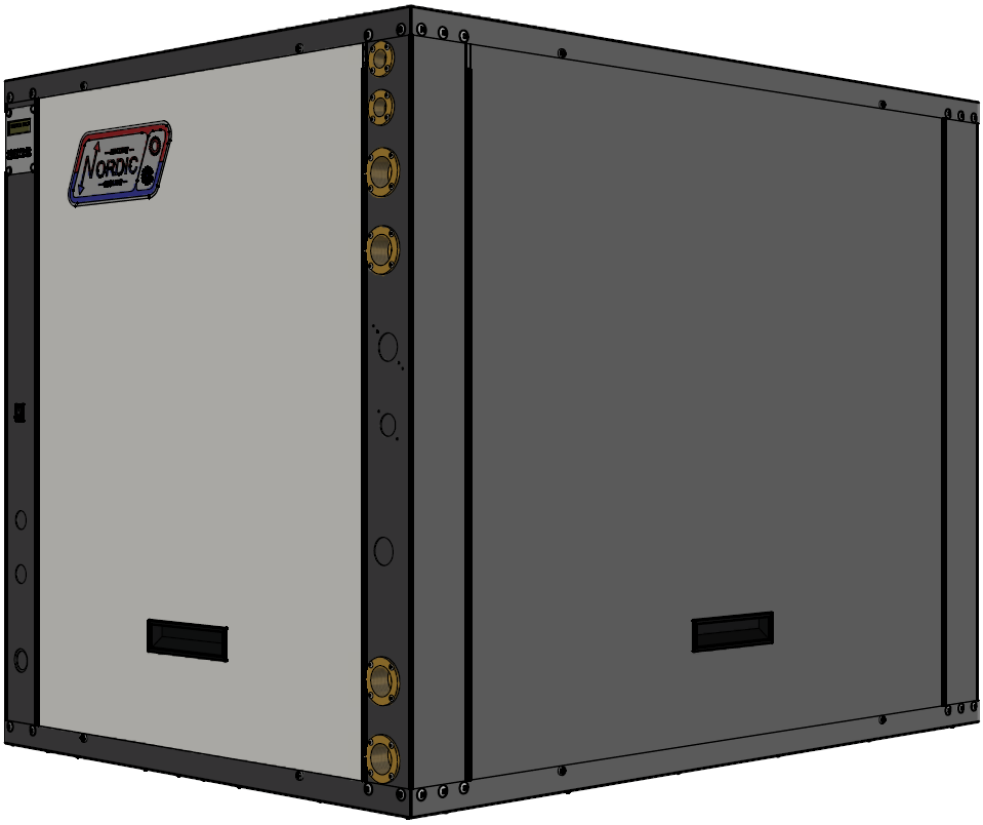
Engineering Specification / Submittal

W-65-HACW-X-*T-**
Liquid to Water Geothermal Heat Pump
R454b, 60 Hz



ENERGY STAR

AHRI CERTIFIED™ www.ahridirectory.org
Water Source HP
ANSI/AHRI/ASHRAE/ISO13256-1

TÜV SÜD C US

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002900SPC-01

A2L refrigerant: mildly flammable.

Read ***Application, Installation, and Service Manual*** for precautions and procedures.

Installation of a unit with **A2L** refrigerant may require calculations involving the size of the mechanical room and/or rooms served by the unit. These calculations may affect installation procedures used and ventilation provided, and should be fully understood and considered to ensure code compliance.

Model Nomenclature

W—65—HACW—X—1T—CC—xx

Series:
W = standard temperature water to water

Nominal Size:
25 = 020 compressor
45 = 030 compressor
55 = 040 compressor
65 = 051 compressor
75 = 060 compressor
80 = 067/070 compressor

Functions:
H = Heating
AC = Active Cooling
W = domestic hot Water

Refrigerant:
X = R454b **[A2L]**

Revision:
01, 02 etc.

Indoor Loop Coil:
C = Copper coaxial
Y = CuNi coax coil & piping
Z = CuNi coax coil only

Outdoor Loop Coil:
C = Copper coaxial
Y = CuNi coax coil & piping
Z = CuNi coax coil only

Compressor:
S = single stage scroll
T = 2-stage scroll

Voltage Code:
1 = 208/230-1-60
2 = 208-3-60
4 = 460-3-60
5 = 575-3-60

APPLICATION/AVAILABILITY TABLE

MODEL	FUNCTION	REFRIGERANT	VOLTAGE	COMPRESSOR	OUTDOOR HEAT EXCHANGER	INDOOR HEAT EXCHANGER	REVISIONS			
W-65	HACW	X	1 2 4 5	T	C Y Z	C Y 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.

Features

⇒ **W-Series** is a **liquid source hydronic heat pump**, which requires a ground loop or open water well system for heat exchange.

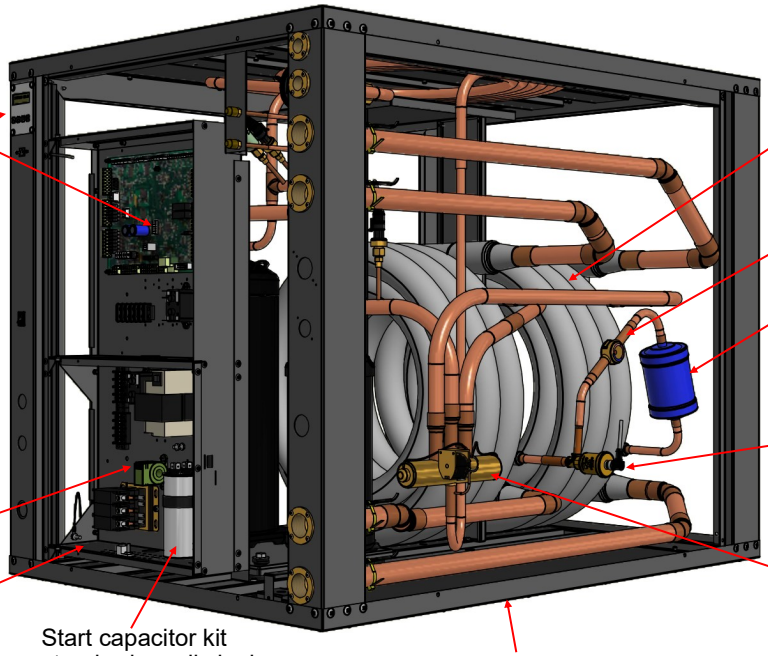
⇒ **R454b** refrigerant (GWP=466) is climate change-friendly. Note that R454b is an A2L.

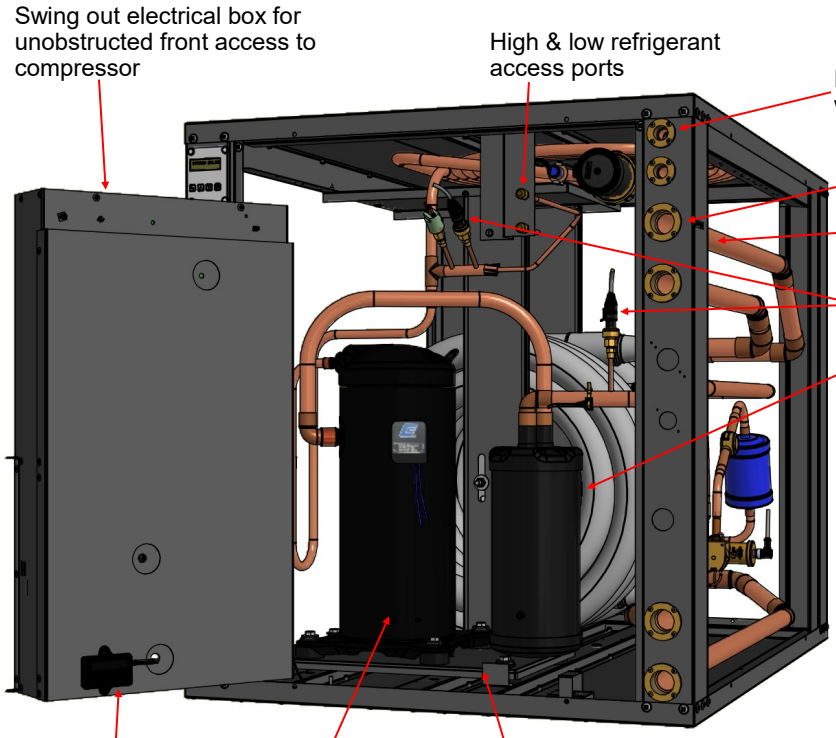
⇒ **TUV listed** (CSA/UL/ETL equivalent)

⇒ AHRI certified & Energy Star listed for performance

GEN2 Control

- Built in hydronic temperature control means no external sensor or aquastat required
- Outdoor reset functionality for better COP during warm weather
- Dry contacts for auxiliary heat, controlled by heat pump
- Provision for powering indoor & outdoor loop circulators
- Advanced control board with BACnet MS/TP interface for remote control and data access including all sensor data & alarm conditions
- LCD display/user interface
- USB port for complete data access; free PC App software for Windows included

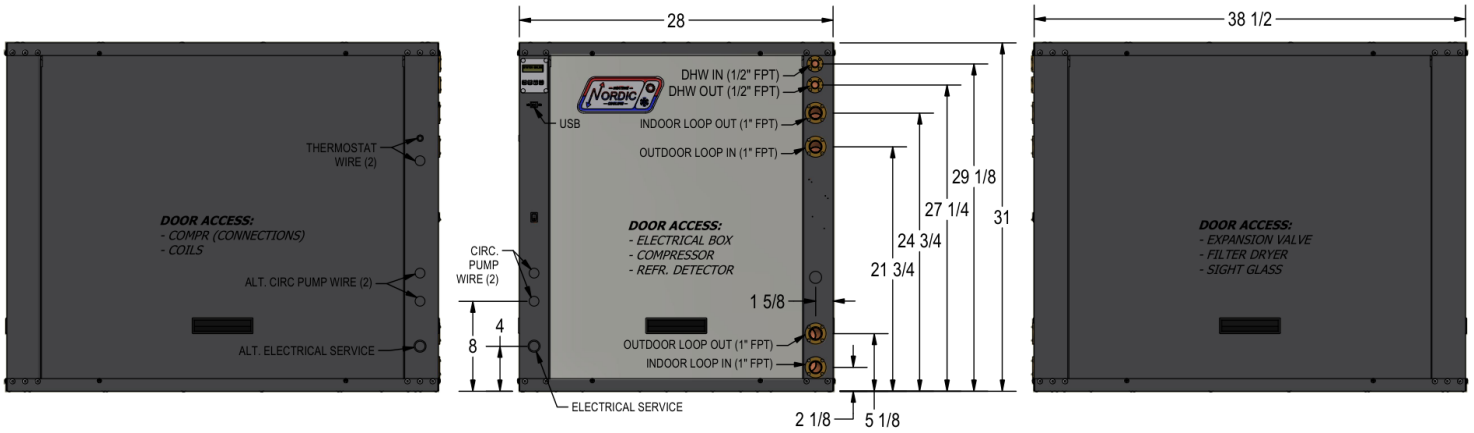




Available Accessories

- Motorized water valve for open loop/well installations
- Pump module with loop / unit isolation valves (230VAC) for ground loop applications
- Hydronic buffer tank with 12, 15, or 20kW electric backup elements
- Barbed P/T port adapters for loop connections
- Anti-vibration pad for under unit
- Compressor sound jacket
- Secure Start module
- CuNi hydronic heat exchanger
- Outdoor temperature sensor with enclosure, for outdoor reset functionality

Dimensions



LEFT SIDE
CLEARANCE
OPTIONAL

RECOMMENDED
FRONT CLEARANCE:
2 FT

RECOMMENDED
RIGHT SIDE CLEARANCE:
2 FT

NO BACK CLEARANCE REQUIRED

Specifications

Electrical Specifications (R454b)										
Nomenclature Identifier	Power Supply			Compressor		Circulators	FLA	MCA	Max. Breaker	Minimum Wire Size
	V-ø-Hz	MIN	MAX	RLA	LRA	Max. A	Amps	Amps	Amps	ga
1	208/230-1-60	187	253	25.2	147	7.0	33.0	39.3	60	#6-2*
2	208-3-60	187	229	13.8	150	7.0	21.6	25.1	40	#8-3*
4	460-3-60	414	506	6.9	58	-	7.7	9.4	15	#14-3
5	575-3-60	518	632	5.8	48	-	6.6	8.1	15	#14-3

* additional conductor required if connecting 115VAC circulators to the unit

Shipping Information				
MODEL	WEIGHT lb. (kg)	DIMENSIONS in (cm)		
		L	W	H
W-65	490 (222)	45 (114)	37 (94)	37 (94)

Sound Levels (dBA)*		
MODEL	1 ft distance	3 ft distance
W-65	55.7	53.0

* With all doors installed.

A2L

Refrigerant Charge				
MODEL	lb	*kg*	TYPE	OIL
W-65	8.5	*3.9*	R454b	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*
W-65	14	*0.88*

Note for circ pump sizing: flow rate may be greater than required for boiler of a similar heating capacity.

Loop Pressure Drop Data			INDOOR (water 104°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*
W-65	8	*0.50*	1.8	*12*	1.9	*13*	2.2	*15*	2.9	*20*
	9	*0.57*	2.1	*14*	2.3	*16*	2.7	*19*	3.6	*24*
	10	*0.63*	2.4	*17*	2.6	*18*	3.3	*23*	4.3	*30*
	11	*0.69*	2.9	*20*	3.2	*22*	4	*28*	5.3	*36*
	12	*0.76*	3.6	*25*	3.9	*27*	4.6	*32*	6.0	*42*
	13	*0.82*	4.1	*28*	4.4	*30*	5.2	*36*	6.8	*47*
	14	***0.88***	**4.7**	***32***	**5**	***34***	**5.8**	***40***	**7.6**	***53***
	15	*0.95*	5.5	*38*	5.7	*39*	6.5	*45*	8.5	*59*
	16	*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 ELT	50	*10*	Reduce flow if necessary during startup.
	Heating	Maximum LLT	120	*49*	
	Cooling	Minimum LLT	41	*5*	Water system (no antifreeze).
	Cooling	Minimum LLT	32	*0*	Antifreeze system. Adequate freeze protection required.
	Cooling	Maximum ELT	80	*27*	
Outdoor	Heating	Minimum ELT	39	*4*	Ground water (open loop) system.
	Heating	Minimum ELT	23	*-5*	Ground loop system. Adequate freeze protection required.
	Cooling	Minimum ELT	39	*4*	Ground water (open loop) system.
	Cooling	Minimum ELT	32	*0*	Ground loop system. Adequate freeze protection required.
	Cooling	Maximum LLT	120	*49*	
* Values in this table are for rated liquid flow values.					

Standard Capacity Ratings

Standards C13256-2 / ISO13256-2 / ARI 13256-2

Standard Capacity Ratings - Ground Loop Heating*							60Hz
EWT 104°F (40°C)		*15% Methanol by Weight Ground Loop Fluid			STAGE 1 - ELT 41°F (5°C) STAGE 2 - ELT 32°F (0°C)		
Model	**Liquid Flow (Outdoor & Indoor)**		**Mode**	**Input Energy**	**Capacity**		**COP_H**
	gpm	*L/s*		Watts	Btu/hr	*kW*	W/W
W-65	**14.0**	***0.88***	**Stage 1**	3,094	**32,200**	**9.4**	**3.05**
			Stage 2	3,867	**40,200**	**11.8**	**3.05**

Standard Capacity Ratings - Ground Loop Cooling*								60Hz
EWT 53.6°F (12°C)		*15% Methanol by Weight Ground Loop Fluid				STAGE 1 - ELT 68°F (20°C) STAGE 2 - ELT 77°F (25°C)		
Model	**Liquid Flow (Outdoor & Indoor)**		**Mode**	**Input Energy**	**Capacity**		**COP_C**	**EER**
	gpm	*L/s*		Watts	Btu/hr	*kW*	W/W	Btu/hr/W
W-65	**14.0**	***0.88***	**Stage 1**	1,910	**37,600**	**11.0**	**5.77**	**19.7**
			Stage 2	3,202	**47,700**	**14.0**	**4.37**	**14.9**

Standard Capacity Ratings - Ground Water Heating						60Hz
EWT 104°F (40°C)						ELT 50°F (10°C)
Model	**Liquid Flow (Outdoor & Indoor)**		**Mode**	**Input Energy**	**Capacity**	**COP_H**
	gpm	*L/s*		Watts	Btu/hr	*kW*	W/W
W-65	**14.0**	***0.88***	**Stage 1**	3,090	**38,800**	**11.4**	**3.68**
			Stage 2	4,206	**54,200**	**15.9**	**3.78**

Standard Capacity Ratings - Ground Water Cooling							60Hz
EWT 53.6°F (12°C)							ELT 59°F (15°C)
Model	**Liquid Flow (Outdoor & Indoor)**		**Mode**	**Input Energy**	**Capacity**		**COP_C**	**EER**
	gpm	*L/s*		Watts	Btu/hr	*kW*	W/W	Btu/hr/W
W-65	**14.0**	***0.88***	**Stage 1**	1,660	**39,200**	**11.5**	**6.92**	**23.6**
			Stage 2	2,561	**52,000**	**15.2**	**5.95**	**20.3**

Performance Tables (US UNITS)

W-65-HACW-X-1T *R454b, 60 Hz, YAS51K1E-PFV*

HEATING

OUTDOOR LOOP *(15% Methanol)*						ELECTRICAL		INDOOR LOOP *(Water)*						
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**
25	15	14	22	-3.4	23,400	16.6	3,734	104	116	14	109	5.1	**35,700**	**2.80**
30	20	14	26	-3.8	26,200	17.1	3,831		117	14	110	5.5	**38,800**	**2.97**
35	25	14	31	-4.3	29,300	17.6	3,922		117	14	110	6.0	**42,300**	**3.16**
40	29	14	35	-4.8	32,700	18.0	4,019		118	14	111	6.6	**46,000**	**3.35**
45	34	14	40	-5.3	36,400	18.5	4,110		118	14	111	7.2	**50,000**	**3.57**
50	39	14	44	-5.9	40,200	19.0	4,206		119	14	112	7.8	**54,200**	**3.78**
55	43	14	49	-6.5	44,400	19.4	4,301		120	14	112	8.4	**58,700**	**4.00**
60	48	14	53	-7.2	48,900	19.9	4,390		120	14	113	9.1	**63,500**	**4.24**
65	52	14	57	-7.9	53,600	20.3	4,482		121	14	114	9.8	**68,600**	**4.49**
70	57	14	61	-8.7	58,800	20.7	4,567		121	14	115	10.6	**74,100**	**4.76**
25	16	14	22	-3.1	21,300	18.6	4,192	115.0	126	14	120	5.0	**35,200**	**2.46**
30	21	14	27	-3.5	24,100	19.0	4,261	114.5	126	14		5.5	**38,200**	**2.63**
35	25	14	31	-3.9	27,000	19.4	4,333	114.1	126	14		5.9	**41,400**	**2.80**
40	30	14	36	-4.4	30,200	19.7	4,401	113.6	126	14		6.4	**44,800**	**2.98**
45	35	14	40	-4.9	33,700	20.1	4,473	113.0	126	14		7.0	**48,600**	**3.18**
50	39	14	45	-5.5	37,500	20.4	4,539	112.4	126	14		7.6	**52,600**	**3.40**
55	44	14	49	-6.1	41,500	20.7	4,603	111.8	127	14		8.2	**56,900**	**3.62**
60	48	14	53	-6.7	45,900	21.1	4,671	111.2	127	14		8.8	**61,500**	**3.86**
65	53	14	58	-7.4	50,600	21.4	4,731	110.4	127	14		9.6	**66,400**	**4.11**
70	58	14	62	-8.2	55,500	21.7	4,794	109.7	127	14		10.3	**71,500**	**4.37**

COOLING

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**
50	71	14	59	9.0	**61,400**	10.3	2,254	54	38	14	46	-7.8	54,100	**24.0**
55	76	14	64	8.9	**60,800**	10.9	2,424		38	14	46	-7.6	52,900	**21.8**
60	81	14	69	8.9	**60,300**	11.6	2,596		39	14	46	-7.4	51,800	**20.0**
65	86	14	74	8.8	**59,600**	12.3	2,766		39	14	46	-7.3	50,600	**18.3**
70	91	14	79	8.7	**59,000**	13.1	2,944		40	14	47	-7.1	49,400	**16.8**
75	96	14	84	8.6	**58,400**	13.9	3,126		40	14	47	-6.9	48,200	**15.4**
80	101	14	89	8.6	**57,900**	14.8	3,320		41	14	47	-6.7	47,000	**14.2**
85	106	14	94	8.5	**57,300**	15.7	3,520		41	14	47	-6.6	45,700	**13.0**
90	111	14	98	8.4	**56,600**	16.7	3,738		41	14	47	-6.4	44,300	**11.9**
95	116	14	103	8.3	**56,100**	17.7	3,967		42	14	47	-6.2	43,000	**10.8**

Performance Tables (METRIC UNITS)

W-65-HACW-X-1T *R454b, 60 Hz, YAS51K1E-PFV*

METRIC

HEATING

OUTDOOR LOOP *(15% Methanol)*						ELECTRICAL		INDOOR LOOP *(Water)*						
ELT (°C)	Evap. Temp.	Flow (L/s)	LLT (°C)	Delta T (°C)	Heat Abs. (kW)	Compressor Current (A)	Input Power (W)	EWT (°C)	Cond. Temp.	Flow (L/s)	LWT (°C)	Delta T (°C)	**Heating (kW)**	**COP_H**
-3.9	-9.3	0.88	-5.8	-1.9	6.9	16.6	3,734	40	46.8	0.88	42.8	2.8	**10.5**	**2.80**
-1.1	-6.7	0.88	-3.2	-2.1	7.7	17.1	3,831		47.1	0.88	43.1	3.1	**11.4**	**2.97**
1.7	-4.1	0.88	-0.7	-2.4	8.6	17.6	3,922		47.4	0.88	43.3	3.3	**12.4**	**3.16**
4.4	-1.6	0.88	1.7	-2.7	9.6	18.0	4,019		47.7	0.88	43.7	3.7	**13.5**	**3.35**
7.2	1.1	0.88	4.3	-2.9	10.7	18.5	4,110		48.0	0.88	44.0	4.0	**14.7**	**3.57**
10.0	3.6	0.88	6.7	-3.3	11.8	19.0	4,206		48.3	0.88	44.3	4.3	**15.9**	**3.78**
12.8	6.2	0.88	9.2	-3.6	13.0	19.4	4,301		48.7	0.88	44.7	4.7	**17.2**	**4.00**
15.6	8.8	0.88	11.6	-4.0	14.3	19.9	4,390		48.9	0.88	45.1	5.1	**18.6**	**4.24**
18.3	11.3	0.88	13.9	-4.4	15.7	20.3	4,482		49.3	0.88	45.4	5.4	**20.1**	**4.49**
21.1	13.9	0.88	16.3	-4.8	17.2	20.7	4,567		49.6	0.88	45.9	5.9	**21.7**	**4.76**
-3.9	-8.9	0.88	-5.6	-1.7	6.2	18.6	4,192	46.1	52.1	0.88	49	2.8	**10.3**	**2.46**
-1.1	-6.3	0.88	-3.0	-1.9	7.1	19.0	4,261	45.8	52.1	0.88		3.1	**11.2**	**2.63**
1.7	-3.7	0.88	-0.5	-2.2	7.9	19.4	4,333	45.6	52.2	0.88		3.3	**12.1**	**2.80**
4.4	-1.2	0.88	2.0	-2.4	8.9	19.7	4,401	45.3	52.3	0.88		3.6	**13.1**	**2.98**
7.2	1.4	0.88	4.5	-2.7	9.9	20.1	4,473	45.0	52.4	0.88		3.9	**14.2**	**3.18**
10.0	3.9	0.88	6.9	-3.1	11.0	20.4	4,539	44.7	52.4	0.88		4.2	**15.4**	**3.40**
12.8	6.5	0.88	9.4	-3.4	12.2	20.7	4,603	44.3	52.5	0.88		4.6	**16.7**	**3.62**
15.6	9.1	0.88	11.9	-3.7	13.5	21.1	4,671	44.0	52.6	0.88		4.9	**18.0**	**3.86**
18.3	11.6	0.88	14.2	-4.1	14.8	21.4	4,731	43.6	52.7	0.88		5.3	**19.5**	**4.11**
21.1	14.2	0.88	16.5	-4.6	16.3	21.7	4,794	43.2	52.8	0.88		5.7	**21.0**	**4.37**

COOLING

ELT (°C)	Cond. Temp.	Flow (L/s)	LLT (°C)	Delta T (°C)	Heat Rej. (kW)	Compressor Current (A)	Input Power (W)	EWT (°C)	Evap. Temp.	Flow (L/s)	LWT (°C)	Delta T (°C)	**Cooling (kW)**	**COP_C**
10.0	21.8	0.88	15.0	5.0	**18.00**	10.3	2,254	12	3.2	0.88	7.7	-4.3	15.90	**7.03**
12.8	24.5	0.88	17.7	4.9	**17.80**	10.9	2,424		3.4	0.88	7.8	-4.2	15.50	**6.39**
15.6	27.3	0.88	20.5	4.9	**17.70**	11.6	2,596		3.7	0.88	7.9	-4.1	15.20	**5.86**
18.3	30.0	0.88	23.2	4.9	**17.50**	12.3	2,766		3.9	0.88	7.9	-4.1	14.80	**5.36**
21.1	32.8	0.88	25.9	4.8	**17.30**	13.1	2,944		4.2	0.88	8.1	-3.9	14.50	**4.92**
23.9	35.5	0.88	28.7	4.8	**17.10**	13.9	3,126		4.4	0.88	8.2	-3.8	14.10	**4.51**
26.7	38.3	0.88	31.5	4.8	**17.00**	14.8	3,320		4.7	0.88	8.3	-3.7	13.80	**4.16**
29.4	41.0	0.88	34.1	4.7	**16.80**	15.7	3,520		5.0	0.88	8.3	-3.7	13.40	**3.81**
32.2	43.8	0.88	36.9	4.7	**16.60**	16.7	3,738		5.2	0.88	8.4	-3.6	13.00	**3.49**
35.0	46.5	0.88	39.6	4.6	**16.40**	17.7	3,967		5.5	0.88	8.6	-3.4	12.60	**3.17**

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.

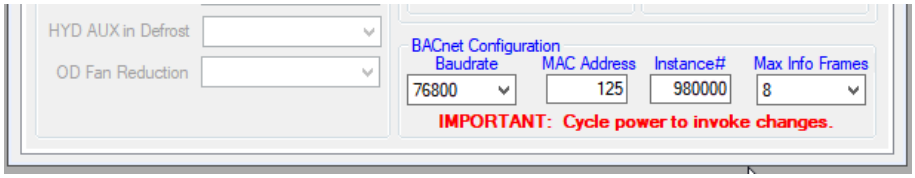
The connector on the control board is a three wire removable screw connector. The signals are as follows:
A: Communications line (+) (right pin)
B: Communications line (-) (middle pin)
C: Ground connection (left pin)

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.

Refer to *Application, Installation, & Service Manual* for BACnet objects (read and write).

Engineering Guide Specifications

General

The reversing water-to-water heat pump shall be a single packaged reverse-cycle heating/cooling unit, with desuperheating circuit for domestic hot water heating. The unit shall be listed by a nationally recognized safety-testing laboratory (NRTL), such as TUV, QPS, ETL, UL, or CSA. 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 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" page of 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). 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-dryer, sight glass, and suction accumulator.

Refrigerant used shall have a global warming potential (GWP) of less than 500. A refrigerant leak detector shall be factory installed.

Compressors shall be supplied with isolation consisting of rubber vibration isolators between the compressor and mounting plate, and rubber vibration isolators between the mounting plate and cabinet. Compressor motors shall have internal 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'.

The unit shall be equipped with a double wall desuperheating heat exchanger, to heat domestic hot water with a small percentage of the unit's capacity while operating in space heating or cooling modes. A bronze/SS head ECM circ pump and a temperature control to turn it off at 140°F / 60°C shall be built in.

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" nominal female National Pipe Thread (NPT). Domestic hot water (desuperheater) water connectors shall be ½" 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.

Desuperheater connections for domestic hot water shall be 1/2" NPT, 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 and potable water safety.

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. A Setpoint Control routine to control buffer tank temperature, including an indoor loop circulator control algorithm that allows operation without an external water temperature sensor or aquastat.
2. 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.
3. Random compressor start delay of 0-120 seconds on unit power up to facilitate starting multiple units after a power failure.
4. 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.
5. Automatic intelligent reset: after a trip, unit shall automatically restart when short cycle delay expires if the fault has cleared. Should a fault reoccur 2 times sequentially then permanent lockout shall occur, requiring cycling of the power to the unit in order to reset.
6. Manual reset high pressure in case of electronic board failure.
7. The low pressure shall not be monitored for the first 90 seconds after a compressor start to prevent nuisance safety trips.
8. 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.
9. Externally mounted 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.
10. BACnet connectivity for control by building automation system, and providing alarm feedback.
11. Automatic data logging with onboard data storage, retrievable through PC software application.

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-Series

RESIDENTIAL 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 RESIDENTIAL WARRANTY - PARTS
MG warrants its Residential 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 five (5) years 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 ten (10) years from the Warranty Inception Date (as defined below).
(4) Other accessories and parts built or sold by MG, when installed and purchased with MG Units, for five (5) years from the date of shipment from MG.
(5) 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 six (6) months 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 Residential 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 RESIDENTIAL WARRANTY - LABOUR
This Limited Express Residential Labour Warranty shall cover the **labour** incurred by MG authorized service personnel in connection with the installation of a new or repaired warranty part that is covered by this Limited Express Residential Warranty only to the extent specifically set forth in the current **labour** allowance schedule "A" provided by MG's Warranty Department and only as follows:
(1) MG Units for two (2) years from the Warranty Inception Date.
(2) Thermostats, auxiliary electric heaters and geothermal pump modules built or sold by MG, when installed with MG Units, for two (2) years from the Warranty Inception Date.
(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 five (5) years from the Warranty Inception Date.

Labour costs are not covered by this Limited Express Residential Warranty to the extent they **exceed** the amount allowed under said allowance schedule, they are not specifically provided for in said allowance schedule, they are not the result of work performed by MG authorized service personnel, they are incurred in connection with a part not covered by this Limited Express Residential Warranty, or they are incurred more than the time periods set forth in this paragraph after the Warranty Inception Date.

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, maintenance, repair, wiring or voltage conditions.
(7) Products subjected to accident, misuse, negligence, abuse, fire, flood, lightning, unauthorized alteration, misapplication, contaminated or corrosive liquid or air supply, operation at abnormal air or liquid temperatures or flow rates, or opening of the refrigerant circuit by unqualified personnel.
(8) Mold, fungus or bacteria damage
(9) Corrosion or abrasion of the product.
(10) Products supplied by others.
(11) Products which have been operated in a manner contrary to MG's printed instructions.
(12) Products which have insufficient performance as a result of improper system design or improper application, installation, or use of MG's products.
(13) Electricity or fuel, or any increases or unrealized savings in same, for any reason whatsoever.

Except for the limited **labour** allowance coverage set forth above, 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 Residential Warranty.
(2) The costs of **labour**, refrigerant, materials or service incurred in diagnosis and removal of the 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 not covered by MG's Limited Express Residential Warranty.
(4) The costs of normal maintenance.

This Limited Express Residential Warranty applies to MG Residential Class products manufactured on or after February 15, 2010. 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 RECIEVED BY MG LIMITED WITHIN 90 DAYS OF START UP.

Limitation: This Limited Express Residential 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 Residential Warranty.

LIMITATION OF REMEDIES
In the event of a breach of the Limited Express Residential 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.