



Engineering Specification

WH-90-H-B-*S-**

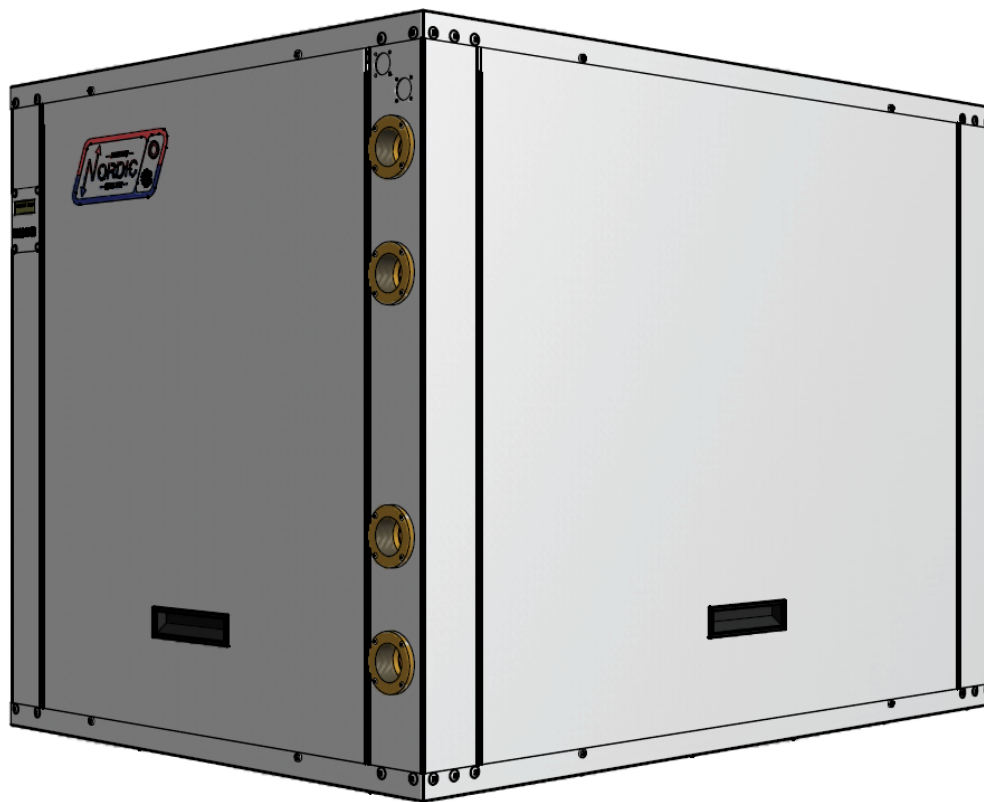
High Temperature Commercial Water to Water Heat Pump

Single Refrigeration Circuit, R134a

Nominal Size 8 Ton

Non-Reversing

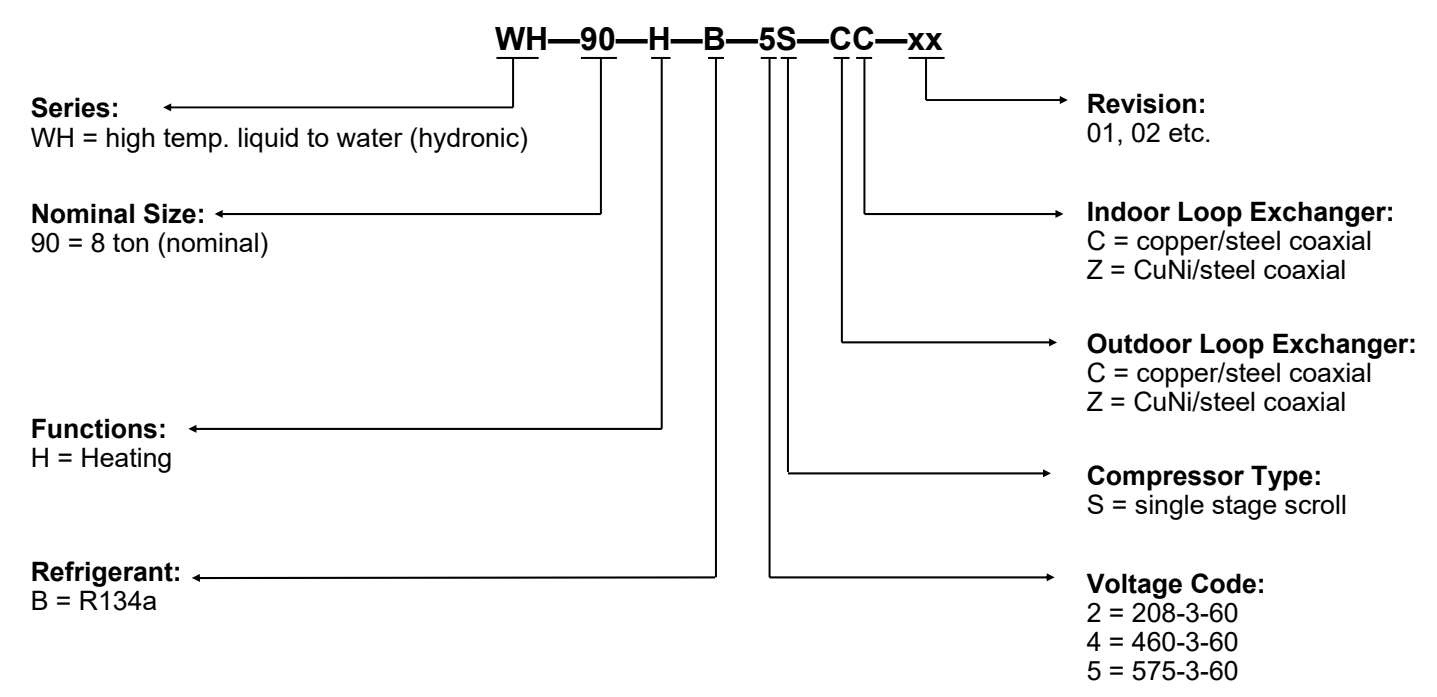
60Hz



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002489SPC-01

Model Nomenclature



APPLICATION TABLE										
MODEL	FUNCTION	REFRIGERANT	VOLTAGE	COMPRESSOR	OUTDOOR HEAT EXCHANGER	INDOOR HEAT EXCHANGER	REVISIONS			
W-90	H	B	2 4 5	S	C Z	C Z	01			
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 .

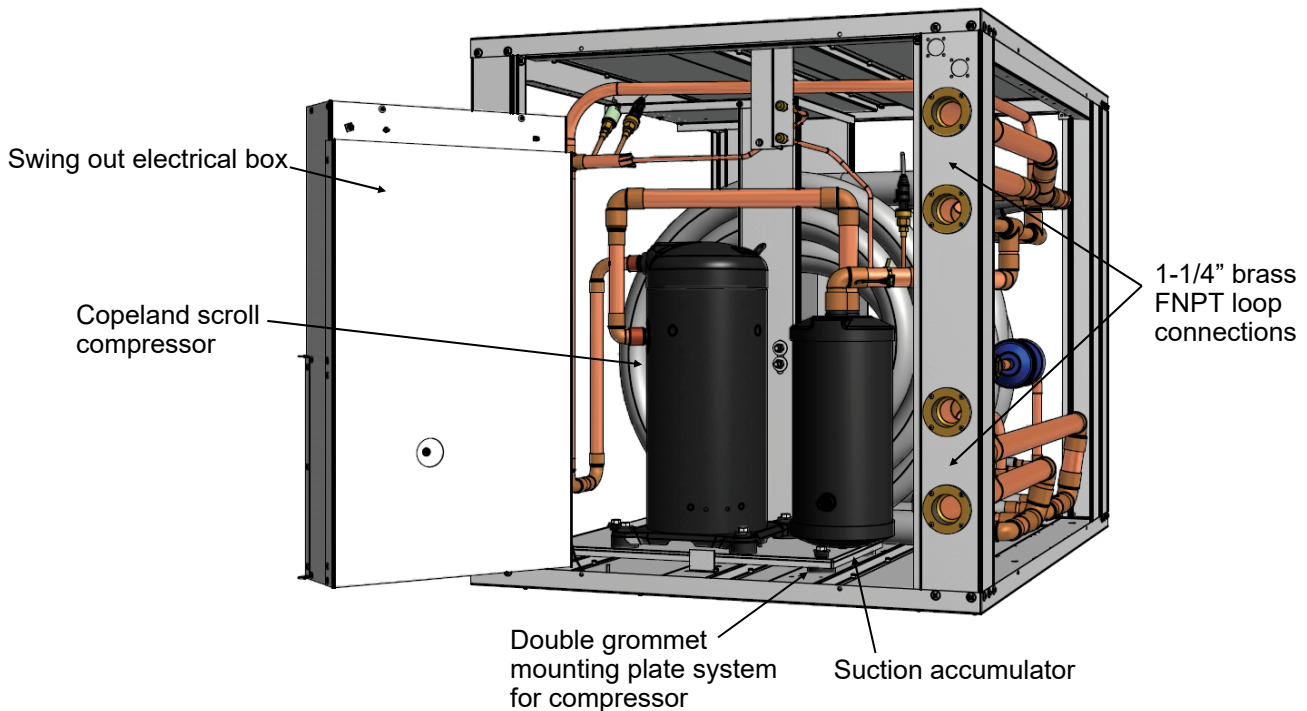
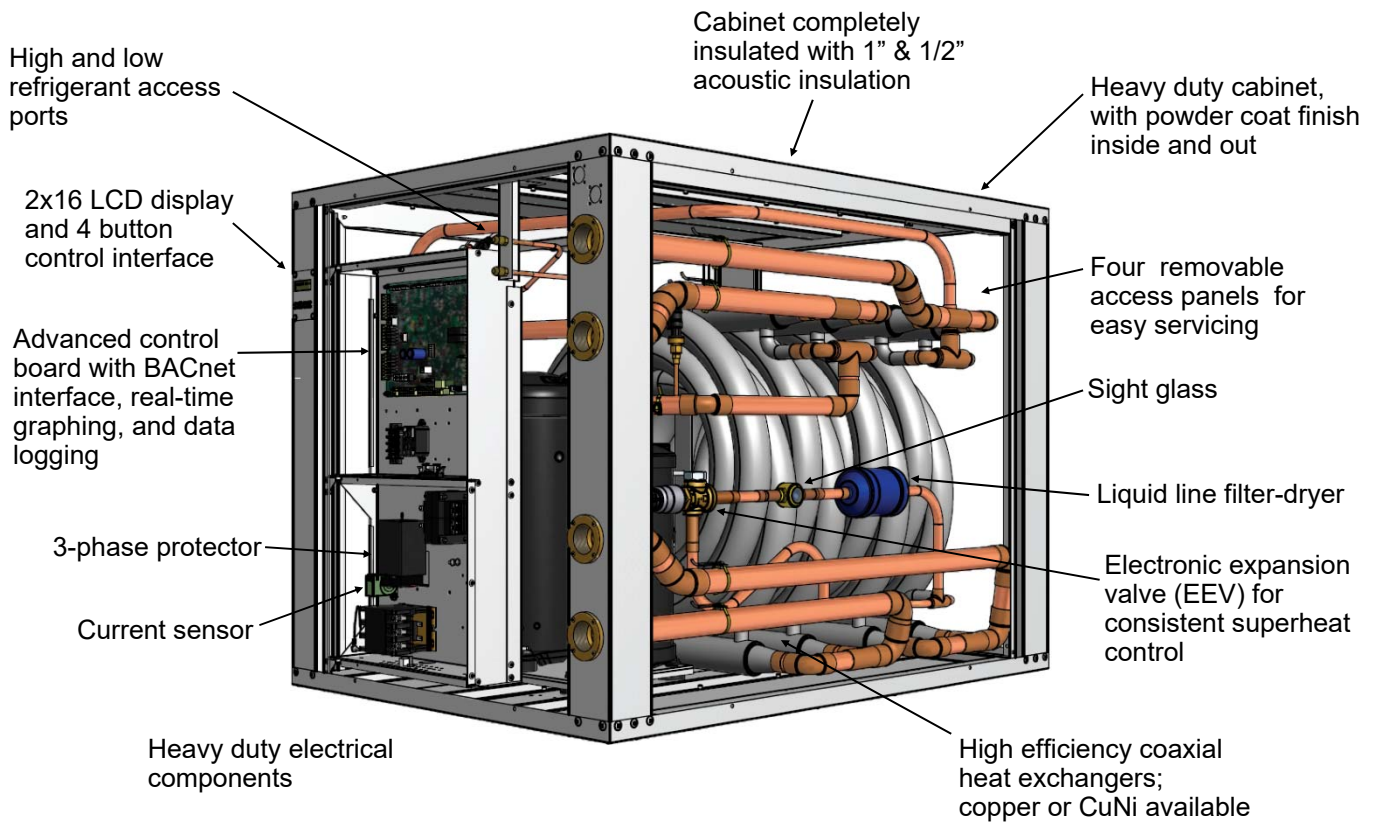
Design Features

- Indoor loop water heating to 160°F / 71 °C (as opposed to 130°F / 54°C for R410a W-series units), with a minimum source loop temperature of 45°F / 7°C.
- TUV listed for electrical certification
- Satin galvanized steel cabinet with powder coat finish
- Acoustically insulated cabinet (1/2" & 1" thick)
- All connections located on same side
- Access panels on all four sides, serviceable from two; swing out electrical box for compressor access
- Refrigeration service ports located inside unit (1/4" Schrader)
- Insulated coaxial heat exchanger and piping, available in copper or cupro-nickel (CuNi)
- 1-1/4" brass FNPT fittings for loop connections
- Connection points for outdoor and indoor circulator pump power
- Single-stage Copeland scroll compressor
- Dual-grommet-mounted compressor for reduced noise and vibration
- Suction line accumulator
- Liquid line filter-dryer & sight glass
- Electronic Expansion Valve (EEV)
- Refrigerant high and low pressure sensors
- Suction line temperature sensor
- Manual reset high pressure control
- Temperature sensors on all 4 water lines
- 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 (0-5VDC or 4-20mA) with onboard 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
- Unit may be configured for standalone operation with outdoor reset functionality (requires outdoor temperature sensor accessory)
- Random start on power up (0-2 minutes)
- 24VAC and 0-10VDC output for external pump / water valve control (24VAC 500mA max)

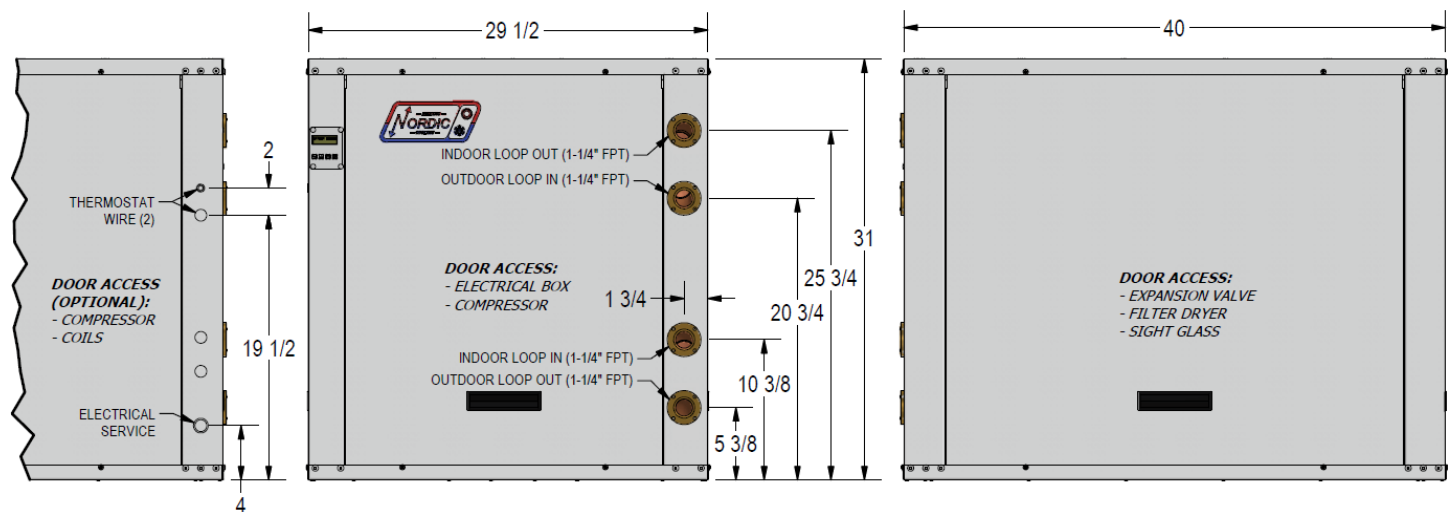
Available Accessories

- Hydronic buffer tank with 15, or 20kW of electric backup elements
- Anti-vibration pad for under unit
- Outdoor temperature sensor with enclosure, for outdoor reset functionality
- Tank temperature sensor(s)

Design Features



Dimensions



Specifications

Electrical Specifications									
Nomenclature Identifier	Power Supply			Compressor		FLA	MCA	Maximum Fuse/Breaker	Minimum Wire Size
	V-ø-Hz	MIN	MAX	RLA	LRA	Amps	Amps	Amps	ga
2	208-3-60	187	229	25.3	195	32.5	38.8	60	#6-3
4	460-3-60	414	506	11.5	95	11.7	14.6	20	#12-3
5	575-3-60	518	632	10.3	80	10.5	13.1	20	#12-3

Shipping Information				
MODEL	WEIGHT lb. (kg)	DIMENSIONS in (cm)		
		L	W	H
WH-90	650 (295)	46 (117)	37 (94)	37 (94)

Refrigerant Charge				
MODEL	lb	kg	Refrigerant	Oil Type
WH-90	14.0	6.4	R134a	POE
- Oil capacity is marked on the compressor label. - Refrigerant charge is subject to revision; actual charge is indicated on the unit nameplate.				

Required Indoor & Outdoor Loop Flow Rate		
MODEL	gpm	L/s
WH-90	24	1.5

Loop Pressure Drop Data			INDOOR (water 104°F)		OUTDOOR (water 50°F)		OUTDOOR (15% methanol 32°F)		OUTDOOR (35% prop. glycol 32°F)	
WH-90	gpm	L/s	psi	kPa	psi	kPa	psi	kPa	psi	kPa
	16	0.50	1.8	12	1.9	13	2.2	15	2.9	20
	18	0.57	2.1	14	2.3	16	2.7	19	3.6	24
	20	0.63	2.4	17	2.6	18	3.3	23	4.3	30
	22	0.69	2.9	20	3.2	22	4	28	5.3	36
	24	0.76	3.6	25	3.9	27	4.6	32	6.0	42
	26	0.82	4.1	28	4.4	30	5.2	36	6.8	47
	28	0.88	4.7	32	5	34	5.8	40	7.6	53
	30	0.95	5.5	38	5.7	39	6.5	45	8.5	59
	32	1.01	6.3	43	6.5	45	7.3	50	9.6	66

Operating Temperature Limits					
Loop	Mode	Parameter	(°F)	(°C)	Note
Indoor	Heating	Minimum EWT	70-110	21-43	Use formula (Outdoor EWT + 20°F) or (Outdoor EWT + 11°C). Indoor loop may require flow control below this temperature.
		Maximum LWT	160	71	
Outdoor	Heating	Minimum EWT	45	7	Reduce flow to limit suction pressure above this temperature.
		Maximum EWT	90	32	
EWT/LWT: Entering/Leaving Water Temperature. Values in these tables are for rated liquid and water flow values.					

Performance Tables

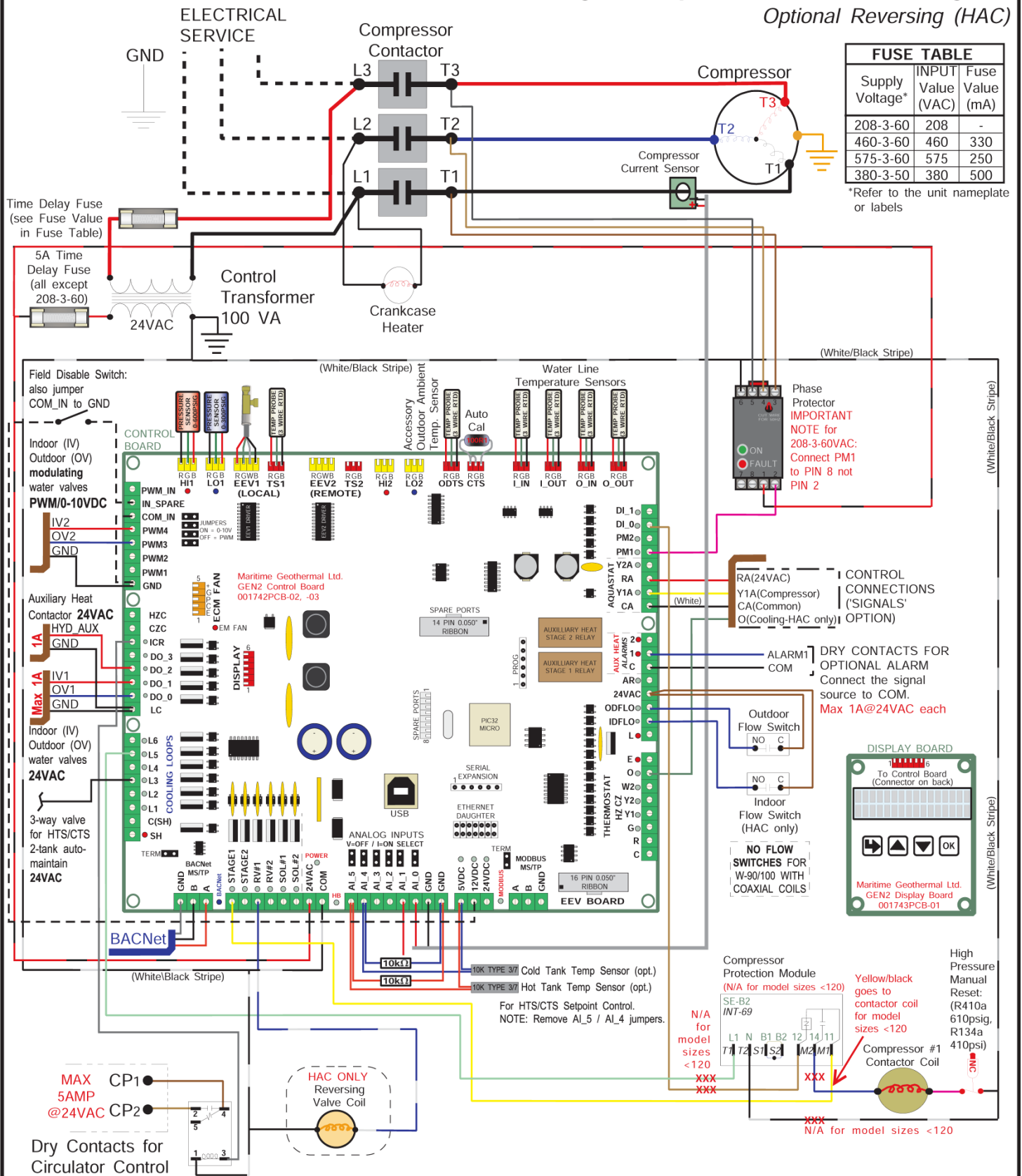
	OUTDOOR LOOP						ELECTRICAL		INDOOR LOOP						
	ELT (°F)	Evap. Temp.	Flow (gpm)	LLT (°F)	Delta T (°F)	Heat Abs. (Btu/hr)	Compressor Current (A)	Input Power (W)	EWT (°F)	Cond. Temp.	Flow (gpm)	LWT (°F)	Delta T (°F)	Heating (Btu/hr)	COP _H
HEATING	50	43	24	46	4	45,460	21.5	5,190	115	122	24	120	5	62,754	3.54
	60	52	24	55	5	55,414	21.8	5,313	114	122	24		6	73,128	4.03
	70	61	24	64	6	67,234	21.9	5,441	113	123	24		7	85,387	4.60
	80	70	24	73	7	80,715	22.0	5,558	112	125	24		8	99,266	5.23
	90	78	24	82	8	96,071	21.8	5,655	110	126	24		10	114,944	5.96
	50	43	24	47	3	39,537	24.9	6,287	135	142	24	140	5	60,576	2.82
	60	52	24	56	4	47,252	25.1	6,417	134	142	24		6	68,736	3.14
	70	61	24	65	5	56,409	25.1	6,496	134	143	24		7	78,163	3.53
	80	70	24	74	6	66,591	25.0	6,587	133	143	24		7	88,655	3.94
	90	79	24	84	7	78,209	24.5	6,631	132	144	24		8	100,413	4.44
	50	45	24	47	3	32,463	29.1	7,568	155	162	24	160	5	57,875	2.24
	60	54	24	57	3	38,998	29.4	7,764	155	162	24		5	65,078	2.46
	70	63	24	66	4	46,158	29.4	7,870	154	163	24		6	72,601	2.70
	80	72	24	75	5	54,095	29.2	7,895	153	163	24		7	80,621	2.99
	90	81	24	85	5	62,589	28.5	7,885	153	164	24		7	89,072	3.31

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)	10.0	6.2	1.5	7.9	2.1	13,320	21.5	5,190	46.0	49.8	1.5	49	2.9	18,387	3.54
	15.5	11.2	1.5	13.0	2.6	16,236	21.8	5,313	45.5	50.1	1.5		3.4	21,426	4.03
	21.1	16.2	1.5	18.0	3.1	19,700	21.9	5,441	44.9	50.4	1.5		4.0	25,018	4.60
	26.7	20.9	1.5	22.9	3.7	23,649	22.0	5,558	44.3	51.4	1.5		4.6	29,085	5.23
	32.2	25.8	1.5	27.7	4.5	28,148	21.8	5,655	43.6	52.4	1.5		5.3	33,678	5.96
	10.0	6.2	1.5	8.2	1.8	11,584	24.9	6,287	57.2	61.2	1.5	60	2.8	17,749	2.82
	15.5	11.2	1.5	13.4	2.2	13,845	25.1	6,417	56.8	61.3	1.5		3.2	20,140	3.14
	21.1	16.2	1.5	18.5	2.6	16,528	25.1	6,496	56.4	61.6	1.5		3.6	22,901	3.53
	26.7	21.1	1.5	23.6	3.1	19,511	25.0	6,587	55.9	61.9	1.5		4.1	25,976	3.94
	32.2	26.1	1.5	28.6	3.6	22,915	24.5	6,631	55.3	62.2	1.5		4.7	29,421	4.44
	10.0	7.1	1.5	8.5	1.5	9,512	29.1	7,568	68.4	71.9	1.5	71	2.7	16,957	2.24
	15.6	12.1	1.5	13.7	1.8	11,426	29.4	7,764	68.1	72.3	1.5		3.0	19,068	2.46
	21.1	17.0	1.5	18.9	2.1	13,524	29.4	7,870	67.8	72.6	1.5		3.4	21,272	2.70
	26.7	22.3	1.5	24.1	2.5	15,850	29.2	7,895	67.4	72.9	1.5		3.7	23,622	2.99
	32.2	27.3	1.5	29.3	2.9	18,338	28.5	7,885	67.0	73.3	1.5		4.1	26,098	3.31

W/WH-Commercial Single Compressor Schematic Diagram

Optional Reversing (HAC)

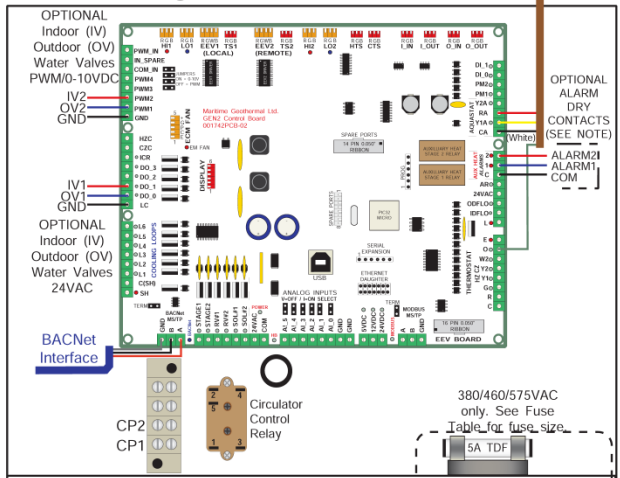


					Drawn By Dan Rheault	Date 24-Jun-2019	MARITIME GEOTHERMAL LTD.		170 Plantation Rd. Petitcodiac, NB E4Z 6H4		
					Checked By Dan Rheault	Date 24-Jun-2019	Drawing Name W/WH-Commercial Single Compressor Schematic				
					Approved By (ENG)	Date					
					Approved By (MFG)	Date	Size		Drawing Number	Drawing Rev	SHEET
01	Initial Release	D. RHEAULT	D. RHEAULT	24-Jun-2019			A		002399SCH	01	1 of 1
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date					

W-90/100 Electrical Box Diagram

Scroll / Reversing / BACNet Interface Optional Domestic Hot Water

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



CONTROL CONNECTIONS (HARD WIRED OPTION)

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

OPTIONAL ALARM DRY CONTACTS (SEE NOTE)
ALARM2
ALARM1
COM

POWER SUPPLY CONNECTIONS		
Wire	Compressor	Contactor
Line 3	L3	
Line 2	L2	
Line 1	L1	
Connect "Gnd" to Gnd. Lug		

FUSE TABLE ***		
Supply Voltage	Fuse Value*	
208-3-60	-----	
460-3-60	330mA	
575-3-60	250mA	
380-3-50	500mA	
*Value is marked in electrical box.		

IMPORTANT NOTE FOR 3 PHASE SCROLL COMPRESSORS

This unit is equipped with a scroll compressor which 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).

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

BACNet Interface (MS/TP) (RS-485)

Use twisted pair shielded conductor cable.

- A - Communication
- B - Communication
- GND - Ground

TSTAT_Y1A: Stage 1 (Compressor#1)
TSTAT_O: Heating/Cooling Mode (active for cooling mode)

Low Voltage Wiring (24VAC)

Use an 18-5 conductor cable.

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

A dry connection from "R" to "Y1" will start Compressor#1.

A dry connection from "R" to "O" will activate cooling mode

NOTE: Control of the unit is done either via the BACNet interface, Setpoint Control or low voltage wiring.

NOTE: There is a 5 minute anti-short cycle timer for the compressor.

NOTE: CP1 and CP2 provide a dry contact that can be used as a control signal to turn on circulator pumps when the compressor starts.
MAX 5amps @ 24VAC

NOTE: 24VAC is present across OV1 and GND in heating mode (IV1 and GND in cooling mode) to power an external water valve when either compressor starts.
MAX 1amp @ 24VAC

NOTE: Alarm1 signals are dry contacts (NO), max 1A@24VAC each. Connect the signal source to COM. Alarm1 relay will be energized when a permanent fault occurs.

DHW wire with insulated terminal connects here:

208 VAC models:
Brown wire

380/460/575 VAC models:
Black wire

Power Wiring

L3
L2
L1
Gnd

Label

L3
L2
L1
Gnd

Compressor Contactor

GND Lug

Current Sensor

Output

24VAC (GND)

100VA Control Transformer (208VAC only)

2A TDF

200VA DHW Transformer 115VAC Secondary

1A TDF 600VAC

1A TDF 600VAC

1A TDF 600VAC

1A TDF 600VAC

1A TDF 600VAC

1A TDF 600VAC

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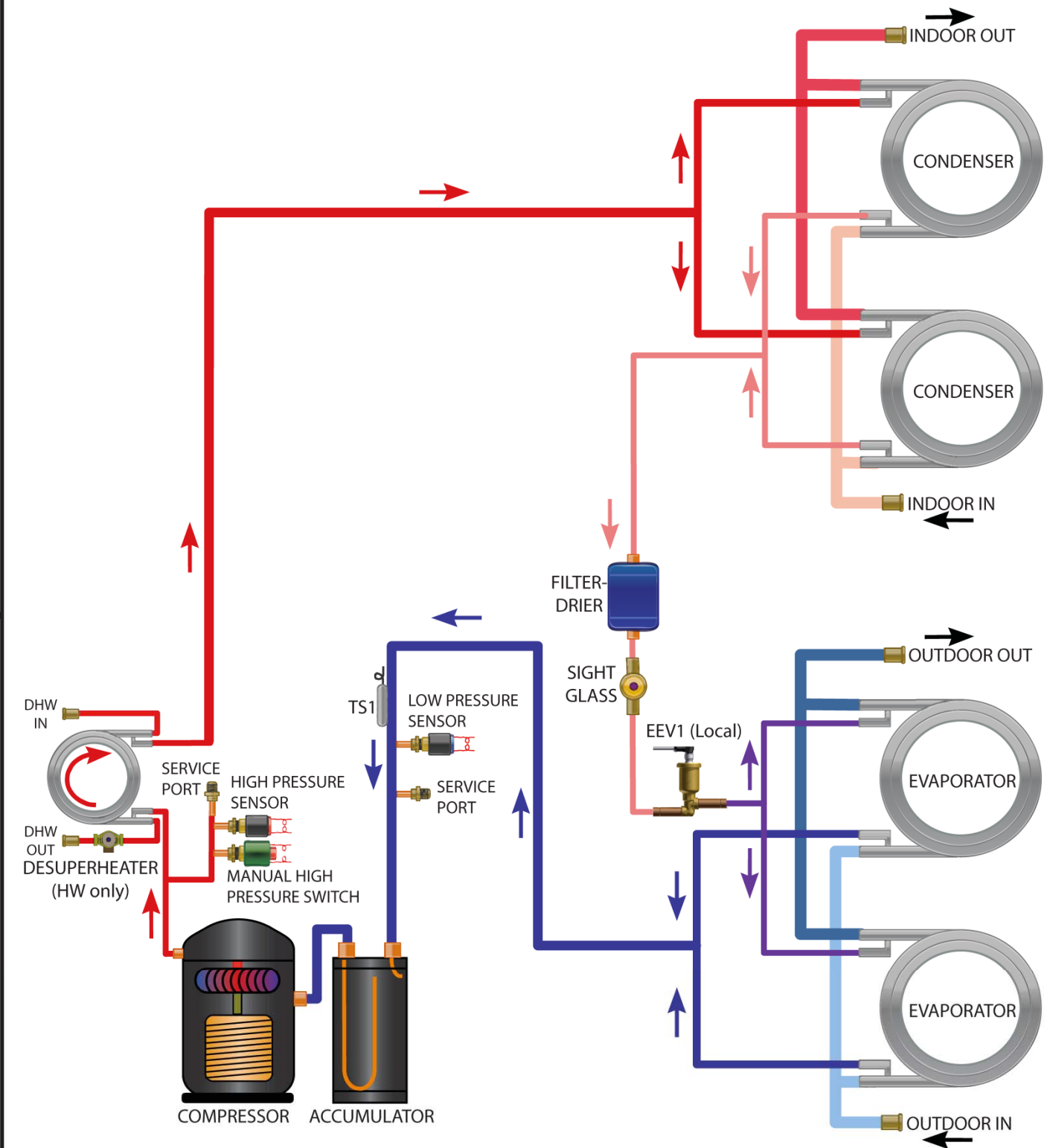
1A TDF 600VAC

REV	ECO #	IMPL BY	APVD BY	DATE
01	000226 (IR)	C. GEDDES	C. GEDDES	14 NOV 2014

Drawn By	Chris Geddes	Date	14 NOV 2014
Checked By	Chris Geddes	Date	14 NOV 2014
Approved By (ENG)	Chris Geddes	Date	14 NOV 2014
Approved By (MFG)		Date	

MARITIME GEOTHERMAL LTD.		170 Plantation Rd. Pettitcodiac, NB E4Z 6H4	
Drawing Name		W-90/100-H***.*S-*** Electrical Box Diagram	
Size	A	Drawing Number	001904ELB
Drawing Rev	01	Sheet	1 of 1

W-90/100 Refrigeration Circuit Heating Only



					Drawn By C.GEDDES	Date 04 MAY 2014	<div>MARITIME GEOTHERMAL LTD.</div> <div>P.O. Box 2555 170 Plantation Rd. Petitcodiac, NB CANADA E4Z 6H4</div>				
					Checked By C.GEDDES	Date 04 MAY 2014					
					Eng. Approved By C.GEDDES	Date 04 MAY 2014	Drawing Name W-90/100 EEV Refrigeration Circuit Heating Only				
					Mfg. Approved By	Date					
02	000226	C. GEDDES	C. GEDDES	15 NOV 2014	Approved By	Date	Size LET	Drawing Number 000995RCD	Drawing Revision 02	Sheet 1 / 1	
01	Initial Release	C. GEDDES	C. GEDDES	04 MAY 2009							
REV	ECO#	IMPL BY	APVD BY	DATE							

Engineering Guide Specifications

General

The liquid source reversing water-to-water heat pump shall be a single packaged single refrigeration circuit heating or 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 unit, as manufactured by Maritime Geothermal, Petitcodiac, New Brunswick, shall be designed to operate correctly within liquid temperature ranges specified on the "Operating Temperature Limits" table in this engineering specification document.

Factory Quality

Each unit shall be run tested at the factory with water circulating through the 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 enclosed in a sheet metal cabinet. Cabinet shall be constructed of powder coated galvanized sheet metal of minimum 20 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 1/2 inch [12.7 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. The unit must have a minimum of three access panels for serviceability of the compressor compartment. Units having only one access panel to compressor/heat exchangers/expansion device/refrigerant piping shall not be acceptable. 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 only one sealed refrigerant circuit, containing a hermetic motor scroll compressor, Electronic Expansion Valve (EEV), coaxial heat exchangers, factory installed high and low pressure sensors, manual reset high pressure switch, service ports, liquid line filter-drier, sight glass, and suction accumulator.

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

The water to refrigerant heat exchangers shall consist of a steel outer jacket with twisted copper inner tube, designed and certified for 600 psig [4136 kPa] working pressure on the refrigerant side and 450 psig [3108 kPa] on the water side. Heat exchangers headered together in parallel shall use a reverse-return or symmetrical arrangement on the water side and symmetrical arrangement on the refrigerant side to ensure even flow splitting. 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. Cupro-nickel (CuNi) inner tube shall be available as a factory option.

The electronic expansion valve shall be of stepper-motor rather than pulsing type, and shall provide proper superheat control over the unit's operating range with minimal deviation from superheat setpoint. 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 out connections (for indoor and outdoor loops). The primary connection type shall be 1-1/4" nominal female National Pipe Thread (NPT). All water connectors shall be rigidly mounted to cabinet with corrosion resistant fasteners to prevent relative movement. All water connectors shall be constructed of copper or brass material for corrosion resistance.

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 contactor, and 24VAC 100VA transformer with built in circuit breaker or fused on both primary and secondary sides. A terminal strip with screw in terminals shall be provided for field control wiring. Units shall be name-plated for use with time delay fuses or circuit breakers. Unit controls shall be 24VAC and provide heating as required by the remote thermostat or controller, or on-board controller. Unit shall provide remote fault indication to the control system via serial communications as well as provide fault messages on the front panel LCD display.

Unit Control

The control system shall have the following features:

1. 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.
2. Random compressor start delay of 0-120 seconds on unit power up to facilitate starting multiple units after a power failure.
3. Compressor shutdown for high or low refrigerant pressures, Loss of Charge (LOC), optional low flow conditions, and for optional phase protection faults on three phase models.
4. Automatic intelligent reset: unit shall automatically restart after a trip short cycle delay expires if 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.
5. Manual reset high pressure in case of electronic board failure.
6. The low pressure shall not be monitored for the first 90 seconds after a compressor start to prevent nuisance safety trips.
7. 2 x 16 backlit Liquid Crystal Display (LCD) and four buttons provide basic configuration and data access . Unit may be configured for stand alone operation.
8. Universal Serial Bus (USB) port for full data access and diagnostic information, including manual override of all inputs and outputs, data-logging, and real-time charting.
9. BACnet connectivity for control by building automation system, and providing alarm feedback.

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.

LIMITED WARRANTY

MARITIME GEOTHERMAL LTD. warrants that its commercial geothermal heat pumps shall be free from defects in materials and workmanship for a period of ONE (1) YEAR after the date of installation or for a period of ONE (1) YEAR AND SIXTY (60) DAYS after the date of shipment, whichever occurs first. This warranty covers all internal components of the heat pump.

MARITIME GEOTHERMAL LTD. shall, at its option, repair or replace any part covered by this warranty. Defective parts shall be returned to MARITIME GEOTHERMAL LTD., transportation charges prepaid. Replacement of repaired parts and components are warranted only for the remaining portion of the original warranty period.

This warranty is subject to the following conditions:

1. The geothermal heat pump(s) must be properly installed and maintained in accordance with MARITIME GEOTHERMAL LTD.'s guidelines. Improper installation **includes but is not limited to** the following conditions:
 - 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 or in a fashion which directly or indirectly leads to failure of components or the entire heat pump
 - 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 or optional spring feet
 - 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
2. The installer must complete the **Startup Record** and return it to MARITIME GEOTHERMAL LTD. within 21 days of unit installation.
3. For new construction, it is the responsibility of the building or general contractor to supply temporary heat to the structure prior to occupancy. Geothermal heat pumps are designed to provide heat only to the completely finished and insulated structure. Startup of the unit shall not be scheduled prior to completion of construction and final duct installation for validation of this warranty.
4. It is the customer's responsibility to supply the proper quantity and quality of water or properly sized ground loop with adequate freeze protection.

MARITIME GEOTHERMAL LTD.'s sole and exclusive liability shall be, at its option, to repair or replace any part or component which is returned by the customer during the applicable warranty period set forth above, provided that (1) MARITIME GEOTHERMAL LTD. is promptly notified in writing upon discovery by the customer that such part or component fails or is defective (2) the customer returns such part or component to MARITIME GEOTHERMAL LTD., transportation charges prepaid, within (30) thirty days of failure, and (3) MARITIME GEOTHERMAL LTD.'s examination of such component discloses to its satisfaction that such part or component has failed or is defective and was not caused by one of the circumstances listed above. MARITIME GEOTHERMAL LTD. will not be responsible for any consequential damages or labour costs incurred. In addition, MARITIME GEOTHERMAL LTD. will not be responsible for the cost of replacement parts purchased from a third party.