Installation and Maintenance Manual IM 1301

Group: **WSHP**
Part Number: **910295850**
Date: **August 2020**

SmartSource® Dedicated Outside Air Water Source Heat Pump – Model GOV – Vertical

Unit Sizes 800 – 2400 CFM

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
W	GO	V	012	F	1	RF	B	B	L	S	00	2	0	0	0	S	75	C	D

Category	Code Option	Code		Designation Description
Product Category	**1**	W	=	Water Source Heat Pump
Model Type	**2-3**	GO	=	DOAS
Configuration	**4**	V	=	Vertical
Unit Size	**5-7**	008	=	800 CFM
		012	=	1200 CFM
		016	=	1600 CFM
		024	=	2400 CFM
Voltage	**8**	F	=	208-230/60/3
		K	=	460-60-3
Design Series (Vintage)	**9**	1	=	Revision / Design Series 1
Entering / Discharge Air	**10-11**	RF	=	Rear Entering Air / Upblast Front Discharge
Water Coil Type	**12**	B	=	Brazed Plate Heat Exchanger
Control Options	**13**	B	=	Standard Controller w/ BACnet
		L	=	Standard Controller + LON Module
Fan Motor Options	**14**	L	=	Single Blower Constant CFM (Not Available on 2400)
		K	=	Dual Blower Constant CFM (Not Available on 800)
Sound Package	**15**	B	=	Base Package
		S	=	Sound Package
Options	**16-17**	00	=	Pre-heat Ready
		HH	=	Left-Hand Hydronic Pre-heat Coil, Field Piped
Filters & Racks	18	2	=	Merv 8 in 2" Frame with Duct Flange
		4	=	Merv 13 in 4" Frame with Duct Flange
		0	=	No Filter with Duct Flange
Piping Package	**19**	0	=	None
Not Used	**20**	0	=	None
Control Option	**21**	0	=	None
Standard or Special	**22**	S	=	Standard
		X	=	Special
Transformer	**23-24**	75	=	75VA Control Transformer
Corrosion Protection	**25**	0	=	None
		C	=	Corrosion Protection
Disconnect Switch	**26**	0	=	None
		D	=	Disconnect Switch

Hazard Identification Information

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

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

⚠ WARNING

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

Receiving and Storage

IMPORTANT

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

VISIBLE LOSS OR DAMAGE

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

CONCEALED LOSS OR DAMAGE

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

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

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

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

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

Pre-Installation

⚠ CAUTION

This appliance shall be installed in accordance with national wiring regulations National Electrical Code (NEC). Canadian Electrical Code (CE) by experienced, trained personnel only. 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.

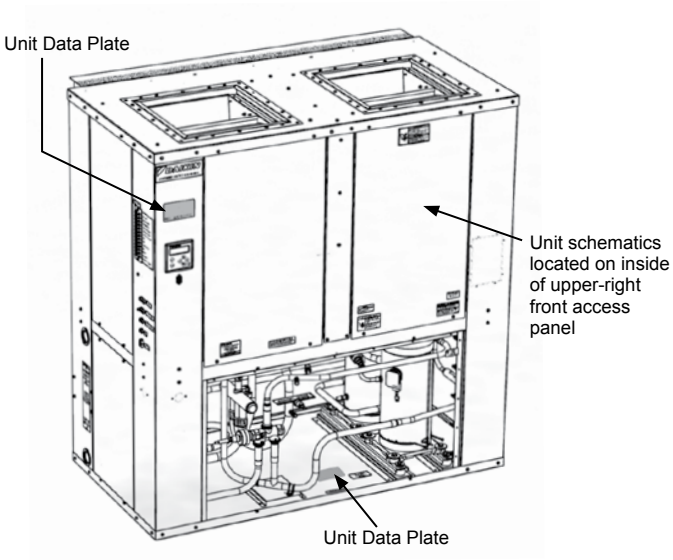
1. To prevent damage, do not operate this equipment for supplementary heating and cooling during the construction period.
2. Inspect the carton for any specific tagging numbers indicated by the factory per a request from the installing contractor. At this time the voltage, phase and capacity should be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

Note: *Check the unit data plate for correct voltage with the plans before installing the equipment, (Figure 1 on page 6). Also, make sure all electrical ground connections are made in accordance with local code.*

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

Unit Identification

Figure 1: Unit Data Plate Locations



Unit Location

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

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

Figure 2: Service Clearances

Note: Local codes that require greater clearances prevail over manufacture recommendations.

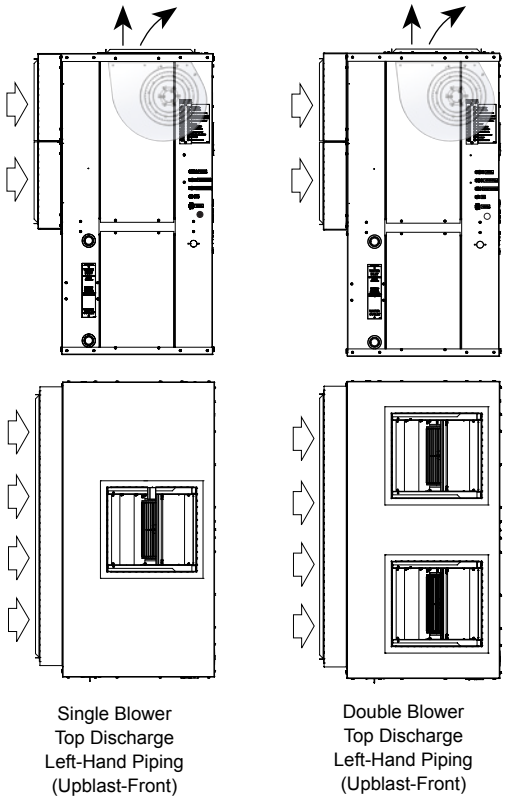
The contractor should make sure that access has been provided including clearance for filter brackets, duct collars and fittings at water and electrical connections. The unit can be installed “free standing” in an equipment room. Generally, the unit is located in a separate room with the air intake ducted to an outdoor air louver. It is recommended that the unit be located on vibration isolators to reduce any vibration (see Figure 4 on page 7).

Fan Arrangements

One fan discharge arrangement and piping arrangement is available. With the return air side defined as the “rear” of the unit, the water piping connections will be on the left-hand (side). All units have a single supply and return water connection with a FPT type fitting that connect directly to the heat exchanger. The condensate connection is a copper FPT type and is located on the right side of the unit. A field installed adapter kit can allow the condensate connection to be relocated to the left front or left side of the unit.

The main control panel is located in the center front of the unit. The fan discharge is top front.

Figure 3: Fan Deck – Unit Configuration Arrangements



Note: *The control box location is considered the “front” of the unit. The piping and electrical connections are always made on the “left-hand” side of the unit.*

Vibration Isolators

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

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

Field supplied isolators may be rubber or spring type. Table 1 provides point load weights to assist in selecting the appropriate isolators.

The holes in the bottom of the unit allow for a 3⁄8" (10 mm) bolt to be secured to the isolator.

Figure 4: Unit Point Load Weights and Vibration Isolators Hole Locations

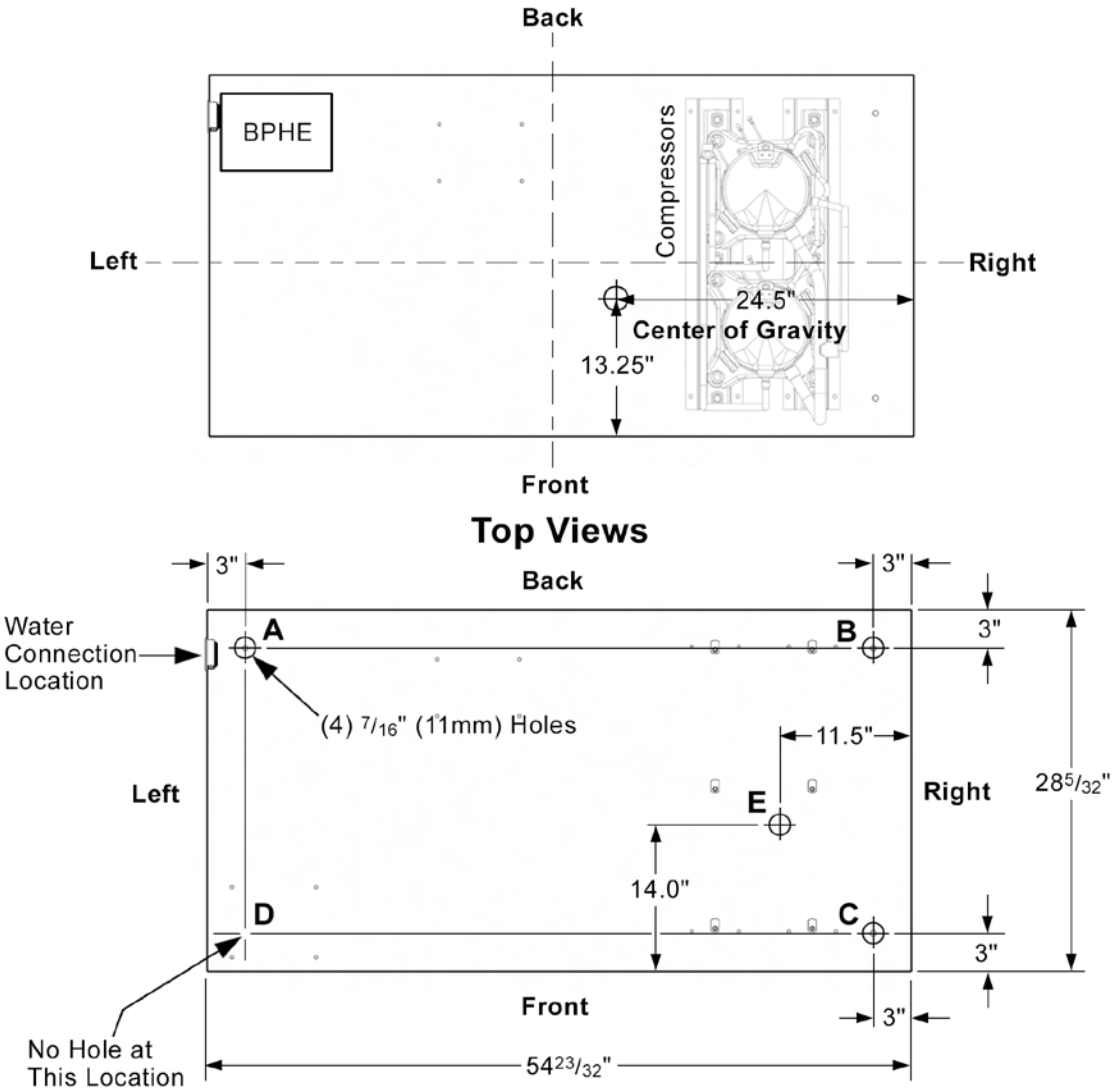


Table 1: Unit Point Load Weights (in Pounds)

Unit Size	No. Fans	A	B	C	D	E
Size 008	1	61	61	82	124	89
Size 012	1	68	68	91	138	98
	2	72	72	96	146	104
Size 016	1	75	75	101	153	109
	2	79	79	106	161	115
Size 024	2	80	80	108	164	117

Ductwork and Attenuation

Discharge ductwork is must be used with these conditioners. Intake air ductwork can be used to directly connect the SmartSource DOAS WSHP intake to an outdoor air louver. If the mechanical room acts as the outdoor air intake plenum then the unit does not require intake ductwork. All ductwork should conform to industry standards of good practice as described in ASHRAE Systems Guide.

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

Unit may have one or two fan outlets. For units with multiple fan outlets the preferred method for minimum static pressure loss would be individual ducts at each outlet connected to a larger main duct downstream (Figure 5).

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

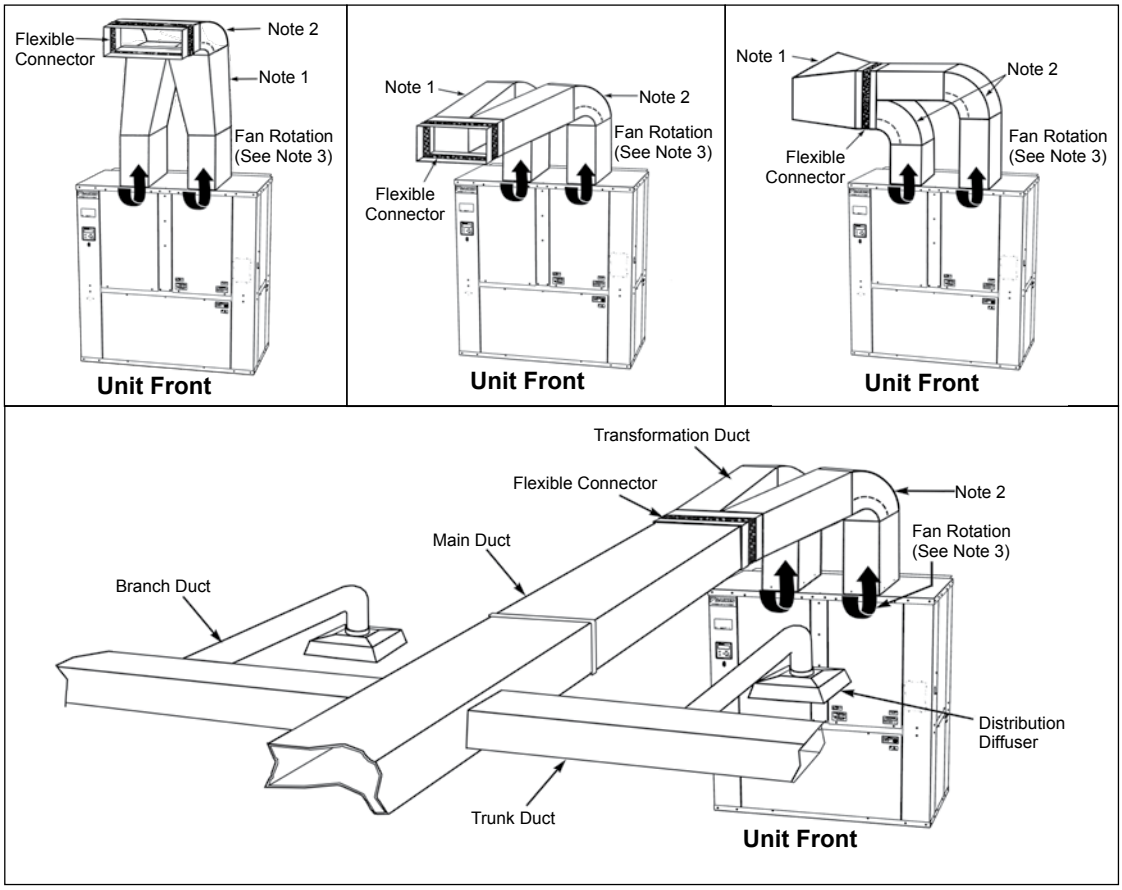
Do not insert sheet metal screws directly into the unit cabinet for connection of supply or return air ductwork, especially return air ductwork which can hit the drain pan or the air coil.

Outdoor Air Damper

It is general practice to close off the ventilation air system during unoccupied periods. The SmartSource DOAS WSHP control includes a 24VAC output to open a field provided damper whenever the system fan is operational. The typical amp rating for output is 250 mA.

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

Figure 5: Suggested Supply Ducting Per ASHRAE and SMACNA Publications



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 flow the differential pressure across the heat exchanger must be measured. Refer to Table 5 on page 13. A direct return system may also work acceptably, but proper water flow balancing is more difficult to achieve and maintain.
2. The piping must comply with local codes.

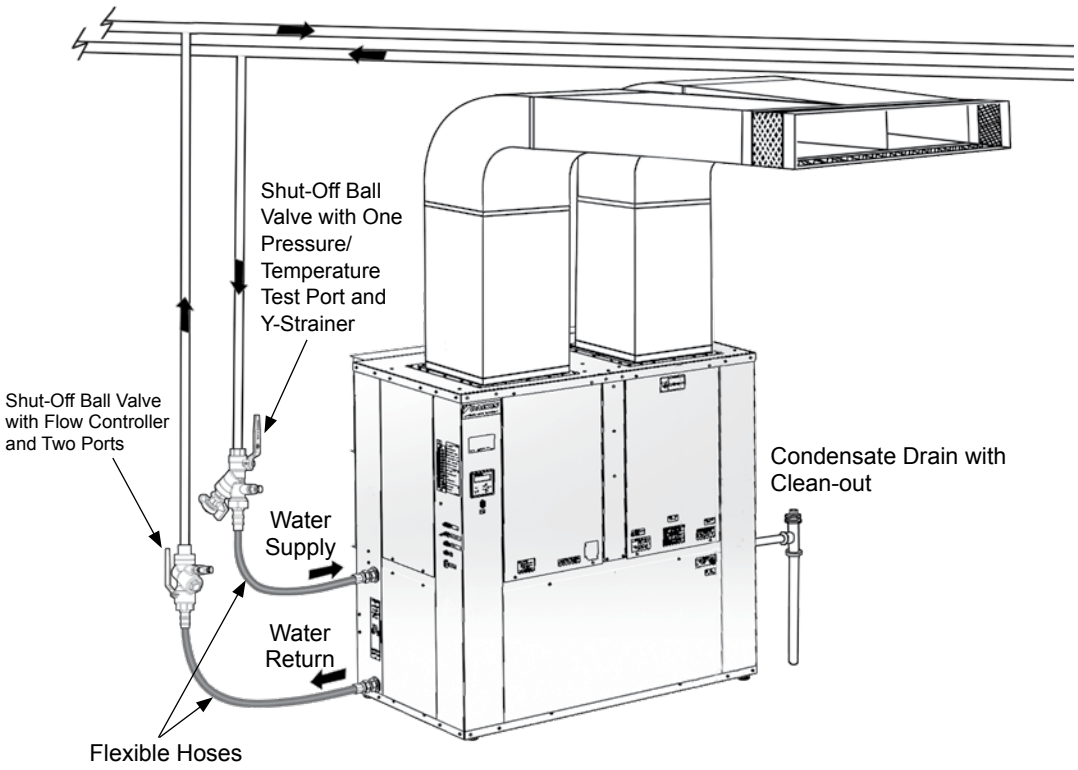
⚠ WARNING

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

Note: *A minimum 20-mesh strainer installed in the supply piping is required.*

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

Figure 6: Typical Piping



Condensate Drain Connection

The SmartSource DOAS WSHP unit condensate drain pan is provided with an internal P-trap. Field connected condensate removal piping must be pitched away from the unit not less than 1/4" per foot. A vent should extend at least 1-1/4" above the unit condensate fitting. A vent is required so that the condensate will drain away from the unit. To avoid having waste gases entering the building, the condensate drain should not be directly piped to a drain/waste/vent stack. See local codes for the correct application of condensate piping to drains

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

IMPORTANT

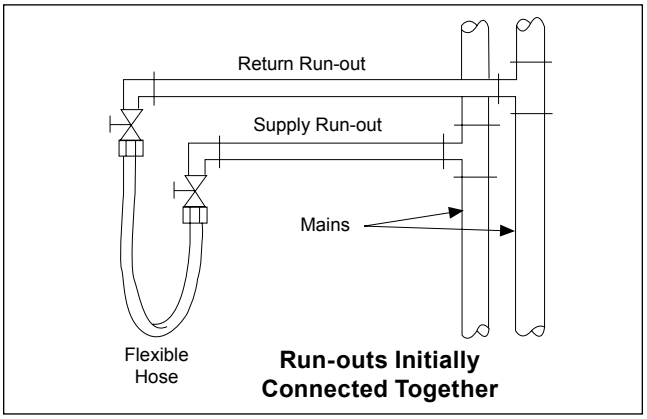
It may be necessary to manually fill the trap at system startup, or to run the unit for sufficient time to build a condensate seal. The condensate trap and condensate piping drainage should be free of any foreign debris. Debris can prevent proper drainage and unit operation and result in condensate buildup..

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

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 7).

Figure 7: Supply and Return Run-Outs Connected Together



2. Fill the system at the city water makeup connection with all air vents open. After filling, close all air vents. The contractor should start main circulator with the pressure reducing valve open. Check vents in sequence to bleed off any trapped air, ensuring circulation through all components of the system. Power to the heat rejector unit should be off, and the supplementary heat control set at 80°F (27°C).While circulating water, the contractor should check and repair any leaks in the piping. Drains at the lowest point(s) in the system should be opened for initial flush and blowdown, making sure city water fill valves are set to make up water at the same rate. Check the pressure gauge at pump suction and manually adjust the makeup to hold the same positive steady pressure both before and after opening the drain valves. Flush should continue for at least two hours, or longer if required, to see clear, clean drain water.
3. Shut off supplemental heater and circulator pump and open all drains and vents to completely drain down the system. Short circuited supply and return run-outs should now be connected to the conditioner supply and return connections. Do not use sealers at the swivel flare connections of hoses.
4. Trisodium phosphate was formerly recommended as a cleaning agent during flushing. However, many states and localities ban the introduction of phosphates into their sewage systems. The current recommendation is to simply flush longer with warm 80°F (27°C) water.
5. Refill the system with clean water. Test the water using litmus paper for acidity, and treat as required to leave the water slightly alkaline (pH 7.5 to 8.5). The specified percentage of antifreeze may also be added at this time. Use commercial grade antifreeze designed for HVAC systems only. Do not use automotive grade antifreeze.

Once the system has been filled with clean water and antifreeze (if used), precautions should be taken to protect the system from dirty water conditions. Dirty water will result in system wide degradation of performance and solids may clog valves, strainers, flow regulators, etc. Additionally, the heat exchanger may become clogged which reduces compressor service life or causes premature failure.

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

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

Avoiding Potential Problems

As shown in Table 2, all water contains some degree of impurities which may affect the performance of a heat pump system. Water flow rates should not exceed the maximum flow rate as shown in Table 3 on page 12

Table 2: Water Impurities, Recommended Water System Application

	Plate Material: ANSI 316 Stainless Steel	Brazing Material: Copper
Alkalinity (HCO_3^-)	no limit	70-300 ppm
Sulphate[1] (SO_4^{2-})	no limit	< 70 ppm
HCO^{3-} / SO_4^{2-}	no limit	> 1.0
Electrical conductivity	no limit	10-500 µS/cm
ph	> 6.0	7.5-9.0
Ammonium (NH_4^+)	no limit	< 2 ppm
Chlorides (Cl^-)	< 300 ppm	< 300 ppm
Free chlorine (Cl_2)	< 1 ppm	< 1 ppm
Hydrogen sulfide (H_2S)	no limit	< 0.05 ppm
Free (aggressive) carbon dioxide (CO_2)	no limit	< 5 ppm
Total hardness	< 300 ppm[5]	< 300 ppm[5]
Nitrate[1] (NO_3^-)	no limit	< 100 ppm
Iron[3] (Fe)	no limit	< 0.2 ppm
Aluminium (Al)	no limit	< 0.2 ppm
Manganese[3] (Mn)	no limit	< 0.1 ppm
Ironoxide	< 0.2 ppm	< 0.2 ppm
Total Dissolved Solids	< 1000 ppm[6]	

Notes: *[1] Sulfates and nitrates works as inhibitors for pitting corrosion caused by chlorides in pH neutral environments*
[2] In general low pH (below 6) increase corrosion risk and high pH (above 7.5) decrease the corrosion risk
[3] Fe3+ and Mn4+ are strong oxidants and may increase the risk for localized corrosion on stainless steels
[4] in combination with brazing material copper
[5] Hardness or SiO2 above 150ppm will increase the risk of scaling
[6] Lower TDS limit may be required

Varying combinations of pH, TDS, Calcium, Alkalinity and water temperature can affect the likelihood of scaling. To determine if the system is at risk for scaling use the Langelier Saturation Index

Operating Limits

Units are designed to start and operate when the ambient air temperature, entering air temperatures, entering water temperature and water flow rates are within the limits listed in Table 3.

Operating Temperature Limits

Table 3: DOAS Operating Temperature Limits

Operating Mode	Entering Air °F				Entering Water °F		Ambient Temperature °F	
	Minimum		Maximum		Minimum	Maximum	Minimum	Maximum
	DB	WB	DB	WB				
Cooling	56	51	115	82	30	110	50	100
Heating	0	n/a	70	n/a	30	90	50	85

Fluid Flow Rate (GPM)	800	1200	1600	2400
Minimum	7.5	12.0	15.0	20.0
Maximum	20.0	32.0	40.0	53.3

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

Environment

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

Power Supply

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

Electrical

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 disconnect switch near the unit is required by code. Refer to Figure 8 for wiring the optional factory provided disconnect switch. Power to the unit must be sized correctly and have dual element (Class RK5) fuses or an HACR circuit breaker for branch circuit over-current protection. See the nameplate for correct ratings.

⚠ 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.

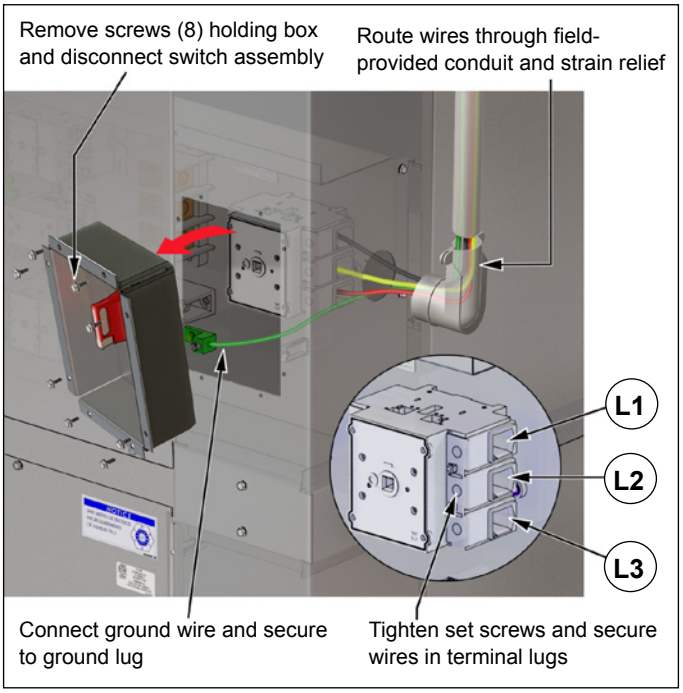
Operating Voltages

208/230-60-3 .....197 volts min.; 253 volts max.

460-60-3 .....414 volts min.; 506 volts max.

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

Figure 8: Optional Factory-Provided Disconnect Switch



Electrical Data

Table 4: DOAS Unit Size 800-2400

Unit Size	Voltage/Hz/ Phase	Fan Quantity	Compressor Motor #1		Compressor Motor #2		Total Fan FLA	Total Unit FLA	Minimum Voltage	Maximum Voltage	Unit MCA	Max. Fuse / HACR Size
			RLA	LRA	RLA	LRA						
008	208-230/60/3	1	14.0	83.1	11.6	73.0	6.6	32.2	187	253	35.7	45
	460/60/3		6.4	41.0	5.7	38.0	5.2	17.3	414	506	18.9	25
012	208-230/60/3	1	16.2	110.0	14.0	83.1	6.6	36.8	187	253	40.9	50
	460/60/3		7.6	52.0	6.4	41.0	5.2	19.2	414	506	21.1	25
	208-230/60/3	2	16.2	110.0	14.0	83.1	13.2	43.4	187	253	47.5	60
	460/60/3		7.6	52.0	6.4	41.0	10.4	24.4	414	506	26.3	30
016	208-230/60/3	1	17.6	136.0	16.5	110.0	6.6	40.7	187	253	45.1	60
	460/60/3		8.5	66.1	7.2	52.0	5.2	20.9	414	506	23.0	30
	208-230/60/3	2	17.6	136.0	16.5	110.0	13.2	47.3	187	253	51.7	60
	460/60/3		8.5	66.1	7.2	52.0	10.4	26.1	414	506	28.2	35
024	208-230/60/3	2	26.9	164.0	25.3	184.0	13.2	65.4	187	253	72.1	90
	460/60/3		12.0	84.0	9.6	84.0	10.4	32.0	414	506	35.0	45

Note: *All 460/60/3 units require 4-wire power which includes a neutral wire. EC motors on 460/60/3 volt units require a 265 volt power supply. Both a hot AND a neutral wire are required to obtain proper fan motor voltage. Therefore, 4-wires with a wye type wiring arrangement is required.*

Water Pressure Drop

Table 5: DOAS Unit Water Pressure Drop 800-2400

Unit Size	Flow	30°F EWT		60°F EWT		90°F EWT	
	GPM	psi	FtWC	psi	FtWC	psi	FtWC
008	7.5	0.57	1.32	0.49	1.13	0.51	1.18
	10	1.01	2.33	0.87	2.01	0.83	1.92
	12.5	1.53	3.53	1.32	3.05	1.23	2.84
	15	2.12	4.90	1.86	4.30	1.7	3.93
	17.5	2.78	6.42	2.47	5.71	2.25	5.20
	20	3.52	8.13	3.15	7.28	2.87	6.63
012	12	0.47	1.09	0.39	0.90	0.44	1.02
	16	0.86	1.99	0.74	1.71	0.73	1.69
	20	1.32	3.05	1.14	2.63	1.08	2.49
	24	1.85	4.27	1.61	3.72	1.49	3.44
	28	2.44	5.64	2.15	4.97	1.97	4.55
	32	3.10	7.16	2.76	6.38	2.52	5.82
016	15	0.76	1.76	0.64	1.48	0.65	1.50
	20	1.32	3.05	1.14	2.63	1.08	2.49
	25	1.99	4.60	1.74	4.02	1.61	3.72
	30	2.76	6.38	2.45	5.66	2.24	5.17
	35	3.64	8.41	3.25	7.51	2.97	6.86
	40	4.62	10.67	4.16	9.61	3.81	8.80
024	20	1.18	2.73	0.99	2.29	0.94	2.17
	25	1.83	4.23	1.57	3.63	1.45	3.35
	30	2.58	5.96	2.25	5.20	2.06	4.76
	35	3.43	7.92	3.03	7.00	2.77	6.40
	40	4.39	10.14	3.92	9.06	3.59	8.29
	45	5.45	12.59	4.91	11.34	4.50	10.40
	50	6.61	15.27	6.00	13.86	5.52	12.75
	53	7.36	17.00	6.71	15.50	6.17	14.25

Antifreeze Correction Factors

Table 6: DOAS Antifreeze Correction Factors

	Antifreeze % by Weight			
	15%	25%	35%	45%
Ethanol/Methanol	1.04	--	--	--
Ethylene Glycol	1.10	1.16	1.22	1.27
Propylene Glycol	1.11	1.20	1.31	1.40

Start-Up

1. Install field sensors (outdoor air/humidity sensor is required) and land wires on the provided terminal block. These connections can be located on the left-hand side of the unit.

⚠ WARNING

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.

Note: *Terminal block is energized at 24VAC when the disconnect is on.*

2. Unit configuration settings must be checked prior to operating the unit. A detailed list of all relevant parameters can be found in OM 1308. Settings can be changed with Technician level access either through the Local User Interface (LUI) or Service Tools (unit does not need to be on in order to use ServiceTools).
3. Open water valves to full-open position and turn on power to the conditioner.
4. Loop Water Type, CFM, Static Pressure, and Elevation all require field input, see Figure 9. Consult the order submittal or engineering specifications for this information. All installed sensors must be set to 'Installed'. If trending is desired and an SD card is installed in the main control board, enable trending to track unit performance. The default time period is '1 minute'.

Additionally, installed sensors must be assigned a corresponding analog input. Digital outputs, if used must also be configured. See Figure 10 on page 15.

5. Using the default setpoints is recommended. These can be changed if desired.

Figure 9: ServiceTools Configuration Screen Unit, Fan and Sensors

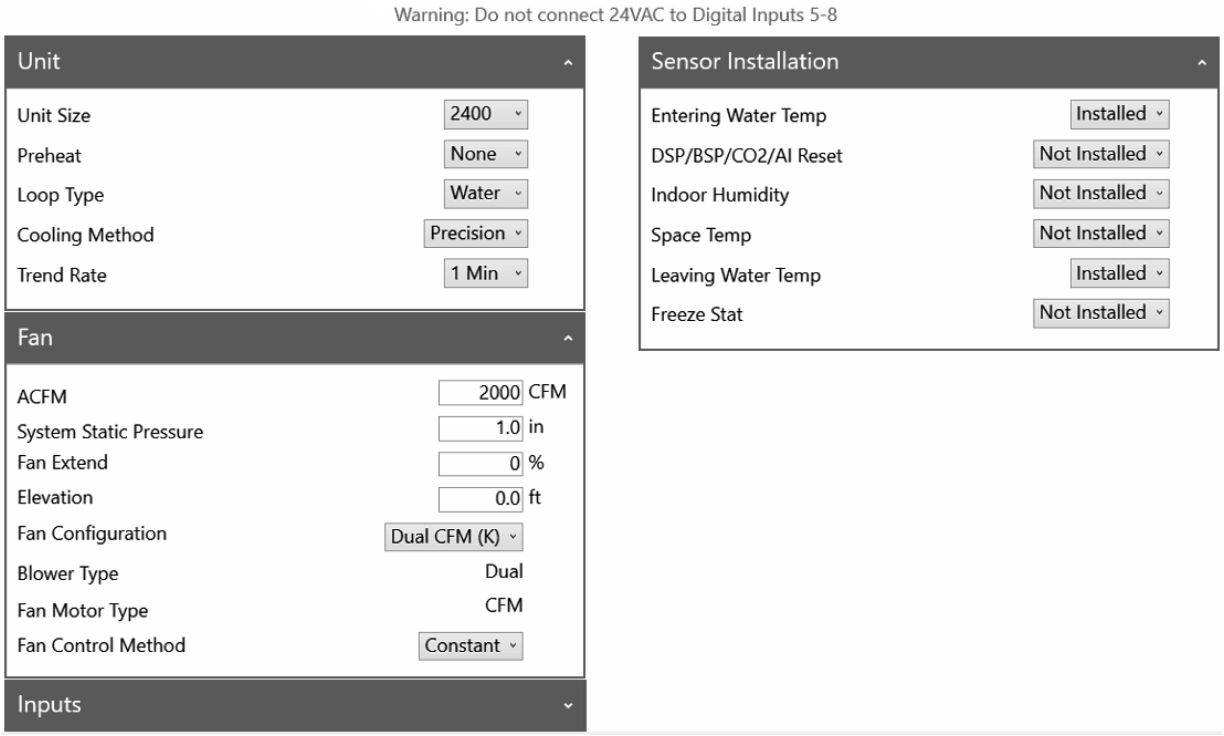
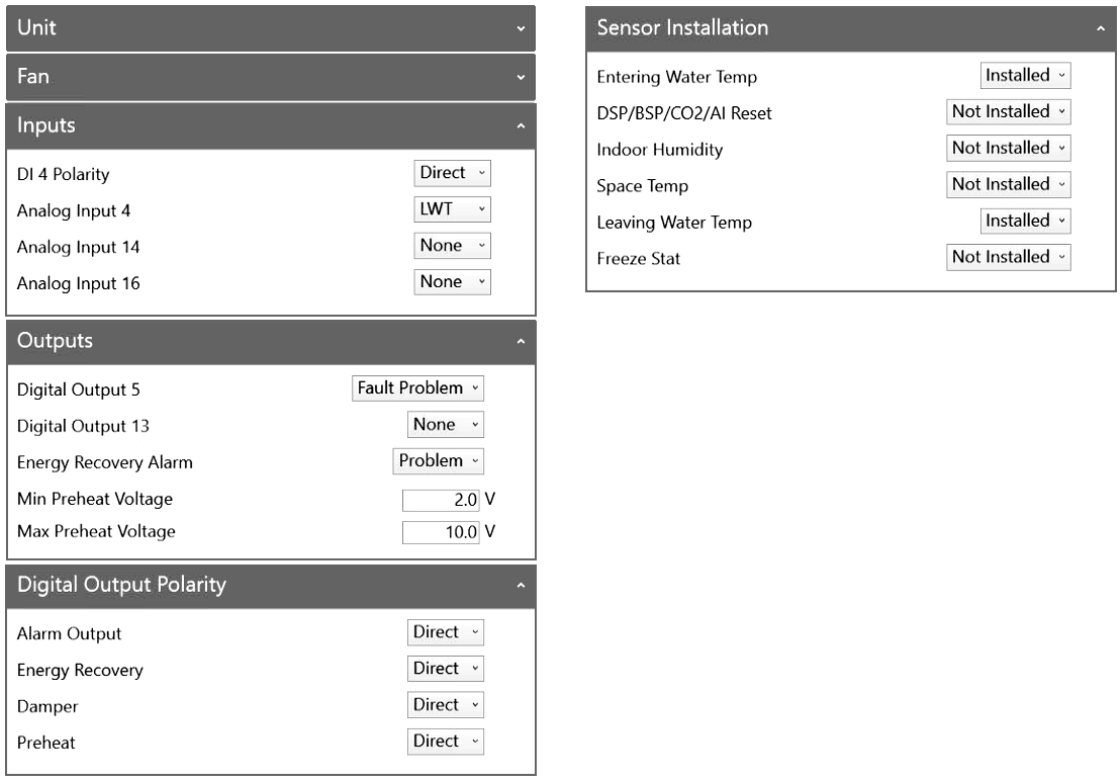
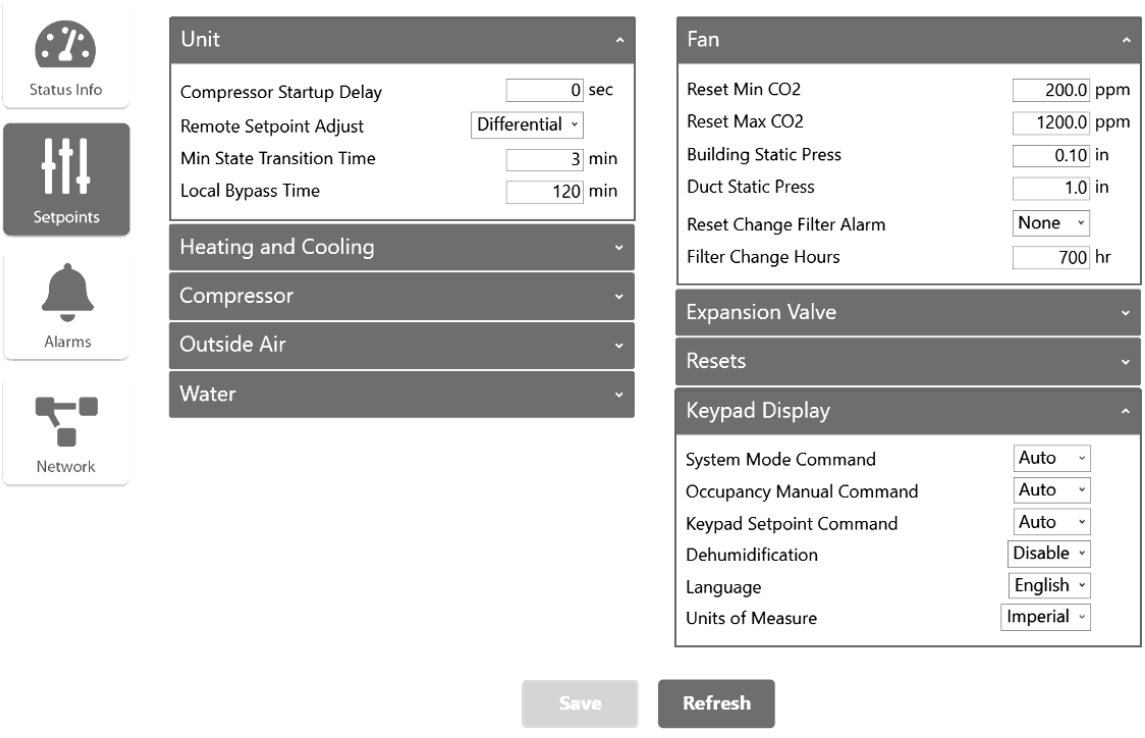


Figure 10: ServiceTools Configuration Screen – Inputs, Outputs, Digital Output Polarity and Sensors



6. DOAS WSHP units are in the unoccupied mode by default. This is done to ensure that the unit does not run without a certified HVAC technician accessing the LUI or ServiceTools prior to operation. To enter the occupied mode, the LUI Occupancy Command must be changed to either 'null' 'Auto' or 'Occupied'. Either change 'KyOccManCmd' through the LUI or 'Occupancy Manual Command' through the service tool under 'Setpoints' and 'Keypad' as seen in Figure 11.

Figure 11: ServiceTools Home Screen – Setpoints and Keypad Menu



7. It is required to perform start-up on two separate occasions; one for cooling/dehumidification and one for heating. While possible, it is not recommended to manipulate setpoints in a manner to run the unit in both cooling and heating given moderate outdoor conditions.

8. During startup, air temperatures and unit amperage readings should be taken at two times. The first time is stage 4, when the compressor starts initially (units start cooling/dehumidification/heating in stage 4) and the second time is when the unit has reached steady state operation. Steady state operation is considered the point where the DOAS WSHP is no longer wanting to stage up or down (if this happens to be stage 4, that is satisfactory). This can be seen on the 'Status' page in the ServiceTools. See Figure 12. The staging will either show "Up" "Down" or "None". Therefore, steady state is considered when both are shown as 'none'. Figure 12 shows a unit that is not in steady state.

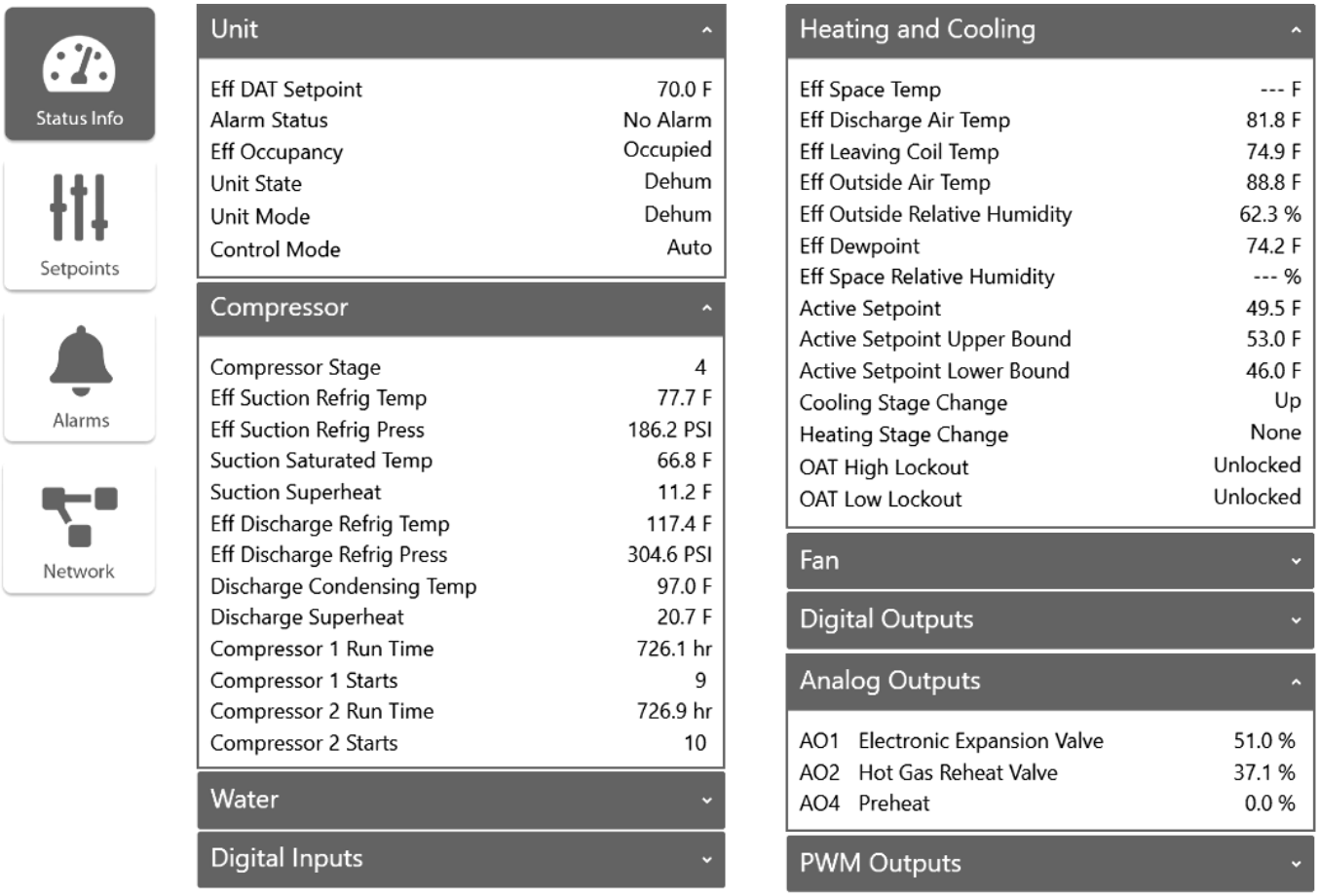
Note: *The DOAS WSHP may cycle through stages during certain field/atmospheric conditions. If this occurs, adjust the setpoints slightly to obtain a steady state operation for startup purposes.*

9. Confirm steady state operation refrigerant temperatures and pressures (as seen through Service Tools, do not connect gauges to unit) are within range. For verification of unit temperature and pressure ranges consult ATS Technical Response: 315-282-6434.

10. Confirm relative air (DB/WB) and water temperatures shown in service tools/LUI are within 10% of measured values. Record these values in the Check Test and Start (CTS) form at the end of this document. Adjust unit setpoints to compensate accordingly.

Note: *Service Tool and LUI display RH% not wet bulb temperature*

Figure 12: ServiceTools – Status Screen



11. Repeat steps 5, 6 and 7 for opposite mode (at a later date).
12. 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. DOAS WSHP units are internally trapped. Do not provide an additional trap.
13. If the compressor does not operate, check the following:
    a. Is supply voltage to the machine compatible?
    b. Is the unit in the occupied mode?
    c. Is there a demand for cooling/dehumidification/ heating?
    d. Is the unit displaying an alarm?
14. If the compressors operate but stop after a brief period:
    a. Is there proper airflow? Check for dirty filter or incorrect ductwork and confirm fan configuration settings and wiring.
    b. Is there proper water flow? Confirm that the pressure drop (and water temperatures?) are in range based on water/glycol mixture and unit size. If not, check valves and circuit setters. Back-flush unit if dirt-clogged.
15. Check for vibrating refrigerant piping, fan wheels, etc.
16. All DOAS WSHP units require air and water loop balancing. For air balancing, do not adjust the airflow parameters previously set. Instead, use the ‘fan extend’ function to increase or decrease the airflow percentage by +/- 15%.

Control Options

The control enclosure houses the major operating electrical controls including the MicroTech controller, control transformer, and compressor relays. Each component is easily accessed for service or replacement.

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

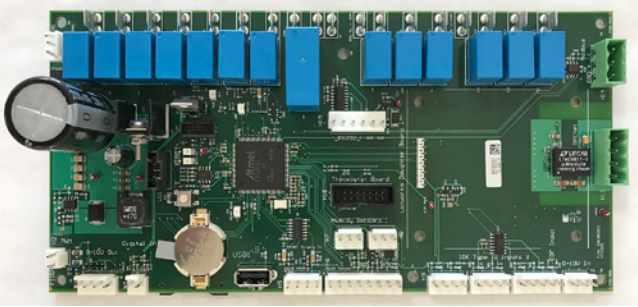
- Standalone operation using a MicroTech controller
- MicroTech controller and LonWorks® communication module
- MicroTech controller with on-board BACnet® communications.

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

Figure 13: Control Options

Control	Description	Application	Protocol
MicroTech®  Unit Controller with On-Board BACnet Communications	The MicroTech SmartSource DOAS WSHP Controller is a microcontroller-based DDC controller designed to provide sophisticated discharge air temperature and humidity control of a dedicated outside air Daikin water source heat pump. In addition to providing normal operating control, the MicroTech provides alarm monitoring and alarm specific component shutdown if critical system conditions occur.	Each unit controller is factory programmed, wired, and tested for standalone operation of your Daikin SmartSource DOAS WSHP using an internal schedule and setpoints or by integration to a building management system	On-board control sensors and/or BACnet MS/TP communications
	On-board BACnet communication capabilities provide network communications and added functionality to easily integrate with an existing building automation system (BAS).	Designed to be linked with a centralized BAS through a BACnet communications network for centralized scheduling and management of multiple heat pumps.	
LONWORKS  Communication Module	The MicroTech control system accepts a plug-in LONWORKS communication module to provide network communications and added functionality to easily integrate with an existing BAS. The communication module can be factory- or field-installed and is tested with all logic required to monitor and control the unit.	LONTALK application protocol is designed for units that are integrated into a LONWORKS communication network for centralized scheduling and management of multiple heat pumps.	LONMARK 3.4 Certified

MicroTech® Controller



⚠ DANGER

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

General Use and Information

All Microtech 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 controller inputs.

MicroTech SmartSource DOAS WSHP controller is conveniently located in the unit control box for easy access through a removable access panel. Factory mounted and run tested, microcontroller-based DDC control device capable of complete, stand-alone unit control or incorporated into a building-wide network using on-board BACnet plug-in communication ports. The controller is pre-programmed with the application code required to operate the unit. The controller supports up to 16 analog inputs, 8 binary inputs, 4 analog outputs, 2 PWM outputs, and 14 binary outputs.

Local User Interface (LUI)

The LUI provides a unit mounted interface which indicates the current unit operating state and can be used to adjust the SmartSource DOAS WSHP operating parameters (operating mode, temperature set points, fan speed and occupancy mode). The LUI has a built in menu structure (password protected) with 6 keys and 2 individual LED indicators to adjust the unit ventilator operating parameters.

MicroTech Unit Protections and LED Fault Status Annunciation

Assumes cycle fan operation-not continuous fan operation:

- **Start-up –** The unit will not operate until all the inputs and safety controls are checked for normal conditions.
- **Cooling mode** – On an initial call for cooling, the fan will energize, the pump request will energize, and the 45 second flow timer will start. When the compressor minimum off, and random startup timers are expired, the unit will enter stage 4 cooling. After the initial interstage timer has expired the unit will stage the compressors up and down to maintain the leaving coil temperature setpoint.
- **Dehumidification mode –** When the outside air conditions are below the adjustable dewpoint setpoint the unit will enter the dehumidification mode. Dehumidification mode operates similarly to the normal cooling state, only the compressors are staged up and down to maintain a leaving coil temperature setpoint and a modulating hot gas reheat valve is controlled to reheat the air to the reheat discharge air temperature setpoint.
- **Heating mode** – On an initial call for heating, the fan will energize, the pump request will energize, the 45 second flow timer will start. After the flow, compressor minimum off, and random startup timers are expired, the unit will enter stage 4 heating; the reversing valve will energize 5 seconds after the compressor turns on. After the initial interstage timer has expired the unit will stage the compressors up and down to maintain the discharge air temperature setpoint.

- **Preheat Control (Optional)** – Preheat provides additional heating that can be used in conjunction with compressor heating, if all stages of heat are activated and the discharge air temperature setpoint is not being met.

General Rules

- Unit must be in heating stage 8 and the interstage timer expired.
- Discharge air temperature must be below the heating discharge air temperature setpoint minus 1/2 of the DAT deadband.

Operation

Preheat outputs: will operate as follows

- When preheat is required the Hydronic/Electric Heat Stage output will be energized.
- When preheat is required the 0-10VDC Modulating Pre-Heat output will send a varying voltage signal to maintain the heating discharge air temperature setpoint using PI loop control.

- **Short cycle protection & random start –** After power cycle or deactivation of certain alarms, or when leaving the unoccupied mode, a new random compressor start-delay time between 300 and 360 seconds is generated. The random start timer prevents compressors in different units from starting simultaneously. Compressor minimum OFF 360 sec) and compressor minimum ON (180 sec) timers prevent compressor short cycling.
- **Unoccupied mode –** A simple “grounded” signal between Occupancy terminals on TB4 (no power source required), puts the unit into the unoccupied mode for night setback operation.
- **Inter-staging timer –** A default value of 5 minutes between staging of compressors, this feature minimizes short cycling of compressors and improves comfort.
- **Override mode –** A switch can be activated during the unoccupied mode to put the unit back into the occupied mode for two hours for after-hours heating or cooling.
- **Motorized valve/pump restart –** The Pump/Motor Valve terminals on TB4 are used to energize (open) a motorized valve or start a water pump to get water circulating prior to starting the compressor on call for heating or cooling. Compressor operation shall be delayed a minimum of 45 seconds, after the motorized valve/isolation valve output energizes to allow for supply water flow.
- **Brownout protection –** The MicroTech unit controller measures the input voltage and will suspend compressor and fan operation if the voltage falls below 80% of the unit nameplate rated value. Two external LED status are generated and an output is available to a "fault" LED at the thermostat.
- **Emergency unit shutdown** – A simple grounded signal puts the unit into the shutdown mode. Remote shutdown is provided so that when properly connected to a water loop controller or remote switch, the emergency shutdown input can be used to shut down the water source heat pump. Compressor and fan operations are suspended, and an a unique two external LED status is generated.
- **Condensate overflow protection (cooling & dehumidification modes only)** – The MicroTech unit controller incorporates a liquid sensor at the top of the drain pan. When the unit senses a high condensate water level for 60 consecutive seconds while in the cooling or dehumidification modes the unit enters the "Off Alarm" machine state. The dehumidification or cooling mode operation will immediately be de-energized as well as the pump output.
- **Reset of automatic lockouts (alternate method) -** A feature to reset some lockouts like high pressure and/or low suction refrigerant temperature at the unit is available. When the cause of the fault condition has been fixed, repaired or resolved, the unit can be reset at the unit. Apply a grounded signal to the tenant override input for a minimum of 10 seconds. The unit will now be reset. Alternatively, dropping power to the unit from the disconnect switch and re-applying power will reset the unit.
- **Intelligent alarm reset** – The Intelligent Reset feature helps to minimize nuisance trips of automatic lockouts caused by low-temperature faults. This feature clears faults the first two times they occur within a 7 day period and triggers an automatic lockout on the 3rd fault. The fault remains active until the alarm is manually cleared. At the end of the 7 day period, all counts for that specific intelligent reset alarm are cleared to zero only if the occurrence counter is presently less than the value of three. The 7 day period and alarm counts are stored in memory that is cleared when power is cycled.
- **Equipment protection control –** The MicroTech controller receives separate input signals from the refrigerant high-pressure switch and the low suction line temperature sensor. In a high-pressure situation, compressor operation is suspended. In a low temperature situation, the unit goes into a defrost cycle where the unit is put into cooling operation for 60 seconds until the coaxial heat exchanger is free of ice. Each switch generates its own unique LED status.

Input and Output Designations

Note: *Refer to Figure 14 on page 23 for input and output terminals locations*

Table 7: Input and Output Designations

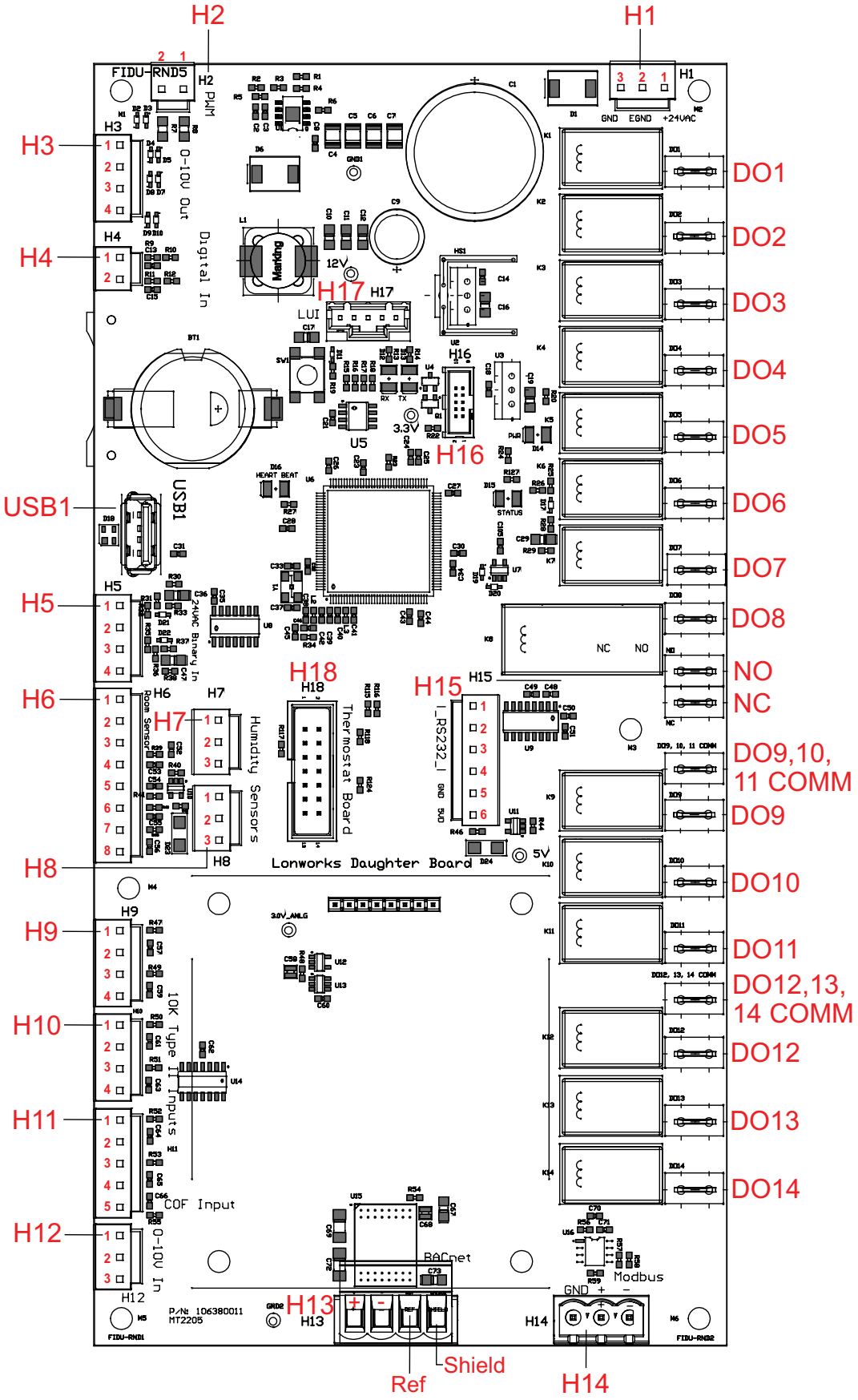
Terminal	Software I/O	Signal Type	DOAS WSHP Function
PWM			
H2-1	PWM 1	80Hz Cycle	Supply Fan
H2-2	PWM 2	80Hz Cycle	Not Used
Analog Outputs			
H3-1	AO 1	0-10VDC Out	Electronic Expansion Valve
H3-2	AO 2	0-10VDC Out	Modulating Hot Gas Reheat
H3-3	AO 3	0-10VDC Out	Not Used
H3-4	AO 4	0-10VDC Out	"Modulating Pre-Heat Valve SCR Pre-heat (Mutually Exclusive)"
Binary Inputs			
H4-1	BI 5	Discrete BI	Dirty Filter
H4-2	BI 6	Discrete BI	Energy Recovery Feedback
H5-1	BI 1	24VAC BI	High Pressure
H5-2	BI 2	24VAC BI	Freeze Stat
H5-3	BI 3	24VAC BI	Low Pressure
H5-4	BI 4	24VAC BI	Duct High Limit
Room Sensor Inputs			
H6-1	BI 7	Discrete BI	Occupancy
H6-2	BI 8	Discrete BI	Shutdown
H6-3	BO Status LED	Binary Output	Status LED
H6-4	AI 1	0-1.5K Pot	Not Used
H6-5	AI 2	0-1.5K Pot	Unit Mode
H6-6	AI 3	0-1.5K Pot	Not Used
H6-7	AI 4	10K Type II Thermistor	Space Temperature/ Leaving Water Temperature
H6-8		GND	GND
Analog Inputs			
H7-1		5VDC (Output)	Sensor Power
H7-2	AI 5	0-5 VDC Signal	Suction Refrigerant Pressure
H7-3		GND	Sensor Ground
H8-1		5VDC (Output)	Sensor Power
H8-2	AI 6	0-5 VDC Signal	Discharge Refrigerant Pressure
H8-3		GND	Sensor Ground
H9-1	AI 7	10K Type II Thermistor	Discharge Air
H9-2		GND	Sensor Ground
H9-3	AI 8	230K ohm Thermistor	Discharge Refrigerant Temperature
H9-4		GND	Sensor Ground
H10-1	AI 9	10K Type II Thermistor	Outdoor Air Temperature
H10-2		GND	Sensor Ground
H10-3	AI 10	10K Type II Thermistor	Entering Water Temperature
H10-4		GND	Sensor Ground
H11-1	AI 11	10K Type II Thermistor	Leaving Coil Temperature
H11-2		GND	Sensor Ground
H11-3	AI 12	10K Type II Thermistor	Suction Refrigerant Temperature
H11-4		GND	Sensor Ground
H11-5	AI 13	Conductivity	Condensate
H12-1	AI 14	0-10VDC Input	Duct/Building Static Pressure/ VOC/CO2
H12-2	AI 15	0-10VDC Input	Outdoor Humidity
H12-3	AI 16	0-10VDC Input	Indoor Humidity/ CFM
Binary Outputs			
DO1	DO1	24VAC Output	ECM Signal
DO2	DO2	24VAC Output	Crank Case Heater C1
DO3	DO2	24VAC Output	Not Used
DO4	DO2	24VAC Output	Reversing Valve
DO5	DO2	24VAC Output	Fault Indication
DO6	DO2	24VAC Output	Energy Recovery Signal
DO7	DO2	24VAC Output	2 Position Damper
DO8C	DO2	24VAC or Dry Contact Common	24VAC or Dry Contact Common
DO8-NC	DO2	Normally Closed Output	Pump or Motorized Valve NC
DO8-NO	DO2	Normally Open Output	Pump or Motorized Valve NO
DO9, 10, 11 C	DO2	24VAC or Dry Contact Common for 3 outputs	24VAC Common
DO9	DO2	24VAC or Dry Contact Output	Compressor 1 Low
DO10	DO2	24VAC or Dry Contact Output	Compressor 1 High
DO11	DO2	24VAC or Dry Contact Output	Compressor 2 Low
DO12, 13, 14 C	DO2	24VAC or Dry Contact Common for 3 outputs	24VAC Common
DO12	DO2	24VAC or Dry Contact Output	Compressor 2 High
DO13	DO2	24VAC or Dry Contact Output	Preheat Digital Output
DO14	DO14	24VAC or Dry Contact Output	Not Used

Controller I/O Specifications

Table 8: MicroTech Controller I/O Specifications

Power Supply	24 VAC +/-20% 50/60 Hz
Transformer Sizing	24VA with no loads connected to DO1-7. Otherwise, up to 75VA total depending on the load on DO1-7
Operating Temperature	-4°F(-20°C) to 158°F(70°C)
Storage Temperature	-40°F(-40°C) to 185°F(85°C)
Humidity	10%RH to 90%RH (non-condensing)
Agency Compliance	UL 60730-1 CSA E60730-1
Analog Inputs	AI 1-3 Resistive Input 0-1.5K ohms AI 5-6 Ratiometric 0-5 VDC AI 4, 7, 9-1 Negative Temperature Coefficient (NTC) thermistor Reference resistance = 10,000 ohms @ 77°F (25°C) AI 8 Negative Temperature Coefficient (NTC) thermistor Reference resistance = 230,000 ohms @ 77°F (25°C) AI 13 Resistive input active when input is less than 201K ohms AI 14-16 0-10 VDC
Analog Outputs	AO 1-4 0-10 VDC 4-20 mA
PWM Outputs	PWM 1,2 12 VDC, 80Hz
Binary Inputs	BI 1-4 Supports contact closure using external 24 VAC BI 5-8 Supports dry contact closure to ground
Binary Outputs	Binary outputs are designed for 24 VAC low voltage applications. Maximum total output is limited by transformer VA BO 1-7 24 VAC maximum combined load = 10 amps BO 8 24 VAC maximum load = 10 amps BO 9-11 24 VAC maximum load = 10 amps per relay 24 VAC maximum combined load = 12 amps BO 12-14 24 VAC maximum load = 10 amps per relay 24 VAC maximum combined load = 12 amps

Figure 14: MicroTech Unit Controller Terminal Locations



MicroTech® Controller with LonWorks® Communication Module or On-Board BACnet®

Each SmartSource DOAS WSHP come with on-board BACnet MS/TP communications capability or can be optionally equipped with a LonWorks communication module. The BACnet module is designed to communicate over a BACnet MS/TP communications network to a building automation system (BAS). The LonWorks module is LonMark 3.4 certified and designed to communicate over a LonWorks communications network to a BAS. The LonWorks communication module is microprocessor-based and can be factory or field-installed.

MicroTech LonWorks Communication Module (Future)

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

MicroTech On-Board BACnet Communication

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

MicroTech Controller with Communication Features

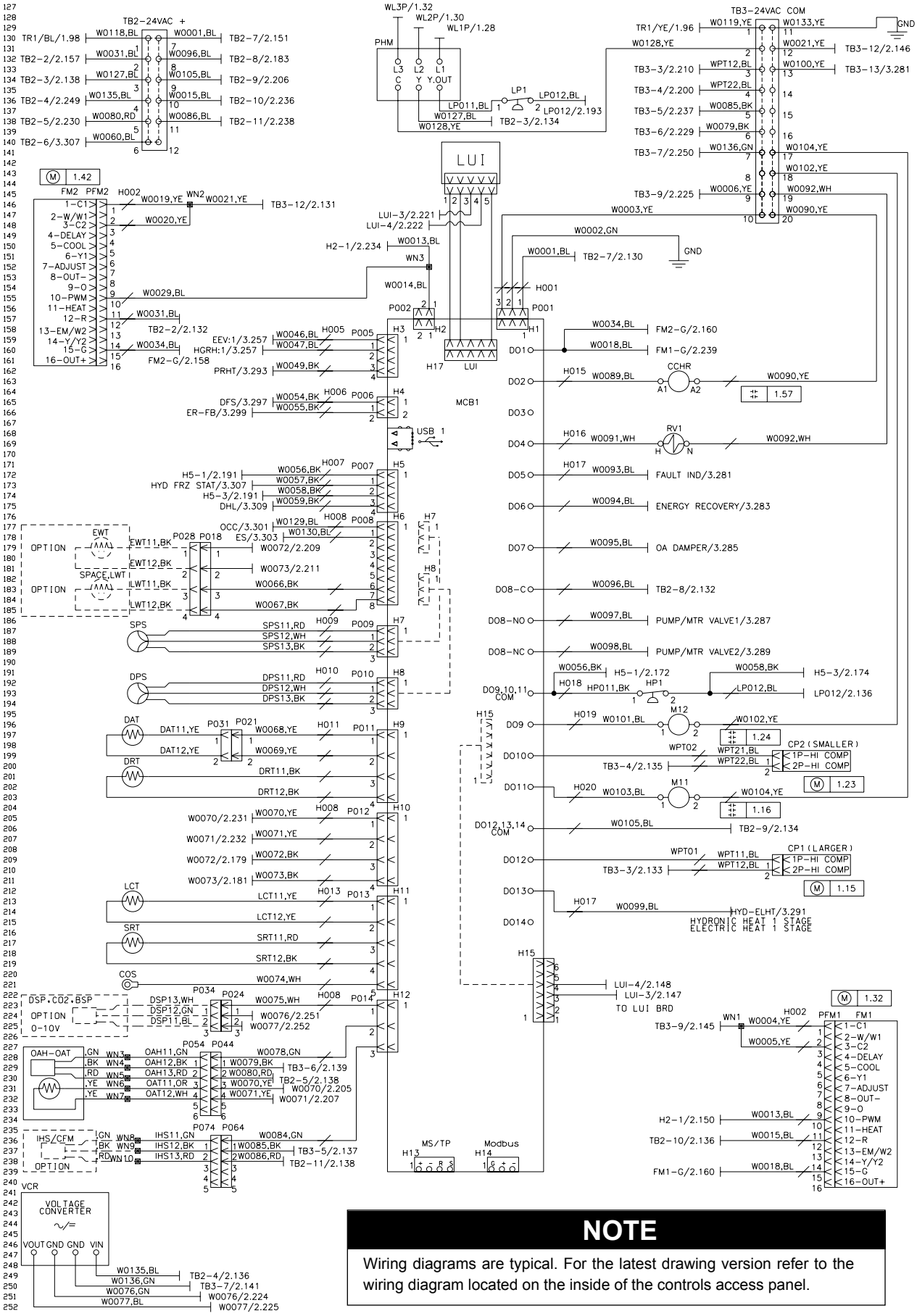
The MicroTech Controller with LonWorks or BACnet Communication orchestrates the following unit operations with a BAS:

- Enable heating and cooling to maintain supply air temperature setpoint based on a outside air conditions
- Enable fan and compressor operation
- Monitors all equipment protection controls
- Monitors discharge air temperatures
- Monitors space or leaving water and entering water temperature (optional field installed)
- Relays status of all vital unit functions

Onboard status LEDs indicate the status of the MicroTech LonWorks module or BACnet communications.

The communication modules provide network access to setpoints for operational control

DOAS Unit with MicroTech Controls, 208-230 / 60 / 3



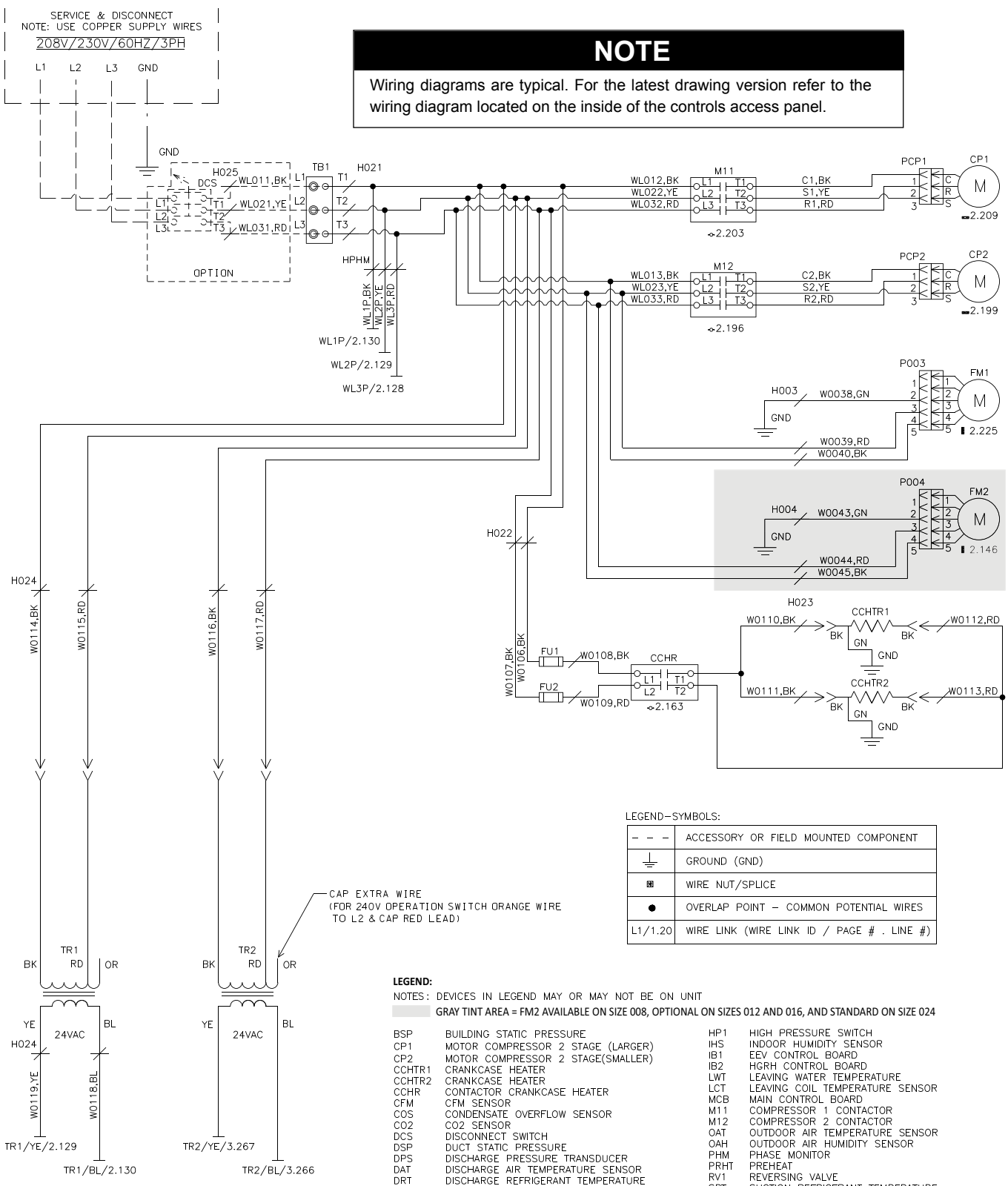
NOTE

Wiring diagrams are typical. For the latest drawing version refer to the wiring diagram located on the inside of the controls access panel.

DOAS Unit with MicroTech Controls, 208-230 / 60 / 3, Service and Disconnect

NOTE

Wiring diagrams are typical. For the latest drawing version refer to the wiring diagram located on the inside of the controls access panel.



LEGEND–SYMBOLS:

– – –	ACCESSORY OR FIELD MOUNTED COMPONENT
⏚	GROUND (GND)
⊠	WIRE NUT/SPLICE
●	OVERLAP POINT – COMMON POTENTIAL WIRES
L1/1.20	WIRE LINK (WIRE LINK ID / PAGE # . LINE #)

LEGEND:

NOTES: DEVICES IN LEGEND MAY OR MAY NOT BE ON UNIT

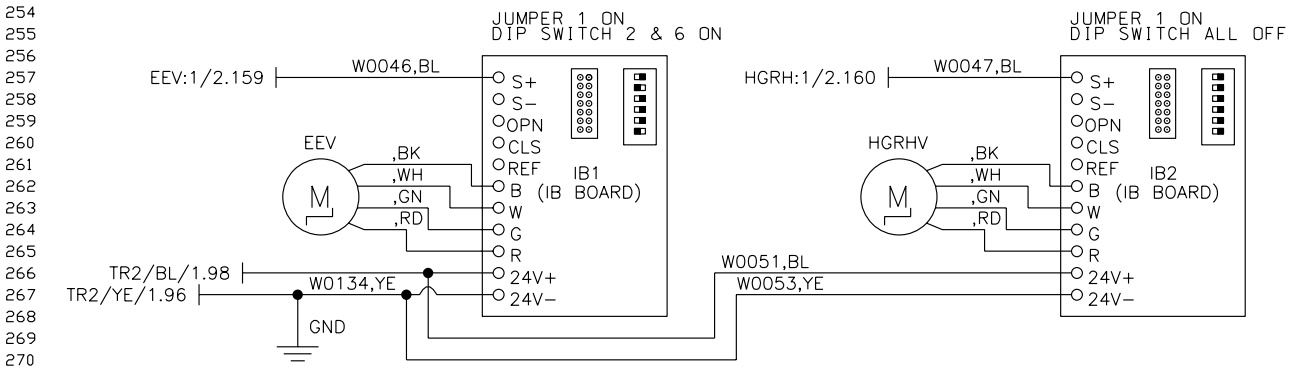
GRAY TINT AREA = FM2 AVAILABLE ON SIZE 008, OPTIONAL ON SIZES 012 AND 016, AND STANDARD ON SIZE 024

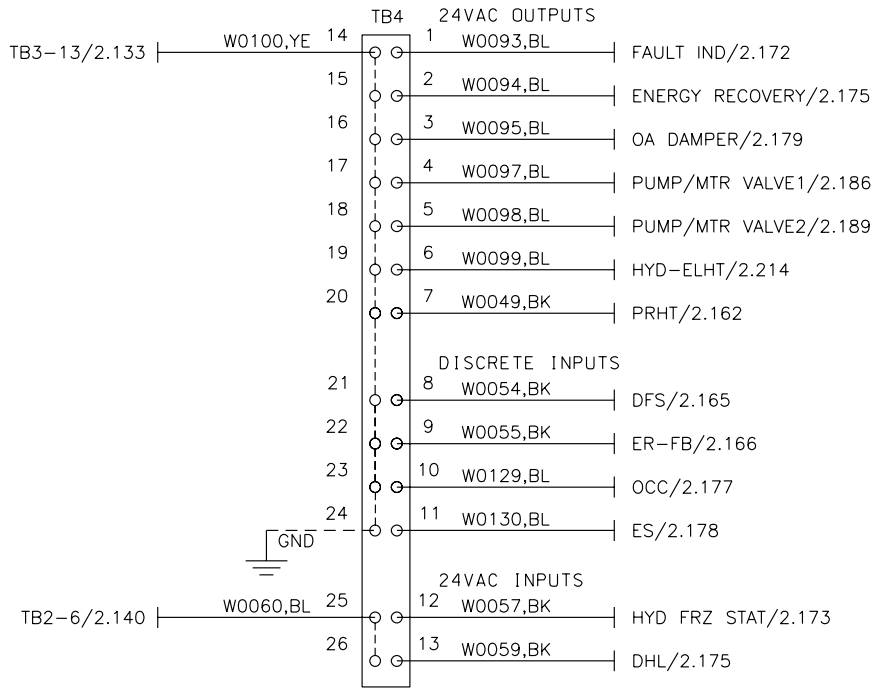
BSP	BUILDING STATIC PRESSURE
CP1	MOTOR COMPRESSOR 2 STAGE (LARGER)
CP2	MOTOR COMPRESSOR 2 STAGE(SMALLER)
CCHTR1	CRANKCASE HEATER
CCHTR2	CRANKCASE HEATER
CCHR	CONTACTOR CRANKCASE HEATER
CFM	CFM SENSOR
COS	CONDENSATE OVERFLOW SENSOR
CO2	CO2 SENSOR
DCS	DISCONNECT SWITCH
DSP	DUCT STATIC PRESSURE
DPS	DISCHARGE PRESSURE TRANSDUCER
DAT	DISCHARGE AIR TEMPERATURE SENSOR
DRT	DISCHARGE REFRIGERANT TEMPERATURE
DHL	DUCT HIGH LIMIT SWITCH
DFS	DIRTY FILTER SWITCH
EEV	ELECTRONIC EXPANSION VALVE
EWT	ENTERING WATER TEMPERATURE
ER–FB	ENERGY RECOVER FEED BACK
FM1	FAN MOTOR
FM2	FAN MOTOR
FU1	FUSE 1
FU2	FUSE 2
HGRHV	HOT GAS REHEAT VALVE
HP1	HIGH PRESSURE SWITCH
IHS	INDOOR HUMIDITY SENSOR
IB1	EEV CONTROL BOARD
IB2	HGRH CONTROL BOARD
LWT	LEAVING WATER TEMPERATURE
LCT	LEAVING COIL TEMPERATURE SENSOR
MCB	MAIN CONTROL BOARD
M11	COMPRESSOR 1 CONTACTOR
M12	COMPRESSOR 2 CONTACTOR
OAT	OUTDOOR AIR TEMPERATURE SENSOR
OAH	OUTDOOR AIR HUMIDITY SENSOR
PHM	PHASE MONITOR
PRHT	PREHEAT
RV1	REVERSING VALVE
SRT	SUCTION REFRIGERANT TEMPERATURE
SPS	SUCTION PRESSURE TRANSDUCER
TB1	TERMINAL BLOCK MAIN POWER
TB2	TERMINAL BLOCK–24VAC +
TB3	TERMINAL BLOCK–24VAC COM
TB4	TERMINAL BLOCK FIELD CONNECTIONS
TR1	TRANFORMER 460V/24V 75VA
TR2	TRANFORMER 460V/24V 75VA
VCR	VOLTAGE CONVERTER 24VDC

NOTES:

1. ALL ELECTRICAL INSTALLATION MUST BE IN ACCORDANCE WITH NATIONAL AND LOCAL ELECTRICAL CODES AND JOB WIRING SCHEMATIC.
2. EXTERNAL WIRING OPTIONS – SEE IM FOR THE DIFFERENT CONFIGURED OPTIONS, WIRING TO BE MINIMUM 18 GA, 90°C.
3. EC MOTORS ARE FACTORY PROGRAMMED FOR SPECIFIED AIR FLOW. CONTACT DAIKIN APPLIED FOR REPLACEMENT.

DOAS Unit with MicroTech Controls, 208-230 / 60 / 3, Dip Switches



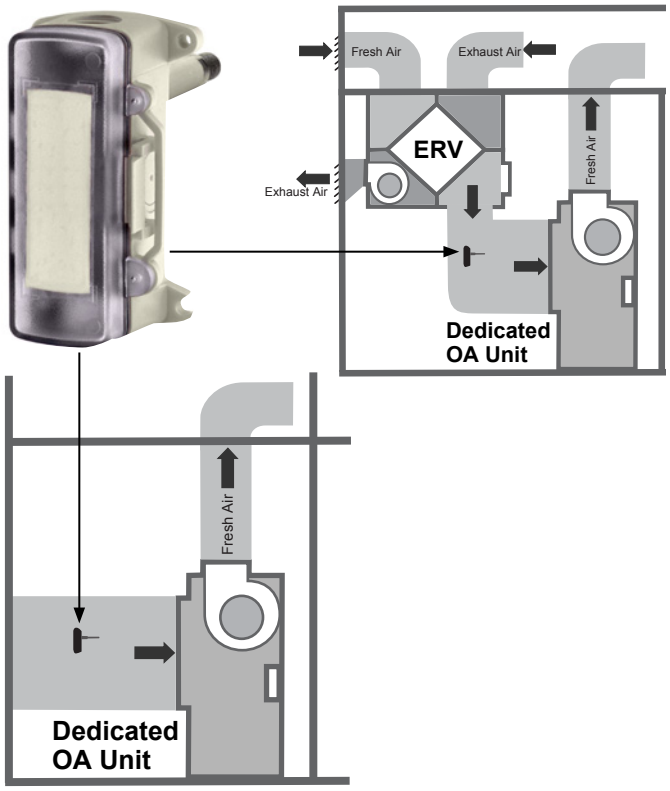


NOTE

Wiring diagrams are typical. For the latest drawing version refer to the wiring diagram located on the inside of the controls access panel.

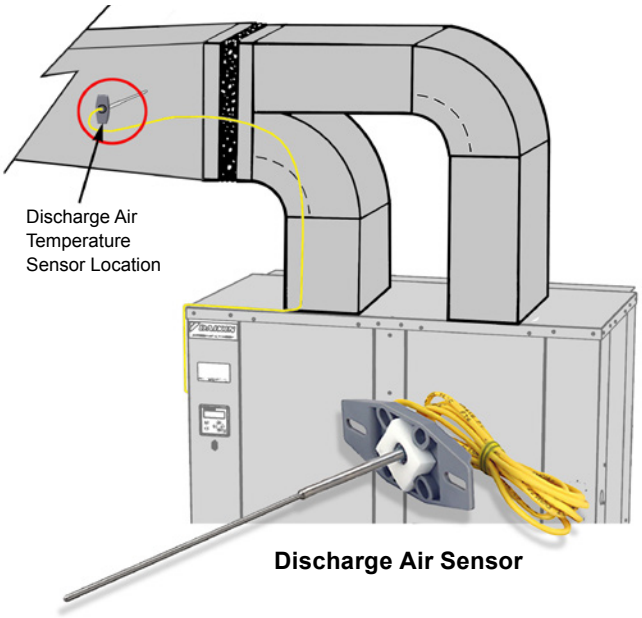
Entering Air Temperature / Humidity Sensor (Standard)

The Entering Air Temperature / Humidity Sensor is used to determine the mode of operation. This sensor must be field installed between the OA intake and unit entering air connection. If an ERV is used this sensor should be installed downstream of the ERV discharge.



Discharge Air Temperature Sensor (Standard)

The Discharge Air Temperature (DAT) sensor is typically installed 2-ft. to 3-ft. down stream of the fan housing. Because the airflow is more uniform at this location in the airstream, a more accurate reading of the discharge air temperature is possible.



Sensors Connectors

Figure 15: Molex Sensors Connectors on Left Side Corner Post

Optional Sensors

CFM / IHS = Cubic Feet Per Minute / Indoor Humidity Sensor

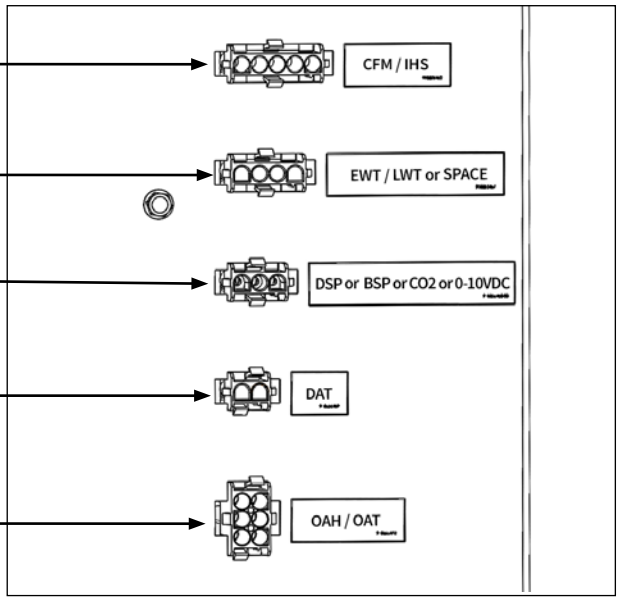
EWT / LWT or SPACE = Entering Water Temperature / Leaving Water Temperature or Space Temperature

DSP or BSP or CO2 or 0-10VDC = Duct Static Pressure or Building Static Pressure or CO_2 or 0-10VDC

Standard Sensors

DAT = Discharge Air Temperature

OAH / OAT = Outside Air Humidity / Outside Air Temperature



Space CO_2 Sensor (Optional)

The CO_2 Sensor is field-installed and used to control variable airflow volume based on maintaining acceptable indoor air quality in the occupied space.

Space Temperature Sensor (Optional)

The Space Temperature Sensor is field-installed and used as a method to reset the discharge air temperature control point to a lower value when the occupied space exceeds a space temperature set point. This sensor includes a unit status LED and unoccupied override button.

Notes: *Three conductors are required for the basic sensor. For complete specification and wiring information refer to ED 19107_WSHP-Tstats_Specs.*

Duct Static Pressure Sensor (Optional)

The Duct Static Pressure Sensor is field-installed and used to control variable airflow volume based on maintaining a duct static pressure set point. Variable airflow building exhaust control must not be used in combination with this feature.

High Duct Limit Switch (Optional)

The High Duct Limit Switch is field-installed and must be installed in all variable air volume applications. It has an adjustable range of 2.35 to 6.4 in H2O.

Building Static Pressure Sensor (Optional)

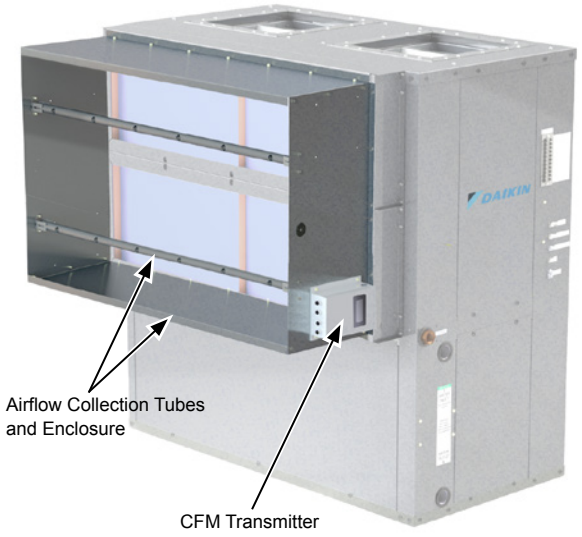
The Building Static Pressure Sensor is field-installed and used to control variable airflow volume based on maintaining a positive building static pressure set point.

Dirty Filter Switch (Optional)

The Dirty Filter Switch is field-installed and is an adjustable differential pressure switch that generates a dirty filter warning. This switch may only be used in constant volume applications.

Outdoor Airflow Sensor (Optional)

The OA CFM sensor kit is field-installed and used to measure the total unit airflow volume. This measurement can be used to comply with the LEED Indoor Environmental Quality EQ1.2 requirement.

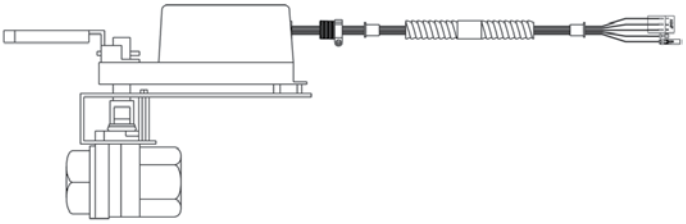


2-Way Motorized Isolation Valve

Figure 16: 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 valve will only energize on a call for heating or cooling. The 1-1/4" valve is rated for 300 psig (2068 kPa.

Figure 17: Normally Closed, Power Open Motorized Valve



Modulating Water Valves

Modulating valves are for use with the optional hydronic pre-heat coil. The valve kits include the valve body, actuator and wiring harness. The MicroTech controls will signal the valves to modulate open only when the unit has reached maximum capacity and is unable to maintain the heating discharge air temperature setpoint. The 1.0" valve bodies have a pressure rating of 600 psig (4136 kPa).

Figure 18: Optional 1.0", 2-Way, Normally Closed (N.C.) Motorized Valve With 2-10VDC Actuator

Figure 19: Optional 1.0", 3-Way, Motorized Valve With 2-10VDC Actuator

Field Wiring Connections

Field wiring connections for optional switches, sensors and valves are made via the molex plugs shown in Figure 15 on page 28, or the external terminal strip shown in Figure 20. For optional sensor and valve installation and wiring instructions refer to the specific IM listed below.

Figure 20: DOAS Unit External Terminal Strip

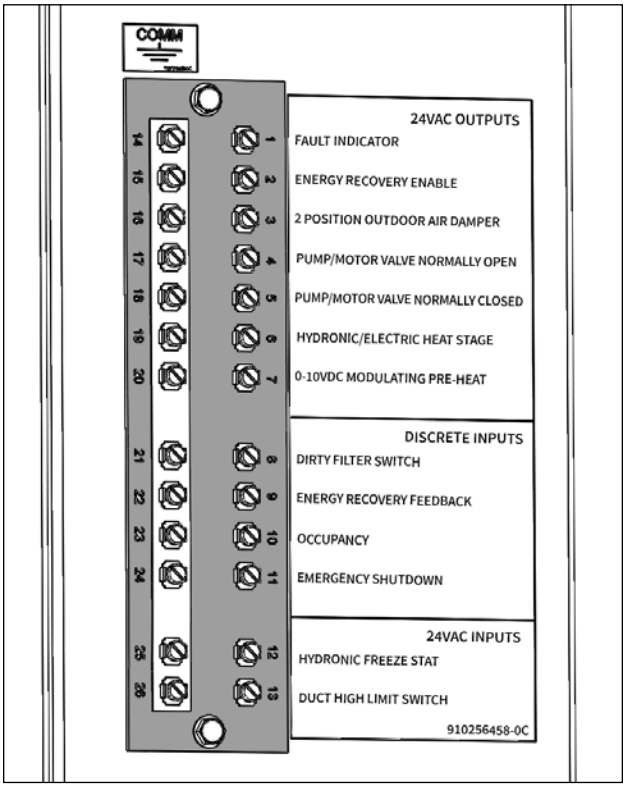


Table 9: Accessory-Specific Installation Literature

Description	Manual #
Space Temperature/Humidity Sensor	IM 1309
Entering/Leaving Water & Space Temperature Sensors	IM 1310
Duct Static Pressure Sensor	IM 1311
Building Static Pressure Sensor	IM 1312
Space CO2 Sensor	IM 1313
High Duct Pressure Limit Switch	IM 1314
Dirty Filter Switch	IM 1315
Outside Airflow Sensor	IM 1316
Alternative Condensate Drain	IM 1317

Alarm and Fault Monitoring

The most important aspect of troubleshooting SmartSource DOAS WSHP controls is to isolate the source of the problem into one of two categories:

- The problem resides within the MicroTech controller (hardware or software).
- The problem is external to the MicroTech controller. Under most circumstances the problem is external to the MicroTech controller.

The MicroTech controller is programmed to monitor the unit for specific alarm conditions.

Alarm Resets:

- **Auto:** Alarm clears automatically when the condition clears
- **Intelligent Reset:** Alarm clears automatically unless the alarm has occurred 3 or more times within 7 days; in that case the alarm must be cleared manually
- **Manual:** The alarm must be cleared manually

Manual reset faults can be reset in one of four ways:

- By cycling the unit power
- Via the keypad/display menu
- Via the network interface
- Via an input from a remote mounted space sensor

If an alarm condition exists, the following occurs:

- The MicroTech controller indicates the alarm condition by displaying the alarm code on the keypad display
- The remote wall-mounted sensor (optional) and onboard MicroTech controller status indicator LED flashes a numerical pattern corresponding to the Alarm Number indicating that an alarm condition exists
- The fault signal binary output energizes
- The MicroTech controller performs the appropriate control actions

Alarm Class and Priority

Alarms in the MicroTech controller are organized by Fault, Problem, or Warning alarm class. Alarm objects are stored according to their priority.

Fault Alarms

Fault alarms have the highest priority and cause the unit to shutdown.

Problem Alarms

Problem alarms have the next highest priority. Problem alarms do not cause unit shutdown but do limit operation of the unit in some way.

Warning Alarms

Warning alarms have the lowest priority. A warning is enunciated whenever an abnormal condition exists which does not affect unit operation.

MicroTech Unit Controller Alarms

Table 10: DOAS MicroTech Controller Alarms

Priority	Description	Type	Name	Alarm Number
0		NONE	NoAlarm	**0**
1	Emergency Shutdown	FAULT	"ShutdownDIAlarm"	**5**
2	Voltage Brownout	FAULT	"BrownoutAlarm"	**10**
3	High DX Pressure	FAULT	"HighDXPressureAlarm"	**1**
4	Low DX Pressure	FAULT	"LowDXPressureAlarm"	**2**
5	Phase Monitor Fault	FAULT	"PhaseMonitorAlarm"	**37**
6	Outside Air Temperature Sensor Failure	FAULT	"OATSensorAlarm"	**32**
7	Outdoor Humidity Sensor Failure	FAULT	"OutdoorHumSensorAlarm"	**30**
8	Leaving Coil Temperature Sensor Failure	FAULT	"LCTSensorAlarm"	**31**
9	High Duct Static Pressure Fault	FAULT	"HighDuctStaticPrsAlarm"	**7**
10	Suction Temperature Sensor Failure	FAULT	"SuctionTempSensorAlarm"	**26**
11	Low Suction Line Temperature	FAULT	"LowSuctLineTempAlarm"	**3**
12	Suction Pressure Sensor Failure	FAULT	"SuctionPressSensorAlarm"	**27**
13	DRT Sensor Failure	FAULT	"DRTSensorAlarm"	**24**
14	High Discharge Refrigerant Temperature	FAULT	"HighDRTAlarm"	**15**
15	Discharge Pressure Sensor Failure	FAULT	"DischargePressSensorAlarm"	**28**
16	Discharge Air Temperature Sensor Failure	FAULT	"DATSensorAlarm"	**39**
17	Low Suction Superheat Fault	FAULT	"LoSuctionSuperHeatAlarm"	**14**
18	Hydronic Coil Freeze	FAULT	"HydronicCoilFreezeAlarm"	**4**
19	Condensate Overflow	FAULT	"CondensateOverflowAlarm"	**8**
20	Low Leaving Coil Temperature Fault	FAULT	"LowLeavingCoilTempAlarm"	**11**
21	High Discharge Air Temperature	FAULT	"HighDischargeAirTempAlarm"	**12**
22	Low Condenser Saturated Refrigerant Temperature	FAULT	"LowCondSatTempAlarm"	**17**
23	Low Evaporator Saturated Refrigerant Temperature	FAULT	"LowEvapSatTempAlarm"	**19**
24	Factory Config String Fault	FAULT	"ConfigErrorAlarm"	**34**
25	Fan Configuration Fault	FAULT	"FanConfigAlarm"	**35**
26	Ambient Lockout Fault	FAULT	"LockoutEnableAlarm"	**38**
27	Energy Recovery Fault	FAULT	"EnergyRecoveryWarningAlarm"	**42**
28	Defrost Alarm	PROBLEM	"DefrostAlarm"	**40**
29	High Condenser Saturated Refrigerant Temperature 2	PROBLEM	"HighCondSatTemp2Alarm"	**20**
30	Low Condenser Saturated Refrigerant Temperature 2	PROBLEM	"LowCondSatTemp2Alarm"	**21**
31	Energy Recovery Warning	PROBLEM	"EnergyRecoveryWarningAlarm"	**41**
32	Low Entering Water Temperature	PROBLEM	"LowEnteringWaterTempAlarm"	**9**
33	SpcT/LWT Sensor Failure	PROBLEM	"SpcTLwtSensorAlarm"	**23**
34	Entering Water Temperature Sensor Failure	WARNING	"EWTSensorAlarm"	**36**
35	High Suction Superheat Warn	WARNING	"HiSuctionSuperHeatAlarm"	**13**
36	High Condenser Saturated Refrigerant Temperature	WARNING	"HighCondSatTempAlarm"	**16**
37	High Evaporator Saturated Refrigerant Temperature	WARNING	"HighEvapSatTempAlarm"	**18**
38	Preheat Insufficient Warning	WARNING	"HydronicHeatAlarm"	**22**
39	CO2 Space Sensor Failure	WARNING	"SpaceCO2SensorAlarm"	**25**
40	Indoor Humidity Sensor Failure	WARNING	"IndoorHumSensorAlarm"	**29**
41	Pressure Differential	WARNING	"OilPurgeAlarm"	**33**
42	Change Dirty Filter	WARNING	"ChangeFilterAlarm"	**6**

Fault Conditions

ShutdownDIAlarm

The controller can be remotely shut down with a binary input. This alarm condition is the highest priority alarm for the controller. When the input is detected, the controller immediately shuts down the unit even when other alarm conditions occur.

BrownoutAlarm

The controller will monitor the 24 volt power input supplied to the board. If a low voltage condition is detected (80% of the reference voltage) the controller will shut down the unit to protect components from the low line voltage conditions.

HighDXPressureAlarm

A normally closed high pressure switch is used to protect the unit from excessively high refrigerant pressure. This pressure switch opens at 600 PSI. The controller will monitor a binary input to detect the potential high pressure condition. A subsequent check to verify that the LowPressure/PhaseMonitor binary input is inactive will identify this as a high pressure switch fault. If the high pressure and low pressure is inactive, the unit will go into a high pressure switch fault alarm.

The alarm clears automatically when the high pressure condition no longer exists. The alarm can occur up to three times within a 7-day period. The third time requires a manual reset of the alarm via the network, LUI keypad display, or ServiceTools software.

LowDXPressureAlarm

Alarm occurs under these three conditions:

1. The normally closed low pressure switch (BI:3) opens

2. The normally closed high pressure switch (BI:1) opens

3. The suction pressure is less than 8 psi

The low pressure switch opens at 7 PSI. This is effectively a 'loss of charge' alarm as the unit will likely fault on low suction temp first if low refrigerant pressure conditions occur. These conditions signal that the unit has entered a low pressure fault condition. The unit controller immediately shuts down. The alarm clears automatically when the low pressure condition no longer exists. The alarm can occur up to three times within a 7-day period. The third time requires a manual reset of the alarm via the network, LUI keypad display, or ServiceTools software.

PhaseMonitorAlarm

The phase monitor fault is a result of analyzing the High Pressure input, the Low Pressure/Phase Monitor input, and the Suction Pressure Transducer value.

If the HiPress and the PhaseMonitor/LowPress inputs are both on, then a check of the actual pressure will identify the condition as either Low Pressure or Phase Monitor Fault. If the pressure is low, then it is a Low Pressure fault, otherwise it will be considered a phase fault.

OATSensorAlarm

This alarm occurs if the outdoor air temperature (OAT) sensor is providing an invalid value. The value can be supplied by the network or by a sensor. It initiates a normal shutdown of the unit. Alarm is cleared when a valid OAT value is received.

OutdoorHumSensorAlarm

This alarm occurs if the outdoor air humidity (OAH) sensor is providing an invalid value. The value can be supplied by the network or by a sensor. It initiates a normal shutdown of the unit. Alarm is cleared when a valid OAH value is received.

LCTSensorAlarm

This alarm occurs if the leaving coil temperature (LCT) sensor is providing an invalid value. Alarm initiates a normal shutdown of the unit. It is cleared when a valid value is received.

HighDuctStaticPrsAlarm

The Duct High Limit switch is a normally closed switch. If the switch opens, the configured duct High pressure has been exceeded and an alarm is raised.

This input can be configured to be direct or reverse acting. That is to say, it can be configured as a normally opened or normally closed switch.

This feature is used on variable air volume units. If the contacts of the duct high pressure limit switch open, and the unit state is not in the OFF state, the Duct High Limit fault occurs.

SuctionTempSensorAlarm

This alarm occurs if the suction temperature sensor is providing an invalid value. Alarm initiates a normal shutdown of the unit. It is cleared when a valid value is received.

LowSuctLineTempAlarm

The suction refrigerant temperature sensor (SRT) is located on the suction line of the compressor. The sensor is used to help protect the unit from excessively low water coil and air coil temperatures. The control module will monitor the compressor suction line temperature sensor and if the refrigerant temperature drops below the low temperature limit setpoint, the controller will go into the “Compressor Low Suction Temperature” fault mode. For standard range units, this is set to 28 degrees Fahrenheit by default. For extended range units this is set to 6.5 degrees Fahrenheit by default.

The actions taken vary depending on the unit mode of operation. If we are in the Heating mode, the unit will attempt to defrost the coil. If the unit is in cooling or dehumidification, then the unit will go to the OFFALARM state until the alarm clears.

SuctionPressSensorAlarm

This alarm occurs if the suction pressure sensor is providing an invalid value. Alarm initiates a normal shutdown of the unit. It is cleared when a valid value is received.

DRTSensorAlarm

This alarm occurs if the discharge refrigerant temperature (DRT) sensor is providing an invalid value. Alarm initiates a normal shutdown of the unit. It is cleared when a valid value is received.

HighDRTAlarm

If the Discharge Refrigerant temperature (DRT) goes above the setpoint for 10 minutes, an alarm is raised. The range for the High DRT Setpoint is 50°F – 250°F with a default value of 225°F. If the DRT ever goes above 250° F, the alarm will be raised immediately.

The alarm requires a manual clear. The alarm will reset when the DRT drops 10°F below the setpoint.

DischargePressSensorAlarm

This alarm occurs if the discharge refrigerant pressure sensor is providing an invalid value. Alarm initiates a normal shutdown of the unit. It is cleared when a valid value is received.

DATSensorAlarm

This alarm occurs if the discharge air temperature (DAT) sensor is providing an invalid value. Alarm initiates a normal shutdown of the unit. It is cleared when a valid value is received.

LoSuctionSuperHeatAlarm

This alarm indicates a low suction superheat condition when the suction refrigerant temperature (SRT) - calculated evaporator saturation temperature (Teg) < low superheat setpoint for three minutes. This setpoint is 2°F by default.

The alarm initiates a normal compressor shutdown. It automatically clears when the SRT - Teg reaches 2°F above the setpoint value. The alarm can occur up to three times within a 7-day period. The third time requires a manual reset via the network, LUI keypad display, or ServiceTools software.

HydronicCoilFreezeAlarm

A field supplied freeze stat input can be used with the unit. If the freeze stat sensor is installed and the sensor indicates a FREEZE condition, the unit will go to the off alarm state.

CondensateOverflowAlarm

The condensate overflow alarm may occur during cooling and dehumidification modes. The alarm will occur if a high water level is detected for 60 seconds. The controller determines this by detecting a path to ground. The single wire sensor completes the path to ground when the water level in the pan is high. If the sensor completes a path to ground while the unit is in the heating mode, this alarm will not occur.

LowLeavingCoilTempAlarm

Normal compressor control is limited when a low leaving coil temperature (LCT) conditions occur. By default, this occurs when the LCT senses a temperature of 32°F or lower. If the compressor has been operating for 12 minutes and the leaving coil temperature is less than the leaving coil temperature low limit for at least three minutes, an alarm is generated. In cooling or dehumidification, if at compressor stage 1 the unit stages down to zero.

If the compressor stage is greater than 1 in cooling or dehumidification, or if the unit is in heating the compressor is shut down and the alarm must be manually cleared.

HighDischargeAirTempAlarm

If the discharge air temperature (DAT) is greater than the discharge air temp limit and the 12 minute startup timer has expired, the high discharge air temp alarm fault occurs. By default, this occurs when the DAT senses a temperature of 110°F or higher.

If the unit is in heating mode and at stage 1, the unit stages down to zero and observes the minimum compressor off times before staging up again.

If the compressor stage is greater than 1 while in heating, or if the unit is not in heating, the compressors are shut down, and this fault is generated. The unit will transition through the normal compressor shutdown and if the fault is still active when the compressor shutdown process is complete, the unit will go to off alarm.

LowCondSatTempAlarm

Low Condenser Saturation temperature will occur when the calculated condenser saturation temperature is lower than setpoint for more than 10 minutes. This setpoint is 50°F by default. This alarm will automatically clear when the temperature returns to 5 degrees above the setpoint.

LowEvapSatTempAlarm

If the calculated evaporator saturation temperature is below the low evaporator saturation temperature setpoint limit, and the 12 minute startup timer has expired, the low evaporator saturation temperature alarm fault occurs. This setpoint is 5°F by default.

This alarm will automatically clear when the temperature returns to 5 degrees above the setpoint.

ConfigErrorAlarm

Alarm occurs when:

- The static pressure setpoint is outside the acceptable range for the unit size.
- Incorrect fan type selected
- One or more of the required sensors is not installed
- Other error detected in the factory configuration string

This alarm initiates a normal shutdown of the unit. It is cleared when all the above fields in the code string are valid. Parameters can be changed through the LUI or ServiceTools.

FanConfigAlarm

A fan configuration alarm is raised if a fan control method is configured which requires a specific input, but the input is not configured for the unit. Parameters can be changed through the LUI or ServiceTools.

LockoutEnableAlarm

The unit can be disabled if the ambient temperature is too high or too low for the DOAS WSHP to appropriately condition the air for the space. This alarm results in an immediate shutdown of the unit. The unit will remain locked out until the ambient air reaches the appropriate temperature.

The lockout feature must be enabled by setting through the LUI keypad display or ServiceTools software. When the feature is enabled,

- If OAT < Outdoor Air Temperature Low Lockout Setpoint (default -20°F), the fault is raised
- If OAT > Outdoor Air Temperature High Lockout Setpoint (default 115°F) the fault is raised

DefrostAlarm

When in heating, a freeze/frost condition can occur when the suction refrigerant temperature (SRT) is low. A defrost cycle will be invoked to attempt to correct a frosted or frozen coil. The defrost cycle runs for up to 1 minute. If the temperature is not rectified, a LowSuctLinTempAlarm (3) fault will be generated, and the unit will be shut off.

The defrost state will be allowed to occur two times within a 7 day period. If it occurs a third time within 7 days, a Defrost Alarm Fault will be generated, and a manual reset will be required.

HighCondSatTemp2Alarm

This is a second test of parameters to determine if we have a high High Condenser Saturated Temperature alarm. This alarm takes the evaporator temperature and calculates a theoretical saturation temperature for the condenser.

If the calculated condenser saturation temperature exceeds the theoretical saturation temperature, and the pressure ratio is greater than 5, then go into alarm.

LowCondSatTemp2Alarm

This is a second test of parameters to determine if there is a Low Condenser Saturated Temperature alarm.

If the calculated condenser saturation temperature is less than 5 degrees above the evaporator saturation temperature, for more than 3 minutes, then go into alarm.

EnergyRecoveryWarningAlarm

This alarm occurs when energy recovery ventilation functionality has been enabled but the feedback output from the energy recovery controller to the MicroTech indicates an alarm.

Energy recovery can be configured as either a Warning or Fault alarm. A Warning alarm disables energy recovery output but does not shut down the unit. A Fault alarm disables energy recovery output and forces the unit to shut down normally.

LowEnteringWaterTempAlarm

The units equipped with an entering water temperature (EWT) sensor will raise an alarm when the temperature drops below a threshold. The threshold varies depending on the solution used for the water loop. The water loop can be water or a glycol solution. The WSHP application allows the user to configure a Low EWT setpoint for a water loop or for a glycol loop. When the EWT is below the setpoint, heating is disabled until the EWT rises above setpoint. This setpoint is 55°F by default for water loops and 28°F by default for glycol loops. Use of default setpoints is recommended. However, setpoints can be changed through the LUI or ServiceTools based on specific unit application..

SpcTLwtSensorAlarm

The space sensor and leaving water temperature (LWT) are optional sensors. This is a problem alarm, and this alarm will be raised if the input is configured for one of the sensors, and either the sensor is not installed or the value is invalid.

EWTSensorAlarm

The entering water temperature sensor (EWT) is an optional sensor. This alarm will be raised if the input is configured for this sensor and the sensor is not installed or the value is invalid.

HiSuctionSuperHeatAlarm

The unit will monitor the suction superheat. If the suction superheat exceeds the high suction superheat limit for 3 minutes raise the alarm. This setpoint is 50°F by default.

HighCondSatTempAlarm

A high condenser saturation temperature alarm occurs when the condenser temperature is higher than setpoint for more than a minute. This setpoint is 130°F by default. This alarm will automatically clear when the temperature returns to 10 degrees lower than the setpoint.

HighEvapSatTempAlarm

A high evaporator saturation temperature alarm occurs when the calculated evaporator saturation temperature is greater than setpoint. This setpoint is 65°F by default. This alarm requires that the unit is experiencing the high temperature condition for at 5 minutes before the alarm is raised.

HydronicHeatAlarm

When in heating, if the unit is at the max heating capacity and the preheat valve is at 100% but the DAT setpoint cannot be achieved, a warning will be generated.

SpaceCO2SensorAlarm

The CO_2 sensor is an optional sensor. This alarm occurs if the space CO_2 sensor is installed but providing an invalid value. The value can be supplied by the network or by a sensor. Alarm is cleared when a valid CO_2 value is received.

IndoorHumSensorAlarm

This alarm occurs if the space relative humidity sensor is providing an invalid value. The value can be supplied by the network or by a sensor. Alarm is cleared when a valid space relative value is received.

Unit Events

Compressor Oil Level Protection

The controller will provide oil level protection by periodically entering a boost mode. There will be a 5 minute oil reclaim (Stage 8), 1-2 times per day. If the unit is running in lower stages of operation the number of reclaim processes may need to be increased.

OilPurgeAlarm

This alarm occurs when the differential pressure ratio is less than the setpoint for 10 minutes while the compressors are running. The default setpoint is a ratio of 1.6. For example, a head pressure of 225 psi and a suction pressure of 150 psi results in a ratio of 1.5. The alarm is cleared when the differential pressure is above the setpoint.

ChangeFilterAlarm

The unit will warn the user of the need to change the filter. A dirty filter input will be monitored to detect a dirty filter condition. The binary input is a switch and it will clear when the filter is replaced. If the use of the binary input is not desired or it is not functioning properly, it can be disabled by modifying the configuration for BI5 to be 'NONE'.

This alarm can also be raised based on a timer and a Filter Change Hours setpoint. When the timer exceeds the Filter Change Hours setpoint, the dirty filter warning will be generated.

Table 11: CoreSense™ Communications LED Flash Code Information

Status	Fault Conditions	Code Fault Description	Code Reset Description	Troubleshooting Information
Solid Green	Normal Operation	Module is powered and operation in normal	N/A	N/A
Solid Red	Module Malfunction	Module has internal fault	N/A	1) Reset module by removing power from T2-T1 2) Replace module
Warning LED Flash				
Green Flash Code 1	Loss of Communication	Module and master controller have lost communications with each other for more than 5 minutes	When communications are confirmed	1) Check the control wiring 2) Verify dipswitch 8 is "ON"
Green Flash Code 2	Future Use	N/A	N/A	N/A
Green Flash Code 3	Short Cycling	Run time of less than 1 minute; number of short cycles exceeds 48 in 24 hours	<48 short cycles in 24 hours	1) Check system charge and pressure control setting 2) Adjust set-point of temperature controller 3) Install anti-short cycling control
Green Flash Code 4	Improper dipswitch 9 setting	N/A	N/A	Verify dipswitch 9 is "OFF"
Green Flash Code 5	Future Use	N/A	N/A	N/A
Alert Lockout LED Flash				
Red Code Flash 1	Motor High Temperature	Ω > 4.5K; Lockout after 5 alerts	Ω > 2.75K and minutes	1) Check supply voltage 2) Check system charge & superheat 3) Check contactor
Red Flash Code 2	Open/Shorted Motor Thermistor	Ω > 220K or Ω < 40; Lockout after 6 hours	40 < Ω < 2.75K and 30 minutes	1) Check for poor connections at module and thermistor fusite 2) Adjust set point of temperature controller 3) Install anti-short cycling control
Red Flash Code 3	Short Cycling	Run time of less than 1 minute; Lockout if the number of alerts exceeds the number configured by the user in 24 hours	Interrupt power to T2-T1 or perform Modbus reset command	1) Check system charge and pressure control setting 2) Adjust set point of temperature controller 3) Install anti-short cycling control
Red Flash Code 4	Not Used	N/A	N/A	N/A
Red Flash Code 5	Future Use	N/A	N/A	N/A
Red Flash Code 6	Missing phase	Missing phase; Lockout after 10 consecutive alerts	After 5 minutes and missing phase condition is not present	1) Check incoming power 2) Check fuses/breakers 3) Check contactor
Red Flash Code 7	Reverse phase	Reverse phase; Lockout after 1 alert	Interrupt power to T2-T1 or perform Modbus reset command	1) Check incoming phase sequence 2) Check contactor 3) Check module phasing wires A-B-C
Red Flash Code 8	Future Use	N/A	N/A	N/A
Red Flash Code 9	Module Low Voltage	Low voltage on T2-T1 terminals*	After 5 minutes and the voltage is back in the normal range	1) Verify correct module p/n 2) Check VA rating of transformer 3) Check for blown fuse in transformer secondary

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

** This alert does not result in a Lockout*

The DOAS WSHP uses 2 Sporlan® IB-G Interface Boards. Troubleshooting for this board is shown in Table 12. The interface boards have their own diagnostic LEDs as seen in Figure 21.

Figure 21: Interface board LED's

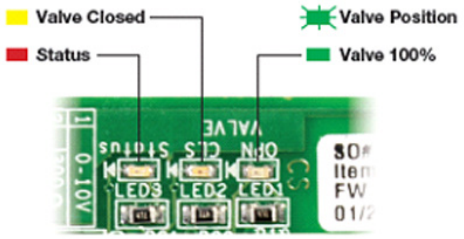


Table 12: Interface Board Troubleshooting

Problem	Check
IB-G Does Not Power On	The Red LED should be on if the IB-G has power. If not, check voltage between 24+ and 24-.
IB-G Continuously Starts up then Resets	Check for reverse polarity across the terminals 24+ and 24-
	Ensure that the polarities are correct across both boards
	Check and ensure ground potentials are the same for the power supplies for both the IB-G and MicroTech controller.
Valve Does Not Move With Control Signal	Ensure Red LED is on to indicate IB-G is powered
	If Green LED is solid:
	Check to ensure terminals 'OPN' and 'REF' are not shorted
	If Green LED is blinking
	Check valve wiring to ensure proper location on the IB-G
	Measure control signal across terminals S+ and S- and ensure it matches the IB-G position established by the 'OPN' LED. For example if the control signal measures 5VDC, ensure the GREEN LED is blinking 4-5 times to denote approximately 50% See Figure 21 for LED location.
	Confirm DIP switches per schematic
	Check valve for short or open
	If Yellow LED is solid:
	Check to ensure terminals 'CLS' and 'REF' are not shorted
	Confirm DIP switch settings per schematic
	Note: DIP switch #8 can be placed in 'ON' position to manually position the valve to 0%.
Valve Does Not Open to 100%	If Green LED is solid, the IB-G has electronically positioned the valve at 100%
	Confirm DIP switch settings per schematic
	Check valve for short or open
	If Green LED is off or blinking
	Check signal across terminals S+ and S-. This is a 0-10VDC signal.
	Confirm DIP switch settings per schematic
	Check to ensure there is not a short across terminals 'CLS' and 'REF'
	Note: A short across terminals 'OPN' and 'REF' will position the valve at 100%.
Valve Does Not Close to 0%	If Yellow LED is solid, the IB-G has electrically positioned the valve to 0%
	Confirm DIP switch settings per schematic
	Check valve for short or open
	If Yellow LED is off:
	Check signal across terminals S+ and S-. The signal should be 0VDC
	Check to ensure there is not a short across 'OPN' and 'REF'
Valve Moves the Wrong Way	Confirm wiring and dip switch settings per schematic
All LEDs are Blinking	This denotes that the DIP switches are positioned in an invalid configuration. Check schematic for proper configuration.

In order to test the EEV itself, first remove all power and wiring from the interface board. Next, measure the resistance between the black and white leads of the valve. Compare this reading to the resistance between the green and red leads. These readings should be within +/- 5% of each other. Last, measure the resistance from any lead to the valve body. A working valve will read infinite/open resistance.

The problem checks described in Table 12 on page 38 should be used as a rough estimate rather than absolute solution. The DOAS WSHP is intricately designed with a complex control sequence. As a result, troubleshooting may be found to be more difficult than a standard WSHP. Therefore, it is recommended to make use of the unit trending available with use of an SD card at 1-minute intervals. Trending can be enabled through either the LUI or ServiceTools. For further questions and/or reviewal of trending data, please contact ATS TRC at 315-282-6434 or TechResponseATS@DaikinApplied.com

Troubleshooting Water Source Heat Pump Units

Table 13: Troubleshooting Refrigeration Circuit

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

Lubrication

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

Charging

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

Make certain that the recycle or recovery equipment used is designed for R-410A.

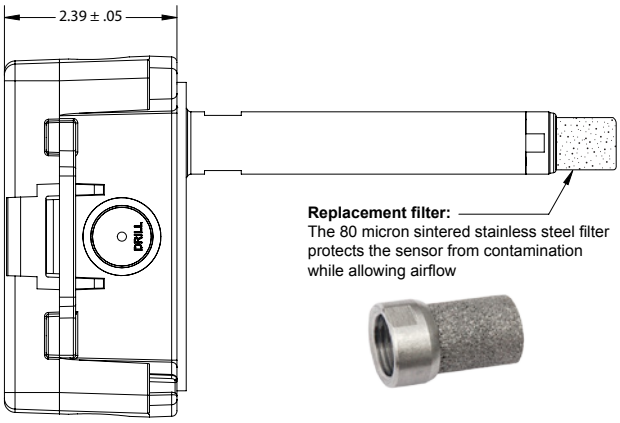
Note: *Because a water source heat pump operates under a wide range of water and air temperatures, the values printed below are to be taken as suggested pressure and temperatures.) All Daikin water source heat pumps are designed for commercial use. The units are designed for the cooling mode of operation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

Superheat	***Head Pressure***
8 to 14 degrees	335-355 PSIG

Note: Value through LUI.

General Maintenance

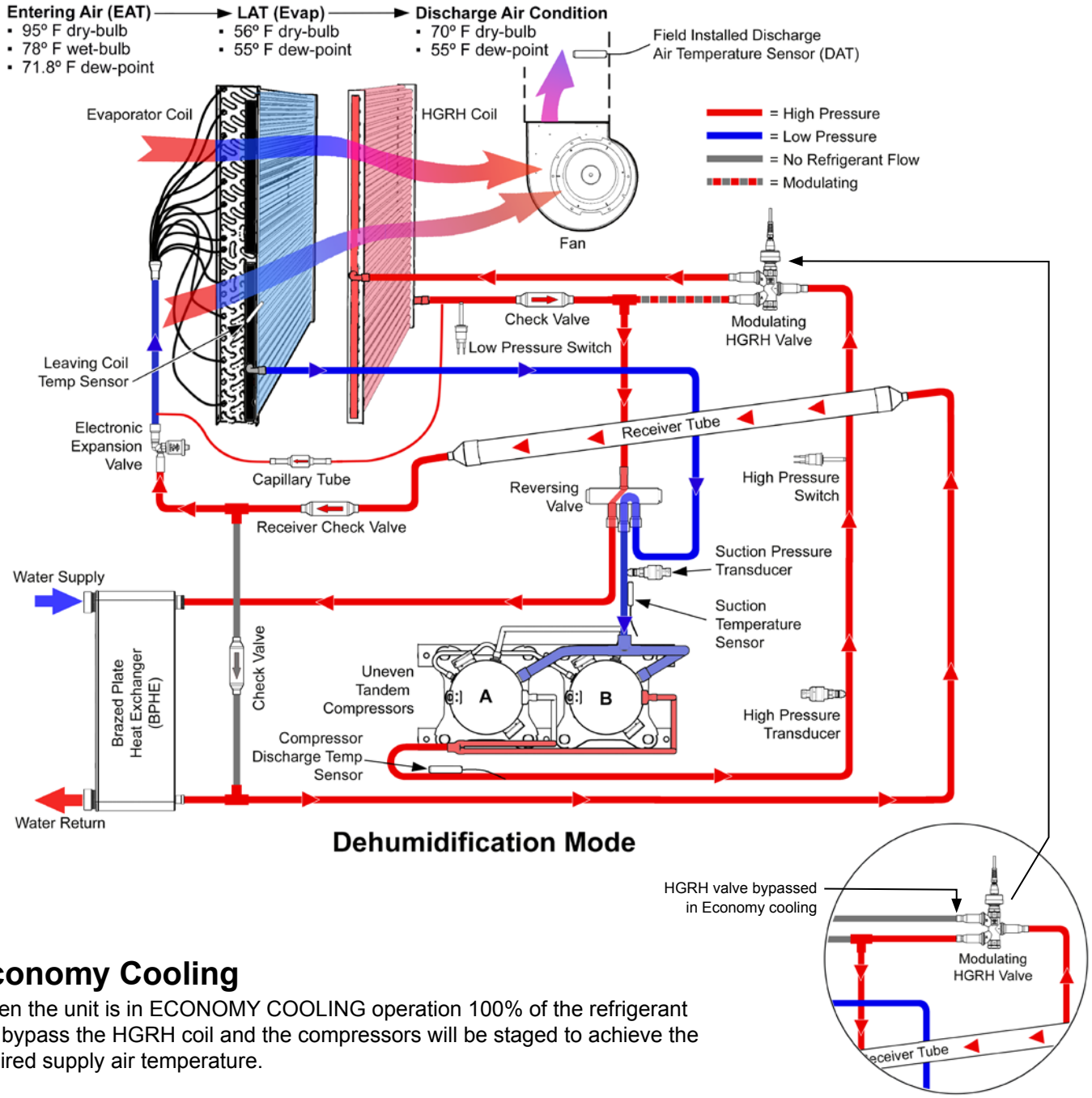
1. Normal maintenance on all units is generally limited to filter changes. Units are provided with permanently lubricated motors and require no oiling.
2. Filter changes are required at regular intervals. The time period between changes will depend upon the project requirements. Check filters at 60-day intervals for the first year until experience is acquired. If light cannot be seen through the filter when held up to sunlight or a bright light, it should be changed. A more critical standard may be desirable.
3. The condensate drain pan should be checked annually and cleaned and flushed as required.
4. Record performance measurements of volts, amps, and water pressure drop (both heating and cooling). A comparison of logged data with start-up and other annual data is useful as an indicator of general equipment condition.
5. Periodic lockouts almost always are caused by air or water problems. The lockout (shutdown) of the unit is a normal protective result. Check for dirt in the water system, water flow rates, water temperatures, airflow rates (may be a dirty filter), and air temperatures. If the lockout occurs in the morning following a return from night setback, entering air below machine limits may be the cause.
6. The outdoor air temperature/humidity sensor includes a filter to protect the humidity sensor from various airborne particles that might reduce the sensor's accuracy. Depending on the sensor's location and environment, this filter may need periodic cleaning. To do this, gently unscrew the filter from the probe. Rinse the filter under warm water until clean. Warm soapy water may be used if necessary. Gently replace the filter by screwing it back into the probe. The filter should screw all the way into the probe. The filter may be replaced by ordering Daikin part number 300065567.



Dehumidification or Precision Cooling Mode

When the unit enters the DEHUMIDIFICATION or PRECISION COOLING modes the reversing valve will be de-energized and the hot gas reheat (HGRH) valve will modulate to vary the amount of high-pressure compressor discharge gas flowing through the hot gas reheat coil. Energy is rejected through the HGRH coil, warming the air, and the HGRH valve will modulate to achieve the desired supply air temperature. After flowing through or bypassing the HGRH coil, the refrigerant will pass through the reversing valve to the brazed plate heat exchanger (BPHE) where excess heat is rejected into the water loop. At this point the refrigerant is a high-pressure liquid and flows through a receiver tube to the electronic expansion valve (EEV). The refrigerant drops to a low pressure as it passes through the EEV, which is modulated to achieve a desired suction superheat condition. As the low-pressure refrigerant passes through the primary DX coil energy is absorbed from the air, cooling and dehumidifying the airflow, before flowing back through the reversing valve to the compressors. Compressor capacity is staged to achieve the desired dew point temperature leaving the primary DX coil.

Figure 22: Dehumidification or Precision Cooling Mode – Refrigeration Cycle



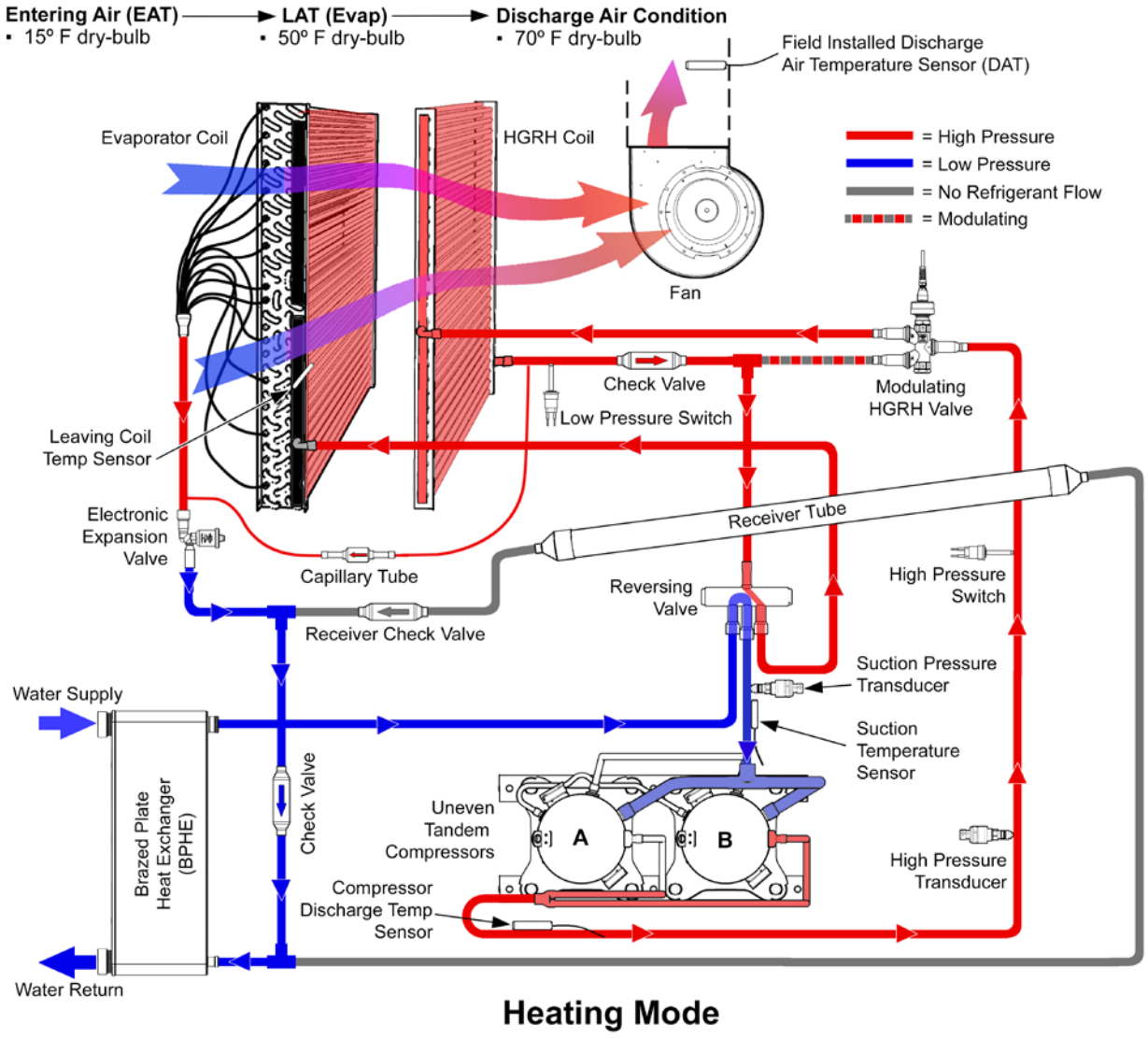
Economy Cooling

When the unit is in ECONOMY COOLING operation 100% of the refrigerant will bypass the HGRH coil and the compressors will be staged to achieve the desired supply air temperature.

Heating Mode

When the unit enters the HEATING mode the reversing valve will be energized and the hot gas reheat (HGRH) valve will modulate to vary the amount of direct 100% of the high-pressure compressor discharge gas to flow through the hot gas reheat coil. The refrigerant will then flow through the reversing valve to the primary DX coil. With Daikin's patent-pending SmartBoost Heating Technology energy is rejected through both the HGRH and primary DX coils, heating the airflow. After flowing through both coils the refrigerant is a high-pressure liquid and flows to the electronic expansion valve (EEV). The refrigerant drops to a low pressure as it passes through the EEV, which is modulated to achieve a desired suction superheat condition. As the low-pressure refrigerant passes through the brazed plate heat exchanger (BPHE) heat is absorbed from the water loop transitioning the refrigerant to a gas. From the BPHE the low-pressure gas flows throughout the reversing valve back to the compressors. Compressor capacity is staged to achieve a desired supply air temperature.

Figure 23: Heating Mode – Refrigeration Cycle



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

DOAS Water Source Heat Pump Check, Test and Start Form

This form must be completed and submitted within ten (10) days of start-up to comply with the terms of the Daikin warranty. Forms should be returned to Daikin Warranty Department, 13600 Industrial Park Blvd, Plymouth, MN 55441

Installation Data

Job Name _____ Check, Test & Start Date _____

City or Town _____ State _____ Zip _____

Who is Performing CTS _____

General Contractor _____

Equipment Type (Check all that apply)

☐ Closed Loop ☐ Open Loop

☐ Geothermal ☐ Other (specify)_____

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

Essential Items Check

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

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

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

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

Please include any suggestions or comments for Daikin Applied: _____

_____

_____

_____

Above System is in Proper Working Order

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

_____
Date

_____
Signature for Sales Representative

_____
Signature for Customer

For Internal Use

Release:

SM _____

CTS _____

T _____

_____
Service Manager Approval

_____
Date

Unit Check / Equipment Data

Form No._____

Installation Data

Job Name _____ Check Test Date: _____

City _____ State _____ Zip _____

Daikin Model # _____

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

General Contractor:_____ Mechanical Contractor:_____

Technician Performing Start-Up: Name_____ Employer:_____

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

Equipment Data

Flow Rate **EWP - LWP = ΔP**

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

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

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

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

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

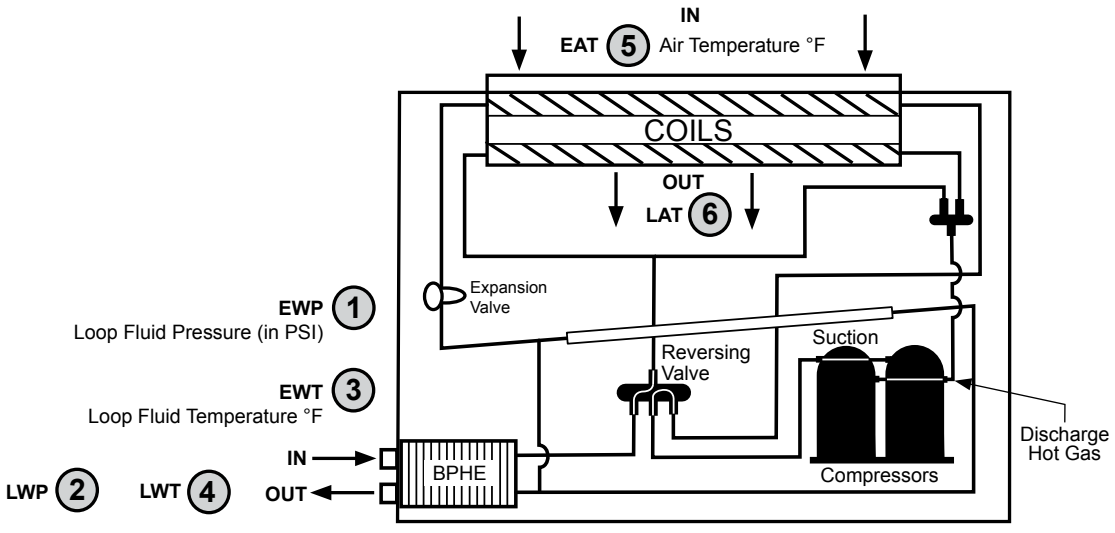
ΔT is the rise or drop in the fluid temperature as it passes through the Coaxial.

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

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

Note: Perform Check, Test and Start-Up in both Cooling/Dehumidification and Heating.

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



Note: *Complete all equipment measurements indicated for each unit per installation on previous page)*

Check, Test and Start Worksheet – Cooling/Dehumidification

Model	Serial #	H.P. #	EWT	LWT	EWP	LWP	EAT (db)	EAT (wb/RH%)	LAT (db)	LAT (wb/RH%)	Volts	Amps Cooling or Dehum	Amps Cooling or Dehum Steady State	Amps Heating	Amps Heating Steady State	Check Air Filter and Coil

Check, Test and Start Worksheet – Heating

Model	Serial #	H.P. #	EWT	LWT	EWP	LWP	EAT (db)	EAT (wb/RH%)	LAT (db)	LAT (wb/RH%)	Volts	Amps Cooling or Dehum	Amps Cooling or Dehum Steady State	Amps Heating	Amps Heating Steady State	Check Air Filter and Coil

Notes / Comments

Daikin Applied Training and Development

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

Warranty

All Daikin equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied representative for warranty details. Refer to Form 933-430285Y. To find your local Daikin Applied representative, go to www.DaikinApplied.com.

Aftermarket Services

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

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to www.DaikinApplied.com.

Products manufactured in an ISO Certified Facility.