

SMARTSOURCE®

LARGE CAPACITY HORIZONTAL WATER SOURCE HEAT PUMP



- MODEL WSLH
- UNIT SIZES 072 - 120 (6 TO 10 TONS)
- R-32 REFRIGERANT

Safety Information	3	Electrical Data	21
Hazard Identification	3	Low Voltage Wire Connections	22
Safety Considerations	3	Typical Connections For Thermostats & Temperature Sensors Applications	22
UL Compliance Statements for Unit Work	4	Typical Wiring Diagrams	25
Unit Labels	4	Operation	32
Introduction	5	Start-Up	32
Model Nomenclature	5	Controls	33
Installation	7	Configuration DIP Switches	34
Receiving and Storage	7	MicroTech SmartSource Unit Controller	35
Operating Limits	7	MicroTech Unit Controller LED Faults and Remedy ..	38
Pre-Installation	8	MicroTech Unit Controller with an Optional BACnet Communication Module	40
Unit Location	10	Maintenance	41
Filter Access	11	Troubleshooting	42
Air Balancing	12	Refrigerant Information	43
Factory Mounted Variable Frequency Drive (VFD) ..	13	Refrigerant Guidelines	43
Ductwork & Attenuation	13	Appendix	50
Ventilation Air	15	Warranty Registration Form	50
Water Piping	16	Limited Product Warranty	54
Water System Quality	17		
Cleaning & Flushing System	18		
Field Installed Accessories	20		



*Models with capacities greater than 135,000 Btuh are not included in the ANSI/AHRU/ASHRAE/ISO13256-1 water-to-air and brine-to-air heat pump certification program.

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Safety Information

Hazard Identification

DANGER

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

WARNING

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

CAUTION

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

NOTICE

Notice indicates practices not related to physical injury.

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

Safety Considerations

This manual provides installation, operation, and maintenance information for Daikin Applied SmartSource Large Capacity Horizontal Water Source Heat Pump with a MicroTech® controller.

NOTICE

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

A means for disconnection must be incorporated in the fixed wiring in accordance with the wiring rules for stationary appliances not fitted with means for disconnection from the supply mains having a contact separation in all poles that provide full disconnection under overvoltage category III.

DANGER

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

WARNING

This Installation and Maintenance bulletin is intended to provide the proper procedures for installing a Daikin Applied Water Source Heat Pump. Failure to follow these procedures can cause property damage, severe personal injury, or death. Additionally, 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.

WARNING



This unit contains R-32, a class A2L refrigerant that is flammable. This unit should only be installed, serviced, repaired, and disposed of by qualified personnel licensed or certified in their jurisdiction to work with R-32 refrigerant. Installation and maintenance must be done in accordance with this manual. Improper handling of this equipment can cause equipment damage or personal injury.

For installation only in locations not accessible to the general public.

Be aware that R-32 refrigerant may not contain an odor. Place in a well ventilated area to prevent accumulation of refrigerant. When installing the unit in a small room, take measures to keep the refrigerant concentration from exceeding allowable safety limits. Excessive refrigerant leaks, in the event of an accident in a closed ambient space, can lead to oxygen deficiency.

Do not pierce or burn this unit.

Never use an open flame during service or repair. Never store in a room with continuously operating ignition sources (for example: open flames, an operating gas appliance, or an operating electric heater), where there is ignitable dust suspension in the air, or where volatile flammables such as thinner or gasoline are handled.

Only use pipes, nuts, and tools intended for exclusive use with R-32 refrigerant in compliance with national codes (ASHRAE15 or IRC).

Do not mix air or gas other than R-32 in the refrigerant system. If air enters the refrigerant system, an excessively high pressure results, which may cause equipment damage or injury.

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

For more information, consult "Refrigerant Guidelines" on [page 43](#).

WARNING

Electric shock hazard. Improper handling of this equipment can cause personal injury or equipment damage. This equipment must be properly grounded. Connections to and service of the MicroTech control panel must be performed only by personnel that are knowledgeable in the operation of the equipment being controlled.

WARNING

When moving flammable A2L refrigerant to/from the unit from an auxiliary tank, a grounding strap must be used. An electrical charge builds when halo-carbon refrigerant travels in a rubber hose. A grounding strap must be used between the auxiliary refrigerant tank and the unit's end sheet (earth ground), which will safely take the charge to the ground. A fire risk could occur if this procedure is not followed.

WARNING

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

WARNING

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

Daikin Applied disclaims any liability resulting from any interference or for the correction thereof.

CAUTION

Static sensitive components. A static discharge while handling electronic circuit boards can cause damage to the components. Discharge any static electrical charge by touching the bare metal inside the control panel before performing any service work. Never unplug any cables, circuit board terminal blocks, or power plugs while power is applied to the panel.







UL Compliance Statements for Unit Work

- All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.
- Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.
- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e., non-sparking, adequately sealed or intrinsically safe.
- If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available at hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.
- No person carrying out work in relation to a refrigeration system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space.
- Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards. Safety checks are necessary to ensure that the risk of ignition is minimized and "No Smoking" signs shall be displayed.
- Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

- If unit is permanently connected to water main; hose sets are not to be used.

Unit Labels

Pictogram warning and informational labels may be present on the unit. Consult the table below for reference.

Label	Description
 Refrigerant class per ISO 817	WARNING - flammable refrigerant present
	Read the technical manual for service instructions
	WARNING - A2L low-burning velocity refrigerant present
	Pressurized medium present
	Read the technical manual for instructions
	WARNING - flammable refrigerant present

Introduction

Model Nomenclature

1	2-3	4	5-7	8	9	10	11-12	13	14	15	16	17	18	19	20	21-22	23	24	25	26	27	28	29	30	31	32	33	34
W	SL	H	120	F	1	R	LE	C	M	T	S	A	Y	Y	2	YY	C	Y	Y	Y	Y	Y	S	G	Y	Y	Y	L

Category	Code Position	Code	=	Description
Product Category	1	W	=	Water Source Heat Pump
Model Type	2-3	SL	=	SmartSource Large Capacity
Configuration	4	H	=	Horizontal
Nominal Capacity	5-7	072	=	72,000 Btu/h Nominal Cooling
		096	=	96,000 Btu/h Nominal Cooling
		120	=	120,000 Btu/h Nominal Cooling
Voltage	8	F	=	208-230/60/3
		K	=	460/60/3
		L	=	575/60/3
Design Series (Vintage)	9	1	=	Design Series 1
Piping Hand	10	R	=	Right Hand
Cabinet Configuration	11-12	LS	=	Left Hand Return / Straight Discharge
		LE	=	Left Hand Return / End Discharge
Water Coil Type	13	C	=	Copper Inner Tube
		G	=	Copper Inner Tube (Geothermal)
		S	=	Cupronickel Inner Tube
		J	=	Cupronickel Inner Tube (Geothermal)
Unit Control	14	M	=	MicroTech Unit Controller
		B	=	MicroTech Unit Controller + BACnet
Controller Options	15	T	=	T-Stat Control
		S	=	Sensor Control
Fan Motor Options	16	S	=	Integral HP - STD Static
		H	=	Integral HP - High Static
		M	=	Integral HP - STD Static with VFD (N/A 575V)
		N	=	Integral HP - High Static with VFD (N/A 575V)
Insulation (Compressor Side / Air Side)	17	A	=	Fiberglass / Fiberglass
		D	=	Sound Blanket + Fiberglass / Fiberglass
Water Coil - Indoor Air	18	Y	=	None
		W	=	Waterside Economizer
Dehumidification	19	Y	=	None
		B	=	Hot Gas Bypass
		R	=	Hot Gas Reheat
Transformer	20	2	=	75VA
Options	21-22	YY	=	None
		0A	=	Freeze Fault
Filter Racks & Filters	23	C	=	2" Rack & 2" Disposable Filter
		D	=	2" Rack & 2" MERV 8 Filter
		H	=	4" Rack & 4" MERV 13 Filter
Water Flow Options	24	Y	=	None
Piping Package	25	Y	=	None
Electric Heat Size	26	Y	=	None
Electric Heat Control (Board Configuration)	27	Y	=	None
Cabinet Color	28	Y	=	Galvanized
		W	=	Off White
Standard or Special	29	S	=	Standard
		X	=	Special
Drain Pan Material	30	S	=	Stainless Steel Drain Pan
		G	=	Galvanized Drain Pan
Electrical Options	31	Y	=	None
		P	=	Phase Monitor

Category	Code Position	Code	=	Description
Corrosion Protection	32	Y	=	None
		C	=	Corrosion Protection
IAQ	33	Y	=	None
Extended Warranty	34	Y	=	None
		V	=	1 Year Extended Compressor Only Parts Warranty
		W	=	1 Year Extended Refrigerant Circuit Parts Warranty
		M	=	1 Year Extended Compressor Only Parts Warranty with 1st Year Labor Allowance
		N	=	1 Year Extended Refrigerant Circuit Parts Warranty with 1st Year Labor Allowance
		S	=	1 Year Extended Complete Unit Parts Warranty with 1st Year Labor Allowance
		E	=	1 Year Extended Complete Unit Parts Warranty
		C	=	4 Year Extended Compressor Only Parts Warranty
		R	=	4 Year Extended Refrigerant Circuit Parts Warranty
		P	=	4 Year Extended Complete Unit Parts Warranty
		F	=	4 Year Extended Compressor Only Parts Warranty with 1st Year Labor Allowance
		H	=	4 Year Extended Refrigerant Circuit Parts Warranty with 1st Year Labor Allowance
		J	=	4 Year Extended Complete Unit Parts Warranty with 1st Year Labor Allowance
		L	=	First Year Labor Allowance
T	=	4 Year Extended Complete Unit Parts Warranty with Labor Allowance		

Installation

WARNING

The installer must determine and follow all applicable local and national 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, personal injury, or death. This equipment must be installed by experienced, trained personnel only.

WARNING

This appliance shall be installed in accordance with national wiring regulations (national electric code, Canadian electric code).

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.

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.

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

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

NOTICE

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

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

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

Operating Limits

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

NOTICE

Altitude Limits: Maximum applied altitude not to exceed 3,000 m/9,843 ft.

NOTICE

The maximum water temperature is 120°F (49°C) and the minimum brine temperature is 25°F (-4°C). The maximum water pressure is 500 psi (3,447 kPa) through the coaxial coil and the minimum water pressure is 0 psi (0 kPa).

Initial Unit Start-Up Temperature Range

NOTICE

This is not for continuous operation. It is assumed that such a start-up is for the purpose of bringing the building space up to occupancy temperature.

Standard Range Units

Units are designed to start 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 at the flow rates used in the ISO 13256-1 rating test, for initial start-up in winter.

Extended Range Units

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

Table 1: Air Limits in °F (°C)

Air Limits	Standard Range Units		Extended Range (Geothermal) Units	
	Cooling (DB/WB)	Heating	Cooling (DB/WB)	Heating
Minimum Ambient Air¹	50°F (10°C)	50°F (10°C)	40°F (4°C)	40°F (4°C)
Maximum Ambient Air²	100°F/77°F (38°C/25°C)	85°F (29°C)	100°F/77°F (38°C/25°C)	85°F (29°C)
Minimum Entering Air¹	65°F/55°F (18°C/13°C)	50°F (10°C)	65°F/55°F (18°C/13°C)	50°F (10°C)
Common Design Entering Air	75°F/63°F (24°C/17°C)	70°F (21°C)	75°F/63°F (24°C/17°C)	70°F (21°C)
Maximum Entering Air²	85°F/71°F (29°C/22°C)	80°F (27°C)	85°F/71°F (29°C/22°C)	80°F (27°C)

¹ Maximum and minimum values may not be combined. If one value is at maximum or minimum, the other 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.

² This is not for continuous operation. It is assumed that such a start-up is for the purpose of bringing the building space up to occupancy temperature.

Table 2: Fluid Limits

Fluid Limits	Standard Range Units		Extended Range (Geothermal) Units	
	Cooling	Heating	Cooling	Heating
Minimum Entering Fluid	55°F (13°C)	55°F (13°C)	30°F (-1°C)	25°F (-4°C)
Common Design Entering Fluid	85-90°F (29-32°C)	70°F (21°C)	90°F (32°C)	35-60°F (1.5-16°C)
Maximum Entering Fluid	120°F (49°C)	90°F (32°C)	120°F (49°C)	90°F (32°C)
Minimum GPM/Ton	2.0			
Nominal GPM/Ton	3.0			
Maximum GPM/Ton	4.0			

Antifreeze

CAUTION

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

Glycols and other alcohols are commonly used as antifreeze; however higher percentage mixtures of alcohols such as ethanol and methanol are not recommended due to increased flammability. Your local sales office should be consulted to determine the antifreeze best suited to your area. The use of antifreeze may impact system performance depending on its concentration and should be considered during initial system design. When antifreeze is added to the water system for freeze protection, recognize that the refrigerant suction pressure will be lower, capacity will be less, and water side pressure drop will be higher. The reduction in performance depends upon the antifreeze concentration and temperature.

In areas where minimum entering loop temperatures drop below 50°F (10°C) or where piping will be routed through areas subject to freezing, antifreeze is required. If 3 GPM/ton is maintained, this limit can be lowered to 42°F (6°C). Care must be given to maintain proper water flow.

Freeze protection should be maintained to 15°F (9°C) below the lowest expected entering loop temperature. For example, if 30°F (-1°C) is the minimum expected entering loop temperature, the leaving loop temperature would be 22 to 25°F (-6 to -4°C) and freeze protection should be at 15°F (-10°C). Calculation is as follows: 30°F - 15°F = 15°F (-1°C - 9°C = -10°C).

All alcohols should be premixed and pumped from a reservoir outside of the building when possible or introduced under the water level to prevent fumes. Calculate the total volume of fluid in the piping system. Then use the percentage by volume shown in Table 3 for the amount of antifreeze needed. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

Table 3: Antifreeze Percentage by Volume

Type	Minimum Temperature for Low Temperature Protection			
	10°F (-12.2°C)	15°F (-9.4°C)	20°F (-6.7°C)	25°F (-3.9°C)
Propylene Glycol	38%	25%	22%	15%
Ethanol¹	29%	25%	20%	14%
Methanol	25%	21%	16%	10%

¹ Must not be denatured with any petroleum product.

Table 4: Antifreeze Correction Factors

Ethylene Glycol					
	10%	20%	30%	40%	50%
Cooling Capacity	0.995	0.992	0.987	0.983	0.979
Heating Capacity	0.991	0.982	0.977	0.969	0.961
Pressure Drop	1.07	1.13	1.18	1.26	1.28
Propylene Glycol					
	10%	20%	30%	40%	50%
Cooling Capacity	0.99	0.98	0.97	0.96	0.95
Heating Capacity	0.987	0.975	0.962	0.942	0.93
Pressure Drop	1.07	1.15	1.25	1.37	1.42
Ethanol					
	10%	20%	30%	40%	50%
Cooling Capacity	0.991	0.951	–	–	–
Heating Capacity	0.995	0.96	–	–	–
Pressure Drop	1.035	0.96	–	–	–
Methanol					
	10%	20%	30%	40%	50%
Cooling Capacity	0.998	0.972	–	–	–
Heating Capacity	0.995	0.97	–	–	–
Pressure Drop	1.023	1.057	–	–	–

NOTE: Higher percentage mixtures of ethanol and methanol are not recommended due to increased flammability.

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.

- To prevent damage, do not operate this equipment for supplementary heating and cooling during the construction period.
- 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.
- Check the unit size against the plans to verify that the unit is being installed in the correct location.

- Before installation, check the available ceiling height versus the height of the unit.
- 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.
- The installing contractor will find it beneficial to confer with piping, sheet metal, and electrical foremen before installing any unit.

NOTICE

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.

- 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.
- Remove all shipping blocks in the fan wheel (if required).
- Change the airflow direction from straight discharge to end discharge or vice versa before the unit is installed in the ceiling. Refer to "Air Discharge Conversion Procedure".

Air Discharge Conversion Procedure

Unit sizes 072 through 120 straight discharge unit may be converted to an end discharge by doing the following:

NOTICE

No additional parts are required to perform this rework. The rework must not be performed while unit is in the ceiling, but on the floor or a work bench.

Estimated Time: 1 Hour

DANGER

Hazardous Voltage! Disconnect all electric power including remote disconnects before servicing.

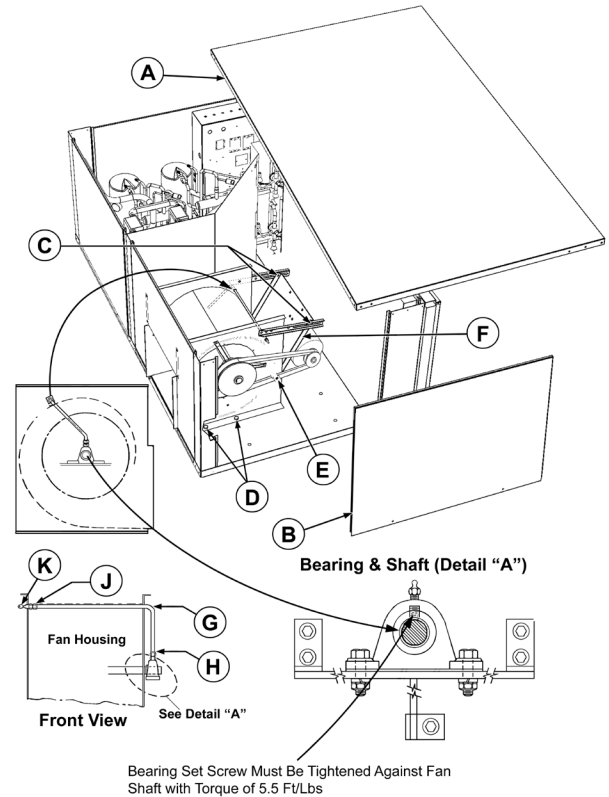
Failure to disconnect power before servicing can cause serious injury or death.

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.

1. Remove the top (A) and the end access panel (B).
2. Loosen the belt tension brackets (C) and roll the drive belt off the blower pulley and the adjustable sheave.
3. Remove the fixed pulley on the blower fan shaft.
4. Remove the four bolts (D) holding the blower housing in place to the unit base or bottom (2 each side).

Figure 1: Fan Blower Conversion Details



5. Remove the blower discharge panel mounting screws holding it in place to the corner post and side post.
6. With all bolts and screws removed, lift out the blower assembly and place it on a workbench.
7. Remove the nuts, bolts and washers (C & E) that are holding the adjustable fan motor plate (F) to the blower housing. There are four sets of nuts, bolts and washers.
8. Rotate the motor and motor plate over end for end 180° putting the fan motor shaft on the opposite side of the blower housing. Reposition the nuts, bolts and washers that hold the motor plate and motor, leaving the adjustable nuts (C) loose for readjustment.
9. Remove the grease fitting tube (G) from the coupling tube (H). Remove the other end of the grease tube (G) at the coupling (J). Also remove the grease tube end (K). Save all for reinstallation.
10. Remove the fan shaft as one complete assembly and reinstall it from the opposite side of the housing assembly. Reassemble the motor mounting plate (F).
11. Reinstall in reverse order as in step 9 the grease tube (G).

NOTICE

The tube must be pushed through the bushing in the blower housing plate prior to coupling (J) and end fitting (K) are reattached.

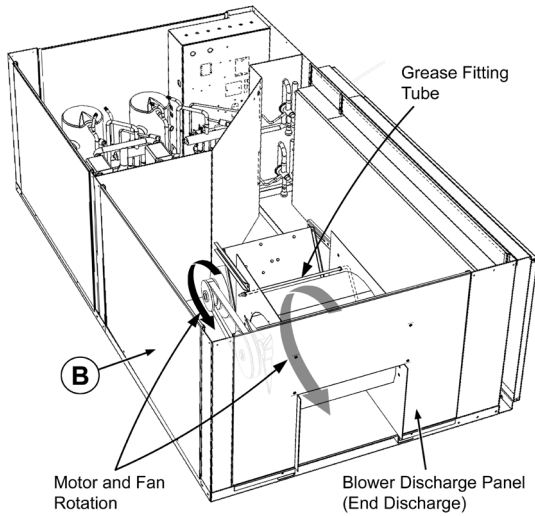
- Center the fan in the housing. Set the bearings (**Detail “A”**) and proper belt tension by referring to “Air Balancing” on page 12.

⚠ WARNING

Do not overtighten the belt tension. Belts that are overtightened are the leading cause of blower assembly failure.

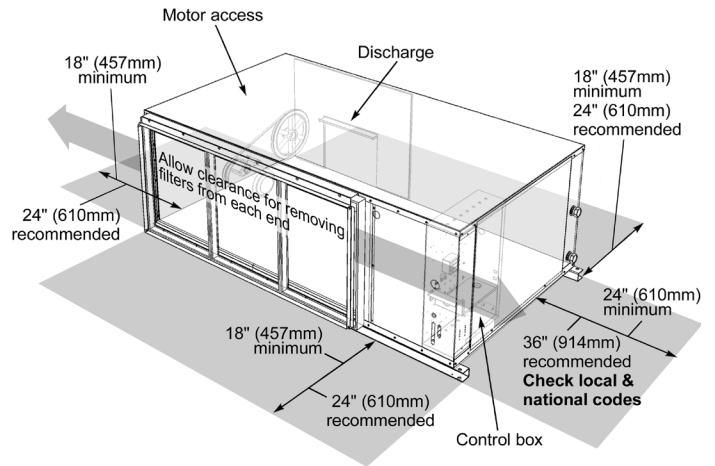
- Lift the completed belt-drive blower assembly and locate it over the holes in the base pan. The belt and pulleys should now be facing the repositioned access panel (**B**).
- Reinstall the access panels, power the unit and operate the blower to confirm proper fan rotation.

Figure 2: Unit Converted to End Discharge



- Each unit is furnished with a hanger kit. The kit is shipped unassembled and includes hanger brackets, rubber isolators, washers, bolts and lock washers. Lay out the threaded rods per the dimension in Figure 6.
- When attaching the hanger rods to the unit, a double nut is recommended since vibration could loosen a single nut. The installer is responsible for providing the hex nuts when installing hanger rods.
- Leave minimum 3" (76 mm) extra threaded rod below the double nuts or minimum 3" (76 mm) clearance between top of unit and ceiling above to facilitate top panel removal for servicing.

Figure 3: Unit Clearances



Unit Location

- Locate the unit in an area that allows for easy removal of the filter and access panels. Leave a minimum of 18" of clearance around the heat pump for easy removal, and to perform routine maintenance, or troubleshooting. Provide sufficient room to make water, electrical and duct connections.
- The contractor should make sure that adequate ceiling panel access exists, including clearance for hanger brackets, duct collars and fittings at water and electrical connections.
- Allow adequate room below the unit for a condensate trap and do not locate the unit above pipes.
- Each unit is suspended from the ceiling by four threaded rods. The rods are attached to the unit corners by a hanger bracket through a rubber isolator.

⚠ CAUTION

Do not use rods smaller than shown in Figure 6. The rods must be securely anchored to the ceiling or to the bar joists.

Filter Access

As standard, each unit is shipped with a 2" filter rack for side filter removal. For bottom removal push the filter up into top bracket to gain clearance of bottom bracket and remove the filter. Also, a sheet metal duct filter retainer can be fabricated when return air duct work is used.

Figure 4: 2" Filter Rack with Return Air Duct Flange Dimensions

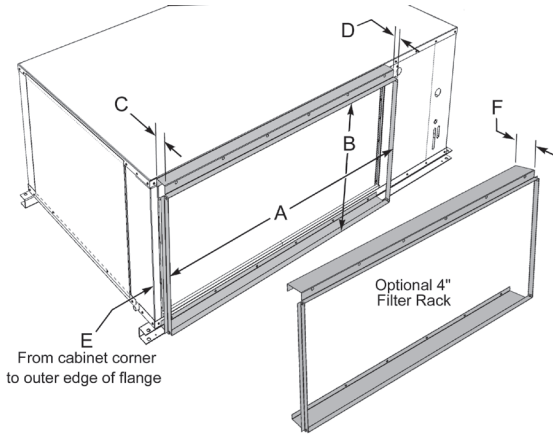


Table 5: Filter Rack Dimensions

A	B	C	D	E	F
55.10" (1400mm)	26.78" (680 mm)	2.20" (56 mm)	1.00" (25 mm)	3.30" (84 mm)	4.20" (107 mm)

Figure 6: Hanger Brackets – Sizes 072 - 120

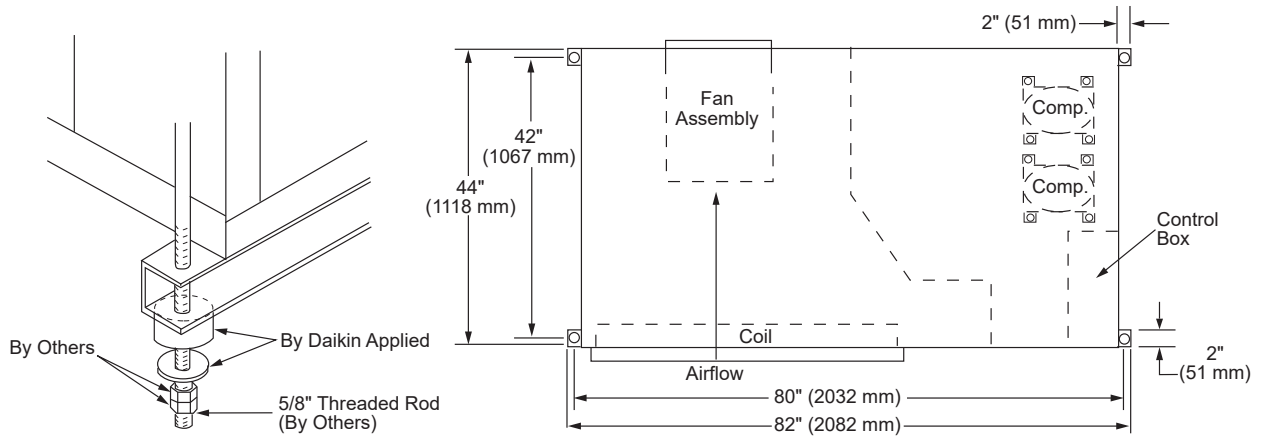


Figure 5: WSLH Filter Rack Dimensions

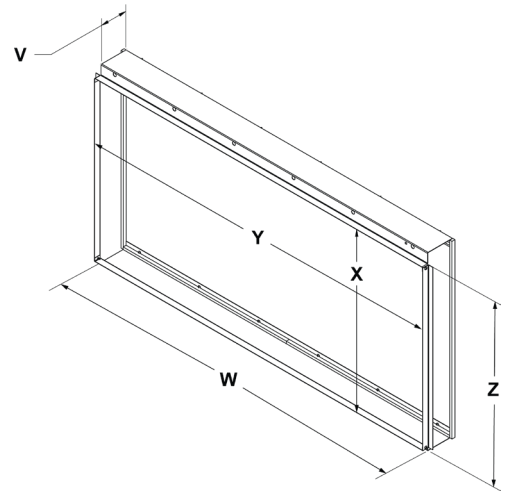


Table 6: WSLH Filter Rack Dimensions

Unit Size	Filter Rack Dimensions (2" or 4")					
	Frame Depth		Frame Width W	Frame Height X	Duct Flange Width Y	Duct Flange Height Z
	2"	4"				
072						
096	2.20" (56 mm)	4.20" (107 mm)	56.53" (1436 mm)	28.82" (732 mm)	55.10" (1400 mm)	26.65" (677 mm)
120						

Air Balancing

Unit sizes 072 through 120 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.

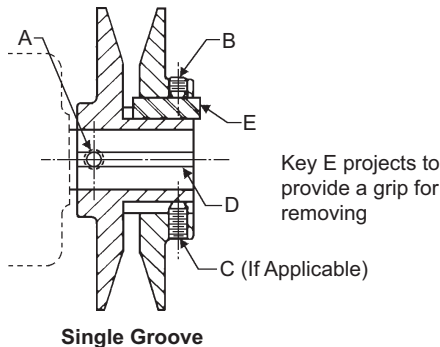
Sheave Adjustment

1. All sheaves should be mounted on the motor or driving shaft with the setscrew "A" toward the motor.
2. Be sure both driving and driven sheaves are in alignment and that shafts are parallel.
3. Fit internal key "D" between sheave and shaft, and lock setscrew "A" securely in place. Wrench torque 110 in.-lb. minimum - 130 in.-lb. maximum.

Adjusting

1. Loosen setscrews "B" and "C" in moving parts of sheave and pull out external key "E". (This key projects a small amount to provide a grip for removing.)

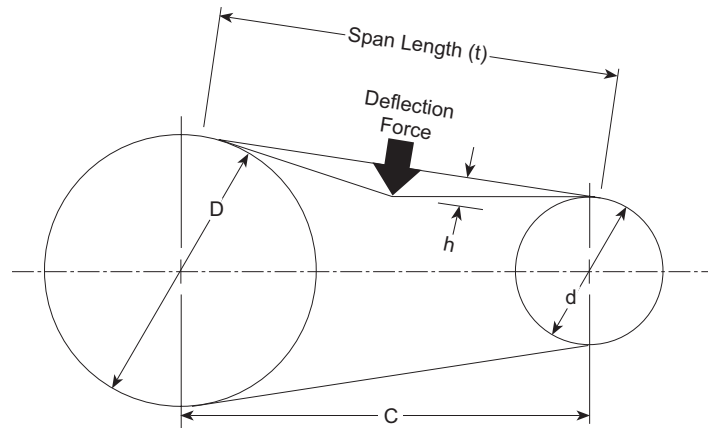
Figure 7: Sheave Adjustment Detail



2. Adjust sheave pitch diameter for desired speed by opening moving parts by half or full turns from closed position. Do not open more than five full turns.
3. Replace external key "E" and securely tighten setscrews "B" over key to 110 in.-lb. to 130 in.-lb. and setscrews "C" into keyway in fixed half of the sheave.
4. Put on belts and adjust belt tension to 4 lbs. - 0.7 lbs. (18N - 3N) for a 1/2" to 3/4" (13 mm to 19 mm) belt deflection height.
5. To determine the deflection distance from normal position, use a straightedge or stretch a cord from sheave to use as a reference line. On multiple-belt drives an adjacent undeflected belt can be used as a reference.
6. Future adjustments should be made by loosening the belt tension and increasing or decreasing the pitch diameter of the sheave by half or full turns as required. Readjust belt tension before starting drive.

7. Be sure that all keys are in place and that all setscrews are tight before starting drive. Setscrews and belt tension must be checked after 24 hours of operation.
8. When new V-belts are installed on a drive, the initial tension will drop rapidly during the first few hours. Check tension frequently during the first 24 hours of operation. Subsequent retensioning should fall between the minimum and maximum force.

Figure 8: Drive Belt Adjustment



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

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

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.

Aligning the Fan and Motor Pulleys

1. Loosen the fan pulley setscrew and motor pulley setscrew. Refer to letter "A" in Figure 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. See Figure 9 for motor mounting bolts. 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

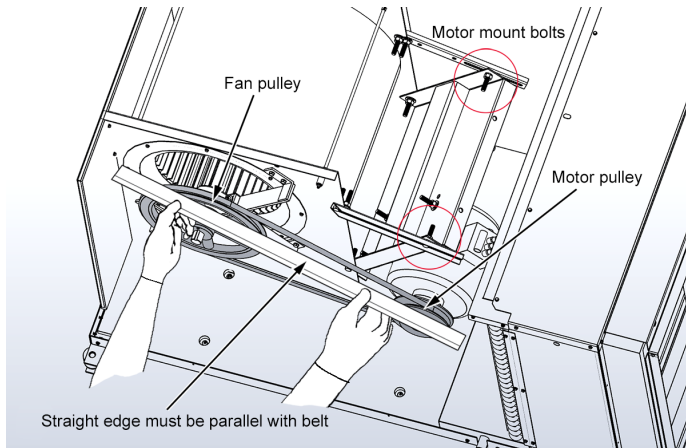


Table 7: Sheave adjustment settings

Unit Size	Motor HP	Motor Shaft Diameter	Motor RPM	0 Turns	1 Turn	2 Turns	3 Turns	4 Turns	5 Turns
072	1.5	0.625	1750	817	788	758	729	700	671
	3.0	1.125	1750	1085	1050	1015	980	945	910
096	1.5	0.625	1750	904	875	846	817	788	758
	3.0	1.125	1750	1085	1050	1015	980	945	910
120	3.0	1.125	1765	824	794	765	735	706	677
	5.0	1.125	1765	1111	1071	1031	992	952	912

NOTE: Bold numbers denote factory setting.

Factory Mounted Variable Frequency Drive (VFD)

Unit sizes 072 through 120 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.

NOTICE

It is not recommended for VFDs to exceed 60 Hz.

Ductwork & Attenuation

Discharge ductwork is normally used with conditioners. Return air ductwork may also be required.

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

The discharge duct system will normally consist of a flexible connector at the unit, a transition piece to the full duct size, a short run of duct and a trunk duct teeing into a branch duct with discharge diffusers as shown in [Figure 11 on page 15](#). The transition piece must not have angles totaling more than 30° or severe loss of air performance can result.

Do not connect the full duct size to the unit without using a transition piece down to the size of the discharge collar on the unit. With metal duct material, the sides only of the elbow and entire branch duct should be internally lined with acoustic fibrous insulation for sound attenuation. Glass fiber duct board material is more absorbing and may permit omission of the canvas connector.

As a general recommendation, the acoustic fibrous insulation should be at least 1/2 inch thick over the entire duct run ([Figure 11 on page 15](#)). For better sound attenuation, line the last five diameters of duct before each register with a one-inch thick sound blanket. Elbows, tees and dampers can create turbulence or distortion in the airflow. Place a straight length of duct, 5 to 10 times the duct width, before the next fitting to smooth out airflow. Diffusers that are located in the bottom of a trunk duct can also produce noise. For this same reason, volume control dampers should be located several duct widths upstream from an air outlet.

The discharge duct must be fully lined and have a square elbow without turning vanes. Return air ductwork can be connected to the standard filter rack. See [Figure 4 on page 11](#) (side filter removal shown). The filter rack can be installed for bottom filter removal or side filter removal by locating the brackets. For side filter removal the brackets should be located on the bottom, left side, and top. For bottom filter removal the brackets should be mounted on the left side top and right side with the spring clips supporting the filter.

Do not use 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. Return air for these applications should enter through a "low" sidewall filter grille and route up the stud space to a ceiling plenum. For horizontal heat pumps mounted from the ceiling, an insulated return plenum is sometimes placed at the return air opening to further attenuate line-of-sight sound transmission through return openings.

Figure 10: WSLH Discharge Dimensions

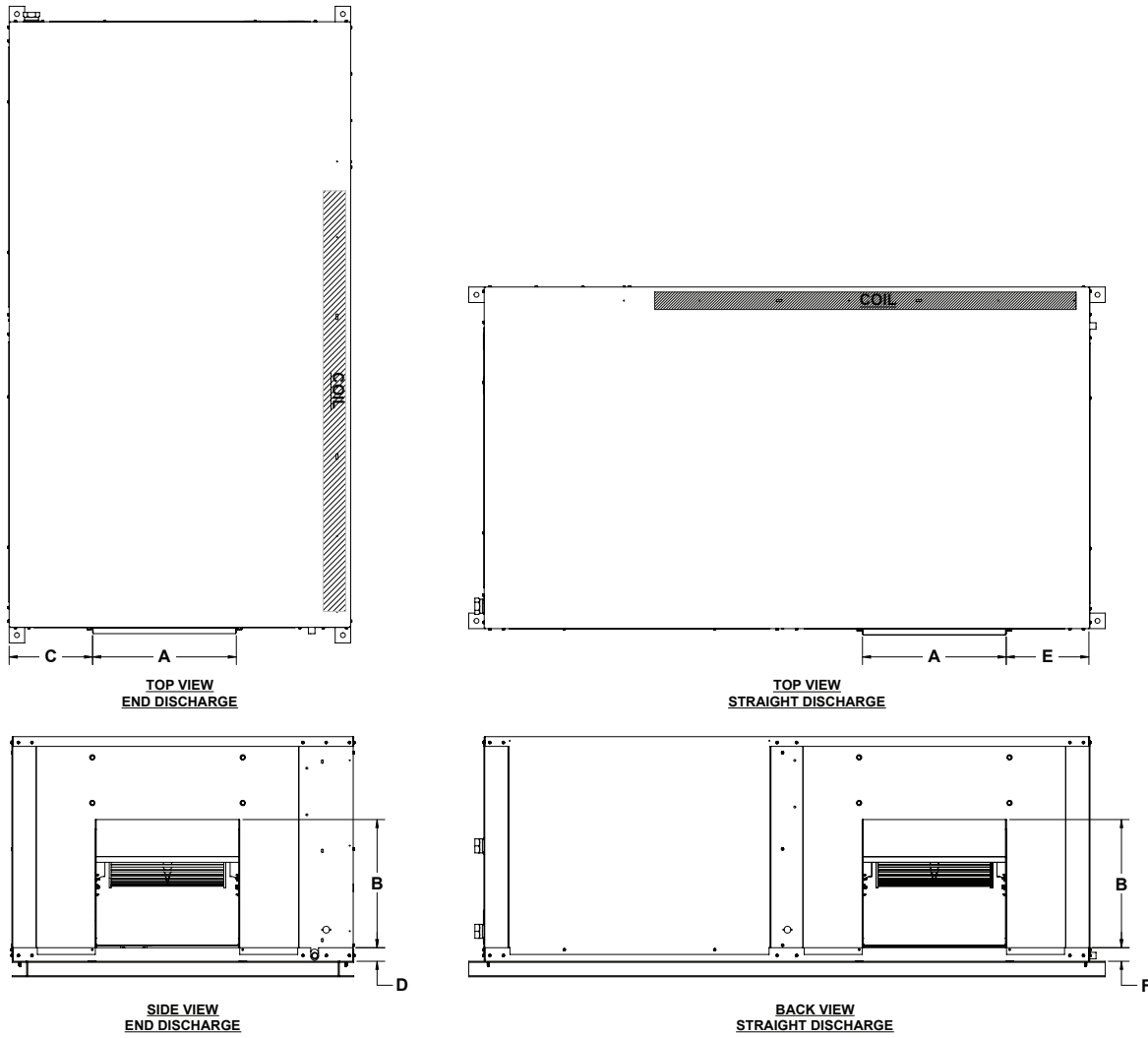


Table 8: WSLH Discharge Air Dimensions

Unit Size	Blower Discharge Opening		End Discharge Offset		Straight-Thru Offset	
			Side	Base	Side	Base
	A	B	C	D	E	F
072	15.64"	13.42"	12.18"	1.75"	12.18"	1.75"
096					10.69"	
120	18.52"	16.44"	10.69"		10.69"	

Figure 11: Suggested Supply Ducting per ASHRAE and SMACNA Publications

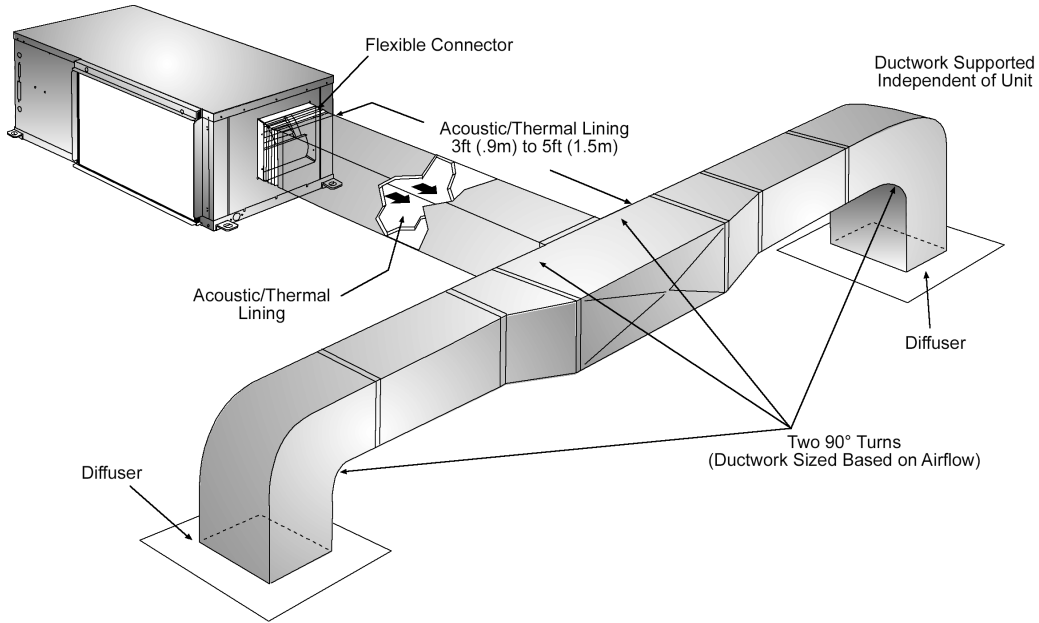
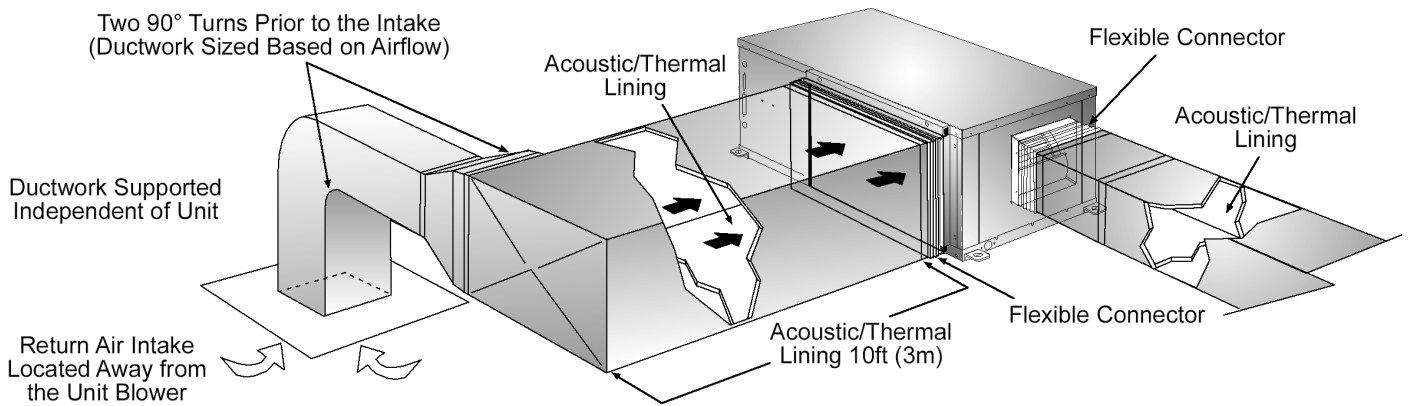


Figure 12: Suggested Return Ducting per ASHRAE and SMACNA Publications



Ventilation Air

NOTICE

Unit is not intended to be used for DOAS operation.

Ventilation may require outside air. 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 typical 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. See [“Operating Limits”](#) on page 7.

Water Piping

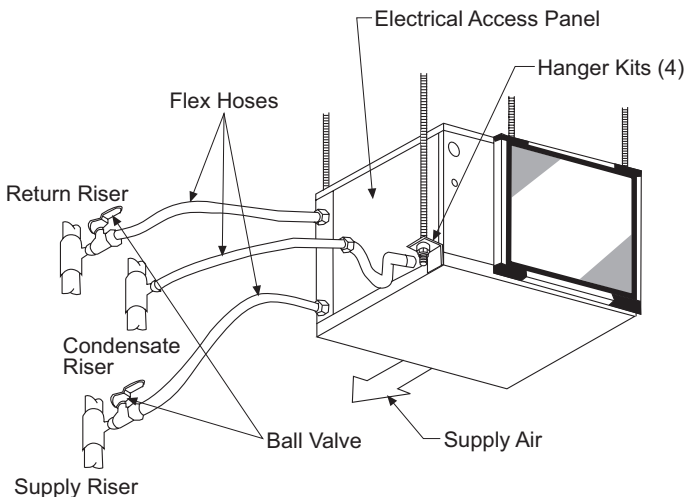
1. All units should be connected to supply and return piping in a two-pipe reverse return configuration. A reverse return system is inherently self-balancing and requires only trim balancing where multiple quantities of units with different flow and pressure drop characteristics exist in the same loop. 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

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

3. Supply and return runouts 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.

Figure 13: Typical Piping



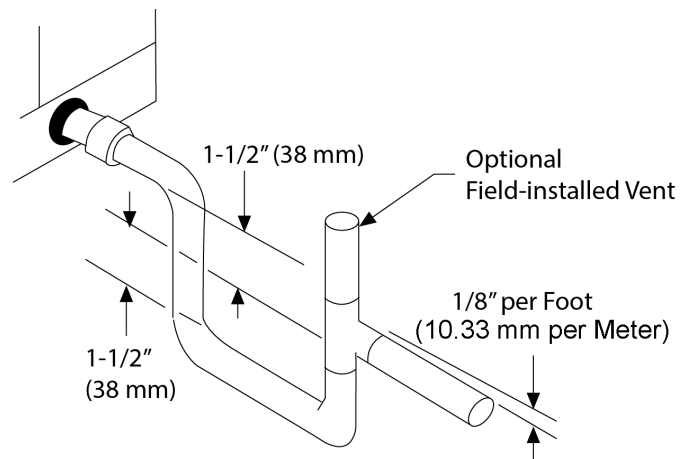
4. Some flexible hose threaded fittings are supplied with sealant compound. If not, apply Teflon tape to assure a tight seal.
5. Supply and return shutoff valves are required at each conditioner. The return valve is used for balancing and

- 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.

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 1/8” per foot (10.33 mm per meter). See Figure 14. An air vent is sometimes required after the trap to prevent air pockets, so the condensate will drain away from the unit. The vent should extend at least 1-1/4” (32 mm) above the unit condensate fitting. 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, etc. Always connect the drain through a trap to the condensate drain system in accordance to the local plumbing codes.

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. Do not locate any point in the drain system above the 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.

2. Automatic flow controlled devices must not be installed prior to system cleaning and flushing.
3. A high point of the piping system must be vented.
4. Check local code for the need for dielectric fittings.

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 9 on page 18 is a list of water characteristics, the potential impurities and their results and the recommended treatment.

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 15).
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 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.

Figure 15: Supply & Return Run-Outs Connected Together

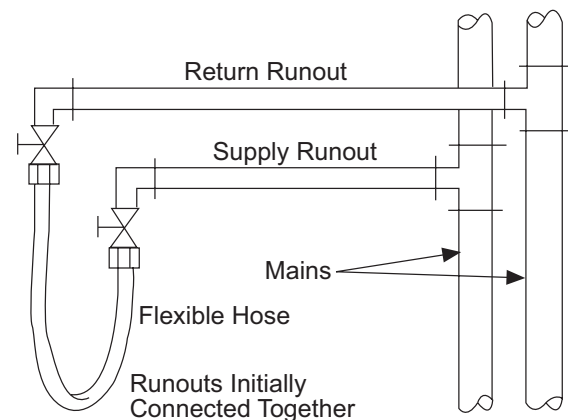
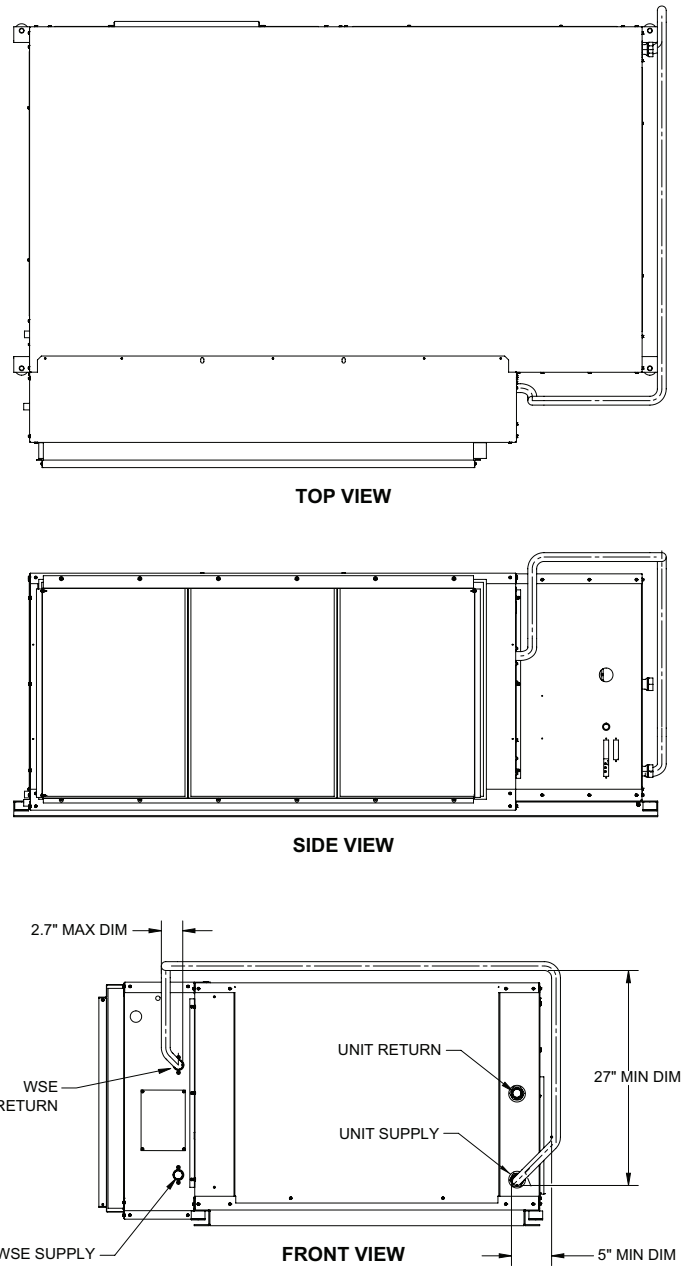


Table 9: Water Quality Conditions and Applications for Units with a Coaxial Heat Exchanger

Potential Problem	Chemical(s) or Condition	Range for Copper Heat Exchangers	Range for 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 ^[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

- NOTE 1:** Water hardness in ppm is equivalent to hardness in mg/L.
- NOTE 2:** Grains/gallon = ppm divided by 17.1
- NOTE 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.
- NOTE 4:** Salt water applications (approx. 25,000 ppm) require secondary heat exchangers due to copper piping between the heat exchanger and the unit fittings.

Figure 16: Typical WSE Field Provided and Installed Jumper Piping Routing Details



NOTE: Do not block access to removable access panels.

Figure 17: WSLH Waterside Economizer Dimensions

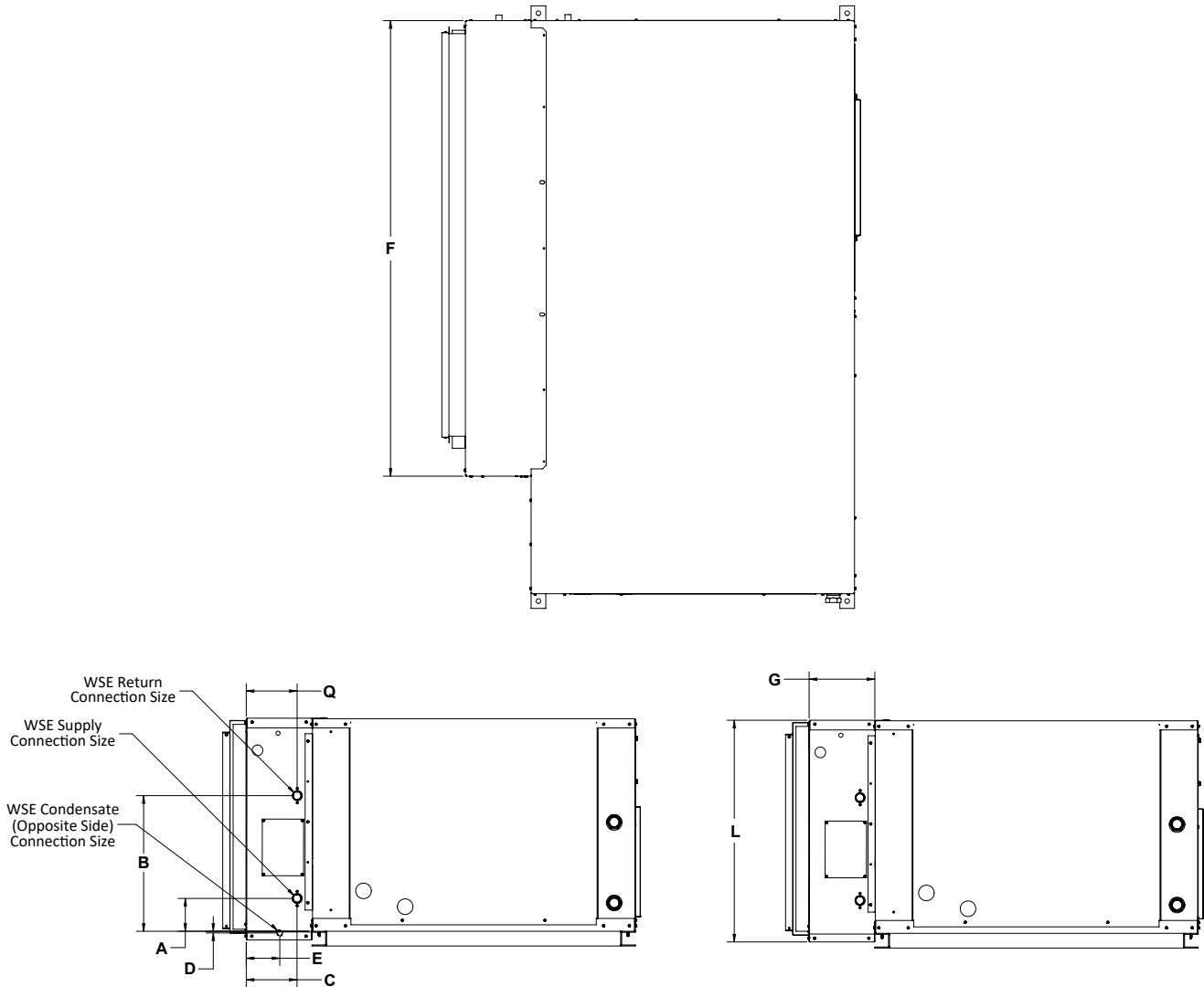


Table 10: WSLH Waterside Economizer Dimensions

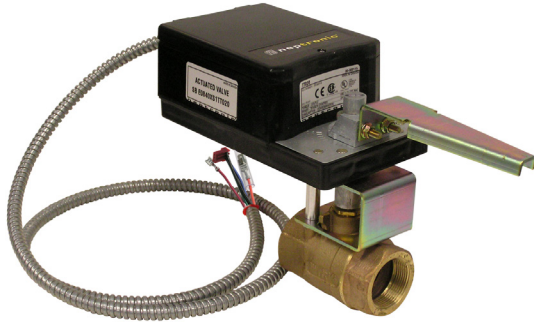
Unit Size	Waterside Economizer Dimensions					Condensate Connection Size	Condensate Drain		Waterside Economizer Overall Cabinet Section		
	Connection Size (FPT)	Supply		Return			D	E	Width	Depth	Height
		G	BB	H	CC			F	G	L	
072	1.0"	4.50"	6.88"	18.5"	6.88"	0.875" ODM	*0.25"	4.38"	62.0"	8.90"	30.17"
096											
120											

NOTE: * Condensate connection dimension "D" is below unit dimensional drawing reference point

Field Installed Accessories

2-Way Motorized Isolation Valve

Figure 18: 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 H6 on the MicroTech controller. See Figure 20 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).

Figure 19: Power Open, Power Closed Motorized Valve

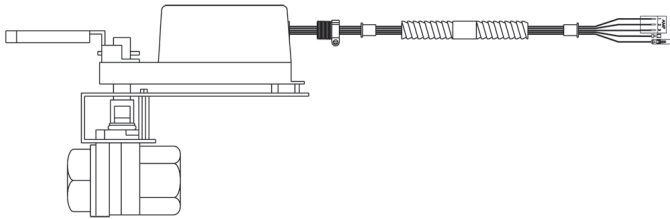


Figure 20: 2-Way Motorized Valve Wiring to MT2300 Controller

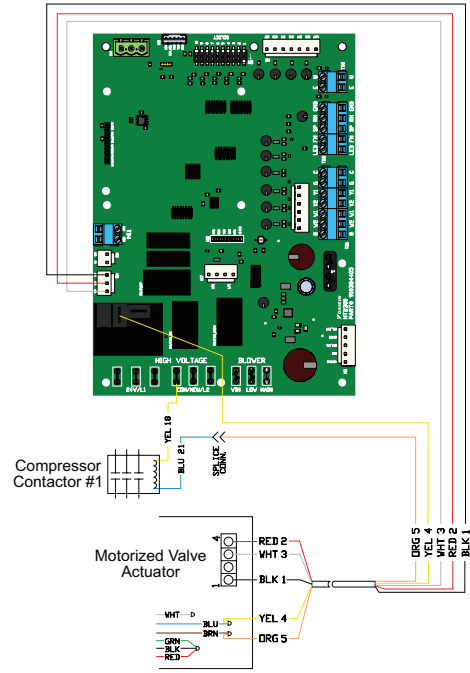
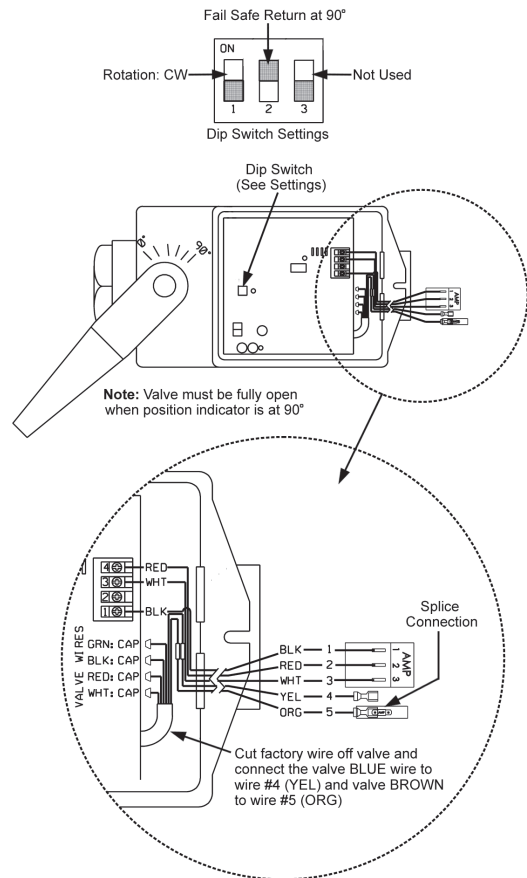


Figure 21: 2-Way Motorized Valve Wiring Details



Electrical Data

WARNING

All field installed wiring must comply with local and national electrical codes. 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, personal injury, or death. This equipment must be installed by experienced, trained personnel only.

WARNING

Use copper conductors only. Conductor insulation must be rated for a minimum temperature of 167°F (75°C).

CAUTION

Fasteners should not be screwed into and penetrate the unit enclosure to avoid damage to internal electrical and mechanical components.

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" (22 mm) 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 overcurrent protection. See the nameplate for correct ratings.
3. Connect the thermostat/subbase wiring with the power "off" to the unit.
4. Field supplied relays installed on any MicroTech unit input terminals may introduce electrical noise. Never install relay coils in series, or parallel, to any MicroTech unit control input.

Table 11: Operating Voltages

Voltage	Minimum	Maximum
208-230/60/3	197	253
460/60/3	414	506
575/60/3	515	632

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%.

Three-Phase Line Voltage (208-230, 460, 575V)

DANGER

LOCKOUT/TAGOUT all power sources prior to wiring or servicing the unit. Hazardous voltage can cause serious injury or death. Disconnect electric power before servicing equipment. More than one disconnect may be required to de-energize the unit.

1. Route line voltage supply wiring through the lower 1-1/8" diameter knockout in the left corner post.
2. Wires should extend through the lower left side of the control box. Route wires through wire ties where provided.
3. Remove and discard the factory provided stripped wire leads from the left side unit contactor screw terminals (not shown).
4. Connect the field supplied wires to the left side contactor screw terminals.
5. Connect ground wire to provided (green) ground screw.

230 Volt Operation

All 208-230 volt three-phase units are factory wired for 208 volt operation. For 230 volt operation, the RED line voltage wire from the transformer must be disconnected from contactor, and replaced with the ORANGE wire from the transformer.

Low Voltage Wire Connections

NOTICE

Never install relay coils in series or parallel with the thermostat inputs.

NOTICE

Units equipped with dehumidification control require installation of a factory supplied return air sensor connected to I/O H4-3/4 terminal. See [Figure 26 on page 23](#) for details.

1. Route the field-supplied low voltage wiring through the upper knockout in the left corner post of unit.
2. Secure the low voltage wire connections to the terminals shown in [Figure 22](#), [Figure 23](#). Refer to [Figure 25 on page 22](#) for I/O Expansion Module terminal TB1-1 connection.

Figure 22: Terminal Connection Locations on the MicroTech Board

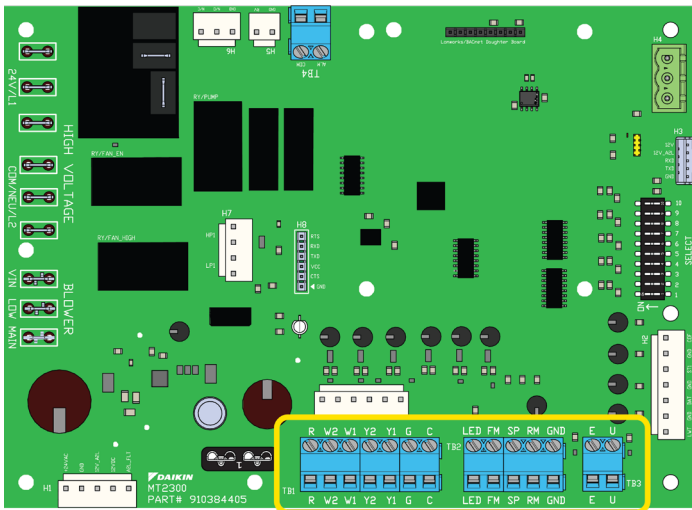
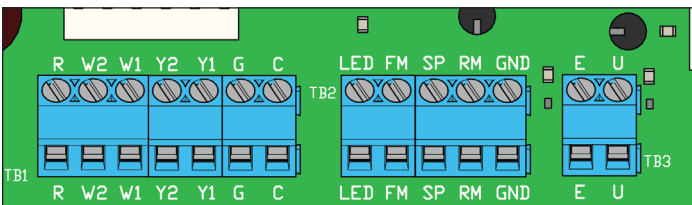
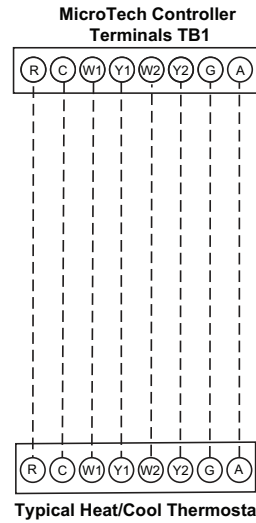


Figure 23: Terminal Connections TB1 (Thermostat Control) and TB2 (Sensor Control) on the MicroTech Board



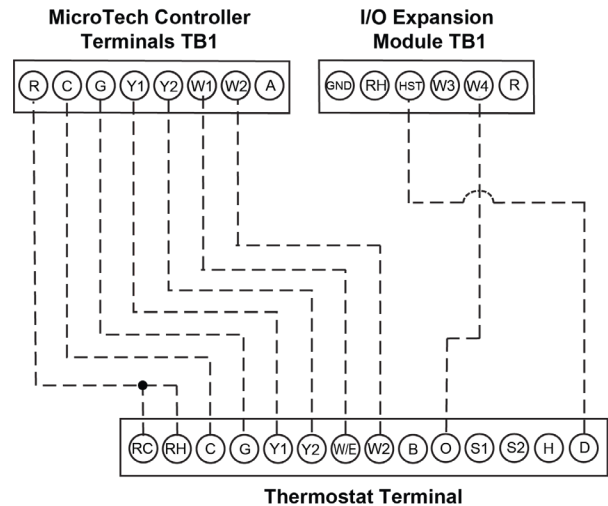
Typical Connections For Thermostats & Temperature Sensors Applications

Figure 24: Wiring Example of Typical Heat/Cool Thermostat Connections



NOTE: For single stage operation wire Y1 from thermostat to Y2 terminal on the MicroTech control board.

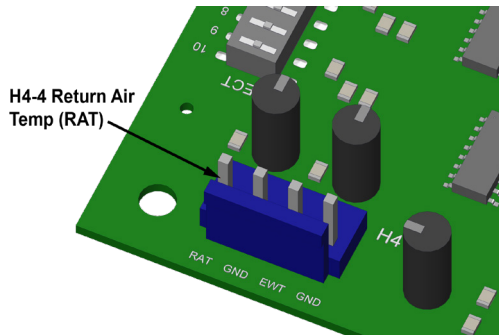
Figure 25: Wiring Example for Two Heat, Three Cool Programmable Thermostat with Dehumidification



NOTE 1: For dehumidification with waterside economizer applications, the W4 connection on I/O Expansion Module is used as the third stage of cooling.

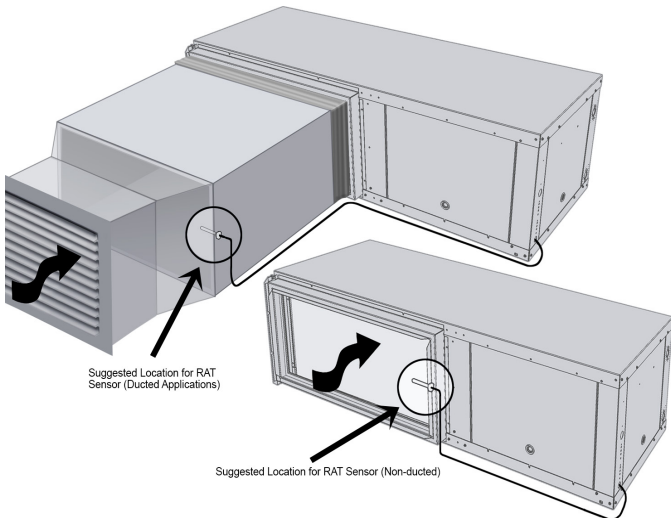
NOTE 2: O terminal as a third stage of cooling is configured in the thermostat Technician Setup Menu.

Figure 26: Units Equipped with Dehumidification and Thermostat Control



NOTE: Factory supplied Return Air Sensor connects to I/O H4-3/4 Terminal.

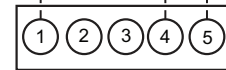
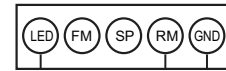
Figure 27: Return Air Temperature Sensor (RAT) Locations



NOTE: Image shown above does not reflect actual unit configuration.

Figure 28: Basic Room Sensor Wiring

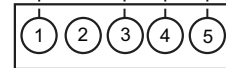
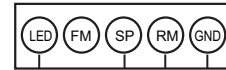
MicroTech Controller Terminals TB2



Basic Room Sensor

Figure 29: Example Wiring of SmartSource MicroTech Board To Basic Temperature Sensor Wiring

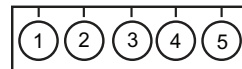
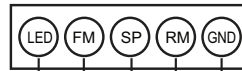
MicroTech Controller Terminals TB2



Basic Room Sensor with Cool to Warm Adjustment

Figure 30: Room Sensor with Temperature Adjustment Wiring

MicroTech Controller Terminals TB2



Room Sensor with Temperature Adjustment

Figure 31: Digitally Adjustable Room Temperature Sensor Wiring

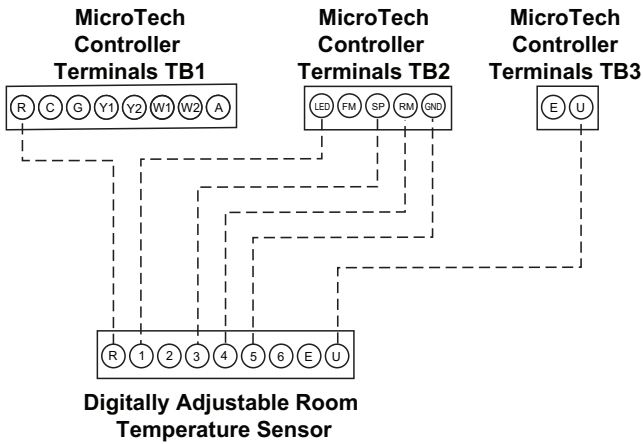


Figure 32: Digitally Adjustable Room Temperature and Humidity Sensor Wiring

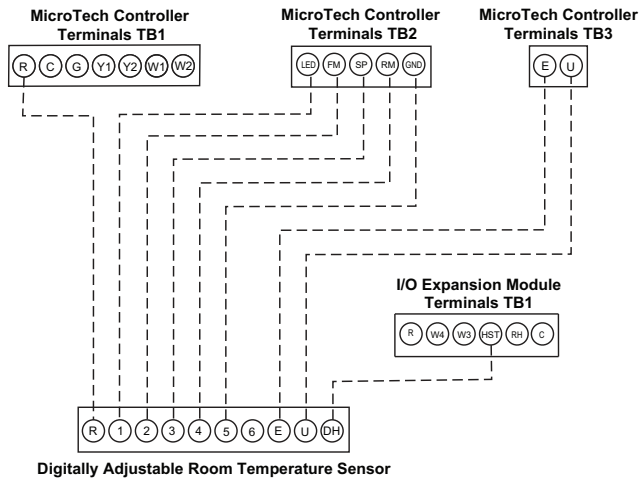
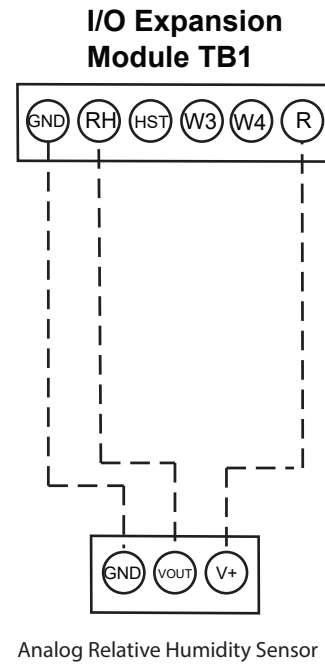


Figure 33: Analog Humidity Sensor Wiring

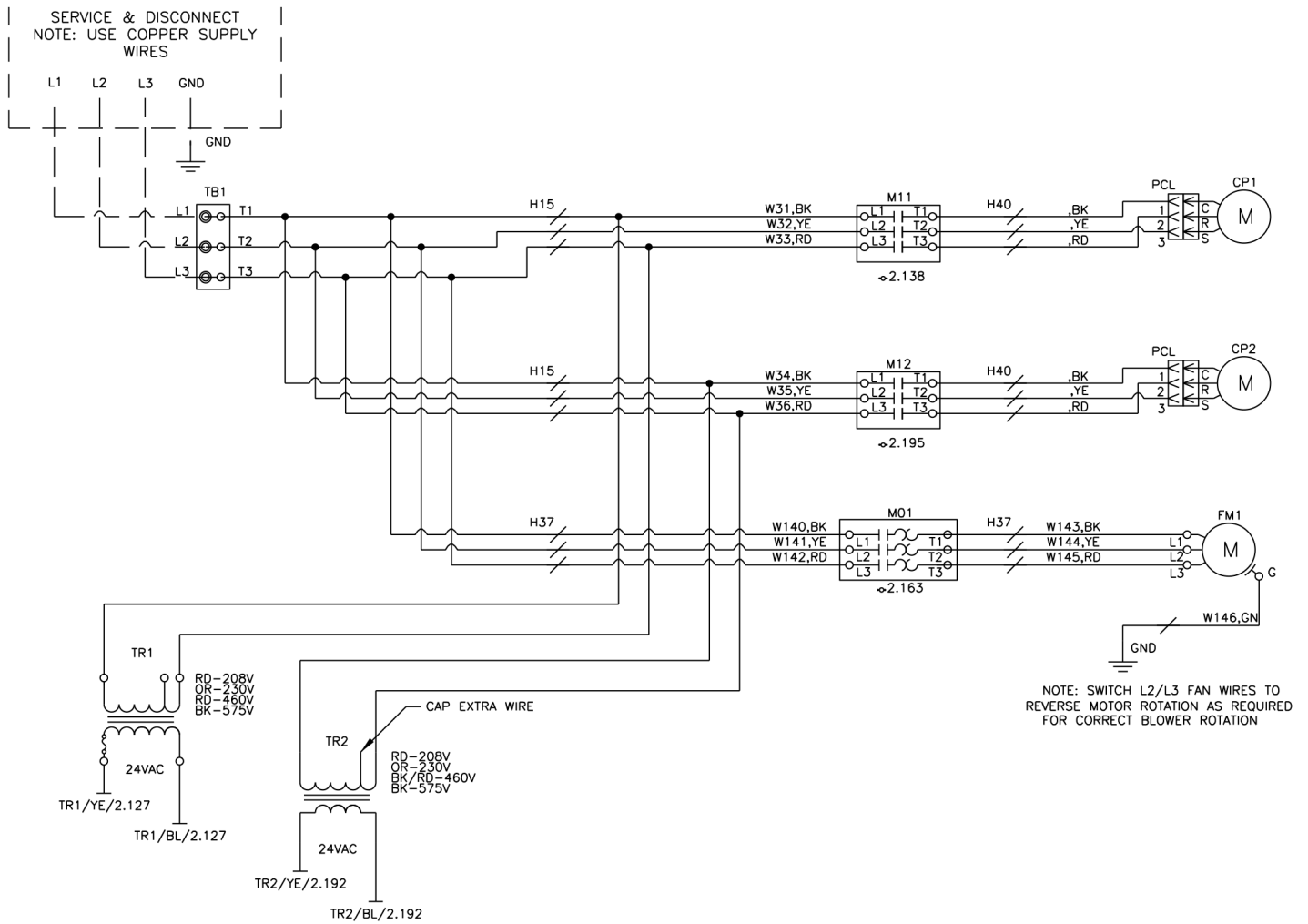


NOTE: Analog humidity sensors are intended to be used in conjunction with a building management system to allow monitoring of relative humidity levels and adjustment of relative humidity setpoints for dehumidification. For standalone controller applications, a humidistat is recommended.

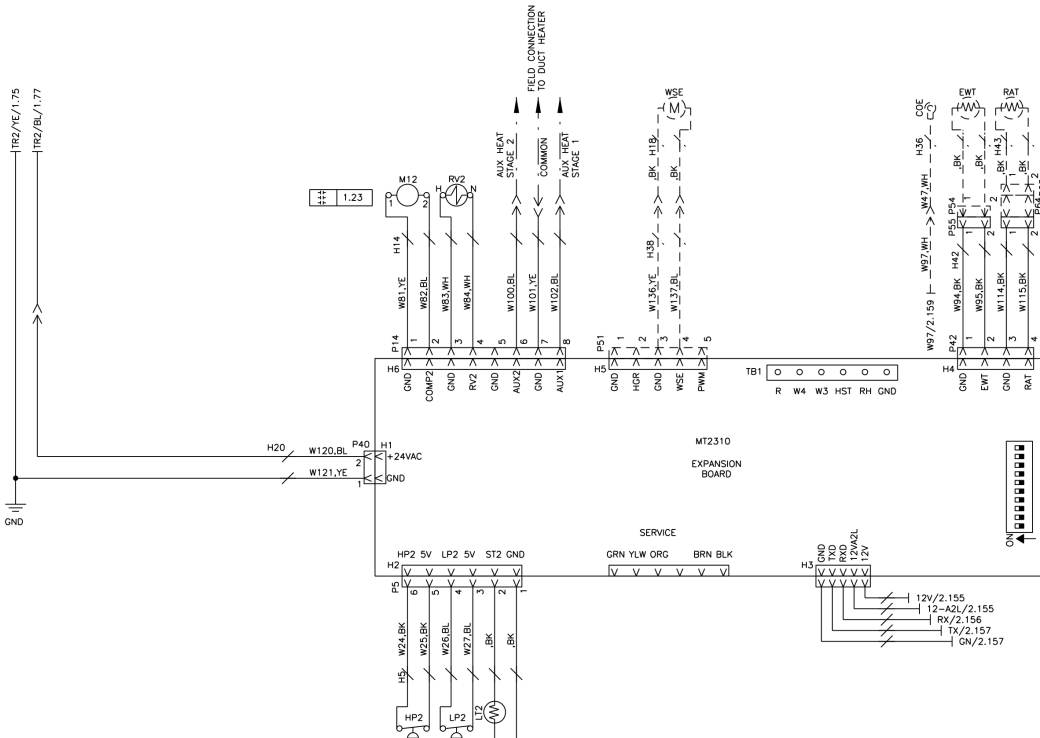
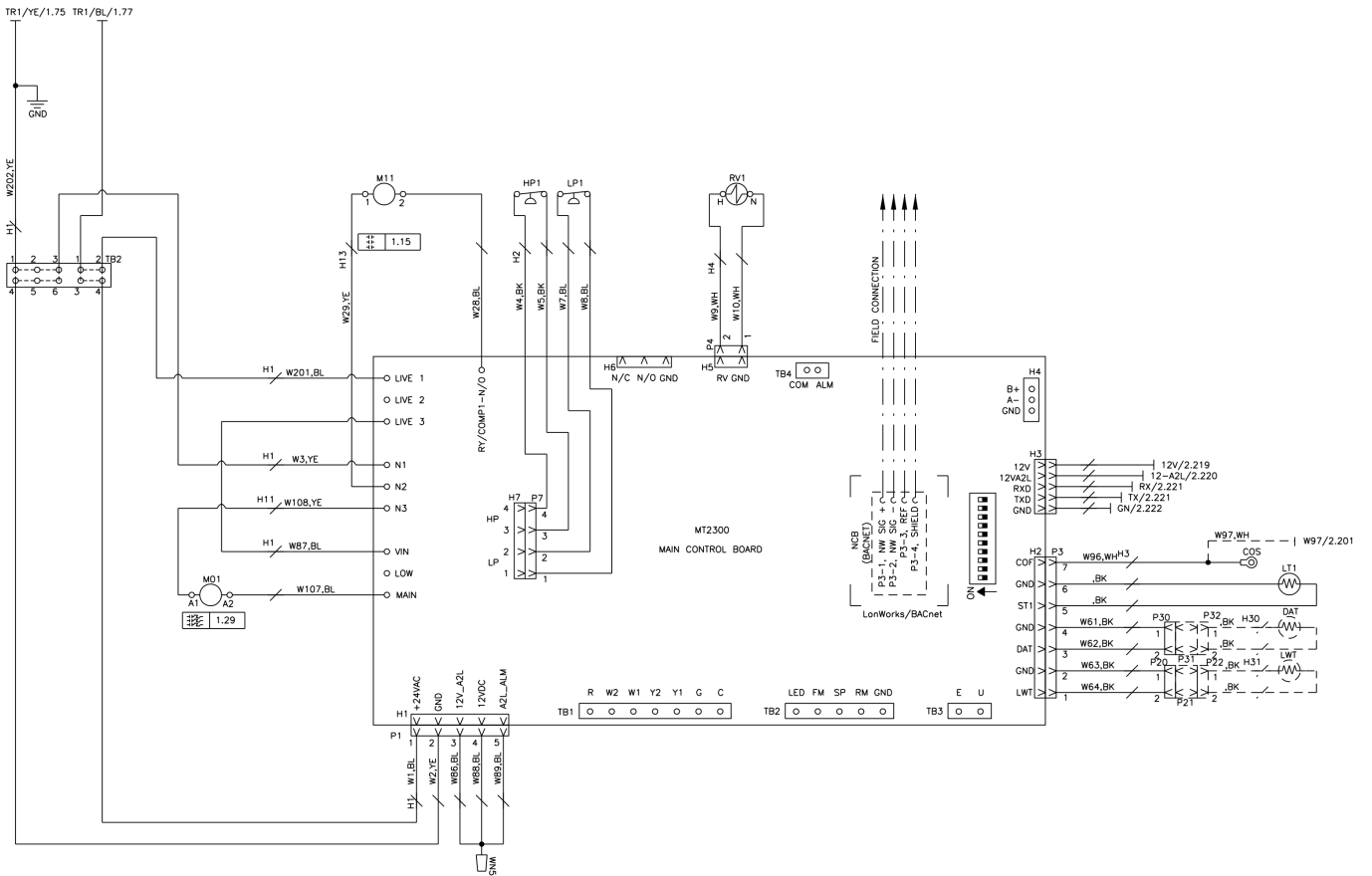
NOTE: Terminal HST is used for optional dehumidification operation.

Typical Wiring Diagrams

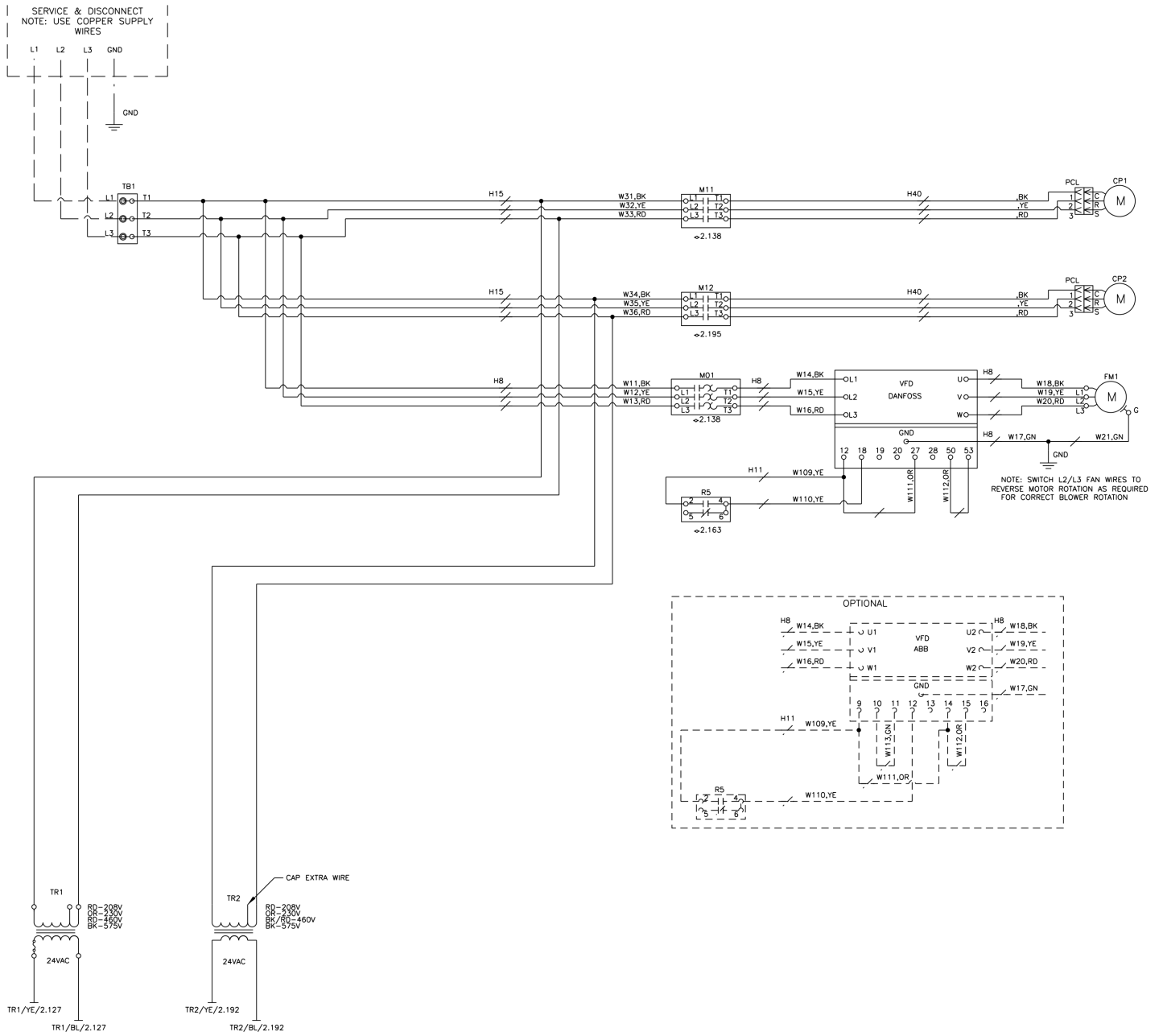
MicroTech Unit Controller with I/O Expansion with WSE



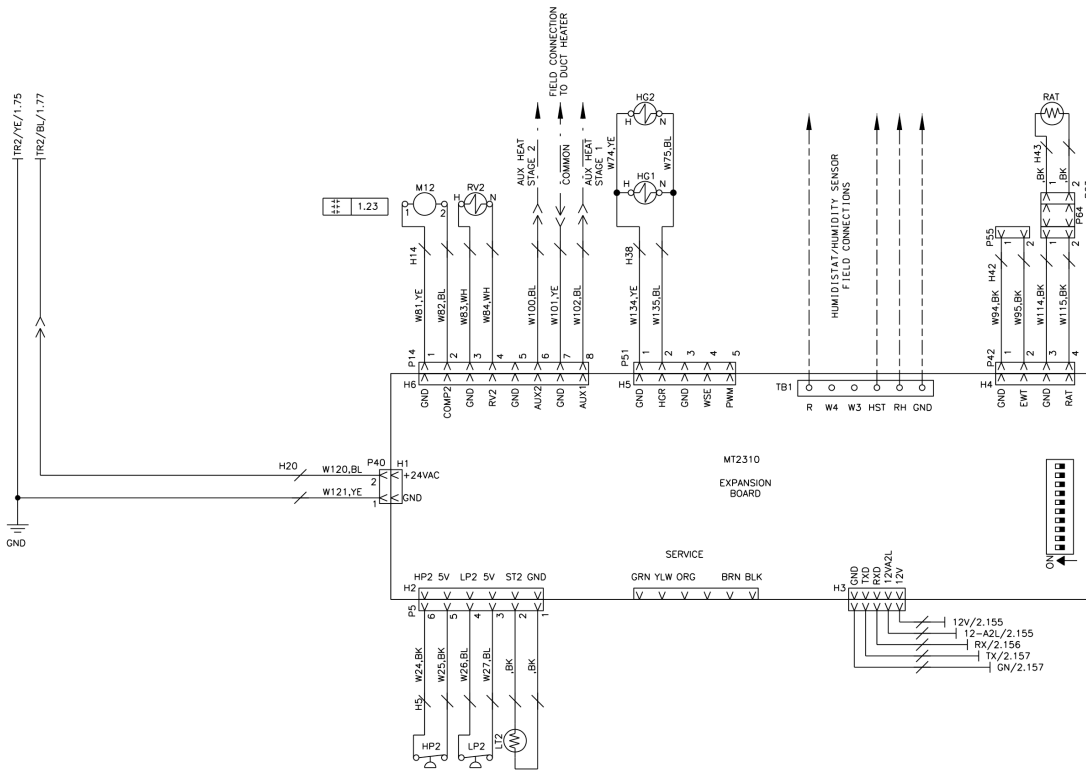
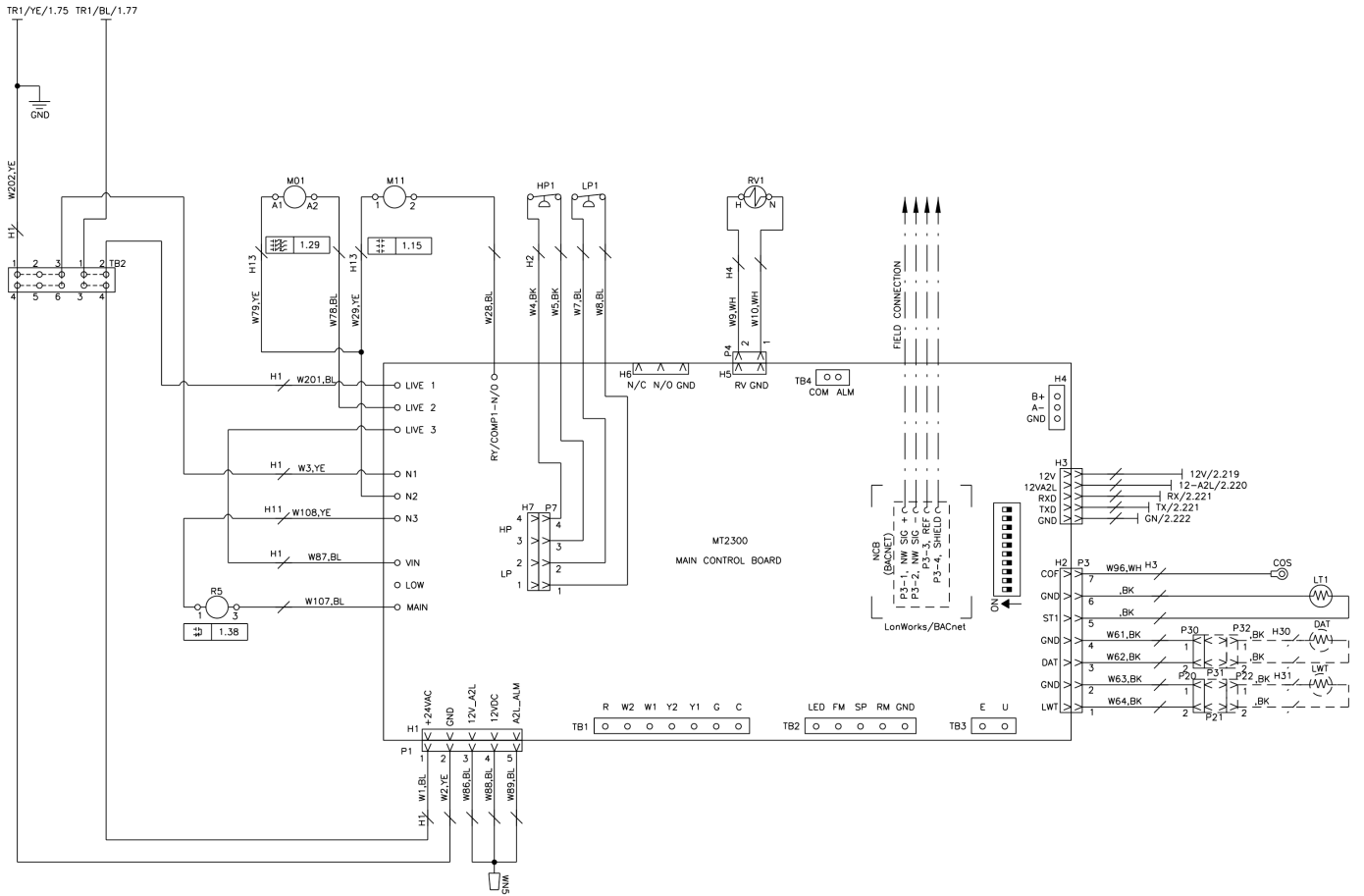
MicroTech Unit Controller with I/O Expansion with WSE, Cont.



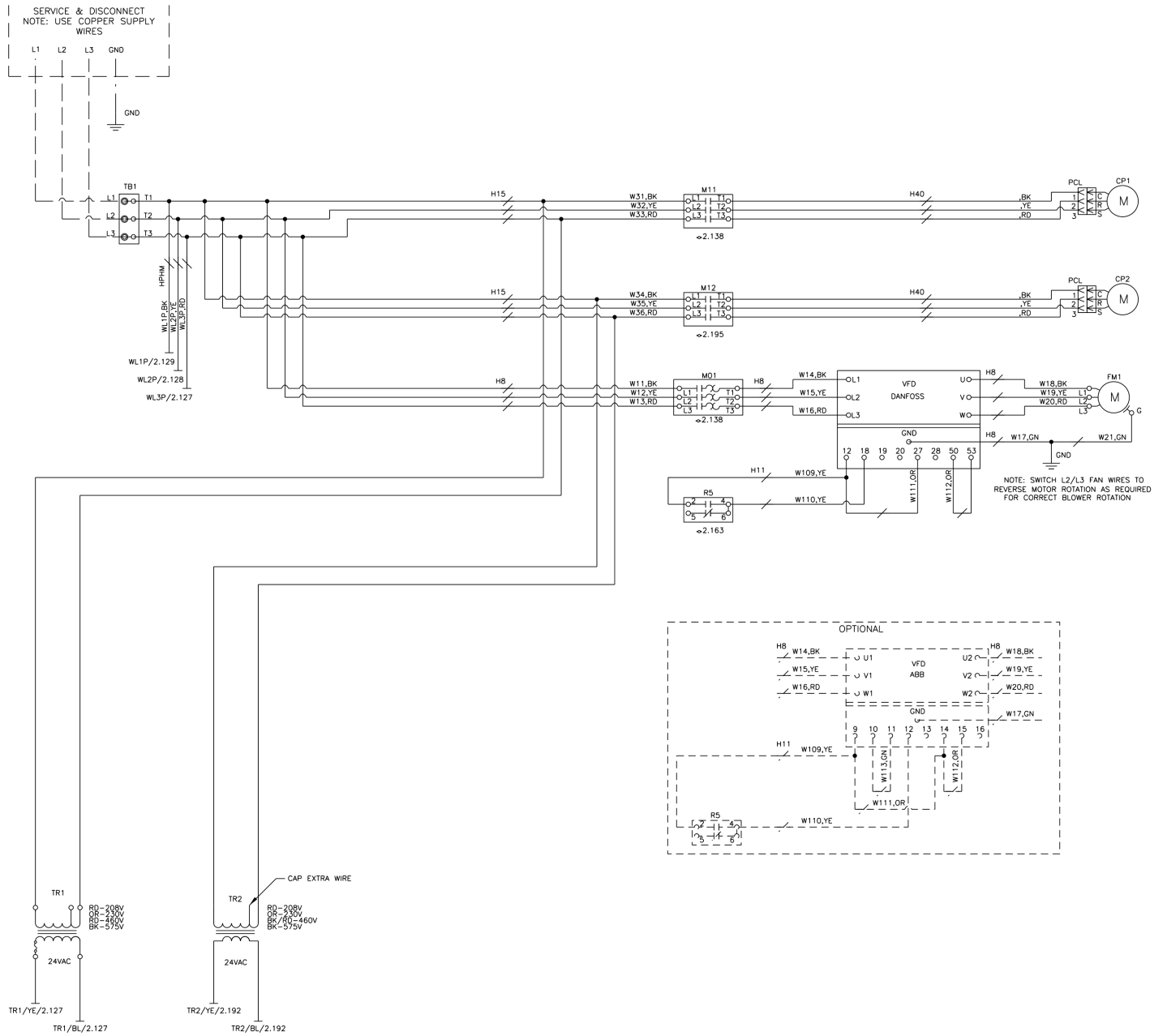
MicroTech Unit Controller with I/O Expansion, HGRH and VFD



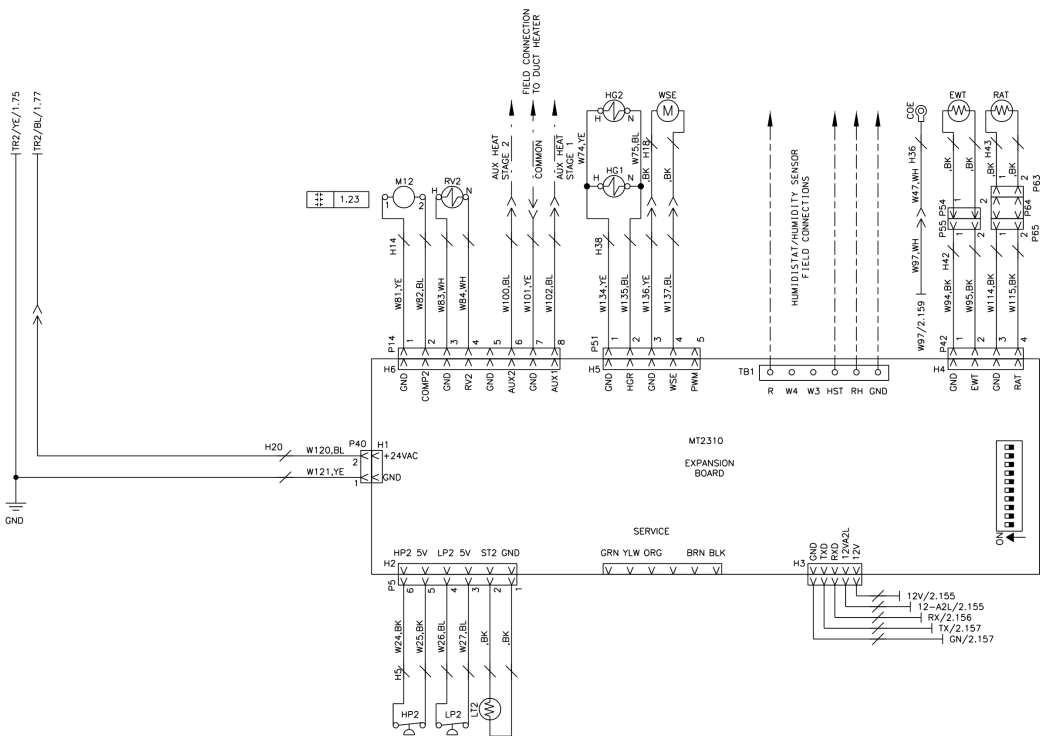
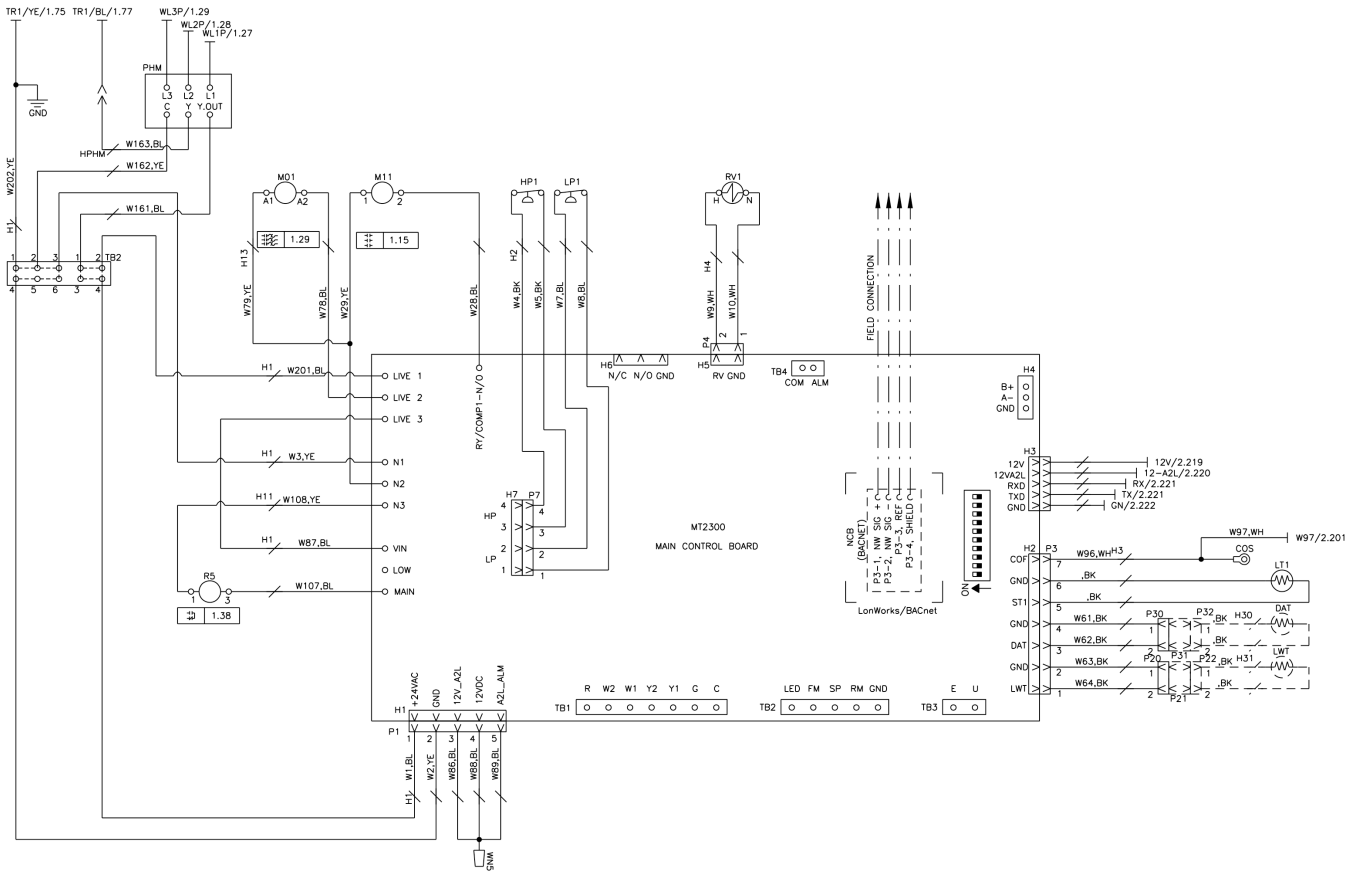
MicroTech Unit Controller with I/O Expansion, HGRH and VFD, Cont.



MicroTech Unit Controller with I/O Expansion, WSE, HGRH, VFD and Phase Monitor



MicroTech Unit Controller with I/O Expansion, WSE, HGRH, VFD and Phase Monitor, Cont.



Wiring Schematics Legend for “Typical Wiring Diagrams”

LEGEND			
COE	Condensate Overflow Protection Sensor - WSE	NCB	Network Control Board
COS	Condensate Overflow Protection Sensor	OLP	Overload Protector - Compressor Motor
CP1,2	Compressor 1, 2	P1-^	Wire Plug
DAT	Discharge Air Temperature Sensor	PCL	Wire Plug Assembly - Compressor Power
EB1	Expansion Control Board	PHM	Phase Monitor
EWT	Entering Water Temperature Sensor	R5	Relay, VFD
FM1-4	Fan Motor 1-4	RAT	Return Air Temperature Sensor
GND	Ground	RV1,2	Reversing Valve 1, 2
H1-^	Wire Harness	TB1	Terminal Block, Line Voltage
HG1,2	Hot Gas Reheat Valve Actuator	TB2	Terminal Block, 24V
HP1,2	High Pressure Switch 1, 2	TR1, 2	Transformer - Control
LP1,2	Low Pressure Switch 1, 2	VFD	Variable Frequency Drive
LT1,2	Compressor Suction Line Temperature Sensor 1, 2	W1-^	Wire
LWT	Leaving Water Temperature Sensor	WN1-^	Wire Nut
M01-04	Fan Motor 1-4 Contactor	WSE	Waterside Economizer Actuator
M11-12	Compressor 1, 2 Contactor	----	Optional Features
MCB	Main Control Board		

NOTE: Devices in legend may or may not be on unit.

Operation

Start-Up

CAUTION

Units must be checked for water leaks upon initial water system start-up. Water leaks may be a result of mishandling or damage during shipping. Failure by the installing contractor to check for leaks upon start-up of the water system could result in property damage.

Check, Test & Start Procedure

NOTICE

Complete the "Water Source Heat Pump Equipment Check, Test and Start Form" on page 50.

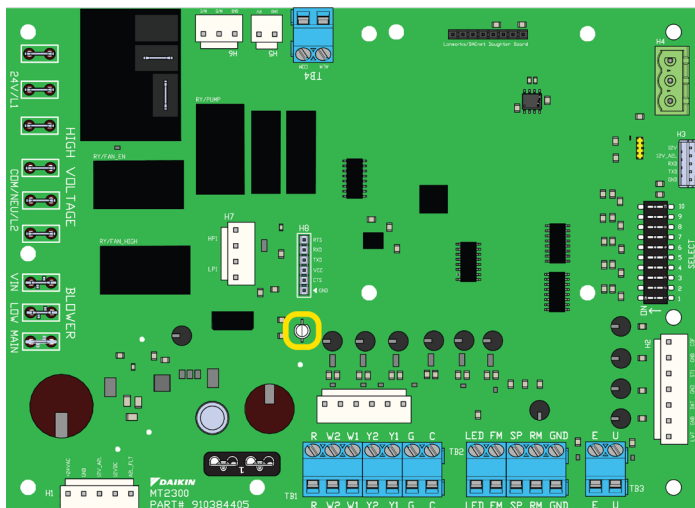
MT2300 Board LED Indicator

When the unit controller is communicating a certain fault or mode, the LED indicator will flash a designated pattern or sequence. See Figure 34 for the location of the MT2300 board LED indicator. Table 12 gives a description of the LED activity. Refer to OM 1364 for additional information.

Table 12: MT2300 Board LED Indicator Sequence

LED Activity	Type	Color	Description
1 Flash	Mode	Green	No Call for Heating/Cooling/Dehumidification
2 Flash	Mode	Green	Call for Cooling
3 Flash	Mode	Green	Call for Heating
4 Flash	Mode	Green	Call for Fan Only

Figure 34: LED Indicator on MT2300 Board



Check As Completed:

NOTICE

To prevent compressor cycling and all compressors from starting up together after loss of power, the required minimum on/off time default is 300 seconds plus the random restart of 0 to 60 seconds.

- Open all valves to full open position and turn on power to the unit.
- Set thermostat for "Fan Only" operation by selecting "Off" at the system switch and "On" at the fan switch. If "Auto" fan operation is selected, the fan will cycle with the compressor. Check for proper air delivery.

Check the unit controller LED indicator for "Fan Only" mode operation.

- 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.

Check the unit controller LED indicator for "Cool" mode operation.

After a few minutes of operation, check the discharge grilles for cool air delivery. To insure proper water flow, measure the temperature difference between entering and leaving water. The temperature differential should be 10°F to 14°F (5°C to 8°C) for units in cooling mode. 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.

- 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. 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).

Check the unit controller LED indicator for "Heat" mode operation.

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, and the air temperature rise through the machine should not exceed 35°F (19°C). If the air temperature rise exceeds 35°F (19°C), then the air flow rate is inadequate.

- 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.

- If the unit does not operate, check the following points:
 - Is supply voltage to the machine compatible?
 - Is thermostat type appropriate?
 - Is thermostat wiring correct?
- If the unit operates but stops after a brief period:
 - Is there proper airflow? Check for dirty filter, incorrect fan rotation (3-phase fan motors only), or incorrect ductwork.
 - Is there proper water flow rate within temperature limits? Check water balancing; back flush unit if dirt-clogged.
 - Check for refrigerant piping rubbing against cabinet or other piping causing vibration. Check fan wheel alignment, set screws, shaft, etc.

Controls

Control Options

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

Two unique control choices are offered with the MicroTech unit control system:

- Standalone operation using a MicroTech unit controller and I/O expansion module
- MicroTech unit 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.

MicroTech Unit Controller

CAUTION
<p>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.</p>

General Use and Information

All MicroTech unit 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 controller inputs. No outside power source may be used to operate the MicroTech unit controller inputs.

The MicroTech unit 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.

Table 13: MicroTech 2300 Unit Controller Connector and Terminal Descriptions

Connector	I/O	Type	Signal	Description
H1-1	+24VAC	Power	VAC	Control Power Voltage
H1-2	GND	Power	Ground	Control Power Common
H1-3	12V_A2L	Input	VDC	A2L Sense Voltage
H1-4	12 VDC	Output	VDC	A2L Mitigation Voltage
H1-5	A2L_ALM	Input	Digital	A2L Fault Alarm
H2-1	LWT	Input	Analog	Leaving Water Temperature
H2-2	GND	REF	Common	
H2-3	DAT	Input	Analog	Discharge Air Temperature
H2-4	GND	REF	Common	
H2-5	ST1	Input	Analog	Comp1 Suction Temperature
H2-6	GND	REF	Common	
H2-7	COF	Input	Analog	Condensate Overflow
H3-1	12V	Output	VDC	Base/Expansion Board Interface
H3-2	12V_A2L	Output	VDC	
H3-3	RXD	COM	UART	
H3-4	TXD	COM	UART	
H3-5	GND	COM	UART	
H4-1	B(+)	COM	N/A	Future Use
H4-2	A(-)	COM	N/A	
H4-3	GND	COM	N/A	
H5-1	GND	REF	Common	Comp1 Reversing Valve
H5-2	RV	Output	24 VAC	
H6-1	GND	REF	Common	Pump Request - Common (Ground) Terminal
H6-2	NO	Output	24 VAC	Pump Request - Normally Open Terminal for Normally Closed Valves
H6-3	NC	Output	24 VAC	Pump Request - Normally Closed Terminal for Normally Open Valves
H7-1,2	LP1	Input	Digital	Comp1 Low Pressure
H7-3,4	HP1	Input	Digital	Comp1 High Pressure
TB1-1	R	Output	24 VAC	Thermostat 24 VAC Power
TB1-2	W2	Input	24 VAC	Thermostat Heat Stage 2
TB1-3	W1	Input	24 VAC	Thermostat Heat Stage 1
TB1-4	Y2	Input	24 VAC	Thermostat Cool Stage 2
TB1-5	Y1	Input	24 VAC	Thermostat Cool Stage 1
TB1-6	G	Input	24 VAC	Thermostat Fan
TB1-7	C	REF	Common	Thermostat Common
TB2-1	LED	Output	5 VDC	Room Sensor LED
TB2-2	FM	Input	Analog	Room Sensor Fan/Mode
TB2-3	SP	Input	Analog	Room Sensor Setpoint Adjust
TB2-4	RM	Input	Analog	Room Sensor Air Temp / Tenant Override
TB2-5	GND	REF	Common	Room Sensor Common
TB3-1	E	Input	Digital	Emergency Shutdown
TB3-2	U	Input	Digital	Unoccupied Sensor
TB4-1,2	ALM	Output	Digital	Alarm Output - Contact Closure
BLOWER	VIN	Input	VAC	Blower Motor Voltage
BLOWER	LOW	Output	VIN	Blower Motor Low Speed
BLOWER	MAIN	Output	VIN	Blower Motor High Speed or ECM
LIVE (Relay)	Comp1	Output	L1/24V	Compressor Stage 1
LIVE x 3	24V/L1	Input	VAC	Comp1 Line1 Control Voltage
LIVE x 3	COM/NEU/L2	Input	VAC	Comp1 Line2 Control Voltage
Daughter Board	BACnet	COM	SPI	BACnet MS/TP Only

Table 14: MT2310 I/O Board Connectors and Terminals

Connector	I/O	Type	Signal	Description
H1-1	GND	Power	Ground	Control Power Common
H1-2	+24VAC	Power	VAC	Control Power Voltage
H2-1	GND	REF	Common	Comp2 Suction Temperature
H2-2	ST2	Input	Analog	
H2-3,4	LP2	Input	Digital	Comp2 Low Pressure
H2-5,6	HP2	Input	Digital	Comp2 High Pressure
H3-1	12V	Input	VDC	Base/Expansion Interface
H3-2	12V_A2L	Input	VDC	
H3-3	TXD	COM	UART	
H3-4	RXD	COM	UART	
H3-5	GND	REF	Common	
H4-1	RAT	Input	Analog	Return Air Temperature
H4-2	GND	REF	Common	
H4-3	EWT	Input	Analog	Entering Water Temperature
H4-4	GND	REF	Common	
H5-1	GND	REF	Common	Hot Gas Reheat Valve
H5-2	HGR	Output	24 VAC	
H5-3	GND	REF	Common	Waterside Economizer Valve
H5-4	WSE	Output	24 VAC	
H5-5	PWM	Output	PWM	Variable Speed Blower Motor
H6-1	GND	REF	Common	Compressor Stage 2
H6-2	COMP2	Output	24 VAC	
H6-3	GND	REF	Common	Comp2 Reversing Valve
H6-4	RV2	Output	24 VAC	
H6-5	GND	REF	Common	Auxiliary Heat 2
H6-6	AUX2	Output	24 VAC	
H6-7	GND	REF	Common	Auxiliary Heat 1 / Hydronic Heat
H6-8	AUX1	Output	24 VAC	
TB1-1	C	REF	Common	Input Common
TB1-2	RH	Input	Analog	Space Relative Humidity
TB1-3	HST	Input	24VAC	Humidistat
TB1-4	W3	Input	24VAC	Thermostat - Stage 3 Heat
TB1-5	W4	Input	24VAC	Thermostat - Stage 4 Heat or Stage 3 Cool
TB1-6	R	Output	24 VAC	Thermostat - 24 VAC Power

Configuration DIP Switches

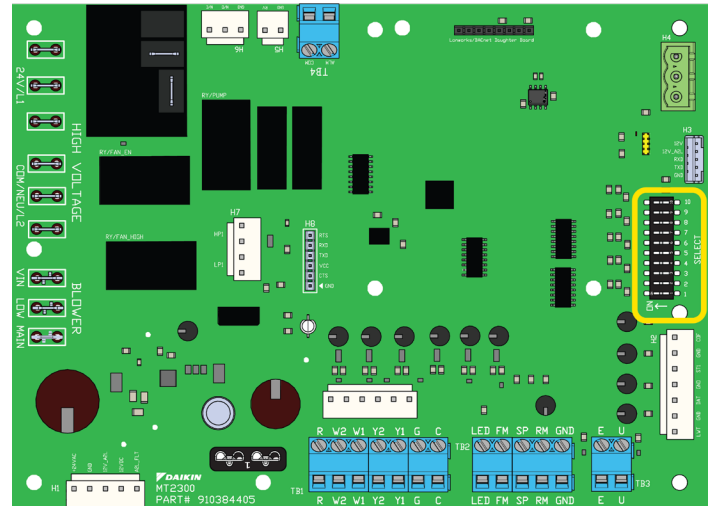
WARNING

Proper antifreeze/water solution is required to minimize the potential of fluid freeze-up. Switch SW3 is factory set for water freeze protection with the switch closed. Operation at fluid temperatures below 32°F (0°C) with anti-freeze protection requires SW3 to be field configured for the switch on. If unit is employing a fresh water system (no anti-freeze protection), it is extremely important that SW3 switch setting remains in the off position (factory default setting) in order to shut down the unit at the appropriate water temperature to protect your heat pump from freezing. Failure to do so can result in unit damage or property damage and will void unit warranty.

NOTICE

The settings of the hardware configuration DIP switches are read when the controller is powered. Any changes to the DIP switch settings require cycling power to the controller or sending a controller a reboot command through the network communications.

Figure 35: Location of Configuration DIP Switches on the MT2300 Unit Controller



CAUTION

The MT2300 unit controller incorporates static sensitive devices. A static charge from touching the device can damage the electronic components. To help prevent damage during service, use static discharge wrist straps. Static discharge wrist straps are grounded to the heat pump chassis through a 1M ohm resistor.

Table 15: MT2300 Main Board DIP Switch Settings

Switch	Description	Position	Model/Options
SW1	Normal/Test Mode	SW1 = OFF (0)	Normal Operation
		SW1 = ON (1)	Service/Test Mode
SW2	Fan Operation	SW2 = OFF (0)	Continuous Fan Operation (On)
		SW2 = ON (1)	Cycling Fan Operation (Auto)
SW3'	Loop Fluid	SW3 = OFF (0)	Water Loop Fluid
		SW3 = ON (1)	Glycol Loop Fluid
SW4	Freeze Fault Detect (FFD)	SW4 = OFF (0)	Disabled FFD
		SW4 = ON (1)	Enabled FFD with LWT sensor installed
SW5	Room Sensor Setpoint Adjust Range	SW5 = OFF (0)	Short Range -5 to +5 F (-2.78 to +2.78 C)
		SW5 = ON (1)	Long Range 55 to 95 F (12.78 to 35 C)
SW6	Thermostat/Room Sensor Control	SW6 = OFF (0)	Thermostat Control
		SW6 = ON (1)	Room Sensor Control

Switch	Description	Position	Model/Options
SW7/ SW8²	Single Compressor Heating Source	SW7 = OFF (0)	Allow Compressor in Heating Mode
		SW7 = ON (1)	Disable Compressor in Heating Mode
	Single Compressor I/O Expansion Module	SW8 = OFF (0)	I/O Expansion Module Not Required
		SW8 = ON (1)	I/O Expansion Module is Required
	Two Compressor Availability	SW7 = OFF (0) SW8 = OFF (0)	Both Compressors Available (Automatic Compressor Fail Replace)
		SW7 = ON (1) SW8 = OFF (0)	Lead Compressor Available (Lag Compressor is Off-Line)
SW7 = OFF (0) SW8 = ON (1)		No Compressors Available	
SW9	WSHP Base Board Application Select	SW9 = OFF (0)	Single Compressor WSHP Application
		SW9 = ON (1)	Two Compressor Application
SW10	Discrete/Variable Speed Fan Select	SW10 = OFF (0)	Fan Single (Fan Main Output) or Variable (PWM) Speed
		SW10 = ON (1)	Dual Speed Fan (Low & High Discrete Outputs)

- See Warning under "Configuration DIP Switches" for DIP switch 3 (SW3) setting information.
- The functionality of SW7 and SW8 depends on the setting of SW9. If SW9 is OFF, SW7 and SW8 will be for Heating Source and I/O Expansion Module functionality. If SW9 is ON, SW7 and SW8 will be for Compressor Availability functionality.

NOTICE

Always disconnect power to the unit prior to making changes to the DIP switch settings on the interface board. The new settings will take effect once power is restored to the unit.

Figure 36: MT2310 I/O Expansion DIP Switches

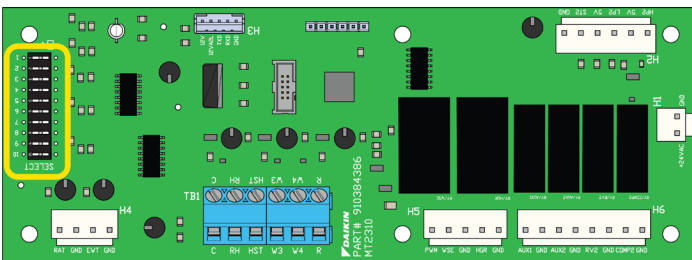


Table 16: MT2310 I/O Expansion Module DIP Switch Settings

Switch	Description	Position	Model/Options
SW1-4	Variable Fan Speed Row Selection	0000 to 1111 Binary	Variable Speed Fan Row Selection (1 to 16), used when "nciVsNetCnfgEn" is set to "Disable" the network override.
SW5/ SW6	Secondary Heating Options	SW5 = OFF (0) SW6 = OFF (0)	None
		SW5 = ON (1) SW6 = OFF (0)	Supplemental Electric Heat
		SW5 = OFF (0) SW6 = ON (1)	Boilerless Electric Heat
		SW5 = ON (1) SW6 = ON (1)	Hydronic Heating
SW7	Hot Gas Reheat (HGRH)	SW7 = OFF (0)	HGRH Disabled
		SW7 = ON (1)	HGRH Enabled
SW8	Waterside Economizer (WSE)	SW8 = OFF (0)	Waterside Economizer Disabled
		SW8 = ON (1)	Waterside Economizer Enabled
SW9	WSHP I/O Expansion Application Select	SW9 = OFF (0)	Single Compressor Application
		SW9 = ON (1)	Two Compressor Application
SW10	Dual Compressor Speed Option	SW10 = OFF (0)	Single Speed Compressor
		SW10 = ON (1)	Dual Speed Compressor
	Dual Compressor: Lead Compressor Select	SW10 = OFF (0)	Compressor #1 is Lead
		SW10 = ON (1)	Compressor #2 is Lead

NOTE: The functionality of SW10 depends on the setting of SW9. If SW9 is OFF, SW10 will be for Single Compressor Speed. If SW9 is ON, SW10 will be for Lead Compressor Select.

MicroTech SmartSource Unit Controller

The MicroTech SmartSource unit controller allows thermostat, Daikin Applied sensor and DDC standalone operation. The R (24VAC) terminal is used to operate thermostat inputs G, Y1, Y2, W1, W2, W3, W4, and TB2. The C (common) terminal is used to control inputs U and E. No external power sources may be used to operate the MicroTech controller. All units must be properly grounded per local code requirements.

NOTICE

For information on sequence of operation and troubleshooting refer to OM 1364.

Remote Reset of Automatic Lockouts

The Remote Reset feature provides the means to remotely reset automatic lockouts. There are three (3) ways to accomplish a unit reset once the fault condition has been remedied:

- Using the thermostat, cycle from cool or heat to off and back to heat or cool two times within 30 seconds.
- Press the Room Sensor or Thermostat Timed Override/Reset Button for more than 10 seconds.
- Turn the unit power off and wait 10 seconds to turn back on.

When the cause of the fault condition has been remedied, and the unit is cycled from not requiring heating or cooling to needing heating or cooling twice within 30 seconds (accomplished by user manipulation of the Heat/Cool/ Auto/Off switch on the thermostat), an alarm reset equivalent to a tenant override button reset is generated. The intelligent reset counter and the 24 hour timer are cleared when this type of alarm reset is generated.

NOTICE

This feature only applies to thermostat controlled systems.

For room sensor controlled units, pressing the “Override” or “Reset” button for more than 10 seconds will apply a ground signal to the Room Temperature Sensor connection at TB2 pin 4, RS clearing the lockout alarm once the cause of the fault condition has been remedied.

A unit power cycle can also be used to clear an automatic lockout if the conditions causing the fault have been remedied.

Table 17: MT2300 Unit Controller Status LEDs

LED Activity	Type	Color	Description
Steady ON	Fault	Yellow	MCU Not Programmed
Steady ON	Fault	Red	MCU Hardware Failure
1 Flash	Fault	R–Y–G	Invalid Configuration
2 Flash	Fault	R–Y–G	Incompatible Software
1 Flash	Fault	R–Y	I/O Exp Board Communications Fail
1 Flash	Mode	G–Y	Service / Test Mode Active
Rapid Flash	Fault	Red	A2L Mitigation – Refrigerant Leak
1 Flash	Fault	Red	Compressor #1 High Pressure
2 Flash	Fault	Red	Compressor #1 Low Pressure
3 Flash	Fault	Red	Compressor #1 Suction Temp Sensor Fail
4 Flash	Fault	Red	Compressor #1 Low Suction Temp
5 Flash	Fault	Red	Compressor #2 High Pressure
6 Flash	Fault	Red	Compressor #2 Low Pressure
7 Flash	Fault	Red	Compressor #2 Suction Temp Sensor Fail
8 Flash	Fault	Red	Compressor #2 Low Suction Temp
9 Flash	Fault	Red	A2L Mitigation – Control Board Without Power
Rapid Flash	Mode	Yellow	A2L Mitigation – Refrigerant Sensor Out of Range
1 Flash	Fault	Yellow	Compressor Low Voltage Brownout
2 Flash	Fault	Yellow	Freeze Fault Detect (FFD)

LED Activity	Type	Color	Description
3 Flash	Fault	Yellow	Control Temp Sensor Out of Range
4 Flash	Fault	Yellow	Entering Water Temp Sensor Out of Range
5 Flash	Fault	Yellow	Leaving Water Temp Sensor Out of Range
6 Flash	Fault	Yellow	Relative Humidity Sensor Out of Range
7 Flash	Fault	Yellow	Condensate Overflow
8 Flash	Fault	Yellow	Space Temp Sensor Out of Range
9 Flash	Fault	Yellow	Return Air Temp Sensor Out of Range
Rapid Flash	Mode	Green	Emergency Shutdown
1 Flash	Mode	Green	No Call for Heating / Cooling / Dehumidification
2 Flash	Mode	Green	Call for Cooling
3 Flash	Mode	Green	Call for Heating
4 Flash	Mode	Green	Call for Fan Only
5 Flash	Mode	Green	Unoccupied Mode Active
6 Flash	Mode	Green	Call for Dehumidification
7 Flash	Mode	Green	Low Entering Water Temp
8 Flash	Mode	Green	HGRH Low Return Air Temp Cutout
9 Flash	Mode	Green	WSE Low Temp Cutout
8 Flash	Mode	Green	HGRH Low Return Air Temp Cutout
9 Flash	Mode	Green	WSE Low Temp Cutout

Table 18: MT2310 I/O Expansion Board Status LEDs

LED Activity	Type	Color	Description
1 Flash	Mode ¹	Green	Variable Speed Fan OFF
2 Flash	Mode ¹	Green	Variable Speed Fan ON: 0 to 20%
3 Flash	Mode ¹	Green	Variable Speed Fan ON: 21 to 30%
4 Flash	Mode ¹	Green	Variable Speed Fan ON: 31 to 40%
5 Flash	Mode ¹	Green	Variable Speed Fan ON: 41 to 50%
6 Flash	Mode ¹	Green	Variable Speed Fan ON: 51 to 60%
7 Flash	Mode ¹	Green	Variable Speed Fan ON: 61 to 70%
8 Flash	Mode ¹	Green	Variable Speed Fan ON: 71 to 80%
9 Flash	Mode ¹	Green	Variable Speed Fan ON: 81 to 90%
10 Flash	Mode ¹	Green	Variable Speed Fan ON: 91 to 100%
Steady ON	Fault	Yellow	MCU Not Programmed
Steady ON	Fault	Red	MCU Hardware Failure
1 Flash	Fault	R–Y–G	Invalid Configuration
2 Flash	Fault	R–Y–G	Incompatible Software
1 Flash	Fault	R–Y	Base Board Communications Failure
Rapid Flash	Fault	Red	A2L Mitigation - Alarm Condition

¹ When the BACnet network is overriding the fan speed DIP switch selection, the LED interval color will be yellow instead of green.

Table 19: Priority Level of Faults and Modes with Resets

Alarm Enumeration (BACnet)	Fault	Indication	Reset ¹
1	No Alarm	Normal operation	NA
2	MT2310 Communication Failure	Single compressor unit with SW #8 set to ON position	A
3	Incompatible Software	Incorrect Software Part or Version Numbers	P
4	Invalid Configuration	Base & IO Exp Application Mismatch or MT2310 detected but not required (SW #8)	P
5	A2L Alarm	A2L refrigerant leak detected	A
6	A2L Error - Power	A2L mitigation control is not powered	A
7	Compressor Low Voltage	"Brownout" condition exists	A
8	Comp #1 High Pressure	Compressor #1 high pressure switch opened	T,N
9	Comp #2 High Pressure	Compressor #2 high pressure switch opened	T,N
10	Comp #1 Low Pressure	Compressor #1 low pressure switch opened	T,N
11	Comp #2 Low Pressure	Compressor #2 low pressure switch opened	T,N
12	Comp #1 Suction Temp Sensor	Compressor #1 suction temp sensor reading "out of range"	N
13	Comp #2 Suction Temp Sensor	Compressor #2 suction temp sensor reading "out of range"	N
14	Leaving Water Temp (LWT) Sensor	LWT sensor not present (SW #4 = ON)	N
15	Freeze Fault Detect (FFD)	LWT sensor temp below freeze setpoint (SW #4 = ON)	T,N
16	Comp #1 Low Suction Temp (ST1)	ST1 sensor temp below minimum setpoint	A,T,N ²
17	Comp #2 Low Suction Temp (ST2)	ST2 sensor temp below minimum setpoint	A,T,N ²
18	A2L Error - Sensor	A2L sensor lost communication or reported failure	A
19	Control Temp Sensor Failure	Room Temp and Return Air Temp sensor reading "out of range"	N
20	Entering Water Temp (EWT) Sensor Failure	EWT sensor reading "out of range"	N
21	Room Temp Sensor Failure	Room temp sensor reading "out of range"	N
22	Return Air Temp Sensor Failure	RAT sensor reading "out of range"	N
23	Space RH Sensor Failure	Space RH sensor reading "out of range"	N
24	Low Entering Water Temp (EWT)	EWT sensor reading below minimum setpoint	A
25	Condensate Overflow	Condensate overflow sensor indicates water present	A,N
26	Waterside Economizer (WSE) Low Temp	WSE temp sensor reading below minimum setpoint	A

¹ "A" = Auto Reset, "T" = Tenant Override Button Reset, "N" = Network Reset, "P" = power cycle only

² Low suction temperature faults have "Intelligent Reset" logic - 3 faults in a 24 hour period disables the auto reset function.

Table 20: I/O Expansion Module Configuration Switch

Fan Speed Row	Switch 1	Switch 2	Switch 3	Fan Only ¹	Cool Stage 1	Cool Stage 2	Heat Stage 1	Heat Stage 2
1	OFF	OFF	OFF	20%	80%	100%	80%	100%
2	ON	OFF	OFF	20%	70%	90%	70%	90%
3	OFF	ON	OFF	20%	60%	80%	60%	80%
4	ON	ON	OFF	20%	50%	70%	50%	70%
5	OFF	OFF	ON	20%	65%	85%	65%	85%
6	ON	OFF	ON	20%	55%	75%	55%	75%
7	OFF	ON	ON	20%	50%	65%	50%	65%
8	ON	ON	ON	20%	50%	55%	50%	55%

¹ When in Fan Only (SW4) mode, OFF = 20% and ON = Cool Stage 1 speed (heat or cool mode fan speeds not affected).

Table 21: Fault Recovery and Reset¹

Fault Description	Auto Recover	Tenant Override Button Reset	Network Reset
I/O Expansion Communication Fail	Yes	No	No
Incompatible Software/ Invalid Configuration	No	No	No
Compressor Low Voltage Brownout	Yes	No	Yes
A2L Mitigation - Leak/ No Power I Sensor Fail	Yes	No	No
All Sensor Failures	No	No	Yes
Compressor High Pressure/ Compressor Low Pressure	No	Yes	Yes
Compressor Low Suction Temp (Heating Mode)	Yes ²	Yes	Yes
Compressor Low Suction Temp (Cooling & Dehumidification Mode)	Yes	Yes	Yes
Freeze Fault Detect	No	Yes	Yes
Condensate Overflow (Cooling & Dehumidification Mode)	Yes	No	Yes
Low Entering Water Temp (Heating without Boilerless EH)	Yes	No	No
Waterside Economizer Low Temp Cutout (WSE Control & Call For Cooling Only)	Yes	No	No

¹ See "Remote Reset of Automatic Lockouts" on page 36 for further details.

² Indicates auto recover is subject to intelligent alarm reset. Alarm auto recovers on first two occurrences, locked out on third within 24 hour period.

MicroTech Unit Controller LED Faults and Remedy

Microcontroller Not Programmed or Hardware Failure

LED Activity	Type	Color	Description
Steady ON	Fault	Red	Hardware Failure
Steady ON	Fault	Yellow	MCU Not Programmed

- Replace the controller.

Invalid Configuration

LED Activity	Type	Color	Description
1 Flash	Fault	R-Y-G	Invalid Configuration

- Verify configuration switch settings on both the main board and I/O expansion board. Configuration switch setting must be verified using the configuration switch setting outlined in this document, main board and I/O expansion board software must be compatible.

Incompatible Software

LED Activity	Type	Color	Description
2 Flash	Fault	R-Y-G	Incompatible Software

- Replace the controller.

I/O Expansion Board Communication Fail

LED Activity	Type	Color	Description
1 Flash	Fault	R-Y	I/O Exp Board Communications Fail

- Verify connection of 5 wire cable between H3 on the MT2300 main board and H3 on the MT2310 I/O expansion board is fully engaged in the connector.
- Confirm the low voltage supply is between 19-32VAC at the H1 terminal of the MT2310 I/O expansion board.
- Replace I/O expansion board.

Service Test Mode Enabled

LED Activity	Type	Color	Description
1 Flash	Mode	G-Y	Service / Test Mode Active

- Configuration switch SW1 is ON for test mode operation.

Compressor High Pressure

LED Activity	Type	Color	Description
1 Flash	Fault	Red	Compressor 1 High Pressure
5 Flash	Fault	Red	Compressor 2 High Pressure

Compressor 1

- Verify high pressure switch is connected to terminal H7, pins 3 and 4 on the main board.
- Check for continuity of the high pressure switch.

Compressor 2

- Verify high pressure switch is connected to terminal H2, pins 5 and 6 on the expansion board.
- Check for continuity of the high pressure switch.

Both Compressors

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.

Compressor Low Pressure

LED Activity	Type	Color	Description
2 Flash	Fault	Red	Compressor 1 Low Pressure
6 Flash	Fault	Red	Compressor 2 Low Pressure

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

Compressor Suction Temp Sensor Fail / Room Temp Sensor Fail (Room Sensor Control Only) / Leaving Water Temp Sensor Fail (FFD Units Only) / Return Air Sensor Failure (HGRH Units Only)

LED Activity	Type	Color	Description
3 Flash	Fault	Red	Compressor 1 Suction Temp Sensor Fail
5 Flash	Fault	Yellow	Leaving Water Temp Sensor Fail
7 Flash	Fault	Yellow	Compressor 2 Suction Temp Sensor Fail
8 Flash	Fault	Yellow	Space Temp Sensor Fail
9 Flash	Fault	Yellow	Return Air Temp Sensor Fail

- Check connection of low suction temperature sensor on terminal H2 pins 3 and 4.
- Check resistance of low suction temperature sensor, leaving water temperature sensor, room sensor, and return air sensor. All sensors are 10kohm thermistor at 77°F (25°C).

Compressor Low Suction Temp

LED Activity	Type	Color	Description
4 Flash	Fault	Red	Compressor 1 Low Suction Temp
8 Flash	Fault	Red	Compressor 2 Low Suction Temp

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

Low Voltage Brownout

LED Activity	Type	Color	Description
1 Flash	Fault	Yellow	Compressor Low Voltage Brownout

- Confirm the low voltage supply is between 19-32VAC at the H1 terminal of the MT2300 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.

Freeze Fault Detect

LED Activity	Type	Color	Description
2 Flash	Fault	Yellow	Freeze Fault Detect (FFD)

- Low leaving water temperature (below 35°F (1.67°C) standard range or 13.5°F (-10.28°C) extended range).

Control Temp Sensor Failure

LED Activity	Type	Color	Description
3 Flash	Fault	Yellow	Control Temp Sensor Fail

- Room sensor control units only (MT2300 configuration switch SW6 is ON).
- Check connection of space temperature sensor on MT2300 terminal TB2 pins 4 (RM) and 5 (GND) and return air temperature sensor on MT2310 terminal H4 pins 3 (GND) and 4 (RAT).
- Check resistance of space sensor and return air sensor. All sensors are 10kohm thermistor at 77°F (25°C).

Entering Water Temp Sensor Fail (Boilerless Electric Heat, Hydronic Heat or Waterside Economizer Only)

LED Activity	Type	Color	Description
4 Flash	Fault	Yellow	Entering Water Temp Sensor Fail

- Check connection of entering water temperature sensor on MT2310 I/O expansion board terminal H4 pins 1 and 2.
- Check resistance of the entering water temperature sensor. All sensors are 10kohm thermistor at 77°F (25°C).

Leaving Water Temperature Sensor Failure

LED Activity	Type	Color	Description
5 Flash	Fault	Yellow	Leaving Water Temp Sensor Fail

- Freeze Fault Detect enabled (MT2300 configuration switch SW4 is ON).
- Check connection of leaving water temperature sensor on MT2300 terminal H2 pins 1 (LWT) and 2 (GND).
- Check resistance of leaving water temperature sensor. All sensors are 10kohm thermistor at 77°F (25°C).

Relative Humidity Sensor Failure

LED Activity	Type	Color	Description
6 Flash	Fault	Yellow	Relative Humidity Sensor Fail

- Relative Humidity Sensor Failure alarm has been enabled via network communications and the sensor is reporting out of range.
- Check connection of relative humidity sensor on MT2310 terminal TB1 pins 1 (REF) and 2 (RH).
- Check that relative humidity sensor has power.
- Check voltage output from relative humidity sensor (0-10VDC, 0-100% RH).

Condensate Overflow

LED Activity	Type	Color	Description
7 Flash	Fault	Yellow	Condensate Overflow

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

Emergency Shutdown

LED Activity	Type	Color	Description
Rapid Flash	Mode	Green	Emergency Shutdown

- Verify the E terminal is not connected to common. Remove wire, if connected, and LED should change to solid green only (Occ, Bypass, Standby modes).

Occupied, Bypass, Standby Modes: Heating/Cooling/Fan Only/Dehumidification

LED Activity	Type	Color	Description
1 Flash	Mode	Green	No Call for Heating / Cooling / Dehumidification
2 Flash	Mode	Green	Call for Cooling
3 Flash	Mode	Green	Call for Heating
4 Flash	Mode	Green	Call for Fan Only
6 Flash	Mode	Green	Call for Dehumidification

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

Unoccupied Mode

LED Activity	Type	Color	Description
5 Flash	Mode	Green	Unoccupied Mode Active

- Terminal U on main control board is connected to common from external source or commanded by network.

Low Entering Water Temperature (Heating) (No Display On Boilerless Electric Heat)

LED Activity	Type	Color	Description
7 Flash	Mode	Green	Low Entering Water Temp

- Verify entering water temperature is greater than set point.

HGRH Low Return Air Temp Cutout

LED Activity	Type	Color	Description
8 Flash	Mode	Green	HGRH Low Return Air Temp Cutout

- Unit is in the dehumidification mode and the return air temperature is below 68°F (20°C).

Waterside Economizer Low Temp Cutout (WSE Control & Call for Cooling)

LED Activity	Type	Color	Description
9 Flash	Mode	Green	WSE Low Temp Cutout

- Entering water temperature is below 45°F (7.22°C).

MicroTech Unit Controller with an Optional BACnet Communication Module



For installation and operation information on MT2300 unit controller and other ancillary components, see:

- OM 1364 - MT2300 Unit Controller with MT 2310 I/O Expansion Board MicroTech Controller
- IM 956 - Temperature Sensors for Units with MicroTech III or MT2300 Unit Controller and LonWorks® or BACnet Communication Module
- IM 1363 - MicroTech MT2300 Water Source Heat Pump Unit Controller BACnet MS/TP Communication Module
- ED 19129 - MicroTech MT2300 Water Source Heat Pump Unit Controller BACnet Protocol Information

Daikin Applied water source heat pumps are available with an optional BACnet MS/TP communication module that is designed to communicate over a BACnet MS/TP communications network to a building automation system (BAS). It can be factory or field-installed.

The unit controller is programmed and tested with all the logic required to monitor and control the unit. An optional wall sensor may be used with the communication module to provide limited local control of the water source heat pump. The unit 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.

The module makes operational data and commands available on a communications network using BACnet objects and properties:

- The network cable is a shielded twisted-pair cable
- Network communications run up to 76.8 kbps
- DIP switches on the controller enable the MS/TP MAC address to be set in the range 0-127
- Four green status LEDs on the communication module indicate communication activity on the MS/TP communication network and with the unit controller

MicroTech Unit Controller with BACnet MS/TP communication module orchestrates the following unit operations:

- Enable heating and cooling to maintain setpoint based on a room sensor
- 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

The MT2300 Unit Controller with an optional communication module Includes:

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

NOTICE

Refer to IM 956 for details to install RAT & DAT sensors.

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; $\pm 5^{\circ}\text{F}$ setpoint adjustment
- Room sensor with LED status, timed-override button, 55°F to 95°F setpoint adjustment
- Room sensor with digital display, timed override button, occupancy button; $\pm 5^{\circ}\text{F}$ setpoint adjustment or 55°F to 95°F temperature setpoint and dehumidification control

Maintenance

Charging

It is recommended to charge the unit with liquid R-32. 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-32. 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-32 in a 300 psig rated cylinder.

 WARNING
Recycle/recovery equipment must be designated for R-32. Improper equipment can cause severe injury or death.

NOTICE
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 Applied 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	335-370 psig	10° to 14°

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

General Maintenance

1. 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.
2. The condensate drain pan should be checked annually and cleaned and flushed as required.
3. Record performance measurements of volts, amps, and water temperature differences (both heating and cooling). A comparison of logged data with startup and other annual data is useful as an indicator of general equipment condition.
4. 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.
5. 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.

Troubleshooting

Table 22: Troubleshooting Refrigeration Circuit

Symptom	Head Pressure	Suction Pressure	Compressor Amp Draw	Super Heat	Subcooling	Air Temp Differential	Water (Loops) Temp Differential	Safety Lock Out
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	Low Temp/High Pressure

Troubleshooting the Water Source Heat Pump Unit

Compressor Runs in Short Cycle

- Check wiring - loose or broken and check for faulty connection.
- Check relays and contacts, also capacitor and wiring.
- Check high pressure switch, low pressure switch and low temperature switch to see if unit is cycling on the safety.
- Check to see if the reversing valve is not hung up and is operating correctly.
- Check condensate overflow sensor in cool/dehumidification mode of operation.
- Check thermostat or room sensor for proper location.

Neither Fan, Nor Compressor Runs and All LED Lights are Off

- Unit control, check thermostat for correct wiring or faulty thermostat.
- Wire may be loose or broken. Replace or tighten wires.
- Fuse may be blown, circuit breaker is open.
- Low voltage, check power supply voltage.

Fan Operates, Compressor Does Not

- Check wiring - loose or broken and check for bad connection.
- High or Low pressure lockout:
 - a. Cool mode, check water flow
 - b. Heating mode, check air flow
 - c. Check reversing valve for proper valve position

- Check compressor overload - make sure it is closed.
- Check compressor to ground, or for internal short to ground.
- Compressor winding may be open. Check continuity with ohm meter.

Compressor Attempts to Start but Does Not



- Check compressor wiring for defective wiring or loose connection.
- Check for defective compressor internal windings with ohm meter.
- Check for faulty compressor capacitor.
- Check for lock rotor amp draw.

Insufficient Cooling or Heating

- Check thermostat for improper location.
- Check for proper air flow - filter could be dirty.
- Check blower assembly for dirt or faulty fan motor capacity.
- Check for low refrigerant charge.
- Check amp draw on blower assembly.
- Check for proper water flow and delta T.

Refrigerant Information

Refrigerant Guidelines

 WARNING	
 A2L	<p>This unit contains R-32, a class A2L refrigerant that is flammable. This unit should only be installed, serviced, repaired, and disposed of by qualified personnel licensed or certified in their jurisdiction to work with R-32 refrigerant. Installation and maintenance must be done in accordance with this manual. Improper handling of this equipment can cause equipment damage or personal injury.</p>
<p>For installation only in locations not accessible to the general public.</p> <p>Be aware that R-32 refrigerant may not contain an odor. Place in a well ventilated area to prevent accumulation of refrigerant. When installing the unit in a small room, take measures to keep the refrigerant concentration from exceeding allowable safety limits. Excessive refrigerant leaks, in the event of an accident in a closed ambient space, can lead to oxygen deficiency.</p> <p>Do not pierce or burn this unit.</p> <p>Never use an open flame during service or repair. Never store in a room with continuously operating ignition sources (for example: open flames, an operating gas appliance, or an operating electric heater), where there is ignitable dust suspension in the air, or where volatile flammables such as thinner or gasoline are handled.</p> <p>Only use pipes, nuts, and tools intended for exclusive use with R-32 refrigerant in compliance with national codes (ASHRAE15 or IRC).</p> <p>Do not mix air or gas other than R-32 in the refrigerant system. If air enters the refrigerant system, an excessively high pressure results, which may cause equipment damage or injury.</p> <p>Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.</p>	

Lubrication

R-32 should be used only with polyolester (POE) oil. The HFC refrigerant components in R-32 will not be compatible with mineral oil or alkylbenzene lubricants. R-32 systems will be charged with the OEM recommended lubricant, ready for use with R-32.

Competence of Personnel

Information of procedures additional to usual information for refrigerating equipment installation, repair, maintenance and decommission procedures is required when equipment with flammable refrigerants is affected.

The training of these procedures is carried out by national training organizations or manufacturers that are accredited to teach the relevant national competency standards that may be set in legislation. The achieved competence should be documented by a certificate.

WARNING

Service on this equipment is to be performed by qualified refrigeration personnel familiar with equipment operation, maintenance, correct servicing procedures, and the safety hazards inherent in this work. Causes for repeated tripping of equipment protection controls must be investigated and corrected. Disconnect all power before doing any service inside the unit. If refrigerant leaks from the unit, there is a potential danger of suffocation since refrigerant will displace the air in the immediate area. Servicing this equipment must comply with the requirements of all applicable industry related published standards and local, state and federal, statutes, regulations and codes in regards to refrigerant reclamation and venting. Avoid exposing refrigerant to an open flame or other ignition source.

Maintaining and servicing R-32 refrigerant should only be performed as recommended by this manual and by personnel licensed or certified in their jurisdiction to handle A2L refrigerants. Dismantling the unit and treatment of the refrigerant, oil, and additional parts must be done in accordance with the relevant local, state, and national regulations.

Only use tools meant for use on R-32 refrigerant, such as a gauge manifold, charge hose, gas leak detector, reverse flow check valve, refrigerant charge base, vacuum gauge, or refrigerant recovery equipment.

The following guidelines align with UL Standard 60335-2-40.

Maintenance and Repair

- Portable equipment shall be repaired outside or in a workshop specially equipped for servicing units with **FLAMMABLE REFRIGERANTS**.
- Ensure sufficient ventilation at the repair place.
- Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.
- Discharge capacitors in a way that won't cause any spark. The standard procedure to short circuit the capacitor terminals usually creates sparks.
- When brazing is required, the following procedures shall be carried out in the right order:
 - Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.
 - Evacuate the refrigerant circuit.
 - Remove parts to be replaced by cutting, not by flame.
 - Purge the braze point with nitrogen during the brazing procedure.
 - Carry out a leak test before charging with refrigerant.
- Reassemble sealed enclosures accurately. If seals are worn, replace them.
- Check safety equipment before putting into service.

Checks to the refrigerating equipment

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times

the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.

The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:

- the actual REFRIGERANT CHARGE is in accordance with the room size within which the refrigerant containing parts are installed;
- the ventilation machinery and outlets are operating adequately and are not obstructed;
- if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- marking to the equipment continues to be visible and legible. Markings that are illegible shall be corrected; and
- refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

Checks to electrical devices

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:

- that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- that no live electrical components and wiring are exposed while charging, recovering or purging the system; and
- that there is continuity of earth bonding.

Sealed electrical and intrinsically safe components

- All sealed electrical components shall be replaced.
- All intrinsically safe components must be replaced.

Cabling

- Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

Leak Detection

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. NEVER use the following when attempting to detect flammable refrigerant leaks:

- A halide torch (or any other detector using a naked flame); or
- Substances containing chlorine.

Detection of flammable refrigerants

The following leak detection methods are deemed acceptable for all refrigerant systems:

- Electronic leak detectors may be used to detect refrigerant leaks. For FLAMMABLE REFRIGERANTS, the sensitivity of electronic leak detectors may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
- Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work. Examples of leak detection fluids are:
 - bubble method; or
 - fluorescent method agents.
- If a leak is suspected, all open flames shall be removed/ extinguished.
- If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to instructions in "[Pressure Testing and Refrigerant Evacuation](#)".

Pressure Testing and Refrigerant Evacuation

- Make sure that air or any matter other than R-32 refrigerant does not get into the refrigeration cycle.
- If refrigerant gas leaks occur, ventilate the room/area as soon as possible.
- R-32 should always be recovered and never released directly into the environment.
- Only use tools meant for use on R-32 refrigerant (such as a gauge manifold, charging hose, or vacuum pump adapter).

Removal and evacuation

When breaking into the refrigerant circuit to make repairs, or for any other purpose, conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration.

- The following procedure shall be adhered to:
 - i. safely remove refrigerant following local and national regulations - see "[Recovery](#)" section;
 - ii. purge the circuit with inert gas;
 - iii. evacuate;

- iv. purge with inert gas;
- v. open the circuit by cutting (if flammable refrigerant) or brazing.
- The refrigerant charge shall be recovered into the correct recovery cylinders according to local and national codes. For equipment containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the equipment safe for flammable refrigerants. This process might need to be repeated several times.
- Compressed air or oxygen shall not be used for purging refrigerant systems.
- For equipment containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum.
- When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.
- Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

Handling and Storage

Conditions for safe storage

- Requirements to be met by storerooms and receptacles:
 - Store only in unopened original receptacles
 - Store in a cool and dry location
- Further information about storage conditions:
 - Keep container tightly sealed
 - Store in cool, dry conditions in well sealed receptacle
 - Protect from heat and direct sunlight
- Maximum storage temperature: 40°C (104°F)

Fire and explosion protection information

Open and handle refrigerant receptacle with care. Keep ignition sources away. Do not smoke. Protect against electrostatic charges. Waste air is to be released into the atmosphere only via suitable separators.

Commissioning

- Ensure that the floor area is sufficient for the refrigerant charge or that the ventilation duct is assembled in a correct manner.
- Connect the pipes and carry out a leak test before charging with refrigerant.
- Check safety equipment before putting into service.

Charging procedures

In addition to conventional charging procedures and specific unit charging guidelines, the following requirements shall be followed:

- Ensure that contamination of different refrigerants does not occur when using charging equipment.

- Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigeration system is electrically connected to ground to protect against electrical shock and to ensure safe discharge of static electricity during maintenance or prior to charging with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.
- Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Decommissioning

- If the safety is affected when the equipment is put out of service, the refrigerant charge shall be removed before decommissioning.
- Ensure sufficient ventilation at the equipment location.
- Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.
- Discharge capacitors in a way that won't cause any spark.
- Remove the refrigerant according to details in "Recovery" section. If recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.
- Ensure all isolation valves on the equipment are closed off.

Labeling

Equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For equipment containing FLAMMABLE REFRIGERANTS, ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.

Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely. When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e., special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants including, when applicable, FLAMMABLE REFRIGERANTS.

If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.

The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that **FLAMMABLE REFRIGERANT** does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Recovery procedure

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely.

Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant.

It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate system electrically.
3. Before attempting the procedure, ensure that
 - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - all personal protective equipment is available and being used correctly;
 - the recovery process is supervised at all times by a competent person;
 - recovery equipment and cylinders conform to the appropriate standards.
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that cylinder is situated on the scale before recovery takes place.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not overfill cylinders (no more than 80% volume liquid charge).

9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.

Disposal

- Waste treatment method recommendation:
 - Must be specially treated adhering to official regulations
 - Incineration in an adequate incinerator is recommended
 - Uncleaned packaging disposal must be made according to official regulations
- Ensure sufficient ventilation at the working place
- The following procedure shall be adhered to:
 - i. safely remove refrigerant following local and national regulations - see "[Recovery](#)" section;
 - ii. evacuate the refrigerant circuit;
 - iii. purge the refrigerant circuit with nitrogen gas for 5 minutes;
 - iv. evacuate again; and
 - v. If compressors are to be removed, cut out the compressor and drain the oil.

Typical Cooling Refrigeration Cycle – Dual Compressors

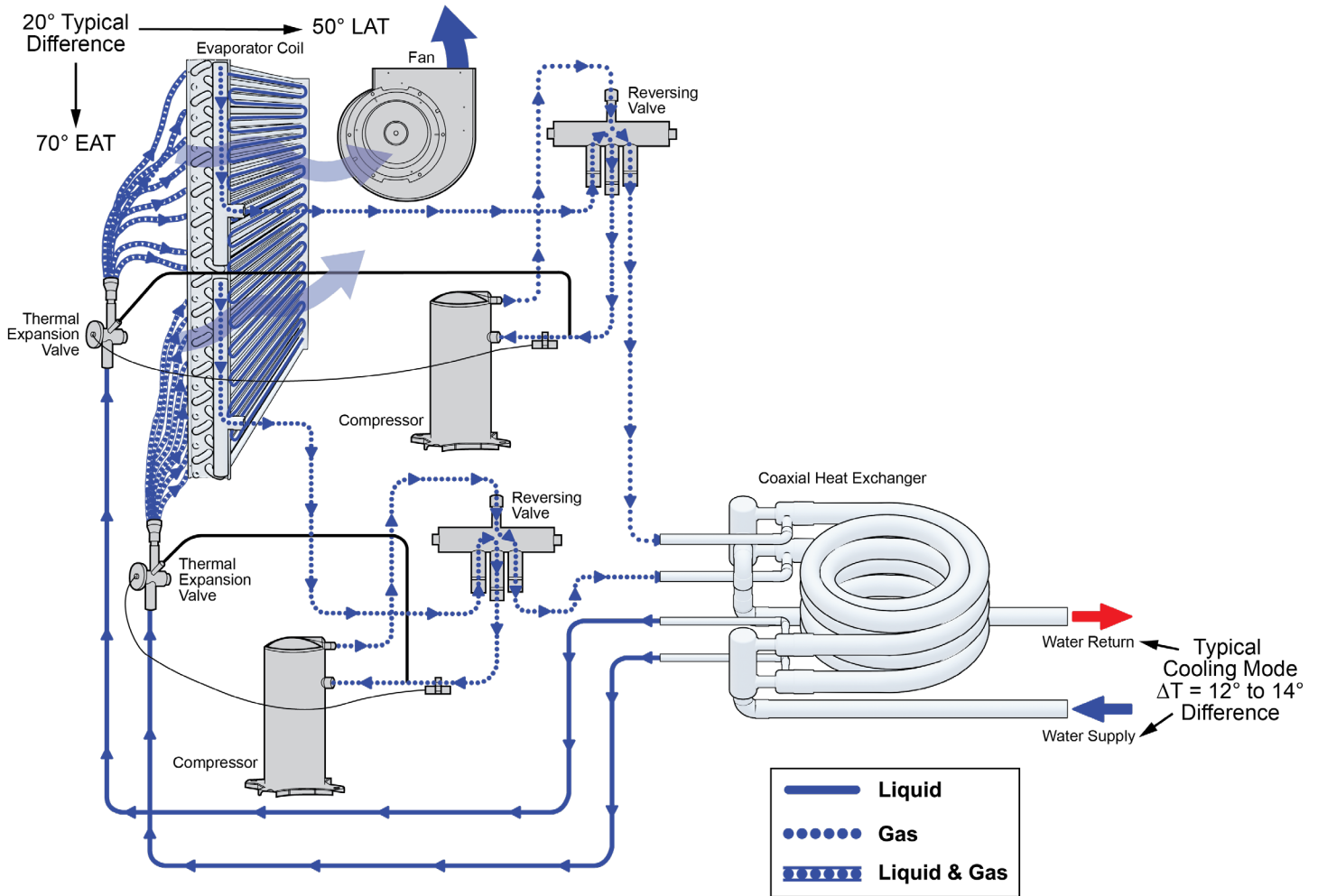
NOTICE

Typical temperature readings are at full load conditions at ISO-13256-1 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 37: Cooling Refrigeration Cycle



Typical Heating Refrigeration Cycle – Dual Compressors

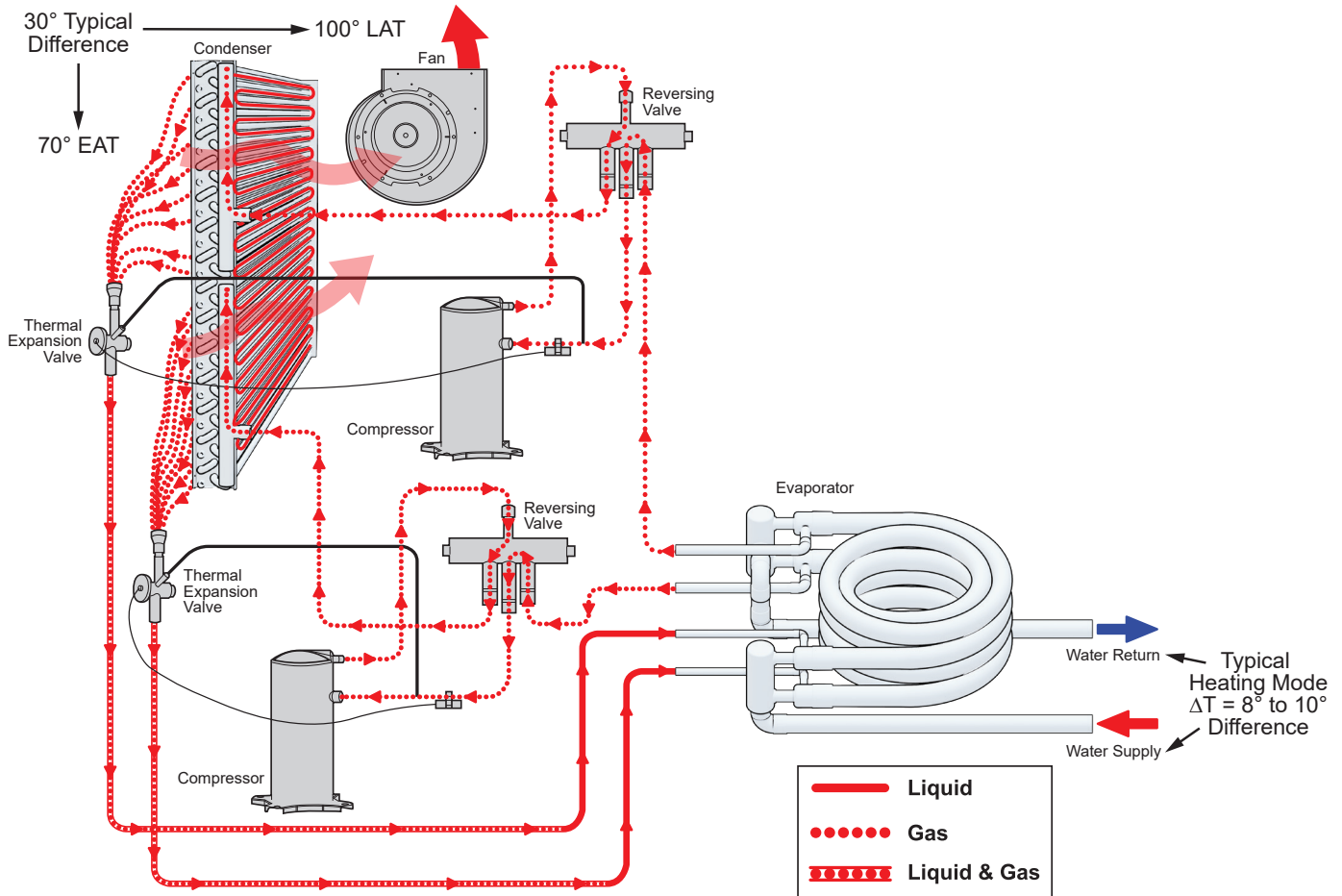
NOTICE

Typical temperature readings are at full load conditions at ISO-13256-1 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 38: Heating Refrigeration Cycle

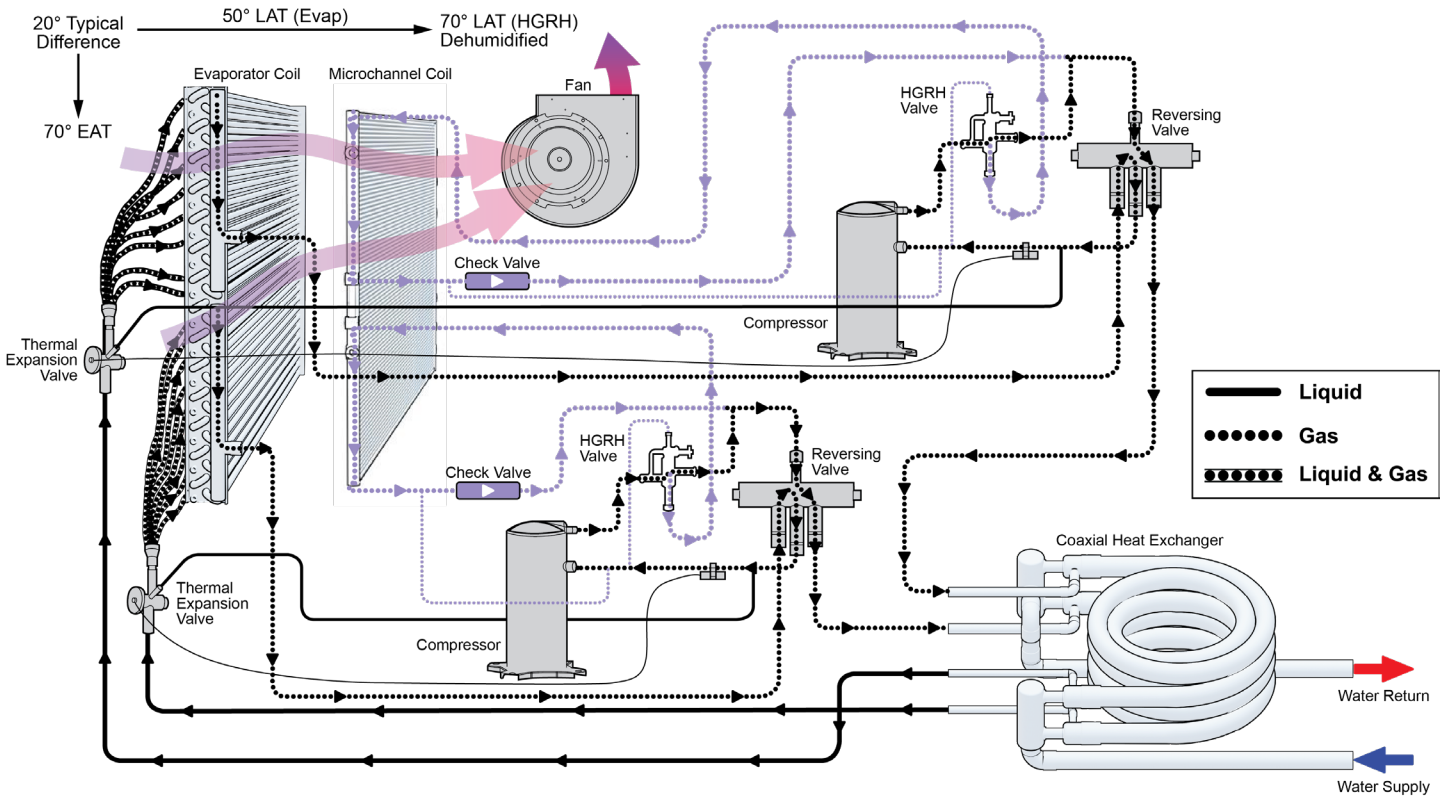


Typical Hot Gas Reheat Refrigeration Cycle – Dual Compressors

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 39: Hot Gas Reheat Refrigeration Cycle



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 locatons indicated on the drawing below.

Equipment Data

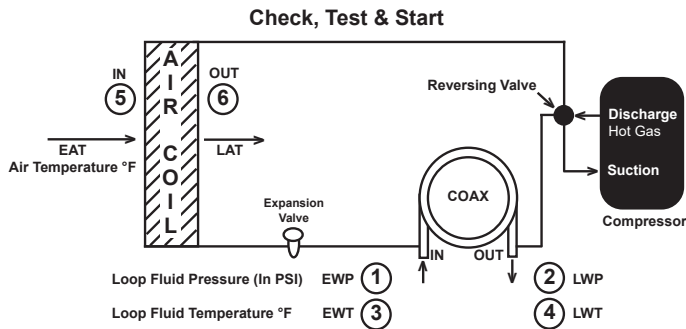
Flow Rate **EWP - LWP = ΔP**
 ① EWP - PSI In _____ minus ② LWP - PSI Out _____ equals ΔP _____
 The first step in finding GPM is to subtract leaving water pressure from entering water pressure. The difference between the two is referred to as ΔP. ΔP can be converted to GPM by looking in the equipment specifiaton 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 1: Perform Check, Test and Start-Up in the Cooling Mode Only.
Note 2: For units with multi-stage compressor operation, verify that the unit is in second stage before logging the requested information.

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



Commercial Check, Test and Start Worksheet

(Complete all equipment measurements indicated for each unit per installation on page 2)

	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 (more comments on back)
1.													
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10.													
11.													
12.													
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36.													
37.													
38.													
39.													
40.													
41.													
42.													

Limited Product Warranty



**DAIKIN APPLIED AMERICAS INC.
LIMITED PRODUCT WARRANTY
(United States and Canada)**

WARRANTY

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

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

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

EXCLUSIONS

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

SOLE REMEDY AND LIMITATION OF LIABILITY

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

ASSISTANCE

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

Form No. 933-430285Y-01-A (11/2023)
Part No. 043028500 Rev.0F

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