Tranquility® Vertical Stack (TSM/TSL) Series

Vertical Stack Water-Source Heat Pumps

Installation, Operation & Maintenance

97B0001N14
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ClimateMaster®
A NIBE GROUP MEMBER

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General Information – Inspection

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

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

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

⚠ WARNING! ⚠

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

⚠ WARNING! ⚠

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

Dimensions shown are in inches and either mm or cm unless noted otherwise.

Inspection - Upon receipt of the equipment, carefully check the shipment against the bill of lading. See figure 1 for components. Make sure all units have been received. Inspect the packaging of each unit, and inspect each unit for damage. Ensure that the carrier makes proper notation of any shortages or damage on all copies of the freight bill and completes a common carrier inspection report. Concealed damage not discovered during unloading must be reported to the carrier within 15 days of receipt of shipment. If not filed within 15 days, the freight company can deny the claim without recourse. Note: It is the responsibility of the purchaser to file all necessary claims with the carrier. Notify your equipment supplier of all damage within fifteen (15) days of shipment.

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

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

⚠ WARNING! ⚠

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

⚠ CAUTION! ⚠

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

⚠ WARNING! ⚠

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

C Cabinet Series Model Nomenclature – TSM

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

SERIES
Tranquility High Rise Cabinet for TSM

UNIT 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	NO	YES	1"
B	YES	NO	1"
C	YES	YES	1"
0	NO	NO	1"
1	NO	YES	2"
2	YES	NO	2"
3	YES	YES	2"
4	NO	NO	2"

HARNESS CONTROLS

OPTION	PSC STANDARD	ECM CONSTANT VOLUME (DXM2 ONLY)	ECM CONSTANT TORQUE	S=SURFACE R =REMOTE W = WALL SENSOR A = ADA	M = MPC
A	YES	NO	NO	A	NO
B	NO	YES		W	M
C	YES	NO			
D	NO	YES		R	NO
N	YES	NO		S	
P				R	
R		YES		S	
S				A	
1	NO			W	M
2		NO	YES	R	NO
4				S	
5					

POWER TERMINATION

OPTION	DISCONNECT SWITCH	BREAKER	ISP
A	YES	NO	NO
B	NO	YES	
C		YES	YES
D	YES	NO	YES
E	NO	NO	YES
0	NO	NO	NO

CABINET HEIGHT

OPTION	80"	88"	ISO PAD
A	NO	YES	NO
B	YES	NO	
C	NO	YES	YES
D	YES	NO	

RISER STYLE OPTIONS

OPTION	DIGIT 9 OPTION	DIGIT 10 OPTION
0 = FOLLOWER/NONE	0, 6	0
1 = STANDARD	1, 2, 3 , 4, 5	ALL OPTIONS AVAILABLE
2 = LEADER		

REVISION LEVEL
D = CURRENT REVISION

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

MISCELLANEOUS CABINET OPTIONS

OPTION	FACTORY CONFIGURED SUPPLY AIR OPENING	SUPPLY AIR DUST PROTECTION	RETURN AIR DUST PROTECTION	TSTAT WHIP
A	YES	YES	YES	NONE
B				15'
C				25'
D				35'
E	NO	NO		NONE
F				15'
G				25'
H				35'
J	YES	YES	NO	NONE
K				15'
L				25'
M				35'
N		NO	YES	NONE
P				15'
Q				25'
R				35'
0	NO	NO	NO	NONE
1				15'
2				25'
3				35'
4	YES			NONE
5				15'
6				25'
7				35'

* Openings that are NOT knocked out will have perforations for the field to configure.

SIDE DISCHARGE OPTIONS

OPTION	DISCHARGE
0	NONE
A	RIGHT SMALL
B	RIGHT LARGE
C	LEFT SMALL
D	LEFT LARGE
E	RIGHT SMALL & LEFT SMALL
F	RIGHT LARGE & LEFT LARGE
G	RIGHT SMALL & LEFT LARGE
H	RIGHT LARGE & LEFT SMALL

BACK/FRONT/TOP DISCHARGE OPTIONS

OPTION	DISCHARGE	UNIT SIZE 09-18 TOP	UNIT SIZE 15-16 TOP	UNIT SIZE 24-36 TOP	C-SERIES 80" TSM	C-SERIES 88" TSM
0	NONE	N/A			YES	YES
A	BACK SMALL					
B	BACK LARGE					
C	FRONT SMALL					
D	FRONT LARGE				NO	
E	TOP	12 X 12	14 X 14	16 X 16	YES	
F	BACK SMALL & TOP					
G	BACK LARGE & TOP					
H	FRONT SMALL & TOP					
J	FRONT LARGE & TOP				NO	
K	BACK SMALL & FRONT SMALL	N/A			YES	
L	BACK LARGE & FRONT LARGE				NO	
M	BACK SMALL & FRONT LARGE				NO	
N	BACK LARGE & FRONT SMALL				YES	
P	BACK SMALL & FRONT SMALL W/TOP	12 X 12	14 X 14	16 X 16	YES	
Q	BACK LARGE & FRONT LARGE W/TOP				NO	
R	BACK SMALL & FRONT LARGE W/TOP				NO	
S	BACK LARGE & FRONT SMALL W/TOP				YES	

RISER: RISER BALL VALVE OPTIONS
5 = Standard Ball Valves N = None

RISER LOCATION/PACKAGING OPTIONS

OPTION	VERTICAL PKG	HORIZONTAL PKG
0 = CABINET & CHASSIS SHIPPED SEPARATELY, NO RISERS, BALL VALVE ASSY OPTIONAL	YES	NO
1 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS SHIPPED SEPARATELY		
2 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS MOUNTED BACK (LEFT)	NO	YES
3 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS MOUNTED BACK (RIGHT)		
4 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS MOUNTED LEFT SIDE		
5 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS MOUNTED RIGHT SIDE		
6 = CHASSIS SHIPPED IN CABINET, RISERS SHIPPED SEPARATELY	YES	NO
7 = CHASSIS SHIPPED IN CABINET, NO RISERS, BALL VALVE ASSY OPTIONAL		

D Cabinet Series Model Nomenclature – Heat Pump – TSL

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

SERIES
D = TSL, 65" Ducted Cabinets

UNIT 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	1" and 2" FILTER
A	NO	YES	1"
B	YES	NO	1"
C	YES	YES	1"
0	NO	NO	1"
1	NO	YES	2"
2	YES	NO	2"
3	YES	YES	2"
4	NO	NO	2"

HARNESS CONTROLS

OPTION	PSC STANDARD	ECM CONSTANT VOLUME (DXM2 ONLY)	ECM CONSTANT TORQUE	S=SURFACE R =REMOTE W = WALL SENSOR A = ADA	M = MPC
A	YES	NO	NO	A	NO
B	NO	YES			
C	YES	NO		W	M
D	NO	YES			
N	YES	NO		R	NO
P				S	
R	NO	YES		R	
S				S	
1				A	
2		NO	YES	W	M
4				R	NO
5				S	

POWER TERMINATION

OPTION	DISCONNECT SWITCH	BREAKER	ISP
A	YES	NO	NO
B	NO	YES	
C		YES	YES
D	YES	NO	YES
E	NO	NO	YES
0	NO	NO	NO

MISCELLANEOUS CABINET OPTIONS

OPTION	FACTORY CONFIGURED SUPPLY AIR OPENING	SUPPLY AIR DUST PROTECTION	RETURN AIR DUST PROTECTION	TSTAT WHIP
A	YES	YES	YES	NONE
B				15'
C				25'
D				35'
J			NO	NONE
K				15'
L				25'
M				35'
N		NO	YES	NONE
P				15'
Q				25'
R				35'
4			NO	NONE
5				15'
6				25'
7				35'

STANDARD
0 = STANDARD
A - Z = SPECIAL EXCEPT "W"

REVISION LEVEL
D = CURRENT REVISION

SIDE DISCHARGE OPTIONS
0 = NONE

TOP DISCHARGE OPTIONS
E = Top

RISER: Riser Ball Valve Options
0 = None
5 = Standard Ball Valves

RISER LOCATION/PACKAGING OPTIONS

OPTION	VERTICAL PKG	HORIZONTAL PKG
0 = CABINET & CHASSIS SHIPPED SEPARATELY, NO RISERS, BALL VALVE ASSY OPTIONAL	YES	NO
1 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS SHIPPED SEPARATELY		
2 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS MOUNTED BACK (LEFT)	NO	YES
3 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS MOUNTED BACK (RIGHT)		
4 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS MOUNTED LEFT SIDE		
5 = CABINET & CHASSIS SHIPPED SEPARATELY, RISERS MOUNTED RIGHT SIDE		
6 = CHASSIS SHIPPED IN CABINET, RISERS SHIPPED SEPARATELY	YES	NO
7 = CHASSIS SHIPPED IN CABINET, NO RISERS, BALL VALVE ASSY OPTIONAL		

RISER STYLE OPTIONS

OPTION	DIGIT 9 OPTION
0 = FOLLOWER/NONE	0, 6, 7
1 = STANDARD	1, 2, 3, 4, 5, 6, 7
2 = LEADER	

CABINET HEIGHT 65"

OPTION	ISO PAD
E	NO
F	YES

E Cabinet Series Model Nomenclature – TSL Hybrid

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

SERIES
E = 65" 80" and 88" HYBRID CABINETS

UNIT 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	NO	YES	1"
B	YES	NO	1"
C	YES	YES	1"
0	NO	NO	1"
1	NO	YES	2"
2	YES	NO	2"
3	YES	YES	2"
4	NO	NO	2"

HARNESS CONTROLS

OPTION	ECM CONSTANT VOLUME	ECM CONSTANT TORQUE	A = ADA R =REMOTE S=SURFACE W=WALL SENSOR	MPC
B	YES	NO	A	NO
D			W	YES
R			R	NO
S			S	
1	NO	YES	A	
2			W	YES
4			R	NO
5			S	

POWER TERMINATION

OPTION	DISCONNECT SWITCH	BREAKER	ISP / BREAKER
A	YES	NO	NO
B	NO	YES	
C			YES
D	YES	NO	
E	NO		
0	NO OPTIONS		

CABINET HEIGHT

OPTION	88"	80"	65"	ISO PAD
A	YES	NO	NO	NO
B	NO	YES		
C	YES	NO		YES
D	NO			
E			YES	NO
F				YES

RISER STYLE OPTIONS

OPTION	DIGIT 9
0 = FOLLOWER/NONE	0, 6, 7
1 = STANDARD	1, 2, 3, 4, 5, 6
2 = LEADER	

RISER: RISER BALL VALVE OPTIONS
5 = Ball Valves, Sweat N = None

RISER LOCATION/PACKAGING OPTIONS

OPTION	VERTICAL PKG	HORIZONTAL PKG	VALVE ASM QTY 2 SHIPPED IN CABINET	VALVE ASM QTY 2 SHIPPED W/RISERS
0 = NONE	YES	NO	YES	NO
1 = RISERS SHIPPED SEPARATELY				
2 = BACK(LEFT)	NO	YES	NO	YES
3 = BACK (RIGHT)				
4 = LEFT SIDE				
5 = RIGHT SIDE				
6 = CHASSIS SHIPPED IN CABINET, RISERS SHIPPED SEPARATELY	YES	NO		
7 = CHASSIS SHIPPED IN CABINET NO RISERS or BALL VALVES			NO	

BACK/FRONT/TOP DISCHARGE OPTIONS

OPTION	DISCHARGE	UNIT SIZE 09-18 TOP	UNIT SIZE 15-16 TOP	UNIT SIZE 24-36 TOP	C-SERIES 80" TSM	C-SERIES 88" TSM
0	NONE	N/A			YES	YES
A	BACK SMALL					
B	BACK LARGE					
C	FRONT SMALL					
D	FRONT LARGE				NO	
E	TOP	12 X 12	14 X 14	16 X 16	YES	
F	BACK SMALL & TOP					
G	BACK LARGE & TOP					
H	FRONT SMALL & TOP					
J	FRONT LARGE & TOP				NO	
K	BACK SMALL & FRONT SMALL	N/A			YES	
L	BACK LARGE & FRONT LARGE				NO	
M	BACK SMALL & FRONT LARGE				NO	
N	BACK LARGE & FRONT SMALL				YES	
P	BACK SMALL & FRONT SMALL W/TOP	12 X 12	14 X 14	16 X 16	YES	
Q	BACK LARGE & FRONT LARGE W/TOP				NO	
R	BACK SMALL & FRONT LARGE W/TOP				NO	
S	BACK LARGE & FRONT SMALL W/TOP				YES	

SIDE DISCHARGE OPTIONS

OPTION	DISCHARGE
0	NONE
A	RIGHT SMALL
B	RIGHT LARGE
C	LEFT SMALL
D	LEFT LARGE
E	RIGHT SMALL & LEFT SMALL
F	RIGHT LARGE & LEFT LARGE
G	RIGHT SMALL & LEFT LARGE
H	RIGHT LARGE & LEFT SMALL

MISCELLANEOUS CABINET OPTIONS

OPTION	SUPPLY AIR OPENING KNOCKED OUT	SUPPLY AIR OPENING RECOVERED	RETURN AIR OPENING KNOCKED OUT	TSTAT WHIP
A	YES	YES	YES	NONE
B				15'
C				25'
D				35'
E	NO	NO		NONE
F				15'
G				25'
H				35'
J	YES	YES	NO	NONE
K				15'
L				25'
M				35'
N		NO	YES	NONE
P				15'
Q				25'
R				35'
0	NO	NO	NO	NONE
1				15'
2				25'
3				35'
4	YES			NONE
5				15'
6				25'
7				35'

* Openings that are NOT knocked out will have perforations for the field to configure.

REVISION LEVEL
A = CURRENT REVISION

TYPE
0 = STANDARD
A - Z = SPECIAL EXCEPT "W"

TSM/TSL Chassis Series Model Nomenclature

1 2 3	4 5	6	7	8	9	10	11	12	13	14	15
T S L	09	G	S	A	S	S	C	S	A	S	C

Series
TSL = Tranquility® High Rise Chassis
TSM = Tranquility® High Rise Chassis

Unit Size
09
12
15
18
24
30
36

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

Chassis Options

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

Controls
A = CXM
B = DXM2
2 = CXM w/MPC
D = DXM2 w/MPC

Water Valve & Pump Option
S = No Water Options
M = 2-Way Water Valve (Fail Closed)
N = 2-Way Water Valve (Fail Opened)
P = Secondary Circulating Pump
T = Modulating Water Valve
G = Standard 3-Way Water Valve
H = Hybrid with Standard Water Valve (Fail Closed)*
J = Hybrid with Standard Water Valve (Fail Opened)*
L = Hybrid with 3-Way Water Valve*
K = Hybrid with Secondary Water Pump and 3-Way Water Valve*

Heat Exchanger Options

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

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

Blower Motor
A = PSC High Static*
B = PSC**
C = ECM Constant Torque
D = ECM Constant Volume

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

Revision Level
C = Current Revision Level

AUTO-FLOW REGULATOR (US GPM) CODE

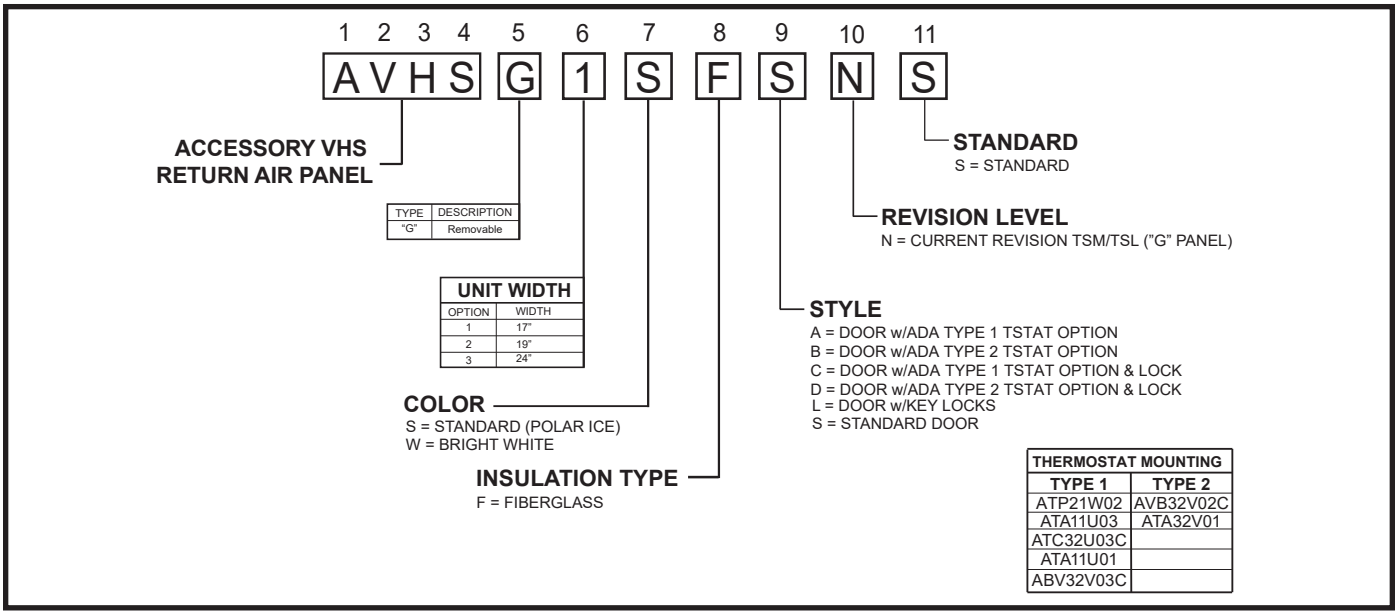
	5/8 SWEAT		7/8 SWEAT				
	UNIT 09	UNIT 12	UNIT 15	UNIT 18	UNIT 24	UNIT 30	UNIT 36
C	1.5	-	-	-	-	-	-
D	2.0	2.0	-	-	-	-	-
E	2.5	2.5	2.5	-	-	-	-
F	3.0	3.0	3.0	3.0	-	-	-
G	-	3.5	3.5	3.5	-	-	-
H	-	-	4.0	4.0	4.0	-	-
J	-	-	-	5.0	5.0	5.0	-
K		-	-	-	6.0	6.0	6.0
L	-	-	-	-	7.0	7.0	7.0
M	-	-	-	-	-	8.0	8.0
N	-	-	-	-	-	-	9.0
P	-	-	-	-	-	-	10.0
S = STANDARD - NO FLOW REGULATOR							

**TSM only *TSL only

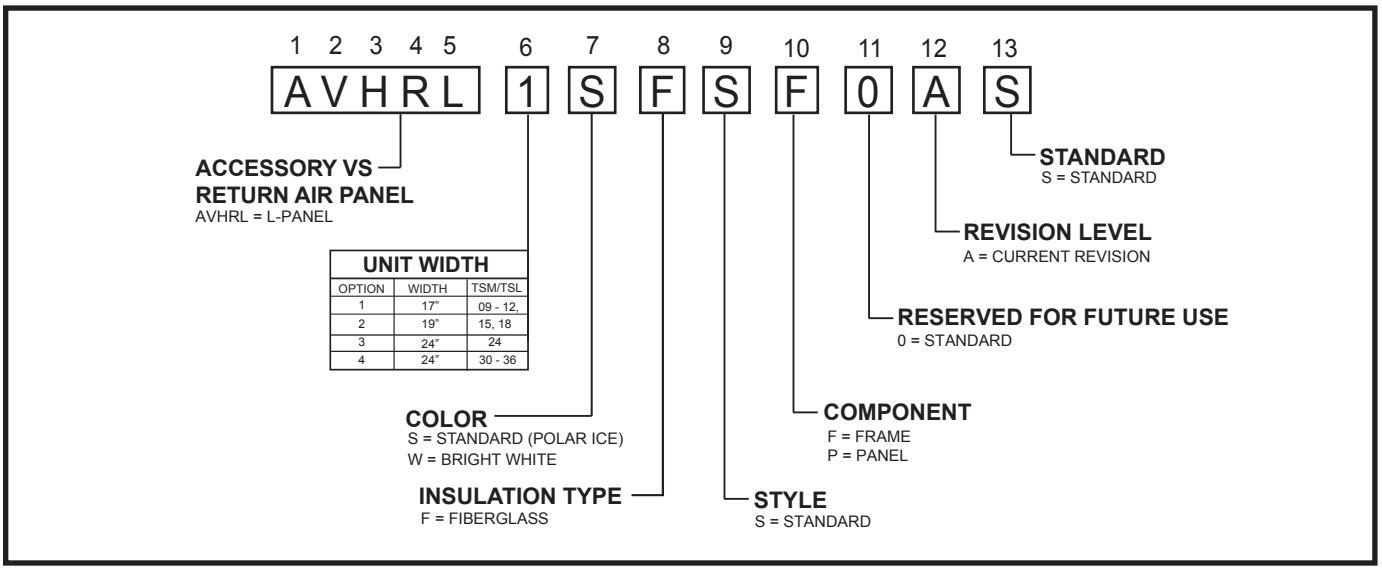
Note: DXM2 includes four (4) temperature sensors: leaving air, discharge line, entering and leaving water.

Accessory Nomenclature

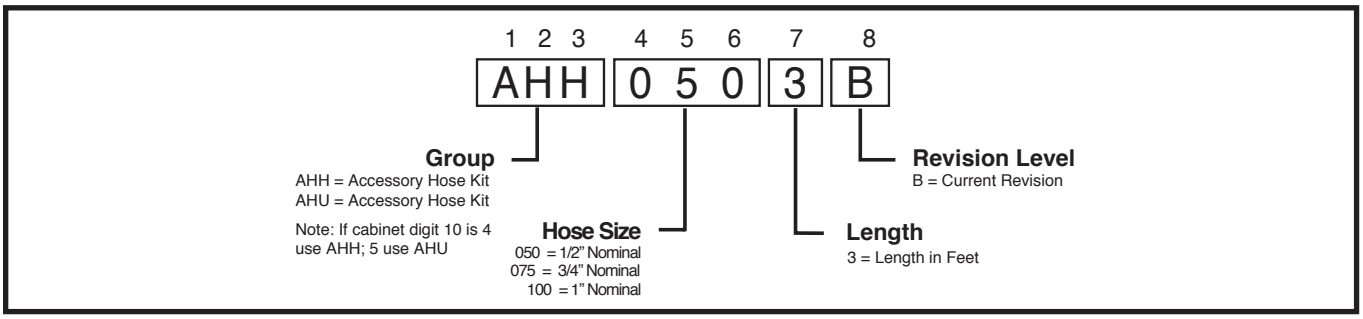
Return Air Panel "G" Style



Return Air Panel "L" Style

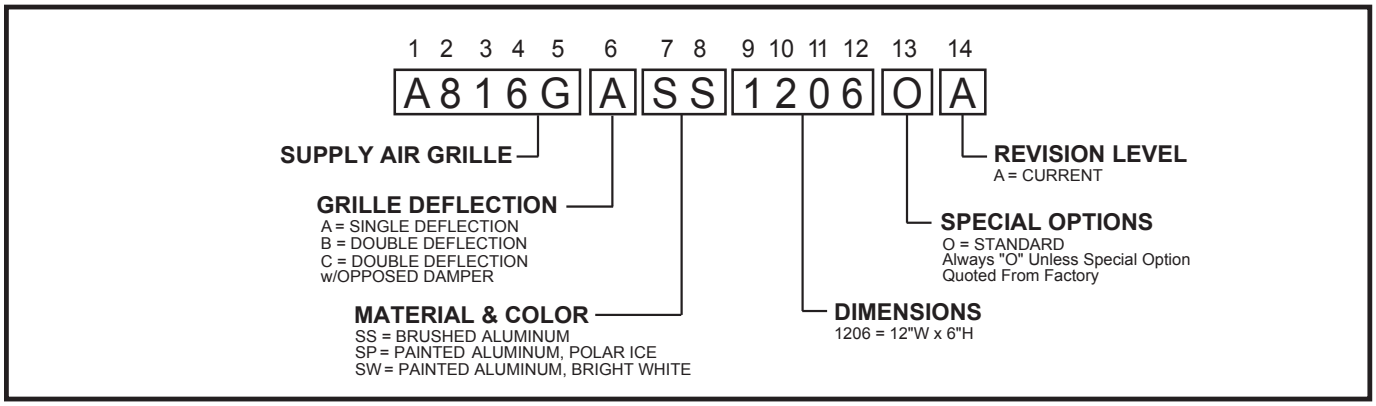


Hose Kit

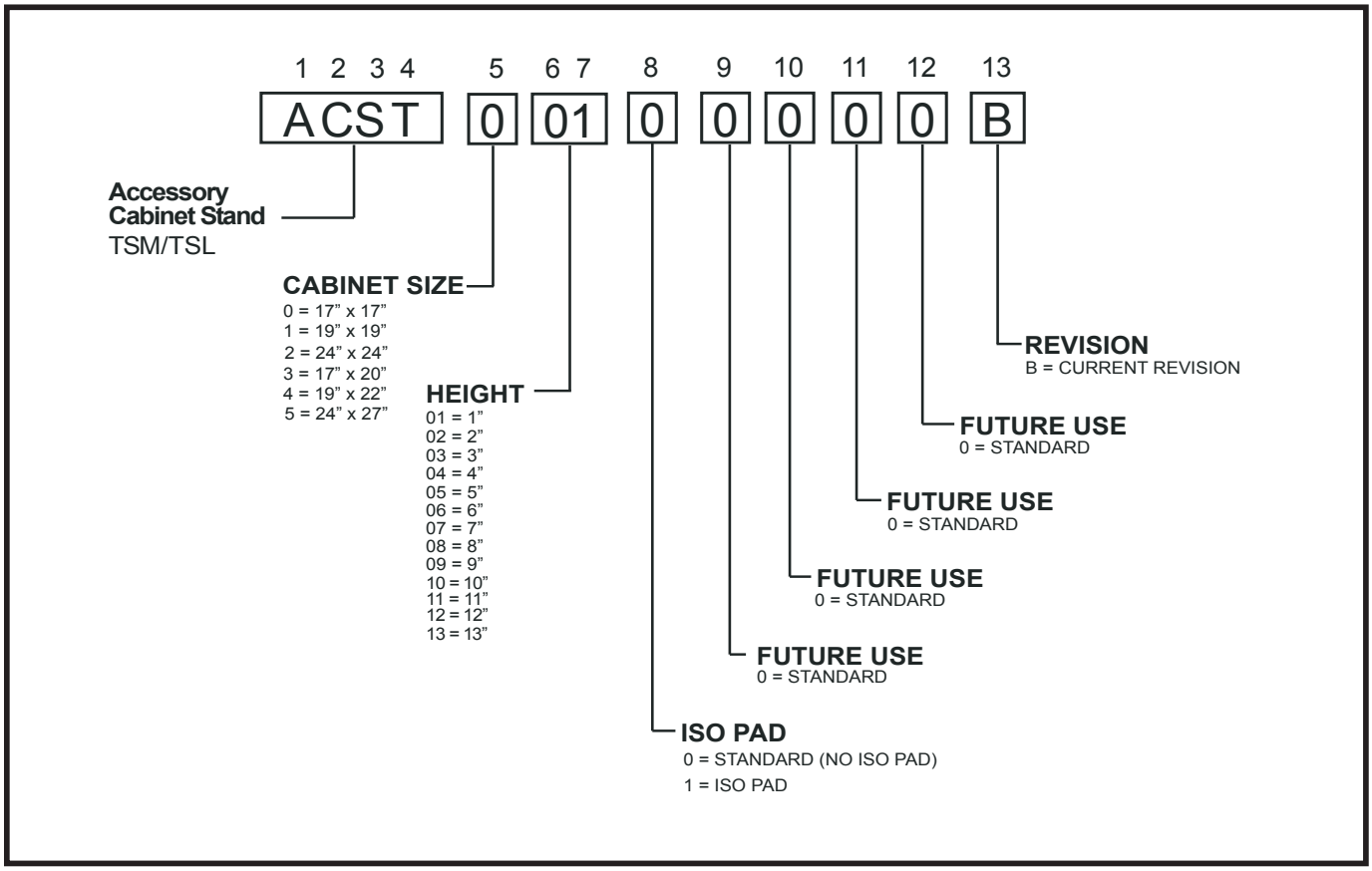


Accessory Nomenclature, Cont'd.

Supply Air Grille

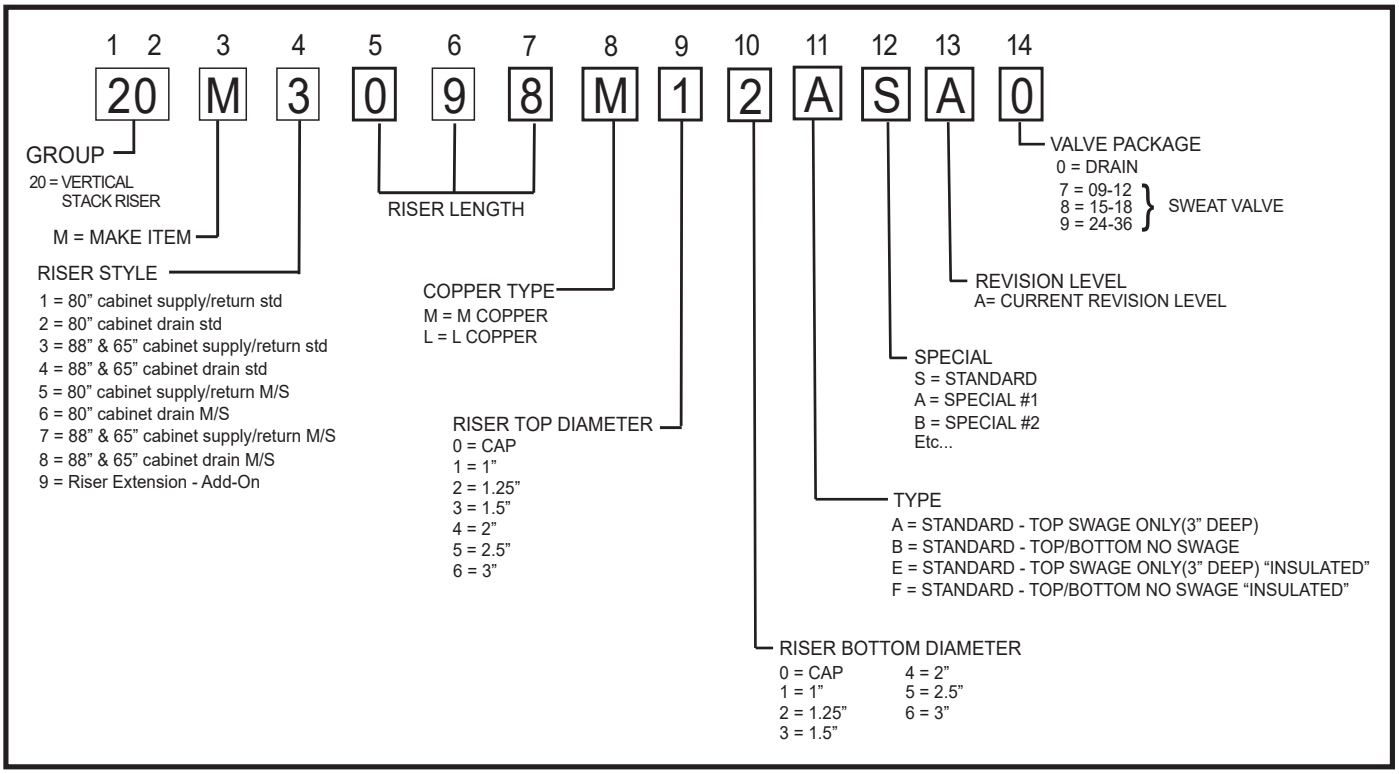


Cabinet Stands (Ship loose in bulk for field attachment)



Accessory Nomenclature, Cont'd.

Riser



Physical Data – TSM

Model	09	12	15	18	24	30	36
Compressor (1 Each)	Rotary				Scroll		
Factory Charge HFC-410A (oz) [kg]	35 [.99]	35 [.99]	43 [1.22]	53 [1.50]	71 [2.01]	66 [1.87]	75 [2.13]
Motor & Blower							
208-230V PSC (HP) [W]	1/30 [25]	1/15 [50]	1/6 [124]	1/6 [124]	1/5 [149]	1/3 [249]	1/3 [249]
265V PSC (HP) [W]	1/30 [25]	1/15 [50]	1/6 [124]	1/6 [124]	1/5 [149]	1/2 [373]	1/2 [373]
ECM Constant Volume (HP) [W]	1/8 [93]	1/8 [93]	1/3 [249]	1/3 [249]	1/3 [249]	1/3 [249]	1/2 [373]
ECM Constant Torque (HP) [W]	1/4 [186]	1/4 [186]	1/3 [249]	1/3 [249]	1/2 [373]	1/2 [373]	3/4 [560]
Blower Wheel Size (diam x w) - (in) [mm]	6.75 x 7.25 [165 x 184]		9.5 x 7.12 [241 x 180]		10.63 x 8.0 [270 x 203]		
Chassis Air Coil							
Air Coil Dimensions (h x w) - (in) [mm]	28 x 12.625 [711 x 321]		28 x 14 [711 x 356]		30 x 18 [762 x 457]		
Return Air Filter Dimensions (h x w) - (in) [mm]	30 x 14 [762 x 356]		30 x 16 [762 x 406]		32 x 20 [813 x 508]		
Coax Volume (Gallons) [Liters]	0.26 [.98]		0.36 [1.4]		0.60 [2.3]		
Hose Size (in)	1/2		3/4		1		
Weight							
Chassis - (lbs) [kg]	110 [50]	117 [53]	123 [56]	125 [57]	186 [84]	190 [86]	192 [87]
80” Cabinet - (lbs) [kg]	114 [52]		133 [60]		170 [77]		
88” Cabinet - (lbs) [kg]	128 [58]		148 [67]		185 [84]		

Unit wiring diagrams available at www.climatemaster.com. Select 'Commercial Professional ', ' Literature ', ' Wiring Diagrams'.

Unit Maximum Water Working Pressure	
Options	**Max Pressure PSIG [kPa]**
Base Unit (Hoses)	400 [2757]
Internal Secondary Pump (ISP)	200 [1.378]
Internal Motorized Water Valve (MWV)	300 [2,068]
Internal Modulating Valve	300 [2,068]
Internal Auto Flow Valve	400 [2,757]

Use the lowest maximum pressure rating when multiple options are combined.
* Units with water valve have 300 [2068] High Pressure Water Switch – 250 [1723] Auto Reset

Physical Data – TSL

Model	09	12	15	18	24	30	36
Compressor (1 Each)	Rotary				Scroll		
Factory Charge HFC-410A (oz) [kg]	35 [.99]	35 [.99]	43 [1.22]	53 [1.50]	71 [2.01]	66 [1.87]	75 [2.13]
Motor & Blower							
208-230V PSC (HP) [W]	1/10 [75]	1/10 [75]	1/3 [249]	1/3 [249]	1/3 [249]	1/3 [249]	3/4 [560]
265V PSC (HP) [W]	1/10 [75]	1/10 [75]	1/3 [249]	1/3 [249]	1/2 [373]	1/2 [373]	3/4 [560]
ECM Constant Volume (HP) [W]	1/8 [93]	1/8 [93]	1/3 [249]	1/3 [249]	1/3 [249]	1/2 [373]	3/4 [560]
ECM Constant Torque (HP) [W]	1/4 [186]	1/4 [186]	1/3 [249]	1/3 [249]	1/2 [373]	1/2 [373]	3/4 [560]
Blower Wheel Size (diam x w) - (in) [mm]	6.75 x 7.25 [165 x 184]		9.5 x 7.12 [241 x 180]		10.63 x 8.0 [270 x 203]		
Chassis Air Coil							
Air Coil Dimensions (h x w) - (in) [mm]	28 x 12.625 [711 x 321]		28 x 14 [711 x 356]		30 x 18 [762 x 457]		
Return Air Filter Dimensions (h x w) - (in) [mm]	30 x 14 [762 x 356]		30 x 16 [762 x 406]		32 x 20 [813 x 508]		
Coax Volume (Gallons) [Liters]	0.26 [.98]		0.36 [1.4]		0.60 [2.3]		
Hose Size (in)	1/2		3/4		1		
Weight							
Chassis - (lbs) [kg]	110 [50]	117 [53]	123 [56]	125 [57]	186 [84]	190 [86]	192 [87]
65” Cabinet - (lbs) [kg]	95 [43]		108 [49]		142 [64]		

Unit wiring diagrams available at www.climatemaster.com. Select 'Commercial Professional ', ' Literature ', ' Wiring Diagrams'.

Unit Maximum Water Working Pressure	
Options	**Max Pressure PSIG [kPa]**
Base Unit (Hoses)	400 [2,757]
Internal Secondary Pump (ISP)	200 [1.378]
Internal Motorized Water Valve (MWV)	300 [2,068]
Internal Modulating Valve	300 [2,068]
Internal Auto Flow Valve	400 [2,757]

Use the lowest maximum pressure rating when multiple options are combined.
* Units with MWV have 300 [2068] High Pressure Water switch - 250 [1723] Auto Reset

Physical Data – TSL Hybrid

Model	09	12	15	18	24	30	36
Compressor (1 Each)	Rotary				Scroll		
Factory Charge HFC-410A (oz) [kg]	35 [.99]	35 [.99]	43 [1.22]	53 [1.50]	71 [2.01]	66 [1.87]	75 [2.13]
Motor & Blower							
ECM Constant Volume (HP) [W]	1/8 [93]	1/4 [186]	1/3 [249]	1/3 [249]	1/2 [373]	3/4 [560]	3/4 [560]
ECM Constant Torque (HP) [W]	1/4 [186]	1/4 [186]	1/3 [249]	1/3 [249]	1/2 [373]	1/2 [373]	3/4 [560]
Blower Wheel Size (diam x w) - (in) [mm]	6.75 x 7.25 [165 x 184]		9.5 x 7.12 [241 x 180]		10.63 x 8.0 [270 x 203]		
Chassis Air Coil							
Refrigerant Air Coil Dimensions (h x w) - (in) [mm]	28 x 12.625 [711 x 321]		28 x 14 [711 x 356]		30 x 18 [762 x 457]		
Hydronic Coil Dimensions (h x w) - (in) [mm]	28 x 12.625 [711 x 321]		28 x 14 [711 x 356]		30 x 18 [762 x 457]		
Return Air Filter Dimensions (h x w) - (in) [mm]	30 x 14 [762 x 356]		30 x 16 [762 x 406]		32 x 20 [813 x 508]		
Coax Volume (Gallons) [Liters]	0.26 [.98]		0.36 [1.4]		0.60 [2.3]		
Hydronic Coil Volume (Gallons) [Liters]	0.08 [0.30]		0.61 [2.31]		0.77 [2.91]		
Hose Size (in)	1/2		3/4		1		
Weight							
Chassis - (lbs) [kg]	132 [60]		181 [83]		228 [104]		
65” Cabinet - (lbs) [kg]	116 [53]		128 [58]		139 [63]		
80” Cabinet - (lbs) [kg]	129 [59]		142 [65]		156 [71]		
88” Cabinet - (lbs) [kg]	137 [63]		151 [69]		166 [76]		

Unit wiring diagrams available at www.climatemaster.com. Select 'Commercial Professional ', ' Literature ', ' Wiring Diagrams'.

Unit Maximum Water Working Pressure	
Options	**Max Pressure PSIG [kPa]**
Base Unit	400 [2,757]
Hydronic Coil	625 [4,309]
Internal Secondary Pump (ISP)	200 [1,378]
Internal Motorized Water Valve (MWV)	300 [2,068]
Internal Modulating Valve	300 [2,068]
Internal Auto Flow Valve	400 [2,757]

Use the lowest maximum pressure rating when multiple options are combined.
* Units with MWV have 300 [2068] High Pressure Water switch - 250 [1723] Auto Reset

Pre-Installation Information

Storage - Equipment should be stored in its original packaging in a clean, dry area. Store chassis in an upright position at all times. Stack units at a maximum of 2 units high.

Store cabinets how they were shipped - horizontal or vertical, keeping them on their pallets for protection. Do not stack multi-packs. Cabinets with risers, stack a maximum of 2 high.

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

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

Prior to flushing risers with water, be sure that the temperature in building will always be above freezing.

Pre-Installation - Installation, Operation, and Maintenance instructions are provided with each unit. The installation site chosen should include adequate service clearance around the unit. Before unit installation and start-up, read all manuals and become familiar with the unit and its operation. Thoroughly check the system before operation. Your installation may require additional, different sequence, or modification to steps in this IOM.

Prepare cabinet for installation as follows:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Each cabinet has labeling that indicates the location where it is to be installed and the riser diameters if they are attached.
3. Keep the cabinet openings and exposed sheet metal covered until installation is complete and all plastering, painting, etc. is finished and cleaned.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.
5. If not ordered with factory configuration option, configure supply air openings - remove knockouts (K.O.), cut insulation, and assemble duct angles. Check to see if supply air openings (size and location) are correct with building plans. Do not remove extra K.O.'s - must securely cover any open unused K.O.'s.
6. For cabinets without risers - remove correct riser knockouts, slit insulation vertical down center of slot (do not remove).
7. Repair any torn insulation with foil tape.
8. A base vibration dampening pad is recommended to help eliminate transfer of vibration to the structure. If isolation pad was not ordered, obtain a 0.070" to 0.125" (1.5 to 3) thick pad and apply to the bottom of the cabinet.
9. **For chassis shipped inside cabinet remove and discard 4 shipping bolts.**
10. Remove inner panel (8 screws) and save for re-installation after chassis is installed.
11. For standard cabinets shipped with risers attached remove and discard condensate pan shipping wire ties. Lift pan approximately 2" to check drain hose is attached and clamped to pan and riser stub.

Prepare chassis for installation as follows:

1. Verify refrigerant tubing is free of kinks or dents and that it does not touch other tubes or unit parts as it passes over or through. Adjust if needed and separate with closed cell insulation.
2. Inspect all electrical connections. Connections must be clean and tight at the terminals.
3. If chassis is not installed in cabinet, store in original carton in a clean and dry location.

⚠ CAUTION! ⚠

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

⚠ CAUTION! ⚠

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

Riser and Cabinet Installation

⚠ WARNING! ⚠

WARNING! To avoid damage from clogged coil surfaces, clogged motor ventilation openings, seized fan blades and potential unit failure, DO NOT OPERATE UNIT without complete enclosure, supply grille, return air panel and filter in place.

⚠ CAUTION! ⚠

CAUTION! To ensure correct riser positioning and to compensate for variations in floor-to-floor dimensions, do not allow the unit to unit riser joint to bottom out.

Core Drilling For Vertical Riser Stack

Core drilling slab slot/holes will determine cabinet placement and surrounding walls. Slot/holes size, location on floor and plumb alignment in two planes from top to bottom are all very important, check plans. Size of slot/hole will depend on slab thickness, ceiling height, riser length, and if risers are attached to cabinet-which side risers are on and how cabinet is angled into final position. Please see the TSM and TSL submittals for reference.

Risers - Risers can be ordered loose, not attached to the cabinet and shipped in bulk separately. Crates will have layers of risers by floors, each cabinets 3 risers (S,R,D) will be next to each other. Lowest floor will be on top layer. Risers will have a tag with the floor and riser number (if the project information is filled out on the Solution Center vertical stack selection screen). Entire riser stacks can be assembled, pressure tested, flushed, and filled before setting cabinets. Use caution if filled risers are in unconditioned space, prevent freezing. Do not construct walls until cabinets are set.

Risers may be different for every location and floor, check before installing. All couplings and reducers are to be field supplied.

Before brazing check building plans to be sure you are installing correct riser; Description of riser, diameter, type, and shutoff size are all variations. See figure 2 for help in identifying riser and dimension to set riser run out. Note dimension is from bottom of cabinet, add if stand or thick isolation pads are used to get correct dimension from floor.

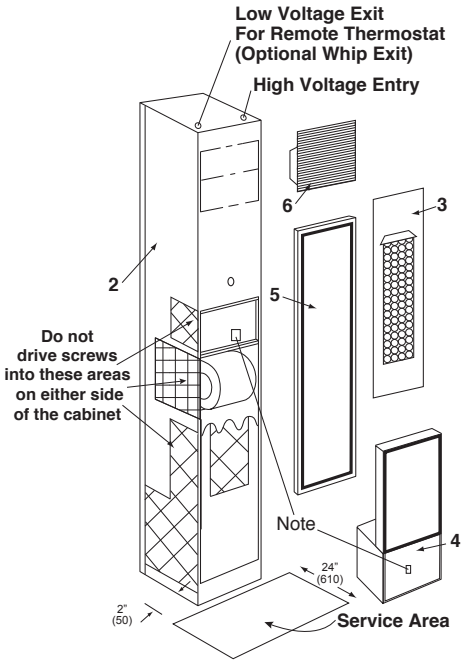
If local codes allow, PVC drain risers may be used.

Description - Supply and return risers can be straight, transition up, transition down, bottom capped, or top capped. Drain risers can be straight, transition up, or top capped. All drain risers and extended range (operation below 60 °F or above 105°F entering water temperature) supply and return risers need insulation.

Riser Diameter (nominal water size) - 1", 1.25", 1.50", 2", 2.5", 3". Top of riser and bottom of riser on floor above must be same diameter.

Figure 1: Vertical Stack Unit Components

1	Supply, Return, and Condensate Risers (not shown)	Install Now
2	Cabinet	
3	Cabinet Inner Panel and Filter	
4	Chassis	Install Later
5	Return Air Panel	
6	Supply Air Grille	
7	Thermostat (Not shown)	
8	Hoses (Not shown)	
9	Optional Stand (Not shown)	Install Now



Note: Matching labels for visual aid, chassis, and cabinet same size and voltage.

⚠ WARNING! ⚠

WARNING! To prevent electrical shorts and drain pan leaks, assure that screws do not penetrate unit components when driving screws near the unit control box or drain pan. Do not allow screws or nails to penetrate chassis, risers, electrical junction boxes, raceways or to interfere with chassis removal. To avoid motor or compressor damage, keep drywall dust out of the unit.

Riser and Cabinet Installation, Cont'd.

Type M has red identification marking (stripe running down the tube) and Type L (thicker wall) has blue identification marking. If tube is insulated pull back carefully to check color.

Shutoff ball valves and hose sizes for cabinet/chassis - 1/2" for sizes 09-12, 3/4" for 15-18, and 1" for sizes 24-36.

Supply riser is always closest to back corner of cabinet, return riser next, and drain riser in approx. middle of the cabinet. Supply risers are 9.25" (235) apart from drain on centerline. See Figures 2 & 3.

Secure Riser Stack to building structure so stack does not drop over time. Cabinet slots allow for 1.50" (38mm) maximum expansion and 1.50" (38mm) maximum contraction, use expansion devices if you exceed these values, and between clamps.

NOTICE: Any risers misplaced, assembled in wrong location, brazed incorrect, modified incorrect (including cutting off or extending), runoff at incorrect height, misalignment found anytime including when cabinets are set, not using expansion devices if specified, or stack was not supported correctly is the sole responsibility of the installing contractor.

Riser Installation When Risers are Shipped Separately

1. Check riser diameter, type, valve size, and position (S,R,D or D,S,R) of risers per cabinet configuration (see floor plans).
2. Suggest each cabinet location be marked with all information (see figure 5).
3. Starting on lowest floor center risers in slot. Set height of supply and return run-outs to 39.75" (1100) and drain run-out to 3.12" (79) from bottom of cabinet. Temporally secure risers (not by rubout or valve) so they do not move.
4. If riser extensions are used insert them on lower floor top of riser, mark like step 5.
5. Next floor up mark riser at bottom at 1" (25) and 2.50" (63), drop through slot and position run-outs same as step 2. Temporally support.
6. On lower floor check that above riser is inserted between 1" (25) and 2.50" (63) (between 2 marks you made). Cut riser if needed or use extension.
7. Insert expansion devices if required by plans.
8. Continue until complete riser stack is assembled.
9. Check all risers are correct diameter, type, valve size; correctly positioned; centered in slot; plumb from top to bottom; depth into swedge correct; run-outs at correct height, and shutoff valve handles are parallel with the side of cabinet. (see Figure 2)
10. Braze all joints with high temperature alloy like Phoscopper or Silfos. (DO NOT use soft solder 50-50, 60-40 or 85-15; low temperature alloys are not acceptable for this application).
11. Must securely anchor riser stacks to building structure at least on one floor. Typically at middle floor and additional floors as needed. Example: 40 floors, anchor at 10, 20, and 30. Use expansion devices between anchors.
12. Remove temporary supports.
13. Check that risers did not drop. If stack dropped, jack up and add additional anchor support.
14. Verify all shutoff valves are closed. DO NOT OPEN VALVES until system has been cleaned and flushed.
15. Pressure check risers–locate and repair any leaks–retest.
16. To facilitate cleaning and flushing, install the hose kit at the end farthest from the pump and connect the ends of the hoses with the riser flush adapter (Kit - AFL5751). Then open both valves before pumping fresh water through the system, close the valves when the system is clean. Remove the flush adapter before installing the chassis. **Note: Refer to System Flushing Section of this manual for more information.**
17. Install air vents in piping loop at highest accessible point as required to bleed the system of air accumulated during installation.

Cabinet Installation When Risers are Shipped Separate or Field Provided

1. Check plans that cabinet is correct for location, cabinet will have label and data plate with information, including unit size, diameters of risers, and electrical data.
2. Remove riser KO's (3) for your cabinet configuration (see Figure 2).
3. Cover supply and return openings with 4 pads. Slit with knife (see Figure 7a).
4. Slide cabinet up to riser allow 1/4" to 1" (6 to 25 mm) clearance.
5. Attach the cabinet assembly to the floor on at least two sides using sheet metal angles. Additional anchorage may be provided by installing brackets at the top of the cabinet.
   a. Anchor built-in risers to the building structure with at least one contact point. To accommodate vertical expansion and contraction DO NOT fasten risers rigidly within the unit.
   b. Verify that unit shut-off valves are closed. DO NOT

Riser and Cabinet Installation, Cont'd.

OPEN VALVES until the system has been cleaned and flushed.

6. For cabinets with chassis inside - remove 4 shipping screws, discard.
7. Remove inner panel (8 screws), save both.
8. Remove condensate pan shipping wire ties.
9. P-Trap Hose must be connected, lift drain pan, extend drain riser stub into cabinet, measure and cut drain hose to length, connect rubber p-trap to riser and clamp. If condensate hose must be rotated, loosen clamp on pan, rotate, and reclamp. Check condensate drain - clean pan if needed. Slowly pour 1 to 2 quarts (1 to 2 liters) of water into pan. Water should drain freely. Check for water in cabinet and on floor. Repair if needed, and then retest.
10. Sheet metal ductwork should not be attached to the cabinet. A canvas-type flexible connection is recommended between the cabinet and the ductwork.

Cabinet Installation When Risers are Attached (See Figure 2)

1. Check plans that cabinet is correct for location, cabinet will have a label and data plate with information, including unit size, diameters of risers, and electrical data (if the project information is filled out on the Solution Center vertical stack selection screen). Move cabinet close to slab slot, do not carry cabinet using risers, always use 2 people.
2. Check risers are 3" above the top of cabinet. If not loosen straps, adjust riser and re-tighten.
3. For applicable cabinet options configure supply air openings and attach angles. See Pre-Installation. If optional stand is required attach to bottom of cabinet with 4 screws.
4. Start on lowest floor, lift cabinet and angle so risers pass through slab slot/holes until cabinet is standing up and setting on floor. Be careful not to damage either end of riser, do not carry cabinet using risers. Move cabinet until risers are centered in slot/holes and cabinet sides are square with proposed walls. If extensions are used, assemble to risers on lower floor. Mark set depth in case they drop before brazing. Dimension should be 1" to 2". Less than 1" or more than 2-1/2" is not acceptable. Extensions should never bottom in swedge of riser. **Note: Riser joints should be well below slab for brazing/inspection.**
5. Attach the cabinet assembly to the floor on at least two sides using sheet metal angles. Additional anchorage may be provided by installing brackets at the top of the cabinet.
6. DO NOT attach drywall studs to cabinet. When all units on a riser are anchored into place, complete riser joints as follows:
   a. Verify that all riser joints are vertically aligned and that risers penetrate 1" to 2" (25 to 50) into the swaged joint of the riser below. DO NOT let riser joint bottom out. Check run outs enter cabinet at 90°.
   b. Braze riser joints with a high-temperature alloy (such as Phos-copper or Silfos). Soft solder (50-50, 60-40 or 85-15) or low-temperature alloys are NOT suitable for this application.
   c. Must securely anchor riser stacks to the building structure with at least one contact point. Typically at middle floors as needed. Example, a 40 floor building would be anchored at floors 10, 20, and 30. To accommodate vertical expansion and contraction use expansion devices between anchors. DO NOT fasten risers rigidly within the unit.
   d. Verify that unit shut-off valves are closed. DO NOT OPEN VALVES until the system has been cleaned and flushed.
   e. Pressure check riser - locate and repair leaks.
   f. If condensate hose must be rotated, loosen clamp on pan, rotate, and re-clamp. Check condensate drain - clean pan if needed. Slowly pour 1 to 2 quarts (1 to 2 liters) of water into pan. Water should drain freely. Check for water in cabinet and on floor. Repair if needed.
   g. Repair or replace any damaged or missing insulation on risers, and extensions (if used).
   h. To facilitate cleaning and flushing, install the hose kit at the end farthest from the pump and connect the ends of the hoses with the riser flush adapter (Kit - AFL5751). Then open both valves before pumping fresh water through the system, close the valves when the system is clean. Remove the flush adapter before installing the chassis.
   Note: Refer to System Flushing Section of this manual for more information.
   i. Install air vents in piping loop at highest accessible point as required to bleed the system of air accumulated during installation.
7. Next floor up select correct unit. Suggest measuring from top of slab to top of riser below. Now measure from bottom of cabinet (or stand/pad if used) to bottom of riser, this dimension should be 1" to 2"more than first measurement. Less than 1" or more than 2-1/2" is not acceptable. Risers should never bottom in swedge below. Cut riser or extension if needed. DO NOT slide riser up or down on cabinet. Repeat steps 2-5.

Riser and Cabinet Installation, Cont'd.

Supply and Return Stack

1. Install a drain valve, shut-off/balancing valves, flow indicators and drain tees at the base of each supply and return riser stack to enable system flushing at start-up, balancing and during servicing.
2. Install strainers at the inlet of each circulating pump.
3. Insulate loop water piping which runs through non-conditioned areas or outside the building. For boiler tower applications loop temperature is normally between 60°F and 90°F, piping does not sweat or suffer heat loss under ambient conditions. For geothermal applications insulate all loop water piping.
4. Cabinet slots and riser stack assemblies are designed to accommodate a maximum of 1-½"(38) expansion and 1-½"(38) contraction. If the calculated riser stack expansion or contraction exceeds 1-½"(38), expansion devices must be provided.

Condensate Piping - Standard and Leader Cabinets (risers shipped attached to the cabinet) - Condensate connection between the drain pan assembly and condensate riser is factory installed, clamped, and trapped in cabinet. Follower cabinets (risers shipped loose or field provided) installer must clip and remove 2 drain pan shipping ties, lift drain pan, extend drain riser stub into cabinet, measure and cut drain hose to length, connect rubber p-trap to riser and clamp.

⚠ NOTICE! ⚠

Loose risers with brazed shutoff! Make sure shutoff handles are parallel with riser entry side of cabinet before brazing stack.

Optional Frame for Return Air G Panel - Position studs in front of cabinet and install frame in opening. Seal the gap between the cabinet and the frame. If fresh air motorized damper assembly is used, field fabricate and install duct from outside to frame opening. Assembly is installed later. See instructions with assembly. **NOTICE! Allow for drywall thickness under frame front flange.**

⚠ NOTICE! ⚠

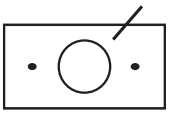
NOTICE! ClimateMaster is not responsible for wallboard repair if 2 x 4 box was not in correct orientation.

Optional Field Supplied Duct Installation - When return air is required to enter the unit through openings in a stud wall, supply and field install an optional duct. Seal duct against the return air grille. Add a blockoff above and below the chassis to ensure that all air entering the unit passes through the filter and refrigerant-to-air coil. Sheet metal ductwork must not be attached to the cabinet. A canvas type flexible connection should be used between the cabinet and the ductwork.

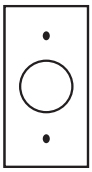
When supply air is ducted from unit, sheet metal ductwork must not be attached to the cabinet. A canvas-type flexible connection should be used between the cabinet and the ductwork.

Drywall Installation - If you have the surface mounted thermostat option (cabinet model digit 5 = P, S, or 5), make sure before you install the drywall that the 2x4 junction box is in the correct orientation. Turn if needed. Check your thermostat.

2 x 4 Junction Box



Shipped Horizontal
(All ClimateMaster Thermostats)



Vertical

For best sound attenuation, Do not to attach studs or drywall to cabinet.

Install studs and drywall using conventional construction methods. Secure drywall to studs with low profile, pan-head sheet metal screws. Drywall must not be fastened to drain pan edges or control box enclosure. Drywall can be attached directly to cabinet (except in places indicated in Figure 1), front of cabinet requires double thickness. Do not attach drywall studs to cabinet. Do not install drywall using adhesive alone.

See typical construction figures 4, 5, and 11 to determine stud layouts and dimension from cabinet to finished wall. Vacuum all drywall dust and construction debris from cabinet insulation, drain pans and blower discharge plenum after cutting out supply and return holes for grilles. Insulation should be placed between the drywall and the cabinet for sound attenuation.

When installation is complete, cover all cabinet openings and exposed sheet metal. (Cardboard from unit shipping cartons can be used). Do not allow paint or wall texture over-spray to contact insulation, sheet metal, coil, fan or other unit components. Warranties are void if paint or other foreign debris is allowed to contaminate internal unit components.

Do not adjust the Sight and Sound X-baffle (see Figure 7). It is not designed to be used as a damper.

Riser and Cabinet Installation, Cont'd.

Figure 2: Riser Placement

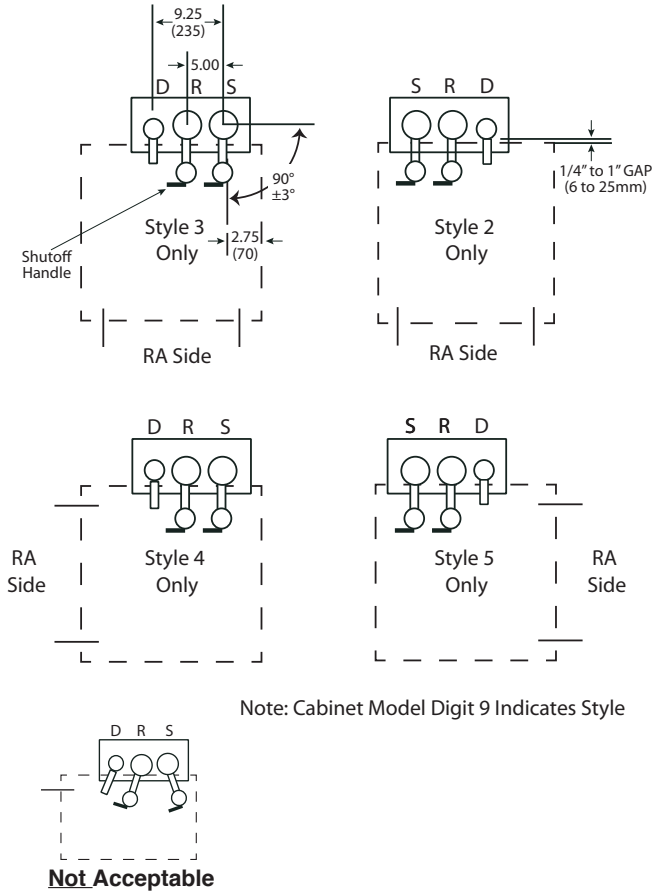


Figure 3: Riser Setting Detail

Cabinet	Size	Valve FPT
D1, D2	09, 12	1/2" (13)
D3, D4	15, 18	3/4" (19)
D5, D6, D7	24, 30, 36	1" (25)

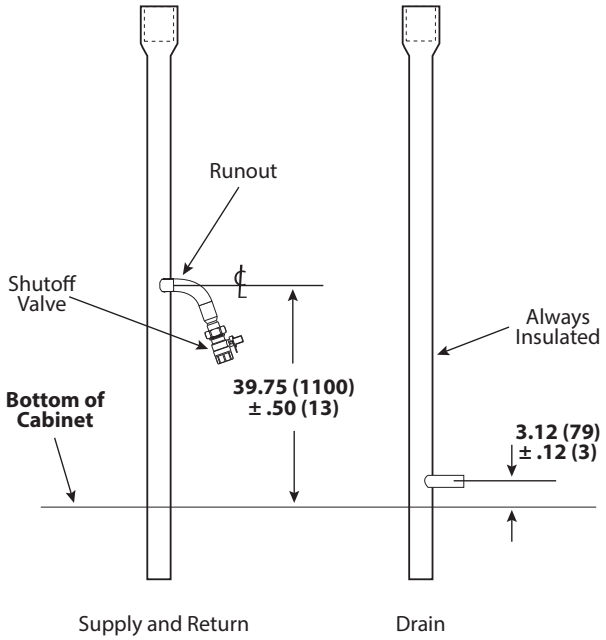


Figure 4: Riser or Extension Insertion

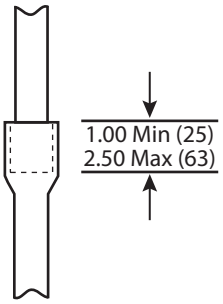
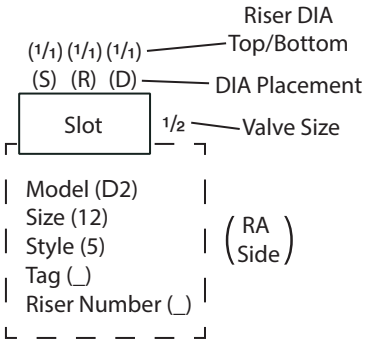
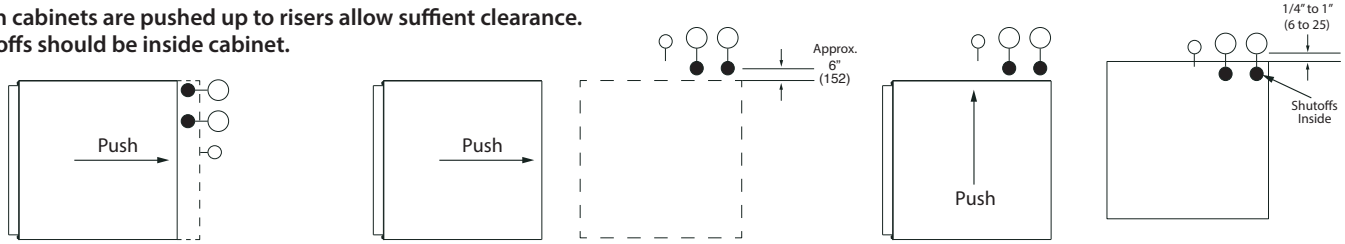


Figure 5: Suggested Floor Markings
(Change data for your unit)

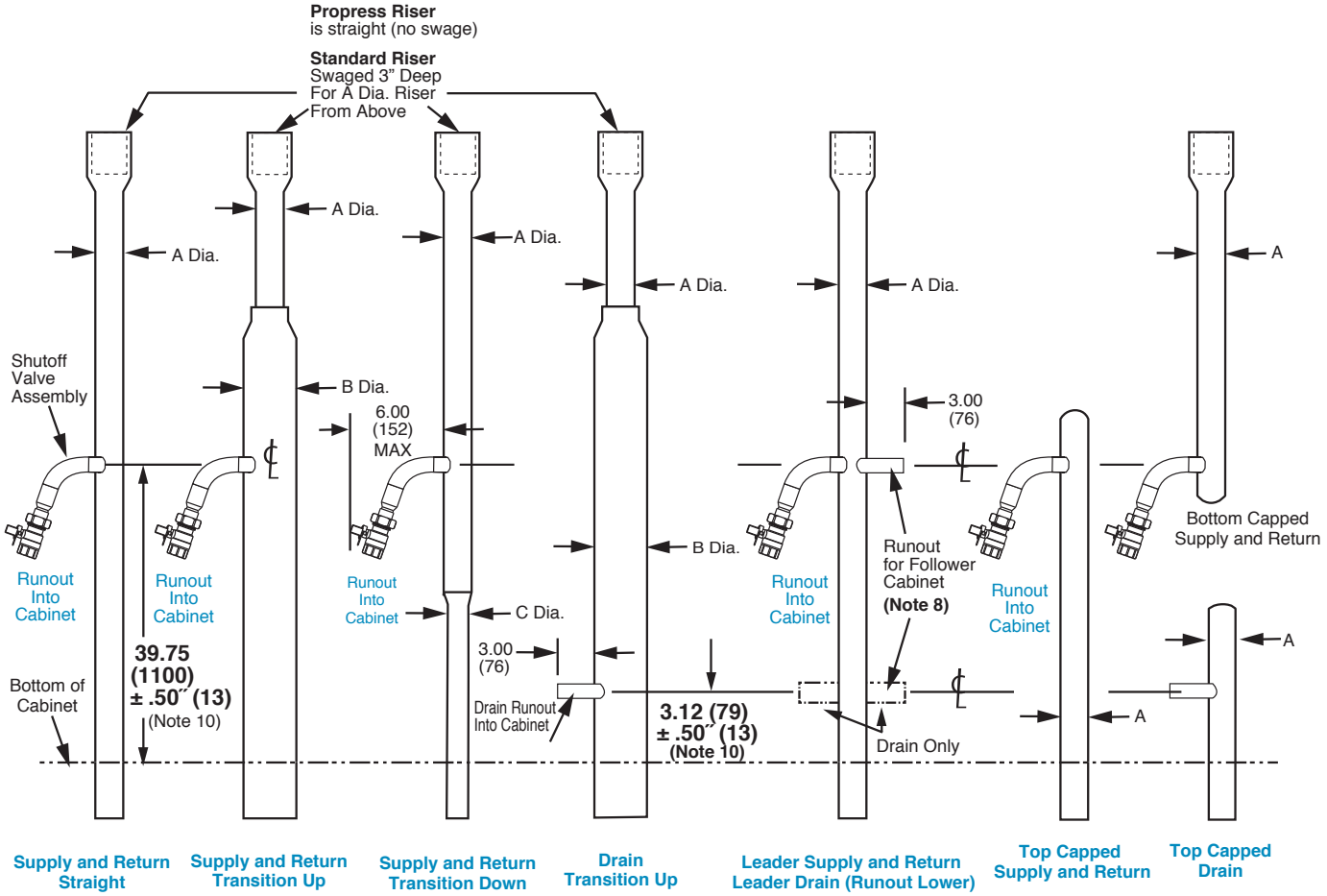


When cabinets are pushed up to risers allow suffient clearance. Shutoffs should be inside cabinet.

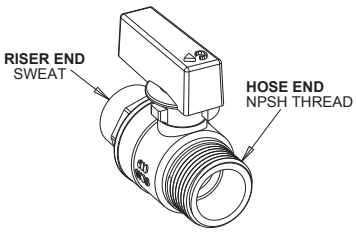


Riser and Cabinet Installation, Cont'd.

Figure 6: Riser Identification



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



Standard Valve
(Cabinet Digit 10 = 5)
Used with AHU Style Hoses

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 run outs are factory brazed.
4. All risers are factory pressure tested.
5. Standard riser diameters are nominal 1", 1¼", 1½", 2", 2½", and 3". Please consult the factory on pricing for nominal 4" water tubing.
6. Copper Type M and L available (4" L only).
7. Drain riser insulated standard. Insulation is optional for supply and return
8. Leader riser - For follower cabinet riser ball valve assemblies, 12" of straight copper are provided for field connection to the leader riser. Assembly to be cut to length and field brazed. In applications where more than 12" of straight copper is needed, copper and fittings to be field provided.
9. Standard ball valves have NPSH threads for connection to AHU hoses 1/2" for sizes 09-12, 3/4" for 15-18, and 1" for sizes 24-36.
10. If cabinet stand or thick ISO pad is used, at installation add height/thickness to shutoff valve and drain run out height. Verify riser shutoff height with plans before brazing.

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

Riser and Cabinet Installation, Cont'd.

Figure 7: Cabinet

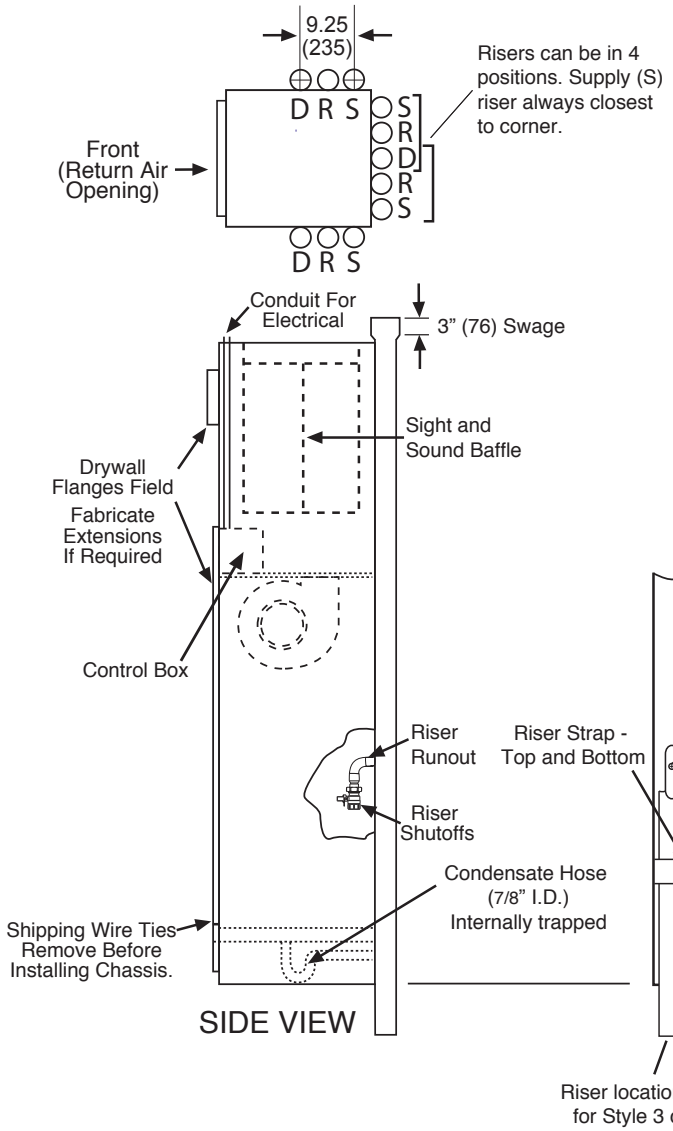
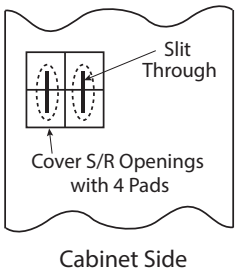
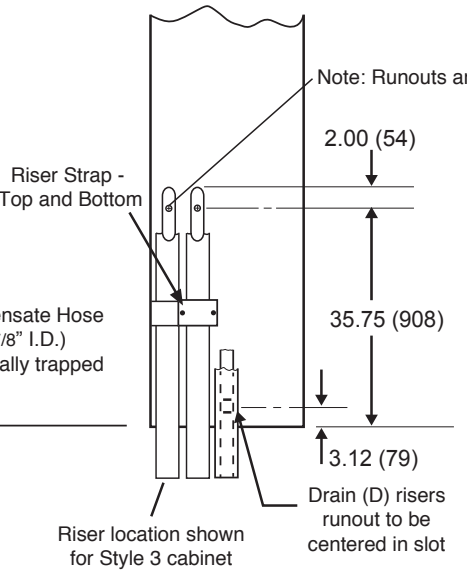


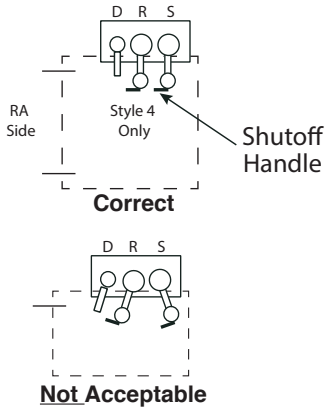
Figure 7a



⚠ ATTENTION ⚠

Supply (S) and Return (R) risers may have moved during shipping. Check, they must be 3" [76 mm] above top of cabinet and shutoff handles are parallel with side of cabinet before brazing stack. Loosen straps and readjust any if needed, then re-tighten. After riser stack is completed and secured to building structure, straps can be removed. After riser stack is completed and secured to building structure, straps can be removed.

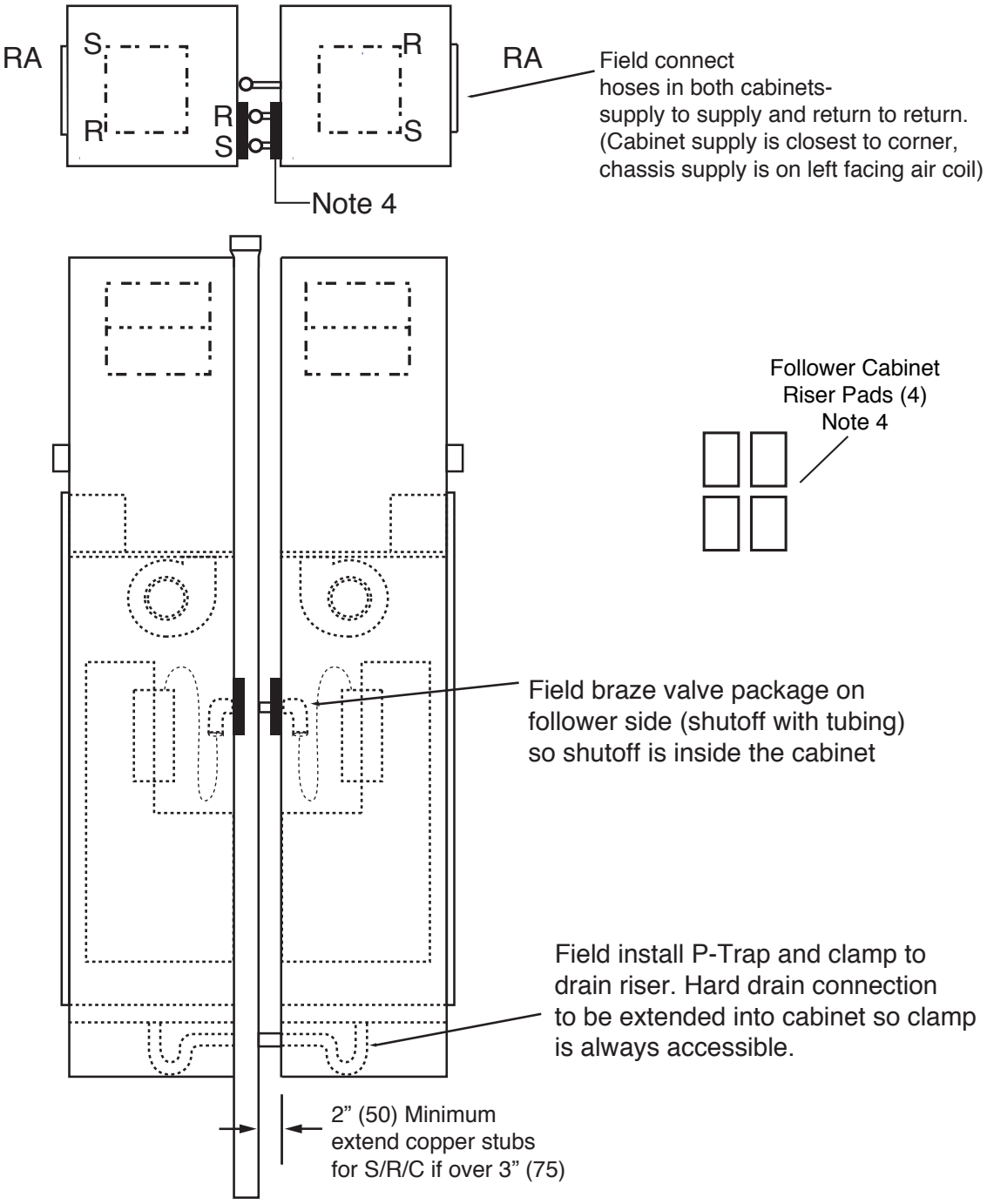




Notes:

1. For chassis shipped in cabinet remove and discard 4 shipping bolts.
2. Supply (S) and Return (R) risers may have moved during shipping. Check, they must be 3" (76) above top of cabinet. Loosen straps and readjust any if needed, then re-tighten. After riser stack is completed and secured to building structure, straps can be removed.
3. When risers are attached at the factory, p-trap drain hose is attached and clamped at cabinet drain pan and drain riser. When risers are field provided or shipped separate, run copper drain stub into cabinet, measure and cut rubber drain hose to length, connect and clamp drain hose to the drain riser.
4. Before installing chassis – check drain hose is connected and clamped at both ends, and drain pan is free and setting on 4 rubber grommets.

Leader/Follower Cabinet Installation

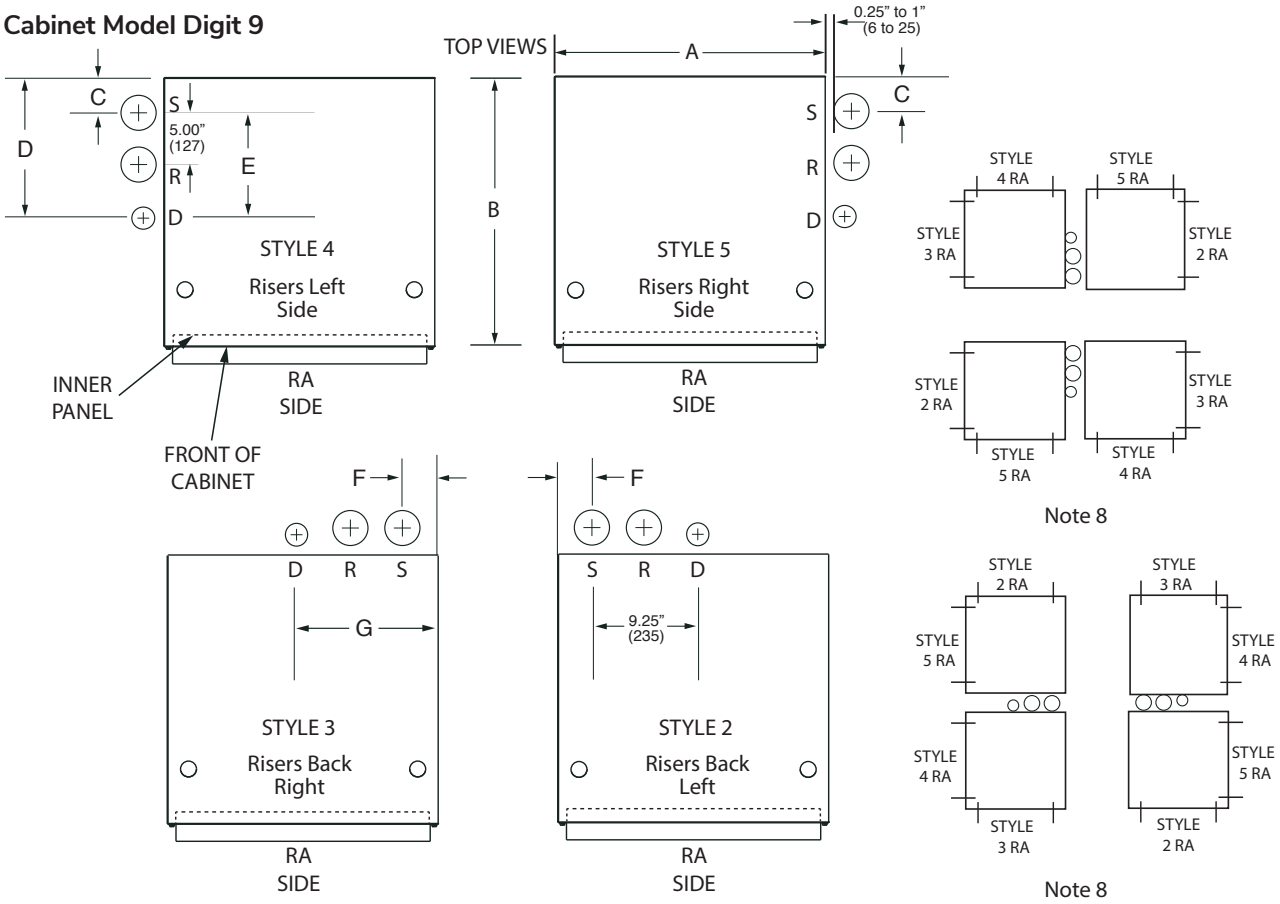


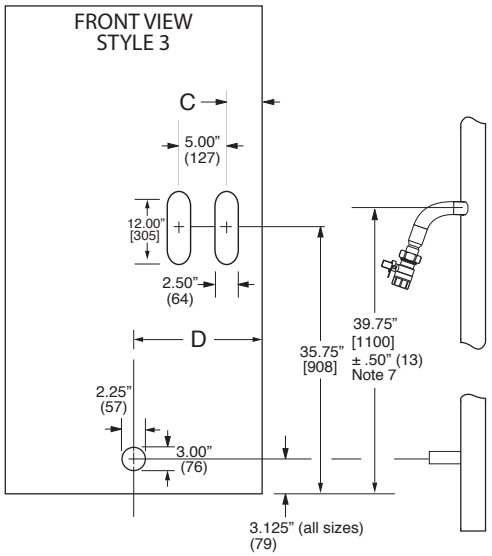
Notes:

1. Contractor must meet all fire code requirements.
2. Size riser diameter for both units GPM.
3. Leader/Follower means both units share common riser.
4. Install pads on back of follower cabinet to cover slots used for S/R risers.

C & D Cabinet Slot Dimensions and Riser Arrangements

Cabinet Model Digit 9





⚠ NOTICE! ⚠

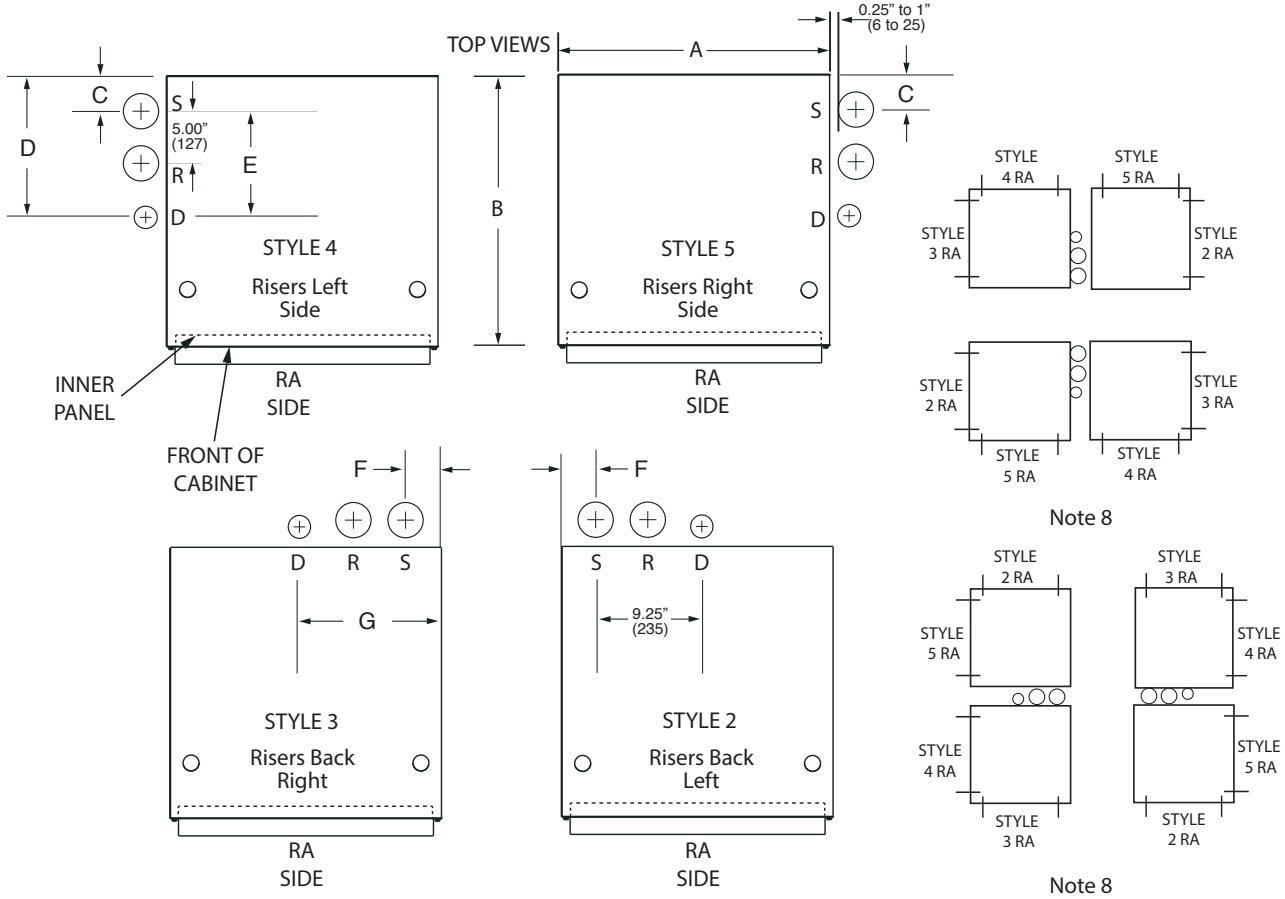
NOTICE! Not all styles will stack above or adjacent to each other. (See Note 8).

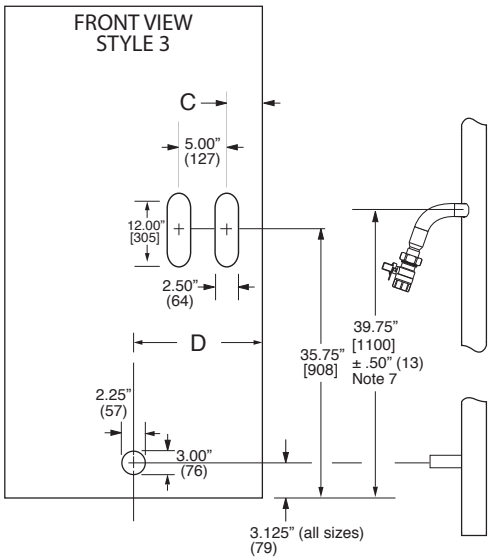
Notes:

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

Size	A	B	C	D	E	F	G
09-12	17.00 [432]	17.00 [432]	2.75 [70]	11.93 [303]	9.18 [233]	1.71 [44]	11.34 [288]
15-18	19.25 [489]	19.00 [483]	2.75 [70]	11.93 [303]	9.18 [233]	2.83 [72]	12.08 [307]
24-36	24.25 [616]	24.00 [610]	2.73 [69]	11.98 [304]	9.25 [235]	2.83 [72]	12.08 [307]

E Cabinet Slot Dimensions and Riser Arrangements





⚠ NOTICE! ⚠

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

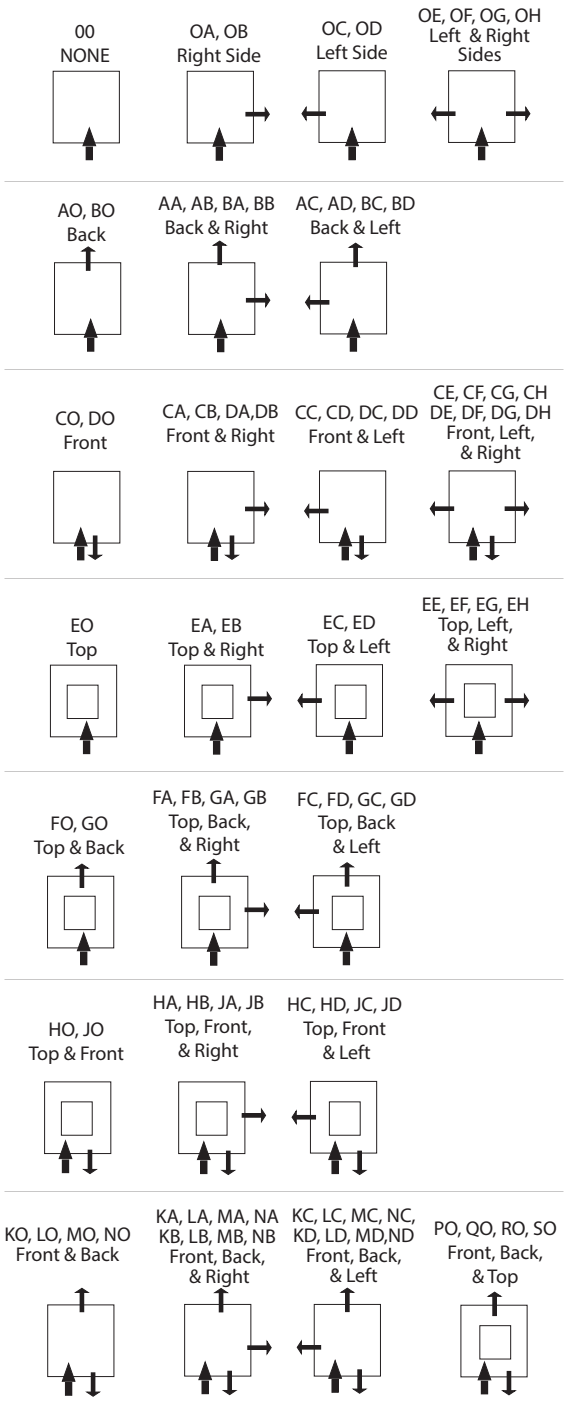
Notes:

1. Dimensions shown are in inches and either mm or cm unless noted otherwise.
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 all cabinet sizes.
6. Slots allow for riser stack expansion and contraction.
7. Supply and return riser stub outs are 39.75" (1100) from bottom of cabinet and is not centered vertically in slot. Drain Run-out is 3.12" (79) from bottom of cabinet.
8. From floor to floor on one riser stack you can only have; all same style, styles 2 and 5; or styles 3 and 4. For leader/follower units you can only have styles 3 or 4 adjacent to 2 or 5.
9. Secure riser stack to building structure.
10. Riser should not touch cabinet and shutoff should be inside cabinet.

Size	A	B	C	D	E	F	G
09-12	17.00 [432]	20.00 [508]	2.75 [70]	11.93 [303]	9.18 [233]	2.09 [53]	11.34 [288]
15-18	19.25 [489]	22.00 [559]	2.75 [70]	11.93 [303]	9.18 [233]	2.84 [72]	12.09 [307]
24-36	24.25 [616]	27.00 [686]	4.23 [108]	13.48 [342]	9.25 [235]	2.83 [72]	12.08 (307)

80” & 88” 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.
3. All sides and top have KO's.
4. 80" Cabinet cannot have front large discharge.

= RETURN AIR (AIR ENTERING CABINET)

= SUPPLY AIR (AIR LEAVING CABINET)

BACK/FRONT/TOP DISCHARGE OPTIONS – DIGIT 11

OPTION	DISCHARGE	UNIT SIZE 09-12 TOP	UNIT SIZE 15-18 TOP	UNIT SIZE 24-36 TOP	C-SERIES 80” TSM	C-SERIES 88” TSM
0	NONE	N/A			YES	YES
A	BACK SMALL					
B	BACK LARGE					
C	FRONT SMALL					
D	FRONT LARGE				NO	
E	TOP	12 x 12	14 x 14	16 x 16	YES	
F	BACK SMALL & TOP					
G	BACK LARGE & TOP					
H	FRONT SMALL & TOP					
J	FRONT LARGE & TOP				NO	
K	BACK SMALL & FRONT SMALL	N/A			YES	
L	BACK LARGE & FRONT LARGE				NO	
M	BACK SMALL & FRONT LARGE				NO	
N	BACK LARGE & FRONT SMALL				YES	
P	BACK SMALL & FRONT SMALL W/TOP	12 x 12	14 x 14	16 x 16	YES	
Q	BACK LARGE & FRONT LARGE W/TOP				NO	
R	BACK SMALL & FRONT LARGE W/TOP				NO	
S	BACK LARGE & FRONT SMALL W/TOP				YES	

SIDE DISCHARGE OPTIONS – DIGIT 12

OPTION	DISCHARGE
0	**NONE**
A	**RIGHT SMALL**
B	**RIGHT LARGE**
C	**LEFT SMALL**
D	**LEFT LARGE**
E	RIGHT SMALL & LEFT SMALL
F	RIGHT LARGE & LEFT LARGE
G	RIGHT SMALL & LEFT LARGE
H	RIGHT LARGE & LEFT SMALL

DISCHARGE K.O. BY UNIT SIZE 88”

T SIZE	Top	Back, Front & Side
09 thru 12	12” x 12”	12” x 6” & 12” x 12”
15 thru 18	14” x 14”	14” x 6” & 14” x 14”
24 thru 36	16” x 16”	16” x 8” & 16” x 16”

DISCHARGE K.O. BY UNIT SIZE 80”

UNIT SIZE	Top	Front	Back & Side
09 thru 12	12” x 12”	12” x 6”	12” x 6” & 12” x 12”
15 thru 18	14” x 14”	14” x 6”	14” x 6” & 14” x 12”
24 thru 36	16” x 16”	16” x 6”	16” x 6” & 16” x 12”

Supply Grille Installation

Supply Grille Installation - Cabinet opening should be sealed to wall. Use canvas-type flex collar or field supplied duct extension if needed.

Refer to Table 1 to make sure that the grille size is correct based on the type and size of the supply air grille.

- Install the grille into the cabinet discharge opening. Assure that the grille flange rests against the drywall covering the cabinet. Do not caulk.
- Secure the grille to the drywall with the screws provided.

Table 1: Supply Grille Sizes and Arrangements

Unit Size	Single Discharge	Double Discharge	Triple Discharge
TSM09	12” x 12” (305 x 305)	12” x 6” (305 x 152)	N/A
TSM12	12” x 12” (305 x 305)	12” x 6” (305 x 152)	N/A
TSM15	12” x 12” (305 x 305)	12” x 6” (305 x 152)	12” x 6” (305 x 152)
TSM18	N/A	12” x 12” (305 x 305)	12” x 6” (305 x 152)
TSM24	N/A	16” x 8” (406 x 203)	16” x 8” (406 x 203)
TSM30	N/A	16” x * (406 x –)	16” x 8” (406 x 203)
TSM36	N/A	16” x * (406 x –)	16” x * (406 x –)

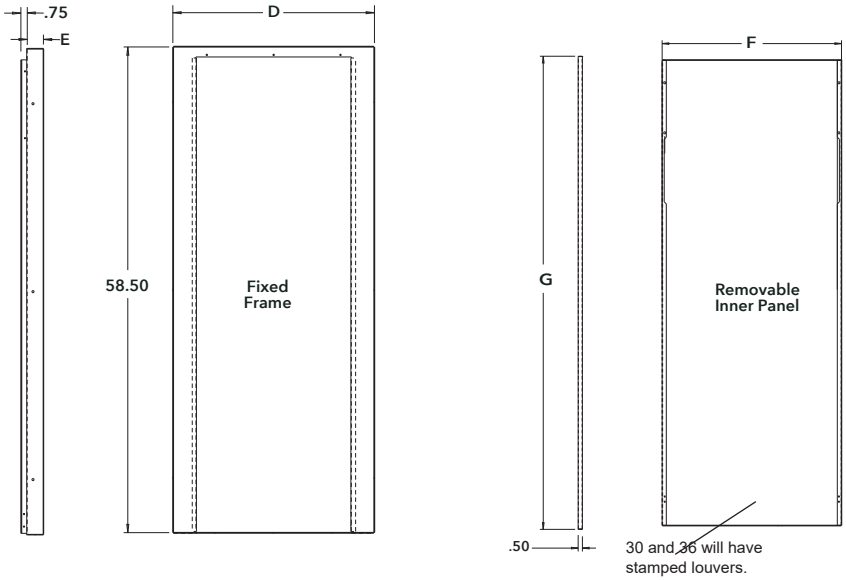
Note - If custom grille sizes are used, area should equal above.
* – 88” (2235) Cabinet = 16” (406); 80” (2032) Cabinet = 12” (305)

Typical Cabinet with "L" Panel Installation

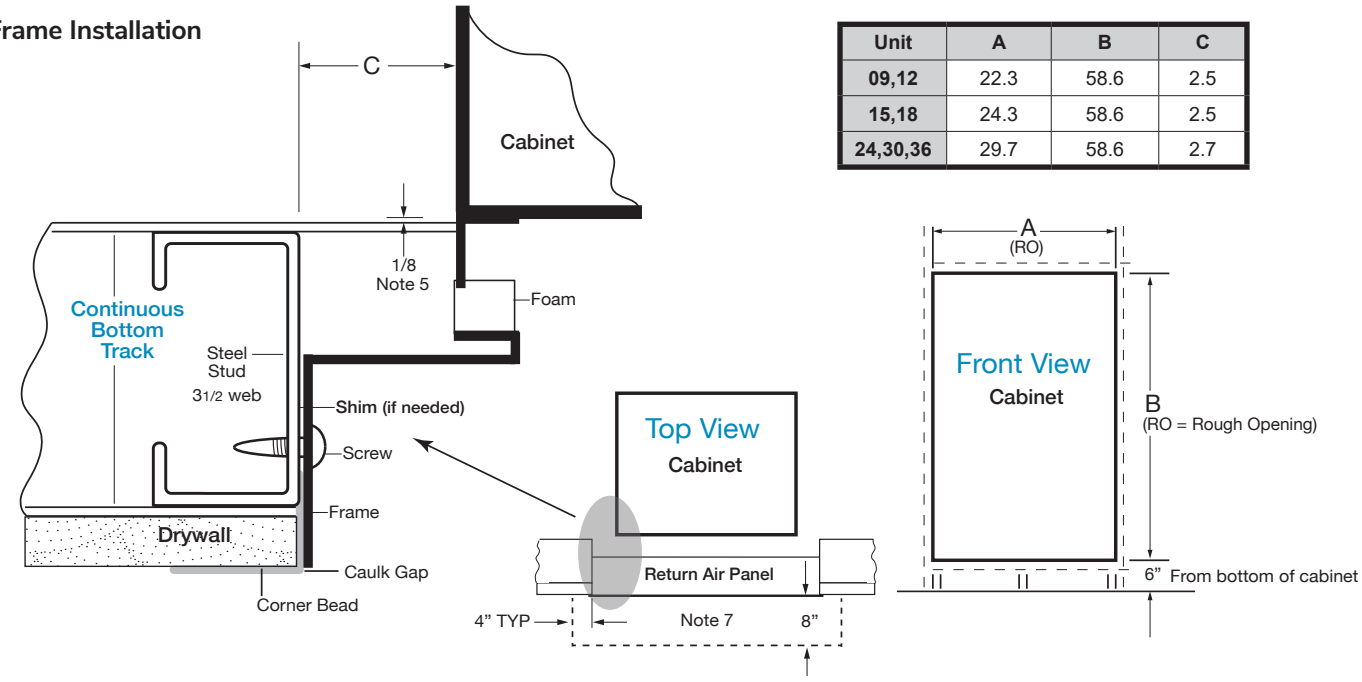
Unit	AVHRL Digit 6	D	E	F	G
09,12	1	22.1	2.0	19.5	55.8
15,18	2	24.1	2.0	21.5	55.8
24	3	29.6	2.0	26.5	55.9
30,36	4	29.6	2.0	26.5	55.9

⚠ NOTICE! ⚠

Frame is attached to studs. Panel is removable for chassis access.



Frame Installation

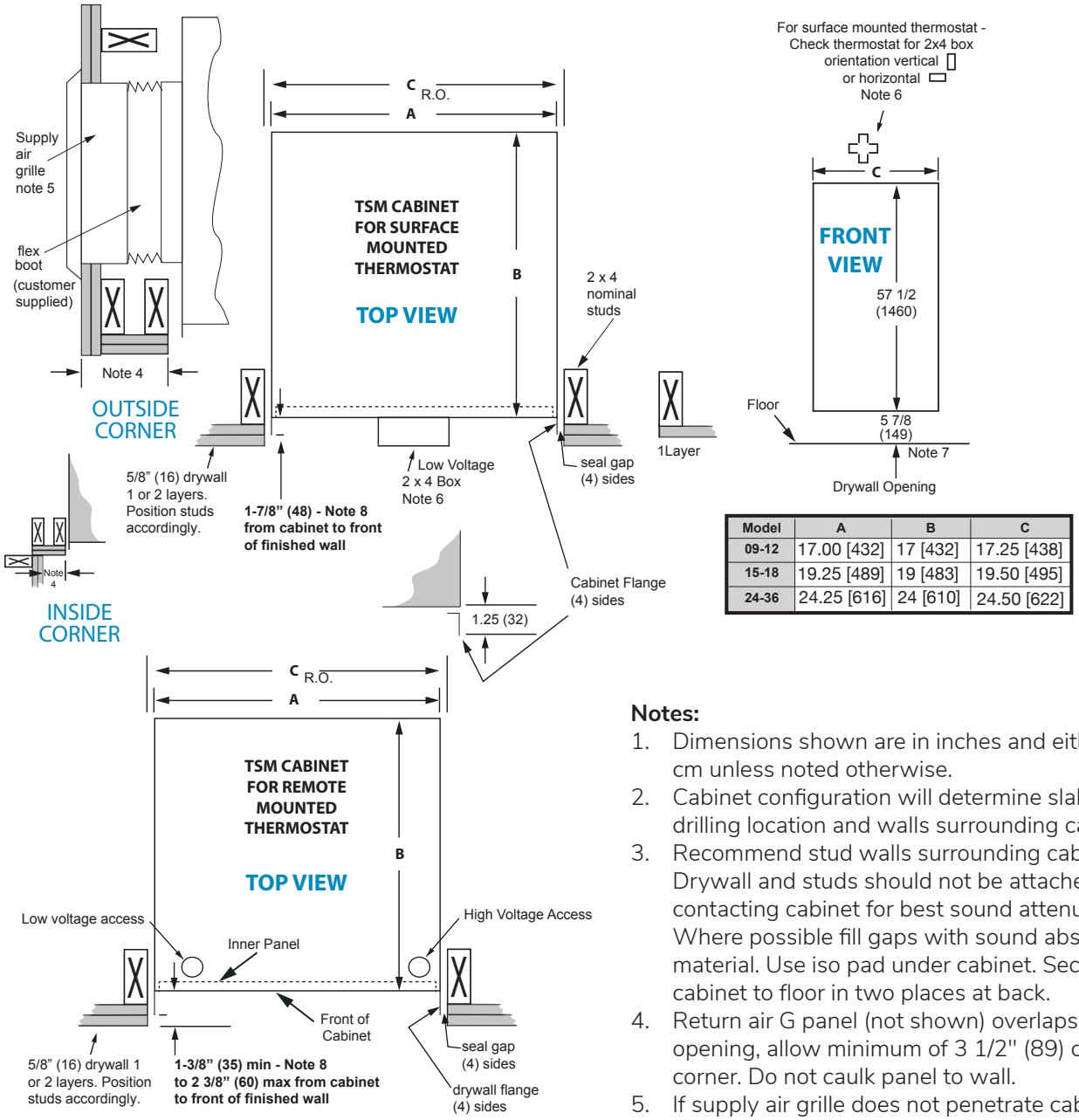


Unit	A	B	C
09,12	22.3	58.6	2.5
15,18	24.3	58.6	2.5
24,30,36	29.7	58.6	2.7

Notes:

1. Dimensions shown are in inches and either mm or cm unless noted otherwise.
2. Frame and panel painted Bright White or Polar Ice.
3. Panel is removable for filter replacement or chassis removal.
4. Frame ships with cabinet — must be installed while framing.
5. Set bottom track 1/8" in front of cabinet.
6. Drywall mud is added to the corner bead to produce a smooth finished surface.
7. Unobstructed area for required air flow.

Typical Cabinet with “G” Panel Installation



Model	A	B	C
09-12	17.00 [432]	17 [432]	17.25 [438]
15-18	19.25 [489]	19 [483]	19.50 [495]
24-36	24.25 [616]	24 [610]	24.50 [622]

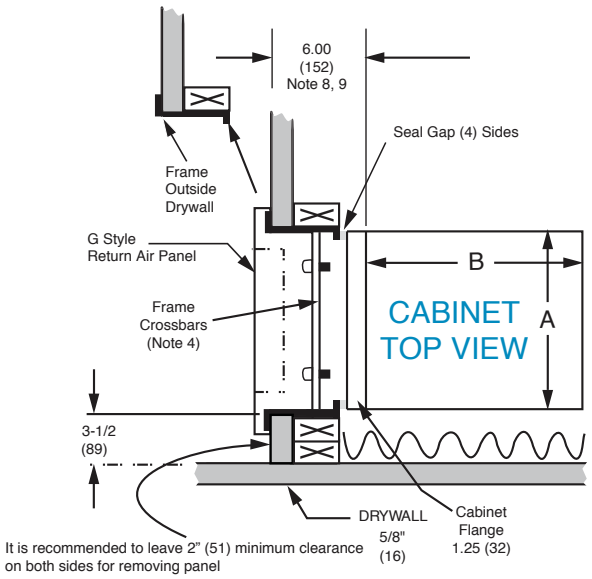
Notes:

1. Dimensions shown are in inches and either mm or cm unless noted otherwise.
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 G 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. Horizontal is standard.
7. If cabinet stand or ISO pad is used add to dimension.
8. For 2"(50) filter set cabinet 2"(50) minimum from front of drywall.

⚠ NOTICE! ⚠

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

Typical Cabinet with "G" Installation – Recessed



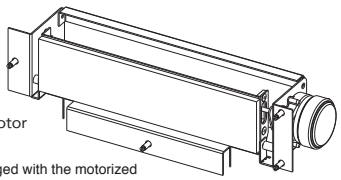
⚠ NOTICE! ⚠

Recessed cabinet requires a frame kit.

Outside air applications require a Motorized Damper or pre-treated air that is above 45ºF degrees (7ºC) and below 95F degrees dry bulb/75ºF degrees wet bulb.

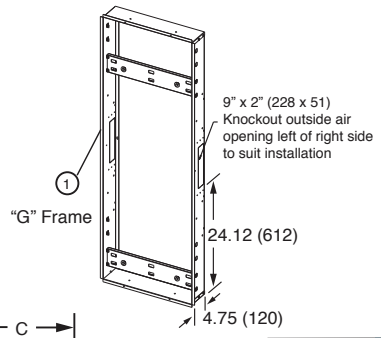
Attach the frame to the wall studs, not the cabinet. Use weather seal material between the frame and cabinet to avoid bypass air being pulled in from the wall cavity.

Do not distort frame. Shim the sides, if required.

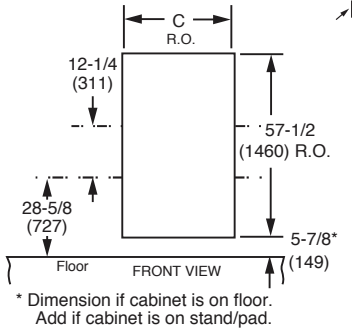


Optional Damper Motor

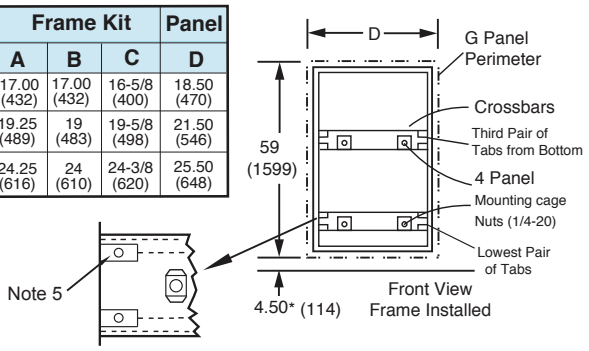
(Order seperately)
Refer to the IOM packaged with the motorized damper assembly for installation instructions and note 7 (below) for its usage.



Kit Part	Qty	Description
1	1	Frame
2	2	Cross Bar



Kit	Size	Frame Kit A	Frame Kit B	Frame Kit C	Panel D
48A0100N50	09-12	17.00 (432)	17.00 (432)	16-5/8 (400)	18.50 (470)
48A0100N51	15-18	19.25 (489)	19 (483)	19-5/8 (498)	21.50 (546)
48A0100N52	24-36	24.25 (616)	24 (610)	24-3/8 (620)	25.50 (648)

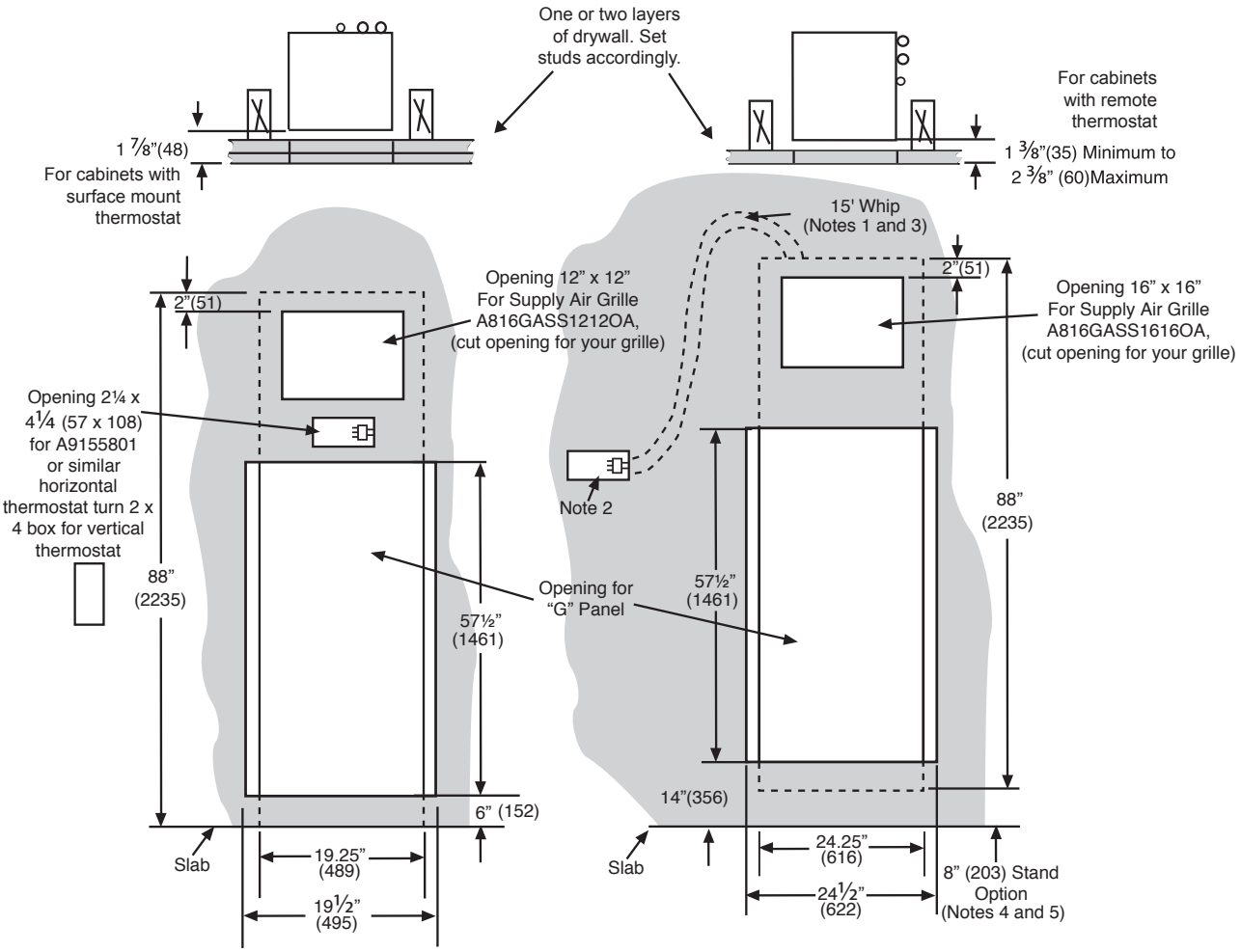


Notes:

1. The cabinet configuration will determine the slab core drilling location and the wall surrounding the cabinet.
2. Stud walls surrounding the cabinet are recommended. For better sound attenuation, the drywall studs should not be attached to or contacting the cabinet.
3. The "G" style return air panel overlaps its rough opening. Allow a minimum of 3.5" (89) of drywall to a corner. Do not caulk the return air panel to the wall.
4. The "G" panel attaches to the cross bars of the frame kit. The cabinet must be recessed behind the wall.
5. For air filter access, pivot the hinged inner panel and open the snapped filter access panel.
6. For chassis access,
   a. Remove the entire G-Panel
   b. Remove the (2x) cross bars of the frame kit
   c. Remove the cabinet's filter panel
   d. Slide out the chassis
7. When untreated outside air will be utilized, the 48A0100N04 motorized damper must be used. The mixed air temperature must be no lower than 45°F degrees (7°C), must be no higher than 95°F DB/75°F WB, and must not exceed 20% of the cabinets total CFM output.
8. For a 2" filter, set the cabinet 6.25" (158) from the front of the dry wall.
9. If the drywall flanges (Qty. 4) are removed, the cabinet can be set 1" (25) closer to the finished drywall.
10. All dimensions are inches (mm) with all nominal 2" x 4" studs being 1.5" (38) x 3.5" (89).

Drywall Openings

NOTICE - Drywall openings shown below are for specific cabinets as indicated. Cut openings for your cabinet, supply air grille, and thermostat.



Cabinet Figure 8

Drywall Openings for sizes 15-18 and G Panel on floor

Cabinet Figure 9

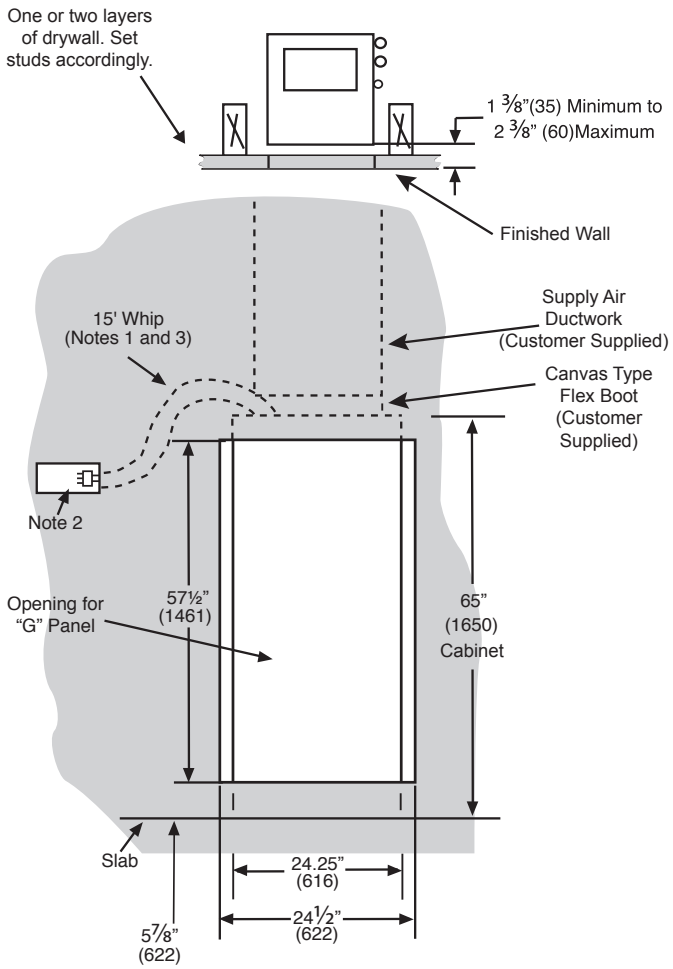
Drywall Openings for sizes 24-36 and G Panel With 8" Stand

Notes:

1. All factory-installed whips end with 9 pin molex connector.
2. Field-supplied 2x4 Box must be a type that the side can be removed so molex can be put inside. Position box horizontal or vertical for thermostat.
3. Optional 15, 25, or 35 foot whips (thermostat cable Class 2) available. Whips in BX armor available as special.
4. 1" to 13"(25 to 330) stands available, stands are bulk shipped and must be field installed.
5. When stands or ISO pads are used, make sure riser length and position is calculated correctly. 3" above and tailpiece always from bottom of cabinet. Stand or ISO pads raises everything up.
6. For 2" filter, set cabinet 2" (50) minimum from front of drywall.

Drywall Openings, Cont'd.

NOTICE - Drywall openings shown below are for specific cabinets as indicated. Cut openings for your cabinet, supply air grille, and thermostat.



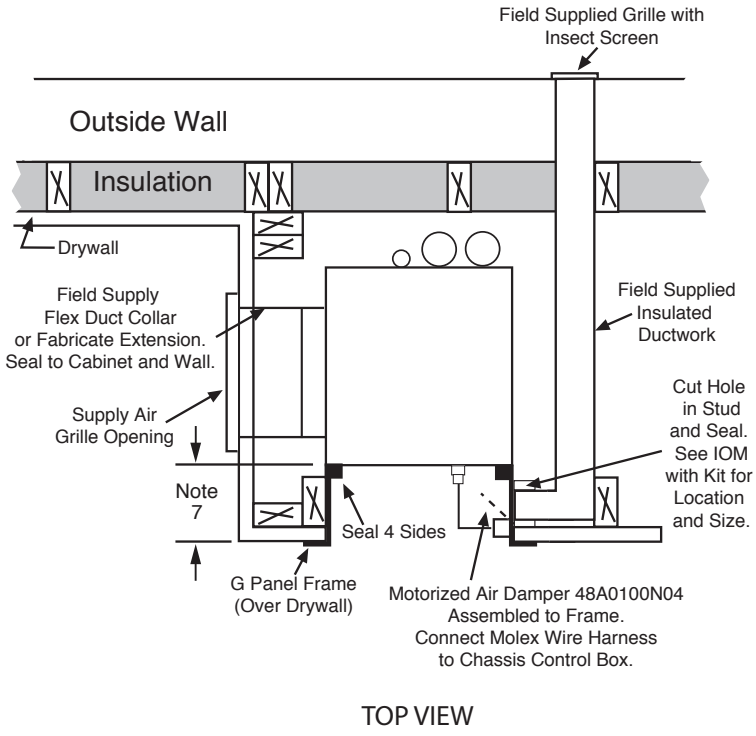
Cabinet
Figure 10

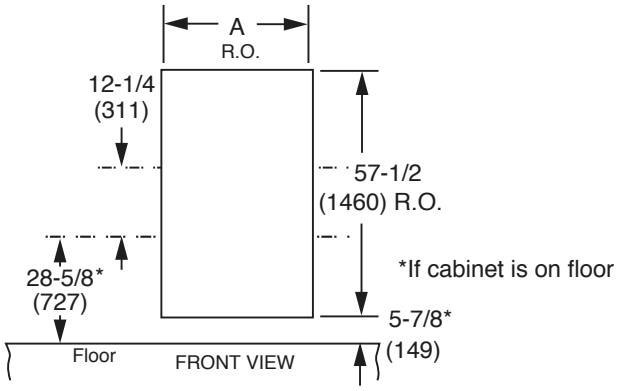
Drywall Openings for 65" Cabinets and G Return Air Panel

Notes:
1. Optional factory-installed whips (Model Digit 13) end with 9 pin molex connector.
2. Field-supplied 2x4 Box must be a type that the side can be removed so molex can be put inside. Position box horizontal or vertical for thermostat.
3. Optional 15, 25, or 35 foot whips (thermostat cable Class 2) available. Whips in BX armor available as special.
4. 1" to 12"(25 to 305) stands available, stands are bulk shipped and must be field installed.
5. When stands or ISO pads are used, make sure riser length and position is calculated correctly. 3" above and tailpiece always from bottom of cabinet. Stand or ISO pads raises everything up.
6. For 2" filter, set cabinet 2" (50) minimum from front of drywall.

Cabinet with “G” Panel Frame

Figure 11: Cabinet with “G” Panel Frame and Optional Outside Air Duct (Field Fabricated)





Models	Frame	A
For 09-12	48A0100N50	16 5/8 (400)
For 15-18	48A0100N51	19 5/8 (498)
For 24-36	48A0100N52	24 3/8 (620)

Notes:

1. All units with outside air option must use motorized air damper. Damper to be closed when unit not operating.
2. Duct can be on right or left side.
3. On all installations, mixed return air to unit must be 45°F (7°C) to 95°F (35°C), and not exceed 20% of total CFM.
4. On all installations, the ambient temperature behind interior wall must be above freezing.
5. Prevent condensate on all installations of risers and loop piping insulate if required.
6. Frame attaches to studs, do not distort shim if required.
7. Cabinets with 1” (25) filter rack remove 2 side cabinet flanges, set back 4.75” (121) minimum; 2” (50) filter rack set back 6.25” (159) minimum.
8. Seal 4 sides between frame and cabinet use foam, foil tape, caulk, or field fabricated sheet metal.

Water-Loop Heat Pump Applications

Commercial Water Loop Applications - Commercial systems typically include a number of units connected to a common piping system with a cooling tower and boiler. Any unit plumbing maintenance work can introduce air into the piping system; therefore air elimination equipment is a major portion of the mechanical room plumbing. In piping systems expected to utilize water temperatures below 50°F [10°C] or above 105°F [40.6°C], 1/2" (13mm) closed cell insulation is required on all piping surfaces to eliminate condensation (extended range units required). Metal to plastic threaded joints should never be used due to their tendency to leak over time.

Teflon tape thread sealant is recommended to minimize internal fouling of the heat exchanger. Do not over tighten connections and route piping so as not to interfere with service or maintenance access. Hose kits are available from ClimateMaster. The piping system should be flushed to remove dirt, piping chips, and other foreign material prior to operation (see "Piping System Cleaning and Flushing Procedures" in this manual). The flow rate is usually set between 2.25 and 3.5 gpm per ton [2.9 and 4.5 l/m per kW] of cooling capacity. ClimateMaster recommends 3 gpm per ton [3.9 l/m per kW] for most applications of water loop heat pumps.

Water loop heat pump (cooling tower/boiler) systems typically utilize a common loop, maintained between 60 and 90°F [16 - 32°C]. The use of a closed circuit evaporative cooling tower with a secondary heat exchanger between the tower and the water loop is recommended. If an open type cooling tower is used continuously, chemical treatment and filtering will be necessary. Water temperature may be viewed on the iGate communicating thermostat or service tool.

Water Quality Standards - Table 3 should be consulted for water quality requirements. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH <7.5 and the calcium hardness is less than 100 ppm, scaling potential is low. If this method yields numbers out of range of those listed, the Ryznar Stability and Langelier Saturation indecies should be calculated. Use the appropriate scaling surface temperature for the application, 150°F [66°C] for direct use (well water/open loop) and DHW (desuperheater); 90°F [32°F] for indirect use. A monitoring plan should be implemented in these probable scaling situations. Other water quality issues such as iron fouling, corrosion prevention and erosion and clogging should be referenced in Table 3.

Ground-Loop Heat Pump Applications

⚠ CAUTION! ⚠

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

⚠ CAUTION! ⚠

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

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

Piping Installation - All earth loop piping materials should be limited to polyethylene fusion only for in-ground sections of the loop. Galvanized or steel fittings should not be used at any time due to their tendency to corrode. All plastic to metal threaded fittings should be avoided due to their potential to leak in earth coupled applications. A flanged fitting should be substituted. P/T plugs should be used so that flow can be measured using the pressure drop of the unit heat exchanger. Units equipped with any of the two vFlow configurations have built in Schrader ports. Water temperature may be viewed on the iGate communicating thermostat or service tool.

Earth loop temperatures can range between 25 and 110°F [-4 to 43°C]. Flow rates between 2.25 and 3 gpm per ton [2.41 to 3.23 l/m per kW] of cooling capacity is recommended in these applications.

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

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

Water Quality Standards - Table 3 should be consulted for water quality requirements. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH <7.5 and the calcium hardness is less than 100 ppm, scaling potential is low. If this method yields numbers out of range of those listed, the Ryznar Stability and Langelier Saturation indecies should be calculated. Use the appropriate scaling surface temperature for the application, 150°F [66°C] for direct use (well water/open loop) and DHW (desuperheater); 90°F [32°F] for indirect use. A monitoring plan should be implemented in these probable scaling situations. Other water quality issues such as iron fouling, corrosion prevention and erosion and clogging should be referenced in Table 3.

Antifreeze - If any liquid fluid or piping is exposed to unconditioned ambient below 42°F (5.5 C), antifreeze must be added. If the liquid fluid entering the heat pump is 50°F (10°C) or below, calculate the leaving heat pump temperature (shown in submittal on performance data selection notes section). Using the lowest temperature leaving the heat pump, must protect system 15°F (8°C) lower. IE: if temperature leaving the heat pump is 35°F subtract 15°F = 20°F protection required, if Methanol is used the system would require 16% mix by volume. Antifreeze is available in alcohol and glycols, contact local sales office for the best type for your system and area. Following must be considered safety, thermal performance, corrosiveness, local codes, stability, convenience, and cost.

All alcohols should be premixed and pumped from a reservoir outside of the building when possible or introduced under the water level to prevent fumes. Calculate the total volume of fluid in the piping system. Then use the percentage by volume shown in table 2 for the amount of antifreeze needed. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

Low Water Temperature Cutout Setting - CXM Control
When antifreeze is selected, the LT1 jumper (JW3) should be clipped to select the low temperature (antifreeze 10.0°F [-12.2°C]) setpoint and avoid nuisance faults (see "Low Water Temperature Cutout Selection" in this manual).
Note: Low water temperature operation requires extended range equipment.

Table 2: Antifreeze Percentages by Volume

	Minimum temperature leaving the unit F (C)			
	25 (-4)	30 (-1)	35 (1.5)	42 (5.5)
	Protect liquid fluid to			
Type	10 (-12)	15 (-9)	20 (-6.5)	25 (-2.5)
Methanol	25%	21%	16%	10%
100% Food Grade PG	38%	25%	22%	15%
Ethanol*	29%	25%	20%	14%

*Ethanol must not be denatured with any petroleum based product
CXM/DXM2 - must clip LT1 jumper if antifreeze is used. DO NOT clip without antifreeze. Check with hydrometer after pump has mixed fluid well, now and at beginning of each heating season.

Ground-Water Heat Pump Applications

Open Loop - Ground Water Systems - Shut off valves should be included for ease of servicing. Boiler drains or other valves should be "tee'd" into the lines to allow acid flushing of the heat exchanger. Shut off valves should be positioned to allow flow through the coax via the boiler drains without allowing flow into the piping system. P/T plugs should be used so that pressure drop and temperature can be measured. Supply and return water piping should be limited to copper, HPDE, or other acceptable high temperature material.Note that PVC or CPVC material is not recommended as they are not compatible with the polyolester oil used in HFC-410A products.

Water quantity should be plentiful and of good quality. Consult Table 3 for water quality guidelines. The unit can be ordered with either a copper or cupro-nickel water heat exchanger. Consult Table 3 for recommendations. Copper is recommended for closed loop systems and open loop ground water systems that are not high in mineral content or corrosiveness. In conditions anticipating heavy scale formation or in brackish water, a cupro-nickel heat exchanger is recommended. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, an open loop system is not recommended. Heat exchanger coils may over time lose heat exchange capabilities due to build up of mineral deposits. Heat exchangers must only be serviced by a qualified technician, as acid and special pumping equipment is required. Desuperheater coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional acid flushing. In some cases, the desuperheater option should not be recommended due to hard water conditions and additional maintenance required.

Water Quality Standards - Table 3 should be consulted for water quality requirements. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH <7.5 and the calcium hardness is less than 100 ppm, scaling potential is low. If this method yields numbers out of range of those listed, the Ryznar Stability and Langelier Saturation indecies should be calculated. Use the appropriate scaling surface temperature for the application, 150°F [66°C] for direct use (well water/open loop) and DHW (desuperheater); 90°F [32°F] for indirect use. A monitoring plan should be implemented in these probable scaling situations. Other water quality issues such as iron fouling, corrosion prevention and erosion and clogging should be referenced in Table 3.

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

Water Control Valve - Always maintain water pressure in the heat exchanger by placing the water control valve(s) on the return line to prevent mineral precipitation during the off-cycle. Pilot operated slow closing valves are recommended to reduce water hammer. If water hammer persists, a mini-expansion tank can be mounted on the piping to help absorb the excess hammer shock. Ensure that the total 'VA' draw of the valve can be supplied by the unit transformer. For instance, a slow closing valve can draw up to 35VA. This can overload smaller 40 or 50 VA transformers depending on the other controls in the circuit. A typical pilot operated solenoid valve draws approximately 15VA.

Flow Regulation - Flow regulation can be accomplished by two methods. One method of flow regulation involves simply adjusting the ball valve or water control valve on the return line. Measure the pressure drop through the unit heat exchanger, and determine flow rate from. Since the pressure is constantly varying, two pressure gauges may be needed. Adjust the valve until the desired flow of 1.5 to 2 gpm per ton [2.0 to 2.6 l/m per kW] is achieved. A second method of flow control requires a flow control device mounted on the outlet of the water control valve. The device is typically a brass fitting with an orifice of rubber or plastic material that is designed to allow a specified flow rate. On occasion, flow control devices may produce velocity noise that can be reduced by applying some back pressure from the ball valve located on the discharge line. Slightly closing the valve will spread the pressure drop over both devices, lessening the velocity noise. **Note: When EWT is below 50°F [10°C], 2 gpm per ton (2.6 l/m per kW) is required.**

Ground-Water Heat Pump Applications, Cont'd.

Water Coil Low Temperature Limit Setting - For all open loop systems, CXM/DXM2 JW3 Jumper (LT1) should **never** be clipped to avoid freeze damage to the unit, and voiding your warranty. See "Low Water Temperature Cutout Selection" in this manual for details on the low limit setting.

NOTICE! Ground-water applications for commercial buildings with more than 2-3 units should include a plate frame heat-exchanger to isolate the heat pumps from the ground-water and confine heat exchanger cleanings to one location and lessen maintenance. Direct use of ground-water may increase the frequency of heat pump maintenance and may shorten life expectancy.

Water Quality Standards

Water Quality Standards

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

CLIMATEMASTER WATER QUALITY STANDARDS

For Closed-Loop and Open-Loop Systems

				Heat Exchanger Type			
				Closed Loop Recirculating	Open Loop, Tower, Ground Source Well		
	Description	Symbol	Units	All Heat Exchanger Types	COAXIAL HX Copper Tube in Tube	COAXIAL HX Cupronickel	Brazed Plate HX 316 SS
Scaling Potential	pH - Chilled Water <85°F			7.0 to 9.0	7.0 to 9.0	7.0 to 9.0	7.0 to 9.0
	pH - Heated Water >85°F			8.0 to 10.0	8.0 to 10.0	8.0 to 10.0	8.0 to 10.0
	Alkalinity	($HCO3^-$)	ppm - $CaCO_3$ equiv.	50 to 500	50 to 500	50 to 500	50 to 500
	Calcium	(Ca)	ppm	<100	<100	<100	<100
	Magnesium	(Mg)	ppm	<100	<100	<100	<100
	Total Hardness	(CaCO3)	ppm - CaCO3 equiv.	30 to 150	150 to 450	150 to 450	150 to 450
	Langelier Saturation Index	LSI		-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5	-0.5 to +0.5
	Ryznar Stability Index	RSI		6.5 to 8.0	6.5 to 8.0	6.5 to 8.0	6.5 to 8.0
Corrosion Prevention	Total Dissolved Solids	(TDS)	ppm - $CaCO_3$ equiv.	<1000	<1000	<1000	<1500
	Sulfate	(SO_4^{2-})	ppm	<200	<200	<200	<200
	Nitrate	(NO_3^-)	ppm	<100	<100	<100	<100
	Chlorine (free)	(Cl)	ppm	<0.5	<0.5	<0.5	<0.5
	Chloride (water < 80°F)	(Cl^-)	ppm	<20	<20	<150	<150
	Chloride (water > 120°F)		ppm	<20	<20	<125	<125
	Hydrogen Sulfide[α]	(H_2S)	ppb	<0.5	<0.5	<0.5	<0.5
	Carbon Dioxide	(CO_2)	ppm	0	<50	10 to 50	10 to 50
	Iron Oxide	(Fe)	ppm	<1.0	<1.0	<1.0	<0.2
	Manganese	(Mn)	ppm	< 0.4	<0.4	<0.4	<0.4
	Ammonia	(NH_3)	ppm	<0.05	<0.1	<0.1	<0.1
	Chloramine	(NH_2CL)	ppm	0	0	0	0
Fouling & Biological	Iron Bacteria		cells/mL	0	0	0	0
	Slime Forming Bacteria		cells/mL	0	0	0	0
	Sulfate reducing bacteria		cells/mL	0	0	0	0
	Suspended Solids[β]	(TSS)	ppm	<10	<10	<10	<10
Electrolysis All HX types	Earth Ground Resistance[χ]		Ohms	0	Consult NEC & local electrical codes for grounding requirements		
	Electrolysis Voltage[δ]		mV	<300	Measure voltage internal water loop to HP ground		
	Leakage Current[δ]		mA	<15	Measure current in water loop pipe		

Building Primary Electrical Ground to unit, must meet local diameter and penetration length requirements

Do not connect heat pump to steel pipe unless dissimilar materials are separated by using Di-electric unions. Galvanic corrosion of heat pump water pipe will occur.

Water Quality Standards, Cont'd.

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

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

ppm = parts per million
ppb = parts per billion

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

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

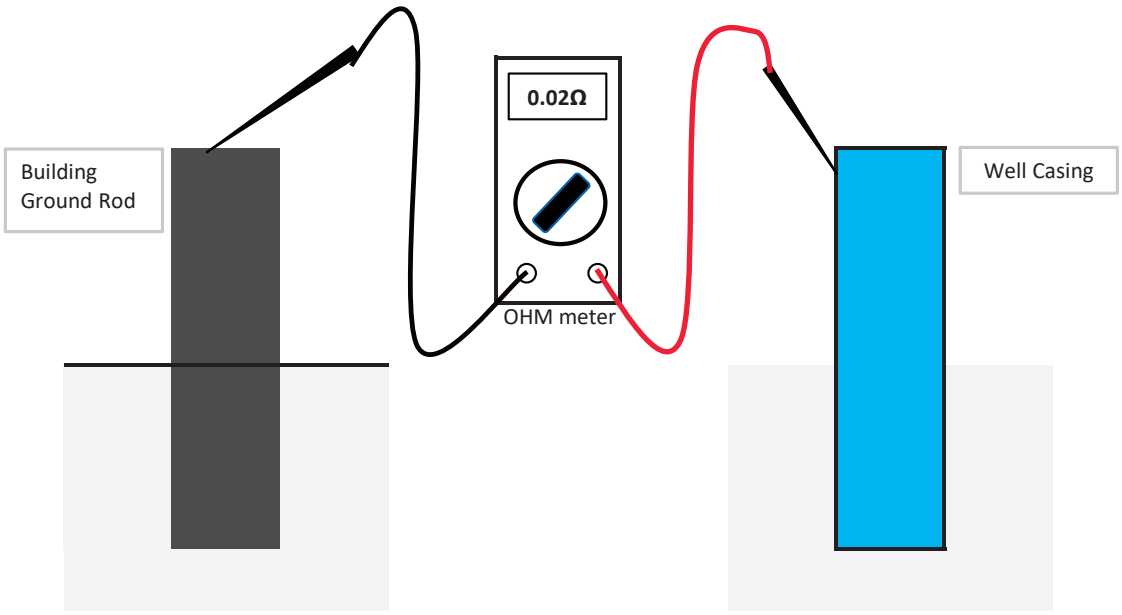
χ An electrical grounding system using a dedicated ground rod meeting NEC and Local Electrical codes must be installed. Building Ground must not be connected the WSHP piping system or other plumbing pipes.

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

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

Water Quality Standards, Cont'd.

Measuring Earth Ground Resistance



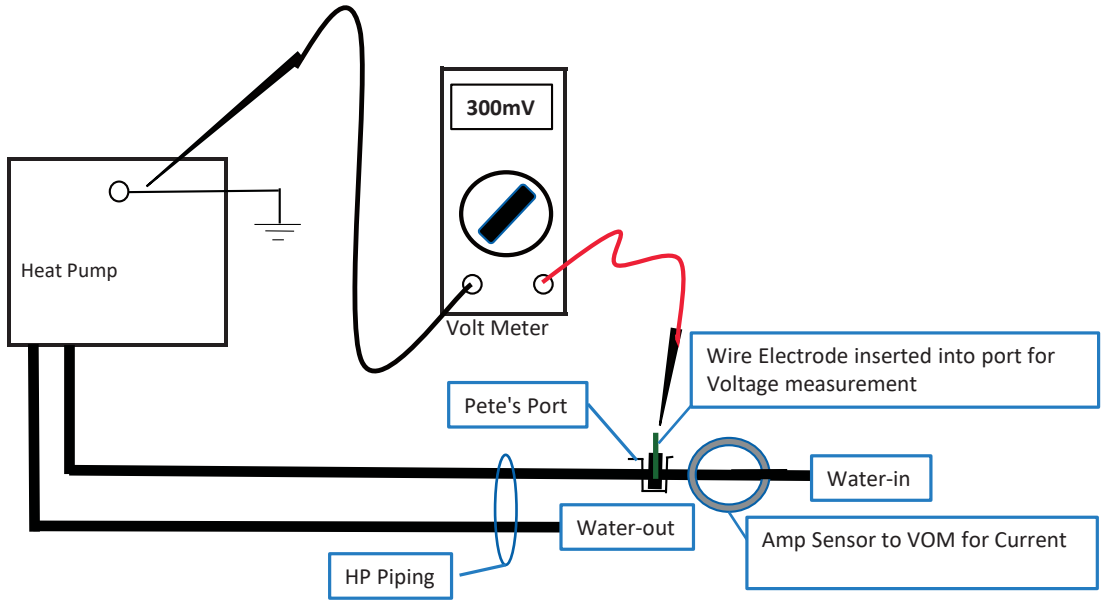
Measure the earth ground bond using an Ohm meter between the building's ground rod and the steel well casing.

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

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

Water Quality Standards, Cont'd.

Measuring Electrolysis Voltage and Current



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

The HP must be operating and the water stream flowing.

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

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

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

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

Electrical Wiring – Line Voltage

⚠ WARNING! ⚠

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

⚠ CAUTION! ⚠

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

Electrical - Line Voltage
All field installed wiring, including electrical ground, must comply with the National Electrical Code as well as all applicable local codes. Refer to the unit electrical data for fuse sizes. Consult wiring diagram for field connections that must be made by the installing (or electrical) contactor. All final electrical connections must be made with a length of flexible conduit to minimize vibration and sound transmission to the building.

⚠ WARNING! ⚠

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

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

Power Connection - Line voltage connection is made by connecting the incoming line voltage wires to the "L" side of the contactor.

208 Volt Operation - All commercial 208/230 Volt units are factory wired for 208 Volt operation. If supply voltage is 230V, then the transformer must be rewired to the 230V tap as illustrated on the wiring diagram by switching the red (208V) and the orange (230V) wires at the contactor terminal.

Unit wiring diagrams available at www.climatemaster.com. Select 'Commercial Professional', 'Literature', 'Wiring Diagrams'

Blower Speed Selection – Units with PSC or ECM-CT Motor
PSC (Permanent Split Capacitor) blower fan speed can be changed by moving the speed tap wires on the fan motor terminal block. See Figure 12.
Note: Check blower table 5a-5n, must maintain minimum CFM for your external static.

Blower Speed Selection – Units with ECM-CV Motor
CFM can be changed from default settings by using a communicating thermostat or service tool with a vertical stack service harness. Use information in Table 5 to set CFM for your static.

Special Note for AHRI Testing: To achieve rated airflow for AHRI testing purposes on all PSC products TSM09 and 12 use high speed tap for heating and medium tap for cooling, all other models use high speed tap for both. When the heat pump has experienced less than 100 operational hours and the coil has not had sufficient time to be "seasoned", it is necessary to clean the coil with a mild surfactant such as Calgon to remove the oils left by manufacturing processes and enable the condensate to properly "sheet" off of the coil.

Figure 12: PSC Motor Speed Tap Selection

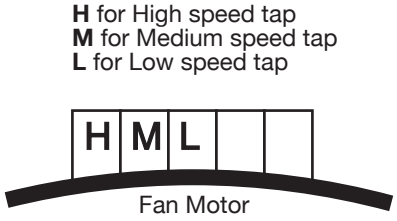


Table 4

Thermostat		Unit		
Type	**Terminal**	**Factory Motor Connection**	**Board Connection**	
1 Stage	G	Med TAP	G	DXM2/ CXM
2 Stage Auto Speed Change	G Y2	Med TAP High TAP	G Y2	DXM2
			G BR2	CXM Relay
2 Speed Manual Change	G G2	Med TAP High TAP	G H	DXM2
			G BR2	CXM Relay

ECM-CV Blower Performance Data

Table 5: TSM/TSL with ECM-CV Motor

Airflow in CFM with wet coil and clean 1" fiberglass air filter.

Tranquility Model	Setting	Cooling Mode		Heating Mode		Dehumid Mode		Continuous Fan Only Mode
		Fan Motor Stage 1	Fan Motor Stage 2*	Fan Motor Stage 1	Fan Motor Stage 2*	Fan Motor Stage 1	Fan Motor Stage 2*	
TSM/L09	Default	250	350	250	350	250	300	250
	Min	250	250	250	250	250	250	250
	Max	400	400	400	400	400	400	400
TSM/L12	Default	300	400	300	400	300	350	300
	Min	300	300	300	300	300	300	300
	Max	500	500	500	500	500	500	500
TSM/L15	Default	500	600	500	600	500	500	500
	Min	500	500	500	500	500	500	500
	Max	700	700	700	700	700	700	700
TSM/L18	Default	600	700	600	700	600	600	500
	Min	600	600	600	600	500	500	500
	Max	800	800	800	800	800	800	800
TSM/L24	Default	650	850	650	850	650	650	600
	Min	650	650	650	650	600	600	600
	Max	950	950	950	950	950	950	950
TSM/L30	Default	850	1000	900	1000	850	850	700
	Min	850	850	900	900	800	800	700
	Max	1100	1100	1100	1100	900	1100	1100
TSM/L36	Default	900	1200	900	1250	900	900	900
	Min	900	900	900	900	900	900	900
	Max	1250	1250	1350	1350	1250	1250	1250

All units AHRI/ISO/ASHRAE 13256-1 rated on CFM shown on performance data page.
If unit is dual voltage rated, then the airflow is rated at the lowest voltage, i.e. 208V for 208-230V units.
Shipped on default settings. C=Cooling; H=Heating; D=Dehumidification
Change from default setting with Service tool (ACDU03C) or Communicating thermostat (ATC32U03C).
Airflow is controlled within 7%, up to the max ESP.
TSL15-36 ramp default is 30 sec.
* - Stage 2 ECM CV motor speed is engaged with a thermostat Y2 call. TSM Series is only available with single-stage compressors.

Blower Performance Data – TSM09

Table 5a

External Static Pressure (in. wg)						
PSC - Low Static	Speed Tap		0.0	0.1	0.2	0.3
	Low	RPM	760	870		
		Power (W)	59	54		
		CFM	290	270		
	Medium	RPM	890	940	1000	
		Power (W)	71	66	61	
		CFM	350	310	270	
	High	RPM	990	1060	1080	1100
		Power (W)	85	80	75	69
		CFM	400	370	310	240
ECM - Constant Torque	Speed Tap		0.0	0.1	0.2	0.3
	1	RPM	680			
		Power (W)	20			
		CFM	250			
	2	RPM	760	870		
		Power (W)	27	30		
		CFM	290	270		
	3	RPM	930	1000	1100	1180
		Power (W)	43	47	51	54
		CFM	370	340	320	290
	4	RPM	1010	1070	1160	1240
		Power (W)	54	58	62	66
		CFM	410	380	360	330
ECM - Constant Volume	CFM		0.0	0.1	0.2	0.3
	250	RPM	680	830	960	1120
		Power (W)	22	30	38	47
	300	RPM	780	920	1060	1200
		Power (W)	29	38	48	58
	350	RPM	890	1020	1160	1280
		Power (W)	40	50	62	73
	400	RPM	990	1110	1240	1340
		Power (W)	52	65	79	92

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%.
RPM/Watt Tolerance 10%.
Denotes Operation not recommended.

Blower Performance Data – TSM12

Table 5b

External Static Pressure (in. wg)						
PSC - Low Static	Speed Tap		0.0	0.1	0.2	0.3
	Low	RPM	760			
		Power (W)	61			
		CFM	300			
	Medium	RPM	830	930		
		Power (W)	74	69		
		CFM	340	320		
	High	RPM	1030	1090	1120	
		Power (W)	90	85	79	
		CFM	450	420	360	
ECM - Constant Torque	Speed Tap		0.0	0.1	0.2	0.3
	1	RPM	800			
		Power (W)	29			
		CFM	320			
	2	RPM	870	960	1050	
		Power (W)	40	44	48	
		CFM	360	340	310	
	3	RPM	960	1040	1130	1220
		Power (W)	59	63	67	71
		CFM	410	390	370	350
	4	RPM	1030	1110	1190	1280
		Power (W)	78	82	87	91
		CFM	450	430	420	400
ECM - Constant Volume	CFM		0.0	0.1	0.2	0.3
	300	RPM	760	890	1040	1170
		Power (W)	29	38	48	58
	350	RPM	850	980	1100	1220
		Power (W)	40	50	62	73
	400	RPM	940	1060	1170	1280
		Power (W)	52	65	79	92
	450	RPM	1030	1140	1230	1330
		Power (W)	73	87	101	115
	500	RPM	1120	1220		
		Power (W)	97	111		

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%.
RPM/Watt Tolerance 10%.
■ Denotes Operation not recommended.

Blower Performance Data – TSM15

Table 5c

External Static Pressure (in. wg)						
PSC - Low Static	Speed Tap		0.0	0.1	0.2	0.3
	Low	RPM	600			
		Power (W)	153			
		CFM	440			
	Medium	RPM	680	740	810	870
		Power (W)	183	177	172	166
		CFM	520	500	480	450
	High	RPM	810	860	900	950
		Power (W)	224	215	205	196
		CFM	650	640	610	570
ECM - Constant Torque	Speed Tap		0.0	0.1	0.2	0.3
	1	RPM	590			
		Power (W)	41			
		CFM	430			
	2	RPM	660	710	760	810
		Power (W)	49	59	59	59
		CFM	500	460	410	370
	3	RPM	760	800	840	890
		Power (W)	77	77	77	86
		CFM	600	570	520	480
	4	RPM	780	830	870	910
		Power (W)	92	92	103	103
		CFM	620	600	560	520
	5	RPM	870	900	940	990
		Power (W)	120	120	130	130
		CFM	710	690	660	630
ECM - Constant Volume	CFM		0.0	0.1	0.2	0.3
	450	RPM	610	700	790	870
		Power (W)	39	53	67	82
	500	RPM	660	740	820	900
		Power (W)	50	64	78	93
	600	RPM	760	830	890	970
		Power (W)	83	97	111	125
	650	RPM	810	870	930	1000
		Power (W)	104	118	133	147
	700	RPM	860	910	960	1030
		Power (W)	125	140	155	170

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%.
RPM/Watt Tolerance 10%.
■ Denotes Operation not recommended.

Blower Performance Data – TSM18

Table 5d

External Static Pressure (in. wg)						
PSC - Low Static	Speed Tap		0.0	0.1	0.2	0.3
	Low	RPM				
		Power (W)				
		CFM				
	Medium	RPM	600	660	730	810
		Power (W)	182	176	170	165
		CFM	520	500	470	440
	High	RPM	750	790	840	900
		Power (W)	221	212	203	194
		CFM	660	630	600	570
ECM - Constant Torque	Speed Tap		0.0	0.1	0.2	0.3
	1	RPM	650			
		Power (W)	57			
		CFM	460			
	2	RPM	730	760	810	
		Power (W)	70	80	80	
		CFM	530	500	470	
	3	RPM	790	820	870	920
		Power (W)	97	97	107	107
		CFM	580	550	520	490
	4	RPM	880	920	950	1000
		Power (W)	137	137	147	147
		CFM	650	630	600	580
	5	RPM	950	990	1030	1070
		Power (W)	177	177	187	187
		CFM	710	690	670	650
ECM - Constant Volume	CFM		0.0	0.1	0.2	0.3
	450	RPM	530	640	740	820
		Power (W)	29	43	56	69
	500	RPM	600	690	780	860
		Power (W)	39	52	65	78
	600	RPM	660	740	820	900
		Power (W)	51	65	79	93
	700	RPM	720	800	870	940
		Power (W)	67	81	95	109
	800	RPM	790	850		
		Power (W)	86	100		

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%.
RPM/Watt Tolerance 10%.
■ Denotes Operation not recommended.

Blower Performance Data – TSM24

Table 5e

External Static Pressure (in. wg)						
PSC - Low Static	Speed Tap		0.0	0.1	0.2	0.3
	Low	RPM				
		Power (W)				
		CFM				
	Medium	RPM	640	690	750	820
		Power (W)	236	227	217	208
		CFM	690	670	640	590
	High	RPM	710	760	820	880
		Power (W)	297	285	272	260
		CFM	860	840	810	770
ECM - Constant Torque	Speed Tap		0.0	0.1	0.2	0.3
	1	RPM	640	690	730	
		Power (W)	62	68	76	
		CFM	710	660	600	
	2	RPM	690	730	780	850
		Power (W)	89	97	102	109
		CFM	820	770	720	670
	3	RPM	740	780	830	890
		Power (W)	120	129	134	143
		CFM	930	880	830	790
	4	RPM		830	880	920
		Power (W)		169	173	185
		CFM		990	950	910
	5	RPM				
		Power (W)				
		CFM				
ECM - Constant Volume	CFM		0.0	0.1	0.2	0.3
	600	RPM	600	660	730	830
		Power (W)	70	87	104	122
	700	RPM	640	700	770	860
		Power (W)	96	115	134	153
	800	RPM	680	750	820	890
		Power (W)	122	143	164	184
	900	RPM	720	790	860	920
		Power (W)	155	176	197	218
	950	RPM	740	810	880	930
		Power (W)	193	214	234	255

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%.
RPM/Watt Tolerance 10%.
Denotes Operation not recommended.

Blower Performance Data – TSM30

Table 5f

External Static Pressure (in. wg)						
PSC - Low Static	Speed Tap		0.0	0.1	0.2	0.3
	Low	RPM	860	850	890	930
		Power (W)	344	328	311	295
		CFM	1010	980	940	880
	Medium	RPM	920	910	940	970
		Power (W)	385	365	345	325
		CFM	1100	1070	1020	960
	High	RPM				1090
		Power (W)				422
		CFM				1240
ECM - Constant Torque	Speed Tap		0.0	0.1	0.2	0.3
	1	RPM	770	770	800	
		Power (W)	105	113	118	
		CFM	880	830	780	
	2	RPM	860	840	880	940
		Power (W)	151	158	165	170
		CFM	1000	960	920	900
	3	RPM	950	920	960	1000
		Power (W)	210	217	225	229
		CFM	1140	1100	1070	1030
	4	RPM		1000	1040	1060
		Power (W)		285	295	299
		CFM		1230	1200	1160
	5	RPM				
		Power (W)				
		CFM				
ECM - Constant Volume	CFM		0.0	0.1	0.2	0.3
	750	RPM	690	720	790	880
		Power (W)	109	133	157	182
	875	RPM	770	790	860	930
		Power (W)	157	183	209	235
	1000	RPM	860	870	930	990
		Power (W)	219	247	275	303
	1100	RPM	920	920	980	1030
		Power (W)	310	336	361	387

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%.
RPM/Watt Tolerance 10%.
■ Denotes Operation not recommended.

Blower Performance Data – TSM36

Table 5g

External Static Pressure (in. wg)						
PSC - Low Static	Speed Tap		0.0	0.1	0.2	0.3
	Low	RPM	870	900		
		Power (W)	328	311		
		CFM	970	930		
	Medium	RPM	940	970	990	1020
		Power (W)	363	344	324	305
		CFM	1080	1040	980	910
	High	RPM	1050	1090	1120	1150
		Power (W)	468	441	415	389
		CFM	1340	1280	1190	1090
ECM - Constant Torque	Speed Tap		0.0	0.1	0.2	0.3
	1	RPM	880	910	950	
		Power (W)	131	132	141	
		CFM	990	950	910	
	2	RPM	970	1010	1050	1090
		Power (W)	191	193	199	209
		CFM	1130	1100	1080	1040
	3	RPM	1070	1110	1150	1170
		Power (W)	267	269	276	288
		CFM	1280	1260	1240	1190
	4	RPM	1190	1210	1250	1270
		Power (W)	373	376	387	398
		CFM	1450	1420	1410	1370
	5	RPM				
		Power (W)				
		CFM				
ECM - Constant Volume	CFM		0.0	0.1	0.2	0.3
	900	RPM	684	769	842	911
		Power (W)	110	140	170	190
	1050	RPM	792	865	922	985
		Power (W)	180	210	230	260
	1200	RPM	899	948	1014	1076
		Power (W)	260	290	330	370
	1350	RPM	985	1071	1100	1152
		Power (W)	350	420	440	480

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%.
RPM/Watt Tolerance 10%.
■ Denotes Operation not recommended.

Blower Performance Data – TSL09

Table 5h

			External Static Pressure (in. wg)							
PSC - High Static	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	Low	RPM	1000	1120	1210	1290	1380			
		Power (W)	145	139	132	125	119			
		CFM	350	340	320	290	270			
	Medium	RPM					1520	1570	1610	1650
		Power (W)					162	151	139	127
		CFM	Operation not recommended				430	390	340	280
	High	RPM								1710
		Power (W)								151
		CFM								390
ECM - Constant Torque	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	1	RPM	980	1080	1170	1260	1360			
		Power (W)	47	51	54	58	62	Operation not recommended		
		CFM	340	320	290	270	240			
	2	RPM	1060	1160	1230	1320	1390	1500		
		Power (W)	58	62	66	70	75	79		
		CFM	380	360	330	310	280	260		
	3	RPM		1230	1310	1390	1440	1530	1590	1650
		Power (W)		79	84	88	92	97	101	105
		CFM		400	380	360	340	320	290	270
	4	RPM				1470	1480	1550	1630	1680
		Power (W)	Operation not recommended			108	113	117	122	126
		CFM				410	390	370	360	340
ECM - Constant Volume	CFM		0.1	0.2	0.3	0.4	0.5	0.6	360	340
	250	RPM	810	950	1100	1230	1370	1490	1560	1640
		Power (W)	30	38	47	57	67	78	89	101
	300	RPM	900	1050	1180	1300	1410	1520	1590	1660
		Power (W)	38	48	58	69	81	93	105	118
	350	RPM	1000	1140	1260	1380	1450	1540	1620	1690
		Power (W)	50	62	73	85	98	110	124	137
	400	RPM	1100	1230	1340	1450	1490	1570		
		Power (W)	65	79	92	105	119	132		

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%
RPM/Watt Tolerance 10%

Blower Performance Data – TSL12

Table 5i

External Static Pressure (in. wg)										
PSC - High Static	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	Low	RPM	980	1090	1190	Operation not recommended				
		Power (W)	145	139	132					
		CFM	350	340	320					
	Medium	RPM		1290	1360	1440	1470	1540	1590	
		Power (W)		197	185	174	162	151	139	
		CFM		500	480	460	430	390	340	
	High	RPM	Operation not recommended					1590	1630	1680
		Power (W)						151	151	151
		CFM						520	470	390
ECM - Constant Torque	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	1	RPM	1070	1140	1230	1320	1400	Operation not recommended		
		Power (W)	66	70	74	78	82			
		CFM	410	380	360	330	310			
	2	RPM	1140	1190	1280	1370	1430	1510	1580	
		Power (W)	54	58	61	65	69	73	77	
		CFM	450	420	400	380	360	330	310	
	3	RPM	1190	1240	1320	1400	1450	1530	1590	1660
		Power (W)	79	83	87	91	96	100	104	108
		CFM	480	460	440	420	400	370	350	330
	4	RPM	Operation not recommended					1580	1630	1690
		Power (W)						137	141	145
		CFM						480	460	440
ECM - Constant Volume	CFM		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	300	RPM	890	1040	1170	1300	1400	1500	1570	1660
		Power (W)	38	48	58	69	81	93	105	118
	350	RPM	980	1100	1220	1340	1430	1520	1590	1670
		Power (W)	50	62	73	85	98	110	124	137
	400	RPM	1060	1170	1280	1380	1450	1540		
		Power (W)	65	79	92	105	119	132		
	450	RPM	1140	1230	1330	1430	Operation not recommended			
		Power (W)	87	101	115	128				
	500	RPM	1220							
		Power (W)	111							

ltage

All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%
RPM/Watt Tolerance 10%

Blower Performance Data – TSL15

Table 5j

External Static Pressure (in. wg)										
PSC - High Static	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	Low	RPM	860	890	900	950	990	1050		
		Power (W)	219	208	197	186	175	164		
		CFM	700	660	610	570	520	480		
	Medium	RPM			960	1010	1030	1070	1590	
		Power (W)			225	212	200	187	139	
		CFM			710	670	610	540	340	
	High	RPM	Operation not recommended				1080	1110	1140	1680
		Power (W)					248	233	219	151
		CFM					720	630	530	390
ECM - Constant Torque	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	1	RPM	720	770	810	870	Operation not recommended			
		Power (W)	66	70	74	79				
		CFM	560	520	480	430				
	2	RPM	770	810	850	910	960			
		Power (W)	79	83	87	92	98			
		CFM	610	570	540	500	450			
	3	RPM	820	860	890	930	990	1040		
		Power (W)	95	101	104	110	114	121		
		CFM	660	630	600	540	500	460		
	4	RPM	850	900	910	970	1010	1070	1120	
		Power (W)	107	111	117	123	128	134	141	
		CFM	690	670	630	600	560	520	470	
	5	RPM			960	1010	1050	1100	1150	1210
		Power (W)			142	147	153	159	166	167
		CFM			710	670	640	600	560	510
ECM - Constant Volume	CFM		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	450	RPM	620	700	790	880	960	1040	1110	1190
		Power (W)	39	53	67	82	96	110	124	139
	500	RPM	670	750	830	910	990	1060	1130	1210
		Power (W)	50	64	78	93	107	121	135	150
	600	RPM	760	840	890	970	1030	1100	1160	1230
		Power (W)	83	97	111	125	139	153	167	181
	650	RPM	810	880	920	1000	1050	1120	1180	1250
		Power (W)	104	118	133	147	162	176	191	205
	700	RPM	860	930	960	1030	1070	1140	1200	1260
		Power (W)	125	140	155	170	185	199	214	229

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%
RPM/Watt Tolerance 10%

Blower Performance Data – TSL18

Table 5k

			External Static Pressure (in. wg)							
PSC - High Static	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	Low	RPM			1030	1090	1110	1120	1130	
		Power (W)			246	235	223	212	200	
		CFM			760	710	650	580	510	
	Medium	RPM				1130	1130	1140	1140	
		Power (W)				251	239	228	216	
		CFM				750	680	610	530	
	High	RPM	Operation not recommended				1180	1180	1170	
		Power (W)					282	270	258	
		CFM					740	660	570	
ECM - Constant Torque	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	1	RPM	750	800	850	880	Operation not recommended			
		Power (W)	73	77	82	87				
		CFM	590	550	500	450				
	2	RPM	820	860	910	960	990	1030		
		Power (W)	95	99	105	110	115	119		
		CFM	660	630	590	540	500	460		
	3	RPM	890	930	960	1040	1060	1090	1130	1200
		Power (W)	123	127	132	138	144	149	154	158
		CFM	730	700	670	640	590	550	520	490
	4	RPM		970	1000	1080	1110	1140	1170	1220
		Power (W)		148	152	158	164	170	176	172
		CFM		750	720	690	660	610	570	520
	5	RPM	Operation not recommended					1230	1180	1180
		Power (W)						217	182	154
		CFM						730	580	470
ECM - Constant Volume	CFM		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	500	RPM	660	750	850	920	990	1060	1120	1200
		Power (W)	52	67	81	96	110	125	139	153
	600	RPM	760	840	920	1010	1070	1130	1200	1270
		Power (W)	88	102	116	130	144	158	172	186
	700	RPM	860	930	980	1090	1150	1210	1280	1340
		Power (W)	138	153	167	182	196	211	225	240
	800	RPM	960	1010	1050	1170	1220	1280	1360	1400
		Power (W)	199	216	232	249	265	282	298	315

ltage

All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%
RPM/Watt Tolerance 10%

Blower Performance Data – TSL24

Table 5l

			External Static Pressure (in. wg)							
PSC - High Static	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	Low	RPM	Operation not recommended			900	940	980	1020	1070
		Power (W)				311	295	279	263	246
		CFM				940	880	810	720	630
	Medium	RPM					980	1010	1040	1080
		Power (W)					325	305	285	265
		CFM					980	900	800	690
	High	RPM								1110
		Power (W)								343
		CFM								890
ECM - Constant Torque	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	1	RPM	680	720	770	820	870	930		
		Power (W)	110	117	123	131	138	146		
		CFM	840	800	760	720	670	630		
	2	RPM	730	770	810	860	910	960	1020	1080
		Power (W)	145	153	160	167	175	183	192	199
		CFM	940	900	860	830	790	750	710	670
	3	RPM	Operation not recommended			900	950	1000	1050	1100
		Power (W)				212	219	227	236	246
		CFM				940	900	870	830	790
	4	RPM							1080	1120
		Power (W)							285	294
		CFM							940	900
	5	RPM								
		Power (W)								
		CFM								
ECM - Constant Volume	CFM		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	600	RPM	560	630	710	780	840	920	990	1070
		Power (W)	52	70	87	104	122	139	157	174
	700	RPM	610	680	750	820	880	950	1020	1080
		Power (W)	77	96	115	134	153	172	191	210
	800	RPM	660	720	790	850	910	980	1040	1100
		Power (W)	102	122	143	164	184	205	226	246
	900	RPM	710	770	830	890	950	1010	1070	1120
		Power (W)	134	155	176	197	218	239	261	282
	950	RPM	740	790	850	900	970	1020	1080	1120
		Power (W)	172	193	214	234	255	276	296	317

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%
RPM/Watt Tolerance 10%

Blower Performance Data – TSL30

Table 5m

External Static Pressure (in. wg)										
PSC - High Static	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	Low	RPM	800	840	880	920	950	980		
		Power (W)	360	344	328	311	295	279		
		CFM	1020	1010	980	940	880	810		
	Medium	RPM	870	910	940	980	1000	1020	1040	
		Power (W)	405	385	365	345	325	305	285	
		CFM	1130	1120	1080	1040	980	900	800	
	High	RPM	Operation not recommended					1120	1120	1130
		Power (W)						395	369	343
		CFM						1120	1010	890
ECM - Constant Torque	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	1	RPM	810	840	870	910	950	1000	1050	1090
		Power (W)	177	185	194	203	212	221	229	236
		CFM	1040	1000	960	920	880	850	810	770
	2	RPM	850	890	920	960	990	1040	1090	1130
		Power (W)	220	229	237	247	257	266	275	283
		CFM	1110	1080	1050	1010	970	940	910	880
	3	RPM	Operation not recommended				1070	1110	1150	1180
		Power (W)					351	363	373	384
		CFM					1140	1100	1070	1040
	4	RPM							1190	1220
		Power (W)							442	451
		CFM							1170	1140
	5	RPM								
		Power (W)								
		CFM								
ECM - Constant Volume	CFM		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	750	RPM	620	690	750	810	890	960	1030	1080
		Power (W)	85	109	133	157	182	206	230	254
	875	RPM	700	760	820	880	950	1010	1070	1130
		Power (W)	131	157	183	209	235	261	287	313
	1000	RPM	780	840	890	950	1010	1070	1120	1170
		Power (W)	191	219	247	275	303	331	359	387
	1150	RPM	880	930	980	1040	1080	1130	1180	1220
		Power (W)	284	310	336	361	387	413	438	464

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%
RPM/Watt Tolerance 10%

Blower Performance Data – TSL36

Table 5n

			External Static Pressure (in. wg)							
PSC - High Static	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	Low	RPM	730	770	820					
		Power (W)	378	358	338					
		CFM	930	920	900					
	Medium	RPM	910	950	970	1000	1020	1040		
		Power (W)	485	459	432	405	379	352		
		CFM	1210	1190	1150	1100	1030	950		
	High	RPM			1100	1120	1120	1130	1130	1130
		Power (W)			529	501	472	444	415	386
		CFM			1370	1310	1230	1130	1020	900
ECM - Constant Torque	Speed Tap		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	1	RPM	830	860	890	930	970	1020		
		Power (W)	193	201	211	221	231	239		
		CFM	1080	1050	1020	980	950	910		
	2	RPM	920	950	970	1010	1060	1090	1140	1170
		Power (W)	265	273	282	294	305	316	326	335
		CFM	1220	1190	1150	1130	1100	1060	1030	1000
	3	RPM	1020	1040	1070	1110	1140	1180	1220	1250
		Power (W)	361	369	377	387	401	414	426	428
		CFM	1370	1340	1310	1290	1260	1230	1200	1160
	4	RPM	940	970	1010	1050	1070	1150		
		Power (W)	315	322	332	341	351	430		
		CFM	1240	1230	1200	1170	1140	1200		
	5	RPM								
		Power (W)								
		CFM								
ECM - Constant Volume	CFM		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
	900	RPM	710	760	820	880	950	1020	1070	1130
		Power (W)	132	157	183	208	234	260	285	311
	1050	RPM	810	860	910	970	1030	1090	1150	1200
		Power (W)	215	244	272	301	329	358	386	415
	1200	RPM	910	950	1000	1050	1110	1160	1220	1260
		Power (W)	299	331	362	393	425	456	487	519
	1350	RPM	1000	1050	1090	1140	1190	1240	1290	1330
		Power (W)	458	483	509	534	560	585	611	636

All data is presented as lowest of nameplate voltage.
All data is shown wet coil with clean 1" filter.
All data is ran at 80°F DB and 67°F WB.
CFM Tolerance is 7%
RPM/Watt Tolerance 10%

Hybrid Blower Motor Correction Table

Size	Hydronic Coil Static
TSL09	0.1
TSL12	0.1
TSL15	0.1
TSL18	0.15
TSL24	0.15
TSL30	0.15
TSL36	0.2

Electrical Wiring – Low Voltage

Thermostat Connections - The thermostat can be spliced or wired directly to the CXM or DXM2 board. See Unit Wire Diagram. Review the appropriate thermostat AOM (Application, Operation and Maintenance) manual.

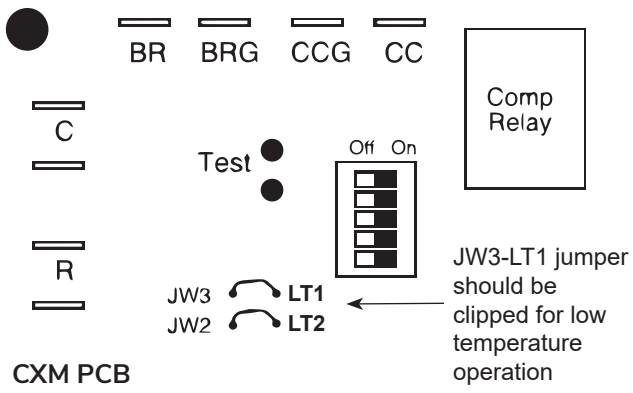
Wall Sensors (ASW) for MPC or LON - Connections are made to DDC controller, see Unit Wire Diagram.

Cabinets with MPC (model digit 5 is C,D,L,M, 2, or 3) requires field to clip JW1 jumper on CXM or DXM2 board in chassis.

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

The factory setting for LT1 is for systems using water no lower than 50°F (10°C), boiler tower or open loop. Water temperature below 50°F (10°C) (extended range) applications must use antifreeze (most ground loops), jumper JW3 must be clipped as shown in Figure 13. Lowest refrigerant temperature, LT1 can sense without faulting off is, with LT1 unclipped - 30°F (-1°C) and clipped - 10°F (-12°C). All ClimateMaster units operating with entering water temperatures below 59°F [15°C] must include the optional water/refrigerant circuit insulation package to prevent internal condensation.

Figure 13: LT1 Limit Setting



⚠ NOTICE! ⚠

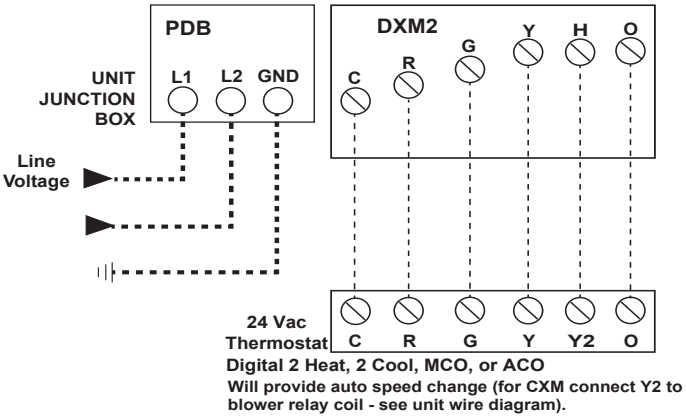
JW3 should never be clipped for equipment or systems without correct antifreeze mixture.

Thermostat Installation

Installation of Optional Wall-Mounted Thermostat - The unit can be furnished with a 24-volt surface mounted ACO or MCO control circuit or a remote 24-volt ACO or MCO thermostat. A typical field connection diagram is shown in Figure 14. Refer to instructions provided with remote thermostat for wiring instructions.

Low-voltage wiring between the unit and the wall thermostat must comply with all applicable electrical codes (i.e., NEC and local codes), and be completed before the unit is installed. Use of eight wire, color-coded, low-voltage cable is recommended.
Note: Your thermostat may require fewer than 8 connections, 8 wires allow future upgrading thermostat. Tape off unused wires.

Figure 14: Typical Field Connections for units with Wall-Mounted 24V Thermostat



Unit wiring diagrams available at www.climatemaster.com. Select 'Commercial Professional ', ' Literature ', ' Wiring Diagrams'

⚠ WARNING! ⚠

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

⚠ CAUTION! ⚠

CAUTION! Use copper conductors only to prevent **equipment** damage

Note: All customer-supplied wiring to be copper only, and must conform to NEC and local electrical codes. Wiring shown with dashed lines must be field-supplied and field-installed.

⚠ WARNING! ⚠

WARNING! Zone integrity must be maintained to efficiently control units or groups of units. Unless zones of control are considered and accounted for, adjacent units may operate in heating and cooling modes simultaneously.

Table 6 below lists recommended wire sizes and lengths to install the thermostat. The total resistance of low-voltage wiring must not exceed 1 ohm. Any resistance in excess of 1 ohm may cause the control to malfunction because of high voltage drop.

A91558 Series Thermostats have 6" (152) pigtail ending with 9-pin Molex. This allows an easy connection to either surface mount or remote with factory whip option.

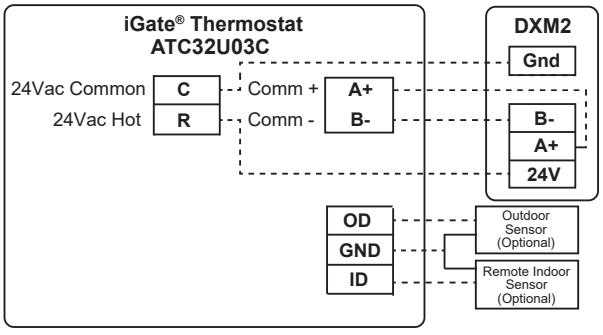
AT Series Thermostats have to be wired to screw terminals under the cover.

Table 6: Recommended Thermostat Wire Sizes

WIRE SIZE	MAX. WIRE LENGTH
22-Gauge	30 Feet
20-Gauge	50 Feet
18-Gauge	75 Feet
16-Gauge	125 Feet
14-Gauge	200 Feet

**Physical distance from thermostat to unit*

Figure 14a: Communicating Thermostat to DXM2



Chassis Pre-Installation

See Figures 15-18

1. Check chassis data plate. Verify chassis is correct for cabinet. Chassis I.D. sticker should match sticker on cabinet blower housing.
2. Remove compressor cover, check for any shipping or handling damage. Make repairs or adjustments.
   a. Verify refrigerant tubing is free of kinks or dents and that it does not touch other tubes or unit parts as it passes over or through. Adjust if needed and separate with closed cell insulation.
   b. Inspect insulation inside compressor enclosure for rubs from tubing or reversing valve. Adjust tubing or RV inward if needed. Be careful not to cause contact somewhere else.
3. Inspect all electrical connections. Connections must be clean and tight at the terminals.
4. Replace any panels or covers removed for steps 2-4.

The chassis is now ready for installation. Always keep chassis upright.

Figure 15

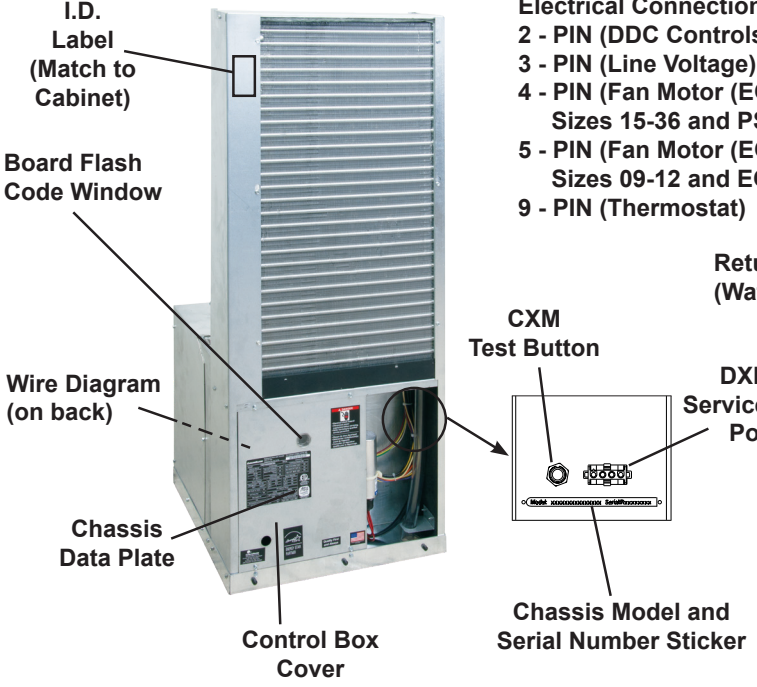


Figure 16

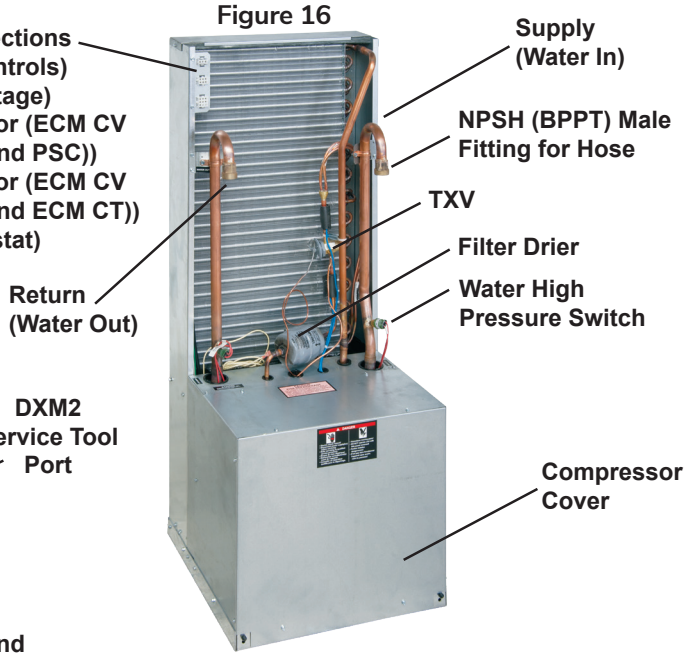


Figure 17: Control Box Cover Removed

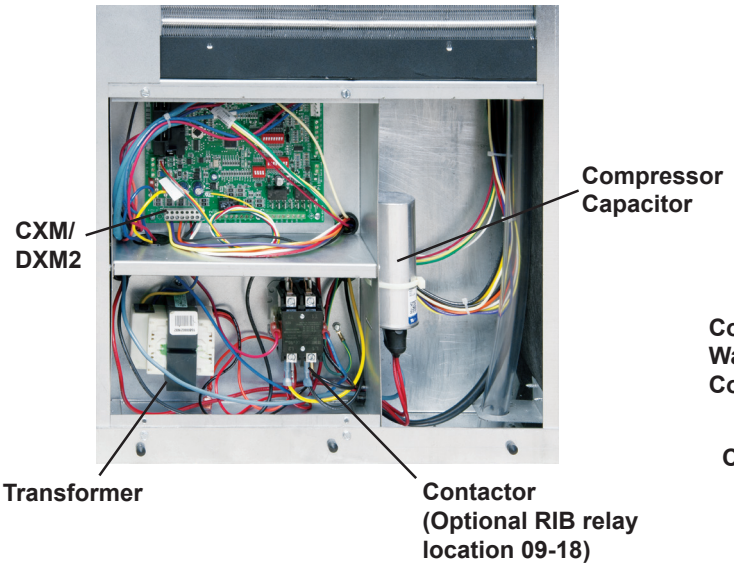
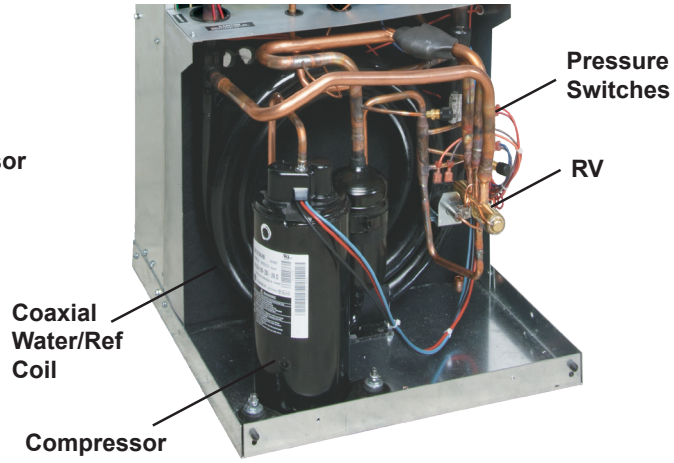


Figure 18: Enclosure Removed

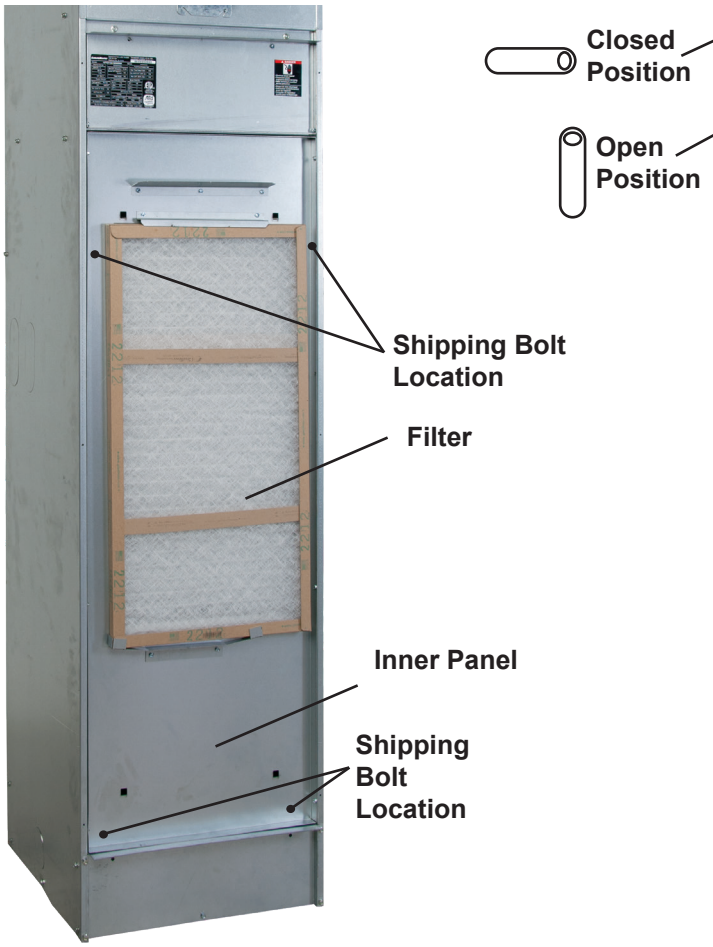


Hose Kit and Chassis Installation

Hose Kit and Chassis Installation - After cabinets are installed, and walls finished remove the filter and front blockoff panel. SAVE THESE FOR RE-INSTALLATION AFTER THE CHASSIS IS INSTALLED!

Step 1: Remove filter and inner panel. (Figure 19) For chassis shipped in cabinet – Remove and discard 4 shipping bolts.

Figure 19



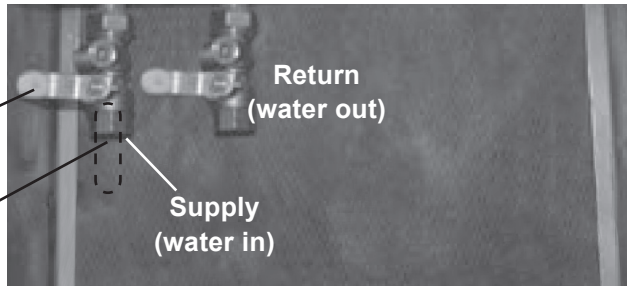
Step 2: Attach the Flex Hoses to shutoffs in the cabinet. Unpack and examine hose kit. Remove all shipping and/or packing material such as rubber bands, plastic caps, and styrofoam. Hose kit should contain (2) hoses.

⚠ CAUTION! ⚠

CAUTION! If the risers are under pressure, do not open shut off valves until installation is complete!

For AHH Hoses - Locate the 2 shutoff valves inside the unit cabinet (Figure 20). Supply (water in) is always closest to corner). Attach the hoses to the water valves with 2 crescent wrenches. Always use a back-up wrench when tightening the hoses to the shutoff valve. Check union valve is tight.

Figure 20



Cabinet (Style 2 riser back left) Shutoff Location Shown

⚠ WARNING! ⚠

WARNING! Do Not Remove Valve or loosen valve union nut without first draining the risers below cabinet level. Check with contractor if risers have water.

⚠ WARNING! ⚠

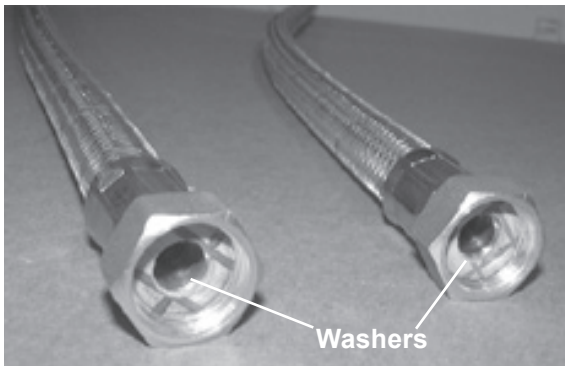
WARNING! Under no circumstances should any part of the hose itself be gripped or twisted by hand, pliers, channel locks or any other tool. Leakage or bursting may occur! Wrenches are used on pipe threads only. Hand tighten swivel connections.

For AHU Hose - Locate the 2 shutoff valves inside the unit cabinet (Figure 20). Supply (water in) is always closest to corner). Check to see if swivel ends have washer inside them (figure 21). Attach the hoses to the water valves.

Note: Make sure the valve handles are in a position that enables them to be fully opened and closed.

Hose Kit and Chassis Installation, Cont'd.

Figure 21



Step 3: Attach AHH or AHU hoses to the Chassis. Check the swivel ends of the hoses (Figure 21). Washers must be in the hose for water tight connection. Slide the chassis part way into the cabinet. Match the WATER IN (supply) hose to the WATER IN tube on the chassis and the WATER OUT (Return) hose to the WATER OUT tube. Position hose toward chassis, use gentle loop- see bend radii Table 7. Hand tighten hose.

Table 7: Hose Minimum Bend Radii

Hose Diameter	Minimum Bend Radii
1/2" (12.7)	2.5 (63.5)
3/4" (19.1)	4.5 (114.3)
1" (25.4)	5.5 (139.7)

Do not bend hoses at less than the minimum bend radius for the hose selected. Less than the minimum bend radius may cause the hose to collapse, which reduces water flow rate. Install an angle adapter to avoid sharp bends in the hose when the radius falls below the required minimum.

⚠ CAUTION! ⚠

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

⚠ CAUTION! ⚠

CAUTION! Piping must comply with all applicable codes.

⚠ CAUTION! ⚠

CAUTION! Corrosive system water requires corrosion resistant fittings and hoses, and may require water treatment.

⚠ WARNING! ⚠

WARNING! Under no circumstances should any part of the hose itself be gripped or twisted by hand, pliers, channel locks or any other tool. Leakage or bursting may occur! Always use a back-up wrench when tightening the hose.

Step 4: Chassis Installation - Check condensate pan is free and on 4 rubber grommets

.

Install the Chassis as follows:

1. Slide Chassis fully into cabinet. Check hose for kinks, do not allow less than minimum bend radius (see table 7), pull chassis partway out, loosen hose and reposition hose if needed, re-tighten.
2. Verify that both the shut-off valves are closed. See Figure 20. (handle horizontal)
3. Verify riser stack has been pressure tested, and all leaks have been repaired.

⚠ WARNING! ⚠

WARNING! Do Not open valves to chassis until system has flushed and purged of air!

⚠ IMPORTANT! ⚠

IMPORTANT! After the system has been filled and system pump is started, all connections should be rechecked for water leaks. ClimateMaster WILL NOT be responsible or liable for damage caused by water leaks at any field water connections!

4. Flush system following the procedure in Preparation for Start-up Section of this manual.
5. When the system is clean and flushed, open both water shut off valves and check piping for leaks. Repair all leaks before continuing.
6. Complete electrical connections between cabinet and chassis. Connect wire harnesses hanging down from under side of control box to chassis connections. (See Figure22). Check that Molex connectors are snapped together, pull gently on connector - do not pull on wires.

Hose Kit and Chassis Installation, Cont'd.

Figure 22

7. Before installing the inner panel and filter, perform the following checks:
   a. Verify all pre-installation and installation steps were completed.
   b. Verify all copper tubes do not touch or rub other tubes or parts of the unit.
   c. Ensure that fan wheel rotates freely and does not rub against housing. If rough handling during shipping has caused fan wheel to shift, adjust as necessary.
   d. Verify that water piping connections to the chassis are complete and that unit service valves which were closed during flushing have been opened.
   e. Verify that power between the cabinet and chassis is properly connected.
   f. Assure that the unit drain is properly positioned, secured and not blocked.
   g. Verify that the nuts used to secure the blower assembly to the fan deck are tight.
   h. Check that chassis is fully inserted, front to back, side gap equal and chassis is centered in cabinet.
   i. After the system has been filled and system pump is started, all connections should be re-checked for water leaks. ClimateMaster WILL NOT be responsible or liable for damage caused by water leaks at any field water connections!
8. Re-attach the inner panel (8 screws) and filter as shown in Figure 23. Chassis must free float on condensate pan. If inner panel holes do not align, push chassis further in.
9. Install the cabinet return air panel after start up. See installation instructions shipped with return air/access panel for detailed information.

Figure 23

Start-Up Preparation

System Cleaning and Flushing - Cleaning and flushing the unit is the single most important step to ensure proper start-up and continued efficient operation of the system. Follow the instructions below to properly clean and flush the system: **Do not flush through TSM chassis**. Coax can get plugged and water flow will be reduced, causing poor performance and may cause LT1 sensor to trip.

⚠ WARNING! ⚠

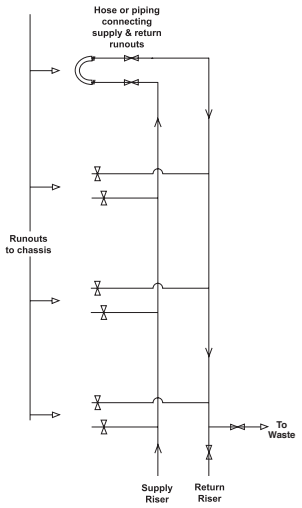
WARNING! To prevent injury or death due to electrical shock or contact with moving part, open unit disconnect before servicing unit.

1. Verify that electrical power to the unit is disconnected.
2. Verify that supply and return riser service valves are closed at each unit.
3. Fill the system with water. Bleed all air from the system but do not allow the system to over flow. Check the system for leaks and make any required repairs.
4. Adjust the water and air level in the expansion tank.
5. With strainers in place, (ClimateMaster recommends a strainer with a #20 stainless steel wire mesh) start the pumps. Systematically check that all of the air is bled from the system.
6. Verify that make-up water is available and adjusted to properly replace any space remaining when all air is evacuated. Check the system for leaks and make any additional repairs required.
7. Set the boiler to raise the loop temperature to approximately 85°F [29.4°C]. Open the drain at the lowest point in the system. Verify that make-up water replacement rate equals rate of bleed. Continue to bleed the system until the water appears clean or for at least three hours whichever is longer.
8. Completely drain the system.

Flush risers as follows: (Refer to Figure 24).

1. Remove cabinet filter and front inner panel. Save these for re-installation after the chassis is installed.
2. Close shut-off valves at each cabinet on the riser except the shut-off valve on the top floor.
3. At the top floor, install the hose kit and connect the ends of the hoses with the factory riser flush adapter from AFL5751. For sweat shutoffs, one AHU hose can be used.
4. Flush solution through supply riser. Note: The solution passes through the top floor connection down the return riser.
5. When the building has more than 10 floors, connect the supply and return runouts on the top two floors to divide the water flow and reduce pressure drop at the pump.
6. Repeat flushing procedure for each set of risers in the building.
7. Refill the system and add in a proportion of trisodium phosphate approximately one pound per 150 gallons [0.4kg per 500 liters] of water. Reset the boiler to raise the loop temperature to about 100°F [37.8°C].
8. Circulate the solution for between 8 to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if desired.
9. Open the supply and return riser service valves at each unit. Refill the system and bleed off all air.
10. Units with internal pumps, to prevent cavitation and pump failure, air must be bleed from both sides of pump. First close off supply and open return shutoff. Open air bleed downstream of pump, bleed air, next close return and open supply shutoff, bleed air. Close air bleed.
11. Test the system pH with litmus paper. The system water should have a pH of 6 to 8.5. Add chemicals as appropriate to maintain pH levels.
12. When the system is successfully cleaned, flushed, refilled, and bled, check the main system panels, safety cutouts, and alarms. Set controls to properly maintain loop temperature.

Figure 24: Typical piping arrangement for flushing risers.



⚠ CAUTION! ⚠

CAUTION! Do Not use "Stop-Leak" or any similar chemical agent in this system. Addition of these chemicals to the loop water can foul the system and can inhibit unit operation.

⚠ CAUTION! ⚠

CAUTION! To avoid possible damage to piping systems constructed of plastic piping, DO NOT allow loop temperature to exceed 110°F [43.3°C].

CXM Control

CXM Control - For detailed control information, see CXM Application, Operation and Maintenance (AOM) manual (part # 97B0003N12).

Field Selectable Inputs - Test mode: Test mode allows the service technician to check the operation of the control in a timely manner. At the unit control board, momentarily shorting the test terminals or externally, momentarily push test button (See Figure 15), the CXM control enters a 20 minute test mode period in which all time delays are sped up 15 times. Upon entering test mode, the status LED will flash a code representing the last fault. For diagnostic ease at the thermostat (applicable models), the alarm relay will also cycle during test mode. The alarm relay will cycle on and off similar to the status LED to indicate a code representing the last fault, at the thermostat (applicable models). Test mode can be exited by shorting the test terminals or holding button for 3 seconds.

Retry Mode: If the control is attempting a retry of a fault, the status LED will slow flash (slow flash = one flash every 2 seconds) to indicate the control is in the process of retrying.

Field Configuration Options - Note: In the following field configuration options, jumper wires should be clipped ONLY when power is removed from the CXM control.

Water coil low temperature limit setting: Jumper 3 (JW3-LT1 Low Temp) provides field selection of temperature limit setting for LT1 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature).
Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].

Air coil low temperature limit setting: Jumper 2 (JW2-LT2 Low Temp) provides field selection of temperature limit setting for LT2 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature). **Note: This jumper should only be clipped under extenuating circumstances, as recommended by the factory.**
Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].

Alarm relay setting: Jumper 1 (JW1-AL2 Dry) provides field selection of the alarm relay terminal AL2 to be jumpered to 24VAC or to be a dry contact (no connection).
Not Clipped = AL2 connected to R. Clipped = AL2 dry contact (no connection).

DIP Switches - Note: In the following field configuration options, DIP switches should only be changed when power is removed from the CXM control.

DIP switch 1: Unit Performance Sentinel Disable - provides field selection to disable the UPS feature.
On = Enabled. Off = Disabled.

DIP switch 2: Stage 2 Selection - provides selection of whether compressor has an "on" delay. If set to stage 2, the compressor will have a 3 second delay before energizing. Also, if set for stage 2, the alarm relay will NOT cycle during test mode.
On = Stage 1. Off = Stage 2

DIP switch 3: Not Used.

DIP switch 4: DDC Output at EH2 - provides selection for DDC operation. If set to "DDC Output at EH2," the EH2 terminal will continuously output the last fault code of the controller. If set to "EH2 normal," EH2 will operate as standard electric heat output.
On = EH2 Normal. Off = DDC Output at EH2.

Note: Some CXM controls only have a 2 position DIP switch package. If this is the case, this option can be selected by clipping the jumper which is in position 4 of SW1.
Jumper not clipped = EH2 Normal. Jumper clipped = DDC Output at EH2.

DIP switch 5: Factory Setting - Normal position is "On." Do not change selection unless instructed to do so by the factory.

Table 8: LED and Alarm Relay Operations

Description of Operation	LED	Alarm
Normal Mode	ON	Open
Normal Mode w/UPS Warning	ON	Cycle (Closed 5 seconds, Open 25 seconds)
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 Minutes)
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 - LT1 Fault in Memory	Flashing Code 4	Cycling Code 4
Test Mode - LT2 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 Thermistor	Flashing Code 9	Cycling Code 9

- Slow Flash = 1 flash every 2 seconds
- Fast Flash = 2 flashes every 1 second
- Flash code 2 = 2 quick flashes, 10 second pause, 2 quick flashes, 10 second pause, etc.
- On pulse 1/3 second; off pulse 1/3 second

DXM2 Control

DXM2 Control - For detailed control information, see DXM2 AOM (part #97B0003N15), or MPC AOM (part # 97B0031N01).

Table 9: LED And Alarm Relay Output Table

DMX2 CONTROLLER FAULT CODES			
DMX2 Fault and Status LED Operation with Test Mode Not Active	**Fault LED (Red)**	**Status LED (Green)**	**Alarm Relay**
DXM2 Is Non-Functional	Off	Off	Open
Normal Operation - No Active Communications	On	On	Open
Normal Operation - With Active Communications	Very Slow Flash	ON	Open
Control Is Currently In Fault Retry Mode	Slow Flash	-	Open
Control Is Currently Locked Out	Fast Flash	-	Closed
Control Is Currently In An Over/ Under Voltage Condition	Slow Flash	-	Open (Closed After 15 min)
Hot Water Mode Active	-	Slow Flash	Open
(NSB) Night Setback Condition Recognized	-	Flashing Code 2	-
(ESD) Emergency Shutdown Condition Recognized	-	Flashing Code 3	-
Invalid Thermostat Input Combination	-	Flashing Code 4	-
High Hot Water Temperature Lockout Active	-	Flashing Code 5	-
Hot Water Mode Sensor Fault Active	-	Flashing Code 6	-
DMX2 Fault LED and Status Operation with Test Mode Active	**Fault LED (Red)**	**Status LED (Green)**	**Alarm Relay**
No Fault Since Power Up In Memory	Flashing Code 1	-	Cycling Code 1
High Pressure Fault In Memory	Flashing Code 2	-	Cycling Code 2
Low Pressure Fault In Memory	Flashing Code 3	-	Cycling Code 3
Low Temperature Protection 1 In Fault Memory	Flashing Code 4	-	Cycling Code 4
Low Temperature Protection 2 In Fault Memory	Flashing Code 5	-	Cycling Code 5
Condensate Overflow Fault In Memory	Flashing Code 6	-	Cycling Code 6
Over/Under Voltage Shutdown In Memory	Flashing Code 7	-	Cycling Code 7
UPS Warning In Memory	Flashing Code 8	-	Cycling Code 8
UPT Fault In Memory	Flashing Code 9	-	Cycling Code 9
ECM Air Flow Fault In Memory	Flashing Code 10	-	Cycling Code 10
Test Mode Active With No ECM Connected Or Operating	-	Fast Flash	-
Test Mode Active With ECM Operating	-	Flashing ECM Airflow	-

- Fast Flash = 2 flashes every 1 second.
- Slow Flash = 1 flash every 2 seconds.
- Very Slow Flash = 1 flash every 5 seconds.
- Numeric Codes = On pulse 1/3 second; Off pulse 1/3 second followed by a 10 second delay.
- ECM Airflow = 1 flash per 100 CFM; On pulse 1/3 second followed by a 10 second delay.
- Alarm Relay Open = alarm signal off; Alarm Relay Closed = alarm signal on.

Field Selectable Inputs - Test mode: Test mode allows the service technician to check the operation of the control in a timely manner, at the board, by pushing test button, or externally, with service tool using harness 11B0100N27 connected to port (See Fig 15). The DXM2 control enters a 20 minute test mode period in which all time delays are sped up 15 times. Upon entering test mode, the status LED will flash a code representing the last fault. For diagnostic ease at the thermostat (applicable models), the alarm relay will also cycle during test mode. The alarm relay will cycle on and off similar to the status LED to indicate a code representing the last fault, at the thermostat (applicable models). Test mode can be exited by holding test button on board for 3 seconds or service tool.

Retry mode: If the control is attempting a retry of a fault, the status LED will slow flash (slow flash = one flash every 2 seconds) to indicate the control is in the process of retrying.

Field Configuration Options - Note: In the following field configuration options, jumper wires should be clipped ONLY when power is removed from the DXM2 control.

Water coil low temperature limit setting: Jumper 3 (JW3-LT1 Low Temp) provides field selection of temperature limit setting for LT1 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature).
Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].

Air coil low temperature limit setting: Jumper 2 (JW2-LT2 Low Temp) provides field selection of temperature limit setting for LT2 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature). **Note: This jumper should only be clipped under extenuating circumstances, as recommended by ClimateMaster technical services.**
Not Clipped = 30°F [-1°C]. Clipped = 10°F [-12°C].

Alarm relay setting: Jumper 4 (JW4-AL2 Dry) provides field selection of the alarm relay terminal AL2 to be jumpered to 24VAC or to be a dry contact (no connection).
Not Clipped = AL2 connected to R. Clipped = AL2 dry contact (no connection).

Low pressure normally open: Jumper 1 (JW1-LP norm open) provides field selection for low pressure input to be normally closed or normally open.
Not Clipped = LP normally closed. Clipped = LP normally open.

ECM Motor Option Jumpers (Set at Factory): For TSM09 and 12 switch ECM motor set AO-1 jumper to PWM.

DIP Switches - Note: In the following field configuration options, DIP switches should only be changed when power is removed from the DXM2 control.

DIP Package #1 (S1) - DIP Package #1 has 8 switches and provides the following setup selections:
1.1 - Unit Performance Sentinel (UPS) disable: DIP Switch 1.1 provides field selection to disable the UPS feature.
On = Enabled. Off = Disabled.

DXM2 Control, Cont'd.

1.2 - Compressor relay staging operation: DIP 1.2 provides selection of compressor relay staging operation. The compressor relay can be selected to turn on with a stage 1 or stage 2 call from the thermostat. This is used with dual stage units (2 compressors where 2 DXM2 controls are being used) or with leader/follower applications. In leader/follower applications, each compressor and fan will stage according to its appropriate DIP 1.2 setting. If set to stage 2, the compressor will have a 3 second on-delay before energizing during a Stage 2 demand. Also, if set for stage 2, the alarm relay will NOT cycle during test mode.
On = Stage 1. Off = Stage 2.

1.3 - Thermostat type (heat pump or heat/cool): DIP 1.3 provides selection of thermostat type. Heat pump or heat/cool thermostats can be selected. When in heat/cool mode, Y1 is the input call for cooling stage 1; Y2 is the input call for cooling stage 2; W1 is the input call for heating stage 1; and O/W2 is the input call for heating stage 2. In heat pump mode, Y1 is the input call for compressor stage 1; Y2 is the input call for compressor stage 2; W1 is the input call for heating stage 3 or emergency heat; and O/W2 is the input call for reversing valve (heating or cooling, depending upon DIP 1.4).
On = Heat Pump. Off = Heat/Cool.

1.4 - Thermostat type (O/B): DIP 1.4 provides selection of thermostat type for reversing valve activation. Heat pump thermostats with "O" output (reversing valve energized for cooling) or "B" output (reversing valve energized for heating) can be selected with DIP 1.4.
On = HP stat with "O" output for cooling. Off = HP stat with "B" output for heating.

1.5 - Dehumidification mode: DIP 1.5 provides selection of normal or dehumidification fan mode. In dehumidification mode, the fan speed relay will remain off during cooling stage 2. In normal mode, the fan speed relay will turn on during cooling stage 2.
On = Normal fan mode. Off = Dehumidification mode.

1.6 - DDC output at EH2: DIP 1.6 provides selection for DDC operation. If set to "DDC Output at EH2," the EH2 terminal will continuously output the last fault code of the controller. If set to "EH2 normal," EH2 will operate as standard electric heat output.
On = EH2 Normal. Off = DDC Output at EH2.

1.7 - Boilerless operation: DIP 1.7 provides selection of boilerless operation. In boilerless mode, the compressor is only used for heating when LT1 is above the temperature specified by the setting of DIP 1.8. Below DIP 1.8 setting, the compressor is not used and the control goes into emergency heat mode, staging on EH1 and EH2 to provide heating.
On = normal. Off = Boilerless operation.

1.8 - Boilerless changeover temperature: DIP 1.8 provides selection of boilerless changeover temperature setpoint. Note that the LT1 thermistor is sensing refrigerant temperature between the coaxial heat exchanger and the expansion device (TXV). Therefore, the 50°F [10°C] setting is not 50°F [10°C] water, but approximately 60°F [16°C] EWT.
On = 50°F [10°C]. Off = 40°F [16°C].

DIP Package #2 (S2) - DIP Package #2 has 8 switches and provides the following setup selections:
2.1 - Accessory1 relay personality: DIP 2.1 provides selection of ACC1 relay personality (relay operation/characteristics). See table 8 for description of functionality.

2.2 - Accessory1 relay personality: DIP 2.2 provides selection of ACC 1 relay personality (relay operation/characteristics). See table 8 for description of functionality.

2.3 - Accessory1 relay personality: DIP 2.3 provides selection of ACC 1 relay options. See table 11 for description of functionality.

Table 10: Accessory DIP Switch Settings

DIP 2.1	DIP 2.2	DIP 2.3	ACC1 Relay Option
On	On	On	Cycle with fan
Off	On	On	Digital NSB
On	Off	On	Water Valve - slow opening
On	On	Off	OAD
Off	Off	Off	Reheat Option - Humidistat
Off	On	Off	Reheat Option - Dehumidistat
DIP 2.4	**DIP 2.5**	**DIP 2.6**	**ACC2 Relay Option**
On	On	On	Cycle with compressor
Off	On	On	Digital NSB
On	Off	On	Water Valve - slow opening
On	On	Off	OAD

All other DIP combinations are invalid

2.4 - Accessory2 relay personality: DIP 2.4 provides selection of ACC 2 relay personality (relay operation/characteristics). See table 8 for description of functionality.

2.5 - Accessory2 relay personality: DIP 2.5 provides selection of ACC 2 relay personality (relay operation/characteristics). See table 8 for description of functionality.

2.6 - Accessory2 relay personality: DIP 2.6 provides selection of ACC 2 relay options. See table 8 for description of functionality.

DIP Package #3 (S3) - Currently not used for TSM.

2.7 - Auto dehumidification fan mode or high fan mode: DIP 2.7 provides selection of auto dehumidification fan mode or high fan mode. In auto dehumidification mode, the fan speed relay will remain off during cooling stage 2 IF the H input is active. In high fan mode, the fan enable and fan speed relays will turn on when the H input is active.
On = Auto dehumidification mode. Off = High fan mode.

2.8 - Special factory selection: DIP 2.8 provides special factory selection. Normal position is "On". Do not change selection unless instructed to do so by the factory.

Safety Features – CXM/DXM2 Controls

The safety features below are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.

Anti-short cycle protection: The control features a 5 minute anti-short cycle protection for the compressor. Note: The 5 minute anti-short cycle also occurs at power up.

Random start: The control features a random start upon power up of 5-80 seconds.

Fault Retry: In Fault Retry mode, the Status LED begins slowly flashing to signal that the control is trying to recover from a fault input. The control will stage off the outputs and then "try again" to satisfy the thermostat input call. Once the thermostat input call is satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the thermostat input call, the control will go into "lockout" mode. The last fault causing the lockout will be stored in memory and can be viewed at the "fault" LED (DXM2 board) or by going into test mode (CXM board). Note: LT1/LT2 faults are factory set at only one try.

Lockout: In lockout mode, the status LED will begin fast flashing. The compressor relay is turned off immediately. Lockout mode can be "soft" reset by turning off the thermostat (or satisfying the call). A "soft" reset keeps the fault in memory but resets the control. A "hard" reset (disconnecting power to the control) resets the control and erases fault memory.

Lockout with emergency heat: While in lockout mode, if W becomes active (CXM), emergency heat mode will occur. If DXM2 is configured for heat pump thermostat type (DIP 1.3), emergency heat will become active if O/W2 is energized.

For LED fault codes and alarm relay output for CXM see table 8 and DXM2 see table 9.

High pressure switch: When the high pressure switch opens due to high refrigerant pressures, the compressor relay is de-energized immediately since the high pressure switch is in series with the compressor contactor coil. The high pressure fault recognition is immediate (does not delay for 30 continuous seconds before de-energizing the compressor). Note: For units with motorized water valve - One high pressure water switch is in series with refrigerant high pressure switch and will cause fault if pressure is 300 PSI (reset at 240 PSI).

Low pressure switch: The low pressure switch must be open and remain open for 30 continuous seconds during "on" cycle to be recognized as a low pressure fault. If the low pressure switch is open for 30 seconds prior to compressor power up it will be considered a low pressure (loss of charge) fault. The low pressure switch input is bypassed for the initial 120 seconds of a compressor run cycle.

Water coil low temperature (LT1): The LT1 thermistor temperature must be below the selected low temperature limit setting for 30 continuous seconds during a compressor run cycle to be recognized as a LT1 fault. The LT1 input is bypassed for the initial 120 seconds of a compressor run cycle. LT1 is set at the factory for one try. Therefore, the control will go into lockout mode once the LT1 fault has occurred.

Air coil low temperature (LT2): The LT2 thermistor temperature must be below the selected low temperature limit setting for 30 continuous seconds during a compressor run cycle to be recognized as a LT2 fault. The LT2 input is bypassed for the initial 60 seconds of a compressor run cycle. LT2 is set at the factory for one try. Therefore, the control will go into lockout mode once the LT2 fault has occurred.

Condensate overflow: The condensate overflow sensor must sense overflow level for 30 continuous seconds to be recognized as a CO fault. Condensate overflow will be monitored at all times.

Over/under voltage shutdown: An over/under voltage condition exists when the control voltage is outside the range of 19VAC to 30VAC. Over/under voltage shut down is a self-resetting safety. If the voltage comes back within range for at least 0.5 seconds, normal operation is restored. This is not considered a fault or lockout. If the CXM/DXM2 is in over/under voltage shutdown for 15 minutes, the alarm relay will close.

Unit Performance Sentinel-UPS: The UPS feature indicates when the heat pump is operating inefficiently. A UPS condition exists when:

a. In heating mode with compressor energized, LT2 is greater than 125°F [52°C] for 30 continuous seconds, or:
b. In cooling mode with compressor energized, LT1 is greater than 125°F [52°C] for 30 continuous seconds, or:
c. In cooling mode with compressor energized, LT2 is less than 40°F [4.5°C] for 30 continuous seconds.

If a UPS condition occurs, the control will immediately go to UPS warning. The status LED will remain on as if the control is in normal mode. Outputs of the control, excluding LED and alarm relay, will NOT be affected by UPS. The UPS condition cannot occur during a compressor off cycle. During UPS warning, the alarm relay will cycle on and off. The cycle rate will be "on" for 5 seconds, "off" for 25 seconds, "on" for 5 seconds, "off" for 25 seconds, etc.

Swapped LT1/LT2 thermistors: During test mode, the control monitors to see if the LT1 and LT2 thermistors are in the appropriate places. If the control is in test mode, the control will lockout with code 9 after 30 seconds if:

Safety Features – CXM/DXM2 Controls, Cont'd.

a. The compressor is on in the cooling mode and the LT1 sensor is colder than the LT2 sensor, or:
b. The compressor is on in the heating mode and the LT2 sensor is colder than the LT1 sensor.

ESD (DXM2 only): The ESD (Emergency Shut Down) mode can be enabled from an external common signal to terminal ESD to shut down the unit. The green status light will flash code 3 when the unit is in ESD mode.

Diagnostic Features - The LED on the CXM board advises the technician of the current status of the CXM control. The LED can display either the current CXM mode or the last fault in memory if in test mode. If there is no fault in memory, the LED will flash Code 1 (when in test mode).

The green status LED and red fault LED on the DXM2 board advise the technician of the current status of the DXM2 control. The status LED will indicate the current mode that the DXM2 control is in. The fault LED will

⚠ CAUTION! ⚠

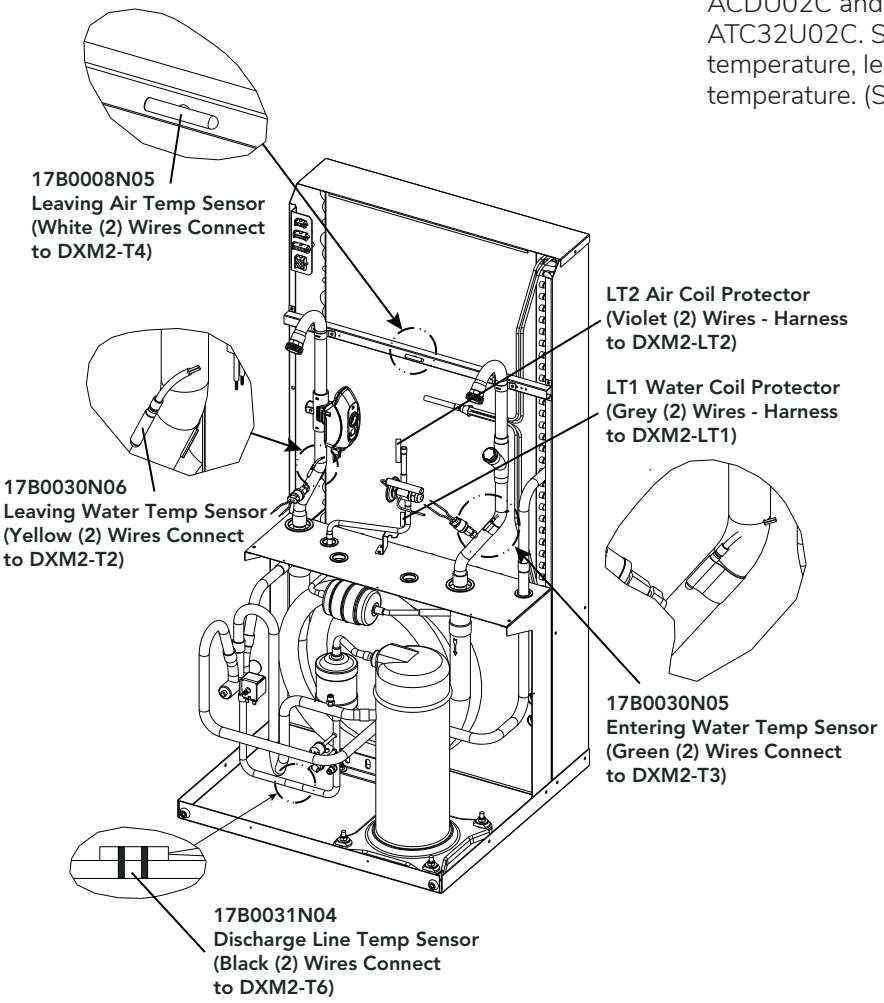
CAUTION! Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

ALWAYS flash a code representing the LAST fault in memory. If there is no fault in memory, the fault LED will flash Code 1. The yellow test LED will turn on when in test mode.

CXM/DXM2 Control Start-up Operation - The control will not operate until all inputs and safety controls are checked for normal conditions. The compressor will have a 5 minute anti-short cycle delay at power-up. The first time after power-up that there is a call for compressor, the compressor will follow a 5 to 80 second random start delay. After the random start delay and anti-short cycle delay, the compressor relay will be energized. On all subsequent compressor calls, the random start delay is omitted.

DXM2 has 4 sensors that can be read with service tool ACDU02C and harness 11B0100N27 or thermostat ATC32U02C. Sensors are entering and leaving water temperature, leaving air temperature, and discharge line temperature. (See Figure 25)

Figure 25: DXM2 Sensor Placement



Notes:

1. Sensors must be positioned on clean section of copper tube approximately as shown, clamped securely, and completely wrapped (except Leaving Air Sensor - Do Not wrap) with cork tape.
2. All sensors are NTC 10K OHM. To check calibration use resistance table in DXM2 AOM.

Unit Commissioning and Operating Conditions

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

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

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

The commissioning table 11 indicates air and water temperatures which are suitable for initial unit commissioning in an environment where the flow rate and water temperature is not yet stable and to avoid nuisance shut down of the units freeze and refrigerant pressure safeties.

The operating table 12 indicates the maximum and minimum ranges of the unit.

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

Table 11: Building Commissioning Limits

BUILDING COMMISSIONING		
	ALL TSM MODELS	
	Cooling °F [°C]	Heating °F [°C]
AMBIENT MIN - MAX DB	45-110 [7-43]	40-85 [4.5-29]
RETURN AIR MIN DB/WB	60/45 [16/7]	40 [4.5]
RETURN AIR MAX DB/WB	100-83 [38-28]	80 [27]
STANDARD UNIT ENTERING WATER MIN* - MAX	40-120 [4.5-49]	60-90 [16-43]
EXTENDED RANGE STANDARD UNIT** ENTERING WATER MIN* - MAX	30-120 [-1-49]	20-90 [-6.7-32]
vFlow® UNIT** ENTERING WATER MIN - MAX	20-120 [-1-49]	20-120 [-1-49]

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

Table 12: Unit Operating Limits

UNIT OPERATING LIMITS		
	ALL TSM MODELS	
	Cooling °F [°C]	Heating °F [°C]
AMBIENT MIN - MAX DB	50-100 [10-38]	50-85 [10-29]
RETURN AIR MIN DB/WB	65/60 [18/15.5]	50 [10]
RETURN AIR MAX DB/WB	95/75 [35/24]	80 [27]
STANDARD UNIT ENTERING WATER MIN* - MAX	50-120 [10-49]	60-90 [16-43]
EXTENDED RANGE STANDARD UNIT** ENTERING WATER MIN* - MAX	30-120 [-1-49]	20-90 [-6.7-32]
vFlow® UNIT** ENTERING WATER MIN - MAX	20-120 [-1-49]	20-120 [-1-49]

*- Requires optional insulation package when operating below the dew point
**- Operation below 50°F (10) EWT requires antifreeze, optional insulation package and jumper clipped.

Unit and System Checkout

⚠ CAUTION! ⚠

CAUTION! To avoid possible damage to a plastic (PVC) piping system, do not allow temperatures to exceed 110ºF (43ºC).

Note: The manufacturer strongly recommends all piping connections, both internal and external to the unit, be pressure tested by an appropriate method prior to any finishing of the interior space or before access to all connections is limited. Test pressure may not exceed the maximum allowable pressure for the unit and all components within the water system. The manufacturer will not be responsible or liable for damages from water leaks due to inadequate or lack of a pressurized leak test, or damages caused by exceeding the maximum pressure rating during installation.

BEFORE POWERING SYSTEM, please check the following:

SYSTEM CHECKOUT

- ❑ **System water temperature:** Check water temperature for proper range and also verify heating and cooling set points for proper operation.
- ❑ **System pH:** Check and adjust water pH if necessary to maintain a level between 6 and 8.5. Proper pH promotes longevity of hoses and fittings (see Table 3).
- ❑ **System flushing:** Verify that all hoses are connected end to end when flushing to ensure that debris bypasses the unit heat exchanger, water valves and other components. Water used in the system must be potable quality initially and clean of dirt, piping slag, and strong chemical cleaning agents. Verify that all air is purged from the system. Air in the system can cause poor operation or system corrosion.
- ❑ **Cooling tower/boiler:** Check equipment for proper set points and operation.
- ❑ **Standby pumps:** Verify that the standby pump is properly installed and in operating condition.
- ❑ **System controls:** Verify that system controls function and operate in the proper sequence.
- ❑ **Low water temperature cutout:** Verify that low water temperature cut-out controls are provided for the outdoor portion of the loop. Otherwise, operating problems may occur.
- ❑ **System control center:** Verify that the control center and alarm panel have appropriate set points and are operating as designed.
- ❑ **Miscellaneous:** Note any questionable aspects of the installation.

⚠ CAUTION! ⚠

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

⚠ CAUTION! ⚠

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

UNIT CHECKOUT

- ❑ **Balancing/shutoff valves:** Ensure that all isolation valves are open and water control valves are wired.
- ❑ **Line voltage and wiring:** Verify that voltage is within an acceptable range for the unit and wiring and fuses/breakers are properly sized. Verify that low voltage wiring is complete.
- ❑ **Unit control transformer:** Ensure that transformer has the properly selected voltage tap. Commercial 208-230V units are factory wired for 208V.
- ❑ **Entering water and air:** Ensure that entering water and air temperatures are within operating limits of Tables 11 & 12.
- ❑ **Low water temperature cutout:** Verify that low water temperature cut-out on the CXM/DXM2 control is properly set.
- ❑ **Unit fan:** Manually rotate fan to verify free rotation and ensure that blower wheel is secured to the motor shaft. Be sure to remove any shipping supports if needed. DO NOT oil motors upon start-up. Fan motors are pre-oiled at the factory. Check unit fan speed selection and compare to design requirements.
- ❑ **Condensate line:** Verify that condensate line is open and properly pitched toward drain.
- ❑ **Water flow balancing:** Record inlet and outlet water temperatures for each heat pump upon startup. This check can eliminate nuisance trip outs and high velocity water flow that could erode heat exchangers.
- ❑ **Unit air coil and filters:** Ensure that filter is clean and accessible. Clean air coil of all manufacturing oils.
- ❑ **Unit controls:** Verify that CXM or DXM2 field selection options are properly set.

Unit Start-Up Procedures

Note: All Pre-Installation, Installation, Unit and System Checkout steps must be followed and completed before starting unit. Startup sequence and number of steps may change for your installation. Follow all safety precautions. Fill out startup log sheet(in this manual) as steps are completed. **Must be certified licensed service technician to perform startup and troubleshooting.**

If operation in any mode has excessive noise or vibration, stop and correct. Check and repair any water leakage.

1. Adjust all valves to their full open positions. Turn on the line power to all heat pumps.
2. Turn the thermostat fan position to FAN ON. Blower should start. Verify all speeds function.
3. Balance air flow at registers.
4. Room temperature should be within the minimum-maximum ranges of Tables 11 & 12. During start-up checks, loop water temperature entering the heat pump should be between 60°F [16°C] and 95°F [35°C]
5. Set thermostat to off position
6. Remove return air panel and open chassis control box.

a. Turn on power, measure incoming high voltage at Compressor Contactor (CC), measure low voltage at board R and C.

b. Amp clamp black wire from CC1 T1.

c. Connect temperature thermocouples to entering and leaving water lines at the chassis. Note for units with DXM2- EWT, LWT, LAT, discharge line, LT1, and LT2 temperatures can be read with service tool or at communicating thermostat

7. Inner panel and filter must be on chassis to block air from bypassing air coil. Bypass air will cause unit to fault off.
8. Check cooling mode (Reversing valve energized)
   a. Set thermostat to cool and set temperature for 5 degrees lower than room temperature. It may take up to 5 minutes for compressor to start. Test mode will reduce safety time delay. Run 5 minutes minimum after compressor starts before taking data.
   b. Air leaving should be 10 to 25°F (5.5 and 14°C) lower than entering air. Check air coil, if humidity is over 50% coil face should be damp but not icing up.
   c. Water temperature leaving should be higher than entering, see Water temperature change table.
9. Check heating mode
   a. Set thermostat to heat and set temperature for 5 degrees higher than room temperature. It may take up to 5 minutes for compressor to start. Test mode will reduce safety time delay. Run 5 minutes minimum after compressor starts before taking data.
   b. Air leaving should be 20 to 30F (11 and 17 C) higher than entering air.
   c. Water temperature leaving should be lower than entering, see Water temperature change table.
10. When testing is completed
    a. set thermostat to owners instructions.
    b. Re assemble all parts.
11. Save start up log sheet for future reference.
12. BE CERTAIN TO FILL OUT AND FORWARD ALL WARRANTY REGISTRATION PAPERS TO CLIMATEMASTER.

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

⚠ WARNING! ⚠

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

⚠ CAUTION! ⚠

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

Table 13: Water Temperature Change Through Heat Exchanger

Water Flow, gpm (l/m)	Rise, Cooling °F (°C)	Drop, Heating °F (°C)
For Closed Loop: Ground Source or Closed Loop Systems at 3 gpm per ton (3.9 l/m per kw)	9 - 12 (5 - 6.7)	4 - 8 (2.2 - 4.4)
For Open Loop: Ground Water Systems at 1.5 gpm per ton (2.0 l/m per kw)	20 - 26 (11.1 - 14.4)	10 - 17 (5.6 - 9.4)

Unit Operating Pressures and Temperatures

Notes for Tables 14A - 14G:

- Airflow is at nominal (rated) conditions;
- Entering air is based upon 70°F [21°C] DB in heating and 80/67°F [27/19°C] in cooling;
- Subcooling is based upon head pressure at compressor service port;
- Cooling air and water values can vary greatly with changes in humidity level.

Table 14A: TSM/TSL09

Entering Water Temp °F	Water Flow GPM	Cooling									Heating								
		Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
20	1.5																		
	2.25																		
	3.0										60 - 63	289 - 306	148 - 163	14 - 18	71 - 75	9 - 12	8 - 17	3 - 4	20 - 22
30	1.5	122 - 125	197 - 204	90 - 105	42 - 46	49 - 53	13 - 16	15 - 20	20 - 24	22 - 23	67 - 71	297 - 315	147 - 162	20 - 24	72 - 76	10 - 12	9 - 18	8 - 9	22 - 23
	2.25	116 - 119	177 - 184	86 - 101	38 - 42	48 - 52	17 - 19	15 - 18	13 - 16	21 - 22	71 - 75	301 - 321	146 - 161	22 - 26	73 - 77	10 - 12	10 - 19	6 - 7	23 - 24
	3.0	112 - 115	168 - 173	97 - 112	36 - 40	39 - 43	19 - 21	14 - 18	10 - 12	21 - 22	74 - 76	303 - 323	146 - 161	23 - 27	73 - 77	11 - 13	10 - 19	4 - 5	23 - 25
50	1.5	128 - 134	240 - 252	107 - 122	62 - 66	51 - 55	11 - 14	13 - 16	20 - 22	21 - 22	97 - 102	333 - 355	139 - 154	37 - 41	77 - 81	9 - 11	13 - 21	11 - 12	29 - 30
	2.25	122 - 131	219 - 233	102 - 117	59 - 63	51 - 55	12 - 17	12 - 16	13 - 15	21 - 22	104 - 108	339 - 361	139 - 154	40 - 44	79 - 83	9 - 11	13 - 21	8 - 9	30 - 31
	3.0	119 - 129	209 - 224	104 - 119	58 - 62	47 - 51	13 - 18	11 - 15	10 - 11	21 - 22	107 - 122	342 - 369	139 - 154	41 - 45	79 - 83	9 - 11	13 - 20	6 - 7	31 - 32
70	1.5	132 - 139	311 - 329	127 - 142	82 - 86	53 - 57	9 - 12	12 - 15	19 - 21	20 - 21	130 - 135	367 - 392	138 - 153	52 - 56	84 - 88	9 - 11	13 - 21	14 - 16	35 - 37
	2.25	131 - 137	287 - 306	121 - 136	80 - 84	53 - 57	10 - 13	10 - 12	13 - 14	20 - 21	139 - 144	375 - 402	138 - 153	55 - 59	85 - 89	10 - 11	13 - 20	10 - 12	37 - 38
	3.0	131 - 136	275 - 294	118 - 133	79 - 83	53 - 57	10 - 13	9 - 11	9 - 11	20 - 21	145 - 149	380 - 407	138 - 153	57 - 61	86 - 90	10 - 11	13 - 19	8 - 9	38 - 39
90	1.5	137 - 144	400 - 420	149 - 164	101 - 105	55 - 59	8 - 10	13 - 16	19 - 20	19 - 20	164 - 169	401 - 430	139 - 154	64 - 68	90 - 94	10 - 13	13 - 17	18 - 20	41 - 43
	2.25	135 - 142	373 - 395	142 - 157	99 - 103	55 - 59	9 - 11	10 - 12	12 - 14	19 - 20	175 - 178	411 - 442	141 - 156	68 - 72	92 - 96	12 - 16	14 - 17	12 - 14	43 - 45
	3.0	135 - 141	359 - 383	138 - 153	98 - 102	56 - 60	9 - 12	9 - 11	9 - 10	19 - 20	179 - 187	415 - 455	142 - 157	69 - 73	93 - 97	13 - 18	14 - 16	9 - 11	44 - 46
100	1.5	139 - 147	448 - 471	161 - 176	110 - 114	56 - 60	8 - 9	13 - 16	18 - 20	18 - 19									
	2.25	138 - 146	420 - 445	155 - 170	108 - 112	56 - 60	8 - 10	11 - 13	12 - 13	18 - 19									
	3.0	138 - 146	405 - 432	151 - 166	108 - 112	57 - 61	8 - 10	10 - 11	9 - 10	18 - 19									
120	1.5	144 - 153	549 - 583	186 - 201	128 - 132	58 - 62	7 - 8	15 - 17	17 - 19	17 - 18									
	2.25	143 - 153	525 - 557	181 - 196	126 - 130	58 - 62	7 - 8	12 - 14	11 - 13	17 - 18									
	3.0	143 - 152	511 - 543	180 - 195	126 - 130	57 - 61	8 - 9	11 - 13	9 - 10	17 - 18									

Table 14B: TSM/TSL12

Entering Water Temp °F	Water Flow GPM	Cooling									Heating								
		Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
20	1.5																		
	2.25																		
	3.0										60 - 63	289 - 306	151 - 166	13 - 17	72 - 76	9 - 12	8 - 17	3 - 4	20 - 22
30	1.5	122 - 125	197 - 204	82 - 97	40 - 44	45 - 49	13 - 16	15 - 20	20 - 24	22 - 23	67 - 71	297 - 315	153 - 168	18 - 22	73 - 77	10 - 12	9 - 18	8 - 9	22 - 23
	2.25	116 - 119	177 - 184	77 - 92	37 - 41	44 - 48	17 - 19	15 - 18	13 - 16	21 - 22	71 - 75	301 - 321	151 - 166	21 - 25	74 - 78	10 - 12	10 - 19	6 - 7	23 - 24
	3.0	112 - 115	168 - 173	89 - 104	36 - 40	38 - 42	19 - 21	14 - 18	10 - 12	21 - 22	74 - 76	303 - 323	151 - 166	22 - 26	74 - 78	11 - 13	10 - 19	4 - 5	23 - 25
50	1.5	128 - 134	240 - 252	103 - 118	59 - 63	48 - 52	11 - 14	13 - 16	20 - 22	21 - 22	97 - 102	333 - 355	145 - 160	35 - 39	78 - 82	9 - 11	13 - 21	11 - 12	29 - 30
	2.25	122 - 131	219 - 233	97 - 112	57 - 61	47 - 51	12 - 17	12 - 16	13 - 15	21 - 22	104 - 108	339 - 361	144 - 159	39 - 43	79 - 83	9 - 11	13 - 21	8 - 9	30 - 31
	3.0	119 - 129	209 - 224	100 - 115	56 - 60	45 - 49	13 - 18	11 - 15	10 - 11	21 - 22	107 - 122	342 - 369	143 - 158	40 - 44	80 - 84	9 - 11	13 - 20	6 - 7	31 - 32
70	1.5	132 - 139	311 - 329	125 - 139	78 - 82	51 - 55	9 - 12	12 - 15	19 - 21	20 - 21	130 - 135	367 - 392	141 - 156	52 - 56	86 - 90	9 - 11	13 - 21	14 - 16	35 - 37
	2.25	131 - 137	287 - 306	119 - 134	76 - 80	50 - 54	10 - 13	10 - 12	13 - 14	20 - 21	139 - 144	375 - 402	141 - 156	56 - 60	88 - 92	10 - 11	13 - 20	10 - 12	37 - 38
	3.0	131 - 136	275 - 294	115 - 130	75 - 79	50 - 54	10 - 13	9 - 11	9 -11	20 - 21	145 - 149	380 - 407	141 - 156	58 - 62	90 - 94	10 - 11	13 - 19	8 - 9	38 - 39
90	1.5	137 - 144	400 - 420	147 - 162	98 - 102	53 - 57	8 - 10	13 - 16	19 - 20	19 - 20	164 - 169	401 - 430	143 - 158	65 - 69	94 - 98	10 - 13	13 - 17	18 - 20	41 - 43
	2.25	135 - 142	373 - 395	141 - 156	96 - 100	53 - 57	9 - 11	10 - 12	12 - 14	19 - 20	175 - 178	411 - 442	143 - 158	70 - 74	99 - 103	12 - 16	14 - 17	12 - 14	43 - 45
	3.0	135 - 141	359 - 383	136 - 151	95 - 99	54 - 58	9 - 12	9 - 11	9 - 10	19 - 20	179 - 187	415 - 455	143 - 158	73 - 77	101 - 105	13 - 18	14 - 16	9 - 11	44 - 46
100	1.5	139 - 147	448 - 471	158 - 173	107 - 111	55 - 59	8 - 9	13 - 16	18 - 20	18 - 19									
	2.25	138 - 146	420 - 445	152 - 167	105 - 109	54 - 58	8 - 10	11 - 13	12 - 13	18 - 19									
	3.0	138 - 146	405 - 432	148 - 163	105 - 109	55 - 59	8 - 10	10 - 11	9 - 10	18 - 19									
120	1.5	144 - 153	549 - 583	181 - 196	126 - 130	57 - 61	7 - 8	15 - 17	17 - 19	17 - 18									
	2.25	143 - 153	525 - 557	175 - 190	125 - 129	57 - 61	7 - 8	12 - 14	11 - 13	17 - 18									
	3.0	143 - 152	511 - 543	176 - 191	124 - 128	56 - 60	8 - 9	11 - 13	9 - 10	17 - 18									

Unit Operating Pressures and Temperatures, Cont'd.

Table 14C: TSM/TSL15

Entering Water Temp °F	Water Flow GPM	Cooling									Heating								
		Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
20	1.5																		
	2.25																		
	3.0										60 - 63	289 - 306	154 - 169	14 - 18	74 - 78	9 - 12	8 - 17	3 - 4	20 - 22
30	1.5	122 - 125	197 - 204	105 - 120	38 - 42	46 - 50	13 - 16	15 - 20	20 - 24	22 - 23	67 - 71	297 - 315	150 - 165	20 - 24	76 - 80	10 - 12	9 - 18	8 - 9	22 - 23
	2.25	116 - 119	177 - 184	116 - 131	34 - 38	41 - 45	17 - 19	15 - 18	13 - 16	21 - 22	71 - 75	301 - 321	149 - 164	22 - 26	76 - 80	10 - 12	10 - 19	6 - 7	23 - 24
	3.0	112 - 115	168 - 173	113 - 128	36 - 40	36 - 40	19 - 21	14 - 18	10 - 12	21 - 22	74 - 76	303 - 323	149 - 164	23 - 27	76 - 80	11 - 13	10 - 19	4 - 5	23 - 25
50	1.5	128 - 134	240 - 252	114 - 129	61 - 65	49 - 53	11 - 14	13 - 16	20 - 22	21 - 22	97 - 102	333 - 355	148 - 163	36 - 40	80 - 84	9 - 11	13 - 21	11 - 12	29 - 30
	2.25	122 - 131	219 - 233	117 - 132	57 - 61	47 - 51	12 - 17	12 - 16	13 - 15	21 - 22	104 - 108	339 - 361	148 - 163	38 - 42	80 - 84	9 - 11	13 - 21	8 - 9	30 - 31
	3.0	119 - 129	209 - 224	117 - 132	57 - 61	44 - 48	13 - 18	11 - 15	10 - 11	21 - 22	107 - 122	342 - 369	149 - 164	39 - 43	80 - 84	9 - 11	13 - 20	6 - 7	31 - 32
70	1.5	132 - 139	311 - 329	128 - 143	82 - 86	53 - 57	9 - 12	12 - 15	19 - 21	20 - 21	130 - 135	367 - 392	148 - 163	48 - 52	85 - 89	9 - 11	13 - 21	14 - 16	35 - 37
	2.25	131 - 137	287 - 306	126 - 141	79 - 83	51 - 55	10 - 13	10 - 12	13 - 14	20 - 21	139 - 144	375 - 402	149 - 164	51 - 55	86 - 90	10 - 11	13 - 20	10 - 12	37 - 38
	3.0	131 - 136	275 - 294	126 - 141	78 - 82	51 - 55	10 - 13	9 - 11	9 -11	20 - 21	145 - 149	380 - 407	150 - 165	52 - 56	86 - 90	10 - 11	13 - 19	8 - 9	38 - 39
90	1.5	137 - 144	400 - 420	147 - 162	101 - 105	56 - 60	8 - 10	13 - 16	19 - 20	19 - 20	164 - 169	401 - 430	152 - 167	59 - 63	91 - 95	10 - 13	13 - 17	18 - 20	41 - 43
	2.25	135 - 142	373 - 395	142 - 157	99 - 103	55 - 59	9 - 11	10 - 12	12 - 14	19 - 20	175 - 178	411 - 442	154 - 169	62 - 66	92 - 96	12 - 16	14 - 17	12 - 14	43 - 45
	3.0	135 - 141	359 - 383	142 - 157	98 - 102	55 - 59	9 - 12	9 - 11	9 - 10	19 - 20	179 - 187	415 - 455	155 - 170	64 - 68	92 - 96	13 - 18	14 - 16	9 - 11	44 - 46
100	1.5	139 - 147	448 - 471	158 - 173	110 - 114	57 - 61	8 - 9	13 - 16	18 - 20	18 - 19									
	2.25	138 - 146	420 - 445	153 - 168	109 - 103	57 - 61	8 - 10	11 - 13	12 - 13	18 - 19									
	3.0	138 - 146	405 - 432	152 - 167	107 - 101	56 - 60	8 - 10	10 - 11	9 - 10	18 - 19									
120	1.5	144 - 153	549 - 583	185 - 200	128 - 132	59 - 63	7 - 8	15 - 17	17 - 19	17 - 18									
	2.25	143 - 153	525 - 557	180 - 195	127 - 131	59 - 63	7 - 8	12 - 14	11 - 13	17 - 18									
	3.0	143 - 152	511 - 543	177 - 192	127 - 131	57 - 61	8 - 9	11 - 13	9 - 10	17 - 18									

Table 14D: TSM/TSL18

Entering Water Temp °F	Water Flow GPM	Cooling									Heating								
		Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
20	1.5																		
	2.25																		
	3.0										60 - 63	289 - 306	154 - 169	14 - 18	74 - 78	9 - 12	8 - 17	3 - 4	20 - 22
30	1.5	122 - 125	197 - 204	105 - 120	38 - 42	46 - 50	13 - 16	15 - 20	20 - 24	22 - 23	67 - 71	297 - 315	150 - 165	20 - 24	76 - 80	10 - 12	9 - 18	8 - 9	22 - 23
	2.25	116 - 119	177 - 184	116 - 131	34 - 38	41 - 45	17 - 19	15 - 18	13 - 16	21 - 22	71 - 75	301 - 321	149 - 164	22 - 26	76 - 80	10 - 12	10 - 19	6 - 7	23 - 24
	3.0	112 - 115	168 - 173	113 - 128	36 - 40	36 - 40	19 - 21	14 - 18	10 - 12	21 - 22	74 - 76	303 - 323	149 - 164	23 - 27	76 - 80	11 - 13	10 - 19	4 - 5	23 - 25
50	1.5	128 - 134	240 - 252	114 - 129	61 - 65	49 - 53	11 - 14	13 - 16	20 - 22	21 - 22	97 - 102	333 - 355	148 - 163	36 - 40	80 - 84	9 - 11	13 - 21	11 - 12	29 - 30
	2.25	122 - 131	219 - 233	117 - 132	57 - 61	47 - 51	12 - 17	12 - 16	13 - 15	21 - 22	104 - 108	339 - 361	148 - 163	38 - 42	80 - 84	9 - 11	13 - 21	8 - 9	30 - 31
	3.0	119 - 129	209 - 224	117 - 132	57 - 61	44 - 48	13 - 18	11 - 15	10 - 11	21 - 22	107 - 122	342 - 369	149 - 164	39 - 43	80 - 84	9 - 11	13 - 20	6 - 7	31 - 32
70	1.5	132 - 139	311 - 329	128 - 143	82 - 86	53 - 57	9 - 12	12 - 15	19 - 21	20 - 21	130 - 135	367 - 392	148 - 163	48 - 52	85 - 89	9 - 11	13 - 21	14 - 16	35 - 37
	2.25	131 - 137	287 - 306	126 - 141	79 - 83	51 - 55	10 - 13	10 - 12	13 - 14	20 - 21	139 - 144	375 - 402	149 - 164	51 - 55	86 - 90	10 - 11	13 - 20	10 - 12	37 - 38
	3.0	131 - 136	275 - 294	126 - 141	78 - 82	51 - 55	10 - 13	9 - 11	9 -11	20 - 21	145 - 149	380 - 407	150 - 165	52 - 56	86 - 90	10 - 11	13 - 19	8 - 9	38 - 39
90	1.5	137 - 144	400 - 420	147 - 162	101 - 105	56 - 60	8 - 10	13 - 16	19 - 20	19 - 20	164 - 169	401 - 430	152 - 167	59 - 63	91 - 95	10 - 13	13 - 17	18 - 20	41 - 43
	2.25	135 - 142	373 - 395	142 - 157	99 - 103	55 - 59	9 - 11	10 - 12	12 - 14	19 - 20	175 - 178	411 - 442	154 - 169	62 - 66	92 - 96	12 - 16	14 - 17	12 - 14	43 - 45
	3.0	135 - 141	359 - 383	142 - 157	98 - 102	55 - 59	9 - 12	9 - 11	9 - 10	19 - 20	179 - 187	415 - 455	155 - 170	64 - 68	92 - 96	13 - 18	14 - 16	9 - 11	44 - 46
100	1.5	139 - 147	448 - 471	158 - 173	110 - 114	57 - 61	8 - 9	13 - 16	18 - 20	18 - 19									
	2.25	138 - 146	420 - 445	153 - 168	109 - 103	57 - 61	8 - 10	11 - 13	12 - 13	18 - 19									
	3.0	138 - 146	405 - 432	152 - 167	107 - 101	56 - 60	8 - 10	10 - 11	9 - 10	18 - 19									
120	1.5	144 - 153	549 - 583	185 - 200	128 - 132	59 - 63	7 - 8	15 - 17	17 - 19	17 - 18									
	2.25	143 - 153	525 - 557	180 - 195	127 - 131	59 - 63	7 - 8	12 - 14	11 - 13	17 - 18									
	3.0	143 - 152	511 - 543	177 - 192	127 - 131	57 - 61	8 - 9	11 - 13	9 - 10	17 - 18									

Table 14E: TSM/TSL24

Entering Water Temp °F	Water Flow GPM	Cooling									Heating								
		Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
20	1.5																		
	2.25																		
	3.0										60 - 63	289 - 306	145 - 160	15 - 19	74 - 78	9 - 12	8 - 17	3 - 4	20 - 22
30	1.5	122 - 125	197 - 204	78 - 93	35 - 39	46 - 50	13 - 16	15 - 20	20 - 24	22 - 23	67 - 71	297 - 315	145 - 160	21 - 25	75 - 79	10 - 12	9 - 18	8 - 9	22 - 23
	2.25	116 - 119	177 - 184	76 - 91	38 - 42	45 - 49	17 - 19	15 - 18	13 - 16	21 - 22	71 - 75	301 - 321	144 - 159	22 - 26	75 - 79	10 - 12	10 - 19	6 - 7	23 - 24
	3.0	112 - 115	168 - 173	94 - 109	37 - 41	39 - 43	19 - 21	14 - 18	10 - 12	21 - 22	74 - 76	303 - 323	144 - 159	23 - 27	76 - 80	11 - 13	10 - 19	4 - 5	23 - 25
50	1.5	128 - 134	240 - 252	98 - 113	57 - 61	50 - 54	11 - 14	13 - 16	20 - 22	21 - 22	97 - 102	333 - 355	142 - 157	38 - 42	81 - 85	9 - 11	13 - 21	11 - 12	29 - 30
	2.25	122 - 131	219 - 233	94 - 109	56 - 60	49 - 53	12 - 17	12 - 16	13 - 15	21 - 22	104 - 108	339 - 361	142 - 157	40 - 44	82 - 86	9 - 11	13 - 21	8 - 9	30 - 31
	3.0	119 - 129	209 - 224	99 - 114	56 - 60	47 - 51	13 - 18	11 - 15	10 - 11	21 - 22	107 - 122	342 - 369	142 - 157	42 - 46	82 - 86	9 - 11	13 - 20	6 - 7	31 - 32
70	1.5	132 - 139	311 - 329	120 - 135	77 - 81	53 - 57	9 - 12	12 - 15	19 - 21	20 - 21	130 - 135	367 - 392	144 - 159	53 - 57	88 - 92	9 - 11	13 - 21	14 - 16	35 - 37
	2.25	131 - 137	287 - 306	115 - 130	76 - 80	53 - 57	10 - 13	10 - 12	13 - 14	20 - 21	139 - 144	375 - 402	145 - 160	56 - 60	90 - 94	10 - 11	13 - 20	10 - 12	37 - 38
	3.0	131 - 136	275 - 294	113 - 128	76 - 80	53 - 57	10 - 13	9 - 11	9 -11	20 - 21	145 - 149	380 - 407	146 - 161	57 - 61	90 - 94	10 - 11	13 - 19	8 - 9	38 - 39
90	1.5	137 - 144	400 - 420	145 - 160	97 - 101	56 - 60	8 - 10	13 - 16	19 - 20	19 - 20	164 - 169	401 - 430	145 - 160	68 - 72	98 - 102	10 - 13	13 - 17	18 - 20	41 - 43
	2.25	135 - 142	373 - 395	140 - 155	95 - 99	53 - 57	9 - 11	10 - 12	12 - 14	19 - 20	175 - 178	411 - 442	147 - 162	71 - 75	100 - 104	12 - 16	14 - 17	12 - 14	43 - 45
	3.0	135 - 141	359 - 383	135 - 150	94 - 98	57 - 61	9 - 12	9 - 11	9 - 10	19 - 20	179 - 187	415 - 455	148 - 163	73 - 77	101 - 105	13 - 18	14 - 16	9 - 11	44 - 46
100	1.5	139 - 147	448 - 471	159 - 174	106 - 110	57 - 61	8 - 9	13 - 16	18 - 20	18 - 19									
	2.25	138 - 146	420 - 445	153 - 168	104 - 108	56 - 60	8 - 10	11 - 13	12 - 13	18 - 19									
	3.0	138 - 146	405 - 432	149 - 164	104 - 108	57 - 61	8 - 10	10 - 11	9 - 10	18 - 19									
120	1.5	144 - 153	549 - 583	188 - 203	123 - 127	58 - 62	7 - 8	15 - 17	17 - 19	17 - 18									
	2.25	143 - 153	525 - 557	183 - 198	122 - 126	58 - 62	7 - 8	12 - 14	11 - 13	17 - 18									
	3.0	143 - 152	511 - 543	183 - 198	122 - 126	57 - 61	8 - 9	11 - 13	9 - 10	17 - 18									

Unit Operating Pressures and Temperatures, Cont'd.

Table 14F: TSM/TSL30

Entering Water Temp °F	Water Flow GPM	Cooling									Heating								
		Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
20	1.5																		
	2.25																		
	3.0										63 - 67	289 - 306	160 - 175	14 - 18	89 - 93	9 - 12	4 - 6	3 - 4	18 - 20
30	1.5	116 - 118	160 - 165	102 -117	42 - 46	46 - 50	13 - 16	14 - 16	18 - 20	22 - 23	72 - 75	297 - 315	157 - 172	19 - 23	90 - 94	10 - 12	4 - 6	7 - 9	19 - 20
	2.25	113 - 116	150 - 155	115 - 130	37 - 41	43 - 47	17 - 19	14 - 16	11 - 13	21 - 22	75 - 78	301 - 321	156 - 171	21 - 25	91 - 95	10 - 12	4 - 6	6 - 7	20 - 22
	3.0	104 - 107	145 - 150	117 - 132	36 - 40	39 - 43	19 - 21	14 - 16	9 - 11	19 - 21	78 - 82	303 - 323	155 - 170	23 - 27	91 - 95	11 - 13	4 - 6	4 - 5	20 - 22
50	1.5	128 - 132	215 - 225	111 - 126	63 - 67	50 - 54	15 - 18	13 - 16	20 - 22	21 - 22	104 - 110	333 - 355	150 - 165	35 - 39	96 - 100	9 - 11	6 - 7	10 - 11	26 - 28
	2.25	122 - 127	200 - 210	115 - 130	59 - 63	48 - 52	19 - 21	11 - 14	11 - 13	21 - 22	108 - 114	336 - 358	150 - 165	38 - 42	97 - 101	11 - 13	6 - 7	8 - 9	26 - 28
	3.0	119 - 125	195 - 205	116 - 131	57 - 61	46 - 50	18 - 20	12 - 15	9 - 11	21 - 22	107 - 113	333 - 355	150 - 165	39 - 43	97 - 101	9 - 11	6 - 7	6 - 7	26 - 28
70	1.5	132 - 139	293 - 303	127 - 142	82 - 86	54 - 58	9 - 12	10 - 12	18 - 20	20 - 21	132 - 137	359 - 369	150 - 165	49 - 53	103 - 107	12 - 14	6 - 7	14 - 16	32 - 34
	2.25	131 - 136	273 - 283	124 - 139	80 - 84	53 - 57	10 - 13	9 - 11	12 - 14	20 - 21	139 - 144	366 - 376	151 - 166	52 - 56	104 - 108	14 - 16	6 - 7	10 - 12	32 - 34
	3.0	132 - 137	263 - 273	124 - 139	78 - 82	52 - 56	13 - 15	9 - 11	9 - 11	20 - 21	144 - 148	374 - 384	153 - 168	53 - 57	105 - 109	14 - 16	6 - 7	8 - 9	32 - 34
90	1.5	137 - 144	358 - 368	149 - 164	101 - 105	57 - 61	10 - 11	10 - 12	16 - 18	19 - 20	164 - 169	395 - 405	160 - 175	57 - 61	106 - 110	20-24	7 - 8	16	35 - 37
	2.25	136 - 142	335 - 345	142 - 157	99 - 103	56 - 60	9 - 11	10 - 12	12 - 14	19 - 20	173 - 178	403 - 413	164 - 179	59 - 63	107 - 111	22-26	8 - 9	10 - 12	36 - 38
	3.0	134 - 140	328 - 338	141 - 156	97 -101	56 - 60	10 - 12	9 - 11	9 - 10	19 - 20	179 - 187	415 - 425	166 - 181	60 - 64	107 - 111	24-28	9 - 10	9 - 11	36 - 38
100	1.5	143 - 148	430 - 440	163 - 178	110 - 114	58 - 62	8 - 9	10 - 12	18 - 20	18 - 19									
	2.25	142 - 147	407 - 417	155 - 170	109 - 113	58 - 62	8 - 10	8 - 10	13 - 15	18 - 19									
	3.0	141 - 146	395 - 405	153 - 168	107 - 111	58 - 62	9 - 11	7 - 9	9 - 10	18 - 19									
120	1.5	148 - 152	533 - 543	195 - 210	127 - 131	61 - 65	9 - 11	9 - 11	15 - 17	17 - 18									
	2.25	150 - 155	513 - 523	187 - 202	126 - 130	61 - 65	8 - 10	7 - 9	10 - 12	17 - 18									
	3.0	147 - 152	502 - 512	183 - 198	125 - 129	60 - 64	9 - 11	7 - 9	8 - 10	17 - 18									

Table 14G: TSM/TSL36

Entering Water Temp °F	Water Flow GPM	Cooling									Heating								
		Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Rise °F	Air Temp Drop °F DB	Suction Pressure PSIG	Discharge Pressure PSIG	Discharge Temp °F	LT1 Temp °F	LT2 Temp °F	Super-heat	Sub-cooling	Water Temp Drop °F	Air Temp Rise °F DB
20	1.5																		
	2.25																		
	3.0										63 - 65	289 - 306	157 - 172	15 - 19	89 - 93	8 - 11	2 - 4	3 - 4	15 - 17
30	1.5	121 - 125	197 - 207	100 - 115	41 - 45	44 - 48	14 - 17	15 - 18	17 - 19	20 - 22	69 - 73	295 - 305	153 - 168	20 - 24	90 - 94	8 - 11	2 - 4	8 - 10	20 - 22
	2.25	119 - 123	174 - 184	96 - 111	38 - 42	44 - 48	16 - 19	15 - 18	12 - 14	21 - 23	73 - 76	295 - 305	152 - 167	23 - 27	91 - 95	8 - 11	3 - 5	4 - 6	19 - 22
	3.0	118 - 122	157 - 163	97 - 112	37 - 41	40 - 44	16 - 19	14 - 17	10 - 12	22 - 25	78 - 82	295 - 305	151 - 166	24 - 28	92 - 96	8 - 11	3 - 5	4 - 6	19 - 22
50	1.5	128 - 132	243 - 253	114 - 129	59 - 63	48 - 52	9 - 12	19 - 22	20 - 22	19 - 21	97 - 102	325 - 335	149 - 164	37 - 41	95 - 99	9 - 12	4 - 6	11 - 13	26 - 28
	2.25	126 - 130	226 - 236	108 - 123	57 - 61	47 - 51	9 - 12	16 - 19	15 - 19	22 - 24	104 - 108	329 - 339	149 - 164	39 - 43	96 - 100	8 - 11	4 - 6	10 - 12	17 - 19
	3.0	130 - 134	213 - 223	107 - 122	56 - 60	46 - 50	12 - 15	12 - 15	9 - 11	22 - 24	108 - 112	334 - 344	149 - 164	41 - 45	97 - 101	9 - 12	4 - 6	6 - 8	28 - 30
70	1.5	132 - 136	228 - 238	135 - 150	78 - 82	51 - 55	9 - 12	18 - 21	21 - 23	19 - 21	131 - 136	359 - 369	149 - 164	51 - 55	102 - 106	9 - 12	3 - 5	14 - 16	31 - 33
	2.25	133 - 137	297 - 307	128 - 143	76 - 80	51 - 55	9 - 12	17 - 19	16 - 19	20 - 22	138 - 142	366 - 376	150 - 165	55 - 59	104 - 108	10 - 13	3 - 5	6 - 8	34 - 36
	3.0	132 - 134	287 - 297	125 - 140	75 - 79	51 - 55	10 - 13	14 - 17	9 - 11	21 - 23	144 - 148	374 - 384	151 - 166	57 - 61	105 - 109	10 - 13	3 - 5	8 - 10	35 - 37
90	1.5	137 - 144	400 - 420	163 - 178	96 - 100	55 - 59	8 - 10	13 - 16	19 - 20	19 - 20	164 - 169	395 - 405	153 - 168	64 - 68	110 - 114	10 - 13	3 - 5	18 - 20	39 - 41
	2.25	135 - 142	373 - 395	155 - 170	94 - 98	54 - 58	9 - 11	10 - 12	12 - 14	19 - 20	173 - 178	403 - 413	155 - 170	68 - 72	113 - 117	12 - 15	3 - 5	14 - 16	41 - 43
	3.0	135 - 141	359 - 383	151 - 166	93 - 97	54 - 58	9 - 12	9 - 11	9 - 10	19 - 20	179 - 187	415 - 425	156 - 171	71 - 75	114 - 118	13 - 18	3 - 5	9 - 11	42 - 44
100	1.5	139 - 147	450 - 460	180 - 195	105 - 109	56 - 60	8 - 9	20 - 23	14 - 16	19 - 20									
	2.25	138 - 146	420 - 445	171 - 186	104 - 108	56 - 60	8 - 10	11 - 13	12 - 13	18 - 19									
	3.0	138 - 146	405 - 432	166 - 181	103 - 107	56 - 60	8 - 10	10 - 11	9 - 10	18 - 19									
120	1.5	144 - 153	560 - 590	218 - 233	123 - 127	59 - 63	6 - 8	15 - 17	17 - 19	17 - 18									
	2.25	143 - 153	540 - 560	208 - 223	122 - 126	58 - 62	6 - 8	12 - 14	11 - 13	17 - 18									
	3.0	143 - 152	535 - 565	203 - 218	121 - 125	58 - 62	6 - 8	17 - 20	10 - 12	18 - 19									

Coax Water Pressure Drop

Model	GPM	Pressure Drop, PSI				PD Added for
		30°F	50°F	70°F	90°F	Add for MWV
TSM/L09	1.1	1.2	1.0	0.8	0.7	0.7
	1.7	2.7	1.9	1.8	1.6	1.6
	2.3	4.5	3.1	2.9	2.8	2.6
TSM/L12	1.5	2.1	1.5	1.4	1.3	1.3
	2.3	4.3	3.1	2.9	2.8	2.6
	3.0	7.0	5.1	4.8	4.6	4.4
TSM/L15	1.9	0.6	0.4	0.4	0.3	0.3
	2.8	1.4	0.9	0.8	0.7	0.7
	3.8	2.3	1.4	1.3	1.2	1.1
TSM/L18	2.3	0.6	0.4	0.4	0.4	0.3
	3.4	1.6	1.1	1.0	0.9	0.9
	4.5	2.8	2.0	1.8	1.6	1.5
TSM/L24	3.0	1.0	0.7	0.7	0.6	0.6
	4.5	2.1	1.5	1.4	1.2	1.2
	6.0	3.6	2.4	2.2	2.1	1.9
TSM/L30	3.8	1.3	1.0	0.9	0.8	0.8
	5.6	2.9	2.0	1.9	1.8	1.7
	7.5	5.0	3.4	3.2	3.1	2.8
TSM/L36	4.5	1.8	1.4	1.3	1.1	1.0
	6.8	3.6	2.8	2.5	2.2	2.0
	9.0	5.9	4.5	4.0	3.6	3.3

Start-Up Log Sheet

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

Job Name: _____ **Street Address:** _____
Chassis Model Number: _____ **Serial Number:** _____
Cabinet Model Number: _____ **Serial Number:** _____
Unit Location in Building: _____
Date: _____ **Sales Order No:** _____

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

Fan Motor	Description	Value
PSC	Speed Tap	
CT ECM	Speed Tap	
CV ECM	CFM Setting	

Temperatures: (Circle) F or C **Antifreeze: _____Type: _____%**

Pressures: (Circle) PSIG or kPa

	Cooling Mode	Heating Mode
Temperatures		
Return-Air DB		
Supply-Air DB		
Air Temperature Differential		
Entering Fluid		
Leaving Fluid		
Fluid Temperature Differential		
Units with DXM2 *		
LT1		
LT2		
Discharge Line		
Leaving Air		
Voltages		
Supply at Unit		
Transformer Low Side		
Amps		
Compressor		

Allow unit to run 15 minutes in each mode before taking data.
Do not connect refrigerant gauges during start up unless instructed by ClimateMaster service tech.
*Temperatures can be read with service tool or communicating thermostat.

Preventive Maintenance

Water Coil Maintenance
(Direct ground water applications only)
If the system is installed in an area with a known high mineral content (125 P.P.M. or greater) in the water, it is best to establish a periodic maintenance schedule with the owner so the coil can be checked regularly. Consult the well water applications section of this manual for a more detailed water coil material selection. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. Therefore, 1.5 gpm per ton [2.0 l/m per kW] is recommended as a minimum flow. Minimum flow rate for entering water temperatures below 50°F [10°C] is 2.0 gpm per ton [2.6 l/m per kW].

Water Coil Maintenance
(All other water loop applications)
Generally water coil maintenance is not needed for closed loop systems. However, if the piping is known to have high dirt or debris content, it is best to establish a periodic maintenance schedule with the owner so the water coil can be checked regularly. Dirty installations are typically the result of deterioration of iron or galvanized piping or components in the system. Open cooling towers requiring heavy chemical treatment and mineral buildup through water use can also contribute to higher maintenance. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with both the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. However, flow rates over 3 gpm per ton (3.9 l/m per kW) can produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

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

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

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

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

Fan Motors - All units have lubricated fan motors. Fan motors should never be lubricated unless obvious, dry operation is suspected. Periodic maintenance oiling is not recommended, as it will result in dirt accumulating in the excess oil and cause eventual motor failure. Conduct annual dry operation check and amperage check to ensure amp draw is no more than 10% greater than indicated on serial plate data.

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

Cabinet - Check inside cabinet once a year. Gently brush or vacuum clean if needed. Do not tear insulation, repair with foil tape.

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

All product families have transitioned to CoreMax® high flow service valves. In place of Schrader ports.

The CoreMax® system:
- Permits up to six times higher flow rate to substantially reduce refrigerant recovery and evacuation time
- Maintains compatibility with ¼” flare standard refrigeration hose connections
- Has lower leak rates than the traditional refrigerant valve/access fittings
- Requires a special tool (FasTest - SCFT20A) to replace the valve core without reclaiming, evacuating and recharging the system. The tool can be purchased directly from FasTest or check with your local supply house.

For additional information, please contact our technical service department.

Functional Troubleshooting

CXM	DXM2	Fault	Htg	Clg	Possible Cause	Solution
Y	Y	**Green Status LED Off**	X	X	Main power problems	Check line voltage circuit breaker and disconnect.
						Check for line voltage between L1 and L2 on the contactor.
						Check for 24VAC between R and C on CXM/DXM2
						Check primary/secondary voltage on transformer.
Y	Y	**HP Fault Code 2 High Pressure**		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
						Check water flow adjust to proper flow rate.
				X	Water Temperature out of range in cooling	Bring water temp within design parameters.
			X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
						Check fan motor operation and airflow restrictions.
						Dirty Air Coil- construction dust etc.
						Too high of external static. Check static vs blower table.
			X		Air temperature out of range in heating	Bring return air temp within design parameters.
			X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table.
			X	X	Bad HP Switch	Check switch continuity and operation. Replace.
			X	X	Open water pressure switch (MWV Option)	Reset at 240 PSI, check water pressure. Replace.
Y	Y	**LP/LOC Fault Code 3 Low Pressure / Loss of Charge**	X	X	Insufficient charge	Check for refrigerant leaks
			X		Compressor pump down at start-up	Check charge and start-up water flow.
Y	Y	**LT1 Fault Code 4 Water coil low temperature limit**	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting.
						Plugged strainer or filter. Clean or replace..
						Check water flow adjust to proper flow rate.
			X		Inadequate antifreeze level	Check antifreeze density with hydrometer.
			X		Improper temperature limit setting (30°F vs 10°F [-1°C vs -2°C])	Clip JW3 jumper for antifreeze (10°F [-12°C]) use.
			X		Water Temperature out of range	Bring water temp within design parameters.
			X	X	Bad thermistor	Check temp and impedance correlation per chart
Y	Y	**LT2 Fault Code 5 Air coil low temperature limit**		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace.
						Check fan motor operation and airflow restrictions.
						Too high of external static. Check static vs blower table.
				X	Air Temperature out of range	Too much cold vent air? Bring entering air temp within design parameters.
				X	Improper temperature limit setting (30°F vs 10°F [-1°C vs -12°C])	Normal airside applications will require 30°F [-1°C] only.
			X	X	Bad thermistor	Check temp and impedance correlation per chart.
Y	Y	**Condensate Fault Code 6**	X	X	Blocked drain (Note)	Check for blockage and clean drain.
			X	X	Improper trap	Check trap dimensions and location ahead of vent.
				X	Poor drainage	Check for piping slope away from unit.
						Check slope of unit toward outlet.
						Poor venting. Check vent location.
				X	Moisture on sensor	Check for moisture shorting to air coil.
			X	X	Plugged air filter	Replace air filter.
			x	X	Restricted Return Air Flow	Find and eliminate restriction. Increase return duct and/or grille size.
Y	Y	**Over/Under Voltage Code 7 (Auto resetting)**	X	X	Under Voltage	Check power supply and 24VAC voltage before and during operation.
						Check power supply wire size.
						Check compressor starting. Need hard start kit?
						Check 24VAC and unit transformer tap for correct power supply voltage.
			X	X	Over Voltage	Check power supply voltage and 24VAC before and during operation.
						Check 24VAC and unit transformer tap for correct power supply voltage.
Y	Y	**Unit Performance Sentinel Code 8**	X		Heating Mode LT2>125°F [52°C]	Check for poor air flow or overcharged unit.
				X	Cooling Mode LT1>125°F [52°C] OR LT2< 40ºF [4ºC])	Check for poor water flow, or air flow.
Y	Y	**Swapped Thermistor Code 9**	X	X	LT1 and LT2 swapped	Reverse position of thermistors
N	Y	**ECM Fault - Code 10**	X	X	Blower does not operate	Check blower line voltage
						Check blower low voltage wiring
					Blower operating with incorrect airflow	Wrong unit size selection
						Wrong unit family selection
						Wrong motor size
						Incorrect blower selection
N	Y	**Low Air Coil Pressure Fault (ClimaDry) Code 11**		X	Reduced or no air flow in cooling or ClimaDry	Check for dirty air filter and clean or replace
						Check fan motor operation and airflow restrictions
						Too high of external static - check static vs blower table
					Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
					Bad pressure switch	Check switch continuity and operation - replace
N	Y	**Low Air Coil Temperature Fault - (ClimaDry) Code 12**		X	Reduced airflow in cooling, ClimaDry, or constant fan	Check for dirty air filter and clean or replace
						Check fan motor operation and airflow restrictions
						Too high of external static - check static vs blower table
					Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
					Bad thermistor	Check temp and impedance correlation per chart

Note: TSM has 2 condensate sensors – check cabinet pan and chassis pan for blockage.

Performance Troubleshooting

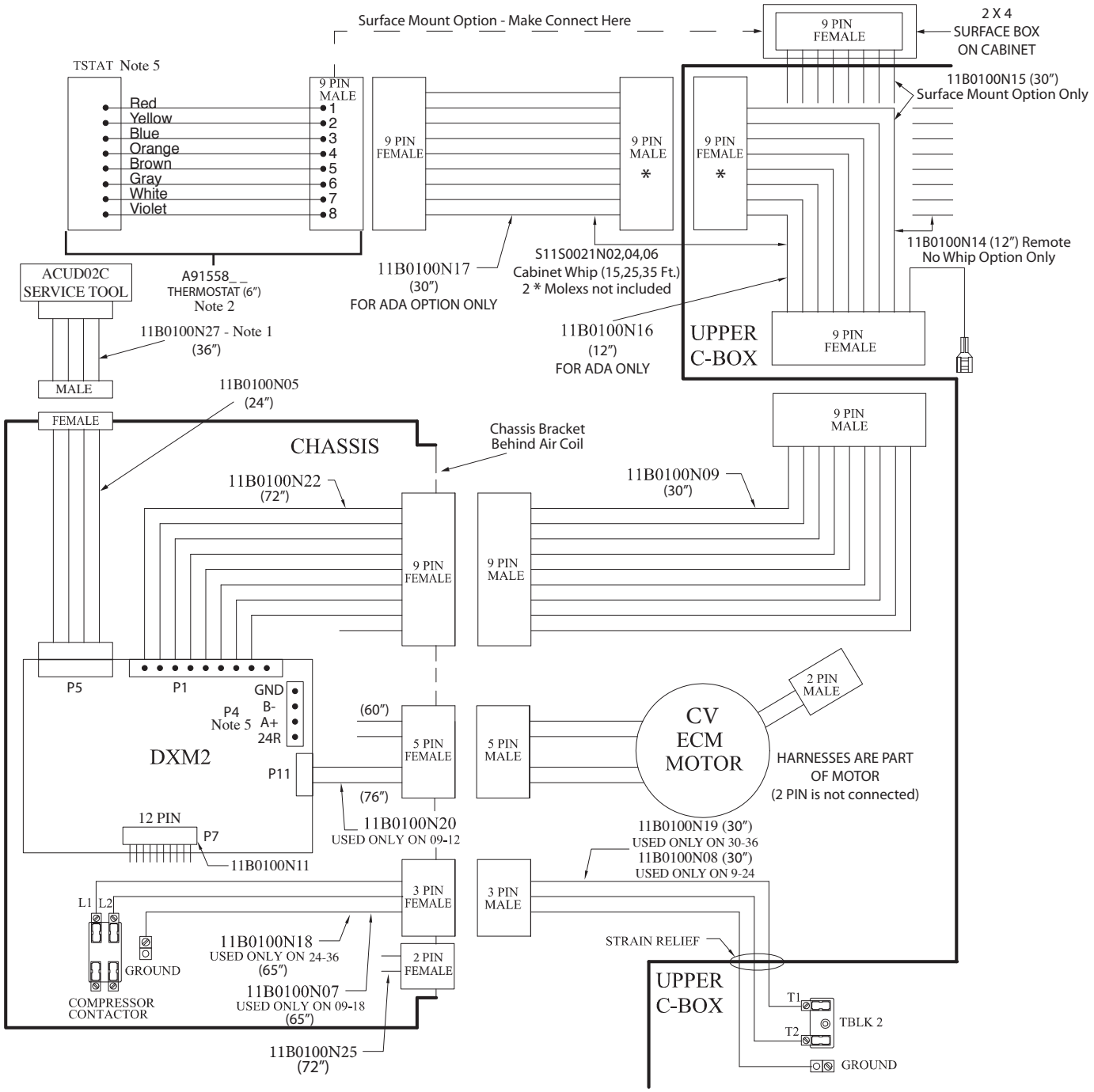
Performance Troubleshooting	Htg	Clg	Possible Cause	Solution
Insufficient capacity/ Not cooling or heating	X	X	Dirty filter	Replace or clean.
	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				Too high of external static. Check static vs. blower table.
	X	X	Leaky duct work	Check supply and return air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present.
	X	X	Low refrigerant charge	Check superheat and subcooling per chart.
	X	X	Restricted metering device	Check superheat and subcooling per chart. Replace.
		X	Defective reversing valve	Perform RV touch test.
	X	X	Thermostat improperly located	Check location and for air drafts behind stat.
	X	X	Unit undersized	Recheck loads & sizing. Check sensible clg. load and heat pump capacity.
	X	X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Inlet water too hot or too cold	Check load, loop sizing, loop backfill, ground moisture.
High Head Pressure	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow. Adjust to proper flow rate.
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture.
	X		Air temperature out of range in heating	Bring return air temperature within design parameters.
		X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Unit overcharged	Check superheat and subcooling. Re-weigh in charge.
	X	X	Non-condensables in system	Vacuum system and re-weigh in charge.
	X	X	Restricted metering device.	Check superheat and subcooling per chart. Replace.
Low Suction Pressure	X		Reduced water flow in heating.	Check pump operation or water valve operation/setting.
				Plugged strainer or filter. Clean or replace.
				Check water flow. Adjust to proper flow rate.
	X		Water temperature out of range.	Bring water temperature within design parameters.
		X	Reduced air flow in cooling.	Check for dirty air filter and clean or replace.
				Check fan motor operation and air flow restrictions.
				Too high of external static. Check static vs. blower table.
		X	Air temperature out of range	Too much cold vent air? Bring entering air temperature within design parameters.
	X	X	Insufficient charge	Check for refrigerant leaks.
Low Discharge Air Temperature in Heating	X		Too high of air flow	Check fan motor speed selection and air flow chart.
	X		Poor performance	See 'Insufficient Capacity'
High humidity		X	Too high of air flow	Check fan motor speed selection and airflow chart.
		X	Unit oversized	Recheck loads & sizing. Check sensible clg load and heat pump capacity.
Modulating Valve Troubleshooting	X	X	Improper output setting	Verify the AO-2 jumper is in the 0-10V position
			No valve output signal	Check DC voltage between AO2 and GND. Should be O when valve is off and between 3.3v and 10v when valve is on.
			No valve operation	Check voltage to the valve
				Replace valve if voltage and control signals are present at the valve and it does not operate

PT ports would not be accessible on high rise units since the chassis and hose are inside the cabinet and unit will not operate properly if opened up.

To check temperature - connect thermocouples to chassis supply and return tubes, close up unit, run unit minimum of 15 minutes.

To check water flow through chassis - with unit off, pull chassis part way out, remove hose on chassis return (right side), connect spare hose to chassis return with other end in bucket or vessel to collect the water, open supply shutoff, time water (longer times will be more accurate) and then shutoff, measure water and calculate GPM, reconnect cabinet hose and reassemble chassis.

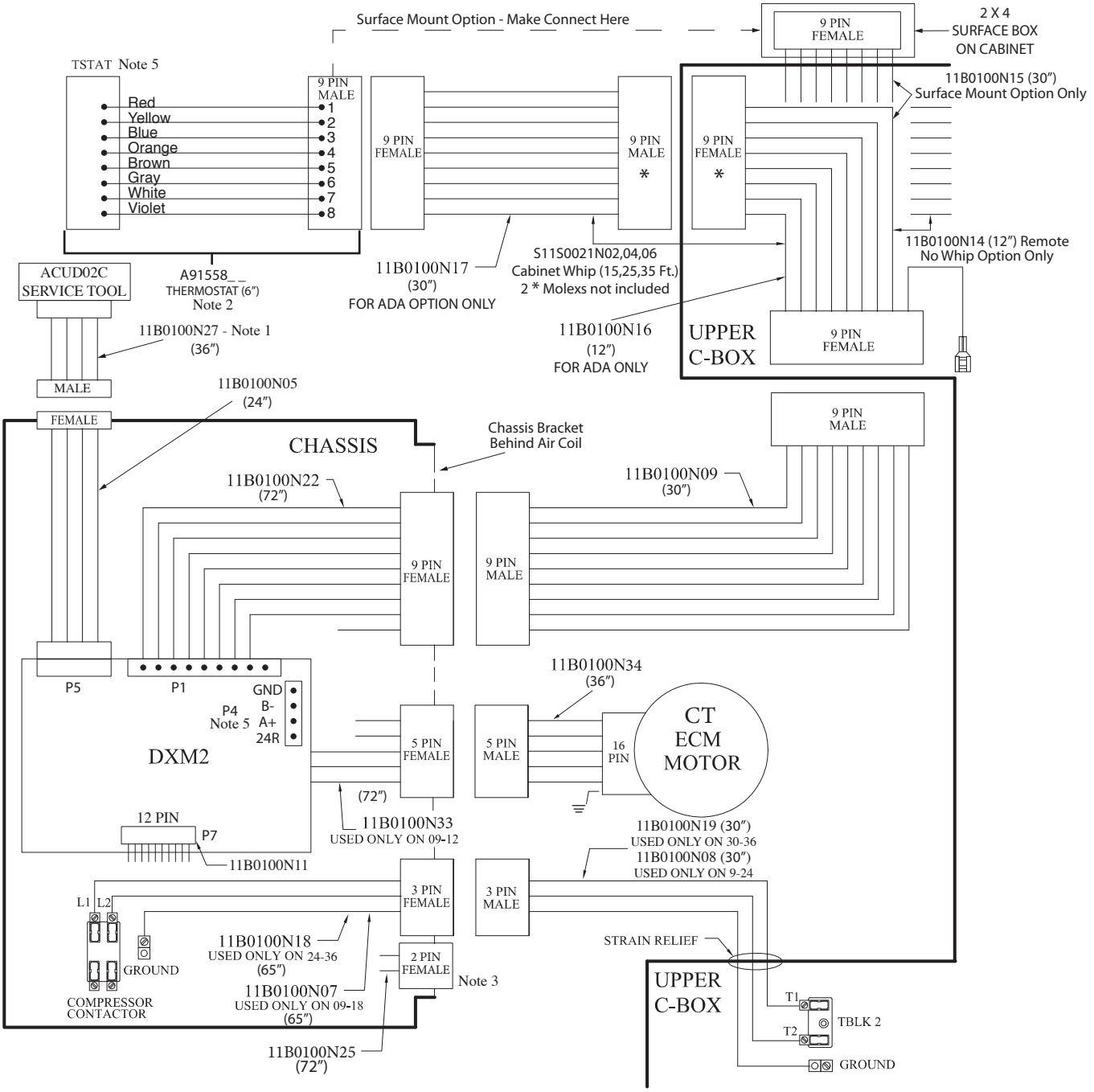
Wire Harnesses for 09-12 ECM-CV Motor
Use for Wire Harness Part Numbers Only



Notes:

1. Remove harness that is on service tool.
2. A91558 - Thermostat connect to ADA Panel, Remote cabinet whip, or Surface box on cabinet. Number of wires will vary.
3. For MPC need 11B0100N24 (in cabinet 12") and 11B0100N23 (connects cabinet to chassis 30")
4. Use unit wire diagram for wire colors and connection points.
5. For T-Stat ATC32U02 or A9155806 and chassis does not have communicating stat option, must move 4 wires at DXM2 P1 to P4 (BRN to GND, WHT to A+, VIO to B-, Red to R). Remaining wires at P1 remove and tape off.

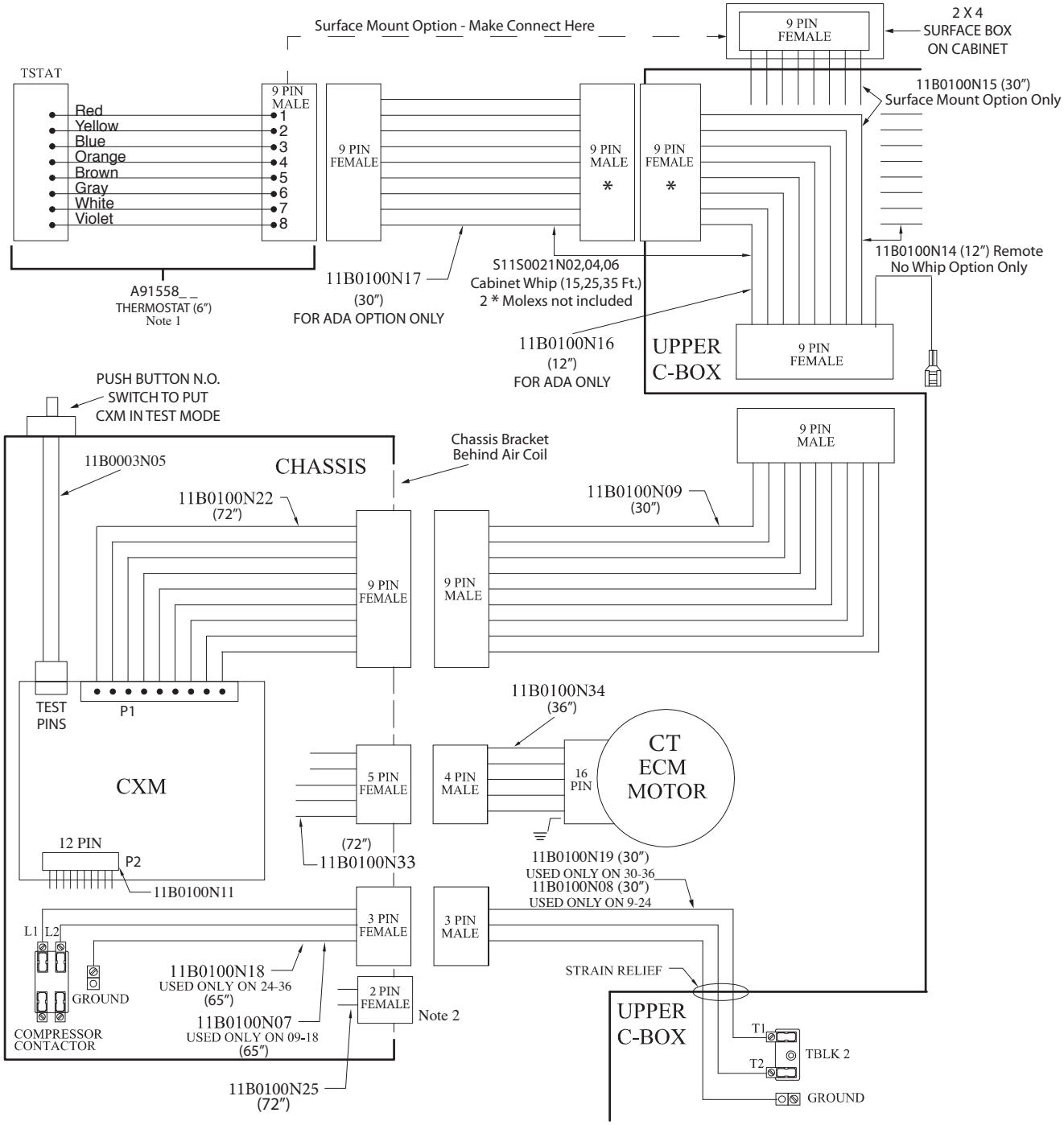
Wire Harnesses for 09-12 ECM-CT w/DXM2
Use for Wire Harness Part Numbers Only



Notes:

1. Remove harness that is on service tool.
2. A91558 - Thermostat connect to ADA Panel, Remote cabinet whip, or Surface box on cabinet. Number of wires will vary.
3. For MPC need 11B0100N24 (in cabinet 12") and 11B0100N23 (connects cabinet to chassis 30")
4. Use unit wire diagram for wire colors and connection points.
5. For T-Stat ATC32U02 or A9155806 and chassis does not have communicating stat option, must move 4 wires at DXM2 P1 to P4 (BRN to GND, WHT to A+, VIO to B-, Red to R). Remaining wires at P1 remove and tape off.

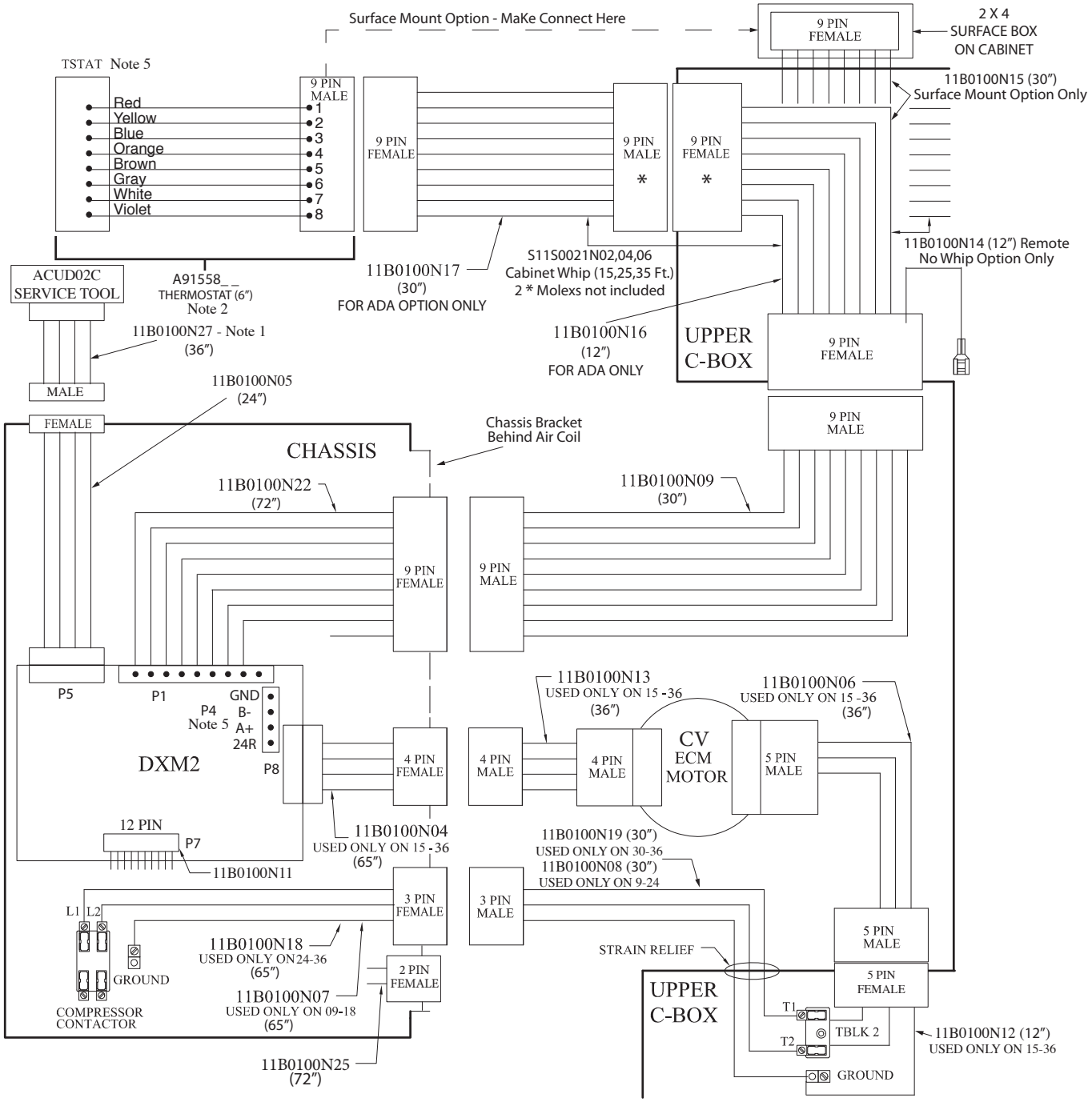
Wire Harnesses for 09-12 ECM-CT Motor w/CXM
Use for Wire Harness Part Numbers Only



Notes:

1. A91558 - Thermostat connect to ADA Panel, Remote cabinet whip, or Surface box on cabinet. Number of wires will vary.
2. For MPC need 11B0100N24 (in cabinet 12") and 11B0100N23 (connects cabinet to chassis 30")
3. Use unit wire diagram for wire colors and connection points.

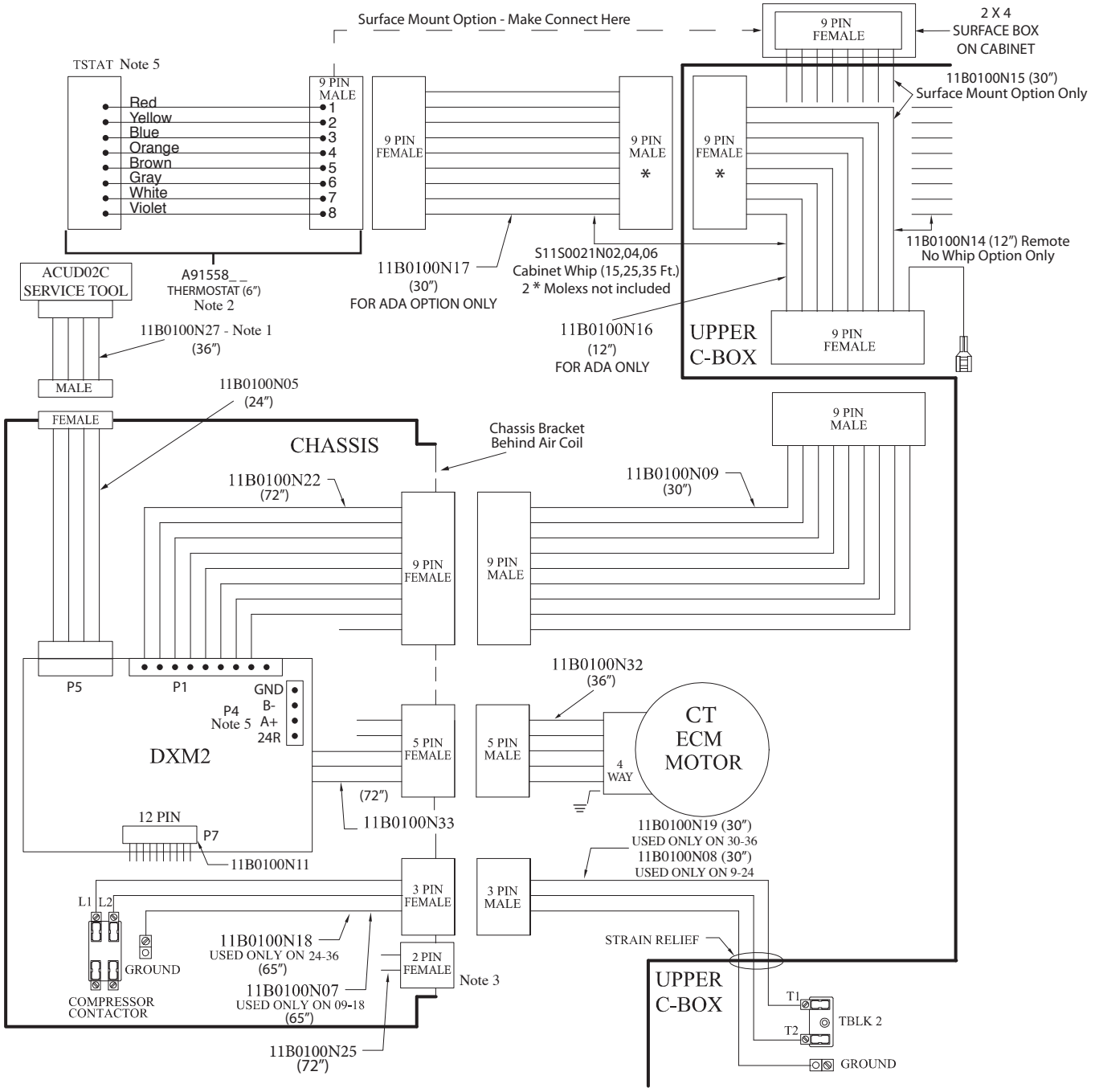
Wire Harness for 15-36 ECM-CV Motor
Use for Wire Harness Part Numbers Only



Notes:

1. Remove harness that is on service tool.
2. A91558 - Thermostat connect to ADA Panel, Remote cabinet whip, or Surface box on cabinet. Number of wires will vary.
3. For MPC need 11B0100N24 (in cabinet 12") and 11B0100N23 (connects cabinet to chassis 30")
4. Use unit wire diagram for wire colors and connection points.
5. For T-Stat ATC32U02 or A9155806 and chassis does not have communicating stat option, must move 4 wires at DXM2 P1 to P4 (BRN to GND, WHT to A+, VIO to B-, Red to R). Remaining wires at P1 remove and tape off.

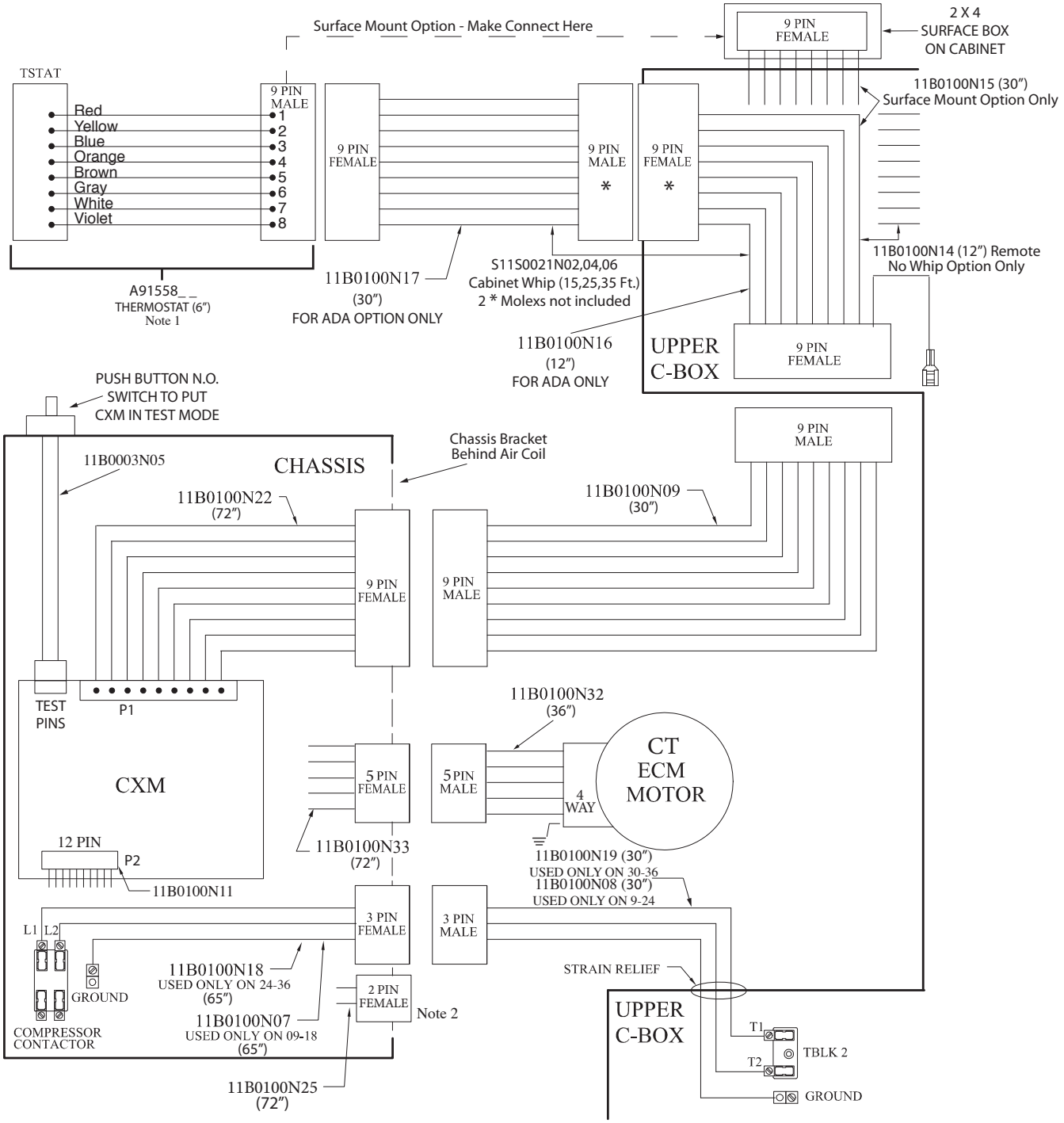
Wire Harnesses for 15-36 ECM-CT Motor w/DXM2
Use for Wire Harness Part Numbers Only



Notes:

1. Remove harness that is on service tool.
2. A91558 - Thermostat connect to ADA Panel, Remote cabinet whip, or Surface box on cabinet. Number of wires will vary.
3. For MPC need 11B0100N24 (in cabinet 12") and 11B0100N23 (connects cabinet to chassis 30")
4. Use unit wire diagram for wire colors and connection points.
5. For T-Stat ATC32U02 or A9155806 and chassis does not have communicating stat option, must move 4 wires at DXM2 P1 to P4 (BRN to GND, WHT to A+, VIO to B-, Red to R). Remaining wires at P1 remove and tape off.

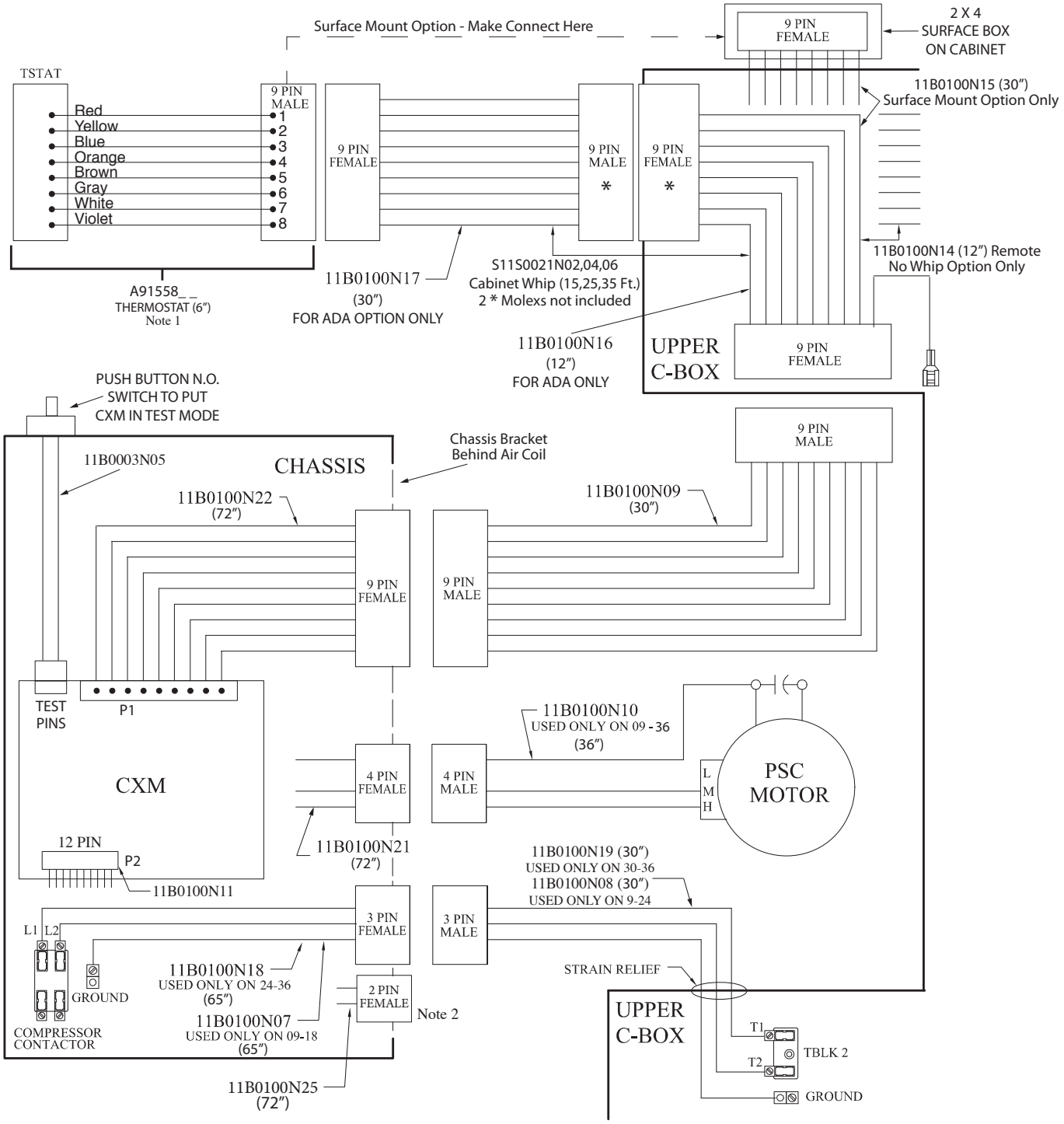
Wire Harnesses for 15-36 ECM-CT Motor w/CXM
Use for Wire Harness Part Numbers Only



Notes:

1. A91558 - Thermostat connect to ADA Panel, Remote cabinet whip, or Surface box on cabinet. Number of wires will vary.
2. For MPC need 11B0100N24 (in cabinet 12") and 11B0100N23 (connects cabinet to chassis 30")
3. Use unit wire diagram for wire colors and connection points.

Wire Harnesses for 09-36 PSC Motor
Use for Wire Harness Part Numbers Only



Notes:

1. A91558 - Thermostat connect to ADA Panel, Remote cabinet whip, or Surface box on cabinet. Number of wires will vary.
2. For MPC need 11B0100N24 (in cabinet 12") and 11B0100N23 (connects cabinet to chassis 30")
3. Use unit wire diagram for wire colors and connection points.

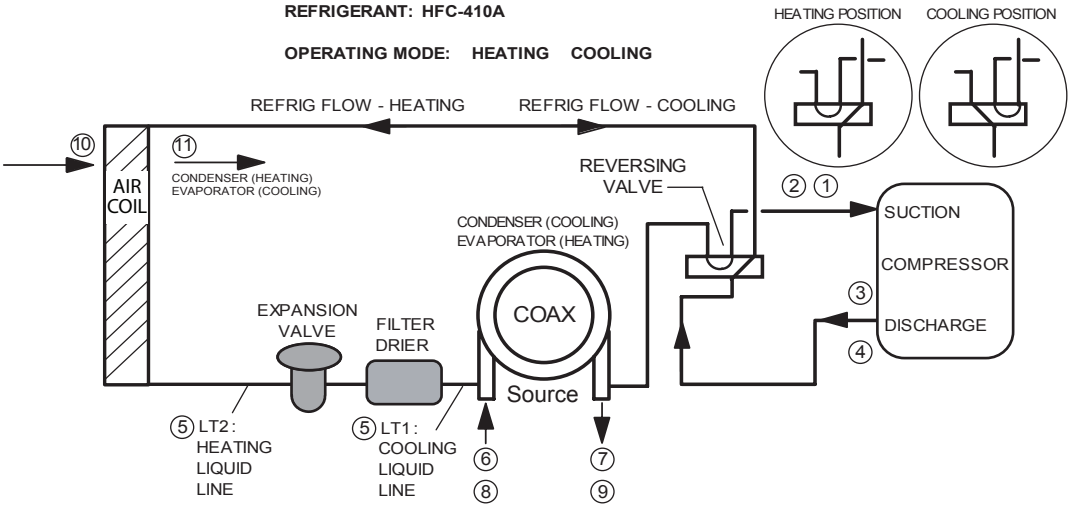
Troubleshooting Form

Water-to-Air Units

Customer: _____ Loop Type: _____ Startup Date: _____

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

Complaint: _____



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

DXM2 - 3, 6, 7, and 10 can be read by service tool.

Heat of Extraction (Absorption) or Heat of Rejection:

HE or HR =

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

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

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

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

Note: Never connect refrigerant gauges during startup procedures. If water-side analysis shows poor performance, refrigerant troubleshooting may be required. Connect refrigerant gauges as a last resort.

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

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

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

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

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

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

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

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

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

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

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

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

Rev.: 11/09

LC083

Notes:

Notes:

Notes:

TSM/TSL Vertical Stack

Rev.: March 24, 2022

Revision History

Date:	Item:	Action:
10/01/21	Pages 37-40	Updated Water Quality Standards table
09/28/21	All	Removed LON Controls
09/07/21	Pages 8, 11, and 12	Added ADA table to AVHSG decoder, Added RA filter dimensions to the physical data tables
05/17/21	Pages 4-6	Fixed return air dust protection labeling error on digit 13 of the cabinet decoders
01/18/21	Page 9	Added Riser Decoder
01/08/21	pg. 55, Figure 16, Added Pages 10-12 - Physical Data	Updated
11/13/20	Combined TSM & TSL Product Installation & Operations Manuals.	ECM blower tables updates. Changed naming convention of master/slave cabinets to leader/follower cabinets. Various text and figure reference updates. New Document Part # created when the two documents were merged
06/15/20	Coax pressure drop table	Updated
03/12/19	Pages 29-35	Updated page header from TSL to TSM
09/26/18	Reduced footprint of sizes 09-12. Introduced ECM-CT w CXM and Flush Return Panel “L”	Updated
07/7/17	Added sweat shutoff and AHU Hoses	updated
04/15/16	Text	Updated
08/26/15	Removed vFlow, Electrical Heat, Revised Electrical Data	Updated
06/24/15	Misc. edits, updated decoders, elec. HT, vFlow, electrical data	Updated
02/25/15	Misc. edits	Updated
12/18/14	Text - Page 56-57	Updated
12/16/14	Misc. edits	Updated
10/31/14	Misc. edits	Updated
09/03/14	Figure 12 - Page 29	Updated
05/12/14	Page 4, 6, 23, 26, 34	Updated

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