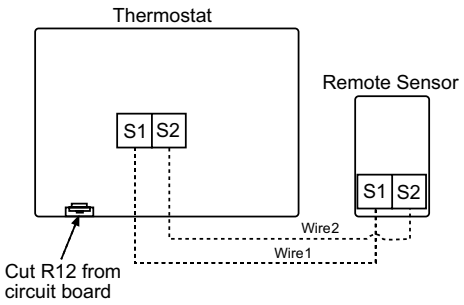
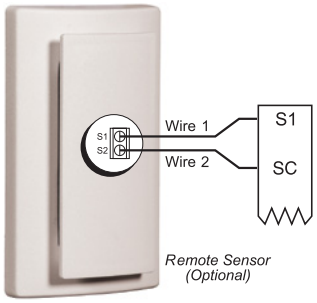


Figure 28: Remote Room Sensor Used With Thermostats 910193126, 910193127, 910193128, 910193129, 910193131, 910193132, 910193133, 910193134 – P/N 667720401



Sensors used with MicroTech III control Building Automated System Operation (BAS)

Figure 29: Digitally Adjustable Display Sensor (6-button) – P/N 910121754

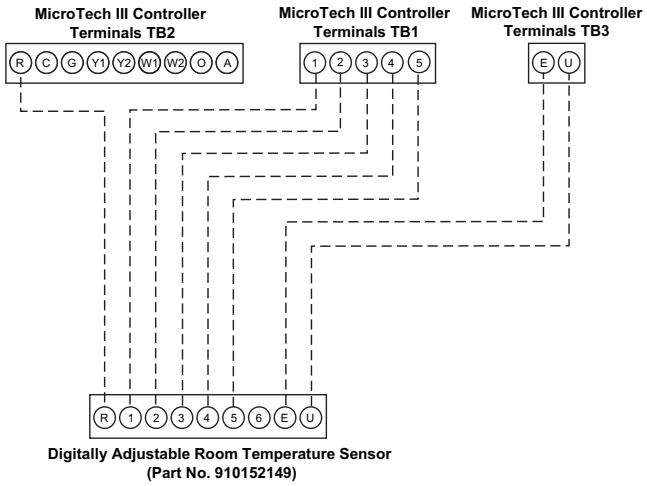


Figure 30: Digitally Adjustable Display Sensor (4-button) – P/N 910152147

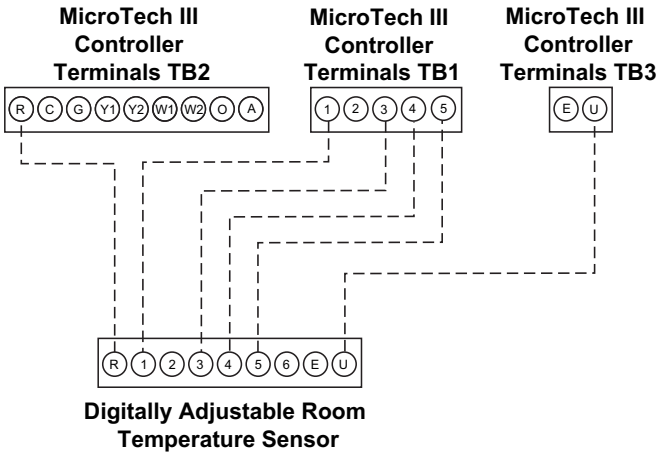


Figure 31: Cool/Warm Adjustable Sensor – P/N 910171464

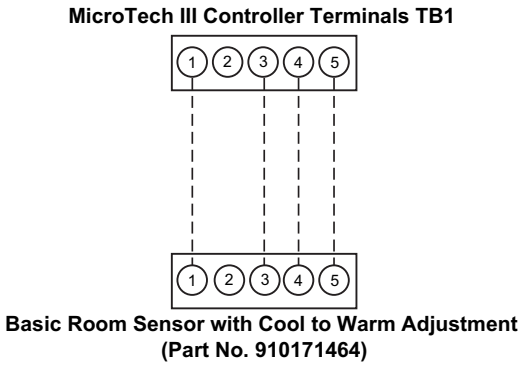
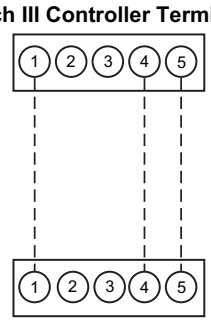
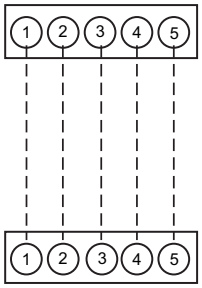


Figure 32: Basic sensor – P/N 910152149



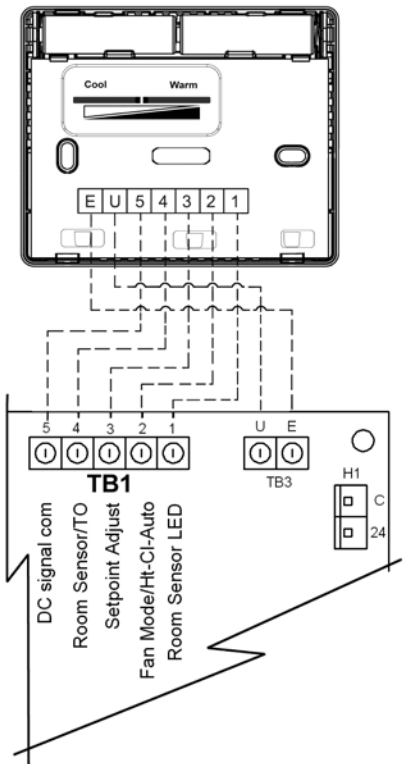
Basic Room Sensor (Part No.s 669529001, 910152149)

Figure 33: Room sensor with temperature adjustment wiring



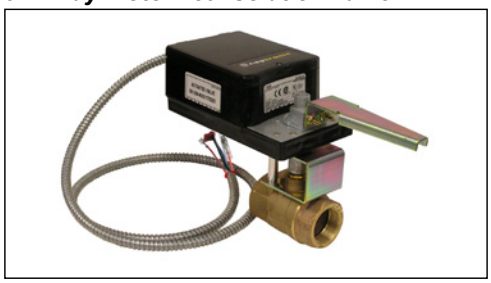
Room Sensor with Temperature Adjustment (Part No.s 669529101, 669529201, 910121753)

Figure 34: Adjustable Cool/Warm with Occupancy Switch – P/N 910121753



2-way motorized isolation valve

Figure 35: 2-way motorized isolation valve



Used in variable pumping type applications, the valve actuator is wired and typically piped in the return water line. The 2-way motorized water valve kit includes the valve body, actuator and wire harness. The 24VAC valve actuator must be wired directly to terminal block H8 on the MicroTech III controller. See Figure 37 on page 41 for wiring details. The valve will only energize on a call for heating or cooling. The 1-1/4" valve is rated for 300 psig (2068 kPa and the 1-1/2" valve is rated for 150 psig (1034 kPa).

Figure 36: Power open, power closed, motorized valve

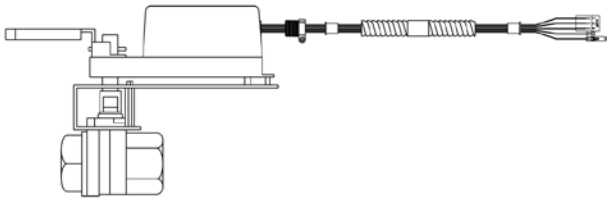


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Figure 37: 2-way motorized valve wiring to MicroTech III controller

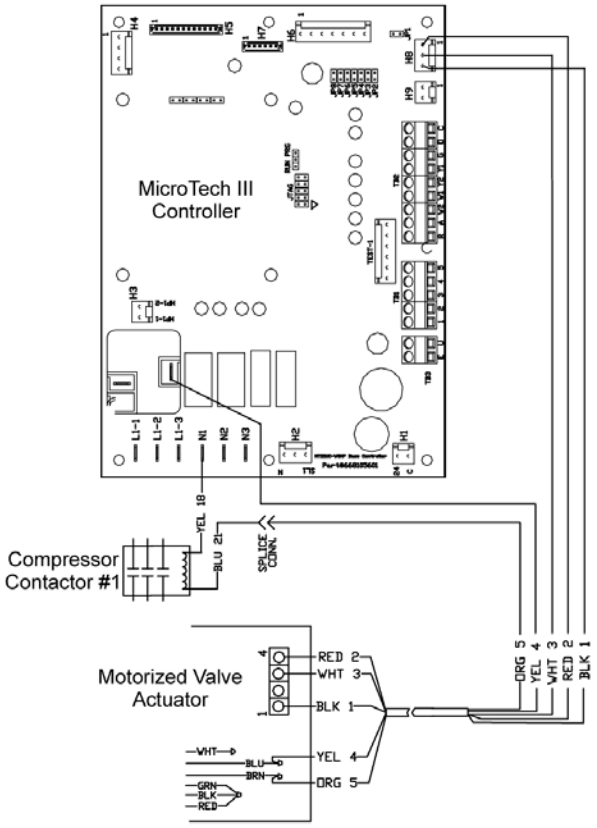
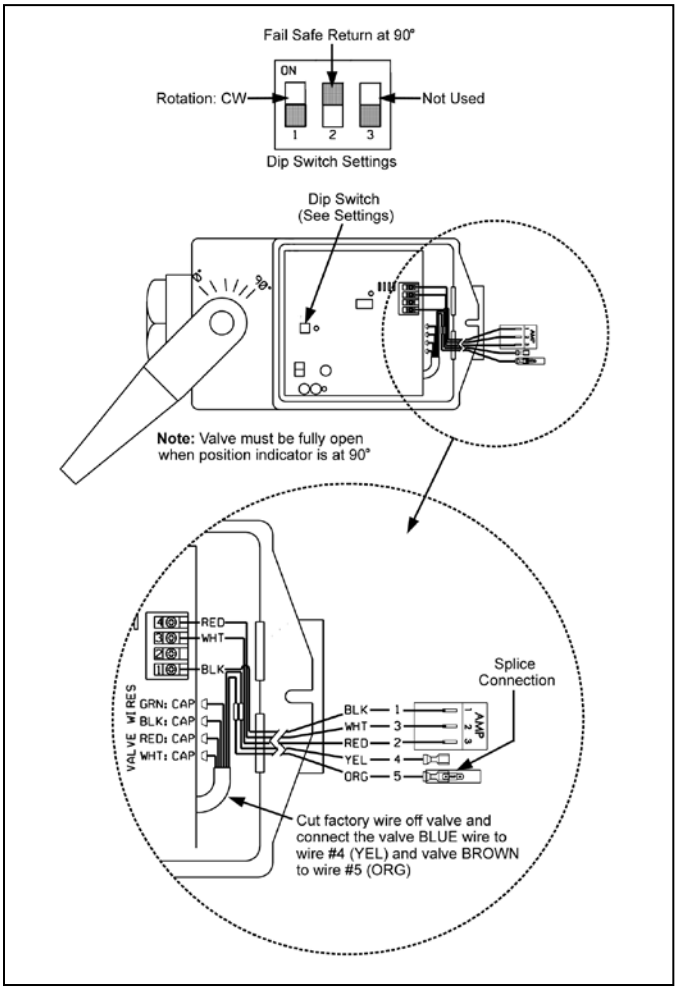


Figure 38: 2-way motorized valve wiring details



MicroTech III unit controller and I/O expansion module status LED's and fault outputs

Table 14: MicroTech III controller status LED's & fault outputs

Description	Type*	Yellow	Green	Red
I/O Expansion Communication Fail	Fault	ON	Flash	Flash
Invalid Configuration	Fault	Flash	Flash	OFF
Low Voltage Brownout	Fault	OFF	Flash	OFF
Emergency Shutdown	Mode	OFF	Flash	OFF
Compressor #1 High Pressure (HP1)	Fault	OFF	OFF	Flash
Compressor #1 Low Pressure (LP1)	Fault	OFF	OFF	ON
Compressor #1 Suction Temp Sensor Fail	Fault	Flash	Flash	ON
Freeze Fault Detect (Freeze Fault Protection Only)	Fault	Flash	OFF	Flash
Compressor #1 Low Suction Temp (LT1)	Fault	Flash	OFF	OFF
Room Temp Sensor Fail (with Room Sensor Control Only)	Fault	Flash	Flash	ON
Leaving Water Temp Sensor Fail (Freeze Fault Protection Only)	Fault	Flash	Flash	ON
Condensate Overflow (Cooling & Dehumidification Modes Only)	Fault	ON	OFF	OFF
Serial EEPROM Corrupted	Fault	ON	ON	ON
Service Test Mode Enabled	Mode	Flash	Flash	Flash
Unoccupied Mode	Mode	ON	ON	OFF
Occupied, Bypass, Standby, or Tenant Override Modes	Mode	OFF	ON	OFF

Note: ** The MicroTech III baseboard LED's mode / faults are listed in order of priority.*

Table 15: I/O expansion module status LED's & fault outputs

Description	Type	Yellow	Green	Red
Baseboard Communication Fail	Fault	OFF	Flash	Flash
Compressor #2 High Pressure (HP2)	Fault	OFF	OFF	Flash
Compressor #2 Low Pressure (LP2)	Fault	OFF	OFF	ON
Compressor #2 Low Suction Temp (LT2) Sensor Fail	Fault	Flash	Flash	ON
Compressor #2 Low Suction Temp (LT2)	Fault	Flash	OFF	OFF
Entering Water Temp Sensor Fail (with Boilerless Electric Heat and Waterside Economizer)	Fault	ON	OFF	Flash
Low Entering Water Temperature (No Display with Boilerless Electric Heat)	Fault	OFF	ON	Flash
Fan is OFF	Mode	OFF	ON	OFF
Fan is ON	Mode	OFF	Flash	OFF

Note: *Mode / Faults are listed in order of priority.*

MicroTech III unit controller LED faults and remedy

Table 16: I/O expansion communication fail

Description	Type	Yellow	Green	Red
I/O Expansion Communication Fail	Fault	ON	Flash	Flash

- *Verify connection of 12 wire cable between H5 on the main board and H1 on the I/O expansion board is fully engaged in the connector.*
- *Verify run program jumper on the I/O expansion board is installed in the run position.*
- *Replace the run jumper with a spare jumper.*
- *Replace I/O expansion board.*

Table 17: Invalid configuration

Description	Type	Yellow	Green	Red
Invalid Configuration	Fault	Flash	Flash	OFF

- *Verify jumper selection on both the main board and I/O expansion board. Jumper selections must be verified using the jumper configuration setting outline in this manual.*

Table 18: Low voltage brownout / emergency shutdown

Description*	Type	Yellow	Green	Red
Low Voltage Brownout	Fault	OFF	Flash	OFF
Emergency Shutdown	Mode	OFF	Flash	OFF

** Same LED display for both conditions*

- *Verify the E terminal is not connected to common. Remove wire, if connected, and LED should change to solid green only.*
- *Confirm the low voltage supply is between 19-32VAC at the H1 terminal of the main board. If the low voltage supply is out of range, verify the unit supply voltage matches the nameplate voltage and the correct transformer primary wire has been selected.*

Table 19: Compressor high pressure

Description	Type	Yellow	Green	Red
Compressor High Pressure	Fault	OFF	OFF	Flash

- *Verify high pressure switch is connected to terminal H3 on the main board.*
- *Check for continuity of the high pressure switch.*

If the high pressure fault resets when power is recycled:

- *Check water flow (cooling operation)*
- *Check airflow (heating operation)*
- *Entering water and air temperatures should be within the operating limits.*

Table 20: Compressor low pressure

Description	Type	Yellow	Green	Red
Compressor Low Pressure	Fault	OFF	OFF	ON

- *Loose wire connection on low pressure circuit*
- *Failed low pressure switch*
- *Unit is low on charge*

Table 21: Compressor suction temp sensor fail, room temp sensor fail, leaving water temp sensor fail

Description	Type	Yellow	Green	Red
Compressor Suction Temp Sensor Fail	Fault	Flash	Flash	ON
Room Temp Sensor Fail (Room Sensor Control Only)	Fault	Flash	Flash	ON
Leaving Water Temp Sensor Fail	Fault	Flash	Flash	ON

- *Check connection of low suction temperature sensor on terminal H6 pins 2 and 3.*
- *Check resistance of low suction temperature sensor, leaving water temperature sensor, and room sensor or return air sensor. All sensors are 10kohm thermistor @77°F.*
- *Return air sensor and room sensor shall not be connected simultaneously.*

Table 22: Compressor low suction temp

Description	Type	Yellow	Green	Red
Compressor Low Suction Temp	Fault	Flash	OFF	OFF

- *Check water flow (heating operation)*
- *Check airflow (cooling operation)*
- *Entering water and air temperatures should be within the operating limits.*

Table 23: Freeze fault detect

Description	Type	Yellow	Green	Red
Freeze Fault Detect	Fault	Flash	OFF	Flash

- *Low entering water temperature (below 35°F standard range or 13.5°F extended range)*

Table 24: Condensate overflow

Description	Type	Yellow	Green	Red
Condensate Overflow	Fault	ON	OFF	OFF

- *Poor condensate drain*
- *Check the resistance to ground on condensate wire. This should be open if there is no water in the pan.*

Table 25: Serial EEPROM corrupted

Description	Type	Yellow	Green	Red
Serial EEPROM Corrupted	Fault	ON	ON	ON

- *Replace main board*

Table 26: Waterside economizer low temp cutout (WSE control & call for cooling)

Description	Type	Yellow	Green	Red
Waterside Economizer Low Temp Cutout (WSE Control & Call for Cooling)	Mode	Flash	ON	Flash

- *Water temperature is below 35°F.*

Table 27: Service test mode enabled

Description	Type	Yellow	Green	Red
Service Test Mode Enabled	Mode	Flash	Flash	Flash

- *Jumper JP1 is shorted for test mode operation.*

Table 28: Unoccupied mode

Description	Type	Yellow	Green	Red
Unoccupied Mode	Mode	ON	ON	OFF

- *Terminal U on main control board is connected to common from external source.*

Table 29: Occupied, bypass, standby, or tenant override modes

Description	Type	Yellow	Green	Red
Occupied, Bypass, Standby, or Tenant Override Modes	Mode	OFF	ON	OFF

- *Unit is operating normal. It may currently have a control signal or ready to operate when a control signal is active.*

I/O expansion module LED faults and remedy

Table 30: Baseboard communication fail

Description	Type	Yellow	Green	Red
Baseboard Communication Fail	Fault	Flash	OFF	Flash

- *Verify jumper JP8 on main board is shorted.*
- *Verify connection of cable between H5 on main board and H1 on I/O expansion board.*

Table 31: Compressor #2 high pressure

Description	Type	Yellow	Green	Red
Compressor #2 High Pressure	Fault	OFF	OFF	Flash

- *Verify high pressure switch is connected to terminal HP2 on the I/O expansion.*
- *Check for continuity of the high pressure switch.*

If the high pressure fault resets when power is recycled:

- *Check water flow (cooling operation)*
- *Check airflow (heating operation)*
- *Entering water and air temperatures should be within the operating limits*

Table 32: Compressor #2 low pressure

Description	Type	Yellow	Green	Red
Compressor #2 Low Pressure	Fault	OFF	OFF	ON

- *Loose wire connection on low pressure circuit*
- *Failed low pressure switch*
- *Circuit #2 is low on charge*

Table 33: Compressor #2 low suction temp

Description	Type	Yellow	Green	Red
Compressor #2 Low Suction Temp	Fault	Flash	OFF	OFF

- *Check water flow (heating operation)*
- *Check airflow (cooling operation)*
- *Entering water and air temperatures should be within the operating limits.*

Table 34: Compressor #2 low suction temp

Description	Type	Yellow	Green	Red
Compressor #2 Low Suction Temp	Fault	Flash	OFF	OFF

- *Check water flow (heating operation)*
- *Check airflow (cooling operation)*
- *Entering water and air temperatures should be within the operating limits.*

Table 35: Compressor suction temp sensor fail

Description	Type	Yellow	Green	Red
Compressor Suction Temp Sensor Fail	Fault	Flash	OFF	OFF

- *Check connection of low suction temperature sensor on terminal H7 pins 1 and 2.*
- *Check resistance of low suction temperature sensor. All sensors are 10kohm thermistor @77°F.*

Table 36: Entering water temp sensor fail (boilerless electric heat or waterside economizer only)

Description	Type	Yellow	Green	Red
Entering Water Temp Sensor Fail (Boilerless Electric Heat or Waterside Economizer Only)	Fault	ON	OFF	Flash

- *Verify connections at terminals H4 on the I/O expansion board*
- *Verify resistance of EWT thermistor is 10K @ 77°F.*

Table 37: Low entering water temperature (no display on boilerless electric heat)

Description	Type	Yellow	Green	Red
Low Entering Water Temperature (No Display On Boilerless Electric Heat)	Fault	OFF	ON	Flash

- *Verify entering water temperature is greater than set point.*

Additional troubleshooting for size 290 only

IMPORTANT

The compressors in this unit are supplied with advanced diagnostics. Should this unit fail to operate properly with solid green lights (no faults) check the module on each compressor and refer to the troubleshooting section in this manual.

Table 38: CoreSense™ communications LED flash code information

Status	Fault Conditions	Code Fault Description	Code Reset Description	Troubleshooting Information
Solid Green	Normal Operation	Module is powered and operation in normal	N/A	N/A
Solid Red	Module Malfunction	Module has internal fault	N/A	1) Reset module by removing power from T2-T1 2) Replace module
Warning LED Flash				
Green Flash Code 1	Loss of Communication	Module and master controller have lost communications with each other for more than 5 minutes	When communications are confirmed	1) Check the control wiring 2) Verify dipswitch 8 is "ON"
Green Flash Code 2	Future Use	N/A	N/A	N/A
Green Flash Code 3	Short Cycling	Run time of less than 1 minute; number of short cycles exceeds 48 in 24 hours	<48 short cycles in 24 hours	1) Check system charge and pressure control setting 2) Adjust set-point of temperature controller 3) Install anti-short cycling control
Green Flash Code 4	Improper dipswitch 9 setting	N/A	N/A	Verify dipswitch 9 is "OFF"
Green Flash Code 5	Future Use	N/A	N/A	N/A
Alert Lockout LED Flash				
Red Code Flash 1	Motor High Temperature	Ω > 4.5K; Lockout after 5 alerts	Ω > 2.75K and minutes	1) Check supply voltage 2) Check system charge & superheat 3) Check contactor
Red Flash Code 2	Open/Shorted Motor Thermistor	Ω > 220K or Ω < 40; Lockout after 6 hours	40 < Ω < 2.75K and 30 minutes	1) Check for poor connections at module and thermistor fusite 2) Adjust set point of temperature controller 3) Install anti-short cycling control
Red Flash Code 3	Short Cycling	Run time of less than 1 minute; Lockout if the number of alerts exceeds the number configured by the user in 24 hours	Interrupt power to T2-T1 or perform Modbus reset command	1) Check system charge and pressure control setting 2) Adjust set point of temperature controller 3) Install anti-short cycling control
Red Flash Code 4	Not Used	N/A	N/A	N/A
Red Flash Code 5	Future Use	N/A	N/A	N/A

CoreSense communications LED flash code information (continued)

Red Flash Code 6	Missing phase	Missing phase; Lockout after 10 consecutive alerts	After 5 minutes and missing phase condition is not present	1) Check incoming power 2) Check fuses/breakers 3) Check contactor
Red Flash Code 7	Reverse phase	Reverse phase; Lockout after 1 alert	Interrupt power to T2-T1 or perform Modbus reset command	1) Check incoming phase sequence 2) Check contactor 3) Check module phasing wires A-B-C
Red Flash Code 8	Future Use	N/A	N/A	N/A
Red Flash Code 9	Module Low Voltage	Low voltage on T2-T1 terminals*	After 5 minutes and the voltage is back in the normal range	1) Verify correct module p/n 2) Check VA rating of transformer 3) Check for blown fuse in transformer secondary

Notes: *The flash code number corresponds to the number of LED flashes, followed by a pause, and then the flash code is repeated. A lockout condition produces a red flash, followed by a pause, a solid red, a second pause, and then repeated.*

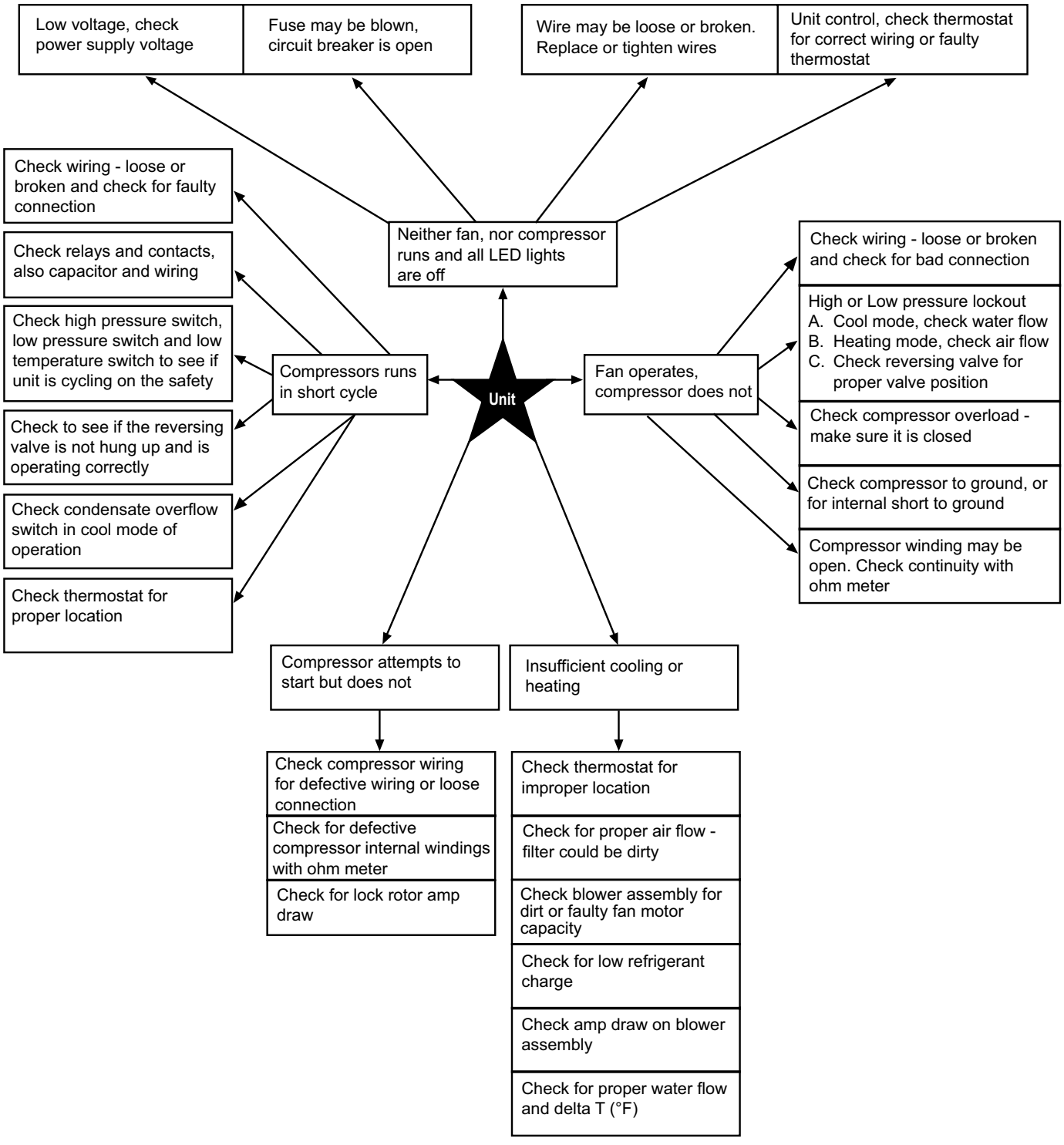
** This alert does not result in a Lockout*

Troubleshooting water source heat pump units

Table 39: Troubleshooting refrigeration circuit

Symptom	Head Pressure	Suction Pressure	Compressor Amp Draw	Super Heat	Subcooling	Air Temp Differential	Water (loops) Temp Differential	Safety Lock Out
Charge Undercharge System (Possible Leak)	Low	Low	Low	High	Low	Low	Low	Low Pressure
Overcharge System	High	High	High	Normal	High	Normal Low	Normal	High Pressure
Low Air Flow Heating	High	High	High	High Normal	Low	High	Low	High Pressure
Low Air Flow Cooling	Low	Low	Low	Low Normal	High	High	Low	Low Temp
Low Water Flow Heating	Low Normal	Low Normal	Low	Low	High	Low	High	Low Temp
Low Water Flow Cooling	High	High	High	High	Low	Low	High	High Pressure
High Air Flow Heating	Low	Low	Low	Low	High	Low	Low	Low Temp
High Air Flow Cooling	Low	High	Normal	High	Low	Low	Normal	High Pressure
High Water Flow Heating	Normal	Low	Normal	High	Normal	Normal	Low	High Pressure
High Water Flow Cooling	Low	Low	Low	Low	High	Normal	Low	Low Temp
TXV Restricted	High	Low	Normal Low	High	High	Low	Low	

Figure 39: Troubleshooting guide - unit operation



Lubrication

R-410A should be used only with polyester (POE) oil. The HFC refrigerant components in R-410A will not be compatible with mineral oil or alkylbenzene lubricants. R-410A systems will be charged with the OEM recommended lubricant, ready for use with R-410A.

Charging

Due to the zeotropic nature of R-410A, it should be charged as a liquid. In situations where vapor is normally charged into a system, a valve should be installed in the charging line to flash the liquid to vapor while charging.

Make certain that the recycle or recovery equipment used is designed for R-410A. The pressure of R-410A refrigerant is approximately 60 percent greater than that of R-22. Pressure gauges require a range up to 800 PSIG high side and 250 PSIG low side. Recovery cylinders require a 400 PSIG rating – do not put R-410A in a 300 PSIG rated cylinder.

⚠ WARNING

Recycle/recovery equipment must be designated for R-410A. R-410A pressure is greater than R-22. Improper equipment can cause severe injury or death.

Note: *Because a water source heat pump operates under a wide range of water and air temperatures, the values printed below are to be taken as suggested pressure and temperatures.) All Daikin water source heat pumps are designed for commercial use. The units are designed for the cooling mode of operation and fail safe to cooling. The reversing valve is energized for the heating mode of operation.*

Superheat	*Head Pressure*	*Water Delta T*
8 to 14 degrees	335-355 PSIG	10° to 14°

Note: All information above is based on ISO standard 13256-1 and tested at these conditions.

General maintenance

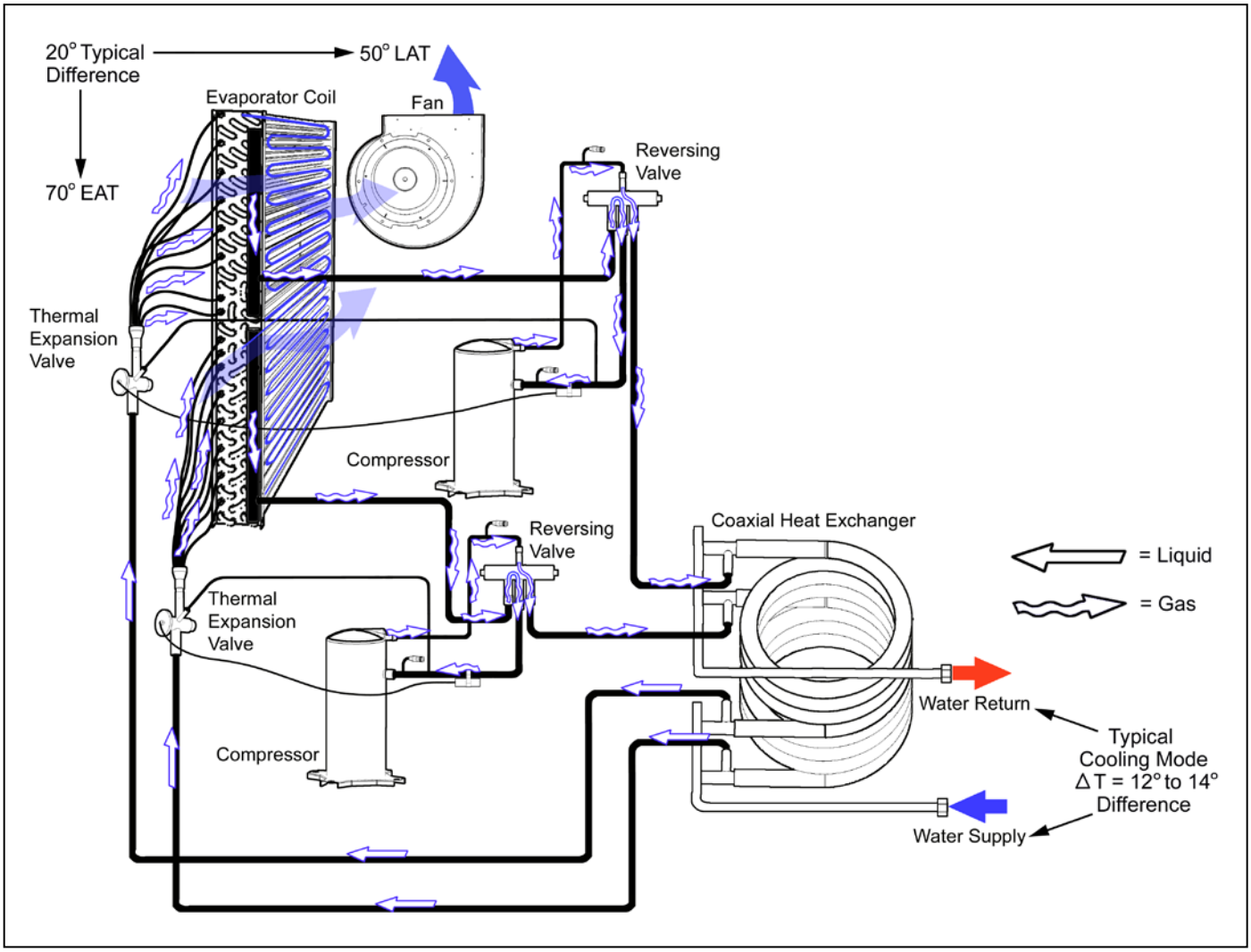
1. Normal maintenance on all units is generally limited to filter changes. Units are provided with permanently lubricated motors and require no oiling even though oil caps may be provided.
2. Filter changes are required at regular intervals. The time period between changes will depend upon the project requirements. Some applications such as motels produce a lot of lint from carpeting and linen changes, and will require more frequent filter changes. Check filters at 60-day intervals for the first year until experience is acquired. If light cannot be seen through the filter when held up to sunlight or a bright light, it should be changed. A more critical standard may be desirable.
3. The condensate drain pan should be checked annually and cleaned and flushed as required.
4. Record performance measurements of volts, amps, and water temperature differences (both heating and cooling). A comparison of logged data with start-up and other annual data is useful as an indicator of general equipment condition.
5. Periodic lockouts almost always are caused by air or water problems. The lockout (shutdown) of the unit is a normal protective result. Check for dirt in the water system, water flow rates, water temperatures, airflow rates (may be a dirty filter), and air temperatures. If the lockout occurs in the morning following a return from night setback, entering air below machine limits may be the cause.
6. Fan shaft bearings should be periodically greased using any good quality lithium or lithium complex base grease, using mineral oil, conforming to NLGI grade 2 consistency, and an oil viscosity of 455-1135SUS at 100°F (100-200 cSt at 40°C). Compatibility of grease is critical. Lubricatable bearings are supplied with grease fittings or zerks for ease of lubrication with hand or automatic grease guns. Always wipe the fitting and grease nozzle clean.

Typical cooling refrigeration cycle – dual compressors

Note: *Typical temperature readings are at full load conditions at ISO-13256 for boiler-tower applications.*

When the wall thermostat calls for COOLING, the reversing valve (de-energized) directs the flow of the refrigerant, a hot gas, from the compressor to the water-to-refrigerant heat exchanger (coaxial heat exchanger). There, the heat is removed by the water, and the hot gas condenses to become a liquid. The liquid then flows through a thermal expansion valve to the air-to-refrigerant heat exchanger coil (evaporator). The liquid then evaporates and becomes a gas, at the same time absorbing heat and cooling the air passing over the surfaces of the coil. The refrigerant then flows as a low pressure gas through the reversing valve and back to the suction side of the compressor to complete the cycle.

Figure 40: Cooling refrigeration cycle

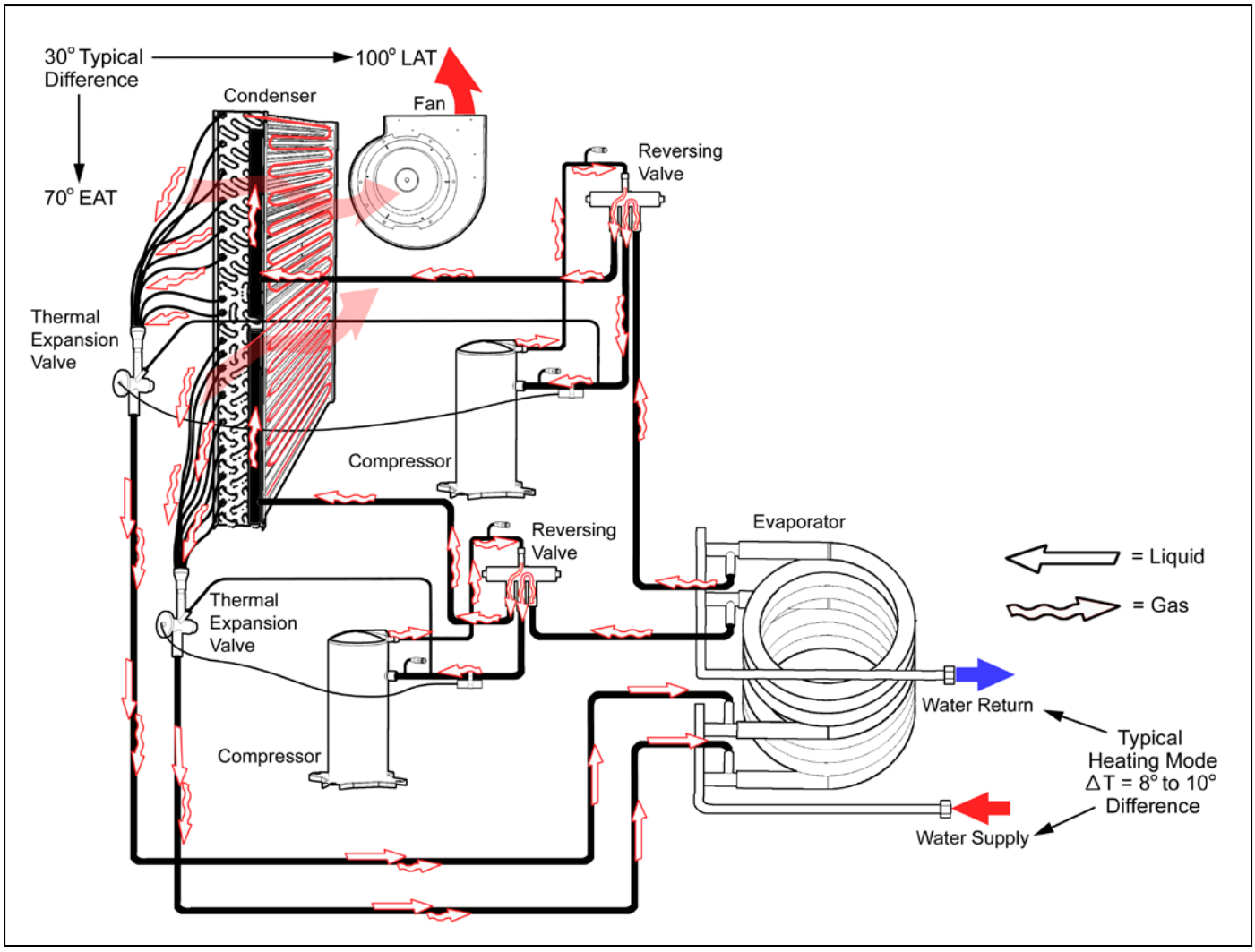


Typical heating refrigeration cycle – dual compressors

Note: *Typical temperature readings are at full load conditions at ISO-13256 for boiler-tower applications.*

When the wall thermostat calls for HEATING, the reversing valve (energized) directs the flow of the refrigerant, a hot gas, from the compressor to the air-to-refrigerant heat exchanger coil (condenser). There, the heat is removed by the air passing over the surfaces of the coil and the hot gas condenses and becomes a liquid. The liquid then flows through a thermal expansion valve to the water-to-refrigerant heat exchanger (evaporator). The liquid then evaporates and becomes a gas, at the same time absorbing heat and cooling the water. The refrigerant then flows as a low pressure gas through the reversing valve and back to the suction side of the compressor to complete the cycle.

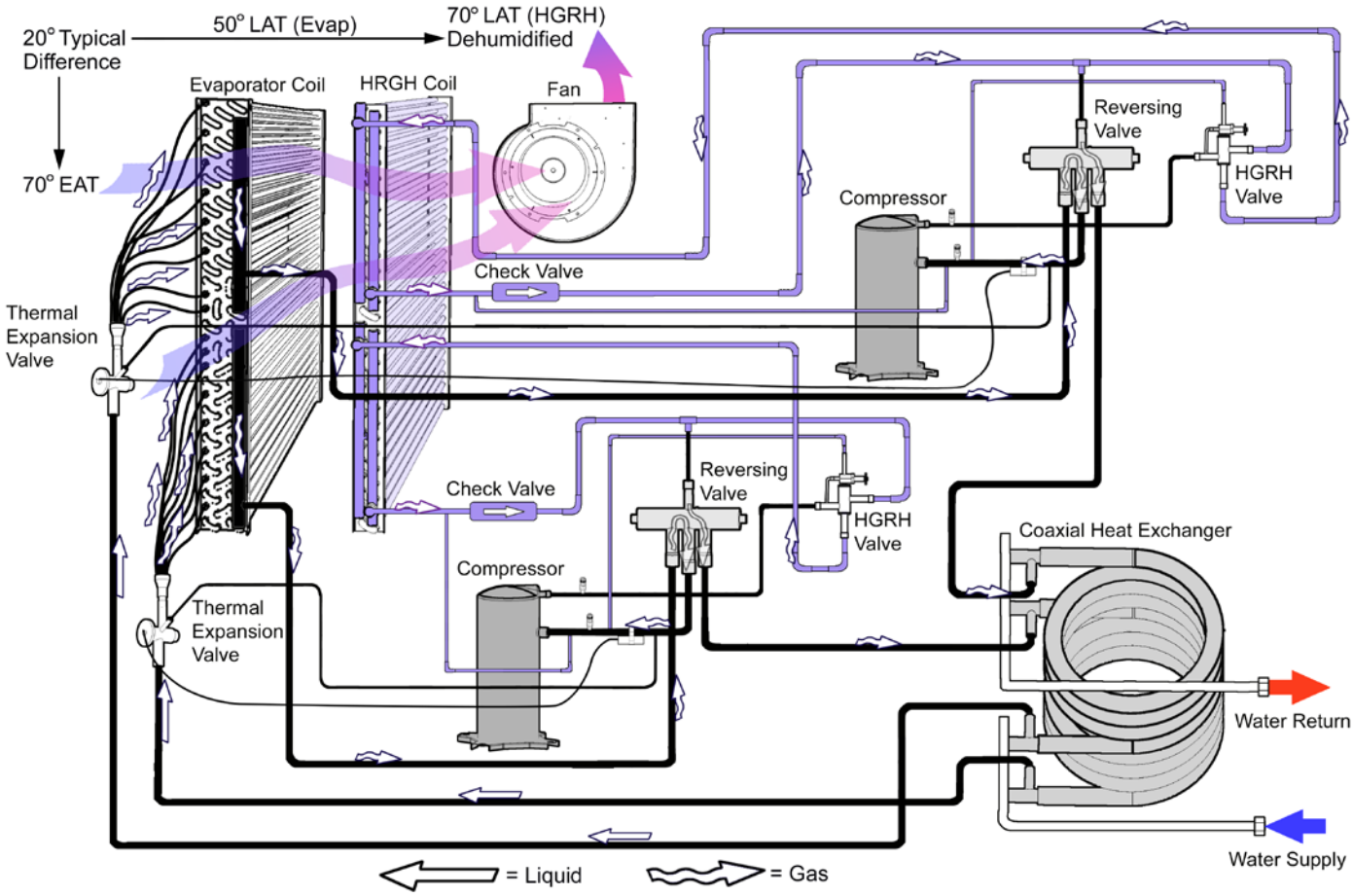
Figure 41: Heating Refrigeration Cycle



Typical hot gas reheat refrigeration cycle – dual compressors

When the DEHUMID setting is not satisfied and COOLING has been satisfied the reversing valve remains (de-energized) but the hot gas reheat (HGRH) valve is (energized). This directs the flow of the refrigerant, a hot gas, from the compressor through the hot gas reheat (HGRH) coil thus heat is removed from the refrigerant gas to reheating the cooled air from the evaporator coil. Then the refrigerant flows to the water-to-refrigerant heat exchanger (coaxial heat exchanger). There, the heat is removed by the water, and the hot gas condenses to become a liquid. The liquid then flows through a thermal expansion valve to the air-to-refrigerant heat exchanger coil (evaporator). The liquid then evaporates and becomes a gas, at the same time absorbing heat and cooling the air passing over the surfaces of the coil. The refrigerant then flows as a low pressure gas through the reversing valve and back to the suction side of the compressor to complete the cycle.

Figure 42: Hot gas reheat refrigeration cycle



DAIKIN

Water source heat pump equipment check, test and start form

This form must be completed and submitted within ten (10) days of start-up to comply with the terms of the Daikin warranty. Forms should be returned to Daikin Warranty Department.

Installation Data

Job Name _____ Check, Test & Start Date _____

City or Town _____ State _____ Zip _____

Who is Performing CTS _____

General Contractor _____

Equipment Type (Check all that apply)

☐ Closed Loop ☐ Open Loop

☐ Geothermal ☐ Other (specify)_____

Essential Items Check of System – *Note:* *"No" answers below require notice to installer by memorandum (attached copy.)*

Essential Items Check

A. Voltage Check_____ Volts Loop Temp._____ °F Heating Set For _____ °F Cooling System Water P.H. Levels _____

B. Yes	No	Condition	Comments
☐	☐	Loop Water Flushed Clean	
☐	☐	Closed Type Cooling Tower	
☐	☐	Water Flow Rate to Heat Pump Balanced	
☐	☐	Standby Pump Installed	
☐	☐	System Controls Functioning	
☐	☐	Outdoor Portion of Water System Freeze Protected	
☐	☐	Loop System Free of Air	
☐	☐	Filters Clean	
☐	☐	Condensate Traps Installed	

Note: "No" answers below require notice to installer by memorandum (attached copy.)

☐	☐	Outdoor Air to Heat Pumps:	
☐	☐	Other Conditions Found:	

Please include any suggestions or comments for Daikin Applied: _____

_____

_____

_____

Above System is in Proper Working Order

Note: *This form must be filled out and sent to the warranty administrator before any service money can be released.*

_____
Date

_____
Signature for Sales Representative

_____
Signature for Customer

For Internal Use

Release:

SM _____

CTS _____

T _____

_____
Service Manager Approval

_____
Date

Unit check / equipment data

Installation Data

Job Name _____ Check Test Date: _____

City _____ State _____ Zip _____

Daikin Model # _____

Daikin Serial # _____ Job site Unit ID # (HP #)_____

General Contractor:_____ Mechanical Contractor:_____

Technician Performing Start-Up: Name_____ Employer:_____

Complete equipment data from measurements taken at the locations indicated on the drawing below.

Equipment Data

Flow Rate **EWP - LWP = ΔP**

(1) EWP - PSI In _____ minus (2) LWP - PSI Out _____ equals ΔP _____

The first step in finding GPM is to subtract leaving water pressure from entering water pressure. The difference between the two is referred to as ΔP. ΔP can be converted to GPM by looking in the equipment specificaton catalog. **Caution ΔP ≠ GPM**

Note: A conversion table must be used to find GPM from (Delta) ΔP measurements.

Loop Fluid Temperature Rise / Drop through Coaxial Heat Exchanger **EWT - LWT = ΔT**

(3) EWT - °F Out_____ minus (4) LWT - °F Out_____ equals Fluid ΔT _____

ΔT is the rise or drop in the fluid temperature as it passes through the Coaxial.

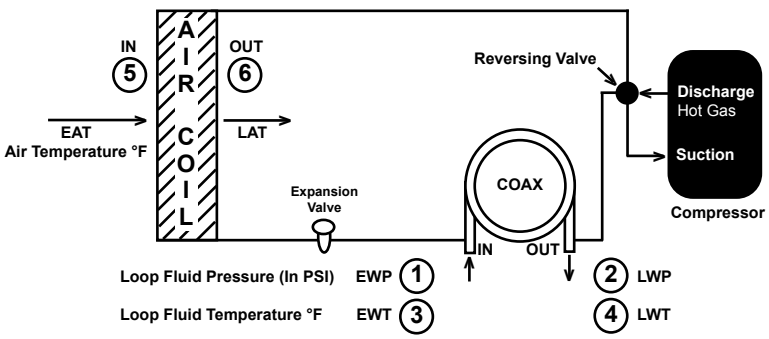
Air Temperature Rise / Drop through the air coil **ΔT x CFM x 1.08 = BTUH Sensible**

(5) EAT - °F In_____ minus (6) LAT - °F Out _____ equals Air ΔT_____

Note: Perform Check, Test and Start-Up in the Cooling Mode Only.

EWT - Entering Water Temperature
EWP - Entering Water Pressure
EAT - Entering Air Temperature
Δ- Delta (Differential)
LWT - Leaving Water Temperature
LWP - Leaving Water Pressure
LAT - Leaving Air Temperature
CFM - Cubic Feet/Minute
BTUH - British Thermal Units/Hour

Check, Test & Start



Form No._____

Commercial check, test and start worksheet

(Complete all equipment measurements indicated for each unit per installation on previous page)

	Model	Serial #	H.P. #	EWT ③	LWT ④	EWP ①	LWP ②	EAT ⑤	LAT ⑥	Volts	Amps Cooling	Check Air Filter and Coil	Comments (provide comments on additional sheets)
1.													
2.													
3.													
4.													
5.													
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42.													

Part No._____

Daikin Applied Training and Development

Now that you have made an investment in modern, efficient Daikin equipment, its care should be a high priority. For training information on all Daikin 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 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. Refer to Form 933-430285Y. 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.