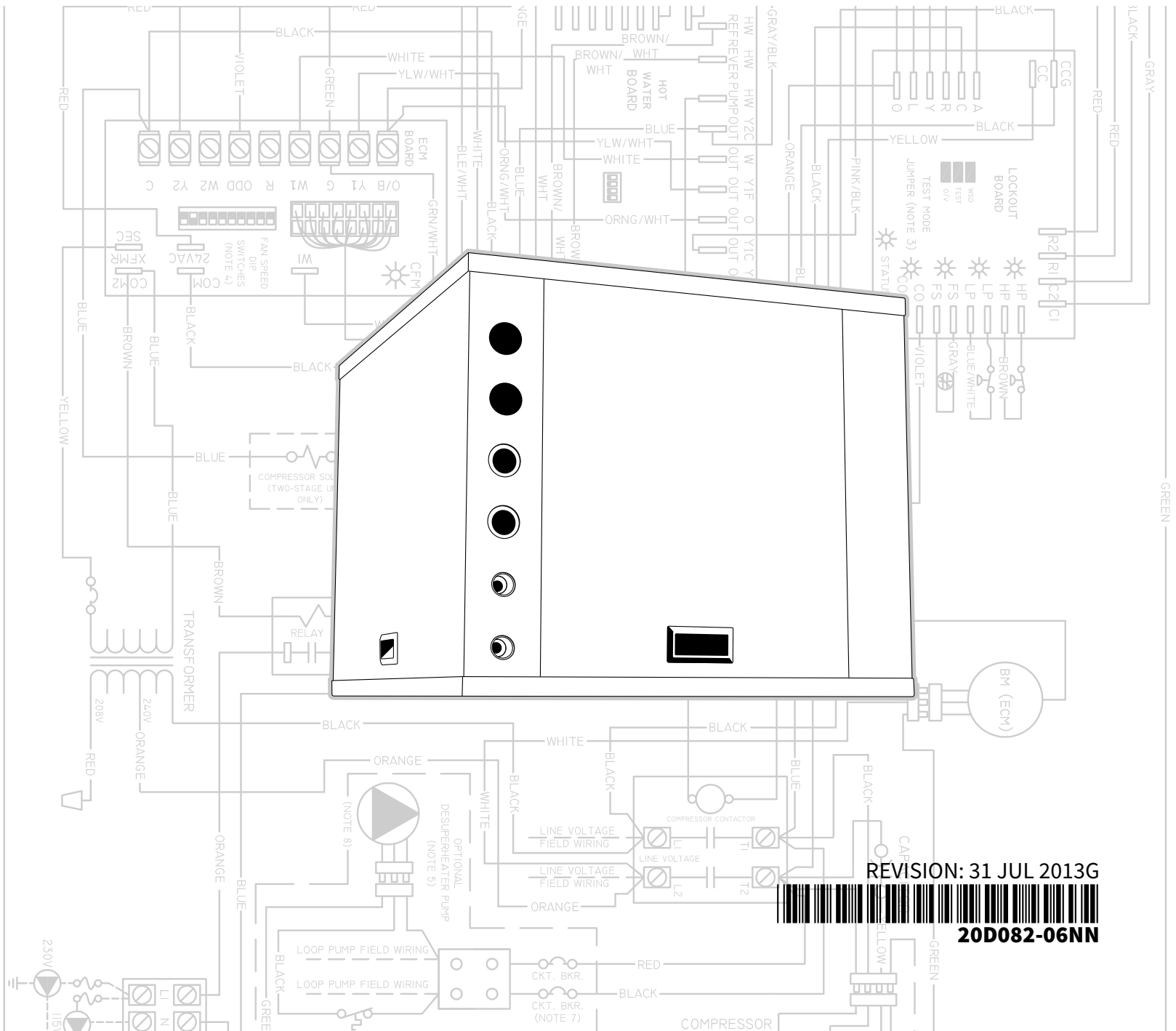
ENERTECH®

Geothermal Made Better®

Engineering Data and Installation Manual

ST MODELS SPLIT SYSTEM WATER-TO-AIR HEAT PUMPS



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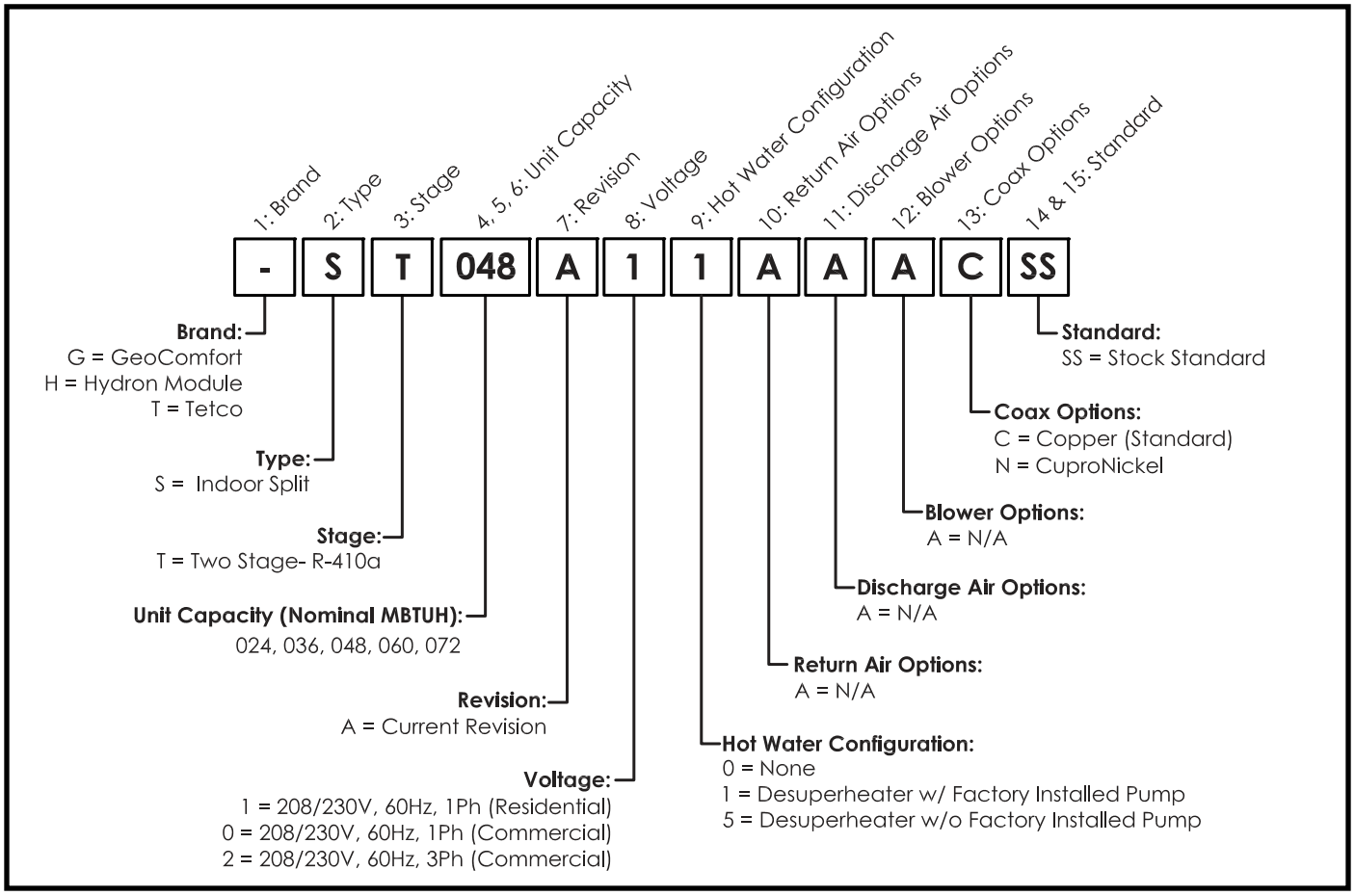
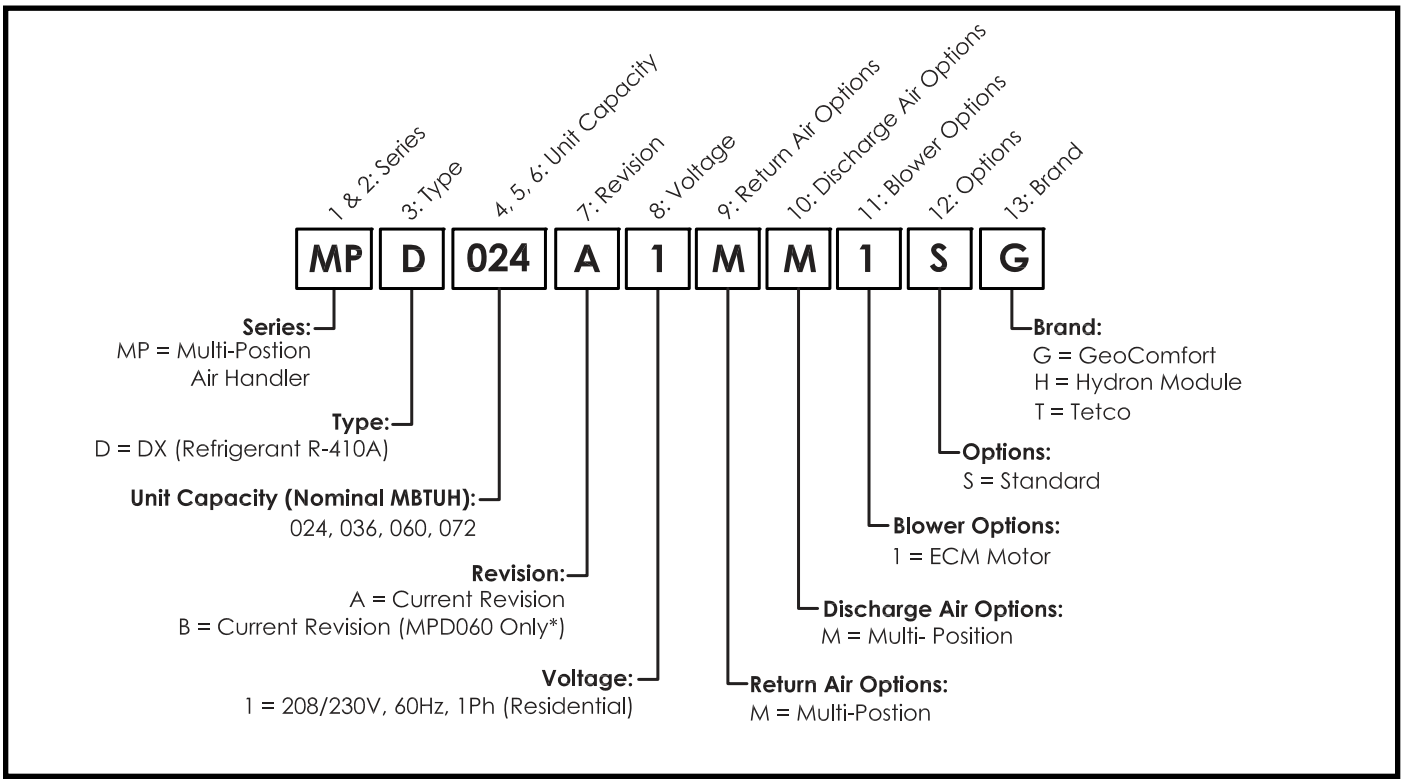
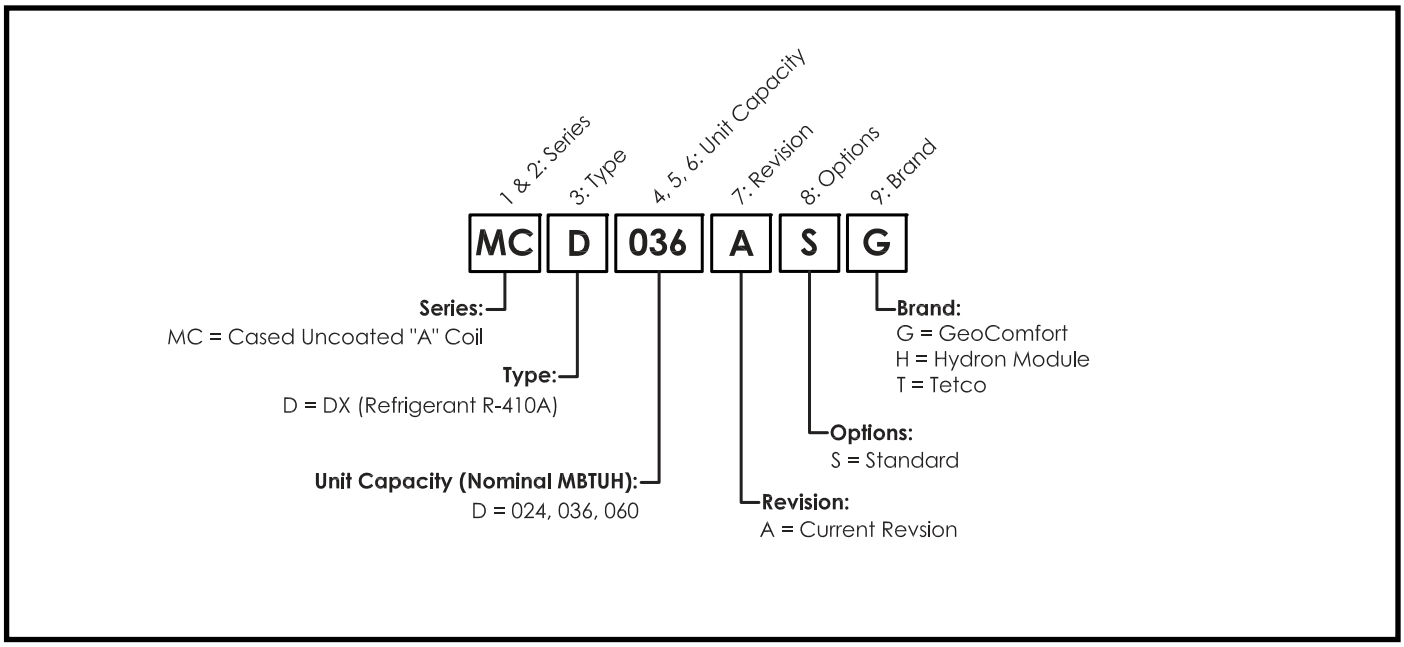


Air Handlers

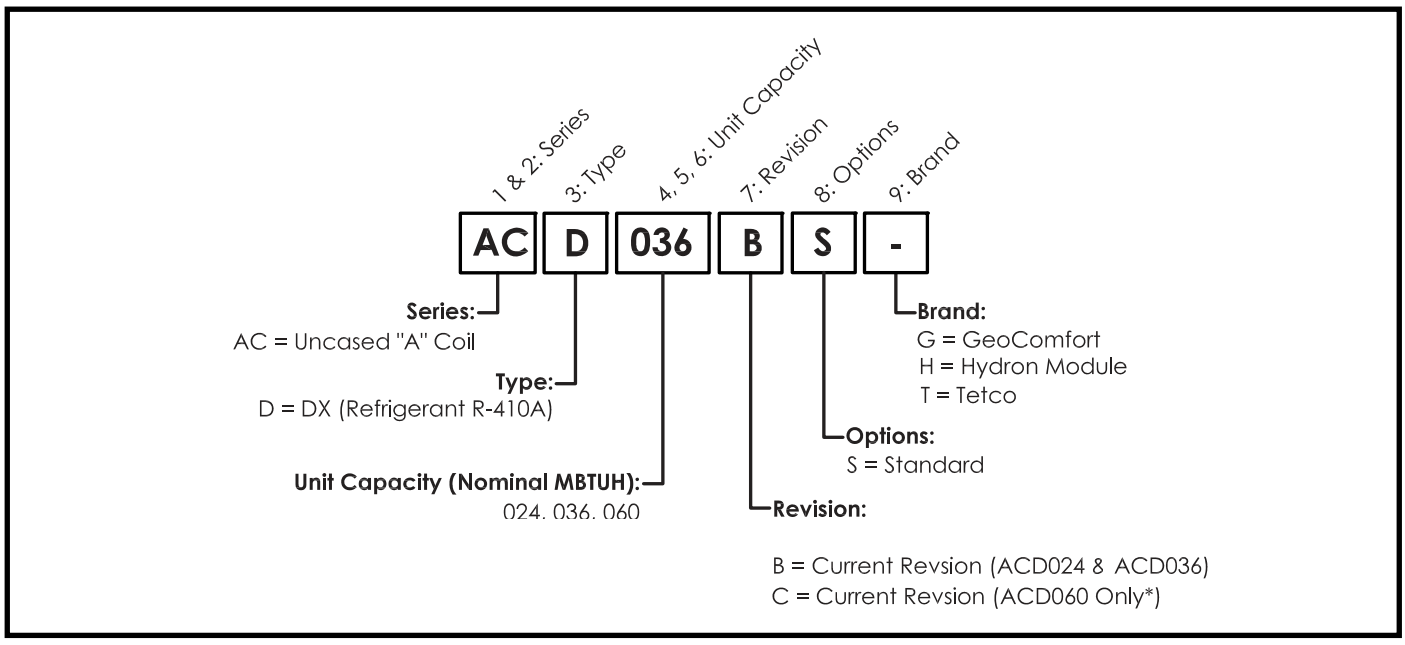


Section 1d: Air Handler/"A" Coil Model Nomenclature

Cased "A" Coils



"A" Coils



Section 2: AHRI Performance Data

Ground Loop Heat Pump

MODEL	CAPACITY	HEATING		COOLING	
		Btu/hr	COP	Btu/hr	EER
ST024	Full Load	18,600	3.4	24,900	16.1
	Part Load	14,400	3.8	18,300	22.1
ST036	Full Load	28,400	3.7	38,000	16.5
	Part Load	22,600	4.2	28,900	23.9
ST048	Full Load	35,900	3.8	48,600	18.7
	Part Load	27,900	4.2	39,400	26.4
ST060	Full Load	44,200	3.5	62,200	16.8
	Part Load	34,700	3.9	47,400	22.5
ST072	Full Load	51,200	3.4	67,800	15.9
	Part Load	41,500	3.7	53,700	22.1

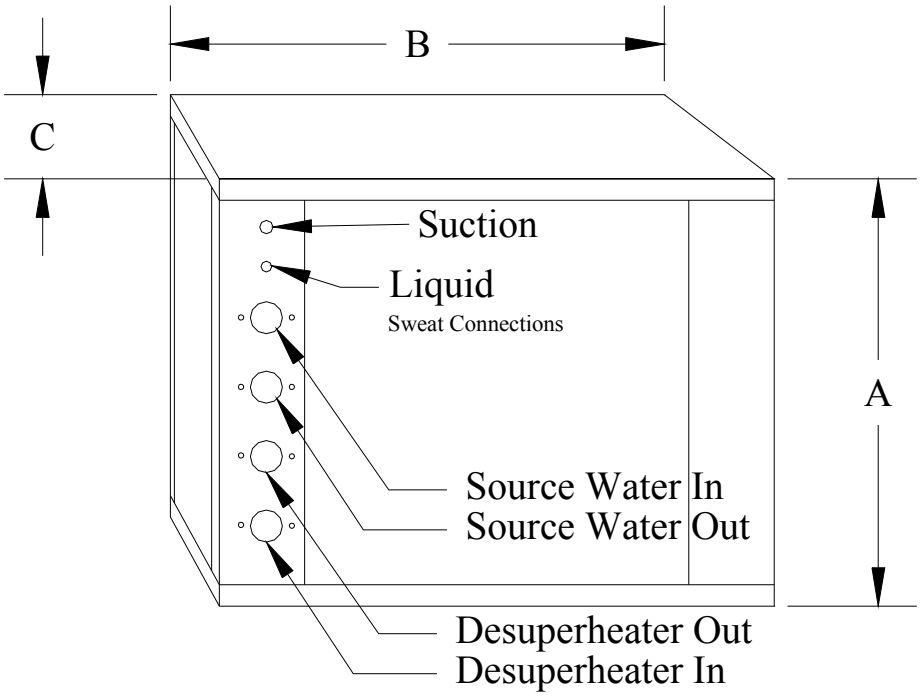
Note:
Rated in accordance with ISO Standard 13256-1 which includes Pump Penalties.
Heating capacities based on 68.0°F DB, 59.0°F WB entering air temperature.
Cooling capacities based on 80.6°F DB, 66.2°F WB entering air temperature.
Entering water temperatures Full Load: 32°F heating / 77°F cooling.
Entering water temperatures Part Load: 41°F heating / 68°F cooling.

Ground Water Heat Pump

MODEL	CAPACITY	HEATING		COOLING	
		Btu/hr	COP	Btu/hr	EER
ST024	Full Load	23,500	4.2	26,900	20.8
	Part Load	16,200	4.1	19,100	26.8
ST036	Full Load	36,400	4.4	40,600	21.9
	Part Load	25,600	4.8	30,100	28.8
ST048	Full Load	44,600	4.5	53,200	24.0
	Part Load	31,800	4.9	40,900	30.5
ST060	Full Load	55,400	4.1	65,900	21.0
	Part Load	39,400	4.4	49,100	26.3
ST072	Full Load	63,700	4.1	71,700	20.2
	Part Load	46,700	4.1	55,600	26.0

Note:
Rated in accordance with ISO Standard 13256-1 which includes Pump Penalties.
Heating capacities based on 68.0°F DB, 59.0°F WB entering air temperature.
Cooling capacities based on 80.6°F DB, 66.2°F WB entering air temperature.
Entering water temperatures: 50°F heating / 59°F cooling.
*ST072 with ACD060C does not qualify for ENERGY STAR on Ground Water Ratings

Section 3a: Unit Dimensional and Physical Data



Model	Dimensional Data			Refrigeration Connection		Water Loop*		Desuperheater		Unit Weight (Pounds)
	A	B	C	Liquid	Suction	IN	OUT	IN	OUT	
024	18.8	22.0	25.5	3/8”	7/8”	1.0”	1.0”	3/4”	3/4”	180
036	21.8	26.0	30.5	3/8”	7/8”	1.0”	1.0”	3/4”	3/4”	225
048	22.8	26.0	30.5	3/8”	7/8”	1.0”	1.0”	3/4”	3/4”	270
060	22.8	26.0	30.5	1/2”	1-1/8”	1.0”	1.0”	3/4”	3/4”	270
072	22.8	28.0	30.5	1/2”	1-1/8”	1.0”	1.0”	3/4”	3/4”	295

* Water loop fittings are Double O-Ring fittings on GeoComfort residential units only. Hydron Module, TETCO, and Commercial voltage units have threaded fittings.

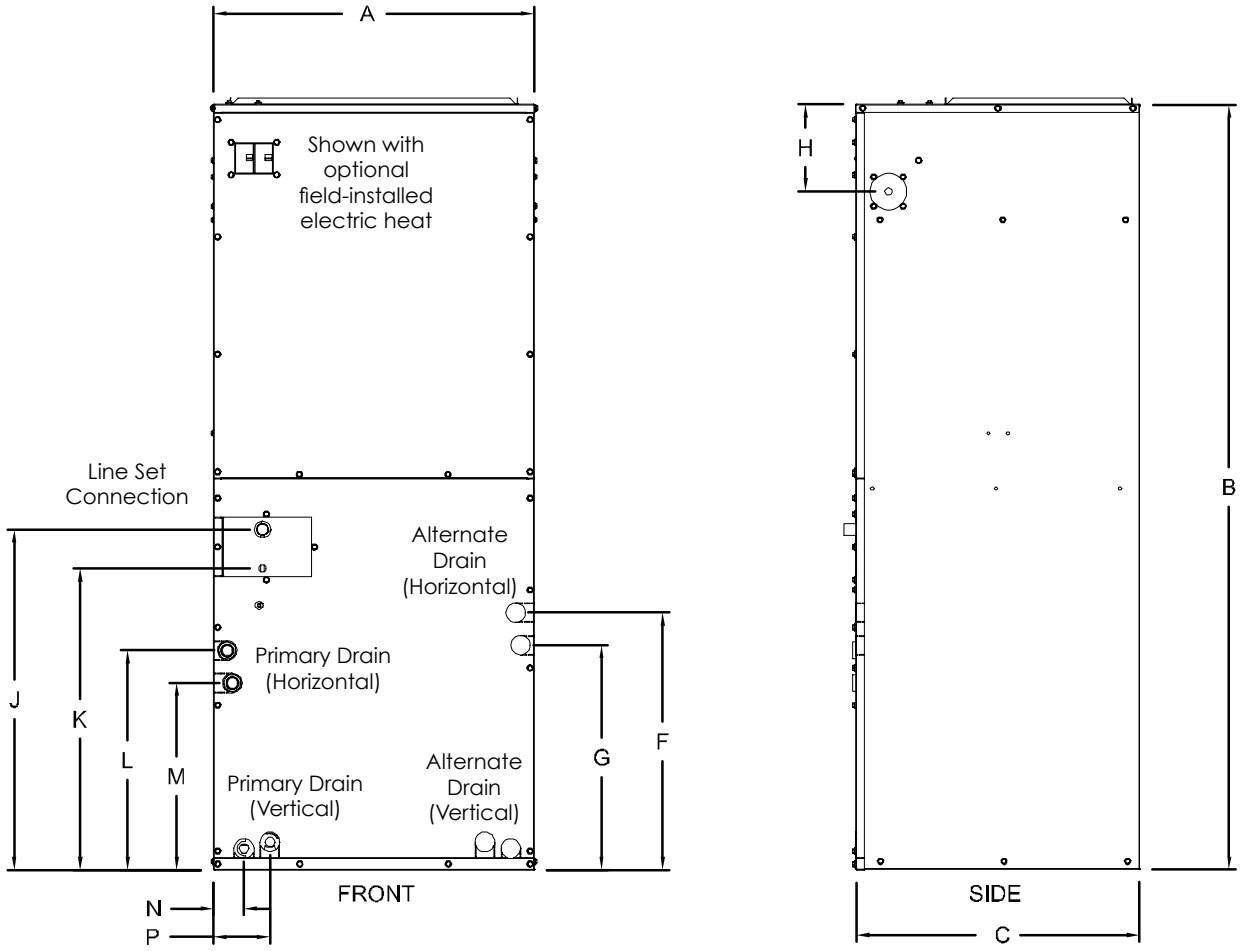
AHRI Air Handler and “A” Coil Matches

Compressor Section	Air Handler Match	“A” Coil Match
024	MPD024A	ACD024B
036	MPD036A	ACD036B
048	MPD060B	ACD060C
060	MPD060B	ACD060C
072	MPD072A	ACD060C

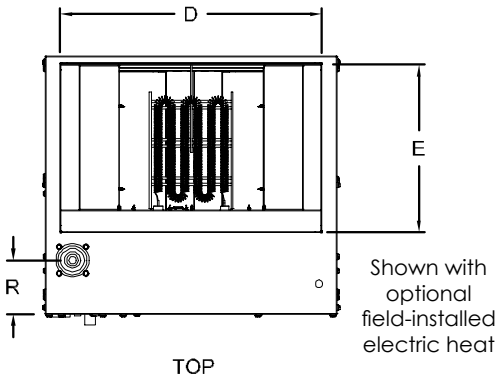
⚠ NOTICE ⚠

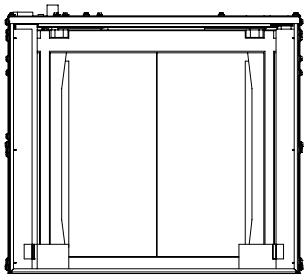
WHEN MATCHING AN ST048 OR ST060 WITH AN MPD060B, REFER TO THE CFM CHART ON PAGE 56 FOR THE PROPER AIRFLOW JUMPER SETTINGS.

Section 3b: Air Handler Dimensional and Physical Data



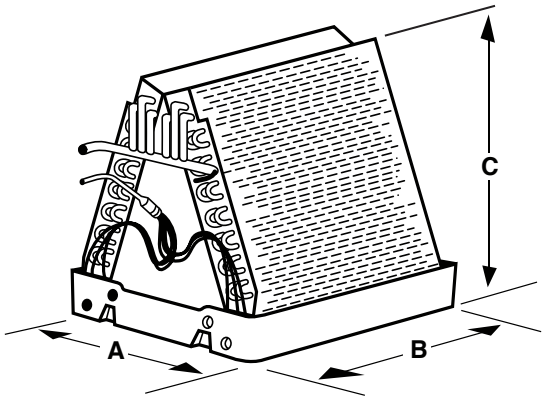
Model	Size (tons)	All Dimensions in Inches														
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	R
MPD024A	2	17 5/8	43	21	15 5/8	12 1/2	13 1/2	11	6 3/4	16 3/4	14	11	10 3/4	2	1 1/2	5
MPD036A	3	21 1/8	48	21	19	12 1/2	14 1/2	13	6 3/4	20	17	12 3/4	10 1/4	2 1/4	4 3/8	5
MPD060B	4 - 5	24 5/8	58 7/8	21 3/4	22 1/4	14 1/4	19 3/4	17 1/4	6 3/4	26	23	16 3/4	14 3/8	4 1/4	4 3/8	4 1/2
MPD072A	6	24 5/8	58 7/8	21 3/4	22 1/4	14 1/4	19 3/4	17 1/4	6 3/4	26	23	16 3/4	14 3/8	4 1/4	4 3/8	4 1/2



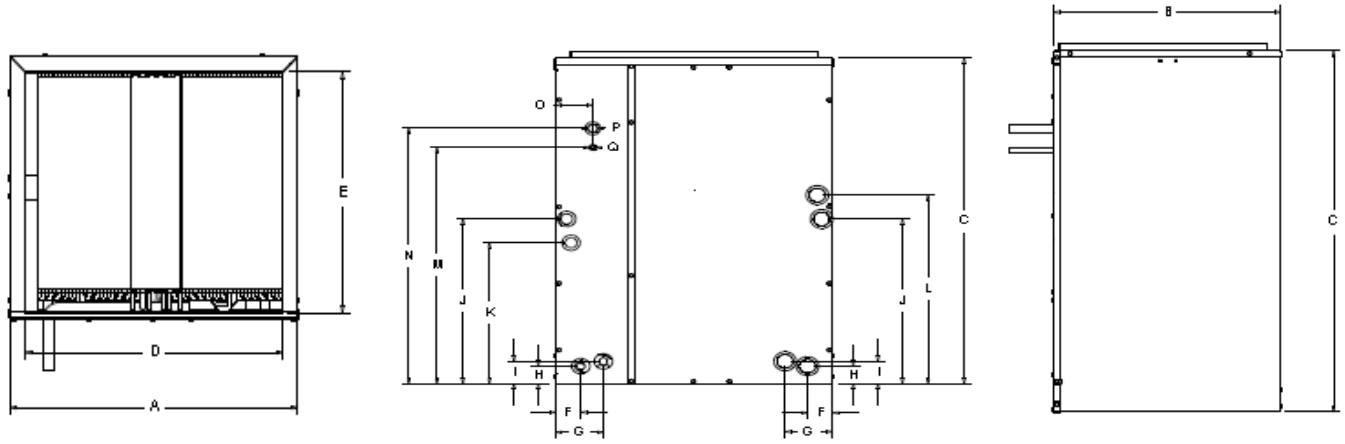


Return Air Opening		
Model	Width	Depth
MPD024A	15 1/2	19 3/4
MPD036A	19 3/4	19 3/4
MPD060B	23 1/2	20 3/4
MPD072A	23 1/2	20 3/4

Section 3c: "A" Coil Dimensional and Physical Data



Model	Size (tons)	All Dimensions in Inches				
		A	B	C	Liquid	Suction
ACD024B	2	16 5/8	19	14 1/2	3/8	3/4
ACD036B	3	19 5/8	19	18 1/2	3/8	3/4
ACD060C	4 - 6	23 3/4	20 1/2	27 7/8	3/8	7/8



Model	Size (Tons)	All Dimensions In Inches (nominal)																	Weight (lbs)
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
024	2	17.5	21.0	20.0	15.2	19.2	2.1	4.1	1.8	2.3	11.1	8.5	13.8	9.2	11.0	3.3	.88	.38	45
036	3	21.0	21.0	24.0	18.7	19.2	2.2	4.3	1.8	2.3	12.9	10.6	15.7	11.9	14.2	3.3	.88	.38	50
060	5	24.5	22.0	34.0	22.0	19.9	2.2	4.2	1.9	2.3	17.3	12.8	19.8	24.8	26.8	3.3	.88	.38	72

NOTES:

1. The AC series coils are designed as high efficiency "A" coils to be installed on new and existing indoor furnaces. These coils may be used in upflow and downflow applications.
2. Coils are ETL and CSA approved.
3. Primary and secondary drain connections are available on the LH or RH side of the drain pan, and are 3/4" FPT. Center line of drains located from pan corner, 1 1/2" for primary and 3 1/2" for secondary.
4. Drain pan is injection molded high temperature UL approved plastic.
5. All coils are equipped with factory-installed TXV, 15% bleed type.

⚠ WARNING ⚠

IF USING A DUAL FUEL APPLICATION, "A" COIL MUST BE INSTALLED ON THE OUTLET OF THE FURNACE. INSTALLATION ON THE RETURN COULD CAUSE FURNACE HEAT EXCHANGER FAILURE, AND MAY VOID FURNACE WARRANTY.

Section 4a: Unit Electrical Data

Model	Voltage Code	60Hz Power		Compressor		HWG Pump FLA	Ext Loop Pump FLA*	Total Unit FLA	Min Circuit AMPS	Max Fuse HACR	Min AWG	Max Ft
		Volts	Phase	LRA	RLA							
024	0	208/230	1	58.3	11.7	N/A	N/A	11.7	14.6	25	14	55
	1	208/230	1	58.3	11.7	0.5	4.0	16.2	19.1	30	14	39
	2	208/230	3	55.4	6.5	N/A	N/A	6.5	8.1	15	14	99
036	0	208/230	1	83.0	15.3	N/A	N/A	15.3	19.1	30	14	42
	1	208/230	1	83.0	15.3	0.5	4.0	19.8	23.6	35	12	50
	2	208/230	3	73.0	11.6	N/A	N/A	11.6	14.5	25	14	55
048	0	208/230	1	104.0	21.2	N/A	N/A	21.2	26.5	45	10	78
	1	208/230	1	104.0	21.2	0.5	5.5	27.2	32.5	50	8	94
	2	208/230	3	83.1	14.0	N/A	N/A	14.0	17.5	30	14	46
060	0	208/230	1	152.9	27.1	N/A	N/A	27.1	33.9	60	8	94
	1	208/230	1	152.9	27.1	0.5	5.5	33.1	39.9	60	8	77
	2	208/230	3	110.0	16.5	N/A	N/A	16.5	20.6	35	12	60
072	0	208/230	1	179.2	29.7	N/A	N/A	29.7	37.1	60	8	86
	1	208/230	1	179.2	29.7	0.5	5.5	35.7	43.1	70	6	114
	2	208/230	3	136.0	17.6	N/A	N/A	17.6	22.0	40	12	56

Notes:
1. All line and low voltage wiring must adhere to the National Electrical Code and Local Codes, whichever is the most stringent.
2. Wire length based on a one way measurement with a 2% voltage drop.
3. Wire size based on 60°C copper conductor and minimum circuit ampacity.
3. All fuses class RK-5
4. Min/Max Voltage: 208/230/60/1 = 187/252, 208/230/60/3 = 187/252
* The external loop pump FLA is based on a maximum of three UP26-116F-230V pumps (1/2hp) for 048 - 062 and two pumps for 024 - 038

NOTE: Proper Power Supply Evaluation

When any compressor bearing unit is connected to a weak power supply, starting current will generate a significant “sag” in the voltage which reduces the starting torque of the compressor motor and increases the start time. This will influence the rest of the electrical system in the building by lowering the voltage to the lights. This momentary low voltage causes “light dimming”. The total electrical system should be evaluated with an electrician and HVAC technician. The evaluation should include all connections, sizes of wires, and size of the distribution panel between the unit and the utility’s connection. The transformer connection and sizing should be evaluated by the electric utility provider.

⚠ CAUTION ⚠

CHECK COMPRESSOR AMP DRAW TO VERIFY COMPRESSOR ROTATION ON THREE PHASE UNITS. COMPARE AGAINST UNIT ELECTRICAL TABLES. REVERSE ROTATION RESULTS IN HIGHER SOUND LEVELS, LOWER AMP DRAW, AND INCREASED COMPRESSOR WEAR. THE COMPRESSOR INTERNAL OVERLOAD WILL TRIP AFTER A SHORT PERIOD OF OPERATION.

Section 4a: Unit Electrical Data

Section 4b: Air Handler Section Unit Electrical Data

Model	60 HZ Power		Field-Installed Elect Heat		Motor Amps / HP	Minimum Circuit Ampacity[2]	Maximum Fuse Size[2]
	Volts	Phase	# Circuits	kW[1]			
MPD024A	208/230	1	None	0	2.8 / 0.33	3.5	10
			1	10		54.9	60
MPD036A	208/230	1	None	0	4.3 / 0.50	5.4	10
			1	10		56.4	60
			2	15		30.3 / 56.4	40 / 70
MPD060B	208/230	1	None	0	6.8 / 1.0	8.5	15
			1	10		58.9	70
			2	15		32.8 / 58.9	40 / 70
			2	20		58.9 / 58.9	70 / 70
MPD072A	208/230	1	None	0	6.8 / 1.0	8.5	15
			1	10		58.9	70
			2	15		32.8 / 58.9	40 / 70
			2	20		58.9 / 58.9	70 / 70

Notes:
1. Nominal kW at 240V. Derate 25% for 208V.
2. Units with field-installed electric heat 15kW and larger have two circuits. Data shown as “XX/XX” refers to circuit 1 before the “/” and circuit 2 after the “/”
3. Always refer to unit nameplate data prior to installation

Section 5: Specification Glossary & Calculations

Glossary of Terms

CFM = Airflow, Cubic Feet/Minute	HR = Total Heat Of Rejection, Btu/hr
COP = Coefficient of Performance = BTU Output / BTU Input	KW = Total Power Unit Input, Kilowatts
DH = Desuperheater Capacity, Btu/hr	LAT = Leaving Air Temperature, Fahrenheit
EAT = Entering Air Temperature, Fahrenheit (Dry Bulb/Wet Bulb)	LC = Latent Cooling Capacity, Btu/hr
EER = Energy Efficiency Ratio = BTU output/Watts input	SC = Sensible Cooling Capacity, Btu/hr
EWT = Entering Source Water Temperature, Fahrenheit	LWT = Leaving Source Water Temperature, Fahrenheit
ELT = Entering Load Water Temperature, Fahrenheit	LLT = Leaving Load Water Temperature, Fahrenheit
GPM = Water Flow, Gallons Per Minute	TC = Total Cooling Capacity, Btu/hr
HC = Total Heating Capacity, Btu/hr	WPD = Water Pressure Drop, PSI & Feet of Water
HE = Total Heat Of Extraction, Btu/hr	

Heating & Cooling Calculations

Heating	Cooling
$LAT = EAT + \frac{HC}{CFM \times 1.08}$	$LAT\ (DB) = EAT\ (DB) - \frac{SC}{CFM \times 1.08}$
$LWT = EWT - \frac{HE}{GPM \times 500}$	$LWT = EWT + \frac{HR}{GPM \times 500}$
LC = TC - SC	

Section 5: Water Flow Selection

Water Flow Selection

Proper flow rate is crucial for reliable operation of geothermal heat pumps. The performance data shows three flow rates for each entering water temperature (EWT column). The general “rule of thumb” when selecting flow rates is the following:

Top flow rate: Open loop systems (1.5 to 2.0 gpm per ton)
Middle flow rate: Minimum closed loop system flow rate (2.25 to 2.50 gpm/ton)
Bottom flow rate: Nominal (optimum) closed loop system flow rate (3.0 gpm/ton)

Although the “rule of thumb” is adequate in most areas of North America, it is important to consider the application type before applying this “rule of thumb.” Antifreeze is generally required for all closed loop (geothermal) applications. Extreme Southern U.S. locations are the only exception. Open loop (well water) systems cannot use antifreeze, and must have enough flow rate in order to avoid freezing conditions at the Leaving Source Water Temperature (LWT) connection.

Calculations must be made for all systems without antifreeze to determine if the top flow rate is adequate to prevent LWT at or near freezing conditions. The following steps should taken in making this calculation:

Determine minimum EWT based upon your geographical area.
Go to the performance data table for the heat pump model selected and look up the the Heat of Extraction (HE) at the “rule of thumb” water flow rate (GPM) and at the design Entering Air Temperature (EAT).

Calculate the temperature difference (TD) based upon the HE and GPM of the model (step 4).
TD = HE / (GPM x 500).
Calculate the LWT (step 6).
LWT = EWT - TD.

If the LWT is below 35-38°F, there is potential for freezing conditions if the flow rate or water temperature is less than ideal conditions, and the flow rate must be increased.

Example 1:
EWT = 50°F.
3-Ton Model, high capacity. Flow rate = 5 GPM. HE = 26,900 Btuh.
TD = 26,900 / (5 x 500) = 10.8°F
LWT = 50 - 10.8 = 39.2°F
Water flow rate should be adequate under these conditions.

Example 2:
EWT = 40°F.
3-Ton Model, high capacity. Flow rate = 5 GPM. HE = 23,200 Btuh.
TD = 23,200 / (5 x 500) = 9.3°F
LWT = 40 - 9.3 = 30.7°F
Water flow rate must be increased.

Performance Data Notes

1. Capacity data is based upon 15% (by volume) methanol antifreeze solution.
2. Desuperheater capacity is based upon 0.4 GPM Flow per nominal ton at 90°F entering hot water temperature.
3. Interpolation between above categories is permissible; extrapolation is not.
4. See Flow Rate Selection above for proper application.

Section 6a: Model 024 with MPD024A Performance Data: 2.0 Ton, Part Load, 500 CFM Cooling / 500 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	6.0	5.9	13.7	500	12.1	7.8	92.4	1.25	2.84	1.6								
				450	12.0	7.9	94.7	1.21	2.91	1.6								
30	4.0	2.8	6.5	500	12.9	8.6	93.9	1.27	2.98	1.7								
				450	12.8	8.6	96.3	1.23	3.05	1.7								
	5.0	4.0	9.3	500	13.8	9.5	95.6	1.25	3.23	1.8								
				450	13.7	9.5	98.2	1.22	3.29	1.8								
	6.0	5.6	12.9	500	14.1	9.8	96.1	1.26	3.28	1.8								
				450	14.0	9.8	98.8	1.22	3.36	1.8								
40	4.0	2.5	5.7	500	14.3	9.8	96.5	1.32	3.17	1.9								
				450	14.3	9.9	99.4	1.28	3.27	2.0								
	5.0	3.5	8.2	500	15.3	10.8	98.3	1.31	3.42	2.1								
				450	15.3	11.0	101.5	1.27	3.53	2.1								
	6.0	4.9	11.3	500	15.7	11.2	99.1	1.31	3.51	2.1								
				450	15.6	11.3	102.1	1.27	3.60	2.1								
50	4.0	2.1	4.9	500	15.9	11.2	99.4	1.37	3.40	2.1	500	20.9	12.9	0.62	22.9	0.58	36.0	1.5
				450	15.8	11.3	102.5	1.33	3.48	2.1	450	20.7	12.6	0.61	22.9	0.65	31.8	1.5
	5.0	3.1	7.1	500	17.0	12.4	101.5	1.36	3.66	2.3	500	21.0	12.9	0.61	22.9	0.56	37.5	1.4
				450	16.9	12.4	104.8	1.32	3.75	2.3	450	20.8	12.6	0.61	23.0	0.63	33.0	1.4
	6.0	4.2	9.8	500	17.4	12.8	102.2	1.36	3.75	2.3	500	21.0	12.9	0.61	22.9	0.55	38.2	1.3
				450	17.3	12.8	105.6	1.32	3.84	2.3	450	20.8	12.6	0.61	22.9	0.62	33.5	1.3
60	4.0	1.9	4.3	500	18.3	13.5	103.9	1.40	3.83	2.4	500	20.4	12.6	0.62	22.8	0.71	28.7	1.8
				450	18.1	13.5	107.2	1.36	3.90	2.5	450	20.2	12.3	0.61	22.9	0.80	25.3	1.8
	5.0	2.7	6.2	500	19.5	14.8	106.1	1.39	4.11	2.6	500	20.4	12.7	0.62	22.8	0.69	29.6	1.7
				450	19.4	14.8	109.9	1.35	4.21	2.6	450	20.3	12.4	0.61	22.9	0.77	26.4	1.7
	6.0	3.7	8.6	500	20.0	15.2	107.0	1.40	4.19	2.7	500	20.5	12.7	0.62	22.8	0.68	30.1	1.6
				450	19.9	15.3	110.9	1.36	4.29	2.7	450	20.3	12.4	0.61	22.9	0.76	26.7	1.6
70	4.0	1.7	4.0	500	20.7	15.8	108.3	1.43	4.24	2.7	500	19.7	12.3	0.62	22.6	0.86	22.9	2.2
				450	20.6	15.9	112.4	1.39	4.34	2.7	450	19.6	12.0	0.61	22.9	0.96	20.4	2.1
	5.0	2.5	5.7	500	22.2	17.4	111.1	1.42	4.58	2.9	500	19.8	12.4	0.63	22.6	0.83	23.9	2.0
				450	22.0	17.3	115.3	1.37	4.71	2.9	450	19.6	12.1	0.62	22.8	0.93	21.1	2.0
	6.0	3.4	7.8	500	22.7	17.9	112.0	1.42	4.68	3.0	500	19.8	12.4	0.63	22.6	0.81	24.4	1.9
				450	22.6	17.9	116.5	1.38	4.80	3.0	450	19.7	12.1	0.61	22.8	0.91	21.6	1.9
80	4.0	1.6	3.7	500	22.5	17.5	111.7	1.46	4.52	3.0	500	19.1	12.0	0.63	22.5	1.00	19.1	2.5
				450	22.3	17.5	115.9	1.42	4.60	3.1	450	18.9	11.7	0.62	22.7	1.11	17.0	2.4
	5.0	2.3	5.4	500	24.0	19.1	114.4	1.45	4.85	3.2	500	19.1	12.0	0.63	22.4	0.96	19.9	2.3
				450	23.9	19.1	119.2	1.41	4.97	3.3	450	19.0	11.8	0.62	22.7	1.08	17.6	2.3
	6.0	3.2	7.4	500	24.6	19.6	115.6	1.46	4.94	3.3	500	19.2	12.1	0.63	22.4	0.95	20.2	2.3
				450	24.5	19.7	120.4	1.41	5.09	3.3	450	19.0	11.8	0.62	22.6	1.06	17.9	2.2
90	4.0	1.6	3.6	500	24.3	19.2	115.0	1.49	4.78	3.2	500	18.1	11.6	0.64	22.1	1.17	15.5	2.8
				450	24.1	19.2	119.6	1.45	4.87	3.2	450	18.0	11.3	0.63	22.4	1.30	13.8	2.7
	5.0	2.2	5.2	500	25.9	20.8	118.0	1.48	5.13	3.5	500	18.2	11.6	0.64	22.1	1.13	16.1	2.7
				450	25.8	20.9	123.1	1.44	5.25	3.5	450	18.0	11.3	0.63	22.3	1.26	14.3	2.6
	6.0	3.1	7.2	500	26.6	21.5	119.3	1.49	5.23	3.5	500	18.2	11.6	0.64	22.0	1.11	16.4	2.5
				450	26.4	21.5	124.3	1.44	5.37	3.5	450	18.1	11.3	0.62	22.3	1.24	14.6	2.4
100	4.0	1.5	3.4								500	16.8	11.0	0.65	21.5	1.38	12.2	3.1
											450	16.7	10.7	0.64	22.0	1.55	10.8	3.0
	5.0	2.1	4.9								500	16.9	11.0	0.65	21.5	1.34	12.6	3.0
											450	16.7	10.8	0.65	21.8	1.50	11.1	2.9
	6.0	3.0	6.8								500	16.9	11.1	0.66	21.4	1.32	12.8	2.8
											450	16.7	10.8	0.65	21.7	1.47	11.4	2.7
110	4.0	1.3	3.0								500	15.4	10.4	0.68	20.9	1.61	9.6	3.3
											450	15.2	10.1	0.66	21.3	1.80	8.4	3.2
	5.0	1.9	4.3								500	15.4	10.4	0.68	20.7	1.56	9.9	3.2
											450	15.3	10.2	0.67	21.2	1.74	8.8	3.1
	6.0	2.6	6.0								500	15.5	10.4	0.67	20.7	1.53	10.1	3.1
											450	15.3	10.2	0.67	21.1	1.71	8.9	3.0

Operation Not Recommended

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6b: Model 024 with MPD024A Performance Data: 2.0 Ton, Full Load, 950 CFM Cooling / 900 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	6.0	5.2	12.1	900	17.0	11.4	87.5	1.63	3.06	2.3								
				975	17.0	11.8	86.1	1.51	3.30	2.3								
30	4.0	2.5	5.9	900	18.4	12.9	88.9	1.60	3.37	2.5								
				975	18.4	13.3	87.5	1.48	3.64	2.5								
	5.0	3.6	8.4	900	18.8	13.3	89.3	1.61	3.42	2.5								
				975	18.8	13.7	87.9	1.50	3.67	2.5								
	6.0	5.0	11.7	900	19.0	13.4	89.5	1.63	3.42	2.5								
				975	19.0	13.8	88.0	1.51	3.69	2.5								
40	4.0	2.3	5.4	900	20.8	15.1	91.4	1.66	3.67	2.8								
				975	20.8	15.5	89.8	1.54	3.96	2.8								
	5.0	3.3	7.7	900	21.3	15.6	91.9	1.68	3.71	2.8								
				975	21.3	16.0	90.2	1.56	4.00	2.8								
	6.0	4.6	10.7	900	21.5	15.7	92.1	1.70	3.71	2.9								
				975	21.5	16.1	90.4	1.58	3.99	3.0								
50	4.0	2.1	4.9	900	23.2	17.3	93.9	1.73	3.93	3.1	950	33.4	20.1	0.60	38.1	1.37	24.4	2.4
				975	23.2	17.7	92.0	1.61	4.22	3.1	925	32.8	20.1	0.61	37.5	1.39	23.6	2.4
	5.0	3.1	7.1	900	23.7	17.7	94.4	1.75	3.97	3.1	950	33.6	19.2	0.57	38.1	1.33	25.3	2.1
				975	23.7	18.2	92.5	1.62	4.29	3.1	925	33.0	19.2	0.58	37.6	1.35	24.4	2.1
	6.0	4.2	9.8	900	23.9	17.9	94.6	1.76	3.98	3.2	950	33.8	19.1	0.57	38.3	1.31	25.8	2.0
				975	23.9	18.3	92.7	1.64	4.27	3.2	925	33.2	19.1	0.58	37.7	1.33	25.0	2.0
60	4.0	2.0	4.6	900	26.1	20.0	96.9	1.78	4.30	3.5	950	32.6	20.0	0.61	37.7	1.50	21.7	3.0
				975	26.1	20.5	94.8	1.65	4.63	3.5	925	32.0	20.0	0.63	37.2	1.51	21.2	3.0
	5.0	2.8	6.5	900	26.6	20.5	97.4	1.80	4.33	3.5	950	32.8	19.1	0.58	37.8	1.46	22.5	2.7
				975	26.6	20.9	95.3	1.67	4.67	3.6	925	32.2	19.1	0.59	37.2	1.47	21.9	2.7
	6.0	3.9	9.0	900	26.9	20.7	97.7	1.82	4.33	3.6	950	33.0	19.0	0.58	37.9	1.43	23.1	2.5
				975	26.9	21.1	95.5	1.69	4.66	3.8	925	32.4	19.0	0.59	37.3	1.45	22.3	2.5
70	4.0	1.8	4.3	900	28.9	22.6	99.7	1.84	4.60	3.8	950	31.6	19.8	0.63	37.2	1.65	19.2	3.5
				975	28.9	23.1	97.4	1.71	4.95	3.8	925	31.1	19.8	0.64	36.8	1.67	18.6	3.5
	5.0	2.6	6.1	900	29.6	23.3	100.5	1.86	4.66	3.9	950	31.9	18.9	0.59	37.4	1.61	19.8	3.2
				975	29.6	23.7	98.1	1.73	5.01	3.9	925	31.3	18.9	0.60	36.9	1.63	19.2	3.2
	6.0	3.7	8.5	900	29.8	23.4	100.7	1.88	4.64	4.0	950	32.0	18.8	0.59	37.4	1.58	20.3	3.0
				975	29.8	23.9	98.3	1.74	5.02	4.0	925	31.4	18.8	0.60	36.9	1.60	19.6	3.0
80	4.0	1.7	4.0	900	31.3	24.7	102.2	1.93	4.75	4.1	950	30.4	19.2	0.63	36.5	1.80	16.9	4.0
				975	31.3	25.2	99.7	1.79	5.12	4.2	925	29.8	19.2	0.64	36.0	1.83	16.3	4.0
	5.0	2.5	5.7	900	32.0	25.3	102.9	1.95	4.81	4.3	950	30.6	18.3	0.60	36.6	1.76	17.4	3.6
				975	32.0	25.8	100.4	1.81	5.18	4.3	925	30.1	18.3	0.61	36.2	1.78	16.9	3.6
	6.0	3.4	8.0	900	32.3	25.6	103.2	1.97	4.80	4.3	950	30.8	18.2	0.59	36.7	1.73	17.8	3.5
				975	32.3	26.1	100.7	1.83	5.17	4.4	925	30.2	18.2	0.60	36.2	1.75	17.3	3.5
90	4.0	1.6	3.8	900	33.6	26.7	104.6	2.01	4.90	4.4	950	28.9	18.4	0.64	35.8	2.03	14.2	4.4
				975	33.6	27.2	101.9	1.87	5.26	4.4	925	28.3	18.4	0.65	35.3	2.05	13.8	4.4
	5.0	2.3	5.4	900	34.4	27.5	105.4	2.03	4.97	4.6	950	29.1	17.6	0.60	35.8	1.97	14.8	4.0
				975	34.4	27.9	102.7	1.89	5.33	4.6	925	28.5	17.6	0.62	35.3	2.00	14.3	4.0
	6.0	3.2	7.5	900	34.7	27.7	105.7	2.06	4.94	4.6	950	29.2	17.5	0.60	35.8	1.94	15.1	3.9
				975	34.7	28.2	103.0	1.91	5.32	4.6	925	28.7	17.5	0.61	35.4	1.96	14.6	3.9
100	4.0	1.5	3.6								950	27.1	17.9	0.66	35.2	2.36	11.5	5.0
											925	26.6	17.9	0.67	34.8	2.39	11.1	5.0
	5.0	2.2	5.1								950	27.3	17.0	0.62	35.1	2.30	11.9	4.5
											925	26.8	17.0	0.63	34.7	2.32	11.6	4.5
	6.0	3.1	7.0								950	27.5	17.0	0.62	35.2	2.26	12.2	4.4
											925	26.9	17.0	0.63	34.7	2.28	11.8	4.4
110	4.0	1.4	3.3								950	25.3	17.3	0.68	34.6	2.72	9.3	5.5
											925	24.8	17.3	0.70	34.2	2.75	9.0	5.5
	5.0	2.1	4.8								950	25.4	16.5	0.65	34.4	2.65	9.6	5.0
											925	25.0	16.5	0.66	34.1	2.68	9.3	5.0
	6.0	2.9	6.6								950	25.6	16.4	0.64	34.5	2.60	9.8	4.8
											925	25.1	16.4	0.65	34.1	2.63	9.5	4.8

Operation Not Recommended

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6c: Model 036 with MPD036A Performance Data: 3.0 Ton, Part Load, 1050 CFM Cooling / 1050 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	7.0	2.6	5.9	1050	17.5	11.4	85.4	1.79	2.86	2.3								
				900	17.4	11.4	87.9	1.77	2.88	2.3								
	5.0	1.5	3.4	1050	18.9	12.7	86.7	1.81	3.06	2.5								
				900	18.8	12.7	89.3	1.78	3.09	2.5								
30	6.0	1.7	3.9	1050	19.1	12.9	86.8	1.81	3.09	2.5								
				900	19.0	12.9	89.5	1.78	3.13	2.5								
	7.0	2.5	5.8	1050	19.4	13.2	87.1	1.81	3.14	2.5								
				900	19.3	13.2	89.9	1.79	3.16	2.5								
	5.0	1.4	3.2	1050	21.8	15.6	89.2	1.83	3.49	2.9								
				900	21.7	15.5	92.3	1.81	3.51	2.9								
40	6.0	1.6	3.7	1050	22.0	15.8	89.4	1.83	3.52	2.9								
				900	21.9	15.7	92.5	1.81	3.55	2.9								
	7.0	2.3	5.4	1050	22.4	16.2	89.8	1.83	3.59	2.9								
				900	22.3	16.1	92.9	1.81	3.61	3.1								
	5.0	1.3	3.0	1050	24.7	18.4	91.8	1.85	3.91	3.3	1050	30.9	22.3	0.72	34.9	1.18	26.2	2.6
				900	24.6	18.4	95.3	1.83	3.94	3.3	900	30.8	21.1	0.69	34.6	1.12	27.5	2.5
50	6.0	1.5	3.5	1050	25.0	18.7	92.0	1.85	3.96	3.3	1050	30.9	22.3	0.72	34.8	1.14	27.1	2.5
				900	24.9	18.7	95.6	1.83	3.99	3.3	900	30.8	21.1	0.69	34.5	1.08	28.5	2.4
	7.0	2.2	5.1	1050	25.4	19.1	92.4	1.86	4.00	3.3	1050	30.9	22.4	0.72	34.7	1.12	27.6	2.3
				900	25.3	19.1	96.0	1.83	4.05	3.3	900	30.8	21.1	0.69	34.4	1.06	29.1	2.2
	5.0	1.2	2.9	1050	27.9	21.5	94.6	1.88	4.35	3.7	1050	29.8	21.9	0.73	34.4	1.35	22.1	3.2
				900	27.8	21.5	98.6	1.86	4.38	3.7	900	29.7	20.7	0.70	34.1	1.29	23.0	3.0
60	6.0	1.4	3.3	1050	28.3	21.9	95.0	1.88	4.41	3.7	1050	29.8	22.0	0.74	34.3	1.31	22.7	3.1
				900	28.1	21.8	98.9	1.86	4.43	3.7	900	29.7	20.8	0.70	33.9	1.24	24.0	2.9
	7.0	2.1	4.9	1050	28.7	22.3	95.3	1.88	4.47	3.8	1050	29.8	22.0	0.74	34.2	1.28	23.3	2.9
				900	28.6	22.3	99.4	1.86	4.51	4.0	900	29.7	20.8	0.70	33.9	1.22	24.3	2.7
	5.0	1.2	2.8	1050	31.2	24.7	97.5	1.90	4.81	4.1	1050	28.6	21.5	0.75	33.9	1.55	18.5	3.7
				900	31.1	24.7	102.0	1.88	4.85	4.1	900	28.5	20.3	0.71	33.5	1.47	19.4	3.5
70	6.0	1.4	3.2	1050	31.6	25.1	97.9	1.90	4.87	4.1	1050	28.6	21.5	0.75	33.7	1.50	19.1	3.6
				900	31.4	25.0	102.3	1.88	4.89	4.1	900	28.5	20.4	0.72	33.3	1.42	20.1	3.4
	7.0	2.0	4.7	1050	32.0	25.5	98.2	1.91	4.91	4.2	1050	28.7	21.5	0.75	33.7	1.47	19.5	3.4
				900	31.9	25.5	102.8	1.88	4.97	4.2	900	28.6	20.4	0.71	33.4	1.40	20.4	3.2
	5.0	1.2	2.7	1050	34.3	27.7	100.2	1.92	5.23	4.6	1050	27.4	21.0	0.77	33.5	1.78	15.4	4.3
				900	34.1	27.6	105.1	1.89	5.29	4.6	900	27.3	19.8	0.73	33.1	1.69	16.2	4.1
80	6.0	1.3	3.1	1050	34.7	28.1	100.6	1.92	5.30	4.6	1050	27.5	21.0	0.76	33.4	1.72	16.0	4.2
				900	34.5	28.0	105.5	1.89	5.35	4.6	900	27.4	19.9	0.73	33.0	1.63	16.8	4.0
	7.0	2.0	4.5	1050	35.2	28.6	101.0	1.92	5.37	4.7	1050	27.5	21.0	0.76	33.3	1.69	16.3	3.9
				900	35.0	28.5	106.0	1.90	5.40	4.9	900	27.4	19.9	0.73	32.9	1.60	17.1	3.7
	5.0	1.1	2.6	1050	37.3	30.7	102.9	1.93	5.66	5.0	1050	26.0	20.3	0.78	33.0	2.06	12.6	5.0
				900	37.2	30.7	108.3	1.91	5.71	5.0	900	26.0	19.2	0.74	32.7	1.96	13.3	4.7
90	6.0	1.3	3.0	1050	37.8	31.2	103.3	1.93	5.74	5.0	1050	26.1	20.4	0.78	32.9	1.99	13.1	4.8
				900	37.6	31.1	108.7	1.91	5.77	5.0	900	26.0	19.3	0.74	32.5	1.89	13.8	4.5
	7.0	1.9	4.3	1050	38.3	31.7	103.8	1.94	5.78	5.1	1050	26.1	20.4	0.78	32.8	1.95	13.4	4.4
				900	38.2	31.7	109.3	1.91	5.86	5.1	900	26.0	19.3	0.74	32.3	1.86	14.0	4.2
	5.0	1.1	2.5								1050	24.3	19.6	0.81	32.5	2.39	10.2	5.5
											900	24.3	18.6	0.77	32.0	2.27	10.7	5.2
100	6.0	1.2	2.9								1050	24.3	19.7	0.81	32.2	2.31	10.5	5.3
											900	24.3	18.6	0.77	31.8	2.20	11.0	5.0
	7.0	1.8	4.2								1050	24.4	19.7	0.81	32.1	2.27	10.7	5.1
											900	24.3	18.6	0.77	31.7	2.16	11.3	4.8
	5.0	1.1	2.6								1050	22.5	18.9	0.84	31.9	2.75	8.2	5.9
											900	22.5	17.9	0.80	31.4	2.61	8.6	5.6
110	6.0	1.3	3.0								1050	22.5	18.9	0.84	31.6	2.66	8.5	5.7
											900	22.5	17.9	0.80	31.1	2.53	8.9	5.4
	7.0	1.9	4.4								1050	22.6	18.9	0.84	31.5	2.61	8.7	5.6
											900	22.5	17.9	0.80	31.0	2.48	9.1	5.3

Operation Not Recommended

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6d: Model 036 with MPD036A Performance Data: 3.0 Ton, Full Load, 1350 CFM Cooling / 1350 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	9.0	3.8	8.8	1350	27.3	18.8	88.7	2.50	3.20	3.7								
				1150	26.4	18.1	91.3	2.42	3.20	3.6								
30	5.0	1.5	3.5	1350	28.2	19.7	89.3	2.50	3.31	3.8								
				1150	27.4	19.1	92.1	2.42	3.32	3.7								
	7.0	2.5	5.8	1350	28.6	20.0	89.6	2.51	3.34	3.8								
				1150	27.8	19.5	92.4	2.43	3.35	3.7								
	9.0	3.7	8.6	1350	29.2	20.6	90.0	2.53	3.38	3.8								
				1150	28.3	19.9	92.8	2.45	3.38	3.7								
40	5.0	1.4	3.2	1350	32.2	23.3	92.1	2.60	3.63	4.2								
				1150	31.2	22.6	95.1	2.52	3.63	4.2								
	7.0	2.4	5.5	1350	32.6	23.7	92.4	2.62	3.65	4.3								
				1150	31.7	23.1	95.5	2.53	3.67	4.3								
	9.0	3.5	8.0	1350	33.3	24.3	92.8	2.64	3.70	4.3								
				1150	32.3	23.6	96.0	2.56	3.70	4.5								
50	5.0	1.3	3.0	1350	36.2	26.9	94.8	2.72	3.90	4.7	1350	41.4	29.1	0.70	48.3	2.02	20.5	3.4
				1150	35.1	26.1	98.3	2.63	3.91	4.6	1150	41.2	28.3	0.69	47.7	1.90	21.7	3.3
	7.0	2.2	5.1	1350	36.7	27.4	95.2	2.73	3.94	4.8	1350	41.7	29.0	0.70	48.6	2.01	20.7	3.2
				1150	35.6	26.6	98.7	2.64	3.95	4.7	1150	41.5	28.2	0.68	48.0	1.90	21.8	3.1
	9.0	3.2	7.5	1350	37.4	28.0	95.7	2.75	3.98	4.9	1350	41.9	29.0	0.69	48.6	1.96	21.4	3.1
				1150	36.3	27.2	99.2	2.66	4.00	4.8	1150	41.7	28.1	0.67	48.0	1.85	22.5	3.0
60	5.0	1.2	2.8	1350	40.1	30.4	97.5	2.83	4.15	5.2	1350	40.4	28.9	0.72	48.0	2.22	18.2	4.2
				1150	38.9	29.6	101.3	2.73	4.17	5.2	1150	40.2	28.0	0.70	47.3	2.09	19.2	4.1
	7.0	2.1	4.7	1350	40.6	30.9	97.8	2.84	4.19	5.4	1350	40.7	28.8	0.71	48.3	2.22	18.3	4.0
				1150	39.4	30.0	101.7	2.75	4.20	5.4	1150	40.5	27.9	0.69	47.6	2.09	19.4	3.9
	9.0	3.0	7.0	1350	41.5	31.7	98.5	2.87	4.24	5.5	1350	40.9	28.7	0.70	48.3	2.16	18.9	3.8
				1150	40.2	30.7	102.4	2.77	4.25	5.6	1150	40.7	27.9	0.69	47.7	2.04	20.0	3.7
70	5.0	1.1	2.6	1350	44.0	33.9	100.2	2.95	4.37	5.8	1350	39.3	28.6	0.73	47.7	2.47	15.9	5.0
				1150	42.7	33.0	104.4	2.85	4.39	5.6	1150	39.1	27.7	0.71	47.1	2.33	16.8	4.8
	7.0	1.9	4.5	1350	44.6	34.5	100.6	2.96	4.41	6.0	1350	39.5	28.5	0.72	47.9	2.47	16.0	4.8
				1150	43.3	33.5	104.9	2.87	4.42	5.8	1150	39.3	27.6	0.70	47.2	2.32	16.9	4.6
	9.0	2.8	6.6	1350	45.6	35.4	101.3	2.99	4.47	6.1	1350	39.7	28.4	0.72	47.9	2.40	16.5	4.5
				1150	44.2	34.3	105.6	2.89	4.48	5.9	1150	39.5	27.5	0.70	47.2	2.26	17.5	4.4
80	5.0	1.1	2.5	1350	48.0	37.4	102.9	3.10	4.54	6.3	1350	37.1	27.7	0.75	46.5	2.74	13.5	5.7
				1150	46.6	36.4	107.5	2.99	4.57	6.4	1150	36.9	26.9	0.73	45.7	2.58	14.3	5.5
	7.0	1.8	4.2	1350	48.7	38.1	103.4	3.11	4.59	6.4	1350	37.3	27.6	0.74	46.6	2.73	13.7	5.4
				1150	47.2	36.9	108.0	3.01	4.59	6.5	1150	37.2	26.7	0.72	46.0	2.58	14.4	5.2
	9.0	2.7	6.2	1350	49.7	39.0	104.1	3.14	4.64	6.6	1350	37.5	27.5	0.73	46.6	2.66	14.1	5.3
				1150	48.2	37.8	108.8	3.04	4.65	6.7	1150	37.3	26.7	0.72	45.9	2.51	14.9	5.1
90	5.0	1.0	2.4	1350	52.0	40.9	105.7	3.25	4.69	6.9	1350	34.5	26.6	0.77	45.0	3.09	11.2	6.4
				1150	50.5	39.8	110.7	3.14	4.71	6.7	1150	34.3	25.8	0.75	44.2	2.91	11.8	6.2
	7.0	1.8	4.1	1350	52.8	41.7	106.2	3.26	4.75	7.0	1350	34.8	26.5	0.76	45.3	3.08	11.3	6.0
				1150	51.2	40.4	111.2	3.16	4.75	6.8	1150	34.6	25.7	0.74	44.5	2.90	11.9	5.8
	9.0	2.6	6.0	1350	53.9	42.7	107.0	3.29	4.80	7.2	1350	34.9	26.4	0.76	45.1	3.00	11.6	5.9
				1150	52.3	41.4	112.1	3.19	4.80	7.0	1150	34.7	25.6	0.74	44.3	2.82	12.3	5.7
100	5.0	1.0	2.4								1350	32.3	25.7	0.80	44.4	3.55	9.1	7.1
											1150	32.1	24.9	0.78	43.5	3.35	9.6	6.9
	7.0	1.7	4.0								1350	32.5	25.6	0.79	44.6	3.54	9.2	6.7
											1150	32.4	24.8	0.77	43.8	3.34	9.7	6.5
	9.0	2.6	5.9								1350	32.7	25.5	0.78	44.5	3.45	9.5	6.6
											1150	32.5	24.7	0.76	43.6	3.25	10.0	6.4
110	5.0	1.1	2.5								1350	30.0	24.7	0.82	43.9	4.06	7.4	7.9
											1150	29.8	23.9	0.80	42.9	3.83	7.8	7.6
	7.0	1.8	4.3								1350	30.2	24.6	0.81	44.0	4.05	7.5	7.4
											1150	30.0	23.8	0.79	43.0	3.82	7.9	7.2
	9.0	2.7	6.2								1350	30.3	24.5	0.81	43.8	3.95	7.7	7.2
											1150	30.2	23.8	0.79	42.9	3.72	8.1	7.0

Operation Not Recommended

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6e: Model 048 with MPD060B Performance Data: 4.0 Ton, Part Load, 1150 CFM Cooling / 1100 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	7.0	2.8	6.5	1100	21.9	14.4	88.4	2.19	2.93	2.9								
				1000	21.3	13.8	89.7	2.20	2.84	2.8								
	5.0	1.1	2.5	1100	23.5	16.3	89.8	2.10	3.28	3.1								
				1000	22.8	15.6	91.1	2.12	3.15	3.0								
30	6.0	2.1	4.8	1100	23.6	16.1	89.9	2.19	3.16	3.2								
				1000	22.9	15.4	91.2	2.20	3.05	3.1								
	7.0	2.8	6.4	1100	24.3	16.8	90.5	2.20	3.24	3.2								
				1000	23.6	16.1	91.9	2.21	3.13	3.1								
	5.0	1.0	2.3	1100	27.7	20.3	93.3	2.16	3.76	3.6								
				1000	26.9	19.5	94.9	2.17	3.63	3.7								
40	6.0	1.9	4.5	1100	27.8	20.2	93.4	2.24	3.64	3.7								
				1000	27.0	19.3	95.0	2.25	3.52	3.7								
	7.0	2.6	6.0	1100	28.7	21.0	94.2	2.26	3.72	3.7								
				1000	27.8	20.1	95.7	2.27	3.59	3.9								
	5.0	0.9	2.2	1100	31.6	24.1	96.6	2.20	4.21	4.2	1150	41.3	27.9	0.68	46.1	1.42	29.1	3.3
				1000	30.7	23.1	98.4	2.22	4.05	4.1	1000	39.7	25.9	0.65	44.4	1.39	28.6	3.1
50	6.0	1.8	4.2	1100	31.8	24.0	96.8	2.29	4.07	4.2	1150	40.9	28.0	0.68	45.7	1.40	29.2	3.1
				1000	30.9	23.1	98.6	2.30	3.94	4.1	1000	39.3	26.0	0.66	44.0	1.38	28.5	2.9
	7.0	2.4	5.6	1100	32.7	24.8	97.5	2.31	4.15	4.3	1150	41.0	28.1	0.69	45.6	1.36	30.1	3.0
				1000	31.8	23.9	99.4	2.32	4.02	4.2	1000	39.4	26.1	0.66	44.0	1.34	29.4	2.8
	5.0	0.9	2.1	1100	35.1	27.5	99.5	2.24	4.59	4.6	1150	40.5	27.6	0.68	46.2	1.66	24.4	4.1
				1000	34.1	26.4	101.6	2.25	4.44	4.6	1000	38.9	25.7	0.66	44.5	1.63	23.9	3.8
60	6.0	1.7	4.0	1100	35.3	27.4	99.7	2.32	4.46	4.5	1150	40.2	27.8	0.69	45.8	1.64	24.5	3.9
				1000	34.3	26.3	101.8	2.34	4.29	4.6	1000	38.6	25.8	0.67	44.1	1.61	24.0	3.6
	7.0	2.3	5.4	1100	36.4	28.4	100.6	2.34	4.56	4.7	1150	40.2	27.8	0.69	45.6	1.59	25.3	3.7
				1000	35.3	27.2	102.7	2.36	4.38	4.8	1000	38.6	25.8	0.67	44.0	1.57	24.6	3.4
	5.0	0.9	2.0	1100	38.0	30.3	102.0	2.26	4.93	5.0	1150	39.5	27.3	0.69	46.1	1.92	20.6	4.7
				1000	36.9	29.2	104.2	2.27	4.76	4.9	1000	38.0	25.4	0.67	44.4	1.88	20.2	4.4
70	6.0	1.7	3.9	1100	38.2	30.2	102.2	2.35	4.76	4.9	1150	39.2	27.4	0.70	45.7	1.90	20.6	4.5
				1000	37.1	29.0	104.4	2.36	4.61	4.8	1000	37.6	25.5	0.68	43.9	1.86	20.2	4.2
	7.0	2.2	5.2	1100	39.3	31.2	103.1	2.36	4.88	5.1	1150	39.2	27.4	0.70	45.5	1.84	21.3	4.3
				1000	38.2	30.1	105.4	2.38	4.70	5.0	1000	37.7	25.5	0.68	43.9	1.81	20.8	4.0
	5.0	0.8	1.9	1100	40.0	32.2	103.7	2.28	5.14	5.3	1150	37.9	26.5	0.70	45.4	2.21	17.1	5.5
				1000	38.9	31.1	106.0	2.29	4.98	5.2	1000	36.5	24.7	0.68	43.9	2.17	16.8	5.1
80	6.0	1.6	3.8	1100	40.3	32.2	103.9	2.37	4.98	5.3	1150	37.6	26.7	0.71	45.1	2.19	17.2	5.3
				1000	39.1	31.0	106.2	2.38	4.81	5.3	1000	36.1	24.8	0.69	43.4	2.15	16.8	4.9
	7.0	2.2	5.0	1100	41.5	33.3	104.9	2.39	5.09	5.4	1150	37.6	26.7	0.71	44.9	2.13	17.7	5.0
				1000	40.3	32.1	107.3	2.40	4.92	5.5	1000	36.2	24.8	0.69	43.3	2.09	17.3	4.6
	5.0	0.8	1.9	1100	41.8	34.0	105.2	2.30	5.32	5.6	1150	35.8	25.6	0.72	44.5	2.56	14.0	6.2
				1000	40.6	32.7	107.6	2.31	5.15	5.4	1000	34.4	23.8	0.69	43.0	2.52	13.7	5.8
90	6.0	1.6	3.6	1100	42.1	33.9	105.4	2.39	5.16	5.7	1150	35.5	25.7	0.72	44.1	2.53	14.0	5.9
				1000	40.9	32.7	107.9	2.40	4.99	5.5	1000	34.1	23.9	0.70	42.6	2.49	13.7	5.5
	7.0	2.1	4.8	1100	43.3	35.1	106.4	2.41	5.26	5.8	1150	35.5	25.7	0.72	43.9	2.46	14.4	5.6
				1000	42.1	33.8	109.0	2.42	5.10	5.6	1000	34.1	23.9	0.70	42.4	2.42	14.1	5.2
	5.0	0.8	1.8								1150	33.3	24.6	0.74	43.5	2.99	11.1	6.9
											1000	32.0	22.8	0.71	42.0	2.93	10.9	6.4
100	6.0	1.5	3.5								1150	33.0	24.7	0.75	43.1	2.96	11.1	6.6
											1000	31.7	22.9	0.72	41.6	2.90	10.9	6.1
	7.0	2.0	4.6								1150	33.1	24.7	0.75	42.9	2.87	11.5	6.3
											1000	31.8	23.0	0.72	41.4	2.82	11.3	5.9
	5.0	0.8	1.8								1150	30.6	23.4	0.76	42.3	3.44	8.9	7.4
											1000	29.4	21.8	0.74	40.9	3.38	8.7	6.9
110	6.0	1.5	3.5								1150	30.3	23.5	0.78	41.9	3.40	8.9	7.2
											1000	29.1	21.9	0.75	40.5	3.34	8.7	6.7
	7.0	2.0	4.7								1150	30.4	23.6	0.78	41.7	3.31	9.2	7.0
											1000	29.2	21.9	0.75	40.3	3.25	9.0	6.5

Operation Not Recommended

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6f: Model 048 with MPD060B Performance Data: 4.0 Ton, Full Load, 1650 CFM Cooling / 1600 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	12.0	7.1	16.4	1600	37.1	26.9	91.5	3.00	3.62	4.9								
				1500	37.0	26.7	92.8	3.02	3.59	4.9								
30	7.0	2.8	6.4	1600	36.2	25.9	90.9	3.02	3.51	4.8								
				1500	36.2	25.9	92.3	3.03	3.50	4.8								
	9.0	4.2	9.7	1600	37.0	26.7	91.4	3.01	3.60	4.9								
				1500	36.9	26.6	92.8	3.03	3.57	4.9								
	12.0	6.9	15.9	1600	37.9	27.6	91.9	3.03	3.66	5.0								
				1500	37.9	27.5	93.4	3.04	3.65	5.0								
40	7.0	2.6	6.0	1600	41.0	30.4	93.7	3.12	3.85	5.4								
				1500	40.9	30.2	95.2	3.13	3.83	5.5								
	9.0	3.9	9.1	1600	41.9	31.3	94.2	3.11	3.95	5.5								
				1500	41.8	31.1	95.8	3.13	3.91	5.6								
	12.0	6.4	14.9	1600	42.9	32.2	94.8	3.13	4.02	5.7								
				1500	42.8	32.1	96.4	3.14	3.99	5.9								
50	7.0	2.4	5.6	1600	45.4	34.4	96.3	3.21	4.14	6.0	1650	57.4	39.4	0.69	65.7	2.44	23.5	4.7
				1500	45.3	34.3	98.0	3.23	4.11	6.0	1525	57.0	38.0	0.67	65.2	2.39	23.8	4.5
	9.0	3.7	8.5	1600	46.4	35.4	96.9	3.21	4.24	6.1	1650	56.9	39.3	0.69	65.1	2.40	23.7	4.3
				1500	46.3	35.3	98.6	3.23	4.20	6.1	1525	56.5	38.0	0.67	64.5	2.35	24.0	4.2
	12.0	6.0	13.9	1600	47.5	36.5	97.5	3.22	4.32	6.3	1650	57.5	39.6	0.69	65.5	2.33	24.7	4.2
				1500	47.4	36.3	99.3	3.24	4.29	6.3	1525	57.1	38.3	0.67	64.9	2.28	25.0	4.1
60	7.0	2.3	5.3	1600	48.2	37.0	97.9	3.28	4.31	6.3	1650	55.7	38.8	0.70	64.8	2.68	20.8	5.7
				1500	48.0	36.8	99.6	3.29	4.27	6.3	1525	55.4	37.5	0.68	64.3	2.62	21.1	5.5
	9.0	3.5	8.0	1600	49.2	38.0	98.5	3.28	4.39	6.5	1650	55.2	38.7	0.70	64.2	2.64	20.9	5.4
				1500	49.1	37.9	100.3	3.29	4.37	6.6	1525	54.9	37.4	0.68	63.7	2.58	21.3	5.2
	12.0	5.7	13.1	1600	50.4	39.2	99.2	3.29	4.49	6.7	1650	55.9	39.0	0.70	64.6	2.56	21.8	5.2
				1500	50.3	39.0	101.0	3.31	4.45	6.7	1525	55.5	37.7	0.68	64.1	2.51	22.1	5.0
70	7.0	2.2	5.0	1600	50.2	38.8	99.1	3.33	4.42	6.5	1650	54.0	38.1	0.71	64.1	2.97	18.2	6.6
				1500	50.1	38.7	100.9	3.35	4.38	6.5	1525	53.6	36.8	0.69	63.5	2.90	18.5	6.4
	9.0	3.3	7.6	1600	51.3	39.9	99.7	3.33	4.51	6.8	1650	53.5	38.0	0.71	63.5	2.92	18.3	6.4
				1500	51.2	39.8	101.6	3.35	4.48	6.8	1525	53.1	36.7	0.69	62.9	2.86	18.6	6.2
	12.0	5.4	12.5	1600	52.5	41.1	100.4	3.34	4.61	7.0	1650	54.1	38.3	0.71	63.8	2.84	19.0	6.1
				1500	52.4	40.9	102.3	3.36	4.57	7.0	1525	53.7	37.0	0.69	63.2	2.77	19.4	5.9
80	7.0	2.1	4.8	1600	52.7	41.1	100.5	3.39	4.55	6.9	1650	51.5	37.0	0.72	62.7	3.28	15.7	7.6
				1500	52.6	41.0	102.5	3.41	4.52	7.0	1525	51.1	35.8	0.70	62.0	3.20	16.0	7.4
	9.0	3.1	7.3	1600	53.8	42.2	101.1	3.39	4.65	7.1	1650	51.0	36.9	0.72	62.0	3.23	15.8	7.2
				1500	53.7	42.1	103.1	3.40	4.63	7.2	1525	50.7	35.7	0.70	61.5	3.16	16.0	7.0
	12.0	5.2	11.9	1600	55.2	43.6	101.9	3.40	4.76	7.3	1650	51.6	37.2	0.72	62.3	3.13	16.5	7.0
				1500	55.0	43.3	104.0	3.42	4.71	7.3	1525	51.2	36.0	0.70	61.6	3.06	16.7	6.8
90	7.0	2.0	4.6	1600	54.9	43.2	101.8	3.44	4.68	7.2	1650	48.6	35.7	0.73	61.1	3.67	13.2	8.6
				1500	54.8	43.0	103.8	3.46	4.64	7.2	1525	48.3	34.5	0.71	60.6	3.59	13.5	8.3
	9.0	3.0	7.0	1600	56.1	44.4	102.5	3.44	4.78	7.4	1650	48.2	35.7	0.74	60.6	3.62	13.3	8.1
				1500	56.0	44.2	104.6	3.46	4.74	7.4	1525	47.8	34.4	0.72	59.9	3.54	13.5	7.8
	12.0	4.9	11.4	1600	57.5	45.7	103.3	3.45	4.88	7.6	1650	48.7	35.9	0.74	60.7	3.51	13.9	8.0
				1500	57.3	45.5	105.4	3.47	4.84	7.6	1525	48.4	34.7	0.72	60.1	3.43	14.1	7.7
100	7.0	1.9	4.4								1650	45.9	34.4	0.75	60.2	4.19	11.0	9.5
											1525	45.5	33.2	0.73	59.5	4.09	11.1	9.2
	9.0	2.9	6.7								1650	45.4	34.4	0.76	59.5	4.12	11.0	9.1
											1525	45.1	33.2	0.74	58.9	4.03	11.2	8.8
	12.0	4.8	11.0								1650	45.9	34.6	0.75	59.6	4.00	11.5	8.9
											1525	45.6	33.5	0.73	58.9	3.91	11.7	8.6
110	7.0	1.9	4.4								1650	42.9	33.0	0.77	59.0	4.72	9.1	10.4
											1525	42.7	31.9	0.75	58.5	4.62	9.2	10.1
	9.0	2.8	6.6								1650	42.5	33.0	0.78	58.4	4.65	9.1	10.1
											1525	42.3	31.8	0.75	57.8	4.55	9.3	9.7
	12.0	4.7	10.8								1650	43.0	33.2	0.77	58.4	4.52	9.5	9.7
											1525	42.7	32.1	0.75	57.8	4.42	9.7	9.4

Operation Not Recommended

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6g: Model 060 with MPD060B Performance Data: 5.0 Ton, Part Load, 1300 CFM Cooling / 1400 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	12.0	8.8	20.3	1400	26.5	16.9	87.5	2.81	2.76	3.4	Operation Not Recommended							
				1350	26.2	16.6	88.0	2.81	2.73	3.4								
30	6.0	5.9	13.6	1400	32.3	25.1	91.4	2.12	4.46	4.2								
				1350	32.0	24.8	91.9	2.12	4.42	4.2								
	8.0	7.7	17.7	1400	27.8	18.4	88.4	2.74	2.97	3.7								
				1350	27.5	18.1	88.9	2.74	2.94	3.7								
	12.0	8.3	19.1	1400	29.3	19.6	89.4	2.83	3.03	3.8								
				1350	29.1	19.4	90.0	2.83	3.01	3.8								
40	6.0	5.0	11.5	1400	38.1	30.7	95.2	2.17	5.14	5.0								
				1350	37.7	30.3	95.9	2.17	5.09	4.7								
	8.0	6.5	15.0	1400	32.7	23.1	91.6	2.81	3.41	4.4								
				1350	32.4	22.8	92.2	2.81	3.38	4.4								
	12.0	7.0	16.1	1400	34.6	24.7	92.9	2.90	3.50	4.5								
				1350	34.3	24.4	93.5	2.90	3.47	5.1								
50	6.0	4.3	9.9	1400	43.5	35.9	98.8	2.22	5.74	5.8	1300	51.8	31.2	0.60	57.3	1.60	32.4	3.7
				1350	43.1	35.5	99.6	2.22	5.69	5.7	1200	51.7	31.0	0.60	57.0	1.56	33.1	3.7
	8.0	5.6	12.9	1400	37.4	27.6	94.7	2.87	3.82	5.0	1300	47.9	32.1	0.67	54.1	1.83	26.2	3.6
				1350	37.0	27.2	95.4	2.87	3.78	4.9	1200	47.8	31.9	0.67	53.8	1.77	27.0	3.6
	12.0	6.0	13.9	1400	39.5	29.4	96.1	2.97	3.90	5.1	1300	47.9	32.3	0.67	53.8	1.72	27.8	3.4
				1350	39.2	29.1	96.9	2.97	3.87	5.1	1200	47.8	32.1	0.67	53.5	1.67	28.6	3.4
60	6.0	4.0	9.2	1400	48.4	40.7	102.0	2.25	6.30	6.3	1300	50.8	30.9	0.61	57.2	1.87	27.2	4.5
				1350	47.9	40.2	102.9	2.25	6.24	5.9	1200	50.7	30.7	0.61	56.9	1.82	27.9	4.5
	8.0	5.2	12.0	1400	41.6	31.6	97.5	2.92	4.17	5.4	1300	47.0	31.8	0.68	54.3	2.13	22.1	4.4
				1350	41.2	31.2	98.3	2.92	4.13	5.5	1200	46.9	31.6	0.67	54.0	2.07	22.7	4.4
	12.0	5.6	12.9	1400	43.9	33.6	99.0	3.01	4.27	5.7	1300	47.0	32.0	0.68	53.9	2.01	23.4	4.2
				1350	43.5	33.2	99.8	3.01	4.23	6.3	1200	46.9	31.8	0.68	53.6	1.95	24.1	4.2
70	6.0	3.9	9.0	1400	52.3	44.6	104.6	2.27	6.75	6.9	1300	49.5	30.5	0.62	56.9	2.17	22.8	5.3
				1350	51.8	44.1	105.5	2.27	6.69	6.8	1200	49.5	30.3	0.61	56.7	2.10	23.6	5.3
	8.0	5.1	11.7	1400	44.9	34.8	99.7	2.95	4.46	5.9	1300	45.9	31.4	0.68	54.3	2.47	18.6	5.2
				1350	44.5	34.4	100.5	2.95	4.42	5.8	1200	45.8	31.2	0.68	54.0	2.40	19.1	5.2
	12.0	5.5	12.6	1400	47.5	37.1	101.4	3.04	4.58	6.3	1300	45.8	31.5	0.69	53.8	2.33	19.7	5.0
				1350	47.0	36.6	102.2	3.04	4.53	6.2	1200	45.7	31.4	0.69	53.4	2.26	20.2	5.0
80	6.0	3.8	8.8	1400	55.2	47.4	106.5	2.29	7.06	7.3	1300	47.5	29.7	0.63	56.0	2.50	19.0	6.1
				1350	54.6	46.8	107.4	2.29	6.99	6.8	1200	47.5	29.5	0.62	55.8	2.43	19.5	6.1
	8.0	4.9	11.4	1400	47.4	37.3	101.3	2.97	4.68	6.3	1300	44.0	30.6	0.70	53.7	2.84	15.5	6.0
				1350	46.9	36.7	102.2	2.98	4.61	6.5	1200	43.9	30.4	0.69	53.3	2.76	15.9	6.0
	12.0	5.3	12.3	1400	50.1	39.6	103.1	3.07	4.78	6.6	1300	44.0	30.7	0.70	53.1	2.68	16.4	5.7
				1350	49.6	39.1	104.0	3.07	4.73	7.1	1200	43.9	30.6	0.70	52.8	2.61	16.8	5.7
90	6.0	3.5	8.2	1400	57.6	49.7	108.1	2.31	7.31	7.8	1300	44.8	28.6	0.64	54.7	2.90	15.4	6.9
				1350	57.1	49.2	109.2	2.31	7.24	7.7	1200	44.8	28.5	0.64	54.4	2.81	15.9	6.9
	8.0	4.6	10.7	1400	49.5	39.3	102.7	3.00	4.83	6.7	1300	41.5	29.4	0.71	52.8	3.30	12.6	6.8
				1350	49.0	38.8	103.6	3.00	4.79	6.6	1200	41.4	29.3	0.71	52.3	3.20	12.9	6.8
	12.0	5.0	11.5	1400	52.3	41.7	104.6	3.10	4.94	7.0	1300	41.5	29.6	0.71	52.1	3.11	13.3	6.4
				1350	51.8	41.2	105.5	3.10	4.90	6.9	1200	41.4	29.4	0.71	51.7	3.02	13.7	6.4
100	6.0	3.2	7.4	Operation Not Recommended							1300	41.7	27.5	0.66	53.2	3.38	12.3	7.7
											1200	41.7	27.3	0.65	52.9	3.28	12.7	7.6
	8.0	4.2	9.7								1300	38.6	28.3	0.73	51.7	3.85	10.0	7.6
											1200	38.6	28.1	0.73	51.3	3.73	10.3	7.5
	12.0	4.5	10.4								1300	38.6	28.4	0.74	51.0	3.63	10.6	7.2
											1200	38.5	28.3	0.74	50.5	3.53	10.9	7.2
110	6.0	3.4	7.8								1300	38.4	26.2	0.68	51.7	3.89	9.9	8.2
											1200	38.3	26.1	0.68	51.2	3.77	10.2	8.2
	8.0	4.4	10.1								1300	35.5	27.0	0.76	50.6	4.43	8.0	8.2
											1200	35.5	26.8	0.75	50.2	4.30	8.3	8.1
	12.0	4.7	10.9								1300	35.5	27.1	0.76	49.8	4.18	8.5	8.0
											1200	35.4	27.0	0.76	49.3	4.06	8.7	8.0

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6h: Model 060 with MPD060B Performance Data: 5.0 Ton, Full Load, 1950 CFM Cooling / 1900 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	15.0	9.7	22.5	1900	44.4	31.3	91.6	3.84	3.39	5.9	Operation Not Recommended							
				1750	44.4	31.2	93.5	3.87	3.36	5.9								
30	8.0	7.4	17.0	1900	43.1	29.9	91.0	3.86	3.27	5.7								
				1750	43.1	29.9	92.8	3.88	3.25	5.7								
	12.0	7.9	18.3	1900	44.5	31.3	91.7	3.87	3.37	5.9								
				1750	44.5	31.2	93.5	3.90	3.34	5.9								
	15.0	9.2	21.3	1900	45.4	32.2	92.1	3.88	3.43	6.0								
				1750	45.4	32.1	94.0	3.90	3.41	6.0								
40	8.0	6.3	14.5	1900	48.7	35.1	93.7	3.98	3.59	6.4								
				1750	48.7	35.0	95.8	4.01	3.56	6.5								
	12.0	6.8	15.7	1900	50.3	36.6	94.5	4.00	3.68	6.6								
				1750	50.3	36.5	96.6	4.03	3.66	6.7								
	15.0	7.9	18.2	1900	51.4	37.7	95.0	4.00	3.77	6.8								
				1750	51.4	37.6	97.2	4.03	3.74	7.0								
50	8.0	5.6	12.9	1900	54.0	40.0	96.3	4.10	3.86	7.1	1950	69.5	47.3	0.68	80.1	3.12	22.3	5.6
				1750	54.0	39.9	98.6	4.13	3.83	7.1	1700	68.4	44.1	0.64	78.6	3.00	22.8	5.2
	12.0	6.0	13.9	1900	55.8	41.7	97.2	4.12	3.97	7.3	1950	69.5	47.4	0.68	79.9	3.04	22.9	5.2
				1750	55.8	41.6	99.5	4.15	3.94	7.3	1700	68.4	44.3	0.65	78.4	2.92	23.4	4.9
	15.0	7.0	16.2	1900	56.9	42.8	97.7	4.13	4.04	7.5	1950	70.0	47.7	0.68	80.1	2.97	23.6	5.1
				1750	56.9	42.7	100.1	4.16	4.01	7.5	1700	68.8	44.6	0.65	78.5	2.85	24.1	4.8
60	8.0	5.5	12.6	1900	57.2	42.9	97.9	4.19	4.00	7.5	1950	67.6	46.5	0.69	79.3	3.44	19.7	6.8
				1750	57.2	42.8	100.3	4.22	3.97	7.6	1700	66.4	43.5	0.66	77.7	3.30	20.1	6.4
	12.0	5.9	13.6	1900	59.2	44.9	98.8	4.20	4.13	7.8	1950	67.6	46.7	0.69	79.0	3.34	20.2	6.5
				1750	59.2	44.8	101.3	4.23	4.10	7.9	1700	66.4	43.6	0.66	77.4	3.21	20.7	6.1
	15.0	6.8	15.7	1900	60.4	46.0	99.4	4.21	4.20	8.0	1950	68.0	47.0	0.69	79.1	3.26	20.9	6.2
				1750	60.4	45.9	102.0	4.24	4.17	8.0	1700	66.8	43.9	0.66	77.5	3.14	21.3	5.8
70	8.0	5.6	12.9	1900	59.6	45.1	99.0	4.26	4.10	7.8	1950	65.4	45.7	0.70	78.4	3.80	17.2	8.0
				1750	59.6	45.0	101.5	4.29	4.07	7.8	1700	64.3	42.7	0.66	76.8	3.65	17.6	7.5
	12.0	6.0	13.9	1900	61.7	47.1	100.1	4.27	4.23	8.2	1950	65.4	45.9	0.70	78.0	3.69	17.7	7.7
				1750	61.7	47.0	102.6	4.30	4.20	8.2	1700	64.3	42.8	0.67	76.4	3.55	18.1	7.2
	15.0	7.0	16.1	1900	62.9	48.3	100.7	4.28	4.31	8.4	1950	65.8	46.1	0.70	78.1	3.61	18.2	7.3
				1750	62.9	48.2	103.3	4.31	4.28	8.4	1700	64.7	43.1	0.67	76.5	3.47	18.6	6.8
80	8.0	5.6	12.9	1900	62.6	47.8	100.5	4.33	4.24	8.2	1950	62.4	44.4	0.71	76.7	4.20	14.9	9.2
				1750	62.6	47.7	103.1	4.36	4.21	8.4	1700	61.3	41.5	0.68	75.1	4.03	15.2	8.6
	12.0	6.0	13.9	1900	64.7	49.9	101.5	4.35	4.36	8.6	1950	62.4	44.6	0.71	76.3	4.08	15.3	8.8
				1750	64.7	49.8	104.2	4.38	4.33	8.7	1700	61.3	41.6	0.68	74.7	3.92	15.6	8.2
	15.0	7.0	16.2	1900	66.0	51.1	102.2	4.36	4.44	8.8	1950	62.8	44.8	0.71	76.4	3.99	15.7	8.4
				1750	66.0	51.0	104.9	4.39	4.40	8.7	1700	61.7	41.9	0.68	74.8	3.83	16.1	7.9
90	8.0	5.2	12.1	1900	65.2	50.2	101.8	4.40	4.34	8.6	1950	58.9	42.9	0.73	74.9	4.70	12.5	10.3
				1750	65.2	50.1	104.5	4.43	4.31	8.6	1700	57.9	40.1	0.69	73.3	4.52	12.8	9.6
	12.0	5.6	13.0	1900	67.5	52.4	102.9	4.42	4.47	8.9	1950	58.9	43.0	0.73	74.5	4.57	12.9	9.7
				1750	67.5	52.3	105.7	4.45	4.44	8.9	1700	57.9	40.2	0.69	72.9	4.39	13.2	9.1
	15.0	6.5	15.1	1900	68.8	53.7	103.5	4.42	4.56	9.2	1950	59.3	43.3	0.73	74.6	4.47	13.3	9.6
				1750	68.8	53.6	106.4	4.46	4.52	9.2	1700	58.3	40.4	0.69	72.9	4.29	13.6	9.0
100	8.0	4.7	10.7	Operation Not Recommended							1950	55.6	41.3	0.74	73.9	5.36	10.4	11.4
											1700	54.6	38.6	0.71	72.2	5.15	10.6	10.7
	12.0	5.0	11.6								1950	55.6	41.5	0.75	73.3	5.20	10.7	10.9
											1700	54.6	38.7	0.71	71.7	5.00	10.9	10.2
	15.0	5.8	13.4								1950	55.9	41.7	0.75	73.3	5.09	11.0	10.7
											1700	55.0	39.0	0.71	71.7	4.89	11.2	10.0
110	8.0	4.8	11.1								1950	52.0	39.6	0.76	72.6	6.05	8.6	12.5
											1700	51.2	37.0	0.72	71.1	5.82	8.8	11.7
	12.0	5.2	12.0								1950	52.0	39.8	0.77	72.1	5.88	8.8	12.1
											1700	51.2	37.2	0.73	70.5	5.65	9.1	11.3
	15.0	6.0	13.9								1950	52.3	40.0	0.76	71.9	5.75	9.1	11.8
											1700	51.5	37.4	0.73	70.4	5.53	9.3	11.0

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6i: Model 072 with MPD072A Performance Data: 6.0 Ton, Part Load, 1300 CFM Cooling / 1300 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	12.0	5.1	11.2	1300	34.2	22.4	94.4	3.45	2.90	4.4								
				1100	33.5	21.2	98.2	3.61	2.72	4.4								
30	8.0	2.4	5.6	1300	37.0	25.0	96.4	3.51	3.09	4.8								
				1100	36.1	23.6	100.4	3.67	2.88	4.7								
	10.0	3.5	8.0	1300	37.7	25.7	96.9	3.53	3.13	5.0								
				1100	36.9	24.3	101.1	3.70	2.92	4.9								
	12.0	5.0	11.1	1300	38.1	26.0	97.1	3.55	3.14	5.0								
				1100	37.2	24.5	101.3	3.71	2.94	4.9								
40	8.0	2.3	5.2	1300	42.0	29.6	99.9	3.63	3.39	5.5								
				1100	41.0	28.0	104.5	3.80	3.16	5.6								
	10.0	3.2	7.4	1300	42.9	30.4	100.6	3.66	3.43	5.6								
				1100	41.9	28.8	105.3	3.83	3.21	5.6								
	12.0	4.7	10.3	1300	43.3	30.7	100.8	3.68	3.45	5.6								
				1100	42.3	29.2	105.6	3.85	3.22	5.9								
50	8.0	2.2	5.1	1300	46.7	33.9	103.3	3.75	3.65	6.2	1300	57.1	36.7	0.64	64.7	2.24	25.5	4.4
				1100	45.7	32.3	108.5	3.92	3.42	6.1	1150	55.6	34.0	0.61	63.1	2.21	25.2	4.1
	10.0	3.2	7.3	1300	47.7	34.8	104.0	3.78	3.70	6.3	1300	57.5	36.8	0.64	64.8	2.13	27.0	4.2
				1100	46.7	33.2	109.3	3.96	3.46	6.2	1150	55.9	34.2	0.61	63.1	2.10	26.6	3.9
	12.0	4.4	10.1	1300	48.2	35.2	104.3	3.80	3.72	6.3	1300	57.6	36.9	0.64	64.7	2.07	27.8	3.9
				1100	47.1	33.6	109.6	3.97	3.48	6.2	1150	56.1	34.2	0.61	63.1	2.04	27.5	3.6
60	8.0	2.3	5.4	1300	51.9	38.7	107.0	3.88	3.92	6.8	1300	55.2	35.9	0.65	64.0	2.58	21.4	5.3
				1100	50.8	36.9	112.8	4.06	3.67	6.8	1150	53.7	33.3	0.62	62.4	2.54	21.1	4.9
	10.0	3.3	7.7	1300	53.0	39.7	107.7	3.91	3.97	6.9	1300	55.5	36.0	0.65	63.9	2.45	22.7	5.1
				1100	51.8	37.8	113.6	4.09	3.71	6.8	1150	54.0	33.4	0.62	62.3	2.42	22.3	4.7
	12.0	4.2	10.6	1300	53.5	40.1	108.1	3.93	3.99	7.0	1300	55.6	36.1	0.65	63.8	2.39	23.3	4.7
				1100	52.3	38.3	114.0	4.11	3.73	7.2	1150	54.1	33.5	0.62	62.2	2.36	22.9	4.4
70	8.0	2.4	5.6	1300	56.5	42.9	110.2	3.99	4.15	7.5	1300	53.2	35.0	0.66	63.3	2.95	18.0	6.1
				1100	55.2	41.0	116.5	4.17	3.88	7.3	1150	51.7	32.5	0.63	61.6	2.91	17.8	5.7
	10.0	3.4	7.9	1300	57.7	44.0	111.1	4.02	4.21	7.5	1300	53.5	35.2	0.66	63.1	2.81	19.0	5.8
				1100	56.4	42.0	117.5	4.21	3.93	7.3	1150	52.1	32.6	0.63	61.6	2.77	18.8	5.4
	12.0	4.0	11.0	1300	58.2	44.4	111.5	4.04	4.22	7.7	1300	53.7	35.2	0.66	63.0	2.73	19.7	5.6
				1100	56.9	42.5	117.9	4.23	3.94	7.5	1150	52.2	32.7	0.63	61.4	2.70	19.3	5.2
80	8.0	2.3	5.2	1300	59.5	45.6	112.4	4.06	4.29	7.9	1300	50.2	33.9	0.68	61.8	3.39	14.8	7.1
				1100	58.2	43.7	119.0	4.25	4.01	7.9	1150	48.8	31.5	0.65	60.2	3.34	14.6	6.6
	10.0	3.2	7.4	1300	60.8	46.8	113.3	4.09	4.36	8.0	1300	50.5	34.1	0.68	61.5	3.22	15.7	6.8
				1100	59.5	44.9	120.1	4.28	4.07	8.1	1150	49.1	31.6	0.64	60.0	3.18	15.4	6.3
	12.0	3.9	10.3	1300	61.4	47.4	113.7	4.11	4.38	8.1	1300	50.6	34.1	0.67	61.3	3.14	16.1	6.4
				1100	60.0	45.3	120.5	4.30	4.09	8.2	1150	49.2	31.6	0.64	59.7	3.09	15.9	5.9
90	8.0	1.8	4.3	1300	62.4	48.3	114.4	4.12	4.44	8.4	1300	47.1	32.8	0.70	60.4	3.90	12.1	8.0
				1100	61.0	46.3	121.3	4.31	4.15	8.2	1150	45.8	30.4	0.66	58.9	3.85	11.9	7.4
	10.0	2.6	6.0	1300	63.7	49.5	115.4	4.15	4.50	8.6	1300	47.4	32.9	0.69	60.1	3.71	12.8	7.7
				1100	62.3	47.5	122.4	4.35	4.20	8.4	1150	46.1	30.5	0.66	58.6	3.66	12.6	7.1
	12.0	3.8	8.4	1300	64.3	50.1	115.8	4.17	4.52	8.6	1300	47.5	33.0	0.69	59.8	3.61	13.2	7.1
				1100	62.8	47.9	122.9	4.37	4.21	8.4	1150	46.2	30.6	0.66	58.4	3.56	13.0	6.6
100	8.0	1.4	3.3								1300	45.0	31.8	0.71	60.3	4.48	10.0	8.8
											1150	43.8	29.5	0.67	58.9	4.42	9.9	8.2
	10.0	2.0	4.7								1300	45.3	31.9	0.70	59.8	4.26	10.6	8.5
											1150	44.1	29.6	0.67	58.4	4.20	10.5	7.9
	12.0	3.7	6.5								1300	45.4	32.0	0.70	59.6	4.15	10.9	8.2
											1150	44.2	29.7	0.67	58.2	4.09	10.8	7.6
110	8.0	1.8	4.1								1300	42.9	30.8	0.72	60.3	5.09	8.4	9.7
											1150	41.7	28.6	0.69	58.8	5.02	8.3	9.0
	10.0	2.5	5.8								1300	43.2	31.0	0.72	59.7	4.84	8.9	9.4
											1150	42.0	28.7	0.68	58.3	4.77	8.8	8.7
	12.0	3.5	8.1								1300	43.3	31.0	0.72	59.4	4.71	9.2	9.1
											1150	42.1	28.8	0.68	58.0	4.65	9.1	8.5

Operation Not Recommended

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6j: Model 072 with MPD072A Performance Data: 6.0 Ton, Full Load, 2100 CFM Cooling / 2050 CFM Heating

				Heating							Cooling							
EWT	Flow	WPD		Aiflow	HC	HE	LAT	kW	COP	DH	Aiflow	TC	SC	S/T	HR	kW	EER	DH
°F	GPM	PSI	FT	CFM	MBtuh	MBtuh	°F		W/W	MBtuh	CFM	MBtuh	MBtuh		MBtuh		Btuh/W	MBtuh
25	18.0	10.4	24.0	2050	51.4	35.6	93.2	4.62	3.26	6.9	Operation Not Recommended							
				1700	50.4	34.7	97.5	4.60	3.21	6.8								
30	12.0	5.0	11.5	2050	52.5	36.7	93.7	4.62	3.33	7.0								
				1700	51.5	35.8	98.1	4.60	3.28	6.9								
	15.0	7.4	17.1	2050	53.1	37.2	94.0	4.65	3.35	7.0								
				1700	52.0	36.2	98.3	4.62	3.30	6.9								
	18.0	10.1	23.3	2050	53.1	37.1	94.0	4.68	3.32	7.0								
				1700	52.1	36.2	98.4	4.66	3.28	6.9								
40	12.0	4.7	10.8	2050	59.1	42.6	96.7	4.84	3.58	7.8								
				1700	57.9	41.5	101.5	4.81	3.53	7.8								
	15.0	6.9	16.0	2050	59.7	43.1	97.0	4.86	3.60	7.8								
				1700	58.6	42.1	101.9	4.84	3.55	7.8								
	18.0	9.5	21.8	2050	59.8	43.1	97.0	4.90	3.58	7.8								
				1700	58.6	41.9	101.9	4.88	3.52	8.2								
50	12.0	4.4	10.1	2050	65.2	48.0	99.4	5.03	3.80	8.7	2100	77.5	51.8	0.67	90.3	3.74	20.7	6.1
				1700	63.9	46.8	104.8	5.01	3.74	8.5	1750	76.0	47.4	0.62	88.0	3.51	21.7	5.6
	15.0	6.5	15.0	2050	65.9	48.6	99.8	5.06	3.82	8.7	2100	77.7	51.7	0.67	90.1	3.63	21.4	5.8
				1700	64.6	47.4	105.2	5.04	3.76	8.5	1750	76.2	47.3	0.62	87.9	3.42	22.3	5.3
	18.0	8.9	20.5	2050	66.0	48.6	99.8	5.10	3.79	8.7	2100	77.6	51.4	0.66	89.8	3.58	21.7	5.5
				1700	64.7	47.4	105.2	5.08	3.73	8.5	1750	76.2	47.1	0.62	87.7	3.36	22.7	5.0
60	12.0	4.2	9.6	2050	69.3	51.7	101.3	5.16	3.94	9.0	2100	74.6	50.8	0.68	88.5	4.07	18.3	7.4
				1700	68.0	50.5	107.0	5.14	3.88	9.0	1750	73.1	46.5	0.64	86.1	3.82	19.1	6.8
	15.0	6.1	14.2	2050	70.1	52.4	101.7	5.19	3.96	9.1	2100	74.7	50.7	0.68	88.2	3.95	18.9	7.1
				1700	68.7	51.1	107.4	5.17	3.89	9.1	1750	73.3	46.4	0.63	86.0	3.72	19.7	6.5
	18.0	8.4	19.4	2050	70.1	52.3	101.7	5.23	3.93	9.1	2100	74.7	50.5	0.68	88.0	3.89	19.2	6.7
				1700	68.8	51.0	107.5	5.21	3.87	9.3	1750	73.3	46.2	0.63	85.8	3.66	20.0	6.1
70	12.0	4.0	9.2	2050	72.3	54.4	102.7	5.25	4.03	9.5	2100	71.6	49.8	0.70	86.8	4.44	16.1	8.7
				1700	70.9	53.1	108.6	5.23	3.97	9.3	1750	70.2	45.6	0.65	84.4	4.17	16.8	8.0
	15.0	5.9	13.6	2050	73.1	55.1	103.0	5.28	4.06	9.7	2100	71.7	49.7	0.69	86.4	4.31	16.6	8.4
				1700	71.6	53.7	109.0	5.25	4.00	9.5	1750	70.3	45.5	0.65	84.2	4.06	17.3	7.7
	18.0	8.1	18.7	2050	73.1	54.9	103.0	5.32	4.03	9.7	2100	71.7	49.5	0.69	86.2	4.25	16.9	7.9
				1700	71.7	53.6	109.1	5.30	3.96	9.5	1750	70.3	45.3	0.64	84.0	4.00	17.6	7.2
80	12.0	3.9	9.0	2050	75.4	57.2	104.1	5.34	4.14	9.8	2100	68.8	48.6	0.71	85.4	4.87	14.1	10.0
				1700	73.9	55.8	110.3	5.31	4.08	9.9	1750	67.5	44.5	0.66	83.1	4.58	14.7	9.2
	15.0	5.7	13.2	2050	76.2	57.9	104.4	5.36	4.17	10.0	2100	68.9	48.5	0.70	85.0	4.73	14.6	9.6
				1700	74.7	56.5	110.7	5.34	4.10	10.0	1750	67.6	44.4	0.66	82.8	4.45	15.2	8.8
	18.0	7.8	18.1	2050	76.3	57.8	104.5	5.41	4.13	10.0	2100	68.9	48.2	0.70	84.8	4.66	14.8	9.2
				1700	74.8	56.4	110.7	5.38	4.07	10.1	1750	67.6	44.2	0.65	82.6	4.39	15.4	8.4
90	12.0	3.8	8.7	2050	78.0	59.6	105.2	5.40	4.23	10.3	2100	65.9	47.1	0.71	84.4	5.41	12.2	11.3
				1700	76.5	58.1	111.7	5.38	4.17	10.1	1750	64.6	43.1	0.67	82.0	5.09	12.7	10.3
	15.0	5.6	12.9	2050	78.8	60.3	105.6	5.43	4.25	10.4	2100	66.0	47.0	0.71	84.0	5.26	12.5	10.7
				1700	77.3	58.9	112.1	5.40	4.19	10.2	1750	64.7	43.1	0.67	81.6	4.94	13.1	9.8
	18.0	7.6	17.6	2050	78.9	60.2	105.6	5.47	4.23	10.5	2100	66.0	46.8	0.71	83.7	5.18	12.7	10.4
				1700	77.4	58.8	112.2	5.45	4.16	10.3	1750	64.7	42.9	0.66	81.3	4.87	13.3	9.5
100	12.0	3.7	8.5	Operation Not Recommended							2100	62.4	45.7	0.73	83.1	6.06	10.3	12.7
											1750	61.2	41.9	0.68	80.7	5.70	10.7	11.6
	15.0	5.4	12.5								2100	62.5	45.6	0.73	82.6	5.89	10.6	12.1
											1750	61.4	41.8	0.68	80.3	5.54	11.1	11.1
	18.0	7.4	17.1								2100	62.5	45.4	0.73	82.3	5.80	10.8	11.7
											1750	61.3	41.6	0.68	79.9	5.45	11.2	10.7
110	12.0	3.5	8.2								2100	58.9	44.2	0.75	81.9	6.74	8.7	14.0
											1750	57.8	40.5	0.70	79.4	6.34	9.1	12.8
	15.0	5.2	12.1								2100	59.0	44.2	0.75	81.4	6.55	9.0	13.5
											1750	57.9	40.4	0.70	78.9	6.16	9.4	12.3
	18.0	7.2	16.5								2100	59.0	44.0	0.75	81.0	6.45	9.1	12.9
											1750	57.9	40.2	0.69	78.6	6.07	9.5	11.8

Heating data based on 70F EAT; Cooling data based on 80/67F EAT. See Correction Factors on page 24 for different conditions.

Section 6k: Performance Data Correction Factors

Heating Correction Factors

EAT °F	HC	HE	kW
50	1.0450	1.1136	0.8208
55	1.0347	1.0893	0.8567
60	1.0260	1.0640	0.9019
65	1.0089	1.0270	0.9497
70	1.0000	1.0000	1.0000
75	0.9924	0.9741	1.0527
80	0.9870	0.9653	1.0522

Cooling Correction Factors

EAT (WB) °F	TC	HR	kW
55	0.8215	0.8293	0.8635
60	0.8955	0.9001	0.9205
63	0.9404	0.9431	0.9547
65	0.9701	0.9715	0.9774
67	1.0000	1.0000	1.0000
70	1.0446	1.0425	1.0335
75	1.1179	1.1124	1.0878

Sensible Cooling Correction Factors

EAT (WB) °F	EAT (DB) °F				
	70	75	80	85	90
55	1.201	1.289			
60	0.943	1.067	1.192		
63	0.852	0.995	1.138		
65	0.797	0.952	1.106	1.261	
67	0.624	0.812	1.000	1.188	1.343
70		0.697	0.820	0.944	1.067
75			0.637	0.817	0.983

Section 7: Installation Introduction

INTRODUCTION
This geothermal heat pump provides heating and cooling as well as optional domestic water heating capability. Engineering and quality control is built into every geothermal unit. Good performance depends on proper application and correct installation.

Notices, Cautions, Warnings, & Dangers

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

"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.

"WARNING" Indicates potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

"DANGER" Indicates an immediate hazardous situation which, if not avoided, WILL result in death or serious injury.

Inspection
Upon receipt of any geothermal equipment, carefully check the shipment against the packing slip and the freight company bill of lading. Verify that all units and packages have been received. Inspect the packaging of each package and each unit for damages. Insure that the carrier makes proper notation of all damages or shortage on all bill of lading papers. Concealed damage should be reported to the freight company within 15 days. If not filed within 15 days the freight company can deny all claims.

Note: Notify Enertech Global's shipping department of all damages within 15 days. It is the responsibility of the purchaser to file all necessary claims with the freight company.

Unit Protection
Protect units from damage and contamination due to plastering (spraying), painting and all other foreign materials that may be used at the job site. Keep all units covered on the job site with either the original packaging or equivalent protective covering. Cap or recap unit connections and all piping until unit is installed. Precautions must be taken to avoid physical damage and contamination which may prevent proper start-up and may result in costly equipment repair.

⚠ CAUTION ⚠

DO NOT OPERATE THE GEOTHERMAL HEAT PUMP UNIT DURING BUILDING CONSTRUCTION PHASE.

Storage
All geothermal units should be stored inside in the original packaging in a clean, dry location. Units should be stored in an upright position at all times. Units should not be stacked unless specially noted on the packaging.

Pre-Installation
Special care should be taken in locating the geothermal unit. Installation location chosen should include adequate service clearance around the unit. All units should be placed on a formed plastic air pad, or a high density, closed cell polystyrene pad slightly larger than the base of the unit. All units should be located in an indoor area where the ambient temperature will remain above 55°F and should be located in a way that piping and ductwork or other permanently installed fixtures do not have to be removed for servicing and filter replacement.

Pre-Installation Steps:

1. Compare the electrical data on the unit nameplate with packing slip and ordering information to verify that the correct unit has been shipped.
2. Remove any packaging used to support blower during shipping.
3. Inspect all electrical connections and wires. Connections must be clean and tight at the terminals, and wires should not touch any sharp edges or copper pipe.
4. Verify that all refrigerant tubing is free of dents and kinks. Refrigerant tubing should not be touching other unit components.

5. Before unit start-up, read all manuals and become familiar with unit components and operation. Thoroughly check the unit before operating.
6. For A-Coil installations, it is recommended that coil be sprayed with liquid detergent thoroughly and rinsed thoroughly before installation to assure proper drainage of condensate from the coil fins to eliminate water blowoff and to assure maximum coil performance. If not sprayed approximately 50 hours of break in time is required to achieve the same results.

⚠ CAUTION ⚠

ALL GEOTHERMAL EQUIPMENT IS DESIGNED FOR INDOOR INSTALLATION ONLY. DO NOT INSTALL OR STORE UNIT IN A CORROSIVE ENVIRONMENT OR IN A LOCATION WHERE TEMPERATURE AND HUMIDITY ARE SUBJECT TO EXTREMES. EQUIPMENT IS NOT CERTIFIED FOR OUTDOOR APPLICATIONS. SUCH INSTALLATION WILL VOID ALL WARRANTIES.

⚠ WARNING ⚠

FAILURE TO FOLLOW THIS CAUTION MAY RESULT IN PERSONAL INJURY. USE CARE AND WEAR APPROPRIATE PROTECTIVE CLOTHING, SAFETY GLASSES AND PROTECTIVE GLOVES WHEN SERVICING UNIT AND HANDLING PARTS.

⚠ CAUTION ⚠

BEFORE DRILLING OR DRIVING ANY SCREWS INTO CABINET, CHECK TO BE SURE THE SCREW WILL NOT HIT ANY INTERNAL PARTS OR REFRIGERANT LINES.

Components

Master Contactor: Energizes Compressor and optional Hydronic Pump and/or Desuperheater pump package.

Logic Board: Logic Board operates the compressor and protects unit by locking out when safety switches are engaged. It also provides fault indicator(s).

Terminal Strip: Provides connection to the thermostat or other accessories to the low voltage circuit.

Transformer: Converts incoming (source) voltage to 24V AC.

Low Voltage Breaker: Attached directly to transformer, protects the transformer and low voltage circuit.

Reversing Valve: Controls the cycle of the refrigerant system (heating or cooling). Energized in cooling mode.

High Pressure Switch: Protects the refrigerant system from high refrigerant pressure, by locking unit out if pressure exceeds setting.

Low Pressure Switch: Protects the refrigerant system from low suction pressure, if suction pressure falls below setting.

Flow Switch (Freeze Protection Device): Protects the water heat exchanger from freezing, by shutting down compressor if water flow decreases.

Compressor (Copeland Scroll): Pumps refrigerant through the heat exchangers and pressurizes the refrigerant, which increases the temperature of the refrigerant.

Section 8: Installation Considerations

Consumer Instructions: Dealer should instruct the consumer in proper operation, maintenance, filter replacements, thermostat and indicator lights. Also provide the consumer with the manufacturer's Owner's Manual for the equipment being installed.

Enertech Global D-I-Y Policy: Enertech Global's geothermal heat pumps and system installations may include electrical, refrigerant and/or water connections. Federal, state and local codes and regulations apply to various aspects of the installation. Improperly installed equipment can lead to equipment failure and health/safety concerns. For these reasons, only qualified technicians should install a Enertech Global built geothermal system.

Because of the importance of proper installation, Enertech Global does not sell equipment direct to homeowners. Internet websites and HVAC outlets may allow for purchases directly by homeowners and do-it-yourselfers, but Enertech Global offers no warranty on equipment that is purchased via the internet or installed by persons without proper training.

Enertech Global has set forth this policy to ensure installations of Enertech Global geothermal systems are done safely and properly. The use of well-trained, qualified technicians helps ensure that your system provides many years of comfort and savings.

Equipment Installation: Special care should be taken in locating the unit. All units should be placed on a formed plastic air pad, or a high density, closed cell polystyrene pad slightly larger than the base of the unit. All units should be located in an indoor area were the ambient temperature will remain above 55°F and should be located in a way that piping and ductwork or other permanently installed fixtures do not have to be removed for servicing and filter replacement.

Electrical: All wiring, line and low voltage, should comply with the manufacturer's recommendations, The National Electrical Code, and all local codes and ordinances.

Thermostat: Thermostats should be installed approximately 54 inches off the floor on an inside wall in the return air pattern and where they are not in direct sunlight at anytime.

Loop Pumping Modules: Must be wired to the heat pump's electric control box. A special entrance knockout is provided below the thermostat entrance knockout. A pump module connection block, connected to the master contactor, and circuit breaker is provided to connect the Pump Module wiring.

Desuperheater Package: Water heating is standard on all residential units (units may be ordered without). It uses excess heat, during both heating and cooling cycles, to provide hot water for domestic needs. A desuperheater exchanger (coil) located between the compressor and the reversing valve, extracts superheated vapor to heat domestic water; while satisfying its heating and cooling needs. The water circulation pump comes pre-mounted in all residential units, but must be electrically connected to the master contactor. Leaving it disconnected ensures that the pump will not run without a water supply.

The Desuperheater package can make up to 60% (depending on heat pump usage) of most domestic water needs, but a water heater is still recommended.

Desuperheater Piping: All copper tubes & fittings should be 5/8" O.D (1/2" nom) minimum with a maximum of 50ft separation. Piping should be insulated with 3/8" wall closed cell insulation.

Note: Copper is the only approved material for piping the desuperheater.

Section 9: Unit Placement

UNIT PLACEMENT
When installing a geothermal heating and cooling unit, there are several items the installer should consider before placing the equipment.

1. ***Service Access.*** Is there enough space for service access? A general rule of thumb is at least 2 feet in the front and 2 feet on at least one side.
2. ***Unit Air Pad.*** All geothermal heating and cooling equipment should be placed on either a formed plastic air pad, or a high density, closed cell polystyrene pad. Downflow units should be placed on a non-combustible base. This helps eliminate vibration noise that could be transmitted through the floor.
3. The installer has verified that all applicable wiring, ductwork, piping, and accessories are correct and on the job site.

PRE-INSTALLATION
Before you fully install the geothermal equipment, it is recommended you go through this quick checklist before placing the equipment.

- ☐ Fully inspect the unit after unpacking.
- ☐ Open both the air handler section and compressor section and removed any packaging material or documentation included in the unit.
- ☐ Remove all packaging materials and ties from the rear of the blower.
- ☐ Locate the Unit Start-Up form from this manual and have it available as the unit installation proceeds.

⚠ WARNING ⚠

IF USING A DUAL FUEL APPLICATION, "A" COIL MUST BE INSTALLED ON THE OUTLET OF THE FURNACE. INSTALLATION ON THE RETURN COULD CAUSE FURNACE HEAT EXCHANGER FAILURE, AND MAY VOID FURNACE WARRANTY.

Section 9a: Ductwork Installation

DUCT WORK
All new ductwork shall be designed as outlined in Sheet Metal and Air Conditioning Contractors National Association (SMACNA) or Air Conditioning Contractors of America (ACCA) or American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) handbooks.

All supply/return plenums should be isolated from the unit by a flexible connector (canvas) or equivalent to prevent transfer of vibration noise to the ductwork. The flex connector should be designed so as not to restrict airflow. Turning vanes should be used on any run over 500 CFM. If the unit is installed in a noninsulated space the metal ductwork should be insulated on the inside with fiberglass insulation or similar insulation to prevent heat loss/gain and to absorb air noise. If the unit is being installed with existing ductwork, the ductwork must be designed to handle the air volume required by the unit being installed. When running a cooling or heating load on a building, size ductwork accordingly to the building design load and heat pump CFM.

Rule of Thumb: When sizing ductwork use 400 CFM per Ton.

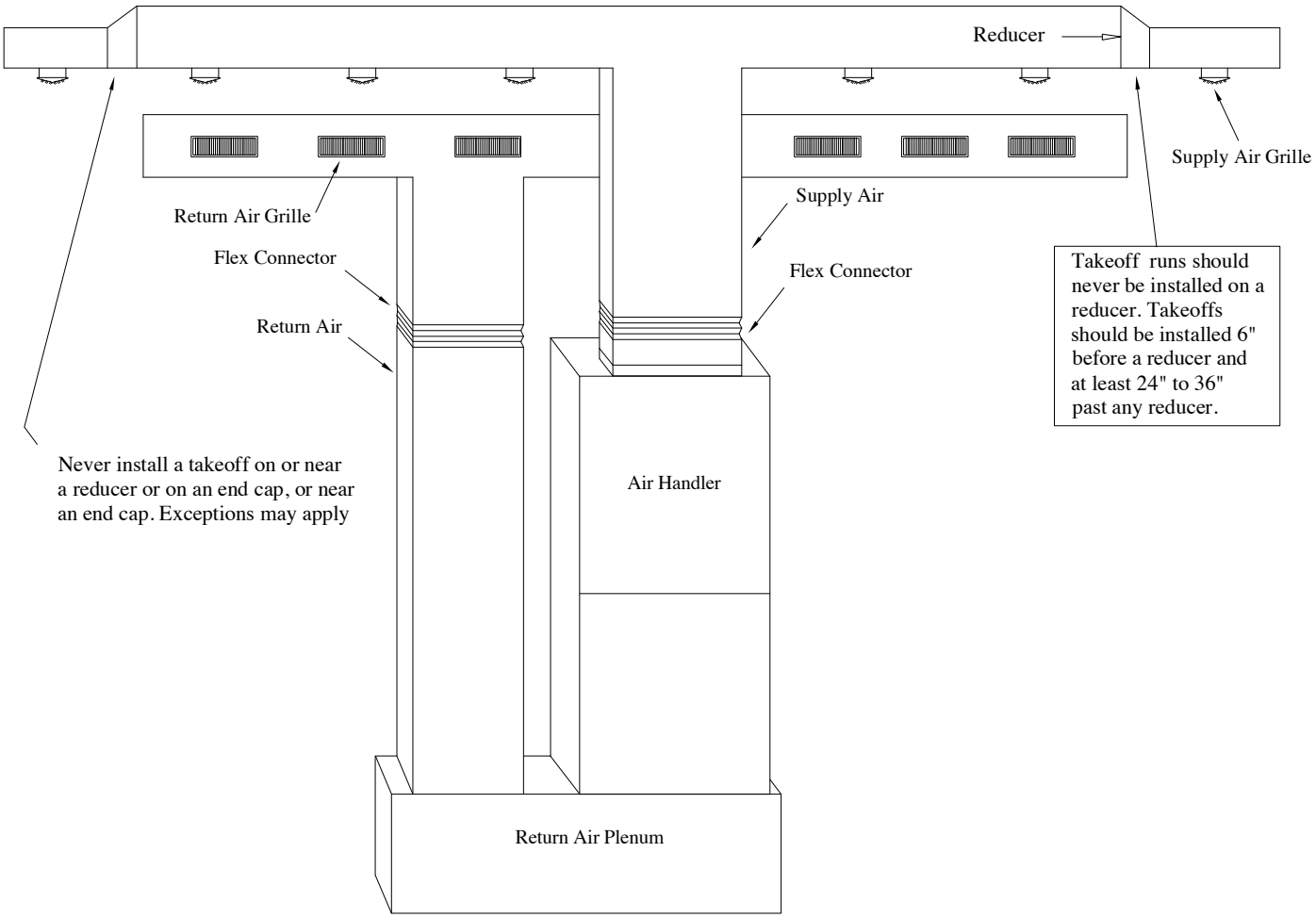
As a general rule, maximum recommended face velocity for a supply outlet used in a residential application is 800 FPM. Maximum recommended return grille velocity is 400 FPM. Systems with higher velocity, are likely to have noise problems.

In buildings where ceilings are 8 feet or more, at least 50 percent of the return air should be taken back to the heat pump from the ceiling or high sidewall location and not more than 50 percent from the floor or low sidewall location.

⚠ NOTICE ⚠

WHEN MATCHING AN ST048 OR ST060 WITH AN MPD060B, REFER TO THE CFM CHART ON PAGE 56 FOR THE PROPER AIRFLOW JUMPER SETTINGS.

Figure 1: Standard Ductwork Connection Setup



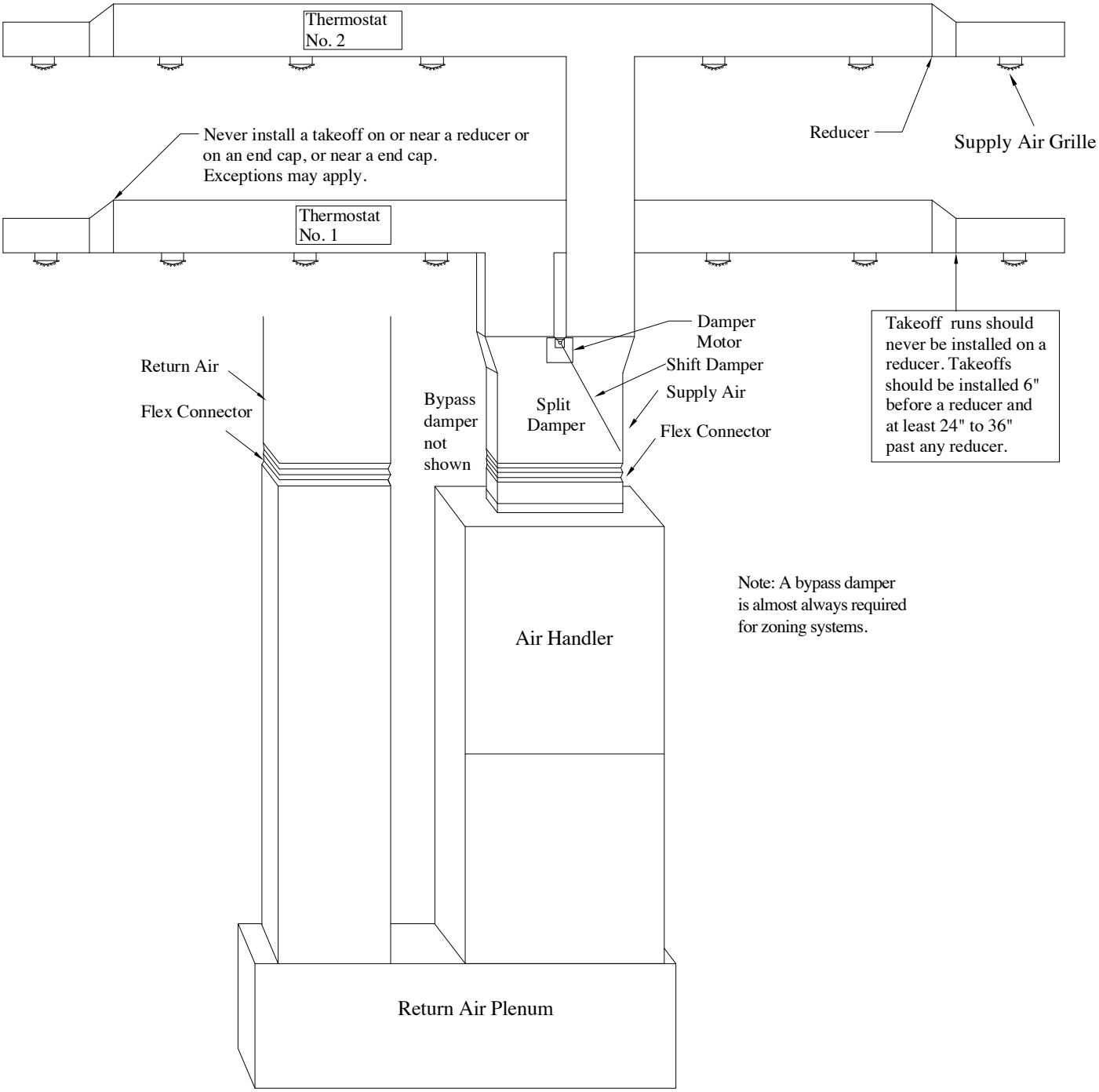
The air handling unit comes with an ECM blower motor. For maximum performance, the blower speed should be set to maintain between 350 and 450 CFM/ton. Changing the wires (for PSC) at the blower will change the blower speed.

Table 1: Maximum Air Velocities

Location	Supply	Return
Main Ducts	900 FPM	600 FPM
Branch Ducts	700 FPM	600 FPM
Grills, Registers, Diffusers	750 FPM	600 FPM

Section 9a: Ductwork Installation

Figure 2: Ductwork with Split Damper Connection Setup



Section 9b: Filter Drier Installation

INSTALLATION

A reversible heat pump filter drier must be installed on the liquid line near the cabinet of the compressor section. A filter drier is furnished with the unit. The filter drier kit includes a 3" piece of 1/2" or 5/8" copper tubing. This tubing will fit either inside or on the outside of the stub coming off the liquid line service valve. Braze it in place. Then braze the filter drier onto it. Make sure the arrow on the filter drier points in the appropriate direction. A second piece of copper is attached between the filter drier and the liquid line (not needed for all applications, depending upon line set size -- consult line set sizing chart).

Refer to the split system I.O.M. (installation, operating, and maintenance) manual for details on line set and unit installation. Always use dry nitrogen when brazing.

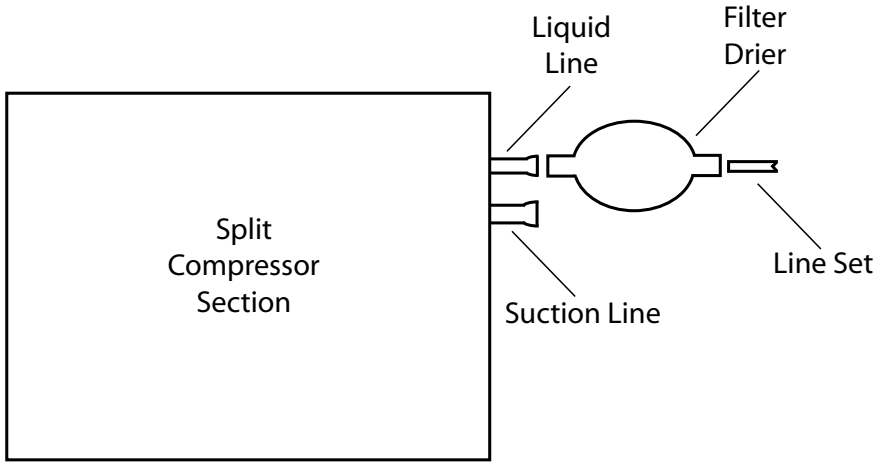
Table 2: Recommended Line Set Sizes

Model	Unit Refrigerant Connections		Recommended Liquid & Suction Line Size			
			20 Feet		50 Feet	
	Liquid Line (OD)	Suction Line (OD)	Liquid Line (OD)	Suction Line* (OD)	Liquid Line (OD)	Suction Line (OD)
024	3/8	7/8	3/8	3/4**	Two-stage unit's line sizes should not be increased due to reduced pumping capacity in first stage.	
036	3/8	7/8	3/8	7/8		
048	3/8	7/8	3/8	7/8		
060	1/2	1-1/8	1/2	1-1/8		
072	1/2	1-1/8	1/2	1-1/8		

40°F Evaporating Temperature
*Suction line is not sized large in two-stage units due to the lower velocity of first stage operation.
**Reduce from 7/8" unit connection to 3/4" suction line for proper velocity

Weight of refrigerant in copper lines per 10 feet	
Liquid Line Size (OD)	Oz. Per 10 Feet
3/8"	5.4
1/2"	10.4
5/8"	19.5

Figure 3: Filter Drier Installation



Section 9c: Line Set Installation

INTRODUCTION
The purpose of this section is to help in the design of refrigeration line sets on geothermal heat pump systems. The three considerations when designing a refrigerant piping system are as follows:

1. System Reliability: Poor Oil Management may shorten the life of the compressor. Proper liquid refrigerant control is essential.

2. System Performance: Pressure drop in refrigerant lines tends to decrease capacity and increase power consumption. High velocities can increase sound levels. Modulation often depends on proper piping.

3. Cost: Level of refrigerant, copper piping, accessories, and labor used will impact the applied cost.

DEFINITIONS
Long line set applications are defined as any line set that includes 50 feet or more of interconnecting tubing or a vertical distance between the evaporator and compressor sections exceeding 20 feet.

LINE SET REQUIREMENTS/LIMITATIONS

Line Set Limitations
Up to 50 equivalent feet: Use rated line sizes listed in unit installation instructions.

50 - 75 equivalent feet or 20 feet of vertical separation: Bi-flow liquid line solenoid and crankcase heater required (refer to table 1 and piping diagrams pages 5, 6, & 7).

Maximum Piping Lengths:
Maximum equivalent length = 75 feet
Maximum linear length = 50 feet
Maximum linear liquid lift = 50 feet
Maximum linear vapor rise =
50 feet (Single Speed)/25 feet (Two Stage)

FITTINGS AND COMPONENTS
All piping should be "ACR" or "L" type copper pipe. Long radius fittings should always be used unless there is not enough physical space. Pressure drop due to friction in pipe, fittings and field installed accessories such as a drier, solenoid valve or other devices should be considered (see Table 3). The pressure drop due to friction is usually smaller than pressure drop due to lift. The pressure drop ratings of field installed devices are usually supplied by the manufacturer of the device and should be used if available.

Equivalent Length
Valves, fittings, and bends create more friction pressure drop than straight copper piping. Find the equivalent feet of straight tubing for each fitting for calculations. This allows for a quick calculation of the total equivalent length (see Example 1). The equivalent length of copper tubing for commonly used fittings, valves, and filter-drier are shown in Table 3.

Total Equivalent Length = Linear Feet of Straight Tubing + Fitting Losses in Equivalent Feet

Example 1: A 3-ton unit with 7/8" vapor tubing has 50 linear feet of straight tubing. The total number of elbows includes three long radius 90° elbows and five standard 90° elbows.

50ft. of straight tubing
\+ 4 standard 90° elbows X 2 equiv ft
\+ 1 liquid line solenoid X 12 equiv ft
\+ 1 filter-drier X 6 equiv ft
= 50ft. + 8ft. + 12ft. + 6ft.
= 76 ft. total equivalent length

Table 3: Copper Fittings in Equivalent Length

Tube Size O.D. (in.)	90° Std A	90° Long Radius - B	45° Std C	45° Long Radius
3/8"	1.2	0.8	0.5	0.3
1/2"	1.3	0.9	0.6	0.4
5/8"	1.6	1.0	0.8	0.5
3/4"	1.8	1.2	0.9	0.6
7/8"	2.0	1.4	1.0	0.7
1-1/8"	2.6	1.7	1.3	0.9
Liquid Line Solenoid	12			
Filter	6			

LINE SETS

Vapor Line

A long line set application can critically increase the charge level needed for a system. As a result, the system is very prone to refrigerant migration during its off-cycle. A crankcase heater and bi-flow liquid line solenoid will help minimize this risk. A crankcase heater and bi-flow liquid line solenoid is recommended for any line set over 50 feet in equivalent length or 20 feet of vertical separation. Because oil separates from the refrigerant in the evaporator, the vapor line velocity must be adequate to carry the oil along with the refrigerant. Horizontal vapor lines require a minimum of 800 fpm velocity for oil entrainment. Vapor risers require 1200 fpm minimum, and preferably 1500 fpm regardless of the length of the riser.

NOTE: When a two-stage compressor section is located above the indoor coil, the maximum vertical rise of a vapor line must not exceed 25 feet. This limit is due to velocity requirements for oil entrainment in the vapor riser.

For example, a 4 ton unit producing 48,000 Btuh with a 7/8" vapor line has a velocity of 1500 fpm (See Figure 5). On first stage the compressor runs at 67% or 32,680 Btuh and has a velocity of less than 1200 fpm per the pressure drop chart. In order to achieve velocity up to 1500 fpm in first stage, the line would have to be 3/4". The pressure drop for 48,000 Btuh would be over 9 psi. A system will lose approximately 1% capacity for every pound of pressure drop due to friction in the suction line. This 1% factor is used to estimate the capacity loss of refrigerant lines. Due to the low velocities created in the vapor line in first stage, a two stage unit vapor line should not be increased from the pipe size at the compressor section.

For all vapor line trapping see Figure 4. Remember to add all the fittings into the total equivalent length of the vapor line.

Liquid Line

Pressure drop due to vertical liquid lift must be considered. The pressure drop for vertical lift is 0.43 pound per foot for R-410A. This is usually large and may be a limiting factor in the ultimate design of the system. Next, the pressure entering the expansion device must be sufficient to produce the required flow through the expansion device. A pressure drop of 175 psi for R-410A across the expansion valve and distributor is necessary to produce full refrigerant flow at rated capacity. Therefore, it is necessary for liquid refrigerant (free of flash gas) to be delivered to the expansion valve. Longer line sets may require a larger liquid line due to the higher pressure drops of smaller diameter tubing. Reference the Installation Manual for recommended liquid line sizes for each unit. Even liquid lines on two stage units can be increased because velocities required for oil return are not critical in the liquid line.

Figure 4: Oil Trap Construction

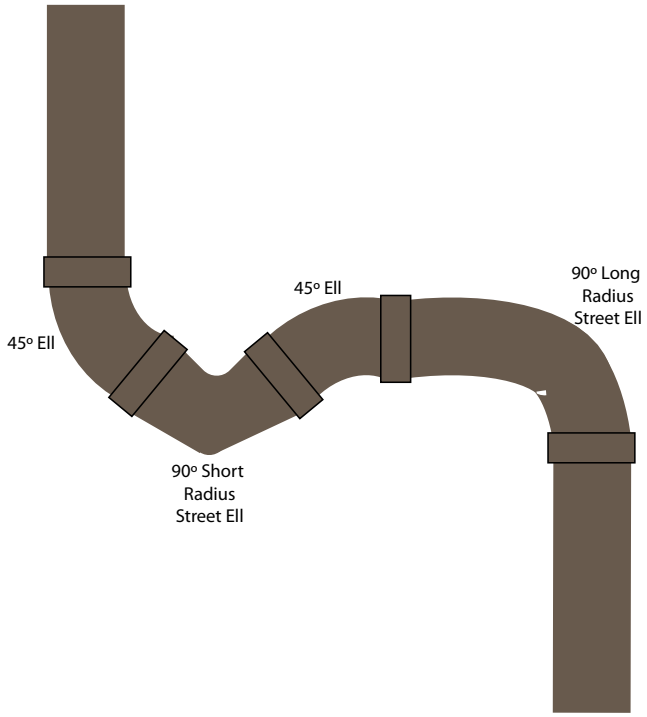
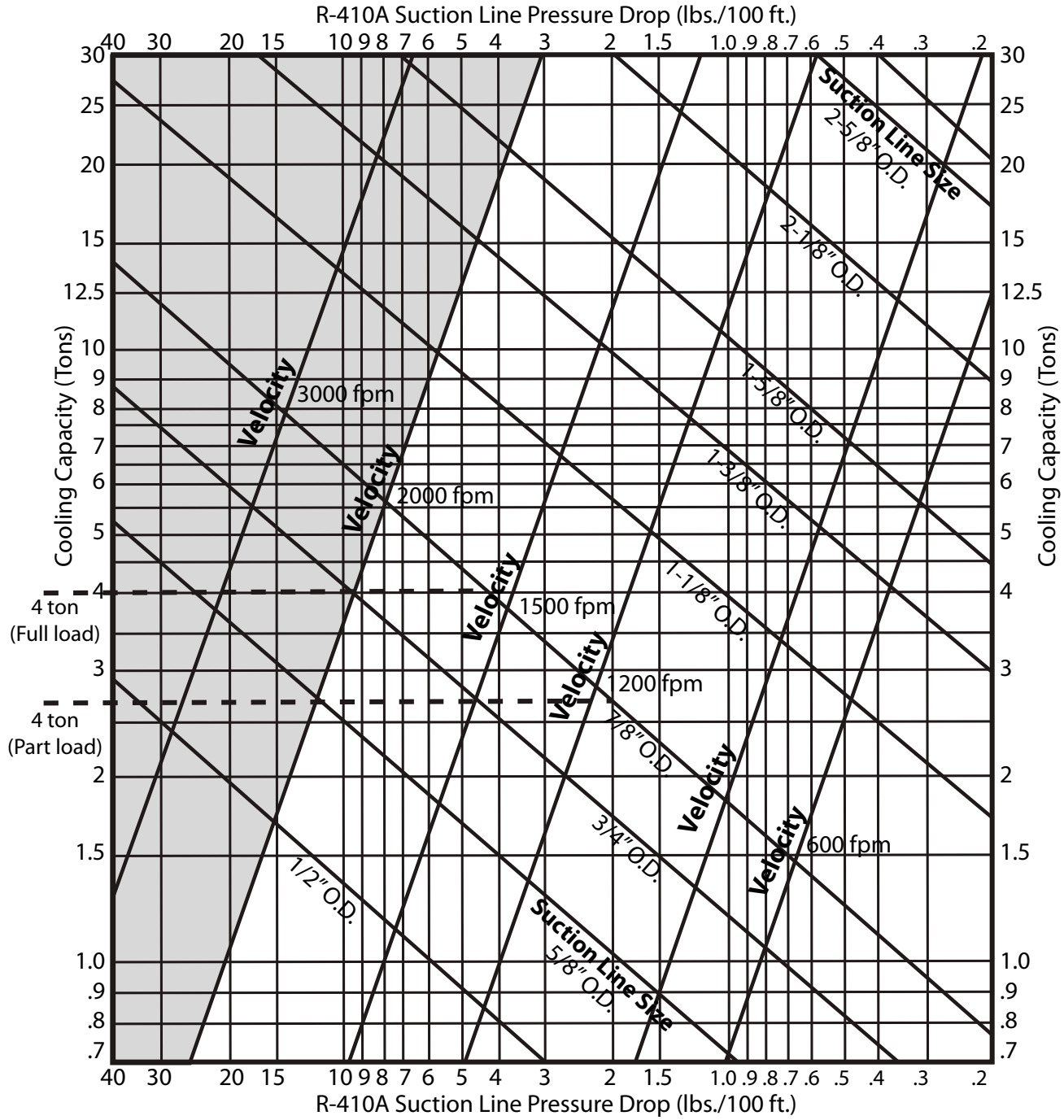


Figure 5: Refrigerant R-410A Suction Line Pressure Drop/Velocity per 100 ft. of Line at 45°F Evaporating Temperature and 125°F Condensing Temperature



To use this chart, first find capacity (tons) on the left side of the chart. To find pipe size, procede right to the smallest pipe size. Pressure drop (vertical line) and velocity (diagonal lines) can then be determined for the pipe size selected. For example, for a 4 ton unit, select 7/8" O.D. line.
NOTE: Shaded area denotes unacceptable velocity range.

GEOTHERMAL REFRIGERATION CIRCUITS

Bi-Flow Liquid Line Solenoid Valve

In order to minimize off-cycle refrigerant migration to the compressor, a bi-flow liquid line solenoid is required for all long line set heat pump applications. The Bi-flow solenoid valve controls the flow of refrigerant only in the direction of the arrow molded into the valve. The bi-flow liquid line solenoid valve is shipped as a single flow valve, the carton contains another valve stem which needs to be installed in the valve to convert it to a bi-flow valve. The bi-flow valve should be connected to the 24V side of the contactor. When installing the valve, **the arrow should be positioned toward the compressor section** to minimize the transfer of liquid directly into the coax in the heating mode. The solenoid should be installed right after the filter-drier or within two feet of the compressor section.

Charging Information

Since the lengths of line sets vary, it is necessary to calculate additional refrigerant charge. Compressor sections do not have additional charge for the line set. Each foot of liquid line and vapor length requires the amount of refrigerant designated in Table 4. Also, long line applications require a minimum of 10 degrees subcooling to prevent any refrigerant flashing before the thermostatic expansion valve. The subcooling and superheat should be checked in both modes of operation. Refer to the operating pressure chart in the Specifications manual for the correct superheat.

PIPING DIAGRAMS

The piping diagrams on the following pages illustrate considerations for applications of a solenoid valve, traps, and piping based upon the location of the compressor section and air handler.

Table 4: Refrigerant Weight

Weight of Refrigerant in Copper Tubing Per Foot (in Ounces)		
O.D. (in.)	Liquid Line	Suction (Vapor) Line
3/8”	0.54	
1/2”	1.04	
5/8”	1.95	0.07
3/4”		0.10
7/8”		0.13
1-1/8”		0.21

SPLIT SYSTEM CHARGING - APPROACH METHOD

Charging Enertech split systems can easily be accomplished by measuring approach temperatures when operating in the cooling mode. This method, outlined in the steps below, is based upon testing in Enertech's R & D labs with matched compressor/air handler or A-coil components. For best results, the indoor temperature should be between 70°F and 85°F in cooling. Charging the unit in cooling is the most accurate method. If unable to charge the unit in cooling mode, refer to the next section, "Split System Charging -- Subcooling/Superheat Method." Refer to figure 6 for temperature and pressure measurement locations when using the approach method.

Please Note: Before utilizing the approach method for checking the system charge, confirm the system reaches a minimum of 2°F subcooling, while maintaining a maximum of 22°F superheat. If you are not able to achieve these readings, further troubleshooting will be required (Reference Table 12 in Section 15, Refrigeration Troubleshooting). Consult the Refrigeration/Troubleshooting manual for a review of Superheat/Subcooling calculations.

1. If the entering water temperature is above 45°F and the entering air temperature is above 70°F, the unit should be charged in cooling for the most accurate results. If the return air temperature is below 70°F, it may be necessary to run the system in emergency heating mode to raise the indoor temperature above 70°F.
2. Evacuate the line set and A-coil. Open the service valves, and monitor the system pressures while charging. Model 024 is charged with 36oz; model 036 is charged with 56oz; and models 048 - 072 are charged with 80oz. This factory charge is a "starting" supply. Charge will need to be added for the line set and heat exchangers. However, do not add charge until the unit has run for at least five minutes, and the subcooling is above 2°F (see step #3).
3. The approach temperatures will not be usable if there is not a liquid lock at the liquid line (i.e. there is some subcooling at the liquid line). Record the liquid line pressure and the saturation temperature (most gauge sets show saturation temperature on the gauge). Measure the liquid line temperature. If the liquid line is not at least 2°F cooler than the liquid line saturation temperature, there may not be a liquid lock. Continue to add charge until subcooling reaches at least 2°F. Then, proceed to step #4.
4. Measure the water flow rate and entering water temperature (EWT). Measure the liquid line temperature (using the same digital thermometer if possible).
5. Subtract the EWT from the liquid line temperature (LLT) to determine approach temperature (Approach temperature = LLT - EWT).
6. Compare the result to Table 5. If the approach temperature is too high, add charge; if it's too low, recover charge. Approach temperature should be within 1°F of the table value.

SPLIT SYSTEM CHARGING - SUBCOOLING/ SUPERHEAT METHOD

If checking charge in the heating mode (***preferred charging mode is cooling***), follow the steps below. For best results, the indoor temperature should be between 60°F and 70°F in heating. If the return air temperature is below 60°F, it may be necessary to run the system in emergency heating mode to raise the indoor temperature above 60°F. Refer to figure 7 for temperature and pressure measurement locations when using the Subcooling/Superheat method.

1. Evacuate the line set and A-coil. Open the service valves, and monitor the system pressures while charging. The compressor section is charged for the compressor section and air handler/A-coil only (except model 024, which includes about 65% of this charge for manufacturing process reasons). Charge will need to be added for the line set (and heat exchangers for model 024). However, do not add charge until the unit has run for at least five minutes, and the subcooling is above 2°F (see step #2).
2. The system will not be stable if there is not a liquid lock at the liquid line (i.e. there is some subcooling at the liquid line). Record the liquid line pressure and the saturation

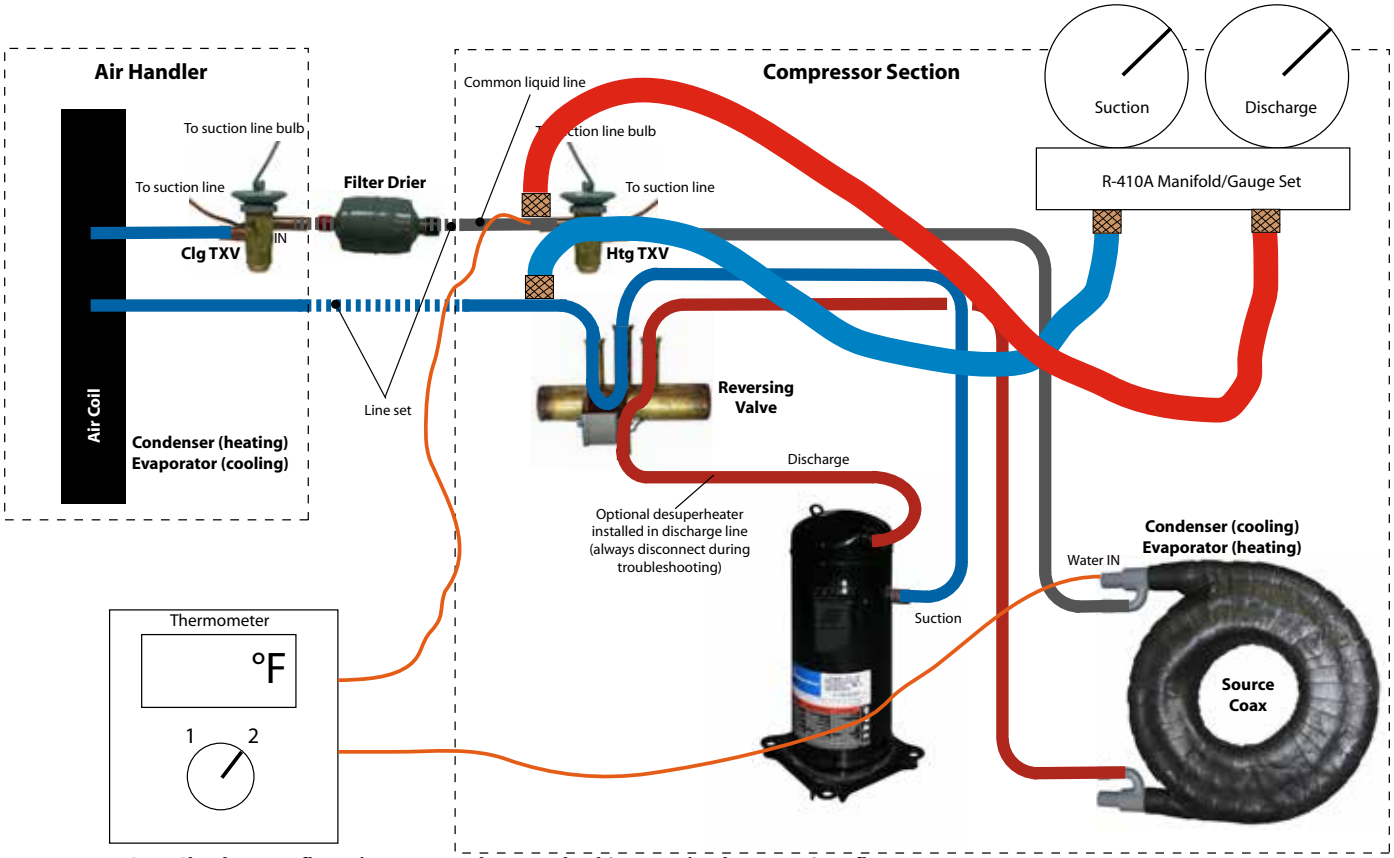
Table 5: Approach Temperatures-Cooling Mode*

Full Load Operation / Desuperheater Disconnected

Water Flow GPM/ton	Entering Water Temp., deg F	Entering Air DB Temp., deg F	Approach Temp. by Model, deg. F **Full Load -- Desuperheater Off**				
			024	036	048	060	072
1.5	45	70 - 85	13	11	17	14	16
	55		10	10	14	11	16
	65		8	8	10	9	15
	75		6	7	8	8	13
	85		4	7	7	6	12
2.25	45	70 - 85	8	7	11	10	14
	55		6	6	8	8	13
	65		4	5	6	6	11
	75		3	4	5	5	10
	85		2	4	4	4	8
3.0	45	70 - 85	8	7	11	9	12
	55		5	6	8	7	11
	65		3	5	6	5	10
	75		2	4	5	4	8
	85		2	4	4	3	7

*Cooling approach temperature = Liquid Line temp - Entering Water temp
(should be within +/- 1 deg F)

Figure 6: Cooling Mode -- Temperature & Pressure Measurement Locations



NOTE: Check water flow via pressure drop method (pressurized systems) or flow meter tool (non-pressurized systems). Compare water flow to chart in Table 2.

temperature (most gauge sets show saturation temperature on the gauge). Measure the liquid line temperature at the air handler. If the liquid line is not at least 2°F cooler than the liquid line saturation temperature (i.e. 2°F Subcooling), there may not be a liquid lock. Continue to add charge until subcooling reaches at least 2°F. Then, proceed to step #3.

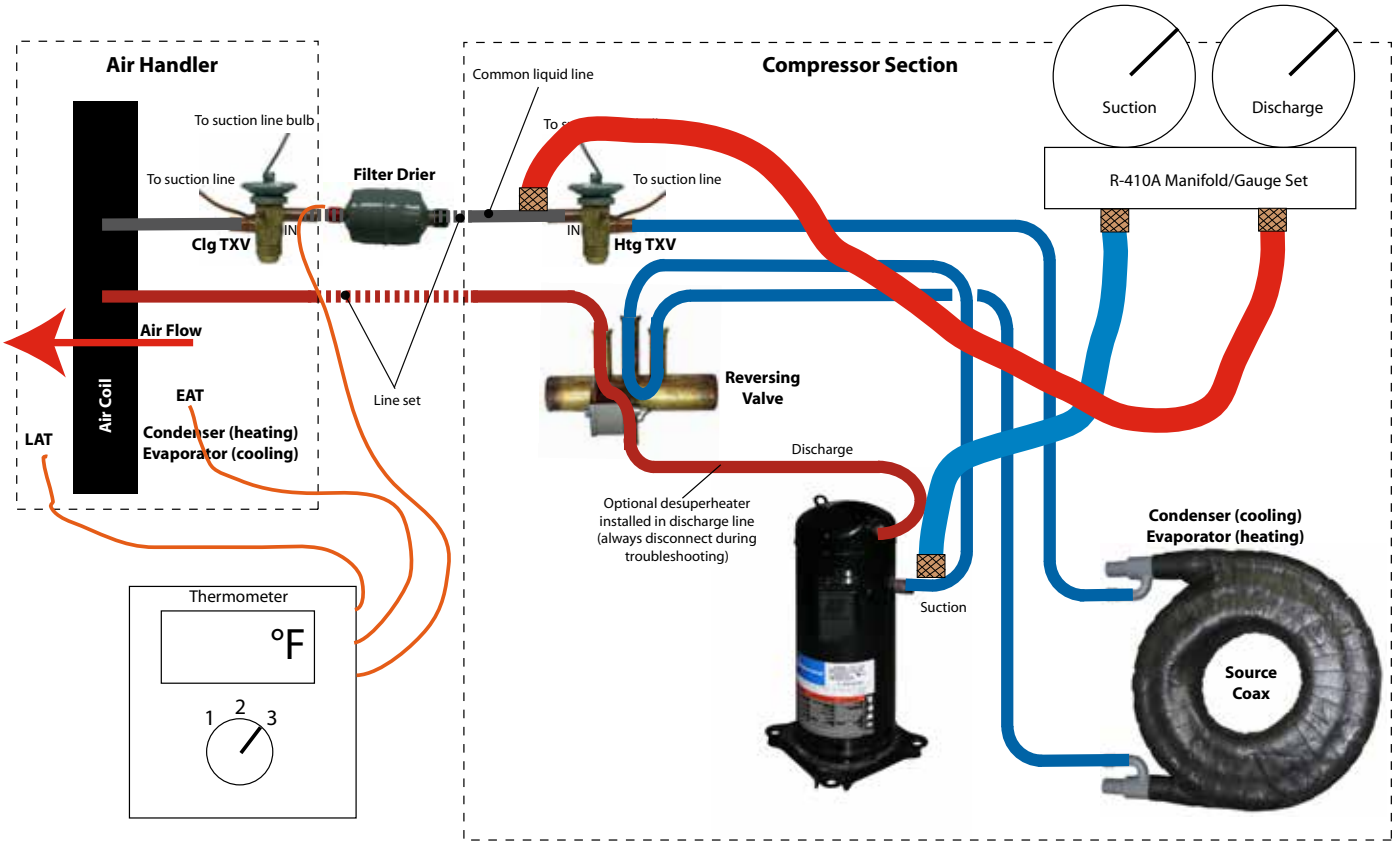
3. Record the suction pressure and the saturation temperature (most gauge sets show saturation temperature on the gauge). Measure the suction line temperature. If the suction line temperature is more than 15°F higher than the saturation temperature (i.e. 15°F Superheat), the unit is undercharged.
4. Continue to add charge to the unit, comparing the Superheat/Subcooling results to Table 6. Stop adding charge when the Superheat/Subcooling values are within range. Each time the refrigerant charge is adjusted, allow at least five minutes run time for the system to stabilize.

Table 6: Subcooling/Superheat-Heating Mode*
Full Load Operation / Desuperheater Disconnected

Model	Entering Water Temp., deg. F	Entering Air Temp., deg. F	Subcooling	Superheat
024	32	60 - 70	3 - 5	8 - 10
	40		2 - 4	9 - 11
	50		2 - 4	9 - 11
036	32	60 - 70	7 - 9	5 - 7
	40		7 - 9	5 - 7
	50		7 - 9	5 - 7
048	32	60 - 70	4 - 6	6 - 8
	40		4 - 6	7 - 9
	50		4 - 6	9 - 11
060	32	60 - 70	2 - 4	4 - 6
	40		3 - 5	5 - 7
	50		6 - 8	5 - 7
072	32	60 - 70	5 - 7	4 - 6
	40		6 - 8	9 - 11
	50		8 - 10	10 - 12

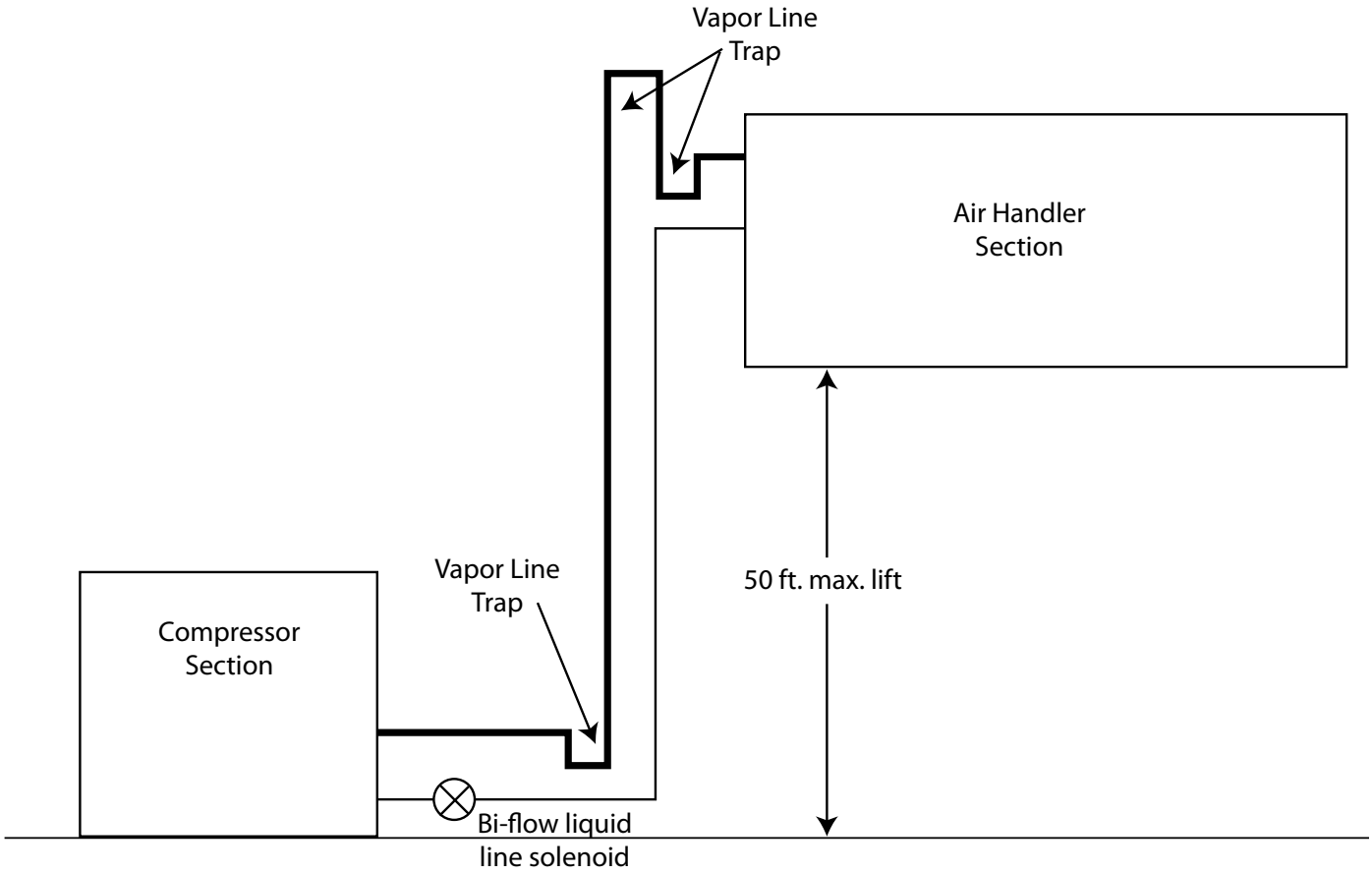
*Valid for flow rates between 1.5 and 3 GPM/ton.

Figure 7: Heating Mode -- Temperature & Pressure Measurement Locations



Section 9c: Line Set Installation

Figure 8: Air handler section above compressor section



Notes:

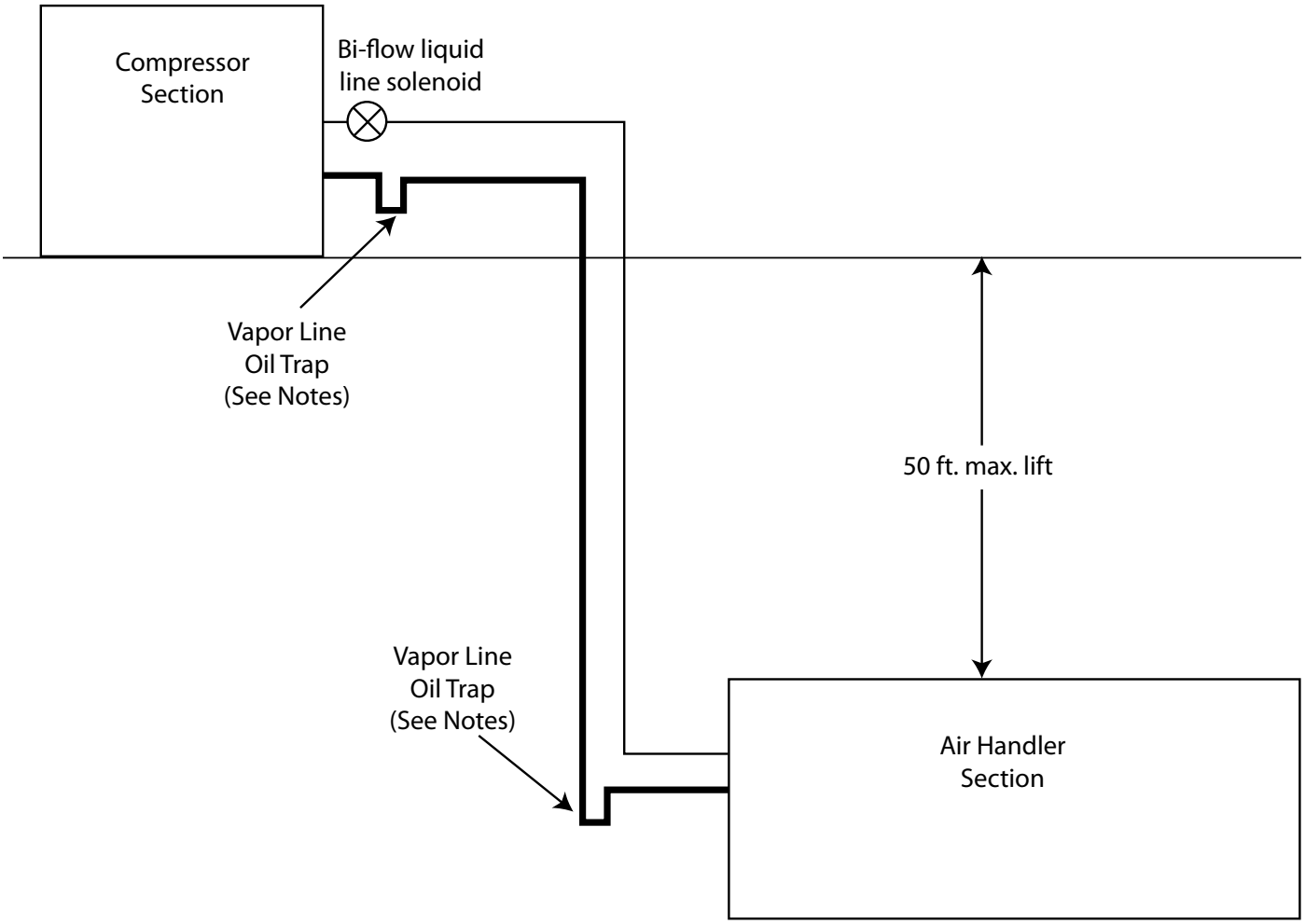
- Crankcase heater and Bi-flow liquid line solenoid required if total equivalent length is greater than or equal to 50 feet or the vertical separation is greater than or equal to 20 feet. See tables below for descriptions and part numbers.
- An inverted vapor line trap must be installed with the top of the trap above the evaporator section.
- P-traps should be installed at the outlet of the evaporator section and at the bottom of vapor line drop.
- 75 feet maximum equivalent line length
- 50 feet maximum vertical separation
- Vapor Line sizes on Two-stage units should not be increased due to the velocity requirements for returning oil to the compressor.

Crankcase Heater Data	
Compatible Models	Part Number
ST024-036	11490003001
ST048-072	11490003002
*Only Required In Long Line Set Applications.	

Bi-flow Solenoid Data		
Compatible Models	Description	Part Number
All Split Models (24-72)	1/2" Valve Body	ARS-4A
	24V Coil	ARSCB
	Bi-flow kit	ARSBK
Only required in long line set applications. All three parts must be ordered.		

Section 9c: Line Set Installation

Figure 9: Compressor section above air handler section



Notes:

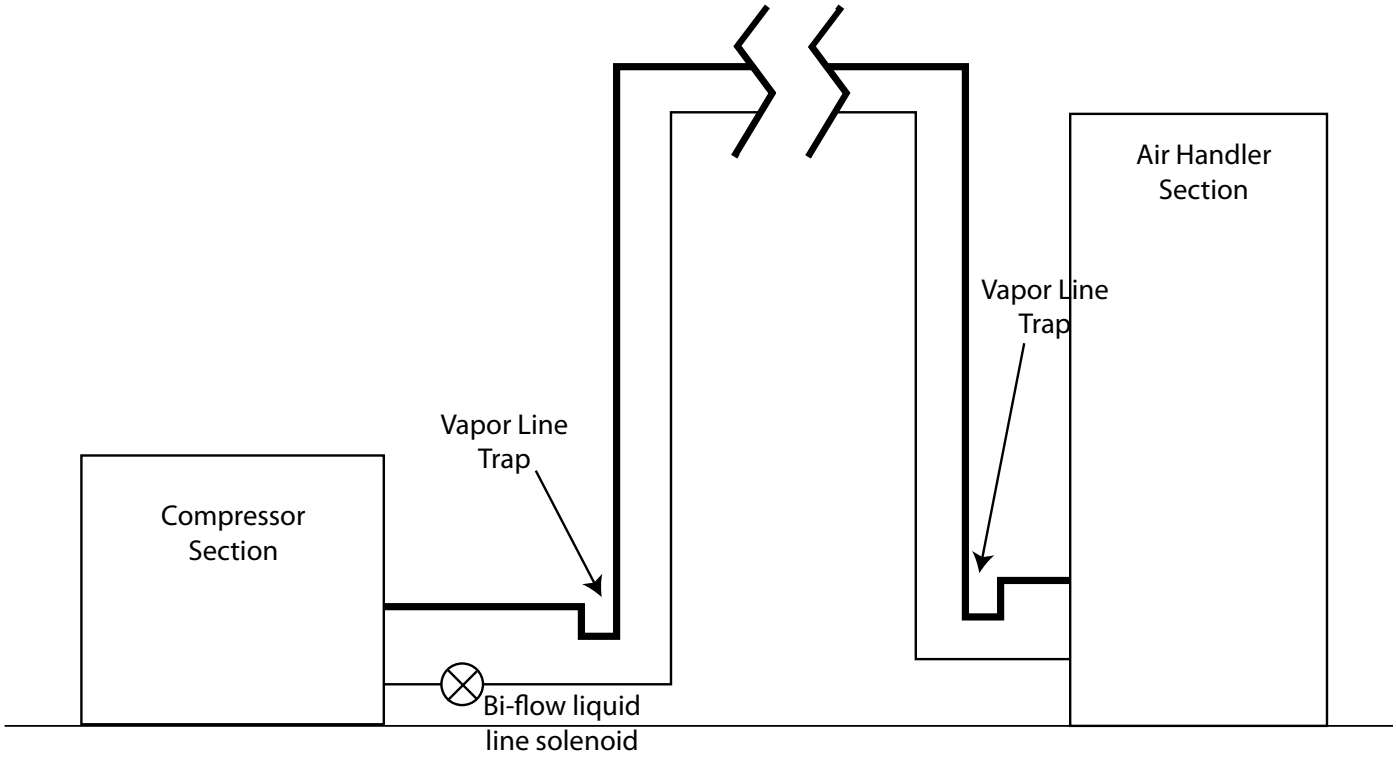
- Crankcase heater and Bi-flow liquid line solenoid required if total equivalent length is greater than or equal to 50 feet or the vertical separation is greater than or equal to 20 feet. See tables below for descriptions and part numbers.
- A P-trap should be installed at the outlet of the evaporator section.
- If vertical separation is greater than or equal to 50 feet a second trap should be installed at the 50 feet mark.
- 75 feet maximum equivalent line length
- 50 feet maximum vertical separation
- Vapor Line sizes on Two-stage units should not be increased due to the velocity requirements for returning oil to the compressor.
- Two-stage units should have a maximum of 25 feet of vertical lift on the vapor line.

Crankcase Heater Data	
Compatible Models	Part Number
ST024-036	11490003001
ST048-072	11490003002
*Only Required In Long Line Set Applications.	

Bi-flow Solenoid Data		
Compatible Models	Description	Part Number
All Split Models (24-72)	1/2" Valve Body	ARS-4A
	24V Coil	ARSCB
	Bi-flow kit	ARSBK
Only required in long line set applications. All three parts must be ordered.		

Section 9c: Line Set Installation

Figure 10: Horizontal piping above air handler section



Notes:

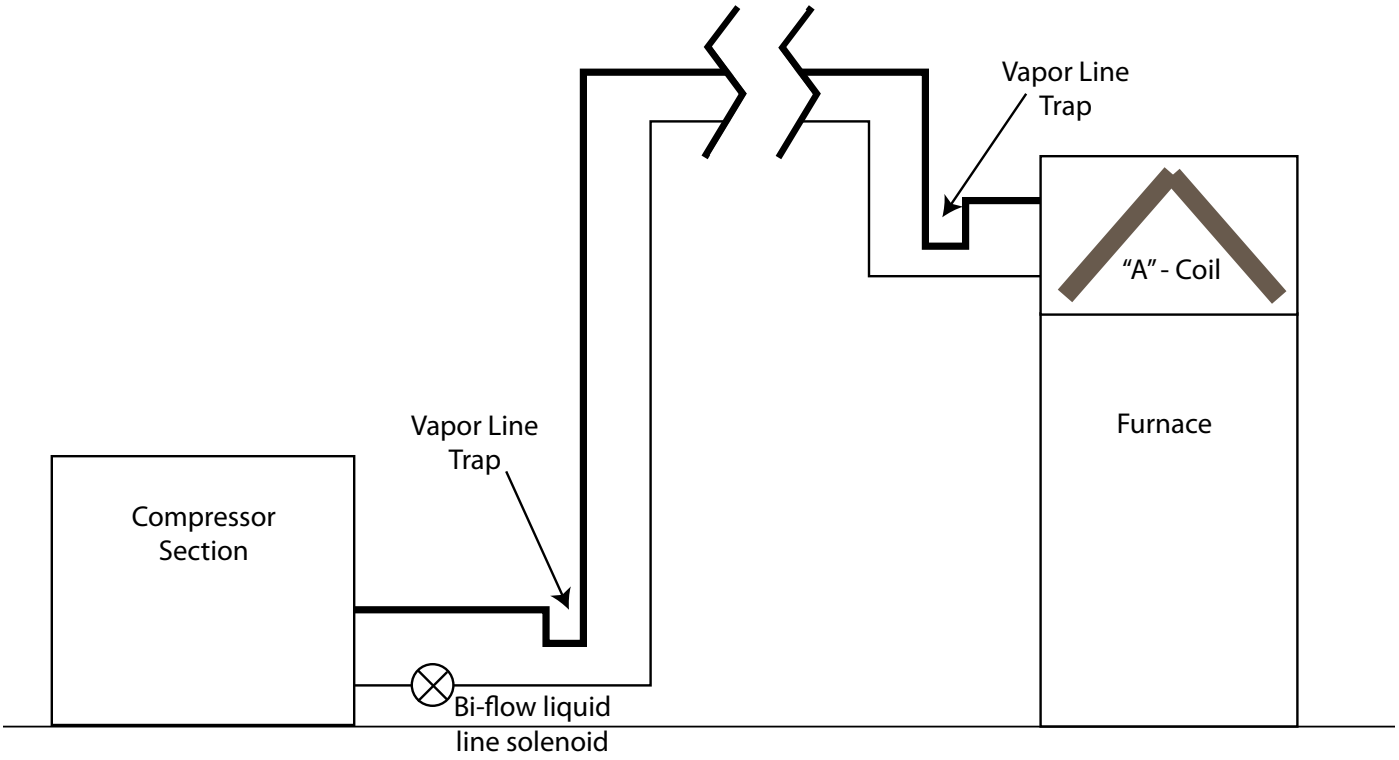
- Crankcase heater and Bi-flow liquid line solenoid required if total equivalent length is greater than or equal to 50 feet or the vertical separation is greater than or equal to 20 feet. See tables below for descriptions and part numbers.
- The vapor line must be installed with the horizontal run higher than the top of the evaporator section.
- P-traps should be installed at the outlet of the evaporator section and at the bottom of vapor line drop.
- 75 feet maximum equivalent line length
- 50 feet maximum vertical separation
- Vapor Line sizes on Two-stage units should not be increased due to the velocity requirements for returning oil to the compressor.

Crankcase Heater Data	
Compatible Models	Part Number
ST024-036	11490003001
ST048-072	11490003002
*Only Required In Long Line Set Applications.	

Bi-flow Solenoid Data		
Compatible Models	Description	Part Number
All Split Models (24-72)	1/2” Valve Body	ARS-4A
	24V Coil	ARSCB
	Bi-flow kit	ARSBK
Only required in long line set applications. All three parts must be ordered.		

Section 9c: Line Set Installation

Figure 11: Horizontal piping above "A" coil



Notes:

- Crankcase heater and Bi-flow liquid line solenoid required if total equivalent length is greater than or equal to 50 feet or the vertical separation is greater than or equal to 20 feet. See tables below for descriptions and part numbers.
- The vapor line must be installed with the horizontal run higher than the top of the evaporator section.
- P-traps should be installed at the outlet of the evaporator section and at the bottom of vapor line drop.
- 75 feet maximum equivalent line length
- 50 feet maximum vertical separation
- Vapor Line sizes on Two-stage units should not be increased due to the velocity requirements for returning oil to the compressor.

Crankcase Heater Data	
Compatible Models	Part Number
ST024-036	11490003001
ST048-072	11490003002
*Only Required In Long Line Set Applications.	

Bi-flow Solenoid Data		
Compatible Models	Description	Part Number
All Split Models (24-72)	1/2" Valve Body	ARS-4A
	24V Coil	ARSCB
	Bi-flow kit	ARSBK
Only required in long line set applications. All three parts must be ordered.		

⚠ WARNING ⚠

IF USING A DUAL FUEL APPLICATION, "A" COIL MUST BE INSTALLED ON THE OUTLET OF THE FURNACE. INSTALLATION ON THE RETURN COULD CAUSE FURNACE HEAT EXCHANGER FAILURE, AND MAY VOID FURNACE WARRANTY.

Section 10: Unit Piping Installation

Open Loop Piping

Placement of the components for an open loop system are important when considering water quality and long term maintenance. The water solenoid valve should always be placed on the outlet of the heat pump, which will keep the heat exchanger under pressure when the unit is not operating. If the heat exchanger is under pressure, minerals will stay in suspension. Water solenoid valves are also designed to close against the pressure, not with the pressure. Otherwise, they tend to be noisy when closing.

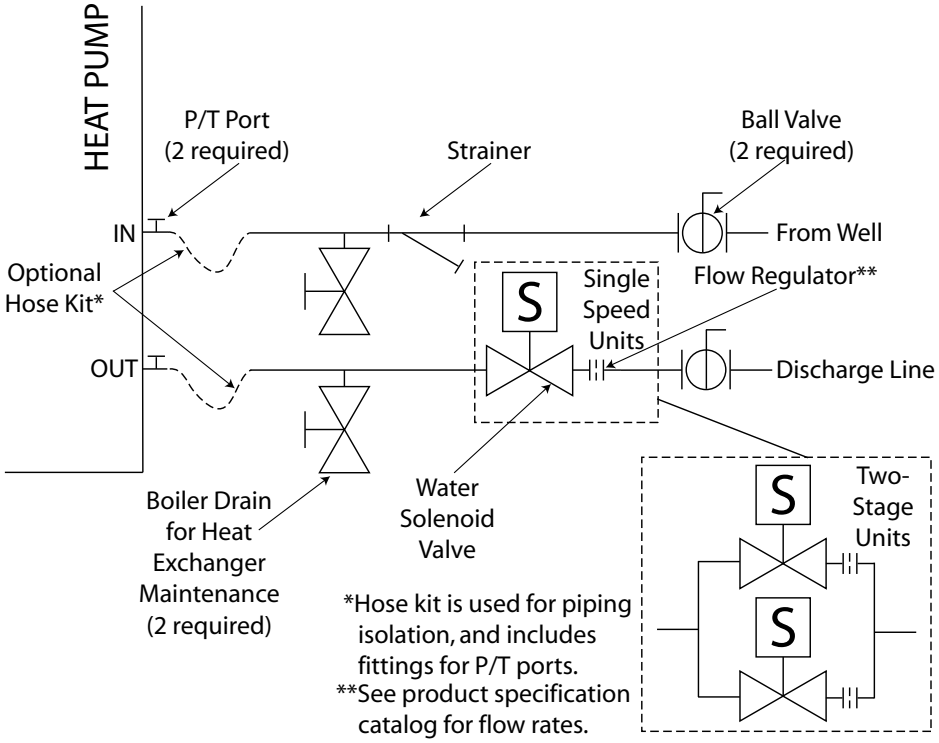
A flow regulator should be placed after the water solenoid valve. Always check the product specification catalog for proper flow rate. A calculation must be made to determine the flow rate, so that the leaving water temperature does not have the possibility of freezing.

Other necessary components include a strainer, boiler drains for heat exchanger flushing, P/T ports and ball valves. Ball valves allow the water to be shut off for service, and also help when velocity noise is noticeable through the flow regulator. Spreading some of the pressure drop across the ball valves will lessen the velocity noise. Always double check flow rate at the P/T ports to make sure the ball valve adjustments have not lowered water flow too much, and essentially taken the flow regulator out of the equation. It's a good idea to remove the ball valve handles once the system is completed to avoid nuisance service calls.

Hose kits are optional, but make for an easier installation, since the P/T ports and connections are included. The hose also helps to isolate the heat pump from the piping system.

Since the heat pump can operate at lower waterflow on first stage, two stage units typically include two water solenoid valves to save water. The flow regulators should be sized so that when one valve is open the unit operates at first stage flow rate, and when both valves are open, the unit operates at full load flow rate. For example, a 4 ton unit needs approximately 4 GPM on first stage, and approximately 7 GPM at full load. The flow regulator after the first valve should be 4 GPM, and the flow regulator after the second valve should be 3 GPM. When both valves are open, the unit will operate at 7 GPM.

Figure 12: Open Loop Piping Example



Note: All split units are two-stage units.

Not recommended for 3 ton and smaller. Use single solenoid and flow regulator.

Section 10: Unit Piping Installation

Water Quality

The quality of the water used in geothermal systems is very important. In closed loop systems the dilution water (water mixed with antifreeze) must be of high quality to ensure adequate corrosion protection. Water of poor quality contains ions that make the fluid "hard" and corrosive. Calcium and magnesium hardness ions build up as scale on the walls of the system and reduce heat transfer. These ions may also react with the corrosion inhibitors in glycol based heat transfer fluids, causing them to precipitate out of solution and rendering the inhibitors ineffective in protecting against corrosion. In addition, high concentrations of corrosive ions, such as chloride and sulfate, will eat through any protective layer that the corrosion inhibitors form on the walls of the system.

Ideally, de-ionized water should be used for dilution with antifreeze solutions since de-ionizing removes both corrosive and hardness ions. Distilled water and zeolite softened water are also acceptable. Softened water, although free of hardness ions, may actually have increased concentrations of corrosive ions and, therefore, its quality must be monitored. It is recommended that dilution water contain less than 100 PPM calcium carbonate or less than 25 PPM calcium plus magnesium ions; and less than 25 PPM chloride or sulfate ions.

In an open loop system the water quality is of no less importance. Due to the inherent variation of the supply water, it should be tested prior to making the decision to use an open loop system. Scaling of the heat exchanger and corrosion of the internal parts are two of the potential problems. The Department of Natural Resources or your local municipality can direct you to the proper testing agency. Please see Table 7 for guidelines.

Table 7: Water Quality

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

Notes:
1. Harness in ppm is equivalent to hardness in mg/l
2. Grains/gallon = ppm divided by 17.1
3. Copper and cupro-nickel heat exchangers are not recommended for pool applications for water outside the range of the table. Secondary heat exchangers are required for applications not meeting the requirements shown above.
4. Saltwater applications (approx. 25,000 ppm) require secondary heat exchangers due to copper piping between the heat exchanger and the unit fittings.

Section 10: Unit Piping Installation

Interior Piping

All interior piping must be sized for proper flow rates and pressure loss. Insulation should be used on all inside piping when minimum loop temperatures are expected to be less than 50°F. Use the table below for insulation sizes with different pipe sizes. All pipe insulation should be a closed cell and have a minimum wall thickness of 3/8". All piping insulation should be glued and sealed to prevent condensation and dripping. Interior piping may consist of the following materials: HDPE, copper, brass, or rubber hose (hose kit only). **PVC is not allowed on pressurized systems.**

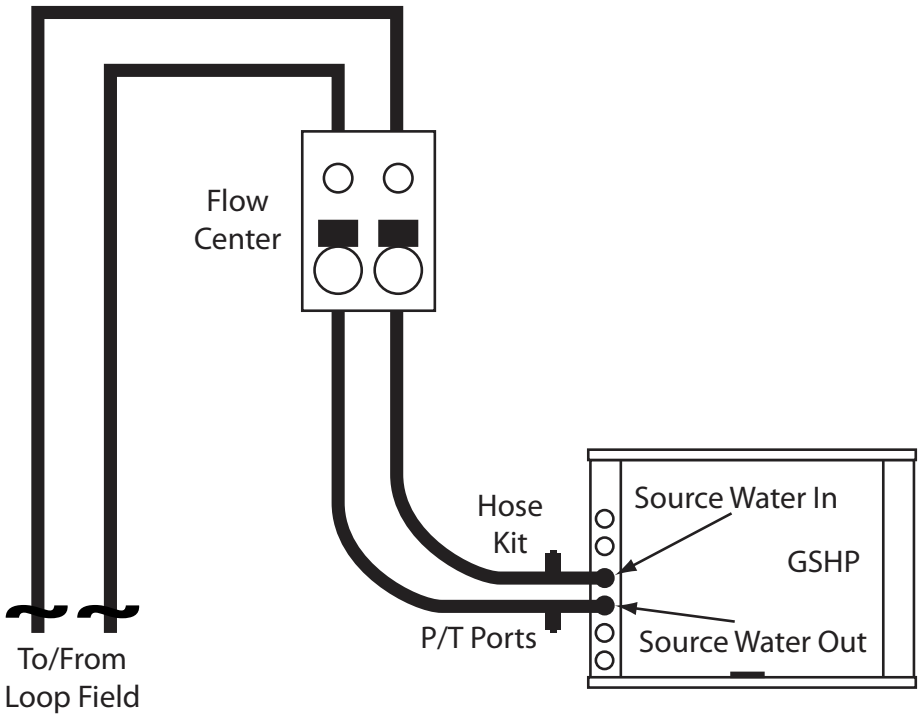
Table 8: Pipe Insulation

Piping Material	Insulation Description
1" IPS Hose	1-3/8" ID - 3/8" Wall
1" IPS PE	1-1/4" ID - 3/8" Wall
1-1/4" IPS PE	1-5/8" ID - 3/8" Wall
2" IPS PD	2-1/8" ID - 3/8" Wall

Typical Pressurized Flow Center Installation

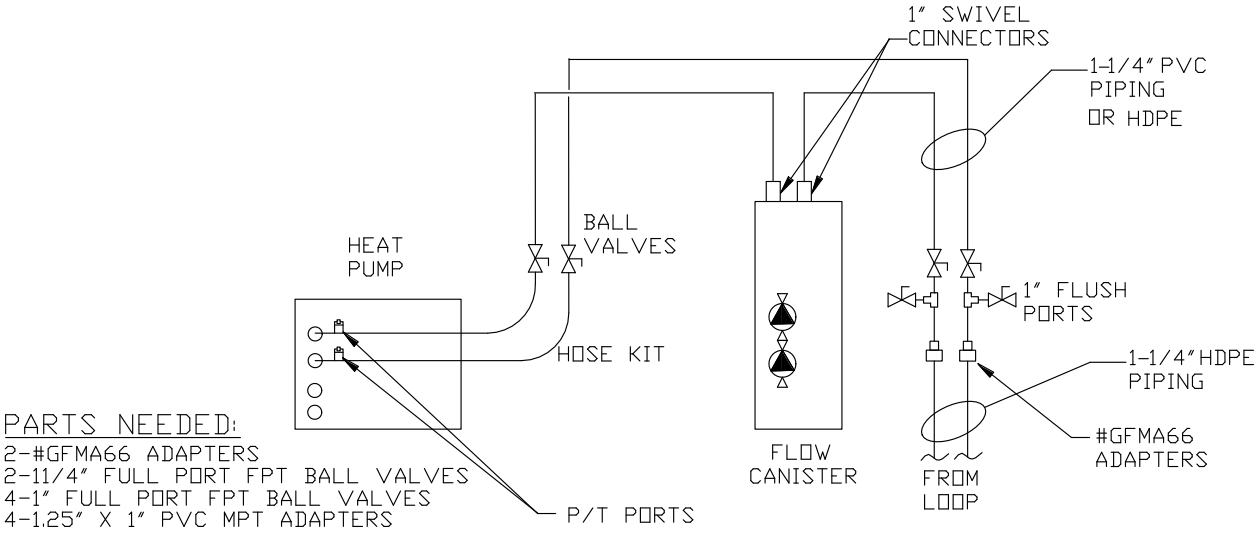
The flow centers are insulated and contain all flushing and circulation connections for residential and light commercial earth loops that require a flow rate of no more than 20 gpm. 1-1/4" fusion x 1" double o-ring fittings (AGA6PES) are furnished with the double o-ring flow centers for HDPE loop constructions. Various fittings are available for the double o-ring flow centers for different connections. See figure 13 for connection options. A typical installation will require the use of a hose kit. Matching hose kits come with double o-ring adapters to transition to 1" hose connection.

Figure 13: Typical Single Unit Piping Connection (Pressurized Flow Center)



Typical Non-Pressurized Flow Center Installation
Standing column flow centers are designed to operate with no static pressure on the earth loop. The design is such that the column of water in the flow center is enough pressure to prime the pumps for proper system operation and pump reliability. The flow center does have a cap/seal, so it is still a closed system, where the fluid will not evaporate. If the earth loop header is external, the loop system will still need to be flushed with a purge cart. The non-pressurized flow center needs to be isolated from the flush cart during flushing because the flow center is not designed to handle pressure. Since this is a non-pressurized system, the interior piping can incorporate all the above-mentioned pipe material options (see interior piping), including PVC. The flow center can be mounted to the wall with the included bracket or mounted on the floor as long as it is properly supported.

Figure 14: Typical Single Unit Piping Connection (Non-Pressurized Flow Center)

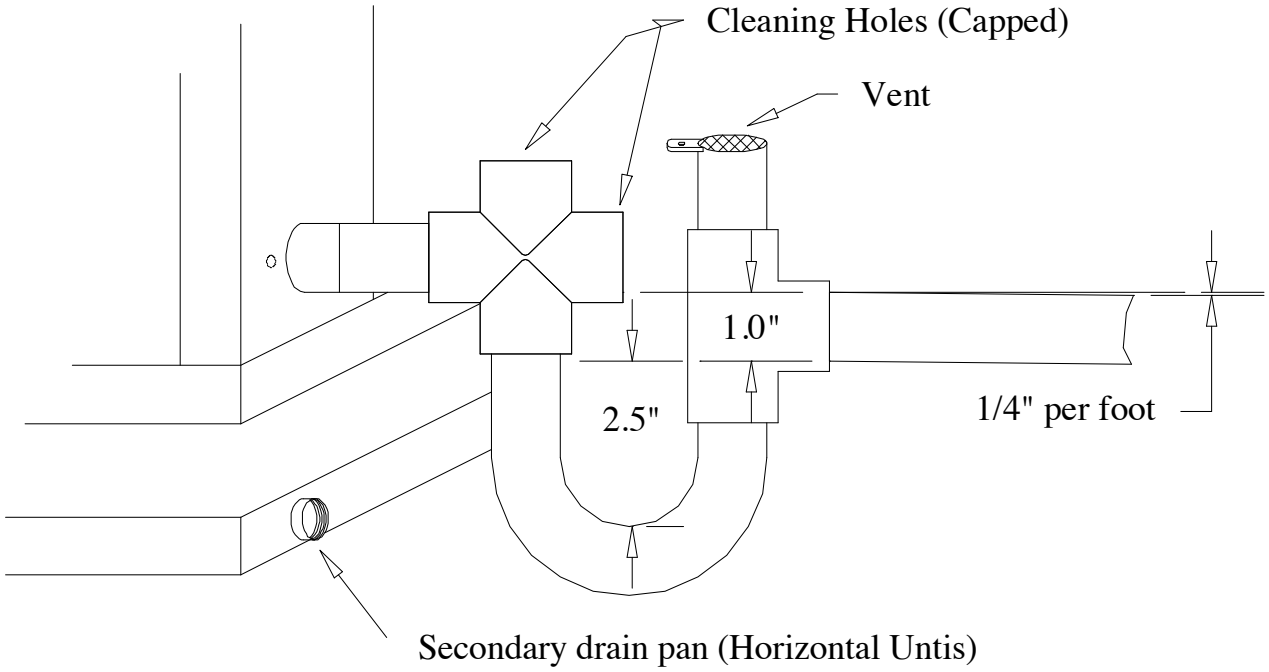


Condensation Drain Connection
Connect the EZ-Trap to the condensate drain on the equipment drain connection. The condensation line must be trapped a minimum of 1.0" as shown on diagram. The condensation line should be pitched away from the unit a minimum of 1/4" per foot. The top of trap must be below the drain connection. For more information on installing EZ-Trap, see installation sheet that comes with the EZ-Trap Kit. Always install the air vent after the trap.

Note: Connect the drain through the trap to the condensation drain system in conformance to local plumbing codes.

Part Number	Description
ACDT1A	EZ-Trap ¾" Kit
ACDT2A	EZ-Trap 1" Kit

Figure 15: Condensation Drain Connection



Section 11: Antifreeze

Antifreeze Overview

In areas where minimum entering loop temperatures drop below 40°F, or where piping will be routed through areas subject to freezing, antifreeze is required. Alcohols and glycols are commonly used as antifreeze. However, local and state/provincial codes supersede any instructions in this document. The system needs antifreeze to protect the coaxial heat exchanger from freezing and rupturing. Freeze protection should be maintained to 15°F below the lowest expected entering source loop temperature. For example, if 30°F is the minimum expected entering source loop temperature, the leaving source loop temperature could be 22 to 25°F. Freeze protection should be set at 15°F (30-15 = 15°F). To determine antifreeze requirements, calculate how much volume the system holds. Then, calculate how much antifreeze will be needed by determining the percentage of antifreeze required for proper freeze protection. See Tables 9 and 10 for volumes and percentages. The freeze protection should be checked during installation using the proper hydrometer to measure the specific gravity and freeze protection level of the solution.

Antifreeze Characteristics

Selection of the antifreeze solution for closed loop systems require the consideration of many important factors, which have long-term implications on the performance and life of the equipment. Each area of concern leads to a different "best choice" of antifreeze. *There is no "perfect" antifreeze.* Some of the factors to consider are as follows (Brine = antifreeze solution including water):

Safety: The toxicity and flammability of the brine (especially in a pure form).

Cost: Prices vary widely.

Thermal Performance: The heat transfer and viscosity effect of the brine.

Corrosiveness: The brine must be compatible with the system materials.

Stability: Will the brine require periodic change out or maintenance?

Convenience: Is the antifreeze available and easy to transport and install?

Codes: Will the brine meet local and state/ provincial codes?

The following are some general observations about the types of brines presently being used:

Methanol: Wood grain alcohol that is considered toxic in pure form. It has good heat transfer, low viscosity, is non-corrosive, and is mid to low price. The biggest down side is that it is flammable in concentrations greater than 25%.

Ethanol: Grain alcohol, which by the ATF (Alcohol, Tobacco, Firearms) department of the U.S. government, is required to be denatured and rendered unfit to drink. It has good heat transfer, mid to high price, is non-corrosive, non-toxic even in its pure form, and has medium viscosity. It also is flammable with concentrations greater than 25%. Note that the brand of ethanol is very important. Make sure it has been formulated for the geothermal industry. Some of the denaturants are not compatible with HDPE pipe (for example, solutions denatured with gasoline).

Propylene Glycol: Non-toxic, non-corrosive, mid to high price, poor heat transfer, high viscosity when cold, and can introduce micro air bubbles when adding to the system. It has also been known to form a "slime-type" coating inside the pipe. Food grade glycol is recommended because some of the other types have certain inhibitors that react poorly with geothermal systems. A 25% brine solution is a minimum required by glycol manufacturers, so that bacteria does not start to form.

Ethylene Glycol: Considered toxic and is not recommended for use in earth loop applications.

GS4 (POTASSIUM ACETATE): Considered highly corrosive (especially if air is present in the system) and has a very low surface tension, which causes leaks through most mechanical fittings. This brine is not recommended for use in earth loop applications.

Section 11: Antifreeze

Notes:

1. Consult with your representative or distributor if you have any questions regarding antifreeze selection or use.
2. All antifreeze suppliers and manufacturers recommend the use of either de-ionized or distilled water with their products.

Antifreeze Charging

Calculate the total amount of pipe in the system and use Table 9 to calculate the amount of volume for each specific section of the system. Add the entire volume together, and multiply that volume by the proper antifreeze percentage needed (Table 8) for the freeze protection required in your area. Then, double check calculations during installation with the proper hydrometer and specific gravity chart (Figure 16) to determine if the correct amount of antifreeze was added.

⚠ CAUTION ⚠

USE EXTREME CARE WHEN OPENING, POURING, AND MIXING FLAMMABLE ANTIFREEZE SOLUTIONS. REMOTE FLAMES OR ELECTRICAL SPARKS CAN IGNITE UNDILUTED ANTIFREEZES AND VAPORS. USE ONLY IN A WELL VENTILATED AREA. DO NOT SMOKE WHEN HANDLING FLAMMABLE SOLUTIONS. FAILURE TO OBSERVE SAFETY PRECAUTIONS MAY RESULT IN FIRE, INJURY, OR DEATH. NEVER WORK WITH 100% ALCOHOL SOLUTIONS.

Table 9: Pipe Fluid Volume

Type	Size	Volume Per 100ft US Gallons
Copper	1” CTS	4.1
Copper	1.25” CTS	6.4
Copper	1.5” CTS	9.2
HDPE	.75” SDR11	3.0
HDPE	1” SDR11	4.7
HDPE	1.25” SDR11	7.5
HDPE	1.5” SDR11	9.8
HDPE	2” SDR11	15.4

Additional component volumes:
Unit coaxial heat exchanger = 1 Gallon
Flush Cart = 8-10 Gallons
10’ of 1” Rubber Hose = 0.4 Gallons

Section 11: Antifreeze

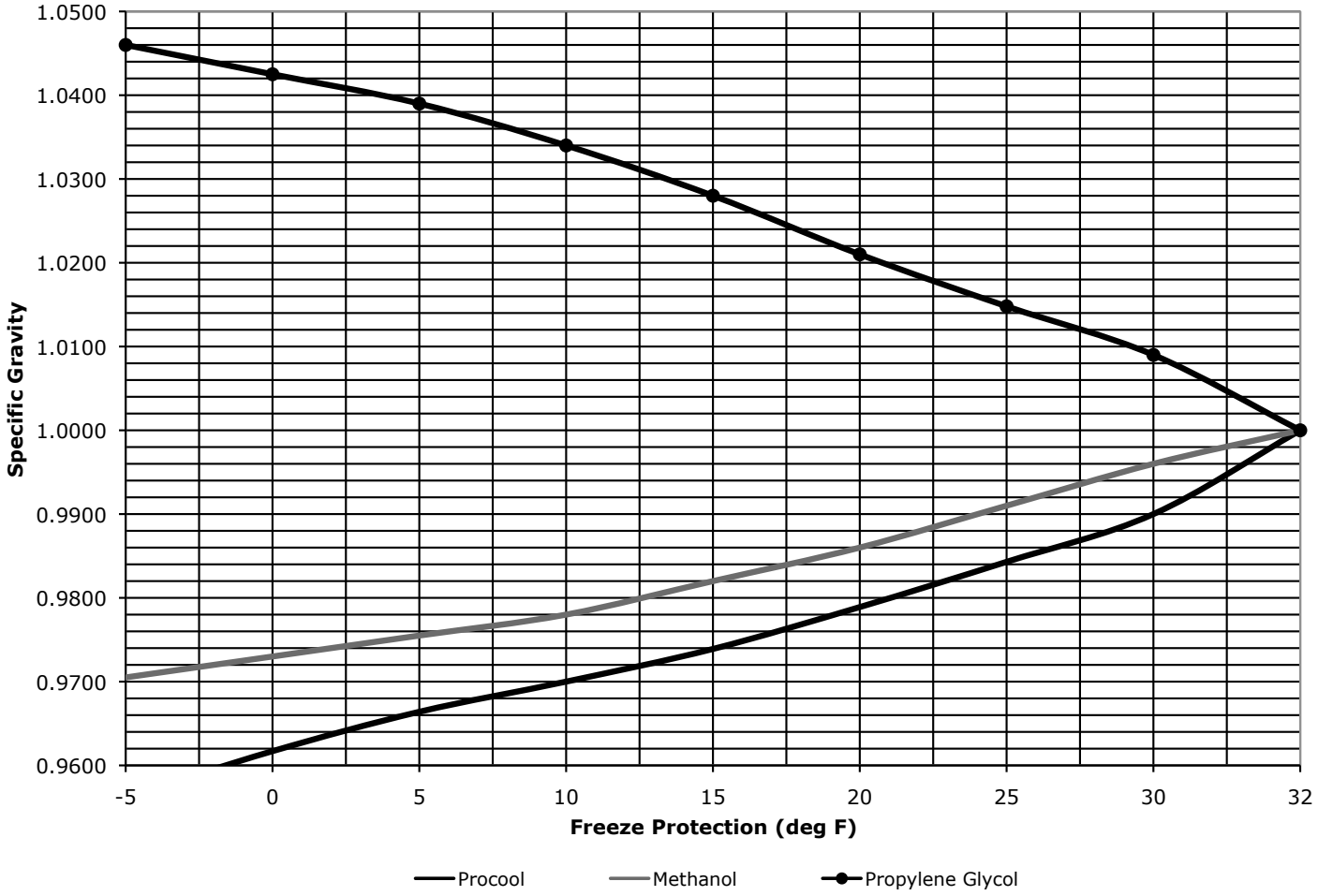
Table 10 Antifreeze Percentages by Volume

Type of Antifreeze	Minimum Temperature for Freeze Protection			
	10°F (-12.2°C)	15°F (-9.4°C)	20°F (-6.7°C)	25°F (-3.9°C)
ProCool (Ethanol)	25%	22%	17%	12%
Methanol	25%	21%	16%	10%
Propylene Glycol	38%	30%	22%	15%
Heat Transfer Fluid (HTF)	Mix according to manufacturer's directions on container label			

Antifreeze solutions are shown in pure form - not premixed
HTF is a premixed Methanol solution

NOTE: Most manufacturers of antifreeze solutions recommend the use of de-ionized water. Tap water may include chemicals that could react with the antifreeze solution.

Figure 16: Antifreeze Specific Gravity



Section 12: Desuperheater Installation

Desuperheater Installation
Units that ship with the desuperheater function also ship with a connection kit.

Note: Desuperheater capacity is based on 0.4 GPM Flow per nominal ton at 90°F entering hot water temperature.

Note: Units that are shipped with a desuperheater do not have the desuperheater pump wires connected to the electrical circuit, to prevent accidentally running the pump while dry. Pump has to be connected to the electric circuit (master contactor) when the lines from the water heater are installed & air is removed.

CONTENTS OF THE DESUPERHEATER FITTING KIT, P/N 11080008001:

- (1) p/n 23-23-0024-001, Installation Instructions
- (1) p/n 11-08-0004-001, 3/4"x 3/4"x 3/4" FPT Brass Tee
- (1) p/n 11-08-0003-001, ¾" Boiler Drain Valve
- (1) p/n 11-08-0005-001, ¾" MPT x 3-1/2" Brass Nipple
- (3) p/n 11-08-0006-001, ½" SWT x ¾" MPT Copper Adaptor
- (1) p/n 11-08-0007-001, ¾" x ¾" x ½" SWT Copper Tee

⚠ WARNING ⚠

TO AVOID SERIOUS INJURY, IT IS RECOMMENDED THAT AN ANTI-SCALD MIXING VALVE IS INSTALLED ON THE HOT WATER SUPPLY LINE INTO THE HOME. EVEN THOUGH HOT WATER TANK TEMPERATURES COULD APPEAR TO BE SET AT LOWER LEVELS, HIGH TEMPERATURE WATER FROM THE DESUPERHEATER COULD RAISE TANK TEMPERATURES TO UNSAFE LEVELS.

Plumbing Installation

NOTE: All plumbing and piping connections must comply with local plumbing codes.

TIP: Measure the distance above the floor or shelf that the water heater is setting on, to where the drain valve is located. This distance must be greater than one-half the width of the tee you're about to install, or you won't be able to thread the tee on to the water heater.

Note: Copper is the only approved material for piping the desuperheater.

1. Disconnect electricity to water heater.
2. Turn off water supply to water heater.
3. Drain water heater. Open pressure relief valve.
4. Remove drain valve and fitting from water heater.
5. Thread the ¾" MPT x 3-1/2" nipple into the water heater drain port. Use Teflon tape, or pipe thread sealant on threads.
6. Thread the branch port of the ¾" brass tee to the other end of the nipple.
7. Thread one of the copper adaptors into the end of the tee closest to the heat pump.
8. Thread the drain valve into the other end of the nipple. See Figure 17.
9. Above the water heater, cut the incoming cold water line. Remove a section of that line to enable the placement of the copper tee.
10. Insert the copper tee in the cold water line. See Figure 18.
11. Thread the remaining two ½"SWT x ¾"MPT copper adaptors into the ¾" FPT fittings on the heat pump, marked HOT WATER IN and HOT WATER OUT.

Section 12: Desuperheater Installation

12. Run interconnecting ½" copper pipe from the HOT WATER OUT on the heat pump, to the copper adaptor located on the tee at the bottom of the water heater (Step 7).

13. Run interconnecting ½" copper pipe from the HOT WATER IN on the heat pump, to the copper tee in the cold water line (Step 10).

14. Install an air vent fitting at the highest point of the line from step 13 (assuming it's the higher of the two lines from the heat pump to the water heater). See Figure 18.

15. Shut off the valve installed in the desuperheater line close to the tee in the cold water line. Open the air vent and all shut off valves installed in the "hot water out".

16. Turn the water supply to the water heater on. Fill water heater. Open highest hot water faucet to purge air from tank and piping.

17. Flush the interconnecting lines, and check for leaks. Make sure air vent is shutoff when water begins to drip steadily from the vent.

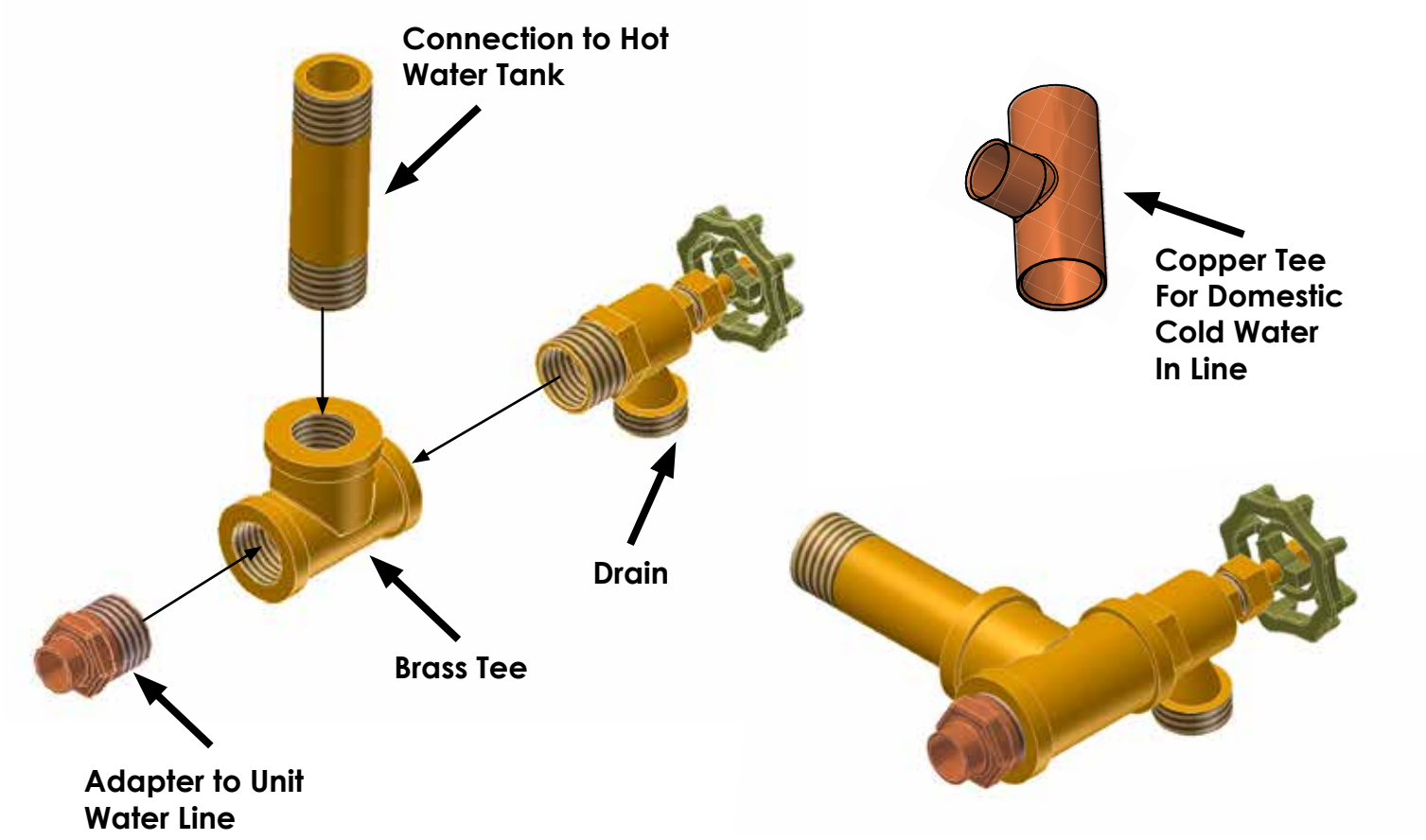
18. Loosen the screw on the end of the desuperheater pump to purge the air from the pump's rotor housing. A steady drip of water will indicate the air is removed. Tighten the screw and the pump can be connected to the contactor or terminal block.

19. Install 3/8" closed cell insulation on the lines connecting the heat pump to the water heater.

20. Reconnect electricity to water heater.

Figure 17: Water Heater Connection Kit Assembly for Bottom of Water Heater

NOTE: Drawing shown vertically for detail. Fitting installs horizontally into hot water tank.



Section 12: Desuperheater Installation

Figure 18: Typical Desuperheater Installation

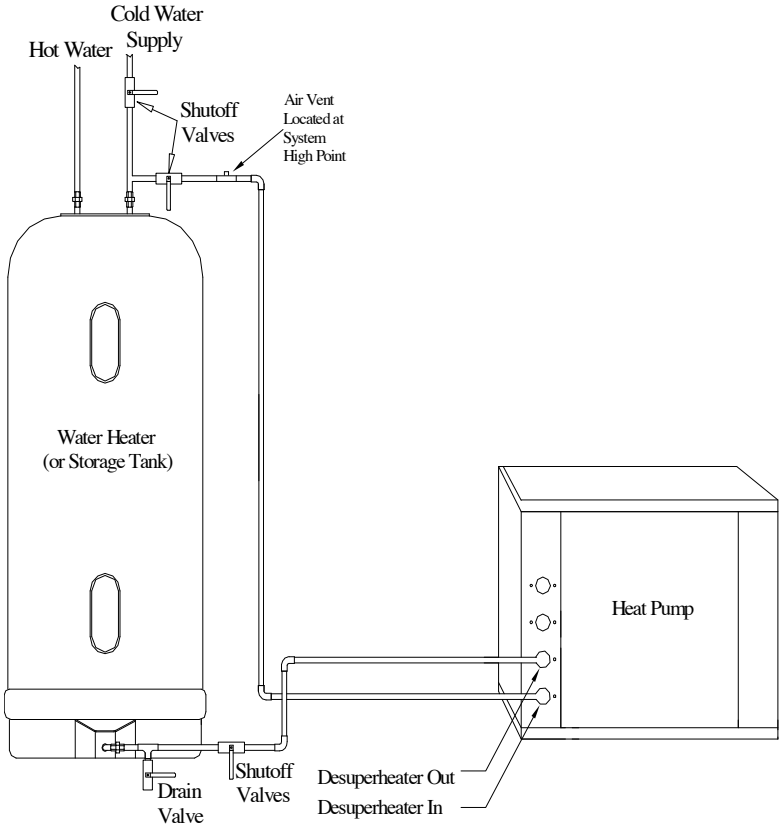
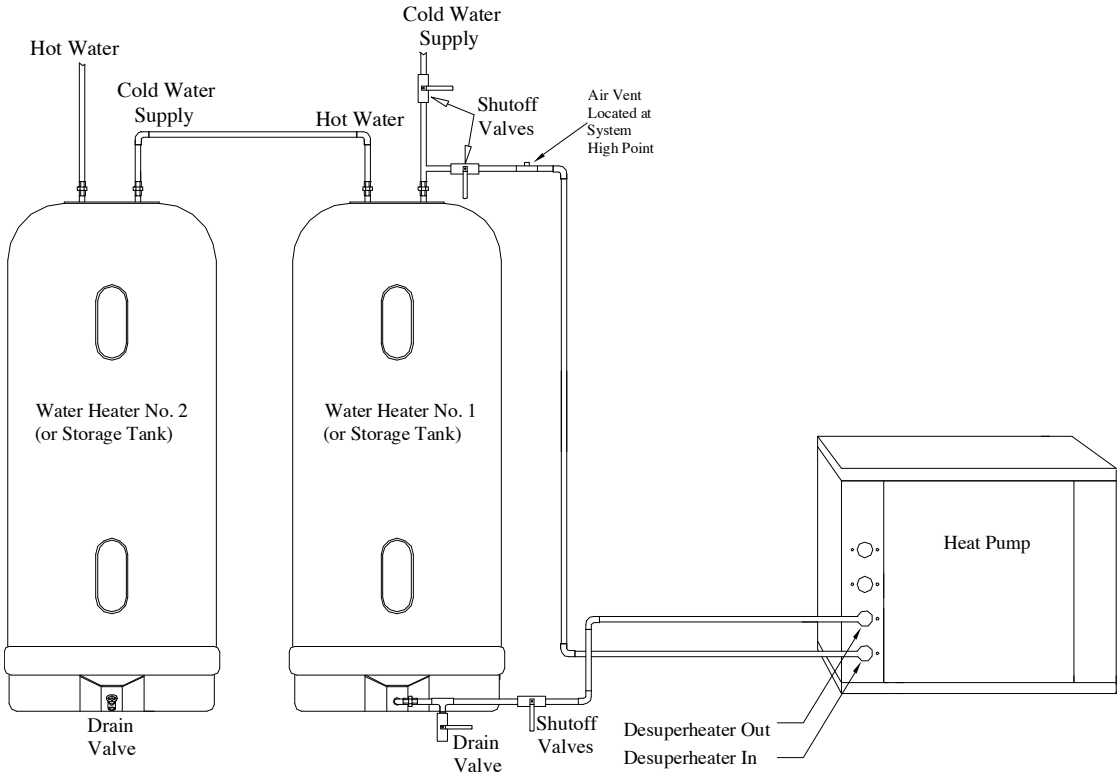


Figure 19: Desuperheater Installation and Preheat Tank



MICROPROCESSOR FEATURES AND OPERATION

Enertech Global geothermal heat pump controls provide a unique modular approach for controlling heat pump operation. The control system uses one, two, or three printed circuit boards, depending upon the features of a particular unit. This approach simplifies installation and troubleshooting, and eliminates features that are not applicable for some units. Split units include only the lockout board in the compressor section.

A microprocessor-based printed circuit board controls the inputs to the unit as well as outputs for status mode, faults, and diagnostics. A status LED and an LED for each fault is provided for diagnostics. Removable low voltage terminal strips provide all necessary terminals for field connections.

Startup/Random Start

The unit will not operate until all the inputs and safety controls are checked for normal conditions. At first power-up, the compressor is energized after a five minute delay. In addition, a zero to sixty second random start delay is added at first power-up to avoid multiple units from being energized at the same time.

Short Cycle Protection

A built-in five minute anti-short cycle timer provides short cycle protection of the compressor.

Component Sequencing Delays

Components are sequenced and delayed for optimum space conditioning performance and to make any startup noise less noticeable.

Test Mode

The microprocessor control allows the technician to shorten most timing delays for faster diagnostics by changing the position of a jumper located on the lockout board.

Water Solenoid Valve Connections

Two accessory relay outputs at the terminal strip provide a field connection for two types of water solenoid valves, a standard 24VAC solenoid valve, or a 24VAC solenoid valve with an end switch. Additional field wiring is no longer required for operation of the end switch.

Loop Pump Circuit Breakers (Single Compressor Units)

The loop pump(s) and desuperheater pump are protected by control box mounted circuit breakers for easy wiring of pumps during installation. Circuit breakers eliminate the need to replace fuses.

Safety Controls

The control receives separate signals for high pressure, low pressure, low water flow, and condensate overflow faults. Upon a continuous 30-second measurement of the fault (immediate for high pressure), compressor operation is suspended (see Fault Retry below), and the appropriate LED flashes. Once the unit is locked out (see Fault Retry below), an output (terminal "L") is made available to a fault LED at the thermostat (water-to-water unit has fault LED on the corner post).

Low Pressure: If the low pressure switch is open for 30 continuous seconds, the compressor operation will be interrupted, and the control will go into fault retry mode. At startup, the low pressure switch is not monitored for 90 seconds to avoid nuisance faults.

High Pressure: If the high pressure switch opens, the compressor operation will be interrupted, and the control will go into fault retry mode. There is no delay from the time the switch opens and the board goes into fault retry mode. There is also no delay of switch monitoring at startup.

Flow Switch: If the flow switch is open for 30 continuous seconds, the compressor operation will be interrupted, and the control will go into fault retry mode. At startup, the flow switch is not monitored for 30 seconds to avoid nuisance faults.

FAULT RETRY

All faults are retried twice before finally locking the unit out. The fault retry feature is designed to prevent nuisance service calls. There is an anti-short cycle period between fault retries. On the third fault, the board will go into lockout mode.

Over/Under Voltage Shutdown
The lockout board protects the compressor from operating when an over/under voltage condition exists. The control monitors secondary voltage (24VAC) to determine if an over/ under voltage condition is occurring on the primary side of the transformer. For example, if the secondary voltage is 19 VAC, the primary voltage for a 240V unit would be approximately 190V, which is below the minimum voltage (197V) recommended by the compressor manufacturer. This feature is self-resetting. If the voltage comes back within range, normal operation is restored. Therefore, over/under voltage is not a lockout.

Under voltage (18 VAC) causes the compressor to disengage and restart when the voltage returns to 20 VAC. Over voltage (31 VAC) causes the compressor to disengage and restart when the voltage returns to 29 VAC. During an over or under voltage condition, all five fault LEDs will blink (HP + LP + FS + CO + Status). When voltage returns to normal operation, the four fault LED's will stop blinking, but the status LED will continue to flash. While the board LEDs are flashing, the thermostat fault light will be illuminated.

Intelligent Reset
If the thermostat is powered off and back on (soft reset), the board will reset, but the last fault will be stored in memory for ease of troubleshooting. If power is interrupted to the board, the fault memory will be cleared.

Diagnostics
The lockout board includes five LEDs (status, high pressure, low pressure, low water flow, condensate overflow) for fast and simple control board diagnosis. On the following page is a table showing LED function.

NOTE: Condensate overflow is not used for split systems. Any condensate overflow protection must be added to the air handler.

Hot Water Pump Control
Controls for high water temperature and low compressor discharge line temperature prevent the hot water (desuperheater) pump from operating when the leaving water temperature is above 130°F, or when the compressor discharge line is too cool to provide adequate water heating.

Lockout Board Jumper Selection
The lockout board includes three jumpers for field selection of various board features.

Water Solenoid Valve Delay (WSD): When the WSD jumper is installed, the "A" terminal is energized when the compressor is energized. When the jumper is removed, the "A" terminal is energized 10 seconds after the compressor. If using the Taco water solenoid valve (or a valve with an end switch), the unit terminal strip includes a means for connecting a valve of this type. The WSD jumper should be installed. If using a fast opening valve that does not have an end switch, the jumper should be removed.

Test Mode (TEST): When the TEST jumper is installed, the board operates in the normal mode. When the jumper is removed, the board operates in test mode, which speeds up all delays for easier troubleshooting. When service is complete, the jumper must be re-installed in order to make sure that the unit operates with normal sequencing delays.

Over/Under Voltage Disable (O/V): When the O/V jumper is installed, the over/under voltage feature is active. When the jumper is removed, the over/under voltage feature is disabled. On rare occasions, variations in voltage will be outside the range of the over/under voltage feature, which may require removal of the jumper. However, removal of the jumper could cause the unit to run under adverse conditions, and therefore should not be removed without contacting technical services. An over/under voltage condition could cause premature component failure or damage to the unit controls. Any condition that would cause this fault must be thoroughly investigated before taking any action regarding the jumper removal. Likely causes of an over/under voltage condition include power company transformer selection,

Table 11a: LED Identification

LED Color	Location[1]	Function	Normal Operation	Fault Retry[2]	Lockout[2]
Green	Top	High Pressure	OFF	Flashing[3]	ON[3]
Orange	2nd	Low Pressure	OFF	Flashing[3]	ON[3]
Red	3rd	Water Flow	OFF	Flashing[3]	ON[3]
Yellow	4th	Condensate* Overflow	OFF	Flashing[3]	ON[3]
Green	Bottom	Status	Flashing[4]	Flashing[5]	Flashing[4]

Notes:
1. Looking at the board when the LEDs are on the right hand side
2. If all five lights are flashing, the fault is over/under voltage
3. Only the light associated with the particular fault/lockout will be on or flashing.
   For example, if a high pressure lockout has occurred, the top green light will be on.
   The orange, red, and yellow lights will be off
4. Status lights will be off when tin test mode
5. Flashes alternately with the fault LED

* Not applicable in split units

insufficient entrance wire sizing, defective breaker panel, incorrect transformer tap (unit control box), or other power-related issues.

SEQUENCE OF OPERATION
Water-to-Air Units, Single Compressor, ECM Fan

Heating, 1st Stage (Y1,G)
The ECM fan is started immediately at 75% (of 1st stage operation) CFM level, first stage compressor and the loop/desuperheater pump(s) are energized 10 seconds after the "Y1" input is received, and the ECM fan adjusts to 100% (of 1st stage operation) CFM level 30 seconds after the "Y1" input.

Heating, 2nd Stage (Y1,Y2,G)
The ECM fan adjusts to 2nd stage CFM level, and the compressor full load solenoid valve is energized.

Heat, 3rd Stage (Y1,Y2,W,G)
The ECM fan remains at 100% of 2nd stage CFM level, and the electric backup heat is energized.

Emergency Heat (W,G)
The fan is started immediately at 100% of 2nd stage CFM level, and the electric backup heat is energized.

Cooling Operation
The reversing valve is energized for cooling operation. Terminal "O" from the thermostat is connected to the reversing valve solenoid.

Cooling, 1st stage (Y1,0,G) Two-Stage Units
The ECM fan is started immediately at 75% (of 1st stage operation) CFM level, first stage compressor and the loop/desuperheater pump(s) are energized 10 seconds after the "Y1" input is received, and the ECM fan adjusts to 100% (of 1st stage operation) CFM level 30 seconds after the "Y1" input.

Cooling, 2nd Stage (Y1,Y2,O,G)
The ECM fan adjusts to 2nd stage CFM level, and the compressor full load solenoid valve is energized.

Fan Only
When the ECM control module receives a "G" call without a call for heating or cooling, the fan operates at 50% of the full load CFM level.

Thermostat Wiring / Fan Speed Notes
For two-stage compressor section units, wire as shown in the wiring diagram on the following page. For single stage units, jumper Y1 and Y2, and use the "CFM Y2" column in table 9b for determining jumper location. The ECM control board in the air handler is the thermostat connection point. Wire nut the thermostat wiring to the "pigtails" connected to the 1/4" spades on the ECM board.

For dehumidification in cooling, cut the resistor at the "DEHUMIDIFY" LED. Use either the HUM terminal (reverse logic -- designed to be used with a humidistat) to lower the fan speed when dehumidification is needed, or if the HUM terminal is not connected (and the resistor is cut), the air handler will operate at a lower fan speed in cooling and normal fan speed in heating.

Figure 20: Lockout Board (Compr Section)

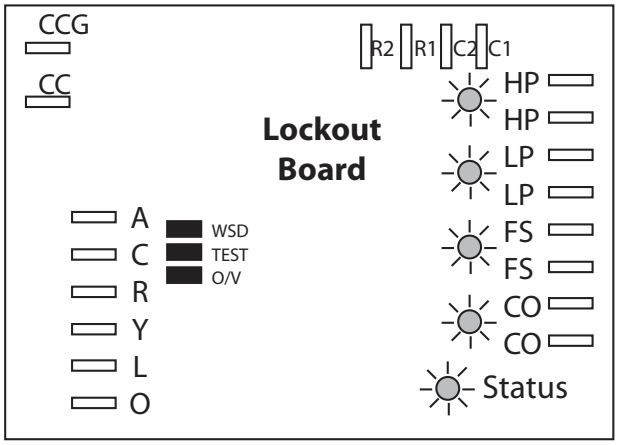


Figure 21: ECM Board (Air Handler Section)

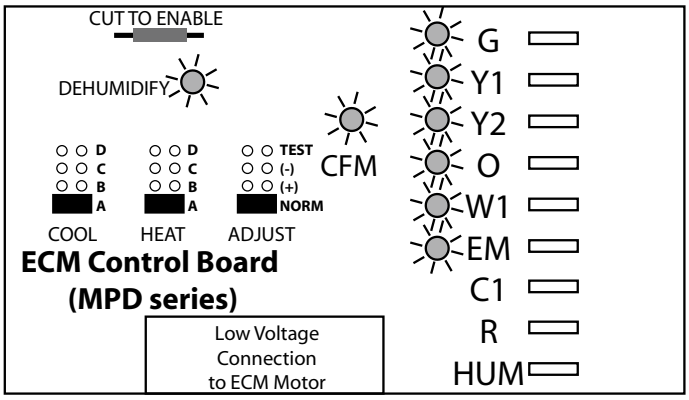


Table 11b: MPD Air Handler Fan Speeds

Model Number	COOL Jumper	HEAT Jumper	ADJUST Jumper	High SPD CFM Y2			Low SPD CFM Y1			FAN G		
				.40"	.60"	.80"	.40"	.60"	.80"	.40"	.60"	.80"
ST024 with MPD024A Ships Set On: COOL Jumper A HEAT Jumper A ADJUST Jumper Norm	A	A	Norm	930	930	920	830	820	810	420	410	410
	B	B	Norm	930	920	890	770	750	730	380	370	360
	C	C	Norm	870	860	820	710	700	670	360	350	330
	D	D	Norm	870	840	810	700	680	650	350	340	330
	A	A	+	930	930	920	930	930	920	470	460	460
	B	B	+	930	930	900	880	860	830	440	430	420
	C	C	+	930	930	890	810	800	760	410	400	380
	D	D	+	930	930	890	800	780	750	400	390	370
ST036 with MPD036A Ships Set On: COOL Jumper C HEAT Jumper C ADJUST Jumper Norm	A	A	Norm	1556	1556	1508	1448	1448	1428	567	539	502
	B	B	Norm	1547	1547	1518	1239	1239	1227	476	433	407
	C	C	Norm	1312	1308	1308	1012	1006	1006	396	349	302
	D	D	Norm	1150	1145	1139	880	873	865	322	288	N/A
	A	A	+	1556	1556	1508	1566	1566	1518	674	633	619
	B	B	+	1547	1547	1518	1428	1428	1428	558	529	493
	C	C	+	1528	1520	1486	1156	1156	1156	450	404	377
	D	D	+	1317	1317	1317	1024	1020	1006	395	345	302
ST048 with MPD060B Change to: COOL Jumper C HEAT Jumper C ADJUST Jumper Norm	A	A	Norm	2180	2170	2116	1810	1810	1784	1157	1137	1137
	B	B	Norm	2015	2015	2004	1678	1678	1664	1087	1087	1045
	C	C	Norm	1710	1701	1693	1407	1407	1396	953	934	905
	D	D	Norm	1567	1567	1546	1318	1304	1274	911	989	962
ST060 with MPD060B Ships Set On: COOL Jumper B HEAT Jumper B ADJUST Jumper Norm	A	A	+	2243	2170	2116	1885	1860	1823	1289	1271	1253
	B	B	+	2232	2170	2105	1897	1873	1848	1215	1203	1191
	C	C	+	1937	1921	1914	1612	1612	1603	1032	1017	981
	D	D	+	1809	1795	1752	1493	1488	1467	1003	978	945
ST072 with MPD072A Ships Set On: COOL Jumper C HEAT Jumper C ADJUST Jumper Norm	A	A	Norm	2511	2511	2498	2511	2511	2498	1298	1298	1274
	B	B	Norm	2498	2461	2422	2344	2344	2330	1160	1160	1140
	C	C	Norm	2076	2068	2054	1532	1522	1503	694	621	534
	D	D	Norm	1848	1848	1832	1330	1330	1307	566	463	415
	A	A	+	**Not Available**								
	B	B	+	2572	2511	2448	2572	2511	2448	1391	1391	1368
	C	C	+	2383	2370	2357	1784	1749	1731	818	764	694
	D	D	+	2155	2133	2122	1544	1524	1499	715	640	543

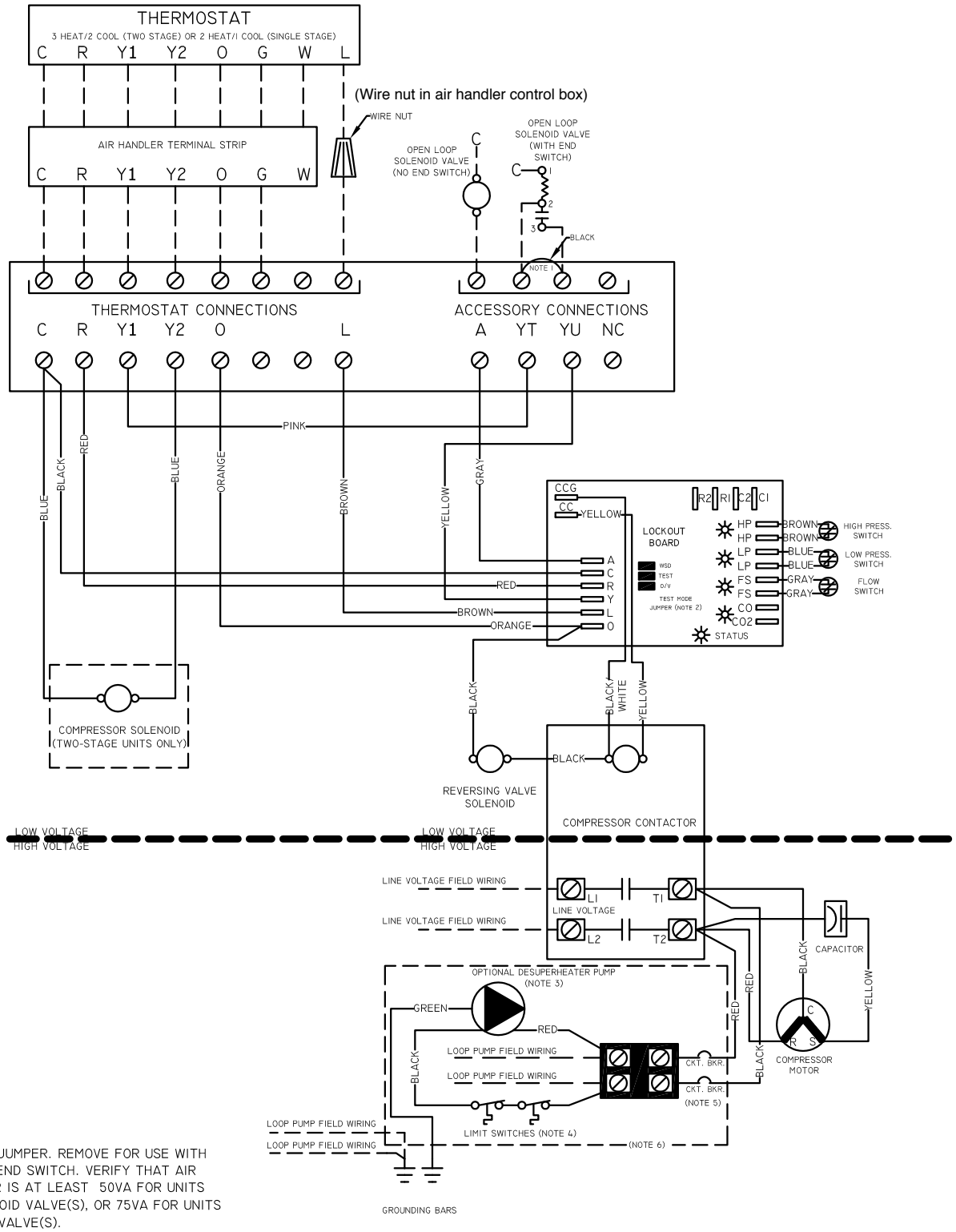
NOTES:

1. Dehumidification mode can be enabled by cutting the jumper on the ECM board. When cut, cooling CFM is reduced by 15%, and heating/auxiliary heat CFM remains unchanged. **Example:** Model 036 with HEAT and COOL jumpers on C setting and ADJUST jumper on Norm setting would run at 1115 CFM with jumper cut, instead of 1308 CFM with jumper intact.

1. Gray shaded areas are recommended settings. Other settings may be used, depending upon application. DO NOT cut dehumidification jumper if CFM setting will cause airflow to be below 250 CFM per ton on first stage, and below 325 CFM per ton on second stage. **Example:** Model 036 should not run below 750 CFM in first stage, or below 975 CFM in second stage.

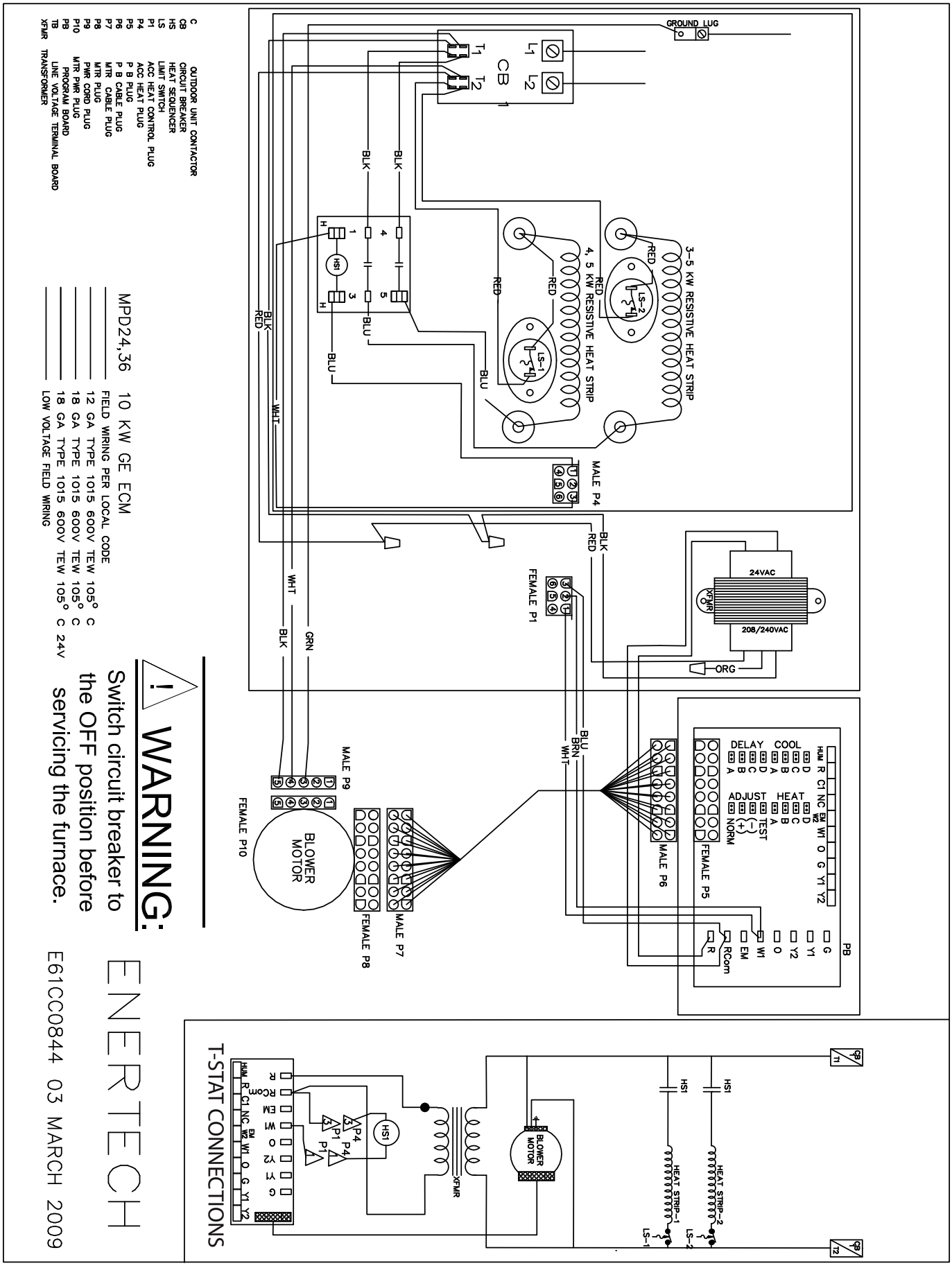
2. The COOL and HEAT jumpers should both be set at the same position. COOL controls heating and cooling airflow; HEAT controls electric heat airflow.

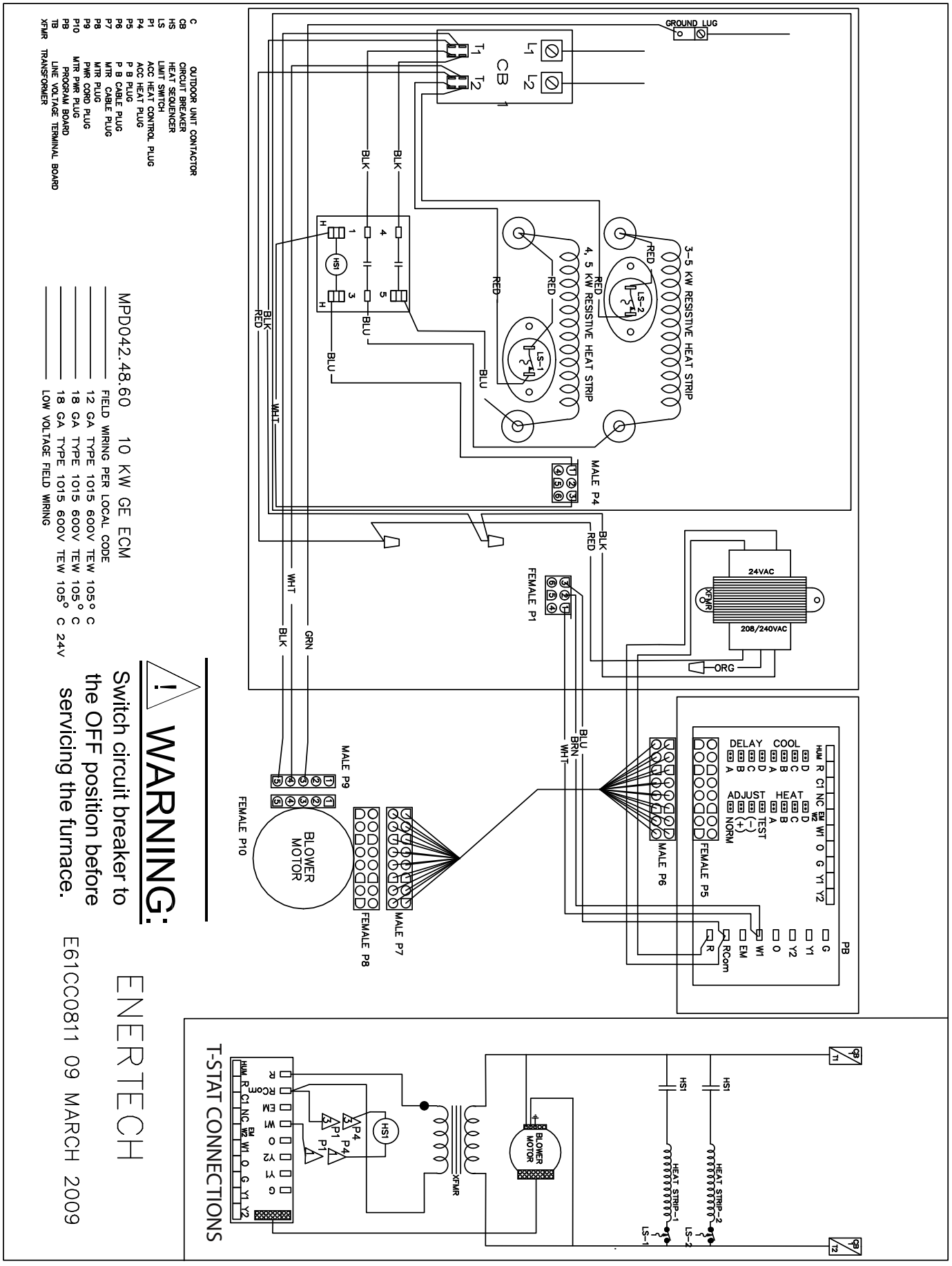
3. Above CFM will be maintained up to 0.50" ESP for models MPD024 and 036, and up to 0.75" ESP for models MPD048 and 60.

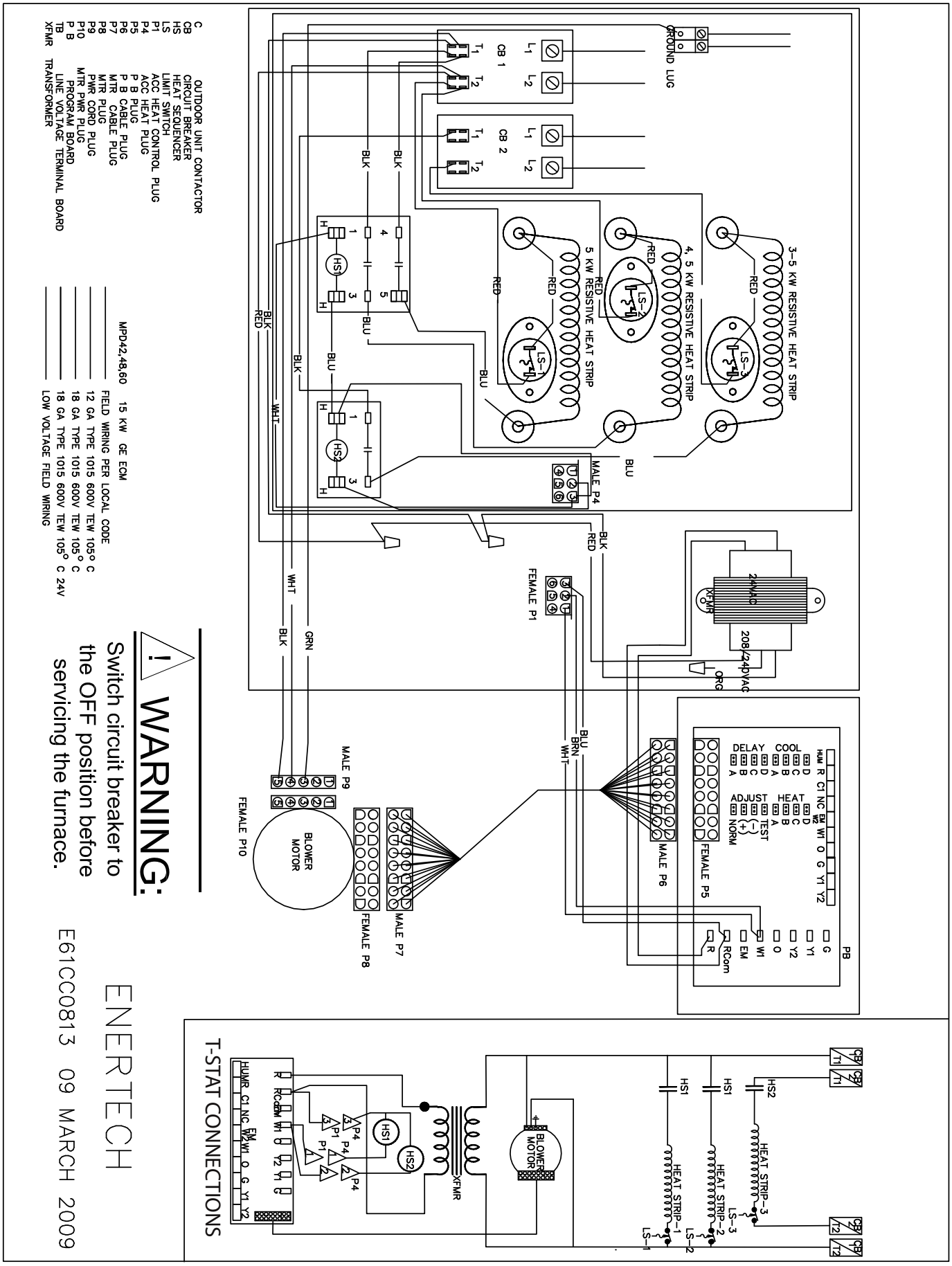


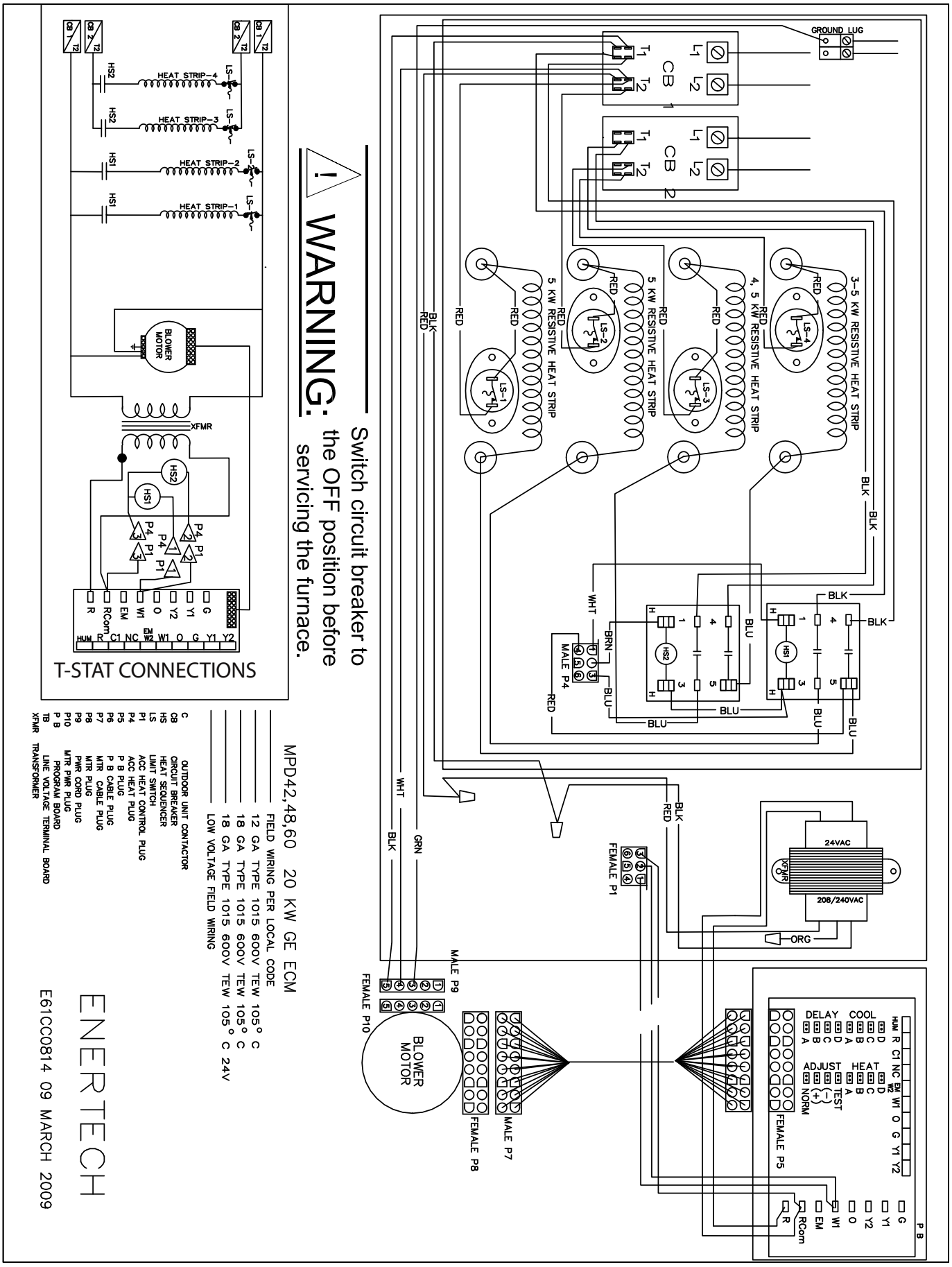
NOTES:

1. FACTORY INSTALLED JUMPER. REMOVE FOR USE WITH SOLENOID VALVE WITH END SWITCH. VERIFY THAT AIR HANDLER TRANSFORMER IS AT LEAST 50VA FOR UNITS WITHOUT WATER SOLENOID VALVE(S), OR 75VA FOR UNITS WITH WATER SOLENOID VALVE(S).
2. JUMPER INSTALLED=NORMAL; JUMPER REMOVED=TEST.
3. DESUPERHEAT PUMP POWER WIRES ARE NOT CONNECTED AT THE FACTORY. DO NOT CONNECT WIRES UNTIL THE PIPING IS COMPLETED AND PURGED OF AIR. RUNNING THE PUMP WITHOUT WATER WILL DAMAGE THE PUMP.
4. DESUPERHEATER LEAVING WATER TEMPERATURE SWITCH OR HOT GAS LINE TEMPERATURE SWITCH WILL DISENGAGE THE PUMP WHEN CONDITIONS ARE INAPPROPRIATE FOR WATER HEATING.
5. CIRCUIT BREAKERS ARE INSTALLED ON RESIDENTIAL MODELS ONLY.
6. EVERYTHING CONTAINED WITHIN THE DASHED BOX IS INSTALLED ON RESIDENTIAL MODELS ONLY.


C OUTDOOR UNIT CONTACTOR
CB CIRCUIT BREAKER
HS HEAT SEQUENCER
LS LIMIT SWITCH
P1 ACC HEAT CONTROL PLUG
P4 ACC HEAT PLUG
P5 P B PLUG
P6 P B CABLE PLUG
P7 MTR CABLE PLUG
P8 MTR PLUG
P9 PWR CORD PLUG
P10 MTR PWR PLUG
PB PROGRAM BOARD
TB LINE VOLTAGE TERMINAL BOARD
XFMR TRANSFORMER
MPD24,36 10 KW GE ECM
FIELD WIRING PER LOCAL CODE
12 GA TYPE 1015 600V TEW 105° C
18 GA TYPE 1015 600V TEW 105° C
18 GA TYPE 1015 600V TEW 105° C 24V
LOW VOLTAGE FIELD WIRING
WARNING:
Switch circuit breaker to the OFF position before servicing the furnace.
GROUND LUG
CB
L1 L2
T1 T2
3-5 KW RESISTIVE HEAT STRIP
4, 5 KW RESISTIVE HEAT STRIP
LS-1
LS-2
HS1
MALE P4
FEMALE P1
24VAC
208/240VAC
XFMR
ORG
MALE P9
FEMALE P10
BLOWER MOTOR
FEMALE P8
MALE P7
MALE P6
FEMALE P5
DELAY COOL
ADJUST HEAT
TEST
NORM
HUM R C1 NC EM W2 W1 O G Y1 Y2
PB
HEAT STRIP-1
HEAT STRIP-2
T-STAT CONNECTIONS
ENERTECH
E61CC0844 03 MARCH 2009


C OUTDOOR UNIT CONTACTOR
CB CIRCUIT BREAKER
HS HEAT SEQUENCER
LS LIMIT SWITCH
P1 ACC HEAT CONTROL PLUG
P4 ACC HEAT PLUG
P5 P B PLUG
P6 P B CABLE PLUG
P7 MTR CABLE PLUG
P8 MTR PLUG
P9 PWR CORD PLUG
P10 MTR PWR PLUG
PB PROGRAM BOARD
TB LINE VOLTAGE TERMINAL BOARD
XFMR TRANSFORMER
MPD042.48.60 10 KW GE ECM
FIELD WIRING PER LOCAL CODE
12 GA TYPE 1015 600V TEW 105° C
18 GA TYPE 1015 600V TEW 105° C
18 GA TYPE 1015 600V TEW 105° C 24V
LOW VOLTAGE FIELD WIRING
WARNING:
Switch circuit breaker to the OFF position before servicing the furnace.
ENERTECH
E61CC0811 09 MARCH 2009
T-STAT CONNECTIONS
GROUND LUG
CB 1
3-5 KW RESISTIVE HEAT STRIP
4, 5 KW RESISTIVE HEAT STRIP
MALE P4
FEMALE P1
24VAC
208/240VAC
ORG
MALE P9
FEMALE P10
BLOWER MOTOR
MALE P7
FEMALE P8
MALE P6
FEMALE P5
PB
HEAT STRIP-1
HEAT STRIP-2
XFMR


C OUTDOOR UNIT CONTACTOR
CB CIRCUIT BREAKER
HS HEAT SEQUENCER
LS LIMIT SWITCH
P1 ACC HEAT CONTROL PLUG
P4 ACC HEAT PLUG
P5 P B PLUG
P6 P B CABLE PLUG
P7 MTR CABLE PLUG
P8 MTR PLUG
P9 PWR CORD PLUG
P10 MTR PWR PLUG
P B PROGRAM BOARD
TB LINE VOLTAGE TERMINAL BOARD
XFMR TRANSFORMER
MPD42,48,60 15 KW GE ECM
FIELD WIRING PER LOCAL CODE
12 GA TYPE 1015 600V TEW 105° C
18 GA TYPE 1015 600V TEW 105° C
18 GA TYPE 1015 600V TEW 105° C 24V
LOW VOLTAGE FIELD WIRING
GROUND LUG
CB 1
CB 2
3-5 KW RESISTIVE HEAT STRIP
4, 5 KW RESISTIVE HEAT STRIP
5 KW RESISTIVE HEAT STRIP
MALE P4
FEMALE P1
24VAC
208/240VAC
MALE P9
FEMALE P10
BLOWER MOTOR
FEMALE P8
MALE P7
MALE P6
FEMALE P5
DELAY
COOL
ADJUST
HEAT
TEST
NORM
PB
WARNING:
Switch circuit breaker to the OFF position before servicing the furnace.
ENERTECH
E61CC0813 09 MARCH 2009
T-STAT CONNECTIONS
HEAT STRIP-3
HEAT STRIP-2
HEAT STRIP-1
LS-3
LS-2
LS-1
XFMR
BLOWER MOTOR


GROUND LUG
CB 1
CB 2
3-5 KW RESISTIVE HEAT STRIP
4, 5 KW RESISTIVE HEAT STRIP
5 KW RESISTIVE HEAT STRIP
LS-1
LS-2
LS-3
LS-4
HS1
HS2
BLK
RED
WHT
BRN
BLU
GRN
MALE P4
FEMALE P1
24VAC
208/240VAC
XFMR
ORG
MALE P9
FEMALE P10
BLOWER MOTOR
FEMALE P8
MALE P7
FEMALE P5
DELAY
COOL
ADJUST
HEAT
TEST
NORM
HUM R C1 NC EM W2 W1 O G Y1 Y2
P B
HEAT STRIP-4
HEAT STRIP-3
HEAT STRIP-2
HEAT STRIP-1
CB 1 T2
CB 2 T2
BLOWER MOTOR
XFMR
HS1
HS2
P4 P1
P1
R RCom EM W1 O Y2 Y1 G
HUM R C1 NC EM W2 W1 O G Y1 Y2
T-STAT CONNECTIONS
! WARNING:
Switch circuit breaker to the OFF position before servicing the furnace.
MPD42,48,60 20 KW GE ECM
FIELD WIRING PER LOCAL CODE
12 GA TYPE 1015 600V TEW 105° C
18 GA TYPE 1015 600V TEW 105° C
18 GA TYPE 1015 600V TEW 105° C 24V
LOW VOLTAGE FIELD WIRING
C OUTDOOR UNIT CONTACTOR
CB CIRCUIT BREAKER
HS HEAT SEQUENCER
LS LIMIT SWITCH
P1 ACC HEAT CONTROL PLUG
P4 ACC HEAT PLUG
P5 P B PLUG
P6 P B CABLE PLUG
P7 MTR CABLE PLUG
P8 MTR PLUG
P9 PWR CORD PLUG
P10 MTR PWR PLUG
P B PROGRAM BOARD
TB LINE VOLTAGE TERMINAL BOARD
XFMR TRANSFORMER
ENERTECH
E61CC0814 09 MARCH 2009

Section 14: Accessories

APSMA PUMP SHARING MODULE

The pump sharing module, part number APS-MA, is designed to allow two units to share one flow center. With the APSMA module, either unit can energize the pump(s). Connect the units and flow center as shown in Figure 22, below. Figure 23 includes a schematic of the board. The module must be mounted in a NEMA enclosure or inside the unit control box. Local code supersedes any recommendations in this document.

Figure 22: APSMA Module Layout

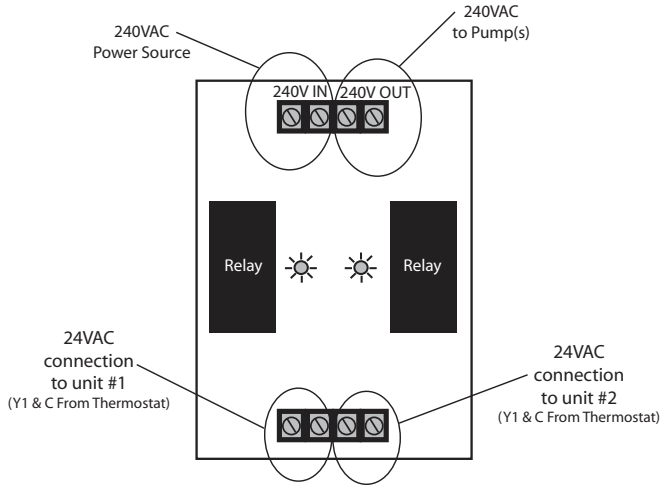
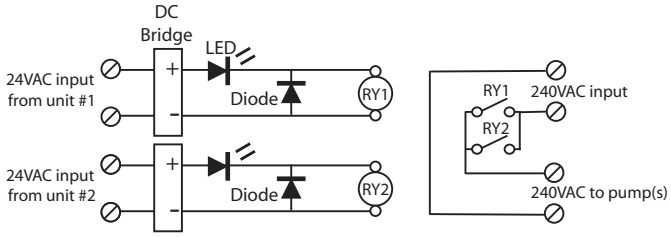


Figure 23: APSMA Module Wiring Schematic



PERFORMANCE CHECK
Heat of Extraction(HE)/Rejection(HR)
Record information on the Unit Start-up Form

Equipment should be in full load operation for a minimum of 10 minutes in either mode – ***WITH THE HOT WATER GENERATOR TURNED OFF.***

1. Determine flow rate in gallons per minute
   a. Check entering water temperature
   b. Check entering water pressure
   c. Check leaving water pressure

Once this information is recorded, find corresponding entering water temperature column in Specification Manual for unit.
Find pressure differential in PSI column in Spec Manual. Then read the GPM column in Spec Manual to determine flow in GPM.

2. Check leaving water temperature of unit.
FORMULA: GPM x water temp diff, x 485 (antifreeze) or 500 (fresh water) = HE or HR in BTU/HR

A 10% variance from Spec Manual is allowed.
Always use the same pressure gauge & temperature measuring device.
Water flow must be in range of Specification Manual. If system has too much water flow, performance problems should be expected

Section 15: Troubleshooting

A: UNIT WILL NOT START IN EITHER CYCLE

Thermostat	Set thermostat on heating and highest temperature setting. Unit should run. Set thermostat on cooling and lowest temperature setting. Unit should run. Set fan to On position. Fan should run. If unit does not run in any position, disconnect wires at heat pump terminal block and jump R, G, Y. Unit should run in heating. If unit runs, replace thermostat with correct thermostat only.
Loose or broken wires	Tighten or replace wires.
Blown Fuse/ Tripped Circuit Breakers	Check fuse size, replace fuse or reset circuit breaker. Check low voltage circuit breaker.
Low Voltage Circuit	Check 24 volt transformer. If burned out or less than 24 volt, replace. Before replacing, verify tap setting and correct if necessary.
Water Flow	If water flow is low (less than 3.5 GPM), unit will not start. Make sure Pump Module or solenoid valve is connected (see wiring diagram). Water has to flow through the heat exchanger in the right direction (see labels at water fitting connections) before the compressor can start. If water flow is at normal flow, use an ohmmeter to check if you get continuity at the flow switch. If no switch is open and flow is a normal flow, remove switch and check for stuck particles or bad switch.

B: UNIT RUNNING NORMAL, BUT SPACE TEMPERATURE IS UNSTABLE

Thermostat	Thermostat is getting a draft of cold or warm air. Make sure that the wall or hole used to run thermostat wire from the ceiling or basement is sealed, so no draft can come to the thermostat. Faulty Thermostat (Replace).

C: NO WATER FLOW

Pump Module	Make sure Pump Module is connected to the control box relay (check all electrical connections). For non-pressurized systems, check water level in Pump Module. If full of water, check pump. Close valve on the pump flanges and loosen pump. Take off pump and see if there is an obstruction in the pump. If pump is defective, replace. For pressurized systems, check loop pressure. Repressurize if necessary. May require re-flushing if there is air in the loop.
Solenoid valve	Make sure solenoid valve is connected. Check solenoid. If defective, replace.

D: IN HEATING OR COOLING MODE, UNIT OUTPUT IS LOW

Water	Water flow & temperature insufficient.
Airflow	Check speed setting, check nameplate or data manual for proper speed, and correct speed setting. Check for dirty air filter—Clean or replace. Restricted or leaky ductwork. Repair.
Refrigerant charge	Refrigerant charge low, causing inefficient operation. Make adjustments only after airflow and water flow are checked.
Reversing valve	Defective reversing valve can create bypass of refrigerant to suction side of compressor. Switch reversing valve to heating and cooling mode rapidly. If problem is not resolved, replace valve. Wrap the valve with a wet cloth and direct the heat away from the valve. Excessive heat can damage the valve. Always use dry nitrogen when brazing. Replace filter/drier any time the circuit is opened.

E: IN HEATING OR COOLING MODE, UNIT OUTPUT IS LOW

Heat pump will not cool but will heat. Heat pump will not heat but will cool.	Reversing valve does not shift. Check reversing valve wiring. If wired wrong, correct wiring. If reversing valve is stuck, replace valve. Wrap the valve with a wet cloth and direct the heat away from the valve. Excessive heat can damage the valve. Always use dry nitrogen when brazing. Replace filter/drier any time the circuit is opened.
Water heat exchanger	Check for high-pressure drop, or low temperature drop across the coil. It could be scaled. If scaled, clean with condenser coil cleaner.
System undersized	Recalculate conditioning load.

F: WATER HEAT EXCHANGER FREEZES IN HEATING MODE

Water flow	Low water flow. Increase flow. See F. No water flow.
Flow Switch	Check switch. If defective, replace.

G: EXCESSIVE HEAD PRESSURE IN COOLING MODE

Inadequate water flow	Low water flow, increase flow.

H: EXCESSIVE HEAD PRESSURE IN HEATING MODE

Low air flow	See E: Noisy blower and low air flow.

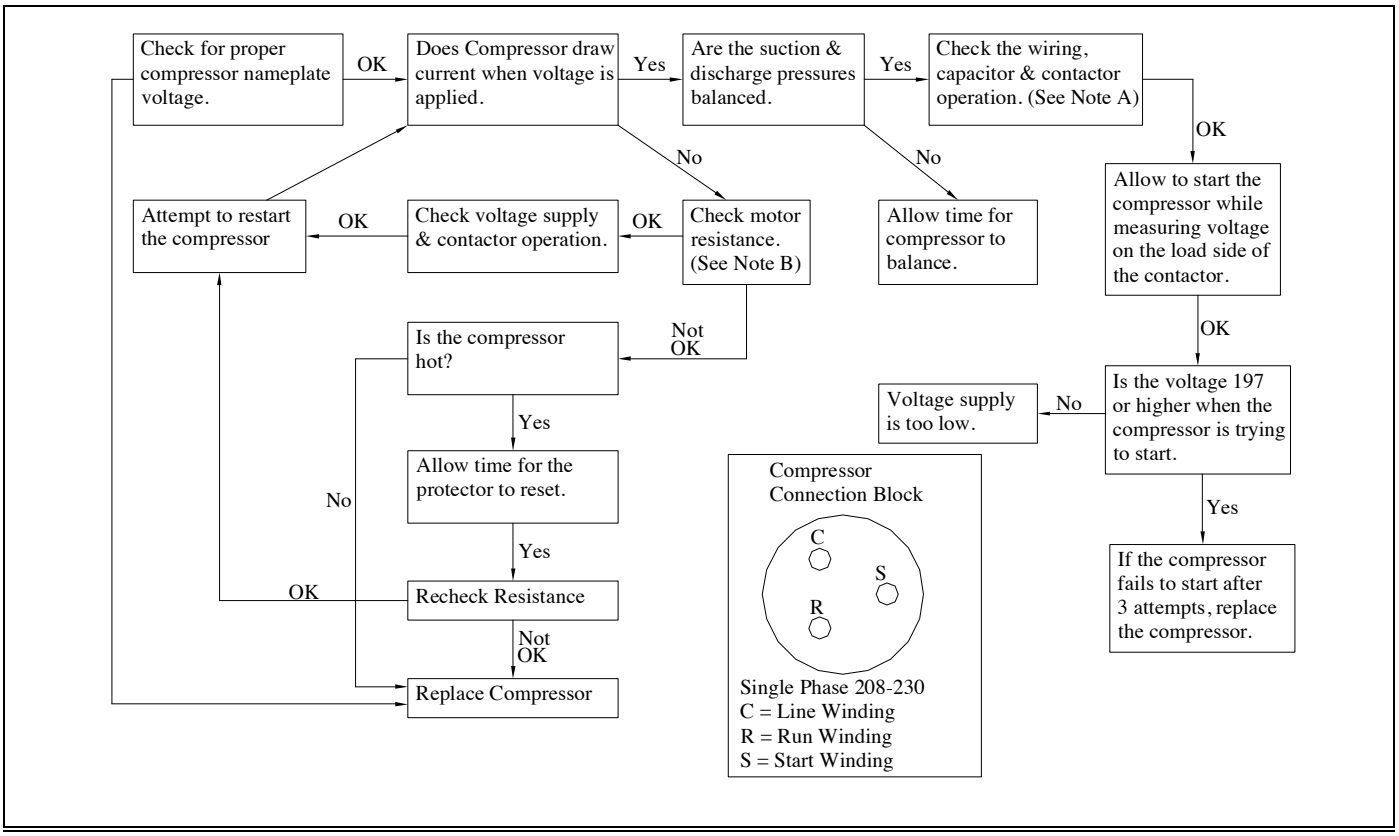
I: AIR COIL FREEZES OVER IN COOLING MODE

Air flow	See E: Noisy blower and low air flow.
Blower motor	Motor not running or running too slow. Motor tripping off on overload. Check for overheated blower motor and tripped overload. Replace motor if defective.
Panels	Panels not in place.
Low air flow	See E: Noisy blower and low air flow.

J: WATER DRIPPING FROM UNIT

Unit not level	Level unit.
Condensation drain line plugged	Unplug condensation line.
Water sucking off the air coil in cooling mode	Too much airflow. Duct work not completely installed. If duct work is not completely installed, finish duct work. Check static pressure and compare with air flow chart in spec manual under specific models section. If ductwork is completely installed it may be necessary to reduce CFM.
Water sucking out of the drain pan	Install an EZ-Trap or P-Trap on the drain outlet so blower cannot suck air back through the drain outlet.

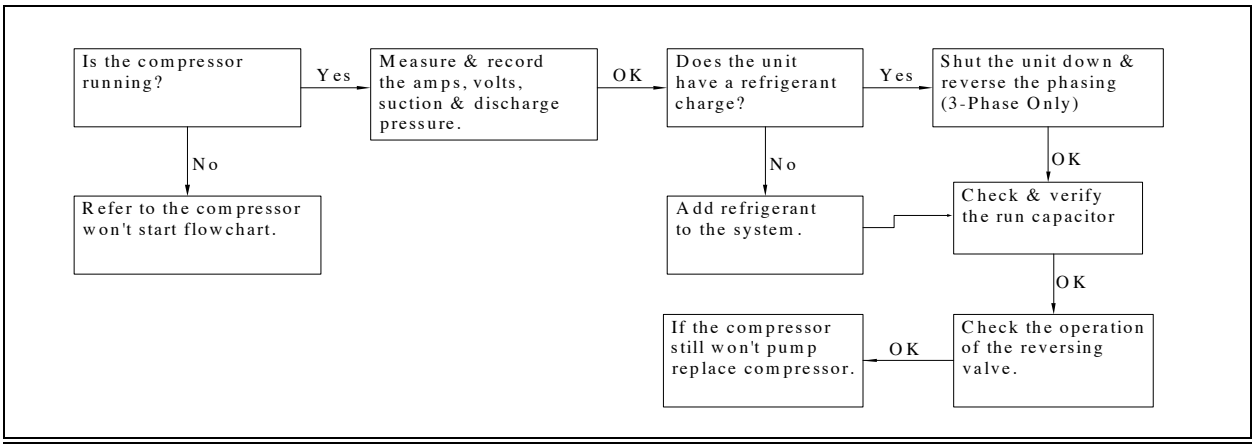
O: COMPRESSOR WON'T START



A: Check all terminals, wires & connections for loose or burned wires and connections. Check contactor and 24 Volt coil. Check capacitor connections & check capacitor with capacitor tester.

B: If ohm meter reads 0 (short) resistance from C to S, S to R, R to C or from anyone of one of these terminals to ground (shorted to ground), compressor is bad.

P: COMPRESSOR WON'T PUMP CHART



Section 15: Troubleshooting

Table 12a: Model 024 Operational Data - Cooling Mode

Troubleshooting Data - Cooling Mode, Full Load Operation (Desuperheater Off)*											
Model	Entering Water Temp., DB deg. F	Entering Air Temp., DB deg. F	GPM/ ton	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Rise, deg. F	Air Temp. Drop, deg F		
									375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
024	50	70 - 85	1.5	209 - 232	122 - 145	19 - 24	16 - 20	23 - 27	22 - 26	20 - 24	19 - 23
			2.25	195 - 217	114 - 135	17 - 21	16 - 20	15 - 19			
			3	182 - 202	106 - 126	12 - 15	18 - 22	11 - 15			
	60		1.5	245 - 268	144 - 166	18 - 21	14 - 17	23 - 27	21 - 25	20 - 24	19 - 23
			2.25	229 - 250	134 - 156	15 - 18	14 - 17	15 - 19			
			3	213 - 233	125 - 145	11 - 13	16 - 19	10 - 14			
	70		1.5	279 - 302	146 - 169	19 - 22	14 - 17	23 - 27	21 - 25	20 - 24	18 - 22
			2.25	261 - 282	136 - 158	17 - 20	14 - 17	14 - 18			
			3	243 - 263	127 - 147	12 - 14	16 - 19	10 - 14			
	80		1.5	338 - 361	153 - 176	21 - 26	12 - 15	22 - 26	20 - 24	19 - 23	18 - 22
			2.25	316 - 337	143 - 164	18 - 22	12 - 15	14 - 18			
			3	294 - 314	133 - 153	13 - 16	14 - 17	10 - 14			
	90		1.5	383 - 406	173 - 196	16 - 19	11 - 13	22 - 26	20 - 24	18 - 22	17 - 21
			2.25	359 - 380	162 - 184	14 - 17	11 - 13	14 - 18			
			3	334 - 354	151 - 171	10 - 12	12 - 15	10 - 14			

Table 12b: Model 024 Operational Data - Heating Mode

Troubleshooting Data - Heating Mode, Full Load Operation (Desuperheater Off)*												
Model	Entering Water Temp., DB deg F	Entering Air Temp., DB deg F	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Drop, deg. F			Air Temp. Rise, deg F		
							1.5 GPM/ ton	2.25 GPM/ ton	3 GPM/ ton	375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
024	32	55	222 - 242	75 - 85	3 - 5	8 - 10	N/A	5 - 7	3 - 5	21 - 25	20 - 24	19 - 23
		60	240 - 260	76 - 86								
		65	257 - 277	76 - 86								
		70	269 - 289	77 - 87								
		75	277 - 297	77 - 87								
	40	55	230 - 250	85 - 95	2 - 4	9 - 11	N/A	6 - 8	4 - 6	25 - 29	23 - 27	21 - 25
		60	249 - 269	86 - 96								
		65	267 - 287	86 - 96								
		70	279 - 299	87 - 97								
		75	288 - 308	88 - 98								
	50	55	244 - 264	106 - 116	2 - 4	9 - 11	11 - 13	7 - 9	5 - 7	28 - 32	26 - 30	24 - 28
		60	264 - 284	106 - 116								
		65	283 - 303	107 - 117								
		70	296 - 316	108 - 118								
		75	305 - 325	109 - 119								

* Pressures are for reference only--Do not use for charging. Preferred charging method is using approach temperatures in cooling. If charging in cooling is not possible, charging in heating may be accomplished using the Subcooling/Superheat values at appropriate water temperature.

Table 12c: Model 036 Operational Data - Cooling Mode

Troubleshooting Data - Cooling Mode, Full Load Operation (Desuperheater Off)*											
Model	Entering Water Temp., DB deg. F	Entering Air Temp., DB deg. F	GPM/ ton	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Rise, deg. F	Air Temp. Drop, deg F		
									375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
036	50	70 - 85	1.5	222 - 245	121 - 144	30 - 37	14 - 17	19 - 23	21 - 25	20 - 24	18 - 22
			2.25	207 - 229	113 - 134	27 - 32	14 - 17	12 - 16			
			3	193 - 213	105 - 125	19 - 23	16 - 19	9 - 13			
	60		1.5	259 - 282	141 - 164	26 - 32	12 - 15	19 - 23	21 - 25	20 - 24	18 - 22
			2.25	243 - 264	132 - 154	22 - 28	12 - 15	12 - 16			
			3	226 - 246	123 - 143	16 - 20	14 - 17	9 - 13			
	70		1.5	296 - 319	144 - 166	27 - 32	12 - 14	19 - 23	21 - 25	19 - 23	18 - 22
			2.25	277 - 299	134 - 156	24 - 28	12 - 14	12 - 16			
			3	258 - 278	125 - 145	17 - 20	13 - 16	8 - 12			
	80		1.5	357 - 380	150 - 173	27 - 34	10 - 12	18 - 22	20 - 24	19 - 23	17 - 21
			2.25	334 - 356	141 - 162	24 - 29	10 - 12	12 - 16			
			3	311 - 331	131 - 151	17 - 21	11 - 14	8 - 12			
	90		1.5	406 - 429	171 - 194	22 - 27	9 - 11	18 - 22	19 - 23	18 - 22	17 - 21
			2.25	380 - 402	160 - 182	20 - 24	9 - 11	11 - 15			
			3	354 - 374	149 - 169	14 - 17	10 - 12	8 - 12			

Table 12d: Model 036 Operational Data - Heating Mode

Troubleshooting Data - Heating Mode, Full Load Operation (Desuperheater Off)*												
Model	Entering Water Temp., DB deg F	Entering Air Temp., DB deg F	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Drop, deg. F			Air Temp. Rise, deg F		
							1.5 GPM/ ton	2.25 GPM/ ton	3 GPM/ ton	375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
036	32	55	241 - 261	74 - 84	7 - 9	5 - 7	N/A	5 - 7	3 - 5	21 - 25	20 - 24	19 - 23
		60	260 - 280	75 - 85								
		65	278 - 298	76 - 86								
		70	289 - 309	77 - 87								
		75	297 - 317	77 - 87								
	40	55	247 - 267	94 - 104	7 - 9	5 - 7	N/A	6 - 8	4 - 6	25 - 29	23 - 27	21 - 25
		60	266 - 286	96 - 106								
		65	285 - 305	97 - 107								
		70	296 - 316	98 - 108								
		75	304 - 324	98 - 108								
	50	55	268 - 288	106 - 116	7 - 9	5 - 7	11 - 13	7 - 9	5 - 7	28 - 32	26 - 30	24 - 28
		60	289 - 309	107 - 117								
		65	309 - 329	109 - 119								
		70	321 - 341	110 - 120								
		75	330 - 350	110 - 120								

* Pressures are for reference only--Do not use for charging. Preferred charging method is using approach temperatures in cooling. If charging in cooling is not possible, charging in heating may be accomplished using the Subcooling/Superheat values at appropriate water temperature.

Section 15: Troubleshooting

Table 12e: Model 048 Operational Data - Cooling Mode

Troubleshooting Data - Cooling Mode, Full Load Operation (Desuperheater Off)*											
Model	Entering Water Temp., DB deg. F	Entering Air Temp., DB deg. F	GPM/ ton	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Rise, deg. F	Air Temp. Drop, deg F		
									375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
048	50	70 - 85	1.5	211 - 234	126 - 149	14 - 16	10 - 12	20 - 24	22 - 26	21 - 25	20 - 24
			2.25	198 - 219	118 - 140	13 - 14	10 - 12	12 - 16			
			3	184 - 204	110 - 130	9 - 10	11 - 13	9 - 13			
	60		1.5	247 - 270	148 - 171	11 - 14	8 - 10	20 - 24	22 - 26	21 - 25	19 - 23
			2.25	231 - 252	139 - 160	10 - 13	8 - 10	12 - 16			
			3	215 - 235	129 - 149	7 - 9	9 - 11	9 - 13			
	70		1.5	281 - 304	150 - 173	14 - 18	8 - 10	19 - 23	22 - 26	20 - 24	19 - 23
			2.25	263 - 285	141 - 162	13 - 15	8 - 10	12 - 16			
			3	245 - 265	131 - 151	9 - 11	9 - 11	9 - 13			
	80		1.5	339 - 362	157 - 180	16 - 19	6 - 8	19 - 23	21 - 25	20 - 24	18 - 22
			2.25	317 - 338	147 - 169	14 - 17	6 - 8	12 - 16			
			3	295 - 315	137 - 157	10 - 12	7 - 9	8 - 12			
	90		1.5	385 - 408	179 - 202	13 - 16	5 - 7	18 - 22	20 - 24	19 - 23	18 - 22
			2.25	360 - 381	168 - 189	11 - 14	5 - 7	11 - 15			
			3	335 - 355	156 - 176	8 - 10	6 - 8	8 - 12			

Table 12f: Model 048 Operational Data - Heating Mode

Troubleshooting Data - Heating Mode, Full Load Operation (Desuperheater Off)*												
Model	Entering Water Temp., DB deg F	Entering Air Temp., DB deg F	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Drop, deg. F			Air Temp. Rise, deg F		
							1.5 GPM/ ton	2.25 GPM/ ton	3 GPM/ ton	375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
048	32	55	232 - 252	75 - 85	4 - 6	6 - 8	N/A	5 - 7	4 - 6	21 - 25	20 - 24	19 - 23
		60	248 - 268	76 - 86								
		65	265 - 285	77 - 87								
		70	276 - 296	78 - 88								
		75	284 - 304	79 - 89								
	40	55	240 - 260	87 - 97	4 - 6	7 - 9	N/A	6 - 8	4 - 6	24 - 28	23 - 27	21 - 25
		60	258 - 278	88 - 98								
		65	275 - 295	89 - 99								
		70	286 - 306	90 - 100								
		75	294 - 314	91 - 101								
	50	55	255 - 275	102 - 112	4 - 6	9 - 11	10 - 12	7 - 9	5 - 7	27 - 31	25 - 29	24 - 28
		60	274 - 294	103 - 113								
		65	292 - 312	104 - 114								
		70	304 - 324	105 - 115								
		75	312 - 332	106 - 116								

* Pressures are for reference only--Do not use for charging. Preferred charging method is using approach temperatures in cooling. If charging in cooling is not possible, charging in heating may be accomplished using the Subcooling/Superheat values at appropriate water temperature.

Table 12g: Model 060 Operational Data - Cooling Mode

Troubleshooting Data - Cooling Mode, Full Load Operation (Desuperheater Off)*											
Model	Entering Water Temp., DB deg. F	Entering Air Temp., DB deg. F	GPM/ ton	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Rise, deg. F	Air Temp. Drop, deg F		
									375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
060	50	70 - 85	1.5	215 - 238	119 - 142	19 - 24	14 - 18	19 - 23	22 - 26	20 - 24	19 - 23
			2.25	201 - 222	112 - 133	17 - 21	14 - 18	12 - 16			
			3	187 - 207	104 - 124	12 - 15	16 - 20	9 - 13			
	60		1.5	251 - 274	140 - 163	16 - 19	12 - 15	19 - 23	21 - 25	20 - 24	18 - 22
			2.25	235 - 257	131 - 153	14 - 17	12 - 15	12 - 16			
			3	219 - 239	122 - 142	10 - 12	14 - 17	9 - 13			
	70		1.5	287 - 310	142 - 165	18 - 22	12 - 14	19 - 23	21 - 25	19 - 23	18 - 22
			2.25	269 - 290	133 - 155	15 - 20	12 - 14	12 - 16			
			3	250 - 270	124 - 144	11 - 14	13 - 16	8 - 12			
	80		1.5	346 - 369	150 - 173	21 - 24	10 - 12	18 - 22	20 - 24	19 - 23	18 - 22
			2.25	323 - 345	141 - 162	18 - 21	10 - 12	12 - 16			
			3	301 - 321	131 - 151	13 - 15	11 - 13	8 - 12			
	90		1.5	393 - 416	171 - 194	16 - 19	9 - 11	18 - 22	19 - 23	18 - 22	17 - 21
			2.25	367 - 389	160 - 182	14 - 17	9 - 11	11 - 15			
			3	342 - 362	149 - 169	10 - 12	10 - 12	8 - 12			

Table 12h: Model 060 Operational Data - Heating Mode

Troubleshooting Data - Heating Mode, Full Load Operation (Desuperheater Off)*												
Model	Entering Water Temp., DB deg F	Entering Air Temp., DB deg F	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Drop, deg. F			Air Temp. Rise, deg F		
							1.5 GPM/ ton	2.25 GPM/ ton	3 GPM/ ton	375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
060	32	55	241 - 261	73 - 83	2 - 4	4 - 6	N/A	5 - 7	3 - 5	20 - 24	19 - 23	18 - 22
		60	258 - 278	74 - 84								
		65	275 - 295	75 - 85								
		70	286 - 306	76 - 86								
		75	294 - 314	76 - 86								
	40	55	253 - 273	86 - 96	3 - 5	5 - 7	N/A	6 - 8	4 - 6	23 - 27	22 - 26	20 - 24
		60	271 - 291	87 - 97								
		65	289 - 309	88 - 98								
		70	300 - 320	89 - 99								
		75	308 - 328	89 - 99								
	50	55	268 - 288	102 - 112	6 - 8	5 - 7	10 - 12	6 - 8	5 - 7	26 - 30	24 - 28	23 - 27
		60	287 - 307	104 - 114								
		65	306 - 326	105 - 115								
		70	318 - 338	106 - 116								
		75	326 - 346	106 - 116								

* Pressures are for reference only--Do not use for charging. Preferred charging method is using approach temperatures in cooling. If charging in cooling is not possible, charging in heating may be accomplished using the Subcooling/Superheat values at appropriate water temperature.

Section 15: Troubleshooting

Table 12i: Model 072 Operational Data - Cooling Mode

Troubleshooting Data - Cooling Mode, Full Load Operation (Desuperheater Off)*											
Model	Entering Water Temp., DB deg. F	Entering Air Temp., DB deg. F	GPM/ ton	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Rise, deg. F	Air Temp. Drop, deg F		
									375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
072	50	70 - 85	1.5	209 - 232	113 - 135	11 - 14	22 - 28	18 - 22	19 - 23	18 - 22	17 - 21
			2.25	195 - 217	105 - 127	10 - 13	22 - 28	11 - 15			
			3	182 - 202	98 - 118	7 - 9	25 - 31	8 - 12			
	60		1.5	245 - 268	132 - 155	10 - 11	19 - 23	18 - 22	19 - 23	17 - 21	16 - 20
			2.25	229 - 250	124 - 145	8 - 10	19 - 23	11 - 15			
			3	213 - 233	115 - 135	6 - 7	21 - 26	8 - 12			
	70		1.5	279 - 302	137 - 160	10 - 11	17 - 20	17 - 21	18 - 22	17 - 21	16 - 20
			2.25	261 - 282	128 - 149	8 - 10	17 - 20	11 - 15			
			3	243 - 263	119 - 139	6 - 7	19 - 23	8 - 12			
	80		1.5	333 - 356	145 - 168	10 - 11	13 - 16	17 - 21	18 - 22	17 - 21	16 - 20
			2.25	311 - 333	135 - 157	8 - 10	13 - 16	11 - 15			
			3	290 - 310	126 - 146	6 - 7	15 - 18	7 - 11			
	90		1.5	378 - 401	165 - 188	6 - 8	12 - 14	17 - 21	17 - 21	16 - 20	15 - 19
			2.25	353 - 375	155 - 176	6 - 7	12 - 14	10 - 14			
			3	329 - 349	144 - 164	4 - 5	13 - 16	7 - 11			

Table 12j: Model 072 Operational Data - Heating Mode

Troubleshooting Data - Heating Mode, Full Load Operation (Desuperheater Off)*												
Model	Entering Water Temp., DB deg F	Entering Air Temp., DB deg F	Liquid Line Press., psi	Suction Line Press., psi	Subcooling	Superheat	Water Temp. Drop, deg. F			Air Temp. Rise, deg F		
							1.5 GPM/ ton	2.25 GPM/ ton	3 GPM/ ton	375 CFM/ ton	400 CFM/ ton	425 CFM/ ton
072	32	55	248 - 268	72 - 82	5 - 7	4 - 6	N/A	5 - 7	3 - 5	20 - 24	18 - 22	17 - 21
		60	265 - 285	73 - 83								
		65	288 - 308	75 - 85								
		70	295 - 315	75 - 85								
		75	305 - 325	76 - 86								
	40	55	261 - 281	84 - 94	6 - 8	9 - 11	N/A	5 - 7	4 - 6	23 - 27	21 - 25	20 - 24
		60	279 - 299	85 - 95								
		65	302 - 322	87 - 97								
		70	310 - 330	87 - 97								
		75	320 - 340	88 - 98								
	50	55	276 - 296	99 - 109	8 - 10	10 - 12	10 - 12	6 - 8	4 - 6	25 - 29	23 - 27	22 - 26
		60	295 - 315	100 - 110								
		65	320 - 340	101 - 111								
		70	328 - 348	102 - 112								
		75	339 - 359	103 - 113								

* Pressures are for reference only--Do not use for charging. Preferred charging method is using approach temperatures in cooling. If charging in cooling is not possible, charging in heating may be accomplished using the Subcooling/Superheat values at appropriate water temperature.

Table 13: Refrigeration Troubleshooting

System Faults	Mode	Discharge Pressure	Suction Pressure	Superheat	Subcooling	Air TD	Water TD	Compressor Amps
Under Charge	Heat	Low	Low	High	Low	Low	Low	Low
	Cool	Low	Low	High	Low	Low	Low	Low
Over Charge	Heat	High	High/Normal	Normal	High	High	Normal	High
	Cool	High	High/Normal	Normal	High	Normal	High	High
Low Air Flow	Heat	High	High/Normal	Normal	High/Normal	High	Low	High
	Cool	Low	Low/Normal	Low	Normal	High	Low	High/Normal
Low Source Water Flow	Heat	Low	Low/Normal	Low	Normal	High	Low	High/Normal
	Cool	High	High/Normal	Normal	High/Normal	High	Low	High
Low Load Water Flow	Heat	High	High/Normal	Normal	High/Normal	High	Low	High
	Cool	Low	Low/Normal	Low	Normal	High	Low	High/Normal
Restricted TXV	Heat	High	Low	High	High	Low	Low	Low
	Cool	High	Low	High	High	Low	Low	Low
TXV Stuck Open	Heat	Low	High/Normal	Low	Low	Low	Low	High
	Cool	Low	High/Normal	Low	Low	Low	Low	High
Inadequate Compression	Heat	Low	High	High/Normal	Low/Normal	Low	Low	Low
	Cool	Low	High	High/Normal	Low/Normal	Low	Low	Low

Section 16: Forms - Troubleshooting

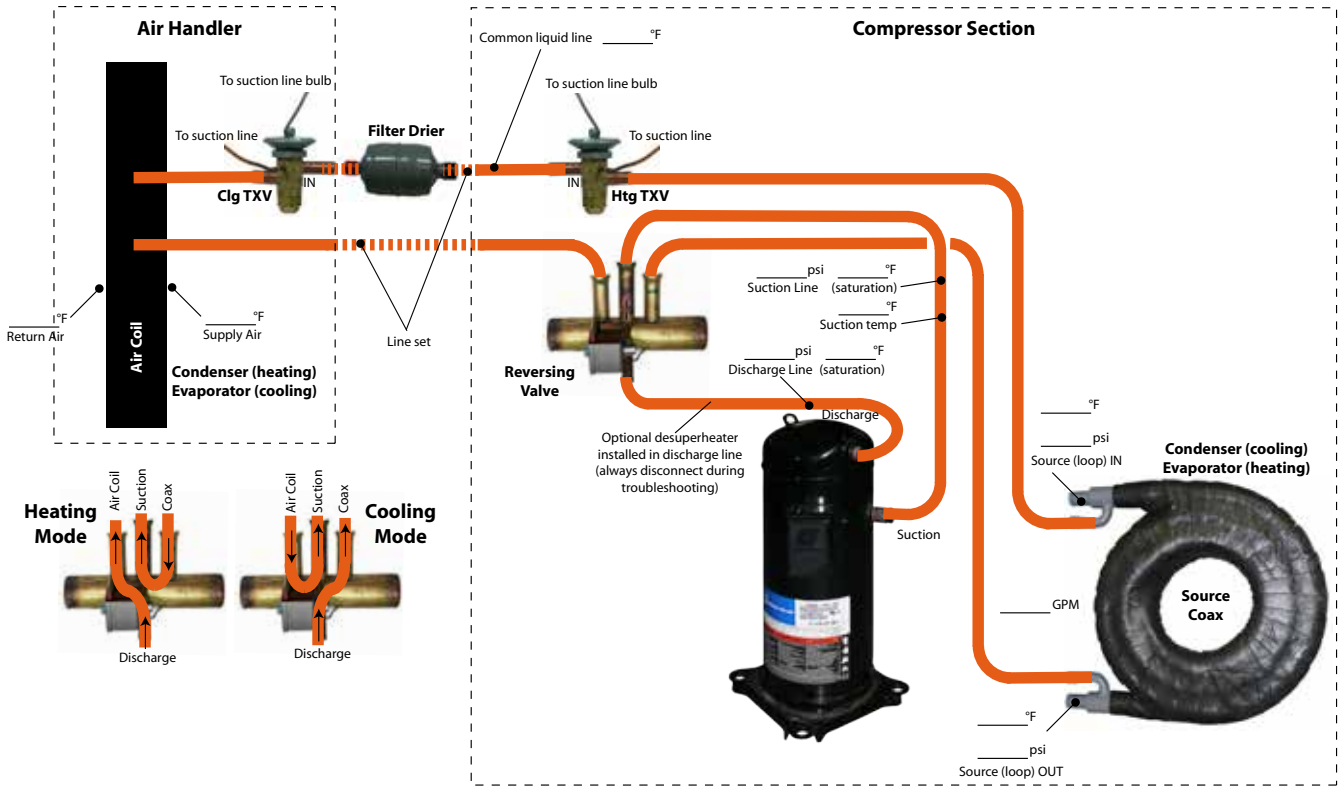
Customer/Job Name:_____ Date:_____

Model #:_____ Serial #:_____

Antifreeze Type:_____

HE or HR = GPM x TD x Fluid Factor
(Use 500 for water; 485 for antifreeze)

SH = Suction Temp. - Suction Sat.
SC = Disch. Sat. - Liq. Line Temp.



Cut along this line

EQUIPMENT START-UP FORM

Customer Name:_____

Customer Address:_____

Model #:_____ Serial #:_____

Dealer Name:_____

Distributor Name:_____ Start-up Date:_____

Loop Type: Open Closed (Circle One)								
Flow Rate	**Cooling**		**Heating**		**Unit Electrical Data**	**Cooling**		**Heating**	
Source Water Pressure In		PSI		PSI	Line Voltage		V		
Source Water Pressure Out		PSI		PSI	Total Unit Amps		A		A
Source Water Pressure Drop		PSI		PSI	Compressor Amps		A		A
Flow Rate		GPM		GPM	Wire Size		GA		
*Check pressure drop chart for GPM					Circuit Breaker Size		A		

Source Water Temp. Difference	**Cooling**		**Heating**	
Source Water Temperature In		ºF		ºF
Source Water Temperature Out		ºF		ºF
Source Water Temperature Difference		ºF		ºF
Heat of Rejection/Extraction	**Cooling**		**Heating**	
Heat of Rejection		BTU/HR		
Heat Of Extraction				BTU/HR

Heat of Extraction/Rejection = GPM X Water Temp. Difference X 500 (Water - Open Loop)
Heat of Extraction/Rejection = GPM X Water Temp. Difference X 485 (Water & Antifreeze - Closed Loop)

Load Water Temp. Difference	**Cooling**		**Heating**	
Load Water Temperature In		ºF		ºF
Load Water Temperature Out		ºF		ºF
Load Water Temperature Difference		ºF		ºF
Air Temperature Difference	**Cooling**		**Heating**	
Supply Air Temperature		ºF		ºF
Return Air Temperature		ºF		ºF
Air Temp. Difference		ºF		ºF
*Confirm auxiliary heaters are de-energized for the above readings.				
Auxiliary Heat Operation Only			**Heating**	
Supply Air Temperature				ºF
Return Air Temperature				ºF
Air Temp. Difference				ºF
Auxiliary Heat Electrical Data			**Heating**	
Line Voltage				V
Total Amperage (Full kW - All Stages)				A
Wire Size				GA
Breaker Size				A
CFM = (Watts X 3.413) ÷ (Air Temp. Difference X 1.08)				
Watts = Volts X Auxiliary Heater Amps				

Installer/Technician:_____ Date:_____

Cut along this line

Equipment Start-Up Process

Check the following before power is applied to the equipment
Caution: Do not start-up the unit until the new structure is ready to be occupied

Electrical:
- ☐ Geothermal unit high voltage wiring is installed correctly
- ☐ Geothermal unit high voltage wiring and breaker are the correct size
- ☐ Auxiliary electric heaters are wired and installed correctly
- ☐ Circulating pumps are wired and fused (if necessary) correctly
- ☐ Desuperheater pump is NOT wired, unless piping is complete and all air is purged
- ☐ Low voltage wiring is correct and completely installed

Plumbing:
- ☐ Pipe and pump sizes are correct
- ☐ Air is purged from all lines
- ☐ Antifreeze is installed
- ☐ All valves are open, including those on the flow center
- ☐ Condensate is trapped and piped to the drain

Ductwork:
- ☐ Filter is installed and clean
- ☐ Packaging is removed from the blower assembly
- ☐ Blower turns freely
- ☐ Canvas connections installed on supply plenum & return drop

Equipment Start-Up

1. Energize geothermal unit with high voltage.
2. Set the thermostat to “Heat” or “Cool.” Adjust set point to energize the unit. System will energize after delays expire (typically a five minute delay).
3. Check water flow with a flow meter (non-pressurized) or pressure drop conversion (pressurized). Pressure drop tables must be used to convert the pressure drop to GPM. The pressure drop can be obtained by checking water pressure in and water pressure out at the P/T ports.
4. Check the geothermal unit’s electrical readings listed in the Unit Electrical Data table.
5. Check the source water temperature in and out at the P/T ports (use insertion probe). Allow 10 minutes of operation before recording temperature drop.
6. Calculate the heat of extraction or heat of rejection.
7. Check the temperature difference of the load coax (water-to-water) or air coil (water-to-air). P/T ports are recommended for use on the load side, but the line temperatures can be used to check the temperature difference.
8. Change the mode of the thermostat and adjust the set point to energize the unit. Check the data in opposite mode as the previous tests. Amp draws as well as temperature differences and flow rate should be recorded.
9. Check auxiliary heat operation by adjusting the thermostat set point 5°F above the room temperature in “Heat” mode or set thermostat to “Emergency." Record voltage, amperage, and air temperature difference.

ENERTECH®
Geothermal Made Better™

WARRANTY ORDER & CLAIM

PHONE: 618.664.9010 **FAX:** 618.664.4597 **EMAIL:** WARRANTY@ENERTECHGEO.COM

ALL WARRANTY REGISTRATIONS SHOULD BE SUBMITTED WITHIN 10 DAYS OF INSTALLATION

COMPANY NAME _____ (Form submitter) DATE _____

PHONE _____ FAX _____ EMAIL _____

ORDERED BY _____ JOB NAME/PO # _____

UNIT *Model #* _____ *Serial #* _____

FAILURE DATE _____

SHIP TO _____ HOMEOWNER ADDRESS _____
(If different than company) _____ _____

_____ _____

Required if claim is for defective flow center

FLOW CENTER MODEL # _____ FLOW CENTER SERIAL # _____

FAILURE CODES, DESCRIPTION AND LABOR REIMBURSEMENT MUST BE FOUND IN WARRANTY MANUAL

FAILURE CODE	DESCRIPTION	PART NUMBER
_____	_____	_____
_____	_____	_____
_____	_____	_____

LABOR REIMBURSEMENT REQUESTED ☐ *NO* ☐ *YES*

DO YOU NEED PARTS ORDERED? ☐ *NO* ☐ *YES* _____ _____

(If no, and replacement was purchased from another vendor, attach copy of bill if reimbursement is needed[5].)

OTHER NOTES _____

_____

FOR ENERTECH COMPANIES USE ONLY

SRO# _____ CREDIT MEMO# _____

1) See warranty coverage summary sheet for labor allowances, conditions and exclusions, etc. **2)** Warranty start date is ship date from Enertech facility unless proof of startup is presented. **3)** Outsourced warranty replacement parts will be reimbursed in the form of credit for the part only. Credit will be no more than the standard equivalent part cost through Enertech. **4)** Factory pre-approval is required for anything outside the scope of this document. **5)** Fuses, hose kits and items not mentioned on Warranty Coverage Summary are not covered under this program.

WARRANTY REGISTRATION

PHONE : 618.664.9010 **FAX :** 618.664.4597 **EMAIL :** WARRANTY@ENERTECHGEO.COM

ALL WARRANTY REGISTRATIONS SHOULD BE SUBMITTED WITHIN 10 DAYS OF INSTALLATION

MODEL NUMBER _____ SERIAL NUMBER _____ BRAND _____

DATE OF SALE _____ DELIVERY DATE _____ INSTALL DATE _____

APPLICATION

☐ *RESIDENTIAL NEW CONSTRUCTION* ☐ *RESIDENTIAL GEO REPLACEMENT* ☐ *RESIDENTIAL RETROFIT*

☐ *MULTI-FAMILY (CONDO/TOWNHOME/MULTI-PLEX)* ☐ *COMMERCIAL* ☐ *OTHER* _____

USE

☐ *SPACE CONDITIONING* ☐ *DOMESTIC WATER HEATING* ☐ *RADIANT HEAT* ☐ *SWIMMING POOL* ☐ *SNOW MELT*

☐ *OTHER* _____

Note: Check all that apply

SOURCE

☐ *CLOSED LOOP (HORIZONTAL, VERTICAL, POND/LAKE)* ☐ *OPEN LOOP (WELL WATER)* ☐ *OTHER* _____

SUPPLEMENTAL / EMERGENCY

☐ *NONE* ☐ *ELECTRIC* ☐ *GAS* ☐ *PROPANE* ☐ *OIL* ☐ *WOOD* ☐ *OTHER* _____

PURCHASER-USER _____ PHONE _____

ADDRESS _____ CITY _____ STATE/PROV _____

POSTAL CODE _____ EMAIL (OPTIONAL) _____

WE HAVE SUPERVISED THE INSTALLATION AND START-UP IN ACCORDANCE WITH ENERTECH MANUFACTURING, LLC. INSTALLATION INSTRUCTIONS.

THIS UNIT IS PERFORMING ☐ SATISFACTORILY ☐ NOT SATISFACTORILY, IF NOT EXPLAIN _____

_____

TO THE BEST OF MY KNOWLEDGE THE ABOVE INFORMATION IS ACCURATE AND I REQUEST THE WARRANTY TO BE PUT INTO EFFECT.

DEALER (INSTALLER) _____ DATE _____

CUSTOMER / END USER _____ DATE _____

DEALER (INSTALLER) EMAIL _____

MAIL THIS FORM TO:
ENERTECH GLOBAL LLC
2506 SOUTH ELM STREET
GREENVILLE, IL 62246

FAX THIS FORM TO:
ENERTECH GLOBAL LLC
618.664.4597

OR REGISTER ONLINE AT WWW.ENERTECHGEO.COM

Revision Table:

Date	By	Page	Note
31 July 2013	GT	2, 7, 11	Updated AHRI Data Tables, Added Cased Coil Nomenclature and Dimensions
25 May 2012	DS	51	Added Warning to Desuperheater Installation
20 Jan 2012	DS	All	Added Voltage Code "2"
29 Nov 2011	DS	7	Updated Physical Data
22 Nov 2011	DS	34 - 36, 67	Updated charging method, troubleshooting charts
11 Nov 2011	DS	All	Minor Formatting Update
01 Nov 2011	DS	All	First published

⚠ NOTICE ⚠

VERY IMPORTANT WARRANTY REGISTRATION INFORMATION LOCATED ON THE BACK COVER.

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