Tranquility® Large (TL) Series

Commercial Vertical Packaged Heat Pump

Installation, Operation & Maintenance

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Revised: January 24, 2023

ClimateMaster®
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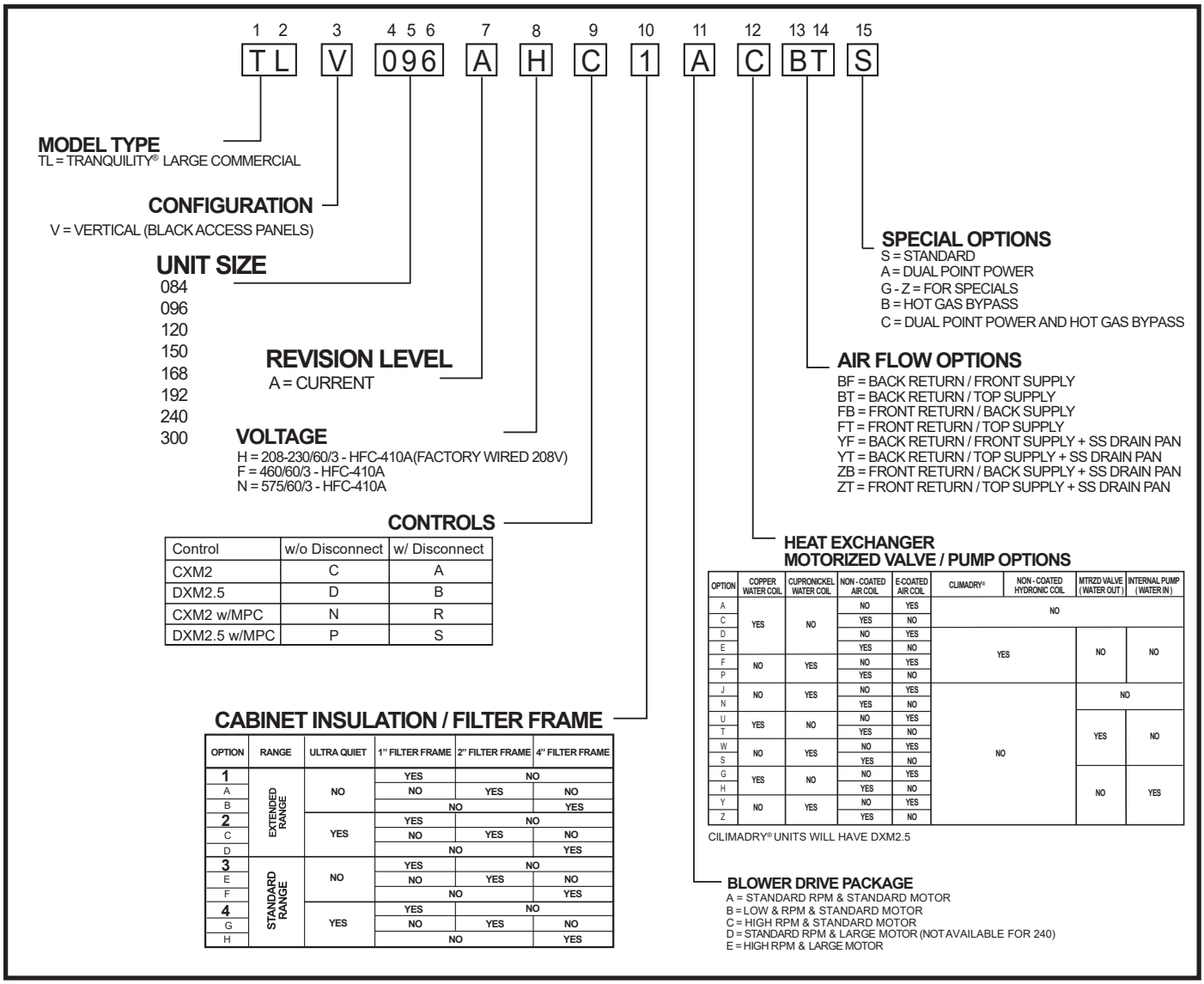
Model Nomenclature



Control	w/o Disconnect	w/ Disconnect
CXM2	C	A
DXM2.5	D	B
CXM2 w/MPC	N	R
DXM2.5 w/MPC	P	S

OPTION	COPPER WATER COIL	CUPRONICKEL WATER COIL	NON - COATED AIR COIL	E-COATED AIR COIL	CLIMADRY®	NON - COATED HYDRONIC COIL	MTRZD VALVE (WATER OUT)	INTERNAL PUMP (WATER IN)
A	YES	NO	NO	YES	NO			
C			YES	NO				
D			NO	YES	YES		NO	NO
E			YES	NO				
F	NO	YES	NO	YES				
P			YES	NO				
J	NO	YES	NO	YES	NO		NO	
N			YES	NO				
U	YES	NO	NO	YES			YES	NO
T			YES	NO				
W	NO	YES	NO	YES				
S			YES	NO				
G	YES	NO	NO	YES			NO	YES
H			YES	NO				
Y	NO	YES	NO	YES				
Z			YES	NO				

CILIMADRY® UNITS WILL HAVE DXM2.5

OPTION	RANGE	ULTRA QUIET	1" FILTER FRAME	2" FILTER FRAME	4" FILTER FRAME
1	EXTENDED RANGE	NO	YES	NO	
A			NO	YES	NO
B			NO		YES
2		YES	YES	NO	
C			NO	YES	NO
D			NO		YES
3	STANDARD RANGE	NO	YES	NO	
E			NO	YES	NO
F			NO		YES
4		YES	YES	NO	
G			NO	YES	NO
H			NO		YES

Notes:

1. ClimaDry® II reheat option (Digit 12 - D, E, F or P) must be ordered with original equipment (cannot be field added). Unit must have DXM2.5 control. Not available for units with internal water valve, flow regulator options, or 575Volt. Check unit submittal for limitations and specific requirements.
2. Antifreeze is not required for TLV but may be required due to EWT in heating or other models with orginal ClimaDry® Option on the same loop.
3. ClimaDry® II is not recommended for applications with poor water quality (see water quality guidelines in unit IOM). The copper heat exchanger (Digit 12 - D or E) with cast iron pump are designed for closed loop systems.
4. The cupro-nickel heat exchanger (Digit 12 - F or P) also includes bronze pump, and is required for use with open loop or ground water systems.
5. Max working water pressure for the ClimaDry® II option is 145psig [999kPa].
6. Thermostat must be either:
   A. Thermostat with dehumidification mode (ATP32U04C or similar)
   B. Thermostat and separate humidistat or dehumidistat controller (see Page 22 for DXM2.5 DIP settings).
7. ClimaDry® II units must have minimum entering air temperature of 70°F DB / 61°F WB while in the cooling, continuous fan, or dehumidification modes. Minimum entering air temperature while operating in the heating mode (not continuous fan) is the minimum entering air temperature for the standard model (without the ClimaDry® option) in the heating mode. Operating below these minimum entering air temperatures may result in nuisance faults.

General Information

Safety
Warnings, cautions, and notices appear throughout this manual. Read these items carefully before attempting any installation, service, or troubleshooting of the equipment.

DANGER: Indicates an immediate hazardous situation, which if not avoided will result in death or serious injury. DANGER labels on unit access panels must be observed.

WARNING: Indicates a potentially hazardous situation, which if not avoided could result in death or serious injury.

CAUTION: Indicates a potentially hazardous situation or an unsafe practice, which if not avoided could result in minor or moderate injury or product or property damage.

NOTICE: Notification of installation, operation, or maintenance information, which is important, but which is not hazard-related.

⚠ WARNING! ⚠

WARNING! The EarthPure® Application and Service Manual should be read and understood before attempting to service refrigerant circuits with HFC-410A.

⚠ WARNING! ⚠

WARNING! To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state, and federal proficiency requirements.

⚠ CAUTION! ⚠

CAUTION! To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. The mechanical components and filters can quickly become clogged with construction dirt and debris, which may cause system damage and void product warranty.

⚠ WARNING! ⚠

WARNING! The installation of water-source heat pumps and all associated components, parts, and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

⚠ WARNING! ⚠

WARNING! All refrigerant discharged from this unit must be recovered WITHOUT EXCEPTION. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

Inspection - Upon receipt of the equipment, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the packaging of each unit, and inspect each unit for damage. Insure that the carrier makes proper notation of any shortages or damage on all copies of the freight bill and completes a common carrier inspection report. Concealed damage not discovered during unloading must be reported to the carrier within 15 days of receipt of shipment. If not filed within 15 days, the freight company can deny the claim without recourse. Note: It is the responsibility of the purchaser to file all necessary claims with the carrier. Notify your equipment supplier of all damage within fifteen (15) days of shipment.

Storage - Equipment should be stored in its original packaging in a clean, dry area. Store units in an upright position at all times.

Unit Protection - Cover units on the job site with either the original packaging or an equivalent protective covering. Cap the open ends of pipes stored on the job site. In areas where painting, plastering, and/or spraying has not been completed, all due precautions must be taken to avoid physical damage to the units and contamination by foreign material. Physical damage and contamination may prevent proper start-up and may result in costly equipment clean-up.

Examine all pipes, fittings, and valves before installing any of the system components. Remove any dirt or debris found in or on these components.

Pre-Installation - Installation, Operation, and Maintenance instructions are provided with each unit. Horizontal equipment is designed for installation above false ceiling or in a ceiling plenum. Other unit configurations are typically installed in a mechanical room. The installation site chosen should include adequate service clearance around the unit. Before unit start-up, read all manuals and become familiar with the unit and its operation. Thoroughly check the system before operation.

General Information, Cont'd.

Prepare units for installation as follows:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Keep the cabinet covered with the original packaging until installation is complete and all plastering, painting, etc. is finished.
3. Verify refrigerant tubing is free of kinks or dents and that it does not touch other unit components.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.
5. Some airflow patterns and some control box locations are field convertible. Locate the conversion section of this IOM.

⚠ CAUTION! ⚠

CAUTION! All three phase scroll compressors must have direction of rotation verified at start-up. Verification is achieved by checking compressor Amp draw. Amp draw will be substantially lower compared to nameplate values. Additionally, reverse rotation results in an elevated sound level compared to correct rotation. Reverse rotation will result in compressor internal overload trip within several minutes. Verify compressor type before proceeding.

⚠ CAUTION! ⚠

CAUTION! DO NOT store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life. Always move and store units in an upright position. Tilting units on their sides will cause equipment damage.

⚠ CAUTION! ⚠

CAUTION! CUT HAZARD - Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing heat pumps.

Tranquility® Large (TL) Series

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TL Physical Data

Model	084	096	120	150	168	192	240	300
Compressor Quantity	Scroll (1)				Scroll (2)			
Factory Charge HFC-410a (oz) [kg] per circuit	140 [3.97]	156 [4.42]	224 [6.35]	248 [7.03]	140 [3.97]	156 [4.42]	224 [6.35]	248 [7.03]
Blower Motor								
Blower Motor Quantity	1							
Standard Motor (hp) [kW]	1.0 [.75]	1.5 [1.12]	2 [1.49]	3 [2.24]	2 [1.49]	3 [2.24]	5 [3.73]	5 [3.73]
Large Motor (hp) [kW]	1.5 [1.12]	2.0 [1.49]	3 [2.24]	5 [3.73]	3 [2.24]	5 [3.73]	7.5 [5.60]	7.5 [5.60]
Blower								
No. of Blowers	1				2			
Blower Wheel Size D x W (in) [cm]	15 x 11 [38.1 x 38.1]			15 x 15 [38.1 x 38.1]	15 x 11 [38.1 x 38.1]			15 x 15 [38.1 x 38.1]
Water Connection Size								
FPT (in) [mm]	1-1/2" [38.1]			2" [50.8]				2-1/2" [63.5]
Coax Volume								
Volume (US Gallons) [liters]	2.19 [8.28]		2.48 [9.37]	3.46 [13.11]	4.83 [18.29]		6.36 [24.08]	7.39 [27.98]
Condensate Connection Size								
FPT (in) [mm]	1" [25.4]							
Air Coil Data								
Air Coil Dimensions H x W (in) [cm]	36 x 48 [91.4 x 121.9]				2 - 36 x 48 [91.4 x 121.9]			
Air Coil Total Face Area (ft^2) [m^2]	12 [1.11]				24 [2.22]			
Miscellaneous Data								
Filter Standard - 1" [25.4mm] Throwaway (qty) (in) [cm]	(QTY.4) 18 x 25 [45.74 x 63.5]				(QTY.8) 18 x 25 [45.74 x 63.5]			
Weight - Operating (lbs) [kg]	880 [399]		930 [422]	960 [435]	1600 [725]		1665 [755]	1695 [769]
Weight - Packaged (lbs) [kg]	895 [406]		945 [429]	975 [442]	1630 [739]		1695 [769]	1725 [782]

All units have grommet compressor mountings, and 1/2" & 1-3/4" electrical knockouts.

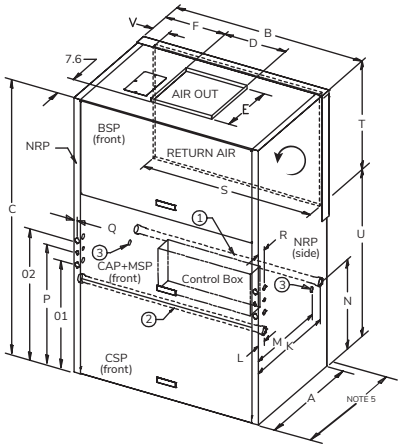
For ClimaDry® option, add 125 lbs [57 kg] for 084-150 and 250 lbs [114 kg] for 168-300.

Unit Maximum Water Working Pressure	
Options	Max Pressure PSIG [kPa]
Base Unit	300 [2,068]
Motorized Water Valve	300 [2,068]
Internal Secondary Pump or ClimaDry®	145 [999]

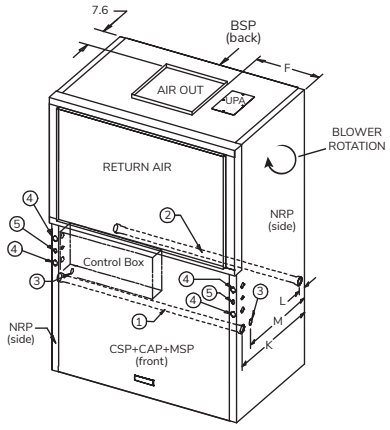
Use the lowest maximum pressure rating when multiple options are combined.

TLV084-150 Dimensional Data

ALL CONFIGURATIONS REQUIRE SERVICE ACCESS AREA DESCRIBED IN NOTES 7, 8, 9, AND 10.



REAR RETURN TOP DISCHARGE (RR/TD)

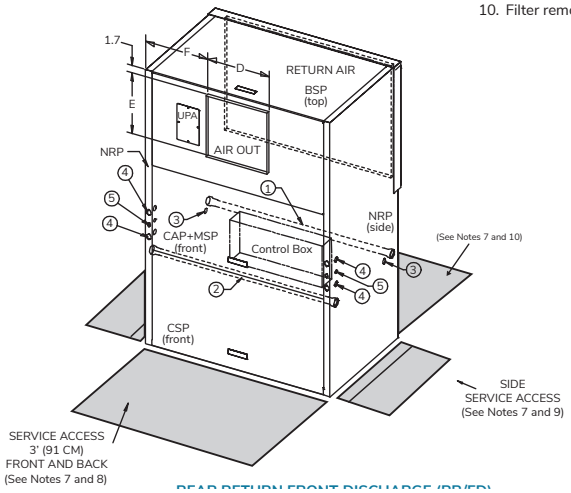


FRONT RETURN TOP DISCHARGE (FR/TD)

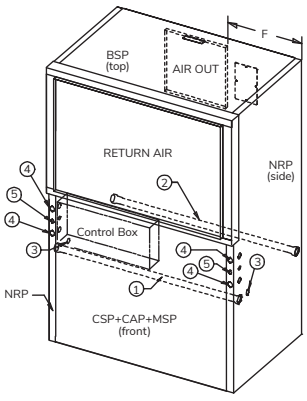
LEGEND	084-120	150
① Water Inlet (See Note 2)	1-1/2" FPT	2" FPT
② Water Outlet (See Note 2)	1-1/2" FPT	2" FPT
③ Condensate Drain (See Note 3)	1" FPT	
④ High Voltage Access (See Note 4)	1-3/8" [3.49 CM]	
⑤ Low Voltage Access (See Note 4)	7/8" [2.2 CM]	

BSP - Blower Service Panel
CAP - Control Access Panel
CSP - Compressor Access Panel
MSP - Motor Service Panel
NRP - Non Removable Panel
UPA - Upper Pulley Access

NOTES:
1. All dimensions in inches (cm)
2. Water inlet and water outlet connections are available on either side (left or right) of the unit. Installer must plug water inlet/outlet not being connected to.
3. Condensate drain is available on either side (left or right) of unit. Drain hose and drain connection will be tied inside the unit. Installer will untie the drain hose, form trap, and connect to the condensate drain hole of installer's choice.
4. Electrical access is available on either side (left or right) of unit and is also available in the front on the left or right side of the unit.
5. Overall Depth - Add 3.12"(8 cm) for 1"(2.5 cm) or 2"(5 cm) Filter Frame; 5.12" for 4" Filter Frame and for FD, RD additional 1.06"(2.7cm) for supply air duct flange.
6. Overall cabinet height dimension does not include duct flange when in top discharge configuration.
7. While access to all removable panels may not be required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
8. Units require 3 feet (91 cm) clearance for water connections, CAP, CSP, MSP and BSP service access.
9. Side service access must be 2 feet (9.4 cm) on any side that connections are made. If no connections are made on a side then service access can be 6 inches(1.5 cm) minimum.
10. Filter removal is from bottom of frame, allow 2 feet (9.4 cm) access for servicing.



REAR RETURN FRONT DISCHARGE (RR/FD)



FRONT RETURN REAR DISCHARGE (FR/RD)

Model		Overall Cabinet			Discharge Connections Duct Flange			Water Connections				Electrical Knockouts					Return Air Connections Using Return Air Opening			
		A	B	C	D	E	F	K	L	M	N	O1	O2	P	Q	R	S	T	U	V
		Depth Note 5	Width	Height Note 6	Supply Width	Supply Depth		1 Water Inlet	2 Water Outlet	3 Con-densate							Return Depth	Return Height		
084-120	in.	34.0	53.1	79.0	17.5	17.6	17.8	31.0	3.0	27.0	25.6	31.0	38.0	34.6	1.0	3.0	48.0	32.4	44.6	2.7
	cm.	86.4	134.9	200.7	44.5	44.6	45.1	78.7	7.6	68.6	65.1	78.7	96.4	87.7	2.5	7.6	121.9	82.2	113.3	6.9
150	in.	34.0	53.1	79.0	21.4	17.6	17.8	31.0	3.0	27.0	25.6	31.0	38.0	34.6	1.0	3.0	48.0	32.4	44.6	2.7
	cm.	86.4	134.9	200.7	54.4	44.6	45.1	78.7	7.6	68.6	65.1	78.7	96.4	87.7	2.5	7.6	121.9	82.2	113.3	6.9

Tranquility® Large (TL) Series

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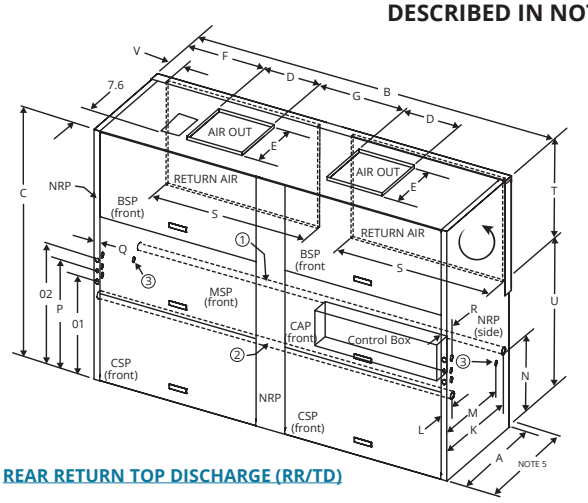
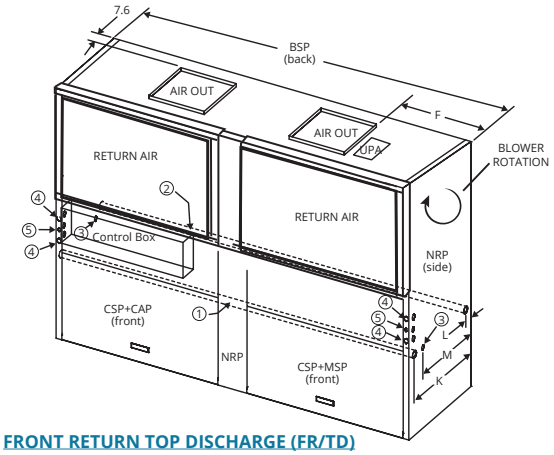
TLV168-300 Dimensional Data

ALL CONFIGURATIONS REQUIRE SERVICE ACCESS AREA DESCRIBED IN NOTES 7, 8, 9, AND 10.



REAR RETURN TOP DISCHARGE (RR/TD)



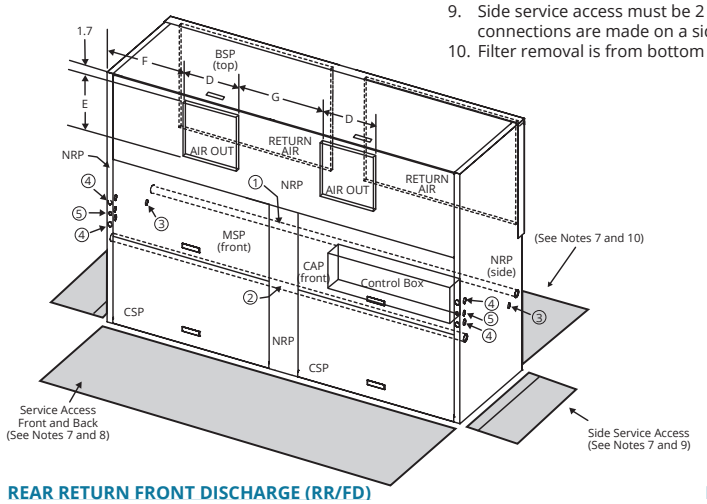
FRONT RETURN TOP DISCHARGE (FR/TD)

LEGEND	168-240	300
1. Water inlet (see note 2)	2" FPT	2 1/2" FPT
2. Water outlet (see note	2" FPT	2 1/2" FPT
3. Condensate drain (see note 3)	1" FPT	
4. High voltage access (see note 4)	1 3/8" (3.49 cm)	
5. Low voltage access (see note 4)	7/8" (2.2 cm)	

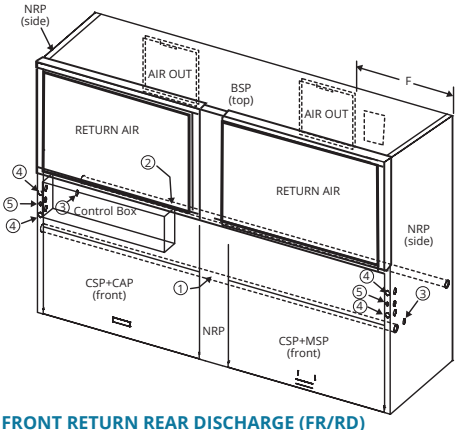
BSP - Blower Service Panel
CAP - Control Access Panel
CSP - Compressor Access Panel
MSP - Motor Service Panel
NRP - Non Removable Panel
UPA - Upper Pulley Access

NOTES:

1. All dimensions in inches (cm)
2. Water inlet and water outlet connections are available on either side (left or right) of the unit. Installer must plug water inlet/outlet not being connected to.
3. Condensate drain is available on either side (left or right) of unit. Drain hose and drain connection will be tied inside the unit. Installer will untie the drain hose, form trap, and connect to the condensate drain hole of installer's choice.
4. Electrical access is available on either side (left or right) of unit and is also available in the front on the left or right side of the unit.
5. Overall Depth - Add 3.12" (8 cm) for 1" (2.5 cm) or 2" (5 cm) Filter Frame; 5.12" for 4" Filter Frame and for FD, RD additional 1.06" (2.7cm) for supply air duct flange.
6. Overall cabinet height dimension does not include duct flange when in top discharge configuration.
7. While access to all removable panels may not be required, installer should take care to comply with all building codes and allow adequate clearance for future field service.
8. Units require 3 feet(91 cm) clearance for water connections, CAP, CSP, MSP and BSP service access.
9. Side service access must be 2 feet (9.4 cm) on any side that connections are made. If no connections are made on a side then service access can be 6 inches (1.5 cm) minimum.
10. Filter removal is from bottom of frame, allow 2 feet (9.4 cm) access for servicing.



REAR RETURN FRONT DISCHARGE (RR/FD)

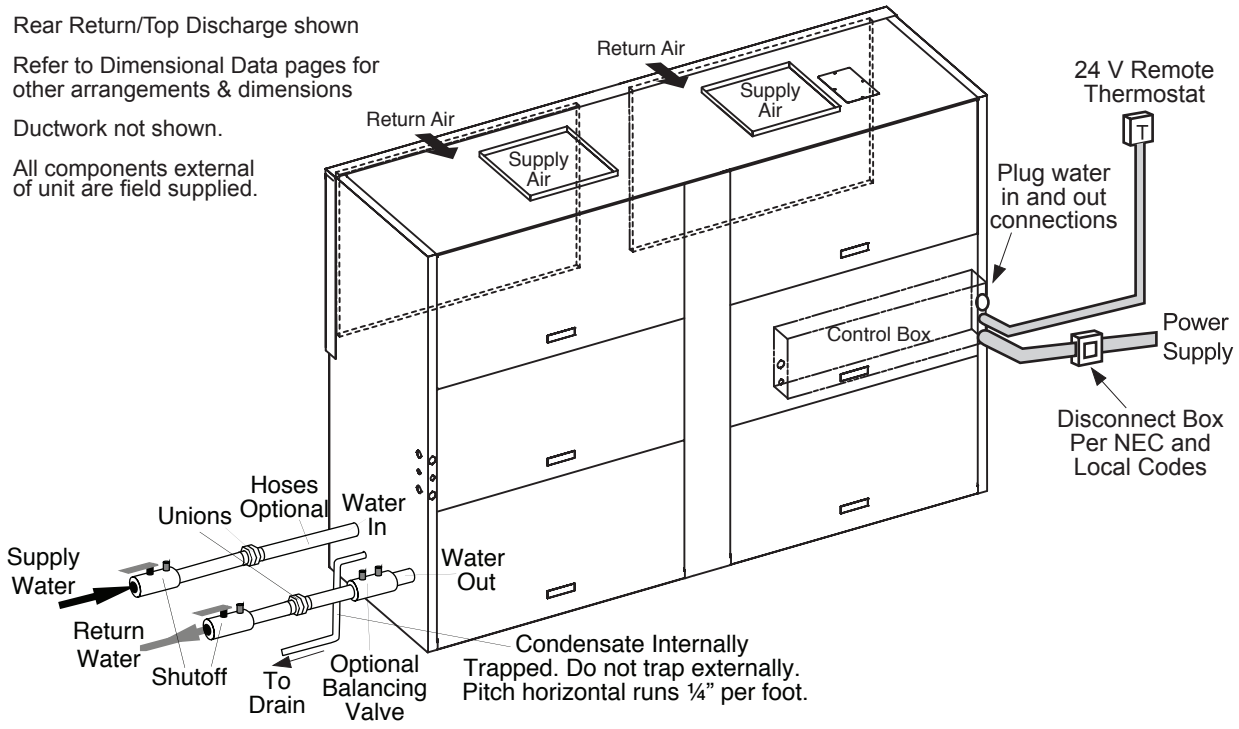


FRONT RETURN REAR DISCHARGE (FR/RD)

Model		Overall Cabinet			Discharge Connections Duct Flange				Water Connections				Electrical Knockouts					Return Air Connections Using Return Air Opening			
		A	B	C	D	E	F	G	K	L	M	N	O1	O2	P	Q	R	S	T	U	V
		Depth Note 5	Width	Height Note 6	Supply Width	Supply Depth			1 Water Inlet	2 Water Outlet	3 Condensate							Return Depth	Return Height		
168-240	in.	34.0	106.7	79.0	17.5	17.6	17.8	31.3	31.0	3.0	27.0	25.6	31.0	38.0	34.6	1.0	3.0	48.0	32.4	44.6	2.7
	cm.	86.4	270.9	200.7	44.5	44.6	45.1	79.4	78.7	7.6	68.6	65.1	78.7	96.4	87.8	2.5	7.6	121.9	82.2	113.3	6.9
300	in.	34.0	106.7	79.0	21.4	17.6	17.8	23.4	31.0	3.0	27.0	25.6	31.0	38.0	34.6	1.0	3.0	48.0	32.4	44.6	2.7
	cm.	86.4	270.9	200.7	54.4	44.6	45.1	59.4	78.7	7.6	68.6	65.1	78.7	96.4	87.8	2.5	7.6	121.9	82.2	113.3	6.9

Installation

Figure 1: Typical Vertical Installation



Vertical Location and Access

TL units are not designed for outdoor installation. Locate the unit in an indoor area that allows enough space for installation and for service personnel to perform typical maintenance or repairs. TL units are typically installed in a floor level closet or in a small mechanical room. Refer to Figure 2b for an illustration of a typical installation. Install units with adequate clearance to allow maintenance and servicing. Conform to the following guidelines when selecting unit location:

- Provide adequate clearance for filter replacement and drain pan cleaning. DO NOT block filter access with piping, conduit or other materials. Refer to submittal drawing for Vertical Unit Dimensions.
- Provide access for fan and fan motor maintenance and for servicing of the compressor and coils without removal of the unit.
- Provide an unobstructed path to the unit within the closet or mechanical room to enable removal of the unit if necessary.
- Provide access to water valves and fittings, and screwdriver access to the unit side panels, discharge collar and all electrical connections

Duct System Design & Installation Guidelines

The following application guidelines must be used when installing TL units. Failure to follow these guidelines could result in unsatisfactory unit performance and/or premature failure of some unit components. ClimateMaster will not warrant, or accept responsibility for products which fail, have defects, damage or insufficient performance as a result of improper application.

- The duct system must be sized to handle the airflow quietly and must not exceed the maximum allowable External Static Pressure. To maximize sound attenuation metal supply and return ducts should include internal insulation or be of duct board construction for the first 10 feet or end of first full-sized elbow.
- Install a flexible connector in all supply and return air ducts close to the unit to inhibit sound transfer to the ducts.
- Do not install uninsulated duct in an unconditioned space. The unit performance will be adversely affected and damage from condensate can occur.

Installation, Cont'd.

- On units with multiple fan outlets a "pair of pants" duct connection must be used for proper air balance and distribution and to prevent fan oscillation.
- Include at least one 90-degree turn in supply air ducts to reduce noise transmission.
- Existing ducts must be checked to ensure proper size and configuration prior to installation of any replacement unit. Also inspect for and repair all air leaks in existing ducts.
- Units may only be connected to a dedicated duct system. Consult the factory BEFORE connecting multiple units to a common duct system.
- Never connect a unit to a duct system with automatic or modulating dampers, VAV boxes, etc. in the supply air system. Never allow a situation where the total unit CFM can drop below the minimum required for proper unit operation.The VAV equipped TL unit is for connection to a single zone duct system.
- Never connect a bypass damper from the supply air duct to the return air duct. Never allow the return air temperature to drop below the minimum allowable normal temperature for proper unit operation.
- Do not use TLV units for 100% outdoor air treatment. Do not add hot-gas-bypass to "convert" a unit for outdoor air treatment. Always use a dedicated outdoor air unit for outdoor air treatment.
- Do not exceed 10% of the total unit CFM with untreated outdoor air. Mixed air entering unit must be less than 95/75F in cooling mode and greater than 60F in heating mode.

Piping Installation

Installation of Supply and Return Piping
Follow these piping guidelines.

1. Install a drain valve at the base of each supply and return riser to facilitate system flushing.
2. Install shut-off / balancing valves and unions at each unit to permit unit removal for servicing.
3. Place strainers at the inlet of each system circulating pump.
4. Select the proper hose length to allow slack between connection points. Hoses may vary in length by +2% to -4% under pressure.
5. Refer to Table 1. Do not exceed the minimum bend radius for the hose selected. Exceeding the minimum bend radius may cause the hose to collapse which reduces water flow rate. Install an angle adapter to avoid sharp bends in the hose when the radius falls below the required minimum.

⚠ CAUTION! ⚠

CAUTION! Piping must comply with all applicable codes.

Table 1: Metal Hose Minimum Bend Radii

Hoses in Inches	Minimum Bend Radius
1" [25.4mm]	5.5" [140mm]
1.25" [31.8mm]	7.0" [178mm]
1.5" [38.1mm]	8.5" [216mm]

Insulation is not required on loop water piping except where the piping runs through unheated areas or outside the building or when the loop water temperature is below the minimum expected dew point of the pipe ambient. **Insulation is required if loop water temperature drops below the dew point.**

Pipe joint compound is not necessary when Teflon threaded tape is pre-applied to hose assemblies or when flared-end connections are used. If pipe joint compound is preferred, use compound only in small amounts on the male pipe threads of the fitting adapters. Prevent sealant from reaching the flared surfaces of the joint.

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with HFC-410A refrigerant. POE oil, if it ever comes in contact with PVC or CPVC piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

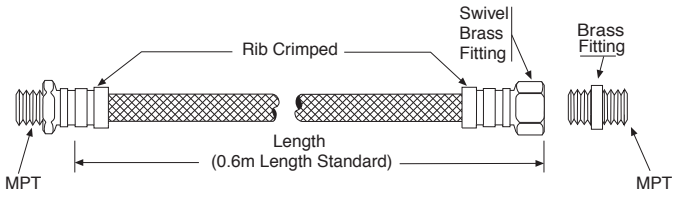
⚠ WARNING! ⚠

WARNING! Do not bend or kink supply lines or hoses.

⚠ CAUTION! ⚠

CAUTION! Corrosive system water requires corrosion resistant fittings and hoses and possibly water treatment.

Figure 2: Supply/Return Hose Kit



Note: When antifreeze is used in the loop, assure that it is compatible with Teflon tape or pipe joint compound employed.

Maximum allowable torque for brass fittings is 30 foot-pounds [41 N-m]. If a torque wrench is not available, tighten finger-tight plus one quarter turn. Tighten steel fittings as necessary.

Optional pressure-rated hose assemblies designed specifically for use with ClimateMaster units are available. Similar hoses can be obtained from alternate suppliers. Supply and return hoses are fitted with swivel-joint fittings at one end to prevent kinking during installation.

Refer to Figure 2 for an illustration of a Supply/Return Hose Kit. External Pipe Thread (MPT) adapters secure hose assemblies to the unit and risers. Install hose assemblies properly and check them regularly to avoid system failure and reduced service life.

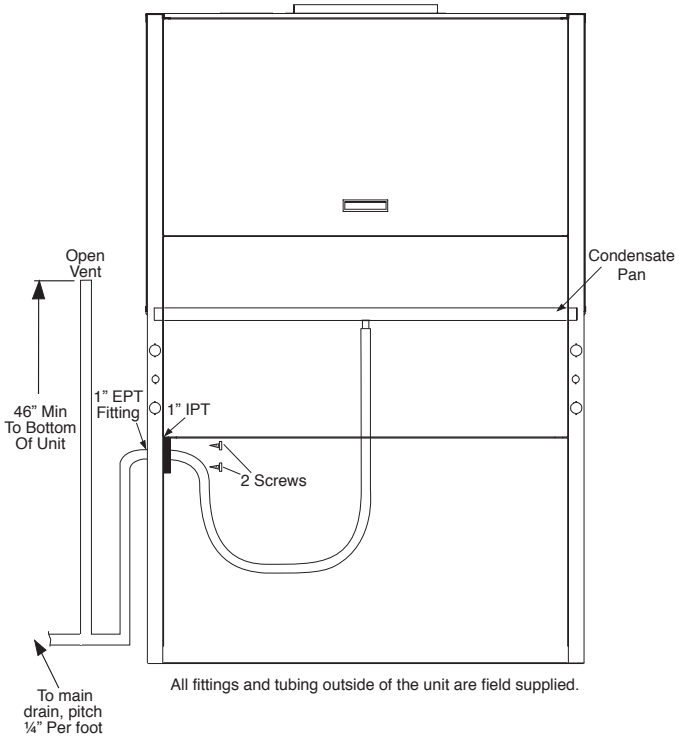
Condensate Installation

Condensate Piping - TL - Remove KO on side that drain will be connected. Remove access panels. Inside of unit, untie and uncoil drain hose. Form trap in hose, make sure hose is not kinked or deformed. Connect plate assembly to side frame with 2 screws.

Outside of unit, connect 1" MPT fitting to plate assembly. Run line to building drain. Horizontal runs must be pitched ¼" per foot (10 mm per 46 cm) toward drain. Do not trap externally.

Figure 3 illustrates a typical trap and vent used with TL series equipment.

Figure 3: TL



Each unit must be installed with its own individual line to the building main condensate drain line or riser. Provide a means to flush or blow out the condensate line. DO NOT install units with a common trap and or vent. Always vent the condensate line when dirt or air can collect in the line or a long horizontal drain line is required. Also vent when large units are working against higher external static pressure than other units connected to the same condensate main since this may cause poor drainage for all units on the line. WHEN A VENT IS INSTALLED IN THE DRAIN LINE, IT MUST BE LOCATED AFTER THE TRAP IN THE DIRECTION OF THE CONDENSATE FLOW and opening 46" (117 cm) minimum from bottom of unit. (Vent per code)

⚠ WARNING! ⚠

WARNING! Ensure condensate line is pitched toward drain 1/4" per foot [10mm per 46cm] of run.

Drain main or riser must be sized for all units connected to it.

Pipe Size	Connected Tons	Connected kW
3/4" [19mm]	<4	<14
1" [25mm]	<6	<21
1-1/4" [32mm]	<30	<105
1-1/2" [38mm]	<50	<175
2" [51mm]	<150	<527
3" [76mm]	<300	<1055
4" [102mm]	<500	<1758

*** Make sure all connections are secure and water tight.**

After drain is connected to main and all drain connections are secure and water tight, pour 1 gallon of water into condensate pan. Water should drain out freely. Repair any leaks.

Water-Loop Heat Pump Applications

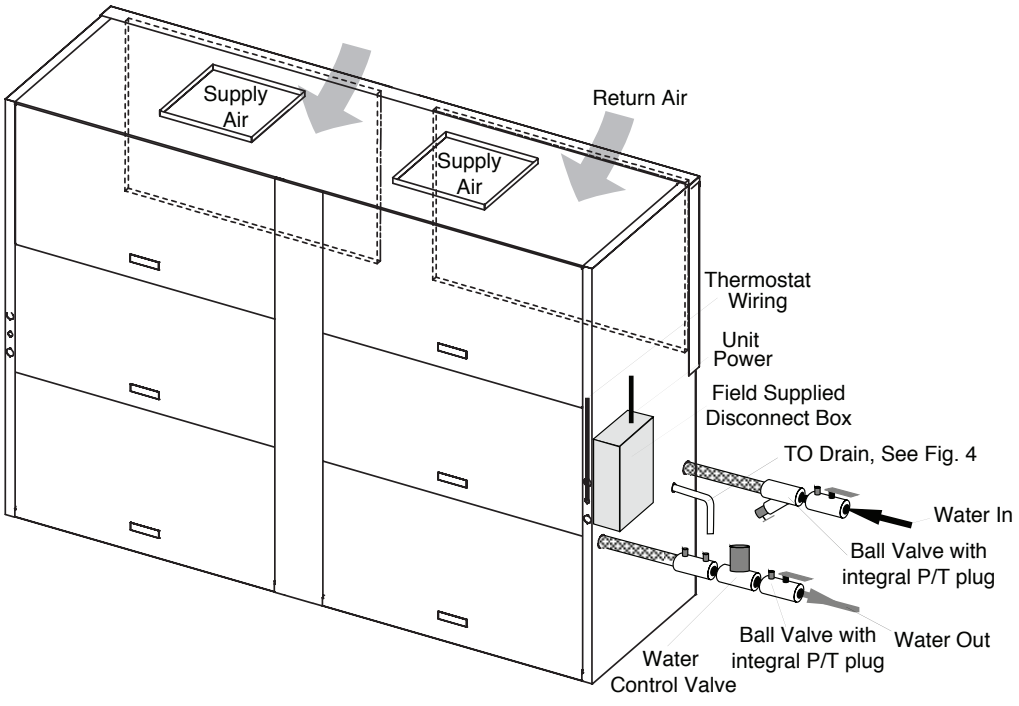
Commercial systems typically include a number of units plumbed to a common piping system. Any unit plumbing maintenance work can introduce air into the piping system, therefore air elimination equipment is a major portion of the mechanical room plumbing. In piping systems expected to utilize water temperatures below 50°F [10°C], 1/2" [13mm] closed cell insulation is required on all piping surfaces to eliminate condensation. Metal to plastic threaded joints should never be employed due to their tendency to leak over time. Teflon tape thread sealant is recommended to minimize internal fouling of the heat exchanger. Do not overtighten connections and route piping so as not to interfere with service or maintenance access. Hose kits are available from ClimateMaster in different configurations as shown in Figure 4 for connection between the TL Series and the piping system. The hose kits include shut off valves, P/T plugs for performance measurement, high pressure stainless steel braid hose, "Y" type strainer with blowdown valve, and "J" type swivel connection. Balancing valves to facilitate the balancing of the system, and an external low pressure drop solenoid valve for use in variable speed pumping systems, may also be included in the hose kit. The piping system should be flushed to remove dirt, piping chips, and other foreign material prior to operation. See Piping System Cleaning and Flushing Procedures.

The flow rate is usually set between 2.25 and 3.5 gpm per ton [2.9 l/m and 4.5 l/m per kW] of cooling capacity. ClimateMaster recommends 2.5 gpm per ton [3.2 l/m per kW] for most applications of water loop heat pumps. To insure proper maintenance and servicing, P/T ports are imperative for temperature and flow verification, as well as performance checks.

Cooling Tower/Boiler Systems typically utilize a common loop maintained 60-90°F [16-32°C]. The use of a closed circuit evaporative cooling tower with 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 will be necessary.

Low Water Temperature Cutout Setting -
CXM2 or DXM2.5 Control: When an antifreeze is selected, the LT1 jumper (JW3) should be clipped to select the low temperature (Antifreeze 13°F [-10.6°C]) setpoint to avoid nuisance faults. See Low Water Temperature Cutout Selection. NOTE THAT THE EXTENDED RANGE OPTION SHOULD BE SELECTED WHEN LOOP CONDITIONS ARE EXPECTED TO DROP BELOW 60°F [16°C].

Figure 4: Typical Water Loop Application



Ground-Loop Heat Pump Applications

⚠ CAUTION! ⚠

CAUTION! The following instructions represent industry accepted installation practices for Closed Loop Earth Coupled Heat Pump Systems. They are provided to assist the contractor in installing trouble free ground loops. These instructions are recommended only. State 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.

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 5. All earth loop piping materials should be limited to only polyethylene fusion for inground sections of the loop. Galvanized or steel fitting 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 and a flanged fitting substituted. P/T plugs should be used so that flow can be measured using the pressure drop of the unit heat exchanger in lieu of other flow measurement means. Earth loop temperatures can range between 25 to 110°F (-4 to 43°C), and 2.25 to 3 gpm of flow per ton (2.41 l/m to 3.23 l/m per kW) of cooling capacity is recommended in these applications. Upon completion of the ground loop piping, pressure test the loop to assure a leak free system.

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.

Figure 5: Typical Earth Loop Application

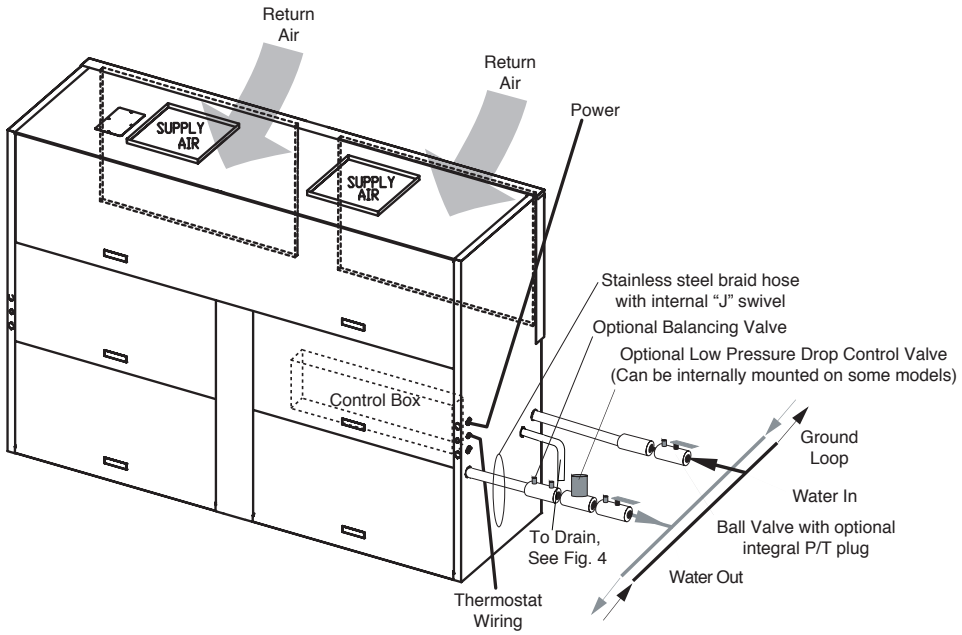


Table 2: Antifreeze Percentages by Volume

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*	29%	25%	20%	14%

* Must not be denatured with any petroleum based product

Ground-Loop Heat Pump Applications, Cont'd.

Antifreeze - In areas where minimum entering loop temperatures drop below 40°F (5°C) or where piping will be routed through areas subject to freezing, anti-freeze is needed. Alcohols and glycols are commonly used as antifreezes, however your local sales manager should be consulted for the antifreeze best suited to your area. Low temperature 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 25 to 22°F (-4 to -6°C) and low temperature protection should be at 15°F (-10°C) e.g. 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 water level to prevent fuming. Initially calculate the total volume of fluid in the piping system. Then use the percentage by volume shown in Table 2 for the amount of antifreeze. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

Low Water Temperature Cut-Out Setting -
CXM2 or DXM2.5 Control: When an antifreeze is selected, the LT1 jumper (JW3) should be clipped to select the low temperature (Antifreeze 10°F [-12.2°C]) setpoint to avoid nuisance faults.

Ground-Water Heat Pump Applications

Shut off valves should be included in case of servicing. Boiler drains or other valves should be 'tee'd' into the line to allow acid flushing of just the heat exchanger. Pressure temperature plugs should be used so that flow and temperature can be measured. Supply and return water piping materials should be limited to copper, PE, or similar material. PVC or CPVC should never be used as they are incompatible with the POE oils used in HFC-410A products and piping system failure and property damage may result.

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with HFC-410A refrigerant. POE oil, if it ever comes in contact with PVC or CPVC piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

Water quantity should be plentiful and of good quality. Consult Table 3 for water quality guidelines. The unit can be ordered with either a copper or cupro-nickel water heat exchanger. Copper is recommended for closed loop systems and 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, a closed loop system is recommended. Heat exchanger coils may over time lose heat exchange capabilities due to a build up of mineral deposits inside. These can be cleaned only by a qualified service mechanic as acid and special pumping equipment are required. Desuperheater coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional acid flushing.

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 handle at least one minute run time of the pump to prevent premature pump failure using its drawdown capacity rating. Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways, depending on local building codes, i.e. 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 - Note the placement of the water control valve. Always maintain water pressure in the heat exchanger by placing water control valves at the outlet of the unit 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. Insure that the total 'VA' draw of the valve can be supplied by the unit transformer. For instance, the slow closing valve can draw up to 35VA. This can overload smaller 40 or 50 VA transformers depending on the other controls employed. A typical pilot operated solenoid valve draws approximately 15VA.

Flow Regulation - Flow regulation can be accomplished by two methods. Most water control valves have a built in flow adjustment. By measuring the pressure drop through the unit heat exchanger, flow rate can be determined and compared to Table 12 (found on page 64). Since the pressure is constantly varying, two pressure gauges might be needed. Simply adjust the water control valve until the desired flow of 1.5 to 2 gpm per ton (2.0 to 2.6 l/m per kW) is achieved. Secondly, a flow control device may be installed. The devices are typically an orifice of plastic material that are designed to allow a specified flow rate. These are mounted on the outlet of the water control valve. On occasion, these valves can produce a velocity noise that can be reduced by applying some back pressure. This is accomplished by slightly closing the leaving isolation valve of the well water setup.

⚠ CAUTION! ⚠

CAUTION! Low Water Temperature Cut-Out Setting
For all open loop systems the 30°F (-1.1°C) LT1 setting (factory setting-water) should be used to avoid freeze damage to the unit. See Low temperature protection selection for closed loop systems with anitfreeze.

Water Quality Standards

Table 3: Water Quality Standards

Clean water is essential to the performance and life span of water source heat pumps. Contaminants, chemicals, and minerals all have the potential to cause damage to the water heat heat exchanger if not treated properly. All closed water loop systems should undergo water quality testing and be maintained to the water quality standards listed in this table.

WATER QUALITY REQUIREMENTS For Closed-Loop and Open-Loop Systems							
				Heat Exchanger Type			
				Closed Loop Recirculating	Open Loop, Tower, Ground Source Well		
	Description	Symbol	Units	All Heat Exchanger Types	COAXIAL HX Copper Tube in Tube	COAXIAL HX Cupronickel	Brazed Plate HX 316 SS
Scaling Potential	pH - Chilled Water <85°F			7.0 to 9.0	7.0 to 9.0	7.0 to 9.0	7.0 to 9.0
	pH - Heated Water >85°F			8.0 to 10.0	8.0 to 10.0	8.0 to 10.0	8.0 to 10.0
	Alkalinity	($HCO3^-$)	ppm - $CaCO_3$ equiv.	50 to 500	50 to 500	50 to 500	50 to 500
	Calcium	(Ca)	ppm	<100	<100	<100	<100
	Magnesium	(Mg)	ppm	<100	<100	<100	<100
	Total Hardness	(CaCO3)	ppm - CaCO3 equiv.	30 to 150	150 to 450	150 to 450	150 to 450
	Langelier Saturation Index	LSI		-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5
	Ryznar Stability Index	RSI		6.5 to 8.0	6.5 to 8.0	6.5 to 8.0	6.5 to 8.0
Corrosion Prevention	Total Dissolved Solids	(TDS)	ppm - $CaCO_3$ equiv.	<1000	<1000	<1000	<1500
	Sulfate	(SO_4^{2-})	ppm	<200	<200	<200	<200
	Nitrate	(NO_3^-)	ppm	<100	<100	<100	<100
	Chlorine (free)	(Cl)	ppm	<0.5	<0.5	<0.5	<0.5
	Chloride (water < 80°F)	(Cl^-)	ppm	<20	<20	<150	<150
	Chloride (water > 120°F)		ppm	<20	<20	<125	<125
	Hydrogen Sulfide[α]	(H_2S)	ppb	<0.5	<0.5	<0.5	<0.5
	Carbon Dioxide	(CO_2)	ppm	0	<50	10 to 50	10 to 50
	Iron Oxide	(Fe)	ppm	<1.0	<1.0	<1.0	<0.2
	Manganese	(Mn)	ppm	< 0.4	<0.4	<0.4	<0.4
	Ammonia	(NH_3)	ppm	<0.05	<0.1	<0.1	<0.1
	Chloramine	(NH_2CL)	ppm	0	0	0	0
Fouling & Biological	Iron Bacteria		cells/mL	0	0	0	0
	Slime Forming Bacteria		cells/mL	0	0	0	0
	Sulfate reducing bacteria		cells/mL	0	0	0	0
	Suspended Solids[β]	(TSS)	ppm	<10	<10	<10	<10
Electrolysis All HX types	Earth Ground Resistance[χ]		Ohms	0	Consult NEC & local electrical codes for grounding requirements		
	Electrolysis Voltage[δ]		mV	<300	Measure voltage internal water loop to HP ground		
	Leakage Current[δ]		mA	<15	Measure current in water loop pipe		
	Building Primary Electrical Ground to unit, must meet local diameter and penetration length requirements						
	Do not connect heat pump to steel pipe unless dissimilar materials are separated by using Di-electric unions. Galvanic corrosion of heat pump water pipe will occur.						

Water Quality Standards, Cont'd.

1. The ClimateMaster Water Quality Table provides water quality requirements for coaxial & brazed plate heat exchangers.
2. The water must be evaluated by an independent testing facility comparing site samples against this Table. When water properties are outside of these parameters, the water must either be treated by a professional water treatment specialist to bring the water quality within the boundaries of this specification, or an external secondary heat exchanger must be used to isolate the heat pump water system from the unsuitable water. Failure to do so will void the warranty of the heat pump system and will limit liability for damage caused by leaks or system failure.
3. Regular sampling, testing and treatment of the water is necessary to assure that the water quality remains within acceptable levels thereby allowing the heat pump to operate at optimum levels.
4. If closed-loop systems are turned off for extended periods, water samples must be tested prior to operating the system.
5. For optimal performance, it is recommended that the closed-loop piping systems are initially filled with de-ionized water.
6. Well water with chemistry outside of these boundaries, and salt water or brackish water requires an external secondary heat exchanger. Surface/Pond water should not be used.
7. If water temperature is expected to fall below 40°F, antifreeze is required. Refer to the heat pump IOM for the correct solution ratios to prevent freezing.

Strainer / Filter Sizing			
Mesh Size	Particle Size		
	Microns	MM	Inch
20	840	0.840	0.0340
30	533	0.533	0.0210
60	250	0.250	0.0100
100	149	0.149	0.0060
150	100	0.100	0.0040
200	74	0.074	0.0029

ppm = parts per million
ppb = parts per billion

α Hydrogen Sulfide has an odor of rotten eggs. If one detects this smell, a test for H2S must be performed. If H2S is detected above the limit indicated, remediation is necessary (Consult with your Water Testing/Treatment Professional) or a secondary heat exchanger is required using appropriate materials as recommended by the heat exchanger supplier.

β Suspended solids and particulates must be filtered to prevent fouling and failure of heat exchangers. Strainers or particulate filters must be installed to provide a maximum particle size of 600 micron (0.60 mm, 0.023 in.) using a 20 to 30 mesh screen size. When a loop is installed in areas with fine material such as sand or clay, further filtration is required to a maximum of 100 micron. Refer to the Strainer / Filter Sizing Chart to capture the particle sizes encountered on the site.

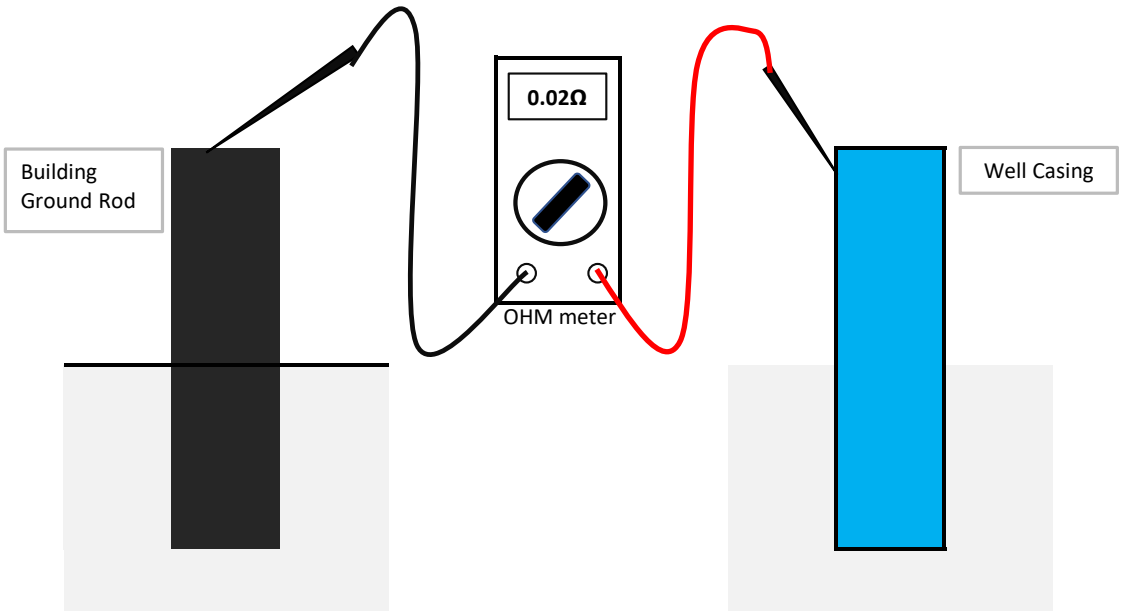
χ An electrical grounding system using a dedicated ground rod meeting NEC and Local Electrical codes must be installed. Building Ground must not be connected the WSHP piping system or other plumbing pipes.

δ Refer to IOM for instructions on measuring resistance and leakage currents within water loops.

Do not use PVC pipe for water loop (compressor POE oil and glycols damage PVC) use of HDPE pipe is recommended.

Water Quality Standards, Cont'd.

Measuring Earth Ground Resistance



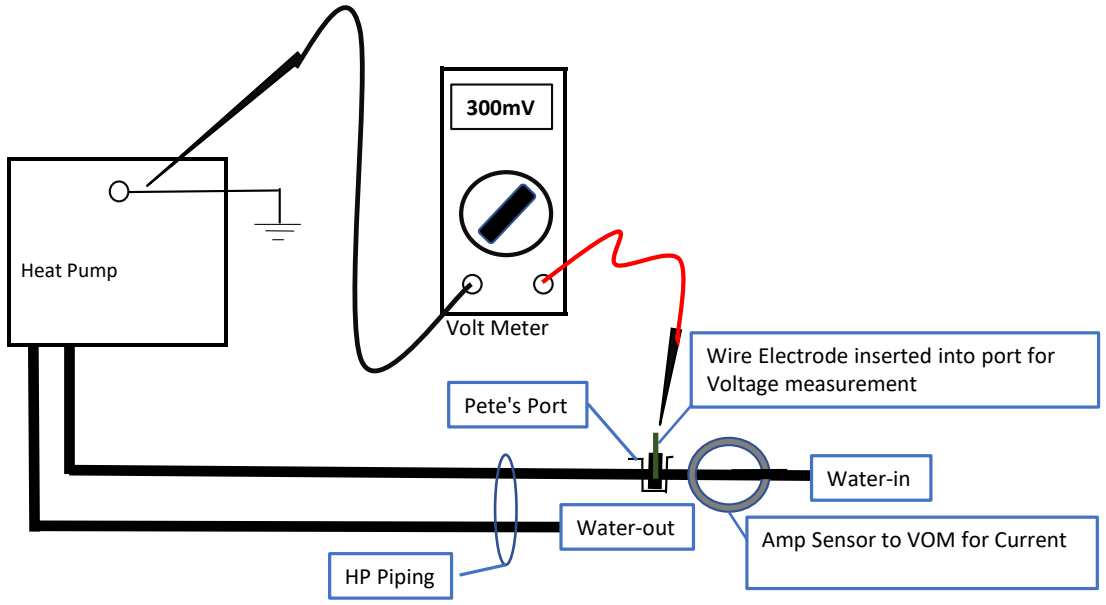
Measure the earth ground bond using an Ohm meter between the building's ground rod and the steel well casing.

The resistance measured should be zero Ohms. The NEC allows a resistance to ground up to 20 Ohms. Any resistance above zero, indicates a poor earth ground which may be the result of a hot neutral line or that conductive water is present. Both of these may lead to electrolysis and corrosion of the heat pump piping. A check for both should be performed and resolved.

Note if the well casing is plastic, a conductive path can be achieved by inserting a #6 AWG bare copper wire into the well water. Remove the temporary conductor when finished.

Water Quality Standards, Cont'd.

Measuring Electrolysis Voltage and Current



Measure the electrolysis voltage using a volt meter between the heat pump ground and a #14 AWG solid copper wire electrode inserted into the water using a Pete's style access port.

The HP must be operating and the water stream flowing.

The voltage measured should be less than 300mV (0.300 V). If higher than 500mV electrolysis will occure and corrosion will result.

If voltage is measured, the cause is a high resistance earth ground or current on the neutral conductor. Remedial measures should be performed.

Measure the current flowing through the piping system by using an amp clamp probe on the water-in line. The HP must be operating and the water stream flowing.

There should be zero amps measured. If current is present, there is leakage current to the plumbing system and it must be rectified to prevent pipe corrosion.

Electrical Data

⚠ WARNING! ⚠

WARNING! To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.

⚠ CAUTION! ⚠

CAUTION! Use only copper conductors for field installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

Table 4A: TL Electrical Data Standard

Model	Voltage Code	Voltage	Min/Max Voltage	Blower Option	Compressor			Fan Motor FLA	Total Unit FLA	Min Circuit Amp	Max Fuse/ HACR
					QTY	RLA	LRA				
TLV084	H	208-3-60	197/254	A, B, C	1	23.2	164.0	4.0	27.2	33.0	50
	H	208-3-60	197/254	D, E	1	23.2	164.0	5.0	28.2	34.0	50
	F	460-3-60	414/506	A, B, C	1	11.2	75.0	2.0	13.2	16.0	25
	F	460-3-60	414/506	D, E	1	11.2	75.0	2.4	13.6	16.4	25
	N	575-3-60	518/633	A, B, C	1	7.9	54.0	1.4	9.3	11.3	15
	N	575-3-60	518/633	D, E	1	7.9	54.0	1.9	9.8	11.8	15
TLV096	H	208-3-60	197/254	A, B, C	1	25.0	164.0	5.0	30.0	36.3	60
	H	208-3-60	197/254	D, E	1	25.0	164.0	6.2	31.2	37.5	60
	F	460-3-60	414/506	A, B, C	1	12.2	100.0	2.4	14.6	17.6	25
	F	460-3-60	414/506	D, E	1	12.2	100.0	3.1	15.3	18.4	30
	N	575-3-60	518/633	A, B, C	1	9.0	78.0	1.9	10.9	13.1	20
	N	575-3-60	518/633	D, E	1	9.0	78.0	2.3	11.3	13.6	20
TLV120	H	208-3-60	197/254	A, B, C	1	30.1	225.0	6.2	36.3	43.8	70
	H	208-3-60	197/254	D, E	1	30.1	225.0	9.2	39.3	46.8	70
	F	460-3-60	414/506	A, B, C	1	16.7	114.0	3.1	19.8	24.0	40
	F	460-3-60	414/506	D, E	1	16.7	114.0	4.3	21.0	25.2	40
	N	575-3-60	518/633	A, B, C	1	12.2	80.0	2.3	14.5	17.5	25
	N	575-3-60	518/633	D, E	1	12.2	80.0	3.4	15.6	18.6	30
TLV150	H	208-3-60	197/254	A, B, C	1	48.1	245.0	9.2	57.3	69.3	110
	H	208-3-60	197/254	D, E	1	48.1	245.0	14.1	62.2	74.2	110
	F	460-3-60	414/506	A, B, C	1	18.6	125.0	4.3	22.9	27.6	45
	F	460-3-60	414/506	D, E	1	18.6	125.0	7.0	25.6	30.3	45
	N	575-3-60	518/633	A, B, C	1	14.7	100.0	3.4	18.1	21.8	35
	N	575-3-60	518/633	D, E	1	14.7	100.0	5.2	19.9	23.6	35
TLV168	H	208-3-60	197/254	A, B, C	2	23.2	164.0	6.2	52.6	58.4	80
	H	208-3-60	197/254	D, E	2	23.2	164.0	9.2	55.6	61.4	80
	F	460-3-60	414/506	A, B, C	2	11.2	75.0	3.1	25.5	28.3	35
	F	460-3-60	414/506	D, E	2	11.2	75.0	4.3	26.7	29.5	40
	N	575-3-60	518/633	A, B, C	2	7.9	54.0	2.3	18.1	20.1	25
	N	575-3-60	518/633	D, E	2	7.9	54.0	3.4	19.2	21.2	25
TLV192	H	208-3-60	197/254	A, B, C	2	25.0	164.0	9.2	59.2	65.4	90
	H	208-3-60	197/254	D, E	2	25.0	164.0	14.1	64.1	70.3	90
	F	460-3-60	414/506	A, B, C	2	12.2	100.0	4.3	28.7	31.8	40
	F	460-3-60	414/506	D, E	2	12.2	100.0	7.0	31.4	34.5	45
	N	575-3-60	518/633	A, B, C	2	9.0	78.0	3.4	21.4	23.6	30
	N	575-3-60	518/633	D, E	2	9.0	78.0	5.2	23.2	25.5	30
TLV240	H	208-3-60	197/254	A, B, C	2	30.1	225.0	14.1	74.3	81.8	110
	H	208-3-60	197/254	E	2	30.1	225.0	21.7	81.9	89.4	110
	F	460-3-60	414/506	A, B, C	2	16.7	114.0	7.0	40.4	44.6	60
	F	460-3-60	414/506	E	2	16.7	114.0	10.0	43.4	47.6	60
	N	575-3-60	518/633	A, B, C	2	12.2	80.0	5.2	29.6	32.6	40
	N	575-3-60	518/633	E	2	12.2	80.0	7.7	32.1	35.1	45
TLV300	H	208-3-60	197/254	A, B, C	2	48.1	245.0	14.1	110.3	122.3	150
	H	208-3-60	197/254	D, E	2	48.1	245.0	21.7	117.9	129.9	175
	F	460-3-60	414/506	A, B, C	2	18.6	125.0	7.0	44.2	48.9	60
	F	460-3-60	414/506	D, E	2	18.6	125.0	10.0	47.2	51.9	70
	N	575-3-60	518/633	A, B, C	2	14.7	100.0	5.2	34.6	38.3	50
	N	575-3-60	518/633	D, E	2	14.7	100.0	7.7	37.1	40.8	50

HACR circuit breaker in USA only
All fuses Class RK-5

Electrical Data, Cont'd.

Table 4B: TL Electrical Data Dual Point Power

Model	Voltage Code	Voltage	Min/Max Voltage	Blower Option	Compressor						Emergency Power Supply		
					QTY	RLA	LRA	Total Comp FLA	Comp MCA	Comp Max Fuse/ HACR	Total Unit FLA	Min Circuit Amp	Max Fuse/ HACR
TLV084	H	208-3-60	197/254	A, B, C	1	23.2	164.0	23.2	29.0	50	4.0	5.0	15
	H	208-3-60	197/254	D, E	1	23.2	164.0	23.2	29.0	50	5.0	6.3	15
	F	460-3-60	414/506	A, B, C	1	11.2	75.0	11.2	38.0	25	2.0	2.5	15
	F	460-3-60	414/506	D, E	1	11.2	75.0	11.2	38.0	25	2.4	3.0	15
	N	575-3-60	518/633	A, B, C	1	7.9	54.0	7.9	9.9	15	1.4	1.8	15
	N	575-3-60	518/633	D, E	1	7.9	54.0	7.9	9.9	15	1.9	2.4	15
TLV096	H	208-3-60	197/254	A, B, C	1	25.0	164.0	25.0	31.3	50	5.0	6.3	15
	H	208-3-60	197/254	D, E	1	25.0	164.0	25.0	31.3	50	6.2	7.8	15
	F	460-3-60	414/506	A, B, C	1	12.2	100.0	12.2	15.3	25	2.4	3.0	15
	F	460-3-60	414/506	D, E	1	12.2	100.0	12.2	15.3	25	3.1	3.9	15
	N	575-3-60	518/633	A, B, C	1	9.0	78.0	9.0	11.3	20	1.9	2.4	15
	N	575-3-60	518/633	D, E	1	9.0	78.0	9.0	11.3	20	2.3	2.9	15
TLV120	H	208-3-60	197/254	A, B, C	1	30.1	225.0	30.1	37.6	60	6.2	7.8	15
	H	208-3-60	197/254	D, E	1	30.1	225.0	30.1	37.6	60	9.2	11.5	20
	F	460-3-60	414/506	A, B, C	1	16.7	114.0	16.7	20.9	35	3.1	3.9	15
	F	460-3-60	414/506	D, E	1	16.7	114.0	16.7	20.9	35	4.3	5.4	15
	N	575-3-60	518/633	A, B, C	1	12.2	80.0	12.2	15.3	25	2.3	2.9	15
	N	575-3-60	518/633	D, E	1	12.2	80.0	12.2	15.3	25	3.4	4.3	15
TLV150	H	208-3-60	197/254	A, B, C	1	48.1	245.0	48.1	60.1	100	9.2	11.5	20
	H	208-3-60	197/254	D, E	1	48.1	245.0	48.1	60.1	100	14.1	17.6	30
	F	460-3-60	414/506	A, B, C	1	18.6	125.0	18.6	23.3	40	4.3	5.4	15
	F	460-3-60	414/506	D, E	1	18.6	125.0	18.6	23.3	40	7.0	8.8	15
	N	575-3-60	518/633	A, B, C	1	14.7	100.0	14.7	18.4	30	3.4	4.3	15
	N	575-3-60	518/633	D, E	1	14.7	100.0	14.7	18.4	30	5.2	6.5	15
TLV168	H	208-3-60	197/254	A, B, C	2	23.2	164.0	46.4	52.2	70	6.2	7.8	15
	H	208-3-60	197/254	D, E	2	23.2	164.0	46.4	52.2	70	9.2	11.5	20
	F	460-3-60	414/506	A, B, C	2	11.2	75.0	22.4	25.2	35	3.1	3.9	15
	F	460-3-60	414/506	D, E	2	11.2	75.0	22.4	25.2	35	4.3	5.4	15
	N	575-3-60	518/633	A, B, C	2	7.9	54.0	15.8	17.8	25	2.3	2.9	15
	N	575-3-60	518/633	D, E	2	7.9	54.0	15.8	17.8	25	3.4	4.3	15
TLV192	H	208-3-60	197/254	A, B, C	2	25.0	164.0	50.0	56.3	80	9.2	11.5	20
	H	208-3-60	197/254	D, E	2	25.0	164.0	50.0	56.3	80	14.1	17.6	30
	F	460-3-60	414/506	A, B, C	2	12.2	100.0	24.4	27.4	35	4.3	5.4	15
	F	460-3-60	414/506	D, E	2	12.2	100.0	24.4	27.4	35	7.0	8.8	15
	N	575-3-60	518/633	A, B, C	2	9.0	78.0	18.0	20.3	25	3.4	4.3	15
	N	575-3-60	518/633	D, E	2	9.0	78.0	18.0	20.3	25	5.2	6.5	15
TLV240	H	208-3-60	197/254	A, B, C	2	30.1	225.0	60.2	67.7	90	14.1	17.6	30
	H	208-3-60	197/254	E	2	30.1	225.0	60.2	67.7	90	21.7	27.1	45
	F	460-3-60	414/506	A, B, C	2	16.7	114.0	33.4	37.6	50	7.0	8.8	15
	F	460-3-60	414/506	E	2	16.7	114.0	33.4	37.6	50	10.0	12.5	20
	N	575-3-60	518/633	A, B, C	2	12.2	80.0	24.4	27.4	35	5.2	6.5	15
	N	575-3-60	518/633	E	2	12.2	80.0	24.4	27.4	35	7.7	9.6	15
TLV300	H	208-3-60	197/254	A, B, C	2	48.1	245.0	96.2	108.2	150	14.1	17.6	30
	H	208-3-60	197/254	D, E	2	48.1	245.0	96.2	108.2	150	21.7	27.1	45
	F	460-3-60	414/506	A, B, C	2	18.6	125.0	37.2	41.9	60	7.0	8.8	15
	F	460-3-60	414/506	D, E	2	18.6	125.0	37.2	41.9	60	10.0	12.5	20
	N	575-3-60	518/633	A, B, C	2	14.7	100.0	29.4	33.1	45	5.2	6.5	15
	N	575-3-60	518/633	D, E	2	14.7	100.0	29.4	33.1	45	7.7	9.6	15

HACR circuit breaker in USA only
All fuses Class RK-5

Electrical Data, Cont'd.

Table 4C: TL Electrical Data Standard with Internal Pump or ClimaDry®

Model	Voltage Code	Voltage	Min/Max Voltage	Blower Option	Compressor			Fan Motor FLA	Pump		Total Unit FLA	Min Circuit Amp	Max Fuse / HACR
					QTY	RLA	LRA		QTY	FLA			
TLV084	H	208-3-60	197/254	A, B, C	1	23.2	164.0	4.0	1	1.10	28.3	34.1	50
	H	208-3-60	197/254	D, E	1	23.2	164.0	5.0	1	1.10	29.3	35.1	50
	F	460-3-60	414/506	A, B, C	1	11.2	75.0	2.0	1	0.55	13.8	16.5	25
	F	460-3-60	414/506	D, E	1	11.2	75.0	2.4	1	0.55	14.1	17.0	25
	N	575-3-60	518/633	A, B, C	1	7.9	54.0	1.4	1	0.44	9.7	11.7	15
	N	575-3-60	518/633	D, E	1	7.9	54.0	1.9	1	0.44	10.2	12.2	20
TLV096	H	208-3-60	197/254	A, B, C	1	25.0	164.0	5.0	1	1.96	32.0	38.2	60
	H	208-3-60	197/254	D, E	1	25.0	164.0	6.2	1	1.96	33.2	39.4	60
	F	460-3-60	414/506	A, B, C	1	12.2	100.0	2.4	1	0.98	15.6	18.6	30
	F	460-3-60	414/506	D, E	1	12.2	100.0	3.1	1	0.98	16.3	19.3	30
	N	575-3-60	518/633	A, B, C	1	9.0	78.0	1.9	1	0.78	11.7	13.9	20
	N	575-3-60	518/633	D, E	1	9.0	78.0	2.3	1	0.78	12.1	14.3	20
TLV120	H	208-3-60	197/254	A, B, C	1	30.1	225.0	6.2	1	1.96	38.3	45.8	70
	H	208-3-60	197/254	D, E	1	30.1	225.0	9.2	1	1.96	41.3	48.8	70
	F	460-3-60	414/506	A, B, C	1	16.7	114.0	3.1	1	0.98	20.8	25.0	40
	F	460-3-60	414/506	D, E	1	16.7	114.0	4.3	1	0.98	22.0	26.2	40
	N	575-3-60	518/633	A, B, C	1	12.2	80.0	2.3	1	0.78	15.3	18.3	30
	N	575-3-60	518/633	E	1	12.2	80.0	3.4	1	0.78	16.4	19.4	30
TLV150	H	208-3-60	197/254	A, B, C	1	48.1	245.0	9.2	1	1.96	59.3	71.3	110
	H	208-3-60	197/254	D, E	1	48.1	245.0	14.1	1	1.96	64.2	76.2	110
	F	460-3-60	414/506	A, B, C	1	18.6	125.0	4.3	1	0.98	23.9	28.5	45
	F	460-3-60	414/506	D, E	1	18.6	125.0	7.0	1	0.98	26.6	31.2	45
	N	575-3-60	518/633	A, B, C	1	14.7	100.0	3.4	1	0.78	18.9	22.6	35
	N	575-3-60	518/633	D, E	1	14.7	100.0	5.2	1	0.78	20.7	24.4	35
TLV168	H	208-3-60	197/254	A, B, C	2	23.2	164.0	6.2	2	1.10	54.8	60.6	80
	H	208-3-60	197/254	D, E	2	23.2	164.0	9.2	2	1.10	57.8	63.6	80
	F	460-3-60	414/506	A, B, C	2	11.2	75.0	3.1	2	0.55	26.6	29.4	40
	F	460-3-60	414/506	D, E	2	11.2	75.0	4.3	2	0.55	27.8	30.6	40
	N	575-3-60	518/633	A, B, C	2	7.9	54.0	2.3	2	0.44	19.0	21.0	25
	N	575-3-60	518/633	D, E	2	7.9	54.0	3.4	2	0.44	20.1	22.1	25
TLV192	H	208-3-60	197/254	A, B, C	2	25.0	164.0	9.2	2	1.96	63.1	69.4	90
	H	208-3-60	197/254	D, E	2	25.0	164.0	14.1	2	1.96	68.0	74.3	90
	F	460-3-60	414/506	A, B, C	2	12.2	100.0	4.3	2	0.98	30.7	33.7	45
	F	460-3-60	414/506	D, E	2	12.2	100.0	7.0	2	0.98	33.4	36.4	45
	N	575-3-60	518/633	A, B, C	2	9.0	78.0	3.4	2	0.78	23.0	25.2	30
	N	575-3-60	518/633	D, E	2	9.0	78.0	5.2	2	0.78	24.8	27.0	35
TLV240	H	208-3-60	197/254	A, B, C	2	30.1	225.0	14.1	2	1.96	78.2	85.7	110
	H	208-3-60	197/254	E	2	30.1	225.0	21.7	2	1.96	85.8	93.3	110
	F	460-3-60	414/506	A, B, C	2	16.7	114.0	7.0	2	0.98	42.4	46.5	60
	F	460-3-60	414/506	E	2	16.7	114.0	10.0	2	0.98	45.4	49.5	60
	N	575-3-60	518/633	A, B, C	2	12.2	80.0	5.2	2	0.78	31.2	34.2	45
	N	575-3-60	518/633	E	2	12.2	80.0	7.7	2	0.78	33.7	36.7	45
TLV300	H	208-3-60	197/254	A, B, C	2	48.1	245.0	14.1	2	1.96	114.2	126.2	150
	H	208-3-60	197/254	D, E	2	48.1	245.0	21.7	2	1.96	121.8	133.8	175
	F	460-3-60	414/506	A, B, C	2	18.6	125.0	7.0	2	0.98	46.2	50.8	60
	F	460-3-60	414/506	D, E	2	18.6	125.0	10.0	2	0.98	49.2	53.8	70
	N	575-3-60	518/633	A, B, C	2	14.7	100.0	5.2	2	0.78	36.2	39.8	50
	N	575-3-60	518/633	D, E	2	14.7	100.0	7.7	2	0.78	38.7	42.3	50

HACR circuit breaker in USA only
All fuses Class RK-5

Electrical Data, Cont'd.

Table 4D: TL Electrical Data Dual Point Power with Pump or ClimaDry®

Model	Voltage Code	Voltage	Min/Max Voltage	Blower Option	Compressor								Emergency Power Supply		
					QTY	RLA	LRA	QTY	Pump FLA	Total FLA	MCA	Max Fuse/ HACR	Fan Motor FLA	Fan MCA	Fan Max Fuse/ HACR
TLV084	H	208-3-60	197/254	A, B, C	1	23.2	164.0	1	1.10	24.3	30.1	50	4.0	5.0	15
	H	208-3-60	197/254	D, E	1	23.2	164.0	1	1.10	24.3	30.1	50	5.0	6.3	15
	F	460-3-60	414/506	A, B, C	1	11.2	75.0	1	0.55	11.8	14.6	25	2.0	2.5	15
	F	460-3-60	414/506	D, E	1	11.2	75.0	1	0.55	11.8	14.6	25	2.4	3.0	15
	N	575-3-60	518/633	A, B, C	1	7.9	54.0	1	0.44	8.3	10.3	15	1.4	1.8	15
	N	575-3-60	518/633	D, E	1	7.9	54.0	1	0.44	8.3	10.3	15	1.9	2.4	15
TLV096	H	208-3-60	197/254	A, B, C	1	25.0	164.0	1	1.96	27.0	33.2	50	5.0	6.3	15
	H	208-3-60	197/254	D, E	1	25.0	164.0	1	1.96	27.0	33.2	50	6.2	7.8	15
	F	460-3-60	414/506	A, B, C	1	12.2	100.0	1	0.98	13.2	16.2	25	2.4	3.0	15
	F	460-3-60	414/506	D, E	1	12.2	100.0	1	0.98	13.2	16.2	25	3.1	3.9	15
	N	575-3-60	518/633	A, B, C	1	9.0	78.0	1	0.78	9.8	12.0	20	1.9	2.4	15
	N	575-3-60	518/633	D, E	1	9.0	78.0	1	0.78	9.8	12.0	20	2.3	2.9	15
TLV120	H	208-3-60	197/254	A, B, C	1	30.1	225.0	1	1.96	32.1	39.6	60	6.2	7.8	15
	H	208-3-60	197/254	D, E	1	30.1	225.0	1	1.96	32.1	39.6	60	9.2	11.5	20
	F	460-3-60	414/506	A, B, C	1	16.7	114.0	1	0.98	17.7	21.9	35	3.1	3.9	15
	F	460-3-60	414/506	D, E	1	16.7	114.0	1	0.98	17.7	21.9	65	4.3	5.4	15
	N	575-3-60	518/633	A, B, C	1	12.2	80.0	1	0.78	13.0	16.0	25	2.3	2.9	15
	N	575-3-60	518/633	E	1	12.2	80.0	1	0.78	13.0	16.0	25	3.4	4.3	15
TLV150	H	208-3-60	197/254	A, B, C	1	48.1	245.0	1	1.96	50.1	62.1	110	9.2	11.5	20
	H	208-3-60	197/254	D, E	1	48.1	245.0	1	1.96	50.1	62.1	110	14.1	17.6	30
	F	460-3-60	414/506	A, B, C	1	18.6	125.0	1	0.98	19.6	24.2	40	4.3	5.4	15
	F	460-3-60	414/506	D, E	1	18.6	125.0	1	0.98	19.6	24.2	40	7.0	8.8	15
	N	575-3-60	518/633	A, B, C	1	14.7	100.0	1	0.78	15.5	19.2	30	3.4	4.3	15
	N	575-3-60	518/633	D, E	1	14.7	100.0	1	0.78	15.5	19.2	30	5.2	6.5	15
TLV168	H	208-3-60	197/254	A, B, C	2	23.2	164.0	2	1.10	48.6	54.4	70	6.2	7.8	15
	H	208-3-60	197/254	D, E	2	23.2	164.0	2	1.10	48.6	54.4	70	9.2	11.5	20
	F	460-3-60	414/506	A, B, C	2	11.2	75.0	2	0.55	23.5	26.3	35	3.1	3.9	15
	F	460-3-60	414/506	D, E	2	11.2	75.0	2	0.55	23.5	26.3	35	4.3	5.4	15
	N	575-3-60	518/633	A, B, C	2	7.9	54.0	2	0.44	16.7	18.7	25	2.3	2.9	15
	N	575-3-60	518/633	D, E	2	7.9	54.0	2	0.44	16.7	18.7	25	3.4	4.3	15
TLV192	H	208-3-60	197/254	A, B, C	2	25.0	164.0	2	1.96	53.9	60.2	80	9.2	11.5	20
	H	208-3-60	197/254	D, E	2	25.0	164.0	2	1.96	53.9	60.2	80	14.1	17.6	30
	F	460-3-60	414/506	A, B, C	2	12.2	100.0	2	0.98	26.4	29.4	40	4.3	5.4	15
	F	460-3-60	414/506	D, E	2	12.2	100.0	2	0.98	26.4	29.4	40	7.0	8.8	15
	N	575-3-60	518/633	A, B, C	2	9.0	78.0	2	0.78	19.6	21.8	30	3.4	4.3	15
	N	575-3-60	518/633	D, E	2	9.0	78.0	2	0.78	19.6	21.8	30	5.2	6.5	15
TLV240	H	208-3-60	197/254	A, B, C	2	30.1	225.0	2	1.96	64.1	71.6	100	14.1	17.6	30
	H	208-3-60	197/254	E	2	30.1	225.0	2	1.96	64.1	71.6	100	21.7	27.1	45
	F	460-3-60	414/506	A, B, C	2	16.7	114.0	2	0.98	35.4	39.5	50	7.0	8.8	15
	F	460-3-60	414/506	E	2	16.7	114.0	2	0.98	35.4	39.5	50	10.0	12.5	20
	N	575-3-60	518/633	A, B, C	2	12.2	80.0	2	0.78	26.0	29.0	40	5.2	6.5	15
	N	575-3-60	518/633	E	2	12.2	80.0	2	0.78	26.0	29.0	40	7.7	9.6	15
TLV300	H	208-3-60	197/254	A, B, C	2	48.1	245.0	2	1.96	100.1	112.1	150	14.1	17.6	30
	H	208-3-60	197/254	D, E	2	48.1	245.0	2	1.96	100.1	112.1	150	21.7	27.1	45
	F	460-3-60	414/506	A, B, C	2	18.6	125.0	2	0.98	39.2	43.8	60	7.0	8.8	15
	F	460-3-60	414/506	D, E	2	18.6	125.0	2	0.98	39.2	43.8	60	10.0	12.5	20
	N	575-3-60	518/633	A, B, C	2	14.7	100.0	2	0.78	31.0	34.6	45	5.2	6.5	15
	N	575-3-60	518/633	D, E	2	14.7	100.0	2	0.78	31.0	34.6	45	7.7	9.6	15

HACR circuit breaker in USA only
All fuses Class RK-5

Electrical – Power Wiring

⚠ WARNING! ⚠

WARNING! To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.

⚠ CAUTION! ⚠

CAUTION! Use only copper conductors for field installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

⚠ WARNING! ⚠

WARNING! Disconnect electrical power source to prevent injury or death from electrical shock.

General Line Voltage Wiring - Be sure the available power is the same voltage and phase as that shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever is applicable.

TL Power Connection - Line voltage connection is made by connecting the incoming line voltage wires to the power block as shown in Figure 6. Consult Table 4a and 4b for correct fuse size.

208 Volt Operation - All 208-230 Volt units are factory wired for 208 Volt. The transformers may be switched to 230V operation as illustrated on the wiring diagram by switching the Red (208V) and the Orange (230V) at the contactor terminal L2.

All field installed wiring, including electrical ground, must comply with the National Electrical Code as well as all applicable local codes.

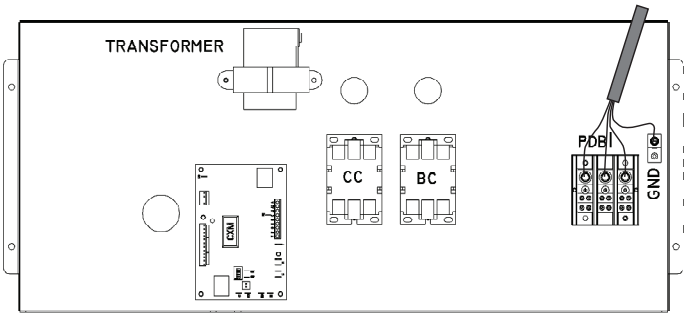
Refer to the unit wiring diagrams for fuse sizes and a schematic of the field connections which must be made by the installing (or electrical) contractor.

Consult the unit wiring diagram located on the inside of the compressor access panel to ensure proper electrical hookup.

All final electrical connections must be made with a length of flexible conduit to minimize vibration and sound transmission to the building.

Thermostat Installation - The thermostat should be located on an interior wall in a larger room away from supply duct drafts. Do NOT locate the thermostat in areas subject to sunlight, drafts or on external walls. The wire access hole behind the thermostat may in certain cases need to be sealed to prevent erroneous temperature measurement. Position the thermostat backplate against the wall so that it appears level and so the thermostat wires protrude through the middle of the backplate. Mark the position of the backplate mounting holes and drill holes with a 3/16" bit. Install supplied anchors and secure plate to the wall. Thermostat wire must be 18 AWG wire. Wire the appropriate thermostat as shown in Figure 13 to the low voltage terminal strip in the CXM2/DXM2.5 Control using 18 AWG thermostat wire of minimum length.

Figure 6: Typical TL Series Line Voltage Field Wiring



CONTROL BOX LAYOUT STANDARD

Electrical – Power & Low Voltage Wiring

ELECTRICAL - LOW VOLTAGE WIRING

Thermostat Connections - The thermostat will be wired to the CXM2/DXM2.5 board located within the unit control box. Refer to the unit wiring diagram for specific details.

Low Water Temperature Cutout Selection - The CXM2/DXM2.5 control allows the field selection of low water (or water-antifreeze solution) temperature limit by clipping jumper JW3, which changes the sensing temperature associated with thermistor LT1. Note that the LT1 thermistor is located on the refrigerant line between the coaxial heat exchanger and expansion device (TXV). Therefore, LT1 is sensing refrigerant temperature, not water temperature, which is a better indication of how water flow rate/temperature is affecting the refrigeration circuit.

The factory setting for LT1 is for systems using water (30°F [-1.1°C] refrigerant temperature). In low water temperature (extended range) applications with antifreeze (most ground loops), jumper JW3 should be clipped as shown in Figure 12 to change the setting to 10°F [-12.2°C] refrigerant temperature, a more suitable temperature when using an antifreeze solution. All ClimateMaster units operating with entering water temperatures below 60°F [15.6°C] must include the optional water/refrigerant circuit insulation package to prevent internal condensation.

Accessory Connections - A terminal paralleling the compressor contactor coil has been provided on the DXM2.5 control. Terminal "A" is designed to control accessory devices. **NOTE: This terminal should be used only with 24 Volt signals and not line voltage. Terminal "A" is energized with the compressor contactor.**

The DXM2.5 controller includes two accessory relays ACC1 and ACC2. Each relay includes a normally open (NO) and a normally closed (NC) contact. Accessory relays may be configured to operate as shown in the tables below.

Accessory Relay 1 Configuration

DIP 2.1	DIP 2.2	DIP 2.3	ACC1 Relay Option
ON	ON	ON	Cycle with fan
OFF	ON	ON	N/A for Residential Applications
ON	OFF	ON	Water valve – Slow opening
ON	ON	OFF	Outside air damper
OFF	ON	OFF	ClimaDry option – Dehumidistat
OFF	OFF	OFF	ClimaDry option – Humidistat
OFF	OFF	ON	N/A for Residential Applications
ON	OFF	OFF	N/A for Residential Applications

All other DIP combinations are invalid

Accessory Relay 2 Configuration

DIP 2.4	DIP 2.5	DIP 2.6	ACC2 Relay Option
ON	ON	ON	Cycle with compressor
OFF	ON	ON	N/A for Residential Applications
ON	OFF	ON	Water valve – Slow opening
OFF	OFF	ON	Humidifier
ON	ON	OFF	Outside air damper

All other DIP combinations are invalid
Water oleniod Valves - An external solenoid valve(s) should be used on ground water installations to shut off flow to the unit when the compressor is not operating.

A slow closing valve may be required to help reduce water hammer. Figure 13 shows typical wiring for a 24VAC external solenoid valve. Figures 8 and 9 illustrate typical slow closing water control valve wiring for Taco 500 series (ClimateMaster P/N AVM) and Taco SBV series valves. Slow closing valves take approximately 60 seconds to open (very little water will flow before 45 seconds). Once fully open, an end switch allows the compressor to be energized. Only relay or triac based electronic thermostats should be used with slow closing valves. When wired as shown, the slow closing valve will operate properly with the following notations:

1. The valve will remain open during a unit lockout.
2. The valve will draw approximately 25-35 VA through the "Y" signal of the thermostat.

Note: This valve can overheat the anticipator of an electromechanical thermostat. Therefore, only relay or triac based thermostats should be used.

Electrical – Low Voltage Wiring for non-vFlow® Units using External Motorized Water Valve

Figure 8: AVM Valve Wiring

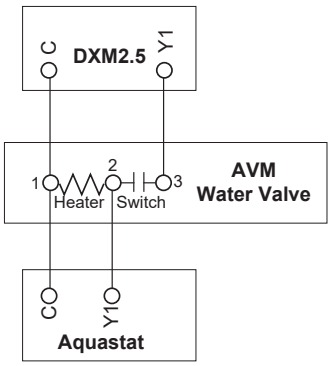


Figure 9: Taco SBV Valve Wiring

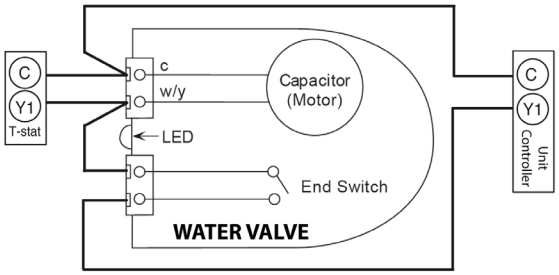
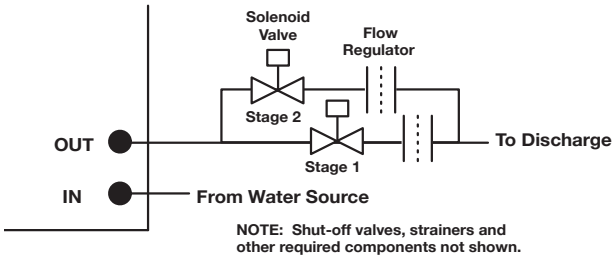
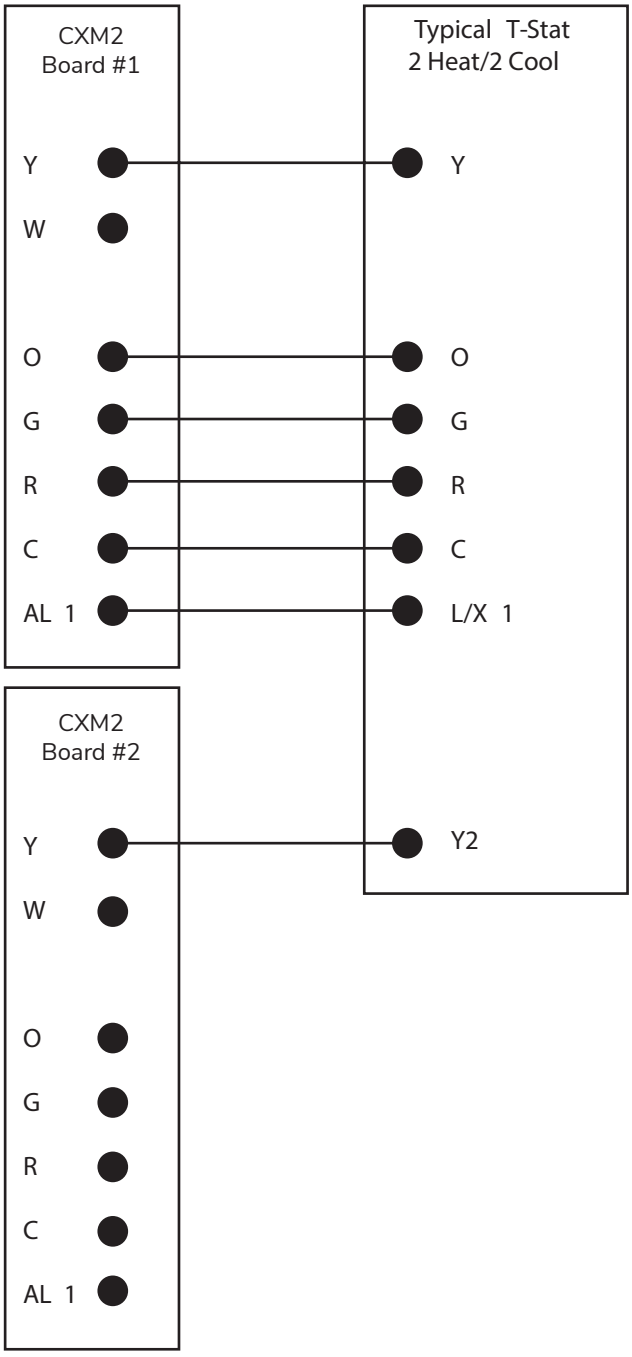


Figure 10: Two-Stage Piping



Electrical – Thermostat Wiring

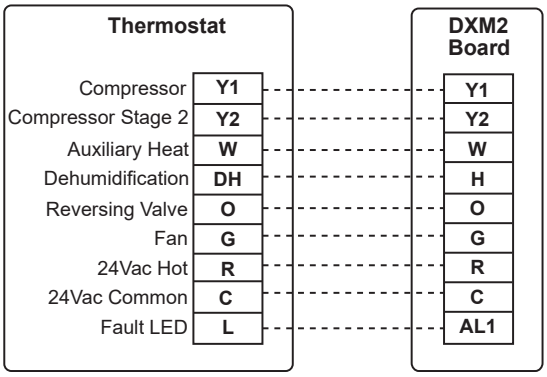
Figure 11: Typical Manual Changeover 2 heat/ 2 cool thermostat wiring with TL unit & CXM2



Electrical – Thermostat Wiring, Cont'd.

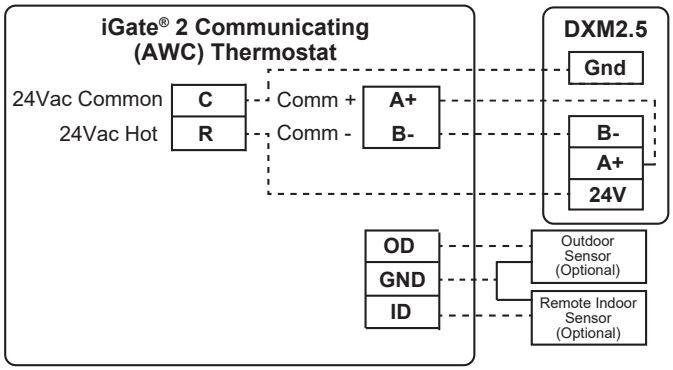
Thermostat Installation - The thermostat should be located on an interior wall in a larger room, away from supply duct drafts. DO NOT locate the thermostat in areas subject to sunlight, drafts or on external walls. The wire access hole behind the thermostat may in certain cases need to be sealed to prevent erroneous temperature measurement. Position the thermostat back plate against the wall so that it appears level and so the thermostat wires protrude through the middle of the back plate. Mark the position of the back plate mounting holes and drill holes with a 3/16" (5mm) bit. Install supplied anchors and secure plate to the wall. Thermostat wire must be 18 AWG wire. Representative thermostat wiring is shown in Figures 12a-b however, actual wiring connections should be determined from the thermostat IOM and or unit wiring diagram. Practically any heat pump thermostat will work with ClimateMaster units, provided it has the correct number of heating and cooling stages.

Figure 12a: Conventional 3 Heat / 2 Cool Thermostat Connection to DXM2.5 Control



Notes:
1) ECM automatic dehumidification mode operates with dehumidification airflows in the cooling mode when the dehumidification output from thermostat is active. Normal heating and cooling airflows are not affected.
2) DXM2.5 board DIP switch S2-7 must be in the auto dehumidification mode for automatic dehumidification.
3) DH connection not possible with units with internal variable speed pump. Use AWC99U01.
4) Only use iGate® 2 Communicating (AWC) Thermostat when using Humidifier (H Input) in units with internal variable speed pump.

Figure 12b: Communicating Thermostat Connection to DXM2 Control



Field Wiring – – – – – – – – –

Factory Wiring ———————

TL Series Wiring Diagram Matrix

All current diagrams can be located online at climatemaster.com. Click 'Commercial Professional'.

1. Click 'Products' in the main navigation
2. Select 'Large Belt Drive Packaged'
3. Select the TL product series
4. Click the Wire Diagrams tab in the middle of the page
5. Select your voltage and controls

Voltages	208-230/60/3, 460/60/3, 575/60/3			
Unit Controller	CXM2		DXM2.5	
Unit Size	TLV084-TLV150	TLV168-TLV300	TLV084-TLV150	TLV168-TLV300
Standard	96B0113N42	96B0113N45		
ISP OR MWV			96B0113N52	96B0113N46
Reheat			96B0113N53	96B0113N49

ClimaDry® II – Sequence of Operation

ClimaDry® II Sequence of Operation - A heat pump equipped with ClimaDry® II can operate in three modes; cooling, cooling with reheat (dehumidification), and heating. The cooling/heating modes are like any other ClimateMaster WSHP. The reversing valve ("O" signal) is energized in cooling, along with the compressor contactor(s) and blower relay. In the heating mode the reversing valve is de-energized. Almost any thermostat will activate the heat pump in heating or cooling modes. The DXM2.5 microprocessor board, which is required with the ClimaDry II option, will accept either heat pump (Y,O) thermostats or non-heat pump (Y,W) thermostats. The reheat mode requires eitherv a separate humidistat/ dehumidistat or a thermostat that has an integrated dehumidification function for activation. The DXM2.5 board is configured to work with either a humidistat or dehumidistat input to terminal "H". Upon receiving an "H" input, the DXM2.5 board will activate the cooling mode and engage reheat. Table 6 shows the relationship between thermostat input signals and unit operation. There are four operational inputs for single stage units and six operational inputs for dual stage units:
-Fan Only
-1st Stage Cooling
-2nd Stage Cooling
-1st Stage Heating
-2nd Stage Heating
-Reheat Mode

- **Fan Only:** A (G) call from the thermostat to the (G) terminal of the DXM2.5 control board will bring the unit on in fan only mode.
- **1st Stage Cooling:** A simultaneous call from (G), (Y1), and (O) to the (G), (Y1), (O/W2) terminals of the DXM2.5 control board will bring the unit on in 1st Stage Cooling.
- **2nd Stage Cooling:** A simultaneous call from (G), (Y1), (Y2), and (O) to the (G), (Y1), (Y2), and (O/W2) terminals of the DXM2.5 control board will bring the unit on in 2nd Stage Cooling. When the call is satisfied at the thermostat the unit will continue to run in 1st Stage Cooling until the 1st Stage Cooling call is removed or satisfied, shutting down the unit. **NOTE: Not all units have two-stage cooling functionality.**
- **1st Stage Heating:** A simultaneous call from (G) and (Y1) to the (G) and (Y1) terminals of the DXM2.5 control board will bring the unit on in 1st Stage Heating.
- **2nd Stage Heating:** A simultaneous call from (G), (Y1), and (Y2) to the (G), (Y1), and (Y2) terminals of the DXM2.5 control board will bring the unit on in 2nd Stage Heating. When the call is satisfied at the thermostat the unit will continue to run in 1st Stage Heating until the call is removed or satisfied, shutting down the unit. **NOTE: Not all units have two-stage heating functionality (e.g. TLV084-150 units).**

Table 5: Humidistat/Dehumidistat Logic and DXM2.5 (2.1, 2.2, 2.3) DIP Settings

Sensor	2.1	2.2	2.3	Logic	Reheat (ON) - H	Reheat (OFF) - H
Humidistat	OFF	OFF	OFF	Reverse	0 VAC	24 VAC
Dehumidistat	OFF	ON	OFF	Standard	24 VAC	0 VAC

Table 6: ClimaDry® II Operating Modes

Mode	Input					Output				
	O	G	Y1	Y2[3]	H	O	G	Y1	Y2[3]	Reheat
No Demand	ON/OFF	OFF	OFF	OFF	OFF	ON/OFF	OFF	OFF	OFF	OFF
Fan Only	ON/OFF	ON	OFF	OFF	OFF	ON/OFF	ON	OFF	OFF	OFF
Cooling 1st Stage	ON	ON	ON	OFF	OFF	ON	ON	ON	OFF	OFF
Cooling 2nd Stage	ON	ON	ON	ON	OFF	ON	ON	ON	ON	OFF
Cooling & Dehumidistat[1]	ON	ON	ON	ON/OFF	ON	ON	ON	ON	ON/OFF	OFF
Dehumidistat Only	ON/OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON
Heating 1st Stage	OFF	ON	ON	OFF	OFF	OFF	ON	ON	OFF	OFF
Heating 2nd Stage	OFF	ON	ON	ON	OFF	OFF	ON	ON	ON	OFF
Heating & Dehumidistat[2]	OFF	ON	ON	ON/OFF	ON	OFF	ON	ON	ON/OFF	OFF

[1]Cooling input takes priority over dehumidify input.
[2]DXM2.5 is programmed to ignore the H demand when the unit is in heating mode.
[3]N/A for single stage units; Full load operation for dual capacity units.
[4]ON/OFF = Either ON or OFF.

ClimaDry® II – Sequence of Operation, Cont'd.

- **Reheat Mode:** A call from the Humidistat/ Dehumidistat to the (H) terminal of the DXM2.5 control board will bring the unit on in Reheat Mode if there is no call for cooling at the thermostat. When the Humidistat/Dehumidification call is removed or satisfied the unit will shut down. NOTE: Cooling always overrides Reheat Mode. In the Cooling mode, the unit cools and dehumidifies. If the cooling thermostat is satisfied but there is still a call for dehumidification, the unit will continue to operate in Reheat Mode.
- **Note: Care must be taken when using a humidistat to operate ClimaDry®. When the DIP switch on the DXM2.5 controller is set for 'humidistat' it reverses the control logic so that an "open" control circuit initiates a ClimaDry run cycle. If a humidistat is not connected, or if a manual switch on the humidistat is set to "off", ClimaDry will see the open circuit and call for dehumidification.**

ClimaDry® II Component Functions

The ClimaDry® II option consists of the following components:

- Motorized Valve/Proportional Controller
- Supply Air Sensor
- Loop Pump
- Hydronic Coil
- Low Air Temperature Switch

The Proportional Controller operates on 24 VAC power supply and automatically adjusts the water valve based upon the Supply Air Sensor. The Supply Air Sensor senses supply air temperature at the blower inlet providing the input signal necessary for the proportional control to drive the motorized valve during the reheat mode of operation. The Motorized Valve is a proportional actuator/three-way valve combination used to divert the condenser water from the coax to the hydronic reheat coil during the reheat mode of operation. The proportional controller signals the motorized valve based on the supply air temperature of the supply air sensor.

The Loop Pump circulates condenser water through the hydronic reheat coil during the reheat mode of operation. In this application, the loop pump is only energized during the reheat mode of operation. The Hydronic Coil is utilized during the reheat mode of operation to reheat the air to the setpoint of the proportional controller. Condenser water is diverted by the motorized valve and pumped through the hydronic coil by the loop pump in proportion to the control setpoint. The amount of reheating is dependent on the setpoint and how far from setpoint the supply air temperature is. The factory setpoint is 72°F [22°C], generally considered "neutral" air.

ClimaDry® II Application Considerations

The reheat coil adds a small amount of resistance to the air stream. In some cases the high static option may be required for applications with higher static ductwork. Consult the submittal data or the Installation/Operation/ Maintenance (I.O.M.) manual for the specific heat pump to review blower tables.

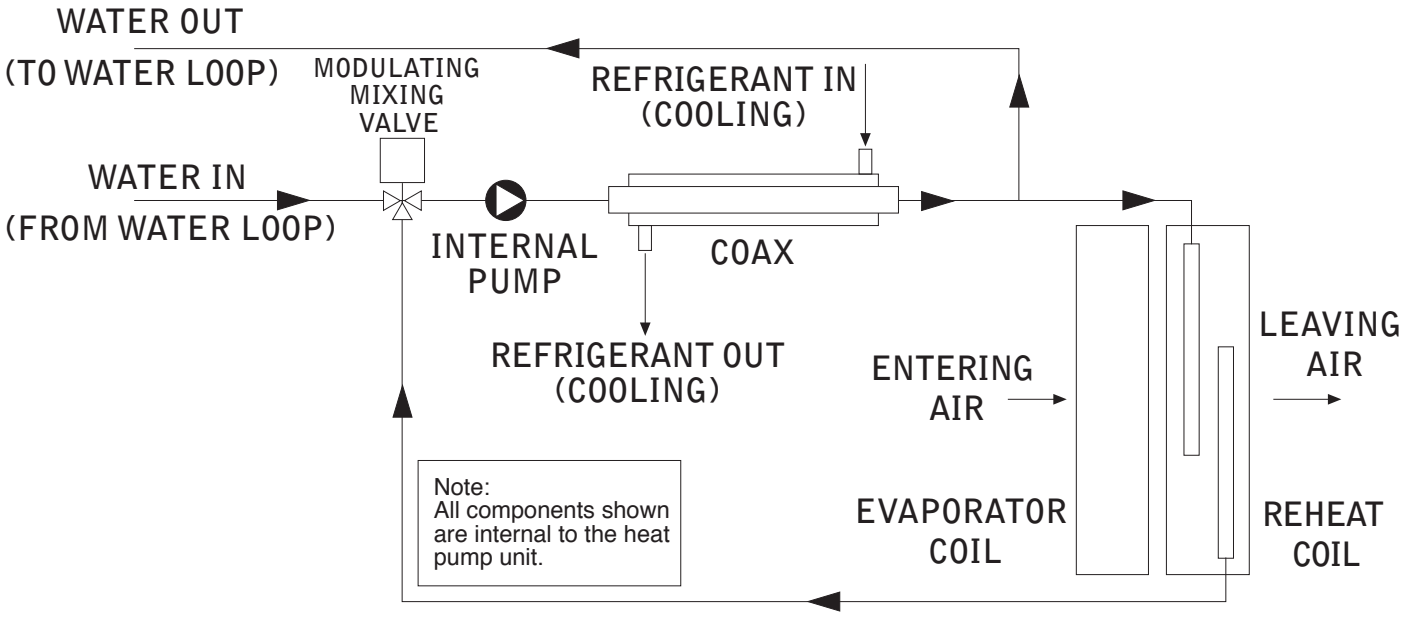
Unlike most hot gas reheat options, the ClimaDry® II option will operate over a wide range of EWTs. Special flow regulation (water regulating valve) is not required for low EWT conditions.

Unit minimum entering air temperature while in the dehumidification, cooling, or continuous fan modes is **65°F DB/55°F WB**. Operation below this minimum may result in nuisance faults.

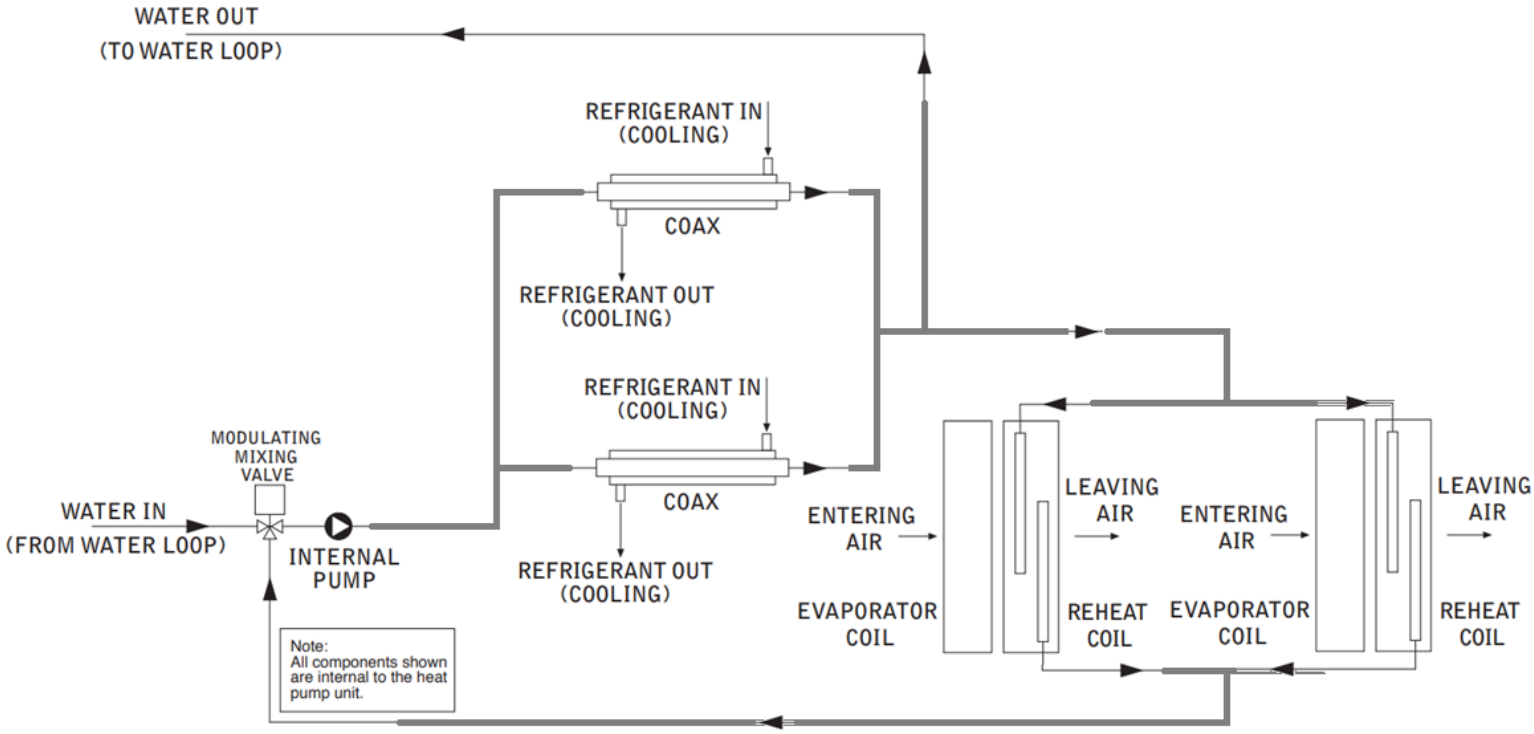
Water-source heat pumps with ClimaDry II should not be used as make-up air units. These applications should use equipment specifically designed for make-up air.

ClimaDry® II – Sequence of Operation, Cont'd.

ClimaDry® II Single Circuit Schematic (TLV084-150)



ClimaDry® II Two Circuit Schematic (TLV168-300)



Controls – CXM2 and DXM2.5

CXM2 Controls

For detailed controller information, see the CXM2 Application, Operation, and Maintenance (AOM) manual (part # 97B0137N01). To confirm the controller type of your particular unit, refer to digit 9 on the unit model number and the unit nomenclature diagram found on page 3 of this manual.

DXM2.5 Controls

For detailed controller information, see the DXM2.5 Application, Operation, and Maintenance (AOM) manual (part # 97B0142N01). To confirm the controller type of your particular unit, refer to digit 9 on the unit model number and the unit nomenclature diagram found on page 3 of this manual.

Blower Adjustment

⚠ CAUTION! ⚠

CAUTION! Always disconnect all power supply(s) to unit prior to making belt or sheave adjustments. Inadvertently starting of the motor can cause damage to the equipment and personal injury.

Airflow and External Static Pressure Selection Adjustment

The TL Series is available with standard, low, and high static options. These options will substitute a different blower drive sheave for each static range. In addition certain static ranges may require the optional large fan motor. Please specify static range and motor horsepower when ordering. See model nomenclature.

Sheave Adjustment

The TL Series is supplied with variable sheave drive on the fan motor to adjust for differing airflows at various ESP conditions. Select an airflow requirement on the left side of the table, then move horizontally to right under the required ESP. Note the sheave turns open, rpm and horsepower for that condition. Fully closed the sheave will produce the highest static capability (higher rpm). To adjust sheave position: loosen belt tension and remove belt, loosen set screw on variable sheave (on fan motor) and open sheave to desired position. Retighten set screw and replace belt and set belt tension as below.

Belt Tensioning

An overly loose belt will, upon motor start, produce a slippage 'squeel' and cause premature belt failure and or intermittent airflow. An overly tight belt can cause premature motor or blower bearing failure.

Sheave and Pulley Alignment

Verify belt is straight; misalignment will cause premature belt failure. Adjust sheave if needed.

Belt Tensioning Procedure - TLV

Blower motors for TLV models are slide base mounted. To adjust the belt tension:

1. Loosen the four (4) bolts that lock the base to the slide rails.
2. Insert a socket into the opening at the front of the base assembly.
3. Turn counter clock wise to tighten or clock wise to loosen the belt.
4. The belt should be tensioned using a tension gauge method such as the Browning Belt Tensioner to set proper belt tension (see next page).
5. After belt tension is set secure the (4) locking bolts.

Notes:

- Motor position should not need adjustment.
- Motor sheave position is at mid position of each sheave. Thus the motor sheave is typically 2.5 turns open on a 5 turn sheave.

Special Note for AHRI Testing

Note 1: All TLV084 ratings @ 2800CFM (1321 l/s) w/21GPM (1.33 l/s). Sheave setting for AHRI is 3.5 turns open.

Note 2: All TLV096 ratings @ 3200CFM (1510 l/s) w/24GPM (1.51 l/s). Sheave setting for AHRI is 3.0 turns open.

Note 3: All TLV120 ratings @ 4000CFM (1888 l/s) w/30GPM (1.89 l/s). Sheave setting for AHRI is 2.5 turns open.

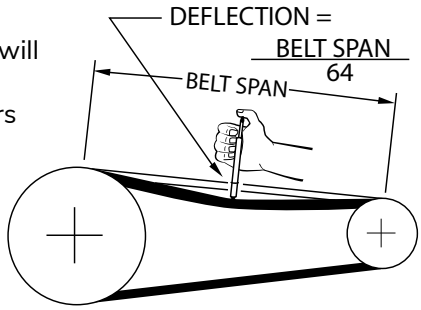
Note 4: Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature.

Note 5: Heating capacities based upon 68°F DB, 59°F WB entering air temperature.

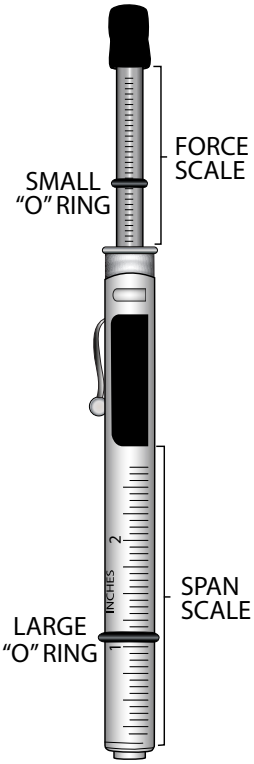
Note 6: All ratings based upon operation at lower voltage of dual voltage rated models.

Tensioning V-Belt Drives

General Rules of Tensioning



1. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions.
2. Check tension frequently during the first 24-48 hours of operation.
3. Over tensioning shortens belt and bearing life.
4. Keep belts free from foreign material which may cause slip.
5. Make V-drive inspection on periodic basis. Tension when slipping. Never apply belt dressing as this will damage the belt and cause early failure.



Tension Measurement Procedure

1. Measure the belt span (see sketch).
2. Position bottom of the large "O" ring on the span scale at the measured belt span.
3. Set the small "O" ring on the deflection force scale to zero.
4. Place the tension checker squarely on one belt at the center of the belt span. Apply a force on the plunger and perpendicular to the belt span until the bottom of the large "O" ring is even with the top of the next belt or with the bottom of a straight edge laid across the sheaves.
5. Remove the tension checker and read the forct applied from the bottom of the small "O" ring on the deflection force scale.
6. Compare the force you have applied with the values given in the table below. The force should be between the minimum and maximum shown. The maximum value is shown for "New Belt" and new belts should be tensioned at this value to allow for expected tension loss. Used belts should be maintained at the minimum value as indicated in the table below.

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

			Belt Deflection Force			
			Super Gripbelts and Unnotched Gripbands		Gripnotch Belts and Notched Gripbands	
Cross Section	Smallest Sheave Diameter Range	RPM Range	Used Belt	New Belt	Used Belt	New Belt
A, AX	7.6 - 9.1	1000 - 2500	16.458	24.464	18.237	27.133
		2501 - 4000	12.454	18.682	15.123	22.240
	9.6 - 12.2	1000 - 2500	20.016	30.246	22.240	32.915
		2501 - 4000	16.902	25.354	19.126	28.467
	12.7 - 17.8	1000 - 2500	24.019	35.584	25.354	41.811
		2501 - 4000	20.906	31.136	22.685	33.805
B, BX	8.6 - 10.7	860- 2500	-	-	21.795	32.026
		2501 - 4000	-	-	18.682	27.578
	11.2 - 14.2	860- 2500	23.574	35.139	36.029	46.704
		2501 - 4000	20.016	29.802	31.581	40.477
	14.7 - 21.8	860- 2500	28.022	41.811	37.808	56.045
		2501 - 4000	26.688	39.587	32.470	48.483

Blower Sheave Information

Table 10: TL Blower Sheave and Belt Information

Model	Configuration Return/Supply	Component	Drive Package				
			A	B	C	D	E
084	Back or Front/Top Back/Front Front/Back	Blower Sheave Motor Sheave Motor Belt	BK95 X 1” 1VP40 X 7/8” 1HP BX79	BK110 X 1” 1VP34 X 7/8” 1HP BX81	BK95 X 1” 1VP50 X 7/8” 1HP BX81	BK95 X 1” 1VP40 X 7/8” 1.5HP BX79	BK95 X 1” 1VP50 X 7/8” 1.5HP BX81
096		Blower Sheave Motor Sheave Motor Belt	BK95 X 1” 1VP40 X 7/8” 1.5HP BX79	BK110 X 1” 1VP34 X 7/8” 1.5HP BX81	BK95 X 1” 1VP50 X 7/8” 1.5HP BX81	BK95 X 1” 1VP40 X 7/8” 2HP BX79	BK95 X 1” 1VP50 X 7/8” 2HP BX81
120		Blower Sheave Motor Sheave Motor Belt	BK95 X 1” 1VP44 X 7/8” 2HP BX80	BK110 X 1” 1VP40 X 7/8” 2HP BX81	BK95 X 1” 1VP60 X 7/8” 2HP BX82	BK95 X 1” 1VP44 X 7/8” 3HP BX80	BK95 X 1” 1VP60 X 7/8” 3HP BX82
150		Blower Sheave Motor Sheave Motor Belt	BK95 X 1” 1VP50 X 7/8” 3HP BX81	BK110 X 1” 1VP50 X 7/8” 3HP BX83	BK95 X 1” 1VP62 X 7/8” 3HP BX83	BK95 X 1” 1VP50 X 1-1/8” 5HP BX77	BK95 X 1” 1VP65 X 1-1/8” 5HP H,F - BX79 N - BX81
168	Back or Front/Top Back/Front Front/Back	Blower Sheave Motor Sheave Motor Belt	BK95H X 1-3/16” 1VP44 X 7/8” 2HP BX80	BK110H X 1-3/16” 1VP40 X 7/8” 2HP BX82	BK95H X 1-3/16” 1VP50 X 7/8” 2HP BX81	BK95H X 1-3/16” 1VP44 X 7/8” 3HP BX80	BK95H X 1-3/16” 1VP50 X 7/8” 3HP BX81
192		Blower Sheave Motor Sheave Motor Belt	BK95H X 1-3/16” 1VP44 X 7/8” 3HP BX80	BK110H X 1-3/16” 1VP40 X 7/8” 3HP BX82	BK95H X 1-3/16” 1VP50 X 7/8” 3HP BX81	BK95H X 1-3/16” 1VP44 X 1-1/8” 5HP BX76	BK95H X 1-3/16” 1VP50 X 1-1/8” 5HP BX77
240		Blower Sheave Motor Sheave Motor Belt	BK90H X 1-3/16” 1VP44 X 1-1/8” 5HP H,F - BX78 N - BX77	BK110H X 1-3/16” 1VP44 X 1-1/8” 5HP BX80	BK95H X 1-3/16” 1VP60 X 1-1/8” 5HP H,F - BX80 N - BX78	N/A	BK95H X 1-3/16” 1VP60 X 1-3/8” 7.5HP H,F - BX79 N - BX78
300		Blower Sheave Motor Sheave Motor Belt	BK105H X 1-3/16” 1VP60 X 1-1/8” 5HP H,F - BX82 N - BX80	BK110H X 1-3/16” 1VP50 X 1-1/8” 5HP BX80	BK95H X 1-3/16” 1VP60 X 1-1/8” 5HP BX78	BK105H X 1-3/16” 1VP60 X 1-3/8” 7.5HP BX80	BK95H X 1-3/16” 1VP60 X 1-3/8” 7.5HP BX78

Note 1: D-drive is not available because standard sheave is not available in 1-3/8”.

Blower Performance

TL 084 Blower Performance

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
2100	BHP			0.24	0.29	0.34	0.37	0.41	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84
	Sheave/Mtr			B	B	B	A	A	A	A	A	A	C	C	C	C	C
	RPM			410	457	499	537	577	612	647	678	710	737	764	791	815	838
	Turns Open			5	3.5	4.5	6	5	4	3	2.5	1.5	6	5.5	4.5	4	3
2200	BHP			0.28	0.315	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84	0.9
	Sheave/Mtr			B	B	B	A	A	A	A	A	A	C	C	C	C	C
	RPM			424	467	507	548	584	621	653	684	716	743	772	797	821	847
	Turns Open			4.5	3.5	4.5	5.5	5	4	3	2	1.5	6	5	4.5	3.5	3
2300	BHP			0.29	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94
	Sheave/Mtr			B	B	B	A	A	A	A	A	A	C	C	C	C	C
	RPM			435	476	518	555	590	627	659	692	721	751	777	803	829	853
	Turns Open			4.5	3	4	5.5	4.5	3.5	2.5	2	1.5	5.5	5	4	3.5	2.5
2400	BHP		0.29	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94	0.99
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	RPM		403	446	485	527	563	600	633	665	697	726	756	783	811	835	858
	Turns Open		5	4	3	6	5.5	4.5	3.5	2.5	1.5	1	5.5	4.5	4	3	2.5
2500	BHP		0.31	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.74	0.79	0.84	0.89	0.94	0.99	1.04
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	A	C	C	C	C	E
	RPM		411	452	495	532	567	604	636	670	700	729	759	786	813	838	864
	Turns Open		5	4	2.5	6	5.5	4	3.5	2.5	1.5	1	5.5	4.5	3.5	3	2.5
2600	BHP		0.34	0.43	0.48	0.53	0.58	0.63	0.68	0.73	0.78	0.83	0.88	0.93	1.03	1.08	1.13
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	A	C	C	E	E	E
	RPM		420	460	500	536	570	606	638	671	701	729	759	786	814	839	865
	Turns Open		4.5	3.5	2.5	6	5	4	3	2	1.5	1	5	4	4	3	2.5
2700	BHP		0.38	0.43	0.48	0.53	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.14
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	A	C	C	E	E	E
	RPM		423	463	504	539	576	609	641	674	703	734	762	788	816	841	867
	Turns Open		4.5	3.5	2	5.5	5	4	3	2	1.5	1	5	4	4	3	2.5
2800	BHP		0.39	0.44	0.49	0.54	0.64	0.69	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.12	1.22
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	C	C	E	E	E	E
	RPM		431	474	510	545	581	613	647	677	706	737	764	793	818	843	869
	Turns Open		4.5	3	2	5.5	5	4	3	2	1.5	5.5	1	4.5	4	3	2.5
2900	BHP		0.44	0.49	0.54	0.59	0.64	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	C	E	E	E	E	E
	RPM		440	481	517	551	586	618	651	681	710	740	767	795	821	845	872
	Turns Open		4	3	2	5.5	4.5	3.5	2.5	1.5	1	5.5	5.5	4.5	3.5	3	2
3000	BHP	0.43	0.49	0.54	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24	1.29
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	D	E	E	E	E	E
	RPM	412	455	492	526	563	595	628	658	687	718	745	774	800	826	852	876
	Turns Open	5	3.5	2.5	6	5.5	4.5	3.5	2.5	1.5	1.5	1	5	4.5	3.5	3	2
3100	BHP	0.44	0.53	0.59	0.64	0.69	0.74	0.84	0.89	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.39
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	D	E	E	E	E	E
	RPM	421	459	499	533	569	600	633	663	691	722	749	777	803	828	854	878
	Turns Open	4.5	3.5	2.5	6	5	4	3	2	1.5	1.5	1	5	4	3.5	2.5	2
3200	BHP	0.49	0.54	0.64	0.69	0.74	0.84	0.89	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.39	1.44
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	D	E	E	E	E	E	E
	RPM	441	478	513	549	581	614	644	672	703	730	759	785	810	837	861	887
	Turns Open	4	3	2	5.5	5	4	3	2	1.5	1.5	5.5	4.5	4	3	2.5	2
3300	BHP	0.54	0.64	0.69	0.74	0.83	0.89	0.94	0.99	1.04	1.14	1.23	1.29	1.34	1.44	1.49	
	Sheave/Mtr	B	B	A	A	A	A	A	A	D	D	E	E	E	E	E	
	RPM	456	495	529	561	595	625	656	685	712	741	767	795	820	844	870	
	Turns Open	3.5	2.5	6	5	4.5	3.5	2.5	2	1.5	1	5	4.5	3.5	3	2.5	
3400	BHP	0.63	0.69	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.44	1.49		
	Sheave/Mtr	B	B	A	A	A	A	A	D	1.5	D	E	E	E	E		
	RPM	471	506	539	574	604	633	664	692	721	747	773	800	825	851		
	Turns Open	3	2	5.5	5	4	3.5	2.5	2	1.5	1	5	4	3.5	2.5		
3500	BHP	0.64	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.23	1.29	1.34	1.44	1.49			
	Sheave/Mtr	B	A	A	A	A	A	D	D	D	E	E	E	E			
	RPM	486	520	555	586	615	647	674	704	730	756	784	808	835			
	Turns Open	2.5	6	5.5	4.5	4	3	2.5	1.5	1	5.5	4.5	4	3			

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance, Cont'd.

TLV 096 Blower Performance

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
2400	BHP		0.29	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94	0.99
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	RPM		403	446	485	527	563	600	633	665	697	726	756	783	811	835	858
	Turns Open		5	4	3	6	5.5	4.5	3.5	2.5	1.5	1	5.5	5	4	3.5	3
2500	BHP		0.31	0.34	0.39	0.44	0.49	0.54	0.59	0.64	0.74	0.79	0.84	0.89	0.94	0.99	1.04
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	RPM		411	452	495	532	567	604	636	670	700	729	759	786	813	838	864
	Turns Open		5	4	2.5	6	5.5	4	3.5	2.5	1.5	1	5.5	5	4	3	3
2600	BHP		0.34	0.43	0.48	0.53	0.58	0.63	0.68	0.73	0.78	0.83	0.88	0.93	1.03	1.08	1.13
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	RPM		420	460	500	536	570	606	638	671	701	729	759	786	814	839	865
	Turns Open		4.5	3.5	2.5	6	5	4	3	2	1.5	1	5	5	4	3	2.5
2700	BHP		0.38	0.43	0.48	0.53	0.59	0.64	0.69	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.14
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	RPM		423	463	504	539	576	609	641	674	703	734	762	788	816	841	867
	Turns Open		4.5	3.5	2	5.5	5	4	3	2	1.5	1	5	4.5	4	3	2.5
2800	BHP		0.39	0.44	0.49	0.54	0.64	0.69	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.12	1.22
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	C	C	C	C	C	C
	RPM		431	474	510	545	581	613	647	677	706	737	764	793	818	843	869
	Turns Open		4.5	3	2	5.5	5	4	3	2	1.5	5.5	5	4.5	3.5	3	2.5
2900	BHP		0.44	0.49	0.54	0.59	0.64	0.74	0.79	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24
	Sheave/Mtr		B	B	B	A	A	A	A	A	A		C	C	C	C	C
	RPM		440	481	517	551	586	618	651	681	710	740	767	795	821	845	872
	Turns Open		4	3	2	5.5	4.5	3.5	2.5	1.5	1	5.5	5	4.5	3.5	2.5	2.5
3000	BHP	0.43	0.49	0.54	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24	1.29
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C	C
	RPM	412	455	492	526	563	595	628	658	687	718	745	774	800	826	852	876
	Turns Open	5	3.5	2.5	6	5.5	4.5	3.5	2.5	1.5	1.5	6	5	4	3.5	2.5	2
3100	BHP	0.44	0.53	0.59	0.64	0.69	0.74	0.84	0.89	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.39
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C	C
	RPM	421	459	499	533	569	600	633	663	691	722	749	777	803	828	854	878
	Turns Open	4.5	3.5	2.5	6	5	4	3	2	1.5	1.5	6	4.5	4	3	2.5	2
3200	BHP	0.49	0.54	0.64	0.69	0.74	0.84	0.89	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.39	1.44
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C	C
	RPM	441	478	513	549	581	614	644	672	703	730	759	785	810	837	861	887
	Turns Open	4	3	2	5.5	5	4	3	2	1.5	1.5	5.5	4.5	4	3	2.5	2
3300	BHP	0.54	0.64	0.69	0.74	0.83	0.89	0.94	0.99	1.04	1.14	1.23	1.29	1.34	1.44	1.49	1.54
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C	E
	RPM	456	495	529	561	595	625	656	685	712	741	767	795	820	844	870	893
	Turns Open	3.5	2.5	6	5	4.5	3.5	2.5	2	1.5	1	5	4.5	3.5	3	2	2
3400	BHP	0.63	0.69	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	C	C	C	C	E	E
	RPM	471	506	539	574	604	633	664	692	721	747	773	800	825	851	875	898
	Turns Open	3	2	5.5	5	4	3.5	2.5	2	1.5	1	5	4	3.5	2.5	2.5	2
3500	BHP	0.64	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.23	1.29	1.34	1.44	1.49	1.54	1.64	1.74
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	C	C	C	C	E	E	E
	RPM	486	520	555	586	615	647	674	704	730	756	784	808	835	858	883	906
	Turns Open	2.5	6	5.5	4.5	4	3	2.5	1.5	1	5.5	4.5	4	3	2.5	2.5	1.5
3600	BHP	0.74	0.79	0.84	0.94	0.99	1.04	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.83
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	C	C	C	E	E	E	E
	RPM	495	528	562	593	624	652	680	708	734	762	787	812	838	861	886	909
	Turns Open	2.5	6	5	4.5	3.5	3	2	1.5	1	5.5	4.5	4	3	2.5	2.5	1.5

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions. Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Table Continued on Next Page

Blower Performance, Cont'd.

Table Continued from Previous Page

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
3700	BHP	0.79	0.84	0.93	0.99	1.04	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.79	1.84
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	C	C	E	E	E	E	E
	RPM	506	541	572	605	633	661	690	716	744	769	793	820	843	868	891	913
	Turns Open	2	5.5	5	4	3.5	3	2	1.5	1	5	4.5	3.5	3	2.5	2	1.5
3800	BHP	0.84	0.89	0.94	1.04	1.13	1.19	1.24	1.34	1.43	1.49	1.54	1.64	1.73	1.79	1.84	1.94
	Sheave/Mtr	B	A	A	A	A	A	A	A	C	C	E	E	E	E	E	E
	RPM	515	549	580	611	640	667	696	721	749	773	798	823	847	872	894	918
	Turns Open	2	5.5	4.5	4	3.5	2.5	1.5	1.5	5.5	5	4	3.5	3	2.5	2	1
3900	BHP	0.89	0.94	1.04	1.09	1.14	1.24	1.34	1.39	1.44	1.54	1.64	1.69	1.74	1.84	1.94	
	Sheave/Mtr	A	A	A	A	A	A	A	A	C	E	E	E	E	E	E	
	RPM	525	556	586	617	645	674	701	726	753	778	804	827	850	875	897	
	Turns Open	6	5.5	4.5	4	3	2.5	1.5	1	5.5	5	4	3.5	2.5	2	2	
4000	BHP	0.94	1.04	1.09	1.14	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.79	1.84	1.94		
	Sheave/Mtr	A	A	A	A	A	A	A	A	E	E	E	E	E	E		
	RPM	539	569	601	629	659	685	711	738	763	789	812	835	860	882		
	Turns Open	5.5	5	4.5	3.5	3	2	1	1	5	4.5	3.5	3	2.5	2		

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance, Cont'd.

TLV 120 Blower Performance

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
3000	BHP			0.54	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24	1.34
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	A	C	C
	RPM			491	529	563	595	626	659	689	717	745	774	801	826	851	877
	Turns Open			5	4	3	2	6	5	4	3.5	3	2	1.5	1	6	5.5
3100	BHP		0.54	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.19	1.24	1.34	1.44
	Sheave/Mtr		B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	RPM		469	504	542	575	607	637	670	699	726	754	783	809	834	859	884
	Turns Open		5.5	5	3.5	2.5	6	5.5	4.5	4	3.5	2.5	2	1.5	6	6	5
3200	BHP		0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.29	1.34	1.44	1.53
	Sheave/Mtr		B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	RPM		485	520	556	588	619	649	680	708	736	765	791	817	841	868	891
	Turns Open		5	4.5	3	2	6	5	4.5	3.5	3	2.5	1.5	1	6	5.5	5
3300	BHP	0.59	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.29	1.34	1.44	1.49	1.54
	Sheave/Mtr	B	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	RPM	464	500	537	570	601	631	662	691	718	745	774	799	824	849	875	898
	Turns Open	6	5	4	2.5	2	5.5	5	4	3.5	2.5	2	1.5	1	5.5	5	4.5
3400	BHP	0.64	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.29	1.34	1.44	1.49	1.54	1.64
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	480	515	551	583	613	642	674	701	728	754	783	808	833	857	882	905
	Turns Open	5.5	4.5	3.5	2.5	6	5.5	4.5	3.5	3	2.5	2	1	6	5.5	5	4.5
3500	BHP	0.69	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.29	1.34	1.44	1.54	1.59	1.64	1.74
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	496	530	565	596	625	654	684	711	738	766	792	816	841	867	890	913
	Turns Open	5	4	3	2	6	5	4	3.5	3	2.5	1.5	1	6	5.5	5	4
3600	BHP	0.74	0.84	0.89	0.94	1.04	1.09	1.14	1.24	1.34	1.39	1.44	1.54	1.59	1.64	1.74	1.84
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C
	RPM	511	544	578	608	637	668	695	722	748	776	800	825	849	874	897	920
	Turns Open	4.5	3.5	2.5	6	5.5	4.5	4	3.5	2.5	2	1	6	6	5	4.5	4
3700	BHP	0.84	0.89	0.94	1.04	1.14	1.19	1.24	1.34	1.39	1.44	1.54	1.64	1.69	1.74	1.84	1.94
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C
	RPM	526	561	592	621	649	679	706	732	758	785	809	833	857	882	905	927
	Turns Open	4	3	2	6	5	4.5	3.5	3	2.5	1.5	1	6	5.5	5	4.5	4
3800	BHP	0.89	0.94	1.04	1.09	1.14	1.24	1.34	1.39	1.44	1.54	1.64	1.69	1.74	1.84	1.94	2.04
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	E
	RPM	544	575	605	633	661	691	717	742	767	794	818	842	867	890	912	934
	Turns Open	3.5	2.5	1.5	5.5	5	4	3.5	2.5	2	1.5	1	6	5.5	4.5	4	3.5
3900	BHP	0.94	1.04	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.79	1.84	1.94	2.04	2.14
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	C	C	C	C	E	E
	RPM	555	589	618	646	676	702	728	753	779	803	827	850	875	898	920	941
	Turns Open	3	2	6	5	4.5	3.5	3	2.5	2	1	6	5.5	5	4.5	4	3.5
4000	BHP	1.04	1.09	1.14	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.79	1.84	1.94	2.04	2.14	2.24
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	C	C	C	E	E	E
	RPM	572	601	630	657	686	712	737	762	789	812	836	859	883	905	927	948
	Turns Open	2.5	2	5.5	5	4	3.5	3	2	1.5	1	6	5.5	5	4.5	4	3.5
4100	BHP	1.14	1.19	1.24	1.34	1.44	1.49	1.54	1.64	1.74	1.84	1.89	1.94	2.04	2.14	2.24	2.34
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	C	C	C	E	E	E	E
	RPM	589	617	645	672	700	726	751	775	801	824	847	872	894	915	937	960
	Turns Open	2	6	5	4.5	4	3	2.5	2	1	6	5.5	5	4.5	4	3.5	3
4200	BHP	1.24	1.29	1.34	1.44	1.54	1.59	1.64	1.74	1.84	2	2.04	2.09	2.14	2.24	2.34	2.44
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	E	E	E	E	E	E	E
	RPM	605	633	660	689	714	739	763	790	813	836	858	882	904	925	946	969
	Turns Open	6	5.5	5	4	3.5	2.5	2.5	1.5	1	6	5.5	5.5	4.5	4	3.5	3
4300	BHP	1.29	1.34	1.44	1.54	1.64	1.69	1.74	1.84	2	2.04	2.14	2.24	2.29	2.34	2.44	2.54
	Sheave/Mtr	A	A	A	A	A	A	A	A	E	E	E	E	E	E	E	E
	RPM	621	649	675	703	728	752	776	802	827	847	869	893	914	935	956	979
	Turns Open	6	5	4.5	3.5	3	2.5	2	1	6	6	5.5	5	4.5	4	3	2.5
4400	BHP	1.39	1.44	1.54	1.64	1.74	1.84	1.89	2	2.04	2.14	2.24	2.34	2.44	2.49	2.54	2.64
	Sheave/Mtr	A	A	A	A	A	A	A	D	E	E	E	E	E	E	E	E
	RPM	637	664	690	717	742	766	791	814	836	858	882	904	925	945	968	988
	Turns Open	5.5	4.5	4	3.5	2.5	2	1.5	1	6	5.5	5	4.5	4	3.5	3	2.5
4500	BHP	1.49	1.54	1.64	1.74	1.84	1.94	2.04	2.09	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84
	Sheave/Mtr	A	A	A	A	A	A	D	D	E	E	E	E	E	E	E	E
	RPM	653	679	707	731	755	779	804	826	848	870	893	914	935	955	978	997
	Turns Open	5	4.5	3.5	3	2	1.5	1.5	1	6	5.5	5	4.5	4	3.5	2.5	2

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions. Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

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Blower Performance, Cont'd.

Table Continued from Previous Page

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
4600	BHP	1.59	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.39	2.44	2.54	2.64	2.74	2.84	2.94
	Sheave/Mtr	A	A	A	A	A	D	D	E	E	E	E	E	E	E	E	E
	RPM	668	694	721	745	768	791	816	838	860	883	904	925	945	967	987	1007
	Turns Open	4.5	4	3	2.5	2	1.5	1	6	5.5	5	4.5	4	3.5	3	2.5	2
4700	BHP	1.74	1.84	1.89	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.69	2.74	2.84	2.94	
	Sheave/Mtr	A	A	A	A	D	D	E	E	E	E	E	E	E	E	E	
	RPM	683	711	735	758	782	806	828	850	871	894	915	935	955	977	997	
	Turns Open	4	3.5	2.5	2	2	1	6	6	5.5	5	4.5	3.5	3.5	3	2	
4800	BHP	1.84	1.94	1.99	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94			
	Sheave/Mtr	A	A	A	D	D	D	E	E	E	E	E	E	E			
	RPM	698	725	749	772	795	819	836	862	883	906	926	946	968			
	Turns Open	3.5	3	2.5	2	1.5	1	6	5.5	5	4.5	4	3.5	3			
4900	BHP	1.94	2.04	2.14	2.24	2.34	2.44	2.49	2.54	2.64	2.74	2.84	2.94				
	Sheave/Mtr	A	D	D	D	D	E	E	E	E	E	E	E				
	RPM	715	739	762	785	810	831	853	874	896	917	937	956				
	Turns Open	3	3	2.5	2	1	6	5.5	5.5	5	4	3.5	3				
5000	BHP	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94						
	Sheave/Mtr	D	D	D	D	E	E	E	E	E	E						
	RPM	730	753	776	798	822	844	865	885	908	928						
	Turns Open	3	2.5	2	1.5	6	6	5.5	5	4.5	4						

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance, Cont'd.

TLV 150 Blower Performance

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
3800	BHP						1.04	1.14	1.24	1.29	1.34	1.44	1.54	1.64	1.74	1.84	1.94
	Sheave/Mtr						B	B	B	A	A	A	A	A	A	A	A
	RPM						659	688	718	746	774	802	829	855	879	905	931
	Turns Open						5.5	4.5	3.5	6	5	4.5	4	3	2.5	2	1
3900	BHP					1.04	1.14	1.19	1.24	1.34	1.44	1.54	1.64	1.74	1.84	1.94	2.03
	Sheave/Mtr					B	B	B	B	A	A	A	A	A	A	A	A
	RPM					639	669	702	729	757	785	811	838	862	887	913	938
	Turns Open					6	5	4	3	5.5	5	4	3.5	3	2	1.5	1
4000	BHP					1.14	1.19	1.24	1.34	1.44	1.54	1.64	1.69	1.74	1.84	1.94	2.04
	Sheave/Mtr					B	B	B	A	A	A	A	A	A	A	A	C
	RPM					651	683	710	739	767	794	821	845	870	895	920	945
	Turns Open					5.5	4.5	4	6	5.5	4.5	4	3.5	2.5	2	1.5	6
4100	BHP				1.09	1.14	1.24	1.34	1.44	1.54	1.64	1.69	1.74	1.84	1.94	2.04	2.14
	Sheave/Mtr				B	B	B	B	A	A	A	A	A	A	A	A	C
	RPM				631	661	692	722	750	778	804	831	854	879	904	928	951
	Turns Open				6	5.5	4.5	3.5	515	5	4.5	3.5	3	2.5	1.5	1	6
4200	BHP				1.14	1.24	1.34	1.44	1.54	1.59	1.64	1.74	1.84	1.94	2.04	2.14	2.24
	Sheave/Mtr				B	B	B	B	A	A	A	A	A	A	A	A	C
	RPM				640	673	703	733	761	788	812	838	863	888	912	934	958
	Turns Open				6	5	4	3	5.5	4.5	4	3.5	3	2	1.5	1	5.5
4300	BHP				1.24	1.34	1.44	1.54	1.59	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34
	Sheave/Mtr				B	B	B	A	A	A	A	A	A	A	A	C	C
	RPM				653	685	715	744	771	796	822	847	872	896	919	942	966
	Turns Open				5.5	4.5	3.5	6	5	4.5	4	3	2.5	2	1	6	5.5
4400	BHP			1.24	1.34	1.44	1.54	1.59	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	A	C	C
	RPM			633	666	697	726	755	782	806	832	857	881	904	927	950	973
	Turns Open			6	5	4	3	5.5	5	4	3.5	3	2.5	1.5	1	6	5.5
4500	BHP			1.3	1.4	1.5	1.6	1.7	1.8	1.9	2	2.1	2.2	2.3	2.4	2.5	2.6
	Sheave/Mtr			B	B	B	A	A	A	A	A	A	A	A	C	C	C
	RPM			646	678	706	735	763	791	817	842	867	889	912	935	958	980
	Turns Open			5.5	4.5	4	6	5.5	4.5	4	3.5	2.5	2	1.5	6	6	5
4600	BHP			1.34	1.44	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64
	Sheave/Mtr			B	B	B	A	A	A	A	A	A	A	A	C	C	C
	RPM			656	687	715	744	772	799	825	850	872	896	919	942	963	987
	Turns Open			5.5	4.5	3.5	6	5	4.5	3.5	3	2.5	2	1	6	5.5	5
4700	BHP		1.34	1.44	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74
	Sheave/Mtr		B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	RPM		637	666	697	727	755	783	809	835	858	882	905	928	951	973	994
	Turns Open		6	5	4	3	5.5	5	4	3.5	3	2	1.5	1	6	5.5	4.5
4800	BHP		1.44	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	RPM		647	678	708	738	766	793	819	844	867	891	914	937	959	980	1001
	Turns Open		5.5	4.5	3.5	6	5	4.5	4	3.5	2.5	2	1.5	6	5.5	5	4.5
4900	BHP	1.44	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	631	662	690	720	749	777	803	827	852	877	900	923	946	966	988	1009
	Turns Open	6	5	4	3.5	5.5	5	4.5	3.5	3	2.5	2	1	6	5.5	5	4.5
5000	BHP	1.54	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.04
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	E
	RPM	642	672	702	731	760	785	811	837	862	886	909	932	953	975	996	1017
	Turns Open	5.5	5	3.5	3	5.5	4.5	4	3.5	3	2	1.5	1	6	5	4.5	4.5
5100	BHP	1.64	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.04	3.19
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	C	C	C	E	E
	RPM	655	685	714	743	769	798	822	847	872	896	917	940	962	983	1005	1025
	Turns Open	5.5	4.5	3.5	6	5	4.5	4	3	2.5	2	1.5	6	5.5	5	5	4.5
5200	BHP	1.74	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.09	3.19	3.29
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	C	C	E	E	E
	RPM	668	697	726	752	782	806	832	857	882	903	926	949	971	992	1013	1032
	Turns Open	5	4	3	5.5	5	4	3.5	3	2	1.5	1	6	5.5	5	4.5	4
5300	BHP	1.84	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.09	3.19	3.29	3.39
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	C	C	E	E	E	E
	RPM	680	709	737	763	790	817	842	867	889	912	935	957	979	1000	1021	1042
	Turns Open	4.5	3.5	6	5.5	4.5	4	3.5	2.5	2	1.5	6		5.5	5	4.5	4

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions. Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Table Continued on Next Page

Blower Performance, Cont'd.

Table Continued from Previous Page

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
5400	BHP	1.94	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	2.94	3.09	3.19	3.29	3.39	3.49
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	C	E	E	E	E	E
	RPM	691	717	745	772	799	825	850	873	897	920	943	965	986	1006	1026	1047
	Turns Open	4	3.5	5.5	5	4.5	3.5	3	2.5	1.5	1	6	6	5	4.5	4	3.5
5500	BHP	2.04	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	3.09	3.14	3.24	3.34	3.44	3.54	3.69
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	D	E	E	E	E	E	E
	RPM	704	729	756	783	810	836	859	883	907	929	952	972	993	1014	1035	1055
	Turns Open	4	6	5.5	4.5	4	3.5	3	2	1.5	1	6	5.5	5	4.5	4	3.5
5600	BHP	2.14	2.24	2.34	2.44	2.54	2.64	2.74	2.84	3.00	3.14	3.24	3.34	3.44	3.54	3.69	3.79
	Sheave/Mtr	B	A	A	A	A	A	A	A	D	D	E	E	E	E	E	E
	RPM	714	740	767	794	818	844	868	892	916	938	959	981	1002	1023	1043	1063
	Turns Open	3.5	6	5	4.5	4	3	2.5	2	1.5	1	6	5.5	4.5	4	3.5	3
5700	BHP	2.24	2.34	2.44	2.54	2.64	2.74	2.89	3.04	3.14	3.24	3.34	3.44	3.59	3.74	3.84	3.94
	Sheave/Mtr	B	A	A	A	A	A	A	D	D	E	E	E	E	E	E	E
	RPM	726	752	779	803	829	854	878	902	925	948	970	990	1011	1031	1051	1071
	Turns Open	3	5.5	5	4	3.5	3	2	2	1	6	5.5	5	4.5	4	3.5	3
5800	BHP	2.34	2.44	2.54	2.64	2.74	2.84	3.00	3.14	3.24	3.34	3.44	3.59	3.74	3.84	3.94	4.04
	Sheave/Mtr	A	A	A	A	A	A	D	D	D	E	E	E	E	E	E	E
	RPM	738	763	788	813	839	864	888	911	934	955	977	998	1019	1039	1058	1077
	Turns Open	6	5	4.5	4	3.5	2.5	2	1.5	1	6	5.5	5	4.5	4	3.5	2.5
5900	BHP	2.44	2.54	2.64	2.74	2.89	3.04	3.14	3.24	3.34	3.49	3.64	3.74	3.84	3.94	4.09	4.19
	Sheave/Mtr	A	A	A	A	A	D	D	D	E	E	E	E	E	E	E	E
	RPM	750	775	799	824	849	874	898	921	944	964	986	1007	1027	1046	1068	1086
	Turns Open	5.5	5	4	3.5	3	2.5	2	1.5	6	5.5	5	4.5	4	3.5	3	2.5
6000	BHP	2.54	2.64	2.74	2.89	3.04	3.14	3.24	3.34	3.49	3.64	3.74	3.84	3.99	4.14	4.24	4.34
	Sheave/Mtr	A	A	A	A	D	D	D	D	E	E	E	E	E	E	E	E
	RPM	758	783	808	833	858	880	904	927	950	972	993	1014	1033	1053	1073	1092
	Turns Open	5.5	4.5	4	3.5	3	2.5	1.5	1	6	5.5	5	4.5	4	3.5	3	2.5
6100	BHP	2.64	2.74	2.89	3.04	3.14	3.24	3.34	3.49	3.64	3.74	3.84	3.99	4.14	1.24	4.34	4.49
	Sheave/Mtr	A	A	A	D	D	D	D	D	E	E	E	E	E	E	E	E
	RPM	769	794	819	843	866	890	913	936	958	980	1000	1021	1041	1061	1081	1099
	Turns Open	5	4.5	3.5	3.5	2.5	2	1.5	1	6	5.5	4.5	4	3.5	3	2.5	2
6200	BHP	2.84	2.94	3.04	3.14	3.24	3.39	3.54	3.64	3.74	3.89	4.04	4.14	4.24	4.39	4.54	4.64
	Sheave/Mtr	A	A	D	D	D	D	D	E	E	E	E	E	E	E	E	E
	RPM	781	815	830	854	878	900	923	946	968	988	1009	1030	1050	1070	1089	1107
	Turns Open	4.5	4	3.5	3	2.5	2	1	6	5.5	5	4.5	4	3.5	3	2.5	2
6300	BHP	2.94	3.04	3.14	3.29	3.44	3.54	3.64	3.79	3.94	4.04	4.14	4.29	4.44	4.54	4.69	4.84
	Sheave/Mtr	A	D	D	D	D	D	D	E	E	E	E	E	E	E	E	E
	RPM	793	817	841	863	886	910	933	955	977	997	1018	1038	1058	1078	1097	1115
	Turns Open	4.5	4	3.5	3	2	1.5		6	5.5	5	4.5	4	3	2.5	2	1.5

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance, Cont'd.

TLV 168 Blower Performance

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
4200	BHP				0.58	0.68	0.74	0.82	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68
	Sheave/Mtr				B	B	B	B	A	A	A	A	A	A	A	A	C
	RPM				457	499	537	577	612	647	678	710	737	764	791	815	838
	Turns Open				6	5	3.5	2.5	6	5.5	4.5	3.5	3	2	1.5	1	3
4400	BHP				0.63	0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68	1.8
	Sheave/Mtr				B	B	B	B	A	A	A	A	A	A	A	C	C
	RPM				467	507	548	584	621	653	684	716	743	772	797	821	847
	Turns Open				5.5	4.5	3.5	2.5	6	5	4	3.5	2.5	2	1	3.5	3
4600	BHP				0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88
	Sheave/Mtr				B	B	B	B	A	A	A	A	A	A	A	C	C
	RPM				476	518	555	590	627	659	692	721	751	777	803	829	853
	Turns Open				5.5	4.5	3	2	5.5	5	4	3	2.5	1.5	1	3.5	2.5
4800	BHP			0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88	1.98
	Sheave/Mtr			B	B	B	B	B	A	A	A	A	A	A	C	C	C
	RPM			446	485	527	563	600	633	665	697	726	756	783	811	835	858
	Turns Open			6	5	4	3	1.5	5.5	4.5	4	3	2.5	1.5	4	3	2.5
5000	BHP			0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.48	1.58	1.68	1.78	1.88	1.98	2.08
	Sheave/Mtr			B	B	B	B	B	A	A	A	A	A	A	C	C	E
	RPM			452	495	532	567	604	636	670	700	729	759	786	813	838	864
	Turns Open			6	5	4	2.5	1.5	5.5	4.5	3.5	3	2	1.5	4	3	2.5
5200	BHP			0.86	0.96	1.06	1.16	1.26	1.36	1.46	1.56	1.66	1.76	1.86	2.06	2.16	2.26
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	E	E	E
	RPM			460	500	536	570	606	638	671	701	729	759	786	814	839	865
	Turns Open			6	4.5	3.5	2.5	6	5.5	4.5	3.5	2.5	2	1	4	3.5	2.5
5400	BHP			0.86	0.96	1.06	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.28
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	E	E	E
	RPM			463	504	539	576	609	641	674	703	734	762	788	816	841	867
	Turns Open			5.5	4.5	3.5	2.5	6	5	4.5	3.5	2.5	2	1	4	3.5	2.5
5600	BHP			0.88	0.98	1.08	1.28	1.38	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.24	2.44
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	D	E	E	E
	RPM			474	510	545	581	613	647	677	706	737	764	793	818	843	869
	Turns Open			5.5	4	3	2	6	5	4	3	2.5	1.5	1.5	4	3.5	2.5
5800	BHP		0.88	0.98	1.08	1.18	1.28	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48
	Sheave/Mtr		B	B	B	B	B	A	A	A	A	A	D	D	E	E	E
	RPM		440	481	517	551	586	618	651	681	710	740	767	795	821	845	872
	Turns Open		6	5	4	3	2	5.5	4.5	4	3	2	2	1.5	3.5	3	2
6000	BHP		0.98	1.08	1.18	1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48	2.58
	Sheave/Mtr		B	B	B	B	B	A	A	A	A	D	D	D	E	E	E
	RPM		455	492	526	563	595	628	658	687	718	745	774	800	826	852	876
	Turns Open		6	5	3.5	2.5	1.5	5.5	4.5	3.5	3	2.5	2	1.5	3.5	3	2
6200	BHP		1.06	1.18	1.28	1.38	1.48	1.68	1.78	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.78
	Sheave/Mtr		B	B	B	B	B	A	A	A	A	D	D	D	E	E	E
	RPM		459	499	533	569	600	633	663	691	722	749	777	803	828	854	878
	Turns Open		5.5	4.5	3.5	2.5	1.5	5.5	4	3.5	2.5	2.5	2	1	3.5	3	2
6400	BHP	0.98	1.08	1.28	1.38	1.48	1.68	1.78	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.78	2.88
	Sheave/Mtr	B	B	B	B	B	A	A	A	A	D	D	D	D	E	E	E
	RPM	441	478	513	549	581	614	644	672	703	730	759	785	810	837	861	887
	Turns Open	6	5.5	4	3	2	6	5	4	3.5	3	2.5	1.5	1	3	2.5	2
6600	BHP	1.08	1.28	1.38	1.48	1.66	1.78	1.88	1.98	2.08	2.28	2.46	2.58	2.68	2.88	2.98	
	Sheave/Mtr	B	B	B	B	B	A	A	A	D	D	D	D	E	E	E	
	RPM	456	495	529	561	595	625	656	685	712	741	767	795	820	844	870	
	Turns Open	6	5	3.5	2.5	2	5.5	4.5	4	3.5	3	2	1.5	3.5	3	2.5	
6800	BHP	1.26	1.38	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.88	2.98		
	Sheave/Mtr	B	B	B	B	A	A	A	D	D	D	D	D	E	E		
	RPM	471	506	539	574	604	633	664	692	721	747	773	800	825	851		
	Turns Open	5.5	4.5	3.5	2.5	6	5.5	4.5	4	3	2.5	2	1	3.5	2.5		
7000	BHP	1.28	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.46	2.58	2.68	2.88	2.98			
	Sheave/Mtr	B	B	B	B	A	A	D	D	D	D	D	D	E			
	RPM	486	520	555	586	615	647	674	704	730	756	784	808	835			
	Turns Open	5	4	3	2	6	5	4.5	3.5	3	2.5	1.5	1	3			

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance, Cont'd.

TLV 192 Blower Performance

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
4800	BHP			0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88	1.98
	Sheave/Mtr			B	B	B	B	B	A	A	A	A	A	A	C	C	C
	RPM			446	485	527	563	600	633	665	697	726	756	783	811	835	858
	Turns Open			6	5	4	3	1.5	5.5	4.5	4	3	2.5	1.5	3.5	3	2.5
5000	BHP			0.68	0.78	0.88	0.98	1.08	1.18	1.28	1.48	1.58	1.68	1.78	1.88	1.98	2.08
	Sheave/Mtr			B	B	B	B	B	A	A	A	A	A	A	C	C	C
	RPM			452	495	532	567	604	636	670	700	729	759	786	813	838	864
	Turns Open			6	5	4	2.5	1.5	5.5	4.5	3.5	3	2.5	1.5	3.5	3	2.5
5200	BHP			0.86	0.96	1.06	1.16	1.26	1.36	1.46	1.56	1.66	1.76	1.86	2.06	2.16	2.26
	Sheave/Mtr			B	B	B	B	B	A	A	A	A	A	A	C	C	C
	RPM			460	500	536	570	606	638	671	701	729	759	786	814	839	865
	Turns Open			6	5	3.5	2.5	1.5	5	4.5	3.5	3	2.5	1	4	3	2.5
5400	BHP			0.86	0.96	1.06	1.18	1.28	1.38	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.28
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	C	C	C
	RPM			463	504	539	576	609	641	674	703	734	762	788	816	841	867
	Turns Open			5.5	4.5	3.5	2.5	6	5	4	3.5	2.5	2	1	4	3	2.5
5600	BHP			0.88	0.98	1.08	1.28	1.38	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.24	2.44
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	C	C	C
	RPM			474	510	545	581	613	647	677	706	737	764	793	818	843	869
	Turns Open			5.5	4.5	3	2	6	5	4	3.5	2.5	2	1.5	4	3	2.5
5800	BHP		0.88	0.98	1.08	1.18	1.28	1.48	1.58	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48
	Sheave/Mtr		B	B	B	B	B	A	A	A	A	A	A	A	C	C	C
	RPM		440	481	517	551	586	618	651	681	710	740	767	795	821	845	872
	Turns Open		6	5	4	3	2	6	4.5	4	3	2.5	2	1.5	3.5	3	2.5
6000	BHP		0.98	1.08	1.18	1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48	2.58
	Sheave/Mtr		B	B	B	B	B	A	A	A	A	A	A	A	C	C	C
	RPM		455	492	526	563	595	628	658	687	718	745	774	800	826	852	876
	Turns Open		6	5	4	2.5	1.5	5.5	4.5	3.5	3	2.5	2	1.5	3.5	3	2
6200	BHP		1.06	1.18	1.28	1.38	1.48	1.68	1.78	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.78
	Sheave/Mtr		B	B	B	B	B	A	A	A	A	A	A	A	C	C	C
	RPM		459	499	533	569	600	633	663	691	722	749	777	803	828	854	878
	Turns Open		6	4.5	3.5	2.5	1.5	5.5	4.5	3.5	3	2	1.5	1	3.5	3	2
6400	BHP	0.98	1.08	1.28	1.38	1.48	1.68	1.78	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.78	2.88
	Sheave/Mtr	B	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	RPM	441	478	513	549	581	614	644	672	703	730	759	785	810	837	861	887
	Turns Open	6	5	4.5	3	2	6	5	4	3.5	2.5	2	1.5	1	3.5	2.5	2
6600	BHP	1.08	1.28	1.38	1.48	1.66	1.78	1.88	1.98	2.08	2.28	2.46	2.58	2.68	2.88	2.98	3.08
	Sheave/Mtr	B	B	B	B	B	A	A	A	A	A	A	A	C	C	C	E
	RPM	456	495	529	561	595	625	656	685	712	741	767	795	820	844	870	893
	Turns Open	6	5	4	3	2	6	4.5	4	3.5	2.5	2	1.5	3.5	3	2.5	2
6800	BHP	1.26	1.38	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	C	C	E	E
	RPM	471	506	539	574	604	633	664	692	721	747	773	800	825	851	875	898
	Turns Open	5.5	4.5	3.5	2.5	6	5.5	4.5	4	3	2.5	2	1.5	3.5	3	2	1.5
7000	BHP	1.28	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.46	2.58	2.68	2.88	2.98	3.08	3.28	3.48
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	C	C	E	E	E
	RPM	486	520	555	586	615	647	674	704	730	756	784	808	835	858	883	906
	Turns Open	5	4	3	2	6	5	4.5	3.5	3	2	1.5	3.5	3	2.5	2	1.5
7200	BHP	1.48	1.58	1.68	1.88	1.98	2.08	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.66
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	C	E	E	E	E
	RPM	495	528	562	593	624	652	680	708	734	762	787	812	838	861	886	909
	Turns Open	4.5	4	2.5	1.5	6	5	4	3.5	3	2	1.5	4	3	2.5	2	1.5
7400	BHP	1.58	1.68	1.86	1.98	2.08	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.58	3.68
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	E	E	E	E	E
	RPM	506	541	572	605	633	661	690	716	744	769	793	820	843	868	891	913
	Turns Open	4.5	3.5	2.5	6	5.5	4.5	4	3	2.5	2	1.5	4	3	2.5	1.5	1
7600	BHP	1.68	1.78	1.88	2.08	2.26	2.38	2.48	2.68	2.86	2.98	3.08	3.28	3.46	3.58	3.68	3.88
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	D	E	E	E	E	E
	RPM	515	549	580	611	640	667	696	721	749	773	798	823	847	872	894	918
	Turns Open	4	3	2	6	5.5	4.5	3.5	3	2.5	2	1	3.5	3	2	1.5	1
7800	BHP	1.78	1.88	2.08	2.18	2.28	2.48	2.68	2.78	2.88	3.08	3.28	3.38	3.48	3.68	3.88	4.08
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	D	D	E	E	E	E	E
	RPM	525	556	586	617	645	674	701	726	753	778	804	827	850	875	897	921
	Turns Open	4	2.5	2	5.5	5	4	3.5	3	2.5	1.5	1	3.5	2.5	2	1.5	1
8000	BHP	1.88	2.08	2.18	2.28	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.58	3.68	3.88	4.08	4.28
	Sheave/Mtr	B	B	B	A	A	A	A	A	D	D	E	E	E	E	E	E
	RPM	539	569	601	629	659	685	711	738	763	789	812	835	860	882	906	927
	Turns Open	3	2.5	1.5	5.5	4.5	4	3	2.5	2	1.5	4	3	2.5	2	1.5	1

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance, Cont'd.

TLV 240 Blower Performance

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
6000	BHP				1.18	1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48	2.68
	Sheave/Mtr				B	B	B	B	A	A	A	A	A	A	A	A	C
	RPM				529	563	595	626	659	689	717	745	774	801	826	851	877
	Turns Open				6	5	4	3	6	5	4.5	4	3.5	2.5	2	1	5.5
6200	BHP				1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.38	2.48	2.68	2.88
	Sheave/Mtr				B	B	B	B	A	A	A	A	A	A	A	A	C
	RPM				542	575	607	637	670	699	726	754	783	809	834	859	884
	Turns Open				5.5	4.5	3.5	3	5.5	5	4.5	3.5	3	2.5	1.5	1	5
6400	BHP			1.28	1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.58	2.68	2.88	3.06
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	A	C	C
	RPM			520	556	588	619	649	680	708	736	765	791	817	841	868	891
	Turns Open			6	5	4	3.5	6	5.5	4.5	4	3.5	2.5	2	1.5	5.5	5
6600	BHP			1.38	1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.58	2.68	2.88	2.98	3.08
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	A	C	C
	RPM			537	570	601	631	662	691	718	745	774	799	824	849	875	898
	Turns Open			5.5	4.5	4	3	5.5	5	4.5	3.5	3	2.5	2	1	5	4.5
6800	BHP			1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.58	2.68	2.88	2.98	3.08	3.28
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	A	C	C
	RPM			551	583	613	642	674	701	728	754	783	808	833	857	882	905
	Turns Open			5.5	4.5	3.5	2.5	5.5	5	4	3.5	3	2	1.5	1	5	4.5
7000	BHP		1.48	1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.58	2.68	2.88	3.08	3.18	3.28	3.48
	Sheave/Mtr		B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	RPM		530	565	596	625	654	684	711	738	766	792	816	841	867	890	913
	Turns Open		6	5	4	3	6	5	4.5	4	3	2.5	2	1.5	5.5	4.5	4
7200	BHP		1.68	1.78	1.88	2.08	2.18	2.28	2.48	2.68	2.78	2.88	3.08	3.18	3.28	3.48	3.68
	Sheave/Mtr		B	B	B	B	A	A	A	A	A	A	A	A	C	C	C
	RPM		544	578	608	637	668	695	722	748	776	800	825	849	874	897	920
	Turns Open		5.5	4.5	3.5	2.5	5.5	5	4.5	3.5	3	2.5	1.5	1	5	4.5	4
7400	BHP		1.78	1.88	2.08	2.28	2.38	2.48	2.68	2.78	2.88	3.08	3.28	3.38	3.48	3.68	3.88
	Sheave/Mtr		B	B	B	B	A	A	A	A	A	A	A	C	C	C	C
	RPM		561	592	621	649	679	706	732	758	785	809	833	857	882	905	927
	Turns Open		5	4	3	2.5	5.5	4.5	4	3.5	2.5	2	1.5	5.5	5	4.5	3.5
7600	BHP	1.78	1.88	2.08	2.18	2.28	2.48	2.68	2.78	2.88	3.08	3.28	3.38	3.48	3.68	3.88	4.08
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	544	575	605	633	661	691	717	742	767	794	818	842	867	890	912	934
	Turns Open	5.5	4.5	3.5	3	5.5	5	4.5	4	3	2.5	2	1	5.5	5	4	3.5
7800	BHP	1.88	2.08	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.58	3.68	3.88	4.08	4.28
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	555	589	618	646	676	702	728	753	779	803	827	850	875	898	920	941
	Turns Open	5	4	3	6	5.5	4.5	4	3.5	3	2	1.5	1	5	4.5	4	3.5
8000	BHP	2.08	2.18	2.28	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.58	3.68	3.88	4.08	4.28	4.48
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C
	RPM	572	601	630	657	686	712	737	762	789	812	836	859	883	905	927	948
	Turns Open	4.5	3.5	3	5.5	5	4.5	4	3	2.5	2	1.5	5.5	5	4.5	4	3.5
8200	BHP	2.28	2.38	2.48	2.68	2.88	2.98	3.08	3.28	3.48	3.68	3.78	3.88	4.08	4.28	4.48	4.68
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C	C
	RPM	589	617	645	672	700	726	751	775	801	824	847	872	894	915	937	960
	Turns Open	4	3.5	2.5	5.5	4.5	4	3.5	3	2.5	1.5	1	5.5	5	4.5	4	3
8400	BHP	2.48	2.58	2.68	2.88	3.08	3.18	3.28	3.48	3.68	4	4.08	4.18	4.28	4.48	4.68	4.88
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	A	C	C	C	C	C
	RPM	605	633	660	689	714	739	763	790	813	836	858	882	904	925	946	969
	Turns Open	3.5	3	5.5	5	4.5	4	3	2.5	2	1.5	1	5	4.5	4	3.5	3

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions. Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Table Continued on Next Page

Blower Performance, Cont'd.

Table Continued from Previous Page

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
8600	BHP	2.58	2.68	2.88	3.08	3.28	3.38	3.48	3.68	4	4.08	4.28	4.48	4.58	4.68	4.88	5.08
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	A	C	C	C	C	C	E
	RPM	621	649	675	703	728	752	776	802	827	847	869	893	914	935	956	979
	Turns Open	3	6	5.5	4.5	4	3.5	3	2.5	2	1	5.5	5	4.5	4	3.5	2.5
8800	BHP	2.78	2.88	3.08	3.28	3.48	3.68	3.78	4	4.08	4.28	4.48	4.68	4.88	4.98	5.08	5.28
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	A	C	C	C	C	E	E
	RPM	637	664	690	717	742	766	791	814	836	858	882	904	925	945	968	988
	Turns Open	2.5	5.5	5	4.5	3.5	3	2.5	2	1.5	1	5	4.5	4	3.5	3	2.5
9000	BHP	2.98	3.08	3.28	3.48	3.68	3.88	4.08	4.18	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	C	C	C	E	E	E	E
	RPM	653	679	707	731	755	779	804	826	848	870	893	914	935	955	978	997
	Turns Open	6	5	4.5	4	3.5	3	2.5	2	1.5	5.5	5	4.5	4	3.5	2.5	2
9200	BHP	3.18	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.78	4.88	5.08	5.28	5.48	5.68	5.88
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	C	C	E	E	E	E	E
	RPM	668	694	721	745	768	791	816	838	860	883	904	925	945	967	987	1007
	Turns Open	5.5	5	4	3.5	3	2.5	2	1.5	1	5	4.5	4	3.5	3	2.5	2
9400	BHP	3.48	3.68	3.78	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.38	5.48	5.68	5.88	6.08
	Sheave/Mtr	A	A	A	A	A	A	A	A	C	E	E	E	E	E	E	E
	RPM	683	711	735	758	782	806	828	850	871	894	915	935	955	977	997	1016
	Turns Open	5	4.5	4	3.5	3	2.5	2	1	5.5	5	4.5	4	3.5	3	2	2
9600	BHP	3.68	3.88	3.98	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.08	6.28	6.48
	Sheave/Mtr	A	A	A	A	A	A	A	A	E	E	E	E	E	E	E	E
	RPM	698	725	749	772	795	819	836	862	883	906	926	946	968	987	1007	1025
	Turns Open	4.5	4	3.5	3	2.5	2	1.5	1	5	4.5	4	3.5	3	2.5	2	1.5
9800	BHP	3.88	4.08	4.28	4.48	4.68	4.88	4.98	5.08	5.28	5.48	5.68	5.88	6.08	6.28	6.48	6.68
	Sheave/Mtr	A	A	A	A	A	A	A	E	E	E	E	E	E	E	E	E
	RPM	715	739	762	785	810	831	853	874	896	917	937	956	978	997	1016	1035
	Turns Open	4.5	4	3.5	3	2.5	1.5	1	5.5	4.5	4.5	3.5	3	3	2.5	2	1.5
10000	BHP	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.08	6.28	6.48	6.68	6.78	6.88
	Sheave/Mtr	A	A	A	A	A	E	E	E	E	E	E	E	E	E	E	E
	RPM	730	753	776	798	822	844	865	885	908	928	948	967	988	1007	1026	1044
	Turns Open	4	3.5	3	2.5	2	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions. Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance Data, Cont'd.

TLV 300 Blower Performance

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)														
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
7600	BHP						2.08	2.28	2.48	2.58	2.68	2.88	3.08	3.28	3.48	3.68	3.88
	Sheave/Mtr						B	B	B	B	A	A	A	A	A	A	A
	RPM						659	688	718	746	774	802	829	855	879	905	931
	Turns Open						5.5	4.5	3.5	3	6	5	4.5	3.5	3	2	1.5
7800	BHP					2.08	2.28	2.38	2.48	2.68	2.88	3.08	3.28	3.48	3.68	3.88	4.06
	Sheave/Mtr					B	B	B	B	B	A	A	A	A	A	A	A
	RPM					639	669	702	729	757	785	811	838	862	887	913	938
	Turns Open					5.5	5	4	3	2.5	5.5	5	4	3.5	2.5	2	1
8000	BHP					2.28	2.38	2.48	2.68	2.88	3.08	3.28	3.38	3.48	3.68	3.88	4.08
	Sheave/Mtr					B	B	B	B	B	A	A	A	A	A	A	A
	RPM					651	683	710	739	767	794	821	845	870	895	920	945
	Turns Open					5.5	4.5	3.5	3	2	5.5	4.5	4	3	2.5	1.5	1
8200	BHP				2.18	2.28	2.48	2.68	2.88	3.08	3.28	3.38	3.48	3.68	3.88	4.08	4.28
	Sheave/Mtr				B	B	B	B	B	A	A	A	A	A	A	A	C
	RPM				631	661	692	722	750	778	804	831	854	879	904	928	951
	Turns Open				6	5	4	3.5	2.5	6	5	4.5	3.5	3	2	1.5	3.5
8400	BHP				2.28	2.48	2.68	2.88	3.08	3.18	3.28	3.48	3.68	3.88	4.08	4.28	4.48
	Sheave/Mtr				B	B	B	B	B	A	A	A	A	A	A	A	C
	RPM				640	673	703	733	761	788	812	838	863	888	912	934	958
	Turns Open				5.5	5	4	3	2	5.5	5	4	3.5	2.5	2	1	3
8600	BHP				2.48	2.68	2.88	3.08	3.18	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68
	Sheave/Mtr				B	B	B	B	A	A	A	A	A	A	A	A	C
	RPM				653	685	715	744	771	796	822	847	872	896	919	942	966
	Turns Open				5.5	4.5	3.5	2.5	6	5.5	4.5	4	3	2.5	1.5	1	3
8800	BHP			2.48	2.68	2.88	3.08	3.18	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88
	Sheave/Mtr			B	B	B	B	B	A	A	A	A	A	A	A	C	C
	RPM			633	666	697	726	755	782	806	832	857	881	904	927	950	973
	Turns Open			6	5	4	3	2.5	5.5	5	4	3.5	3	2	1.5	3.5	2.5
9000	BHP			2.6	2.8	3	3.2	3.4	3.6	3.8	4	4.2	4.4	4.6	4.8	5	5.2
	Sheave/Mtr			B	B	B	B	B	A	A	A	A	A	A	A	C	E
	RPM			646	678	706	735	763	791	817	842	867	889	912	935	958	980
	Turns Open			5.5	4.5	3.5	3	2	5.5	4.5	4	3	2.5	2	1	3	2.5
9200	BHP			2.68	2.88	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28
	Sheave/Mtr			B	B	B	B	A	A	A	A	A	A	A	A	E	E
	RPM			656	687	715	744	772	799	825	850	872	896	919	942	963	987
	Turns Open			5.5	4.5	3.5	2.5	6	5	4.5	3.5	3	2.5	1.5	1	3	2.5
9400	BHP		2.68	2.88	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48
	Sheave/Mtr		B	B	B	B	B	A	A	A	A	A	A	A	E	E	E
	RPM		637	666	697	727	755	783	809	835	858	882	905	928	951	973	994
	Turns Open		6	5	4	3	2.5	5.5	5	4	3.5	2.5	2	1.5	3.5	3	2
9600	BHP		2.88	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68
	Sheave/Mtr		B	B	B	B	A	A	A	A	A	A	A	D	E	E	E
	RPM		647	678	708	738	766	793	819	844	867	891	914	937	959	980	1001
	Turns Open		5.5	4.5	3.5	3	6	5	4.5	4	3	2.5	2	1	3	2.5	2
9800	BHP	2.88	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88
	Sheave/Mtr	B	B	B	B	B	A	A	A	A	A	A	D	E	E	E	E
	RPM	631	662	690	720	749	777	803	827	852	877	900	923	946	966	988	1009
	Turns Open	6	5	4	3.5	2.5	5.5	5	4.5	3.5	2.5	2	1.5	3.5	3	2.5	2
10000	BHP	3.08	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.08
	Sheave/Mtr	B	B	B	B	B	A	A	A	A	A	D	D	E	E	E	E
	RPM	642	672	702	731	760	785	811	837	862	886	909	932	953	975	996	1017
	Turns Open	5.5	4.5	4	3	2	5.5	4.5	4	3.5	2.5	2	1	3	2.5	2	2
10200	BHP	3.28	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.08	6.38
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	D	D	D	E	E	E	E
	RPM	655	685	714	743	769	798	822	847	872	896	917	940	962	983	1005	1025
	Turns Open	5	4.5	3.5	2.5	6	5	4.5	3.5	3	2.5	1.5	1	3	2.5	2	1.5
10400	BHP	3.48	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.18	6.38	6.58
	Sheave/Mtr	B	B	B	B	A	A	A	A	D	D	E	E	E	E	E	E
	RPM	668	697	726	752	782	806	832	857	882	903	926	949	971	992	1013	1032
	Turns Open	5	4	3	2.5	5.5	5	4	3.5	2.5	2	1.5	3.5	3	2.5	2	1.5
10600	BHP	3.68	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.18	6.38	6.58	6.78
	Sheave/Mtr	B	B	B	B	A	A	A	D	D	D	D	E	E	E	E	E
	RPM	680	709	737	763	790	817	842	867	889	912	935	957	979	1000	1021	1042
	Turns Open	4.5	3.5	3	2	5.5	4.5	4	3	2.5	2	1	3	2.5	2	1.5	1

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions. Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Table Continued on Next Page

Blower Performance, Cont'd.

Table Continued from Previous Page

All Data is Wet Coil

Airflow (SCFM)	ESP	Airflow (cfm) at External Static Pressure (in. wg)															
		0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
10800	BHP	3.88	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	5.88	6.18	6.38	6.58	6.78	6.98
	Sheave/Mtr	B	B	B	A	A	A	D	D	D	D	E	E	E	E	E	E
	RPM	691	717	745	772	799	825	850	873	897	920	943	965	986	1006	1026	1047
	Turns Open	4.5	3.5	2.5	6	5	4.5	3.5	3	2	1.5	3.5	3	2.5	2	1.5	1
11000	BHP	4.08	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	6.18	6.28	6.48	6.68	6.88	7.08	7.38
	Sheave/Mtr	B	B	B	A	A	D	D	D	D	D	E	E	E	E	E	E
	RPM	704	729	756	783	810	836	859	883	907	929	952	972	993	1014	1035	1055
	Turns Open	3.5	3	2	5.5	5	4	3	2.5	2	1.5	3.5	3	2.5	2	1	0.5
11200	BHP	4.28	4.48	4.68	4.88	5.08	5.28	5.48	5.68	6.00	6.28	6.48	6.68	6.88	7.08	7.38	
	Sheave/Mtr	B	B	A	A	D	D	D	D	D	D	E	E	E	E	E	
	RPM	714	740	767	794	818	844	868	892	916	938	959	981	1002	1023	1043	
	Turns Open	3.5	2.5	6	5.5	4.5	3.5	3	2.5	1.5	1	3	2.5	2	1.5	1	
11400	BHP	4.48	4.68	4.88	5.08	5.28	5.48	5.78	6.08	6.28	6.48	6.68	6.88	7.18	7.48		
	Sheave/Mtr	B	B	A	D	D	D	D	D	D	D	E	E	E	E		
	RPM	726	752	779	803	829	854	878	902	925	948	970	990	1011	1031		
	Turns Open	3	2	5.5	5	4.5	3.5	3	2	1.5	1	3	2.5	2	1.5		
11600	BHP	4.68	4.88	5.08	5.28	5.48	5.68	6.00	6.28	6.48	6.68	6.88	7.18	7.48			
	Sheave/Mtr	B	A	D	D	D	D	D	D	D	E	E	E	E			
	RPM	738	763	788	813	839	864	888	911	934	955	977	998	1019			
	Turns Open	2.5	6	5.5	4.5	4	3	2.5	2	1	3.5	2.5	2	1.5			
11800	BHP	4.88	5.08	5.28	5.48	5.78	6.08	6.28	6.48	6.68	6.98	7.28	7.48				
	Sheave/Mtr	B	D	D	D	D	D	D	D	D	E	E	E				
	RPM	750	775	799	824	849	874	898	921	944	964	986	1007				
	Turns Open	2	5.5	5	4	3.5	3	2.5	2	1	3	2.5	2				
12000	BHP	5.08	5.28	5.48	5.78	6.08	6.28	6.48	6.68	6.98	7.28	7.48					
	Sheave/Mtr	D	D	D	D	D	D	D	D	E	E	E					
	RPM	758	783	808	833	858	880	904	927	950	972	993					
	Turns Open	6	5.5	4.5	4	3.5	2.5	2	1.5	3.5	3	2.5					
12200	BHP	5.28	5.48	5.78	6.08	6.28	6.48	6.68	6.98	7.28	7.48						
	Sheave/Mtr	D	D	D	D	D	D	D	D	E	E						
	RPM	769	794	819	843	866	890	913	936	958	980						
	Turns Open	6	5	4.5	4	3	2.5	2	1.5	3	2.5						
12400	BHP	5.68	5.88	6.08	6.28	6.48	6.78	7.08	7.28	7.48							
	Sheave/Mtr	D	D	D	D	D	D	D	D	E							
	RPM	781	815	830	854	878	900	923	946	968							
	Turns Open	5.5	4.5	4.5	3.5	3	2	1.5	1	3							
12600	BHP	5.88	6.08	6.28	6.58	6.88	7.08	7.28									
	Sheave/Mtr	D	D	D	D	D	D	D									
	RPM	793	817	841	863	886	910	933									
	Turns Open	5	4.5	4	3	2.5	2	1.5									

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow in rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance Data – Units with ClimaDry®

Coil Face Velocity FPM	TLV with ClimaDry® - Additional ESP Loss		
	TLV084, 096, 168 & 192 In. of Water	TLV120 & 240 In. of Water	TLV300 In. of Water
200	0.14	-	-
225	0.15	-	-
250	0.16	-	-
275	0.17	0.17	-
300	0.18	0.18	-
325	0.19	0.19	0.23
350	0.21	0.21	0.25
375	0.22	0.22	0.26
400	-	0.24	0.28
425	-	0.26	0.30
450	-	0.29	0.33
475	-	-	0.35
500	-	-	0.38
525	-	-	0.41
550	-	-	0.45
575	-	-	0.48

All data is for wet coil.

Example:

Reheat coil loss can be determined from the above table.
Coil velocity (FPM) = Airflow (CFM) / Face Area (sq. ft.)

1. TLV120 has a face area of 11 sq. ft. (see physical data table).
2. At 4,200 cfm, coil velocity (FPM) = 4,200 / 11 = 380 FPM
3. From above table, ESP is .22.
4. TLV120 (without ClimaDry®) A Drive at .5 ESP, 2.5 turns = 4200 CFM
   TLV120 (with ClimaDry®) A Drive at .72 ESP, 2.5 turns = 3900 CFM
   If drop in CFM is not acceptable, adjust turns to 1.5 for 4200 CFM.
   Note - Sometimes drive package must be changed.

Unit Commissioning & Operating Limits

Environment - This unit is designed for indoor installation only. Do not install in an area subject to freezing or where humidity levels can cause cabinet condensation.

Power Supply - A voltage variation of +/- 10% of nameplate utilization voltage is acceptable.

Operation and performance is primarily dependent upon return air temperature, airflow, water temperature, water flow rate and ambient air temperature. This water to air heat pump is capable of operating over a wide temperature range and with flow rates of between 1.5 GPM (.1 l/s) and 3 GPM (.19 l/s) per ton, however usually no more than one of these factors may be at a minimum or maximum level at a time.

The commissioning table indicates air and water temperatures which are suitable for initial unit commissioning in an environment where the flow rate and water temperature is not yet stable and to avoid nuisance shut down of the units freeze and refrigerant pressure safeties.

The operating table indicates the maximum and minimum ranges of the unit.

For more specific unit performance reference the product catalog, the submittal data sheets or contact your supplier for assistance.

Table 11a: Building Commissioning Limits

BUILDING COMMISSIONING		
	ALL TL MODELS	
	Cooling °F [°C]	Heating °F [°C]
AMBIENT MIN - MAX DB	45-110 [7-43]	40-85 [4.5-29]
RETURN AIR MIN DB/WB	50/45 [10/7]	40 [4.5]
RETURN AIR MAX DB/WB	110/83 [43/28]	85 [29]
STANDARD UNIT ENTERING WATER MIN* - MAX	40-120 [4.5-49]	60-90 [16-43]
EXTENDED RANGE UNIT** ENTERING WATER MIN* - MAX	30-120 [-1-49]	20-90 [-6.7-43]

*- Requires optional insulation package when operating below the dew point
**- Requires antifreeze, optional insulation package and jumperclipped.

Table 11b: Unit Operating Limits

UNIT OPERATING LIMITS		
	All TL Models	
	Cooling °F [°C]	Heating °F [°C]
AMBIENT MIN - MAX DB	50-100 [10-38]	50-85 [10-29]
RETURN AIR MIN DB/WB***	65/55 [18/12.8]	60 [16]
RETURN AIR MAX DB/WB	95/75 [35/24]	80 [27]
STANDARD UNIT ENTERING WATER MIN* - MAX	50-120 [10-49]	60-90 [16-43]
EXTENDED RANGE UNIT** ENTERING WATER MIN* - MAX	30-120 [-1-49]	20-90 [-6.7-43]

*- Requires optional insulation package when operating below the dew point
**- Requires antifreeze, optional insulation package and jumper clipped.
***- Return air min. can be 50DB for units with hot gas bypass option

Piping System Cleaning & Flushing

⚠ CAUTION! ⚠

CAUTION! To avoid possible damage to a plastic (PVC) piping system, do not allow temperatures to exceed 110°F [43°C].

⚠ CAUTION! ⚠

CAUTION! DO NOT use 'stop leak' or any similar chemical agent in this system. Addition of these chemicals to the loop water will foul the system and inhibit unit operation.

Note: ClimateMaster strongly recommends all piping connections, both internal and external to the unit, be pressure tested for leakage by an appropriate method prior to any finishing of the interior space or before access to all connections is limited. ClimateMaster will not be responsible or liable for damages from water leaks due to inadequate or a lack of pressurized leak testing during installation.

Cleaning and flushing of the WLHP piping system is the single most important step to ensure proper start-up and continued efficient operation of the system.

Follow the instructions below to properly clean and flush the system:

1. Verify electrical power to the unit is disconnected.
2. Install the system with the supply hose connected directly to the return riser valve. Use a single length of flexible hose.
3. Open all air vents. Fill the system with the water. DO NOT allow system to overflow. Bleed all air from the system. Pressurize and check the system for leaks and repair appropriately.
4. Verify all strainers are in place. (ClimateMaster recommends a strainer with a #20 stainless steel wire mesh.) Start the pumps, and systematically check each vent to ensure all air is bled from the system.
5. Verify make-up water is available. Adjust make-up water appropriately to replace the air which was bled from the system. Check and adjust the water/air level in the expansion tank.
6. Set the boiler to raise the loop temperature to approximately 85°F [29°C]. Open the a drain at the lowest point in the system. Adjust the make-up water replacement rate to equal the rate of bleed.
7. Refill the system and add trisodium phosphate in a proportion of approximately one pound per 150 gallons [1/2 kg per 750 L] of water (or other equivalent approved cleaning agent). Reset the boiler to raise the loop temperature to about 100°F [38°C]. Circulate the solution for a minimum of 8 to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if desired.
8. When the cleaning process is complete, remove the short-circuited hoses. Reconnect the hoses to the proper supply, and return the connections to each of the units. Refill the system and bleed off all air.
9. Test the system pH with litmus paper. The system water should be slightly alkaline (pH 7.5-8.5). Add chemicals, as appropriate, to maintain acidity levels.
10. When the system is successfully cleaned, flushed, refilled and bled, check the main system panels, safety cutouts and alarms. Set the controls to properly maintain loop temperatures.

Unit & System Checkout

⚠ WARNING! ⚠

WARNING! Polyolester Oil, commonly known as POE oil, is a synthetic oil used in many refrigeration systems including those with HFC-410A refrigerant. POE oil, if it ever comes in contact with PVC or CPVC piping, may cause failure of the PVC/CPVC. PVC/CPVC piping should never be used as supply or return water piping with water source heat pump products containing HFC-410A as system failures and property damage may result.

BEFORE POWERING SYSTEM, please check the following:

UNIT CHECKOUT

- ❑ Line Voltage and Wiring: Ensure Voltage is within an acceptable range for the unit and wiring and fuses/ breakers are properly sized. Low voltage wiring is complete.
- ❑ Unit Control Transformer: Ensure transformer has properly selected control voltage tap. 208-230V units are factory wired for 208V operation unless specified otherwise.
- ❑ Balancing/Shutoff Valves: Ensure all isolation valves are open (after system flushing - see System Checkout) water control valves wired and open or coax may freeze and burst.
- ❑ Entering Water and Air: Ensure entering water and air temperatures are within operating limits of Table 11b.
- ❑ Low Water Temperature Cutout: Verify low water temperature cut-out on CXM2/DXM2.5 is properly set.
- ❑ Unit Blower Wheel: Manually rotate blower wheel to verify free rotation and ensure that all blower wheels are secured to blower shaft and centered in housing.
- ❑ Blower Motor: Verify motor bolts are tight. DO NOT oil motors upon start-up. Fan motors are pre-oiled at factory.
- ❑ Check shaft pillow blocks, sheave and pulley are tight
- ❑ Verify sheave has been set to turns in design requirement. Record turns on start up log sheet.
- ❑ Verify belt is straight and proper tension
- ❑ Condensate Line: Condensate line is open, trapped, vented, and properly pitched toward drain.
- ❑ Water Flow Balancing: Verify inlet and outlet water temperatures are recorded for each heat pump upon startup. This check can eliminate nuisance trip outs and high velocity water flows that can erode heat exchangers.
- ❑ Unit Air Coil & Filters: Ensure filter is clean and accessible. To obtain maximum performance and avoid possible condensate blow-off the coil should be cleaned using a 10% solution of dish washing detergent.
- ❑ Unit Controls: Verify CXM2 or DXM2.5 field selection options are proper and complete.

SYSTEM CHECKOUT

- ❑ System Water Temperature: Check water temperature for proper range and also verify heating and cooling setpoints for proper operation.
- ❑ System pH: System water pH is 7.5 - 8.5. Proper pH promotes longevity of hoses and fittings.
- ❑ System Flushing: Verify all hoses are connected end to end when flushing to ensure debris bypasses unit heat exchanger and water valves etc. Water used in the system must be potable quality initially and clean of dirt, piping slag, and strong chemical cleaning agents. Verify all air is purged from the system. Air in the system can cause poor operation or system corrosion.
- ❑ Cooling Tower/Boiler: Check equipment for proper setpoints and operation.
- ❑ Standby Pumps: Verify the standby pump is properly installed and in operating condition.
- ❑ System Controls: Verify system controls function and operate in the proper sequence.
- ❑ Low Water Temperature Cutout: Verify low water temperature cut-out controls are provided for the outdoor portion of the loop or operating problems will occur.
- ❑ System Control Center: Verify control center and alarm panel for proper setpoints and operation (if used).
- ❑ Miscellaneous: Note any questionable aspects of the installation.
- ❑ Log Data: Record data on startup log sheet in this manual or on web site. keep log for future reference.

⚠ WARNING! ⚠

WARNING! Verify ALL water controls are open and allow water flow prior to engaging the compressor. Freezing of the coax or water lines can permanently damage the heat pump.

⚠ WARNING! ⚠

WARNING! To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless antifreeze is added to system water. Condenser coils never fully drain by themselves and will freeze unless winterized with antifreeze.

Unit Start-Up Procedure

⚠ WARNING! ⚠

WARNING! When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with energized equipment.

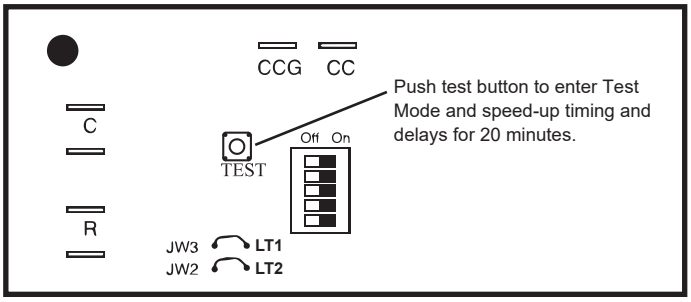
⚠ CAUTION! ⚠

INSTALLER CAUTION! After making water connections on units equipped with ClimaDry®, ensure the three union nuts on the internal three-way water valve are tight.

1. Turn thermostat fan position to "ON". Blower should start.
2. Balance air flow at registers.
3. Adjust all valves to their full open position. Turn on the line power to all heat pump units.
4. Operate unit in cooling cycle. Room temperature should be approximately 45-100°F [7-38°C] DB. For Start-up check, loop water temperature entering the heat pumps should be between 45°F [7°C] and 110°F [43°C].
5. Two factors determine the operating limits of a ClimateMaster TL System– (a) return air temperature, and (b) water temperature. When any one of these factors is at a minimum or maximum level, the other factor must be at normal levels to ensure proper unit operation.
   a. Adjust the unit thermostat to the warmest position. Slowly reduce thermostat setting until the compressor activates.
   b. Check for cool air delivery at the unit grille within a few minutes after the unit has begun to operate. **Note: Units have a five minute time delay in the control circuit that can be eliminated on the CXM2 PCB as shown below in Figure 14. See controls description for detailed features of the control.**
   c. Verify that the compressor is on and that the water flow rate is correct by measuring pressure drop through the heat exchanger using the Pete's plugs and comparing to Table 12.
   d. Check the elevation and cleanliness of the condensate lines. Dripping may be a sign of a blocked line. Check that the condensate trap includes a water seal.
   e. Refer to Table 14. Check the temperature of both supply and discharge water. If temperature is within range, proceed with test. If temperature is outside operating range, check cooling refrigerant pressures in Table 13. Verify correct water flow by comparing unit pressure drop across the heat exchanger versus the data in Table 14. Heat of rejection can be calculated and compared to specification catalog.
   f. Check air temperature drop across the coil when compressor is operating. Air temperature should drop between 15°F [8°C] and 25°F [14°C].
   g. Turn thermostat to "OFF" position. A hissing noise indicates proper functioning of the reversing valve.
6. Operate the heat pump in the heating cycle immediately after checking cooling cycle operation. Allow five (5) minutes between tests for pressure to equalize or cycle the reversing valve to equalize.
   a. Turn thermostat to lowest setting and set thermostat switch to "HEAT" position.
   b. Slowly turn thermostat to a higher temperature until the compressor activates.
   c. Check for warm air delivery at the unit grille within a few minutes after the unit has begun to operate.
   d. Check the temperature of both supply and discharge water. Refer to Table 13. If temperature is within range, proceed with test. If temperature is outside operating range, check heating refrigerant pressures in Table 13.
   e. Check air temperature rise across the coil when compressor is operating. Air temperature should rise between 20°F [11°C] and 30°F [17°C]. Heat of extraction can be calculated and compared to specification catalog.
   f. Check for vibration, noise, and water leaks.
7. If unit fails to operate, perform troubleshooting analysis (CXM2 AOM or DXM2.5 AOM). If the check described fails to reveal the problem and the unit still does not operate, contact a trained service technician to ensure proper diagnosis and repair of the equipment.
8. When testing is complete, set system to maintain desired comfort level.
9. BE CERTAIN TO FILL OUT AND FORWARD ALL WARRANTY REGISTRATION PAPERS TO CLIMATEMASTER.

Note: If performance during any mode appears abnormal, refer to the troubleshooting section of CXM or DXM2.5 AOM. To obtain maximum performance the air coil should be cleaned before start-up. A 10% solution of dishwasher detergent and water is recommended.

Figure 14: Test Mode Button



Coax Water Pressure Drop

Table 12: Coax Water Pressure Drop

Model	GPM	Pressure Drop			
		30°F	50°F	70°F	90°F
TLV084	10.5	2.4	2.0	1.2	1.1
	15.75	5.5	4.6	3.4	3.0
	21	9.2	7.9	6.2	5.7
TLV096	12	3.8	3.1	2.3	2.0
	18	8.0	6.8	5.3	4.8
	24	13.0	11.2	9.2	8.6
TLV120	15	2.1	1.7	1.2	1.0
	22.5	5.3	4.4	3.5	3.2
	30	9.4	8.1	6.7	6.2
TLV150	19	2.7	2.1	1.5	1.3
	28	6.2	5.2	4.1	3.7
	38	11.0	9.5	7.7	7.2

Model	GPM	Pressure Drop			
		30°F	50°F	70°F	90°F
TLV168	21	2.7	2.2	1.4	1.2
	31.5	6.1	5.2	3.8	3.4
	42	10.4	8.9	6.9	6.4
TLV192	24	4.2	3.5	2.6	2.3
	36	9.0	7.6	6.0	5.5
	48	14.6	12.6	10.3	9.6
TLV240	30	2.4	1.9	1.3	1.1
	45	5.9	4.9	3.9	3.6
	60	10.5	9.2	7.5	7.0
TLV300	38	3.1	2.4	1.7	1.5
	56	7.0	5.9	4.6	4.2
	76	12.4	10.7	8.7	8.1

CXM2/DXM2.5 Safety Control Reset - Lockout - In Lockout mode, the Status LED will begin fast flashing. The compressor relay is turned off immediately. Lockout mode can be soft reset via the thermostat “Y” input or can be hard reset via the disconnect. The last fault causing the lockout will be stored in memory and can be viewed by going into test mode.

Fault Retry - In Fault Retry mode, the Status LED begins slow flashing to signal that the control is trying to recover from a fault input. The CXM2 control will stage off the outputs and then “try again” to satisfy the thermostat "Y" input call. Once the thermostat input calls are satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the thermostat "Y" input call, then the control will go to Lockout mode. The last fault causing the lockout will be stored in memory and can be viewed by going into test mode.

Consult the CXM2 AOM or DXM2.5 AOM for complete descriptions.

⚠ CAUTION! ⚠

CAUTION! Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

Start-Up Log Sheet

Installer: Complete unit and system checkout and follow unit start-up procedures in the IOM. Use this form to record unit information, temperatures and pressures during start-up. Keep this form for future reference.

Job Name:_____ **Street Address:** _____

Model Number:_____ **Serial Number:** _____

Unit Location in Building:_____

Date:_____ **Sales Order No:**_____

In order to minimize troubleshooting and costly system failures, complete the following checks and data entries before the system is put into full operation.

Externat Static:_____

Sheave Setting:_____ **Turns OPEN**

Temperatures: F or C **Antifreeze:**_____**%**

Pressures: PSIG or kPa **Type:**_____

	Cooling Mode		Heating Mode
Return-Air Temperature	DB	WB	DB
Supply-Air Temperature	DB	WB	DB
Temperature Differential			
Entering Fluid Temperature			
Leaving Fluid Temperature			
Temperature Differential			
Water Coil Heat Exchanger (Water Pressure IN)			
Water Coil Heat Exchanger (Water Pressure OUT)			
Pressure Differential			
Compressor			
Amps			
Volts			
Discharge Line Temperature			
Flow Rate GPM (l/s)			
Motor			
Amps			
Volts			

Allow unit to run 15 minutes in each mode before taking data

Do not connect gauge lines

Unit Operating Conditions

Table 13: Typical Unit Operating Pressures and Temperatures

Entering Water Temp ºF	GPM per ton	Cooling						Heating					
		Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Rise ºF	Air Temp Drop ºF DB	Suction Pressure PSIG	Discharge Pressure PSIG	Super-heat	Sub-cooling	Water Temp Drop ºF	Air Temp Rise ºF DB
30	1.5							60-69	297-321	9-15	6-14	7-10	18-23
	2.3							63-72	301-325	9-15	6-14	5-8	19-23
	3.0							67-76	305-329	9-15	6-14	4-6	21-24
50	1.5	128-130	227-249	10-14	12-20	21-23	21-26	88-98	329-360	8-14	5-17	10-13	26-28
	2.3	128-130	213-234	11-17	10-18	15-17	21-26	93-103	334-365	8-14	5-17	7-11	27-30
	3.0	124-131	199-219	12-24	8-16	9-11	21-26	97-108	339-371	8-14	5-17	5-8	27-31
70	1.5	131-136	311-334	7-12	11-20	20-22	20-25	117-129	359-394	9-14	7-18	13-19	31-34
	2.3	130-135	297-323	8-11	10-16	14-17	20-25	126-136	369-409	9-14	7-18	10-15	32-36
	3.0	130-138	283-318	11-14	7-13	9-12	20-25	133-145	378-425	9-14	7-18	7-10	34-37
90	1.5	134-140	388-428	7-10	10-15	18-21	20-25	158-169	397-441	11-17	3-17	17-20	37-41
	2.3	133-139	370-406	8-10	9-13	13-17	20-25	167-179	407-452	11-17	3-17	13-16	38-42
	3.0	131-138	353-383	8-10	7-12	9-12	20-25	176-190	418-492	11-17	3-17	9-11	39-42
110	1.5	139-152	485-520	5-10	9-19	18-20	19-24						
	2.3	138-146	469-497	6-10	7-17	13-16	19-24						
	3.0	137-144	449-475	7-10	6-14	9-12	19-24						

*Based on Nominal 400 cfm per ton airflow and 70°F EAT htg and 80/67°F EAT cooling
**Cooling air and water numbers can vary greatly with changes in humidity
Subcooling is based upon the head pressure at compressor service port

Table 14: Water Temperature Change Through Heat Exchanger

Water Flow, gpm [l/m]	Rise, Cooling °F, [°C]	Drop, Heating °F, [°C]
For Closed Loop: Ground Source or Closed Loop Systems at 3 gpm per ton [3.9l/m per kW]	9-12	4-11
For Open Loop: Ground Water Systems at 1.5 gpm per ton [2.0l/m per kW]	18-23	7-20

Preventive Maintenance

Water Coil Maintenance
(Direct Ground Water Applications Only)
If the installation is performed in an area with a known high mineral content (125 P.P.M. or greater) in the water, it is best to establish with the owner a periodic maintenance schedule so the coil can be checked regularly. Consult the well water applications section of this manual for a more detailed water coil material selection. Should periodic coil cleaning be necessary, use standard coil cleaning procedures which are compatible with either the heat exchanger material or copper water lines. Generally, the more water flowing through the unit the less chance for scaling therefore 1.5 gpm per ton [2.0 l/m per kW] is recommended as a minimum flow.

Water Coil Maintenance
(All Other Water Loop Applications)
Generally water coil maintenance is not needed however, if the installation is located in a system with a known high dirt or debris content, it is best to establish with the owner a periodic maintenance schedule so the coil can be checked regularly. These dirty installations are a result of the deterioration of iron or galvanized piping or components in the system or open cooling towers requiring heavy chemical treatment and mineral buildup through water use. Should periodic coil cleaning be necessary, use standard coil cleaning procedures which are compatible with both the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling, however flow rates over 3 gpm per ton can produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

Filters
Filters must be clean to obtain maximum performance. They should be inspected every month under normal operating conditions and be replaced when necessary. Units should never be operated without a filter.

Washable high efficiency electrostatic filters, when dirty, can exhibit a very high pressure drop for the fan motor and reduce air flow resulting in poor performance. It is especially important to provide consistent washing of these filters (in opposite direction of the normal air flow) once per month using a high pressure wash similar to that found at self-serve car washes.

Condensate Drain
In areas where airborne bacteria produce a slime in the drain pan, it may be necessary to treat chemically with an algaecide every three months or so to minimize the problem. The condensate pan may also need to be cleaned periodically to assure indoor air quality. The condensate drain can pick up lint and dirt, especially with dirty filters. Inspect the drain twice a year to avoid the possibility of overflow.

Compressor
Conduct annual amperage checks to ensure amp draw is no more than 10% greater than that indicated by serial plate data.

Fan Motors
All units have lubricated fan motors. Inspection should be performed for proper tension and excessive wear of drive belts every three months.

Air Coil
The air coil must be cleaned to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum clean. Care must be taken not to damage the aluminum fins while cleaning. **CAUTION: Fin edges are sharp.**

Cabinet
Do not allow water to stay in contact with the cabinet for long periods of time to prevent corrosion of the cabinet sheet metal. Generally vertical cabinets are set up from the floor a few inches for prevention. The cabinet can be cleaned using a mild detergent.

Refrigerant System
To maintain sealed circuit integrity, do not install service gauges unless unit operation appears abnormal. Reference the operating chart for pressure and temperatures. Verify that air and water flow rates and temperatures are at proper levels before servicing the refrigerant circuit.

⚠ WARNING! ⚠

WARNING! To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state, and federal proficiency requirements.

Functional Troubleshooting

Fault	Htg	Clg	Possible Cause	Solution
Main power problems	X	X	Green Status LED Off	Check line voltage circuit breaker and disconnect.
				Check for line voltage between L1 and L2 on the contactor.
				Check for 24VAC between R and C on CXM2/DXM2.5
				Check primary/secondary voltage on transformer.
HP Fault Code 2 High Pressure		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow adjust to proper flow rate.
		X	Water Temperature out of range in cooling	Bring water temp within design parameters.
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Dirty Air Coil - construction dust etc.
				Too high of external static. Check static vs blower table.
	X		Air temperature out of range in heating	Bring return air temp within design parameters.
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table.
	X	X	Bad HP Switch	Check switch continuity and operation. Replace.
LP/LOC Fault Code 3 Low Pressure / Loss of Charge	X	X	Insufficient charge	Check for refrigerant leaks
	X		Compressor pump down at start-up	Check charge and start-up water flow.
LT1 Fault Code 4 Water coil low temperature limit	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting.
				Plugged strainer or filter. Clean or replace..
				Check water flow adjust to proper flow rate.
	X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
	X		Improper temperature limit setting (30°F vs 10°F [-1°C vs -2°C])	Clip JW3 jumper for antifreeze (10°F [-12°C]) use.
	X		Water Temperature out of range	Bring water temp within design parameters.
	X	X	Bad thermistor	Check temp and impedance correlation per chart
LT2 Fault Code 5 Air coil low temperature limit		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static? Check static vs blower table.
		X	Air Temperature out of range	Too much cold vent air? Bring entering air temp within design parameters.
		X	Improper temperature limit setting (30°F vs 10°F [-1°C vs -12°C])	Normal airside applications will require 30°F [-1°C] only.
	X	X	Bad thermistor	Check temp and impedance correlation per chart.
Condensate Fault Code 6	X	X	Blocked drain	Check for blockage and clean drain.
	X	X	Improper trap	Check trap dimensions and location ahead of vent.
		X	Poor drainage	Check for piping slope away from unit.
				Check slope of unit toward outlet.
				Poor venting? Check vent location.
		X	Moisture on sensor	Check for moisture shorting to air coil.
	X	X	Plugged air filter	Replace air filter.
	x	X	Restricted Return Airflow	Find and eliminate restriction. Increase return duct and/or grille size.
Over/Under Voltage Code 7 (Auto resetting)	X	X	Under Voltage	Check power supply and 24VAC voltage before and during operation.
				Check power supply wire size.
				Check compressor starting. Need hard start kit?
				Check 24VAC and unit transformer. Tap for correct power supply voltage.
	X	X	Over Voltage	Check power supply voltage and 24VAC before and during operation.
				Check 24VAC and unit transformer. Tap for correct power supply voltage.
Unit Performance Sentinel Code 8	X		Heating mode LT2>125°F [52°C]	Check for poor airflow or overcharged unit.
		X	Cooling Mode LT1>125°F [52°C] OR LT2< 40ºF [4ºC])	Check for poor water flow, or airflow.
Swapped Thermistor Code 9	X	X	LT1 and LT2 swapped	Reverse position of thermistors
No Fault Code Shown	X	X	No compressor operation	See "Only Fan Operates".
	X	X	Compressor overload	Check and replace if necessary.
	X	X	Control board	Reset power and check operation.
Unit Short Cycles	X	X	Dirty air filter	Check and clean air filter.
	X	X	Unit in "test mode"	Reset power or wait 20 minutes for auto exit.
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.
	X	X	Compressor overload	Check and replace if necessary
Only Fan Runs	X	X	Thermostat position	Ensure thermostat set for heating or cooling operation.
	X	X	Unit locked out	Check for lockout codes. Reset power.
	X	X	Compressor Overload	Check compressor overload. Replace if necessary.
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode.
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for Line voltage across BR contacts.
	X	X		Check fan power enable relay operation (if present).
	X	X	Fan motor	Check for line voltage at motor. Check capacitor.
	X	X	Thermostat wiring	Check thermostat wiring at heat pump. Jumper Y and R for compressor operation in test mode
Unit Doesn't Operate in Cooling		X	Reversing valve	Set for cooling demand and check 24VAC on RV coil and at CXM2/DXM2.5 board.
				If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	Check for 'O' RV setup not 'B'.
		X	Thermostat wiring	Check O wiring at heat pump. Jumper O and R for RV coil 'click'.
		X	Thermostat wiring	Put thermostat in cooling mode. Check 24 VAC on O (check between C and O); check for 24 VAC on W (check between W and C). There should be voltage on O, but not on W. If voltage is present on W, thermostat may be bad or wired incorrectly.

Performance Troubleshooting

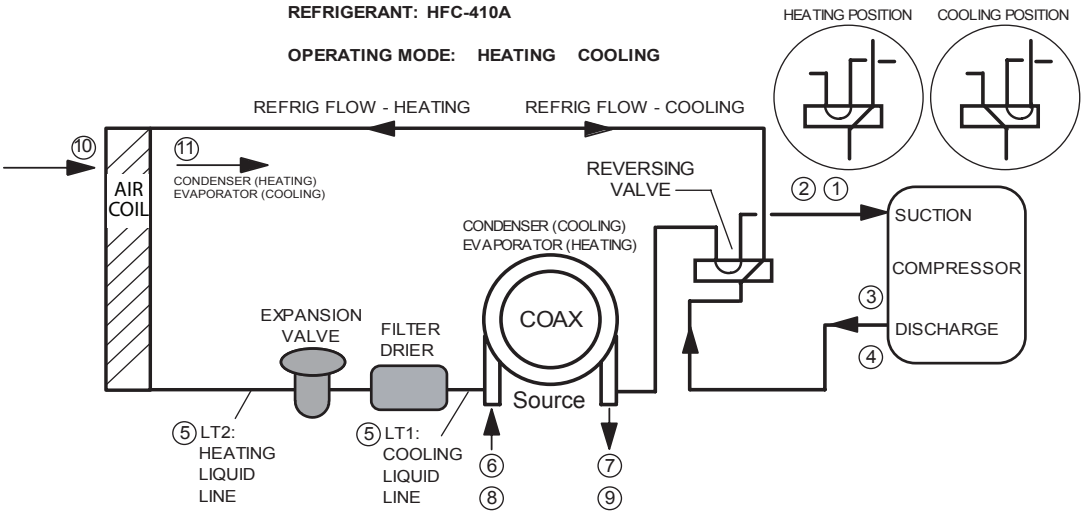
Symptom	Htg	Clg	Possible Cause	Solution
Insufficient capacity/ Not cooling or heating	X	X	Dirty filter	Replace or clean.
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static? Check static vs blower table.
		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static? Check static vs blower table.
	X	X	Leaky duct work	Check supply and return air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present.
	X	X	Low refrigerant charge	Check superheat and subcooling per chart.
	X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.
		X	Defective reversing valve	Perform RV touch test.
	X	X	Thermostat improperly located	Check location and for air drafts behind stat.
	X	X	Unit undersized	Recheck loads & sizing. Check sensible clg. load and heat pump capacity.
	X	X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Inlet water too hot or too cold	Check load, loop sizing, loop backfill, ground moisture.
High Head Pressure	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static? Check static vs blower table.
		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow. Adjust to proper flow rate.
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture.
	X		Air temperature out of range in heating	Bring return air temperature within design parameters.
		X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Unit overcharged	Check superheat and subcooling. Re-weigh in charge.
	X	X	Non-condensables in system	Vacuum system and re-weigh in charge.
	X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.
Low Suction Pressure	X		Reduced water flow in heating	Check pump operation or water valve operation/setting.
				Plugged strainer or filter? Clean or replace.
				Check water flow. Adjust to proper flow rate.
	X		Water temperature out of range	Bring water temperature within design parameters.
		X	Reduced airflow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static? Check static vs blower table.
		X	Air temperature out of range	Too much cold vent air? Bring entering air temperature within design parameters.
	X	X	Insufficient charge	Check for refrigerant leaks.
Low Discharge Air Temperature in Heating	X		Too high of airflow	Check fan motor speed selection and airflow chart.
	X		Poor performance	See ‘Insufficient Capacity’.
High humidity		X	Too high of airflow	Check fan motor speed selection and airflow chart.
		X	Unit oversized	Recheck loads & sizing. Check sensible cooling load and heat pump capacity.

Troubleshooting Form

Customer: _____ Loop Type: _____ Startup Date: _____

Model #: _____ Serial #: _____ Antifreeze Type & %: _____

Complaint: _____



Description	Heating	Cooling	Notes
Voltage			
Compressor Amps			
1 Suction Temp			
2 Suction Press			
2a Saturation Temp			
2b Superheat			
3 Discharge Temp			
4 Discharge Press			
4a Saturation Temp			
4b Subcooling			
5 Liquid Line Temp			
6 Source Water In Tmp			
7 Source Water Out Tmp			Temp Diff. =
8 Source Water In Pres			
9 Source Water Out Pres			
9a Press Drop			
9b Flow Rate			
10 Return Air Temp			
11 Supply Air Temp			

Heat of Extraction (Absorption) or Heat of Rejection:

HE or HR =

Fluid Factor: (for Btuh)	Fluid Factor: (for kW)
500 (Water); 485 (Antifreeze)	4.18 (Water); 4.05 (Antifreeze)

_____ Flow Rate x _____ Temp. Diff x _____ Fluid Factor

Superheat = Suction temperature - suction saturation temp. = _____ (deg F)

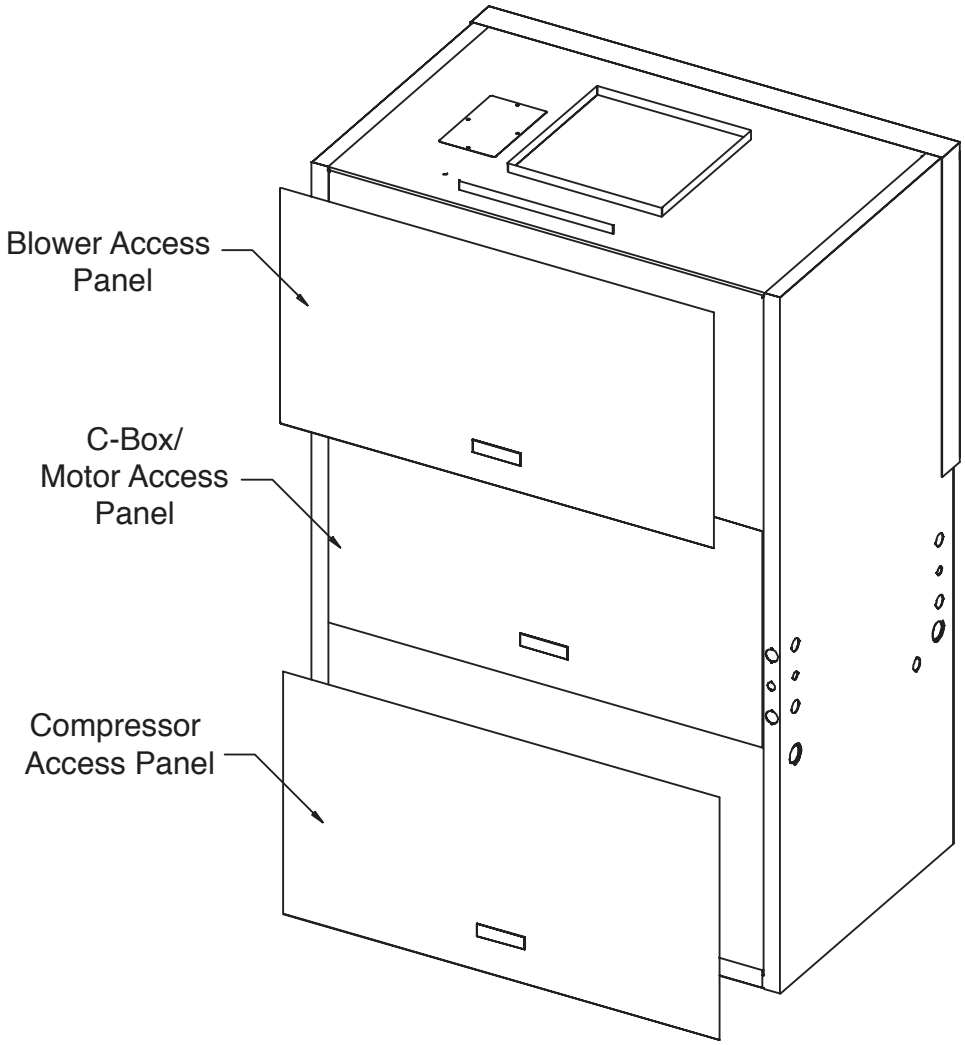
Subcooling = Discharge saturation temp. - liquid line temp. = _____ (deg F)

Note: Never connect refrigerant gauges during startup procedures. Conduct water-side analysis using P/T ports to determine water flow and temperature difference. If water-side analysis shows poor performance, refrigerant troubleshooting may be required. Connect refrigerant gauges as a last resort.

What's New

Follow All Warnings and Cautions in This Manual Before Attempting Conversion.

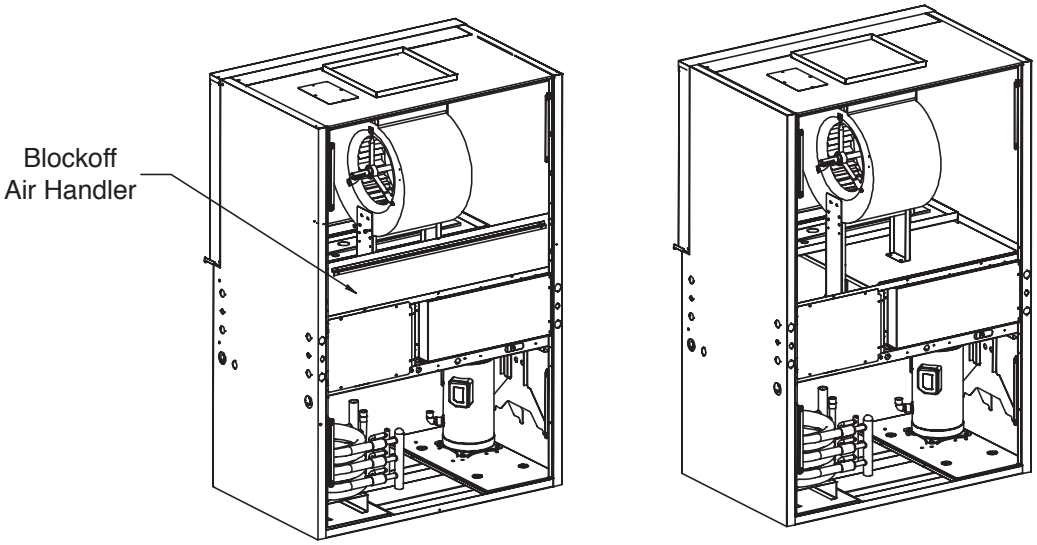
Top Discharge to Straight Discharge Convertible



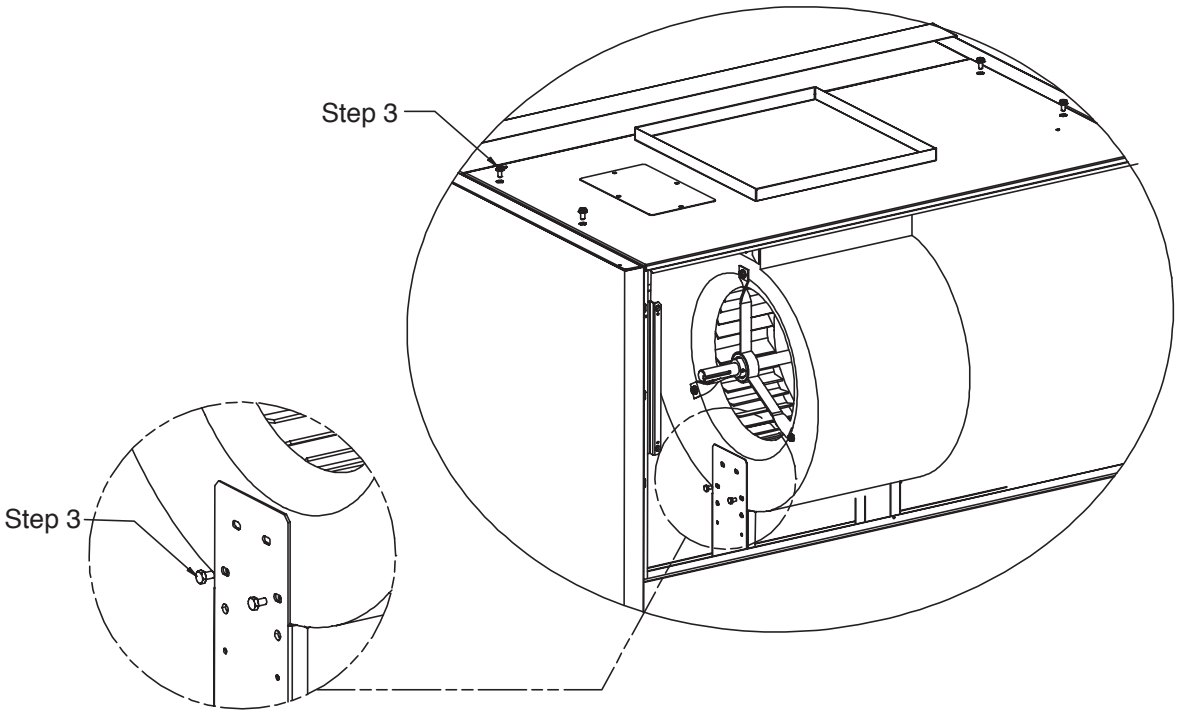
Step 1: Remove the three panels, as shown.

What's New, Cont'd.

Step 2: Remove Blockoff Air Handler as shown.
Loosen belt and remove.

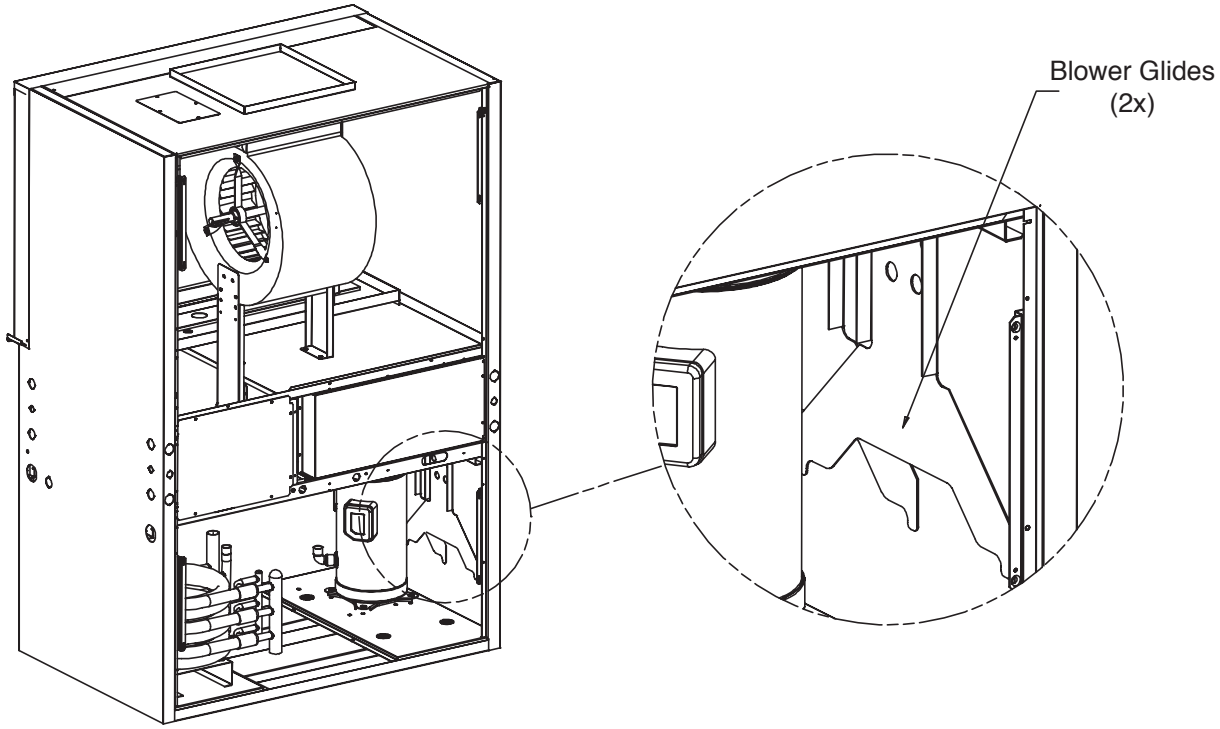


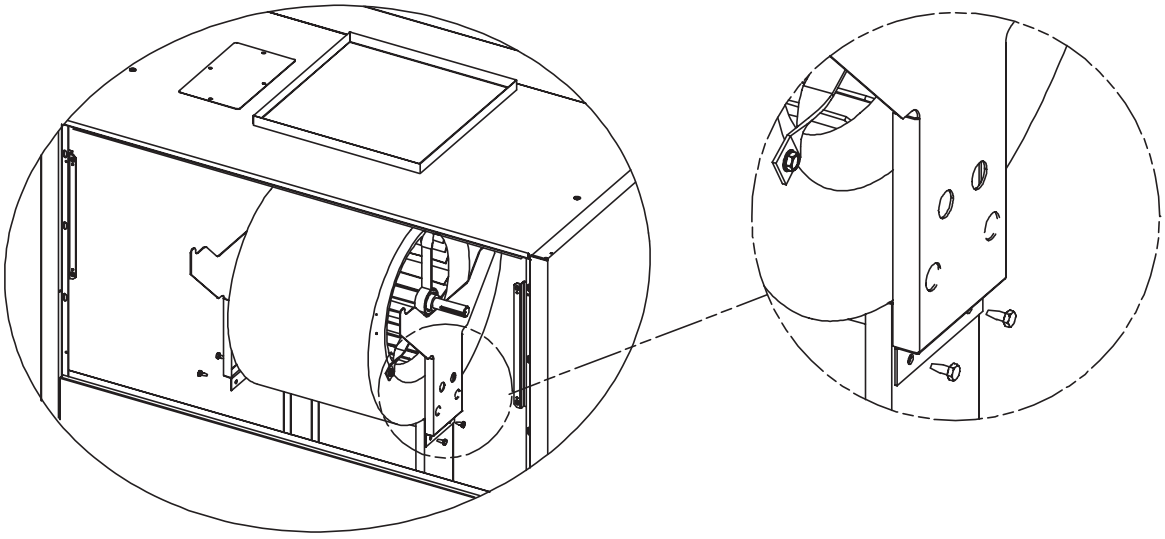
Step 3: Remove bolts (4x) off blower panel.
Remove bolts (4x) (2x ea. side) from blower sides.



What's New, Cont'd.

Step 4: Remove bolts (4x) and take blower glides out.

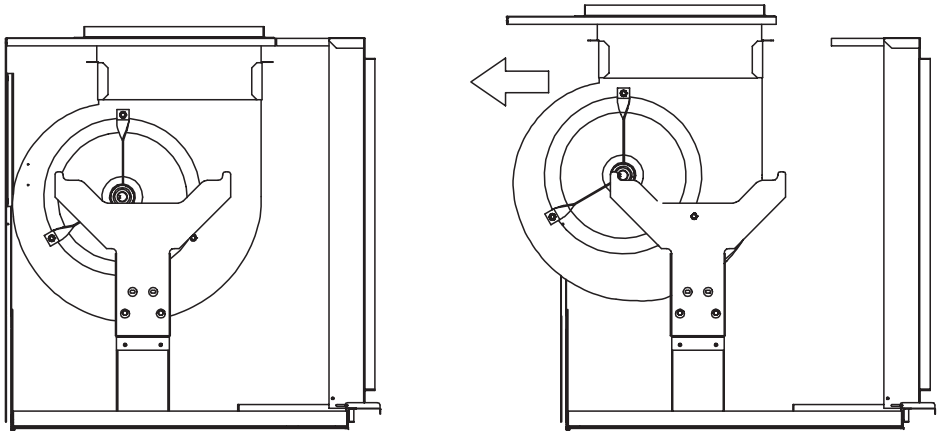




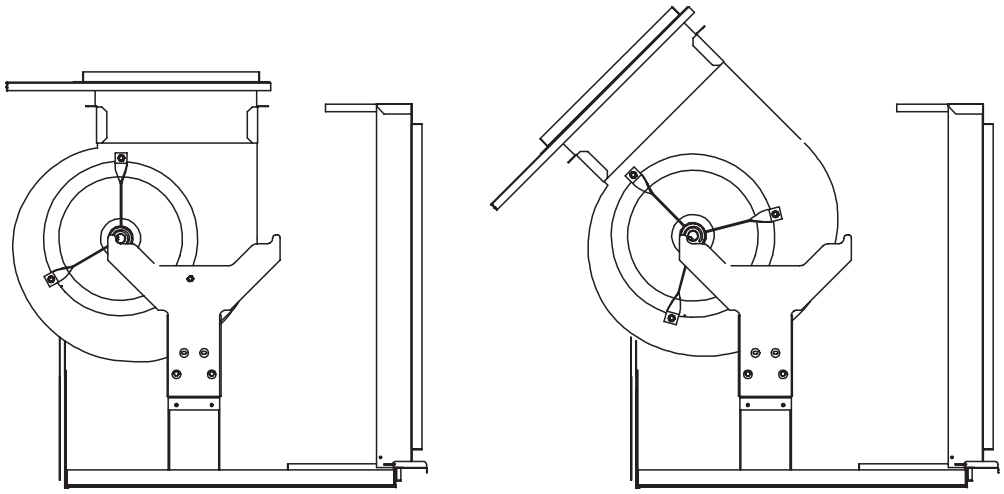
Step 5: Attach Blower Glides to Blower BTM Load Brackets as shown.
Use bottom set of holes (.203 Dia.) on Blower BTM Load Brackets.
Blower Shaft should be sitting right on top of the Blower Glides.

What's New, Cont'd.

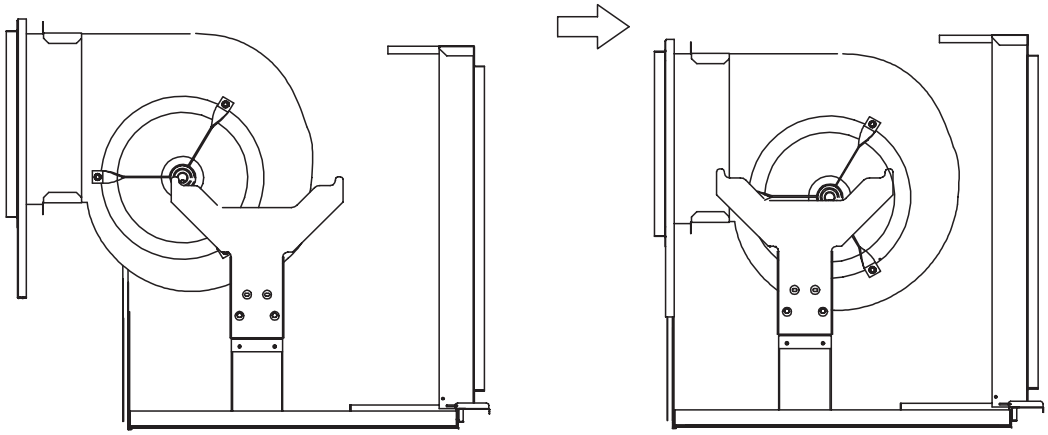
Step 6: Stand in front and pull Blower ASM on to the ridge of the Blower Glides.



Step 7: Rotate Blower ASM using Blower Glides as a guiding track.

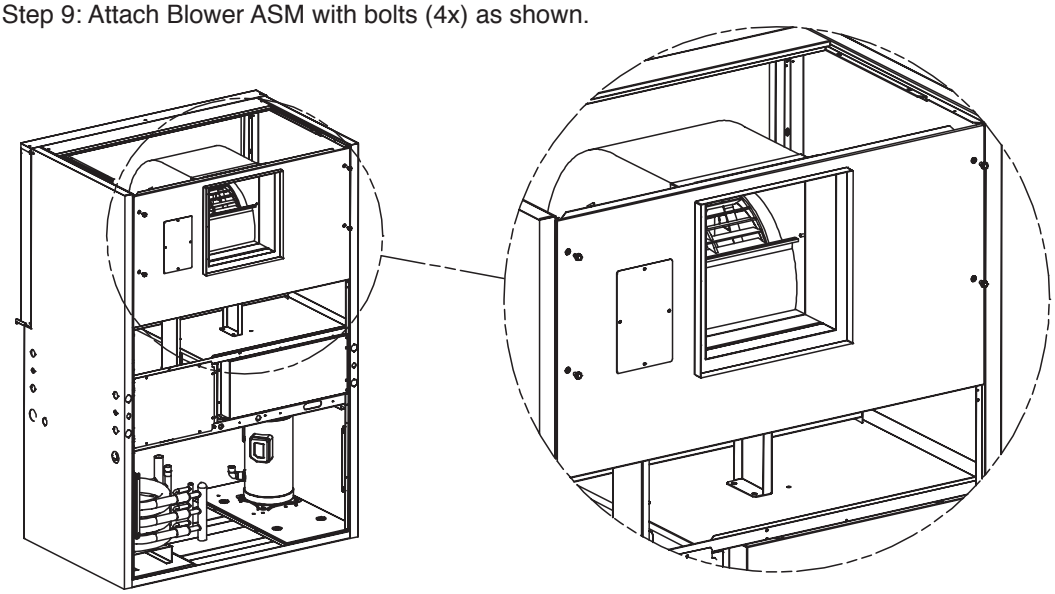


Step 8: When the Blower ASM is parallel to the floor, push the Blower ASM back so that the Blower Panel is flush with the unit.

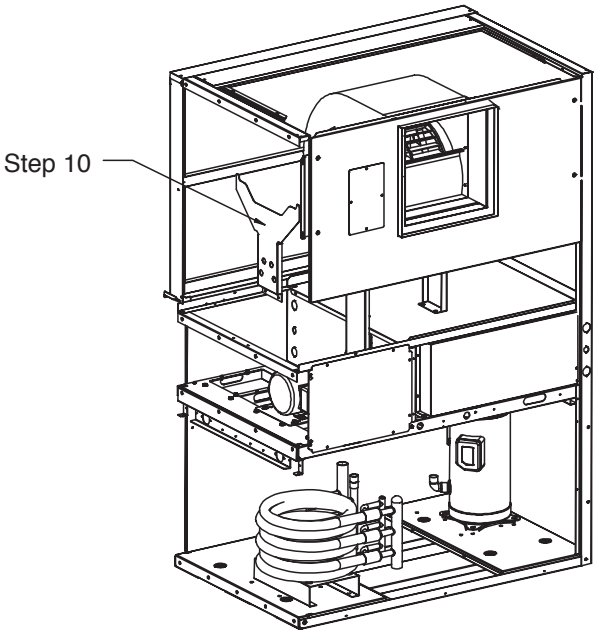


What's New, Cont'd.

Step 9: Attach Blower ASM with bolts (4x) as shown.



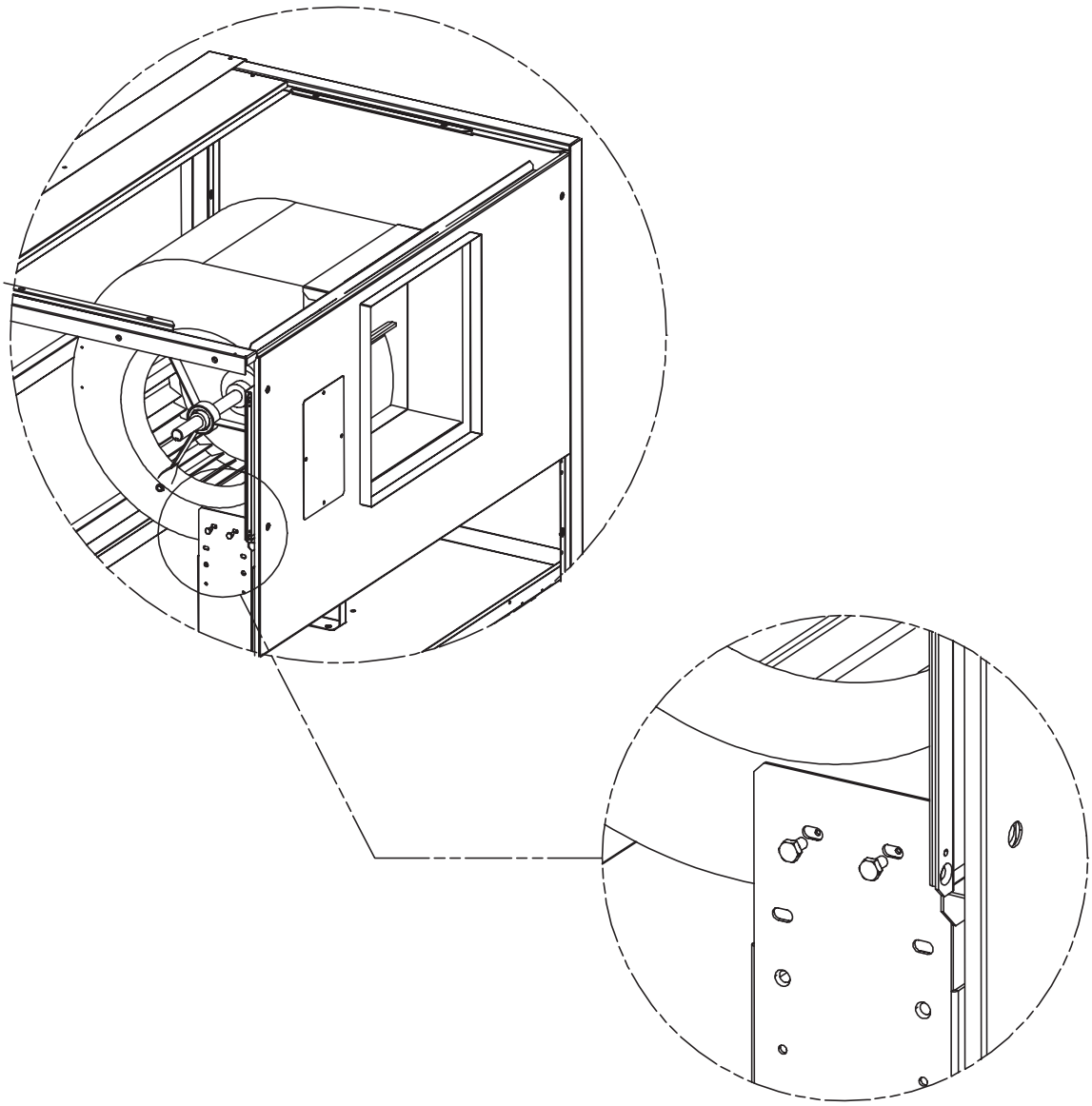
Step 10: Remove Bower Glides (2x) and re-attach back in compressor section.



What's New, Cont'd.

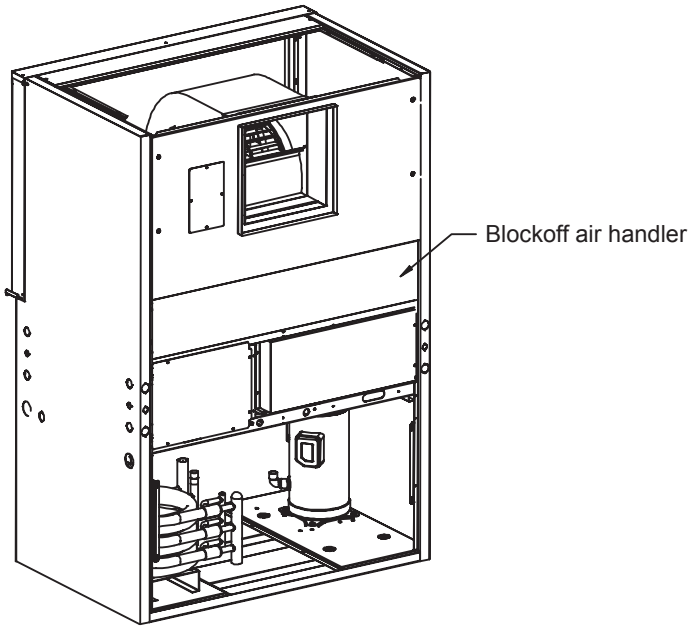
Important!

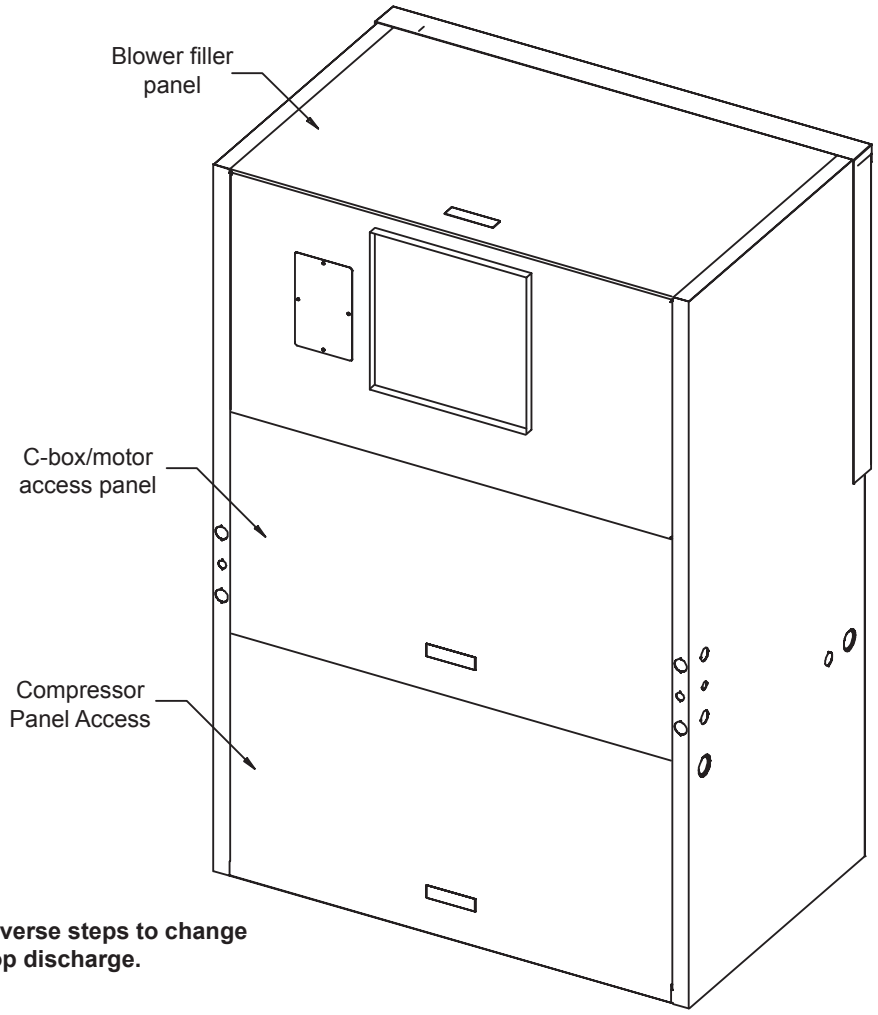
Step 11: Re-bolt Blower ASM to Blower BTM load brackets
(4) 1/4 -20 UNC bolts, (2x) each side
Re-attach belt and tighten.



What's New, Cont'd.

Step 12: Re-attach blockoff air handler as shown.



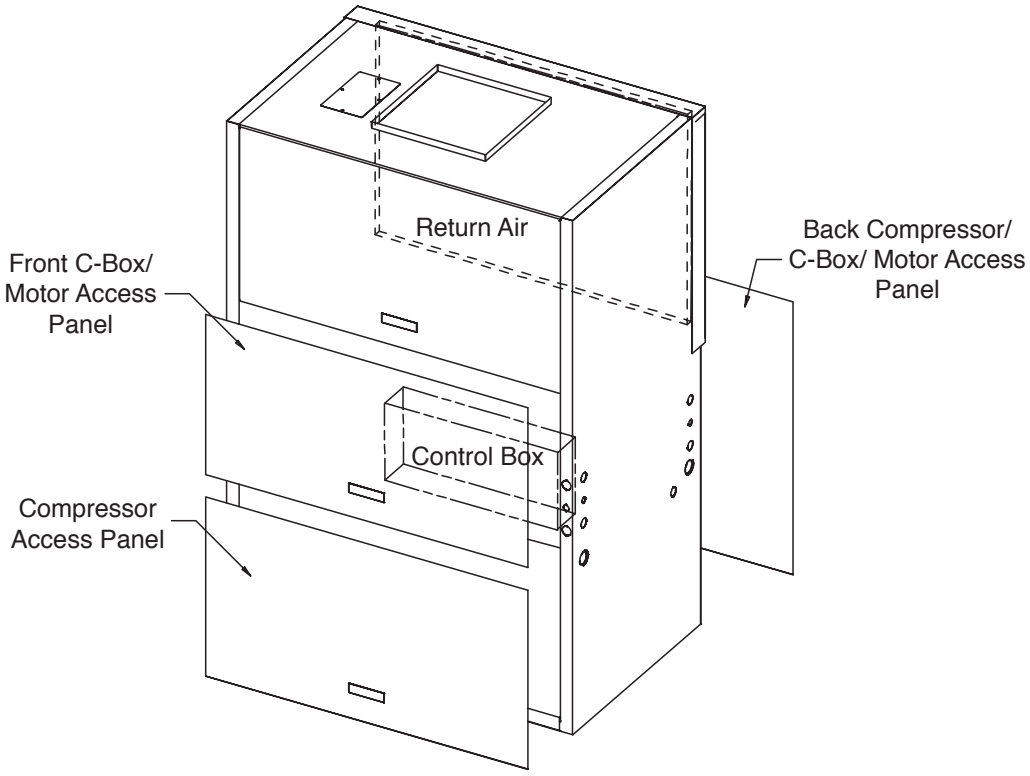


Step 13: Put (3x) panels back on. Reverse steps to change a straight discharge to a top discharge.

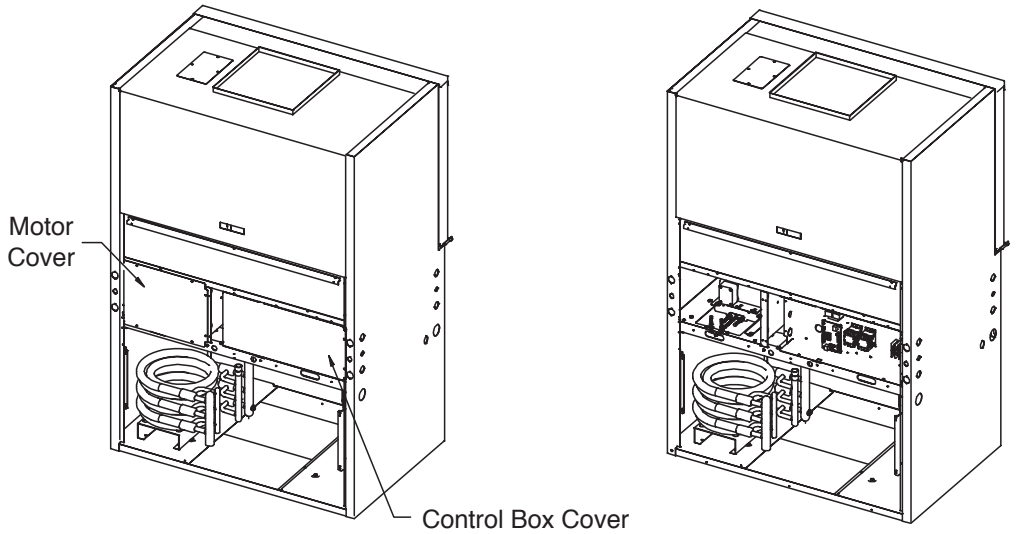
What's New, Cont'd.

Front Control Box/ Motor Access to Back Access Convertible

Step 1: Remove the three panels as shown.

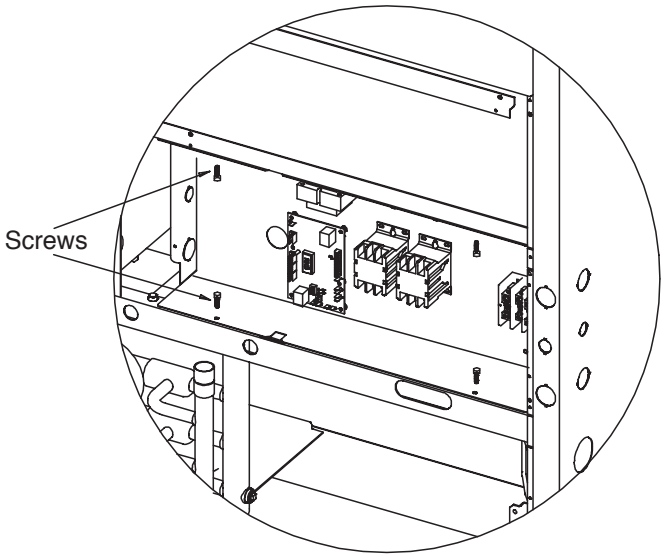


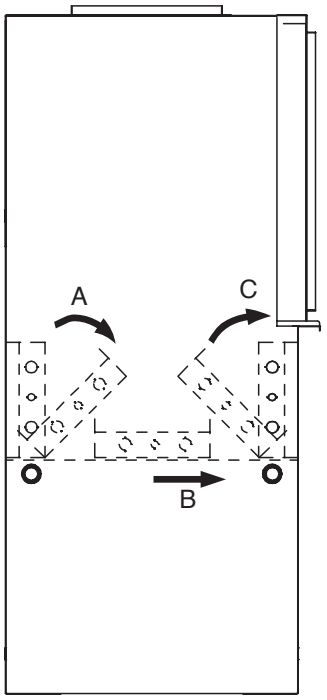
Step 2: Remove Motor Cover and Control Box Cover as shown.



What's New, Cont'd.

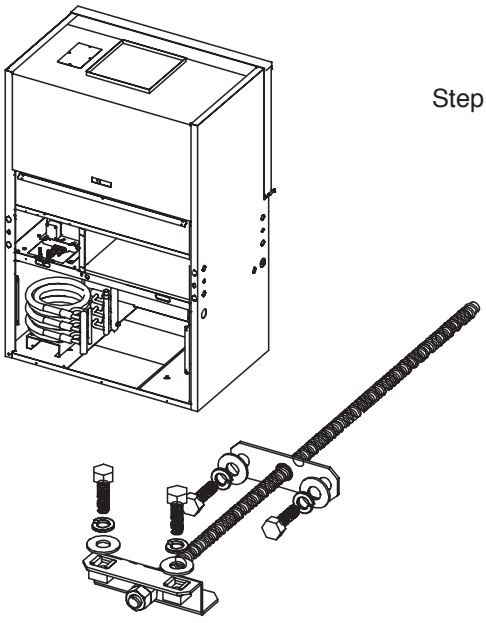
Step 3: Remove screws from Control Box (Qty 4x) and A) flip down, B) slide across and C) flip up as shown using the guide rails inside as a guide. Re-attach control box with screws.

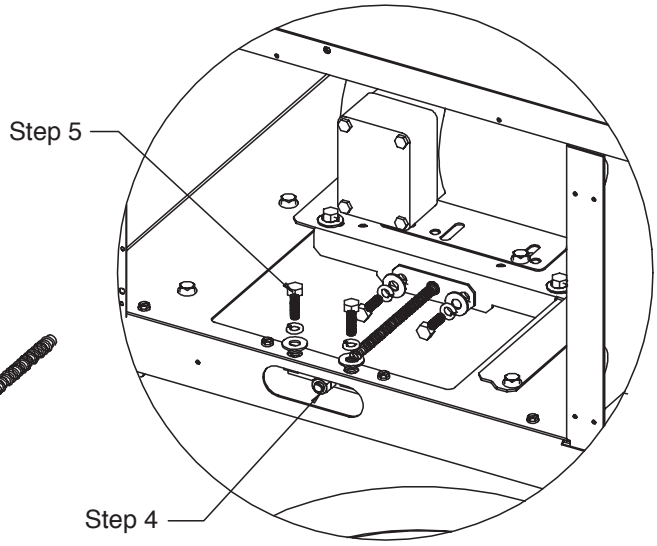




Right Side View

Step 4: Loosen Belt tension and take Belt off.
Step 5: Remove Bolt-Belt Adjustment ASM as shown.

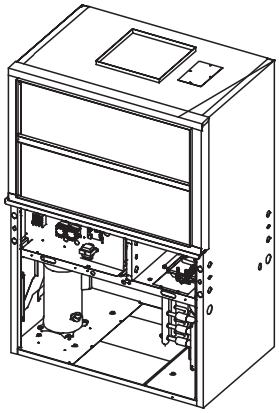


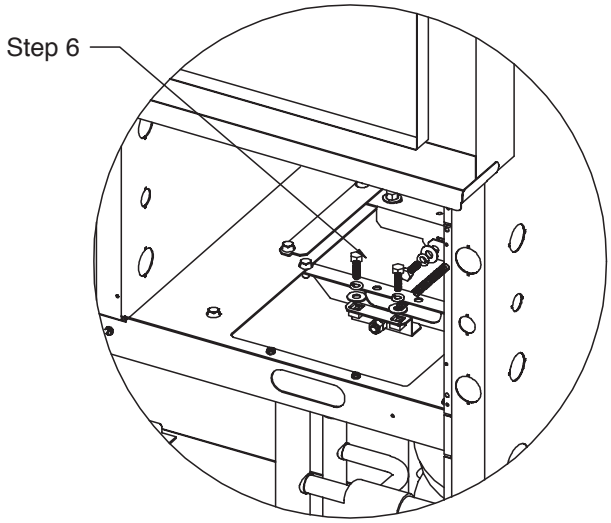


Bolt-Belt Adjustment ASM

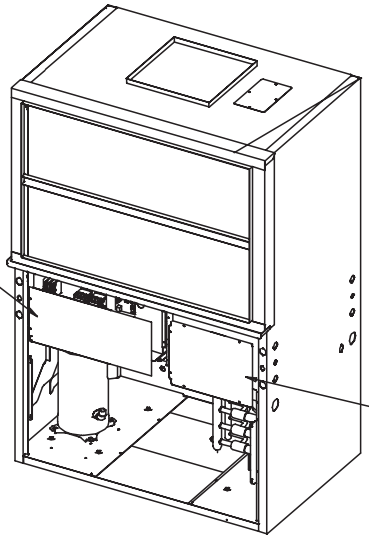
What's New, Cont'd.

Step 6: Move Bolt-Belt Adjustment ASM to opposite side and re-attach.

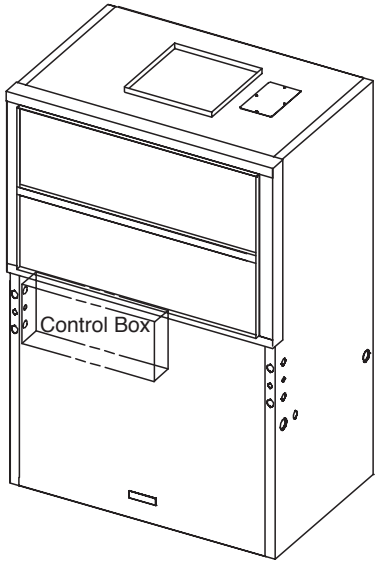




Step 7: Put Belt back on and tighten. Put Control Box Cover and Motor Cover on return side.



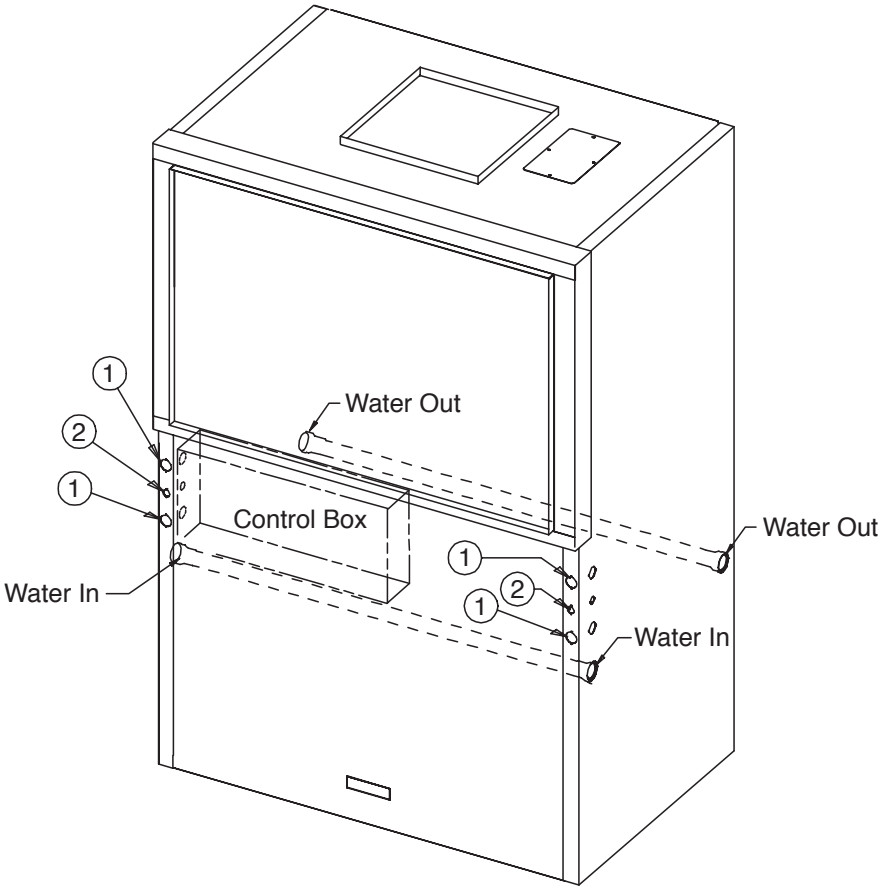
Step 8: Place panels back on unit. Reverse steps to go from a front return to a back return.



Front Return Top Discharge

What's New, Cont'd.

- **Water In-Out Available on Either Side**
- **Hi-Low Voltage Access on Any Side**
- **Full Filter Frame - Bottom Access - 25, 50, 100mm**
- **Filters - 25 or 50mm Fiberglass and 100mm Merv 8**



Front Return Top Discharge

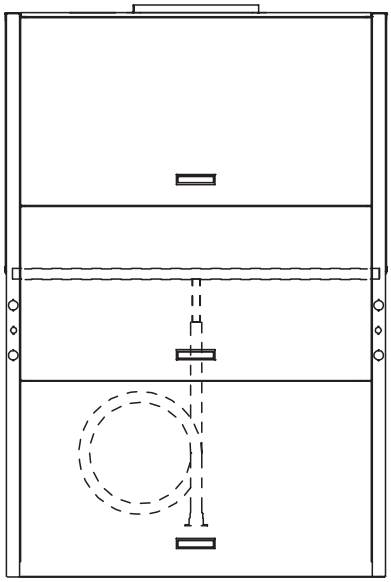
1. Water inlet and outlet connections are available on either side (left or right) of the unit. MPT Plugs (Qty 2x) are shipped loose in plastic bag tied to water leg in front of the unit. Installer must plug up water inlet/outlet side that is not being connected.

2. Electrical access is available on either side (left or right) of unit and is also available (left or right) in the front of the unit.

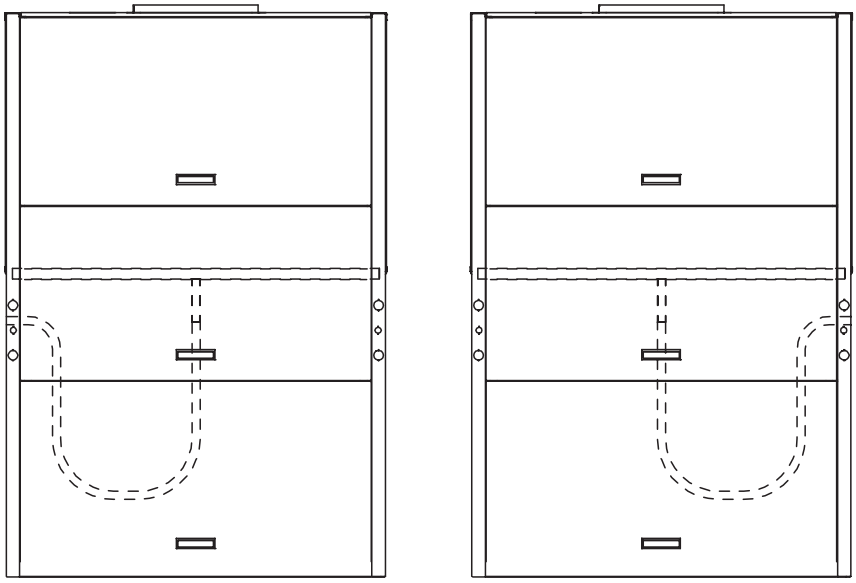
3. 25mm Filter frame can be field converted to 50mm.

What's New, Cont'd.

Condensate Drain Can Connect to Either Side of Unit



Units come with flex hose and 1" FPT
condensate connection tied inside (shown above)



Installer will untie flex hose and make an internal trap
on either the left side (shown above) or on the right side.
Internally attach mounting plate with FPT fitting.

Warranty (U.S. & Canada)

CLIMATEMASTER®

CLIMATE MASTER, INC.
LIMITED EXPRESS WARRANTY/ LIMITATION OF REMEDIES AND LIABILITY

It is expressly understood that unless a statement is specifically identified as a warranty, statements made by Climate Master, Inc., a Delaware corporation, ("CM") or its representatives, relating to CM's products, whether oral, written or contained in any sales literature, catalog or any other agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely CM's opinion or commendation of CM's products.

EXCEPT AS SPECIFICALLY SET FORTH HEREIN, THERE IS NO EXPRESS WARRANTY AS TO ANY OF CM'S PRODUCTS. CM MAKES NO WARRANTY AGAINST LATENT DEFECTS. CM MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.

GRANT OF LIMITED EXPRESS WARRANTY
CM warrants CM products purchased and retained in the United States of America and Canada to be free from defects in material and workmanship under normal use and maintenance as follows: (1) All complete air conditioning, heating and/or heat pump units built or sold by CM for twelve (12) months from date of unit start up or eighteen (18) months from date of shipment (from factory), whichever comes first; (2) Repair and replacement parts, which are not supplied under warranty, for nintey (90) days from date of shipment (from factory). All parts must be returned to CM's factory in Oklahoma City, Oklahoma, freight prepaid, no later than sixty (60) days after the date of the failure of the part; if CM determines the part to be defective and within CM's Limited Express Warranty, CM shall, when such part has been either replaced or repaired, return such to a factory recognized dealer, contractor or service organization, F.O.B. CM's factory, Oklahoma City, Oklahoma, freight prepaid. The warranty on any parts repaired or replaced under warranty expires at the end of the original warranty period.

This warranty does not cover and does not apply to: (1) Air filters, fuses, refrigerant, fluids, oil; (2) Products relocated after initial installation; (3) Any portion or component of any system that is not supplied by CM, regardless of the cause of the failure of such portion or component; (4) Products on which the unit identification tags or labels have been removed or defaced; (5) Products on which payment to CM is or has been in default; (6) Products which have defects or damage which result from improper installation, wiring, electrical imbalance characteristics or maintenance; or are caused by accident, misuse or abuse, fire, flood, alteration or misapplication of the product; (7) Products which have defects or damage which result from a contaminated or corrosive air or liquid supply, operation at abnormal temperatures, or unauthorized opening of refrigerant circuit; (8) Mold, fungus or bacteria damages; (9) Products subjected to corrosion or abrasion; (10) Products manufactured or supplied by others; (11) Products which have been subjected to misuse, negligence or accidents; (12) Products which have been operated in a manner contrary to CM's printed instructions; or (13) Products which have defects, damage or insufficient performance as a result of insufficient or incorrect system design or the improper application of CM's products.

CM is not responsible for: (1) The costs of any fluids, refrigerant or other system components, or associated labor to repair or replace the same, which is incurred as a result of a defective part covered by CM's Limited Express Warranty; (2) The costs of labor, refrigerant, materials or service incurred in removal of the defective part, or in obtaining and replacing the new or repaired part; or, (3) Transportation costs of the defective part from the installation site to CM or of the return of any part not covered by CM's Limited Express Warranty.

Limitation: This Limited Express Warranty is given in lieu of all other warranties. If, notwithstanding the disclaimers contained herein, it is determined that other warranties exist, any such warranties, including without limitation any express warranties or any implied warranties of fitness for particular purpose and merchantability, shall be limited to the duration of the Limited Express Warranty.

LIMITATION OF REMEDIES
In the event of a breach of the Limited Express Warranty, CM will only be obligated at CM's option to repair the failed part or unit or to furnish a new or rebuilt part or unit in exchange for the part or unit which has failed. If after written notice to CM's factory in Oklahoma City, Oklahoma of each defect, malfunction or other failure and a reasonable number of attempts by CM to correct the defect, malfunction or other failure and the remedy fails of its essential purpose, CM shall refund the purchase price paid to CM in exchange for the return of the sold good(s). Said refund shall be the maximum liability of CM. **THIS REMEDY IS THE SOLE AND EXCLUSIVE REMEDY OF THE BUYER OR THEIR PURCHASER AGAINST CM FOR BREACH OF CONTRACT, FOR THE BREACH OF ANY WARRANTY OR FOR CM'S NEGLIGENCE OR IN STRICT LIABILITY.**

LIMITATION OF LIABILITY
CM shall have no liability for any damages if CM's performance is delayed for any reason or is prevented to any extent by any event such as, but not limited to: any war, civil unrest, government restrictions or restraints, strikes or work stoppages, fire, flood, accident, shortages of transportation, fuel, material, or labor, acts of God or any other reason beyond the sole control of CM. **CM EXPRESSLY DISCLAIMS AND EXCLUDES ANY LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGE IN CONTRACT, FOR BREACH OF ANY EXPRESS OR IMPLIED WARRANTY, OR IN TORT, WHETHER FOR CM's NEGLIGENCE OR AS STRICT LIABILITY.**

OBTAINING WARRANTY PERFORMANCE
Normally, the contractor or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any CM recognized dealer, contractor or service organization. If assistance is required in obtaining warranty performance, write or call:

Climate Master, Inc. • Customer Service • 7300 S.W. 44th Street • Oklahoma City, Oklahoma 73179 (405) 745-6000

NOTE: Some states or Canadian provinces do not allow limitations on how long an implied warranty lasts, or the limitation or exclusions of consequential or incidental damages, so the foregoing exclusions and limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and from Canadian province to Canadian province.

Please refer to the CM Installation, Operation and Maintenance Manual for operating and maintenance instructions.

Rev.: 11/09

LC083

Tranquility® Large (TL) Series

Rev.: January 24, 2023

Revision History

Date:	Item:	Action:
01/24/23	All	Introduced CXM2 unit controls, Upgraded DXM2 to DXM2.5 unit controls
08/15/22	Page 37	Added ClimaDry Schematic for TWO Circuit TL units
10/28/21	All	Removed LON Option, discontinued
10/05/21	Water Quality Standards table	Updated
06/22/21	Decoder - Heat Exchanger section and Fonts	Updated
8/5/20	Number sequencing of Tables and Figures and references to them	Updated
09/16/19	DXM2 Text & Insert pages	Updated
04/15/16	Text	Updated
06/16/14	Pages 3, 5, 7, 8, 10, 75	Updated filter frame description
06/09/14	Water Quality Table - page 16 & Find/Change Text “rack” to “rail” - All	Updated
09/30/13	Edit Text - Page 13	Updated
04/15/13	EAT for ClimaDry® Option	Updated
12/11/12	Decoder-Disconnect Option	Added
12/11/12	POE Oil Warning	Added
11/05/12	Circuit Diagram with Safety Devices	Removed
11/05/12	Water Quality Table Condensate Drain Connection	Updated
08/19/11	All	Revised 460 neutral wire to only 072 and lower
08/09/11	Unit Maximum Working Water Pressure	Updated to Reflect New Safeties
06/24/11	All	Incorporated ClimaDry® II Information
01/03/11	Format - All Pages	Updated
07/26/10	Wiring Diagrams	Updated
07/09/10	Table 8	Column Corrected from Voltage to GPM
07/07/10	Pre-Installation	Updated
06/11/10	Format - All Pages	Updated
11/16/09	‘Plugs are Shipped with Unit’ Note	Note Corrected to ‘Plugs are Field Supplied’
11/05/09	Warranty	Updated
10/30/09	Functional Troubleshooting Table	Updated
10/09/09	ClimaDry® II Information	Added
09/14/09	CXM/DXM2 Controls and CXM/DXM2 Safety Control Features Sections	Added

Intertek

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