Tranquility® Vertical Stack (TSM) Series Submittal Data

Models TSM09 - 36
60Hz - HFC-410A

English Language/I-P Units

Revised: 3 July, 2013

CLIMATEMASTER®
Water-Source Heat Pump Systems

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: _____

Tranquility® Vertical Stack (TSM) Series Submittal Data

Models TSM09 - 36
60Hz - HFC-410A

English Language/S-I Units

Revised: 3 July, 2013

CLIMATEMASTER®
Water-Source Heat Pump Systems

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: _____

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*Document page number is shown next to part number (e.g. LC994 - 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_____).

Unit Features

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

The Tranquility® Vertical Stack (TSM) Series offers an innovative, labor-saving solution for spaces where individual, quiet control of the heating and cooling system is important. TSM 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 can be ordered assembled to cabinet or 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. TSM units can operate as stand-alone "ductless" systems, or can be ducted to an adjacent room, making them convenient for low-rise buildings as well. The TSM Series exceeds ASHRAE 90.1 efficiencies, yet maintains small cabinet dimensions. Using EarthPure® (HFC-410A) refrigerant, the TSM 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 TSM Series offers a wide range of units for most any installation. The TSM has an extended range refrigerant circuit, capable of ground loop (geothermal) applications as well as water loop (boiler-tower) applications. Standard features are many. Microprocessor controls, TXV metering device, galvanized steel cabinet and torsion-flex blower motor mounting for all models are just some of the features of the innovative TSM Series.

ClimateMaster's exclusive double isolation compressor mounting system makes the TSM 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 options such as DDC controls, internal pump, auto flow water regulator, and water solenoid valves allow customized design solutions.

The TSM 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.

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 grommeted isolated condensate pan for vibration reduction.
- Double isolation of compressor for quiet operation
- UltraQuiet option
- Air coil hairpins are tin-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)
- Ten Safeties Standard
- LonWorks, BACnet, 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.
- Multiple supply air discharge options
- Full port shut-off valves with memory stop, for supply and return, located opposite return air panel inside cabinet
- 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 and riser chase.
- Wide variety of chassis options including stainless steel drain pan, insulated tubing for extended range operation, autoflow regulator, motorized water valve either normally closed or normally open, secondary circulating pump, and cupro-nickel coaxial heat exchanger
- Selection of thermostats including manual changeover, automatic changeover, or programmable are available.

⚠ ATTENTION! ⚠

TSM has different riser configurations than TRM.
TSM chassis will not fit into the TRM Cabinet.
TSM return air side is defined as the front of unit.
TSM - G panel only.
TSM - All Cabinets - Field must remove supply air knockouts, install duct angles, and remove riser knockouts.

Selection Procedure

Reference Calculations

Heating

$$LWT = EWT - \frac{HE}{GPM \times Constant}$$

$$LAT = EAT + \frac{HC}{CFM \times 1.08}$$

Cooling

$$LWT = EWT + \frac{HE}{GPM \times Constant}$$

$$LAT\ (DB) = EAT\ (DB) - \frac{SC}{CFM \times 1.08}$$

$$LC = TC - SC$$

$$S/T = \frac{SC}{TC}$$

Constant = 500 for water, 485 for antifreeze.

Legend and Glossary of Abbreviations

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

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 (TSM18 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.

TSM Series Nomenclature

Cabinet

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

CABINET SIZE

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

VOLTAGE

OPTION	Volt/Hertz/Phaze
G	208-230/60/1
E	265/60/1

OPTIONS

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

HARNESS CONTROLS

OPTION	PSC	S=SURFACE R =REMOTE W = WALL SENSOR A = ADA	M = MPC L = LON
A	X	A	–
C	X	W	M
L	X	W	L
N	X	R	–
P	X	S	–

POWER TERMINATION

OPTION	DISCONNECT SWITCH	BREAKER	ISP / BREAKER
A	X	–	–
B	–	X	–
C	–	–	X
0	NO OPTIONS		

REVISION LEVEL
A = CURRENT REVISION

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

T-STAT WHIP
0 = No Whip
1 = 15' whip
2 = 25' whip
3 = 35' whip

DISCHARGE OPENINGS BY UNIT SIZE 88"

UNIT SIZE	Top	Back, Front & Side
09 thru 18	12" x 12"	12" x 6" & 12" x 12"
24 thru 36	16" x 16"	16" x 8" & 16" x 16"

DISCHARGE OPENINGS BY UNIT SIZE 80"

UNIT SIZE	Top	Front
09 thru 18	12" x 12"	12" x 6"
24 thru 36	16" x 16"	16" x 6"

SIDE Discharge Air
0 = No Opening
1 = Right Opening
2 = Left Opening
3 = Right & Left Opening

BACK/FRONT/TOP Discharge Air
0 = No Opening
1 = Back Opening
2 = Front Opening
3 = Top Opening
4 = Back & Top Opening
5 = Front & Top Opening
6 = Back & Front Opening
7 = Back, Front & Top Opening

RISER: CHASE/INSULATION
0 = None
1 = Insulation
2 = Chase
3 = Chase & Insulation

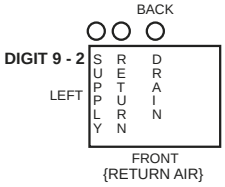
RISER: LOCATION
0 = None
1 = Shipped Separately
2 = Left Back
3 = Right Back
4 = Left Side
5 = Right Side
6 = Chassis ships in Cabinet

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

CABINET HEIGHT

OPTION	80"	88"	ISO PAD
A	–	X	–
B	X	–	–
C	–	X	X
D	X	–	X

DIGIT 9 - 2



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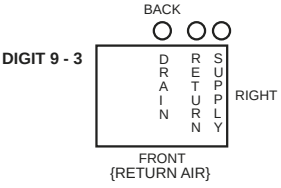

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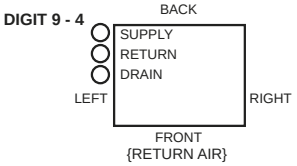

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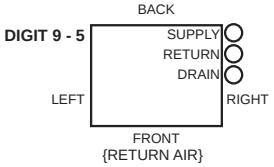


⚠ ATTENTION! ⚠

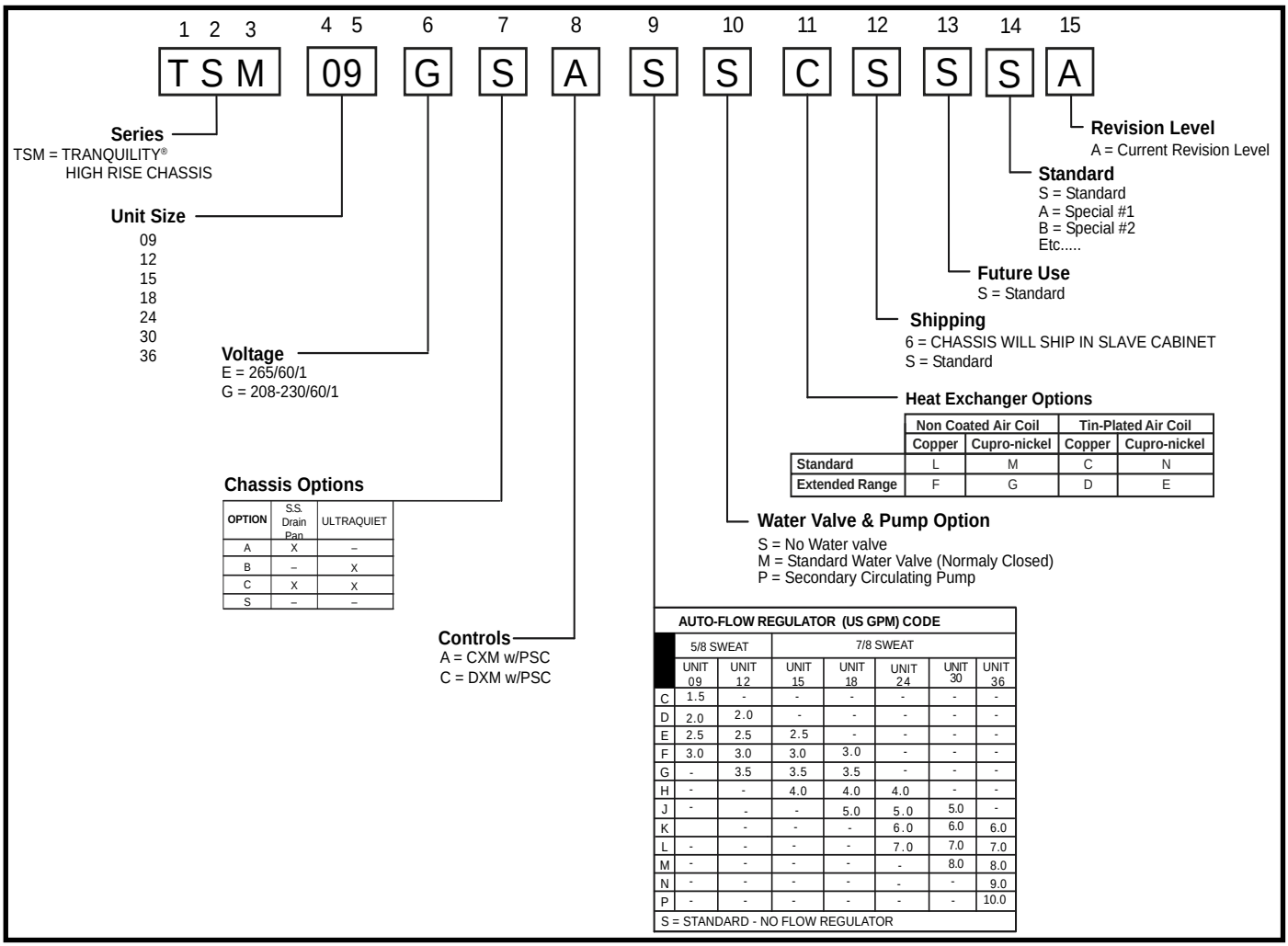
TSM has different riser configurations than TRM.
TSM chassis will not fit into the TRM Cabinet.
TSM return air side is defined as the front of unit.
TSM - G panel only.
TSM - All cabinets - field must remove supply air knockouts and install duct angles.

⚠ NOTICE! ⚠

Front of cabinet is return air side, risers can be on any other side (left, right, or back).

TSM Series Nomenclature

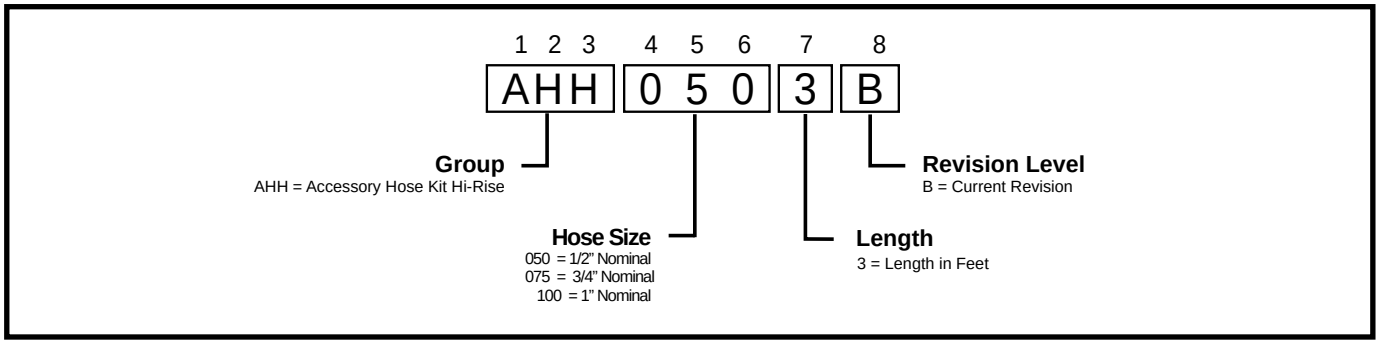
Chassis



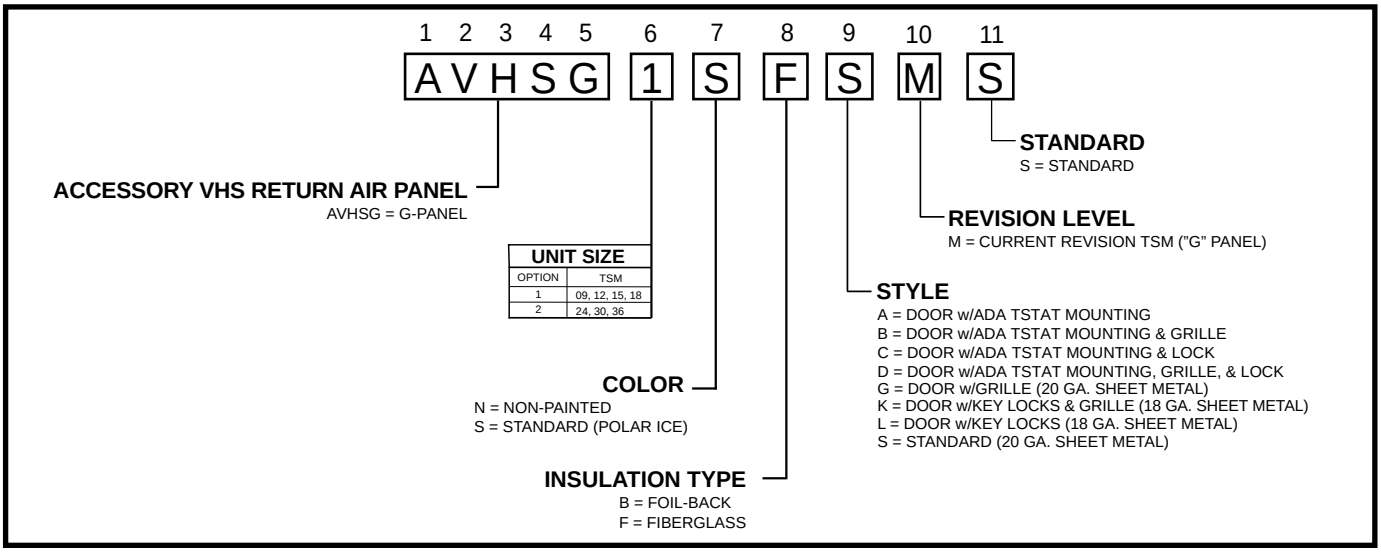
Chassis	Cabinet
09	1
12	2
15	3
18	4
24	5
30	6
36	7

TSM Series Nomenclature

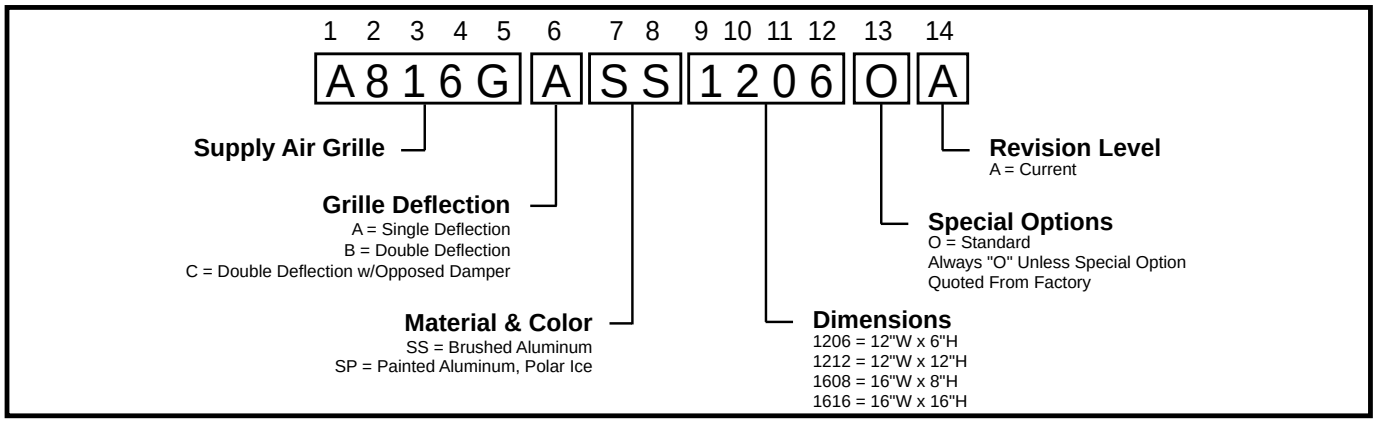
Hose Kit



Return Air Panel



Supply Air Grille



Performance Data – AHRI/ASHRAE/ISO 13256-1

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

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
TSM09	10,100	14.7	13,200	5.4	11,800	23.3	10,500	4.4	10,700	17.1	7,600	3.3
TSM12	11,600	14.2	16,500	5.1	13,700	22.5	13,000	4.3	12,200	16.2	9,800	3.3
TSM15	14,300	13.3	18,000	4.8	16,500	20.5	14,500	4.1	15,200	15.6	11,500	3.3
TSM18	17,300	13.2	22,500	4.8	20,000	20.0	18,000	4.0	18,400	15.1	13,500	3.2
TSM24	25,000	14.4	32,500	4.9	29,000	22.5	26,500	4.3	26,500	16.8	18,400	3.4
TSM30	27,500	13.4	34,500	4.7	31,000	19.5	28,500	4.1	28,500	15.2	22,000	3.3
TSM36	37,500	14.1	44,500	4.9	42,500	21.5	36,500	4.3	38,500	16.2	28,500	3.4

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

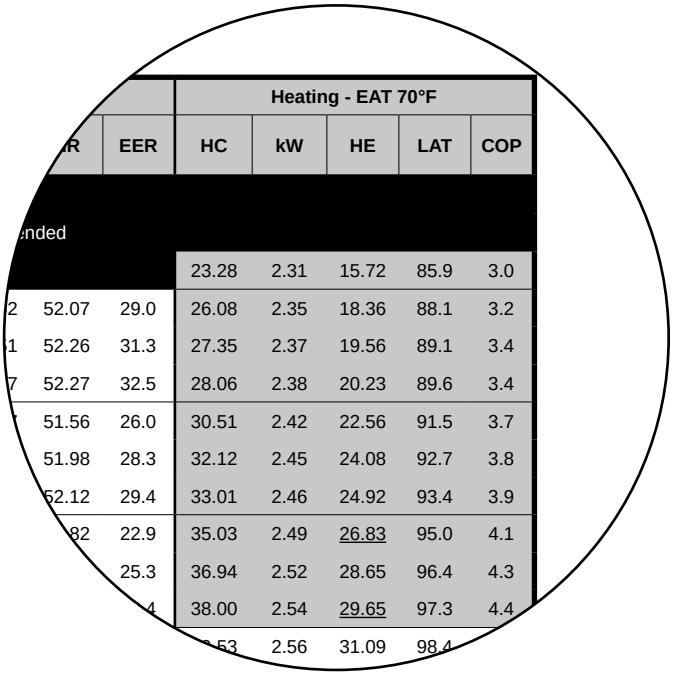
ASHRAE/AHRI/ISO 13256-1. Metric (S-I) Units

Model with 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
TSM09	2.96	4.3	3.87	5.4	3.46	6.8	3.08	4.4	3.14	5.0	2.23	3.3
TSM12	3.40	4.2	4.84	5.1	4.02	6.6	3.81	4.3	3.58	4.7	2.87	3.3
TSM15	4.19	3.9	5.28	4.8	4.84	6.0	4.25	4.1	4.45	4.6	3.37	3.3
TSM18	5.07	3.9	6.59	4.8	5.86	5.9	5.28	4.0	5.39	4.4	3.96	3.2
TSM24	7.33	4.2	9.53	4.9	8.50	6.6	7.77	4.3	7.77	4.9	5.39	3.4
TSM30	8.06	3.9	10.11	4.7	9.09	5.7	8.35	4.1	8.35	4.5	6.45	3.3
TSM36	10.99	4.1	13.04	4.9	12.46	6.3	10.70	4.3	11.28	4.7	8.35	3.4

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

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/DXM JW3 jumper is not clipped (see example below). Otherwise, appropriate levels 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] with 40°F [4.4°C] LWT, 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.



		Heating - EAT 70°F				
R	EER	HC	kW	HE	LAT	COP
nded						
		23.28	2.31	15.72	85.9	3.0
2	29.0	26.08	2.35	18.36	88.1	3.2
1	31.3	27.35	2.37	19.56	89.1	3.4
7	32.5	28.06	2.38	20.23	89.6	3.4
	26.0	30.51	2.42	22.56	91.5	3.7
	28.3	32.12	2.45	24.08	92.7	3.8
	29.4	33.01	2.46	24.92	93.4	3.9
82	22.9	35.03	2.49	26.83	95.0	4.1
	25.3	36.94	2.52	28.65	96.4	4.3
4		38.00	2.54	29.65	97.3	4.4
		53	2.56	31.09	98.4	

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 x 500)

TD = 26,830 / (4.5 x 500)

TD = 12°F

LWT = EWT - TD

LWT = 50 - 12 = 38°F - Requires appropriate antifreeze, 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 31 gpm/ton, the calculation becomes:

TD = 29,650 / (9GPMx500)

TD = 7°F

LWT = 50 - 7 = 43°F - Water is acceptable, do not clip JW3.

Performance Data – TSM09 with PSC Motor

400 CFM Nominal Airflow Heating, 350 CFM Nominal Airlfow 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	1.5	1.6		Operation not recommended										
	2.3	1.8												
	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					
	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, TSM09 (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 – TSM12 with PSC Motor

500 CFM Nominal Airflow Heating, 400 CFM Nominal Airlfow Cooling

Performance capacities shown in thousands of Btuh

*WPD Adder for Motorized Valve, TSM12 (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

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	1.8	4.1		Operation not recommended										
	2.6	6.3												
	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					

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 – TSM15 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	2.3	2.4		Operation not recommended										
	3.5	5.8												
	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, TSM15 (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 – TSM18 with PSC Motor

700 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

*WPD Adder for Motorized Valve, TSM18 (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

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	3.4	2.6		Operation not recommended										
	5.1	4.7												
	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					
	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					

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 – TSM24 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	4.0	0.8		Operation not recommended										
	6.0	2.5												
	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					
	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, TSM24 (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 – TSM30 with PSC Motor

1000 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

*WPD Adder for Motorized Valve, TSM30 (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

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	4.0	1.2		Operation not recommended										
	6.0	2.5												
	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					

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 – TSM36 with PSC 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	4.5	3.7		Operation not recommended										
	6.0	5.0												
	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					
	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, TSM36 (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 Correction Tables

Air Flow Correction Table

Airflow	Cooling				Heating		
% of Nominal (Rated) SCFM	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

Cooling											
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	0.566	*	*	*	*	*	*	*	*	0.986	0.681
50	0.668	1.005	*	*	*	*	*	*	*	0.990	0.756
55	0.771	0.787	0.996	*	*	*	*	*	*	0.993	0.831
60	0.873	0.569	0.780	0.997	1.210	1.263	*	*	*	0.996	0.907
65	0.975		0.564	0.783	0.998	1.051	1.211	*	*	0.999	0.982
66.2	1.000		0.512	0.731	0.947	1.000	1.159	1.389	*	1.000	1.000
67	1.016		0.477	0.697	0.913	0.966	1.125	1.354	*	1.001	1.012
70	1.078			0.569	0.786	0.839	0.995	1.223	1.427	1.002	1.057
75	1.180				0.574	0.626	0.780	1.005	1.203	1.006	1.133

* = 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			Heating		WPD Corr. Fct. EWT 30°F
		EWT 90°F			EWT 30°F		
		Total Cap	Sens Cap	Power	Htg Cap	Power	
Water	0	1.000	1.000	1.000			1.000
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.070
	15	0.986	0.986	1.009	0.968	0.990	1.210
	25	0.978	0.978	1.014	0.947	0.983	1.360
Methanol	5	0.997	0.997	1.002	0.989	0.997	1.070
	15	0.990	0.990	1.007	0.968	0.990	1.160
	25	0.982	0.982	1.012	0.949	0.984	1.220
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.140
	15	0.994	0.994	1.005	0.944	0.983	1.300
	25	0.986	0.986	1.009	0.917	0.974	1.360
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.040
	15	0.994	0.994	1.004	0.980	0.994	1.120
	25	0.988	0.988	1.008	0.966	0.990	1.200

PSC Blower Performance Data

TSM 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)										
				0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
09	High	400H/350C	284	425	415	400	380	360	330	320				
	Medium			360	345	325	320	300						
	Low			300										
12	High	500H/400C	310	520	490	460	440	420	400	375	330			
	Medium			345	330	325	320	310						
	Low			330	320	310	Operation not recommended							
15	High	600	416	689	672	664	652	642	633	618	605	590	568	539
	Medium			600	576	564	554	544	534	525	509	493	447	427
	Low			519	505	487	475	449	437	423				
18	High	685	480	685	674	664	653	640	627	612	594	575	553	528
	Medium			591	581	572	562	552	541	529	515	498	479	
	Low			514	503	492	482							
24	High	850	596	850	830	808	783	785	730	703	672	641	611	
	Medium			761	727	707	679	655	628	602				
	Low			653	630	610	594							
30	High	1000	798	1346	1310	1284	1221	1172	1135	1108	1069	1036	996	959
	Medium			1140	1113	1101	1077	1056	1030	1010	979	952	917	886
	Low			1008	980	968	949	934	914	897	870	846	810	
36	High	1200	882	1262	1234	1209	1180	1153	1122	1091	1057	1024	989	954
	Medium			1129	1107	1090	1068	1046	1020	996	965	935	901	
	Low			1010	995	980	962	940	938	916	893			

Units with CXM or DXM 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.

Physical Data

Model	09	12	15	18	24	30	36
Compressor (1 Each)	Rotary				Scroll		
Factory Charge HFC-410A (oz) [kg]	34 [.07]	34 [.97]	43 [1.22]	53 [1.51]	71 [2.01]	66 [1.87]	75 [2.13]
PSC Motor & Blower Wheel (2 Speeds)							
Motor (hp) [W]	1/30 [25]	1/15 [50]	1/6 [124]	1/6 [124]	1/5 [149]	1/2 [373]	1/2 [373]
Blower Wheel Size (dia x w) - (in) [mm]	6.75 x 7.25 [174 x 184]	6.75 x 7.25 [174 x 184]	9.50 x 7.12 [241 x 181]	9.50 x 7.12 [241 x 181]	9.50 x 7.12 [241 x 181]	9.50 x 8.06 [241 x 205]	9.50 x 8.06 [241 x 205]
Chassis Air Coil							
Air Coil Dimensions (h x w) - (in) [mm]	28 x 14 2 row 14 FPI [711 x 356]	28 x 14 2 row 14 FPI [711 x 356]	28 x 14 3 row 14 FPI [711 x 356]	28 x 14 - 4 row 11 FPI [711 x 356]	30 x 18 3 row 14 FPI [762 x 457]	30 x 18 3 row 14 FPI [762 x 457]	30 x 18 4 row 11 FPI [762 x 457]
Standard Filter - 1" [25.4 mm], (w x h) - (in) [mm]	16 x 30 [406 x 762]	16 x 30 [406 x 762]	16 x 30 [406 x 762]	16 x 30 [406 x 762]	20 x 32 [508 x 813]	20 x 32 [508 x 813]	20 x 32 [508 x 813]
Coax Volume (In Gallons)	0.215	0.26	0.367	0.367	0.602	0.602	0.602
Hose Size (in)	1/2	1/2	3/4	3/4	1		
Weight							
Chassis - (lbs) [kg]	125	125	125	125	186	192	192
Cabinet - (lbs) [kg]	189 [86]	189 [86]	189 [86]	189 [86]	243 [110]	243 [110]	243 [110]

Unit Maximum Water Working Pressure	
Options	**Max Pressure PSIG [kPa]**
Base Unit	300 [2,068]
Internal Secondary Pump (ISP)	145 [999]
Internal Motorized Water Valve (WMV)	300 [2,068]
Internal Auto Flow Valve	300 [2,068]

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

Electrical Data - PSC Motor

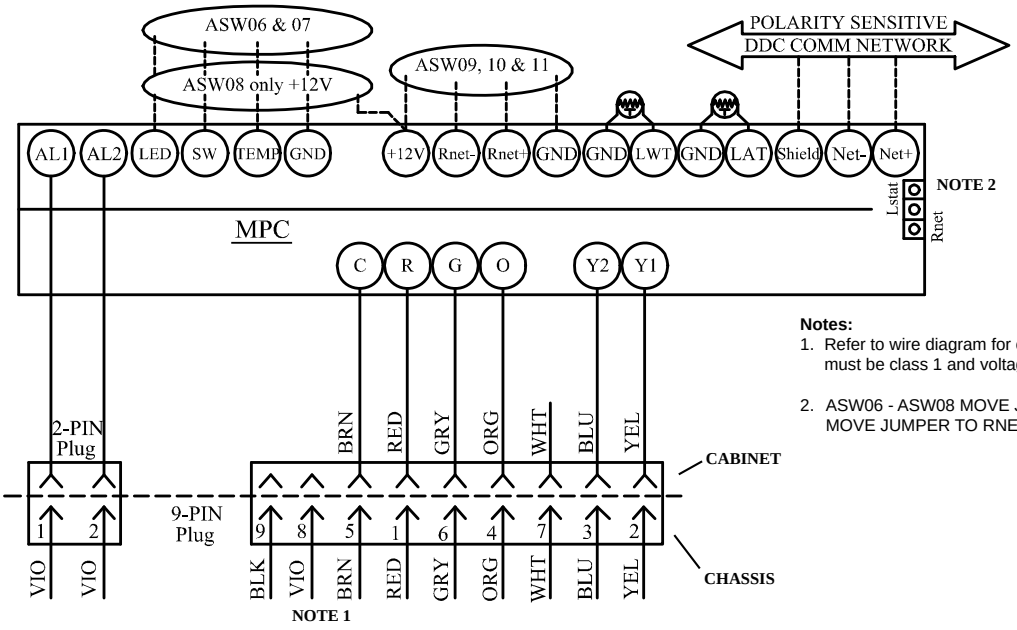
Model #	Rated Voltage	Min/ Max Voltage	Compressor		Fan Motor FLA	Standard Unit					With Pump				
			RLA	LRA		Total FLA	MCA	SCCR kA rms Symetrical	SCCR Volts Maximum	Max Fuse Amps	Total FLA	MCA	SCCR kA rms Symetrical	SCCR Volts Maximum	Max Fuse / HACR
TSM09G	208-230/60/1	197/254	3.7	22.0	0.4	4.1	5.0	NA	NA	15	4.6	5.5	NA	NA	15
TSM09E	265/60/1	239/292	3.5	24.0	0.3	3.8	4.7	NA	NA	15	4.3	5.1	NA	NA	15
TSM12G	208-230/60/1	197/254	4.7	25.0	0.7	5.4	6.6	NA	NA	15	5.9	7.1	NA	NA	15
TSM12E	265/60/1	239/292	4.2	22.0	2.0	6.2	7.3	NA	NA	15	5.3	6.4	NA	NA	15
TSM15G	208-230/60/1	197/254	5.6	29.0	1.0	6.6	8.0	NA	NA	15	7.4	8.8	NA	NA	15
TSM15E	265/60/1	239/292	5.0	28.0	0.9	5.9	7.1	NA	NA	15	6.7	8.0	NA	NA	15
TSM18G	208-230/60/1	197/254	7.6	33.0	1.1	8.7	10.6	NA	NA	15	9.5	11.4	NA	NA	15
TSM18E	265/60/1	239/292	5.6	28.0	0.9	6.5	7.9	NA	NA	15	7.3	8.7	NA	NA	15
TSM24G	208-230/60/1	197/254	12.8	58.3	1.1	13.9	17.1	NA	NA	25	14.7	17.9	NA	NA	30
TSM24E	265/60/1	239/292	9.6	54.0	0.9	10.5	12.9	NA	NA	20	11.3	13.7	NA	NA	20
TSM30G	208-230/60/1	197/254	12.8	64.0	1.9	14.7	17.9	NA	NA	25	15.5	18.7	NA	NA	30
TSM30E	265/60/1	239/292	10.9	60.0	2.0	12.9	15.6	NA	NA	25	13.7	16.4	NA	NA	25
TSM36G	208-230/60/1	197/254	14.1	77.0	1.9	16.0	19.5	NA	NA	30	16.8	20.3	NA	NA	30
TSM36E	265/60/1	239/292	12.2	72.0	2.1	14.3	17.4	NA	NA	25	15.5	18.6	NA	NA	30

TSM Series Wiring Diagram Matrix

All current diagrams can be located online at climatemaster.com. Click 'Commercial' (go to 'Quick Links' in the upper right) using the part numbers presented below.

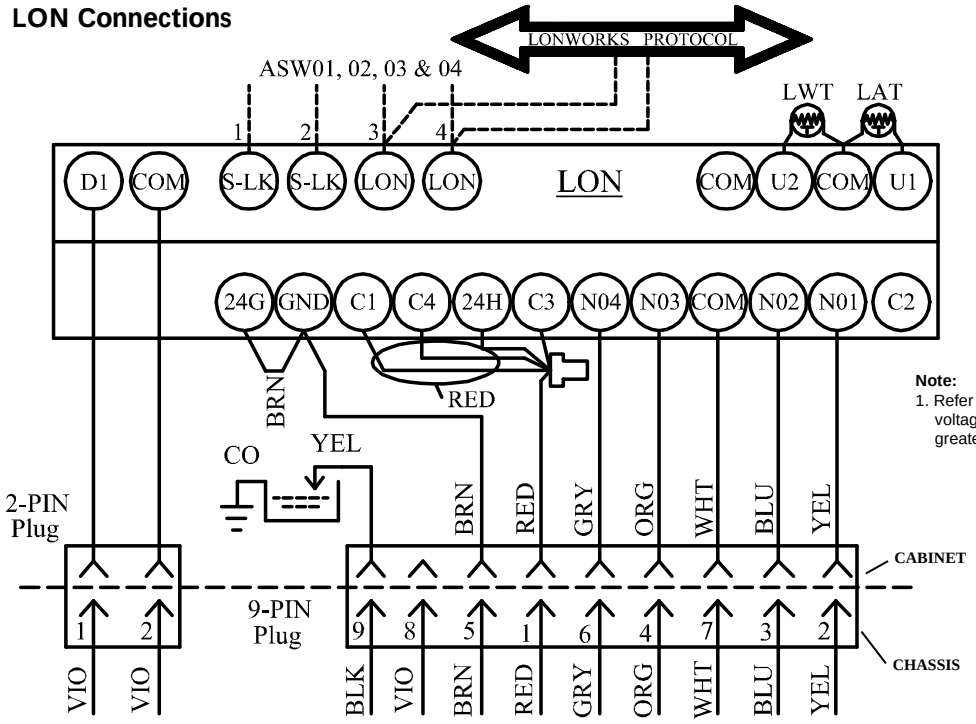
Model	Refrigerant	Wiring Diagram Part Number	Electrical	Control		Agency
TSM09-36 PSC	EarthPure® (HFC-410A)	96B0173N32	208-230/60/1, 265/60/1	CXM	ACO/MCO	ETL
		96B0173N33		DXM		
				DXM		

MPC Connections



Notes:
1. Refer to wire diagram for connection to CXM/DXM. Low voltage wiring must be class 1 and voltage rated equal or greater than unit supply voltage.
2. ASW06 - ASW08 MOVE JUMPER TO LSTAT, ASW09 - ASW11 MOVE JUMPER TO RNET.

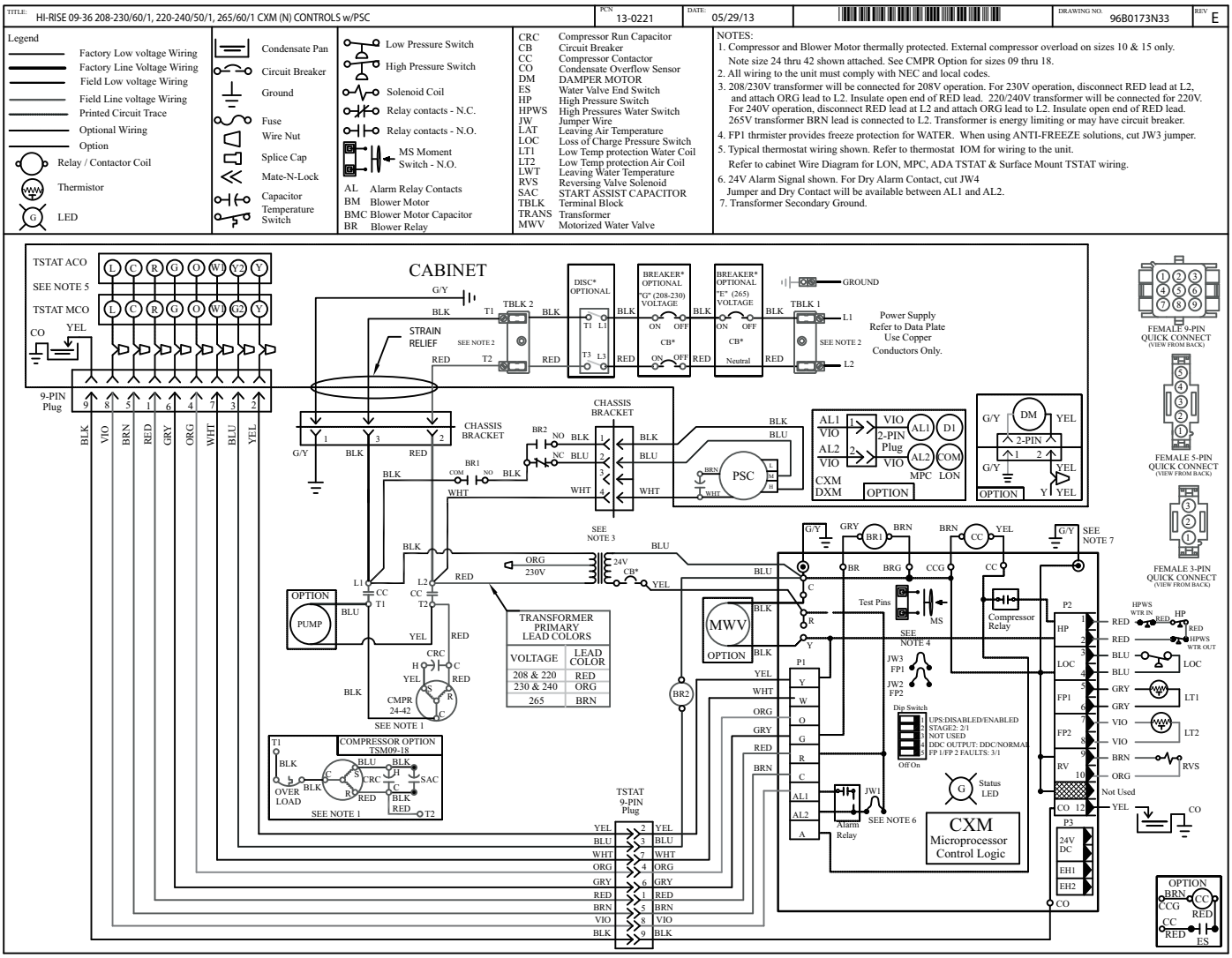
LON Connections



Note:
1. Refer to wire diagram for connection to CXM/DXM. Low voltage wiring must be class 1 and voltage rated equal or greater than unit supply voltage.

NOTE 1

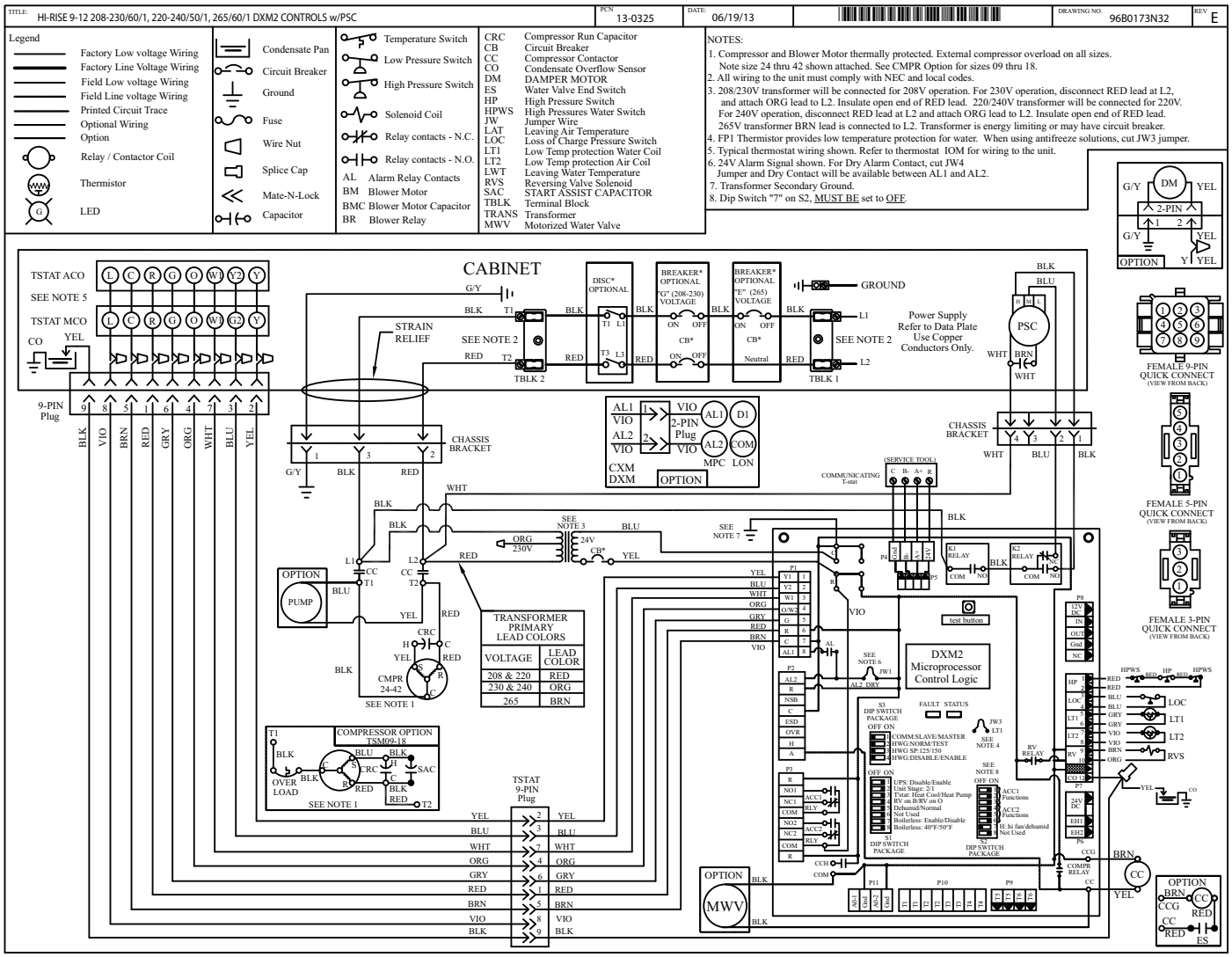
Typical Wiring Diagram – TSM09 - 36 CXM with PSC Motor



CXM CONTROLLER FAULT CODES

DESCRIPTION OF OPERATION	LED	ALARM RELAY
NORMAL MODE	ON	OPEN
NORMAL MODE W/ UPS WARNING	ON	CYCLE (CLOSED 5 SEC. OPEN 25 SEC.)
CXM IS NON-FUNCTIONAL	OFF	OPEN
FAULT RETRY	SLOW FLASH	OPEN
LOCKOUT	FAST FLASH	CLOSED
OVER/UNDER VOLTAGE SHUTDOWN	SLOW FLASH	OPEN (CLOSED AFTER 15 MIN.)
TEST MODE-NO FAULT IN MEMORY	FLASHING CODE 1	CYCLING CODE 1
TEST MODE-HP FAULT IN MEMORY	FLASHING CODE 2	CYCLING CODE 2
TEST MODE-LP FAULT IN MEMORY	FLASHING CODE 3	CYCLING CODE 3
TEST MODE-FP1 FAULT IN MEMORY	FLASHING CODE 4	CYCLING CODE 4
TEST MODE FP2-FAULT IN MEMORY	FLASHING CODE 5	CYCLING CODE 5
TEST MODE-CO FAULT IN MEMORY	FLASHING CODE 6	CYCLING CODE 6
TEST MODE-OVER/UNDER SHUTDOWN IN MEMORY	FLASHING CODE 7	CYCLING CODE 7
TEST MODE-UPS IN MEMORY	FLASHING CODE 8	CYCLING CODE 8
TEST MODE-SWAPPED LT1 TO LT2	FLASHING CODE 9	CYCLING CODE 9

Typical Wiring Diagram – TSM09 - 36 DXM with PSC Motor

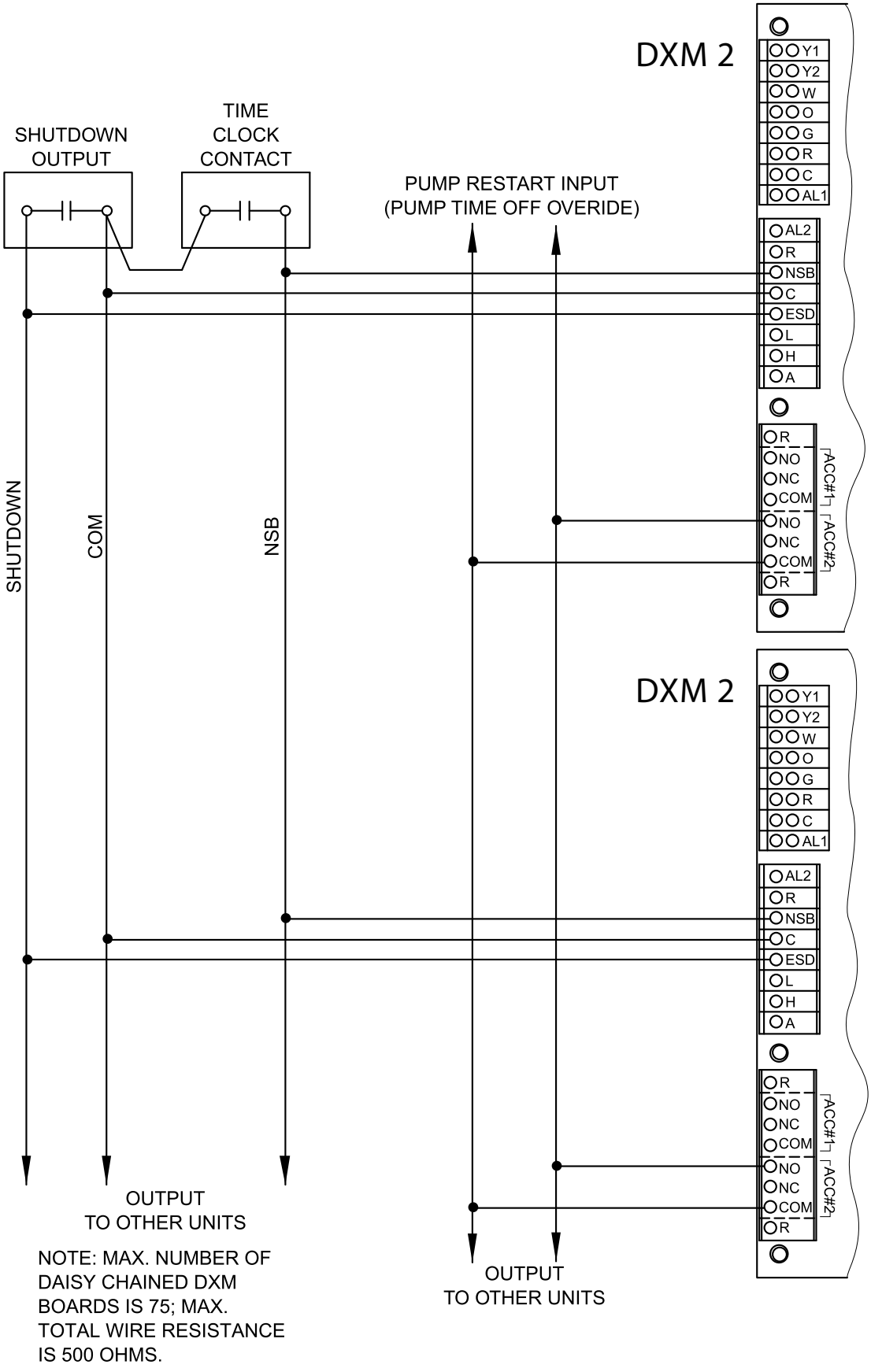


DXM CONTROLLER FAULT CODES

DXM CONTROLLER FAULT CODES				
OPERATION	STATUS LED (GREEN)	TEST LED (YELLOW)	FAULT LED (RED)	ALARM RELAY
NORMAL MODE	ON	OFF	NOTE:2	OPEN
DXM IS NON-FUNCTIONAL	OFF	OFF	OFF	OPEN
TEST MODE	-	ON	NOTE:2	Cycle (Note 3)
NIGHT SETBACK	FLASHING CODE 2	-	NOTE:2	-
EMERGENCY SHUT DOWN	FLASHING CODE 3	-	NOTE:2	-
INVALID T-STAT INPUTS	FLASHING CODE 4	-	NOTE:2	-
NO FAULT IN MEMORY	ON	OFF	FLASHING CODE 1	OPEN
HP: FAULT / (LOCKOUT) NOTE: 1	SLOW FLASH/ (FAST FLASH)	OFF	FLASHING CODE 2	OPEN / (CLOSED)
LP: FAULT / (LOCKOUT) NOTE: 2	SLOW FLASH/ (FAST FLASH)	OFF	FLASHING CODE 3	OPEN / (CLOSED)
FPI: FAULT / (LOCKOUT) NOTE: 1	SLOW FLASH/ (FAST FLASH)	OFF	FLASHING CODE 4	OPEN / (CLOSED)
FP2: FAULT / (LOCKOUT) NOTE: 1	SLOW FLASH/ (FAST FLASH)	OFF	FLASHING CODE 5	OPEN / (CLOSED)
CO: FAULT / (LOCKOUT) NOTE: 1	SLOW FLASH/ (FAST FLASH)	OFF	FLASHING CODE 6	OPEN / (CLOSED)
OVER-UNDER VOLTAGE	SLOW FLASH	OFF	FLASHING CODE 7	OPEN(NOTE4)
NORMAL MODE w/UPS	ON	OFF	FLASHING CODE 8	CYCLE (NOTE5)
SWAPPED LT1/LT2 LOCKOUT	FAST FLASH	OFF	FLASHING CODE 9	CLOSED

1. STATUS LED (GREEN) : SLOW FLASH - CONTROLLER IN FAULT RETRY MODE, FAST FLASH - CONTROLLER IN LOCKOUT MODE SLOW FLASH = 1 FLASH PER EVERY 2 SECONDS. FAST FLASH = 2 FLASHES PER EVERY 1 SECOND.
2. FAULT LED (RED) FLASHES A CODE REPRESENTING LAST FAULT IN MEMORY. IF NO FAULT IN MEMORY, CODE 1 IS FLASHED.
3. CYCLES APPROPRIATE CODE, BY CYCLING ALARM RELAY IN THE SAME SEQUENCE AS FAULT LED.
4. ALARM RELAY CLOSES AFTER 15 MINUTES.
5. ALARM RELAY CYCLES : CLOSED FOR 5 SECONDS AND OPEN FOR 25 SECONDS. . . .

Typical Wiring Diagram – Single Phase TSM Units with DXM Controller with Night Setback, Emergency Shutdown, & Pump Restart

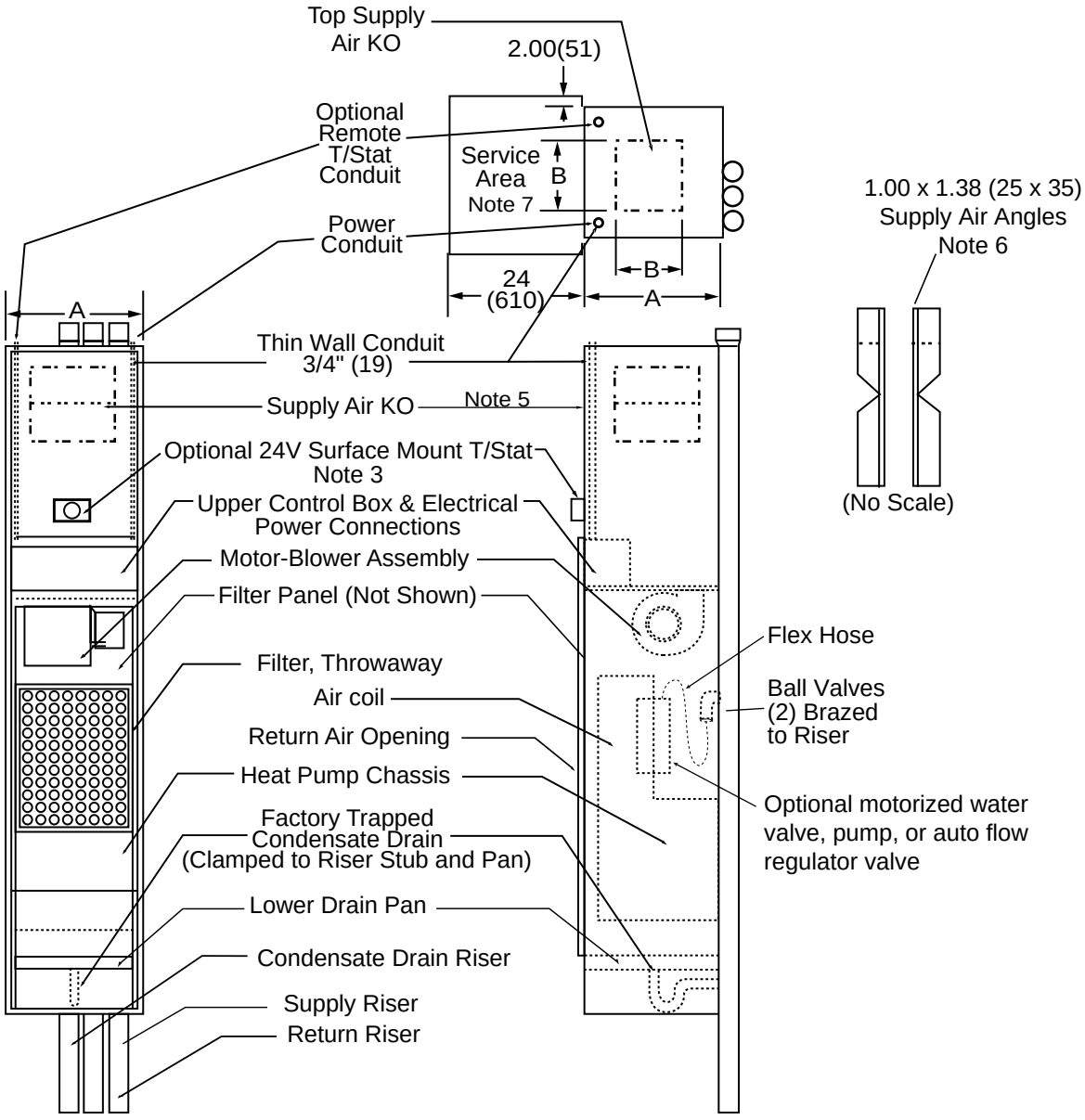


Typical Unit - Exploded View

Major Components

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

TSM – Standard Unit, Furred In Cabinet with Risers



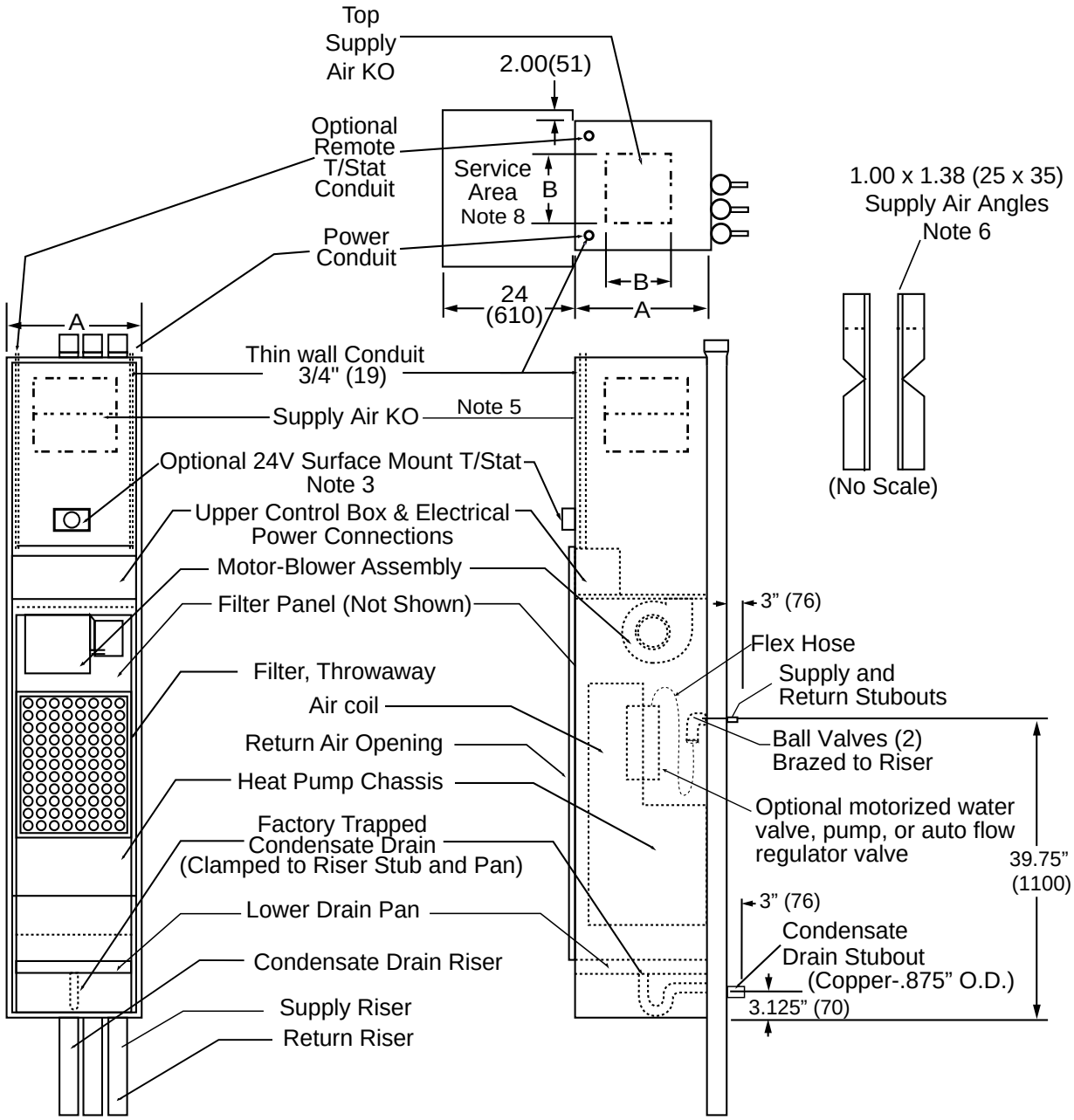
Front (Risers Shown Style 3)

Unit Size	A	B
TSM09 - 18	19 [483]	12 [305]
TSM24 - 36	24 [610]	16 [406]

Notes:

1. All dimensions are in inches (mm).
2. The return air/control box side is defined as front of cabinet. Supply air K.O.'s and riser K.O.'s are on all panels. Supply air grilles can be on any side except riser side.
3. Units with 24v surface mount T/stat option have 2x4 box factory installed. Contractor must specify horizontal or vertical orientation to suit thermostat type.
4. Cabinet shown is Style 3, risers back right.
5. Supply air K.O.'s have to be field removed.
6. Supply air angles are shipped loose. Break off for 6" or 8" (152 or 203). Position inside and attach with screws.
7. Service area from finished wall.

TSM – Master Unit, Furred In Cabinet

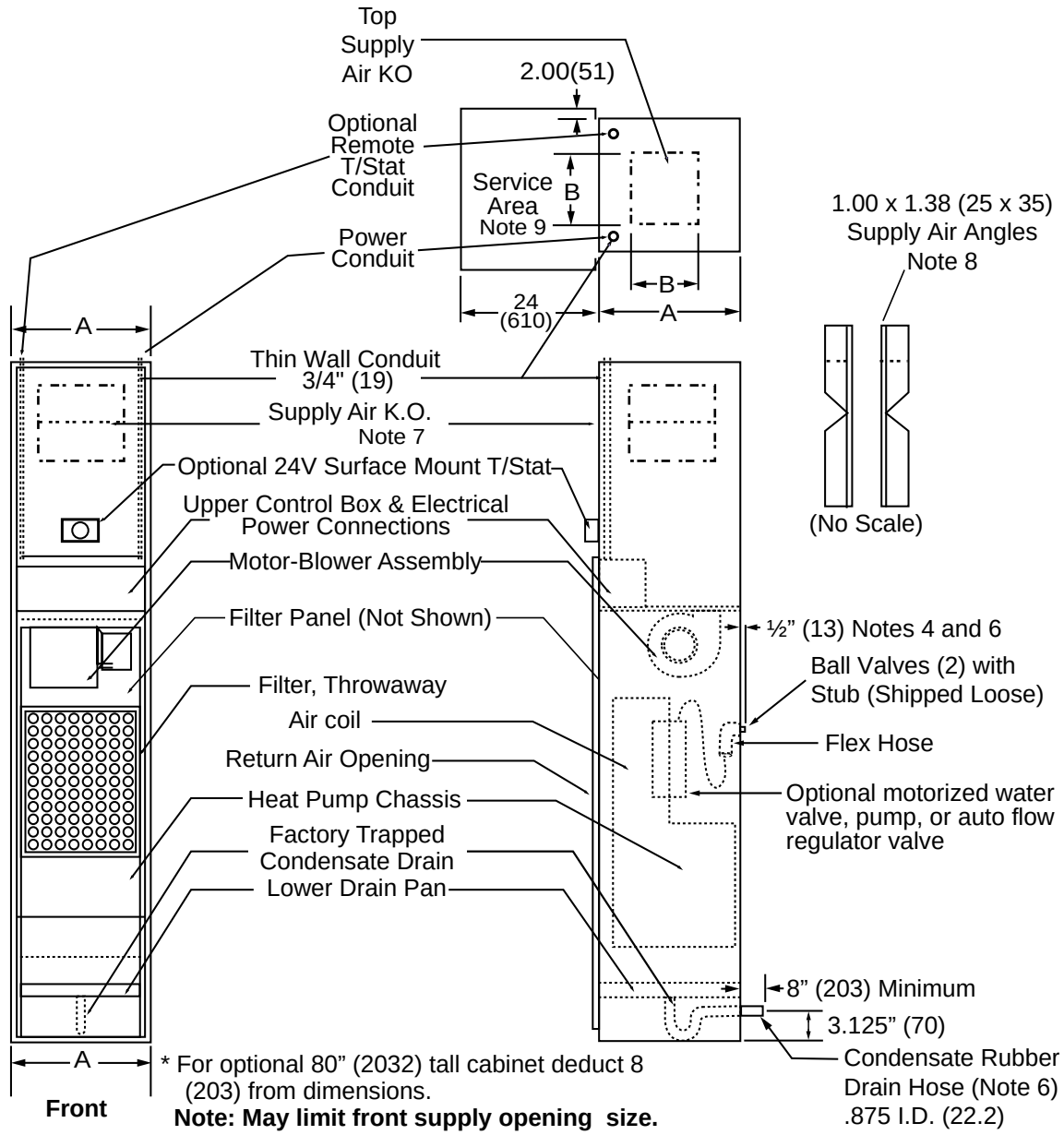


Unit Size	A	B
TSM09 - 18	19 [483]	12 [305]
TSM24 - 36	24 [610]	16 [406]

Notes:

1. All dimensions are in inches (mm).
2. The return air/control box side is defined as front of cabinet. Supply air K.O.'s and riser K.O.'s are on all panels. Supply air grilles can be on any side except riser side.
3. Units with 24v surface mount T/stat option have 2x4 box factory installed. Contractor must specify horizontal or vertical orientation to suit thermostat type.
4. Cabinet shown is Style 3, risers back right.
5. Supply air K.O.'s have to be field removed.
6. Supply air angles are shipped loose. Break off for 6" or 8" (152 or 203). Position inside and attach with screws.
7. Installer must provide crossover water piping from Master to Slave unit. Piping must have same pressure rating or higher as riser.
8. Service area from finished wall.

TSM – Slave Unit, Furred In Cabinet, No Risers

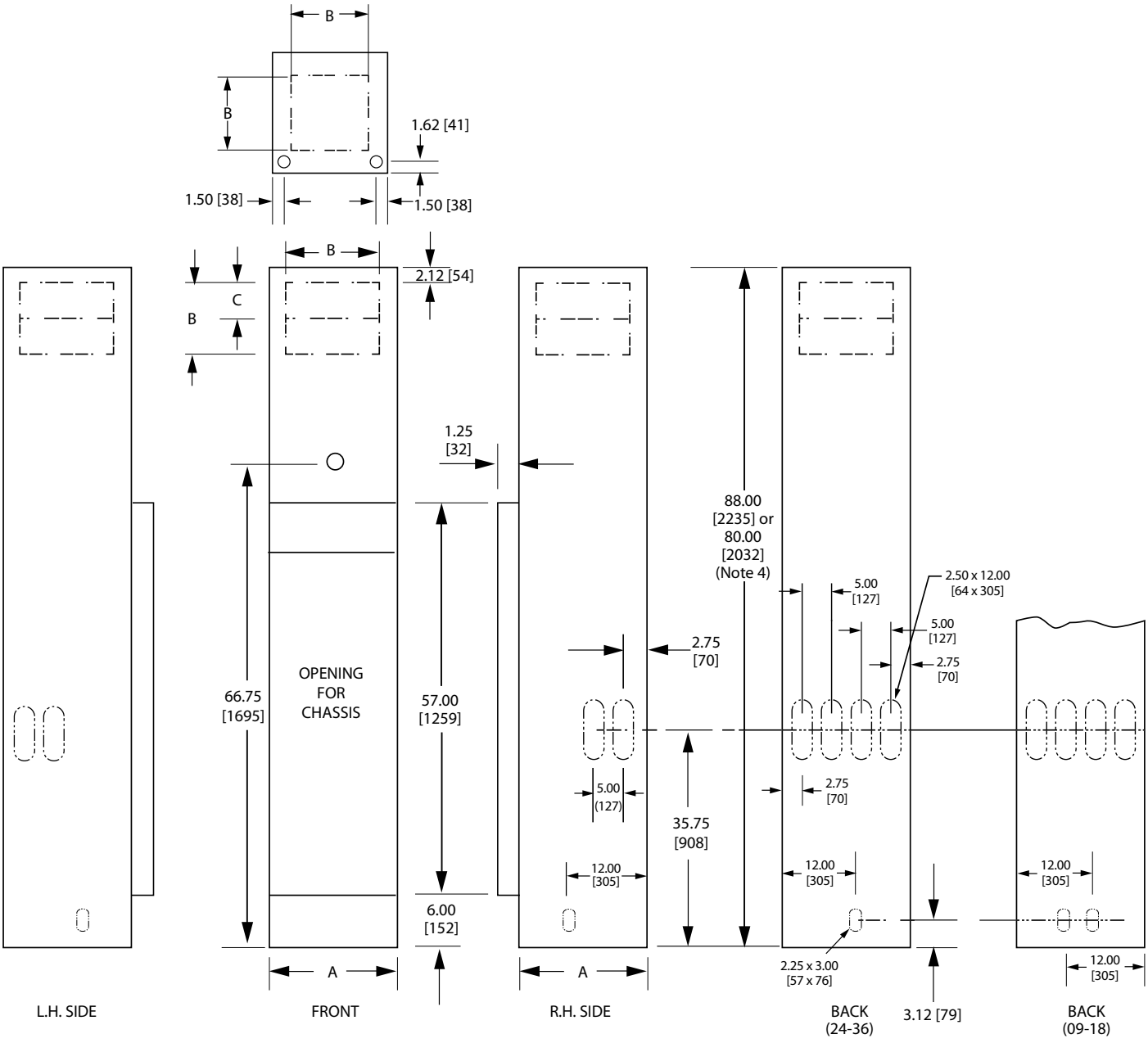


Unit Size	A	B
TSM09 - 18	19 [483]	12 [305]
TSM24 - 36	24 [610]	16 [406]

Notes:

1. All dimensions are in inches (mm).
2. Return air/control box side is defined as front of cabinet. Supply air K.O.'s and riser K.O.'s are on all panels. Supply air grilles can be on any side except riser side.
3. Units with 24v surface mount T/stat option have 2x4 box factory installed. Contractor must specify horizontal or vertical orientation to suit thermostat type.
4. Installer must provide crossover water piping from Master to Slave unit. Piping must have same pressure rating or higher as riser.
5. Ball valve package is shipped loose. Field must position in cabinet (valve opposite RA side and copper protruding 1/2" out of cabinet) and connect to master riser stubouts.
6. Rubber drain hose is shipped loose and must be connected to drain pan and clamped both ends. Suggest running hard tubing inside and clamping inside so there is future access.
7. Supply air and riser K.O.'s have to be removed in field.
8. Supply air angles are shipped loose. Break off for 6" or 8" (152 or 203). Position inside and attach with screws.
9. Service area from finished wall.

Cabinet Dimensions

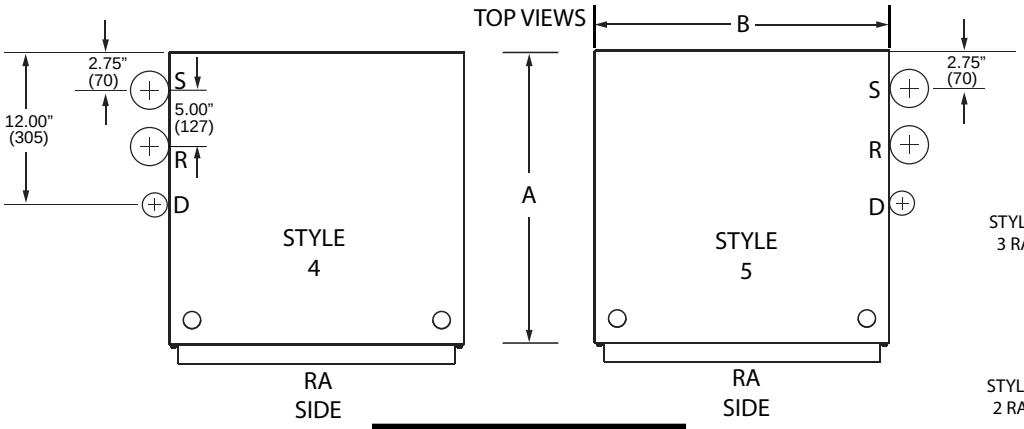


Unit Size	A	B	C
TSM09 - 18	19.00 [483]	12.00 [305]	6.00 [152]
TSM24 - 36	24.00 [610]	16.00 [406]	8.00 [203]

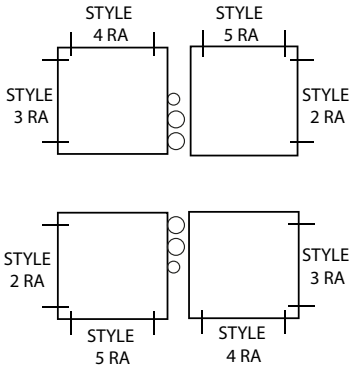
Notes:

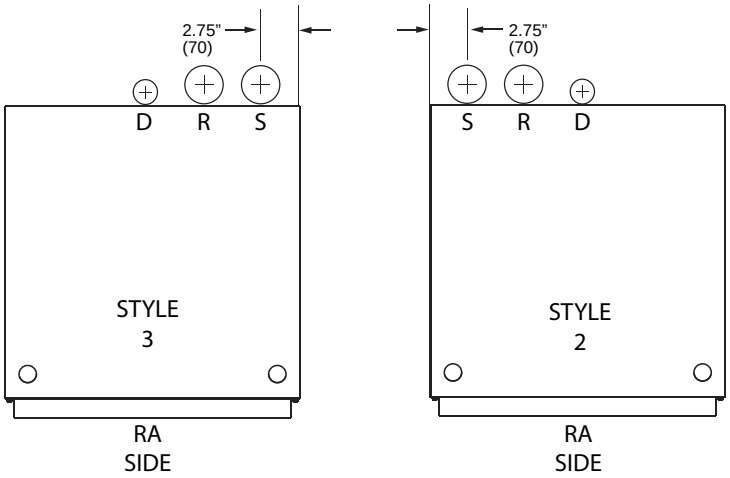
1. All dimensions are in inches (mm).
2. Cabinets have supply air and riser K.O.'s, all panels.
3. Service area to be width of cabinet and 24" [610] from finished wall.
4. 80" cabinets only have B wide x C high K.O's all sides.

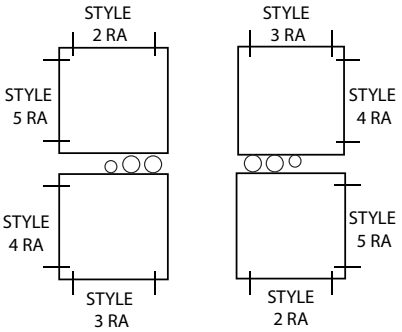
Cabinet Slot Dimensions and Riser Arrangements

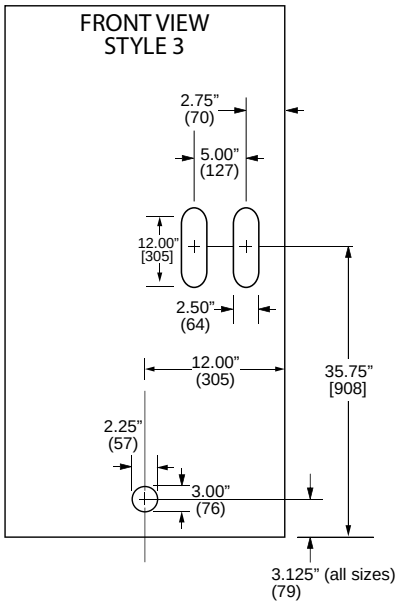


Model	A	B
09-18	19 [483]	19 [483]
24-36	24 [610]	24 [610]









⚠ NOTICE! ⚠

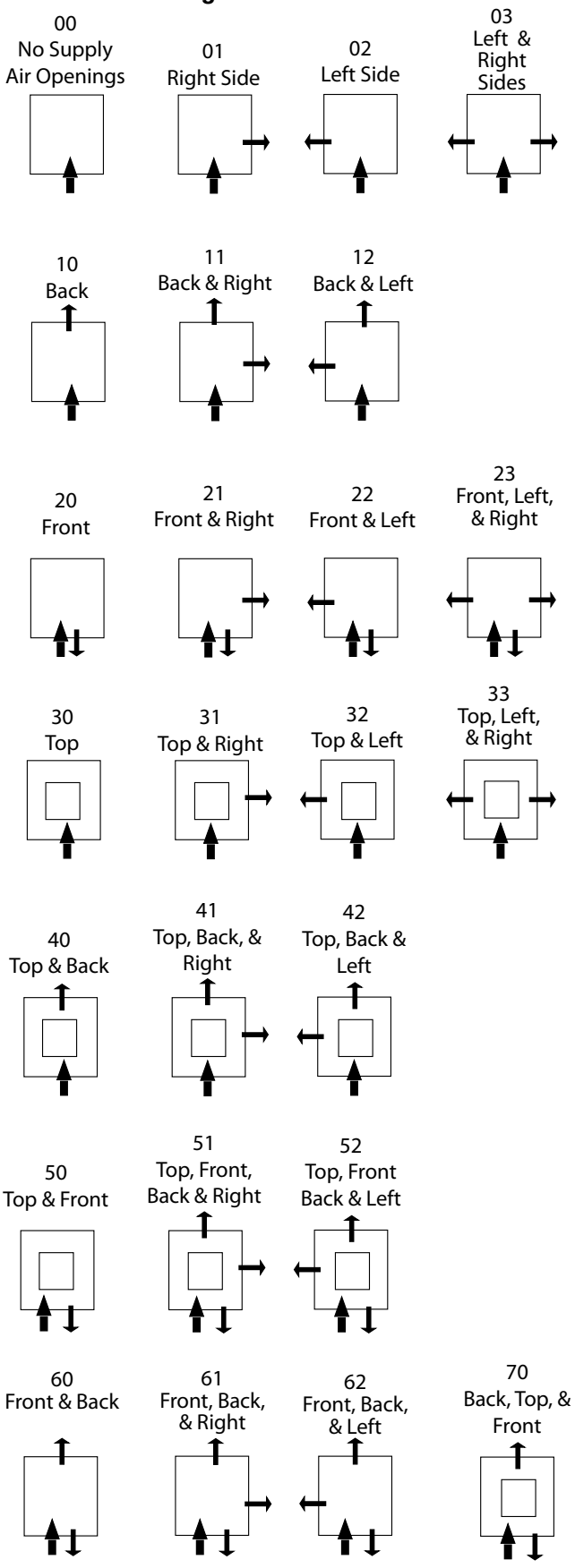
NOTICE! Not all styles will stack above or adjacent to each other. (See Note 8).

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 19 x 19 cabinet.
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 in slot.
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.

TSM Cabinet Configurations

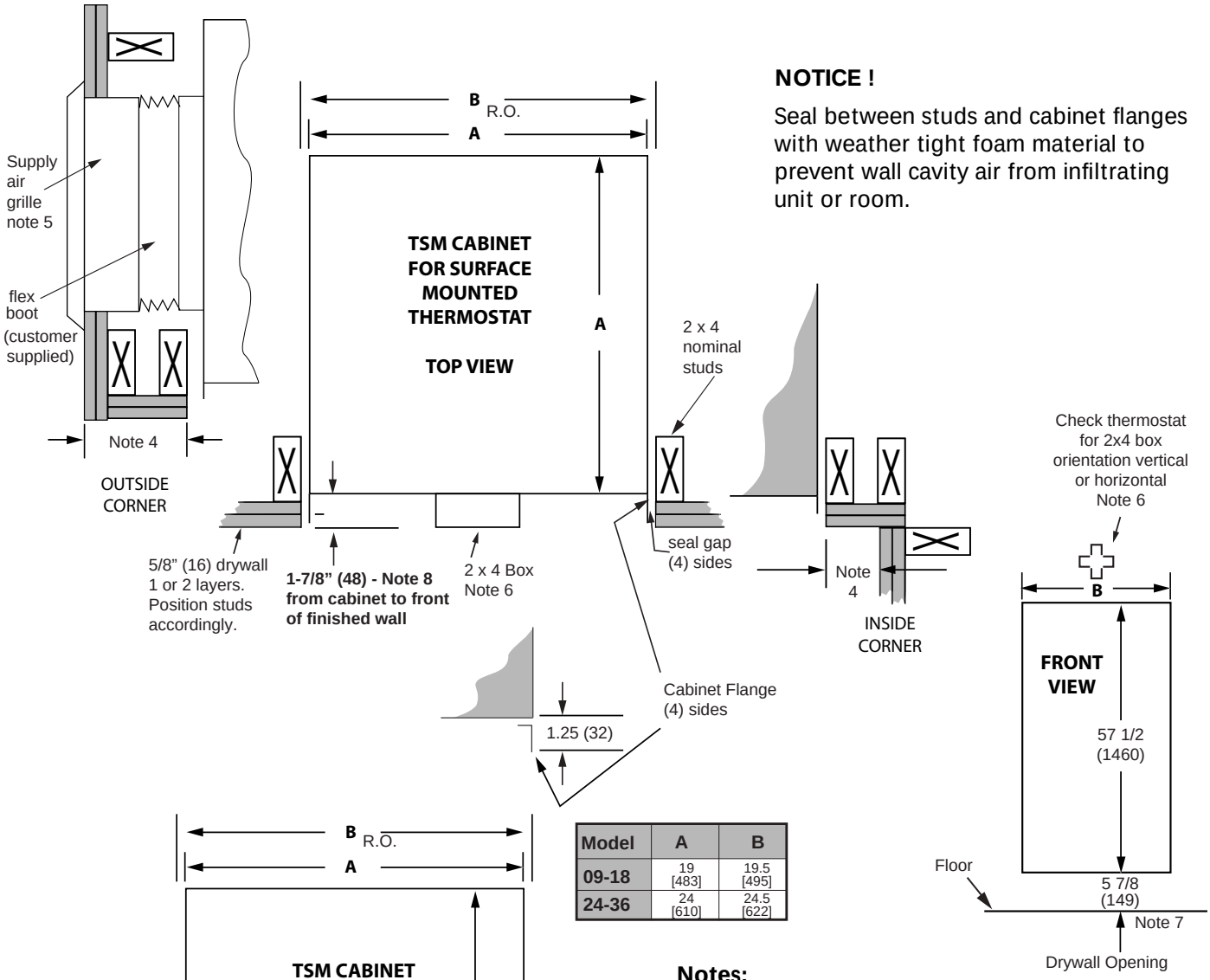
Cabinet Model Digits 11 and 12 Describe Air Flow Configuration



Notes:

1. **Front is return air side and control box location.**
2. **Risers can be on any side without return or supply air openings.**

Typical Cabinet Installation - Flush



Model	A	B
09-18	19 [483]	19.5 [495]
24-36	24 [610]	24.5 [622]

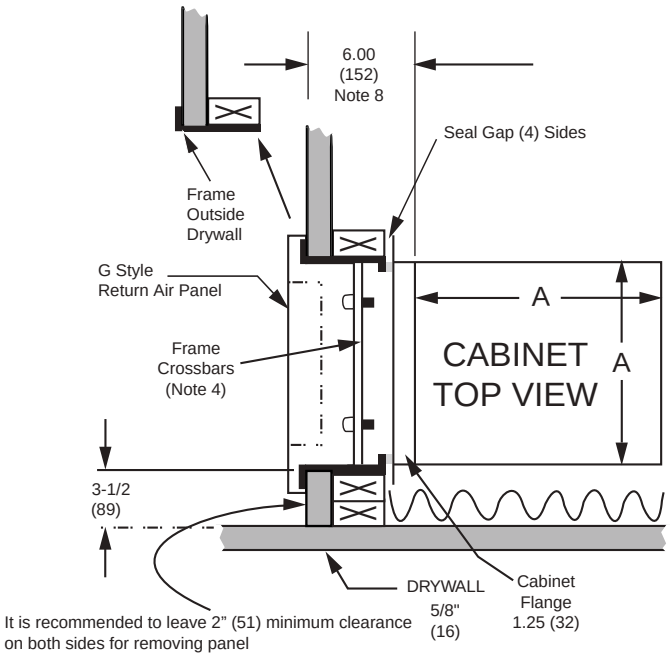
NOTICE !

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

Notes:

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 panel to wall.
5. If supply air grille does not penetrate cabinet connect with flex boot. Customer supplied top duct should also connect with flex boot.
6. Before installing dry wall, contractor must turn box if needed.
7. If cabinet stand or ISO pad is used add to dimension.
8. For 2" MERV 13 filter set cabinet 2" minimum from front of drywall.

Typical Cabinet Installation - Recessed

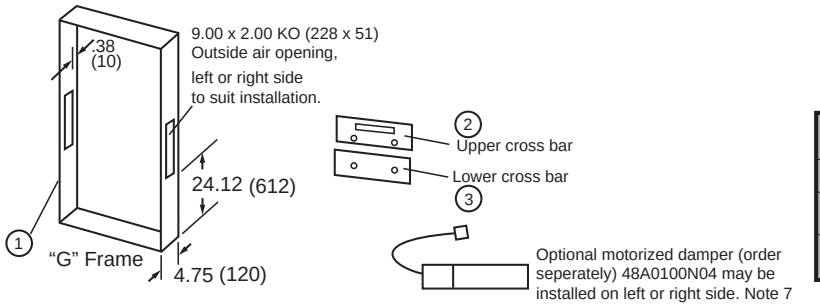


⚠ NOTICE! ⚠

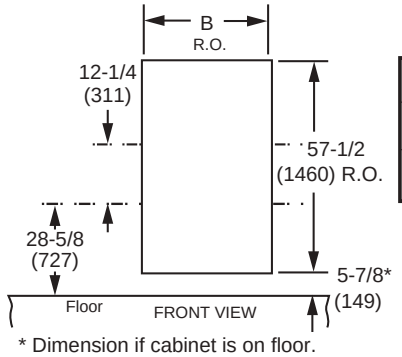
Recessed cabinet requires frame kit.
Outside air requires motorized damper.
Seal between the frame and cabinet with weather seal material to avoid air being pulled in from the wall cavity. Attach frame to studs not cabinet.
Do not distort frame shim sides if required.

Notes:

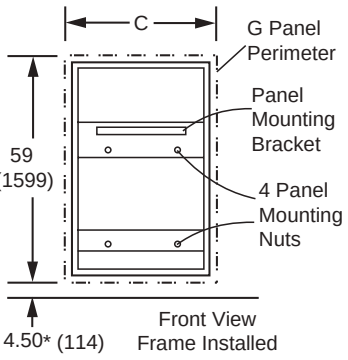
1. Cabinet configuration will determine slab core drilling location and walls surrounding cabinet.
2. Recommend stud walls surrounding cabinet. Drywall and studs should not be attached or contacting cabinet for best sound attenuation. Where possible fill gaps with sound absorbing material. Use iso pad under cabinet. Secure cabinet to floor in two places at back.
3. Return air panel overlaps rough opening, allow minimum of 3 1/2" (89) dry wall to corner. Do not caulk panel to wall.
4. G Panel attaches to frame cross bars. Cabinet must be recessed behind wall.
5. Dimensions are in inches (mm). All studs nominal 2x4, 1.50 (38) x 3.50 (89).
6. 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.
7. **When outside air is required, 48A0100N04 motorized damper must be used, mixed air temperature must be no lower than 45°F (7°C). Contractor must supply air duct, cut hole in stud, remove K.O., assemble and wire damper assembly.**
8. For 2" MERV 13 filter set cabinet 6.25" (158) from front of drywall.



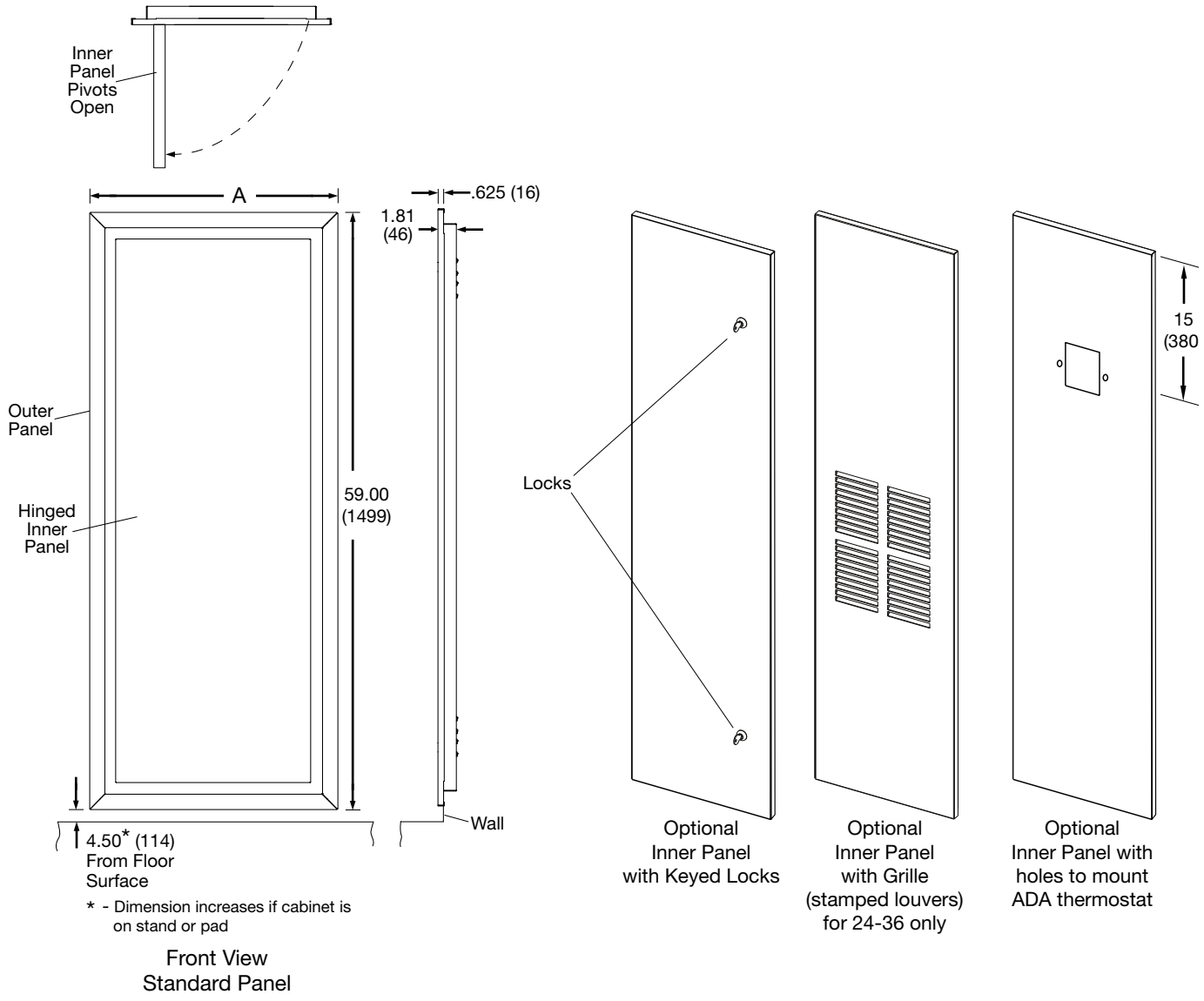
Kit Part	Qty	Description
1	1	Frame
2	1	Upper Cross Bar
3	1	Lower Cross Bar



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



Hinged "G" Style Return Air Panel – AVHSG Series



Unit	AVHS Digit 6	A
09- 18	1	21.50 (546)
24 - 36	2	25.50 (648)

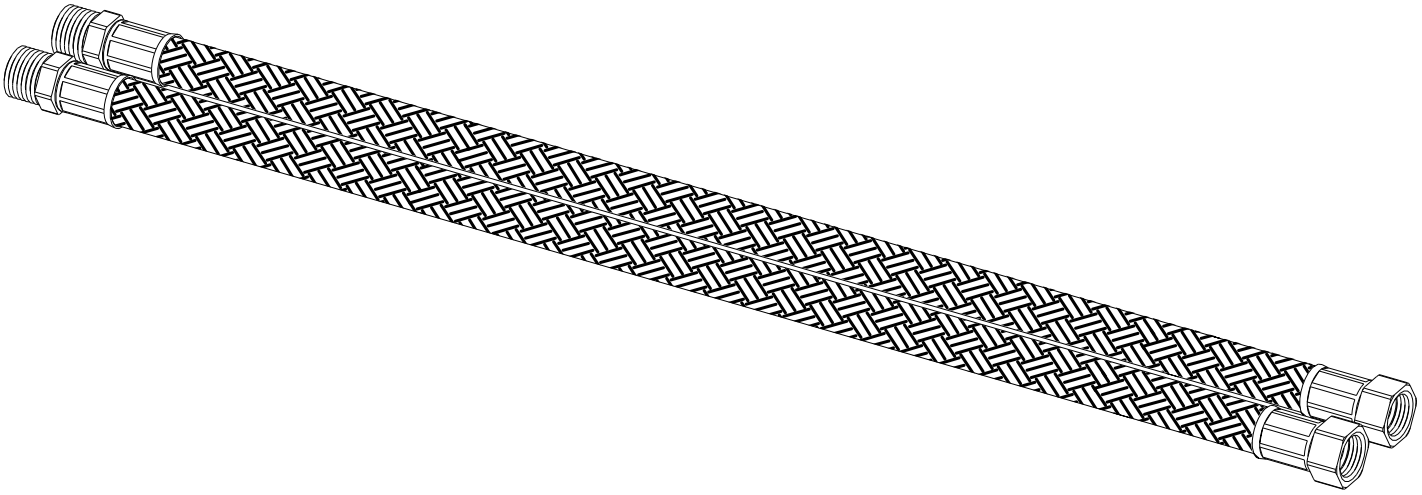
Notes:

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 and/or louvered panel available.
6. Optional frame for recessed cabinet applications and damper assembly available. See page 46.

AHH Series – Stainless Steel Braided Hose Kit

Specifications:

- Designed for VHS 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).
- MPT (External Pipe Thread) fitting at one end; swivel with NPSH thread connector (Internal Thread) at the other end (seals via fiber or EPDM washer, shipped inside connection).
- Swivel connection provides union between chassis and risers.
- 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

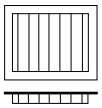
Unit	Part #	Inside Diameter inches	Length feet [cm]	Working Pressure psi [kPa]	Min. Burst Pressure psi [kPa]	Min. Bend Radius inches [mm]
09, 12	AHH0503B	0.50	3 [91]	400 [2756]	1600 [11024]	2.5 [63.5]
15, 18	AHH0753B	0.75	3 [91]	400 [2756]	1600 [11024]	4.5 [114.3]
24-36	AHH1003B	1.00	3 [91]	400 [2756]	1600 [11024]	5.5 [139.7]

Supply Air Grille

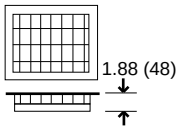
A816G Series Supply Air Grille

Standard cabinet openings and grille sizes.
88" (2235) cabinet models 09-18 – front, back, or sides 12 x 12 (305 x 305) or 12 x 6 (305 x 152) and top 12 x 12 (305 x 305).
80" (2032) cabinet models 09-18 – front, back, or sides 12 x 6 (305 x 152) and top 12 x 12 (305 x 305).
88" (2235) cabinet models 24-36 – front, back, or sides 16 x 16 (406 x 406) or 16 x 8 (406 x 203) and top 16 x 16 (406 x 406).
80" (2032) cabinet models 24-36 – front, back, or sides 16 x 8 (406 x 203) and top 16 x 16 (406 x 406).

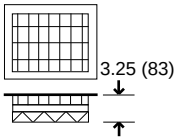
Single Deflection- Adjustable vertical blades for controlling horizontal path of discharge air.



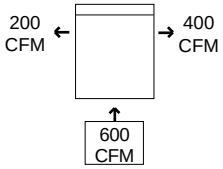
Double Deflection- Adjustable vertical and horizontal blades for controlling horizontal and vertical path of discharge air. (Recommended for all standard applications.)



Double Deflection with Opposed Blade Damper- Addition of opposed blade damper to grille allows control of air volume (CFM) and path of discharge air. (Recommended for applications requiring unequal air flow or side discharge grille(s) with additional top discharge air opening.)



Unequal Air Flow- Air discharges requiring different air volumes (CFM). Use double deflection grilles with opposed blade damper.



Grilles are shipped loose for field installation after drywall has been finished.
Grilles are brushed aluminum or painted (polar ice).
Overall dimensions - add 1.25 (32) to nominal dimensions.

Top Discharge- Units are designed to operate against relatively low air resistance (external static). Use of liberal duct sizing is recommended to maximize total unit air flow (CFM). Top duct outlet will offer more resistance to air flow than side outlets on the same cabinet.

Standard Grille Sizes (Nominal)

Unit Size	Single Discharge	Double Discharge	Triple Discharge
TSM09, 12	12” x 12” [305 x 305]	12” x 6” [305 x 152]	Not Recommended
TSM15 - 18	12” x 12” [305 x 305]	12” x 12” [305 x 305]	12” x 6” [305 x 152]
TSM24	Not Recommended	16” x 16” [406 x 406]	16” x 8” [406 x 203]
TSM30	Not Recommended	16” x 16” [406 x 406]	16” x 8” [406 x 203]
TSM36	Not Recommended	16” x 16” [406 x 406]	16” x 8” [406 x 203]

Notes:

1. When selecting grille sizes consider CFM, velocity (throw), and sound.
2. Other sizes available as special.
3. If custom grill sizes are used - area should be equal to above.

Thermostats

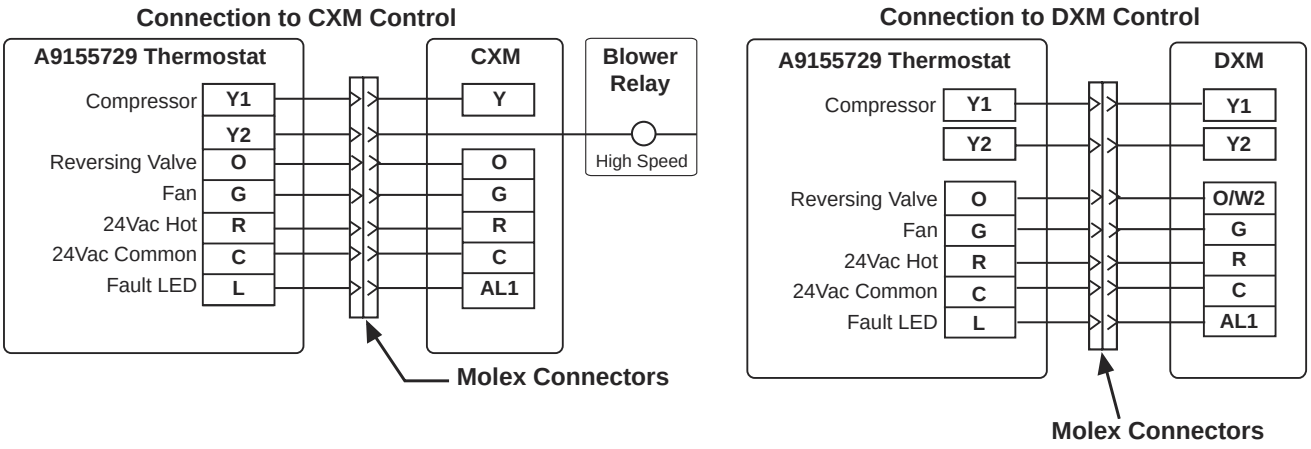
Two types of thermostats are available -
AT Series - require field to make wiring connections to screw terminals on thermostat. Cabinet construction for remote thermostat with field supplied whip (wires long enough to reach wall thermostat location) use AT Series.

A91557 Series - are the AT Series thermostats with a wire harness factory assembled, 6" long wires terminating with 9 pin molex connector. Cabinet construction for surface mount or remote mount thermostat with optional factory whip (15, 25, or 35 foot (572, 762, or 1067 cm) wires terminate with 9 pin molex for quick connection to A91557 Series thermostats.

Customer supplied thermostats should be approved by ClimateMaster Engineering Department prior to using. For cabinets with surface mount construction, field will have to cut off the molex plug and wire to thermostat per wire diagram.

All cabinets are compatible with 2 speed thermostats.

A9155729 shown below is ATP32U03 with factory wire harness (pigtail).



Thermostat Only	Thermostat Assembly with Molex Connector 6" Pigtail	CXM	DXM	Manual Changeover	Automatic Changeover	Programmable	Digital	Fault Indicator	Setback Override	Fan Speeds
ATP32U03	A9155729	X	X	X	X	X	X	X	X	1 or 2*
ATA11U01	A9155736	X	X	X	X		X	X		1
ATM11C11	A9155740	X	X	X						1
ATA22U01	A9155744	X	X	X	X		X	X		1 or 2*
ATP21U01	A9155745	X	X	X		X	X			1
ATA11U03	A9155761	X	X	X	X		X			2**

*Fan speed change automatic through thermostat Y2 signal.
** - Manual speed change

TSM Options

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.

Cabinet Construction for surface-mounted thermostat cabinet has pre-wired 2 x 4 x 1 7/8 deep electric box mounted for horizontal thermostat. Contractor must turn prior to dry walling if field-supplied vertical thermostat is used. Wire harness ends with 9-Pin Molex quick connector for easy connection to A91557 Series thermostats or can be cut off. 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

2" filter improves air filtration and reduces maintenance.

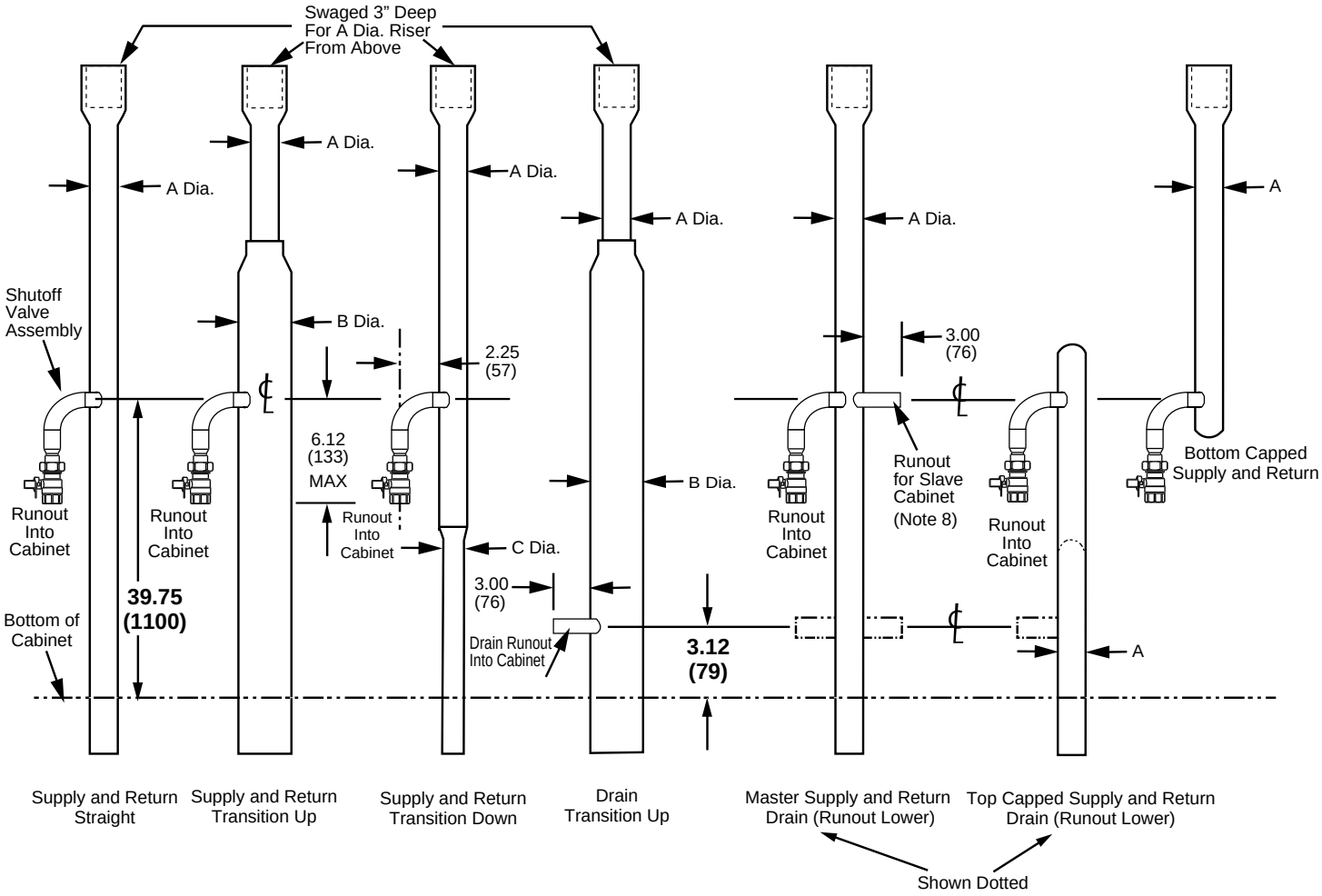
Accessory Filters

1" (25mm) thick, MERV 8, and MERV 11
2" (50mm) thick, MERV 8, and MERV 13

Special Optional Cabinet Stand

Heavy gauge galvanized sheet metal stand field-attached to bottom of cabinet (or factory-installed for cabinets with risers attached) to lift cabinet off floor. Can order 2" to 12" heights (by 1" increments) without or with isolation pad for reduced transmission of vibration to the floor. Contact factory.

Riser Definitions



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" and 3"nominal water tubing.
6. Copper Type M and L available.
7. Drain riser insulated standard. Supply and return insulated optional.
8. Master riser - contractor provides tubing from runout to slave cabinet if needed.
9. Shutoff has FPT for hose (1/2" for C1 (09), C2 (12); 3/4" for C3 (15), C4 (18); or 1" for C5 (24), C6 (30), C7 (36).

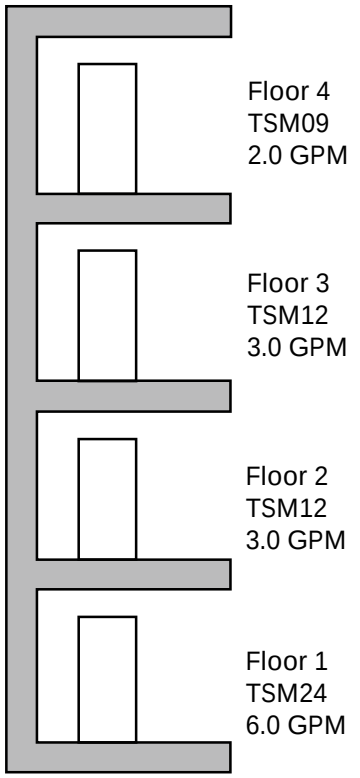
A	1.00	1.25	1.50	2.00	2.50	3.00
B	1.25	1.50	2.00	2.50	3.00	-
C	-	1.00	1.25	1.50	2.00	2.50

Note: All ClimateMaster units 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 - bottom return system feed loop. 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 gallon per minute from "Performance Charts," in "Vertical Stacked Design Guide."

Total Riser GPM (TRGPM) = The sum of, all Units, GPM on each Riser.

Total GPM Per Floor (TGF) = Total GPM minus the sum of Unit GPM from all floors below. TGF = TRGPM - (sum UGPM from units below).

Example: Four floors, Consisting of units sizes TSM24, TSM12 and TSM09, as shown in diagram. GPM's are 6.0, 3.0 and 2.0 respectively.

TRGPM = 6.0 + 3.0 + 3.0 + 2.0 = 14 GPM.

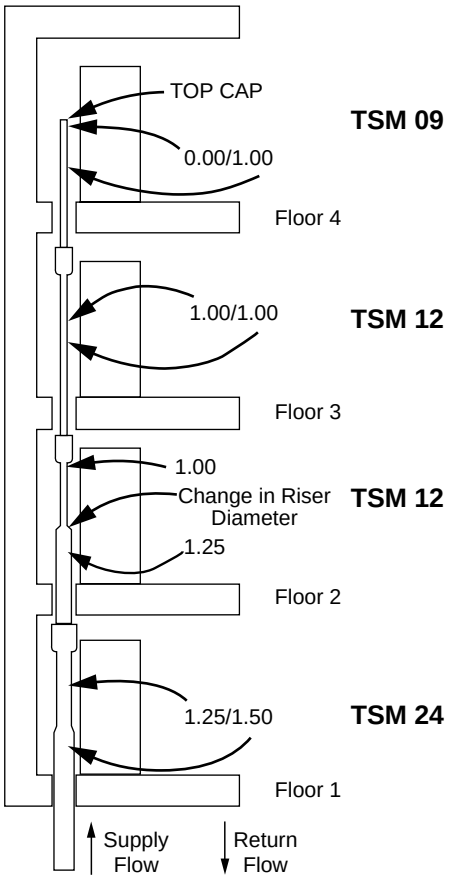
Floor 4: TGF = 14 - (3.0 + 3.0 + 2.0) = 2 GPM needed at floor 4.
Floor 3: TGF = 14 - (3.0 + 2.0) = 5 GPM needed at floor 3.
Floor 2: TGF = 14 - (2.0) = 8 GPM needed at floor 2.
Floor 1: TGF = 14 - (no floors below) = 14 GPM needed at floor 1.

Refer to Riser Diameter Sizing page.

Riser Diameter Sizing

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

Each TSM Vertical Stack unit has three riser pipes: supply, return, and drain. The following example will be for one riser pipe (from the top floor to the bottom floor), and will be representative of the remaining two riser pipes.



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.

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

Top Cap - Top half of riser is eliminated and sealed.
Bottom Cap - Bottom half of riser is eliminated and sealed.
0.00/1.00 - Indicates top cap/1" bottom.
1.00/1.25 - Indicates 1" top/1.25" bottom.
1.25/0.00 - Indicates 1.25" top/bottom cap.
(from this we develop Table 3)

Note: Transitions limited to 1 nominal diameter size larger or smaller within each floor.

Values from Table 3 are to be entered on the Riser Piping Schedule. Top diameter must match bottom diameter of floor above.

Table 1 (Max GPM for Frictional Loss = 4 PD FT/100 FT)

Maximum GPM	7	12	20	44	78	130
Nominal Riser Diameter	1”	1-1/4”	1-1/2”	2”	2-1/2”	3”

Table 2

Floor	GPM	Diameter From Table 1
4	2	1” [25.4]
3	5	1 [25.4]
2	8	1.25” [31.8]
1	14	1.50” [38.1]

Table 3

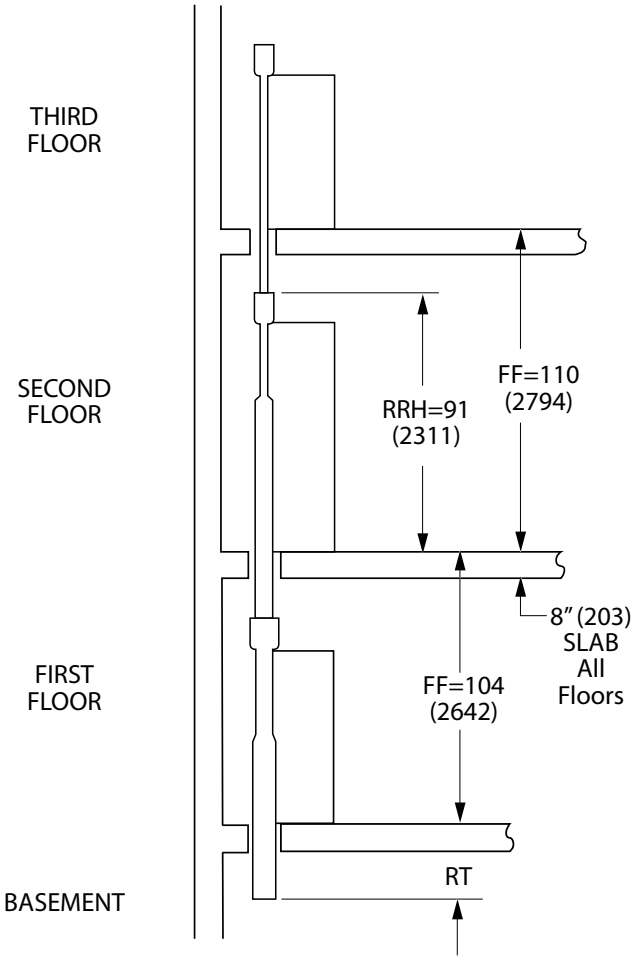
Nomenclature per Unit	Description
0.00/1.00	Top Cap, w/1” Bot Feed
1.00/1.00	1” Full Length Riser
1.00/1.25	1” Top, 1.25” to 1st Floor
1.25/1.50	1.25” Top, 1.50" Bottom

Table 4

Drain Diameter	Max Tonnage
1" [25 mm]	40
1¼" [32mm]	60
1½" [38mm]	90
2" [51mm]	120

Values from Table 3 are to be entered on the Riser Piping Schedule. Top diameter must match bottom diameter of floor above.
Table 4 shows max A/C tonnage for drain riser diameter.

Riser Length Definitions and Sizing



Total Riser Length (L) = FF of floor below + 2"(51)
FF - (RRH + RT) + 4" (102).

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

Room Riser Height (RRH): Cabinet height + 3" (76).

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

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

Example 1 - Calculating Riser Length

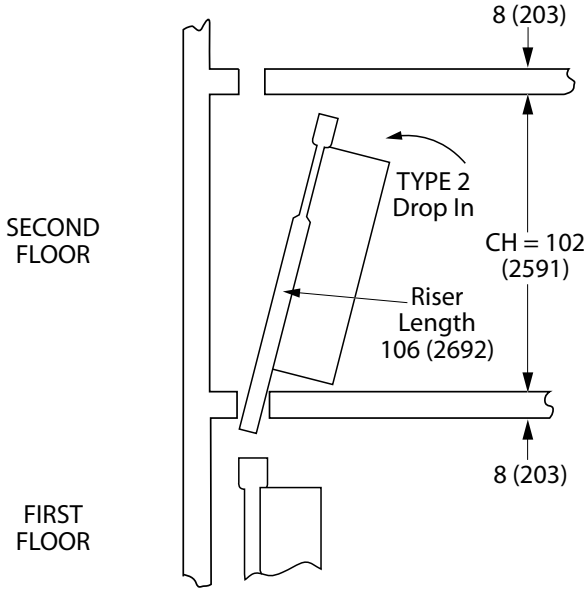
SECOND FLOOR RISER LENGTH
Slab = 8" (203)
Cabinet Height = 88" (2235)

Use FF from first floor
L = FF + 2"(50) = 106 (2692)
RRH = 91 (2311)
RT = 15 (381)

THIRD FLOOR RISER LENGTH
Use FF from second floor
L = 112 (2844)
RRH = 91 (2311)
RT = 21 (533)

Notes:

1. Always use bottom of cabinet for calculations. If optional stand is used, everything raises dimension of stand.
2. If riser maximum is exceeded or RT is less than slab + 5" (127) see riser extension sizing.
3. Complete all core drilling before setting cabinets, openings must be aligned and plumb.
4. Set from lowest floor up.
5. If risers are shipped separate they are bulk shipped to minimize shipping cost.
6. Dimensions are inches (mm).



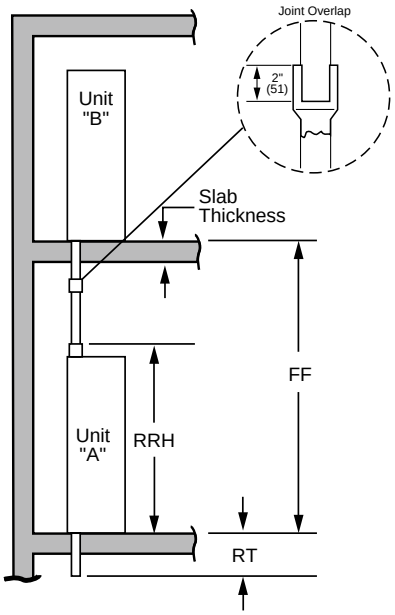
Example 2 - Checking Length for drop in to confirm acceptable

L = 106 (2591) TYPE 2 drop in
Slab Slot = See slab slot chart for width and length.

Clear Height (CH) and Riser Length (L) are used to determine slab slot dimensions so riser will pass through slot without hitting ceiling.

CH = FF - ST

Riser Extension Definitions and Sizing



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

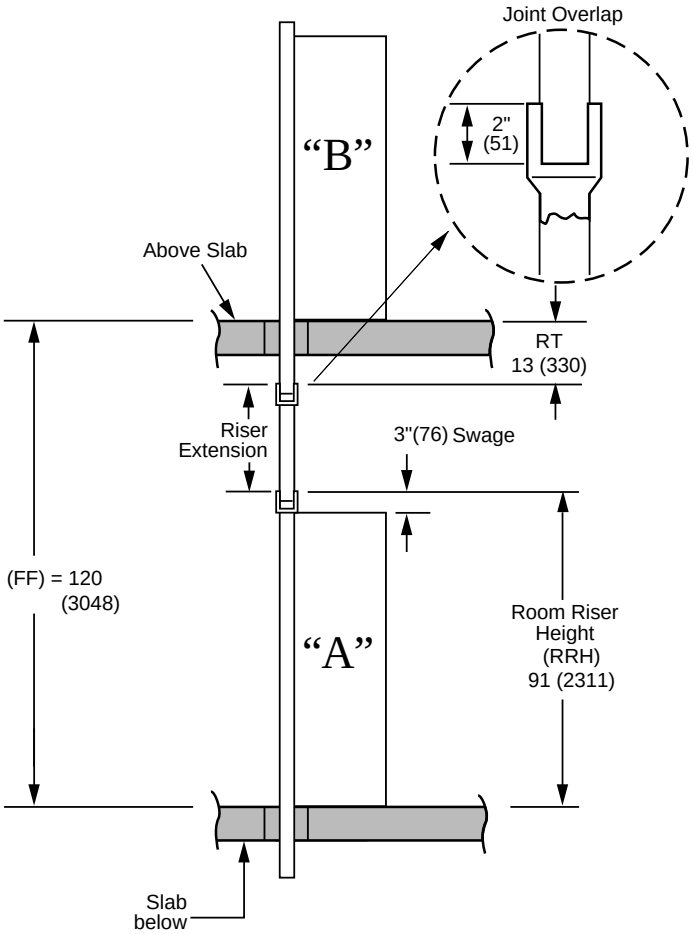
Riser Extension Length = FF - (RRH + RT) + 4" (102).

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

Room Riser Height (RRH): Cabinet height + 3" (76).

Floor To Floor Height (FF): Distance from top of unit 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.



Example: Cabinet = 88
Floor to floor (FF) = 120" (3048)
Room Riser Height (RRH) = 91" (2311)
RT = 13" (330).

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

Notes:
1. Example shown - riser extensions would be ordered with "A" and assembled between "A" and "B".
2. Riser "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).

Setting Cabinet

⚠ NOTICE! ⚠

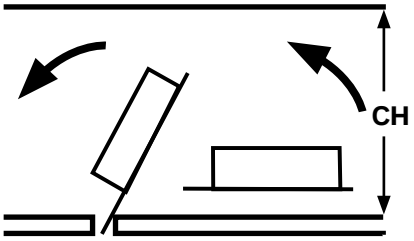
Before locating riser slab slot in floor, review plans and all information in this submittal regarding cabinet, risers, slab slot, rotation into slot, clear height and the relationship of all.

To determine the slab slot size required for the risers and to determine if clear height is OK for unit installation, use the example 2 on riser length page and slab slot charts on the next page.

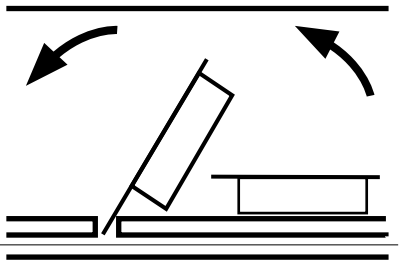
To use the charts you will need the clear height of the room the unit is in, riser length, diameter, and type of installation. (See below)

Rotating Cabinet with Risers Into Position

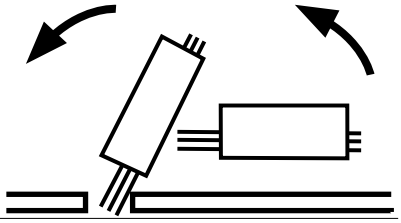
Type 1 Single Units
With a minimum clear height of 93" (2362). Start with the riser side down, lift and insert risers into slot, rotate upward, slowly pass risers through slot, set cabinet on floor.



Type 2 Single Units
With a minimum clear height of 95" (2413). Start with the side opposite of the risers down, lift and insert risers into slot, rotate upward, slowly pass risers through slot, set cabinet on floor.

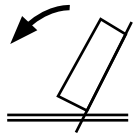
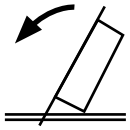
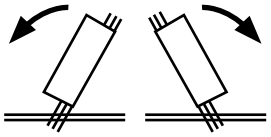


Type 3 Single Units
With a minimum clear height of 94" (2388). Start with the risers on either side, lift and insert risers into slot, rotate upward, slowly pass risers through slot, set cabinet on floor.

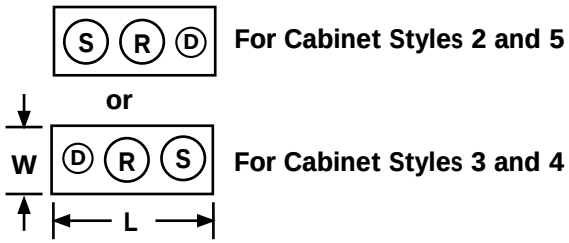


Slab Slot Chart - 3 Pipe

3 Pipe Standard 88" Cabinet

Slab Slot Size		
Type of Installation		
Type 1	Type 2	Type 3
		
W x L	W x L	W x L

Riser Stack Patterns



Clear Height is Floor to Ceiling Dimension

Slab Slot for Cabinets with Risers

Model	Clear Height		Riser length		Type of Installing Cabinet Through Slot					
					Type 1		Type 2		Type 3	
	in	mm	in	mm	in	mm	in	mm	in	mm
09-18	105	2667	115	2921	8 x 13 1/2	203 x343	6 1/2 x 13 1/2	165 x 343	6 1/2 x 16	165 x 406
	100	2540	110	2794						
	98	2498	108	2743						
	96	2438	106	2692						
	95	2413	105	2667						
	94	2387	104	2641						
	93	2362	103	2616						
24-36	105	2667	115	2921	9 x 13 1/2	229 x 343	7 1/2 x 13 1/2	190 x 343	6 1/2 x 16 1/2	165 x 419
	100	2540	110	2794						
	96	2498	108	2743						
	95	2413	105	2667						
	94	2387	104	2641						
	93	2362	103	2616						

Chart dimensions for 3"(76.2) supply and return risers with insulation and 2" drain riser, 88" (2235)cabinet, and 8"(203) slab
Clear height is dimension from floor to ceiling. Riser length is clear height plus slab thickness plus 2" (50).
For 2" (50.8)risers setting by any Type 1,2, or 3 reduce width by 1" (25) also Type 3 reduce length by 1" (25)
For 1" (25.4) risers setting by any Type 1,2, or 3 reduce width by 2" (50) also Type 3 reduce length by 2" (50)
Opening centerline must be aligned from floor to floor
Contractor is responsible to meet all codes and regulations.

Slab Hole if Risers Ship Loose and Installed Before Cabinet

Model	Clear Height		Riser Length		Riser Diameter					
					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 3"(76.2) risers with insulation and 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.

See pages 55 and 56 for examples.

Shipping

Units Are Shipped FOB Factory

TSM 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.

TSM Cabinet without risers attached can ship upright 4 per pallet, see figure 1.

TSM Cabinet with risers attached must be shipped horizontal and normally on dedicated open flat bed trailer either 3 or 6 per pallet, see figure 2 and 3. Cabinets are palletized to maximize shipping density then grouped by unit size, building, and floor where possible. Pallets are shrink wrapped and flat bed load is tarped for protection.
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, end fork pallets, 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 09-18	40	40	49	120 single stacked		500 lbs
Chassis 24-36	50	48	51	96 single stacked		750 lbs
Chassis 09-18	40	40	98	240 double stacked		500 lbs
Chassis 24-36	50	48	102	192 double stacked		750 lbs
Slave cabinet 09-18	43	43	85/93	112		750 lbs
Slave cabinet 24-36	53	53	85/93	72		1000 lbs
Cabinet with Chassis 09-18	43	43	85/93	112		1260 lbs
Cabinet with Chassis 24-36	53	53	85/93	72		1750 lbs

Shipping Height 85” for 80” cabinet and 93” for 88” cabinet
Small and Large cabinets can be mixed on some loads

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

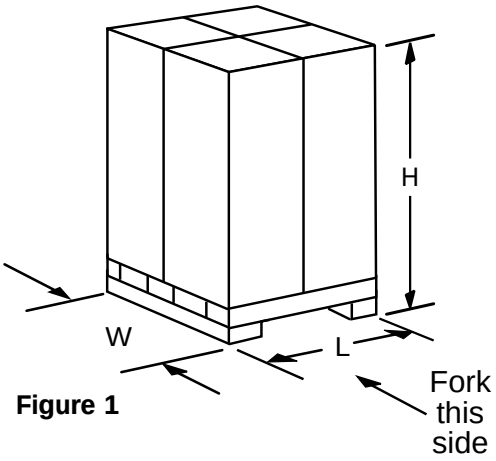


Figure 1

Horizontal Shipping							
Description	Number of cabinets per pallet	Pallet			Up to 110" Long Riser Aprox. Quantity Per 48 foot open flat bed Trailer	111" to 115" Long Riser Aprox. Quantity Per 48 foot open flat bed Trailer	Approximate Weight Per Pallet
		Length	Width	Height			
Cabinet 09-18	4	*	26	88	60	48	800 lbs
	8	*	50	88	60	48	1600 lbs
Cabinet 24-36	3	*	30	87	45	36	800 lbs
	6	*	59	87	45	36	1600 lbs

*- For length of pallet add 5” to riser length

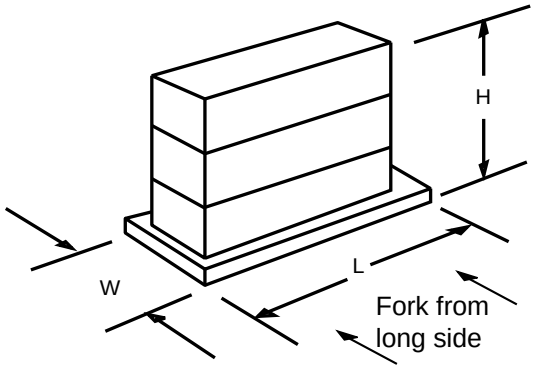


Figure 2

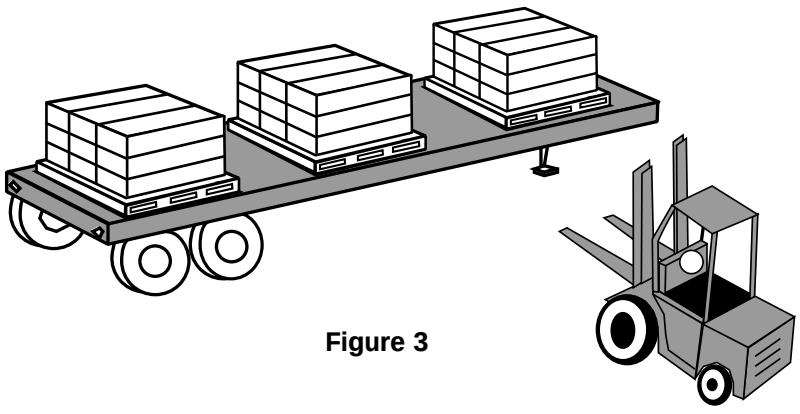


Figure 3

Tranquility® Modular - TSM Series
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General:
Furnish and install ClimateMaster Tranquility® "TSM 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 be fully quality tested by factory run testing under normal operating conditions as described herein. Quality control system shall automatically perform via computer: triple leak check, pressure tests, evacuation and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria. Detailed report card will ship with each unit displaying status for critical tests and components. **Note: If unit fails on any cross check, it shall not be allowed to ship. Serial numbers will be recorded by factory and furnished to contractor on report card for ease of unit warranty status. Units tested without water flow are not acceptable.**

Basic Construction:
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 base shall contain a secondary drain pan fully insulated with a pressure differential drain trap connected 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.**

Standard air filter is 1 inch (25mm) thick fiberglass throwaway.

Option: 2 inch (50mm) thick fiberglass throwaway.

Cabinet arrangements shall allow placement of riser piping on any one of the three sides of the cabinet not used for the chassis access. All cabinet supply air openings shall have knockouts on all sides. Supply air openings for cabinets (except slave) shall have factory knockouts removed and duct flanges attached per model configuration shown on plans. For air noise attenuation purposes, the discharge air from fan shall discharge into insulated plenum that also contains insulated x-shape air baffle. **Units not having supply air noise baffles are not acceptable.** Cabinet design shall allow a full height base board (4.50 inches/114mm) beneath the return air "G" panel. The cabinet shall contain an easily removable motor/blower assembly.

Option: Slave cabinets to have riser and supply air knockouts on all sides. Duct angles ship loose.

Electrical conduit shall be installed from electrical unit control compartment to top of cabinet for low voltage control wiring as well as separate conduit for main power wiring. **Units without these two factory installed electric conduits will not be accepted.**

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Full-length supply, return, and insulated condensate water risers shall be type M copper. 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 ± one inch (25.4mm). **Units not having swaged riser-piping connections shall not be acceptable. Couplings and trim pieces shall not be allowed.**

Option: Bulk ship risers so complete riser stack can be installed, pressure tested, and filled before the cabinets are installed.

Option: Type L riser piping.

Option: Supply and return risers insulated with 3/8" (9.5mm) ARMAFLEX type insulation.

Option: Construction for unit mounted Thermostat (thermostat ordered separate) -- includes junction box mounted outside discharge plenum and has a Molex-type connector inside for quick connection to A91557 Series thermostat. Use part number A9155729, A9155736, A9155740, A9155744, A9155745, or A9155761 thermostat assembly, which is thermostat model ATP32U03, ATA11U01, ATM11C11,ATA22U01, ATP21U01, or ATA11U03 respectively with mating molex-type connector.

Option: Low voltage 15, 25, or 35 foot (572, 762, or 1,067 cm) whip with molex-type connector for connection to remote thermostat. Use part number A9155729, A9155736, A9155740, A9155744, A9155745, or A9155761 thermostat assembly, which is thermostat model ATP32U03, ATA11U01, ATM11C11,ATA22U01, ATP21U01, or ATA11U03 respectively with mating molex-type connector.

Option: Premium automotive grade rubber seal between cabinet and filter.

Fan and Motor Assembly:
The cabinet shall contain a removable motor/blower assembly. Units shall have a direct drive centrifugal fan. The fan motor shall be 3 speed, permanently lubricated, PSC type with thermal overload protection. The fan motor for small size units (09 and 12) shall be isolated from the fan 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 fan 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.**

Chassis:
The chassis, which incorporates the air coil, water coil, drain pan, 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 slave cabinet.

Option: UltraQuiet package shall consist of high technology sound attenuating material that is strategically applied to the compressor (rotary only) and inside compressor compartment to dampen and attenuate sound transmissions. Compressor is mounted on specially engineered sound-tested isolators.

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. 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. 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.**

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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 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.

A factory-mounted high pressure switch is installed in the water piping to disable compressor operation in the event water pressures build due to water freezing in the piping system.

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 pumping requirements. Valve to be normally closed type.

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 for primary/secondary applications.

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. 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. Drain pan shall be fully insulated. 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 suface. Drain outlet shall be connected from pan outlet to condensate riser (if supplied) with factory installed trap inside of cabinet. The unit 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.**

Option: Stainless steel drain pan

Electrical:
A control compartment shall be located within the chassis and shall contain a 50VA transformer, 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.

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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 with compressor contactor.
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 10 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, entering water high pressure switch, leaving water high pressure switch, and condensate overflow protections will not be accepted.

Option: Enhanced solid state control system (DXM 2)
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.**

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.

Units not providing the 10 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, entering water high pressure switch, leaving water high pressure switch, and condensate overflow protections will not be accepted.

Digital Night Setback with Pump Restart (DXM w/ ATP32U03C/04C, ATC32U01C)

The unit will be provided with a Digital Night Setback feature using an accessory relay on the DXM 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 DXM 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/DXM):

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 DXM) 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
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 DXM) 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

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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/Supply Grilles:
The 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" color.

Return air panels that protrude from wall more than 5/8 inch (15.9mm) 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.

Option: Style "G" return air panel with frame for recessing cabinet behind finished wall.

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

Supply grille(s):
Supply grille(s) shall be architecturally designed "brushed" aluminum or powder coated steel (color: polar ice).

Option: Supply grille with double deflection style louvers.

Option: Supply grille with double deflection style louvers with opposed damper.

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/DXM control board for a total of 5 years.

FIELD INSTALLED OPTIONS

Hose Kits - AHH Series (required for field 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. Hose ends shall be solid External NPT 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. The hose kit shall be rated for 400 psi (2756 kPa) design working pressure. This hose kit accessory is required for each cabinet.

Filters:
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 mechanical or electronic type thermostat as selected below with the described features:

a. Multistage Digital Automatic or Manual Changeover Programmable Communicating (ATC32U01C)

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 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 ºF or ºC. 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 ºF or ºC. 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 ºF or ºC. 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 DXM 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 (ATP21U01)
Thermostat shall be 5 day/2 day programmable (with up to 4 setpoints per day), multi-stage (2H/1C), manual 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 ºF or ºC. The thermostat shall provide permanent memory of setpoint(s) without batteries. Thermostat shall provide convenient override feature to temporarily change setpoint.

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 ºF or ºC. Time display shall be selectable for 12 or 24-hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM 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.

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

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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 ºF or ºC. Time display shall be selectable for 12 or 24 hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM 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).

Revision History

Date:	Item:	Action:
07/03/13	Created	