

Tranquility® Ducted Vertical Stack (TSL) Series

Submittal Data

Models TSL09 - 36 60Hz - HFC-410A



LC1007

Rev.: September 1, 2017



ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at climatemaster.com.

TSL Ducted Vertical Stack Series



Unit Features	4
iGate® Communicating Controls	6
vFlow® Modulating Water Valve (Option)	7
Selection Procedure	8
TSL Series Nomenclature	10
Performance Data – AHRI/ASHRAE/ISO 13256-1	13
Performance Data – Selection Notes	14
Performance Data – TSL09 with PSC Motor	15
Performance Data – TSL12 with PSC Motor	16
Performance Data – TSL15 with PSC Motor	17
Performance Data – TSL18 with PSC Motor	18
Performance Data – TSL24 with PSC Motor	19
Performance Data – TSL30 with PSC Motor	20
Performance Data – TSL36 with PSC Motor	21
Performance Data – TSL09 with ECM Motor	22
Performance Data – TSL12 with ECM Motor	23
Performance Data – TSL15 with ECM Motor	24
Performance Data – TSL18 with ECM Motor	25
Performance Data – TSL24 with ECM Motor	26
Performance Data – TSL30 with ECM Motor	27
Performance Data – TSL36 with ECM Motor	28
Performance Data – TSL09 w/Modulating Valve & ECM Motor	29
Performance Data – TSL12 w/Modulating Valve & ECM Motor	30
Performance Data – TSL15 w/Modulating Valve & ECM Motor	31
Performance Data – TSL18 w/Modulating Valve & ECM Motor	32
Performance Data – TSL24 w/Modulating Valve & ECM Motor	33
Performance Data – TSL30 w/Modulating Valve & ECM Motor	34
Performance Data – TSL36 w/Modulating Valve & ECM Motor	35
Performance Data Correction Tables	36
PSC Blower Performance Data	37
ECM Blower Performance Data	38
Sound Data - Case Radiated	39
Sound Data - Ducted Discharge	40
Physical Data	41
Electrical Data	42

Document page number is shown next to part number (e.g. LC1007 - 3 = page 3). Since not all pages are typically used in the submittals process, the page number in the lower right corner can still be used (page ____ of ____).

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TSL Ducted Vertical Stack Series



TSL Series Wiring Diagram Matrix	45
Connections to DDC Options	46
Typical Wiring Diagram – TSL09 - 36 CXM with PSC Motor	47
Typical Wiring Diagram – TSL09 - 36 DXM2 with PSC Motor	48
Typical Wiring Diagram – TSL09 - 12 DXM2 with ECM Motor	49
Typical Wiring Diagram – TSL15 - 36 DXM2 with ECM Motor	50
Typical Wiring Diagram – Single Phase TSL Units w/DXM2 Controller, Night Setback, Emergency Shutdown, & Pump Restart	51
Typical Unit - Exploded View	52
TSL – Standard Unit, Risers Ship Separate	53
Master/Slave Cabinets	54
Cabinet Dimensions	55
Cabinet Slot Dimensions and Riser Arrangements	56
Typical Cabinet Installation	57
Typical Cabinet Installation - Recessed	58
Hinged “G” Style Return Air Panel – AVHSG Series	59
AHH & AHU Series – Stainless Steel Braided Hose Kit	60
Thermostats	61
TSL Options	62
ECM Blower Motor (Optional)	63
Riser Definitions	64
Riser GPM Definitions and Sizing	65
Riser Diameter Sizing	66
Riser Length Definitions and Calculations	67
Riser Extension Definitions and Calculations	68
Slab Hole Chart - 3 Pipe	69
Shipping	70
Engineering Specifications	71
Performance Sheet	82
Revision History	84

TRANQUILITY® VERTICAL STACK (TSL) SERIES WITH EARTHPURE® REFRIGERANT

The Tranquility® Vertical Stack (TSL) Series offers an innovative, labor-saving solution for spaces where individual, quiet control of the heating and cooling system is important. TSL units consist of 2 major components - cabinet behind finished wall and slide in refrigeration chassis. Vertical risers running behind cabinet are especially ideal for multi-story buildings. Risers shipped separate so riser stack can be completely assembled, pressure tested, filled, and water circulated. This allows floor by floor completion and occupancy before construction is completed. The TSL Series exceeds ASHRAE 90.1 efficiencies, yet maintains small cabinet dimensions. Using EarthPure® (HFC-410A) refrigerant, the TSL Series not only protects the environment, it does so while delivering unprecedented comfort, efficiency, and reliability.

Available in sizes 3/4 ton (2.6 kW) through 3 tons (10.6 kW) with numerous cabinet, water piping and control choices, the TSL Series offers a wide range of options for most installations. The TSL has an extended range refrigerant circuit, capable of ground loop (geothermal) applications as well as water loop (boiler-tower) applications. Features include microprocessor controls, TXV metering device, galvanized steel cabinet, torsion-flex blower motor mounting, and (optional) ECM motors for all sizes. These are just some of the features of the innovative TSL Series.

ClimateMaster's exclusive double isolation compressor mounting system makes the TSL Series the quietest vertical stack units on the market. Compressors are mounted on specially engineered sound-tested EPDM grommets to a heavy gauge base pan, which is then isolated from the cabinet base with grommets under the condensate pan for maximized vibration/sound attenuation. Factory-installed internal options such as DDC controls, ECM motors, single speed pump, vFlow® Modulating Water Valve, auto flow water regulator, and 2-way water solenoid valve allow customized design solutions.

iGate® technology is the next generation in intelligent control by using two-way communication to provide a gateway

into the system. The iGate® control system allows end-users and contractors to monitor the performance of the unit, custom tailor its operation, and diagnose any issues, right from the ATC thermostat or diagnostic tool.

The iGate® communications hub is the DXM2 intelligent controller, which analyzes the status of sensors and smart components (which are also two-way communicating) to determine how best to operate the system for optimal comfort, efficiency and long-term reliability. All of this information is passed to the iGate® thermostat (or diagnostic tool), where it can be displayed in plain English. And since communication is both ways, the iGate® thermostat can also be used to configure and tailor the system without even touching the unit.

vFlow® variable water flow technology represents a major advance in water-source system performance made possible through the iGate® system. vFlow® not only builds the major water circulation components into the unit for a clean installation, it also intelligently varies the water flow and improves system reliability. vFlow® also allows cooling and heating operation across the entire 20–120°F entering water conditions, providing ultimate flexibility in designing water-source heating and cooling systems with ClimateMaster vFlow® units.

The heart of vFlow® is a modulating water valve directly linked into the iGate® system. Water flow is automatically varied based on entering and leaving water temperature difference to maintain optimum system performance. vFlow® eliminates two-way valves and automatic flow regulators. vFlow® systems are inherently self-balancing. vFlow® with automatic modulating valves deliver superior value by being priced competitively with inefficient two-way valve with auto flow regulator options.

The TSL Series Vertical Stack Water-Source Heat Pumps are designed to meet the challenges of today's HVAC demands with a low cost/high value solution.

New June 2017

vFlow® Modulating Water Valve (DXM2)
Brazed Riser Shutoff Valves
200 PSIG Rated Internal Pump
Normally Open Water Valve

UNIT FEATURES

- Sizes 09 (3/4 ton, 2.6 kW) through 36 (3 ton, 10.6 kW)
- Environmentally-friendly EarthPure® (HFC-410A) zero ozone depletion refrigerant
- High efficiency rotary and scroll compressors
- Exceeds ASHRAE 90.1 efficiencies
- Removable chassis allows staged installation and ease of maintenance
- Galvanized steel cabinet
- Chassis rests on rubber grommets isolated condensate pan for vibration reduction.
- Double isolation of compressor for quiet operation
- UltraQuiet option
- Air coil hairpins are tin-plated for added protection from formicary corrosion; option non-plated
- TXV metering device
- Cabinet construction for unit or remote-mounted controls
- Two fan speed capability with CXM or DXM2
- Microprocessor controls standard (optional DXM2 and/or DDC controls)
- **Optional Advanced Controls** - iGate® communicating control provides advanced unit functionality and comprehensive configuration, monitoring and diagnostic capabilities through digital communication links with the variable-speed fan motor, and communicating thermostat or Configuration/Diagnostic tool.
 - 6 temperature sensor inputs for system protection and control
 - Anti-short cycle and over/under voltage protection
 - High pressure, loss of charge, and condensate overflow protection
 - LED fault and status indication at controller
 - Service tool port for optional setup and diagnostics at unit
- Eight Safeties Standard.
- Filter Rail for 1" or 2" Filter
- LonWorks, BACnet (MSTP), Modbus and Johnson N2 compatibility options for DDC controls
- Unit Performance Sentinel performance monitoring system
- Integrated drain pan with condensate overflow sensor
- Attractive return air panel with hinged access door ("G" panel) - option key locked.
- Top supply air discharge
- Full port shut-off valves with memory stop, for supply and return risers. Valve option to be union cap or sweat type.
- Stainless steel braided hose kits for connection from piping risers to chassis
- Wide variety of cabinet options including disconnect switch, breaker, thermostat whip with molex connector, isolation pad, stainless steel drain pan, fresh air, and ECM variable speed communicating motor.
- Wide variety of chassis options including stainless steel drain pan, insulated tubing for extended range operation, autoflow regulator, motorized 2-way water valve (normally open or closed), vFlow® modulating water valve, secondary circulating pump rated for 200 PSI, cupro-nickel coaxial heat exchanger, and RIB relay (09-18) for quiet contact closure.
- Selection of thermostats including manual changeover, automatic changeover, or programmable are available.
- Accessory Filters, 1" Merv 8 and 11; 2" Merv 8 and 13

iGate® Information gateway to monitor, control and diagnose your system

Tranquility® Vertical Stack Series is equipped with industry-first, iGate® – Information Gateway – 2-way communicating system that allows users to interact with their water-source system in plain English AND delivers improved reliability and efficiency by precisely controlling smart variable speed components.

Monitor/Configure – Installers can configure from the iGate® communicating thermostat or configuration/diagnostic tool, including: Air flow, loop delta T, water-flow option configuration, unit configuration, accessory configuration, and demand reduction (optional, to limit unit operation during peak times). Users can look up the current system status: temperature sensor readings and operational status of the blower and pump.

Precise Control – The new DXM2 board enables intelligent, 2-way communication between the DXM2 board and smart components like the communicating thermostat, fan motor, and vFlow® modulating water valve. The Intelligent DXM2 board uses information received from the smart components and sensors to precisely control unit operation to deliver higher efficiency, reliability and increased comfort.

Diagnostics – iGate® takes diagnosing geothermal units to a next level of simplicity, by providing a dashboard of system and fault information, in plain English, on the iGate thermostat or service tool.

iGate® Service Warning warns the occupant of a fault and displays fault description, possible causes and current system status (temperature readings, fan RPM and water flow status) which may be reported to service personnel.

In iGate® Service Mode, the service personnel can access fault description, possible causes and most importantly, the conditions (temp, flow, i/o conditions, configuration) at the time of the fault. Manual Operation mode allows the service personnel to manually command operation for any of the thermostat outputs, blower speed, as well as pump speed or valve position from the thermostat, to help troubleshoot specific components.

With iGate® communicating system, users and contractors have a gateway to system information never before available and exclusive to ClimateMaster products.

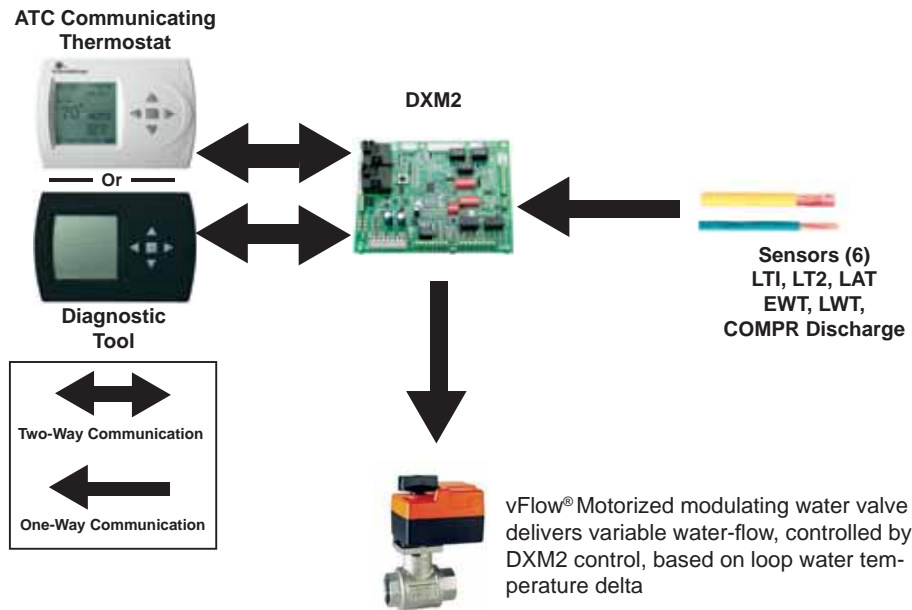


AIRFLOW SELECTION	
	CFM
HEAT STAGE 1	600
HEAT STAGE 2	750
AUXILIARY HEAT	850
EMERGENCY HEAT	850
COOL STAGE 1	525
COOL STAGE 2	700
COOL DEHUMID 1	425
COOL DEHUMID 2	550
CONTINUOUS FAN	350
HEAT OFF DELAY	60
COOL OFF DELAY	30
◀ PREVIOUS	NEXT ▶

POSSIBLE FAULT CAUSES	
LOW WATER COIL TEMP	
LOW WATER TEMP - HTG	
LOW WATER FLOW - HTG	
LOW REFRIG CHARGE - HTG	
INCORRECT LT1 SETTING	
BAD LT1 THERMISTOR	
◀ PREVIOUS	

FAULT TEMPERATURE CONDITIONS	
LT1 LOW WATER TEMP	
HEAT 1 11:11 AM 11/14	
LT1 TEMP	28.1
LT2 TEMP	97.3
HOT WATER EWT	121.5
COMP DISCHARGE	157.7
LEAVING AIR	92.7
LEAVING WATER	34.9
ENTERING WATER	42.1
CONTROL VOLTAGE	26.4
◀ PREVIOUS	

vFlow® Modulating Water Valve (option)



vFlow® Internal Variable Water Flow

Industry-first, Built-in vFlow® provides an ultra-high-efficient internal water flow system. It saves installers time and labor by avoiding installing bulky valves or flow regulators. Multi-unit installations are also much simpler with vFlow® systems, as the units automatically adjust water flow across the system.

vFlow® is enabled by iGate®, which facilitates intelligent communication between the thermostat, DXM2 control, sensors and modulating valve to make true variable water flow a reality.

In applications using vFlow® with modulating valve, when the motorized modulating valve slows down the external pump, consumes fewer watts, thus saving more energy.

vFlow® delivers four main benefits:

1. One component replaces 2 way motorized valve and autoflow regulator.
2. Superior reliability by varying the water flow to deliver more stable operation.
3. Higher cost savings by varying the flow (and pump watt consumption) to match the unit's mode of operation.
4. Allows unit to safely operate in cooling mode or heating mode from 20°F to 120°F.

Modulating Water Valve Operation:

When the unit is in cooling or heating, the DXM2 controller monitors the entering and leaving water temperature. Depending on the water Delta T, the DXM2 sends a voltage signal to the valve which correlates to a percentage open to achieve the water flow needed. As conditions change the voltage signal will readjust the valve for the needed water flow.

The modulating water valve is factory set for a water delta T of 10F for cooling operation and 7F for heating operation. This default setting is estimated to be approximately 3 GPM of water flow per ton of load capacity. Installers can change the water flow by adjusting the delta T upward for lower flow or downward for higher flow by using the ATC thermostat or the ACDU service tool. Please see unit IOM for full instructions.

At low cooling EWT's and high heating EWT's the DXM2 software overrides the Delta T settings and adjusts the valve for a LWT of no less than 60F for cooling and no greater than 70F for heating.

Units with the modulating water valve will operate at EWT's from 20F to 120F in BOTH cooling and heating. When there is no demand for cooling or heating, the valve will be fully closed or can be field configured to remain slightly open allowing some water to pass through.

By controlling the water flow, the system will always operate at its optimal capacity and efficiency.

Selection Procedure

Reference Calculations

Heating	Cooling
$LWT = EWT - \frac{HE}{GPM \times \text{Constant}}$ $LAT = EAT + \frac{HC}{CFM \times 1.08}$	$LWT = EWT + \frac{HR}{GPM \times \text{Constant}}$ $LAT (DB) = EAT (DB) - \frac{SC}{CFM \times 1.08}$ $LC = TC - SC$ $S/T = \frac{SC}{TC}$

Constant = 500 for water, 485 for antifreeze.

Legend and Glossary of Abbreviations

BTUH = BTU(British Thermal Unit) per hour	HWC = hot water generator (desuperheater) capacity, Mbtuh
CFM = airflow, cubic feet/minute	FPT = female pipe thread
COP = coefficient of performance = BTUH output/BTUH input	KW = total power unit input, kilowatts
DB = dry bulb temperature (°F)	LAT = leaving air temperature, °F
EAT = entering air temperature, Fahrenheit (dry bulb/wet bulb)	LC = latent cooling capacity, BTUH
EER = energy efficiency ratio = BTUH output/Watt input	LWT = leaving water temperature, °F
MPT = male pipe thread	MBTUH = 1000 BTU per hour
ESP = external static pressure (inches w.g.)	S/T = sensible to total cooling ratio
EWT = entering water temperature	SC = sensible cooling capacity, BTUH
GPM = water flow in U.S. gallons/minute	TC = total cooling capacity, BTUH
HE = total heat of extraction, BTUH	WB = wet bulb temperature (°F)
HC = air heating capacity, BTUH	WPD = waterside pressure drop (psi & ft. of hd.)
HR = total heat of rejection, BTUH	

Conversion Table - to convert inch-pound (English) to S-I (Metric)

Air Flow	Water Flow	Ext Static Pressure	Water Pressure Drop
Airflow (L/s) = CFM x 0.472	Water Flow (L/s) = gpm x 0.0631	ESP (Pa) = ESP (in of wg) x 249	PD (kPa) = PD (ft of hd) x 2.99

Selection Procedure

Step 1 Determine the actual heating and cooling loads at the desired dry bulb and wet bulb conditions.

Step 2 Obtain the following design parameters: Entering water temperature, water flow rate in GPM, air flow in CFM, water flow pressure drop and design wet and dry bulb temperatures. Air flow CFM should be between 300 and 500 CFM per ton. Unit water pressure drop should be kept as close as possible to each other to make water balancing easier. Go to the appropriate tables and find the proper indicated water flow and water temperature.

Step 3 Select a unit based on total and sensible cooling conditions. Select a unit which is closest to, but no larger than, the actual cooling load.

Step 4 Enter tables at the design water flow and water temperature. Read the total and sensible cooling capacities (Note: interpolation is permissible, extrapolation is not).

Step 5 Read the heating capacity. If it exceeds the design criteria it is acceptable. It is quite normal for Water-Source Heat Pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity.

Step 6 Determine the correction factors associated with the variable factors of dry bulb, wet bulb, and air flow.

Corrected Total Cooling = tabulated total cooling x wet bulb correction x air flow correction.

Corrected Sensible Cooling = tabulated sensible cooling x wet/dry bulb correction, and air flow correction.

Step 7 Compare the corrected capacities to the load requirements. Normally if the capacities are within 10% of the loads, the equipment is acceptable. It is better to undersize than oversize, as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

Step 8 When completed, calculate water temperature rise and assess the selection. If the units selected are not within 10% of the load calculations, then review what effect changing the GPM, water temperature and/or air flow and air temperature would have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat the procedure. Remember, when in doubt, undersize slightly for best performance.

Example Equipment Selection For Cooling

Step 1 Load Determination:

Assume we have determined that the appropriate cooling load at the desired dry bulb 80°F and wet bulb 65°F conditions is as follows

Total Cooling.....17,000 BTUH
Sensible Cooling.....12,000 BTUH
Entering Air Temp.....80°F Dry Bulb / 65°F Wet Bulb

Step 2 Design Conditions:

Similarly, we have also obtained the following design parameters:

Entering Water Temp.....90°F
Water Flow (Based upon 10°F rise in temp.).....5.1 GPM
Air Flow at ESP Unit.....630 CFM (90% of rated)

Step 3, 4 & 5 HP Selection:

After making our preliminary selection (TSL18 with PSC motor), we enter the tables at design water flow and water temperature and read Total Cooling, Sens. Cooling and Heat of Rej. capacities:

Total Cooling.....18,350 BTUH
Sensible Cooling.....13,210 BTUH
Heat of Rejection.....22,470 BTUH

Step 6 & 7 Entering Air and Airflow Corrections:

Next, we determine our correction factors.

Table	Ent Air	Air Flow	Corrected
Corrected Total Cooling =	18,350	x 0.975 x 0.971	= 17,372
Corrected Sens Cooling =	13,210	x 0.999 x 0.932	= 12,299
Corrected Heat of Reject =	22,470	x 0.982 x 0.979	= 21,602

Step 8 Water Temperature Rise Calculation & Assessment:

Actual Temperature Rise.....8.8°F

When we compare the Corrected Total Cooling and Corrected Sensible Cooling figures with our load requirements stated in Step 1, we discover that our selection is within +/- 10% of our sensible load requirement. Furthermore, we see that our Corrected Total Cooling figure is slightly undersized as recommended, when compared to the actual indicated load.

TSL Series Nomenclature

Cabinet

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D	1	G	0	N	0	E	1	0	0	0	0	0	0	C

CABINET SIZE

1 = 09
2 = 12
3 = 15
4 = 18
5 = 24
6 = 30
7 = 36

VOLTAGE

OPTION	Volt/Hertz/Phase
G	208/230/60/1
E	265/60/1

OPTIONS

OPTION	S.S. DRAIN PAN	PREMIUM SEAL	1" and 2" FILTER
A	-	X	1"
B	X	-	1"
C	X	X	1"
0	-	-	1"
1	-	X	2"
2	X	-	2"
3	X	X	2"
4	-	-	2"

BLOWER/CONTROLS

OPTION	PSC	LOW STATIC PSC	ECM	R = REMOTE W = WALL SENSOR A = ADA	M = MPC L = LON
A	X	-	-	A	-
B	-	-	X	A	-
C	X	-	-	W	M
D	-	-	X	W	M
L	X	-	-	W	L
M	-	-	X	W	L
N	X	-	-	R	-
R	-	-	X	R	-
T	-	X	-	A	-
U	-	X	-	W	M
V	-	X	-	R	-

POWER TERMINATION

OPTION	DISCONNECT SWITCH	BREAKER	ISP / BREAKER
A	YES	NO	NO
B	NO	YES	NO
C	NO	NO	YES
1	NO	YES	NO
2	NO	YES	NO
3	NO	YES	NO
4	NO	NO	YES
5	NO	NO	YES
0	NO OPTIONS		

REVISION LEVEL
 C= CURRENT REVISION

STANDARD
 0 = STANDARD
 A, B, C etc.... = SPECIAL 1, 2, 3 etc....

MISC. CABINET OPTIONS
 0 = None
 1 = 15' Whip
 2 = 25' Whip
 3 = 35' Whip
 A = Dust Protection + No Whip
 B = Dust Protection + 15' Whip
 C = Dust Protection + 25' Whip
 D = Dust Protection + 35' Whip

N/A
 0 = Not Used

Discharge Air
 E = Top Opening

Riser: Riser Ball Valve Options
 4 = Ball Valve, Union
 5 = Ball Valve, Sweat

RISER:
 0 = None
 1 = Shipped Separately
 6 = Chassis ships in Cabinet (Risers Not Attached)

RISER STYLE
 0 = SLAVE / NONE
 1 = STANDARD
 2 = MASTER

CABINET HEIGHT

OPTION	65"	ISO PAD
E	X	-
F	X	X

Note: Risers always ship separate.

TSL Series Nomenclature

Chassis

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
T	S	L	0	9	G	S	A	S	S	C	S	S	S	B

Series
TSL = TRANQUILITY®
HIGH RISE CHASSIS

Unit Size
09
12
15
18
24
30
36

Voltage
E = 265/60/1
G = 208/230/60/1

Chassis Options

OPTION	S.S. Drain Pan	Ultraquiet	For Communicating T-Stat	RIB RELAY
A	YES	NO	NO	NO
B	NO	YES		
C	YES	YES		
S	NO	NO		
D	YES	NO	YES	YES
E	NO	YES		
F	YES	YES		
G	NO	NO		
H	YES	NO	NO	
K	NO	YES		
L	YES	YES		
M	NO	NO		
N	YES	NO	YES	
P	NO	YES		
Q	YES	YES		
R	NO	NO		

Controls
A = CXM w/PSC
B = DXM2 w/ECM
C = DXM2 w/PSC

Revision Level
B = Current Revision Level

Standard
S = Standard
A = Special #1
B = Special #2
Etc.....

Future Use
S = Standard

Shipping
6 = Chassis Will Ship In Cabinet (Risers Not Attached)
S = Standard

Heat Exchanger Options

Position 11	Tin Plated Air Coil		Non-Coated Air Coil	
	Copper	Cupro-nickel	Copper	Cupro-nickel
Standard Tubing	C	N	L	M
Insulated Tubing (Extended Range)	D	E	F	G

Water Valve & Pump Option
S = No Water Options
M = 2-Way Water Valve (Normally Closed)
P = Secondary Circulating Pump
T = Modulating Water Valve
N = 2-Way Water Valve (Normally Open)

AUTO-FLOW REGULATOR (US GPM) CODE

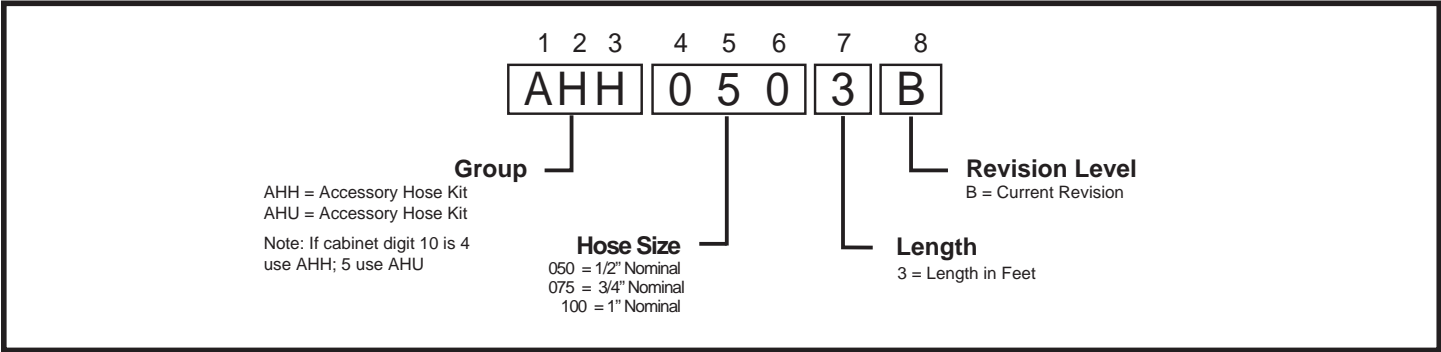
	5/8 SWEAT		7/8 SWEAT				
	UNIT 09	UNIT 12	UNIT 15	UNIT 18	UNIT 24	UNIT 30	UNIT 36
C	1.5	-	-	-	-	-	-
D	2.0	2.0	-	-	-	-	-
E	2.5	2.5	2.5	-	-	-	-
F	3.0	3.0	3.0	3.0	-	-	-
G	-	3.5	3.5	3.5	-	-	-
H	-	-	4.0	4.0	4.0	-	-
J	-	-	-	5.0	5.0	5.0	-
K	-	-	-	-	6.0	6.0	6.0
L	-	-	-	-	7.0	7.0	7.0
M	-	-	-	-	-	8.0	8.0
N	-	-	-	-	-	-	9.0
P	-	-	-	-	-	-	10.0

S = STANDARD - NO FLOW REGULATOR

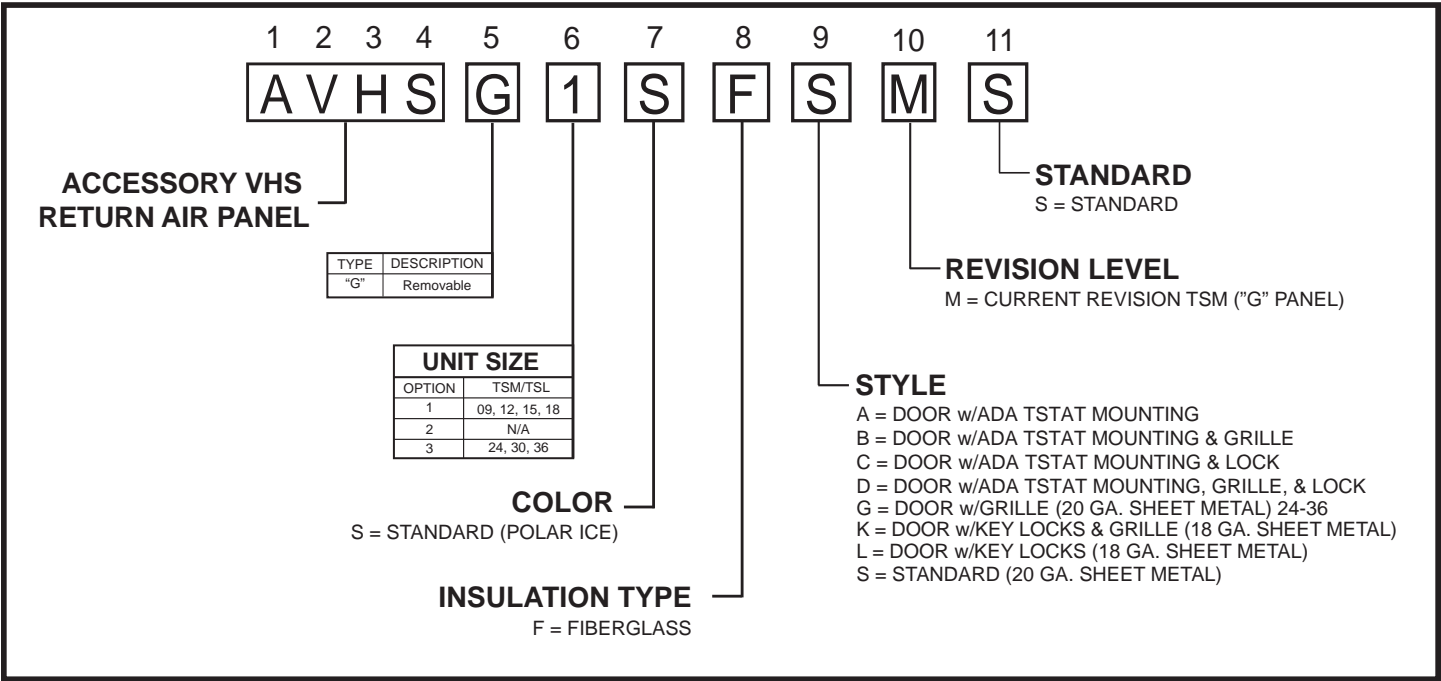
Chassis	Cabinet
09	D1
12	D2
15	D3
18	D4
24	D5
30	D6
36	D7

TSL Series Nomenclature

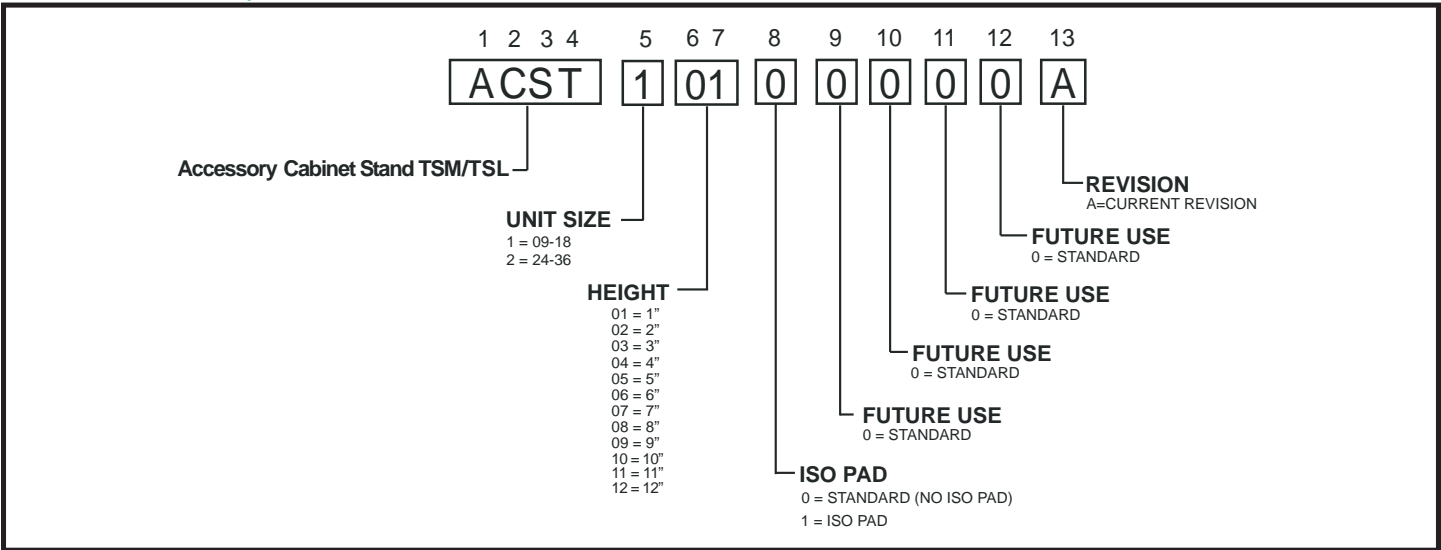
Hose Kit



Return Air Panel



Cabinet Stand (ships loose in bulk for field attachment)



Performance Data – AHRI/ASHRAE/ISO 13256-1

ASHRAE/AHRI/ISO 13256-1. English (I-P) Units

Model with ECM Motor	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
	Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Cooling 77°F		Heating 32°F	
	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
TSL09	10,000	15.2	13,100	5.4	11,800	24.8	10,400	4.4	10,400	17.3	7,500	3.3
TSL12	11,600	14.9	15,800	5.1	13,600	24.2	12,900	4.2	12,500	17.5	9,400	3.3
TSL15	14,600	16.3	18,900	5.4	16,800	25.8	15,000	4.6	15,400	19.2	11,000	3.7
TSL18	17,100	15.1	22,300	5.4	20,300	24.6	17,700	4.6	18,400	17.8	13,000	3.5
TSL24	25,000	16.4	30,500	5.3	29,000	27.2	25,000	4.6	26,500	19.4	18,500	3.6
TSL30	28,500	16.1	33,500	5.3	32,500	24.7	27,500	4.7	29,500	18.4	21,000	3.7
TSL36	37,500	14.8	44,000	5.0	42,500	22.6	36,000	4.3	38,500	16.7	28,000	3.5

Model with PSC Motor	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
	Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Cooling 77°F		Heating 32°F	
	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
TSL09	9,500	14.1	13,000	5.0	11,300	22.5	10,400	4.2	10,000	16.0	7,500	3.2
TSL12	11,600	14.3	15,900	4.7	13,500	22.9	13,000	4.1	12,100	16.4	9,600	3.2
TSL15	14,000	14.3	19,000	5.0	17,500	25.8	15,500	4.8	15,400	17.7	11,500	3.6
TSL18	16,800	13.2	22,800	5.0	19,900	20.6	18,400	4.2	18,600	16.9	13,100	3.4
TSL24	24,500	15.2	31,500	5.0	28,500	24.3	25,500	4.3	26,000	17.9	18,500	3.4
TSL30	28,000	15.2	34,000	5.2	32,000	23.7	27,000	4.4	29,500	18.0	21,000	3.4
TSL36	34,500	14.3	41,500	5.0	38,500	22.0	33,500	4.3	36,000	16.6	25,500	3.5

Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature

Heating capacities based upon 68°F DB, 59°F WB entering air temperature

All units AHRI/ISO/ASHRAE 13256-1 rated on high speed motor TAP

All ratings based upon operation at lower voltage of dual voltage rated models

ASHRAE/AHRI/ISO 13256-1. Metric (S-I) Units

Model with ECM Motor	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
	Cooling 30°C		Heating 20°C		Cooling 15°C		Heating 10°C		Cooling 25°C		Heating 0°C	
	Capacity kW	EER W/W	Capacity kW	COP	Capacity kW	EER W/W	Capacity kW	COP	Capacity kW	EER W/W	Capacity kW	COP
TSL09	2.93	4.5	3.84	5.4	3.46	7.3	3.05	4.4	3.05	5.1	2.20	3.3
TSL12	3.40	4.4	4.63	5.1	3.99	7.1	3.78	4.2	3.66	5.1	2.75	3.3
TSL15	4.28	4.8	5.54	5.4	4.92	7.6	4.40	4.6	4.51	5.6	3.22	3.7
TSL18	5.01	4.4	6.54	5.4	5.95	7.2	5.19	4.6	5.39	5.2	3.81	3.5
TSL24	7.33	4.8	8.94	5.3	8.50	8.0	7.33	4.6	7.77	5.7	5.42	3.6
TSL30	8.35	4.7	9.82	5.3	9.53	7.2	8.06	4.7	8.65	5.4	6.15	3.7
TSL36	10.99	4.3	12.90	5.0	12.46	6.6	10.55	4.3	11.28	4.9	8.21	3.5

Model with PSC Motor	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
	Cooling 30°C		Heating 20°C		Cooling 15°C		Heating 10°C		Cooling 25°C		Heating 0°C	
	Capacity kW	EER W/W	Capacity kW	COP	Capacity kW	EER W/W	Capacity kW	COP	Capacity kW	EER W/W	Capacity kW	COP
TSL09	2.78	4.1	3.81	5.0	3.31	6.6	3.05	4.2	2.93	4.7	2.20	3.2
TSL12	3.40	4.2	4.66	4.7	3.96	6.7	3.81	4.1	3.55	4.8	2.81	3.2
TSL15	4.10	4.2	5.57	5.0	5.13	7.6	4.54	4.8	4.51	5.2	3.37	3.6
TSL18	4.92	3.9	6.68	5.0	5.83	6.0	5.39	4.2	5.45	5.0	3.84	3.4
TSL24	7.18	4.5	9.23	5.0	8.35	7.1	7.47	4.3	7.62	5.2	5.42	3.4
TSL30	8.21	4.5	9.96	5.2	9.38	6.9	7.91	4.4	8.65	5.3	6.15	3.4
TSL36	10.11	4.2	12.16	5.0	11.28	6.4	9.82	4.3	10.55	4.9	7.47	3.5

Cooling capacities based upon 27°C DB, 19°C WB entering air temperature

Heating capacities based upon 20°C DB, 15°C WB entering air temperature

All units AHRI/ISO/ASHRAE 13256-1 rated on high speed motor TAP

All ratings based upon operation at lower voltage of dual voltage rated models

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Performance Data – Selection Notes

For operation in the shaded area to determine if water can be used in lieu of an antifreeze solution, the Leaving Water Temperature (LWT) must be calculated. Flow must be maintained to a level such that the LWT is maintained above 42°F [5.6°C] when the CXM/DXM2 JW3 jumper is not clipped (see example below). Otherwise, appropriate levels (10° below LWT, See IOM) of a proper antifreeze should be used in systems with leaving water temperatures of 42°F [5.6°C] or below and the JW3 jumper should be clipped. This is due to the potential of the refrigerant temperature being as low as 32°F [0°C], which may lead to a nuisance cutout due to the activation of the Low Temperature Protection (LT1). JW3 should **never** be clipped for standard range equipment or systems without antifreeze.

Example:

At 50°F EWT (Entering Water Temperature) and 1.5 gpm/ton, a 3 ton unit has a HE of 26,830 Btuh. To calculate LWT, rearrange the formula for HE as follows:

HE = TD x GPM x 500, where HE = Heat of Extraction (Btuh); TD = temperature difference (EWT - LWT) and GPM = U.S. Gallons per Minute.

$$TD = HE / (GPM \times 500)$$

$$TD = 26,830 / (4.5 \times 500)$$

$$TD = 12^\circ\text{F}$$

$$LWT = EWT - TD$$

LWT = 50 - 12 = 38°F - Requires appropriate antifreeze (Protect to 28°F), JW3 must be clipped, and extended range insulation option.

In this example, a higher flow rate will be required for EWTs of 50°F without antifreeze. At 3 gpm/ton, the calculation becomes:
(Note higher flow increases HE)

$$TD = 29,650 / (9\text{GPM} \times 500)$$

$$TD = 7^\circ\text{F}$$

$$LWT = 50 - 7 = 43^\circ\text{F} - \text{Water is acceptable, do not clip JW3.}$$

			Heating - EAT 70°F				
Model	EER		HC	kW	HE	LAT	COP
Standard			23.28	2.31	15.72	85.9	3.0
2	52.07	29.0	26.08	2.35	18.36	88.1	3.2
1	52.26	31.3	27.35	2.37	19.56	89.1	3.4
7	52.27	32.5	28.06	2.38	20.23	89.6	3.4
	51.56	26.0	30.51	2.42	22.56	91.5	3.7
	51.98	28.3	32.12	2.45	24.08	92.7	3.8
	52.12	29.4	33.01	2.46	24.92	93.4	3.9
	52.2	22.9	35.03	2.49	<u>26.83</u>	95.0	4.1
		25.3	36.94	2.52	28.65	96.4	4.3
		4	38.00	2.54	<u>29.65</u>	97.3	4.4
			39.53	2.56	31.09	98.4	4.5

Performance Data – TSL09 with PSC Motor

400 CFM Nominal Airflow Heating, 350 CFM Nominal Airflow Cooling

Performance capacities shown in thousands of Btu/h

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	3.0	5.7	13.2							6.33	0.65	3.96	75.6	2.8
30	1.5	1.1	2.6	13.08	9.05	0.69	0.41	14.61	32.5	7.36	0.66	4.95	76.9	3.2
	2.3	1.8	4.0	12.95	8.80	0.68	0.39	14.43	33.4	7.70	0.67	5.28	77.3	3.3
	3.0	4.7	10.7	12.82	8.63	0.67	0.39	14.29	33.5	7.89	0.67	5.46	77.5	3.4
40	1.5	0.8	1.9	12.97	9.21	0.71	0.44	14.64	29.6	8.84	0.68	6.39	78.7	3.8
	2.3	1.7	3.9	13.08	9.14	0.70	0.42	14.65	31.6	9.31	0.68	6.84	79.3	3.9
	3.0	4.1	9.6	13.08	9.06	0.69	0.41	14.62	32.4	9.57	0.68	7.09	79.6	4.0
50	1.5	0.5	1.1	12.59	9.16	0.73	0.49	14.42	25.9	10.39	0.69	7.89	80.6	4.4
	2.3	1.6	3.7	12.87	9.21	0.72	0.46	14.58	28.3	10.98	0.69	8.47	81.3	4.6
	3.0	3.6	8.4	12.97	9.21	0.71	0.44	14.63	29.5	11.31	0.69	8.79	81.7	4.7
60	1.5	0.4	1.0	12.00	8.95	0.75	0.55	14.03	22.1	11.95	0.70	9.42	82.5	5.0
	2.3	1.5	3.5	12.40	9.09	0.73	0.51	14.29	24.5	12.65	0.70	10.11	83.4	5.2
	3.0	4.0	9.3	12.57	9.15	0.73	0.49	14.41	25.8	13.04	0.70	10.49	83.9	5.4
70	1.5	0.4	0.9	11.28	8.64	0.77	0.61	13.52	18.6	13.50	0.71	10.94	84.4	5.5
	2.3	1.4	3.3	11.74	8.84	0.75	0.57	13.84	20.7	14.28	0.71	11.71	85.4	5.8
	3.0	3.0	7.0	11.96	8.93	0.75	0.55	14.00	21.9	14.71	0.71	12.13	85.9	6.0
80	1.5	0.3	0.8	10.46	8.27	0.79	0.68	12.94	15.6	14.98	0.71	12.40	86.3	6.1
	2.3	1.3	3.1	10.95	8.49	0.78	0.64	13.29	17.3	15.81	0.72	13.22	87.3	6.4
	3.0	3.1	7.1	11.20	8.60	0.77	0.62	13.46	18.3	16.24	0.72	13.65	87.8	6.6
90	1.5	0.3	0.7	9.61	7.87	0.82	0.75	12.33	12.9	16.36	0.72	13.76	88.0	6.6
	2.3	1.5	3.5	10.09	8.10	0.80	0.71	12.68	14.4	17.18	0.72	14.57	89.0	6.9
	3.0	3.1	7.2	10.34	8.21	0.79	0.69	12.86	15.2	17.58	0.72	14.98	89.5	7.1
100	1.5	0.1	0.2	8.76	7.49	0.86	0.83	11.73	10.8	Operation not recommended				
	2.3	1.2	2.9	9.21	7.69	0.84	0.79	12.05	11.9					
	3.0	2.8	6.4	9.45	7.80	0.83	0.77	12.22	12.5					
110	1.5	0.1	0.2	7.96	7.16	0.90	0.90	11.18	9.0					
	2.3	1.2	2.8	8.36	7.32	0.88	0.86	11.45	9.9					
	3.0	2.7	6.2	8.57	7.41	0.86	0.84	11.60	10.3					
120	1.5	0.1	0.2	7.26	6.93	0.95	0.97	10.72	7.6	Operation not recommended				
	2.3	1.2	2.7	7.59	7.03	0.93	0.94	10.93	8.3					
	3.0	2.6	6.0	7.77	7.09	0.91	0.92	11.05	8.6					

*WPD Adder for Motorized Valve, TSL09 (Cv = 4.9, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
1.5	0.3	0.7
2.3	0.5	1.1
3.0	0.6	1.4

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHR/ISO certified conditions are 80.6°F DB and 68.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHR/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL12 with PSC Motor

500 CFM Nominal Airflow Heating, 400 CFM Nominal Airflow Cooling

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	3.5	9.4	21.7							8.00	0.79	5.31	82.8	3.0
30	1.8	3.4	7.9	15.44	9.92	0.64	0.45	16.96	34.6	9.12	0.81	6.36	84.9	3.3
	2.6	5.6	13.0	15.49	9.88	0.64	0.41	16.89	37.6	9.56	0.82	6.77	85.7	3.4
	3.5	7.8	18.0	15.46	9.83	0.64	0.40	16.81	39.0	9.81	0.82	7.00	86.1	3.5
40	1.8	2.9	6.6	15.13	9.86	0.65	0.51	16.86	29.9	10.87	0.84	8.01	88.1	3.8
	2.6	4.9	11.4	15.36	9.92	0.65	0.47	16.95	32.9	11.47	0.85	8.57	89.2	4.0
	3.5	6.2	14.4	15.44	9.92	0.64	0.45	16.96	34.5	11.81	0.85	8.89	89.8	4.0
50	1.8	2.3	5.3	14.59	9.65	0.66	0.57	16.55	25.4	12.73	0.87	9.77	91.5	4.3
	2.6	4.2	9.8	14.96	9.80	0.65	0.53	16.77	28.2	13.49	0.88	10.49	92.9	4.5
	3.5	7.7	17.8	15.11	9.85	0.65	0.51	16.85	29.7	13.92	0.88	10.90	93.7	4.6
60	1.8	2.3	5.3	13.89	9.35	0.67	0.65	16.10	21.4	14.64	0.89	11.59	95.1	4.8
	2.6	4.1	9.5	14.34	9.55	0.67	0.60	16.40	23.8	15.55	0.90	12.47	96.7	5.0
	3.5	5.9	13.6	14.56	9.64	0.66	0.58	16.53	25.1	16.07	0.91	12.96	97.7	5.2
70	1.8	2.2	5.2	13.07	8.97	0.69	0.73	15.56	17.9	16.56	0.92	13.44	98.6	5.3
	2.6	4.0	9.1	13.57	9.21	0.68	0.68	15.90	19.9	17.61	0.93	14.44	100.5	5.6
	3.5	6.2	14.3	13.82	9.32	0.67	0.66	16.06	21.1	18.19	0.93	15.00	101.6	5.7
80	1.8	2.1	4.9	12.17	8.54	0.70	0.81	14.95	15.0	18.45	0.94	15.26	102.1	5.8
	2.6	3.9	8.9	12.70	8.80	0.69	0.76	15.31	16.6	19.59	0.95	16.36	104.2	6.1
	3.5	5.6	13.0	12.97	8.93	0.69	0.74	15.49	17.5	20.20	0.95	16.96	105.3	6.2
90	1.8	2.1	4.8	11.25	8.09	0.72	0.90	14.33	12.5	20.26	0.95	17.01	105.4	6.2
	2.6	3.7	8.7	11.77	8.34	0.71	0.85	14.68	13.8	21.43	0.96	18.15	107.6	6.5
	3.5	5.5	12.7	12.04	8.48	0.70	0.83	14.86	14.5	22.04	0.97	18.75	108.7	6.7
100	1.8	1.9	4.4	10.34	7.63	0.74	1.00	13.73	10.4	Operation not recommended				
	2.6	3.4	7.8	10.82	7.87	0.73	0.95	14.05	11.4					
	3.5	5.4	12.4	11.08	8.00	0.72	0.92	14.22	12.0					
110	1.8	1.8	4.2	9.48	7.19	0.76	1.09	13.20	8.7					
	2.6	3.3	7.7	9.91	7.41	0.75	1.04	13.46	9.5					
	3.5	5.3	12.2	10.14	7.53	0.74	1.02	13.61	10.0					
120	1.8	1.8	4.1	8.71	6.82	0.78	1.19	12.76	7.3					
	2.6	3.3	7.5	9.07	6.99	0.77	1.14	12.96	8.0					
	3.5	5.2	11.9	9.27	7.09	0.76	1.11	13.08	8.3					

*WPD Adder for Motorized Valve, TSL12 (Cv = 4.9, MOPD = 150 psi)

GPM	WPD Adder	
	PSI	FT
1.8	0.4	0.8
2.6	0.5	1.2
3.5	0.7	1.7

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL15 with PSC Motor

600 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	4.5	8.8	20.3							8.99	0.98	6.15	81.8	2.7
30	2.3	2.3	5.4	17.43	11.10	0.64	0.65	19.15	26.6	10.44	1.01	7.51	84.1	3.0
	3.5	5.0	11.6	16.92	10.50	0.62	0.63	18.56	26.9	10.91	1.02	7.95	84.8	3.1
	4.5	8.3	19.2	16.60	10.17	0.61	0.62	18.20	26.9	11.16	1.02	8.19	85.2	3.2
40	2.3	2.2	5.1	17.82	11.84	0.66	0.72	19.75	24.9	12.41	1.04	9.37	87.1	3.5
	3.5	4.3	9.8	17.67	11.46	0.65	0.68	19.47	26.0	12.98	1.05	9.91	88.0	3.6
	4.5	7.7	17.8	17.52	11.23	0.64	0.66	19.27	26.5	13.29	1.05	10.21	88.5	3.7
50	2.3	2.1	4.8	17.69	12.22	0.69	0.79	19.87	22.4	14.34	1.07	11.20	90.1	3.9
	3.5	4.2	9.7	17.82	12.04	0.68	0.74	19.85	23.9	15.01	1.08	11.84	91.1	4.1
	4.5	7.1	16.4	17.83	11.91	0.67	0.72	19.79	24.6	15.38	1.09	12.18	91.7	4.2
60	2.3	2.1	4.9	17.17	12.30	0.72	0.88	19.64	19.6	16.24	1.10	13.01	93.0	4.3
	3.5	4.2	9.7	17.52	12.29	0.70	0.82	19.81	21.3	17.00	1.11	13.73	94.2	4.5
	4.5	7.0	16.1	17.65	12.24	0.69	0.80	19.86	22.1	17.41	1.11	14.12	94.8	4.6
70	2.3	2.0	4.7	16.36	12.13	0.74	0.97	19.16	16.9	18.09	1.12	14.78	95.9	4.7
	3.5	4.2	9.6	16.85	12.26	0.73	0.91	19.46	18.4	18.93	1.13	15.58	97.1	4.9
	4.5	6.9	15.8	17.08	12.29	0.72	0.89	19.59	19.3	19.38	1.14	16.01	97.8	5.0
80	2.3	2.0	4.5	15.34	11.77	0.77	1.07	18.49	14.3	19.89	1.14	16.51	98.6	5.1
	3.5	4.0	9.2	15.93	11.99	0.75	1.01	18.88	15.7	20.80	1.15	17.39	100.0	5.3
	4.5	6.6	15.3	16.21	12.09	0.75	0.98	19.06	16.5	21.28	1.15	17.85	100.8	5.4
90	2.3	1.9	4.4	14.19	11.25	0.79	1.18	17.71	12.0	21.63	1.16	18.20	101.3	5.5
	3.5	3.9	9.0	14.82	11.55	0.78	1.12	18.14	13.2	22.59	1.16	19.14	102.8	5.7
	4.5	6.6	15.3	15.14	11.68	0.77	1.09	18.35	13.9	23.10	1.16	19.64	103.6	5.8
100	2.3	1.9	4.4	12.97	10.63	0.82	1.30	16.89	10.0	Operation not recommended				
	3.5	3.9	8.9	13.61	10.96	0.81	1.24	17.31	11.0					
	4.5	6.5	15.0	13.93	11.12	0.80	1.21	17.53	11.5					
110	2.3	1.9	4.4	11.74	9.95	0.85	1.42	16.06	8.3					
	3.5	3.9	8.9	12.34	10.28	0.83	1.36	16.46	9.1					
	4.5	6.4	14.8	12.65	10.46	0.83	1.33	16.67	9.5					
120	2.3	1.9	4.4	10.56	9.25	0.88	1.54	15.30	6.9					
	3.5	3.8	8.8	11.10	9.57	0.86	1.48	15.64	7.5					
	4.5	6.3	14.6	11.38	9.74	0.86	1.45	15.83	7.8					

*WPD Adder for Motorized Valve, TSL15 (Cv = 10.3, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
2.3	0.2	0.5
3.5	0.3	0.8
4.5	0.4	1.1

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL18 with PSC Motor

685 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	6.8	7.2	16.7							10.67	1.18	7.16	82.1	2.7
30	3.4	2.2	5.1	23.79	15.72	0.66	0.77	25.90	31.0	12.64	1.21	9.01	84.7	3.1
	5.1	4.2	9.7	23.88	15.52	0.65	0.73	25.85	32.8	13.10	1.22	9.45	85.3	3.1
	6.8	6.7	15.4	23.89	15.38	0.64	0.71	25.79	33.7	13.36	1.23	9.69	85.6	3.2
40	3.4	1.9	4.3	23.35	15.80	0.68	0.85	25.75	27.3	15.18	1.26	11.41	88.0	3.5
	5.1	3.8	8.7	23.61	15.81	0.67	0.81	25.86	29.2	15.79	1.27	11.98	88.8	3.7
	6.8	5.4	12.5	23.71	15.77	0.67	0.79	25.89	30.1	16.12	1.27	12.29	89.3	3.7
50	3.4	1.5	3.5	22.61	15.55	0.69	0.95	25.33	23.8	17.78	1.30	13.87	91.5	4.0
	5.1	3.3	7.7	23.01	15.71	0.68	0.90	25.57	25.6	18.53	1.31	14.57	92.5	4.1
	6.8	4.4	10.0	23.19	15.76	0.68	0.88	25.67	26.5	18.93	1.31	14.96	93.0	4.2
60	3.4	1.5	3.3	21.63	15.06	0.70	1.05	24.70	20.6	20.40	1.34	16.36	94.9	4.5
	5.1	2.9	6.6	22.13	15.32	0.69	1.00	25.03	22.1	21.29	1.35	17.20	96.1	4.6
	6.8	4.3	9.9	22.37	15.44	0.69	0.97	25.19	23.0	21.77	1.36	17.66	96.7	4.7
70	3.4	1.4	3.2	20.45	14.40	0.70	1.16	23.91	17.6	23.04	1.37	18.87	98.4	4.9
	5.1	2.4	5.5	21.03	14.73	0.70	1.11	24.30	19.0	24.07	1.39	19.85	99.8	5.1
	6.8	4.2	9.6	21.31	14.89	0.70	1.08	24.49	19.7	24.62	1.39	20.38	100.5	5.2
80	3.4	1.1	2.4	19.13	13.65	0.71	1.29	23.01	14.9	25.68	1.41	21.38	101.9	5.3
	5.1	2.6	6.0	19.75	14.01	0.71	1.23	23.43	16.1	26.83	1.42	22.49	103.4	5.5
	6.8	4.1	9.5	20.06	14.18	0.71	1.20	23.65	16.7	27.45	1.43	23.08	104.2	5.6
90	3.4	1.1	2.5	17.71	12.86	0.73	1.42	22.04	12.5	28.29	1.44	23.89	105.3	5.8
	5.1	2.8	6.6	18.35	13.21	0.72	1.36	22.47	13.5	29.56	1.45	25.11	107.0	6.0
	6.8	4.0	9.3	18.67	13.39	0.72	1.33	22.69	14.0	30.24	1.46	25.76	107.9	6.1
100	3.4	1.1	2.5	16.22	12.07	0.74	1.56	21.04	10.4	Operation not recommended				
	5.1	2.2	5.0	16.85	12.40	0.74	1.50	21.46	11.2					
	6.8	3.6	8.4	17.17	12.57	0.73	1.47	21.68	11.7					
110	3.4	1.0	2.2	14.70	11.30	0.77	1.72	20.06	8.5					
	5.1	2.1	4.9	15.31	11.60	0.76	1.66	20.45	9.2					
	6.8	3.5	8.2	15.62	11.76	0.75	1.62	20.65	9.6					
120	3.4	1.0	2.2	13.19	10.58	0.80	1.89	19.13	7.0	Operation not recommended				
	5.1	2.1	4.7	13.76	10.85	0.79	1.83	19.48	7.5					
	6.8	3.5	8.0	14.06	10.99	0.78	1.79	19.66	7.8					

*WPD Adder for Motorized Valve, TSL18 (Cv = 10.3, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
3.4	0.3	0.8
5.1	0.5	1.1
6.8	0.7	1.5

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL24 with PSC Motor

850 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	8.0	5.2	12.1							17.55	1.73	12.11	87.1	3.0
30	4.0	0.9	2.1	33.57	21.59	0.64	1.06	36.72	31.8	19.10	1.72	13.69	88.8	3.3
	6.0	2.3	5.3	34.11	21.76	0.64	0.99	37.03	34.4	19.80	1.72	14.39	89.5	3.4
	8.0	5.0	11.4	34.31	21.80	0.64	0.96	37.13	35.7	20.20	1.72	14.79	90.0	3.4
40	4.0	0.7	1.6	32.53	21.15	0.65	1.16	36.03	28.0	21.81	1.73	16.37	91.7	3.7
	6.0	2.3	5.2	33.29	21.48	0.65	1.09	36.54	30.6	22.77	1.74	17.30	92.8	3.8
	8.0	4.6	10.7	33.62	21.61	0.64	1.05	36.75	32.0	23.31	1.74	17.82	93.3	3.9
50	4.0	0.5	1.1	31.23	20.51	0.66	1.28	35.13	24.4	24.83	1.76	19.27	95.0	4.1
	6.0	2.2	5.1	32.14	20.97	0.65	1.20	35.76	26.9	26.06	1.78	20.44	96.3	4.3
	8.0	4.3	9.9	32.57	21.17	0.65	1.16	36.05	28.2	26.75	1.79	21.10	97.1	4.4
60	4.0	0.4	1.0	29.72	19.72	0.66	1.42	34.11	20.9	28.05	1.82	22.32	98.5	4.5
	6.0	2.0	4.6	30.74	20.26	0.66	1.33	34.80	23.2	29.55	1.84	23.72	100.1	4.7
	8.0	4.0	9.3	31.23	20.51	0.66	1.28	35.14	24.4	30.38	1.86	24.49	101.0	4.8
70	4.0	0.4	0.9	28.06	18.82	0.67	1.59	33.02	17.7	31.39	1.88	25.43	102.1	4.9
	6.0	1.8	4.1	29.14	19.41	0.67	1.48	33.72	19.7	33.13	1.92	27.03	104.0	5.1
	8.0	3.8	8.7	29.67	19.70	0.66	1.43	34.08	20.8	34.08	1.94	27.91	105.0	5.1
80	4.0	0.3	0.7	26.31	17.83	0.68	1.78	31.93	14.7	34.76	1.96	28.53	105.8	5.2
	6.0	1.7	4.0	27.40	18.45	0.67	1.66	32.60	16.5	36.67	2.01	30.28	107.9	5.4
	8.0	3.5	8.1	27.96	18.76	0.67	1.60	32.95	17.5	37.70	2.03	31.23	109.0	5.4
90	4.0	0.3	0.7	24.51	16.80	0.69	2.01	30.92	12.2	38.05	2.04	31.54	109.4	5.5
	6.0	1.8	4.2	25.59	17.43	0.68	1.87	31.52	13.7	40.07	2.10	33.38	111.5	5.6
	8.0	3.2	7.4	26.15	17.74	0.68	1.80	31.84	14.5	41.13	2.12	34.34	112.7	5.7
100	4.0	0.3	0.6	22.72	15.77	0.69	2.28	30.05	9.9	Operation not recommended				
	6.0	1.6	3.7	23.76	16.37	0.69	2.12	30.54	11.2					
	8.0	3.0	6.9	24.30	16.68	0.69	2.04	30.81	11.9					
110	4.0	0.2	0.5	21.00	14.77	0.70	2.60	29.41	8.1					
	6.0	1.6	3.7	21.96	15.33	0.70	2.42	29.74	9.1					
	8.0	2.9	6.7	22.47	15.62	0.70	2.33	29.95	9.7					
120	4.0	0.2	0.4	19.39	13.84	0.71	2.97	29.07	6.5	Operation not recommended				
	6.0	1.0	2.3	20.26	14.34	0.71	2.76	29.21	7.3					
	8.0	2.8	6.6	20.73	14.61	0.70	2.66	29.33	7.8					

*WPD Adder for Motorized Valve, TSL24 (Cv = 10.3, MOPD = 150 psi)

GPM	WPD Adder	
	PSI	FT
4.0	0.4	0.9
6.0	0.6	1.3
8.0	0.8	1.8

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL30 with PSC Motor

1000 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	8.0	5.2	12.1							17.82	1.93	11.96	84.5	2.7
30	4.0	0.9	2.1	33.05	22.48	0.68	1.30	36.75	25.4	20.35	1.97	14.35	86.8	3.0
	6.0	2.3	5.3	32.29	21.97	0.68	1.23	35.77	26.2	21.25	1.99	15.20	87.6	3.1
	8.0	5.0	11.4	31.79	21.64	0.68	1.20	35.17	26.4	21.74	2.00	15.67	88.1	3.2
40	4.0	0.7	1.6	33.55	22.84	0.68	1.42	37.65	23.7	23.88	2.03	17.69	90.1	3.4
	6.0	2.3	5.2	33.34	22.68	0.68	1.34	37.19	24.8	24.96	2.05	18.71	91.1	3.6
	8.0	4.6	10.7	33.12	22.53	0.68	1.31	36.85	25.3	25.54	2.06	19.25	91.6	3.6
50	4.0	0.5	1.1	33.29	22.75	0.68	1.55	37.84	21.5	27.28	2.08	20.90	93.2	3.8
	6.0	2.2	5.1	33.53	22.85	0.68	1.46	37.79	22.9	28.49	2.10	22.05	94.3	4.0
	8.0	4.3	9.9	33.56	22.85	0.68	1.42	37.68	23.6	29.14	2.12	22.65	94.9	4.0
60	4.0	0.4	1.0	32.45	22.34	0.69	1.70	37.51	19.1	30.51	2.14	23.95	96.2	4.2
	6.0	2.0	4.6	33.04	22.63	0.68	1.60	37.76	20.7	31.79	2.16	25.16	97.4	4.3
	8.0	4.0	9.3	33.26	22.74	0.68	1.55	37.83	21.4	32.47	2.17	25.79	98.0	4.4
70	4.0	0.4	0.9	31.16	21.69	0.70	1.87	36.81	16.7	33.50	2.19	26.76	98.9	4.5
	6.0	1.8	4.1	32.01	22.11	0.69	1.76	37.28	18.2	34.79	2.21	27.97	100.1	4.6
	8.0	3.8	8.7	32.38	22.30	0.69	1.71	37.47	19.0	35.45	2.23	28.59	100.7	4.7
80	4.0	0.3	0.7	29.53	20.87	0.71	2.07	35.88	14.2	36.18	2.24	29.28	101.4	4.7
	6.0	1.7	4.0	30.56	21.38	0.70	1.95	36.47	15.7	37.40	2.26	30.42	102.5	4.8
	8.0	3.5	8.1	31.04	21.63	0.70	1.89	36.74	16.5	38.00	2.27	30.97	103.1	4.9
90	4.0	0.3	0.7	27.66	19.95	0.72	2.31	34.83	12.0	38.48	2.28	31.42	103.5	4.9
	6.0	1.8	4.2	28.79	20.50	0.71	2.17	35.46	13.3	39.53	2.31	32.40	104.5	5.0
	8.0	3.2	7.4	29.35	20.78	0.71	2.10	35.77	14.0	40.02	2.32	32.85	105.0	5.1
100	4.0	0.3	0.6	25.63	18.96	0.74	2.60	33.76	9.9	Operation not recommended				
	6.0	1.6	3.7	26.81	19.53	0.73	2.43	34.37	11.0					
	8.0	3.0	6.9	27.40	19.82	0.72	2.35	34.68	11.7					
110	4.0	0.2	0.5	23.53	17.95	0.76	2.93	32.79	8.0					
	6.0	1.6	3.7	24.70	18.51	0.75	2.74	33.31	9.0					
	8.0	2.9	6.7	25.30	18.80	0.74	2.65	33.60	9.6					
120	4.0	0.2	0.4	21.44	16.97	0.79	3.32	32.03	6.5					
	6.0	1.0	2.3	22.56	17.49	0.78	3.10	32.41	7.3					
	8.0	2.8	6.6	23.14	17.77	0.77	3.00	32.63	7.7					

*WPD Adder for Motorized Valve, TSL30 (Cv = 10.3, MOPD = 150 psi)

GPM	WPD Adder	
	PSI	FT
4.0	0.4	0.9
6.0	0.6	1.3
8.0	0.8	1.8

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL36 with PSC Motor

1200 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btu/h

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	9.0	8.6	19.8							23.28	2.31	15.72	85.9	3.0
30	4.5	2.8	6.4	46.36	30.52	0.66	1.62	52.07	29.0	26.08	2.35	18.36	88.1	3.2
	6.0	3.8	8.8	46.90	30.81	0.66	1.51	52.26	31.3	27.35	2.37	19.56	89.1	3.4
	9.0	7.4	17.0	47.08	30.90	0.66	1.47	52.27	32.5	28.06	2.38	20.23	89.6	3.4
40	4.5	1.8	4.3	45.35	29.95	0.66	1.77	51.56	26.0	30.51	2.42	22.56	91.5	3.7
	6.0	2.6	5.9	46.16	30.41	0.66	1.65	51.98	28.3	32.12	2.45	24.08	92.7	3.8
	9.0	7.0	16.3	46.49	30.59	0.66	1.60	52.12	29.4	33.01	2.46	24.92	93.4	3.9
50	4.5	0.9	2.1	44.01	29.22	0.66	1.94	50.82	22.9	35.03	2.49	26.83	95.0	4.1
	6.0	2.4	5.6	45.06	29.79	0.66	1.80	51.40	25.3	36.94	2.52	28.65	96.4	4.3
	9.0	4.7	10.7	45.52	30.05	0.66	1.74	51.65	26.4	38.00	2.54	29.65	97.3	4.4
60	4.5	0.9	2.0	42.36	28.34	0.67	2.15	49.89	19.9	39.53	2.56	31.09	98.4	4.5
	6.0	2.3	5.3	43.62	29.01	0.67	1.99	50.60	22.2	41.72	2.60	33.15	100.1	4.7
	9.0	4.4	10.3	44.20	29.32	0.66	1.91	50.93	23.3	42.91	2.62	34.28	101.0	4.8
70	4.5	0.8	1.8	40.44	27.36	0.68	2.40	48.83	17.0	43.95	2.64	35.25	101.8	4.9
	6.0	2.2	5.1	41.88	28.09	0.67	2.21	49.62	19.2	46.34	2.69	37.48	103.7	5.1
	9.0	4.3	10.0	42.56	28.45	0.67	2.12	50.00	20.3	47.62	2.71	38.67	104.7	5.1
80	4.5	0.8	1.8	38.26	26.28	0.69	2.71	47.70	14.3	48.21	2.73	39.21	105.1	5.2
	6.0	2.1	4.9	39.85	27.06	0.68	2.48	48.52	16.3	50.69	2.78	41.50	107.0	5.3
	9.0	4.2	9.6	40.62	27.45	0.68	2.38	48.93	17.3	52.00	2.82	42.69	108.0	5.4
90	4.5	0.8	1.8	35.85	25.12	0.70	3.08	46.54	11.8	52.19	2.82	42.87	108.2	5.4
	6.0	2.1	4.9	37.57	25.94	0.69	2.81	47.35	13.5	54.65	2.90	45.08	110.1	5.5
	9.0	4.0	9.3	38.41	26.35	0.69	2.69	47.77	14.5	55.89	2.94	46.17	111.0	5.6
100	4.5	0.7	1.7	33.20	23.86	0.72	3.52	45.40	9.6	Operation not recommended				
	6.0	2.1	4.8	35.03	24.73	0.71	3.21	46.17	11.1					
	9.0	3.9	9.1	35.93	25.16	0.70	3.06	46.58	11.9					
110	4.5	0.7	1.5	30.35	22.50	0.74	4.04	44.33	7.6					
	6.0	2.0	4.6	32.28	23.42	0.73	3.68	45.03	8.9					
	9.0	3.9	8.9	33.23	23.87	0.72	3.51	45.41	9.6					
120	4.5	0.6	1.5	27.29	21.02	0.77	4.66	43.37	6.0	Operation not recommended				
	6.0	1.9	4.4	29.31	22.00	0.75	4.24	43.98	7.0					
	9.0	3.6	8.4	30.30	22.48	0.74	4.05	44.31	7.6					

*WPD Adder for Motorized Valve, TSL36 (Cv = 10.3, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
4.5	0.4	1.0
6.8	0.7	1.5
9.0	0.9	2.0

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL09 with ECM Motor

400 CFM Nominal Airflow Heating, 350 CFM Nominal Airflow Cooling

Performance capacities shown in thousands of Btu/h

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	3.0	5.7	13.2							6.18	0.65	3.96	75.6	2.8
30	1.5	1.1	2.6	13.23	9.05	0.68	0.41	14.61	32.5	7.21	0.66	4.95	76.9	3.2
	2.3	1.8	4.0	13.10	8.80	0.67	0.39	14.43	33.4	7.55	0.67	5.28	77.3	3.3
	3.0	4.7	10.7	12.97	8.63	0.67	0.39	14.29	33.5	7.74	0.67	5.46	77.5	3.4
40	1.5	0.8	1.9	13.12	9.21	0.70	0.44	14.64	29.6	8.69	0.68	6.39	78.7	3.8
	2.3	1.7	3.9	13.23	9.14	0.69	0.42	14.65	31.6	9.16	0.68	6.84	79.3	3.9
	3.0	4.1	9.6	13.23	9.06	0.69	0.41	14.62	32.4	9.42	0.68	7.09	79.6	4.0
50	1.5	0.5	1.1	12.74	9.16	0.72	0.49	14.42	25.9	10.24	0.69	7.89	80.6	4.4
	2.3	1.6	3.7	13.02	9.21	0.71	0.46	14.58	28.3	10.83	0.69	8.47	81.3	4.6
	3.0	3.6	8.4	13.12	9.21	0.70	0.44	14.63	29.5	11.16	0.69	8.79	81.7	4.7
60	1.5	0.4	1.0	12.15	8.95	0.74	0.55	14.03	22.1	11.80	0.70	9.42	82.5	5.0
	2.3	1.5	3.5	12.55	9.09	0.72	0.51	14.29	24.5	12.50	0.70	10.11	83.4	5.2
	3.0	4.0	9.3	12.72	9.15	0.72	0.49	14.41	25.8	12.89	0.70	10.49	83.9	5.4
70	1.5	0.4	0.9	11.43	8.64	0.76	0.61	13.52	18.6	13.35	0.71	10.94	84.4	5.5
	2.3	1.4	3.3	11.89	8.84	0.74	0.57	13.84	20.7	14.13	0.71	11.71	85.4	5.8
	3.0	3.0	7.0	12.11	8.93	0.74	0.55	14.00	21.9	14.56	0.71	12.13	85.9	6.0
80	1.5	0.3	0.8	10.61	8.27	0.78	0.68	12.94	15.6	14.83	0.71	12.40	86.3	6.1
	2.3	1.3	3.1	11.10	8.49	0.76	0.64	13.29	17.3	15.66	0.72	13.22	87.3	6.4
	3.0	3.1	7.1	11.35	8.60	0.76	0.62	13.46	18.3	16.09	0.72	13.65	87.8	6.6
90	1.5	0.3	0.7	9.76	7.87	0.81	0.75	12.33	12.9	16.21	0.72	13.76	88.0	6.6
	2.3	1.5	3.5	10.24	8.10	0.79	0.71	12.68	14.4	17.03	0.72	14.57	89.0	6.9
	3.0	3.1	7.2	10.49	8.21	0.78	0.69	12.86	15.2	17.43	0.72	14.98	89.5	7.1
100	1.5	0.1	0.2	8.91	7.49	0.84	0.83	11.73	10.8	Operation not recommended				
	2.3	1.2	2.9	9.36	7.69	0.82	0.79	12.05	11.9					
	3.0	2.8	6.4	9.60	7.80	0.81	0.77	12.22	12.5					
110	1.5	0.1	0.2	8.11	7.16	0.88	0.90	11.18	9.0					
	2.3	1.2	2.8	8.51	7.32	0.86	0.86	11.45	9.9					
	3.0	2.7	6.2	8.72	7.41	0.85	0.84	11.60	10.3					
120	1.5	0.1	0.2	7.41	6.93	0.93	0.97	10.72	7.6					
	2.3	1.2	2.7	7.74	7.03	0.91	0.94	10.93	8.3					
	3.0	2.6	6.0	7.92	7.09	0.90	0.92	11.05	8.6					

*WPD Adder for Motorized Valve, TSL09 (Cv = 4.9, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
1.5	0.3	0.7
2.3	0.5	1.1
3.0	0.6	1.4

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL12 with ECM Motor

500 CFM Nominal Airflow Heating, 400 CFM Nominal Airflow Cooling

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	3.5	9.4	21.7							7.76	0.77	5.13	83.9	2.9
30	1.8	3.4	7.9	15.67	10.25	0.65	0.41	17.07	38.2	8.92	0.79	6.23	86.3	3.3
	2.7	5.6	13.0	15.78	10.15	0.64	0.37	17.05	42.4	9.25	0.79	6.54	87.0	3.4
	3.5	7.8	18.0	15.79	10.06	0.64	0.35	17.00	44.5	9.43	0.80	6.71	87.4	3.5
40	1.8	2.9	6.6	15.30	10.23	0.67	0.47	16.92	32.2	10.50	0.81	7.72	89.6	3.8
	2.7	4.9	11.4	15.56	10.27	0.66	0.43	17.04	36.0	10.92	0.82	8.12	90.4	3.9
	3.5	6.2	14.4	15.66	10.25	0.65	0.41	17.07	38.0	11.16	0.83	8.34	90.9	4.0
50	1.8	2.3	5.3	14.74	10.05	0.68	0.54	16.60	27.1	12.11	0.84	9.24	92.9	4.2
	2.7	4.2	9.8	15.12	10.18	0.67	0.50	16.82	30.3	12.62	0.85	9.71	93.9	4.3
	3.5	7.7	17.8	15.28	10.23	0.67	0.48	16.91	32.1	12.90	0.86	9.97	94.5	4.4
60	1.8	2.3	5.3	14.04	9.75	0.69	0.62	16.16	22.7	13.72	0.87	10.74	96.2	4.6
	2.7	4.1	9.5	14.49	9.95	0.69	0.57	16.45	25.3	14.30	0.89	11.28	97.4	4.7
	3.5	5.9	13.6	14.71	10.04	0.68	0.55	16.58	26.8	14.62	0.89	11.57	98.0	4.8
70	1.8	2.2	5.2	13.23	9.37	0.71	0.70	15.62	18.9	15.30	0.91	12.21	99.4	4.9
	2.7	4.0	9.1	13.73	9.60	0.70	0.65	15.95	21.1	15.93	0.92	12.79	100.7	5.1
	3.5	6.2	14.3	13.98	9.72	0.70	0.63	16.12	22.3	16.27	0.93	13.11	101.4	5.2
80	1.8	2.1	4.9	12.35	8.94	0.72	0.78	15.02	15.8	16.81	0.94	13.61	102.5	5.3
	2.7	3.9	8.9	12.87	9.19	0.71	0.73	15.38	17.5	17.47	0.95	14.23	103.9	5.4
	3.5	5.6	13.0	13.14	9.32	0.71	0.71	15.56	18.5	17.82	0.96	14.56	104.6	5.5
90	1.8	2.1	4.8	11.43	8.49	0.74	0.87	14.40	13.1	18.22	0.96	14.93	105.4	5.5
	2.7	3.7	8.7	11.95	8.74	0.73	0.82	14.75	14.5	18.88	0.98	15.55	106.8	5.7
	3.5	5.5	12.7	12.22	8.87	0.73	0.80	14.93	15.3	19.22	0.98	15.87	107.5	5.7
100	1.8	1.9	4.4	10.50	8.05	0.77	0.96	13.78	10.9	Operation not recommended				
	2.7	3.4	7.8	11.00	8.29	0.75	0.91	14.11	12.1					
	3.5	5.4	12.4	11.26	8.41	0.75	0.89	14.29	12.7					
110	1.8	1.8	4.2	9.59	7.65	0.80	1.05	13.19	9.1					
	2.7	3.3	7.7	10.05	7.85	0.78	1.01	13.49	10.0					
	3.5	5.3	12.2	10.30	7.96	0.77	0.98	13.65	10.5					
120	1.8	1.8	4.1	8.74	7.29	0.83	1.15	12.66	7.6					
	2.7	3.3	7.5	9.15	7.46	0.82	1.10	12.91	8.3					
	3.5	5.2	11.9	9.37	7.55	0.81	1.08	13.05	8.7					

*WPD Adder for Motorized Valve, TSL12 (Cv = 4.9, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
1.8	0.4	0.8
2.6	0.5	1.2
3.5	0.7	1.7

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHR/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHR/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL15 with ECM Motor

600 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btu/h

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	4.5	8.8	20.3							8.69	0.83	6.15	81.8	3.2
30	2.3	2.3	5.4	17.43	11.10	0.64	0.50	19.15	34.5	10.14	0.86	7.51	84.1	3.6
	3.5	5.0	11.6	16.92	10.50	0.62	0.48	18.56	35.4	10.61	0.87	7.95	84.8	3.7
	4.5	8.3	19.2	16.60	10.17	0.61	0.47	18.20	35.5	10.86	0.87	8.19	85.2	3.8
40	2.3	2.2	5.1	17.82	11.84	0.66	0.57	19.75	31.5	12.11	0.89	9.37	87.1	4.1
	3.5	4.3	9.8	17.67	11.46	0.65	0.53	19.47	33.4	12.68	0.90	9.91	88.0	4.2
	4.5	7.7	17.8	17.52	11.23	0.64	0.51	19.27	34.2	12.99	0.90	10.21	88.5	4.3
50	2.3	2.1	4.8	17.69	12.22	0.69	0.64	19.87	27.7	14.04	0.92	11.20	90.1	4.6
	3.5	4.2	9.7	17.82	12.04	0.68	0.59	19.85	30.0	14.71	0.93	11.84	91.1	4.7
	4.5	7.1	16.4	17.83	11.91	0.67	0.57	19.79	31.1	15.08	0.94	12.18	91.7	4.8
60	2.3	2.1	4.9	17.17	12.30	0.72	0.73	19.64	23.7	15.94	0.95	13.01	93.0	5.0
	3.5	4.2	9.7	17.52	12.29	0.70	0.67	19.81	26.0	16.70	0.96	13.73	94.2	5.2
	4.5	7.0	16.1	17.65	12.24	0.69	0.65	19.86	27.2	17.11	0.96	14.12	94.8	5.3
70	2.3	2.0	4.7	16.36	12.13	0.74	0.82	19.16	20.0	17.79	0.97	14.78	95.9	5.5
	3.5	4.2	9.6	16.85	12.26	0.73	0.76	19.46	22.1	18.63	0.98	15.58	97.1	5.7
	4.5	6.9	15.8	17.08	12.29	0.72	0.74	19.59	23.2	19.08	0.99	16.01	97.8	5.8
80	2.3	2.0	4.5	15.34	11.77	0.77	0.92	18.49	16.6	19.59	0.99	16.51	98.6	5.9
	3.5	4.0	9.2	15.93	11.99	0.75	0.86	18.88	18.4	20.50	1.00	17.39	100.0	6.1
	4.5	6.6	15.3	16.21	12.09	0.75	0.83	19.06	19.4	20.98	1.00	17.85	100.8	6.2
90	2.3	1.9	4.4	14.19	11.25	0.79	1.03	17.71	13.8	21.33	1.01	18.20	101.3	6.3
	3.5	3.9	9.0	14.82	11.55	0.78	0.97	18.14	15.3	22.29	1.01	19.14	102.8	6.5
	4.5	6.6	15.3	15.14	11.68	0.77	0.94	18.35	16.1	22.80	1.01	19.64	103.6	6.7
100	2.3	1.9	4.4	12.97	10.63	0.82	1.15	16.89	11.3	Operation not recommended				
	3.5	3.9	8.9	13.61	10.96	0.81	1.09	17.31	12.5					
	4.5	6.5	15.0	13.93	11.12	0.80	1.06	17.53	13.2					
110	2.3	1.9	4.4	11.74	9.95	0.85	1.27	16.06	9.3					
	3.5	3.9	8.9	12.34	10.28	0.83	1.21	16.46	10.2					
	4.5	6.4	14.8	12.65	10.46	0.83	1.18	16.67	10.8					
120	2.3	1.9	4.4	10.56	9.25	0.88	1.39	15.30	7.6					
	3.5	3.8	8.8	11.10	9.57	0.86	1.33	15.64	8.3					
	4.5	6.3	14.6	11.38	9.74	0.86	1.30	15.83	8.7					

*WPD Adder for Motorized Valve, TSL15 (Cv = 10.3, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
2.3	0.2	0.5
3.5	0.3	0.8
4.5	0.4	1.1

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL18 with ECM Motor

700 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btu/h

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	6.8	7.2	16.7							10.67	1.03	7.16	82.1	3.0
30	3.4	2.2	5.1	23.79	15.72	0.66	0.62	25.90	38.5	12.64	1.06	9.01	84.7	3.5
	5.1	4.2	9.7	23.88	15.52	0.65	0.58	25.85	41.4	13.10	1.07	9.45	85.3	3.6
	6.8	6.7	15.4	23.89	15.38	0.64	0.56	25.79	42.8	13.36	1.08	9.69	85.6	3.6
40	3.4	1.9	4.3	23.35	15.80	0.68	0.70	25.75	33.2	15.18	1.11	11.41	88.0	4.0
	5.1	3.8	8.7	23.61	15.81	0.67	0.66	25.86	35.8	15.79	1.12	11.98	88.8	4.1
	6.8	5.4	12.5	23.71	15.77	0.67	0.64	25.89	37.2	16.12	1.12	12.29	89.3	4.2
50	3.4	1.5	3.5	22.61	15.55	0.69	0.80	25.33	28.3	17.78	1.15	13.87	91.5	4.5
	5.1	3.3	7.7	23.01	15.71	0.68	0.75	25.57	30.7	18.53	1.16	14.57	92.5	4.7
	6.8	4.4	10.0	23.19	15.76	0.68	0.73	25.67	31.9	18.93	1.16	14.96	93.0	4.8
60	3.4	1.5	3.3	21.63	15.06	0.70	0.90	24.70	24.0	20.40	1.19	16.36	94.9	5.0
	5.1	2.9	6.6	22.13	15.32	0.69	0.85	25.03	26.0	21.29	1.20	17.20	96.1	5.2
	6.8	4.3	9.9	22.37	15.44	0.69	0.82	25.19	27.1	21.77	1.21	17.66	96.7	5.3
70	3.4	1.4	3.2	20.45	14.40	0.70	1.01	23.91	20.2	23.04	1.22	18.87	98.4	5.5
	5.1	2.4	5.5	21.03	14.73	0.70	0.96	24.30	21.9	24.07	1.24	19.85	99.8	5.7
	6.8	4.2	9.6	21.31	14.89	0.70	0.93	24.49	22.9	24.62	1.24	20.38	100.5	5.8
80	3.4	1.1	2.4	19.13	13.65	0.71	1.14	23.01	16.8	25.68	1.26	21.38	101.9	6.0
	5.1	2.6	6.0	19.75	14.01	0.71	1.08	23.43	18.3	26.83	1.27	22.49	103.4	6.2
	6.8	4.1	9.5	20.06	14.18	0.71	1.05	23.65	19.1	27.45	1.28	23.08	104.2	6.3
90	3.4	1.1	2.5	17.71	12.86	0.73	1.27	22.04	13.9	28.29	1.29	23.89	105.3	6.4
	5.1	2.8	6.6	18.35	13.21	0.72	1.21	22.47	15.2	29.56	1.30	25.11	107.0	6.6
	6.8	4.0	9.3	18.67	13.39	0.72	1.18	22.69	15.8	30.24	1.31	25.76	107.9	6.8
100	3.4	1.1	2.5	16.22	12.07	0.74	1.41	21.04	11.5	Operation not recommended				
	5.1	2.2	5.0	16.85	12.40	0.74	1.35	21.46	12.5					
	6.8	3.6	8.4	17.17	12.57	0.73	1.32	21.68	13.0					
110	3.4	1.0	2.2	14.70	11.30	0.77	1.57	20.06	9.3					
	5.1	2.1	4.9	15.31	11.60	0.76	1.51	20.45	10.2					
	6.8	3.5	8.2	15.62	11.76	0.75	1.47	20.65	10.6					
120	3.4	1.0	2.2	13.19	10.58	0.80	1.74	19.13	7.6					
	5.1	2.1	4.7	13.76	10.85	0.79	1.68	19.48	8.2					
	6.8	3.5	8.0	14.06	10.99	0.78	1.64	19.66	8.6					

*WPD Adder for Motorized Valve, TSL18 (Cv = 10.3, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
3.4	0.3	0.8
5.1	0.5	1.1
6.8	0.7	1.5

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL24 with ECM Motor

850 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btu/h

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	8.0	5.2	12.1							17.55	1.60	12.11	87.1	3.2
30	4.0	0.9	2.1	33.57	21.59	0.64	0.92	36.72	36.4	19.10	1.59	13.69	88.8	3.5
	6.0	2.3	5.3	34.11	21.76	0.64	0.86	37.03	39.8	19.80	1.59	14.39	89.5	3.7
	8.0	5.0	11.4	34.31	21.80	0.64	0.83	37.13	41.6	20.20	1.59	14.79	90.0	3.7
40	4.0	0.7	1.6	32.53	21.15	0.65	1.03	36.03	31.7	21.81	1.59	16.37	91.7	4.0
	6.0	2.3	5.2	33.29	21.48	0.65	0.95	36.54	35.0	22.77	1.60	17.30	92.8	4.2
	8.0	4.6	10.7	33.62	21.61	0.64	0.92	36.75	36.7	23.31	1.61	17.82	93.3	4.2
50	4.0	0.5	1.1	31.23	20.51	0.66	1.15	35.13	27.3	24.83	1.63	19.27	95.0	4.5
	6.0	2.2	5.1	32.14	20.97	0.65	1.06	35.76	30.3	26.06	1.65	20.44	96.3	4.6
	8.0	4.3	9.9	32.57	21.17	0.65	1.02	36.05	31.9	26.75	1.66	21.10	97.1	4.7
60	4.0	0.4	1.0	29.72	19.72	0.66	1.29	34.11	23.1	28.05	1.68	22.32	98.5	4.9
	6.0	2.0	4.6	30.74	20.26	0.66	1.19	34.80	25.8	29.55	1.71	23.72	100.1	5.1
	8.0	4.0	9.3	31.23	20.51	0.66	1.15	35.14	27.3	30.38	1.73	24.49	101.0	5.2
70	4.0	0.4	0.9	28.06	18.82	0.67	1.45	33.02	19.3	31.39	1.75	25.43	102.1	5.3
	6.0	1.8	4.1	29.14	19.41	0.67	1.34	33.72	21.7	33.13	1.79	27.03	104.0	5.4
	8.0	3.8	8.7	29.67	19.70	0.66	1.29	34.08	23.0	34.08	1.81	27.91	105.0	5.5
80	4.0	0.3	0.7	26.31	17.83	0.68	1.65	31.93	16.0	34.76	1.82	28.53	105.8	5.6
	6.0	1.7	4.0	27.40	18.45	0.67	1.52	32.60	18.0	36.67	1.87	30.28	107.9	5.7
	8.0	3.5	8.1	27.96	18.76	0.67	1.46	32.95	19.1	37.70	1.90	31.23	109.0	5.8
90	4.0	0.3	0.7	24.51	16.80	0.69	1.88	30.92	13.0	38.05	1.91	31.54	109.4	5.8
	6.0	1.8	4.2	25.59	17.43	0.68	1.74	31.52	14.7	40.07	1.96	33.38	111.5	6.0
	8.0	3.2	7.4	26.15	17.74	0.68	1.67	31.84	15.7	41.13	1.99	34.34	112.7	6.1
100	4.0	0.3	0.6	22.72	15.77	0.69	2.15	30.05	10.6	Operation not recommended				
	6.0	1.6	3.7	23.76	16.37	0.69	1.99	30.54	12.0					
	8.0	3.0	6.9	24.30	16.68	0.69	1.91	30.81	12.7					
110	4.0	0.2	0.5	21.00	14.77	0.70	2.47	29.41	8.5					
	6.0	1.6	3.7	21.96	15.33	0.70	2.28	29.74	9.6					
	8.0	2.9	6.7	22.47	15.62	0.70	2.19	29.95	10.3					
120	4.0	0.2	0.4	19.39	13.84	0.71	2.84	29.07	6.8					
	6.0	1.0	2.3	20.26	14.34	0.71	2.62	29.21	7.7					
	8.0	2.8	6.6	20.73	14.61	0.70	2.52	29.33	8.2					

*WPD Adder for Motorized Valve, TSL24 (Cv = 10.3, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
4.0	0.4	0.9
6.0	0.6	1.3
8.0	0.8	1.8

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL30 with ECM Motor

1000 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btu/h

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	8.0	5.2	12.1							17.82	1.72	11.96	84.5	3.0
30	4.0	0.9	2.1	33.05	22.48	0.68	1.08	36.75	30.5	20.35	1.76	14.35	86.8	3.4
	6.0	2.3	5.3	32.29	21.97	0.68	1.02	35.77	31.7	21.25	1.77	15.20	87.6	3.5
	8.0	5.0	11.4	31.79	21.64	0.68	0.99	35.17	32.2	21.74	1.78	15.67	88.1	3.6
40	4.0	0.7	1.6	33.55	22.84	0.68	1.20	37.65	27.9	23.88	1.81	17.69	90.1	3.9
	6.0	2.3	5.2	33.34	22.68	0.68	1.13	37.19	29.6	24.96	1.83	18.71	91.1	4.0
	8.0	4.6	10.7	33.12	22.53	0.68	1.09	36.85	30.3	25.54	1.84	19.25	91.6	4.1
50	4.0	0.5	1.1	33.29	22.75	0.68	1.33	37.84	25.0	27.28	1.87	20.90	93.2	4.3
	6.0	2.2	5.1	33.53	22.85	0.68	1.25	37.79	26.9	28.49	1.89	22.05	94.3	4.4
	8.0	4.3	9.9	33.56	22.85	0.68	1.21	37.68	27.8	29.14	1.90	22.65	94.9	4.5
60	4.0	0.4	1.0	32.45	22.34	0.69	1.48	37.51	21.9	30.51	1.92	23.95	96.2	4.6
	6.0	2.0	4.6	33.04	22.63	0.68	1.38	37.76	23.9	31.79	1.95	25.16	97.4	4.8
	8.0	4.0	9.3	33.26	22.74	0.68	1.34	37.83	24.9	32.47	1.96	25.79	98.0	4.9
70	4.0	0.4	0.9	31.16	21.69	0.70	1.65	36.81	18.8	33.50	1.97	26.76	98.9	5.0
	6.0	1.8	4.1	32.01	22.11	0.69	1.54	37.28	20.7	34.79	2.00	27.97	100.1	5.1
	8.0	3.8	8.7	32.38	22.30	0.69	1.49	37.47	21.7	35.45	2.01	28.59	100.7	5.2
80	4.0	0.3	0.7	29.53	20.87	0.71	1.86	35.88	15.9	36.18	2.02	29.28	101.4	5.2
	6.0	1.7	4.0	30.56	21.38	0.70	1.73	36.47	17.7	37.40	2.05	30.42	102.5	5.4
	8.0	3.5	8.1	31.04	21.63	0.70	1.67	36.74	18.6	38.00	2.06	30.97	103.1	5.4
90	4.0	0.3	0.7	27.66	19.95	0.72	2.10	34.83	13.2	38.48	2.07	31.42	103.5	5.5
	6.0	1.8	4.2	28.79	20.50	0.71	1.95	35.46	14.7	39.53	2.09	32.40	104.5	5.5
	8.0	3.2	7.4	29.35	20.78	0.71	1.88	35.77	15.6	40.02	2.10	32.85	105.0	5.6
100	4.0	0.3	0.6	25.63	18.96	0.74	2.38	33.76	10.8	Operation not recommended				
	6.0	1.6	3.7	26.81	19.53	0.73	2.21	34.37	12.1					
	8.0	3.0	6.9	27.40	19.82	0.72	2.13	34.68	12.8					
110	4.0	0.2	0.5	23.53	17.95	0.76	2.71	32.79	8.7					
	6.0	1.6	3.7	24.70	18.51	0.75	2.52	33.31	9.8					
	8.0	2.9	6.7	25.30	18.80	0.74	2.43	33.60	10.4					
120	4.0	0.2	0.4	21.44	16.97	0.79	3.10	32.03	6.9					
	6.0	1.0	2.3	22.56	17.49	0.78	2.89	32.41	7.8					
	8.0	2.8	6.6	23.14	17.77	0.77	2.78	32.63	8.3					

*WPD Adder for Motorized Valve, TSL30 (Cv = 10.3, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
4.0	0.4	0.9
6.0	0.6	1.3
8.0	0.8	1.8

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL36 with ECM Motor

1200 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	Operation not recommended													
	9.0	8.6	19.8							23.28	2.22	15.72	85.9	3.1
30	4.5	2.8	6.4	46.26	30.11	0.65	1.53	51.50	30.2	26.08	2.26	18.36	88.1	3.4
	6.0	3.8	8.8	46.26	30.05	0.65	1.46	51.25	31.7	27.35	2.28	19.56	89.1	3.5
	9.0	7.4	17.0	46.01	29.82	0.65	1.40	50.77	33.0	28.06	2.29	20.23	89.6	3.6
40	4.5	1.8	4.3	45.73	29.87	0.65	1.68	51.44	27.3	30.51	2.33	22.56	91.5	3.8
	6.0	2.6	5.9	46.11	30.05	0.65	1.59	51.54	29.0	32.12	2.36	24.08	92.7	4.0
	9.0	7.0	16.3	46.29	30.11	0.65	1.51	51.45	30.6	33.01	2.37	24.92	93.4	4.1
50	4.5	0.9	2.1	44.61	29.29	0.66	1.85	50.92	24.1	35.03	2.40	26.83	95.0	4.3
	6.0	2.4	5.6	45.31	29.66	0.65	1.75	51.27	25.9	36.94	2.43	28.65	96.4	4.5
	9.0	4.7	10.7	45.84	29.93	0.65	1.65	51.49	27.7	38.00	2.45	29.65	97.3	4.5
60	4.5	0.9	2.0	43.02	28.46	0.66	2.06	50.04	20.9	39.53	2.47	31.09	98.4	4.7
	6.0	2.3	5.3	43.97	28.95	0.66	1.94	50.57	22.7	41.72	2.51	33.15	100.1	4.9
	9.0	4.4	10.3	44.79	29.38	0.66	1.82	51.01	24.6	42.91	2.53	34.28	101.0	5.0
70	4.5	0.8	1.8	41.06	27.44	0.67	2.31	48.94	17.8	43.95	2.55	35.25	101.8	5.1
	6.0	2.2	5.1	42.18	28.02	0.66	2.17	49.57	19.5	46.34	2.60	37.48	103.7	5.2
	9.0	4.3	10.0	43.23	28.56	0.66	2.03	50.16	21.3	47.62	2.62	38.67	104.7	5.3
80	4.5	0.8	1.8	38.78	26.29	0.68	2.62	47.71	14.8	48.21	2.64	39.21	105.1	5.4
	6.0	2.1	4.9	40.04	26.92	0.67	2.45	48.38	16.4	50.69	2.69	41.50	107.0	5.5
	9.0	4.2	9.6	41.25	27.54	0.67	2.29	49.05	18.0	52.00	2.73	42.69	108.0	5.6
90	4.5	0.8	1.8	36.27	25.06	0.69	2.99	46.46	12.1	52.19	2.73	42.87	108.2	5.6
	6.0	2.1	4.9	37.61	25.71	0.68	2.79	47.11	13.5	54.65	2.81	45.08	110.1	5.7
	9.0	4.0	9.3	38.93	26.37	0.68	2.60	47.79	15.0	55.89	2.85	46.17	111.0	5.8
100	4.5	0.7	1.7	33.58	23.77	0.71	3.43	45.27	9.8	Operation not recommended				
	6.0	2.1	4.8	34.97	24.43	0.70	3.19	45.86	11.0					
	9.0	3.9	9.1	36.35	25.10	0.69	2.97	46.50	12.2					
110	4.5	0.7	1.5	30.78	22.45	0.73	3.95	44.25	7.8					
	6.0	2.0	4.6	32.18	23.10	0.72	3.68	44.73	8.7					
	9.0	3.9	8.9	33.60	23.77	0.71	3.42	45.28	9.8					
120	4.5	0.6	1.5	27.92	21.12	0.76	4.57	43.50	6.1					
	6.0	1.9	4.4	29.31	21.77	0.74	4.25	43.83	6.9					
	9.0	3.6	8.4	30.73	22.42	0.73	3.96	44.23	7.8					

*WPD Adder for Motorized Valve, TSL36 (Cv = 10.3, MOPD = 150 psi)		
GPM	WPD Adder	
	PSI	FT
4.5	0.4	1.0
6.8	0.7	1.5
9.0	0.9	2.0

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL09 with Modulating Valve and ECM Motor

400 CFM Nominal Airflow Heating, 350 CFM Nominal AirFlow Cooling

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						GPM	WPD		Heating - EAT 70°F					
		PSI	FT	TC	SC	kW	HR	EER	LWT		PSI	FT	HC	kW	HE	LAT	COP	LWT
20										3.0	5.7	13.2	6.18	0.65	3.96	75.6	2.8	17
30	1.0	0.7	1.6	13.10	9.16	0.45	14.62	29.4	60	1.5	1.1	2.5	7.21	0.66	4.95	76.9	3.2	23
	1.0	0.7	1.6	13.10	9.16	0.45	14.62	29.4	60	2.3	1.8	4.2	7.55	0.67	5.28	77.3	3.3	25
	1.0	0.7	1.6	13.10	9.16	0.45	14.62	29.4	60	3.0	4.7	10.9	7.74	0.67	5.46	77.5	3.4	26
40	1.5	1.4	3.3	13.10	9.16	0.45	14.62	29.4	60	1.5	0.8	1.8	8.69	0.68	6.39	78.7	3.8	31
	1.5	1.4	3.3	13.10	9.16	0.45	14.62	29.4	60	2.3	1.7	3.9	9.16	0.68	6.84	79.3	3.9	34
	1.5	1.4	3.3	13.10	9.16	0.45	14.62	29.4	60	3.0	4.1	9.5	9.42	0.68	7.09	79.6	4.0	35
50	1.5	0.5	1.1	12.74	9.12	0.49	14.42	25.9	69	1.5	0.5	1.1	10.24	0.69	7.89	91.6	4.4	39
	2.3	1.6	3.7	13.01	9.17	0.46	14.58	28.3	63	2.3	1.6	3.7	10.83	0.69	8.47	93.0	4.6	42
	2.9	3.6	8.4	13.10	9.16	0.45	14.62	29.4	60	3.0	3.6	8.4	11.12	0.69	8.75	93.7	4.7	44
60	1.5	0.4	1.0	12.16	8.93	0.55	14.03	22.1	79	1.5	0.4	1.0	11.80	0.70	9.42	95.3	5.0	47
	2.3	1.5	3.5	12.55	9.06	0.51	14.29	24.5	73	2.3	1.5	3.5	12.50	0.70	10.11	96.9	5.2	51
	3.0	4.0	9.3	12.72	9.11	0.49	14.40	25.7	70	3.0	4.0	9.3	12.89	0.70	10.49	97.8	5.4	53
70	1.5	0.4	0.9	11.43	8.63	0.62	13.53	18.6	88	1.5	0.4	0.9	13.35	0.71	10.94	98.8	5.5	55
	2.3	1.4	3.3	11.89	8.82	0.57	13.85	20.7	82	2.3	1.4	3.3	14.13	0.71	11.71	100.6	5.8	60
	3.0	3.0	7.0	12.11	8.91	0.55	14.00	21.9	79	3.0	3.0	7.0	14.56	0.71	12.13	101.6	6.0	62
80	1.5	0.3	0.8	10.61	8.27	0.69	12.95	15.5	97	1.5	0.3	0.8	14.83	0.71	12.40	102.3	6.1	63
	2.3	1.3	3.1	11.10	8.49	0.64	13.30	17.3	92	2.3	1.3	3.1	15.66	0.72	13.22	104.2	6.4	68
	3.0	3.1	7.1	11.27	8.56	0.63	13.41	17.9	90	2.7	3.1	7.1	15.95	0.72	13.50	104.8	6.5	70
90	1.5	0.3	0.7	9.75	7.89	0.76	12.34	12.9	106	1.4	0.2	0.5	15.95	0.72	13.50	104.8	6.5	70
	2.3	1.5	3.5	9.75	7.89	0.76	12.34	12.9	106	1.4	0.2	0.5	15.95	0.72	13.50	104.8	6.5	70
	3.0	3.1	7.2	9.75	7.89	0.76	12.34	12.9	106	1.4	0.2	0.5	15.95	0.72	13.50	104.8	6.5	70
100	1.5	0.1	0.2	8.90	7.51	0.83	11.73	10.7	116	0.9	0.1	0.2	15.95	0.72	13.50	104.8	6.5	70
	2.3	1.2	2.9	9.35	7.71	0.79	12.06	11.8	111	0.9	0.1	0.2	15.95	0.72	13.50	104.8	6.5	70
	3.0	2.8	6.4	9.59	7.82	0.77	12.23	12.4	108	0.9	0.1	0.2	15.95	0.72	13.50	104.8	6.5	70
110	1.5	0.1	0.2	8.10	7.16	0.90	11.18	9.0	125	0.7	0.1	0.2	15.95	0.72	13.50	104.8	6.5	70
	2.3	1.2	2.8	8.50	7.33	0.87	11.45	9.8	120	0.7	0.1	0.2	15.95	0.72	13.50	104.8	6.5	70
	3.0	2.7	6.2	8.71	7.42	0.85	11.60	10.3	118	0.7	0.1	0.2	15.95	0.72	13.50	104.8	6.5	70
120	1.5	0.1	0.2	7.39	6.91	0.97	10.70	7.6	134	0.5	0.1	0.2	15.95	0.72	13.50	104.8	6.5	70
	2.3	1.2	2.7	7.72	7.02	0.94	10.92	8.2	130	0.5	0.1	0.2	15.95	0.72	13.50	104.8	6.5	70
	3.0	2.7	6.2	7.90	7.09	0.92	11.04	8.6	127	0.5	0.1	0.2	15.95	0.72	13.50	104.8	6.5	70

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL12 with Modulating Valve and ECM Motor

400 CFM Nominal Airflow Heating, 500 CFM Nominal AirFlow Cooling

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						GPM	WPD		Heating - EAT 70°F					
		PSI	FT	TC	SC	kW	HR	EER	LWT		PSI	FT	HC	kW	HE	LAT	COP	LWT
20										3.5	9.4	21.7	7.76	0.77	5.13	83.9	2.9	17
	1.1	1.1	2.6	15.10	9.86	0.51	16.85	29.6	60	1.8	3.4	7.9	8.92	0.79	6.23	86.3	3.3	23
30	1.1	1.1	2.6	15.10	9.86	0.51	16.85	29.6	60	2.6	5.6	12.9	9.25	0.79	6.54	87.0	3.4	25
	1.1	1.1	2.6	15.10	9.86	0.51	16.85	29.6	60	3.5	7.8	18.0	9.43	0.80	6.71	87.4	3.5	26
40	1.7	2.3	5.3	15.10	9.86	0.51	16.85	29.6	60	1.8	2.9	6.7	10.50	0.81	7.72	89.6	3.8	31
	1.7	2.3	5.3	15.10	9.86	0.51	16.85	29.6	60	2.6	4.9	11.3	10.92	0.82	8.12	90.4	3.9	34
50	1.7	2.3	5.3	15.10	9.86	0.51	16.85	29.6	60	3.5	6.2	14.3	11.16	0.83	8.34	90.9	4.0	35
	1.8	2.3	5.3	14.58	9.66	0.58	16.55	25.3	69	1.8	2.3	5.3	12.74	0.87	9.77	91.5	4.3	39
60	2.6	4.2	9.7	14.95	9.81	0.53	16.77	28.1	63	2.6	4.2	9.7	13.49	0.88	10.49	92.9	4.5	42
	3.3	7.7	17.8	15.10	9.86	0.51	16.85	29.6	60	3.5	7.7	17.8	13.85	0.88	10.83	93.6	4.6	43
70	1.8	2.3	5.3	13.87	9.34	0.65	16.09	21.3	78	1.8	2.3	5.3	14.64	0.89	11.59	95.0	4.8	47
	2.6	4.1	9.5	14.33	9.55	0.60	16.39	23.8	73	2.6	4.1	9.5	15.54	0.90	12.46	96.7	5.0	50
80	3.5	6.9	15.9	14.55	9.65	0.58	16.52	25.1	69	3.5	6.9	15.9	16.05	0.91	12.95	97.7	5.2	53
	1.8	2.2	5.2	13.04	8.95	0.73	15.53	17.9	88	1.8	2.2	5.2	16.55	0.92	13.42	98.6	5.3	55
90	2.6	4.0	9.1	13.55	9.20	0.68	15.87	19.9	82	2.6	4.0	9.1	17.58	0.93	14.42	100.5	5.6	59
	3.5	6.2	14.3	13.80	9.31	0.66	16.04	21.0	79	3.5	6.2	14.3	18.16	0.93	14.98	101.5	5.7	61
100	1.8	2.1	4.9	12.14	8.51	0.81	14.92	14.9	97	1.8	2.1	4.9	18.42	0.93	15.23	102.0	5.8	63
	2.6	3.9	8.9	12.67	8.77	0.76	15.28	16.6	92	2.6	3.9	8.9	19.55	0.95	16.33	104.1	6.1	68
110	3.5	5.6	13.0	12.94	8.90	0.74	15.46	17.5	89	3.4	5.6	13.0	20.11	0.95	16.87	105.2	6.2	70
	1.8	2.1	4.8	11.20	8.05	0.90	14.29	12.4	106	1.7	1.8	4.2	20.11	0.95	16.87	105.2	6.2	70
120	2.6	3.7	8.7	11.72	8.31	0.85	14.64	13.7	101	1.7	1.8	4.2	20.11	0.95	16.87	105.2	6.2	70
	3.5	5.5	12.7	12.00	8.44	0.83	14.82	14.5	98	1.7	1.8	4.2	20.11	0.95	16.87	105.2	6.2	70
130	1.8	1.9	4.4	10.28	7.60	1.00	13.68	10.3	116	1.1	0.5	1.2	20.11	0.95	16.87	105.2	6.2	70
	2.6	3.4	7.8	10.77	7.84	0.95	14.00	11.4	111	1.1	0.5	1.2	20.11	0.95	16.87	105.2	6.2	70
140	3.5	5.4	12.4	11.03	7.97	0.92	14.17	12.0	108	1.1	0.5	1.2	20.11	0.95	16.87	105.2	6.2	70
	1.8	1.8	4.2	9.41	7.18	1.09	13.13	8.6	125	0.8	0.1	0.2	20.11	0.95	16.87	105.2	6.2	70
150	2.6	3.3	7.7	9.84	7.39	1.04	13.40	9.4	120	0.8	0.1	0.2	20.11	0.95	16.87	105.2	6.2	70
	3.5	5.3	12.2	10.08	7.50	1.02	13.55	9.9	118	0.8	0.1	0.2	20.11	0.95	16.87	105.2	6.2	70
160	1.8	1.8	4.1	8.63	6.84	1.19	12.70	7.2	135	0.7	0.1	0.2	20.11	0.95	16.87	105.2	6.2	70
	2.6	3.3	7.5	8.99	7.00	1.14	12.89	7.9	130	0.7	0.1	0.2	20.11	0.95	16.87	105.2	6.2	70
170	3.5	5.2	11.9	9.19	7.09	1.12	13.01	8.2	127	0.7	0.1	0.2	20.11	0.95	16.87	105.2	6.2	70

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL15 with Modulating Valve and ECM Motor

600 CFM Nominal Airflow Heating, 600 CFM Nominal AirFlow Cooling

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						GPM	WPD		Heating - EAT 70°F					
		PSI	FT	TC	SC	kW	HR	EER	LWT		PSI	FT	HC	kW	HE	LAT	COP	LWT
20										4.5	8.8	20.3	8.99	0.83	6.15	81.8	3.2	17
30	1.3	1.8	4.2	17.75	11.82	0.58	19.74	30.5	60	2.3	2.3	5.3	10.14	0.86	7.51	84.1	3.6	23
	1.3	1.8	4.2	17.75	11.82	0.58	19.74	30.5	60	3.5	5.0	11.6	10.61	0.87	7.95	84.8	3.7	25
	1.3	1.8	4.2	17.75	11.82	0.58	19.74	30.5	60	4.5	8.3	19.2	10.86	0.87	8.19	85.2	3.8	26
40	2.0	2.2	5.1	17.75	11.82	0.58	19.74	30.5	60	2.3	2.2	5.1	12.11	0.89	9.37	87.1	4.1	32
	2.0	2.2	5.1	17.75	11.82	0.58	19.74	30.5	60	3.5	4.3	9.9	12.68	0.90	9.91	88.0	4.2	34
	2.0	2.2	5.1	17.75	11.82	0.58	19.74	30.5	60	4.5	7.7	17.8	12.99	0.90	10.21	88.5	4.3	35
50	2.3	2.1	4.8	17.67	12.19	0.64	19.85	27.6	68	2.3	2.1	4.8	14.34	0.92	11.20	90.1	4.6	40
	3.5	4.2	9.7	17.75	11.90	0.59	19.77	30.0	61	3.5	4.2	9.7	15.06	0.93	11.89	91.2	4.7	43
	4.1	7.1	16.4	17.75	11.82	0.58	19.74	30.5	60	4.1	7.1	16.4	15.26	0.93	12.07	91.5	4.8	44
60	2.3	2.1	4.9	17.22	12.43	0.73	19.70	23.7	78	2.3	2.1	4.9	16.24	0.95	13.01	93.0	5.0	48
	3.5	4.2	9.7	17.54	12.32	0.67	19.83	26.1	71	3.5	4.2	9.7	17.06	0.96	13.79	94.3	5.2	52
	4.5	7.0	16.1	17.63	12.24	0.65	19.85	27.1	69	4.5	7.0	16.1	17.41	0.96	14.12	94.8	5.3	54
70	2.3	2.0	4.7	16.45	12.32	0.82	19.25	20.1	87	2.3	2.0	4.7	18.09	0.97	14.78	95.9	5.5	57
	3.5	4.2	9.6	16.97	12.43	0.76	19.57	22.3	81	3.5	4.2	9.6	18.99	0.98	15.64	97.2	5.7	61
	4.5	6.9	15.8	17.14	12.44	0.74	19.66	23.2	79	4.5	6.9	15.8	19.38	0.99	16.01	97.8	5.8	63
80	2.3	2.0	4.5	15.39	11.81	0.92	18.54	16.7	96	3.5	3.4	7.9	20.86	1.00	17.45	100.1	6.1	70
	3.5	4.0	9.2	16.07	12.16	0.86	19.00	18.7	91	3.5	3.4	7.9	20.86	1.00	17.45	100.1	6.1	70
	4.5	6.6	15.3	16.31	12.27	0.83	19.16	19.5	89	3.5	3.4	7.9	20.86	1.00	17.45	100.1	6.1	70
90	2.3	1.9	4.4	14.08	10.89	1.03	17.57	13.7	106	1.8	1.8	4.2	20.87	1.00	17.46	100.1	6.1	70
	3.5	3.9	9.0	14.87	11.47	0.96	18.16	15.4	100	1.8	1.8	4.2	20.87	1.00	17.46	100.1	6.1	70
	4.5	6.6	15.3	15.17	11.67	0.94	18.38	16.1	98	1.8	1.8	4.2	20.87	1.00	17.46	100.1	6.1	70
100	2.3	1.9	4.4	12.53	9.59	1.13	16.39	11.1	115	1.2	0.6	1.4	20.87	1.00	17.46	100.1	6.1	70
	3.5	3.9	8.9	13.39	10.34	1.07	17.06	12.5	110	1.2	0.6	1.4	20.87	1.00	17.46	100.1	6.1	70
	4.5	6.5	15.0	13.74	10.62	1.05	17.32	13.1	108	1.2	0.6	1.4	20.87	1.00	17.46	100.1	6.1	70
110	2.3	1.9	4.4	10.77	7.97	1.24	15.00	8.7	123	0.9	0.2	0.5	20.87	1.00	17.46	100.1	6.1	70
	3.5	3.9	8.9	11.67	8.81	1.19	15.72	9.8	119	0.9	0.2	0.5	20.87	1.00	17.46	100.1	6.1	70
	4.5	6.4	14.8	12.04	9.15	1.16	16.01	10.3	117	0.9	0.2	0.5	20.87	1.00	17.46	100.1	6.1	70
120	2.3	1.9	4.4	8.83	6.14	1.35	13.43	6.5	132	0.7	0.1	0.2	20.87	1.00	17.46	100.1	6.1	70
	3.5	3.8	8.8	9.73	6.98	1.30	14.16	7.5	128	0.7	0.1	0.2	20.87	1.00	17.46	100.1	6.1	70
	4.5	6.3	14.6	10.10	7.33	1.28	14.46	7.9	126	0.7	0.1	0.2	20.87	1.00	17.46	100.1	6.1	70

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL18 with Modulating Valve and ECM Motor

700 CFM Nominal Airflow Heating, 700 CFM Nominal AirFlow Cooling

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						GPM	WPD		Heating - EAT 70°F					
		PSI	FT	TC	SC	kW	HR	EER	LWT		PSI	FT	HC	kW	HE	LAT	COP	LWT
20										6.8	7.2	16.6	10.66	1.03	7.15	82.1	3.0	17.9
30	1.7	0.3	0.7	22.88	15.85	0.75	25.43	30.5	60	3.4	2.2	5.1	11.47	1.04	7.91	83.1	3.2	21
	1.7	0.3	0.7	22.88	15.85	0.75	25.43	30.5	60	5.1	4.2	9.7	11.47	1.04	7.91	83.1	3.2	21
	1.7	0.3	0.7	22.88	15.85	0.75	25.43	30.5	60	6.8	6.7	15.5	11.47	1.04	7.91	83.1	3.2	21
40	2.6	0.4	0.9	22.88	15.85	0.75	25.43	30.5	60	3.4	1.9	4.4	14.65	1.10	10.91	87.3	3.9	31
	2.6	0.4	0.9	22.88	15.85	0.75	25.43	30.5	60	5.1	3.8	8.8	14.65	1.10	10.91	87.3	3.9	31
	2.6	0.4	0.9	22.88	15.85	0.75	25.43	30.5	60	6.8	5.4	12.5	14.65	1.10	10.91	87.3	3.9	31
50	3.4	0.5	1.2	22.46	15.70	0.80	25.18	28.2	60	3.4	1.5	3.5	17.82	1.14	13.92	91.5	4.6	42
	5.1	1.7	3.9	22.87	15.84	0.75	25.43	30.5	60	5.1	3.3	7.6	18.57	1.15	14.64	92.5	4.7	44
	5.1	2.8	6.5	22.87	15.84	0.75	25.43	30.5	60	6.8	4.4	10.2	18.57	1.15	14.64	92.5	4.7	44
60	3.4	1.5	3.5	21.49	15.22	0.90	24.56	23.8	74	3.4	1.5	3.5	20.46	1.18	16.43	95.0	5.1	50
	5.1	2.9	6.7	21.99	15.48	0.85	24.88	25.9	70	5.1	2.9	6.7	21.35	1.19	17.29	96.2	5.3	53
	6.8	4.3	9.9	22.22	15.60	0.82	25.04	27.0	67	6.8	4.3	9.9	21.84	1.20	17.75	96.8	5.3	55
70	3.4	1.4	3.2	20.34	14.55	1.01	23.80	20.1	84	3.4	1.4	3.2	23.10	1.22	18.95	98.5	5.6	59
	5.1	2.4	5.5	20.90	14.89	0.96	24.17	21.8	79	5.1	2.4	5.5	24.13	1.23	19.93	99.8	5.8	62
	6.8	4.2	9.7	21.18	15.05	0.93	24.36	22.7	77	6.8	4.2	9.7	24.68	1.24	20.46	100.6	5.8	64
80	3.4	1.1	2.5	19.06	13.78	1.14	22.93	16.8	93	3.4	1.1	2.5	25.72	1.25	21.45	101.9	6.0	67
	5.1	2.6	6.0	19.66	14.14	1.08	23.34	18.2	89	4.5	2.2	5.1	26.52	1.26	22.21	103.0	6.2	70
	6.8	4.1	9.5	19.96	14.32	1.05	23.54	19.0	87	4.5	2.2	5.1	26.52	1.26	22.21	103.0	6.2	70
90	3.4	1.1	2.5	17.67	12.95	1.27	22.00	13.9	103	2.2	2.0	4.6	26.52	1.26	22.21	103.0	6.2	70
	5.1	2.8	6.5	18.29	13.31	1.21	22.42	15.1	99	2.2	2.0	4.6	26.52	1.26	22.21	103.0	6.2	70
	6.8	4.0	9.2	18.60	13.50	1.18	22.63	15.8	97	2.2	2.0	4.6	26.52	1.26	22.21	103.0	6.2	70
100	3.4	1.1	2.5	16.21	12.12	1.42	21.04	11.5	112	1.5	0.9	2.1	26.52	1.26	22.21	103.0	6.2	70
	5.1	2.2	5.1	16.83	12.46	1.35	21.45	12.4	108	1.5	0.9	2.1	26.52	1.26	22.21	103.0	6.2	70
	6.8	3.6	8.3	17.15	12.64	1.32	21.65	13.0	106	1.5	0.9	2.1	26.52	1.26	22.21	103.0	6.2	70
110	3.4	1.0	2.3	14.70	11.31	1.57	20.07	9.4	122	1.1	0.5	1.2	26.52	1.26	22.21	103.0	6.2	70
	5.1	2.1	4.9	15.31	11.63	1.51	20.46	10.2	118	1.1	0.5	1.2	26.52	1.26	22.21	103.0	6.2	70
	6.8	3.5	8.1	15.62	11.80	1.48	20.66	10.6	116	1.1	0.5	1.2	26.52	1.26	22.21	103.0	6.2	70
120	3.4	1.0	2.3	13.19	10.56	1.74	19.13	7.6	131	0.9	0.2	0.5	26.52	1.26	22.21	103.0	6.2	70
	5.1	2.1	4.9	13.77	10.84	1.68	19.48	8.2	128	0.9	0.2	0.5	26.52	1.26	22.21	103.0	6.2	70
	6.8	3.5	8.1	14.06	10.99	1.64	19.67	8.6	126	0.9	0.2	0.5	26.52	1.26	22.21	103.0	6.2	70

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL24 with Modulating Valve and ECM Motor

850 CFM Nominal Airflow Heating, 850 CFM Nominal AirFlow Cooling

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						GPM	WPD		Heating - EAT 70°F					
		PSI	FT	TC	SC	kW	HR	EER	LWT		PSI	FT	HC	kW	HE	LAT	COP	LWT
20										8.0	5.2	12.0	13.86	1.73	7.94	83.1	2.3	18.0
30	2.4	0.5	1.2	32.76	21.27	1.01	36.21	32.3	60	4.0	0.9	2.1	17.35	1.67	11.67	86.9	3.1	24
	2.4	0.5	1.2	32.76	21.27	1.01	36.21	32.3	60	6.0	2.3	5.3	18.24	1.65	12.60	87.8	3.2	26
	2.4	0.5	1.2	32.76	21.27	1.01	36.21	32.3	60	8.0	5.0	11.6	18.73	1.65	13.11	88.4	3.3	27
40	3.7	0.7	1.6	32.76	21.27	1.01	36.22	32.3	60	4.0	0.7	1.6	21.45	1.63	15.90	91.3	3.9	32
	3.7	0.7	1.6	32.76	21.27	1.01	36.22	32.3	60	6.0	2.3	5.3	22.57	1.63	17.02	92.5	4.1	34
	3.7	0.7	1.6	32.76	21.27	1.01	36.22	32.3	60	8.0	4.6	10.6	23.17	1.63	17.62	93.2	4.2	36
50	4.0	0.5	1.1	31.60	20.72	1.12	35.42	28.3	68	4.0	0.5	1.2	25.28	1.64	19.70	95.5	4.5	40
	6.0	2.2	5.1	32.45	21.13	1.04	36.01	31.2	62	6.0	2.2	5.1	26.56	1.65	20.94	96.9	4.7	43
	7.4	4.0	9.2	32.76	21.27	1.01	36.22	32.3	60	8.0	4.3	9.9	27.25	1.66	21.60	97.6	4.8	45
60	4.0	0.4	1.0	30.07	19.92	1.26	34.35	23.9	77	4.0	0.4	1.0	28.88	1.68	23.15	99.4	5.0	48
	6.0	2.0	4.6	30.98	20.40	1.17	34.98	26.4	72	6.0	2.0	4.6	30.29	1.71	24.46	100.9	5.2	52
	8.0	4.0	9.3	31.43	20.63	1.13	35.29	27.7	69	8.0	4.0	9.3	31.04	1.72	25.16	101.7	5.3	54
70	4.0	0.4	0.9	28.42	19.02	1.41	33.24	20.1	87	4.0	0.4	0.9	32.28	1.75	26.31	103.1	5.4	57
	6.0	1.8	4.1	29.36	19.54	1.32	33.87	22.2	81	6.0	1.8	4.1	33.81	1.79	27.70	104.7	5.5	61
	8.0	3.8	8.7	29.83	19.80	1.28	34.19	23.4	79	7.0	3.8	8.7	34.62	1.81	28.44	105.6	5.6	63
80	4.0	0.3	0.7	26.69	18.04	1.60	32.14	16.7	96	4.0	0.3	0.7	35.56	1.84	29.29	106.6	5.7	65
	6.0	1.7	4.0	27.64	18.58	1.49	32.74	18.5	91	6.0	1.7	4.0	37.21	1.89	30.78	108.4	5.8	70
	8.0	3.5	8.1	28.12	18.85	1.44	33.05	19.5	88	6.2	1.7	3.9	37.32	1.89	30.88	108.6	5.8	70
90	4.0	0.3	0.7	24.92	17.03	1.82	31.13	13.7	106	3.1	0.2	0.5	37.32	1.89	30.88	108.6	5.8	70
	6.0	1.8	4.2	25.86	17.56	1.70	31.65	15.2	101	3.1	0.2	0.5	37.32	1.89	30.88	108.6	5.8	70
	8.0	3.2	7.4	26.34	17.84	1.64	31.93	16.1	98	3.1	0.2	0.5	37.32	1.89	30.88	108.6	5.8	70
100	4.0	0.3	0.6	23.15	16.01	2.08	30.26	11.1	115	2.1	0.1	0.2	37.32	1.89	30.88	108.6	5.8	70
	6.0	1.6	3.7	24.06	16.53	1.94	30.68	12.4	110	2.1	0.1	0.2	37.32	1.89	30.88	108.6	5.8	70
	8.0	3.0	6.9	24.52	16.80	1.87	30.92	13.1	108	2.1	0.1	0.2	37.32	1.89	30.88	108.6	5.8	70
110	4.0	0.2	0.5	21.40	15.01	2.40	29.60	8.9	125	1.5	0.1	0.2	37.32	1.89	30.88	108.6	5.8	70
	6.0	1.6	3.7	22.27	15.50	2.24	29.90	10.0	120	1.5	0.1	0.2	37.32	1.89	30.88	108.6	5.8	70
	8.0	2.9	6.7	22.71	15.76	2.16	30.07	10.5	118	1.5	0.1	0.2	37.32	1.89	30.88	108.6	5.8	70
120	4.0	0.2	0.4	19.73	14.08	2.79	29.24	7.1	135	1.2	0.1	0.2	37.32	1.89	30.88	108.6	5.8	70
	6.0	1.0	2.3	20.54	14.53	2.59	29.38	7.9	130	1.2	0.1	0.2	37.32	1.89	30.88	108.6	5.8	70
	8.0	2.8	6.6	20.95	14.76	2.50	29.48	8.4	127	1.2	0.1	0.2	37.32	1.89	30.88	108.6	5.8	70

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL30 with Modulating Valve and ECM Motor

1000 CFM Nominal Airflow Heating, 1000 CFM Nominal AirFlow Cooling

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						GPM	WPD		Heating - EAT 70°F					
		PSI	FT	TC	SC	kW	HR	EER	LWT		PSI	FT	HC	kW	HE	LAT	COP	LWT
20										8.0	5.2	12.0	17.82	1.72	11.96	84.5	3.0	17
30	2.5	0.5	1.1	33.42	22.73	1.22	37.56	27.5	60	4.0	0.9	2.1	18.94	1.74	13.02	85.5	3.2	20
	2.5	0.5	1.1	33.42	22.73	1.22	37.56	27.5	60	6.0	2.3	5.3	18.94	1.74	13.02	85.5	3.2	20
	2.5	0.5	1.1	33.42	22.73	1.22	37.56	27.5	60	8.0	5.0	11.6	18.94	1.74	13.02	85.5	3.2	20
40	3.8	0.7	1.6	33.42	22.73	1.22	37.56	27.5	60	4.0	0.7	1.6	23.68	1.81	17.50	89.9	3.8	31
	3.8	0.7	1.6	33.42	22.73	1.22	37.56	27.5	60	6.0	2.3	5.3	23.68	1.81	17.50	89.9	3.8	31
	3.8	0.7	1.6	33.42	22.73	1.22	37.56	27.5	60	8.0	4.6	10.6	23.68	1.81	17.50	89.9	3.8	31
50	4.0	0.5	1.1	33.35	22.92	1.33	37.89	25.0	69	4.0	0.5	1.2	27.28	1.87	20.90	93.2	4.3	40
	6.0	2.2	5.1	33.47	22.83	1.25	37.72	26.8	63	6.0	2.2	5.1	28.49	1.89	22.05	94.3	4.4	43
	7.5	4.3	9.9	33.42	22.73	1.22	37.56	27.5	60	8.0	4.3	9.9	29.01	1.90	22.54	94.8	4.5	44
60	4.0	0.4	1.0	32.55	22.62	1.48	37.60	21.9	79	4.0	0.4	0.9	30.51	1.92	23.95	96.2	4.6	48
	6.0	2.0	4.6	33.13	22.86	1.39	37.85	23.9	73	6.0	2.0	4.6	31.79	1.95	25.16	97.4	4.8	52
	8.0	4.0	9.3	33.32	22.91	1.34	37.89	24.9	69	8.0	4.0	9.2	32.47	1.96	25.79	98.0	4.9	54
70	4.0	0.4	0.9	31.19	21.95	1.66	36.85	18.8	88	4.0	0.4	0.9	33.50	1.97	26.76	98.9	5.0	57
	6.0	1.8	4.1	32.09	22.41	1.55	37.36	20.8	82	6.0	1.8	4.2	34.79	2.00	27.97	100.1	5.1	61
	8.0	3.8	8.7	32.48	22.59	1.49	37.57	21.8	79	8.0	3.8	8.8	35.45	2.01	28.59	100.7	5.2	63
80	4.0	0.3	0.7	29.46	21.03	1.86	35.81	15.8	98	4.0	0.3	0.7	36.18	2.02	29.28	101.4	5.2	65
	6.0	1.7	4.0	30.55	21.61	1.73	36.46	17.6	92	6.1	1.8	4.2	37.43	2.05	30.44	102.6	5.4	70
	8.0	3.5	8.1	31.07	21.88	1.67	36.77	18.6	89	6.1	1.8	4.2	37.43	2.05	30.44	102.6	5.4	70
90	4.0	0.3	0.7	27.50	19.98	2.10	34.67	13.1	107	3.1	0.3	0.7	37.43	2.05	30.44	102.6	5.4	70
	6.0	1.8	4.2	28.68	20.61	1.95	35.34	14.7	102	3.1	0.3	0.7	37.43	2.05	30.44	102.6	5.4	70
	8.0	3.2	7.4	29.26	20.92	1.88	35.69	15.5	99	3.1	0.3	0.7	37.43	2.05	30.44	102.6	5.4	70
100	4.0	0.3	0.6	25.45	18.90	2.38	33.57	10.7	117	2.0	0.2	0.5	37.43	2.05	30.44	102.6	5.4	70
	6.0	1.6	3.7	26.62	19.52	2.21	34.18	12.0	111	2.0	0.2	0.5	37.43	2.05	30.44	102.6	5.4	70
	8.0	3.0	6.9	27.22	19.83	2.14	34.51	12.8	109	2.0	0.2	0.5	37.43	2.05	30.44	102.6	5.4	70
110	4.0	0.2	0.5	23.44	17.89	2.71	32.69	8.6	126	1.5	0.1	0.2	37.43	2.05	30.44	102.6	5.4	70
	6.0	1.6	3.7	24.54	18.43	2.52	33.14	9.7	121	1.5	0.1	0.2	37.43	2.05	30.44	102.6	5.4	70
	8.0	2.9	6.7	25.11	18.73	2.43	33.41	10.3	118	1.5	0.1	0.2	37.43	2.05	30.44	102.6	5.4	70
120	4.0	0.2	0.4	21.61	17.07	3.11	32.21	7.0	136	1.2	0.1	0.2	37.43	2.05	30.44	102.6	5.4	70
	6.0	1.0	2.3	22.56	17.48	2.88	32.41	7.8	131	1.2	0.1	0.2	37.43	2.05	30.44	102.6	5.4	70
	8.0	2.8	6.6	23.08	17.72	2.78	32.56	8.3	128	1.2	0.1	0.2	37.43	2.05	30.44	102.6	5.4	70

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data – TSL36 with Modulating Valve and ECM Motor

1200 CFM Nominal Airflow Heating, 1200 CFM Nominal AirFlow Cooling

EWT °F	GPM	WPD		Cooling - EAT 80/67°F						GPM	WPD		Heating - EAT 70°F					
		PSI	FT	TC	SC	kW	HR	EER	LWT		PSI	FT	HC	kW	HE	LAT	COP	LWT
20										9.0	8.6	19.9	23.28	2.22	15.72	85.9	3.1	17
30	3.4	0.9	2.0	45.94	30.11	1.63	51.51	28.2	60	4.5	2.8	6.5	26.08	2.26	18.36	88.1	3.4	22
	3.4	0.9	2.0	45.94	30.11	1.63	51.51	28.2	60	6.0	3.8	8.8	27.35	2.28	19.56	89.1	3.5	23
	3.4	0.9	2.0	45.94	30.11	1.63	51.51	28.2	60	9.0	7.4	17.1	28.06	2.29	20.23	89.6	3.6	26
40	5.2	2.2	5.1	45.94	30.11	1.63	51.51	28.2	60	4.5	1.8	4.2	30.51	2.33	22.56	91.5	3.8	30
	5.2	2.2	5.1	45.94	30.11	1.63	51.51	28.2	60	6.0	2.6	6.0	32.12	2.36	24.08	92.7	4.0	32
	5.2	2.2	5.1	45.94	30.11	1.63	51.51	28.2	60	9.0	7.0	16.2	33.01	2.37	24.92	93.4	4.1	34
50	4.5	0.9	2.1	44.37	29.84	1.86	50.71	23.9	73	4.5	0.9	2.1	35.03	2.40	26.83	95.0	4.3	28
	6.0	2.4	5.6	45.14	30.09	1.75	51.12	25.7	67	6.0	2.4	5.5	36.94	2.43	28.65	96.4	4.5	40
	9.0	4.7	10.7	45.79	30.13	1.66	51.44	27.6	61	9.0	4.7	10.9	38.00	2.45	29.65	97.3	4.5	43
60	4.5	0.9	2.0	42.74	29.04	2.07	49.80	20.7	82	4.5	0.9	2.1	39.39	2.46	31.00	98.3	4.7	46
	6.0	2.3	5.3	43.69	29.54	1.95	50.33	22.4	77	6.0	2.3	5.3	40.98	2.48	32.50	99.5	4.8	49
	9.0	4.4	10.3	44.55	29.91	1.83	50.81	24.3	71	9.0	4.4	10.2	42.71	2.51	34.13	100.9	5.0	52
70	4.5	0.8	1.8	40.81	27.89	2.32	48.73	17.6	92	4.5	0.8	1.8	43.76	2.53	35.11	101.7	5.1	54
	6.0	2.2	5.1	41.90	28.55	2.18	49.33	19.2	86	6.0	2.2	5.1	45.51	2.57	36.75	103.0	5.2	58
	9.0	4.3	10.0	42.94	29.14	2.04	49.91	21.0	81	9.0	4.3	9.9	47.40	2.61	38.50	104.5	5.3	61
80	4.5	0.8	1.8	38.61	26.55	2.62	47.57	14.7	101	4.5	0.8	1.8	48.00	2.62	39.06	105.0	5.4	63
	6.0	2.1	4.9	39.82	27.29	2.46	48.20	16.2	96	6.0	2.1	4.9	49.87	2.67	40.78	106.4	5.5	66
	9.0	4.2	9.6	40.98	28.00	2.30	48.83	17.8	91	8.5	4.1	9.5	51.61	2.71	42.36	107.7	5.6	70
90	4.5	0.8	1.8	36.19	25.14	2.99	46.39	12.1	111	4.3	0.7	1.6	51.61	2.71	42.36	107.7	5.6	70
	6.0	2.1	4.9	37.48	25.88	2.79	47.00	13.4	106	4.3	0.7	1.6	51.61	2.71	42.36	107.7	5.6	70
	9.0	4.0	9.3	38.75	26.64	2.61	47.64	14.9	101	4.3	0.7	1.6	51.61	2.71	42.36	107.7	5.6	70
100	4.5	0.7	1.7	33.58	23.73	3.43	45.27	9.8	120	2.8	0.4	0.9	51.61	2.71	42.36	107.7	5.6	70
	6.0	2.1	4.8	34.93	24.44	3.19	45.83	10.9	115	2.8	0.4	0.9	51.61	2.71	42.36	107.7	5.6	70
	9.0	3.9	9.1	36.27	25.18	2.98	46.43	12.2	110	2.8	0.4	0.9	51.61	2.71	42.36	107.7	5.6	70
110	4.5	0.7	1.5	30.81	22.39	3.95	44.28	7.8	130	2.1	0.2	0.5	51.61	2.71	42.36	107.7	5.6	70
	6.0	2.0	4.6	32.20	23.05	3.68	44.75	8.8	125	2.1	0.2	0.5	51.61	2.71	42.36	107.7	5.6	70
	9.0	3.9	8.9	33.59	23.74	3.42	45.28	9.8	120	2.1	0.2	0.5	51.61	2.71	42.36	107.7	5.6	70
120	4.5	0.6	1.5	27.91	21.16	4.57	43.50	6.1	139	1.7	0.1	0.2	51.61	2.71	42.36	107.7	5.6	70
	6.0	1.9	4.4	29.34	21.75	4.25	43.85	6.9	135	1.7	0.1	0.2	51.61	2.71	42.36	107.7	5.6	70
	9.0	3.6	8.4	30.76	22.37	3.96	44.27	7.8	130	1.7	0.1	0.2	51.61	2.71	42.36	107.7	5.6	70

Interpolation is permissible; extrapolation is not.
 All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
 AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
 Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
 All performance is based upon the lower voltage of dual voltage rated units.
 Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
 Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
 Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
 See performance correction tables for operating conditions other than those listed above.
 See Performance Data Selection Notes for operation in the shaded areas.

Performance Data Correction Tables

Air Flow Correction Table

Airflow % of Nominal (Rated) SCFM	Cooling				Heating		
	Total Capacity	Sensible Capacity	Power	Heat of Rejection	Heating Capacity	Power	Heat of Extraction
70	0.921	0.8	0.969	0.943	0.942	1.077	0.934
75	0.934	0.833	0.974	0.952	0.952	1.062	0.947
80	0.946	0.866	0.979	0.961	0.961	1.048	0.958
85	0.958	0.899	0.985	0.97	0.971	1.035	0.969
90	0.971	0.932	0.99	0.979	0.980	1.023	0.979
95	0.985	0.966	0.995	0.989	0.990	1.011	0.989
100	1.000	1.000	1.000	1.000	1.000	1.000	1.000
105	1.017	1.035	1.005	1.013	1.010	0.989	1.011

Entering Air Correction Table

Heating			
Entering Air DB°F	Heating Capacity	Power	Heat of Extraction
45	1.107	0.768	1.181
50	1.085	0.814	1.143
55	1.064	0.860	1.108
60	1.043	0.906	1.072
65	1.022	0.952	1.036
68	1.009	0.981	1.015
70	1.000	1.000	1.000
75	0.982	1.050	0.962
80	0.953	1.103	0.921

Ent. Air WB °F	Total Capacity	Sensible Capacity-Entering Air Dry Bulb, °F								Power	Heat of Rejection
		65	70	75	80	80.6	85	90	95		
45	0.557	*	*	*	*	*	*	*	*	0.986	0.672
50	0.658	1.100	*	*	*	*	*	*	*	0.989	0.747
55	0.758	0.861	1.091	*	*	*	*	*	*	0.992	0.821
60	0.859	0.623	0.854	1.091	1.325	1.383	*	*	*	0.996	0.896
65	0.960		0.617	0.857	1.093	1.151	1.326	*	*	0.999	0.970
66.2	0.984		0.561	0.801	1.037	1.095	1.270	1.521	*	1.000	0.988
67	1.000		0.523	0.763	1.000	1.058	1.232	1.482	*	1.000	1.000
70	1.060			0.623	0.861	0.919	1.090	1.339	1.563	1.002	1.045
75	1.161				0.629	0.686	0.854	1.101	1.318	1.005	1.119

* = Sensible capacity equals total capacity

AHRI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling - 80.6°F DB/66.2°F WB, and Heating - 68°F DB/59°F WB entering air temperature

Antifreeze Correction Table

Antifreeze Type	Antifreeze %	Cooling			WPD Corr. Fct. EWT 40°F
		EWT 40°F			
		Total Cap	Sens Cap	Power	
Propylene Glycol	15	0.968	0.968	0.990	1.210
	25	0.947	0.947	0.983	1.360
Methanol	15	0.968	0.968	0.990	1.160
	25	0.949	0.949	0.984	1.220
Ethanol	15	0.944	0.944	0.983	1.300
	25	0.917	0.917	0.974	1.360
Ethylene Glycol	15	0.980	0.980	0.994	1.120
	25	0.966	0.966	0.990	1.200

PSC Blower Performance Data

TSL with PSC Motor

Airflow in CFM with wet coil and clean 1" (25mm) fiberglass air filter.

Size	Fan Speed	Rated CFM	Min CFM	External Static Pressure (in. wg)																
				0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.6	0.65	0.70	0.75	0.80		
09	High	400H/350C	284							486	451	435	416	400	384	368				
	Medium							460	447	433	420	400	389	375	361	345	329			
	Low			402	395	389	380	372	361	350	339	328	314	303						
12	High	500H/400C	310						502	486	470	451	435	416	400	384				
	Medium			495	480	472	460	447	433	420	405	389	375	361	342	329				
	Low			402	395	389	380	372	361	350	338	328	318							
15	High	600	416								712	691	668	656	635	623	608	586		
	Medium										696	675	659	637	623	607	586			
	Low			Operation not recommended							637	600	575	549	524	500	458			
18	High	700	480							712	691	668	656	635	623	608	585	485		
	Medium									696	675	659	637	623	607	586	490			
	Low							700	674	637	600	575	549	524	500					
24	High	850	596					1204	1184	1163	1134	1104	1072	1040	1001	961	918	875		
	Medium							980	975	970	960	945	930	910	890	865	840	810	775	740
	Low							890	880	870	865	850	838	825	805	785	768	750	710	670
30	High	1000	798					1204	1184	1163	1134	1100	1072	1040	1001	961	918	875		
	Medium							980	975	970	960	945	930	910	890	865	840	810		
	Low							890	880	870	865	850	840	825	805					
36	High	1200	850					1436	1405	1379	1345	1316	1280	1235	1205	1166	1120	1081	1040	1000
	Medium							1200	1180	1168	1145	1126	1098	1070	1040	1014	980	950	910	875
	Low			950	940	930	920	910	900	890	870	850								

Units with CXM or DXM2 factory shipped on medium and HIGH TAPs. Field select other TAPs if needed.

All airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

All units AHRI/ISO/ASHRAE 13256-1 rated at CFM in table.

CFM Tolerance is 7%.

TSL with Low Static PSC

Airflow in CFM with wet coil and clean 1" (25mm) fiberglass air filter.

Size	Fan Speed	Rated CFM	Min. CFM	External Static Pressure (in. wg)										
				0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50		
09	High	400H/350C	284	420	400	375	330	310	300	290				
	Medium			340	320	300	285							
	Low			330	310	290								
12	High	500H/400C	310	420	400	375			330	310	Operation not recommended			
	Medium			340	320									
	Low			330	310									
15	High	600	416	748	726	703	688			672	659	625		
	Medium			594	584	580	571	561	551	541	526	511		
	Low			521	516	505	500	489	468	461	451			
18	High	700	480	726	703	688	672	659	625	615	615			
	Medium			584	580	571	561	551	541	526	511			
	Low			516	505	500	489							
24	High	850	596	1220	1200	1190	1180	1150	1135	1120	1100			
	Medium			950	940	930	920	900	885	870				
	Low			840	835	830	820	810	795	787				
30	High	1000	798	1220	1200	1190	1180	1150	1135	1120	1100			
	Medium			950	940	930	920	900	885	870				
	Low			840	835	830	820	810	798					
36	High	1200	850	1200	1190	1180	1150	1135	1120			1100		
	Medium			940	930	920	900	880	870	860				
	Low													

Units with CXM or DXM2 factory shipped on medium and HIGH TAPs. Field select other TAPs if needed.

All airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

All units AHRI/ISO/ASHRAE 13256-1 rated at CFM in table.

CFM Tolerance is 7%.

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ECM Blower Performance Data

TSL Ducted ECM 65" Cabinet

All data wet coil clean filter.

Tranquility Model	ESP Range (in wg)	Setting	Cooling Mode		Dehumid Mode		Heating Mode		Constant Fan Only Mode	Hi Fan Mode	Aux Emerg Mode
			Stg 2	Stg 1	Stg 2	Stg 1	Stg 2	Stg 1			
TSL09	0.05 – 0.4	Default	400	350	350	300	450	400	300	400	450
		Maximum	450	450	450	450	450	450	450	450	450
		Minimum	350	300	350	300	400	300	300	350	400
TSL12	0.05 – 0.4	Default	450	400	400	350	450	400	300	400	450
		Maximum	450	450	450	450	450	450	450	450	450
		Minimum	400	350	350	300	400	350	300	350	400
TSL15	0.1 – 0.5	Default	700	600	600	500	600	500	400	600	600
		Maximum	700	700	700	600	700	700	700	700	700
		Minimum	600	500	500	450	500	450	450	500	500
TSL18	0.1 – 0.5	Default	800	700	700	600	700	600	450	600	700
		Maximum	800	800	800	700	800	800	800	800	800
		Minimum	700	600	600	500	600	500	450	500	600
TSL24	0.15 – 0.6	Default	850	800	750	650	850	750	500	750	850
		Maximum	950	850	950	800	950	850	950	950	950
		Minimum	800	650	650	600	750	650	500	650	750
TSL30	0.15 – 0.6	Default	1150	1000	1000	900	1150	1000	600	850	1150
		Maximum	1150	1150	1100	1000	1150	1150	1100	1100	1150
		Minimum	1000	900	900	800	1000	900	600	800	1000
TSL36	0.15 – 0.6	Default	1200	1100	1100	1000	1200	1100	800	950	1200
		Maximum	1350	1200	1200	1100	1350	1200	1200	1350	1350
		Minimum	1100	1000	1000	950	1100	1000	800	1000	1100

All units AHRI/ISO/ASHRAE 13256-1 rated on CFM shown on performance data page.
 Airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.
 Shipped on default settings. C = Cooling; H = Heating; D = Dehumidification.
 Change from default setting with service tool (ACDU02) or Communicating thermostat (ATC32U01).
 Airflow is controlled within 7% up to the max ESP.
 TSL15-36 ramp default is 30.

Sound Data - Case Radiated

Model	Mode	Standard Construction Free Inlet Case Radiated							UltraQuiet Construction Free Inlet Case Radiated						
		Octave Band Frequency, Hz							Octave Band Frequency, Hz						
		125	250	500	1000	2000	4000	8000	125	250	500	1000	2000	4000	8000
TSL09	Fan Only Low Speed Fan	64	57	54	52	47	44	41	64	57	54	52	47	44	41
	Fan Only Med Speed Fan	68	61	57	55	50	48	45	68	61	57	55	50	48	45
	Fan Only High Speed Fan	69	63	59	56	52	51	47	69	63	59	56	52	51	47
	Cooling Low Speed Fan	71	60	60	57	50	48	47	70	59	60	57	50	48	47
	Cooling Med Speed Fan	71	63	60	57	52	50	48	70	62	60	57	52	50	48
	Cooling High Speed Fan	72	63	61	58	53	52	50	71	62	61	58	53	52	50
	Heating Low Speed Fan	74	62	58	57	53	51	49	73	61	58	57	53	51	49
	Heating Med Speed Fan	74	64	59	59	54	52	50	73	63	59	59	54	52	50
TSL12	Heating High Speed Fan	75	64	60	59	55	53	51	74	63	60	59	55	53	51
	Fan Only Low Speed Fan	64	57	55	52	47	44	41	64	57	55	52	47	44	41
	Fan Only Med Speed Fan	68	61	57	55	51	49	45	68	61	57	55	51	49	45
	Fan Only High Speed Fan	70	63	59	55	52	51	48	70	63	59	55	52	51	48
	Cooling Low Speed Fan	69	60	57	52	48	45	42	68	59	57	52	48	45	42
	Cooling Med Speed Fan	70	62	58	55	51	49	46	69	61	58	55	51	49	46
	Cooling High Speed Fan	71	64	59	56	52	51	48	70	63	59	56	52	51	48
	Heating Low Speed Fan	69	59	54	52	47	44	41	68	58	54	52	47	44	41
TSL15	Heating Med Speed Fan	70	62	57	54	50	48	45	69	61	57	54	50	48	45
	Heating High Speed Fan	71	63	58	55	52	51	47	70	62	58	55	52	51	47
	Fan Only Low Speed Fan	69	62	61	57	53	52	46	69	62	61	57	53	52	46
	Fan Only Med Speed Fan	69	62	62	58	54	52	47	69	62	62	58	54	52	47
	Fan Only High Speed Fan	69	63	62	58	54	53	47	69	63	62	58	54	53	47
	Cooling Low Speed Fan	69	63	61	57	53	52	47	68	62	61	57	53	52	47
	Cooling Med Speed Fan	70	63	62	58	54	53	48	69	62	62	58	54	53	48
	Cooling High Speed Fan	70	64	62	58	54	53	48	69	63	62	58	54	53	48
TSL18	Heating Low Speed Fan	69	63	61	57	53	52	46	68	62	61	57	53	52	46
	Heating Med Speed Fan	69	63	61	58	53	52	47	68	62	61	58	53	52	47
	Heating High Speed Fan	70	64	62	58	54	53	47	69	63	62	58	54	53	47
	Fan Only Low Speed Fan	70	64	61	56	52	50	44	70	64	61	56	52	50	44
	Fan Only Med Speed Fan	70	64	61	56	52	50	44	70	64	61	56	52	50	44
	Fan Only High Speed Fan	69	63	61	56	51	50	44	69	63	61	56	51	50	44
	Cooling Low Speed Fan	71	65	61	59	53	53	58	70	64	61	58	53	53	58
	Cooling Med Speed Fan	71	65	61	58	53	53	57	70	64	61	58	53	53	57
TSL24	Cooling High Speed Fan	70	64	61	58	53	52	56	69	63	61	58	53	52	56
	Heating Low Speed Fan	70	65	61	58	53	53	55	69	64	61	58	53	53	55
	Heating Med Speed Fan	70	65	61	58	53	53	55	69	64	61	58	53	53	55
	Heating High Speed Fan	69	64	61	57	53	53	55	68	63	61	57	53	53	55
	Fan Only Low Speed Fan	68	62	59	56	53	51	46	68	62	59	56	53	51	46
	Fan Only Med Speed Fan	69	64	60	58	55	54	49	69	64	60	58	55	54	49
	Fan Only High Speed Fan	71	70	62	60	58	57	52	71	70	62	60	58	57	52
	Cooling Low Speed Fan	68	63	60	56	53	52	47	67	62	60	56	53	52	47
TSL30	Cooling Med Speed Fan	70	64	60	58	55	54	49	69	63	60	58	55	54	49
	Cooling High Speed Fan	72	69	63	61	58	57	53	71	68	63	61	58	57	53
	Heating Low Speed Fan	70	62	60	56	53	53	47	69	61	60	56	53	53	47
	Heating Med Speed Fan	70	64	61	57	55	54	49	69	63	61	57	55	54	49
	Heating High Speed Fan	72	70	62	59	57	57	52	71	69	62	59	57	57	52
	Fan Only Low Speed Fan	67	63	59	56	53	52	46	67	63	59	56	53	52	46
	Fan Only Med Speed Fan	69	64	60	58	55	54	49	69	64	60	58	55	54	49
	Fan Only High Speed Fan	71	70	63	60	58	57	52	71	70	63	60	58	57	52
TSL36	Cooling Low Speed Fan	71	63	61	59	54	53	50	70	62	61	59	54	53	50
	Cooling Med Speed Fan	71	64	62	59	55	54	49	70	63	62	59	55	54	49
	Cooling High Speed Fan	73	69	63	62	58	57	53	72	68	63	62	58	57	53
	Heating Low Speed Fan	74	63	60	57	53	52	48	73	62	60	57	53	52	48
	Heating Med Speed Fan	74	64	61	58	55	54	49	73	63	61	58	55	54	49
	Heating High Speed Fan	74	70	63	60	58	57	52	73	68	63	60	58	57	52
	Fan Only Low Speed Fan	67	61	58	55	52	50	44	67	61	58	55	52	50	44
	Fan Only Med Speed Fan	70	66	61	59	56	55	49	70	66	61	59	56	55	49
TSL36	Fan Only High Speed Fan	71	67	62	61	58	57	51	71	67	62	61	58	57	51
	Cooling Low Speed Fan	71	61	59	57	52	50	45	70	60	59	57	52	50	45
	Cooling Med Speed Fan	70	66	62	60	57	55	49	69	65	62	60	57	55	49
	Cooling High Speed Fan	73	67	63	62	59	57	52	72	66	63	62	59	57	52
	Heating Low Speed Fan	78	62	60	56	53	50	45	77	61	60	56	53	50	45
	Heating Med Speed Fan	75	66	61	59	56	55	49	74	65	61	59	56	55	49
	Heating High Speed Fan	76	67	62	61	58	57	51	75	66	62	61	58	57	51

Notes: Sound power data is obtained using appropriate testing method in a qualified reverberant sound laboratory as per AHRI 260-2011.
For dBA and NC in particular room use sound analyzer on climatemaster.com.

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Sound Data - Ducted Discharge

Model	Mode	Standard Construction Ducted Discharge							UltraQuiet Construction Ducted Discharge						
		Octave Band Frequency, Hz							Octave Band Frequency, Hz						
		125	250	500	1000	2000	4000	8000	125	250	500	1000	2000	4000	8000
TSL09	Fan Only Low Speed Fan	59	52	47	51	40	37	37	59	52	47	51	40	37	37
	Fan Only Med Speed Fan	62	55	46	52	44	43	39	62	55	46	52	44	43	39
	Fan Only High Speed Fan	65	58	49	52	46	45	41	65	58	49	52	46	45	41
	Cooling Low Speed Fan	59	52	50	51	40	38	37	58	52	50	51	40	38	37
	Cooling Med Speed Fan	63	56	47	52	44	43	40	62	56	47	52	44	43	40
	Cooling High Speed Fan	64	58	49	52	47	46	42	63	58	49	52	47	46	42
	Heating Low Speed Fan	60	52	44	49	40	37	37	59	52	44	49	40	37	37
	Heating Med Speed Fan	63	55	46	52	44	42	39	62	55	46	52	44	42	39
TSL12	Heating High Speed Fan	65	57	48	52	46	45	41	64	57	48	52	46	45	41
	Fan Only Low Speed Fan	59	52	45	49	40	37	37	59	52	45	49	40	37	37
	Fan Only Med Speed Fan	63	56	47	53	44	43	39	63	56	47	53	44	43	39
	Fan Only High Speed Fan	63	56	47	53	44	43	39	63	56	47	53	44	43	39
	Cooling Low Speed Fan	69	60	57	52	48	45	42	68	60	57	52	48	45	42
	Cooling Med Speed Fan	70	62	58	55	51	49	46	69	62	58	55	51	49	46
	Cooling High Speed Fan	71	64	59	56	52	51	48	70	63	59	56	52	51	48
	Heating Low Speed Fan	60	52	44	48	40	37	36	59	52	44	48	40	37	36
TSL15	Heating Med Speed Fan	63	55	46	52	44	42	39	62	55	46	52	44	42	39
	Heating High Speed Fan	65	57	48	53	46	45	41	64	57	48	53	46	45	41
	Fan Only Low Speed Fan	68	61	53	52	47	45	40	68	61	53	52	47	45	40
	Fan Only Med Speed Fan	68	63	53	52	47	45	39	68	63	53	52	47	45	39
	Fan Only High Speed Fan	68	62	52	52	47	45	39	68	62	52	52	47	45	39
	Cooling Low Speed Fan	68	63	53	53	48	45	40	67	63	53	53	48	45	40
	Cooling Med Speed Fan	68	63	53	53	48	45	40	67	63	53	53	48	45	40
	Cooling High Speed Fan	68	62	53	52	47	45	40	67	62	53	52	47	45	40
TSL18	Heating Low Speed Fan	68	61	52	52	47	44	39	67	61	52	52	47	44	39
	Heating Med Speed Fan	68	61	52	52	47	44	39	67	61	52	52	47	44	39
	Heating High Speed Fan	69	62	53	52	47	44	39	68	61	53	52	47	44	39
	Fan Only Low Speed Fan	68	61	53	52	47	45	40	68	61	53	52	47	45	40
	Fan Only Med Speed Fan	68	61	53	53	47	45	40	68	61	53	53	47	45	40
	Fan Only High Speed Fan	68	62	52	52	47	45	39	68	62	52	52	47	45	39
	Cooling Low Speed Fan	68	61	53	52	47	45	40	67	61	53	52	47	45	40
	Cooling Med Speed Fan	67	60	52	52	47	45	40	66	60	52	52	47	45	40
TSL24	Cooling High Speed Fan	67	60	52	52	47	45	39	66	59	52	52	47	45	39
	Heating Low Speed Fan	68	61	52	52	47	44	39	67	61	52	52	47	44	39
	Heating Med Speed Fan	68	61	52	52	47	44	39	67	61	52	52	47	44	39
	Heating High Speed Fan	68	60	52	52	47	44	39	67	60	52	52	47	44	39
	Fan Only Low Speed Fan	64	64	54	53	50	48	42	64	64	54	53	50	48	42
	Fan Only Med Speed Fan	66	64	55	53	52	50	44	66	64	55	53	52	50	44
	Fan Only High Speed Fan	68	66	57	56	54	53	47	68	66	57	56	54	53	47
	Cooling Low Speed Fan	64	63	55	54	50	48	42	63	63	55	54	50	48	42
TSL30	Cooling Med Speed Fan	65	65	55	53	52	50	44	64	65	55	53	52	50	44
	Cooling High Speed Fan	68	66	57	56	55	53	47	67	66	57	56	55	53	47
	Heating Low Speed Fan	64	61	54	53	50	47	41	63	61	54	53	50	47	41
	Heating Med Speed Fan	65	62	54	53	51	49	43	64	62	54	53	51	49	43
	Heating High Speed Fan	67	65	57	55	54	52	46	66	64	57	55	54	52	46
	Fan Only Low Speed Fan	64	62	54	53	50	48	42	64	62	54	53	50	48	42
	Fan Only Med Speed Fan	65	63	55	53	52	50	43	65	63	55	53	52	50	43
	Fan Only High Speed Fan	68	66	57	56	55	53	47	68	66	57	56	55	53	47
TSL36	Cooling Low Speed Fan	63	62	58	52	50	48	42	62	62	58	52	50	48	42
	Cooling Med Speed Fan	65	64	56	53	52	50	43	64	64	56	53	52	50	43
	Cooling High Speed Fan	68	65	57	55	53	53	47	67	64	57	55	53	53	47
	Heating Low Speed Fan	66	61	53	53	50	47	41	65	61	53	53	50	47	41
	Heating Med Speed Fan	67	62	55	54	52	49	43	66	62	55	54	52	49	43
	Heating High Speed Fan	68	64	57	55	54	52	46	67	63	57	55	54	52	46
	Fan Only Low Speed Fan	64	59	53	50	49	46	40	64	59	53	50	49	46	40
	Fan Only Med Speed Fan	67	63	56	54	53	51	45	67	63	56	54	53	51	45
TSL36	Fan Only High Speed Fan	68	65	58	56	55	53	47	68	65	58	56	55	53	47
	Cooling Low Speed Fan	64	58	54	49	48	45	40	63	58	54	49	48	45	40
	Cooling Med Speed Fan	67	63	56	54	53	51	45	66	63	56	54	53	51	45
	Cooling High Speed Fan	69	65	58	56	55	53	48	68	64	58	56	55	53	48
	Heating Low Speed Fan	64	58	52	50	49	45	40	63	58	52	50	49	45	40
	Heating Med Speed Fan	67	63	56	54	52	50	44	66	63	56	54	52	50	44
	Heating High Speed Fan	68	64	57	56	54	52	46	67	64	57	56	54	52	46

Notes: Sound power data is obtained using appropriate testing method in a qualified reverberant sound laboratory as per AHRI 260-2011.
For dBA and NC in particular room use sound analyzer on climatemaster.com.

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Physical Data

Model	09	12	15	18	24	30	36
Compressor (1 Each)	Rotary				Scroll		
Factory Charge HFC-410A (oz) [kg]	34 [.97]		43 [1.22]	53 [1.51]	71 [2.01]	66 [1.87]	84 [2.38]
PSC Blower Wheel							
Motor (HP) [W]	1/10 [75]		1/3 [248]				3/4 [561]
Blower Wheel Size (dia x w) - (in) [mm]	6.75 x 7.25 [174 x 184]		9.50 x 7.12 [241 x 181]		9.50 x 8.06 [241 x 205]		
ECM Blower Wheel							
Motor (HP) [W]	1/4 [186]		1/3 [248]			1/2 [373]	3/4 [561]
Blower Wheel Size (dia x w) - (in) [mm]	6.75 x 7.25 [174 x 184]		9.50 x 7.12 [241 x 181]		9.50 x 8.06 [241 x 205]		
Chassis Air Coil							
Air Coil Dimensions (h x w) - (in) [mm]	28 x 14 - [711 x 356]				30 x 18 [762 x 457]		
Standard Filter - 1" [25.4 mm], (w x h) - (in) [mm]	16 x 30 [406 x 762]				20 x 32 [508 x 813]		
Coax Volume (Gallons) [l]	0.215 [.81]	0.26 [.98]	0.367 [1.39]		0.602 [2.28]		
Hose Size (in)	1/2		3/4		1		
Weight							
Chassis - (lbs) [kg]	103 [47]	105 [48]	123 [56]	125 [57]	186 [84]	190 [86]	192 [87]
Cabinet - (lbs) [kg]	108 [49]				142 [64]		

Unit Maximum Water Working Pressure	
Options	Max Pressure PSIG [kPa]
Base Unit (Hoses)	400 [2,757]
Internal Secondary Pump (ISP)	200 [1378]
Internal Motorized Water Valve (MWV)*	300 [2,068]
Internal Auto Flow Valve	400 [2,757]

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

* Units with MWV have 300 [2068] High Pressure Water switch - 250 [1723] Auto Reset

Electrical Data - Standard Static and Low Static PSC Motor (208/230V)

Standard Static PSC Motor (208/230V)

Model #	Voltage Code "G"	Compressor		Blower Motor	Pump Option	Total Unit FLA	Min Circuit Amps	Max Fuse Amps
		RLA	LRA	FLA	FLA			
TSL09	208/230-60-1	3.7	22	0.83	no	4.5	5.5	15
					yes	5.3	6.3	15
TSL12		4.7	25	0.83	no	5.5	6.7	15
					yes	6.3	7.5	15
TSL15		5.6	29	1.6	no	7.2	8.6	15
					yes	8.3	9.7	15
TSL18		6.6	33	2.7	no	9.3	11.0	15
					yes	10.4	12.0	15
TSL24		12.8	58.3	2.7	no	15.5	18.7	30
					yes	16.6	19.8	30
TSL30		12.8	64	2.7	no	15.5	18.7	30
					yes	16.6	19.8	30
TSL36		14.1	77	3.0	no	17.1	20.6	30
					yes	18.2	21.7	35

Low Static PSC Motor (208/230V)

Model #	Voltage Code "G"	Compressor		Blower Motor	Pump Option	Total Unit FLA	Min Circuit Amps	Max Fuse Amps
		RLA	LRA	FLA	FLA			
TSL09	208/230-60-1	3.7	22	0.31	no	4.0	4.9	15
					yes	4.8	5.7	15
TSL12		4.7	25	0.83	no	5.5	6.7	15
					yes	6.3	7.5	15
TSL15		5.6	29	1.0	no	6.6	8.0	15
					yes	7.7	9.1	15
TSL18		6.6	33	1.0	no	7.6	9.3	15
					yes	8.7	10.3	15
TSL24		12.8	58.3	1.1	no	13.9	17.1	25
					yes	15.0	18.2	30
TSL30		12.8	64	2.7	no	15.5	18.7	30
					yes	16.6	19.8	30
TSL36		14.1	77	2.7	no	16.8	20.3	30
					yes	17.9	21.4	35

Electrical Data - Standard and Low Static PSC Motor (265V)

Standard Static PSC Motor (265V)

Model #	Voltage Code "E"	Compressor		Blower Motor	Pump Option	Total Unit FLA	Min Circuit Amps	Max Fuse Amps
		RLA	LRA	FLA	FLA			
TSL09	265-60-1	3.5	22	0.83	no	4.3	5.2	15
					yes	5.1	6.0	15
TSL12		4.2	22	0.83	no	5.0	6.1	15
					yes	5.8	6.9	15
TSL15		5	28	1.58	no	6.6	7.8	15
					yes	7.9	9.1	15
TSL18		5.6	28	2.0	no	7.6	9.0	15
					yes	8.9	10.3	15
TSL24		9.6	54	2.0	no	11.6	9.0	20
					yes	12.9	15.3	20
TSL30		10.9	60	2.0	no	12.9	15.6	25
					yes	14.2	16.9	25
TSL36		12.2	72	2.9	no	15.1	18.2	30
					yes	16.4	19.5	30

Low Static PSC Motor (265V)

Model #	Voltage Code "E"	Compressor		Blower Motor	Pump Option	Total Unit FLA	Min Circuit Amps	Max Fuse Amps
		RLA	LRA	FLA	FLA			
TSL09	265-60-1	3.5	22	0.3	no	3.8	4.7	15
					yes	4.6	5.5	15
TSL12		4.2	22	0.6	no	4.8	5.9	15
					yes	5.6	6.7	15
TSL15		5	28	0.86	no	5.9	7.1	15
					yes	7.2	8.4	15
TSL18		5.6	28	0.86	no	6.5	7.9	15
					yes	7.8	9.2	15
TSL24		9.6	54	0.9	no	10.5	12.9	20
					yes	11.8	14.2	20
TSL30		10.9	60	2.0	no	12.9	15.6	25
					yes	14.2	16.9	25
TSL36		12.2	72	2.0	no	14.2	17.3	25
					yes	15.5	18.6	30

Electrical Data - ECM Motor (208/230V) and (265V)

ECM Motor (208/230V)

Model #	Voltage Code "G"	Compressor		Blower Motor	Pump Option	Total Unit FLA	Min Circuit Amps	Max Fuse Amps
		RLA	LRA	FLA	FLA			
TSL09	208/230-60-1	3.7	22	2.6	no	6.3	7.2	15
					yes	7.1	8.0	15
TSL12		4.7	25	2.6	no	7.3	8.5	15
					yes	8.1	9.3	15
TSL15		5.6	29	2.6	no	8.2	9.6	15
					yes	9.3	10.7	15
TSL18		6.6	33	2.6	no	9.2	10.9	15
					yes	10.3	11.9	15
TSL24		12.8	58.3	2.6	no	15.4	18.6	30
					yes	16.5	19.7	30
TSL30		12.8	64	3.9	no	16.7	19.9	30
					yes	17.8	21.0	30
TSL36		14.1	77	5.2	no	19.3	22.8	35
					yes	20.4	23.9	35

ECM Motor (265V)

Model #	Voltage Code "G"	Compressor		Blower Motor	Pump Option	Total Unit FLA	Min Circuit Amps	Max Fuse Amps
		RLA	LRA	FLA	FLA			
TSL09	265-60-1	3.5	22	2.5	no	6.0	6.9	15
					yes	6.8	7.7	15
TSL12		4.2	22	2.5	no	6.7	7.8	15
					yes	7.5	8.6	15
TSL15		5	28	2.1	no	7.1	8.4	15
					yes	8.4	9.7	15
TSL18		5.6	28	2.1	no	7.7	9.1	15
					yes	9.0	10.4	15
TSL24		9.6	54	2.1	no	11.7	14.1	20
					yes	13.0	15.4	25
TSL30		10.9	60	3.2	no	14.1	16.8	25
					yes	15.4	18.1	25
TSL36		12.2	72	4.7	no	16.9	20.0	30
					yes	18.2	21.3	30

TSM/TSL Series Wiring Diagram Matrix

All current diagrams can be located online at climatemaster.com. Click 'Commercial Professional' (go to 'Resources/literature/wiring diagrams' in the upper right), use part numbers below to lookup wiring diagrams

Model	Wiring Diagram Part Number	Control		Agency	
TSM/TSL CHASSIS - 230/208/60/1; 265/60/1 410A Refrigerant					
09-36, PSC , N.C. MWV	96B0413N42	CXM	STANDARD THERMOSTAT	ETL	
09-36, PSC , N.O. MWV	96B0418N03				
09-36, PSC , N.C. MWV	96B0413N41				
09-36, PSC , N.O. MWV	96B0418N04				
09-36, PSC , MODUL WV	96B0413N05				
09-12, ECM, N.C. MWV	96B0413N43	DXM2			COMMUNICATING THERMOSTAT
09-12, ECM, N.O. MWV	96B0418N01				
09-12, ECM, MODUL WV	96B0413N06				
15-36, ECM, N.C. MWV	96B0413N44				
15-36, ECM, N.O. MWV	96B0418N02				
15-36, ECM, MODUL WV	96B0413N07				
09-36, PSC , N.C. MWV	96B0413N54				
09-36, PSC , N.O. MWV	96B0418N14				
09-36, PSC , MODUL WV	96B0413N19				
09-12, ECM , N.C. MWV	96B0413N55				
09-12, ECM , N.O. MWV	96B0413N15				
09-12, ECM , MODUL WV	96B0413N17				
15-36, ECM , N.C. MWV	96B0413N56				
15-36, ECM , N.O. MWV	96B0413N56				
15-36,ECM , MODUL WV	96B0413N18				
TSM/TSL CABINET - 230/208/60/1; 265/60/1 410A Refrigerant					
09-36 PSC	96B0135N07	CXM/DXM2	SURFACE MOUNT THERMOSTAT	ETL	
09-12 ECM	96B0135N08	CXM/DXM2	SURFACE MOUNT THERMOSTAT		
15-36 ECM	96B0135N09	CXM/DXM2	SURFACE MOUNT THERMOSTAT		
09-36 PSC	96B0135N01	CXM/DXM2	REMOTE THERMOSTST		
09-12 ECM	96B0135N02	CXM/DXM2	REMOTE THERMOSTST		
15-36 ECM	96B0135N03	CXM/DXM2	REMOTE THERMOSTST		
09-36 PSC	96B0135N04	CXM/DXM2	ADA		
09-12 ECM	96B0135N05	CXM/DXM2	ADA		
15-36 ECM	96B0135N06	CXM/DXM2	ADA		
TSM/TSL CABINET AUX MPC/LON					
09-36 PSC; MPC	96B0135N21	CXM/DXM2	WALL SENSOR	ETL	
09-12 ECM; MPC	96B0135N22	CXM/DXM2	WALL SENSOR		
15-36 ECM; MPC	96B0135N23	CXM/DXM2	WALL SENSOR		
09-36 PSC; LON	96B0135N11	CXM/DXM2	WALL SENSOR		
09-12 ECM; LON	96B0135N12	CXM/DXM2	WALL SENSOR		
15-36 ECM; LON	96B0135N13	CXM/DXM2	WALL SENSOR		

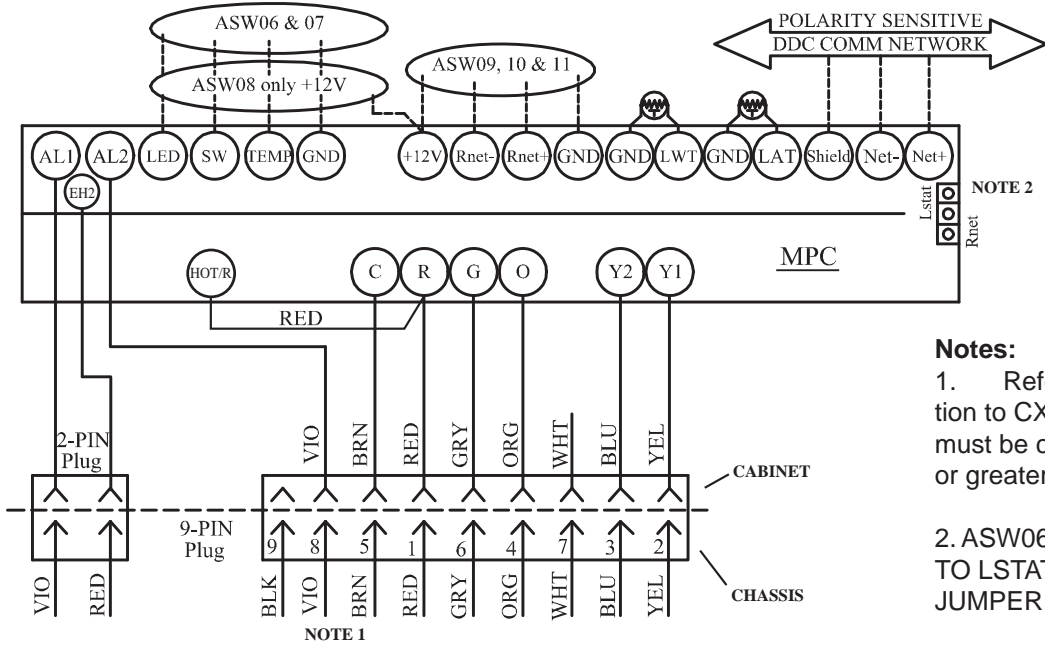
DIP Setting Table

<p>TSM DIGIT 8 = F,Q + CXM Standard</p> <p>S1</p>	<p>TSM DIGIT 8 = K,G + DXM2 Standard</p> <p>S1 S2</p>
<p>TSM DIGIT 8 = H,T + CXM w/LON or MPC</p> <p>S1</p>	<p>TSM DIGIT 8 = V,U + DXM2 w/LON or MPC</p> <p>S1 S2</p>

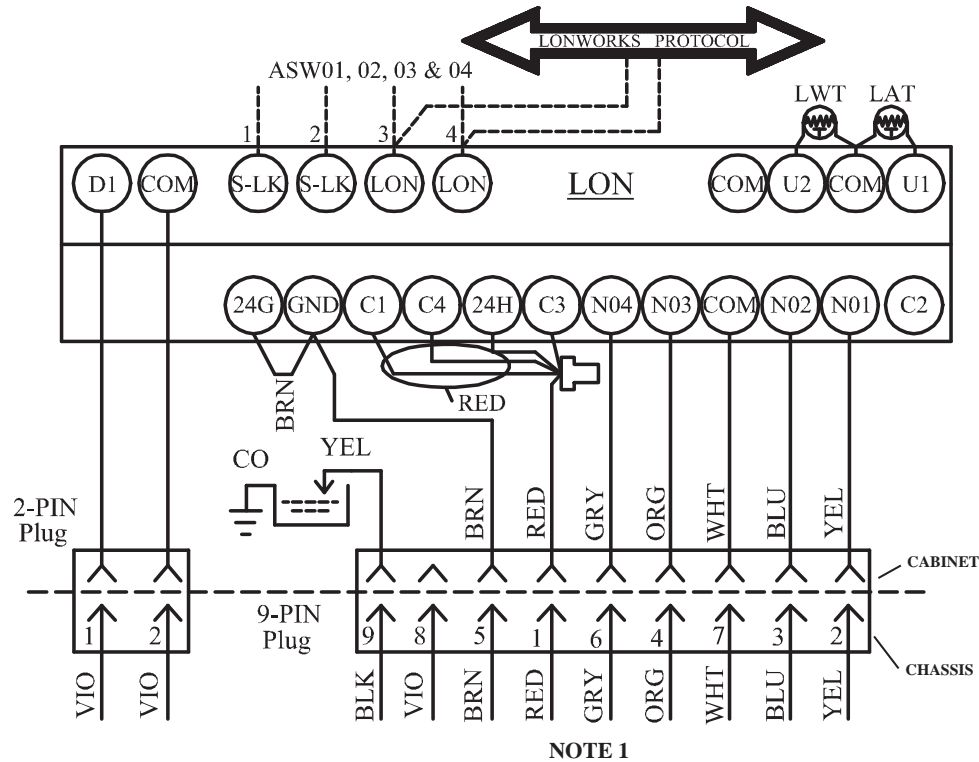
Note: Shade indicates DIP switch locating

Connections to DDC Options

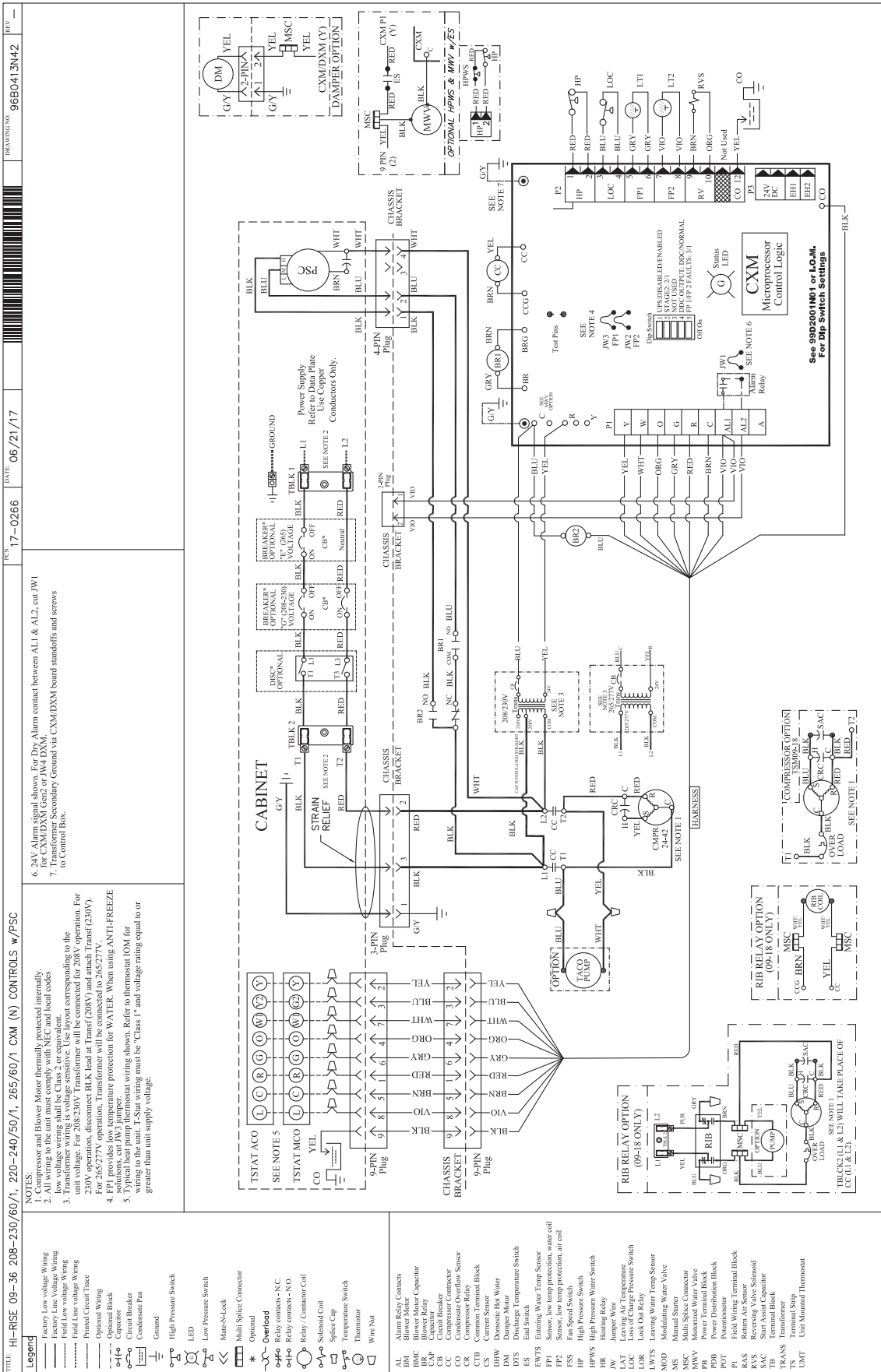
MPC Connections



LON Connections

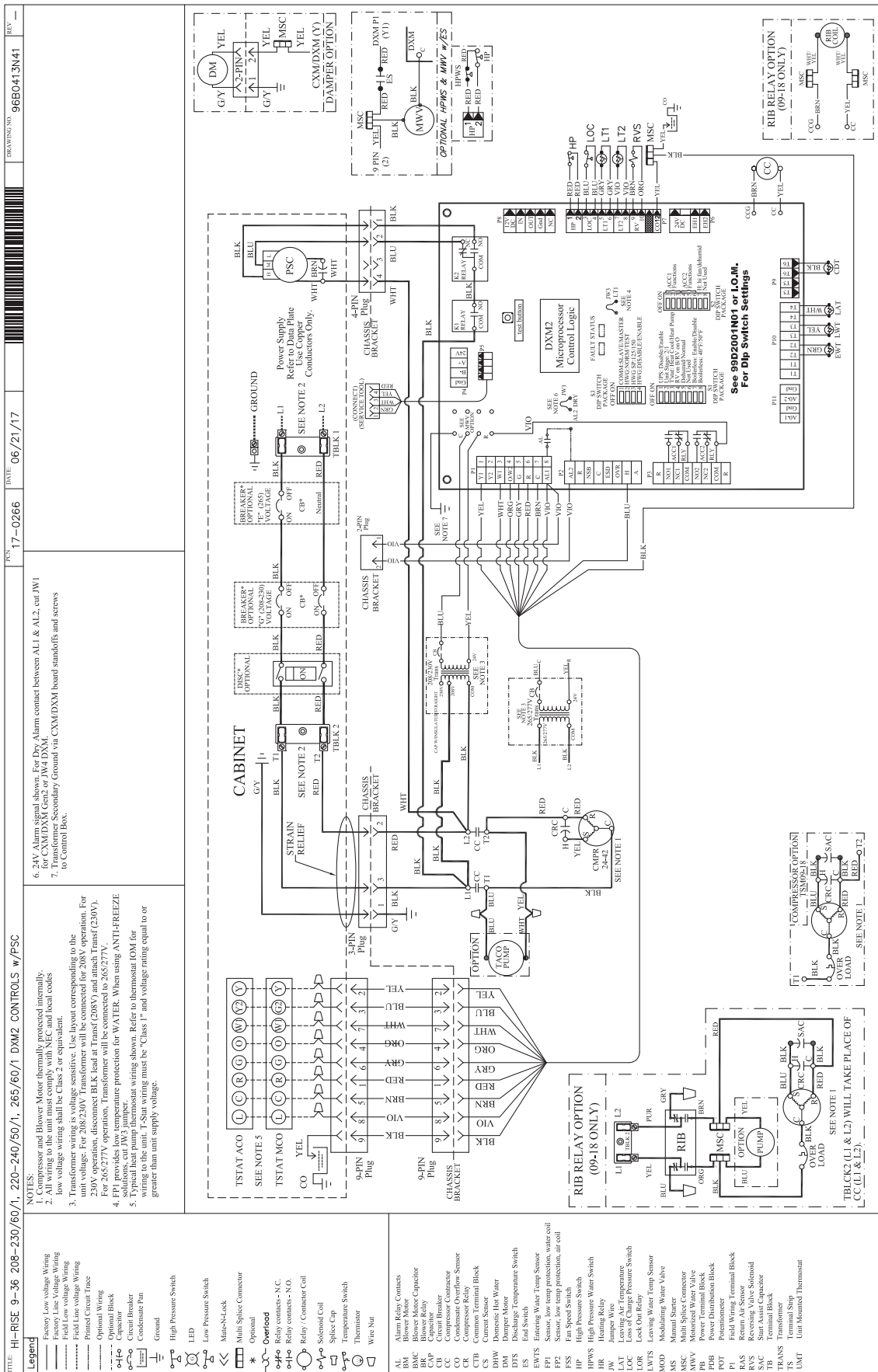


Typical Wiring Diagram – TSL09 - 36 CXM with PSC Motor



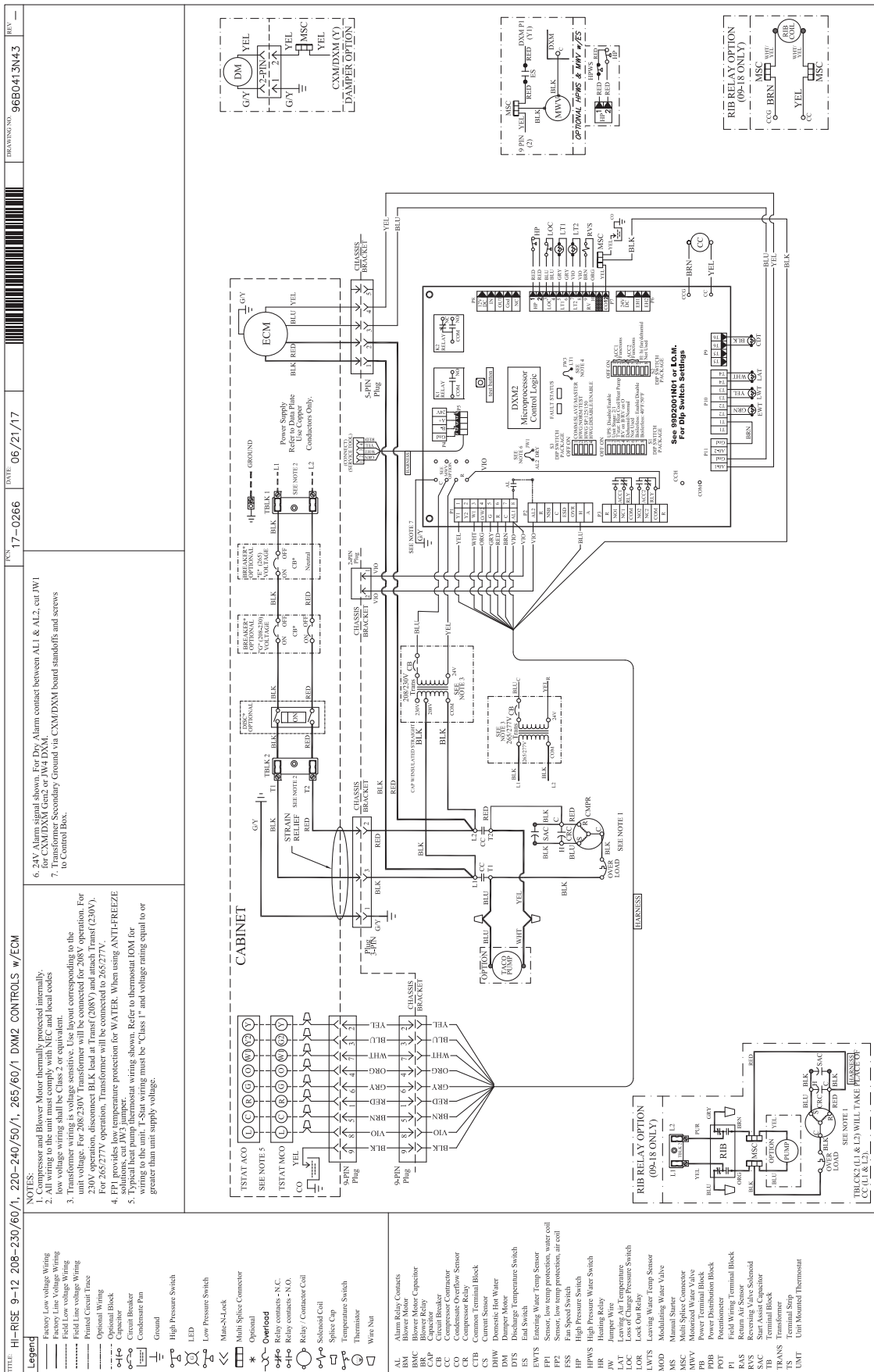
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Typical Wiring Diagram – TSL09 - 36 DXM2 with PSC Motor



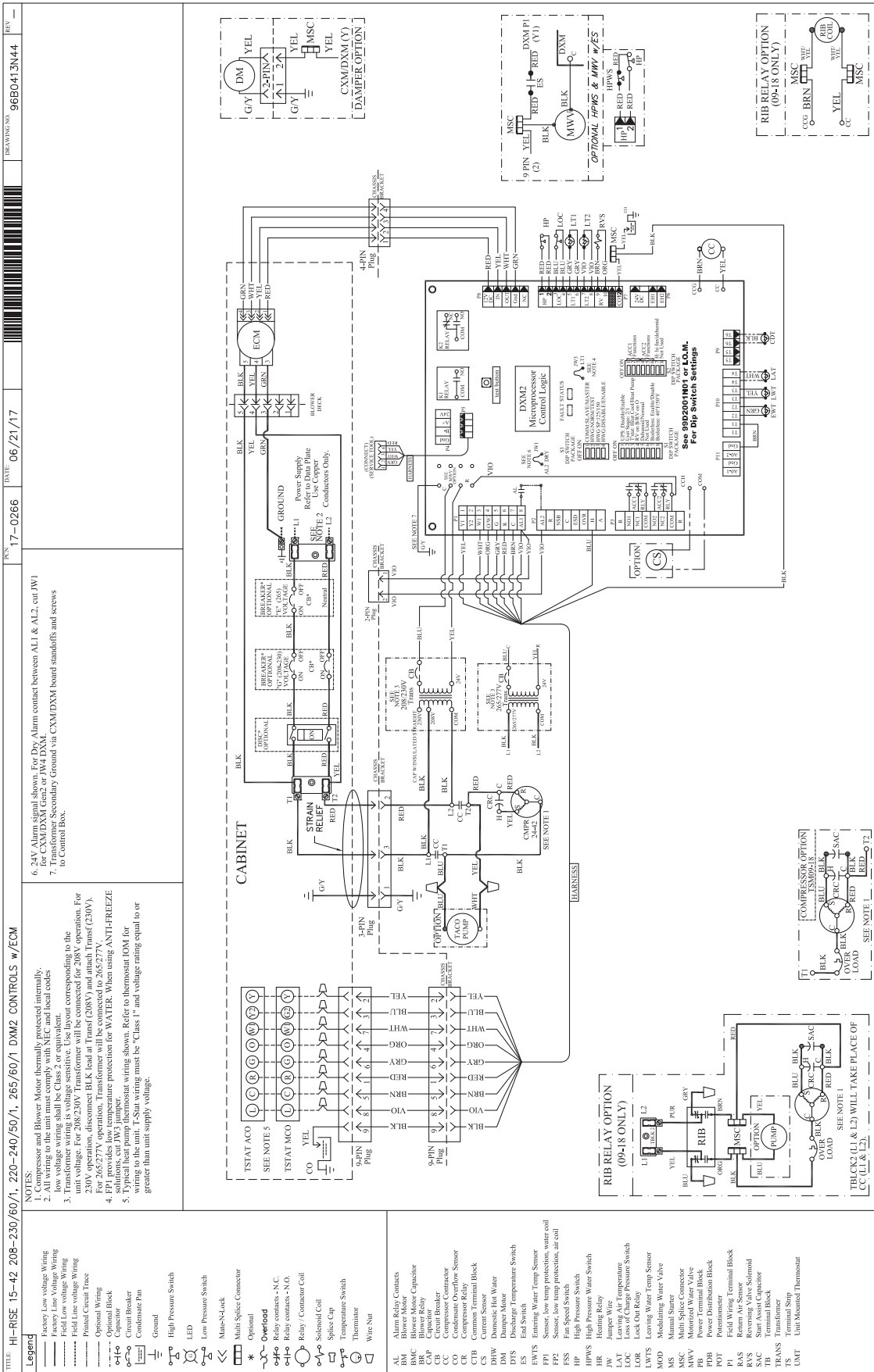
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Typical Wiring Diagram – TSL09 - 12 DXM2 with ECM Motor



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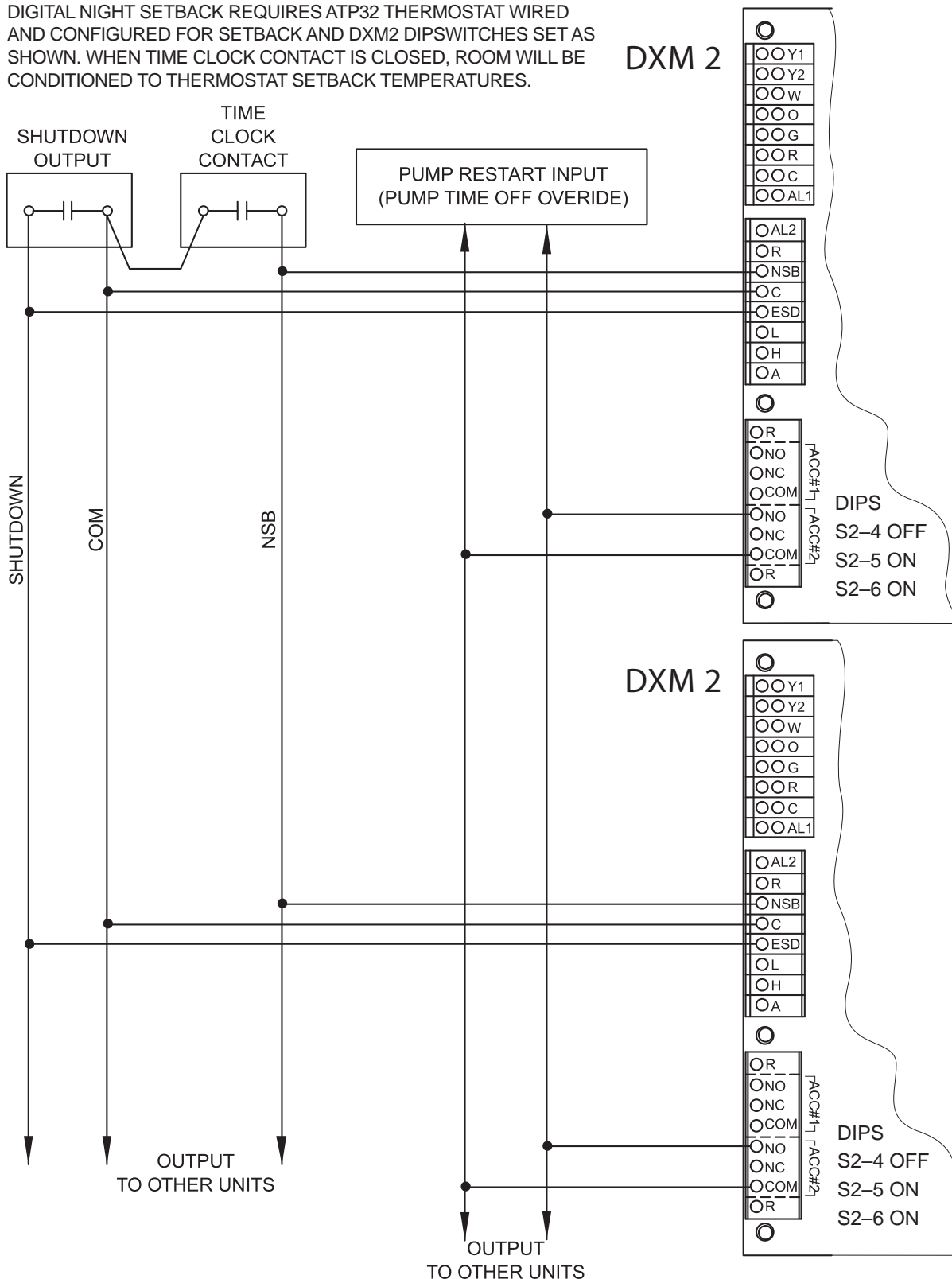
Typical Wiring Diagram – TSL15 - 36 DXM2 with ECM Motor



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Typical Field Wiring Diagram – Units with DXM2 Controller with Digital Night Setback, Emergency Shutdown, & Pump Restart

DIGITAL NIGHT SETBACK REQUIRES ATP32 THERMOSTAT WIRED AND CONFIGURED FOR SETBACK AND DXM2 DIPSWITCHES SET AS SHOWN. WHEN TIME CLOCK CONTACT IS CLOSED, ROOM WILL BE CONDITIONED TO THERMOSTAT SETBACK TEMPERATURES.



NOTES:

1. MAX. NUMBER OF DAISY CHAINED DXM BOARDS IS 75; MAX TOTAL WIRE RESISTANCE IS 500 OHMS.
2. NIGHT SETBACK MODE (DIP SWITCH SETTINGS ALL ON)— ALL THERMOSTAT INPUTS ARE IGNORED. ROOM WILL NOT BE CONDITIONED WHILE TIME CLOCK CONTACT IS CLOSED UNLESS TEMPERATURE SENSOR IS FIELD WIRED BETWEEN R AND OVR.

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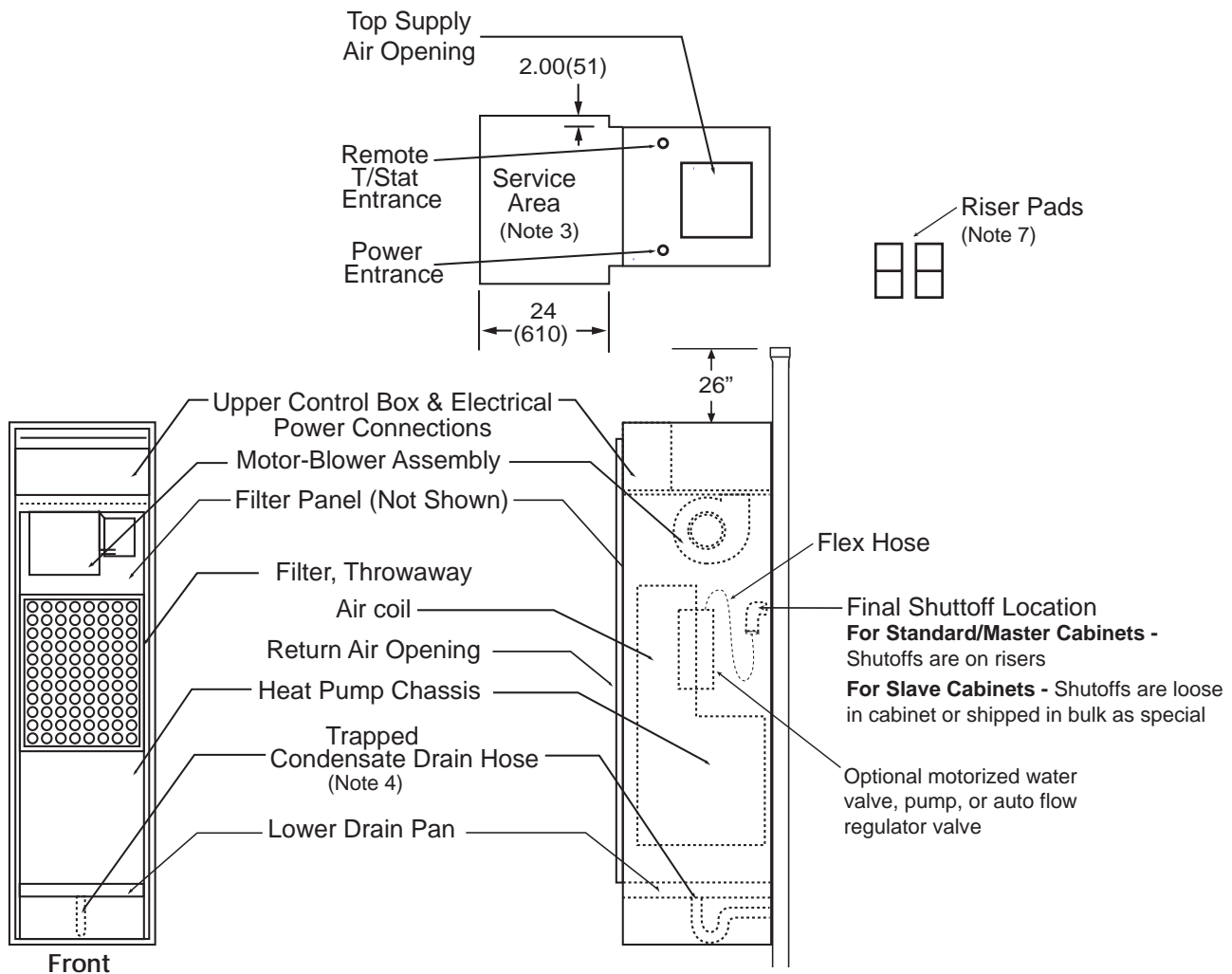
Typical Unit - Exploded View

Major Components

1. TSL Cabinet (Furred-in)
 - A - floating condensate drain pan
 - B - drain P trap
 - C - optional disconnect / breaker location
 - D - upper control box (high voltage terminal blocks optional MPC, Lon)
 - E - blower assembly/motor
 - F - shutoffs (not shown)
 - G - filter panel
 - H - filter
2. TSL Chassis
 - A - compressor acoustic enclosure, compressor, water coil, reversing valve
 - B - data plate
 - C - lower control box (transformer, CXM/DXM2, contactor)
 - D - capacitor
 - E - high and low voltage locking quick connectors
 - F - air coil
3. Architectural Acoustic Return Air Panel (G)
 - A - frame
 - B - hinged inner panel
4. Hoses (Not Shown)
5. Thermostat (Not Shown)
6. Supply Air Ductwork, field supplied (Not shown)



Note 1 - Matching labels for visual aid, chassis and cabinet same size and voltage



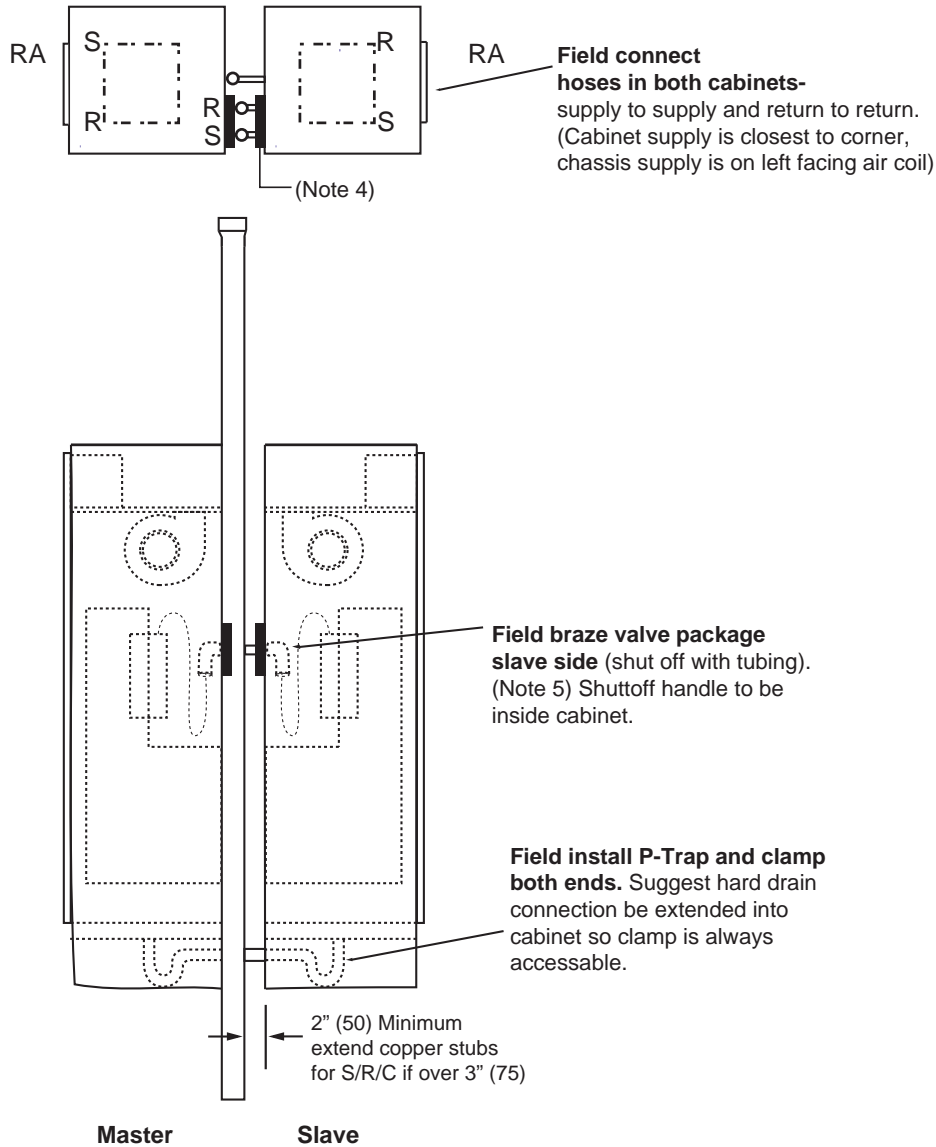
Notes:

1. All dimensions are in inches (mm).
2. The return air/control box side is defined as front of cabinet. Riser K.O.'s are on all panels.
3. Service area from finished wall and 4" wider than cabinet.
4. Installer must cut drain hose connect to condensate pan and riser stubout, clamp both ends. Suggest running hard tubing inside and clamping inside so there is future access
5. Contractor to supply ductwork, see blower table for maximum static.
6. Risers ship separate for standard and master cabinets.
7. Installer must apply riser pads to outside of cabinet to seal supply and return slots.

▲ NOTICE! ▲

Design all ductwork in accordance with SMACNA guidelines.

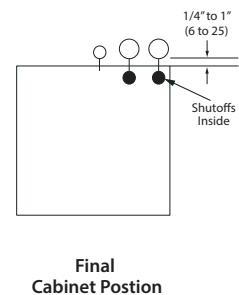
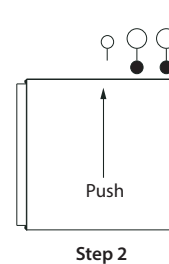
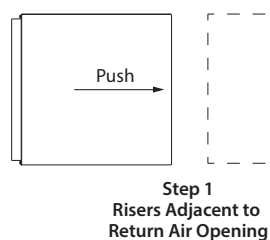
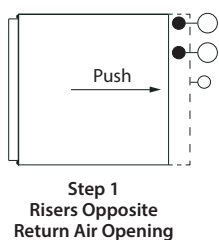
Master/Slave Cabinet



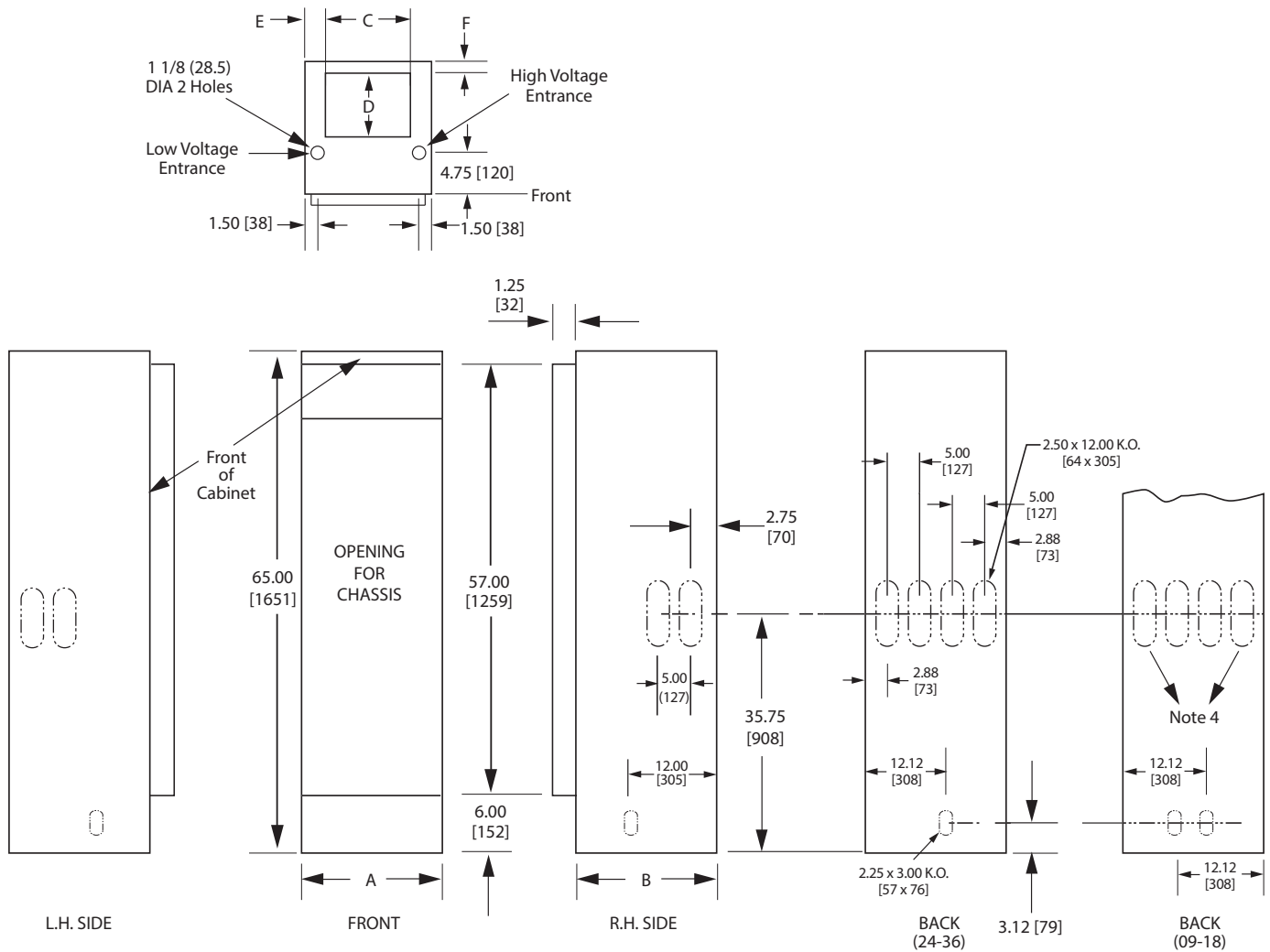
Notes:

1. Contractor must meet all fire and building code requirements.
2. Size riser diameter for both units GPM.
3. Master/Slave means both units share common riser.
4. Install pads on back of slave cabinet to cover slots used for S/R risers.
5. Installer must provide crossover water piping from riser to slave unit. Piping must have same pressure rating or higher as riser.

When cabinets are pushed up to risers allow sufficient clearance. Shutoffs should be inside cabinet.



Cabinet Dimensions

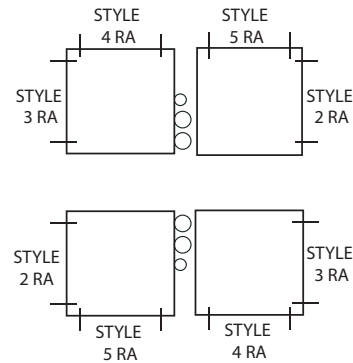
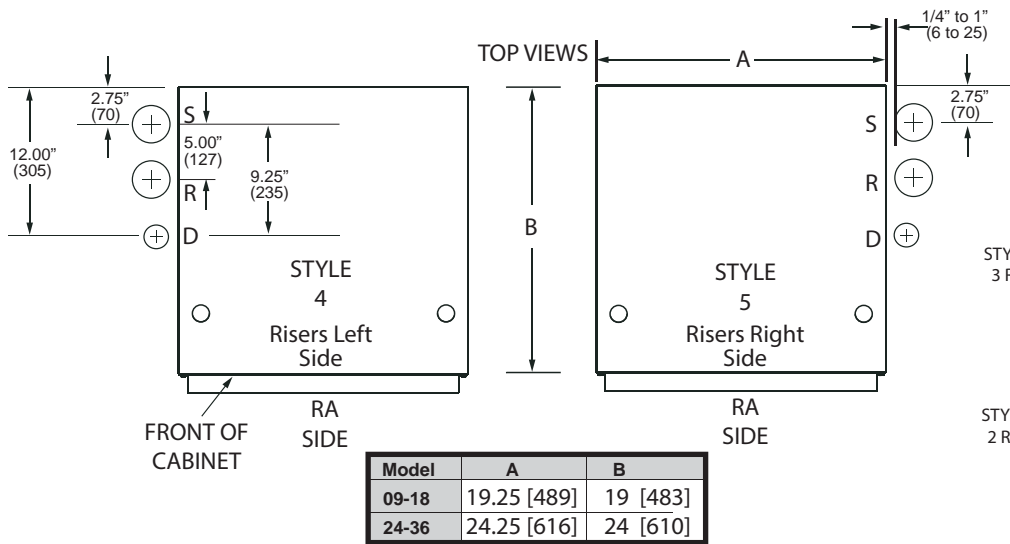


Notes:

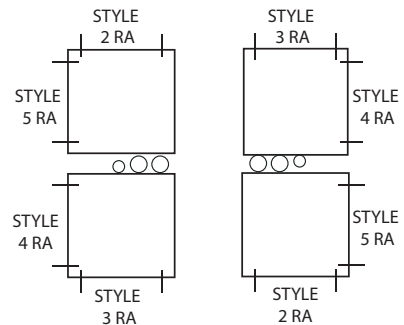
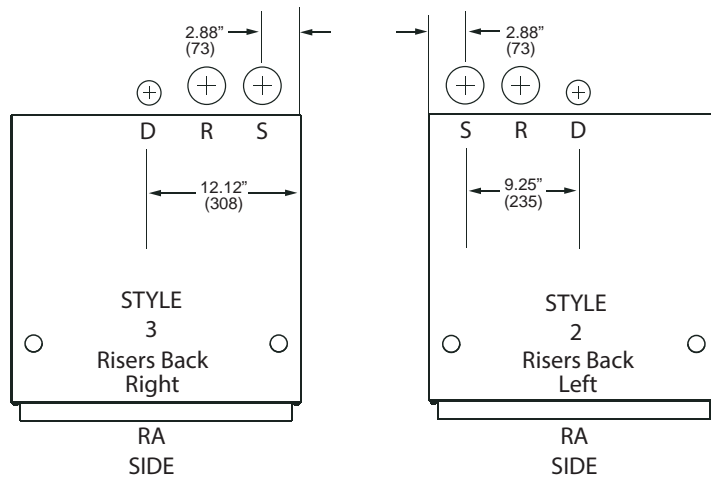
1. All dimensions are in inches (mm).
2. Cabinets have riser K.O.'s, all panels. Remove only K.O.'s necessary to configure cabinet. Seal any K.O.'s removed by mistake.
3. Service area to be width of cabinet and 24" [610] from finished wall.
4. For 09-18 cabinet use drain diagonally across from supply and return risers.
5. Cabinet model digits 11 and 12 will be E0.

Unit Size	A	B	C	D	E	F
TSL09 - 12	19.25 [489]	19.00 [483]	11.50 [292]	6.00 [152]	2.62 [66.5]	.665 [17]
TSL15 - 18					3.87 [93]	
TSL24 - 36	24.25 [616]	24.00 [610]	12.00 [305]	12.00 [305]	6.12 [155.5]	1.04 [26]

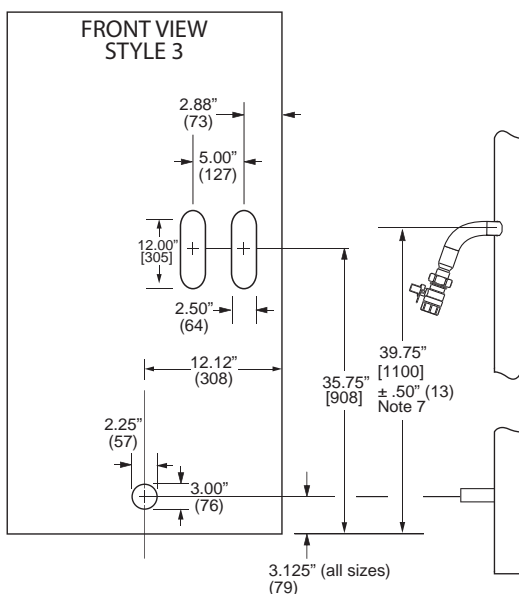
Cabinet Slot Dimensions and Riser Arrangements



Note 8



Note 8



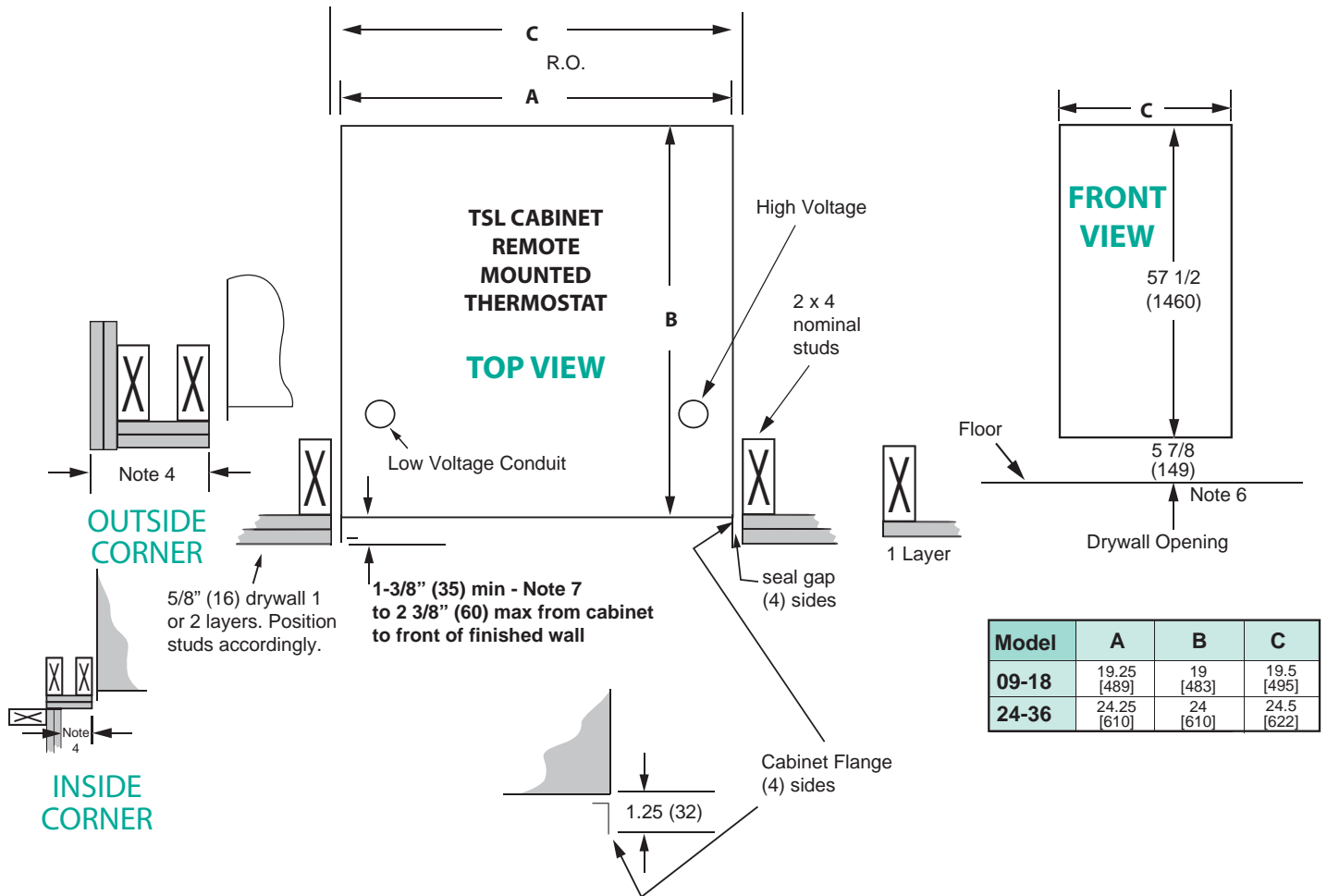
▲ NOTICE! ▲

NOTICE! Not all styles will stack above or adjacent to each other. (See Note 8).

Notes:

1. Dimensions are inches [mm].
2. Style refers to cabinet model digit 9 - riser location.
3. **Return air side is the front of the cabinet.**
4. Supply riser is closest to corner.
5. Drain is not centered on D1-D4 (09-18) cabinets.
6. Slots allow for riser stack expansion and contraction.
7. Supply and return riser stub outs are 39.75" (1100) from bottom of cabinet and is not centered vertically in slot. Drain Runout is 3.12" (79) from bottom of cabinet.
8. From floor to floor on one riser stack you can only have: all same style, styles 2 and 5; or styles 3 and 4. For master/slave units you can only have styles 3 or 4 adjacent to 2 or 5.
9. Secure riser stack to building structure.
10. Riser should not touch cabinet and shutoff should be inside cabinet.

Typical Cabinet with G Panel Installation

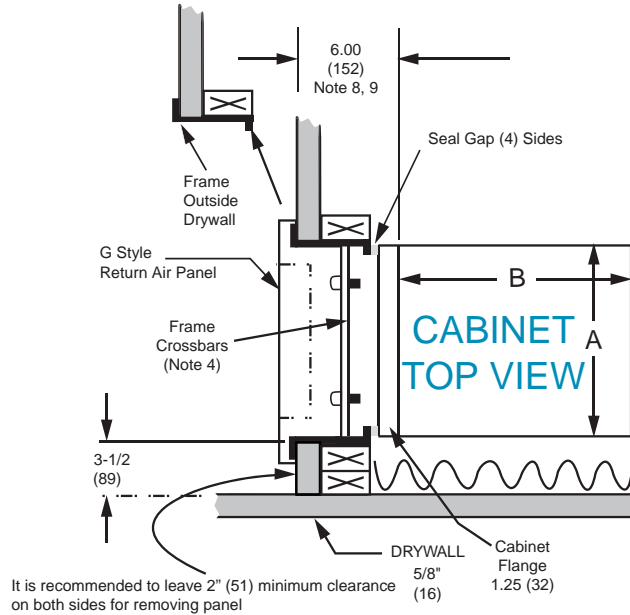


⚠ NOTICE! ⚠

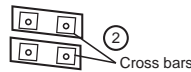
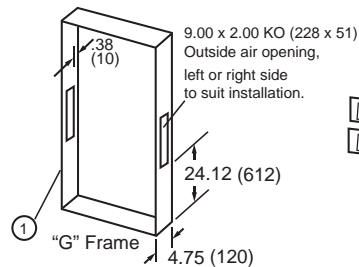
Seal between studs and cabinet flanges with weather tight foam material to prevent wall cavity air from infiltrating unit or room.

1. All dimensions are in inches (mm).
2. Cabinet configuration will determine slab core drilling location and walls surrounding cabinet.
3. Recommend stud walls surrounding cabinet. Drywall and studs should not be attached or contacting cabinet for best sound attenuation. Where possible fill gaps with sound absorbing material. Use iso pad under cabinet. Secure cabinet to floor in two places at back.
4. Return air panel (not shown) overlaps rough opening, allow minimum of 3 1/2" (89) dry wall to corner. Do not caulk G panel to wall.
5. Installer supplied top duct should connect with flex boot.
6. If cabinet stand or ISO pad is used add to dimension.
7. For 2" (50) filter set cabinet 2" (50) minimum from front of drywall.

Typical Recessed Cabinet with G Panel and Frame Installation



It is recommended to leave 2" (51) minimum clearance on both sides for removing panel



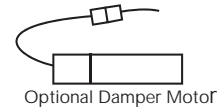
⚠ NOTICE! ⚠

Recessed cabinet requires frame kit.

Outside air requires motorized damper or pre-treated air Above 45°F (7°C).

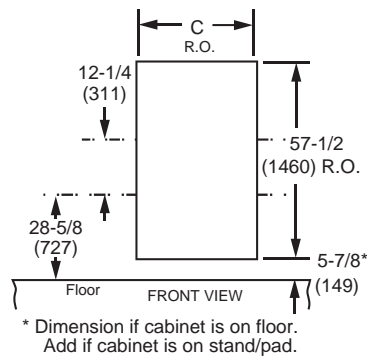
Seal between the frame and cabinet with weather seal material to avoid air being pulled in from the wall cavity. Attach frame to studs not cabinet.

Do not distort frame shim sides if required.



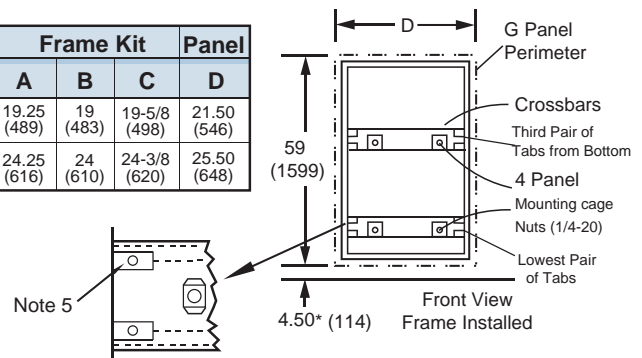
(Order separately) 48A0100N04 may be installed on left or right side. Note 7 short wire harness to be installed in electric box, remove ko in box cover, snap in molex.

Kit Part	Qty	Description
1	1	Frame
2	2	Cross Bar



* Dimension if cabinet is on floor. Add if cabinet is on stand/pad.

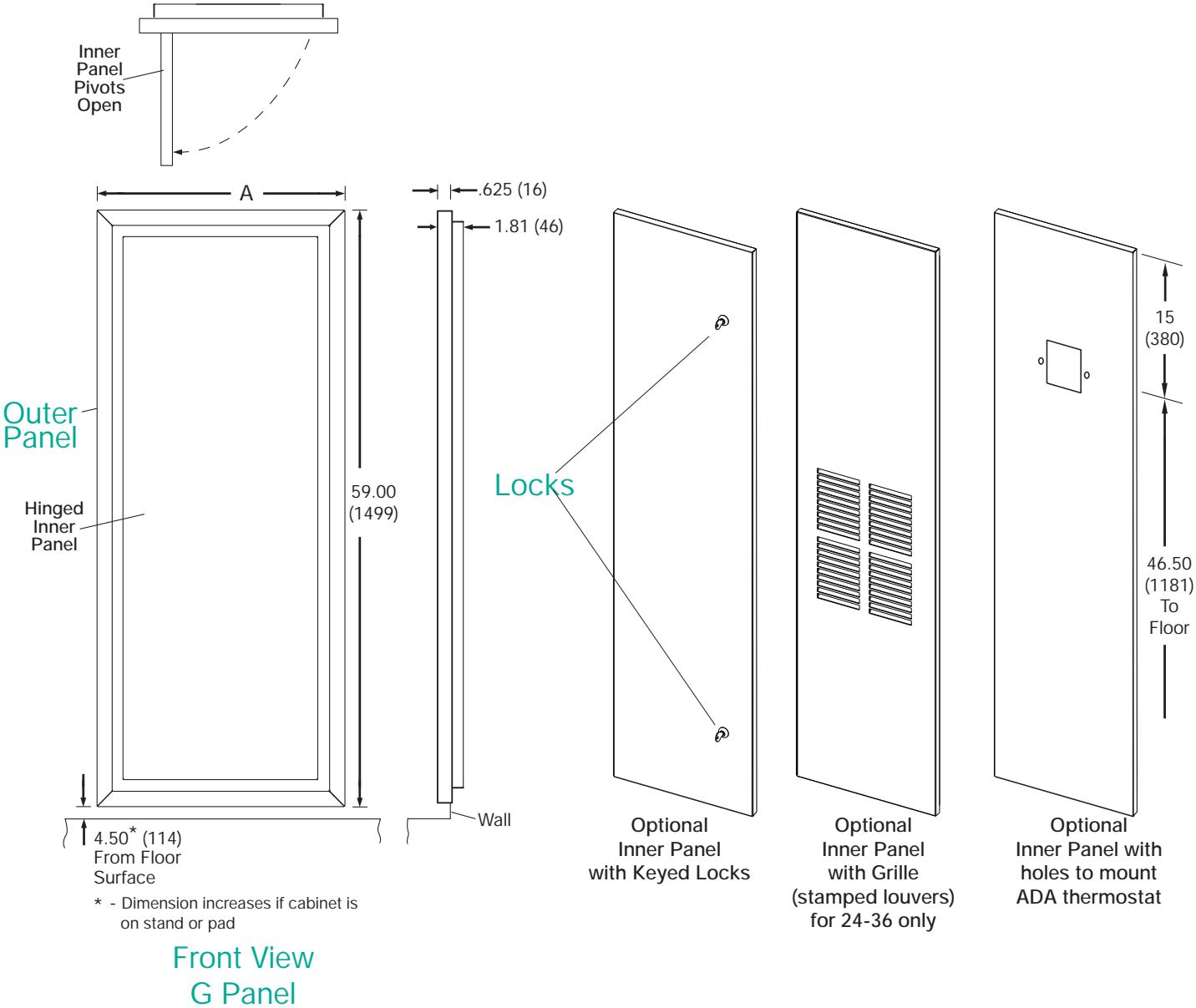
Kit	Size	Frame Kit				Panel
		A	B	C	D	
48A0100N51	09-18	19.25 (489)	19 (483)	19-5/8 (498)	21.50 (546)	
48A0100N52	24-36	24.25 (616)	24 (610)	24-3/8 (620)	25.50 (648)	



Notes

- Cabinet configuration will determine slab core drilling location and walls surrounding cabinet.
- Recommend stud walls surrounding cabinet. Drywall and studs should not be attached or contacting cabinet for best sound attenuation. Where possible fill gaps with sound absorbing material. Use iso pad under cabinet. Secure cabinet to floor in two places at back.
- Return air panel overlaps rough opening, allow minimum of 3 1/2" (89) dry wall to corner. Do not caulk panel to wall.
- G Panel attaches to frame cross bars. Cabinet must be recessed behind wall.
- Bend out 4 tabs per side on frame. Position cross bars behind ears, attach with 8 screws.
- For filter access, pivot inner panel, open filter access snap. For chassis removal, remove G Panel, remove 2 cross bars, remove filter panel, slide out chassis.
- When untreated outside air is required, 48A0100N04 motorized damper must be used, mixed air temperature must be no lower than 45°F (7°C), no higher than 95 DB/75 WB, and not exceed 20% of total CFM. Contractor must supply air duct, cut hole in stud, remove K.O., assemble and wire damper assembly.**
Note: Use extreme weather temperatures.
- For 2" filter set cabinet 6.25" (158) from front of drywall.
- If drywall flanges (2) are removed, cabinet can be set 1" (25) closer to finished wall.
- Dimensions are in inches (mm). All studs nominal 2x4, 1.50 (38) x 3.50 (89).

Hinged “G” Style Return Air Panel – AVHSG Series



Notes:

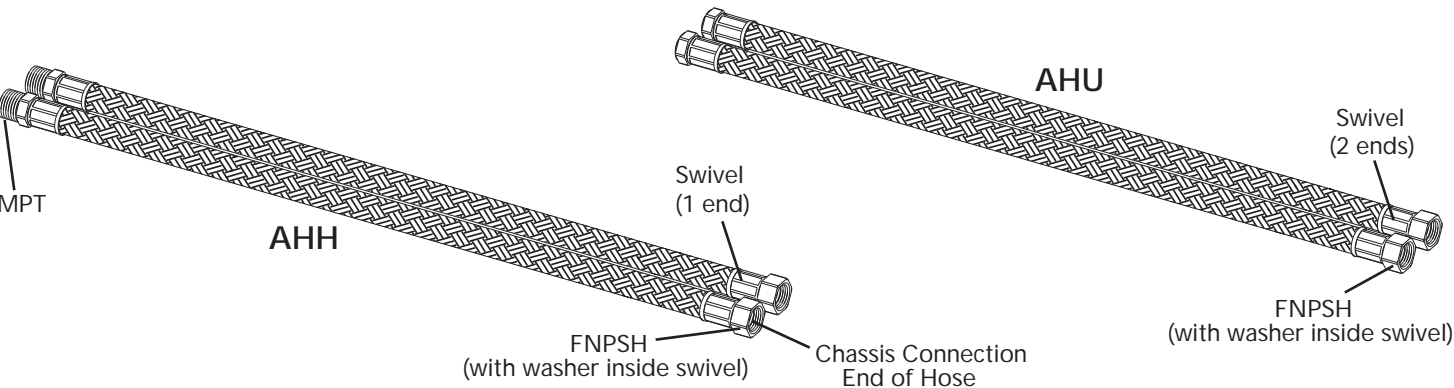
1. Dimensions are in inches (mm).
2. Panel painted polar ice.
3. Inner panel pivots open 90°, for filter replacement without removing panel.
4. Shipped as left-hand pivot, but can be field converted to right hand. Cannot convert panel with grille, or ADA options.
5. Optional locks, ADA, and louvered panel available.
6. Optional frame for recessed cabinet applications and damper assembly available. See Recessed Cabinet.

Unit	AVHSG Digit 6	A
09 - 18	1	21.50 (546)
24 - 36	3	25.50 (648)

Hose Kits and Stands

AHH and AHU Series Hose Kit Specifications:

- See drawing for end connections; AHH used for union cap valve and AHU used for sweat valve.
- Designed for vertical high rise water-source heat pump applications.
- Kevlar® reinforced EPDM core with ANSI 302/304 stainless steel outer braid.
- Fire rated materials per ASTM E 84-00 (NFPA 255, ANSI/UL 723 & UBC 8-1).
- Swivel connection provides union between chassis and riser shutoff.
- Brass fittings, stainless steel ferrules.
- Temperature range of 15°F [9°C] to 180°F [82°C]. (Operation below 32°F requires antifreeze)
- Max. working pressure of 400 psi [2756 kPa].
- Min. burst pressure of four times working pressure.



Physical Data

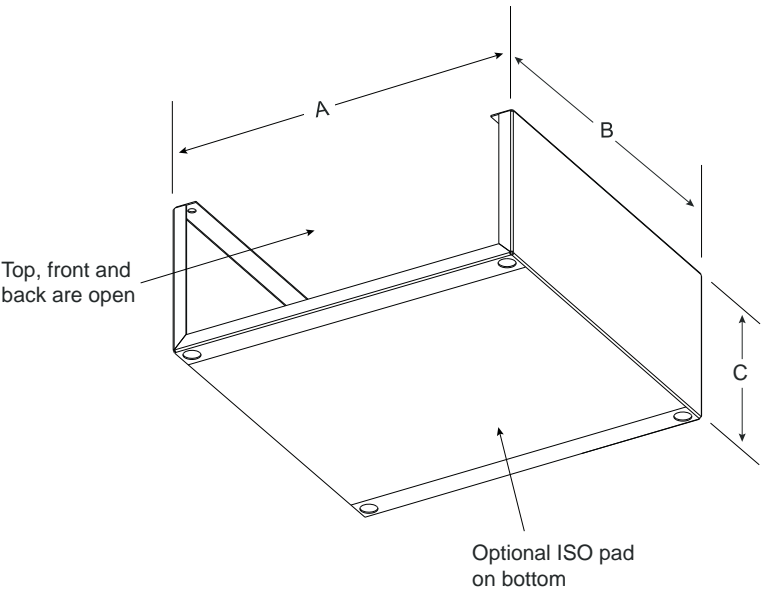
Unit	Inside Diameter inches	Length feet [cm]	Working Pressure psi [kPa]	Min. Burst Pressure psi [kPa]	Min. Bend Radius inches [mm]
09, 12	0.50	3 [91]	400 [2756]	1600 [11024]	2.5 [63.5]
15, 18	0.75	3 [91]	400 [2756]	1600 [11024]	4.5 [114.3]
24-36	1.00	3 [91]	400 [2756]	1600 [11024]	5.5 [139.7]

ACST Cabinet Stands

Specifications

- 1" to 12" (25 to 305) tall, 1" (25) increments
- 16 Gauge galvanized steel
- Attached to cabinet with 4 screws, included.
- Ships in bulk for field installaton.
- Optional ISO pad .06" (1.5) thick

Unit	A	B	C
09-18	18.86 [479]	18.25 [464]	1 to 12 (25 to 305)
24-36	23.86 [606]	23.25 [590]	



Thermostats

Two types of thermostats are available -

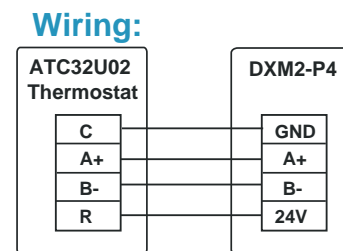
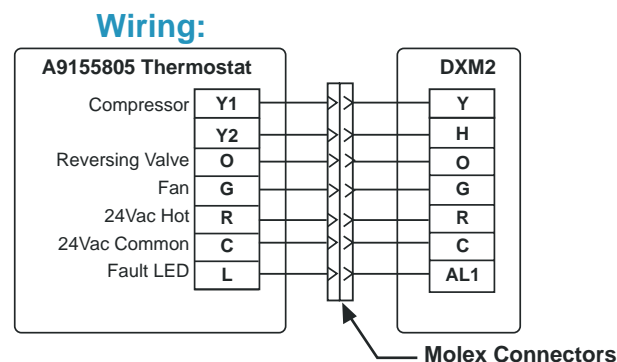
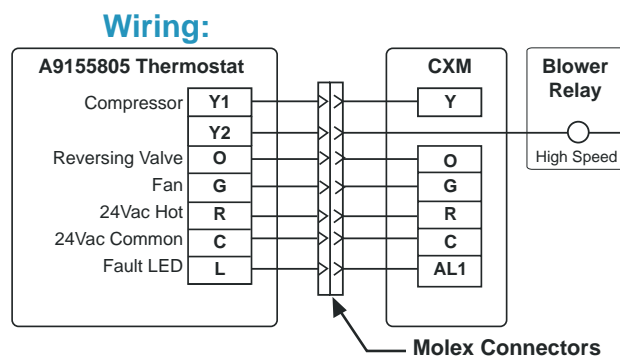
AT Series - require field to make wiring connections to screw terminals on thermostat. Cabinet construction for remote thermostat with field supplied whip (wires long enough to reach wall thermostat location) use AT Series.

A91558 Series - are the AT Series thermostats with a wire harness factory assembled, 6" long wires terminating with 9 pin molex connector. Cabinet construction for remote mount thermostat with optional factory whip (15, 25, or 35 foot (457, 762, or 1067 cm) wires terminate with 9 pin molex for quick connection to A91558 Series thermostats.

Customer supplied thermostats should be approved by ClimateMaster Engineering Department prior to using.

All cabinets are compatible with 2 speed thermostats (G2 or Y2).

A9155805 shown below is ATP32U03C with factory wire harness (pigtail) assembled to thermostat.



Thermostat Only	Thermostat Assembly with Molex Connector 6" Pigtail	CXM	DXM2	Manual Changeover	Automatic Changeover	Programmable	Digital	Fault Indicator	Setback Override	Fan Speeds	Set Temperature Limits	Communicating
ATA11U01	A9155801	X	X	X	X		X	X		1		
ATA11U03	A9155802	X	X	X	X		X			2**	X	
ATA22U01	A9155804	X	X	X	X		X	X		1 or 2*		
ATP32U03C	A9155805	X	X	X	X	X	X	X	X	1 or 2*	X	
ATP21W02	A9155809 A9155811	X	X	X		X	X			1		
ATC32U02C	A9155806		X	X	X	X	X	X	X	2*	X	X

*Fan speed change automatic through thermostat Y2 signal.

** - Manual speed change

Note: A9155809 for ADA, A9155811 for Remote Mount.

TSL Cabinet Options

Optional Low Static PSC Motor

For installations with minimal ductwork. See blower table.

Optional Cabinet Disconnect Switch

Located on control box access door. Can be accessed through slot in "G" Panel Frame. Classified as motor disconnect. See Cabinet decoder.

Optional Cabinet Circuit Breaker

Located on control box access door. Can be accessed through slot in "G" Panel Frame. All 208/230V and 265V 15 and 20 amp classified as HACR breaker. 265V 25 amp and higher classified as supplemental breaker. See Cabinet decoder.

Optional Thermostat Wire Harness (WHIP)

Low voltage wire harness 15, 25, or 35 foot ending with 9-Pin Molex quick connector. Exits cabinet on top, left front corner. Thermostat cable is rated CL-2. See Cabinet decoder. Can be encased in BX conduit as special, contact factory.

Optional Premium Seal

Located on cabinet filter panel, seal is upgraded to extruded rubber gasket for durability and long life.

Optional 2" Filter and Holder

2" filter improves air filtration and reduces maintenance.

Accessory Filters (Not available for every application - check blower table for ESP)

1" (25mm) thick, MERV 8, and MERV 11

2" (50mm) thick, MERV 8, MERV 11, and MERV 13

TSL Accessory Filter ESP Table

		TSL with ECM Motor				Accessory Filter Initial ESP				
Model	Size	Max CFM	Max ESP	coil area	face velocity	Merv 8		Merv 11		Merv 13
				sq ft	fps	1"	2"	1"	2"	2"
D1	9	450	0.4	2.5	180	0.08	0.06	0.09	0.08	0.15
D2	12	450	0.4	2.5	180	0.08	0.06	0.09	0.08	0.15
D3	15	700	0.5	2.5	280	0.17	0.14	0.22	0.15	0.25
D4	18	800	0.5	2.5	320	0.20	0.16	0.29	0.19	0.28
D5	24	950	0.6	3.4	280	0.17	0.14	0.22	0.15	0.25
D6	30	1150	0.6	3.4	340	0.22	0.16	0.33	0.20	0.30
D7	36	1350	0.6	3.4	400	0.26	0.21	0.44	0.24	0.34

ECM Blower Motor (Optional)

The ECM blower motor (optional) for TSL09 - 36 is controlled directly by the DXM2 control board that converts thermostat inputs and CFM settings to signals used by the ECM motor controller. To take full advantage of the ECM motor features, a communicating multi-stage thermostat should be used (ATC32U**).

The DXM2 control maintains a selectable operating airflow [CFM] for each heat pump operating mode. For each operating mode there are maximum and minimum airflow limits. See the ECM Blower Performance tables for the maximum, minimum, and default operating airflows.

Airflow levels are selected using the configuration menus of a communicating thermostat (ATC32U02C) or configuration/diagnostic tool (ACDU02C and harness 11B0100N27). The configuration menus allow the installer to independently select and adjust the operating airflow for each of the operating modes. Air flow can be selected in 25 CFM increments within the minimum and maximum limits shown in the ECM Blower Performance Table. The blower operating modes include:

- First Stage Cooling (Y1 & O)
- Second Stage Cooling (Y1, Y2, & O)
- First Stage Heating (Y1)
- Second Stage Heating (Y1 & Y2)
- Fan (G with no Y1, Y2, or W)

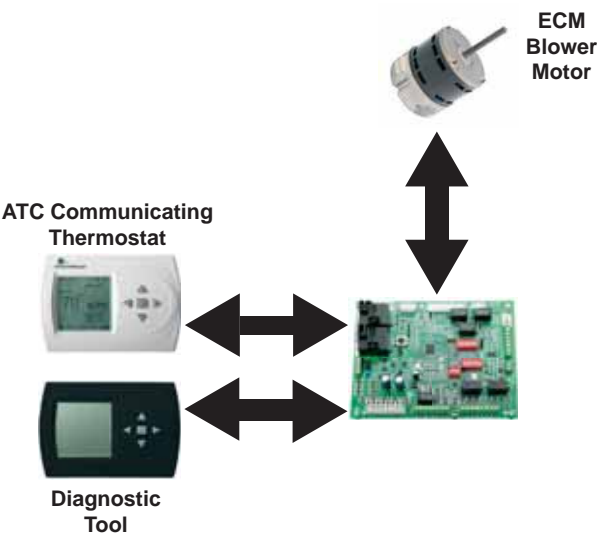
The ECM motor for all TSL models includes “soft start” and “ramp down” features. The soft start feature is a gentle increase of motor rpm at blower start up. This creates a much quieter blower start cycle.

The ramp down feature allows the blower to slowly decrease rpm to a full stop at the end of each blower cycle. This creates a much quieter end to each blower cycle and adds overall unit efficiency.

The ramp down, time can be changed, feature is eliminated during an ESD (Emergency Shut Down) situation. When the DXM2 ESD input is activated, the blower and all other control outputs are immediately de-activated.

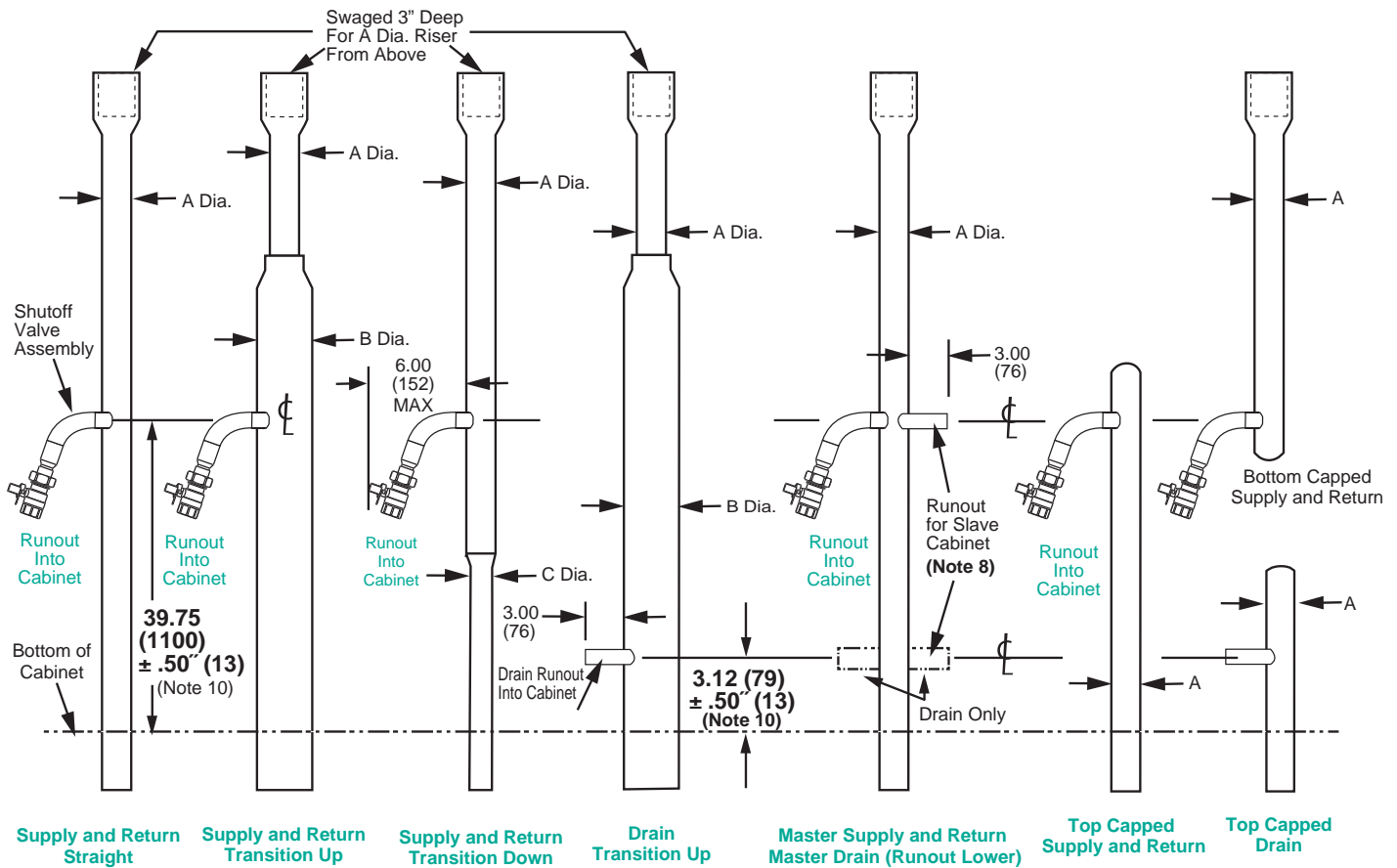
The ramp down feature (also known as the heating or cooling “Off Delay”) is field selectable by the installer. The allowable range is 0 to 255 seconds.

Airflow Configuration Screen on Communicating Thermostat or (ACDU) Service Tool.



AIRFLOW SELECTION	
	CFM
HEAT STAGE 1	600
HEAT STAGE 2	750
AUXILIARY HEAT	850
EMERGENCY HEAT	850
COOL STAGE 1	525
COOL STAGE 2	700
COOL DEHUMID 1	425
COOL DEHUMID 2	550
CONTINUOUS FAN	350
HEAT OFF DELAY	60
COOL OFF DELAY	30
◀ PREVIOUS	NEXT ▶

Riser Definitions



Riser Diameters (in.)							
A	1.00	1.25	1.50	2.00	2.50	3.00	4.00
B	1.25	1.50	2.00	2.50	3.00	-	-
C	-	1.00	1.25	1.50	2.00	2.50	-

Notes:

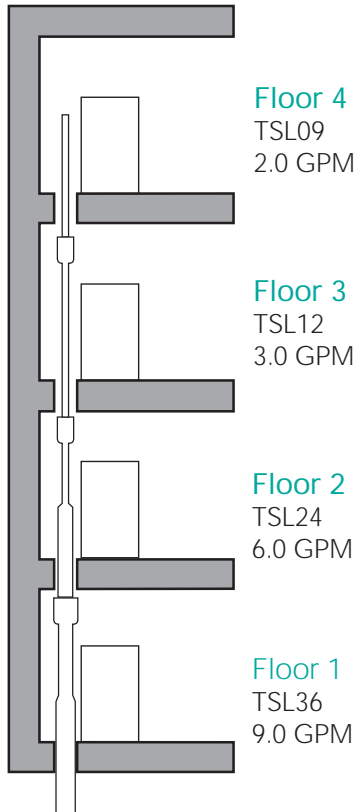
1. You must know water flow direction to determine if cabinet requires transition up or down.
2. Transitions can only change by one diameter (1" to 1¼", 1¼" to 1½", etc.)
3. Riser transition couplings and runouts are factory brazed.
4. All risers are factory pressure tested.
5. Standard riser diameters are 1", 1¼", 1½", 2", 2½", 3" and 4" nominal water tubing.
6. Copper Type M and L available.(4 L only)
7. Drain riser insulated standard. Insulation is optional for supply and return.
8. Master riser - contractor provides tubing from runout to slave cabinet if needed and brazes shutoff for slave.
9. Union shutoff has FTP for AHH hose. Brazed valve has NPSH threads for AHU hose. [1/2" for D1 (09), D2 (12); 3/4" for D3 (15), D4 (18); or 1" for D5 (24), D6 (30), D7 (36)]
10. If cabinet stand or thick ISO Pad is used, at installation add height/thickness to shutoff valve and drain runout height. Verify riser shutoff height with plans before brazing.

Note: ClimateMaster units with motorized valve option have water high pressure switches. Do not design riser stack where switch will not reset (trip - 300 PSI; Reset - 250 PSI).

Riser GPM Definitions and Sizing

Riser GPM requirements and individual Unit GPM requirements are necessary to select the proper Riser Piping diameters. Refer to this page to determine GPM requirement, then refer to Riser Diameter Sizing Table to determine Riser Piping diameters.

Example is for bottom supply (upward flow) - bottom return (downward flow) system feed loop, both supply and return will be same GPM. GPM's are dependent upon unit load and system loop water temperatures. Please refer to Performance Charts for individual Unit GPM requirements.



Unit GPM (UGPM) = Required gallons per minute from "Performance Charts," or GPM used to calculate unit capacity.

Note: For factory installed AFR check Flow Rate available (See Table)

Total Riser GPM (TRGPM) = The total GPM's required for all units on each Riser.

Total GPM Per Floor (TGF) = Total GPM minus the sum of Unit GPM from all floors above or below, depending on direction of flow.

Example: Four floors, Consisting of units sizes TSL36, TSL24, TSL12 and TSL09, as shown in diagram. UGPM's are 9.0, 6.0, 3.0 and 2.0 respectively.

$TRGPM = 9.0 + 6.0 + 3.0 + 2.0 = 20 \text{ GPM.}$

Upward Flow:

Floor 1: TGF = 20 Add all floor GPM's (TRGPM).
 Floor 2: TGF = 11 Total GPM minus floor 1 GPM.
 Floor 3: TGF = 5 Total GPM minus floors 1 and 2 GPM's.
 Floor 4: TGF = 2 Total GPM minus floors 1, 2, and 3 GPM's.

Downward Flow:

Floor 4: TGF = 20 Add all floor GPM's (TRGPM).
 Floor 3: TGF = 18 Total GPM minus floor 4 GPM.
 Floor 2: TGF = 15 Total GPM minus floors 1 and 2 GPM's.
 Floor 1: TGF = 9 Total GPM minus floors 1, 2, and 3 GPM's.

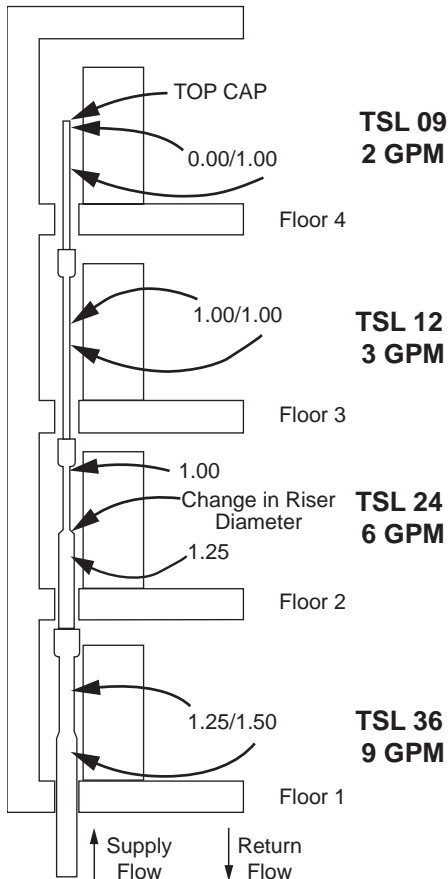
Auto-Flow Regulator (US GPM) Code							
	5/8 Sweat		7/8 SWEAT				
	Unit 09	Unit 12	Unit 15	Unit 18	Unit 24	Unit 30	Unit 36
C	1.5	—	—	—	—	—	—
D	2.0	2.0	—	—	—	—	—
E	2.5	2.5	2.5	—	—	—	—
F	3.0	3.0	3.0	3.0	—	—	—
G	—	3.5	3.5	3.5	—	—	—
H	—	—	4.0	4.0	4.0	—	—
J	—	—	—	5.0	5.0	5.0	—
K	—	—	—	—	6.0	6.0	6.0
L	—	—	—	—	7.0	7.0	7.0
M	—	—	—	—	—	8.0	8.0
N	—	—	—	—	—	—	9.0
P	—	—	—	—	—	—	10.0

Riser Diameter Sizing

Refer to Riser GPM Definitions and Sizing for the prefix to this example.

Each TSL Vertical Stack unit has three riser pipes: supply, return, and drain. The following example will be for Supply and Return riser pipe (from the top floor to the bottom floor), supply flow up and return flow down.

Note: If flows are both same direction, you will have to create two table 3's, Supply and Return



From Table 1 (below) determine the proper riser diameter needed to satisfy the required GPM's at each unit. Refer to Table 2 (below) for a summary.

Top Cap - Top half of riser is eliminated and sealed.

Bottom Cap - Bottom half of riser is eliminated and sealed.

The following nomenclature is used to designate the diameters at the top (always first) and bottom of each unit.

0.00/1.00 - Indicates top cap/1" bottom.

1.00/1.00 - Indicates 1" top/bottom.

1.00/1.25 - Indicates 1" top/1.25" bottom.

1.25/1.50 - Indicates 1.25" top/1.50" bottom.

(from this we develop Table 3)

Note: Transition risers limited to 1 nominal diameter size larger or smaller within each floor (cabinet).

Table 1

Maximum GPM	10	16	23	48	80	135	190
Nominal Riser Diameter	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"

Max GPM for 1" to 1½" sized for 4 FT per second velocity

Max GPM for 2" to 4" sized for 5.5 FT per second velocity.

Note: Max GPM per NABB recommendation. Never exceed 6.5 FPS, excessive noise and abrasion will occur.

Table 2

Floor	TGF	Diameter From Table 1
4	2	1" [25.4]
3	5	1 [25.4]
2	11	1.25" [31.8]
1	20	1.50" [38.1]

Table 3

Nomenclature per Unit	Description
0.00/1.00	Top Cap, w/1" Bot Feed
1.00/1.00	1" Full Length Riser
1.00/1.25	1" Top, 1.25" to 1st Floor
1.25/1.50	1.25" Top, 1.50" Bottom

Table 4 (From IMC-2012 Table 307.2.2)

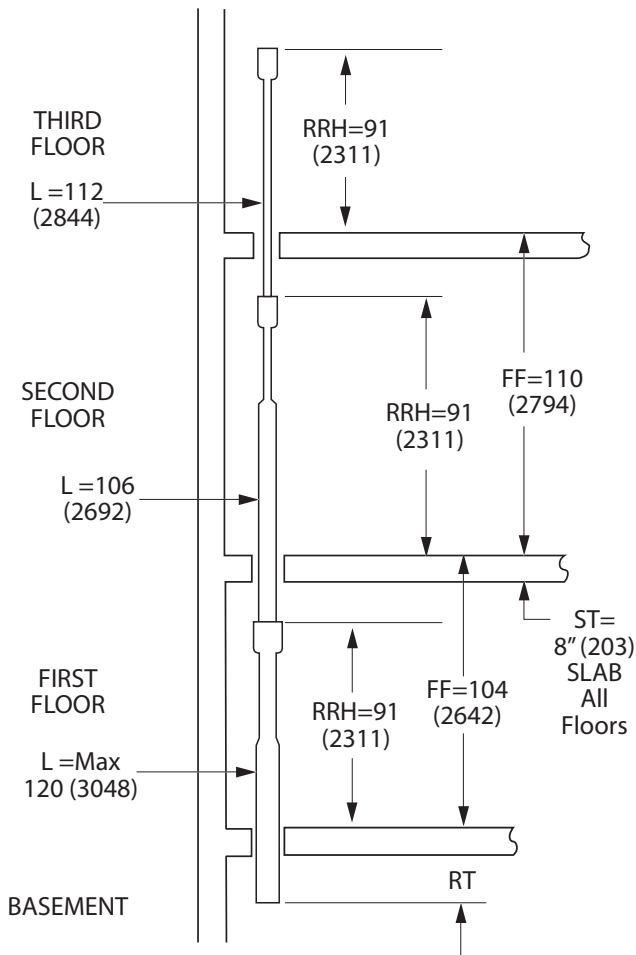
Drain Diameter	Max Tonnage
1" [25 mm]	40
1¼" [32mm]	90
1½" [38mm]	125
2" [51mm]	250

Values from Table 3 are to be entered on the Riser Piping Schedule of EZ Order.

Top diameter must match bottom diameter of floor above.

To calculate drain riser diameter, add up unit tonnage and use Table 4. Example has 6¾ tons, so 1" diameter is adequate.

Swage Riser Length Definitions and Calculations



Total Riser Length (L) for same height cabinets on every floor = FF of floor below + 2" (51)

Note - If cabinet heights are mixed then L must be calculated.

Floor To Floor Height (FF): Distance from top of slab to top of above slab.

Room Riser Height (RRH): = 91 (2311) for all TSL's.

Riser Tail (RT): Length of riser extending down from the cabinet. Riser tail piece must extend a minimum of 5" (127) below slab.

$RT = L - RRH$

Slab thickness (ST): Slab thickness plus and additional material added to slab prior to setting cabinets.

Riser insertion into swage = 2" (51)

Calculating Riser Dimensions for Example: 8" finished slab all floors

FIRST FLOOR - (Pick L depending how far below slab wanted)

$L = 120$ (3048) Max Standard Length

$RT = L - RRH = 120$ (3048) - 91 (2311) = 29 (737)

SECOND FLOOR -

$L = FF$ (Floor 1) + 2 (51) = 106 (2692)

$RT = L - RRH = 106$ (2692) - 91 (2311) = 15 (381)

THIRD FLOOR -

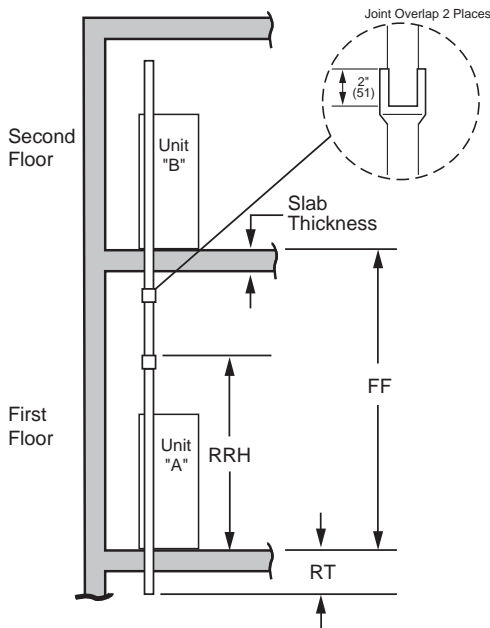
$L = FF$ (Floor 2) + 2 (51) = 112 (2844)

$RT = L - RRH = 112$ (2844) - 91 (2311) = 21 (533)

Notes:

1. For calculating riser length do not include ISO pad or stand, except remember that below (B) on any floor should be 5 (127) or more for ease of brazing. For risers installed before cabinet—ISO pad or stand does affect riser shutoff valve and drain stub setting dimension from floor, add to 39.75 (1100) and 3.12 (79). Check plans before brazing.
2. If riser maximum is exceeded or RT is less than slab + 5" (127) must use extension, see riser extension sizing.
3. Complete all core drilling before assembling riser stack.
4. Set from lowest floor up.
5. Risers ship in bulk. Can ship by floor as special.
6. Secure riser stack to building structure and use expansion fittings as required.
7. For calculationg and entering on EZ, use full length even if top or bottom is capped.
8. Dimensions are inches (mm).

Swage Riser Extension Definitions and Calculations



Riser Extension Length: Start with the floor to floor Dim. (FF) From this subtract the room riser height and tail length. Then add 4" (102) for the two joint overlaps.

Riser Extension Length = FF {First floor} - (RRH {First floor} + RT {Second floor}) + 4" (102). Minimum extension is 10 (254). Reduce riser length, if needed.

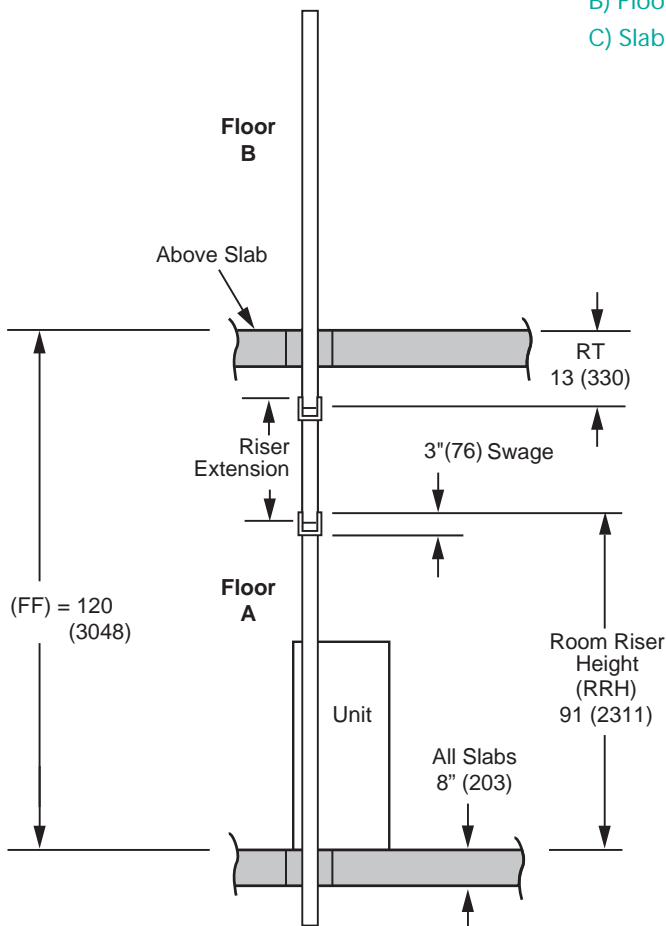
Riser Tail (RT): Length of riser extending down from the cabinet. Riser tail must extend a minimum of 5" (127) below slab, for ease of brazing.

Room Riser Height (RRH): 91 (2311) for TSL.

Floor To Floor Height (FF): Distance from top of slab to top of above slab. Slab thickness (ST); Slab thickness plus and additional material added to slab prior to setting cabinets.

Special care must be taken in sizing riser lengths and tail piece lengths when:

- A) Riser extensions are used.
- B) Floor to floor heights vary.
- C) Slab thickness varies from floor to floor.



Calculate extension length for Floor A.

Example: Floor to floor (FF) = 120" (3048)
Room Riser Height (RRH) = 91" (2311)
RT (Floor above) = 13" (330).

Riser Extension: $120" - (13" + 91") + 4" = 20"$.
 $3048 - (330 + 2311) + 102 = 508 \text{ mm}$.

Notes:

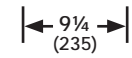
1. Example shown - riser extensions would be ordered with Floor "A" and assembled between "A" and "B".
2. Riser and extension "A" Top and Riser "B" bottom must be the same diameter. Extensions cannot transition.
3. Extensions are shipped loose, bulk shipped to minimize shipping cost.
4. Dimensions are inches (mm).
5. Any extension below "A" can be ordered as a factory special.

Slab Hole Chart - 3 Pipe

Riser Stack Patterns

(S) (R) (D) For Cabinet Styles 2 and 5

or

(D) (R) (S) For Cabinet Styles 3 and 4


Clear Height is Floor to Ceiling Dimension

Slab Hole, Risers Ship Loose and Installed Before Cabinet

Model	Riser Diameter									
	Clear Height		Riser Length		3	76.2	2	50.8	1	25.4
	in	mm	in	mm	in	mm	in	mm	in	mm
All	105	2667	115	2921	6 1/2	165	5 1/2	140	4 1/2	114
	100	2540	110	2794						
	96	2438	106	2692						
	95	2413	105	2667						
	94	2387	104	2641						
	93	2362	103	2616						

Dimensions for 8" (203) slab

Clear height is dimension from floor to ceiling. Riser length is clear height plus slab thickness plus 2" (50).

Opening centerline must be aligned from floor to floor

For risers over 100" (2540) using extensions with clear height equal to riser length or more, the hole size can be riser diameter plus 1" (25mm).

If riser diameter is not shown use next larger size.

Contractor is responsible to meet all codes and regulations.

Units Are Shipped FOB Factory

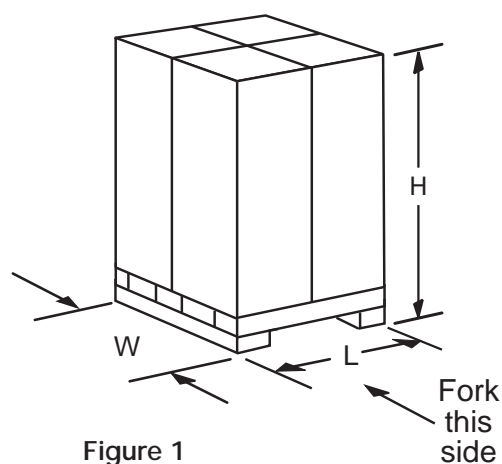
TSL Chassis can be shipped 2 ways.

1. Upright in carton 4 per pallet, see figure 1.
2. Upright inside cabinet (risers shipped separate or customer supplied) 4 per pallet, see figure 1.

TSL Cabinet will ship upright 4 per pallet, see figure 1.

Cabinets are palletized to maximize shipping density then grouped by unit size, building, and floor where possible. Special shipping accommodations can be provided. Request added cost before quoting job, shipping cost could increase significantly and any additional charges will be billed. Some examples include reduced number of units per pallet, palletized specifically by riser, by floor, or over crating.

Vertical Shipping					
Description	Per 4 pack on pallet			Aprox. Quantity Per 53 foot Box Trailer	Approximate Weight per pallet
	Length	Width	Height		
Chassis 09-12	40	40	50	120 single stacked	480
Chassis 09-12	40	40	100	240 double stacked	480
Chassis 15-18	40	40	50	120 single stacked	560
Chassis 15-18	40	40	100	240 double stacked	560
Chassis 24-36	50	48	52	96 single stacked	825
Chassis 24-36	50	48	104	192 double stacked	825
Cabinet 09-18	40	40	71	112 single stacked	500
Cabinet 24-36	50	48	71	72 single stacked	625
Cabinet with Chassis 09-12	40	40	71	112 single stacked	940
Cabinet with Chassis 15-18	40	40	71	112 single stacked	1020
Cabinet with Chassis 24-36	50	48	71	72 single stacked	1410



Small and Large cabinets can be mixed on some loads.

88" Cabinets cannot have stands factory assembled, must ship loose or ship horizontal.

Tranquility® Modular - TSL Series

Engineering Specifications – Page 1

General:

Furnish and install ClimateMaster Tranquility® "TSL Vertical Stack" Water Source Heat Pumps, as indicated on the plans with capacities and characteristics as listed in the schedule and the specifications that follow.

Units shall be supplied completely factory built capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 48.9°C) as standard. Equivalent units from other manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated and certified in accordance with Air-Conditioning, Heating and Refrigeration Institute/International Standards Organization (AHRI / ISO 13256-1). All equipment must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-1995 for the United States and CAN/CSA-C22.2 NO.236 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI / ISO and ETL-US-C labels.

All units shall pass a factory acceptance test. The quality control system shall automatically perform the factory acceptance test via computer. A detailed report card from the factory acceptance test shall ship with each unit. *(Note: If unit fails the factory acceptance test it shall not be allowed to ship. Unit serial number will be recorded by factory acceptance test and furnished on report card for ease of unit warranty status.)*

Cabinet Construction:

The cabinet construction is for ducted top discharge. The cabinet panels shall be fabricated from heavy gauge galvanized steel. The rigid one-piece cabinet assembly shall be constructed so that it is self-supporting, and can be installed prior to the chassis arrival, and to be able to avoid damage during construction. Top, base, fan deck, and other metal structural parts are to be 16 gauge construction, while exterior panels to be 20 gauge; unit further strengthened by structural breaks at corners. Units not constructed of a minimum of these thicknesses are not acceptable. Cabinet shall have a full panel over the chassis opening for structural rigidity of the cabinet; no "open" top or "open" bottom designs allowed.

The cabinet shall contain a secondary drain pan fully insulated with a pressure differential drain trap for field connection to the condensate riser pipe, and guide rails for the slide in refrigeration chassis. Drain pan to be rubber grommet mounted to provide isolation of chassis from the cabinet. Drain pan(s) shall be easily accessible for cleaning. All interior surfaces shall be lined with 1/2 inch (12.7mm) thick, 1-1/2 lb/ft³ (24 kg/m³) acoustic type fiberglass insulation. All insulation shall be foil faced and have exposed edges butted up to flanges to prevent the introduction of glass fibers into the air stream.

Standard insulation must meet NFPA Fire Hazard Classification requirements 25/50 per ASTM E84, UL 723, CAN/ULC S102-M88 and NFPA 90A requirements; air erosion and mold growth limits of UL-181; stringent fungal resistance test per ASTM-C1071 and ASTM G21; and shall meet zero level bacteria growth per ASTM G22. Unit insulation must meet these stringent requirements or unit(s) will not be accepted.

Option: Isolation pad attached to bottom of cabinet for best sound attenuation.

Standard is 1 inch (25mm) filter holder with 1" (25mm) thick fiberglass throwaway filter.

Option: 2 inch (50mm) filter holder with 2" (50mm) thick fiberglass throwaway filter.

Cabinet arrangements shall allow riser piping on any one of the three sides of the cabinet not used for the chassis access. Cabinet to be top ducted. Ductwork to be field fabricated. Return K.O. to be removed from panel behind the filter. Field shall configure cabinets by removing factory Riser knockouts per model configuration shown on plans. Cabinet design shall allow a full height base board (4.50 inches/114mm) beneath the return air panel. The cabinet shall contain an easily removable motor/blower assembly.

ClimateMaster works continually to improve its products. As a result, the design and specifications of each product at the time of order may be changed without notice and may not be as described herein. Please contact ClimateMaster's Customer Service Department at 1-405-745-6000 for specific information on the current design and specifications. Statements and other information contained herein are not express warranties and do not form the basis of any bargain between the parties, but are merely ClimateMaster's opinion or commendation of its products. The latest version of this document is available at climatemaster.com.

Tranquility® Modular - TSL Series

Engineering Specifications – Page 2

Option: Factory to provide dust protection, includes capping top opening and leaving K.O. in panel behind filter (installer to remove both).

Electrical connections are direct into the control compartment through top of cabinet.

Option: Low voltage 15, 25, or 35 foot (572, 762, or 1,067 cm) wire harness (whip) with molex-type connector for connection to remote mounted thermostat. Use A9155801, A9155802, A9155803, A9155804, A9155805, A9155806, or A9155811 thermostat assembly, which is thermostat model ATA11U01, ATA11U03, ATP21U01, ATA22U01, ATP32U03C, ATC32U02C, or ATP21W02 respectively with mating molex-type connector.

Option: Premium automotive grade rubber seal between cabinet inner panel and chassis.

Risers supply, return, and insulated condensate water risers will ship separate. Risers shall be type M copper. Riser length up to 120" (305cm) is standard. Supply and return risers have integral internal piping including ball valves (for shut off purposes at unit). Risers and piping shall be factory pressure tested to check for leaks. Field installed hose kits are required to connect the chassis piping to the cabinet ball valve. The condensate riser shall be insulated with 3/8" (9.5mm) Armaflex type insulation. The top of each riser shall be deeply swaged (3 in./76.2mm) to accept connection to the riser above/below, allowing for a floor to floor dimensional variance of \pm one inch (25.4mm). Risers are shipped loose so complete riser stack can be constructed, pressure tested, and filled prior to cabinet placement. Units not having swaged riser-piping connections shall not be acceptable. Couplings and trim pieces shall not be allowed.

Option: Master Riser.

Option: Type L riser piping.

Option: Supply and return risers insulated with 3/8" (9.5mm) ARMAFLEX (closed cell) type insulation. 1" through 3" diameter standard, 4" diameter available. Union style or brazed shutoffs available.

Blower and Motor Assembly:

The cabinet shall contain a removable motor/blower assembly. Units shall have a direct drive centrifugal blower. The motor shall be 3 speed, permanently lubricated, PSC type with thermal overload protection. The motor for small size units (09 and 12) shall be isolated from the housing by a torsionally flexible motor mounting system with rubber type grommets to inhibit vibration induced high noise levels associated with "hard wire belly band" motor mounting. The motor on medium and large units (15-36) shall be isolated with flexible rubber type isolation grommets only. Airflow/External static pressure rating of the unit shall be based on a wet coil and clean filter. Ratings based on a dry coil and/or no air filter shall not be acceptable.

Option: ECM variable speed ball bearing type motor. The fan motor shall provide soft starting, maintain constant CFM over its static operating range and provide airflow adjustment in 25 CFM increments via its control board. The fan motor shall be isolated from housing by rubber grommets. The motor shall be permanently lubricated and have thermal overload protection. A special dehumidification mode shall be provided to allow lower airflows in cooling for better dehumidification. The dehumidification mode may be constant or automatic (humidistat controlled).

Option: Low static PSC motor for installations with minimal ductwork.

Tranquility® Modular - TSL Series

Engineering Specifications – Page 3

Chassis:

The chassis, which incorporates the air coil, water coil, drain pan with solid-state electronic condensate overflow protection, compressor, and electrical components shall be easily installed for quick jobsite installation and future servicing purposes. The slide in chassis shall have insulated panels surrounding the compressor. Compressors are not in the air stream. The chassis base shall be fabricated from heavy gauge galvanized steel formed to match the slide in rails of the cabinet. Units shall have a factory installed 1 inch (25.4mm) thick filter bracket and throwaway type glass fiber filter. Furnish one spare set of filters.

Option: Chassis can ship upright in cabinet.

Option: UltraQuiet package shall consist of the standard double isolation of the compressor plus sound attenuating compressor blanket applied to the compressor. All sheet metal surrounding the compressor shall have high density sound attenuating material with STC rating of 26 per ASTM E-90 and then covered with fiberglass insulation.

Option: VFlow® The unit will be supplied with internally factory mounted modulating water valve with delta T control. The factory built-in valve shall modulate water flow through unit based on a field adjustable water temperature difference between the entering and leaving water. The valve shall automatically adjust for operating mode, source water temperature and variations in external head pressure. The valve will also act as a shut-off valve to prevent water flow through the unit when the unit is not activated and will have a minimum position capability.

Option: Factory wired for communicating thermostat, requires ATC32U02 thermostat.

Option: Rib relay replaces contactor for model 09 through 18. Eliminates contactor “click” when first energized.

Water connections between chassis and the cabinet shall be accomplished via a hose kit consisting of Kevlar-reinforced EPDM core hose surrounded by a stainless-steel braid. Hose kit shall have brass fittings with stainless-steel ferrules. AHH hose ends shall be solid External MPT which connects to mating fitting on cabinet shut off ball valve(s), and Internal NPSM (National Pipe Straight Mechanical) swivel end with fiber or EPDM washer which connects to mating threaded end connection on chassis. AHU hose ends shall be Internal NPSM (National Pipe Straight Mechanical) swivel end with fiber or EPDM washer which connects to mating threaded end connection on chassis. The hose kit shall be rated for 400 psi (2756 kPa) design working pressure.

Refrigerant Circuit:

All units shall contain an EarthPure® (HFC-410A) sealed refrigerant circuit including a high efficiency scroll or rotary compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high pressure switch, low pressure switch (loss of charge), water coil low temperature sensor, and air coil low temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units that cannot be reset at the thermostat shall not be acceptable.

Hermetic compressors shall be internally sprung and externally isolated. The compressor shall have a dual level vibration isolation system. The compressor will be mounted on specially engineered sound-tested EPDM vibration isolation grommets to a large heavy gauge compressor base pan, which is then isolated from the cabinet by resting on condensate drain pan which is isolated

Tranquility® Modular - TSL Series

Engineering Specifications – Page 4

by grommets for maximized vibration attenuation. All units (except units with rotary compressors) shall include a discharge muffler to further enhance sound attenuation. Compressor shall have thermal overload protection.

Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 625 PSIG (4309 kPa) refrigerant working pressure. Copper hairpins are tin electroplated for added protection from formicary corrosion. Units that do not have tin-plated hairpins shall not be acceptable.

Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 500 PSIG (3445 kPa) working water pressure. The refrigerant to water heat exchanger shall be "electro-coated" with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced types with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 20° to 120°F (-6.7° to 48.9°C). Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent over-cooling an already cold room.

Option: The unit will be supplied with non-plated air to refrigerant heat exchanger.

Option: The unit will be supplied with cupro-nickel coaxial water to refrigerant heat exchanger.

Option: The unit will be supplied with internally factory mounted two-way water valve for variable speed loop pumping requirements. Valve to be normally closed type. Water circuit will have factory installed high pressure switch located between MWV and Heat Exchanger.

Option: The unit will be supplied with internally factory mounted automatic water flow regulators.

Option: The unit will be supplied with internally mounted secondary pump rated for 200 PSIG

Option: The unit will be supplied with modulating water valve (requires DMX2). The valve will maintain a set loop Delta T. Unit will operate at optimal capacity and efficiency.

Cabinet Drain Pan:

The drain pan shall be constructed of galvanized steel and have a powder coat paint application to further inhibit corrosion. This corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117. Drain pan to be isolated from cabinet with four EPDM vibration isolation grommets. Drain pan shall be fully insulated. Drain pan shall have side rails that chassis slides in and out on for ease of installation. Drain pan shall have at a minimum a doubled sloped surface to allow positive drainage to the outlet opening, which shall be at the lowest level of the entire pan surface. Drain outlet shall have factory installed rubber hose that forms trap inside of cabinet. The cabinet drain pan as standard will be supplied with solid-state electronic condensate overflow protection. Drain pans that are not isolated from cabinet shall not be acceptable. Mechanical float switches will NOT be accepted.

Tranquility® Modular - TSL Series

Engineering Specifications – Page 5

Option: Stainless steel drain pan

Note: If plastic type material is used, it must be HDPE (High Density Polyethylene) to avoid thermal cycling shock stress failure over the lifetime of the unit.

Electrical:

A control compartment shall be located within the chassis and shall contain a 50VA transformer with load side circuit breaker, 24 volt activated, 2 pole compressor contactor, relay and solid-state controller for complete unit operation. Reversing valve and fan motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 Volt and provide heating or cooling as required by the remote thermostat/sensor. A control compartment shall be located within the cabinet and shall contain a terminal block for high voltage connections. All electrical connections between the chassis and cabinet shall be made via locking quick-connects.

Option: Disconnect Switch, Non-Fused, classified as motor disconnect.

Option: Circuit Breaker, all 208/230 volt and 265 volt, 15 and 20 amp - HACR rated, 265 volt 25 amp and higher - supplemental rated.

Solid State Control System (CXM):

Units shall have a solid-state control system. Units utilizing electro-mechanical control shall not be acceptable. The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

- a. Anti-short cycle time delay on compressor operation.
- b. Random start on power up mode.
- c. Low voltage protection.
- d. High voltage protection.
- e. Unit shutdown on high or low refrigerant pressures.
- f. Unit shutdown on low water temperature.
- g. Condensate overflow electronic protection.
- h. Option to reset unit at thermostat or disconnect.
- i. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
- j. Ability to defeat time delays for servicing.
- k. Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low voltage, high voltage, low water/air temperature cut-out, condensate overflow, and control voltage status.
- l. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
- m. 24V output to cycle a motorized water valve or other device when compressor relay is active.
- n. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
- o. Water coil low temperature sensing (selectable for water or antifreeze).
- p. Air coil low temperature sensing.

Units not providing the 8 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low

Tranquility® Modular - TSL Series

Engineering Specifications – Page 6

pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protection for both drain pans will not be accepted.

Option: Enhanced solid state control system (DXM2)

This control system is a communicating controller, also features two stage control of cooling and two stage control of heating modes for exacting temperature and dehumidification purposes.

This control system coupled with a multi-stage thermostat will better dehumidify room air by automatically running the heat pump's fan at lower speed on the first stage of cooling thereby implementing low sensible heat ratio cooling. On the need for higher cooling performance the system will activate the second stage of cooling and automatically switch the fan to the higher fan speed setting. This system may be further enhanced with a humidistat. Units not having automatic low sensible heat ratio cooling will not be accepted; as an alternate a hot gas reheat coil may be provided with control system for automatic activation.

This controller shall have sensors to monitor entering water, leaving water, supply air, and compressor discharge line temperatures. Temperatures can be read by using service tool or communicating thermostat.

Control shall have all of the above-mentioned features of the CXM control system along with the following expanded features:

- a. Removable thermostat connector.
- b. Night setback control.
- c. Random start on return from night setback.
- d. Minimized reversing valve operation (Unit control logic shall only switch the reversing valve when cooling is demanded for the first time. The reversing valve shall be held in this position until the first call for heating, ensuring quiet operation and increased valve life.).
- e. Override temperature control with 2-hour timer for room occupant to override setback temperature at the thermostat.
- f. Dry contact night setback output for digital night setback thermostats.
- g. Ability to work with heat pump or heat/cool (Y, W) type thermostats.
- h. Ability to work with heat pump thermostats using O or B reversing valve control.
- i. Emergency shutdown contacts.
- j. Boilerless system heat control at low loop water temperature.
- k. Ability to allow up to 3 units to be controlled by one thermostat.
- l. Relay to operate an external damper.
- m. Ability to automatically change fan speed from multistage thermostat.
- n. Relay to start system pump.
- o. 75 VA control transformer. Control transformer shall have load side short circuit and overload protection via a built in circuit breaker.
- p. Entering water temperature sensing.
- q. Leaving water temperature sensing.
- r. Leaving air temperature sensing.
- s. Discharge line air temperature sensing.

Units not providing the 8 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protection for both drains will not be accepted.

Tranquility® Modular - TSL Series

Engineering Specifications – Page 7

When DXM2 is connected to either ACDU service tool or ATC32U thermostat the installer/technician can; check and set CFM; check dip switch S1, S2, and S3 settings; run operation modes manually; check all physical inputs from thermostat and refrigerant pressure switches status, (Y1, Y2, W, O, G, H, ESD, NSB, OR, HP switch, and LOC switch); current or at time of fault the following temperatures -LT1, LT2, compressor discharge, leaving air, leaving water, entering water and control voltage; record last five faults, list possible reasons, and clear faults.

Digital Night Setback with Pump Restart (DXM2 w/ ATP32U03C/04C, ATC32U02C)

The unit will be provided with a Digital Night Setback feature using an accessory relay on the DXM2 controller with an ATP32U03/04 thermostat and an external, field-provided time clock. The external time clock will initiate and terminate the night setback period. The thermostat will have a night setback override feature with a programmable override time period. An additional accessory relay on the unit DXM2 controller will energize the building loop pump control for the duration of the override period. (Note: this feature requires additional low voltage wiring. Consult Application Drawings for details.)

Remote Service Sentinel (CXM/DXM2):

Solid state control system shall communicate with thermostat to display (at the thermostat) the unit status, fault status, and specific fault condition, as well as retrieve previously stored fault that caused unit shutdown. The Remote Service Sentinel allows building maintenance personnel or service personnel to diagnose unit from the wall thermostat. The control board shall provide a signal to the thermostat fault light, indicating a lockout. Upon cycling the G (fan) input 3 times within a 60 second time period, the fault light shall display the specific code as indicated by a sequence of flashes. A detailed flashing code shall be provided at the thermostat LED to display unit status and specific fault status such as over/under voltage fault, high pressure fault, low pressure fault, low water temperature fault, condensate overflow fault, etc. Units that do not provide this remote service sentinel shall not be acceptable.

Option: Lonworks interface system

Units shall have all the features listed above (either CXM or DXM2) and the control board will be supplied with a LONWORKS interface board, which is LONMark certified. This will permit all units to be daisy chained via a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

- a. Space temperature
- b. Leaving water temperature
- c. Discharge air temperature
- d. Command of space temperature setpoint
- e. Cooling status
- f. Heating status
- g. Low temperature sensor alarm
- h. Low pressure sensor alarm
- i. High pressure switch alarm
- j. Condensate sensor alarm
- k. Hi/low voltage alarm
- l. Fan "ON/AUTO" position of space thermostat as specified above
- m. Unoccupied/occupied command
- n. Cooling command
- o. Heating command
- p. Fan "ON/AUTO" command

Tranquility® Modular - TSL Series

Engineering Specifications – Page 8

- q. Fault reset command
- r. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built in circuit breaker.

Option: MPC (Multiple Protocol Control) interface system

Units shall have all the features listed above (either CXM or DXM2) and the control board will be supplied with a Multiple Protocol interface board. Available protocols are BACnet MS/TP, Modbus, or Johnson Controls N2. The choice of protocol shall be field selectable/changeable via the use of a simple selector switch. Protocol selection shall not require any additional programming or special external hardware or software tools. This will permit all units to be daisy chain connected by a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

- a. Space temperature
- b. Leaving water temperature
- c. Discharge air temperature
- d. Command of space temperature setpoint
- e. Cooling status
- f. Heating status
- g. Low temperature sensor alarm
- h. Low pressure sensor alarm
- i. High pressure switch alarm
- j. Condensate overflow alarm
- k. Hi/low voltage alarm
- l. Fan "ON/AUTO" position of space thermostat as specified above
- m. Unoccupied/occupied command
- n. Cooling command
- o. Heating command
- p. Fan "ON/AUTO" command
- q. Fault reset command
- r. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built in circuit breaker.

Return Panel:

The G return panel shall be architecturally designed, acoustic type, flush mounted with hinged door for easy and quick access to filter and unit interior. Chassis shall be easily removed. The hinged return panel shall be made of heavy gauge die formed galvanized steel with a powder coat finish in "Polar Ice" or "Polar White" color.

Return air panels that protrude from wall more than 7/8 inch (22mm) are not acceptable.

Option: "G" panel with mounting for ADA thermostat allows thermostat to be mounted low to comply with ADA height requirement.

Option: "G" panel with keyed locks - prevents users from tampering with units.

Tranquility® Modular - TSL Series

Engineering Specifications – Page 9

Option: Style “G” return air panel with frame for recessing cabinet 5 inches(127mm) or more behind finished wall.

Option: Motorized fresh air damper for “G” panel with frame - allows outside air to enter on right or left side.

Warranty:

ClimateMaster shall warranty equipment for a period of 12 months from start up or 18 months from shipping (which ever occurs first).

Option: Extended 4-year compressor warranty covers compressor for a total of 5 years.

Option: Extended 4-year refrigeration circuit warranty covers coils, reversing valve, expansion valve and compressor for a total of 5 years.

Option: Extended 4-year control board warranty covers the CXM/DXM2 control board for a total of 5 years.

FIELD INSTALLED OPTIONS

Hose Kits - (required for chassis to shutoff valve water connections):

Water connections between chassis and the cabinet shall be accomplished via a hose kit consisting of Kevlar-reinforced EPDM core hose surrounded by a stainless-steel braid. Hose kit shall have brass fittings with stainless-steel ferrules. The hose kit shall be rated for 400 psi (2756 kPa) design working pressure. This hose kit accessory is required for each cabinet. AHH for union cap valve and AHU for sweat valve.

Cabinet Stands - ACST Series

Heavy 16 gauge galvanized steel construction, bolts to bottom of cabinet. Heights 1” (25mm) to 12” (305 mm) by 1” (25mm) increments. Ships in bulk for field attachment.

Filters:

Pleated media disposable 1 inch (25mm) thick MERV 8 or MERV 11, 2 inch (50mm) thick MERV 8 or MERV 13.

Thermostats:

The thermostat shall be a ClimateMaster electronic type thermostat as selected below with the described features:

Note: To achieve full benefit of controls, use 2 speed thermostat (switch for manual or Y2 for automatic change).

a. Multistage Digital Automatic or Manual Changeover Programmable Communicating (ATC32U02C)

Thermostat shall be electronic communicating LCD 7 Day Programmable (with up to 4 setpoints per day), thermostat shall be provided. The thermostat shall offer three stages of heating and two stages of cooling with precise temperature control and have a four-wire connection to the unit. The thermostat shall be capable of manual or automatic change-over operation and shall operate in standard or programmable mode. An integrated humidity control feature shall be included to control a humidifier and/or a dehumidifier. The thermostat shall include a utility demand reduction feature to be initiated by an independent time program

Tranquility® Modular - TSL Series

Engineering Specifications – Page 10

or an external input. The thermostat shall have a comprehensive installation setup menu to include configuration of the unit CFM for each mode of operation (ECM motor option required).

The thermostat shall display system faults with probable cause and troubleshooting guidance. Comprehensive service diagnostics menus shall display, system inputs, system outputs, configuration settings, Geo source inlet and outlet temperatures, compressor discharge line temperature, liquid line temperature, leaving air temperature. The thermostat shall allow for immediate manual control of all DXM2 outputs at the thermostat for rapid troubleshooting.

b. Single Stage Digital Auto or Manual Changeover (ATA11U01)

Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch and fan ON-AUTO switch. Thermostat shall have an LCD display with temperature and setpoint(s) in °F or °C. The Thermostat shall provide permanent memory of setpoint(s) without batteries. A fault LED shall be provided to display specific fault condition. Thermostat shall provide temperature display offset for custom applications.

c. Single Stage Digital Auto or Manual Changeover and Manual Two Fan Speed Selections (ATA11U03)

Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system settings, high and low fan settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, setpoint(s), mode, and status indication. The temperature indication shall be selectable for °F or °C. The thermostat shall provide permanent memory of setpoint(s) without batteries. Thermostat shall provide heating setpoint range limit, cooling setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall allow the use of an accessory remote temperature sensor (17B0008N05). Thermostat navigation shall be accomplished via 4 push buttons.

d. Multistage Digital Automatic Changeover (ATA22U01)

Thermostat shall be multi-stage (2H/2C), manual or automatic changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, setpoint(s), mode, and status indication. The temperature indication shall be selectable for °F or °C. The thermostat shall provide permanent memory of setpoint(s) without batteries. A fault LED shall be provided to indicate specific fault condition(s). Thermostat shall provide temperature display offset for custom applications. Thermostat shall allow unit to provide better dehumidification with optional DXM2 controller by automatically using lower fan speed on stage 1 cooling (higher latent cooling) as main cooling mode, and automatically shifting to high-speed fan on stage 2 cooling. Thermostat can be configured to heat and cool even if in off mode (replaces night low limit switch (NLLS) in cabinet).

e. Multistage Manual Changeover Programmable 5/2 Day (ATP21W02)

Thermostat shall be 5 day/2 day programmable (with up to 4 setpoints per day), multi-stage (2H/1C), manual or automatic changeover with HEAT-OFF-COOL-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, setpoint(s), mode, and status indication. The temperature indication shall be selectable for °F or °C.

f. Multistage Automatic or Manual Changeover Programmable 7 Day (ATP32U03C)

Thermostat shall be 7 day programmable (with up to 4 setpoints per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Thermostat shall have a blue backlit dot matrix LCD display with temperature, setpoints, mode, and status indication. The temperature indication shall be selectable for °F or °C. Time display shall be selectable for 12 or 24-hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM2 controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of setpoints without batteries. Thermostat

Tranquility® Modular - TSL Series

Engineering Specifications – Page 11

shall provide heating setpoint range limit, cooling setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008C). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

g. Multistage Automatic or Manual Changeover Programmable 7 Day with Humidity Control (ATP32U04C)

Thermostat shall be 7 day programmable (with up to 4 setpoints per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO-EM HEAT system settings and fan ON-AUTO settings. Separate dehumidification and humidification setpoints shall be configurable for discreet outputs to a dehumidification option and/or an external humidifier. Installer configuration mode shall allow thermostat dehumidification mode to operate with ClimaDry® reheat or with ECM fan dehumidification mode via settings changes. Thermostat shall have a blue backlit dot matrix LCD display with temperature, relative humidity, setpoints, mode, and status indication. The temperature indication shall be selectable for °F or °C. Time display shall be selectable for 12 or 24 hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM2 controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of setpoints without batteries. Thermostat shall provide heating setpoint range limit, cooling setpoint range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008C). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

DDC Sensors:

ClimateMaster wall mounted DDC sensor to monitor room temperature and interfaces with optional DDC interface system described above. Several types as described below:

- a. Sensor only with no display (LON and MPC).
- b. Sensor with override (LON only).
- c. Sensor with setpoint adjustment and override (MPC only).
- d. Sensor with setpoint adjustment and override, LCD display, status/fault indication (LON and MPC).

Performance Sheet

SUBMITTAL DATA - S-I UNITS

Unit Designation: _____

Job Name: _____

Architect: _____

Engineer: _____

Contractor: _____

PERFORMANCE DATA

Cooling Capacity: _____ kW

EER: _____

Heating Capacity: _____ kW

COP: _____

Ambient Air Temp: _____ °C

Entering Water Temp (Clg): _____ °C

Entering Air Temp (Clg): _____ °C

Entering Water Temp (Htg): _____ °C

Entering Air Temp (Htg): _____ °C

Airflow: _____ l/s

Fan Speed or Motor/RPM/Turns: _____

Operating Weight: _____ (kg)

ELECTRICAL DATA

Power Supply: _____ Volts

_____ Phase _____ Hz

Minimum Circuit Ampacity: _____

Maximum Overcurrent Protection: _____

SUBMITTAL DATA - I-P UNITS

Unit Designation: _____

Job Name: _____

Architect: _____

Engineer: _____

Contractor: _____

PERFORMANCE DATA

Cooling Capacity: _____ Btuh

EER: _____

Heating Capacity: _____ Btuh

COP: _____

Ambient Air Temp: _____ °F

Entering Water Temp (Clg): _____ °F

Entering Air Temp (Clg): _____ °F

Entering Water Temp (Htg): _____ °F

Entering Air Temp (Htg): _____ °F

Airflow: _____ CFM

Fan Speed or Motor/RPM/Turns: _____

Operating Weight: _____ (lb)

ELECTRICAL DATA

Power Supply: _____ Volts

_____ Phase _____ Hz

Minimum Circuit Ampacity: _____

Maximum Overcurrent Protection: _____

Notes

Revision History

Date:	Item:	Action:
9/1/17	All	Updated decoder and DMX wiring diagrams
08/18/17	All	Updated information to new decoders
07/7/17	Cabinet and chassis decoders, 200 PSI pump, and modulating water valve, normally open MWV, and configuring cabinet.	Updated
05/08/17	Hose Kit Decoder and sweat valve	Updated
11/15/16	Document Design Update	Updated
04/19/16	Page 33	Updated
03/8/16	Page 62	Edit Engineering Specs
10/08/15	Performance Data - Page 12	Updated
09/01/15	Removed Electric Heat and vFlow Options	Updated
06/24/15	All	Updated
06/03/15	Engineering Specifications	Updated
1/14/15	All	Added vFlow, A Panel, ATP21W02, and Miscellaneous changes
12/16/14	Edits - Page 56	Updated
11/03/14	Misc Edits	Updated
06/30/14	Decoder	Updated
06/05/14	Created	



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