Installation and Maintenance Manual

IM 1356-1

Group: **Applied Terminal Systems**
Document PN: **IM1356-1**
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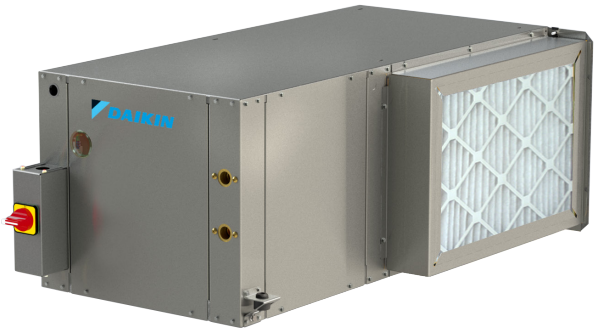
SmartSource® Horizontal Water Source Heat Pump

Model SCH, SMH, and SSH
Sizes 007 – 070 (1/2 thru 6 tons)



Contents

Model Nomenclature

1	2-3	4	5-7	8	9	10	11-12	13	14	15	16	17	18	19	20	21-22	23	24	25	26	27	28	29	30	31	32	33	34
W	SC	H	007	E	1	F	RS	C	M	T	P	A	Y	Y	1	YY	A	Y	Y	Y	Y	Y	S	S	Y	E	Y	Y

Category	Code Option	Code	=	Description
Product Category	1	W	=	Water Source Heat Pump
Model Type	2-3	SC	=	SmartSource Small Capacity Compact - 1 Stage
		SM	=	SmartSource Small Capacity Plus - 1 Stage
		SS	=	SmartSource Small Capacity Premium - 1 Stage
Configuration	4	H	=	Horizontal
Nominal Capacity	5-7	007	=	7,000 Btuh Nominal Cooling
		009	=	9,000 Btuh Nominal Cooling
		012	=	12,000 Btuh Nominal Cooling
		015	=	15,000 Btuh Nominal Cooling
		019	=	19,000 Btuh Nominal Cooling
		024	=	24,000 Btuh Nominal Cooling
		030	=	30,000 Btuh Nominal Cooling
		042	=	42,000 Btuh Nominal Cooling
		048	=	48,000 Btuh Nominal Cooling
		060	=	60,000 Btuh Nominal Cooling
		070	=	70,000 Btuh Nominal Cooling (SC & SS Only)
Voltage	8	A	=	115/60/1 (007-015)
		E	=	208-230/60/1 (007-070)
		F	=	208-230/60/3 (024-070)
		J	=	265/60/1 (007-036)
		K	=	460/60/3 (024-070)
		L	=	575/60/3 (048-070)
Design Series (Vintage)	9	1	=	Design Series 1
Piping Hand	10	F	=	Front
Return Air / Discharge Air	11-12	LS	=	Left Hand Return / Straight Discharge
		LE	=	Left Hand Return / End Discharge
		RS	=	Right Hand Return / Straight Discharge
		RE	=	Right Hand Return / End Discharge
Water Coil Type	13	C	=	Copper Inner Tube (SC & SM)
		G	=	Cupro-Nickel Inner Tube (SC & SM)
		B	=	Brazed Plate Heat Exchanger (SS Only)
		H	=	Brazed Plate Heat Exchanger (Geothermal) (SS Only)
		S	=	Geothermal - Copper Inner Tube (SC & SM)
		J	=	Geothermal - Cupro-Nickel (SC & SM)
Unit Control	14	M	=	MicroTech Unit Controller
		B	=	MicroTech Unit Controller + BACnet
Controller Options	15	T	=	Thermostat Control
		S	=	Sensor Control
Fan Motor Options	16	P	=	PSC (Not available on SS)
		C	=	ECM Constant CFM (Sizes 015-070)
		T	=	ECM Constant Torque
Insulation (Compressor Side / Air Side)	17	A	=	Standard (1/2" Fiberglass, Entire Unit)
		B	=	IAQ (Closed Cell Foam, Entire Unit)
		C	=	Sound Package (Dual Layer Fiberglass, Entire Unit)
		D	=	Sound Blanket + (1/2" Fiberglass, Entire Unit) 024-070
		E	=	Sound Blanket + IAQ (Closed Cell Foam, Entire Unit) 024-070
		F	=	Sound Blanket + Sound Package (Dual Layer Fiberglass, Entire Unit) 024-070
Water Coil - Indoor Coil	18	Y	=	None
		W	=	Waterside Economizer
		H	=	Hydronic Heat
Dehumidification	19	Y	=	None
		R	=	Hot Gas Reheat (SM & SH 015-070)
		S	=	Simplified Dehumidification
Transformer	20	1	=	50VA Transformer
		2	=	75VA Transformer
Options	21-22	YY	=	None
		0A	=	Freeze Fault
		0C	=	Water Pressure Differential Switch (N/A on SC & SM sizes 007-012)
		0F	=	Freeze Fault + Water Pressure Differential Switch

Nomenclature (Continued)

1	2-3	4	5-7	8	9	10	11-12	13	14	15	16	17	18	19	20	21-22	23	24	25	26	27	28	29	30	31	32	33	34
W	SC	H	007	E	1	F	RS	C	M	T	P	A	Y	Y	1	YY	A	Y	Y	Y	Y	Y	S	S	Y	E	Y	Y

Category	Code Option	Code	=	Description
Filter Racks & Filters	23	A	=	Standard 1" Rack - 1" Disposable Filter
		B	=	1" Bottom Access - 1" Disposable Filter
		D	=	2" Rack - 2" MERV 8 Filter
		H	=	4" Rack - 4" MERV 13 Filter
		J	=	4" Bottom Access - 4" MERV 13 Filter
		Y	=	None
Water Flow Options	24	Y	=	None
		A	=	Isolation Valve (NO) (Not available for SC & SM sizes 007-012)
		B	=	Isolation Valve (NC) (Not available for SC & SM sizes 007-012)
		C	=	Head Pressure Control - Refrigerant Tap
Piping Package	25	Y	=	None
		A	=	Auto Flow Control - 1.5 GPM
		B	=	Auto Flow Control - 1.5 GPM
		C	=	Auto Flow Control - 2.5 GPM
		D	=	Auto Flow Control - 3.0 GPM
		E	=	Auto Flow Control - 4.0 GPM
		G	=	Auto Flow Control - 5.0 GPM
		H	=	Auto Flow Control - 6.0 GPM
		J	=	Auto Flow Control - 7.0 GPM SS Model Only
		K	=	Auto Flow Control - 8.0 GPM
		L	=	Auto Flow Control - 9.0 GPM
		M	=	Auto Flow Control - 10.0 GPM
		N	=	Auto Flow Control - 11.0 GPM
		P	=	Auto Flow Control - 12.0 GPM
		Q	=	Auto Flow Control - 13.0 GPM
		S	=	Auto Flow Control - 15.0 GPM
Electric Heat	26	Y	=	None
		F	=	Electric Heat Control Harness - 24V Signal (Field Installed Duct Heater by Others)
Electric Heat Control (Board Configuration)	27	Y	=	None
		B	=	Boilerless Electric Heat
		P	=	Primary Electric Heat (No Heat Pump Heating)
		S	=	Supplemental Heat
Cabinet Color	28	Y	=	None (Galvanized)
		B	=	Textured Charcoal Bronze
		W	=	Off White
		S	=	Antique Ivory
		D	=	Cupola White
		V	=	Soft Grey
		K	=	Putty Beige
Standard or Special	29	S	=	Standard
		X	=	Special
Drain Pan Material	30	S	=	Stainless Steel Drain Pan (Standard)
		P	=	Plastic Drain Pan (Not available for SC & SM sizes 007-012)
Electrical Options	31	Y	=	None
		D	=	Non-Fused Disconnect Switch
Corrosion Protection	32	Y	=	None
		C	=	Corrosion Protection
Future Use	33	Y	=	None

Nomenclature (Continued)

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W	SC	H	007	E	1	F	RS	C	M	T	P	A	Y	Y	1	YY	A	Y	Y	Y	Y	Y	S	S	Y	E	Y	Y

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

Introduction

Hazard Identification Information

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

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

Safety Considerations

This manual provides installation, operation, and maintenance information for Daikin Applied SmartSource Horizontal Water Source Heat Pump.

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

This appliance must be installed where it can not be accessible to the general public.

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

⚠ WARNING

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

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

Do not pierce or burn this unit.

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

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

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

For more information, consult "R-32 Guidelines" on page 74.

⚠ DANGER

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

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

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

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

⚠ WARNING

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

⚠ CAUTION

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

Unit Labels

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

Label	Description
	WARNING - flammable refrigerant present
	Read the technical manual for service instructions
	WARNING - A2L low-burning velocity refrigerant present
	Pressurized medium present
	Ultraviolet (UV) radiation present
	Read the technical manual for instructions
	WARNING - flammable refrigerant present

Receiving and Storage

⚠ CAUTION

Sharp edges can cause minor injury. Avoid contact with them.

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 Daikin Applied Warranty Claims Department should then be contacted.

For storing, each carton is marked with "up" arrows.

The unit should be shipped or stored in the normal up-right position. 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. Units should not be installed in environments that fall below freezing or exceed 140°F ambient.

NOTICE

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.

⚠ WARNING

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

⚠ WARNING

This appliance 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.

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

Pre-Installation Checklist

☐ To prevent damage, do not operate this equipment for supplementary ventilation, heating and cooling during the construction period.

☐ Inspect the carton for any specific tagging numbers indicated by the factory per a request from the installing contractor.

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

Table 1: Operating Voltages

Voltage	Minimum	Maximum
115/60/1	103	126
208-230/60/1	197	253
265/60/1	238	292
208-230/60/3	197	253
460/60/3	414	506
575/60/3	515	632

Note: Three-phase system imbalance shall not exceed 2%.

☐ If 460/60/3 unit includes a constant CFM EC motor verify that a 4-wire power supply is provided that includes a neutral wire providing 265 volt power to the fan motor.

☐ Check the unit size against the plans to verify that the unit is being installed in the correct location.

☐ Before installation, check the available ceiling height versus the height of the unit.

☐ Note the location and routing of water piping, condensate drain piping, and electrical wiring. The locations of these items are clearly marked on submittal drawings.

☐ The installing contractor will find it beneficial to confer with piping, sheet metal, and electrical foremen before installing any unit.

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

☐ Remove shipping brackets securing unit to skid.

System Applications

Water Loop Application

Commercial systems typically include a number of units connected to a common piping system. Any unit plumbing maintenance work can introduce air into the piping system; therefore air elimination equipment is a major portion of the mechanical room plumbing. For piping systems expected to utilize water temperatures below 50°F [10°C], closed cell insulation is recommended on all piping surfaces to eliminate condensation. Metal to plastic threaded joints should never be used due to their tendency to leak over time. All units include flush mounted FPT water connections integral to the unit corner post, which do not require a backup wrench.

A thread sealant is recommended to minimize internal fouling of the heat exchanger. Do not over tighten connections and route piping so as not to interfere with service or maintenance access. Accessory hose kits are available from Daikin Applied as an option and are available in different configurations for connection between the unit and the piping system depending upon selection. The hose kits include high pressure stainless steel outer braided and fire rated hoses and may include shut off valves, P/T ports for performance measurement, with a combination “Y” type strainer with blow down valve, and “JIC” type swivel connections.

Auto balancing valves and an external low pressure drop motorized valve for use in variable pumping systems may also be included in the accessory hose kit option.The piping system should be flushed to remove dirt, piping chips, and other foreign material prior to operation (see "Flushing the Earth Loop" on page 10. The water flow rates should be kept at approximately 3 GPM per nominal cooling ton (a 10°F temperature rise in cooling). To ensure proper maintenance and servicing, P/T ports are imperative for temperature and flow verification, as well as performance checks.

Water loop heat pump (cooling tower/boiler) systems typically utilize a common loop, maintained between 60 - 90°F [16 - 32°C]. When an open type cooling tower is used, a secondary heat exchanger between the tower and the water loop is recommended. If an open type cooling tower is used continuously, chemical treatment and filtering may be necessary.

Note: *For SSH units, a minimum 20-mesh strainer installed in the supply piping is required.*

Ground-Loop Application

⚠ CAUTION

The following instructions represent industry accepted installation practices for closed loop earth coupled heat pump systems. Instructions are provided to assist the contractor in installing trouble free ground loops. These instructions are recommendations only. State/provincial and local codes MUST be followed and installation MUST conform to ALL applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

⚠ CAUTION

Ground loop applications require extended range equipment and optional refrigerant/water circuit insulation.

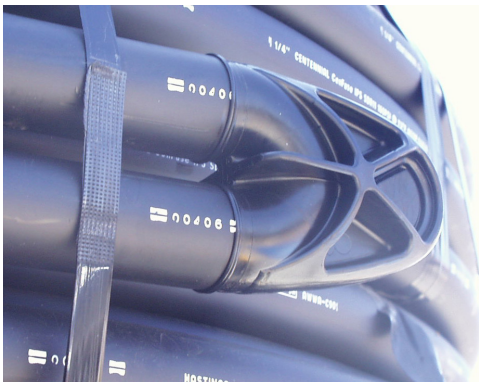
Pre-Installation

Prior to installation, locate and mark all existing underground utilities, piping, etc. Install loops for new construction before sidewalks, patios, driveways, and other construction has begun. During construction, accurately mark all ground loop piping on the plot plan as an aid in avoiding potential future damage to the installation.

Piping Installation

The typical closed loop ground source system is shown in Figure 3. All earth loop piping materials should be limited to polyethylene or equivalent per International Ground Source Heat Pump Association (IGSHPA).

Figure 1: Polyethylene Fused Piping



Galvanized or steel fittings should not be used at any time due to their tendency to corrode. All plastic to metal threaded fittings should be avoided due to their potential to leak in earth coupled applications. A flanged fitting should be substituted. P/T plugs should be used so that flow can be measured using the pressure drop of the unit heat exchanger.

Earth loop temperatures can range between 25 and 110°F [-4 to 43°C]. The water flow rates should be kept at approximately 3 GPM per nominal cooling ton (a 10°F temperature rise in cooling).

Test individual horizontal loop circuits before backfilling. Test vertical U-bends and pond loop assemblies prior to installation. Pressures of at least 100 psi [689 kPa] should be used when testing. Do not exceed the pipe pressure rating. Test entire system when all loops are assembled.

Flushing the Earth Loop

Upon completion of system installation and testing, flush the system to remove all foreign objects and purge to remove all air.

Antifreeze

In areas where minimum entering loop temperatures drop below 50°F [10°C] or where piping will be routed through areas subject to freezing, antifreeze is required.

Alcohols and glycols are commonly used as antifreeze; however your local sales office should be consulted to determine the antifreeze best suited to your area. Freeze protection should be maintained to 15°F [9°C] below the lowest expected entering loop temperature. For example, if 30°F [-1°C] is the minimum expected entering loop temperature, the leaving loop temperature would be 22 to 25°F [-6 to -4°C] and freeze protection should be at 15°F [-10°C]. Calculation is as follows: 30°F - 15°F = 15°F [-1°C - 9°C = -10°C].

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

Figure 2: Flushing The Loop

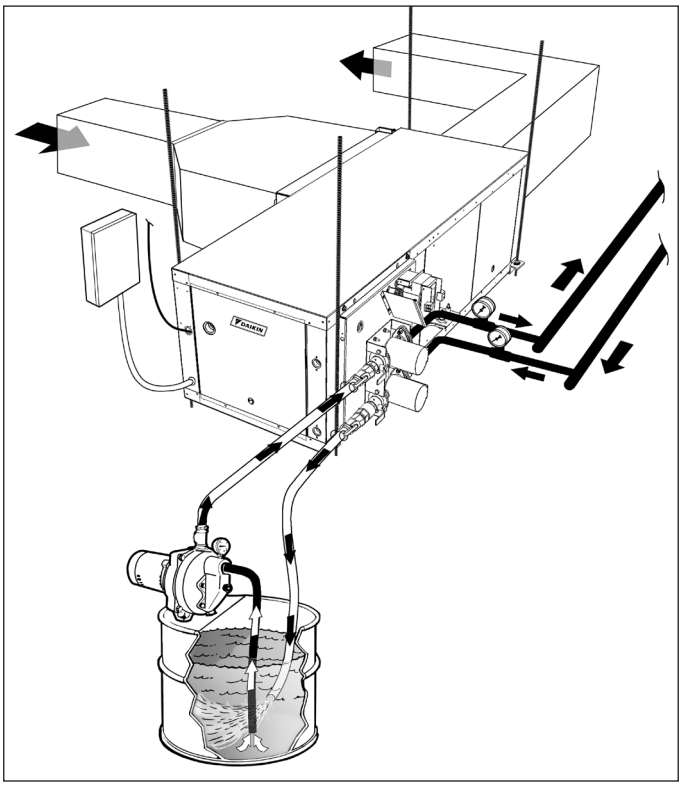


Figure 3: Typical Ground Loop Application (Loop Pump by Others Shown)

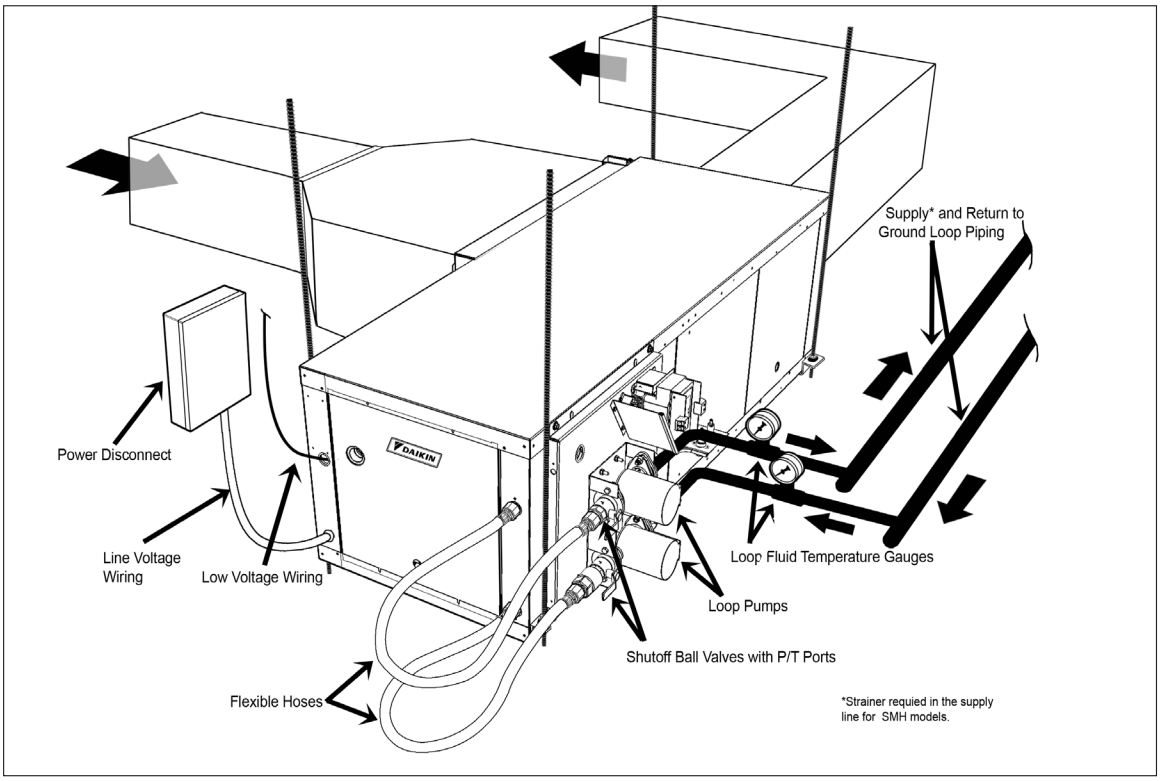


Table 2: Antifreeze Percentage By Volume

Type	Minimum Temperature for Low Temperature Protection			
	10°F [-12.2°C]	15°F [-9.4°C]	20°F [-6.7°C]	25°F [-3.9°C]
Methanol	25%	21%	16%	10%
100% USP food grade Propylene Glycol	38%	25%	22%	15%
Ethanol[1]	29%	25%	20%	14%

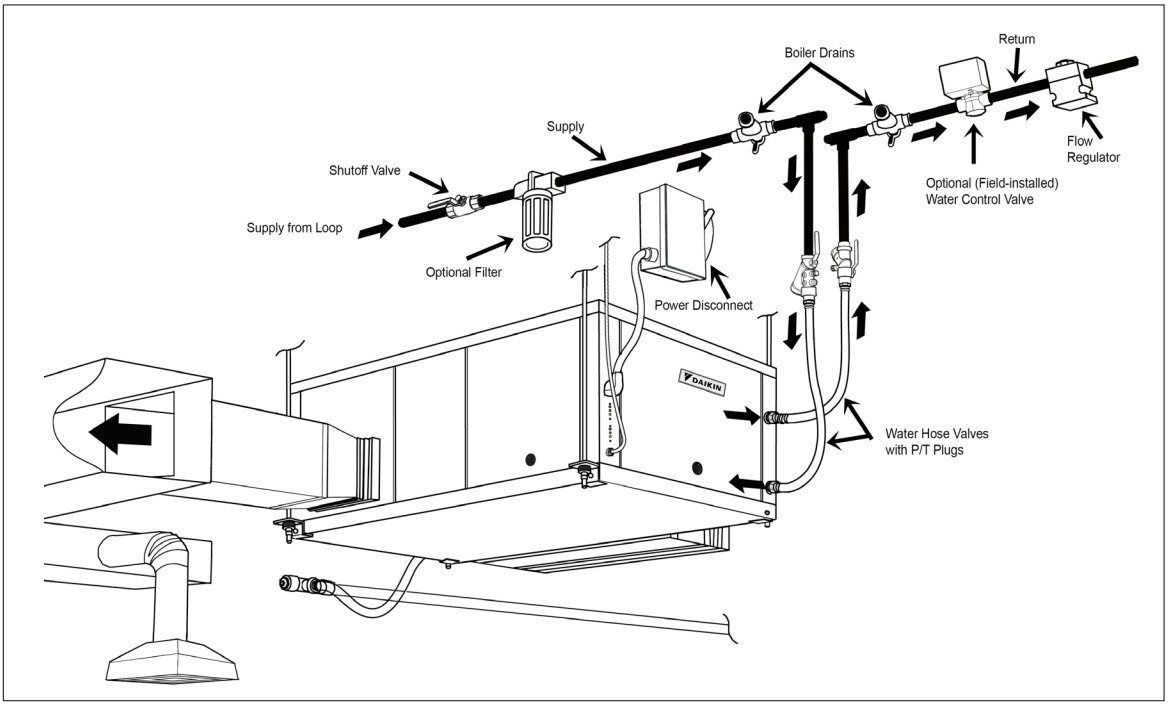
Note: *[1] Must not be denatured with any petroleum product.*

Table 3: Antifreeze Correction Factors (For Heat Pump Operation Only)

	Antifreeze % By Weight			
	15%	25%	35%	45%
Ethanol				
Cooling Capacity	0.985	–	–	–
Heating Capacity	0.9825	–	–	–
Pressure Drop	1.04	–	–	–
Ethylene Glycol				
Cooling Capacity	0.9935	0.9895	0.985	0.981
Heating Capacity	0.9865	0.9795	0.973	0.965
Pressure Drop	1.10	1.16	1.22	1.27
Methanol				
Cooling Capacity	0.985	–	–	–
Heating Capacity	0.9825	–	–	–
Pressure Drop	1.04	–	–	–
Propylene Glycol				
Cooling Capacity	0.985	0.975	0.965	0.955
Heating Capacity	0.981	0.9685	0.952	0.936
Pressure Drop	1.11	1.20	1.31	1.40

Ground-Water Application

Figure 4: Typical Open Loop Application



Open Loop - Ground Water Systems - Typical open loop piping is shown in Figure 4. Shut off valves should be included for ease of servicing. Boiler drains or other valves should be installed in the supply and return lines to allow cleaning of the heat exchanger. Shut off valves should be positioned to allow flow through the coax via the boiler drains without allowing flow into the piping system. P/T plugs should be used so that pressure drop and temperature can be measured. Piping materials should be limited to copper.

⚠ WARNING

PVC or CPVC should not be used as they are not compatible with the POE oils used in HFC-32 products and piping system failure and property damage may result.

Water quantity should be plentiful and of good quality. See "Water impurities, result & recommended water system application" on page 16 for water quality guidelines. The unit can be ordered with either a copper or cupro-nickel water heat exchanger. Consult Table 7 on page 16 for recommendations. Copper is recommended for open loop ground water systems that are not high in mineral content or corrosiveness. In conditions anticipating heavy scale formation or in brackish water, a cupro-nickel heat exchanger is recommended. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, an open loop system is not recommended. Heat exchanger coils may over time lose heat exchange capabilities due to build up of mineral deposits. Heat exchangers must only be serviced by a qualified technician, as acid cleaning and special pumping equipment may be required.

Water Quality Standards - Table 7, "Water Quality Conditions and Applications" on page 16 should be consulted for water quality requirements. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH <7.5 and the calcium hardness is less than 100 ppm, scaling potential is low. If this method yields numbers out of range of those listed, the Ryznar Stability and Langelier Saturation indices should be calculated. Use the appropriate scaling surface temperature for the application, 150°F [66°C] for direct use (well water/open loop); 90°F [32°F] for indirect use. A monitoring plan should be implemented in these probable scaling situations. Other water quality issues such as iron fouling, corrosion prevention and erosion and clogging should be referenced in Table 7 on page 16.

Expansion Tank and Pump - Use a closed, bladder type expansion tank to minimize mineral formation due to air exposure. The expansion tank should be sized to provide at least one minute continuous run time of the pump using its draw-down capacity rating to prevent pump short cycling. Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways, depending on local building codes (e.g. recharge well, storm sewer, drain field, adjacent stream or pond, etc.). Most local codes forbid the use of sanitary sewer for disposal. Consult your local building and zoning department to assure compliance in your area.

Water Control Valve (Factory or field-installed option) - Note the placement of the water control valve in on page 12. Always maintain water pressure in the heat exchanger by placing the water control valve(s) on the return line to prevent mineral precipitation during the off-cycle. Pilot operated slow closing valves are recommended to reduce water hammer. If water hammer persists, a mini-expansion tank can be mounted on the piping to help absorb the excess hammer shock. If a field provided motorized valve and actuator is utilized, ensure that the total 'VA' draw of the valve can be supplied by the unit transformer. For instance, a slow closing valve can draw up to 35VA. Units are furnished with a factory-installed 50 VA transformer. An optional 75VA transformer is also available. A typical pilot operated solenoid valve draws approximately 15VA (see Figure 42 on page 56).

Flow Control - Flow control can be accomplished by two methods. One method involves simply adjusting the field-provided ball valve or flow control valve on the return line. Measure the pressure drop through the unit heat exchanger, and determine flow rate from Table 4. Since the pressure is constantly varying, two pressure gauges may be needed. Adjust the valve until the desired flow of 1.5 to 4 gpm, per ton [5.7 to 15.1 l/m, per kW] is achieved. A second method of flow control requires a flow control device mounted on the outlet of the flow control valve. This device is typically a brass fitting with an orifice of rubber or plastic material that is designed to allow a specified flow rate. On occasion, flow control devices may produce velocity noise that can be reduced by applying some back pressure from the ball valve located on the discharge line. Slightly closing the valve will spread the pressure drop over both devices, reducing the velocity noise.

Table 4: SCH Unit Water Pressure Drop

Unit Size	GPM	Pressure Drop, FOH
007	1.2	1.0
	1.8	1.9
	2.3	2.8
009	1.5	1.4
	2.3	2.8
	3.0	4.3
012	2.0	2.8
	3.0	5.2
	4.0	8.2
015	2.5	3.5
	3.8	6.9
	5.0	10.8
019	3.2	6.7
	4.8	11.8
	6.3	17.4
024	4.0	5.2
	6.0	10.0
	8.0	15.8
030	5.0	7.5
	7.5	14.3
	10.0	22.6
036	6.0	6.1
	9 .0	12.0
	12.0	19.3
042	7.0	7.9
	10.5	15.5
	14.0	24.9
048	8.0	5.0
	12.0	10.5
	16.0	18.0
060	10.0	4.7
	15.0	10.5
	20.0	18.6
070	11.7	5.2
	17.5	13.2
	23.3	25.8

Table 5: SMH Unit Water Pressure Drop

Unit Size	GPM	Pressure Drop, FOH
007	1.2	1.2
	1.8	2.3
	2.3	3.4
009	1.5	1.5
	2.3	3.1
	3.0	4.9
012	2.0	2.7
	3.0	5.1
	4.0	8.1
015	2.5	3.0
	3.8	6.0
	5.0	9.4
019	3.2	4.5
	4.8	8.8
	6.3	13.9
024	4.0	5.7
	6.0	9.9
	8.0	14.7
030	5.0	5.2
	7.5	10.0
	10.0	15.9
036	6.0	3.2
	9 .0	6.7
	12.0	11.5
042	7.0	4.2
	10.5	8.9
	14.0	15.3
048	8.0	3.5
	12.0	7.5
	16.0	12.9
060	10.0	5.3
	15.0	11.5
	20.0	20.2

Table 6: SSH Unit Water Pressure Drop

Unit Size	GPM	Pressure Drop, FOH
007	1.2	3.3
	1.8	6.8
	2.3	10.5
009	1.5	6.3
	2.3	12.9
	3.0	20.0
012	2.0	4.4
	3.0	9.2
	4.0	15.5
015	2.5	1.2
	3.8	2.5
	5.0	4.2
019	3.2	1.6
	4.8	3.8
	6.3	6.8
024	4.0	2.8
	6.0	5.9
	8.0	10.1
030	5.0	2.0
	7.5	4.5
	10.0	8.1
036	6.0	3.2
	9 .0	6.8
	12.0	11.7
042	7.0	3.1
	10.5	6.6
	14.0	11.2
048	8.0	3.3
	12.0	7.0
	16.0	11.9
060	10.0	2.9
	15.0	6.2
	20.0	10.6
070	11.7	3.5
	17.5	7.5
	23.3	12.9

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:

1. 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.
2. Corrosion – Decomposition of the metal caused by absorption of gases from the air. Corrosion may occur in any metal component of the system.
3. 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.

"Water Quality Conditions and Applications" is a list of water characteristics, the potential impurities and their results and the recommended treatment.

NOTE: SSH models require the use of a strainer in the water supply.

Avoiding Potential Problems

As shown in Table 7, all water contains some degree of impurities which may affect the performance of a heat pump system. The use of a cupro-nickel coil can help avoid potential problems. Water flow rates should:

- Be high enough that the temperature rise through the heat exchanger does not exceed 12° F when operating in the cooling mode.
- Not exceed 4 GPM per nominal ton. Flow rates that have velocities of 10 feet per second or more may cause pipe erosion and heat exchanger failure.

Supply & Return Piping

Pre-Installation Considerations

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.

A direct return system may also work acceptably, but proper water flow balancing is more difficult to achieve and maintain. The piping can be steel or copper.

⚠ WARNING

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

Supply and return runouts usually join the unit via short lengths of high pressure flexible hose which are sound and vibration isolators for both unit operating noise and hydraulic pumping noise.

- One end of the hose should have a swivel fitting to facilitate removal for service.

Note: *Hard piping is not recommended since no vibration or noise attenuation can be accomplished.*

Table 7: Water Quality Conditions and Applications

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

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

2. Grains/gallon = ppm divided by 17.1.

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

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

Figure 5: Flexible Hose Kit #7

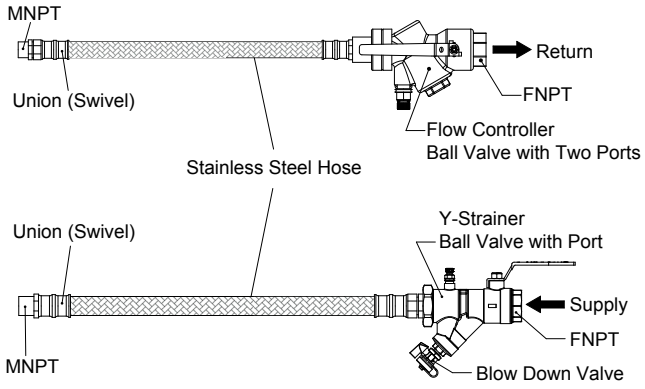
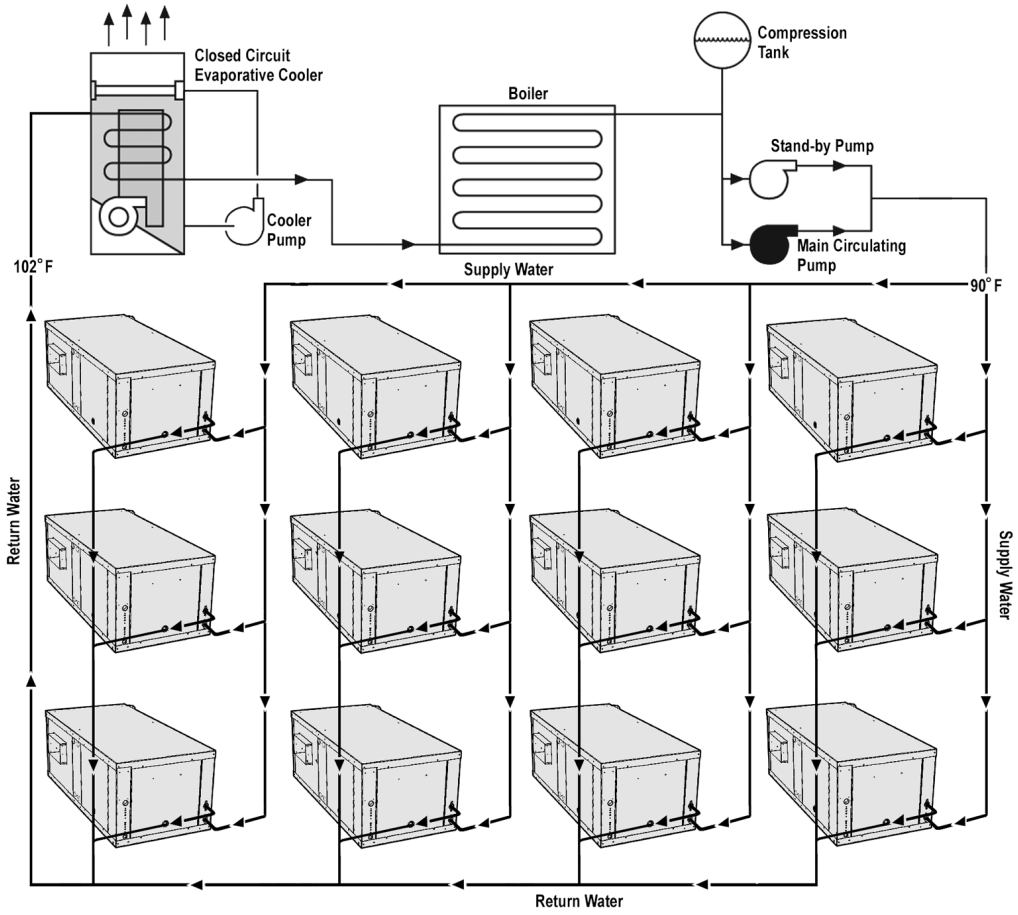


Figure 6: Example of A Reverse Return Piping System



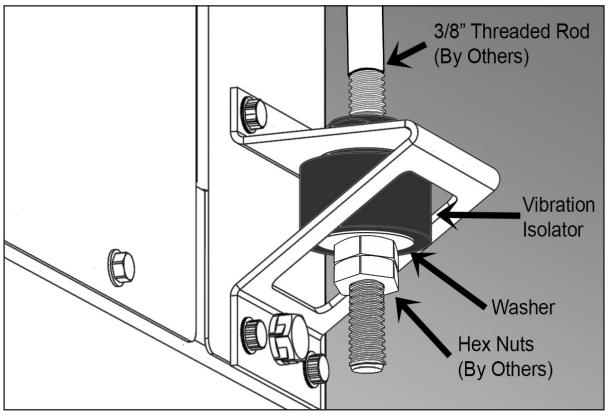
Installation Considerations

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

> **⚠ CAUTION**
>
> Do not use rods smaller than shown in Figure 7. The rods must be securely anchored to the ceiling or to the bar joists.

5. Each unit is furnished with a hanger kit. The hanger brackets are assembled to the unit. The rubber isolators, washers, bolts and lock washers are shipped and packed with the unit. Lay out the field-provided threaded rods per the dimension in Table 8.
6. When attaching the hanger rods to the unit, a double nut is recommended since vibration could loosen a single nut. The installer is responsible for providing the hex nuts when installing hanger rods.

Figure 7: Hanger Bracket Detail - Sizes 007 Through 070



7. Make sure the unit is installed level and leave a minimum 3" (76 mm) extra threaded rod below the double nuts or minimum 3" (76 mm) clearance between top of unit and ceiling above to facilitate top panel removal for servicing.
8. Remove all shipping blocks from the fan wheel, (Figure 9).

Hanger Bracket Locations

Figure 8: Hanger Bracket Locations Dimensions

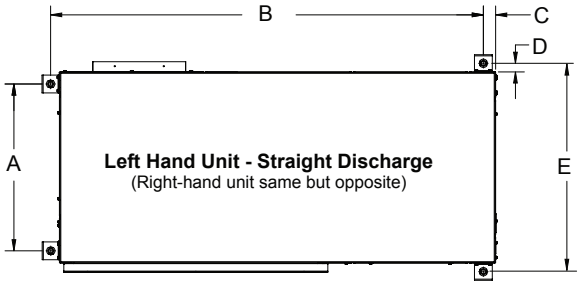


Table 8: SCH Hanger Brackets Dimensions

Unit Size	Dimensions - inches				
	A	B	C	D	E
007, 009, 012	19	34	1.4	1.0	11.5
015, 019	19	42			17
024, 030	20	43			17.3
036, 042	21.5	49			19
048, 060	24	54			21
070	24	65			21

Table 9: SMH Hanger Bracket Dimensions

Unit Size	Dimensions - inches				
	A	B	C	D	E
007, 009, 012	19	40	1.4	1.0	11.5
015, 019	20	43			17.3
024, 030	21.5	49			19
036, 042	24	54			19
048, 060	24	65			21

Table 10: SSH Unit Hanger Bracket Dimensions

Unit Size	Dimensions - inches				
	A	B	C	D	E
007, 009, 012	19	42	1.4	1.0	17
015, 019	21.5	49			19
024, 030	24	54			19
036, 042	24	65			21
048, 060, 070	24	79			21

Figure 9: Remove Foam Shipping Block From Fan Housing and Hardware Box, Applied Based on Fan Configuration

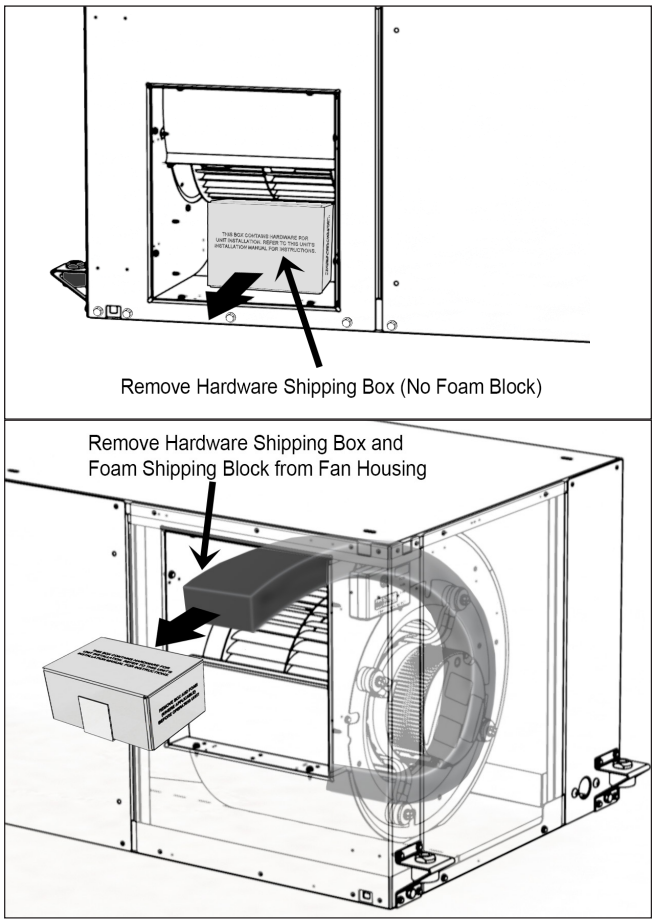


Figure 10: Recommended Clearances for Service Access

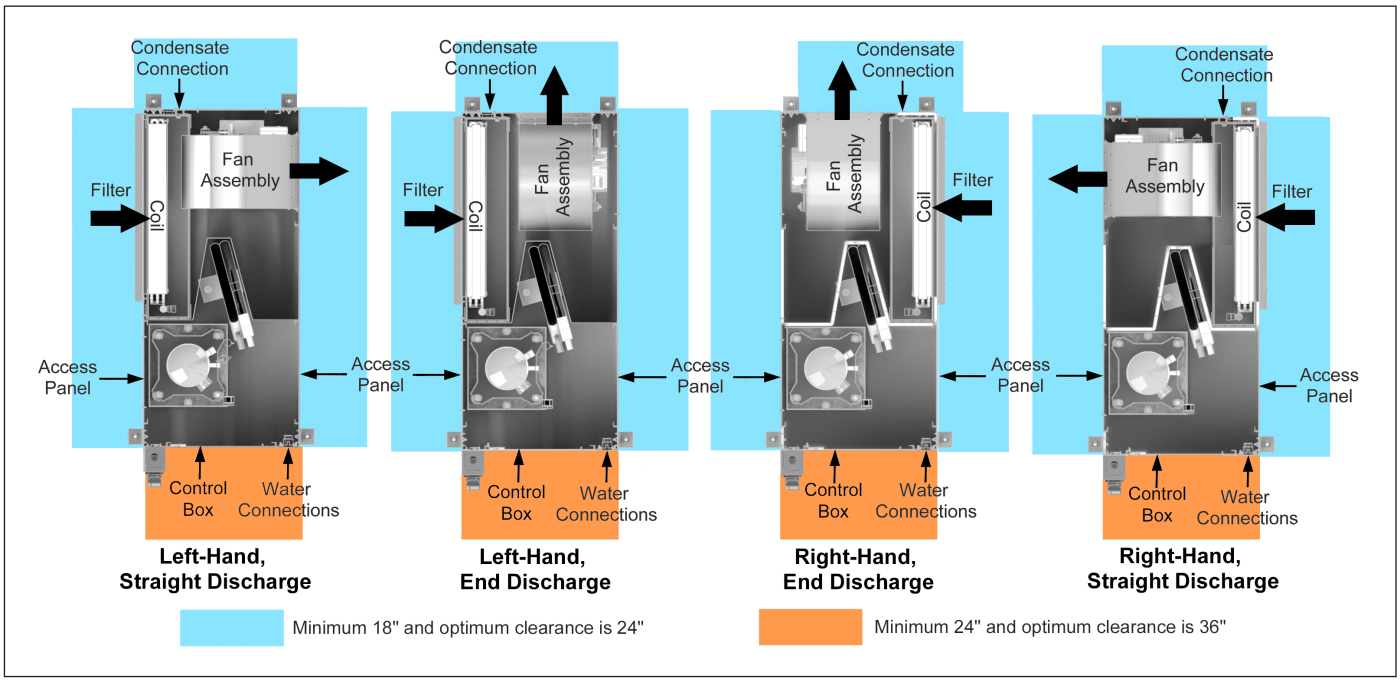
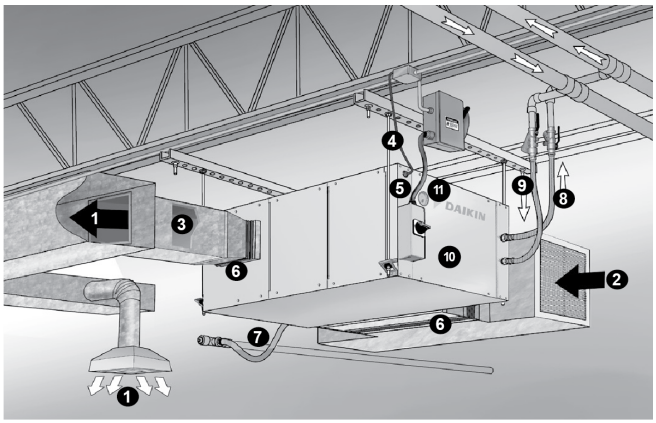


Figure 11: Horizontal Unit - Typical Installation In Ceiling



1. Discharge air
2. Return air
3. Acoustic thermal duct lining - 10 feet
4. Low voltage wiring to unit control box
5. Line voltage to optional non-fused disconnect switch
6. Flexible duct collar(s)
7. Condensate drain with trap
8. Flexible, braided, stainless steel return hose with flow controller/ball valve with port
9. Flexible, braided, stainless steel supply hose with Y-strainer/ball valve with port
10. Access to unit control box
11. LED annunciator lights sight glass to view unit operation status and faults

⚠ WARNING

Clearance should be maintained to meet local and national code requirements.

Discharge Air Conversion

A straight discharge unit may be converted to an end discharge by doing the following:

Note: *The information covered in this section of the blower assembly orientation is typical of Daikin Applied units. Regardless, if you are changing end to straight or straight to end the blower assembly has to turn 90 degrees and simultaneously rotate 180 degrees to achieve the proper orientation. Not all Daikin Applied units will have the same air discharge location but will have the same general results when following the instructions.*

⚠ DANGER

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

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

⚠ CAUTION

Sharp edges can cause minor injury. Avoid contact with them.

1. Perform conversion prior to installing the unit.
2. Remove the bolts securing the hanger bracket as indicated in Figure 12. Remove the (8) screws around the perimeter of the panel and fan assembly.

   Note: Retain all screws for reinstalling.
3. Disconnect power wiring from the fan motor. EC motors will require removal of control wire plug.
4. Lift the fan assembly out rotating it 180 degrees and position it within the opening at the end of the unit. The fan motor should be accessible through the available access panel when installed properly.
5. Secure the fan assembly to the unit frame with the screws removed previously.
6. Reinstall the access panel in the fan motor access opening (Figure 12).

Ductwork and Attenuation

Discharge duct shall be used with these units. Where return air ductwork is required, the unit comes standard with a 1" thick, factory-installed disposable filter, mounted in a 2-sided filter rack. The filter can be easily removed from either side. A 2" deep 4-sided, gasketed filter rack is available as a factory-installed option to accept a 2" Merv 8 filter. Also available a 4" deep, 4-sided, gasketed filter rack with a 4" Merv 13 filter.

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

A field supplied discharge duct system will normally consist of:

- a flexible connector at the unit
- a 10 foot length of insulated duct
- and a trunk duct teeing into a branch circuit with discharge diffusers

Figure 12: Converting Discharge Air

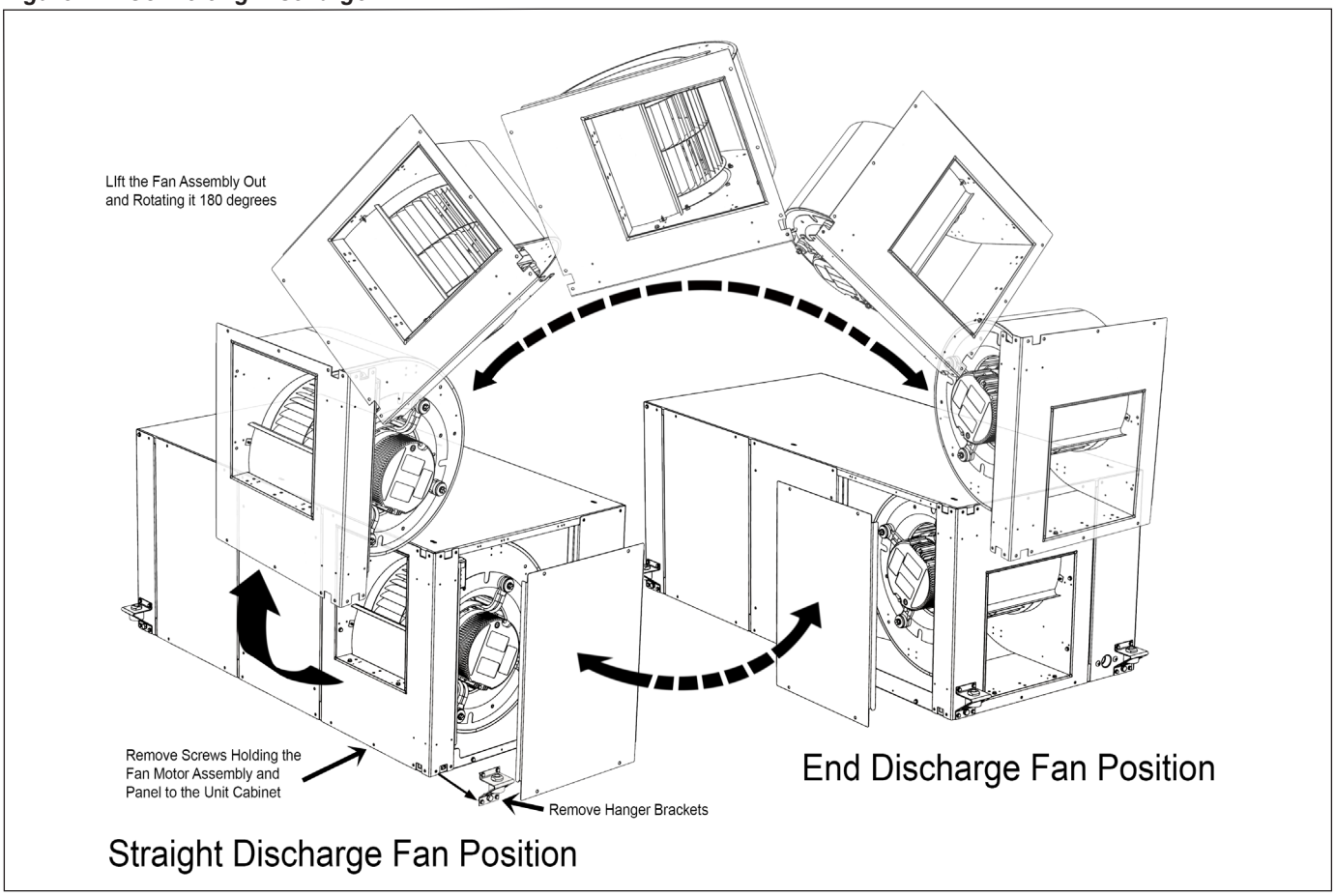
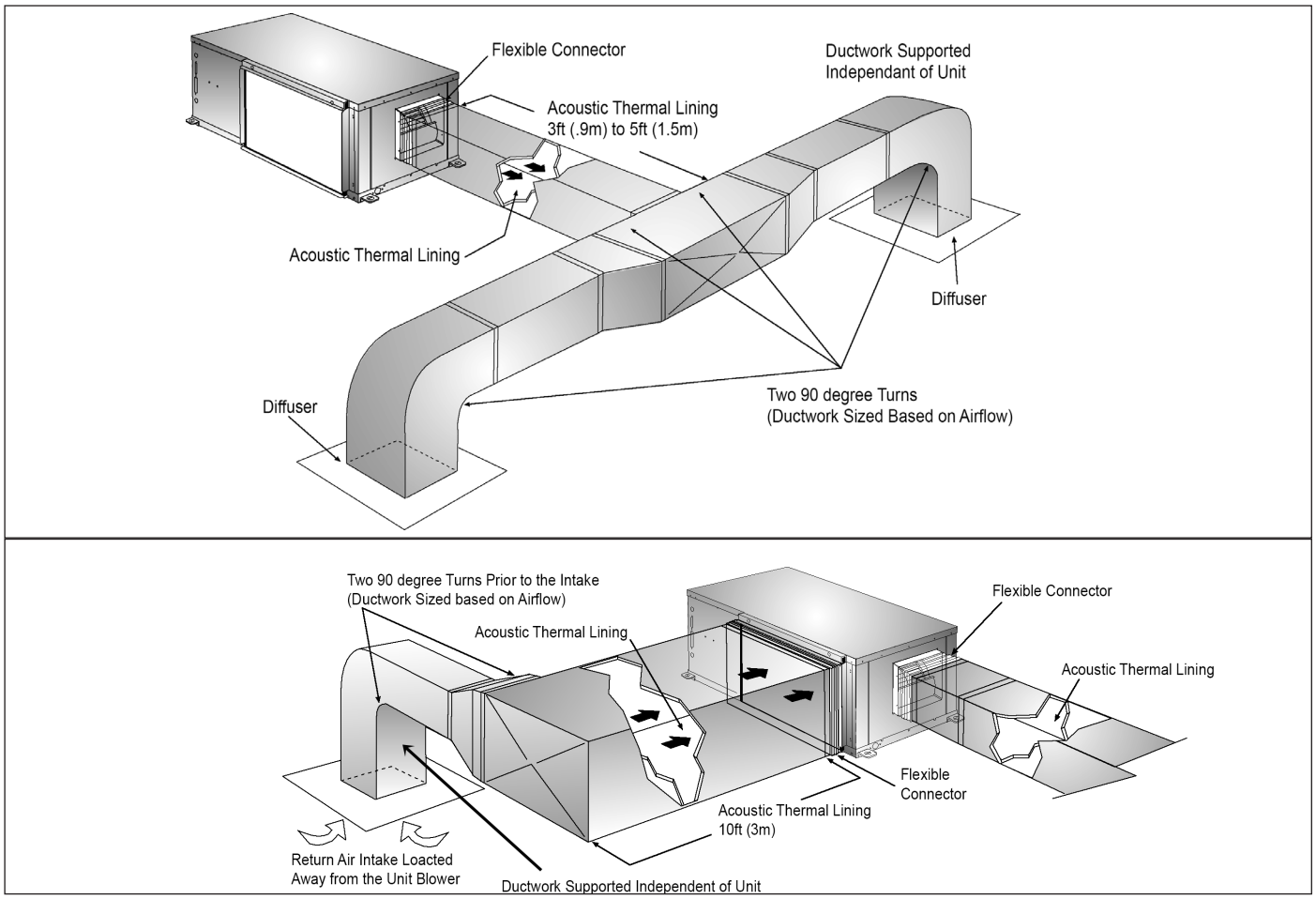


Figure 13: Typical Ducting for Horizontal Unit



Notes: *1. Transformation to supply duct have maximum slope of 1" in 7".*

2. Square elbows with double thickness vanes may be substituted.

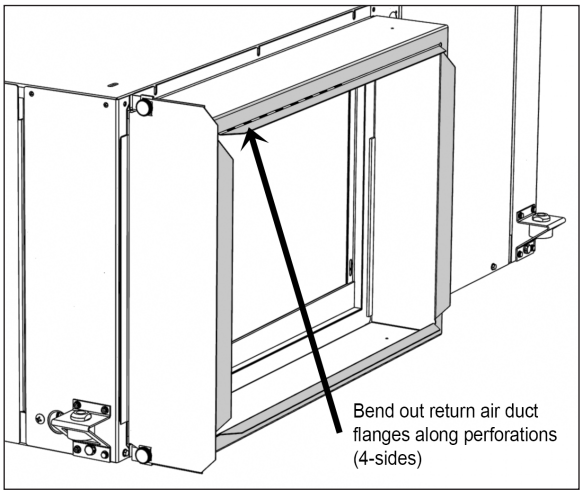
3. Do not install ducts so that the air flow is counter to fan rotation. If necessary, turn fan section.

4. Transformations and units must be adequately supported so no weight is on the flexible fan connection.

Air Duct Connections

1. Bend the perforated supply and return air duct flanges out 90 degrees with wide duct pliers.

Figure 14: Bend Duct Flanges Out 90 Degrees



Note: It is recommended that a field supplied flexible (boot) connector is attached to the flanges to isolate vibration. See Figure 13.

2. Connect the flexible boot connector and duct to the flanges. Screws used to secure supply duct should be inserted in the duct flange only.

Note: *Screws should not be installed through the unit cabinet. Installation of screws through the unit cabinet may contact with refrigerant piping voiding warranty. The unit cabinet should not be cut or altered for installation of accessories.*

⚠ WARNING

If for any reason the perforated supply or return duct flanges are not required they must be bent out 90 degrees or removed.

Installation

Filter Rack, Return Duct Collar Dimensions

Figure 15: Filter Rack, Return Duct Collar Dimensions

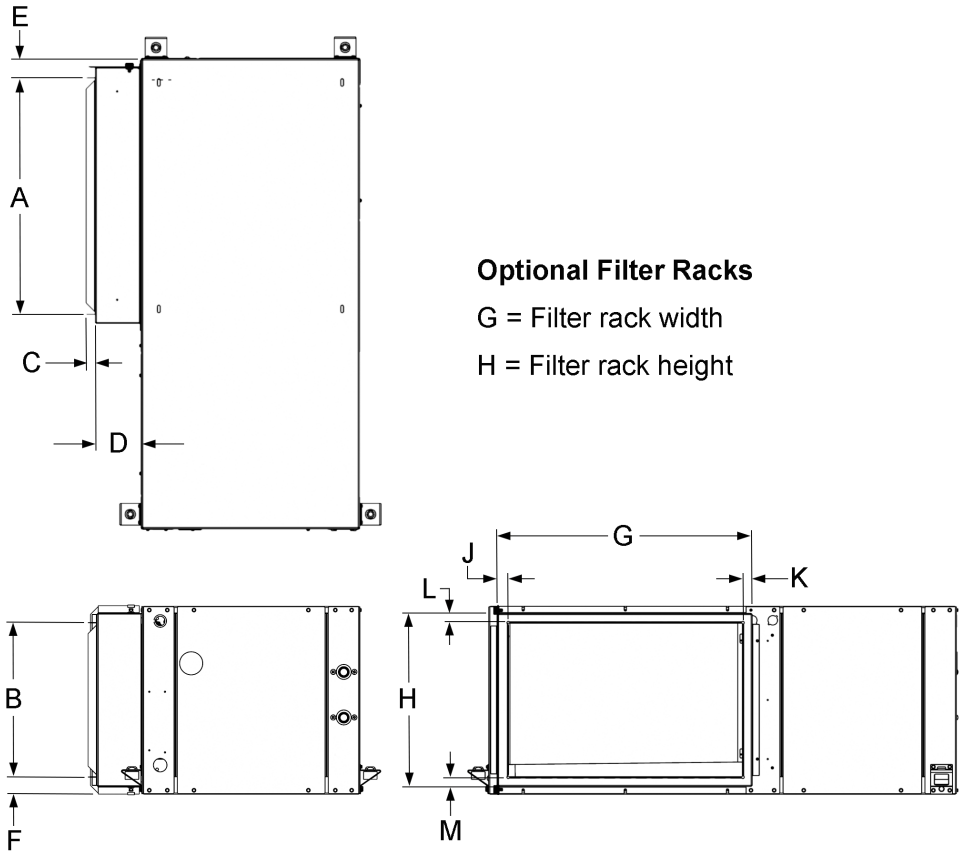


Table 11: SCH Letter Dimensions for Figure 15

Unit Size	*A	*B	C	D		E	F	G	H	*J	*K	*L	*M
				2-inch	4-inch								
007, 009, 012	16.2	8.5	0.9	2.2	4.2	1.7	1.5	17.8	10.0	1.0	0.8	0.8	0.8
015, 019	22.2	14.0	0.9	2.2	4.2	1.7	1.5	23.8	15.6	1.0	0.8	0.8	0.8
024, 030	21.7	14.5	0.9	2.2	4.2	1.7	1.5	23.4	15.9	1.0	0.8	0.8	0.8
036	27.2	16.0	0.9	2.2	4.2	1.7	1.5	28.9	17.6	1.0	0.8	0.8	0.8
042	27.2	16.0	0.9	2.2	4.2	1.7	1.5	28.9	17.6	1.0	0.8	0.8	0.8
048	31.4	18.0	0.9	2.2	4.2	1.7	1.5	33.2	19.6	1.0	0.8	0.8	0.8
060	31.4	18.0	0.9	2.2	4.2	1.7	1.5	33.2	19.6	1.0	0.8	0.8	0.8
070	44.2	18.0	0.9	2.2	4.2	2.0	1.5	44.9	19.6	1.0	0.8	0.8	0.8

Table 12: SMH Letter Dimensions for Figure 15

Unit Size	*A	*B	C	D		E	F	G	H	*J	*K	*L	*M
				2-inch	4-inch								
007, 009, 012	22.2	8.5	0.8	2.2	4.2	1.7	1.5	23.8	10	1.0	0.8	0.8	0.8
015, 019	21.7	14.5	0.8	2.2	4.2	2.0	1.5	23.4	15.9	1.0	0.8	0.8	0.8
024, 030	27.2	16.0	0.8	2.2	4.2	1.7	1.5	28.9	17.6	1.0	0.8	0.8	0.8
036	31.4	16.0	0.8	2.2	4.2	1.7	1.5	33.1	17.6	1.0	0.8	0.8	0.8
042	31.4	16.0	0.8	2.2	4.2	1.7	1.5	33.1	17.6	1.0	0.8	0.8	0.8
048	43.2	18.0	0.8	2.2	4.2	2.0	1.5	44.9	19.6	1.0	0.8	0.8	0.8
060	43.2	18.0	0.8	2.2	4.2	2.0	1.5	44.9	19.6	1.0	0.8	0.8	0.8

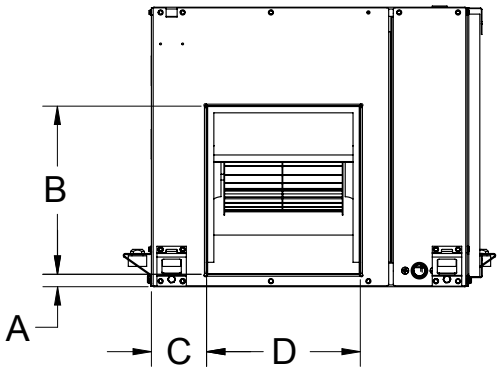
Table 13: SSH Letter Dimensions for Figure 15

Unit Size	*A	*B	C	D		E	F	G	H	*J	*K	*L	*M
				2-inch	4-inch								
007, 009, 012	22	14.0	0.8	2.2	4.2	1.7	1.5	24	15.6	1.0	0.8	0.8	0.8
015, 019	27.1	16.0	0.8	2.2	4.2	1.7	1.5	29	17.6	1.0	0.8	0.8	0.8
024, 030	31.4	16.0	0.8	2.2	4.2	1.7	1.5	33.1	17.6	1.0	0.8	0.8	0.8
036	43.2	18.0	0.8	2.2	4.2	1.7	1.5	44.9	19.6	1.0	0.8	0.8	0.8
042	43.2	18.0	0.8	2.2	4.2	1.7	1.5	44.9	19.6	1.0	0.8	0.8	0.8
048	47.2	18.0	0.8	2.2	4.2	2.0	1.5	48.9	19.6	1.0	0.8	0.8	0.8
060	47.2	18.0	0.8	2.2	4.2	2.0	1.5	48.9	19.6	1.0	0.8	0.8	0.8
070	47.2	18.0	0.8	2.2	4.2	2.0	1.5	48.9	19.6	1.0	0.8	0.8	0.8

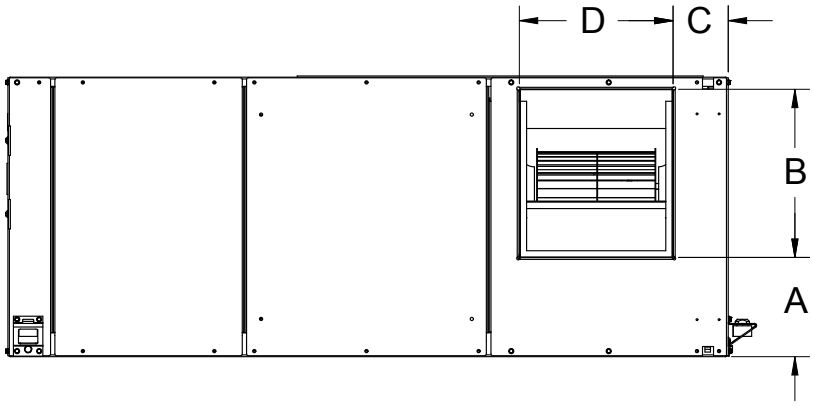
NOTE: *Filter rack flange dimensions are to the outside edge of the flange when bent out to 90 degrees at perforations.
Dimensions are approximate and dependent on degree of bend.

Discharge Air Duct Collar Connections

Figure 16: SCH Discharge Air Duct Collars Locations and Dimensions



End Discharge



Straight Discharge

Table 14: SCH Discharge Duct Collar Letter Dimensions for Figure 16.

Unit Size	End Discharge				Straight Discharge			
	A	B	C	D	A	B	C	D
007, 009, 012	1.5	5.0	3.0	9.5	5.5	5.0	3.0	9.25
015, 019	1.0	10.5	3.0	9.5	5.5	10.5	3.0	9.25
024, 030	1.0	10.5	3.5	9.5	6.0	10.5	3.5	9.25
036	1.5	10.5	4.5	9.5	7.5	10.5	4.5	9.25
042	1.0	11.5	4.0	10.5	6.5	11.5	3.75	10.5
048	3.0	11.5	5.0	10.5	6.5	11.5	5.25	10.25
060	3.0	11.5	5.0	10.5	6.5	11.5	5.25	10.25
070	2.5	13.5	4.5	13.0	5.0	13.5	4.5	13.0

Table 15: SMH Dishcharge Duct Collar Letter Dimensions for Figure 16.

Unit Size	End Discharge				Straight Discharge			
	A	B	C	D	A	B	C	D
007, 009, 012	5.5	5.0	3.0	9.5	1.5	5.0	3.0	9.25
015, 019	1.0	10.5	3.5	9.5	6.0	10.5	3.5	9.25
024, 030	1.0	10.5	5.0	9.5	8.0	10.5	5.0	9.25
036	1.0	10.5	6.0	9.5	6.0	10.5	5.75	9.25
042	1.0	11.5	5.5	10.5	6.5	11.5	5.25	10.5
048	3.0	11.5	5.5	10.5	6.5	11.5	5.25	10.5
060	3.0	11.5	4.5	13.0	5.0	11.5	4.5	13.0

Table 16: SSH Dishcharge Duct Collar Letter Dimensions for Figure 16.

Unit Size	End Discharge				Straight Discharge			
	A	B	C	D	A	B	C	D
007, 009, 012	4.0	5.0	3.0	9.5	8.0	5.0	3.0	9.25
015, 019	1.5	10.5	4.5	9.5	7.5	10.5	4.5	9.25
024, 030	2.5	10.5	6.0	9.5	6.0	10.5	5.75	9.25
036	3.5	10.5	6.0	9.5	7.5	10.5	5.75	9.25
042	3.0	11.5	5.5	10.5	6.5	11.5	5.25	10.5
048	3.0	11.5	5.5	10.5	6.5	11.5	5.25	10.5
060	2.5	13.5	4.5	13.0	5.0	13.5	4.5	13.0
070	2.5	13.5	4.5	13.0	5.0	13.5	4.5	13.0

Notes: *1. Filter rack flange dimensions are to the outside edge of the flange.*

** Unit size 070 uses two (2) filters when standard filters are selected, where dimension "X" (height) = the overall outside edge dimension.*

Electrical Connections

Figure 17: Horizontal Unit Electrical Locations

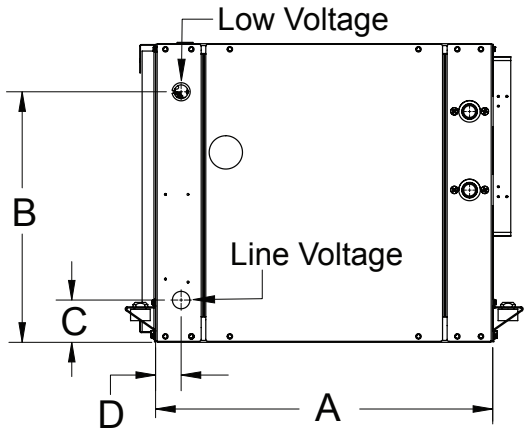


Table 17: SCH Electrical Connections Locations

Unit Size	A Unit Width	B	C	D
007, 009, 012	19.0	10.4	2.6	1.6
015, 019		15.7	2.7	
024, 030	20.0	15.9		
036, 042	21.5	15.9		
048, 060, 070	24.0	17.7		

Table 18: SMH Electrical Connections Locations

Unit Size	A Unit Width	B	C	D
007, 009, 012	19.0	1.4	2.6	1.6
015, 019	20.0	15.9	2.7	
024, 030	21.5			
036	23.9			
042				
048		17.7		
060				

Table 19: SSH Electrical Connections Locations

Unit Size	A Unit Width	B	C	D
007, 009, 012	18.9	10.4	2.7	1.6
015, 019	21.5	15.9		
024, 030, 036, 042, 048, 060, 070	24.0	17.7		

Table 20: Operating Voltages

Voltage	Minimum	Maximum
115/60/1	103	126
208-230/60/1	197	253
265/60/1	238	292
208-230/60/3	197	253
460/60/3	414	506
575/60/3	515	632

NOTE: 1. Three-phase system imbalance shall not exceed 2%.
2. Use a short length of flexible conduit at the unit connection to minimize and isolate vibration to the building. All conduit should be supported to avoid contact with unit cabinet or immediate building structure to prevent unnecessary noise.

⚠ WARNING

All field installed wiring must comply with local and national electrical codes. This equipment presents hazards of electricity, rotating parts, sharp edges, heat and weight. Failure to read and follow these instructions can result in property damage, personal injury or death. This equipment must be installed by experienced, trained personnel only.

⚠ CAUTION

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

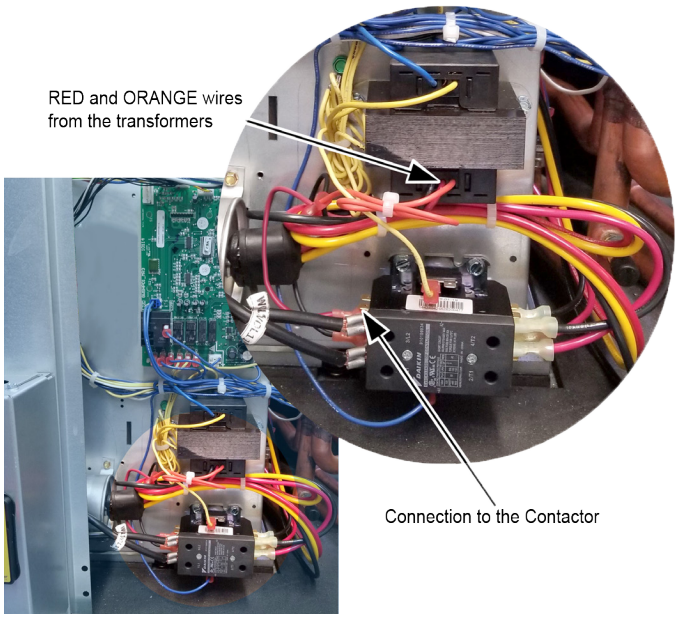
⚠ WARNING

Use copper conductors only. Conductors must be minimum 75°C.

230 Volt Operation

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

Figure 18: For 230 Volt Operation, Disconnect the RED transformer wire at the contactor and replace with the ORANGE wire



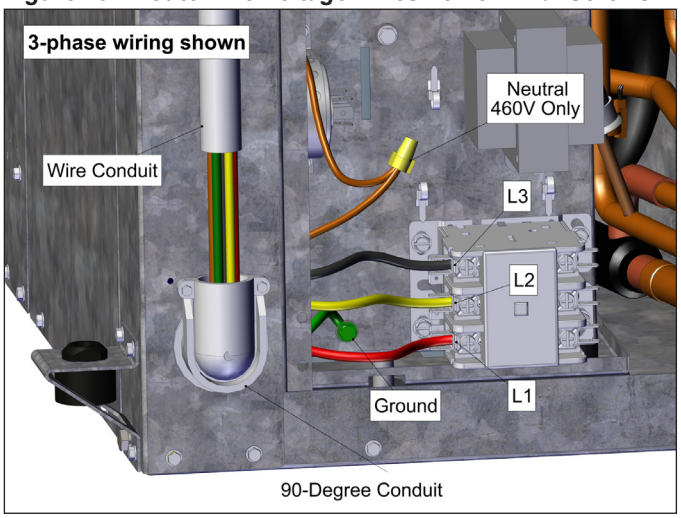
Three-Phase Line Voltage (208-230, 460, 575V)

⚠ DANGER

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

1. Route line voltage supply wiring through the lower 1-1/8" diameter knockout in the left corner post.
2. Wires should extend through the lower left side of the control box. Route wires through wire ties where provided.
3. Remove and discard the factory provided stripped wire leads from the left side unit contactor screw terminals (not shown).
4. Connect the field supplied wires to the left side contactor screw terminals as shown in Figure 19.
5. Connect ground wire to provided (green) ground screw
6. Twist neutral wires and wire nut (460V units only)

Figure 19: Route Line Voltage Wires To Terminal Screws



Note: *Units without constant EC motor will not include a neutral conductor. For clarity, not all unit wires are shown in the unit line voltage connection area.*

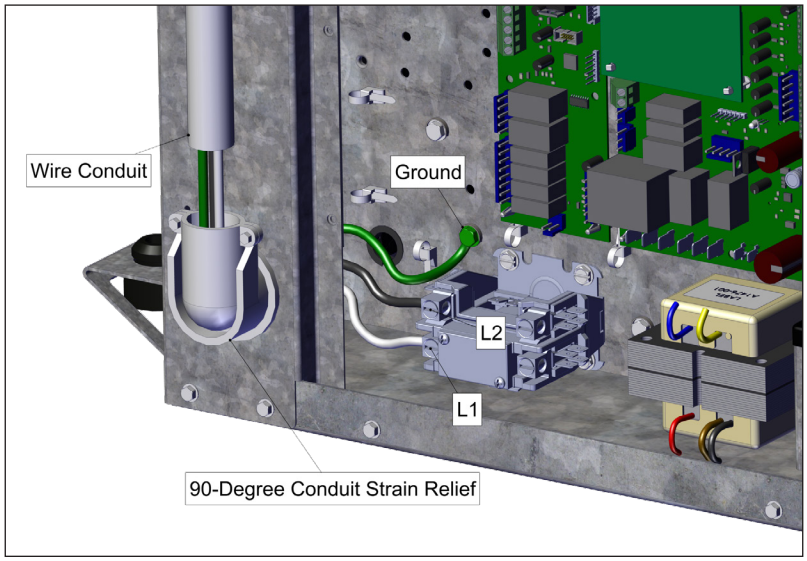
Single Phase Line Voltage (115, 208-230, 265V)

⚠ DANGER

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

1. Route line voltage supply wiring through the lower 1-1/8" diameter electrical knockout in the left corner post.
2. Route wires through wire ties where provided.
3. Connect the field supplied wires to the left side contactor screw terminals as shown in Figure 20.
4. Secure ground wire to (green) ground screw.

Figure 20: Line Voltage Wiring Route To Wire Connections



Non-Fused Disconnect Switch

Figure 21: Optional Non-Fused Disconnect Switch Location and Dimensions

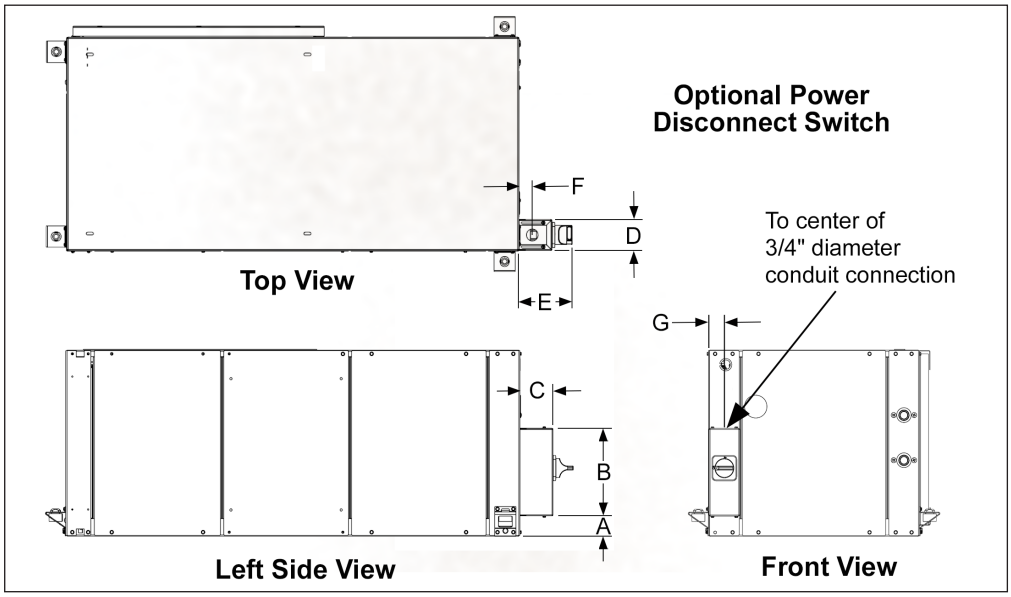


Table 21: SCH Unit Dimensions

Unit Size	A	B	C	D	E	F	G
All Sizes*	1.75	8.1	3.1	3.0	4.7	1.0	1.5

Table 22: SMH Unit Dimensions

Unit Size	A	B	C	D	E	F	G
007, 009, 012	1.75	8.25	3.0	3.0	4.7	1.0	1.5
015, 019	1.75	8.25	3.0	3.0	4.7	1.0	1.5
024, 030	1.75	8.25	3.0	3.0	4.7	1.0	1.5
036	1.75	8.25	3.0	3.0	4.7	1.0	1.5
042	1.75	8.25	3.0	3.0	4.7	1.0	1.5
048	1.75	8.25	3.0	3.0	4.7	1.0	1.5
060	1.75	8.25	3.0	3.0	4.7	1.0	1.5

Table 23: SSH Unit Dimensions

Unit Size	A	B	C	D	E	F	G
007, 009, 012	1.75	8.25	3.0	3.0	4.7	1.0	1.5
015, 019	1.75	8.25	3.0	3.0	4.7	1.0	1.5
024, 030	1.75	8.25	3.0	3.0	4.7	1.0	1.5
036	1.75	8.25	3.0	3.0	4.7	1.0	1.5
042	1.75	8.25	3.0	3.0	4.7	1.0	1.5
048	1.75	8.25	3.0	3.0	4.7	1.0	1.5
060	1.75	8.25	3.0	3.0	4.7	1.0	1.5
070	1.75	8.25	3.0	3.0	4.7	1.0	1.5

Line Voltage Electrical Connections With Disconnect – 115-575V

⚠ DANGER

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

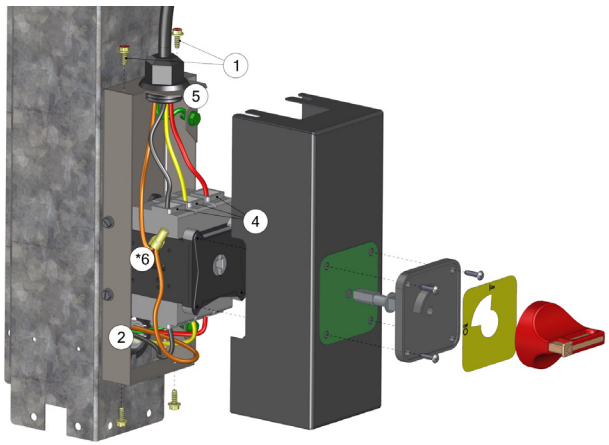
When units are equipped with the optional non-fused disconnect switch, the line voltage supply is brought in through the top of the junction box. Disconnect location and dimension details are provided in Figure 22.

NOTE: The disconnect location may vary depending on the return air handing. See Figure 22. Right-hand unit shown, with switch mounted on the opposite corner post from return air.

460V units with constant CFM EC motor require a neutral conductor. See number bubble “6” in Figure 22.

1. Remove screws from the top and bottom locations on the disconnect switch cover.
2. These are the factory-installed wires from the switch to the line voltage terminals in the unit control box.
3. Connect wires to the upper unused terminals.
4. Tighten terminal screws to secure wires.
5. Connect ground wire to provided green ground screw.
6. Connect field provided neutral conductor, if required.
7. Replace cover and secure with screws.

Figure 22: 460V Wiring With Neutral Wire (*Constant CFM EC Motors Only) To The Non-Fused Disconnect Switch



Low Voltage Wire Connections

Notes: *1. Never install relays coils in series or parallel with the thermostat inputs.*

2. Units equipped with dehumidification control require installation of a factory supplied return air sensor connected to I/O H4-3/4 terminal. See Figure 28 on page 37 for details.

1. Route the field-supplied low voltage wiring through the upper knockout in the left corner post as shown in Figure 23.

1. Secure the low voltage wire connections to the terminals shown in Figure 23, Figure 24. Refer to Figure 25 on page 35 for I/O Expansion Module terminal TB1-1 connection.

Figure 23: Terminal Connection Locations on the MicroTech Board

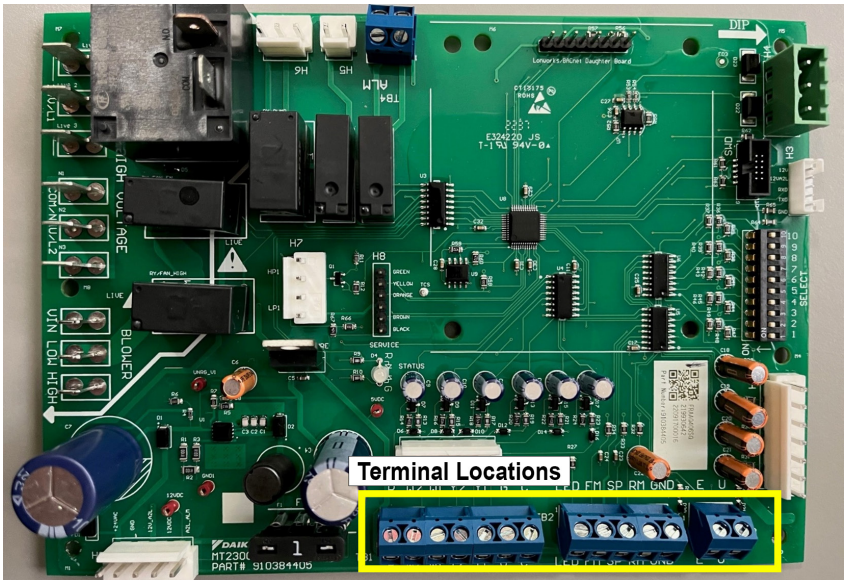
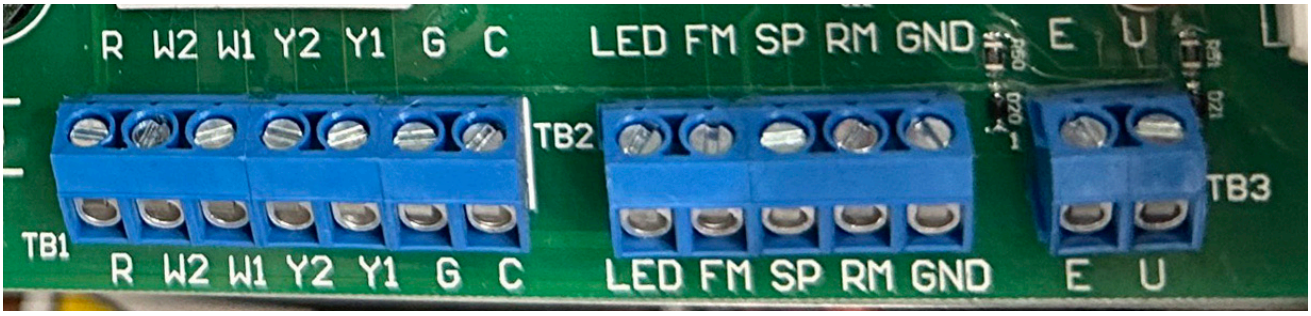
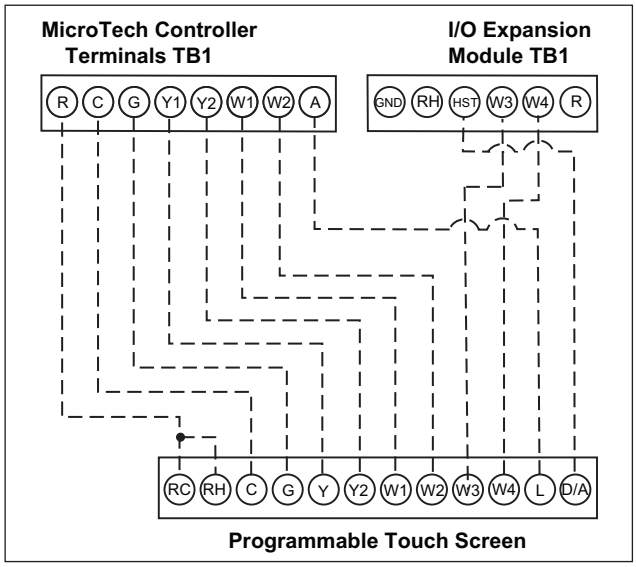


Figure 24: Terminal Connections TB1 (Thermostat Control) and TB2 (Sensor Control) on the MicroTech Board



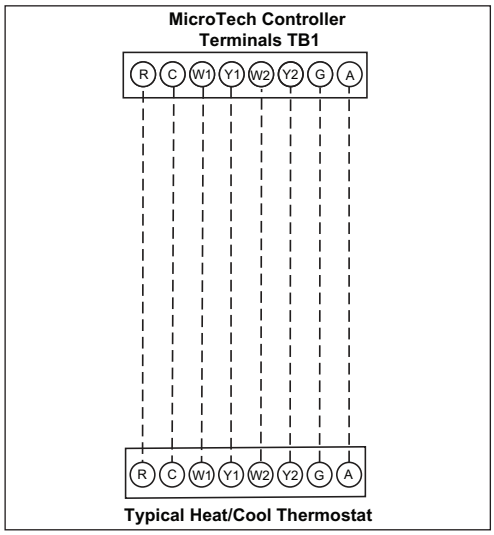
Typical Connections For Thermostats & Temperature Sensors Applications

Figure 25: Wiring Example for Two-Stage Thermostat with Electrical Heat and Hot Gas Reheat. (Y2 Connection On MircoTech Controller Should Be Used To Achieve Rated Capacity)



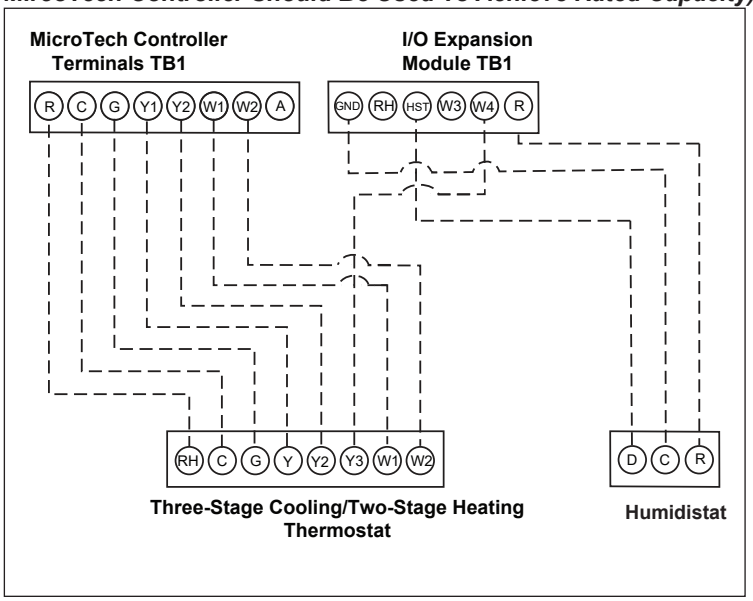
Note: *I/O Expansion Module Terminal TB1-1 is used for optional dehumidification. I/O Expansion Module Terminal TB1-1 is used for optional WSE operation on a unit with WSE but no dehumidificaiton.*

Figure 26: Wiring Example of Typical Heat/Cool Thermostat Connections



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

Figure 27: Wiring Example for Two-Stage Thermostat with Electrical Heat and Hot Gas Reheat. (Y2 Connection On MircoTech Controller Should Be Used To Achieve Rated Capacity)



Note: *For dehumidification with waterside economizer applications, the W4 connection On I/O Expansion Module is used as the third stage of cooling and to achieve rated capacity*

Figure 28: Units Equipped with Dehumidification and Thermostat Control. Factory Supplied Return Air Sensor Connects To I/O H4-3/4 Terminal.

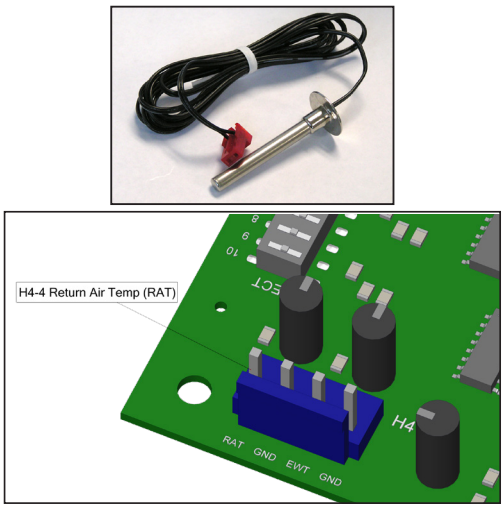


Figure 29: Return Air Temperature Sensor (RAT) locations

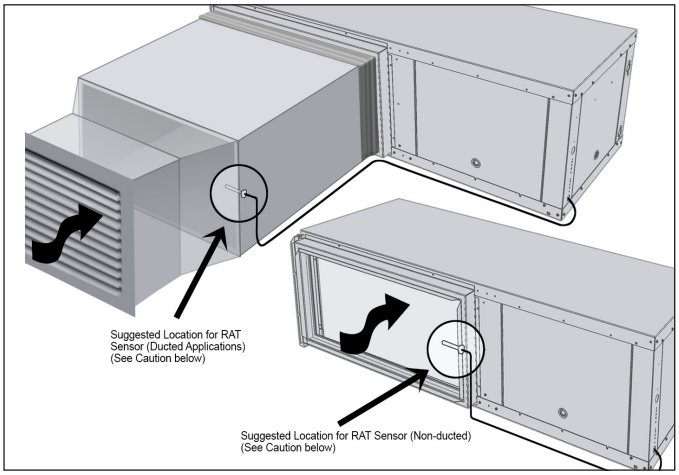


Figure 30: Basic Room Sensor Wiring

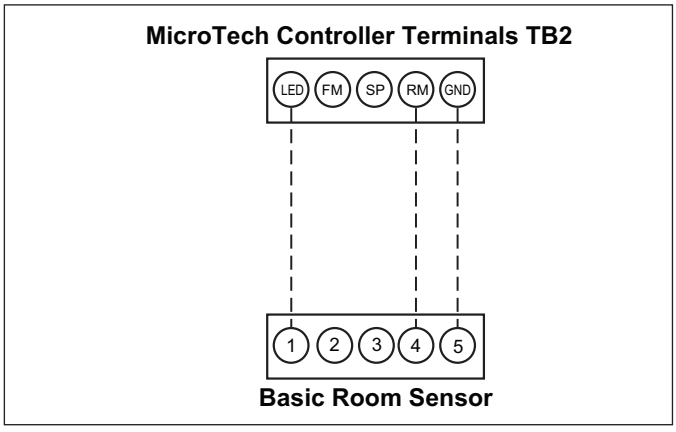


Figure 31: Example Wiring of SmartSource MicroTech Board To Basic Temperature Sensor Wiring

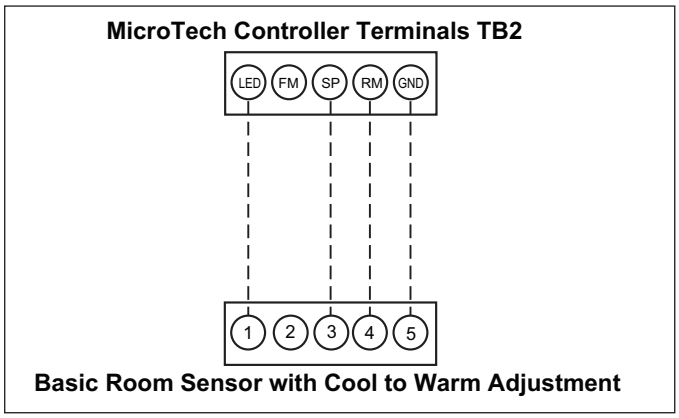


Figure 32: Room Sensor with Temperature Adjustment Wiring

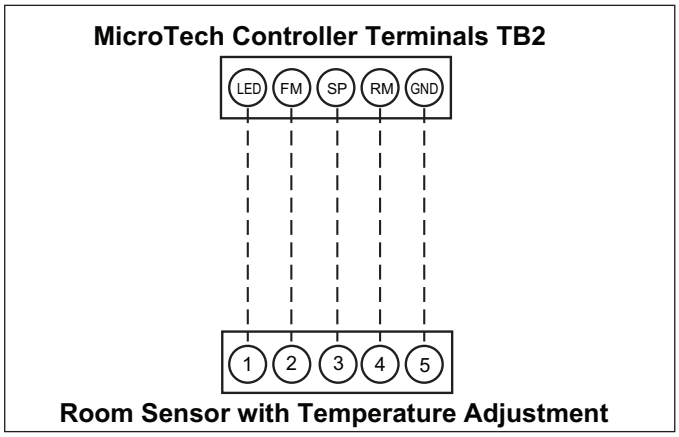


Figure 33: Digitally Adjustable Room Temperature Sensor Wiring

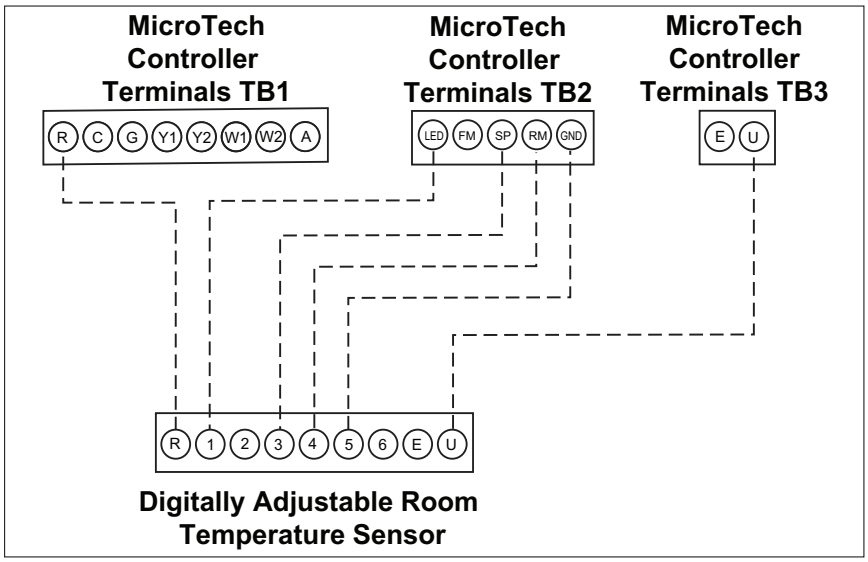
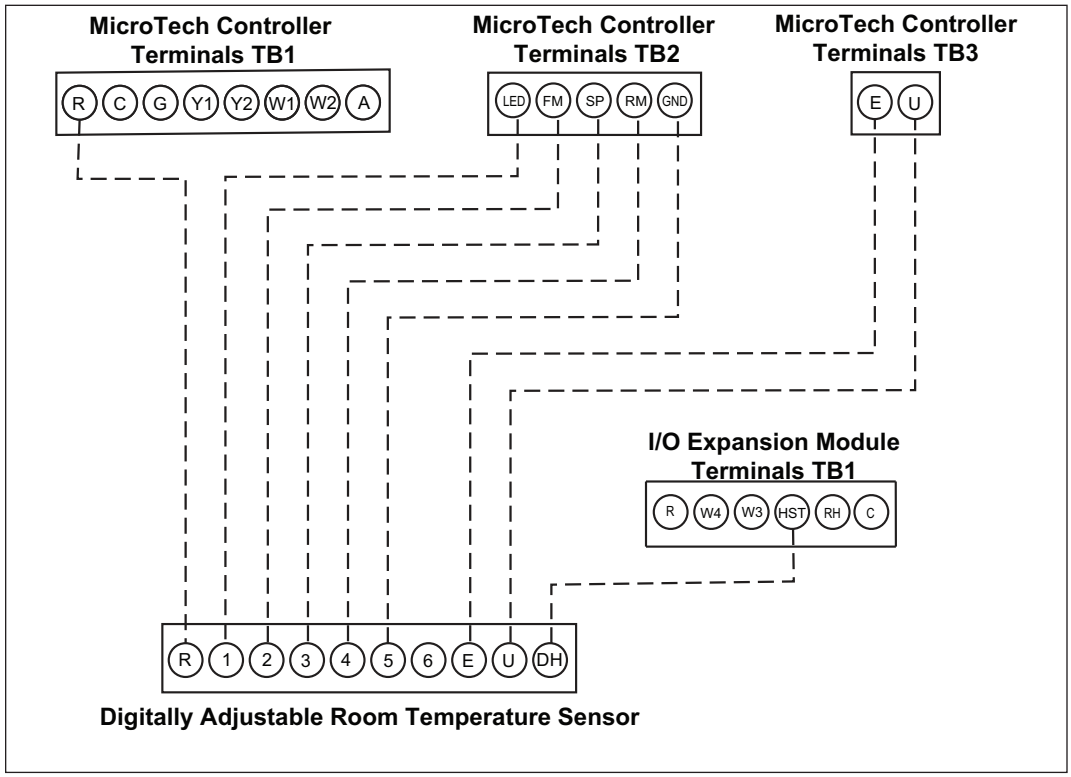
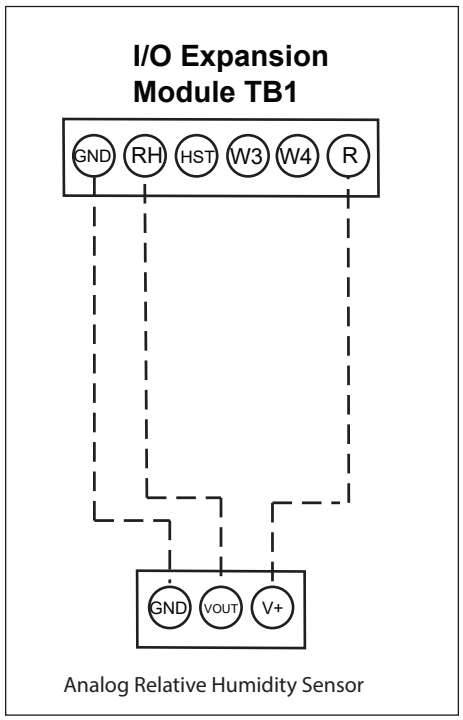


Figure 34: Digitally Adjustable Room Temperature and Humidity Sensor Wiring



Note: *Terminal TB1-1 is used for optional dehumidification operation.*

Figure 35: Analog Humidity Sensor Wiring

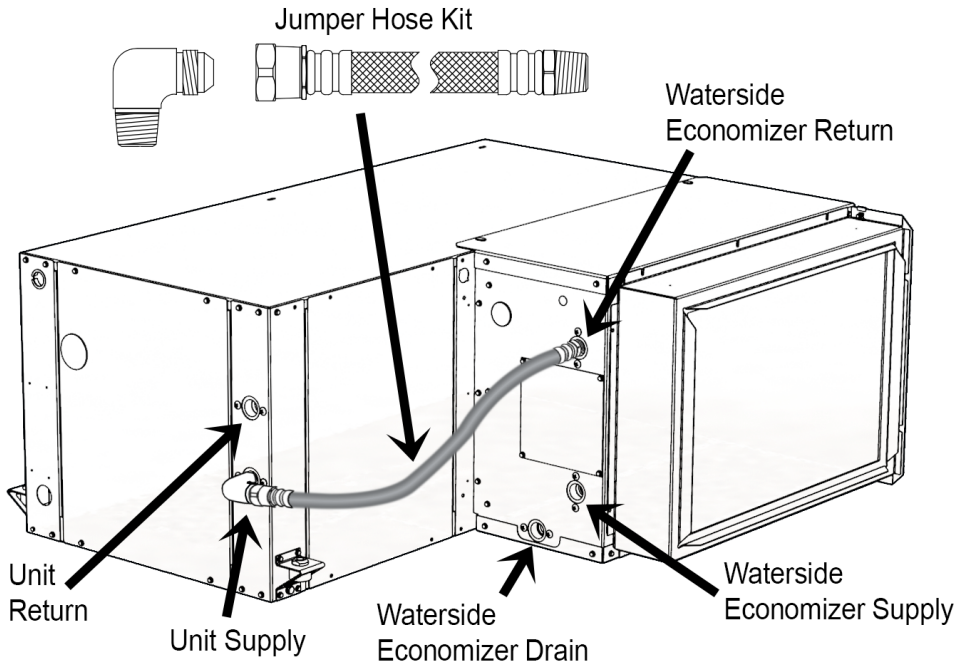


Note: *Analog humidity sensors are intended to be used in conjunction with a building management system to allow monitoring of relative humidity levels and adjustment of relative humidity setpoints for dehumidification. For standalone controller applications, a humidistat is recommende*

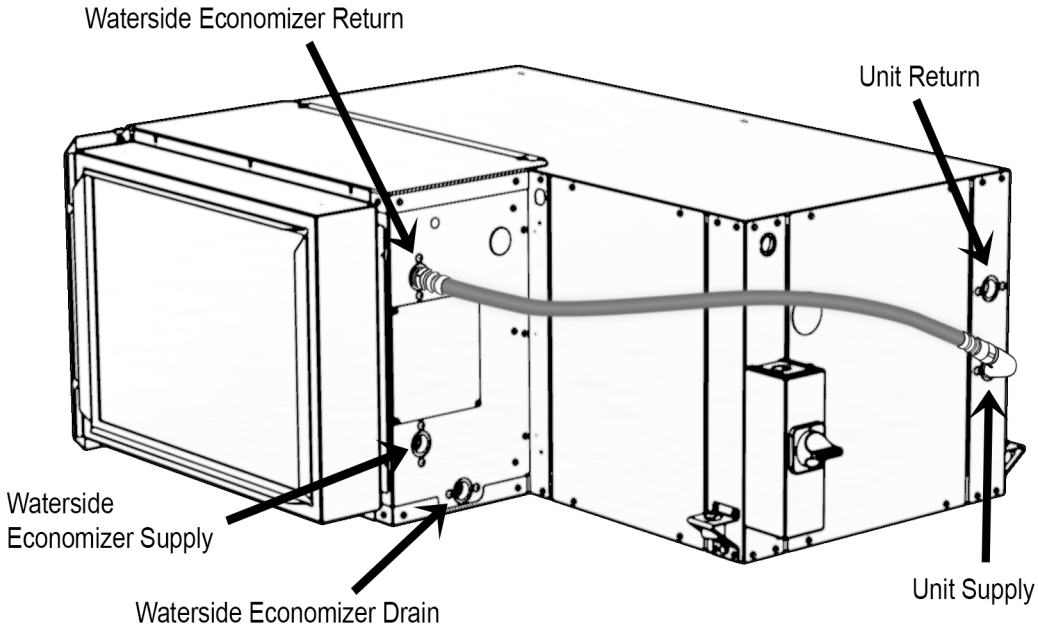
Piping Considerations

Units With Waterside Economizer

Figure 36: Unit with WSE Jumper Hose



Right-Hand Unit With Waterside Economizer Jumper Hose



Left-Hand Unit With Waterside Economizer Jumper Hose

Note: *The economizer package incorporates its own drain pan to collect condensate from the coil. This pan MUST be independently trapped and can be piped into the drain line for the heat pump.*

Waterside Economizer Piping Locations and Dimensions

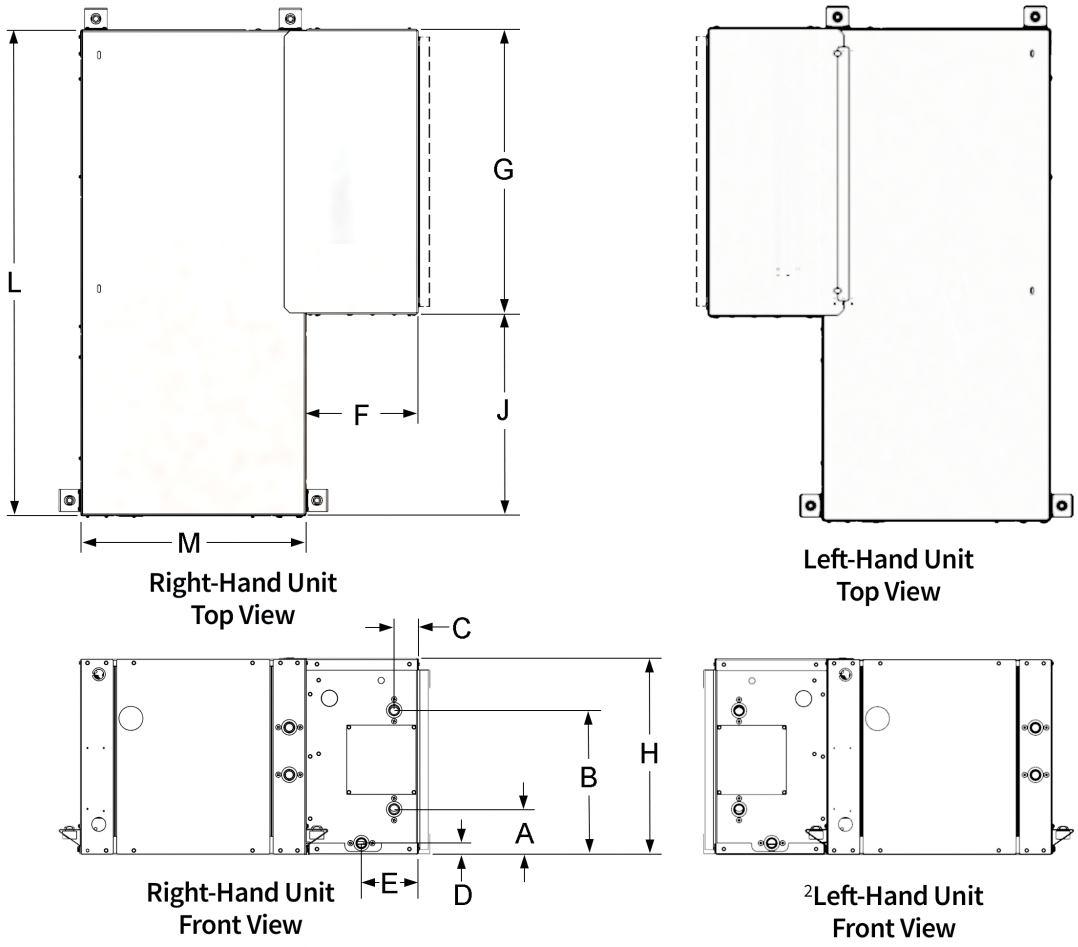


Table 24: SCH Unit with Waterside Economizer - Dimensions

Unit Size	WSE Supply & Return Connections				WSE 3/4" FPT Condensate Drain		Waterside Economizer Overall Cabinet Section			L	M
	Connection Size (FPT)	A (Supply)	B (Return)	C	D	E	F	G	H		
007, 009, 012	1/2"	2.8	9.7	2.5	1.0	5.0	10.0	19.5	11.6	34.0	19.0
015, 019	1/2"	4.0	12.5	2.0	1.0	5.0	10.0	25.5	17.1	42.0	19.0
024, 030	3/4"	4.0	12.5	2.0	1.0	5.0	10.0	25.5	17.4	43.0	20.0
036, 042	3/4"	3.5	13.5	2.0	1.0	5.0	10.0	31.0	19.1	49.0	21.5
048, 060	1"	3.5	15.5	1.5	1.0	5.0	10.0	35.0	21.1	54.0	24.0
070	1"	3.5	15.5	2.5	1.0	5.0	10.0	46.5	21.1	65.0	24.0

Table 25: SMH Unit with Waterside Economizer - Dimensions

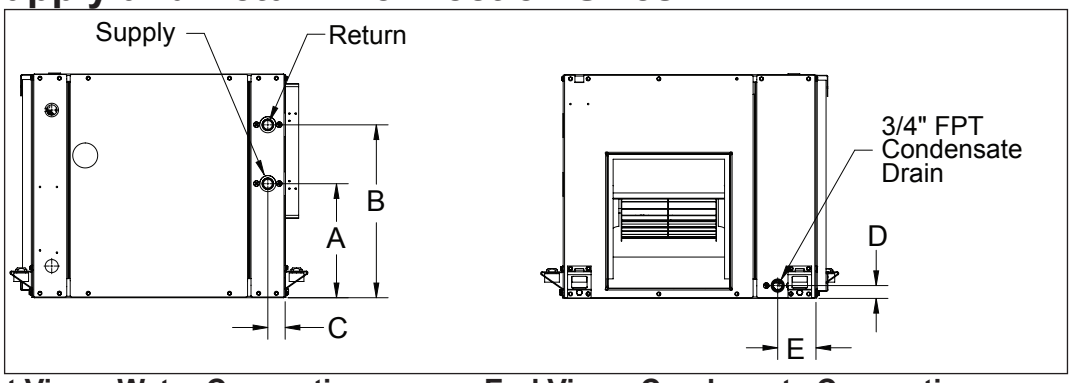
Unit Size	WSE Supply & Return Connections				WSE 3/4" FPT Condensate Drain		Waterside Economizer Overall Cabinet Section			L	M
	Connection Size (FPT)	A (Supply)	B (Return)	C	D	E	F	G	H		
007, 009, 012	3/4"	2.4	9.3	2.5	1.0	5.0	10.0	25.5	11.6	40.0	19.0
015, 019	3/4"	4.0	12.8	2.0	1.0	5.0	10.0	25.0	17.4	43.0	20.0
024, 030	3/4"	3.5	13.5	2.0	1.0	5.0	10.0	31.0	19.1	49.0	21.5
036, 042	1"	3.5	15.5	2.5	1.0	5.0	10.0	46.5	21.1	65.0	24.0
048, 060	1"	3.5	15.5	2.5	1.0	5.0	10.0	46.5	21.1	65.0	24.0

Table 26: SSH Unit with Waterside Economizer - Dimensions

Unit Size	WSE Supply & Return Connections				WSE 3/4" FPT Condensate Drain		Waterside Economizer Overall Cabinet Section			L	M
	Connection Size (FPT)	A (Supply)	B (Return)	C	D	E	F	G	H		
007, 009, 012	1/2"	4.0	12.5	2.0	1.0	5.0	10.0	25.5	17.1	43.0	19.0
015, 019	3/4"	3.5	13.5	2.0	1.0	5.0	10.0	30.5	19.1	49.0	21.5
024, 030	1"	3.5	13.5	2.0	1.0	5.0	10.0	35.0	19.1	54.0	24.0
036, 042	1"	3.5	15.5	2.5	1.0	5.0	10.0	46.0	21.1	65.0	24.0
048, 060	1"	3.5	15.5	2.5	1.0	5.0	10.0	50.5	21.1	79.0	24.0
070	1"	3.5	15.5	2.5	1.0	5.0	10.0	50.5	21.1	79.0	24.0

NOTE: 1. All dimensions within ± 0.10 inches (2.5 mm).
2. Left-hand waterside economizer connections same as right-hand but opposite.

Unit Supply and Return Connection Sizes



Front View - Water Connections **End View - Condensate Connection**

Table 27: SCH Unit Supply, Return, and Condensate Dimensions

Unit Size	Connection Size (FPT)	A	B	C		D	E
				Supply	Return		
007, 009, 012	1/2"	1.5	10.5	2.5	1.5	1.0	3.3
015, 019	1/2"	8.0	11.5	1.5	1.5	1.0	3.3
024, 030	3/4"	7.0	11.5	1.5	1.5	1.0	3.3
036, 042	3/4"	9.7	14.5	1.5	1.5	1.0	3.3
048, 060, 070	1"	10.8	14.5	1.5	1.5	1.5	3.3

Table 28: SMH Unit Supply, Return, and Condensate Dimensions

Unit Size	Connection Size (FPT)	A	B	C		D	E
				Supply	Return		
007, 009, 012	1/2"	1.5	10.5	2.5	1.5	1.0	3.3
015, 019	3/4"	7.0	11.5	1.5	1.5	1.0	3.3
024, 030	3/4"	9.7	13.0	1.5	1.5	1.0	3.3
036, 042	1"	10.8	14.5	1.5	1.5	1.0	3.3
048, 060	1"	10.8	16.0	1.5	1.5	1.5	3.3

Table 29: SSH Unit Supply, Return, and Condensate Dimensions

Unit Size	Connection Size (FPT)	A	B	C		D	E
				Supply	Return		
007, 009, 012	1/2"	3.0	9.0	1.5	1.5	1.0	3.3
015, 019	1"	2.5	15.5	1.5	1.5	1.0	3.3
024, 030	1"	2.5	15.5	1.5	1.5	1.5	3.3
036, 042	1"	2.5	15.5	1.5	1.5	1.5	3.3
048, 060, 070	1"	2.5	15.5	1.5	1.5	1.5	3.3

⚠ WARNING

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

NOTE: Do not over-torque fittings. The maximum torque without damage to fittings is 30 foot pounds. If a torque wrench is not available, use as a rule of thumb, finger tight plus one quarter turn.

1. No unit should be connected to the supply and return piping until the water system has been cleaned and flushed completely, see "Cleaning & Flushing System" on page 30. After the cleaning and flushing has taken place, the initial connection should have all valves wide open in preparation for water system flushing.
2. Supply and return shutoff valves are required at each unit. The return valve can be used for balancing. When used it should have a “memory stop” so that it can be closed off, and reopened to the proper position for the required flow.

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

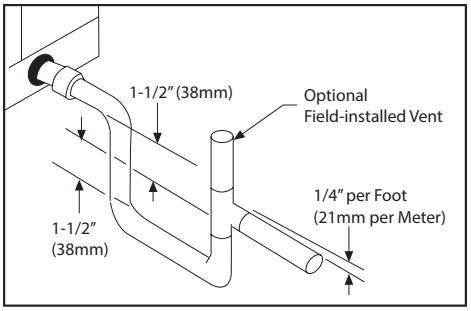
3. Each water source heat pump is provided with a 3/4" FPT flush mount fitting for connection of a condensate drain. Copper or steel condensate piping should be insulated to prevent sweating. Do not locate any point in the drain system above the condensate drain connection of any unit.

NOTE: 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.

Condensate Drain

A field provided condensate trap must be installed on each water source heat pump. Condensate removal piping must be pitched away from the unit not less than 1/4" per foot. An air vent is sometimes required after the trap to prevent air pockets, so the condensate will drain away from the unit. The vent should extend at least 1-1/4" above the unit condensate fitting. The vent can also act as a clean out if the trap becomes clogged. To avoid having waste gases entering the building, the condensate drain should not be directly piped to a drain/waste/vent stack, etc. Always connect the drain through a trap to the condensate drain system in accordance to the local plumbing codes.

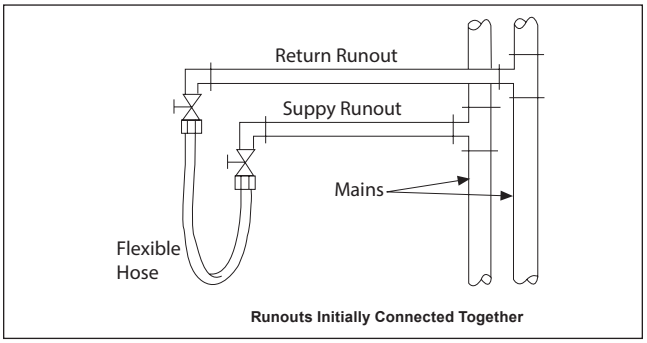
Figure 37: Unit Condensate Drain Pipe Trap Detail



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 runouts must be connected together at each conditioner location. This will prevent the introduction of dirt into the unit. See Figure 38.

Figure 38: Supply and Return Runouts 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 runouts should now be connected to the conditioner supply and return connections. Do not use sealers at the swivel flare connections of hoses.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.
4. 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.
5. 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.

Controls

Table 30: MicroTech SmartSource Unit Controller Terminals and Descriptions

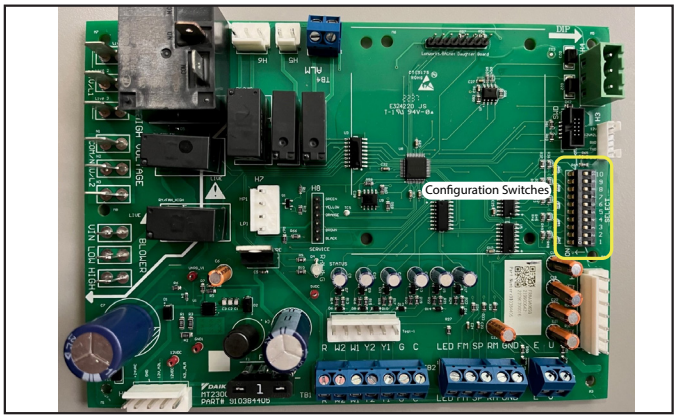
H1 – 1	+24VAC	24 VAC Power Input
H1 – 2	GND	24 VAC Common
H1 – 3	12V_A2L	12 VDC Input
H1 – 4	12VDC	12 VDC Output
H1 – 5	A2L_ALM	A2L Alarm Input
H2 – 1	LWT	Leaving Water Temp Sensor – Signal
H2 – 2	GND	Leaving Water Temp Sensor – Common
H2 – 3	ST1	Compressor Suction Temp Sensor – Signal
H2 – 4	GND	Compressor Suction Temp Sensor – Common
H2 – 5	DAT	Discharge Air Temp Sensor – Signal
H2 – 6	GND	Discharge Air Temp Sensor – Common
H2 – 7	COF	Condensate Overflow Signal Input
H3 - 1	12V	Connections to I/O Expansion Board
H3 - 2	12V_A2L	
H3 - 3	RXD	
H3 - 4	TXD	
H3 - 5	GND	
H4 - 1	B	RS 485 Communications (Future)
H4 - 2	A	
H4 - 3	GND	
H5 - 1	GND	Reversing Valve – Common
H5 - 2	RV	Reversing Valve – Output
H6 -1	GND	24 VAC Common
H6 - 2	N/O	Isolation Valve/Pump Request Relay N/O
H6 - 3	N/C	Isolation Valve/Pump Request Relay N/C
H7 - 1		Compressor Low Pressure Switch (LP1) – Source Voltage
H7 - 2	LP1	Compressor Low Pressure Switch (LP1) – Signal
H7 - 3		Comp High Pressure Switch (HP1) – Source Voltage
H7 - 4	HP1	Comp High Pressure Switch (HP1) – Signal
TB1 - 1	R	24 VAC
TB1 - 2	W2	Thermostat – Heat Stage #2 (W2) Input
TB1 - 3	W1	Thermostat – Heat Stage #1 (W1) Input
TB1 - 4	Y2	Thermostat – Cool Stage #2 (Y2) Input
TB1 - 5	Y1	Thermostat – Cool Stage #1 (Y1) Input
TB1 - 6	G	Thermostat – Fan Input
TB1 - 7	C	24 VAC Common
TB2 - 1	LED	Room Sensor – Status LED Output
TB2 - 2	FM	Room Sensor – Fan Mode & Unit Mode Switches
TB2 - 3	SP	Room Sensor – Setpoint Adjust
TB2 - 4	RM	Room Sensor – Room Temp Sensor & Tenant Override
TB2 - 5	GND	Room Sensor – DC Signal Common
TB3 - 1	E	Emergency Shutdown Input
TB3 - 2	U	Unoccupied Input
TB4 - 1		Alarm Output Common
TB4 - 2	ALM	Alarm Output
24V/L1	Live 1	Line Voltage/24VAC Terminal 1
	Live 2	Line Voltage/24VAC Terminal 2
	Live 3	Line Voltage/24VAC Terminal 3
COM/ NEU/ L2	N1	Neutral/Ground Terminal 1
	N2	Neutral/Ground Terminal 2
	N3	Neutral/Ground Terminal 3
Blower	VIN	Fan Output – Supply Voltage
	LOW	Fan Low Required Output – Switched VIN
	MAIN	Fan Main Required Output – Switched VIN
RY/ COMP1	NC	24V/L1 Voltage
	No Connection	No Connection
	COM	Compressor 1 Output

Table 31: I/O Expansion Module Connectors / Terminals

H1 - 1	GND	24 VAC Common
H1 - 2	+24VAC	24 VAC Power Input
H2 - 1	GND	Compressor 2 Suction Temp Sensor – Common
H2 - 2	ST2	Compressor 2 Suction Temp Sensor – Signal
H2 - 3		Compressor 2 Low Pressure Switch (LP2) – Source Voltage
H2 - 4	LP2	Compressor 2 Low Pressure Switch (LP2) – Signal
H2 - 5		Compressor 2 High Pressure Switch (HP2) – Source Voltage (Jumper Wire for Single Compressor)
H2 - 6	HP2	Compressor 2 High Pressure Switch (HP2) – Signal (Jumper Wire for Single Compressor)
H3 - 1	12V	Connections to I/O Expansion Board
H3 - 2	12V_A2L	
H3 - 3	RXD	
H3 - 4	TXD	
H3 - 5	GND	
H4 - 1	GND	Entering Water Temp Sensor – Common
H4 - 2	EWT	Entering Water Temp Sensor – Signal
H4 - 3	GND	Return Air Temp Sensor – Common
H4 - 4	RAT	Return Air Temp Sensor – Signal
H5 - 1	GND	Hot Gas Reheat Common
H5 - 2	HGR	Hot Gas Reheat Output – N/O
H5 - 3	GND	Water Side Economizer Common
H5 - 4	WSE	Waterside Economizer Output – N/O
H5 - 5	PWM	ECM Fan Motor Variable Speed Signal Output
H6 - 1	GND	Compressor – High Capacity Common
H6 - 2	COMP2	Compressor – High Capacity Output – N/O
H6 - 3	GND	Reversing Valve Comp 2 Common
H6 - 4	RV2	Reversing Valve Comp 2 Output
H6 - 5	GND	Auxiliary Heat Stage #2 Common
H6 - 6	AUX2	Auxiliary Heat Stage #2 Output – N/O
H6 - 7	GND	Auxiliary Heat Stage #1 / Hydronic Heat Common
H6 - 8	AUX1	Auxiliary Heat Stage #1 / Hydronic Heat Output N/O (24 VAC)
TB1 - 1	GND	24 VAC Common
TB1 - 2	RH	0-10 VDC Relative Humidity Input
TB1 - 3	HST	Humidistat Signal Input
TB1 - 4	W3	Thermostat – Heat Stage #3 (W3) Input
TB1 - 5	W4	Thermostat – Heat Stage #4 (W4) Input/Cool Stage #3 (Y3) Input
TB1 - 6	R	24VAC

Configuration Switch Settings

Figure 39: Configuration Switch Location



⚠ WARNING

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

Table 32: MicroTech Main Board Configuration Switch Settings and Descriptions

Switch	Description	Position	Model/Options
SW1	Normal/Test Mode	SW1 = OFF (0)	Normal Opteration
		SW1 = ON (1)	Service/Test Mode
SW2	Fan Operation	SW2 = OFF (0)	Continuous Fan Operation (On)
		SW2 = ON (1)	Cycling Fan Operation (Auto)
SW3	Loop Fluid	SW3 = OFF (0)	Water Loop Fluid
		SW3 = ON (1)	Glycol Loop Fluid
SW4	Freeze Fault Detect (FFD)	SW4 = OFF (0)	Disabled FFD
		SW4 = ON (1)	Enabled FFD with LWT sensor installed
SW5	Room Sensor Setpoint Adjust Range	SW5 = OFF (0)	Short Range -5 to +5 F (-2.78 to +2.78 C)
		SW5 = ON (1)	Long Range 55 to 95 F (12.78 to 35 C)
SW6	Thermostat/Room Sensor Control	SW6 = OFF (0)	Thermostat Control
		SW6 = ON (1)	Room Sensor Control
SW7/SW8	Single Compressor Heating Source	SW7 = OFF (0)	Allow Compressor in Heating Mode
		SW7 = ON (1)	Disable Compressor in Heating Mode
	Single Compressor IO Expansion Module	SW8 = OFF (0)	IO Expansion Module Not Required
		SW8 = ON (1)	IO Expansion Module is Required
	Dual Compressor Availability	SW7 = OFF (0) SW8 = OFF (0)	Both Compressors Available (Automatic Compressor Fail Replace)
		SW7 = ON (1) SW8 = OFF (0)	Lead Compressor Available (Lag Compressor is Off-Line)
		SW7 = OFF (0) SW8 = ON (1)	No Compressors Available
SW9	WSHP Base Board Application Select	SW9 = OFF (0)	SmartSource WSHP Application
		SW9 = ON (1)	SmartSource LC Large Two Comp WSHP Application
SW10	Discrete/Variable Speed Fan Select	SW10 = OFF (0)	Fan Single (Fan Main Output) or Variable (PWM) Speed
		SW10 = ON (1)	Dual Speed Fan (Low & High Discrete Outputs)

Table 33: I/O Expansion Module Configuration Switch Settings

Switch	Description	Position	Model/Options
SW1-4	Variable Fan Speed Row Selection	0000 to 1111 Binary	Variable Speed Fan Row Selection (1 to 16), used when “nciVsNetCnfgEn” is set to “Disable” the network override. See page 51 and page 52 for more information
SW5/SW6	Secondary Heating Options	SW5 = OFF (0) SW6 = OFF (0)	None
		SW5 = ON (1) SW6 = OFF (0)	Supplemental Electric Heat
		SW5 = OFF (0) SW6 = ON (1)	Boilerless Electric Heat
		SW5 = ON (1) SW6 = ON (1)	Hydronic Heating
SW7	Hot Gas Reheat (HGR)	SW7 = OFF (0)	HGR Disabled
		SW7 = ON (1)	HGR Enabled
SW8	Waterside Economizer (WSE)	SW8 = OFF (0)	Waterside Economizer Disabled
		SW8 = ON (1)	Waterside Economizer Enabled
SW9	WSHP IO Expansion Application Select	SW9 = OFF (0)	SmartSource WSHP Application
		SW9 = ON (1)	Enfinity Large Two Comp WSHP Application
SW10	Dual Compressor Speed Option	SW10 = OFF (0)	Single Speed Compressor
		SW10 = ON (1)	Dual Speed Compressor
	Dual Compressor: Lead Compressor Select	SW10 = OFF (0)	Compressor #1 is Lead
		SW10 = ON (1)	Compressor #2 is Lead

MicroTech SmartSource Unit Controller

The MicroTech SmartSource unit controller allows thermostat, Daikin Applied sensor and DDC standalone operation. The R (24VAC) terminal is used to operate thermostat inputs G, Y1, Y2, W1, W2, W3, W4 and TB1. The C (common) terminal is used to control inputs U and E. No external power sources may be used to operate the MicroTech controller. All units must be properly grounded per local code requirements.

NOTICE

For information on sequence of operation and troubleshooting refer to OM 1149-xx.

Remote Reset of Automatic Lockouts

The Remote Reset feature provides the means to remotely reset automatic lockouts. There are (3) means to reset an automatic lockout condition:

- Using the thermostat create 2 demands for capacity within 30 seconds
- Press the Room Sensor Timed Override/Reset Button for more than 10 seconds
- Turn the unit power off

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

Note: *This feature only applies to thermostat controlled systems.*

For room sensor controlled units, pressing the “Override” or “Reset” button for more than 10 seconds will apply a ground signal to the tenant override in(screw terminal connection at TB2 pin 4) will clear the lockout alarm once the cause of the fault condition has been cleared.

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

Table 34: MicroTech SmartSource Unit Controller Fault and Status LED's

Description	LED	Type	Color
MCU Not Programmed or Hardware Failure	Steady On	Fault	Red
Invalid Configuration	1 Flash	Fault	R-Y-G
Incompatible Software	2 Flash	Fault	R-Y-G
IO Exp Board Communications Fail	1 Flash	Fault	R-Y
Service I Test Mode Active	1 Flash	Mode	G-Y
A2L Mitigation - Refrigerant Leak	Rapid Flash	Fault	Red
Compressor #1 High Pressure	1 Flash	Fault	Red
Compressor #1 Low Pressure	2 Flash	Fault	Red
Compressor #1 Suction Temp Sensor Fail	3 Flash	Fault	Red
Compressor #1 Low Suction Temp	4 Flash	Fault	Red
Compressor #2 High Pressure	5 Flash	Fault	Red
Compressor #2 Low Pressure	6 Flash	Fault	Red
Compressor #2 Suction Temp Sensor Fail	7 Flash	Fault	Red
Compressor #2 Low Suction Temp	8 Flash	Fault	Red
A2L Mitigation - Control Board Without Power	9 Flash	Fault	Red
A2L Mitigation - Refrigerant Sensor Fail	Rapid Flash	Mode	Yellow
Compressor Low Voltage Brownout	1 Flash	Fault	Yellow
Freeze Fault Detect (FFD)	2 Flash	Fault	Yellow
Control Temp Sensor Fail	3 Flash	Fault	Yellow
Entering Water Temp Senor Fail	4 Flash	Fault	Yellow
Leaving Water Temp Senor Fail	5 Flash	Fault	Yellow
Relative Humidity Sensor Fail	6 Flash	Fault	Yellow
Condensate Overflow	7 Flash	Fault	Yellow
Space Temp Sensor Fail	8 Flash	Mode	Yellow
Return Air Temp Sensor Fail	9 Flash	Fault	Yellow
Emergency Shutdown	Rapid Flash	Mode	Green
No Call for Heating / Cooling / Dehumidification	1 Flash	Mode	Green
Call for Cooling	2 Flash	Mode	Green
Call for Heating	3 Flash	Mode	Green
Call for Fan Only	4 Flash	Mode	Green
Unoccupied Mode Active	5 Flash	Mode	Green
Call for Dehumidification	6 Flash	Mode	Green
Low Entering Water Temp	7 Flash	Mode	Green
HGR Low Return Air Temp Cutout	8 Flash	Mode	Green
WSE Low Temp Cutout	9 Flash	Mode	Green

Table 35: I/O Expansion Module Fault and Status LED's

Description	Type	LED	Color
MCU not programmed or hardware fail	Fault	Steady On	Red
Invalid Configuration	Fault	1 Flash	R-Y-G
Incompatible Software	Fault	2 Flash	R-Y-G
Base Board Communications Fail	Fault	1 Flash	R-Y
A2L Mitigation - Alarm Condition	Fault	Rapid Flash	Red
Variable Speed Fan OFF	Mode (1)	1 Flash	Green
Variable Speed Fan ON: 0 to 20%	Mode (1)	2 Flash	Green
Variable Speed Fan ON: 21 to 30%	Mode (1)	3 Flash	Green
Variable Speed Fan ON: 31 to 40%	Mode (1)	4 Flash	Green
Variable Speed Fan ON: 41 to 50%	Mode (1)	5 Flash	Green
Variable Speed Fan ON: 51 to 60%	Mode (1)	6 Flash	Green
Variable Speed Fan ON: 61 to 70%	Mode (1)	7 Flash	Green
Variable Speed Fan ON: 71 to 80%	Mode (1)	8 Flash	Green
Variable Speed Fan ON: 72 to 90%	Mode (1)	9 Flash	Green
Variable Speed Fan ON: 73 to 100%	Mode (1)	10 Flash	Green

Note *(1) When the BAS network is overriding the fan lookup table row selection, the LED interval color will be yellow instead of OFF.*

Table 36: Fault Recovery and Reset

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

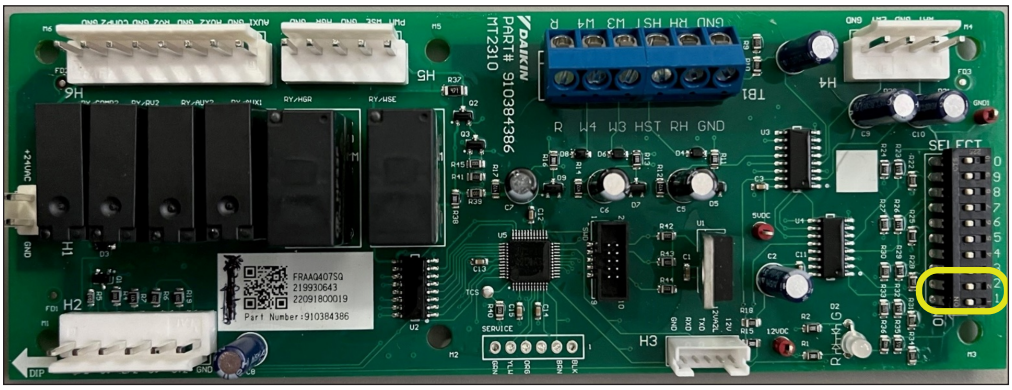
*** Indicates auto recover is subject to intelligent alarm reset. Alarm auto recovers on first two occurrences, locked out on third within 24 hour period.**

See "Remote Reset of Automatic Lockouts" on page 50 for further details.

Table 37: I/O Expansion Module Configuration Switch

I/O Expansion module configuration		
Setting	**SW1**	**SW2**
1	Off	Off
2	On	Off
3	Off	On
4	On	On

Figure 40: SW1 & SW2 Location On The I/O Expansion Module



Fan Only Speed Configuration Switch (SW4)

In In addition to the SW1, SW2, and SW3 switches, all units have the capability to set Fan Only CFM values independent to those associated with other modes of operation using the SW4 switch. When the SW4 switch is Off the fan only speed will be fixed at the speed associated with a low 20% duty cycle output. When the SW4 switch is On, the Fan Only speed will match the speed for the Stage 1/Low CFM output.

For example, unit size 036 with SW1 and SW2 switches set at Setting #3, SW3 set at Off, and SW4 set at On, will deliver 1200 CFM at stage 2 compressor operation mode, 1050 CFM at stage 1 compressor operation, 1350 CFM in electric heat mode, 1050 CFM in fan only mode, 975 CFM in dehumidification mode, 1050 CFM in hydronic heat mode and 1050 CFM in waterside economizer mode.

Table 38: Representative Data for Size 036, Constant CFM

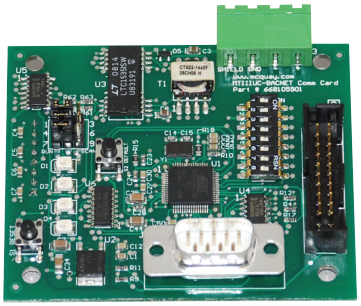
	Setting	Maximum ESP (in. wg.)[2]	[1]Low CFM Heat	[1]High CFM Heat	[1]Low CFM Cool	[1]High CFM Cool	Dehumidification	Electric Heat	Fan Only SW4 On	Fan Only SW4 Off	Hydronic Heat	Waterside Economizer
036	1 (High)	0.7	1200	1350	1200	1350	1125	1350	1200	750	1200	1200
	2 (Medium)		1125	1275	1125	1275	1050	1350	1125	750	1125	1125
	3 (Standard)		1050	1200	1050	1200	975	1350	1050	750	1050	1050
	4 (Low)		975	1125	975	1125	975	1350	975	750	975	975

MicroTech SmartSource Controller with BACnet® Communication Module

For installation and operation information on MicroTech 2300 SmartSource unit controller and other ancillary components see:

- IM 928 - MicroTech BACnett® Communication Module
- OM 931 - MicroTech SmartSource Unit Controller for Water Source Heat Pumps Operation anld Maintenance Manual
- IM 955 - MicroTech Wall Sensor For use with MicroTech SmartSource Unit Controller
- IM 956 - Temperature Sensors for Units with MicroTech Unit Controller BACnet® Communication Module

Figure 41: MicroTech BACnet Water Source Heat Pump Snap-In Communication Module



Fan Speed Configuration Switches (SW1, SW2, SW3)

Configuration Switches on the I/O expansion module allow maximum CFM settings to be field adjustable. Fan speed control optimizes unit fan speed (CFM) based on thermostat/room sensor inputs. The fan speed switch allows for manually setting an optimal CFM specific to the application requirements. Each setting on the fan speed configuration switches represents settings 1-4. See table 56 on page 61 for the complete list of fan speed selector switch settings. Additionally SW3 can be used to reduce the CFM setting. Setting the SW3 to On will reduce the out put signal by 15% of it's maximum value, with a minimum output of 50% of the maximum value while heating, cooling, or dehumidifying.

Variable CFM

All units have the capability to deliver variable CFM based on the thermostat wiring. By using a multi-stage wall thermostat, the unit can deliver lower CFM as the space temperature is satisfied. For example, unit size 024 with SW1 and SW2 switches at setting 3 and a 3-stage cooling wall thermostat will deliver 650 CFM at stage 1 cooling, 700 CFM at stage 2 cooling and 800 CFM at stage 3 cooling. All of this is accomplished by wiring the thermostat to the appropriate terminal on the MicroTech III controller terminal strip. The variable CFM feature allows for improved humidity levels by increasing latent cooling capacity through reduced CFM. Here, we are attempting to satisfy cooling at the lowest airflow, 650 CFM, but having the capability to deliver higher airflow, 800 CFM, if needed.

Start-up

⚠ CAUTION

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

Check, Test & Start Procedure

NOTICE

Complete the "Water Source Heat Pump Equipment Check, Test and Start Form" on page 38.

Check As Completed:

Open all valves to full open position and turn on power to the unit.

Set thermostat for “Fan Only” operation by selecting “Off” at the system switch and “On” at the fan switch. If “Auto” fan operation is selected, the fan will cycle with the compressor. Check for proper air delivery.

Set thermostat to “Cool.” If the thermostat is an automatic changeover type, simply set the cooling temperature to the coolest position. On manual changeover types additionally select “Cool” at the system switch.

Again, many units have time delays which protect the compressor(s) against short cycling. After a few minutes of operation, check the discharge grilles for cool air delivery. To insure proper water flow, measure the temperature difference between entering and leaving water. The temperature differential should be 10°F to 14°F (5°C to 8°C) for units in cooling mode. It should be approximately 1½ times greater than the heating mode temperature difference. For example, if the cooling temperature difference is 15°F (8°C), the heating temperature difference should have been 10°F (5°C).

Without automatic flow control valves, target a cooling temperature difference of 10°F to 14°F (5°C to 8°C). Adjust the combination shutoff/balancing valve in the return line to a water flow rate which will result in the 10˚F to 14°F (5°C to 8°C) difference.

Set thermostat to “Heat.” If the thermostat is the automatic changeover type, set system switch to the “Auto” position and depress the heat setting to the warmest selection. Some units have built-in time delays which prevent the compressor from immediately starting. With most control schemes, the fan will start immediately. After a few minutes of compressor operation, check for warm air delivery at discharge grille. If this is a “cold building” start-up, leave unit running until return air to the unit is at least 65°F (18°C).

Measure the temperature difference between entering and leaving air and entering and leaving water. With entering water of 60°F to 80°F (16°C to 27°C), leaving water should be 6°F to 12°F (3.3°C to 6.6°C) cooler, and the air temperature rise through the machine should not exceed 35°F (19°C). If the air temperature exceeds 35°F (19°C), then the water flow rate is inadequate.

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

If the unit does not operate, check the following points:

- Is supply voltage to the machine compatible?
- Is thermostat type appropriate?
- Is thermostat wiring correct?

If the unit operates but stops after a brief period:

- Is there proper airflow? Check for dirty filter, incorrect fan rotation (3-phase fan motors only), or incorrect ductwork.
- Is there proper water flow rate within temperature limits?
- Check water balancing; back flush unit if dirt-clogged.
- Check for vibrating refrigerant piping, fan wheels, etc.

Operating Limits

Environmental Limits

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.

NOTICE
Altitude Limits: Maximum applied altitude not to exceed 3,000 meters/9,843 feet

Air Limits

Table 39: Air Limits in °F (°C)

Air Limits	Standard Range Units		Extended Range (Geothermal) Units	
	Cooling (DB/WB)	Heating	Cooling (DB/WB)	Heating
Minimum Ambient Air[1]	50°F (10°C)	50°F (10°C)	40°F (4°C)	40°F (4°C)
Maximum Ambient Air[2]	100°F/77°F (38°C/25°C)	85°F (29°C)	100°F/77°F (38°C/25°C)	85°F (29°C)
Minimum Entering Air[1]	65°F/55°F (18°C/13°C)	50°F (10°C)	65°F/55°F (18°C/13°C)	50°F (10°C)
Common Design Entering Air	75°F/63°F (24°C/17°C)	70°F (21°C)	75°F/63°F (24°C/17°C)	70°F (21°C)
Maximum Entering Air[2]	85°F/71°F (29°C/22°C)	80°F (27°C)	85°F/71°F (29°C/22°C)	80°F (27°C)

Fluid Limits

Table 40: Fluid Limits

Fluid Limits	Standard Range Units		Extended Range (Geothermal) Units	
	Cooling	Heating	Cooling	Heating
Minimum Entering Fluid	55°F (13°C)	55°F (13°C)	30°F (-1°C)	20°F (-6°C)
Common Design Entering Fluid	85-90°F (29-32°C)	70°F (21°C)	90°F (32°C)	35-60°F (1.5-16°C)
Maximum Entering Fluid	120°F (43°C)	90°F (32°C)	120°F (43°C)	90°F (32°C)
Minimum GPM/Ton	2.0			
Nominal GPM/Ton	3.0			
Maximum GPM/Ton	4.0			

Notes: *1. 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.*

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

Motorized Isolation Valve Kit

The motorized valve kit is available as a factory-installed or a field-installed option.

Wired as shown in Figure 42, the motorized valve will open on a call for compressor operation.

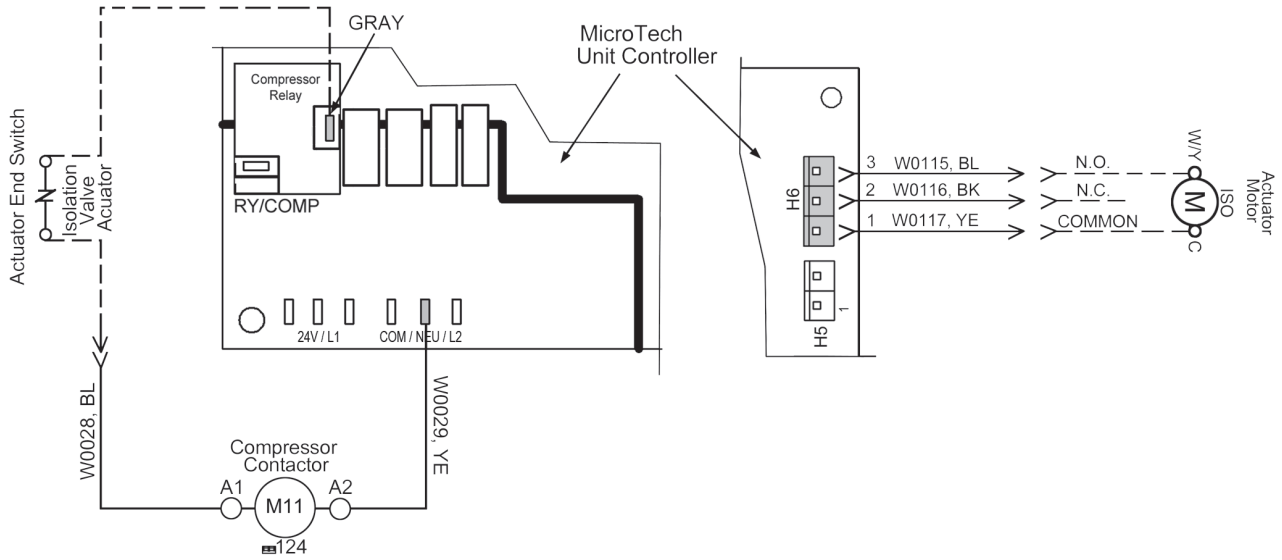
The motorized isolation valve actuator (ISO) has both a 24V power connection and a 24V end switch connection.

Install the supplied wire harness into plug H6 on the main control board. Run wires between the ISO actuator and the supplied wire harness ends.

Connect N.O. & N.C. actuators as shown on the schematic. The end switch should be wired in series with the 24V compressor signal wire. Connect the end switch wires as shown in the schematic. The end switch will close when the valve is fully open.

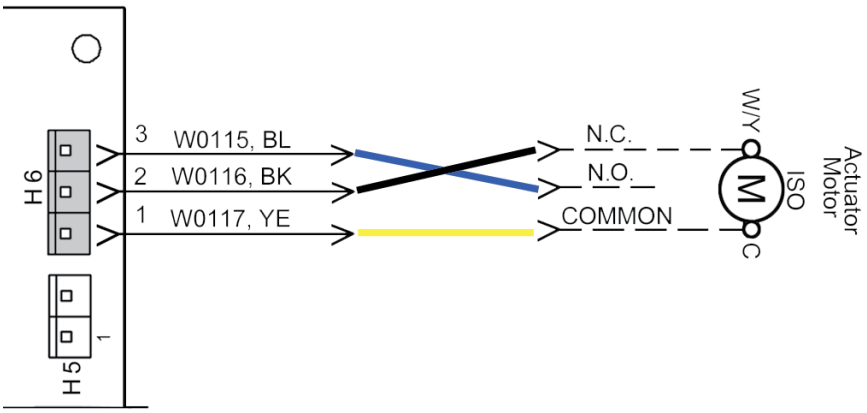
Note: *For detailed installation instructions for the motorized valve, refer to IM 1151.*

Figure 42: Motorized Valve Wiring



NOTE: Image is representive, and board may differ slightly.

Figure 43: MT2300 wiring to an existing motorized valve from a previously installed unit with MicroTech III controller



Note: *If reusing a motorized valve on an existing Daikin Applied R-410A unit, the wiring harness for connections 1, 2, and 3 for the R32 product are different. Therefore, the wiring connections (Common, N.O., and N.C.) to the motorized valve must be rewired.*

Control Wiring Schematics

Figure 44: MicroTech Unit Control with PSC Motor - 208-230, 265, 460, 575 Volt

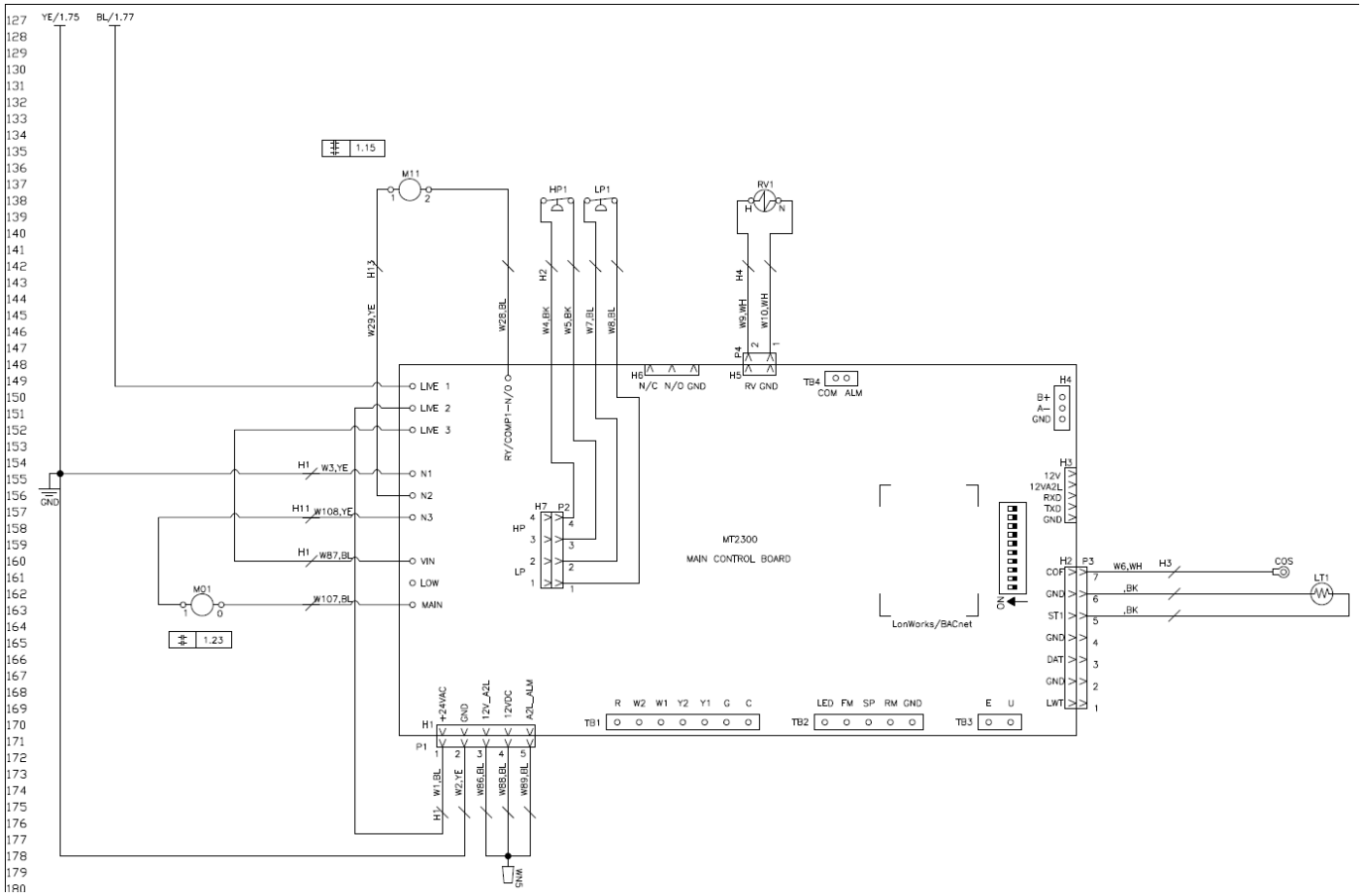


Figure 45: MicroTech Unit Control with Constant Torque EC Motor - 115 Volt - No Options

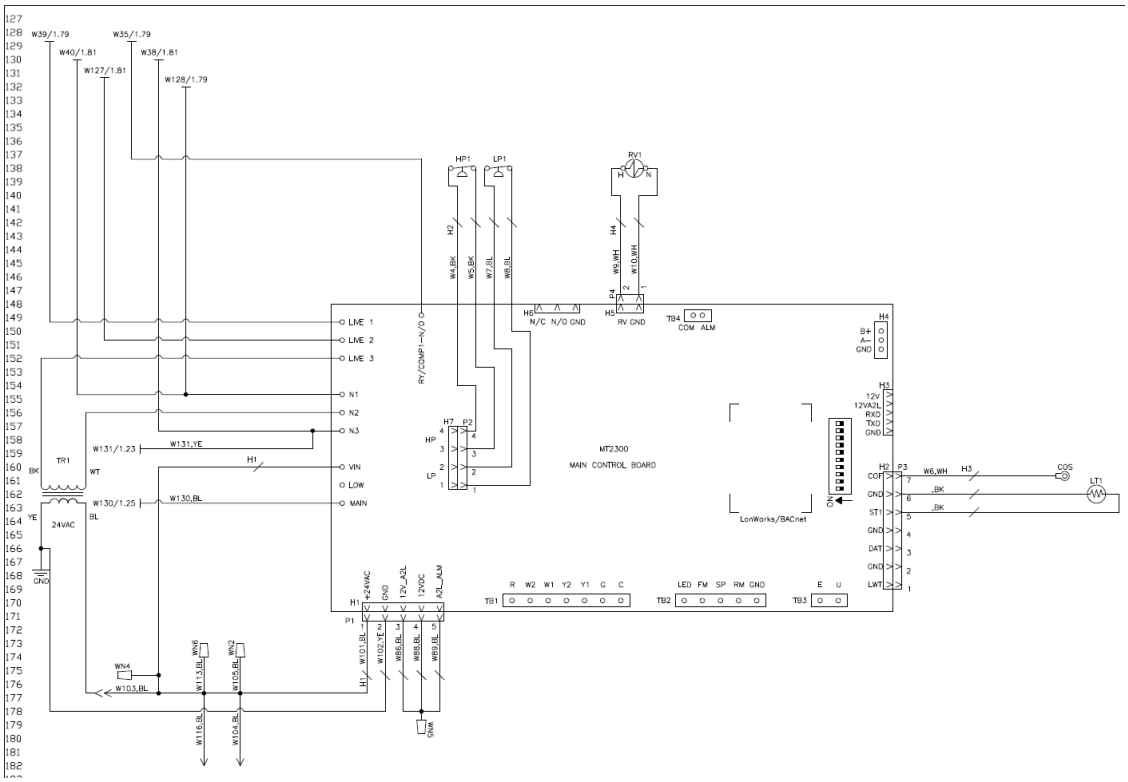


Figure 46: MicroTech Unit Control with Constant Torque EC Motor with Waterside Economizer

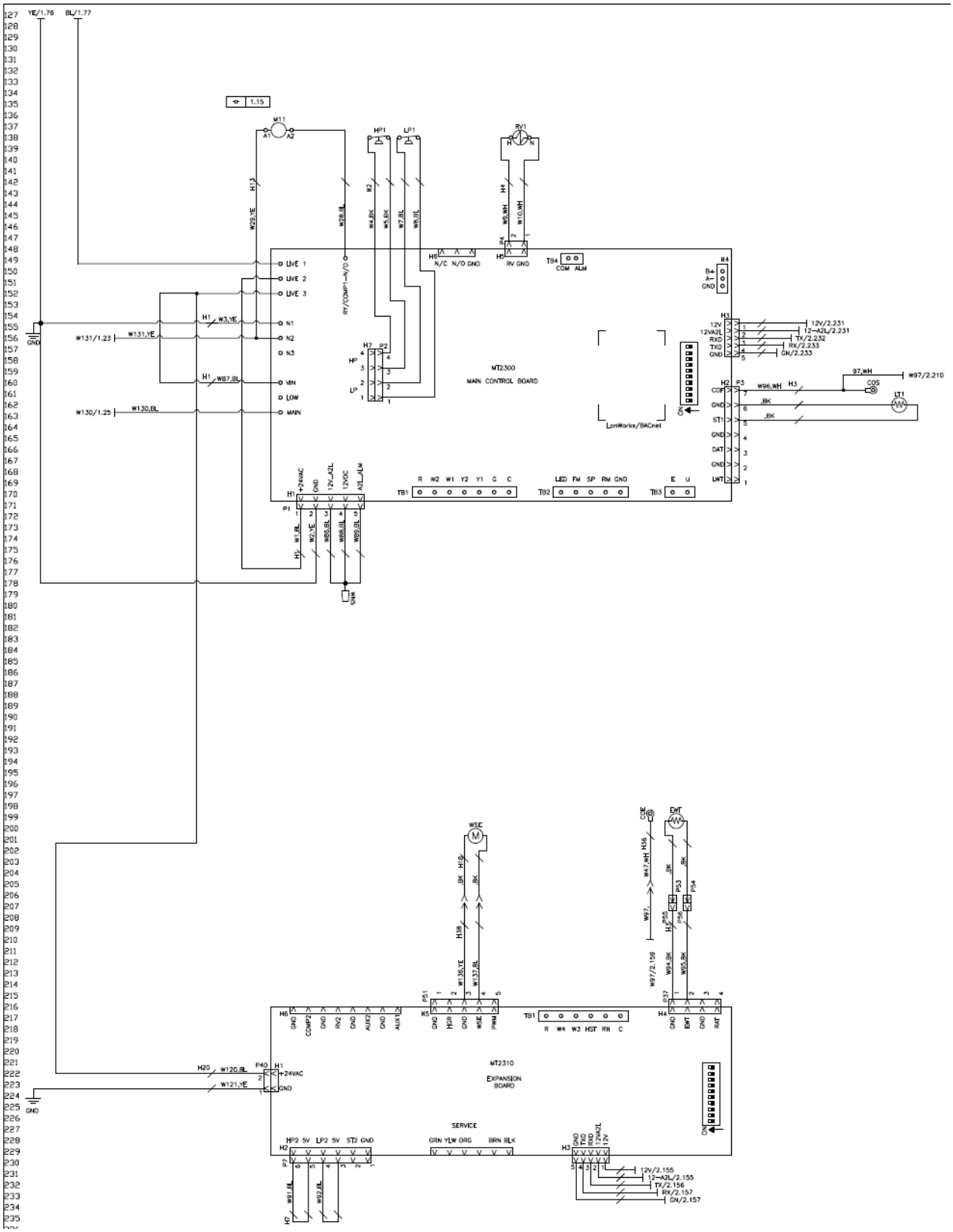


Figure 47: MicroTech Unit Control with Constant CFM EC Motor with Hot Gas Reheat

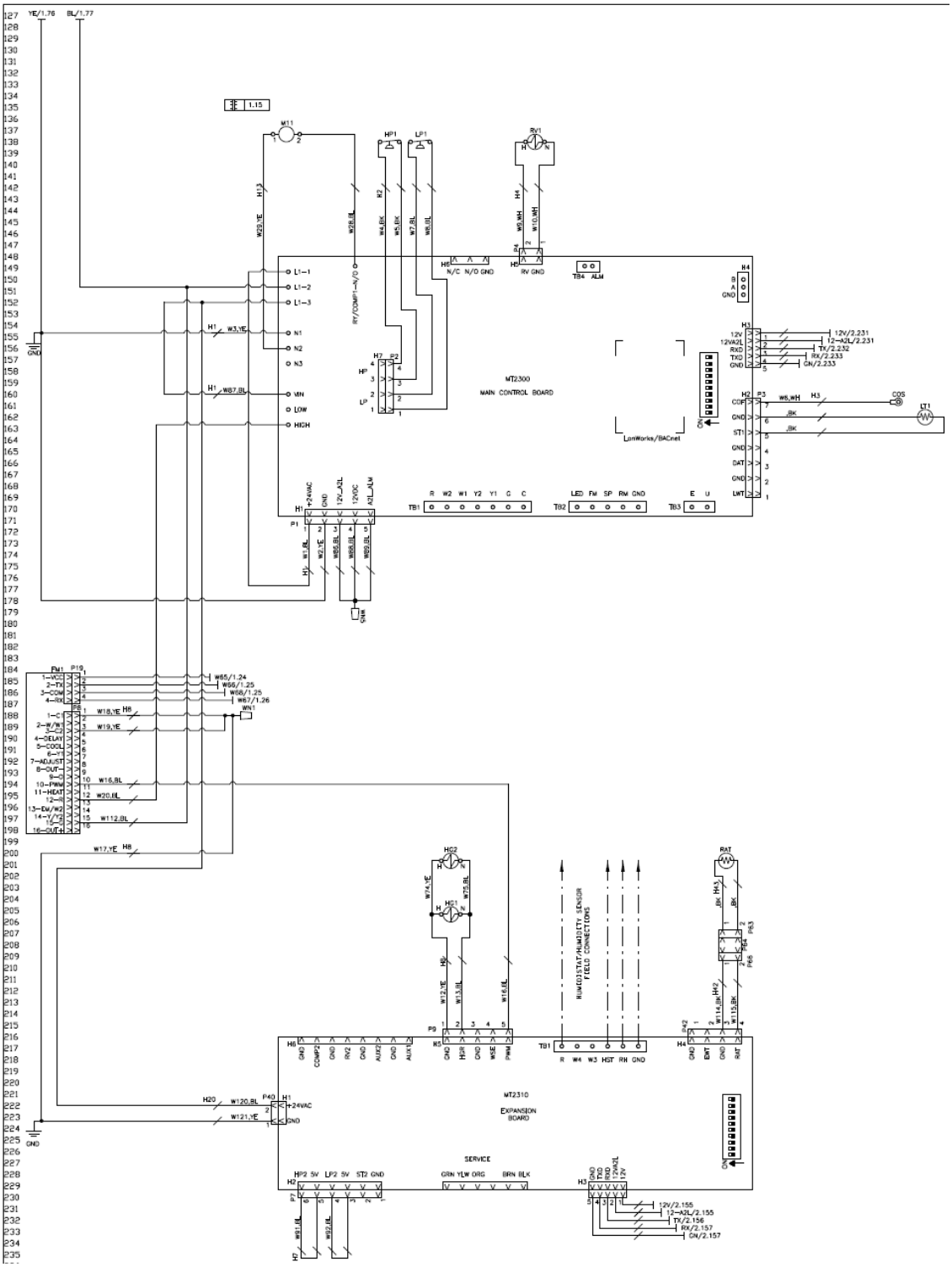


Figure 48: MicroTech Unit Control with Constant CFM EC Motor - 2-Stage Unit

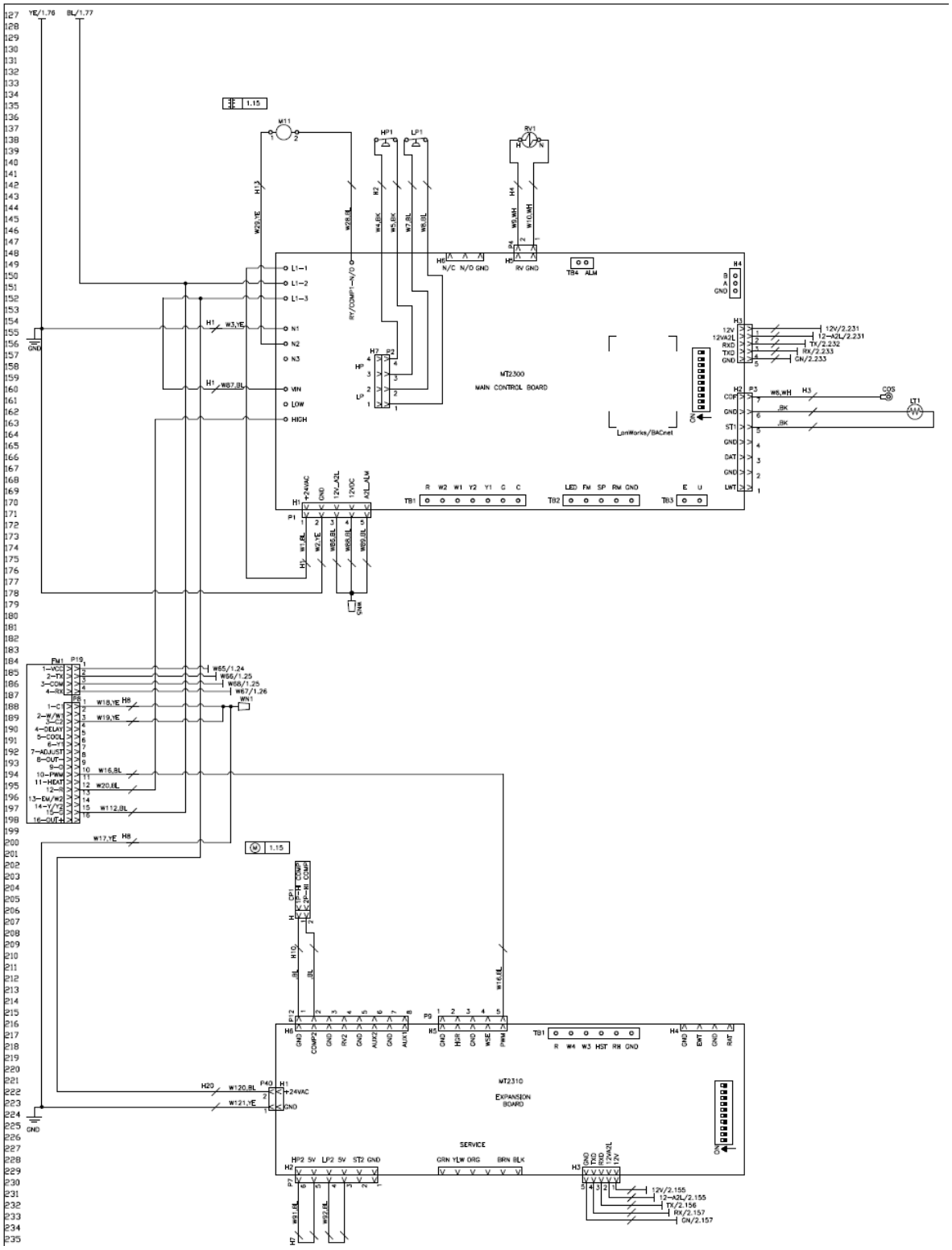


Figure 49: MicroTech Unit Control with Constant CFM EC Motor with Electric Heat Control Wiring

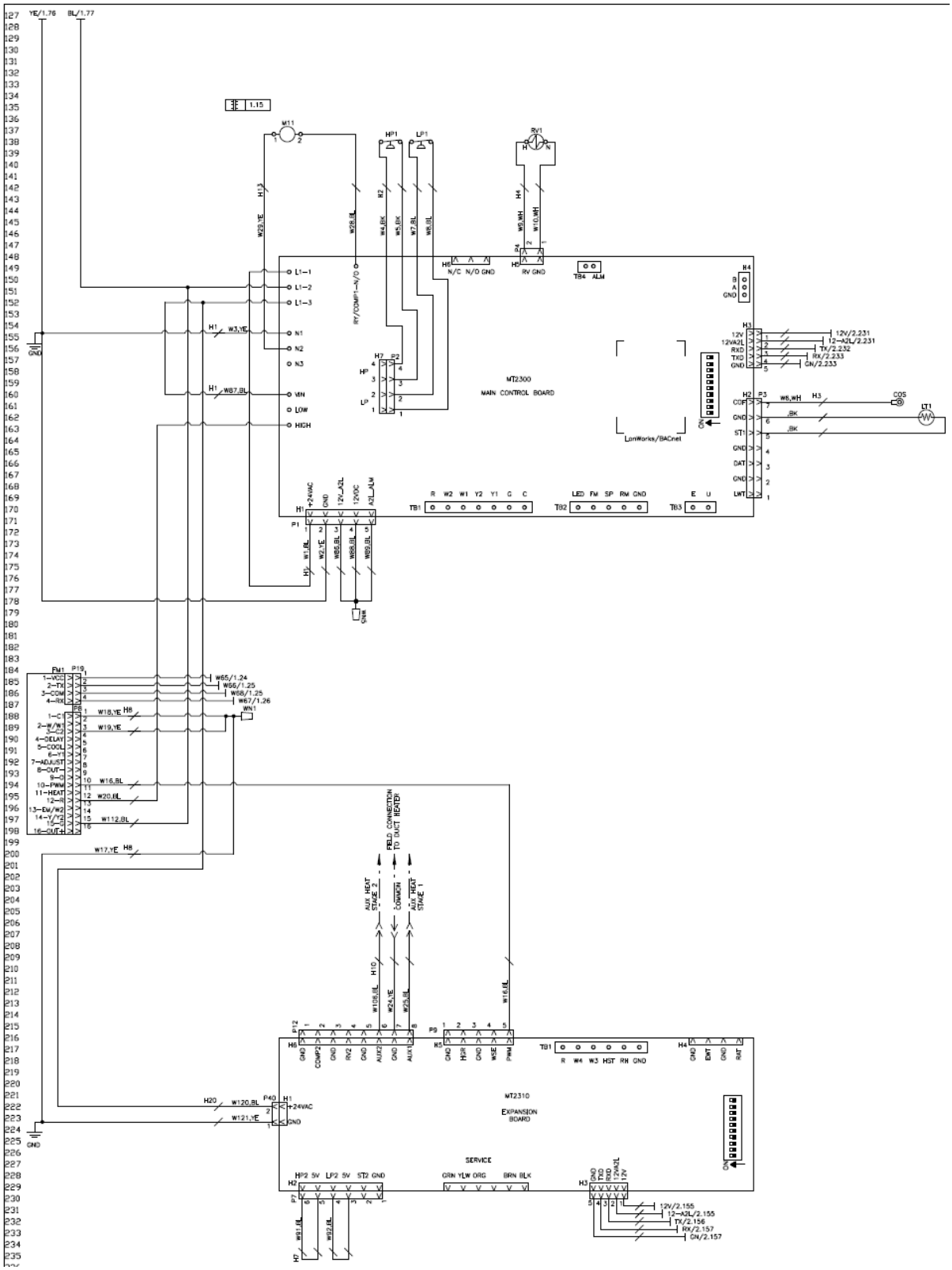
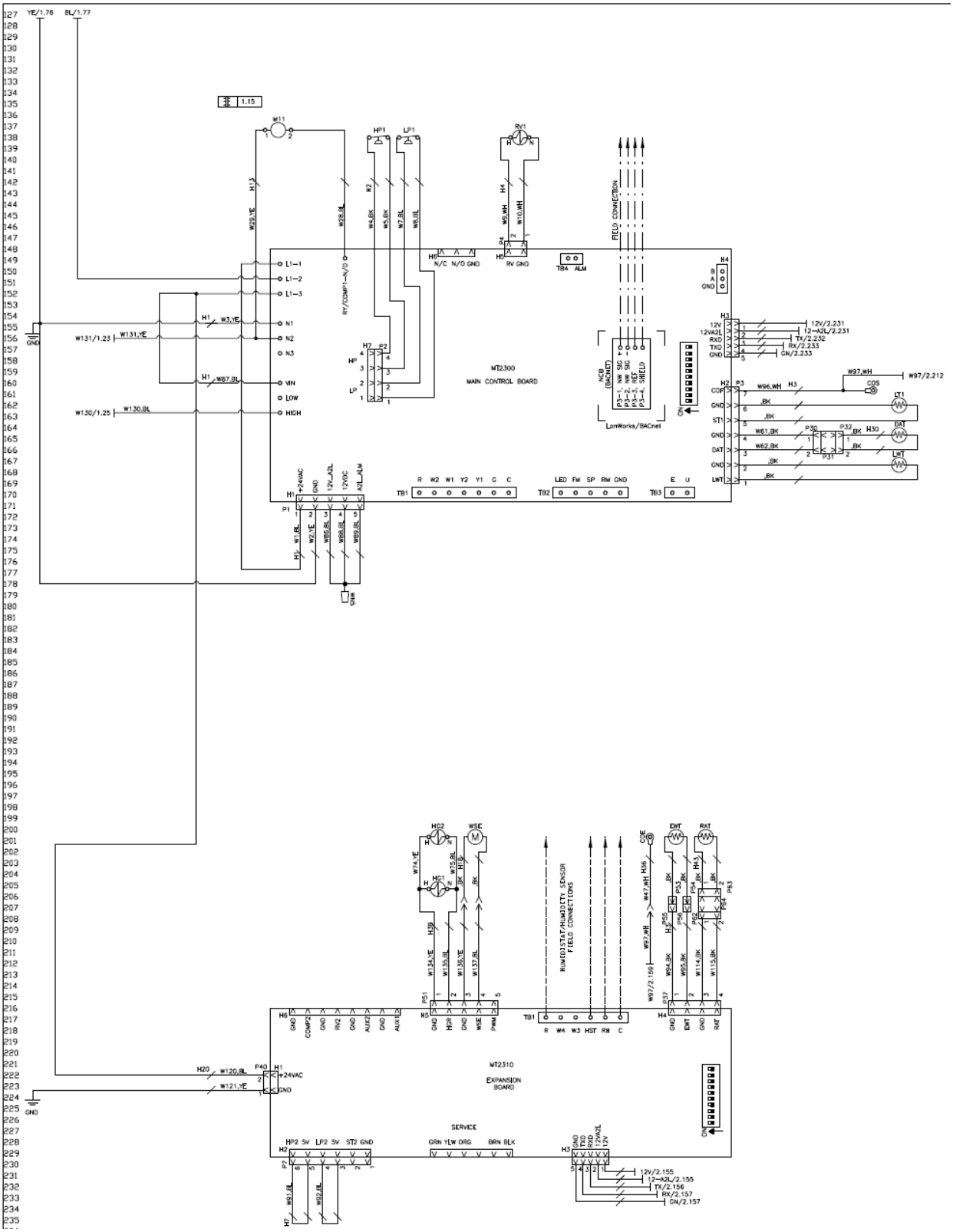


Figure 50: MicroTech Unit Control with Constant CFM EC Motor with BACnet Communication Module



Line Voltage Wiring Schematics

Figure 51: 115V/60Hz/1Ph With PSC Motor

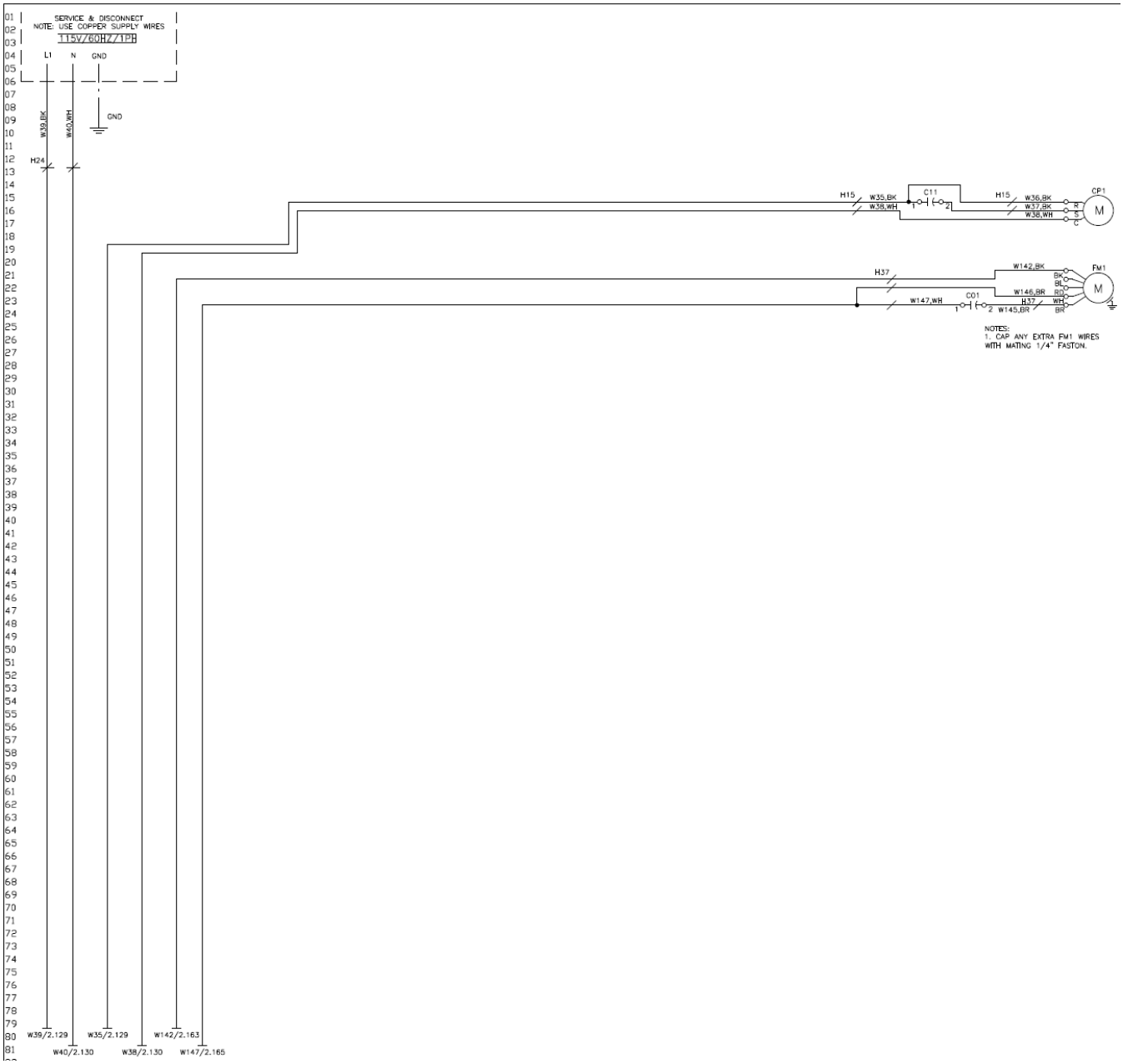


Figure 52: 115V/60Hz/1Ph With Constant Torque EC Motor

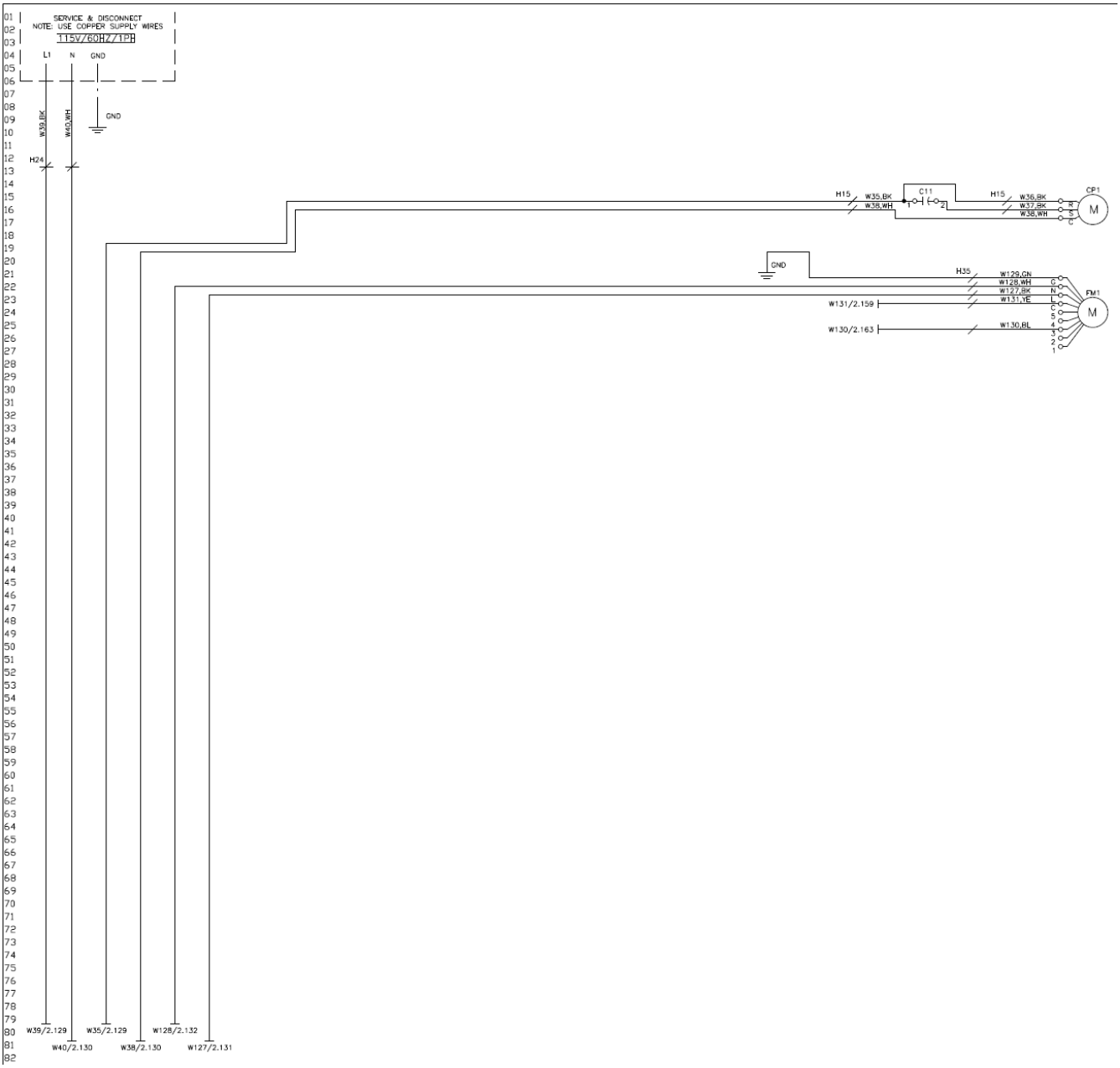


Figure 53: 265V/60Hz/1Ph With Constant Torque EC Motor

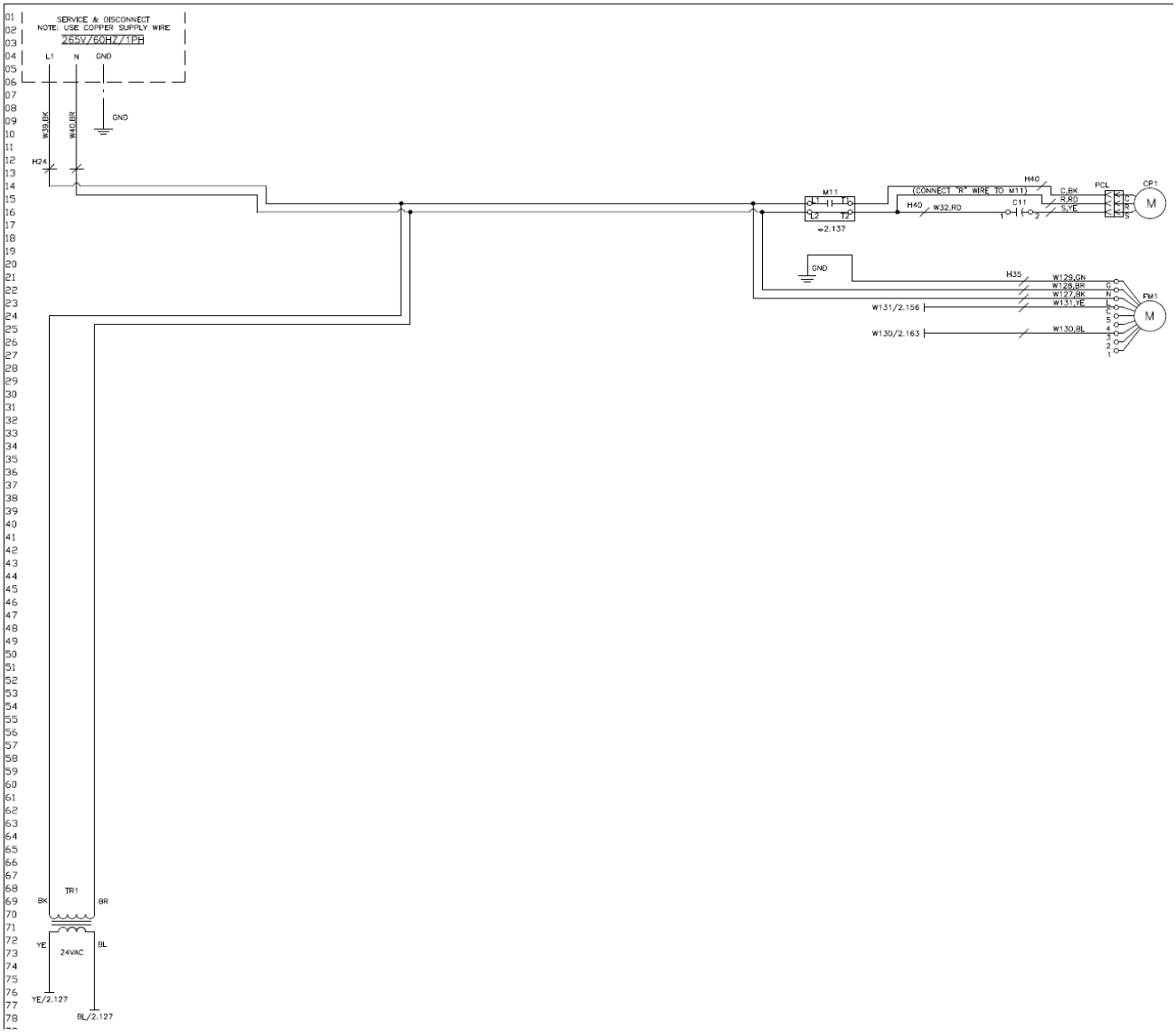


Figure 54: 208-230V/60Hz/3Ph With Constant Torque EC Motor

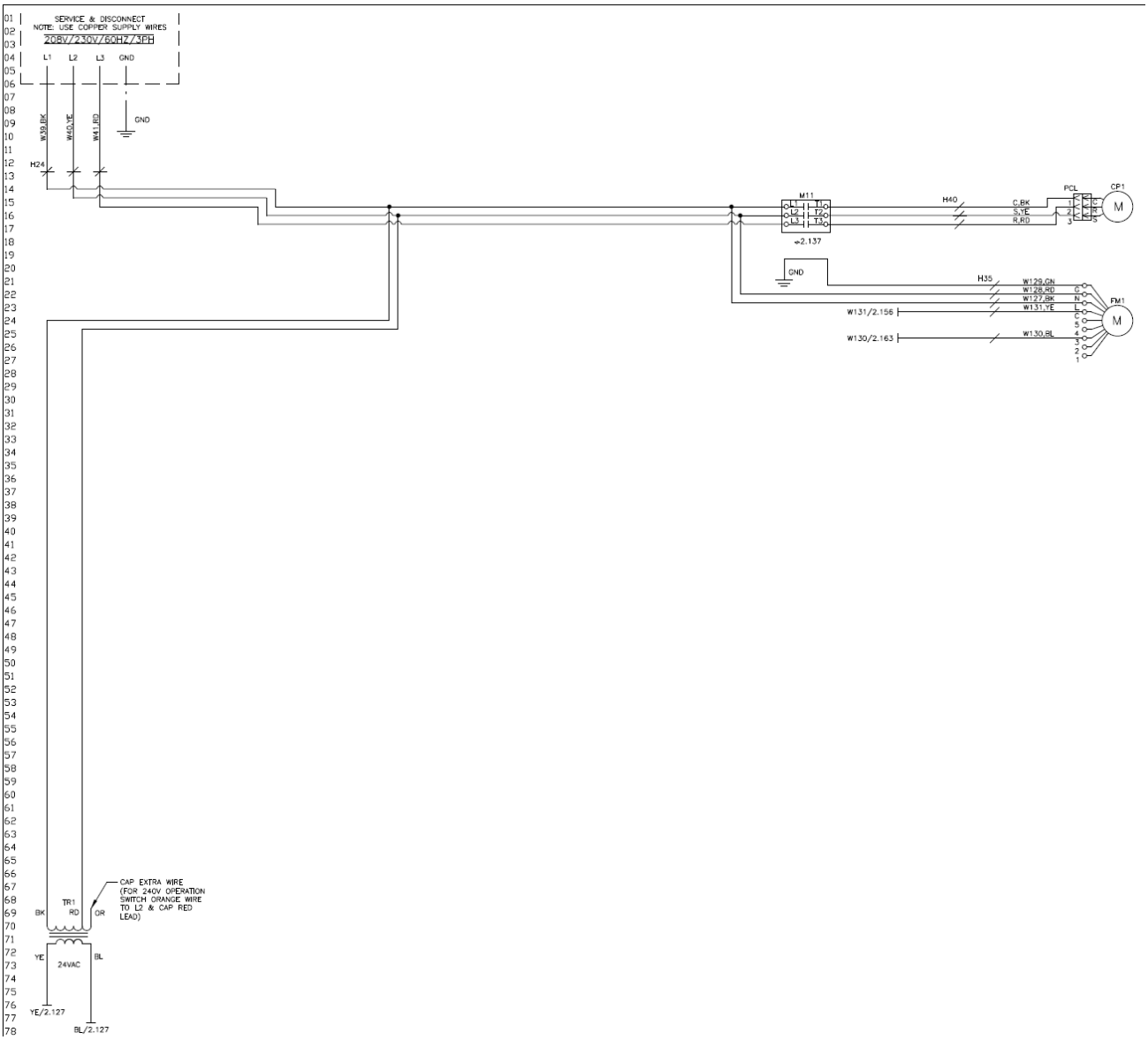


Figure 55: 265-277V/60Hz/1Ph, 208-230V/60Hz/1Ph With PSC Motor

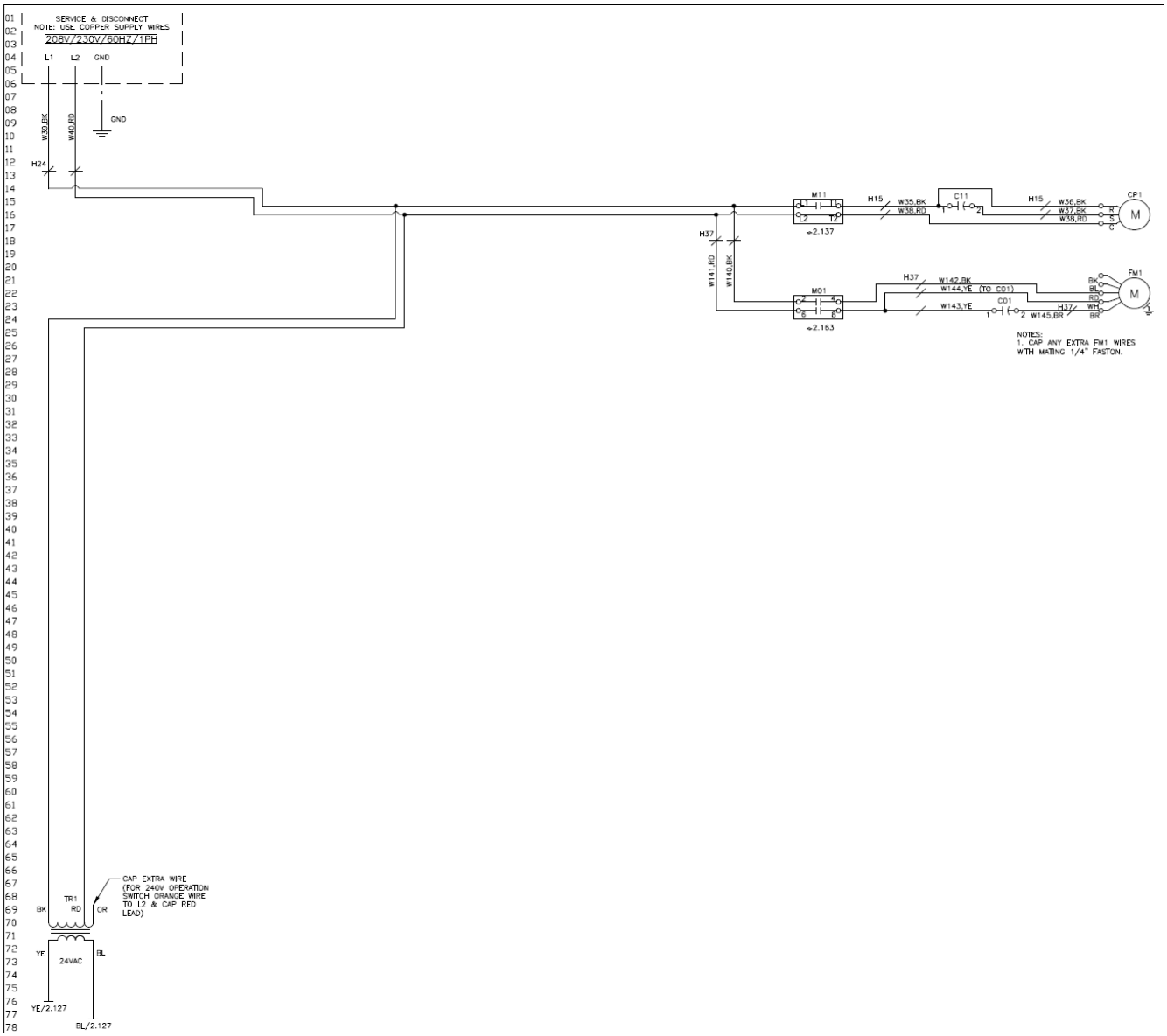


Figure 56: 460V/60Hz/3Ph, 575V/60Hz/3Ph, 208-230V/60Hz/3Ph With PSC Motor

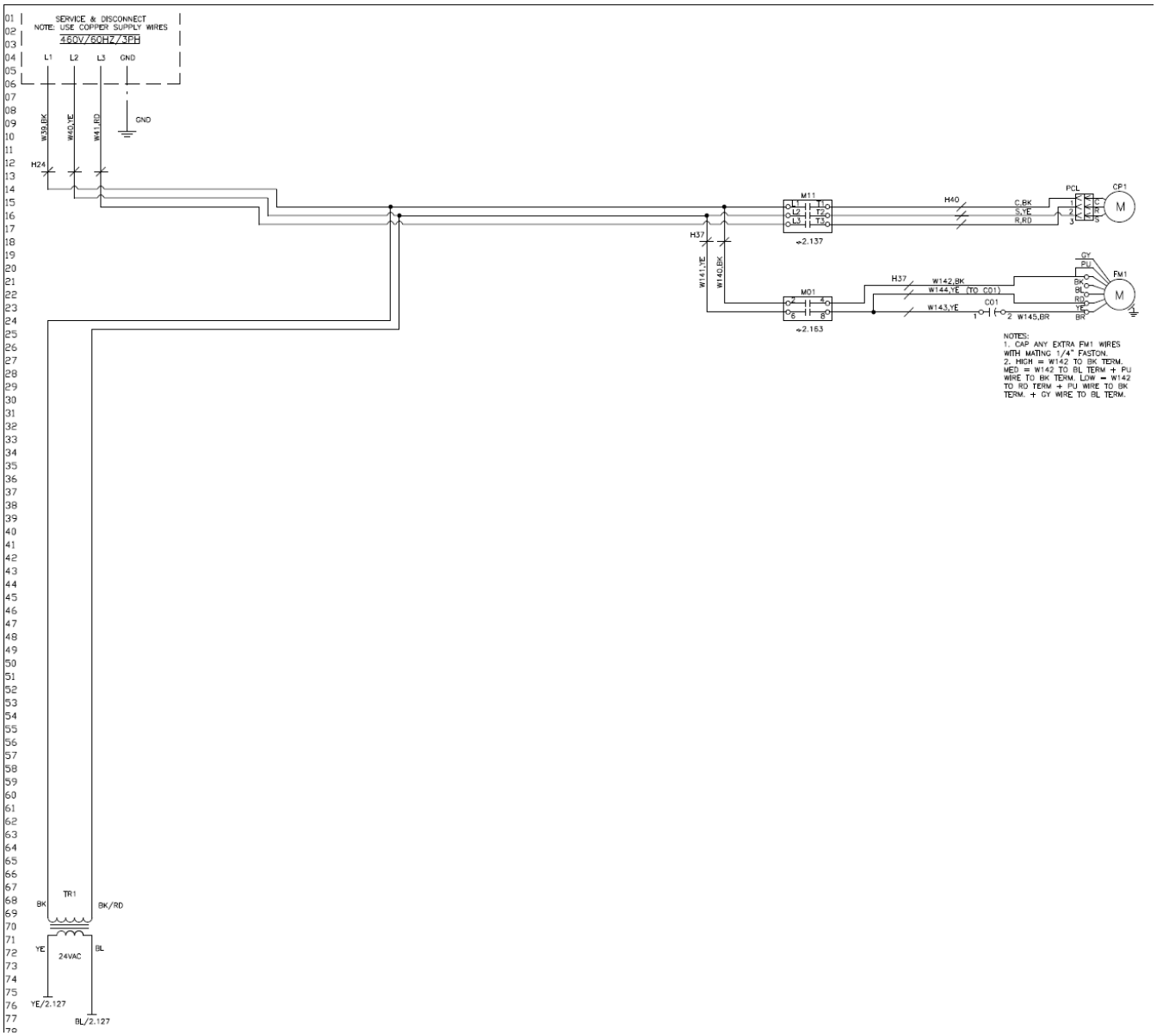


Figure 57: 208-230V/60Hz/3Ph, With Constant CFM EC 2-Stage Motor

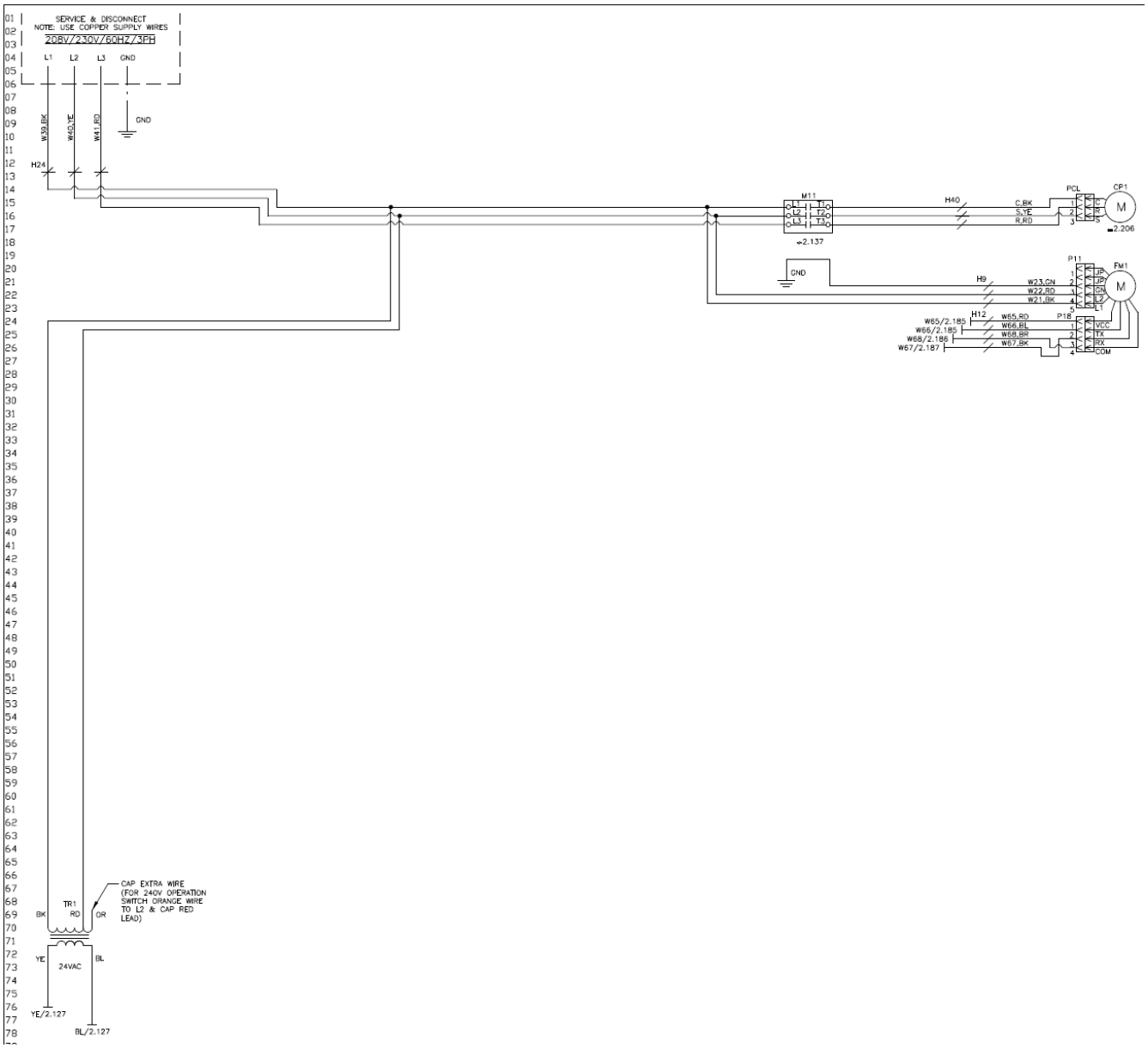
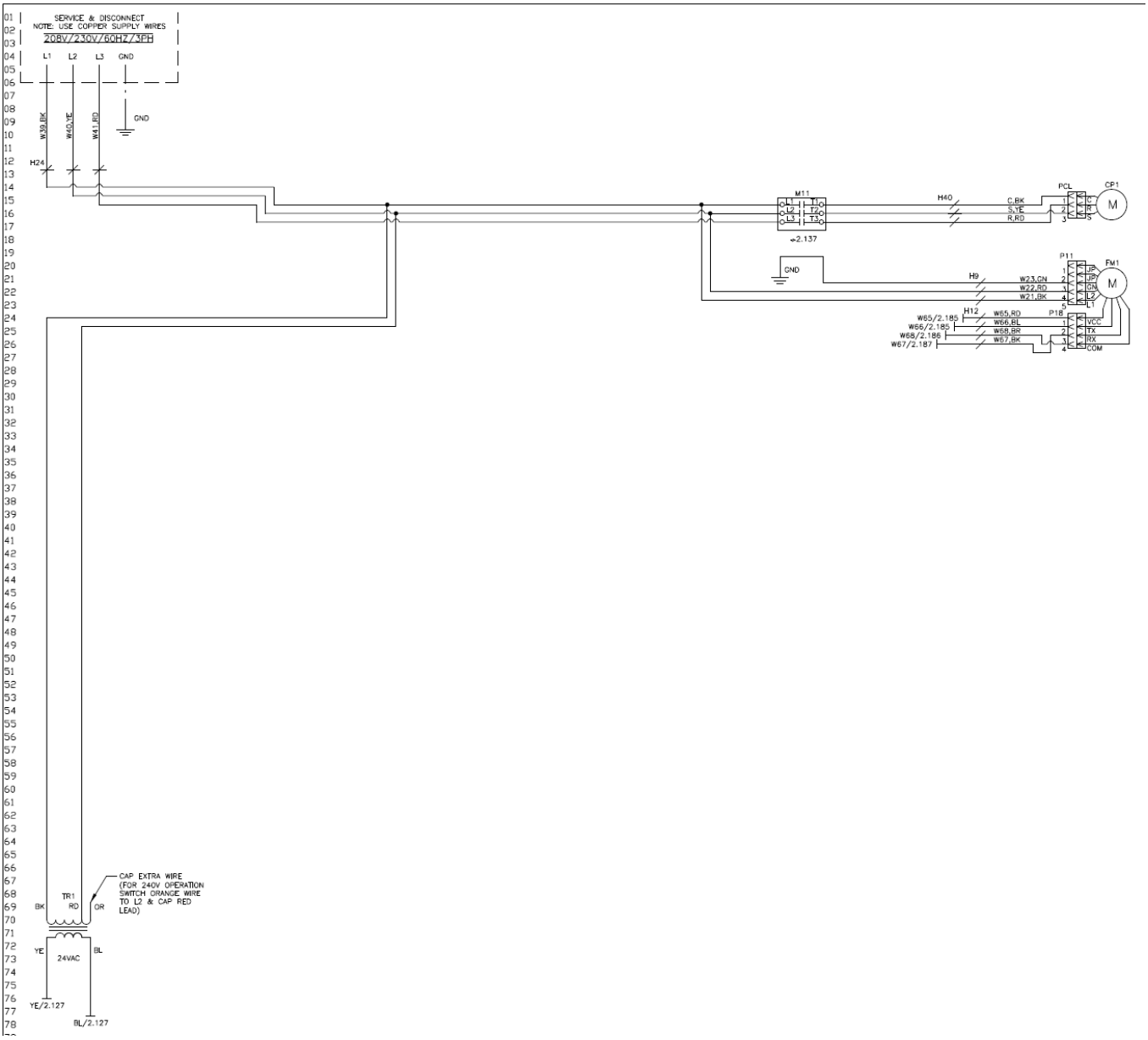


Figure 58: 460V/60Hz/3Ph With Constant CFM EC Motor with Electic Heat Control



Wiring Schematics Legend

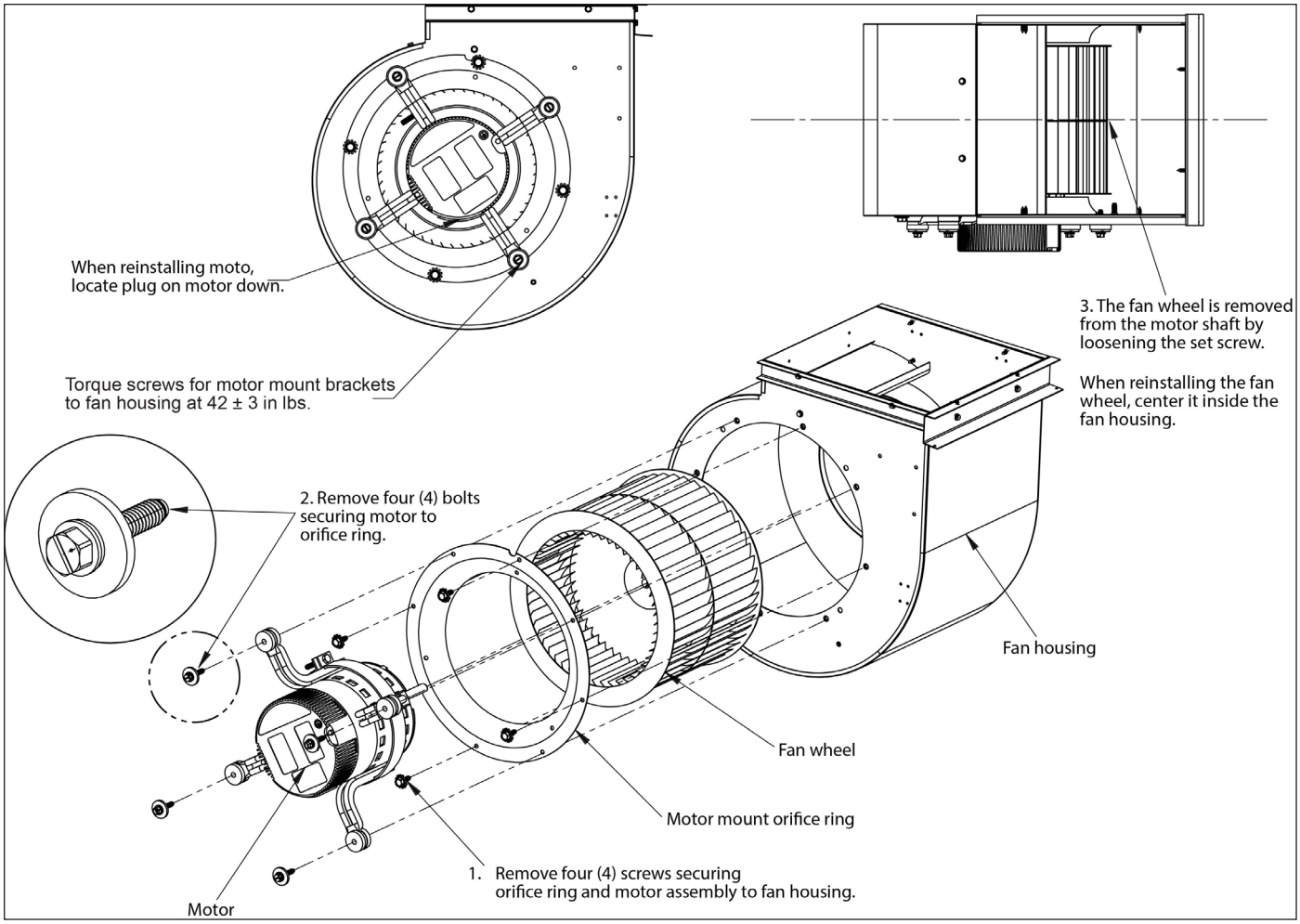
Note: *Devices in legend may or may not be on unit.*

AN1, 2	LED Annunciator
CO1	Fan Motor 1 Capacitor
C11	Compressor 1 Capacitor
CP1	Compressor 1
COE	Condensate Overflow Protection Sensor - WSE
COS	Condensate Overflow Protection Sensor
DAT	Discharge Air Temperature Sensor
DCS	Disconnect Switch
EB1	Expansion Control Board 1
EB2	Expansion Control Board 2 - fan speed ctrl
EWT	Entering Water Temperature Sensor
FM1	Fan Motor 1
GND	Ground
HG1	Hot Gas Reheat Valve Actuator
HP1	High Pressure Switch
HYH	Hot Water Heat Valve Actuator
LAT	Leaving Air Temperature Sensor
LP1	Low Pressure Switch
LT1	Compressor Suction Line Temperature Sensor
LWT	Leaving Water Temperature Sensor
M01	Fan Motor Contactor
M11	Compressor 1 Contactor
MCB	Main Control Board
NCB	Network Control Board
OLP	Overload Protector - Compressor Motor
RAT	Return Air Temperature Sensor
RV1	Reversing Valve
TR1	Transformer - Control
TR2	Transformer - Fan Motor
W0001	Wire
WH001	Wire Harness
WN1	Wire Nut
WP001	Wire Plug
WSE	Waterside Economizer Actuator

Maintenance

1. Normal maintenance on all units is generally limited to filter changes. Units are provided with permanently lubricated motors and require no oiling even though oil caps may be provided.
2. Filter changes are required at regular intervals. The time period between changes will depend upon the project requirements. Some applications such as motels produce a lot of lint from carpeting and linen changes, and will require more frequent filter changes. Check filters at 60-day intervals for the first year until experience is acquired. If light cannot be seen through the filter when held up to sunlight or a bright light, it should be changed. A more critical standard may be desirable.
3. The condensate drain pan should be checked annually and cleaned and flushed as required.
4. Record performance measurements of volts, amps, and water temperature differences (both heating and cooling). A comparison of logged data with start-up and other annual data is useful as an indicator of general equipment condition.
5. Periodic lockouts almost always are caused by air or water problems. The lockout (shutdown) of the unit is a normal protective result. Check for dirt in the water system, water flow rates, water temperatures, airflow rates (may be a dirty filter), and air temperatures. If the lockout occurs in the morning following a return from night setback, entering air below machine limits may be the cause.

Figure 59: Disassemble Motor Orifice Ring and Motor Mount Screws From Fan Housing



R-32 Guidelines

⚠ WARNING

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

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

Do not pierce or burn this unit.

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

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

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

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

The unit shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.

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

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

Maintenance

- Portable equipment shall be repaired outside or in a workshop specially equipped for servicing units with FLAMMABLE REFRIGERANTS.
- Ensure sufficient ventilation at the repair place.
- Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.
- Discharge capacitors in a way that won't cause any spark. The standard procedure to short circuit the capacitor terminals usually creates sparks.
- Reassemble sealed enclosures accurately. If seals are worn, replace them.
- Check safety equipment before putting into service.

Repair

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

Lubrication

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

Leak Detection

NEVER use the following when attempting to detect R-32 refrigerant leaks:

- A halide torch (or any other detector using a naked flame)
- Substances containing chlorine
- Electronic leak detection

Pressure Testing and Refrigerant Evacuation

- Make sure that air or any matter other than R-32 refrigerant does not get into the refrigeration cycle.
- If refrigerant gas leaks occur, ventilate the room as soon as possible.

- R-32 should always be recovered and never released directly into the environment.
- Only use tools meant for use on R-32 refrigerant (such as a gauge manifold, charging hose, or vacuum pump adapter).

Handling and Storage

Precautions for safe handling

Waste air is to be released into the atmosphere only via suitable separators. Open and handle receptacle with care.

Information about fire and explosion protections

Keep ignition sources away. Do not smoke. Protect against electrostatic charges.

Conditions for safe storage

Storage

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

Commissioning

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

Decommissioning

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

Recovery

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

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants including, when applicable, FLAMMABLE REFRIGERANTS. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.

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

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

Disposal

- Waste treatment method reccomendation:
  - Must be specially treated adhering to official regulations.
  - Incineration in an adequate incinerator is reccomended.
  - Uncleaned packaging disposal must be made according to official regulations.
- Ensure sufficient ventilation at the working place.
- Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.
- Evacuate the refrigerant circuit.
- Purge the refrigerant circuit with nitrogen for 5 min.
- Evacuate again.
- Cut out the compressor and drain the oil

Competence of Personel

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

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

Information and Training

The training should include the substance of the following

- Information about the explosion potential of flammable refrigerants to show that flammables may be dangerous when handled without care.
- Information about potential ignition sources, especially those that are not obvious, such as lighters, light switches, vacuum cleaners, electric heaters.
- Information about the different safety concepts:
  - Unventilated: Safety of the appliance does not depend on ventilation of the housing. Switching off the appliance or opening of the housing has no significant effect on the safety. Nevertheless, it is possible that leaking refrigerant may accumulate inside the enclosure and flammable atmosphere will be released when the enclosure is opened.
  - Ventilated enclosure : Safety of the appliance depends on ventilation of the housing. Switching off the appliance or opening of the enclosure has a significant effect on the safety. Care should be taken to ensure sufficient ventilation before.
  - Ventilated room: Safety of the appliance depends on the ventilation of the room. Switching off the appliance or opening of the housing has no significant effect on the safety. The ventilation of the room shall not be switched off during repair procedures.
- Information about refrigerant detectors:
  - Principle of function, including influences on the operation.
  - Procedures, how to repair, check or replace a refrigerant detector or parts of it in a safe way.
  - Procedures, how to disable a refrigerant detector in case of repair work on the refrigerant carrying parts.
- Information about the concept of sealed components and sealed enclosures according to IEC 60079-15:2010.
- Information about the correct working procedures:
  - Commissioning
    i. Ensure that the floor area is sufficient for the refrigerant charge or that the ventilation duct is assembled in a correct manner.
    ii. Connect the pipes and carry out a leak test before charging with refrigerant.
    iii. Check safety equipment before putting into service.
  - Maintenance
    i. Portable equipment shall be repaired outside or in a workshop specially equipped for servicing units with flammable refrigerants.
    ii. Ensure sufficient ventilation at the repair place.
    iii. Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.
    iv. Discharge capacitors in a way that won't cause any spark. The standard procedure to short circuit the capacitor terminals usually creates sparks.
    v. Reassemble sealed enclosures accurately. If seals are worn, replace them.
    vi. Check safety equipment before putting into service.
  - Repair
    i. Portable equipment shall be repaired outside or in a workshop specially equipped for servicing units with flammable refrigerants.
    ii. Ensure sufficient ventilation at the repair place.
    iii. Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.
    iv. Discharge capacitors in a way that won't cause any spark.
    v. When brazing is required, the following procedures shall be carried out in the right order:
      - Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.
      - Evacuate the refrigerant circuit.
      - Remove parts to be replaced by cutting, not by flame.
      - Purge the braze point with nitrogen during the brazing procedure.
      - Carry out a leak test before charging with refrigerant.

    vi. Reassemble sealed enclosures accurately. If seals are worn, replace them.
    vii. • Check safety equipment before putting into service.
  - Decommissioning
    i. If the safety is affected when the equipment is putted out of service, the refrigerant charge shall be removed before decommissioning.
    ii. Ensure sufficient ventilation at the equipment location.
    iii. Be aware that malfunction of the equipment may be

caused by refrigerant loss and a refrigerant leak is possible.

iv. Discharge capacitors in a way that won't cause any spark.

v. Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.

— Disposal

i. Ensure sufficient ventilation at the working place.

ii. Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.

Information on Servicing

Checks to the area

Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized

Work procedure

Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.

General work area

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

Checking for presence of refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i. e. non-sparking, adequately sealed or intrinsically safe.

Presence of fire extinguisher

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

No ignition sources

No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

Ventilated area

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Checks to the refrigerating equipment

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer's technical department for assistance.

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

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

Checks to electrical devices

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

Initial safety checks shall include:

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

- that there is continuity of earth bonding.

Repairs to sealed components

- During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.
- Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
- Ensure that the apparatus is mounted securely.
- Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.

Repair to intrinsically safe components

- Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.
- Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.
- Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

NOTE: The use of silicon sealant can inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

Cabling

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

Detection of flammable refrigerants

- Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- The following leak detection methods are deemed acceptable for all refrigerant systems.
- Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
- Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

NOTE: Examples of leak detection fluids are

- bubble method
- fluorescent method agents.

- If a leak is suspected, all naked flames shall be removed/ extinguished.
- If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to instructions above.

Removal and evacuation

- When breaking into the refrigerant circuit to make repairs, or for any other purpose, conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration.
- The following procedure shall be adhered to:
  i. safely remove refrigerant following local and national regulations;
  ii. purge the circuit with inert gas;
  iii. evacuate (optional for A2L);
  iv. purge with inert gas (optional for A2L);
  v. open the circuit by cutting or brazing.
- The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times.
- Compressed air or oxygen shall not be used for purging refrigerant systems.
- For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L).
- When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

- Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the REFRIGERATING SYSTEM is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.
- Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Decommissioning

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

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

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

- Become familiar with the equipment and its operation.
- Isolate system electrically.
- Before attempting the procedure, ensure that mechanical handling equipment is available, if required, for handling refrigerant cylinders; all personal protective equipment is available and being used correctly; the recovery process is supervised at all times by a competent person; recovery equipment and cylinders conform to the appropriate standards.
- Pump down refrigerant system, if possible.
- If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- Make sure that cylinder is situated on the scales before recovery takes place.
- Start the recovery machine and operate in accordance with instructions.
- Do not overfill cylinders (no more than 80 % volume liquid charge).
- Do not exceed the maximum working pressure of the cylinder, even temporarily.
- When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked.

Labelling

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

Recovery

- When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.
- When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i. e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
- The recovery equipment shall be in good working order with a set of instructions concerning the equipmenthat is at hand and shall be suitable for the recovery of all appropriate refrigerants including, when applicable, FLAMMABLE REFRIGERANTS. In addition, a set of calibrated weighing scales shall be availableand in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.
- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that FLAMMABLE REFRIGERANT does not remain within the lubricant. The evacuation process shall be carried out prior to returning the

compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

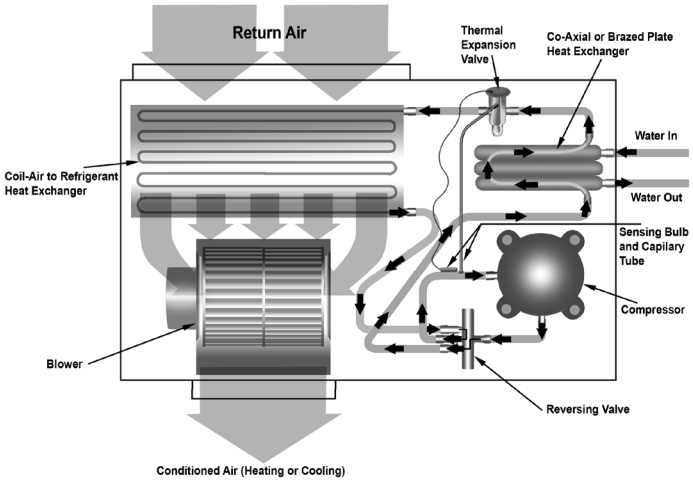
Troubleshooting

Table 41: Troubleshooting Refrigeration Circuit

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

Typical Refrigeration Cycles

Figure 60: Cooling Mode



Cooling Refrigeration Cycle

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

Heating Refrigeration Cycle

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

WSHP Equipment Check, Test and Start Form

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

Installation Data

Job Name _____ Check, Test & Start Date _____

City or Town _____ State _____ Zip _____

Who is Performing CTS _____

General Contractor _____

Equipment Type (Check all that apply)

☐ Closed Loop ☐ Open Loop

☐ Geothermal ☐ Other (specify)_____

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

Essential Items Check

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

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

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

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

Please include any suggestions or comments for Daikin Applied: _____

_____

_____

_____

Above System is in Proper Working Order

Note: *After contacting TRC to report the issue, 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

Form WS-CTS-00.01 (Rev. 4/14)

Unit Check / Equipment Data

Installation Data

Job Name _____ Check Test Date: _____

City _____ State _____ Zip _____

Daikin Model # _____

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

General Contractor:_____ Mechanical Contractor:_____

Technician Performing Start-Up: Name_____ Employer:_____

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

Equipment Data

Flow Rate **EWP - LWP = ΔP**

① EWP - PSI In _____minus ② LWP - PSI Out _____ equals ΔP_____

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

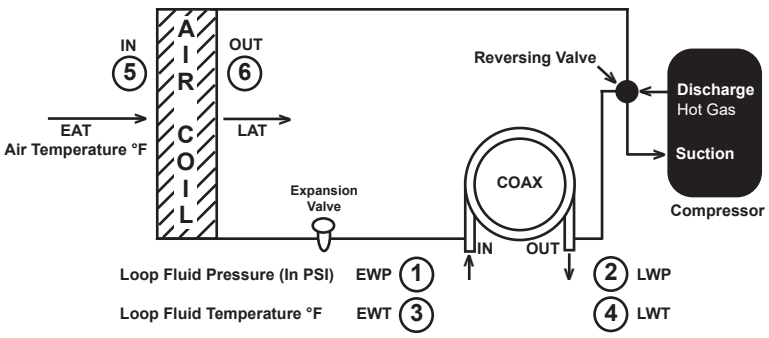
Air Temperature Rise / Drop through the air coil **ΔT x CFM x 1.08 = BTUH Sensible**

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

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

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

Check, Test & Start



Form No._____

Commercial Check, Test and Start Worksheet

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

	Model	Serial #	H.P. #	EWT ③	LWT ④	EWP ①	LWP ②	EAT ⑤	LAT ⑥	Volts	Amps Cool-ing	Check Air Filter and Coil	Comments
1.													
2.													
3.													
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Daikin Applied Training and Development

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

Warranty

All Daikin Applied equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied representative for warranty details. 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.