



Engineering Specification

W-120-H-P-*S-PP/PD

Commercial Water to Water Heat Pump

Single Refrigeration Circuit, R410a

Nominal Size 10 Ton

Non-Reversing

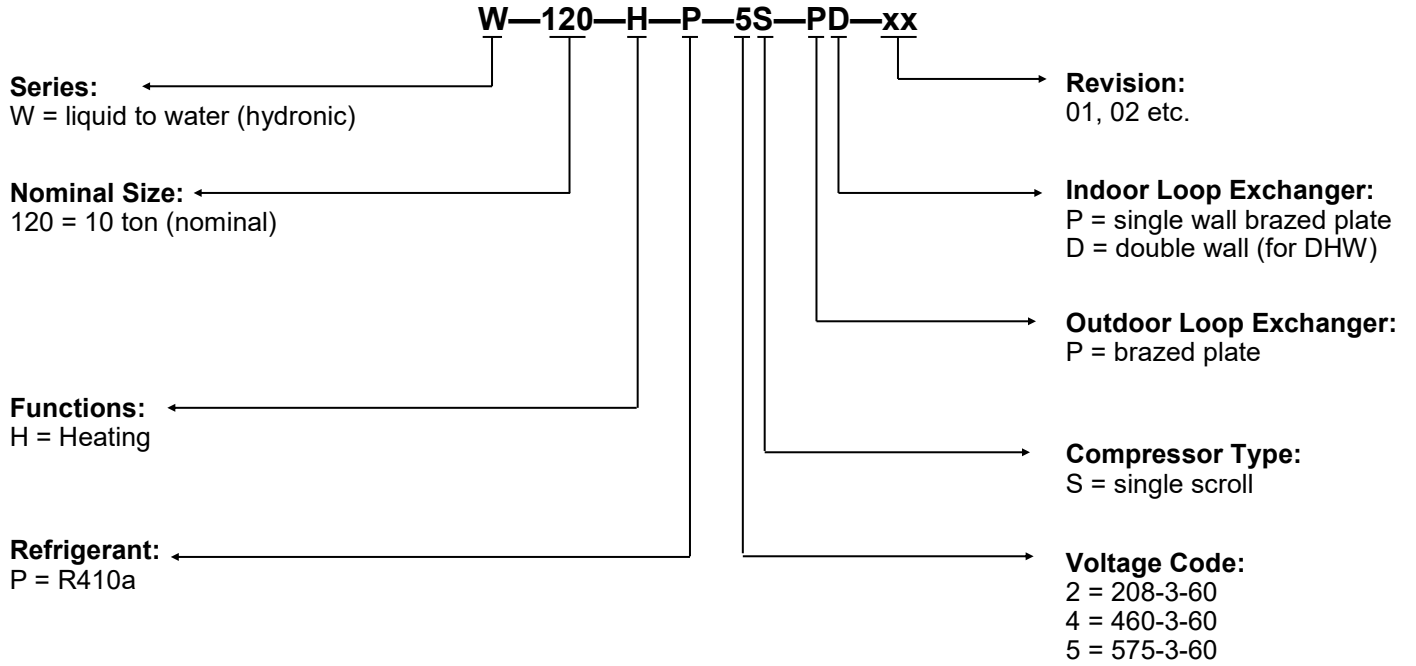
Single Wall Condenser OR Double Wall Condenser for DHW



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Model Nomenclature



APPLICATION TABLE										
MODEL SIZE	FUNCTION	REFRIGERANT	VOLTAGE	COMPRESSOR	OUTDOOR COIL	INDOOR COIL	REVISIONS			
W-120	H	P	2 4 5	S	P	P D	02			

This manual applies only to the models and revisions listed in this table.

Maritime Geothermal Ltd. has a continuous improvement policy and reserves the right to modify specification data at any time without prior notice .

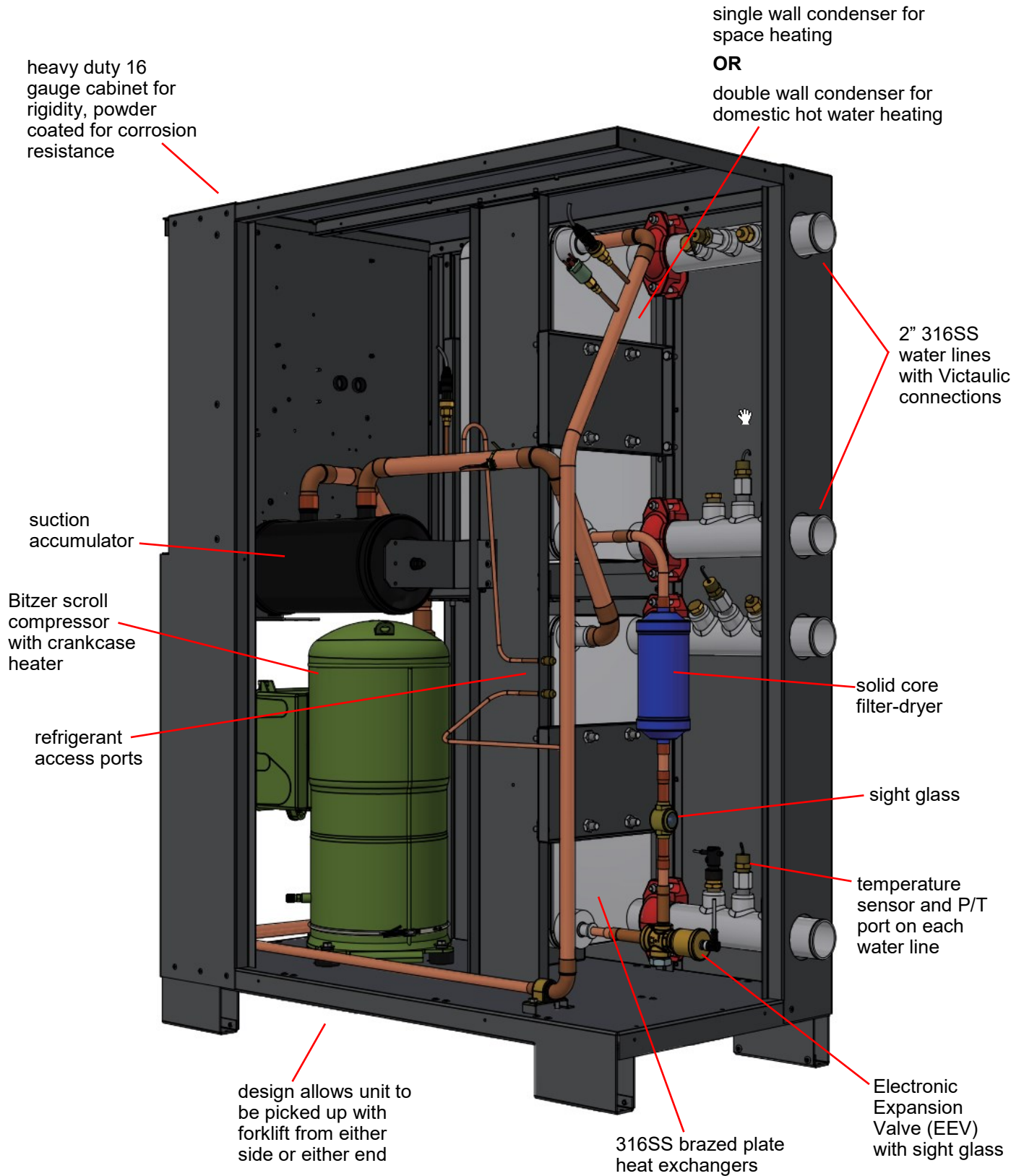
Design Features

- Indoor loop water heating to 130°F / 54°C, at typical geothermal ground loop temperatures
- Direct domestic hot water heating with optional double wall condenser, up to 140°F / 60°C (*pending testing*)
- TUV listed for electrical certification
- 16 gauge heavy duty cabinet with 4-side access for fork lift
- Insulated heat exchangers and piping
- Single refrigeration circuit, with minimum-volume design for superior oil management
- Advanced dual-shell Bitzer scroll compressor
- Suction and discharge vibration absorbers
- Suction line accumulator, for compressor liquid protection
- Liquid line solid core filter-dryer
- Liquid line sight glass
- Electronic Expansion Valve (EEV) with built in sight glass
- Refrigeration service ports for each refrigeration circuit (1/4" Schrader)
- 316 stainless steel brazed plate heat exchangers, with optional double-wall indoor loop brazed plate condenser for dedicated domestic hot water heating duty
- 316 stainless piping with 2" Victaulic connections for the outdoor and indoor loops
- 3-phase protection
- High and low pressure sensors
- Suction line temperature sensor
- Manual reset high pressure control
- Flow switch is standard equipment for outdoor loop
- Temperature sensor and P/T port on all four water lines (Outdoor In, Outdoor Out, Indoor In and Indoor Out)
- Advanced control board with BACNet interface for remote operation and data access including all sensor data and alarm conditions, PWM outputs (or 0-10VDC), configurable analog inputs (0-10VDC or 4-20mA) with on board 5VDC, 12VDC and 24VDC power supplies.
- USB port for complete data access using Windows laptop computer and provided software; including real-time charting, data logging, and diagnostic functionality with manual override operation
- 2 x 16 LCD display for control and data access
- Random start on power up (0-2 minutes)
- Dry contacts for external pump control signal (24VAC 5A MAX)

Available Accessories

- Tank temperature sensor(s)
- 2" modulating water valve

Design Features



Suitable for open or closed loop applications.

Design Features

multiple units may be installed
with no side clearance, with
headers horizontal

heavy duty 16
gauge cabinet for
rigidity, powder
coated for corrosion
resistance

LCD interface &
USB port

completely insulated
with 1" acoustic
insulation

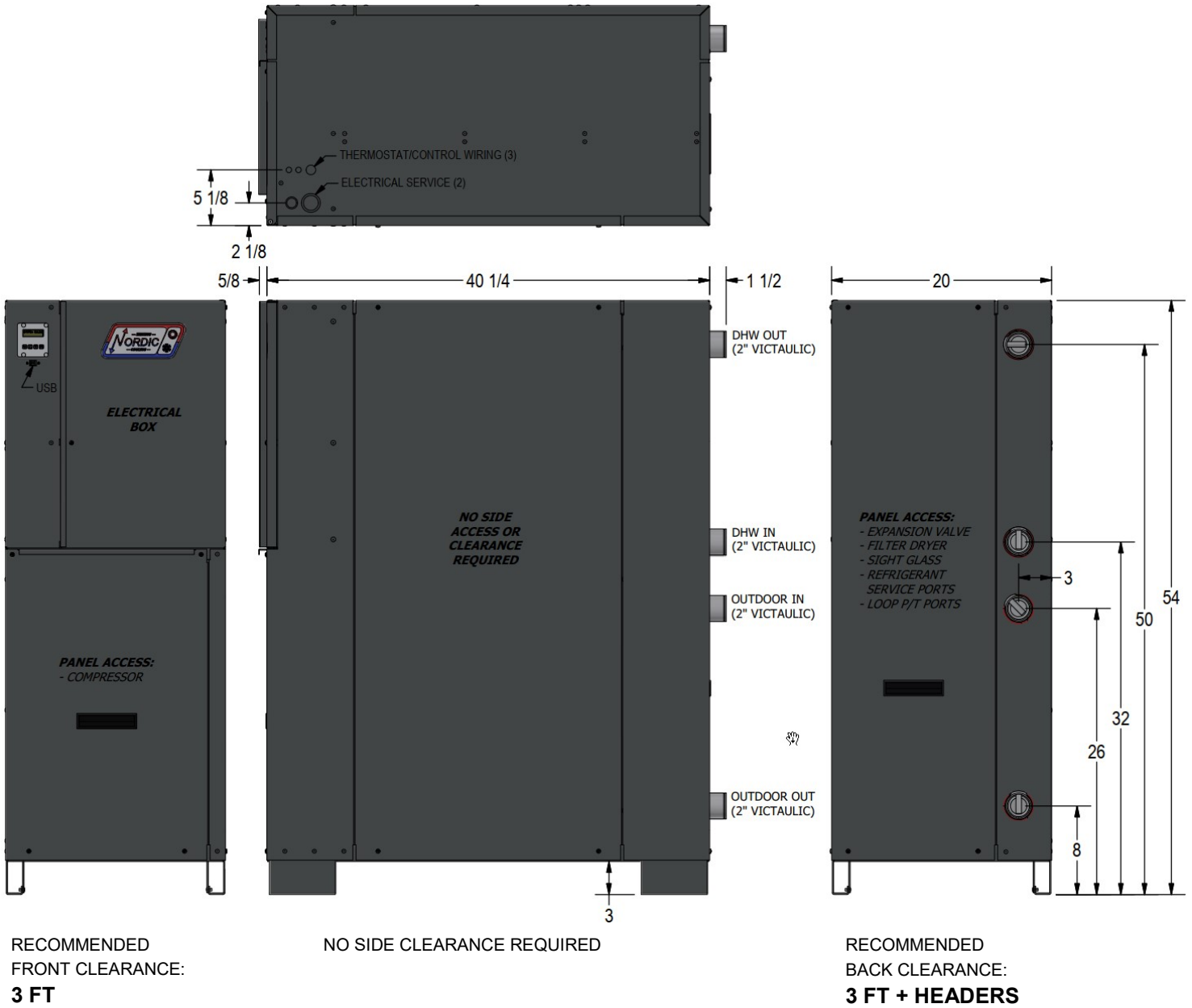


no side
access
required

end access:
piping connections,
line components

end access:
compressor,
electric box

Dimensions



All dimensions in inches.

Specifications

Electrical Specifications									
Nomenclature Identifier	Power Supply			Compressor		FLA	MCA	Maximum Fuse/Breaker	Minimum Wire Size
	V- ϕ -Hz	MIN	MAX	RLA	LRA	Amps	Amps	Amps	ga
2	208-3-60	187	229	45.0	217	45.5	56.8	100	#3-3
4	460-3-60	414	506	23.6	122	23.8	29.7	50	#8-3
5	575-3-60	518	632	17.1	85	17.3	21.6	40	#8-3

Refrigerant Charge				
MODEL	Refrigerant	lb	kg	Oil Type
W-120	R410a	10.0	4.5	PVE

- Oil capacity is marked on the compressor label.
 - Refrigerant charge is subject to revision; actual charge is indicated on the unit nameplate.

Shipping Information				
MODEL	WEIGHT lb. (kg)	DIMENSIONS in (cm)		
		L	W	H
W-120	645 (293)	60 (152)	30 (76)	60 (152)

Operating Temperature Limits					
Loop	Mode	Parameter	(°F)	(°C)	Note
Indoor Loop	HEATING (indoor is hot loop)	Minimum ELT/EWT	50	10	0-10VDC modulating water valve required on indoor loop at temperatures < 80°F (27°C), or manual flow reduction at startup
		Maximum LLT/LWT	130	54	
	ICE production	Maximum LLT/LWT	110	43	Maximum hot loop temperature during ICE production (specify ICE duty at order).
Outdoor Loop	HEATING (outdoor is cold loop)	Minimum LWT	37	3	For water loops without antifreeze, e.g. open loop systems
		Maximum ELT/EWT	80	27	0-10VDC modulating water valve required on outdoor loop above this temperature to limit suction pressure (contact Engineering for firmware revision of this feature)
		Minimum LLT	-->	-->	Ground loop system: depends on antifreeze type and % settings.
	ICE production	Minimum LLT	0	-17	Minimum cold loop temperature during ice production (specify ICE duty at order).

ELT: Entering Liquid Temperature (implies antifreeze present)
 LLT: Leaving Liquid Temperature (implies antifreeze present)
 EWT: Entering Water Temperature
 LWT: Leaving Water Temperature

Values in these tables are for rated liquid and water flows.

Pressure Drops		INDOOR Single Wall Option (water 104°F)		INDOOR Double Wall Option (water 140°F)		OUTDOOR (water 50°F)		OUTDOOR (15% methanol 32°F)		OUTDOOR (35% prop. glycol 32°F)	
gpm	L/s	psi	kPa	psi	kPa	psi	kPa	psi	kPa	psi	kPa
15	1.0	0.6	4	0.1	0.6	0.7	5	0.9	6	1.6	11
20	1.3	1.0	7	0.2	1	1.2	8	1.5	10	2.3	16
25	1.6	1.5	10	0.2	1	1.7	12	2.2	15	3.1	21
30	1.9	2.2	15	0.3	2	2.4	17	2.9	20	4.1	28
35	2.2	3.0	21	0.4	3	3.1	21	3.8	26	5.3	37
40	2.5	3.9	27	0.5	3	4.0	28	4.8	33	6.7	46

BACnet Interface

The BACnet interface is an **MS/TP** connection via RS-485 twisted pair. BACnet **IP** is not available.
 Recommended wire: 22-24 AWG single twisted pair, 100-120 Ohms impedance, 17pF/ft or lower capacitance, with braided or aluminum foil shield, such as Belden 9841 or 89841.

The connector on the control board is a three wire removable screw connector. The signals are as follows:

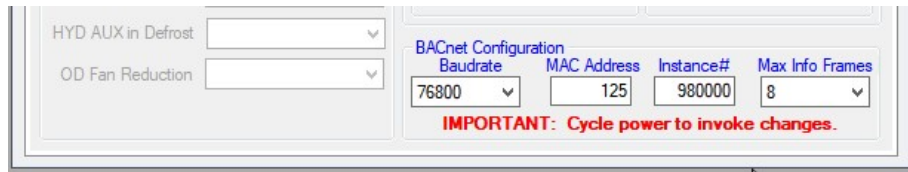
- A: Communications line (+) (right pin)
- B: Communications line (-) (middle pin)
- C: Ground connection (left pin)

If connecting multiple units to one RS-485 connection point, connect the signal cable from the master building controller to the first unit. Connect the second unit to the first unit (in same connector), connect the third unit to the second unit, and so on until all units are connected (daisy-chain). Remove the TERM jumper (located just above the BACnet connector on control board) from all units except the last one. The shield ground should be connected only to the GND pin of the unit for single unit installations. For multiple units, the shield ground should only be connected to the GND pin of the last unit. The shield grounds for intermediate units should be connected together. The shield ground should be left unconnected at the building controller end for all cases.

Vendor: Maritime Geothermal Ltd.
 Vendor ID: 260
 Model Name: MGT GEN2 Control Board

The following parameters can be set via the PC App's *Configuration Window*:

- 1) **Baud rate**
 9600, 19200, 38400, or 76800
- 2) **MAC address**
 Maximum value is 125.
- 3) **Instance number**
 Maximum value is 4194303.



The BACnet parameter **Max_Master** has a fixed value of **127** in this device.

BACnet data is available regardless of the selected control method. In order to control the unit via the BACnet interface, set **Control Source** to **BACnet** either by using the PC App's configuration window or the LCD menus.

BACnet OBJECTS - CONTROL SIGNALS (READ/WRITE)				
Name	Data Type	ID	Property	Description
SYSTEM_Y1A	Binary Value	BV0	Present Value	Stage 1 - bottom compressor (active is on)
SYSTEM_O	Binary Value	BV2	Present Value	Reversing valve. Inactive=HEATING, Active=COOLING (HAC units only)
BACnet_Units	Binary Value	BV9	Present Value	Select units for BACnet objects. OFF=US standard, ON=metric

BACnet OBJECTS - OPERATION MODE Description (Read Only)				
Name	Data Type	ID	Present Value	Description
Operation Mode	Analog Value	AV5	2	Hydronic heating
			3	Hydronic cooling (HAC units only)
			11	Hydronic heating OFF
			12	Hydronic cooling OFF (HAC units only)

Note: Object is type Analog Value but value will always be an integer value.

BACnet OBJECTS - LIMITS Description (Read Only)				
Name	ID	BIT #	Decimal Value*	Bit Description
Limits (Present Value)	AV6	0	1	Low Indoor OUT temperature
		1	2	High Indoor OUT temperature
		2	4	Low Outdoor OUT temperature
		3	8	High Outdoor OUT temperature

Note: Limits object is type Analog Value but value is bit coded and may be decoded as such (integer value).
 Note *: Value is for a single alarm and reference only.

Note: object names are subject to change without prior notice.

BACnet OBJECTS - DATA (Read Only)

	Name	ID	Property	Units	Description
Type - Analog Input	AI0 (Comp1_Current)	AI0	Present Value	Amps	Stage 1 compressor current draw (AI0)
	AI1 (Comp2_Current)	AI1	Present Value	User	N/A
	AI2	AI2	Present Value	User	User defined (0-5VDC or 4-20mA)
	AI3	AI3	Present Value	User	User defined (0-5VDC or 4-20mA)
	AI4 (CTS)	AI4	Present Value	degF (degC)	Cold tank temperature from sensor - requires accessory
	AI5 (HTS)	AI5	Present Value	degF (degC)	Hot tank temperature from sensor - requires accessory
	LPS1	AI6	Present Value	PSIG (kPa)	Stage 1 low pressure value (suction pressure)
	HPS1	AI7	Present Value	PSIG (kPa)	Stage 1 high pressure value (discharge pressure)
	EVAP1	AI8	Present Value	degF (degC)	Stage 1 evaporating Temperature
	COND1	AI9	Present Value	degF (degC)	Stage 1 condensing Temperature
	Suction Line 1	AI10	Present Value	degF (degC)	Stage 1 suction line temperature
	Superheat 1	AI11	Setpoint Value	degF (degC)	Stage 1 superheat
	EEV1 Position	AI12	Present Value	%	Stage 1 EEV position (% open)
	LPS2	AI13	Present Value	PSIG (kPa)	N/A
	HPS2	AI14	Present Value	PSIG (kPa)	N/A
	EVAP2	AI15	Present Value	degF (degC)	N/A
	COND2	AI16	Setpoint Value	degF (degC)	N/A
	Suction Line 2	AI17	Present Value	degF (degC)	N/A
	Superheat 2	AI18	Setpoint Value	degF (degC)	N/A
	EEV2 Position	AI19	Present Value	%	N/A
	Outside Ambient	AI20	Present Value	degF (degC)	Outdoor ambient temperature - requires accessory
	O_IN	AI21	Present Value	degF (degC)	Outdoor IN temperature
	O_OUT	AI22	Present Value	degF (degC)	Outdoor OUT temperature
	I_IN	AI23	Present Value	degF (degC)	Indoor IN temperature
I_OUT	AI24	Present Value	degF (degC)	Indoor OUT temperature	
Type - Analog Value	PWM_IN	AV0	Present Value	%	PWM input (from external source)
	PWM1 (OD Fan)	AV1	Present Value	%	PWM output value (spare)
	PWM2	AV2	Present Value	%	PWM output value (spare)
	PWM3 (OV2)	AV3	Present Value	%	OV2 - PWM or 0-10VDC for outdoor loop water valve
	PWM4 (IV2)	AV4	Present Value	%	IV2 - PWM or 0-10VDC for indoor loop water valve
	Operation Mode	AV5	Present Value	N/A	Description of mode - see Operation Mode Description table
	Limits description	AV6	Present Value	N/A	Description of active limits - see Limits Description table
	Permanent Alarms 1	AV7	Present Value	N/A	Descr. of active stg 1 alarms - see Alarm Descriptions table
	Permanent Alarms 2	AV8	Present Value	N/A	N/A
	Board Faults	AV9	Present Value	N/A	Description of active faults - see Fault Descriptions table
Sensor Faults	AV10	Present Value	N/A	Description of active faults - see Fault Descriptions table	
Type - Binary Output	STAGE1	BO0	Present Value	N/A	Stage 1 compressor contactor
	STAGE2	BO1	Present Value	N/A	N/A
	ICR (Indoor Circ)	BO2	Present Value	N/A	Indoor circulator control
	DO0 (OV1)	BO3	Present Value	N/A	OV1 - 24VAC for outdoor loop water valve
	DO1 (IV1)	BO4	Present Value	N/A	IV1 - 24VAC for indoor loop water valve
	DO2 (HYD_AUX)	BO5	Present Value	N/A	Hydronic Auxiliary
	DO3 (AUX_ONLY)	BO6	Present Value	N/A	N/A
	PHS1	BO7	Present Value	N/A	Stage 1 dry contact pin for locked out on alarm
	PHS2	BO8	Present Value	N/A	N/A
Type - Binary Value	CONTROLS	BV9	Present Value	N/A	Control indicator: 0=local (man.override), 1=remote (BACnet)
	Outdoor Flow	BV10	Present Value	N/A	Outdoor Loop flow switch
	Indoor Flow	BV11	Present Value	N/A	Indoor Loop flow switch (reversing models only)
	Phase Monitor1	BV12	Present Value	N/A	Stage 1 3-phase monitor
	Phase Monitor2	BV13	Present Value	N/A	N/A
	Comp Monitor1	BV14	Present Value	N/A	Stage 1 compressor monitor
Comp Monitor2	BV15	Present Value	N/A	N/A	

BACnet OBJECTS - ALARM Descriptions (Read Only)			
Name	Data Type	ID	Description
AI0 (Comp1 Current)	Analog Input	AI0	Stage 1 status alarm (start / stop failure, from current sensor)
AI1 (Comp2 Current)	Analog Input	AI1	N/A
LPS1	Analog Input	AI6	Stage 1 low pressure alarm
HPS1	Analog Input	AI7	Stage 1 high pressure alarm
LPS2	Analog Input	AI13	N/A
HPS2	Analog Input	AI14	N/A
Outdoor Flow	Binary Value	BV10	Outdoor loop flow alarm
Indoor Flow	Binary Value	BV11	Indoor loop flow alarm (HAC models only)
Phase Monitor1	Binary Value	BV12	Stage 1 3-phase monitor alarm
Phase Monitor2	Binary Value	BV13	N/A
Comp Monitor1	Binary Value	BV14	Stage 1 compressor monitor alarm (from compressor protection module)
Comp Monitor2	Binary Value	BV15	N/A

Name	ID	BIT #	Decimal Value*	Bit Description
Permanent Alarms 1 (Present Value)	AV7	0	1	Stage 1 master permanent alarm (occurs when any alarm occurs)
		1	3	Stage 1 low pressure heating mode alarm (suction pressure)
		2	5	Stage 1 low pressure cooling mode alarm (suction pressure)
		3	9	Stage 1 high pressure heating mode alarm (discharge pressure)
		4	17	Stage 1 high pressure cooling mode alarm (discharge pressure)
		5	33	Stage 1 loss of charge alarm
		6	65	Stage 1 3-phase monitor alarm
		7	129	Stage 1 compressor monitor alarm (from compressor prot. module)
		8	257	Stage 1 status alarm (start / stop failure, from current sensor)
		14	16,385	Outdoor loop flow alarm
		15*	32,769	Indoor loop flow alarm (reversing models only)
Permanent Alarms 2 (Present Value)	AV8	0	1	N/A
		1	3	N/A
		2	5	N/A
		3	9	N/A
		4	17	N/A
		5	33	N/A
		6	65	N/A
		7	129	N/A
		8	257	N/A
		14	16,385	N/A
		15*	32,769	N/A

Note: Permanent Alarm objects are type Analog Value but values are bit coded and may be decoded as such (integer value).
Note *: Value is for a single alarm and reference only. Value includes + 1 for Master Alarm

BACnet OBJECTS - FAULT Descriptions (Read Only)

Name	Data Type	ID	Description
AI4 (Cold Tank)	Analog Input	AI0	Cold tank temperature sensor faulty or disconnected - requires accessory
AI5 (Hot Tank)	Analog Input	AI1	Hot tank temperature sensor faulty or disconnected - requires accessory
LPS1	Analog Input	AI6	Stage 1 low pressure sensor faulty or disconnected
HPS1	Analog Input	AI7	Stage 1 high pressure sensor faulty or disconnected
LPS2	Analog Input	AI13	N/A
HPS2	Analog Input	AI14	N/A
Suction Line1	Analog Input	AI10	Stage 1 suction line temperature sensor faulty or disconnected
Suction Line2	Analog Input	AI17	N/A
Outside Ambient	Analog Input	AI20	Outside temperature sensor faulty or disconnected - requires accessory
O_IN	Analog Input	AI21	Outdoor IN temperature sensor faulty or disconnected
O_OUT	Analog Input	AI22	Outdoor OUT temperature sensor faulty or disconnected
I_IN	Analog Input	AI23	Indoor IN temperature sensor faulty or disconnected
I_OUT	Analog Input	AI24	Indoor OUT temperature sensor faulty or disconnected

Name	ID	BIT #	Decimal Value*	Bit Description
Board Faults (Present Value)	AV9	0	1	Digital inputs
		1	2	Digital outputs
		2	4	PWM outputs
		3	8	Analog to digital conversion
		4	16	Real time clock
		5	32	EEPROM memory
		6	64	Menu buttons
		7	128	LCD interface
Sensor Faults (Present Value)	AV10	0	1	Stage 1 suction line temperature sensor
		1	2	N/A
		2	4	Outdoor Ambient temperature sensor - accessory
		3	8	Calibration temperature resistor plug
		4	16	Indoor IN temperature sensor
		5	32	Indoor OUT temperature sensor
		6	64	Outdoor IN temperature sensor
		7	128	Outdoor OUT temperature sensor
		8	256	Cold tank temperature sensor on AI4 - accessory
		9	512	Hot tank temperature sensor on AI5 - accessory

Note: Board and Sensor Fault objects are type Analog Value but values are bit coded and may be decoded as such (integer value).
 Note * : Value is for a single fault and reference only.

Standard Capacity Ratings

Standard Capacity Ratings - Ground Loop Heating*										60Hz
EWT 104°F (40°C)								ELT 32°F (0°C)		
Model	Liquid Flow (Outdoor & Indoor)		Outdoor Pressure Drop*		Indoor Pressure Drop		Input Energy	Capacity		COP _H
	gpm	L/s	psi	kPa	psi	kPa	Watts	Btu/hr	kW	W/W
W-120	30	1.9	4.1	28	2.2	15	8,690	99,810	29.3	3.36

* 35% Propylene Glycol by Volume Outdoor (Ground) Loop Fluid

Standard Capacity Ratings - Ground Water Heating										60Hz
EWT 104°F (40°C)								ELT 50°F (10°C)		
Model	Liquid Flow (Outdoor & Indoor)		Outdoor Pressure Drop		Indoor Pressure Drop		Input Energy	Capacity		COP _H
	gpm	L/s	psi	kPa	psi	kPa	Watts	Btu/hr	kW	W/W
W-120	30	1.9	2.4	17	2.2	15	9,050	132,100	38.7	4.28

Standard Capacity Ratings - Ground Loop Cooling*											60Hz
EWT 53.6°F (12°C)								ELT 77°F (25°C)			
Model	Liquid Flow (Outdoor & Indoor)		Outdoor Pressure Drop*		Indoor Pressure Drop		Input Energy	Evap. Capacity		COP _C	EER
	gpm	L/s	psi	kPa	psi	kPa	Watts	Btu/hr	kW	W/W	Btu/hr/W
W-120	30	1.9	3.1	21	2.4	17	7,480	112,300	32.9	4.40	15.0

* 35% Propylene Glycol by Volume Outdoor (Ground) Loop Fluid

Standard Capacity Ratings - Ground Water Cooling											60Hz
EWT 53.6°F (12°C)								ELT 59°F (15°C)			
Model	Liquid Flow (Outdoor & Indoor)		Outdoor Pressure Drop		Indoor Pressure Drop		Input Energy	Evap. Capacity		COP _C	EER
	gpm	L/s	psi	kPa	psi	kPa	Watts	Btu/hr	kW	W/W	Btu/hr/W
W-120	30	1.9	2.4	17	2.4	17	6,030	126,800	37.2	6.15	21.0

Performance Tables

W-120-H-P-*S-PP/PD R410a, 60 Hz, GSD6-0120

	OUTDOOR LOOP						ELECTRICAL		INDOOR LOOP						
	ELT (°F)	Evap. Temp.	Flow (gpm)	LLT (°F)	Delta T (°F)	Heat Abs. (Btu/hr)	Compressor Current (A)	Input Power (W)	EWT (°F)	Cond. Temp.	Flow (gpm)	LWT (°F)	Delta T (°F)	Heating (Btu/hr)	COP _H
HEATING	25	15	30	21	4	60,618	12.4	8,557	104	114	30	110	6	89,477	3.06
	30	20	30	25	5	67,489	12.5	8,654		115	30	111	7	96,680	3.27
	35	24	30	30	5	75,012	12.6	8,742		115	30	111	7	104,504	3.50
	40	28	30	34	6	83,117	12.7	8,842		116	30	112	8	112,950	3.74
	45	32	30	38	7	91,964	12.8	8,941		116	30	112	8	122,210	4.01
	50	37	30	43	7	101,486	12.9	9,049		117	30	113	9	132,100	4.28
	55	41	30	47	8	111,784	13.1	9,163		118	30	114	10	142,788	4.57
	60	45	30	51	9	122,990	13.2	9,274		118	30	115	11	154,373	4.88
	25	16	30	21	4	56,933	13.4	9,169	114	121	30	120	6	87,881	2.81
	30	20	30	25	5	63,800	13.5	9,275	114	122	30		6	95,110	3.01
	35	24	30	30	5	71,200	13.6	9,391	113	122	30		7	102,904	3.21
	40	29	30	34	6	79,361	13.7	9,498	112	123	30		8	111,430	3.44
	45	33	30	39	6	88,299	13.8	9,603	112	124	30		8	120,805	3.69
	50	38	30	43	7	98,039	13.9	9,707	111	124	30		9	130,899	3.95
	55	42	30	47	8	108,703	14.1	9,806	110	124	30		10	141,900	4.24
	60	46	30	51	9	120,359	14.2	9,902	110	125	30		10	153,882	4.55

	ELT (°F)	Cond. Temp.	Flow (gpm)	LLT (°F)	Delta T (°F)	Heat Rej. (Btu/hr)	Compressor Current (A)	Input Power (W)	EWT (°F)	Evap. Temp.	Flow (gpm)	LWT (°F)	Delta T (°F)	Cooling (Btu/hr)	EER
	COOLING	60	82	30	70	10	145,987	9.3	6,107	54	37	30	45	8	125,962
65		88	30	75	10	143,205	9.8	6,474	38		30	45	8	121,926	18.8
70		93	30	80	10	140,446	10.3	6,868	38		30	46	8	117,822	17.2
75		99	30	85	10	138,026	10.8	7,309	39		30	46	8	113,898	15.6
80		104	30	90	10	135,726	11.4	7,729	39		30	46	7	109,992	14.2
85		110	30	94	9	133,620	12.1	8,251	40		30	47	7	106,103	12.9
90		115	30	99	9	131,513	12.8	8,807	40		30	47	7	102,098	11.6
95		121	30	104	9	129,687	13.5	9,421	41		30	47	7	98,179	10.4

METRIC

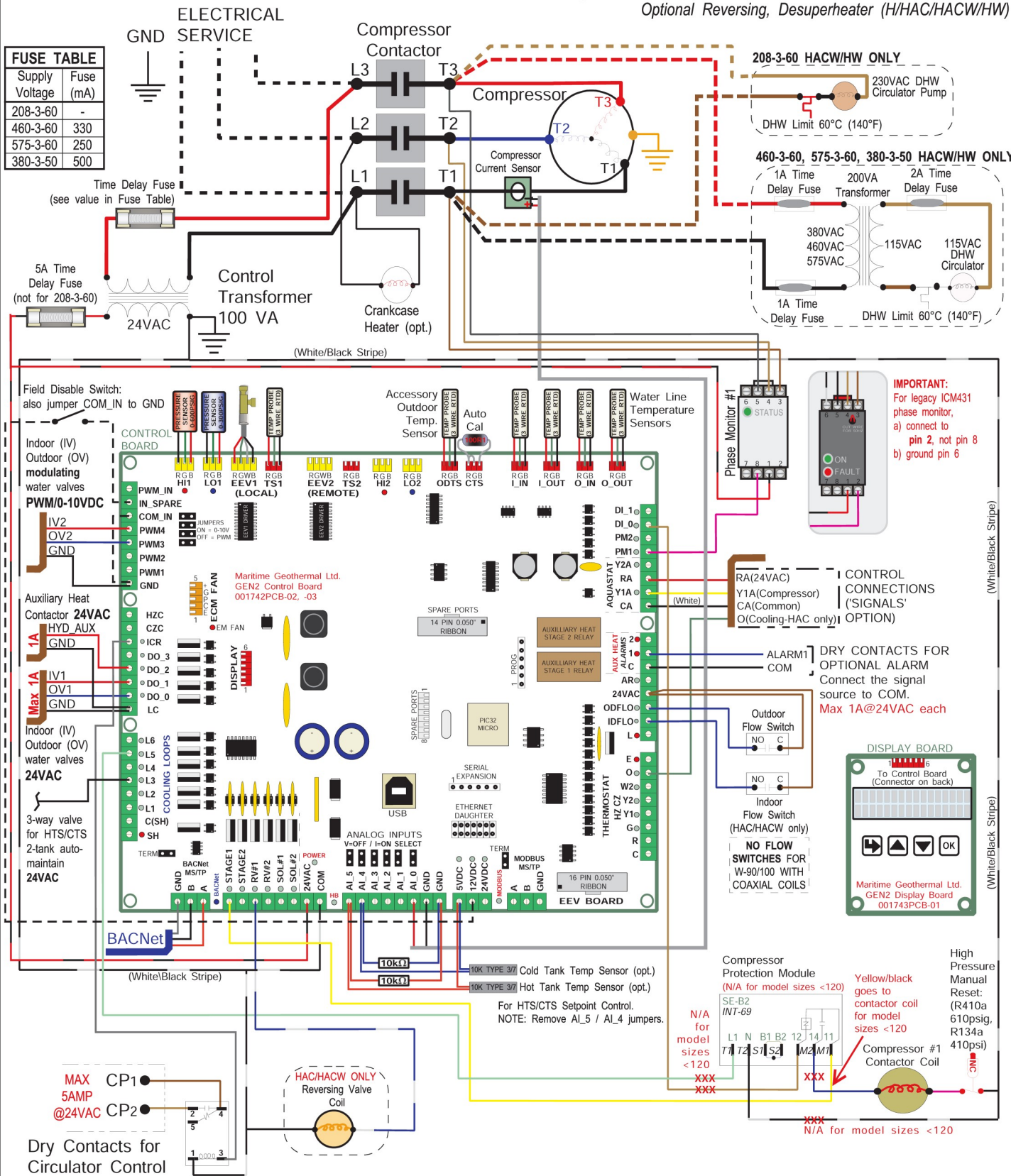
	OUTDOOR LOOP						ELECTRICAL		INDOOR LOOP						
	ELT (°C)	Evap. Temp.	Flow (L/s)	LLT (°C)	Delta T (°C)	Heat Abs. (W)	Compressor Current (A)	Input Power (W)	EWT (°C)	Cond. Temp.	Flow (L/s)	LWT (°C)	Delta T (°C)	Heating (W)	COP _H
HEATING (METRIC)	-3.9	-9.3	1.89	-6.3	2.4	17,765	12.4	8,557	40	45.7	1.89	43.4	3.4	26,223	3.06
	-1.1	-6.9	1.89	-3.8	2.7	19,779	12.5	8,654		46.0	1.89	43.7	3.7	28,334	3.27
	1.7	-4.6	1.89	-1.3	3.0	21,984	12.6	8,742		46.3	1.89	44.0	4.0	30,627	3.50
	4.4	-2.2	1.89	1.2	3.3	24,359	12.7	8,842		46.6	1.89	44.3	4.3	33,102	3.74
	7.2	0.2	1.89	3.6	3.6	26,952	12.8	8,941		46.9	1.89	44.6	4.6	35,816	4.01
	10.0	2.6	1.89	6.0	4.0	29,743	12.9	9,049		47.2	1.89	45.0	5.0	38,715	4.28
	12.8	5.0	1.89	8.4	4.4	32,761	13.1	9,163		47.6	1.89	45.4	5.4	41,847	4.57
	15.6	7.4	1.89	10.7	4.8	36,045	13.2	9,274		47.8	1.89	45.8	5.8	45,242	4.88
	-3.9	-9.2	1.89	-6.1	2.2	16,686	13.4	9,169	45.6	49.5	1.89	49	3.3	25,755	2.81
	-1.1	-6.7	1.89	-3.6	2.5	18,698	13.5	9,275	45.3	49.8	1.89		3.6	27,874	3.01
	1.7	-4.3	1.89	-1.1	2.8	20,867	13.6	9,391	45.0	50.2	1.89		3.9	30,158	3.21
	4.4	-1.8	1.89	1.3	3.1	23,258	13.7	9,498	44.7	50.6	1.89		4.2	32,657	3.44
	7.2	0.6	1.89	3.7	3.5	25,878	13.8	9,603	44.3	50.8	1.89		4.6	35,405	3.69
	10.0	3.1	1.89	6.1	3.9	28,733	13.9	9,707	43.9	51.1	1.89		4.9	38,363	3.95
	12.8	5.5	1.89	8.5	4.3	31,858	14.1	9,806	43.5	51.3	1.89		5.4	41,587	4.24
	15.6	7.9	1.89	10.8	4.7	35,274	14.2	9,902	43.1	51.5	1.89		5.8	45,098	4.55

	ELT (°C)	Cond. Temp.	Flow (L/s)	LLT (°C)	Delta T (°C)	Heat Rej. (W)	Compressor Current (A)	Input Power (W)	EWT (°C)	Evap. Temp.	Flow (L/s)	LWT (°C)	Delta T (°C)	Cooling (W)	COP _c
	COOLING (METRIC)	15.6	27.8	1.89	21.2	5.7	42,785	9.3	5,869	12	2.8	1.89	7.3	4.7	36,916
18.3		30.9	1.89	23.9	5.6	41,969	9.8	6,236	3.2		1.89	7.5	4.5	35,733	5.52
21.1		34.0	1.89	26.6	5.5	41,161	10.3	6,631	3.4		1.89	7.6	4.4	34,530	5.03
23.9		37.1	1.89	29.3	5.4	40,451	10.8	7,071	3.8		1.89	7.8	4.2	33,380	4.57
26.7		40.2	1.89	32.0	5.3	39,777	11.4	7,542	4.1		1.89	7.9	4.1	32,235	4.17
29.4		43.3	1.89	34.7	5.2	39,160	12.1	8,065	4.4		1.89	8.1	3.9	31,096	3.77
32.2		46.3	1.89	37.3	5.1	38,543	12.8	8,620	4.7		1.89	8.2	3.8	29,922	3.40
35.0		49.4	1.89	40.1	5.1	38,008	13.5	9,234	5.0		1.89	8.4	3.6	28,773	3.05

W/WH-Commercial Single Compressor Schematic Diagram

Optional Reversing, Desuperheater (H/HAC/HACW/HW)

Supply Voltage	Fuse (mA)
208-3-60	-
460-3-60	330
575-3-60	250
380-3-50	500



REV	ECO #	IMPL BY	APVD BY	DATE
02	ISSUE 02	D. RHEAULT	D. RHEAULT	15-Mar-2022
02	-	D. RHEAULT	D. RHEAULT	10-Jun-2021
01	Initial Release	D. RHEAULT	D. RHEAULT	24-Jun-2019

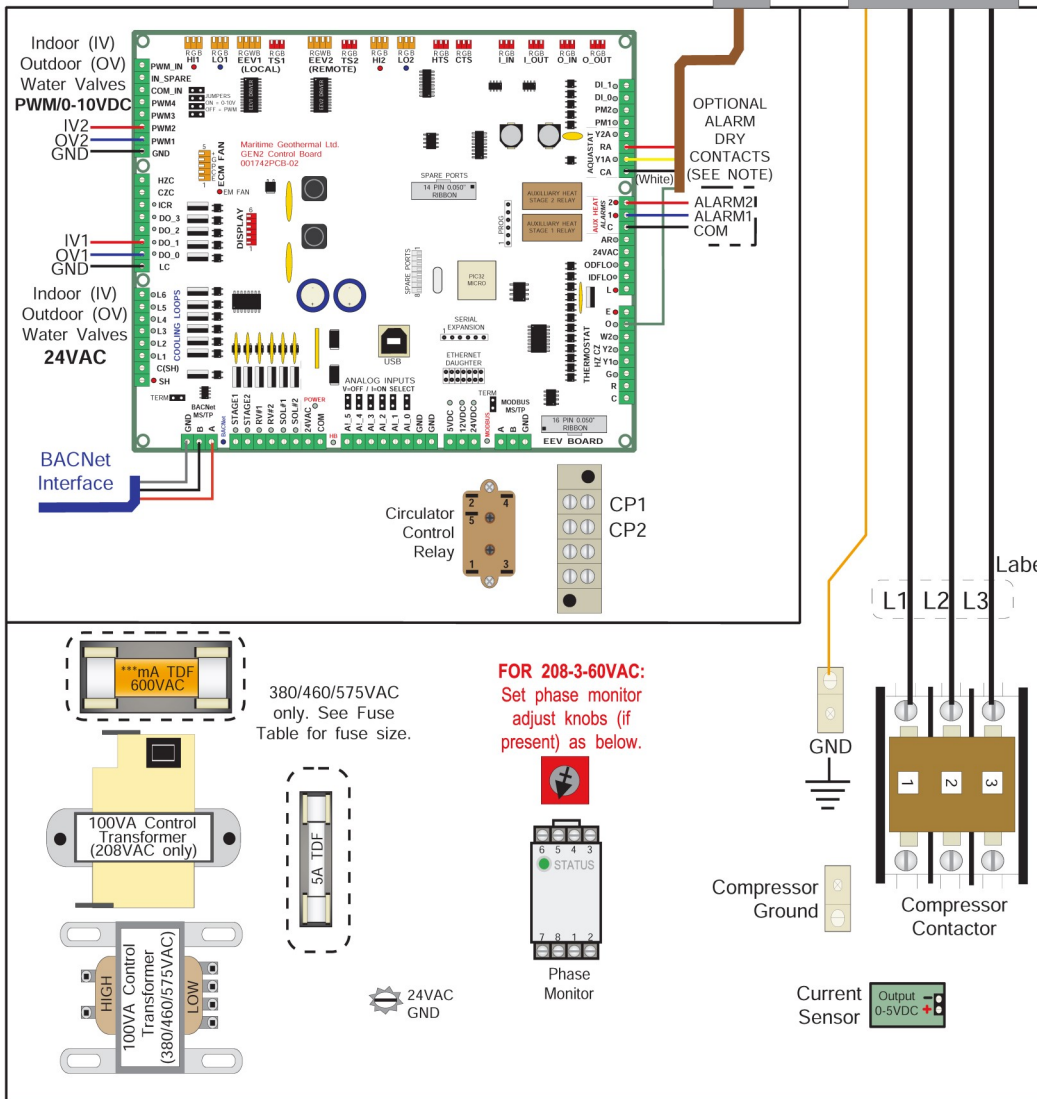
Drawn By Dan Rheaault	Date 24-Jun-2019
Checked By Dan Rheaault	Date 24-Jun-2019
Approved By (ENG)	Date
Approved By (MFG)	Date
Approved By	Date

		170 Plantation Rd. Petitcodiac, NB E4Z 6H4	
		Drawing Name W/WH-Commercial Single Compressor Schematic	
Size A	Drawing Number 002399SCH	Drawing Rev 02(i2)	SHEET 1 of 1

W/WH Commercial Single Compressor Electrical Box Diagram



DANGER: HIGH VOLTAGE.
Ensure power is off before opening the electrical box cover.



FUSE TABLE ***	
Supply Voltage	Fuse Value*
208-3-60	-----
460-3-60	330mA
575-3-60	250mA
380-3-50	500mA

CONTROL CONNECTIONS (HARDWIRED OPTION)

RA(24VAC)
Y1A(Compressor #1)
CA(Common)
O(Cooling - HAC only)

*Value is marked in electrical box.

Use PC App or LCD menus to select 1 of 3 Control Methods:

- BACnet
- Hardwired (24VAC signals)
- Setpoint Control (internal)

1. BACnet (MS/TP RS-485)

Use twisted pair shielded-conductor cable.

A - Communication
B - Communication
GND - Ground

SYSTEM_Y1A: Stage 1 (compr.1)
SYSTEM_O: Htg/Cooling Mode (active in cooling - HAC only)

2. Hardwired/Signals (24VAC)

Use an 18-3 or 18-4 cable.

C - 24VAC Common
R - 24VAC Hot
Y1A - Stage 1 (Compressor 1)
O - Heating/Cooling Mode (active for cooling mode - HAC only)

A dry contact from R to Y1A will start compressor.
A dry contact from R to O will activate cooling mode (HAC only)

3. Setpoint Control

Unit will be controlled by internal water line temperature sensors. See manual for setup instructions.

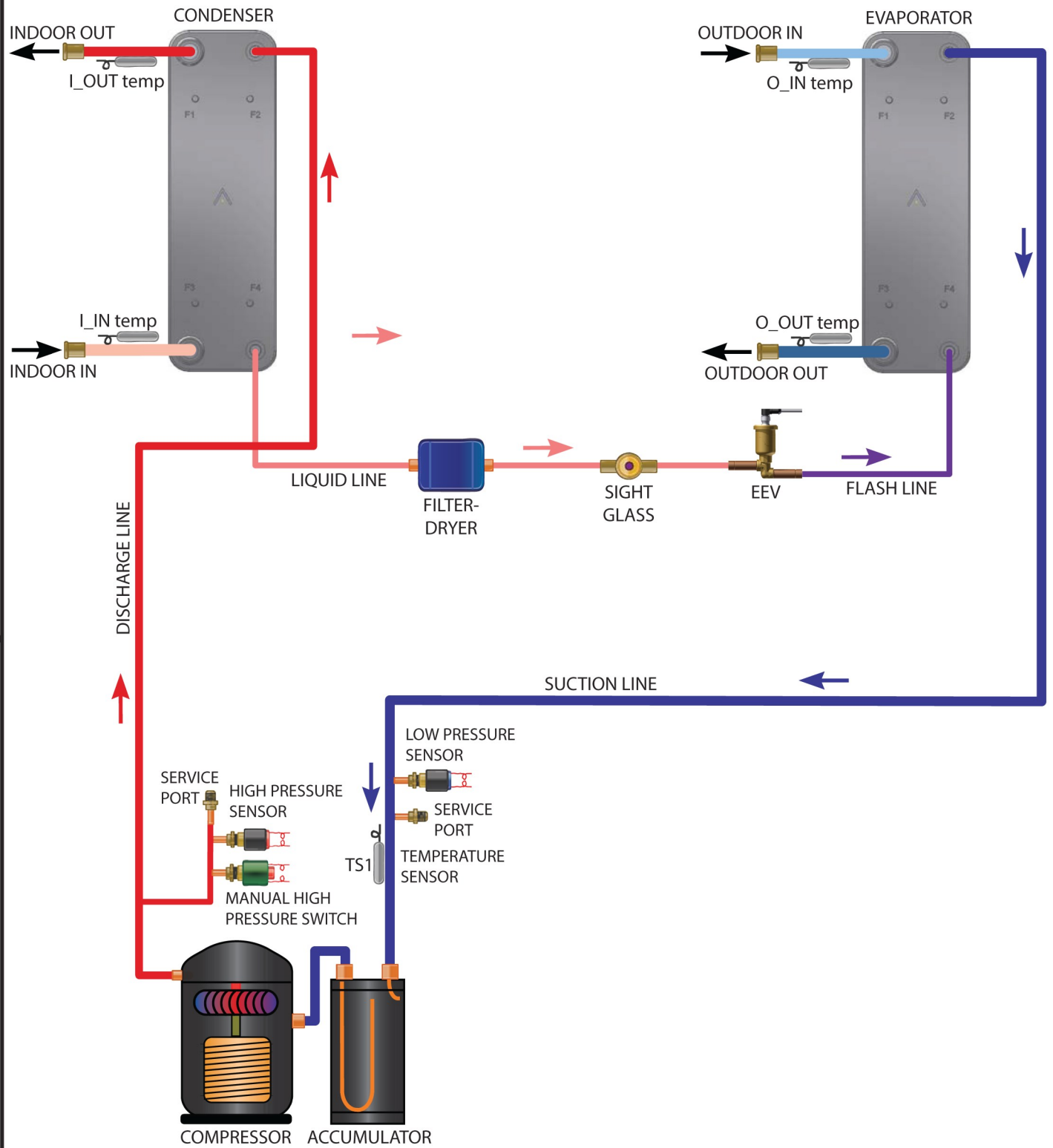
IMPORTANT NOTES:

- **3 PHASE SCROLL COMPRESSORS** must rotate in the proper direction. After the initial connection, if the phase protection module(s) indicate a fault on power up, turn the power off and reverse the L1 and L2 supply leads. Turn the power on and clear the fault(s).
- **IMPORTANT:** Ensure sufficient antifreeze concentration is used and correctly set in control board via the PC App, so that the correct low pressure cutout value is implemented to prevent freezing conditions. Failure to do so could cause the heat exchanger to freeze and rupture, voiding the warranty.

- **Anti-short cycle timer** of 6 minutes.
- **Alarm1** signal is dry contacts (NO). Connect the signal source to COM. **MAX 1amp @ 24VAC**
- **CP1 and CP2** are a dry contact that can be used to turn on circulator pumps when either compressor starts. In Setpoint Control mode, it is indoor circulators only (sampling). **MAX 5amps @ 24VAC**
- **Water Valve:** 24VAC is present across OV1/IV1 and GND to power an external ON/OFF water valve when either compressor starts. Modulating water valves can be connected between OV2/IV2 and GND. **MAX 1amp @ 24VAC**

					Drawn By Chris Geddes	Date 28-JUN-2019	MARITIME GEOTHERMAL LTD.		170 Plantation Rd. Petitcodiac, NB E4Z 6H4	
					Checked By Chris Geddes	Date 28-JUN-2019	Drawing Name		W~WH-Commercial Single Compressor	
01	ISSUE 02	D. RHEAULT	D. RHEAULT	15-Mar-2022	Approved By Chris Geddes	(ENG) Date 28-JUN-2019	Electrical Box Diagram			
01	Initial Release	C. GEDDES	C. GEDDES	28-JUN-2019	Approved By	(MFG) Date	Size	Drawing Number	Drawing Rev	SHEET
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date	A	002400ELB	01(i2)	1 of 1

W/WH-Commercial Refrigeration Circuit - Heating Only



Engineering Guide Specifications

General

The liquid source water-to-water heat pump shall be a single packaged single refrigeration circuit heating / cooling unit. The unit shall be listed by a nationally recognized testing laboratory (NRTL), such as UL, CSA, TUV, or ETL. The unit shall be rated in accordance with applicable standards of the Air Conditioning, Heating, and Refrigeration Institute / International Standards Organization (AHRI/ISO) and/or Canadian Standards Association (CSA). The liquid source water to water heat pump, as manufactured by Maritime Geothermal Ltd. of Petitcodiac, New Brunswick, Canada shall be designed to operate correctly within liquid temperature ranges specified on the "Minimum and Maximum Operating Temperatures" page of this engineering specification document.

Factory Quality

Each unit shall be run tested at the factory with water circulating in both indoor and outdoor loops. Quality control system checks shall include: computerized nitrogen pressurized leak test, evacuation of refrigeration circuit to sustained vacuum, accurate system charge, detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria. Units tested without water flow are not acceptable. The units shall be warranted by the manufacturer against defects in materials and workmanship in accordance with the warranty section at the end of this document. Optional extended factory warranty coverage may be available.

Cabinet

Each unit shall be constructed in a heavy duty sheet metal cabinet. Cabinet shall be constructed of powder coated galvanized sheet metal of minimum 16 gauge. Sheet metal gauge shall be higher where structurally required. Design and construction of cabinet shall be such that it is rigid and passes the CSA/UL Loading Test requirements (200 lb roof test and 25 lb guard test). All panels shall be lined with minimum 1 inch [25.4 mm] thick acoustic type glass fiber insulation. All insulation shall meet the fire retardant provisions of NFPA 90A. This material shall also provide acoustical benefit. Cabinet must have a minimum of two end access panels for serviceability, with further panels removable as necessary for major service. The electrical box shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic grommets.

Refrigerant Circuit

All units shall contain one sealed refrigerant circuit, containing a hermetic motor scroll compressor, one electronic expansion valve, factory installed high and low pressure safety controls or sensors, service ports, solid core filter-dryer, sight glass, reversing valve (for reversing units), and suction accumulator. Refrigerant circuit shall be of a minimum-volume design to ensure reliable oil management. To this end, units with receivers designed to hold the entire system charge are not acceptable.

Compressors shall be specified for heat pump duty with internal isolation consisting of rubber vibration isolators. Compressor motors shall have internal overload protection.

The water to refrigerant heat exchangers shall be of a stainless steel brazed plate design, designed and certified for 650 psig [4480 kPa] working pressure on the refrigerant side and 650 psig [4480 kPa] on the water side. Heat exchangers shall be insulated over all of their outside surface with minimum 3/8" thick closed cell insulation. Insulation consisting of 1/8" closed-cell insulating tape shall not be acceptable. A double wall condenser shall be available as a factory option for direct heating of domestic/potable water.

The electronic expansion valve shall be of a stepper-motor rather than pulsing type, and shall provide proper superheat control over the unit's operating range with minimal deviation from superheat setpoint. The valve shall be controlled by an electronic superheat controller which provides operator-adjustable superheat and real-time LED/LCD display of current superheat. Superheat shall be determined through the suction pressure-temperature method. Externally mounted pressure controlled water regulating flow valves or thermostatic expansion valves (TXV's) in place of electronic expansion valves are not acceptable.

The suction accumulator shall be insulated with minimum 3/8" thick closed cell insulation to prevent condensation. The accumulator's internal oil return port shall be sized properly for the unit's operating range. To ensure proper oil return, suction accumulator shall not be 'oversized'.

Piping and Connections

The unit shall have two sets of primary water in and water out connections (outdoor and indoor/DHW). The primary connection type shall be 2" stainless steel pipe for grooved/Victaulic connection.

All internal water and refrigerant piping shall be insulated with minimum 3/8" thick closed cell insulation. Insulation consisting of 1/8" closed-cell insulating tape shall not be acceptable.

Electrical

Controls and safety devices shall be factory wired and mounted within the unit. Controls shall include 24 volt alternating current (24VAC) activated compressor contactors, reversing valves, and 24VAC 100VA transformer with built in circuit breaker or fused on both primary and secondary sides. Units shall be name-plated for use with time delay fuses or circuit breakers. Unit controls shall be 24VAC and provide heating or cooling as required by the remote thermostat or controller. 3-phase protection shall be present in each unit to protect the compressor against loss of phase and reverse rotation. 3-phase protection shall be factory installed. Unit shall have dry contacts for controlling loop circulating pumps via an external 24VAC contactor. Unit shall provide remote fault indication to the control system via serial communication and fault messages on front panel LCD display.

Unit Control

The control system shall have the following features:

1. An on-board water temperature control routine using internal water line sensors and sampling via circulator control, so that external control is optional.
2. BACnet control, and also control by external dry contacts, as field alternatives to the above on-board routine.
3. Anti-short cycle time delay on compressor operation. Time delay shall be a minimum of 5 minutes, for both thermostat demand and safety control reset starts. An override shall be provided to disable this delay for unit commissioning and testing purposes.
4. Random compressor start delay of 0-120 seconds on unit power up to facilitate starting multiple units after a power failure.
5. Flow switch on outdoor loop, and also on indoor loop for reversing units.
6. Compressor shutdown for high or low refrigerant pressures, low flow conditions, and for phase protection faults.
7. Automatic intelligent reset: unit shall automatically restart 5 minutes after trip if the fault has cleared. Should a fault reoccur 3 times sequentially then permanent lockout shall occur, requiring cycling of the power to the unit in order to reset.
8. Manual reset high pressure in case of electronic board failure.
9. The low pressure shall not be monitored for the first 90 seconds after a compressor start to prevent nuisance safety trips.
10. 2 x 16 backlit Liquid Crystal Display (LCD) and four buttons for limited data access. Unit may be configured for stand alone operation with optional temperature sensor(s)
11. Universal Serial Bus (USB) port for full data access and diagnostic information, including real-time charting and data-logging

Maritime Geothermal works continually to improve its products. As a result, the design and specifications of any product may be changed without notice. Please contact Maritime Geothermal at 1-506-756-8135 or visit www.nordicghp.com for latest design and specifications. Purchaser's approval of this data set signifies that the equipment is acceptable under the provisions of the job specification. Statements and other information contained herein are not express warranties and do not form the basis of any commercial contract or other agreement between any parties, but are merely Maritime Geothermal's statement of opinion regarding its products.

Warranty: W/WH-Commercial Series

COMMERCIAL LIMITED EXPRESS WARRANTY

Unless a statement is specifically identified as a warranty, statements made by Maritime Geothermal Ltd. ("MG") or its representatives relating to MG's products, whether oral, written or contained in any sales literature, catalogue or agreement, are not express warranties and do not form a part of the basis of the bargain, but are merely MG's opinion or commendation of MG's products.

SET FORTH HERE IS THE ONLY EXPRESS WARRANTY THAT APPLIES TO MG'S PRODUCTS. MG MAKES NO WARRANTY AGAINST LATENT DEFECTS. MG MAKES NO WARRANTY OF MERCHANTABILITY OF THE GOODS OR OF THE FITNESS OF THE GOODS FOR ANY PARTICULAR PURPOSE.

LIMITED EXPRESS COMMERCIAL WARRANTY - PARTS

MG warrants its Commercial Class products, purchased and retained in the United States of America and Canada, to be free from defects in material and workmanship under normal use and maintenance as follows:

- (1) Air conditioning, heating and/or heat pump units built or sold by MG ("MG Units") for one (1) year from the Warranty Inception Date (as defined below).
- (2) Thermostats, auxiliary electric heaters and geothermal pumping modules built or sold by MG, when installed with MG Units, for five (5) years from the Warranty Inception Date (as defined below).
- (3) Sealed refrigerant circuit components of MG Units (which components only include the compressor, refrigerant to air/water heat exchangers, reversing valve body and refrigerant metering device) for one (1) year from the Warranty Inception Date (as defined below).
- (4) Other accessories, when purchased separately, for (1) year from the date of shipment from MG.

The "Warranty Inception Date" shall be the date of original unit installation, as per the date on the installation Startup Record; or sixty (60) days from date of unit shipment from MG, whichever comes first.

To make a claim under this warranty, parts must be returned to MG in Petitcodiac, New Brunswick, freight prepaid, no later than ninety (90) days after the date of the failure of the part. If MG determines the part to be defective and within MG's Limited Express Commercial Warranty, MG shall, when such part has been either replaced or repaired, return such to a factory recognized distributor, dealer or service organization, freight prepaid. The warranty on any part repaired or replaced under warranty expires at the end of the original warranty period.

LIMITED EXPRESS COMMERCIAL WARRANTY - LABOUR

MARITIME GEOTHERMAL LTD. will not be responsible for any consequential damages or labour costs incurred.

This warranty does not cover and does not apply to:

- (1) Air filters, fuses, refrigerant, fluids, oil.
- (2) Products relocated after initial installation.
- (3) Any portion or component of any system that is not supplied by MG, regardless of the cause of the failure of such portion or component.
- (4) Products on which the unit identification tags or labels have been removed or defaced.
- (5) Products on which payment to MG, or to the owner's seller or installing contractor, is in default.
- (6) Products subjected to improper or inadequate installation, including but not limited to:
 - Indoor or outdoor loop flow lower than listed in engineering specification or as expressly approved by MARITIME GEOTHERMAL LTD.
 - Operating the heat pump either manually or with automated controls so that the unit is forced to function outside its normal operating range
 - Disabling of safety controls
 - Insufficient loop antifreeze concentration for loop temperature, or antifreeze concentration incorrectly set in control board
 - Fouled heat exchangers due to poor water quality
 - Failure to use strainers or clean them regularly
 - Impact or physical damage sustained by the heat pump
 - Poor refrigeration maintenance practices, including brazing without nitrogen flow, or using wrong braze/flux
 - Incorrect voltage or missing phase supplied to unit
 - Unit modified electrically or mechanically from factory supplied condition
 - Water quality outside of recommended limits (e.g. salinity or pH)
 - Unit not mounted with supplied anti-vibration grommets when specified for use
 - Corrosion damage due to corrosive ambient environment
 - Failure due to excessive cycling caused by improper mechanical setup or improperly programmed external controller
 - Physical loads or pressures placed on unit from external equipment
- (7) Mold, fungus or bacteria damage
- (8) Corrosion or abrasion of the product.
- (9) Products supplied by others.
- (10) Electricity or fuel, or any increases or unrealized savings in same, for any reason whatsoever.

MG is not responsible for:

- (1) The costs of fluids, refrigerant or system components **supplied by others**, or associated **labour** to repair or replace the same, which is incurred as a result of a defective part covered by MG's Limited Commercial Warranty.
- (2) The costs of **labour**, refrigerant, materials, or service incurred in diagnosis and removal of defective part, or in obtaining and replacing the new or repaired part.
- (3) Transportation costs of the defective part from the installation site to MG, or of the return of that part if warranty coverage declined.
- (4) The costs of normal maintenance.

MG'S LIABILITY UNDER THE TERMS OF THIS LIMITED WARRANTY SHALL APPLY ONLY TO THE MG UNITS REGISTERED WITH MG THAT BEAR THE MODEL AND SERIAL NUMBERS STATED ON THE INSTALLATION START UP RECORD, AND MG SHALL NOT, IN ANY EVENT, BE LIABLE UNDER THE TERMS OF THIS LIMITED WARRANTY UNLESS THIS INSTALLATION START UP RECORD HAS BEEN ENDORSED BY OWNER & DEALER/INSTALLER AND RECEIVED BY MG LIMITED WITHIN 90 DAYS OF START UP.

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

LIMITATION OF REMEDIES

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

LIMITATION OF LIABILITY

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

OBTAINING WARRANTY PERFORMANCE

Normally, the dealer or service organization who installed the products will provide warranty performance for the owner. Should the installer be unavailable, contact any MG recognized distributor, dealer or service organization. If assistance is required in obtaining warranty performance, write or call Maritime Geothermal Ltd.

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