Engineering Specification / Submittal

W-140-H-X-*S-P* *(Non-reversing)*
W-140-HAC-X-*S-PP* *(Reversing)*

Commercial Water to Water Heat Pump / Chiller
Single Compressor, R454b, 60 Hz
Heating/Cooling or Dedicated Domestic Hot Water Application
Nominal Size 11.5 Ton

Maritime Geothermal Ltd.
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002774SPC-02

A2L refrigerant: mildly flammable.

Read ***Application, Installation, & 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—140—H—X—5S—PD—xx

Series:
W = liquid to water (hydronic)
WH = high temperature liquid to water

Nominal Size:
120 = 10 ton
140 = 11.5 ton
180 = 15 ton
235 = 20 ton

Functions:
H = heating (no reversing valve)
HAC = heating/cooling (reversing valve)

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

Revision:
01, 02 etc.

Indoor Loop Exchanger:
P = single wall brazed plate
D = double wall brazed plate for DHW

Outdoor Loop Exchanger:
P = brazed plate

Compressor Type:
S = single stage scroll

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

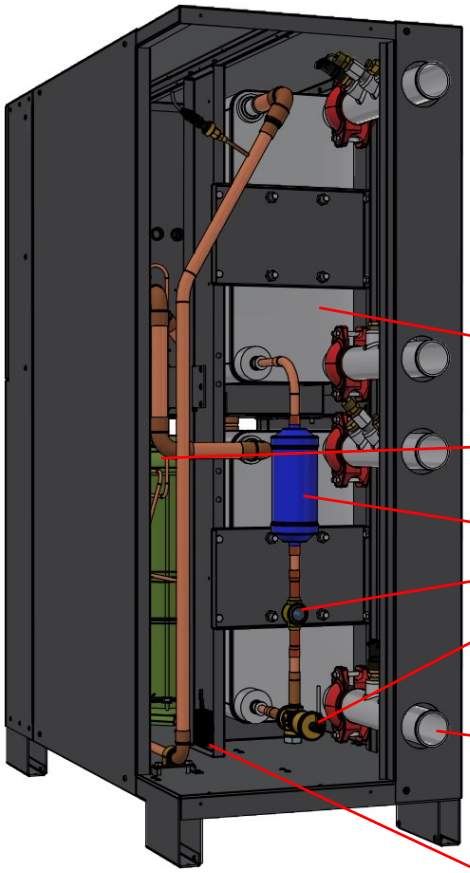
APPLICATION/AVAILABILITY TABLE

MODEL	FUNCTION	REFRIGERANT	VOLTAGE	COMPRESSOR	OUTDOOR COIL	INDOOR COIL	REVISIONS				
W-140	H	X	2 4 5	S	P	P D	03				
	HAC	X	2 4 5	S	P	P	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.

Features



⇒ Suitable for **space heating/cooling, heat recovery**, or **ice making/arena applications**

⇒ **Single compressor** design allows double wall condenser option for direct heating of **domestic hot water (DHW)**

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

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

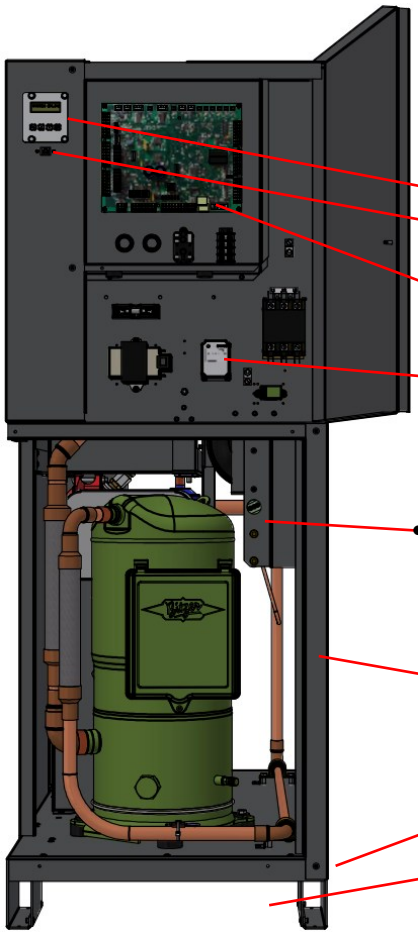
Refrigeration Circuit

- 316SS brazed plate heat exchangers, insulated
- optional double wall condenser for direct heating of domestic hot water ("-H" non-reversing units only)
- Bitzer advanced scroll compressor w/crankcase heater & suction accumulator
- high and low pressure & suction temperature sensors
- solid core filter-dryer
- sight glass
- Electronic Expansion Valve (EEV)
- optional reversing valve

Loop Connections

- 2" 316SS water lines with Victaulic connections, insulated
- Flow switch is standard for outdoor & indoor loops
- temperature sensor and P/T port on each water line

- R454b refrigerant leak detector



Electrical & Control

- 2 x 16 LCD display for control and data access
- USB port for complete data access using laptop computer and provided software; including real-time charting, data logging, and diagnostic functionality with manual override operation
- advanced control board with BACnet MS/TP interface for remote control and data access including all sensor data & alarm conditions
- 3-phase protection
- dry contacts for external pump control

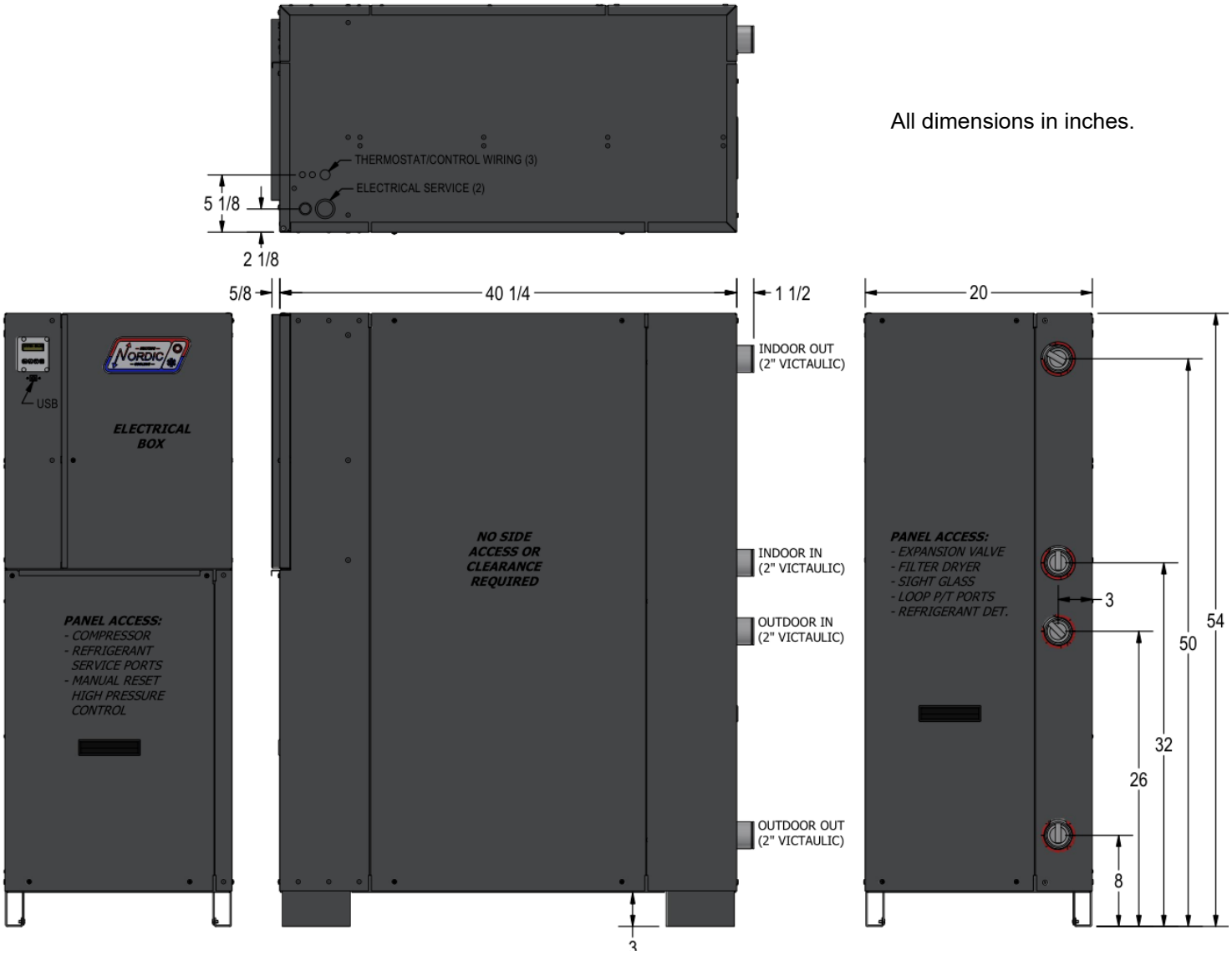
- **refrigerant service ports** & manual **reset high pressure control** now at electrical box end of unit for ease of access

Frame & Enclosure

- heavy duty cabinet with 5 removable access panels, constructed of 16ga satin galvanized steel, with powder coat finish and 1" insulation
- only end access is required, allowing multiple units to be installed side by side with no side clearance using horizontal headers
- frame design allows unit to be picked up with forklift from either side or either end
- height clearance accommodates pallet jack

Dimensions

All dimensions in inches.



RECOMMENDED FRONT CLEARANCE:
3 FT

NO SIDE CLEARANCE REQUIRED

RECOMMENDED BACK CLEARANCE:
3 FT + HEADERS

Single wall condenser option ("**-PP**") for non-DHW applications shown.

For double wall direct-DHW heating models ("**-PD**"), INDOOOR IN/OUT connections shown above become DHW connections.

Specifications

Electrical Specifications (R454b)										
MODEL	Nomenclature Identifier	Power Supply			Compressors (each)		FLA	MCA	Maximum Fuse/Breaker	Minimum Wire Size
		V-ø-Hz	MIN	MAX	RLA	LRA	Amps	Amps	Amps	ga
W-140	2	208-3-60	187	229	44.2	252	44.7	55.8	100	#3-3
	4	460-3-60	414	506	22.6	137	23.1	28.8	50	#8-3
	5	575-3-60	518	632	19.2	103	19.7	24.5	40	#8-3

SCCR = 50kA

A2L

Refrigerant Charge				
MODEL	TYPE	lb	*kg*	OIL
W-140	R454b	11.5	*5.2*	PVE-BVC32

- Note that R454b charge per refrigeration circuit is below '***m2***' as defined in the UL/CSA 60335-2-40 standard
- **Refrigerant charge is subject to slight revision** but always below ***m2***; actual charge is indicated on the unit nameplate
- Oil capacity is marked on the compressor label

Shipping Information				
MODEL	WEIGHT lb. (kg)	DIMENSIONS in (cm)		
		L	W	H
W-140	675 (307)	60 (152)	30 (76)	60 (152)

Standard Capacity Ratings - Ground Loop Heating* 60Hz						
EWT 104°F (40°C)					ELT 32°F (0°C)	
MODEL	Liquid Flow (Outdoor & Indoor)		Input Energy	Capacity		COP_H
	gpm	*L/s*	Watts	Btu/hr	*kW*	W/W
W-140	34	*2.1*	8,980	**104,600**	***31***	**3.41**
* 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)		Input Energy	Capacity		COP_H
	gpm	*L/s*	Watts	Btu/hr	*kW*	W/W
W-140	34	*2.1*	9,284	**143,700**	***42***	**4.54**

Standard Capacity Ratings - Ground Loop Cooling* 60Hz							
EWT 53.6°F (12°C)						ELT 77°F (25°C)	
MODEL	Liquid Flow (Outdoor & Indoor)		Input Energy	Evap. Capacity		COP_C	EER
	gpm	*L/s*	Watts	Btu/hr	*kW*	W/W	Btu/hr/W
W-140	34	*2.1*	8,225	**125,800**	***37***	**4.48**	**15.3**
* 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)		Input Energy	Evap. Capacity		COP_C	EER
	gpm	*L/s*	Watts	Btu/hr	*kW*	W/W	Btu/hr/W
W-140	34	*2.1*	6,324	**134,700**	***39***	**6.24**	**21.3**

Specifications

Recommended Flow Rates						
MODEL	OUTDOOR LOOP		INDOOR LOOP (MAX. 130°F)		INDOOR LOOP (DHW to 140°F)	
	gpm(US)	*L/s*	gpm(US)	*L/s*	gpm(US)	*L/s*
W-140	34	*2.1*	34	*2.1*	20	*1.3*

Heat Pump Holdup Volumes						
MODEL	OUTDOOR LOOP		INDOOR LOOP (SINGLE WALL '–PP')		INDOOR LOOP (DOUBLE WALL '–PD')	
	US gal	*L*	US gal	*L*	US gal	*L*
W-140	2.29	*8.66*	2.29	*8.66*	2.67	*10.1*

W-SERIES 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*	
		Maximum LLT/LWT	140	*60*	Domestic hot water (DHW) heating with double wall condenser option and reduced flow rate.
	COOLING (reversing HAC units only, indoor is cold loop)	Minimum LWT	40	*4*	Indoor loop with water only (no antifreeze).
		Minimum LLT	-->	-->	Indoor loop with antifreeze: depends on antifreeze type & %
		Maximum ELT	80	*27*	0-10VDC modulating water valve required on indoor loop above this temperature, or manual flow reduction at startup
Outdoor Loop	**HEATING** (outdoor is cold loop)	Minimum LWT	38	*3*	For water loops without antifreeze, e.g. open loop systems
		Minimum LLT	-->	-->	Ground loop system: depends on antifreeze type and % settings.
		Maximum ELT/EWT	80	*27*	0-10VDC modulating water valve required on outdoor loop above this temperature to limit suction pressure
	COOLING (reversing HAC units only, outdoor is hot loop)	Minimum ELT/EWT	50	*10*	0-10VDC modulating water valve required on outdoor loop at temperatures < 80°F (27°C) to keep head pressure up
		Maximum LLT/LWT	130	*54*	

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.

Specifications

Pressure Drop Data
(US UNITS)

		OUTDOOR LOOP & INDOOR LOOP w/ SINGLE WALL OPTION					*INDOOR LOOP w/ DOUBLE WALL OPTION*	
		water 130°F	**water 104°F**	**water 50°F**	**15% methanol 32°F**	**35% prop. glycol 32°F**	**DHW 140°F**	**DHW 50°F**
	USgpm	psi	psi	psi	psi	psi	psi	psi
W-140	**20**	0.7	0.7	0.7	0.9	1.1	**0.8**	**0.8**
	22	0.8	0.8	0.8	1.0	1.3	0.9	0.9
	24	0.9	0.9	1.0	1.1	1.5	1.0	1.1
	26	1.1	1.1	1.1	1.3	1.7	1.2	1.3
	28	1.2	1.2	1.3	1.5	1.9	1.4	1.5
	30	1.4	1.4	1.5	1.7	2.2	1.6	1.7
	32	1.6	1.6	1.7	1.9	2.5	1.8	1.9
	34	**1.8**	**1.8**	**1.9**	**2.1**	**2.7**	2.0	2.1
	36	2.0	2.0	2.1	2.3	3.0	2.2	2.4

METRIC

Pressure Drop Data
(METRIC UNITS)

		OUTDOOR LOOP & INDOOR LOOP w/ SINGLE WALL OPTION					*INDOOR LOOP w/ DOUBLE WALL OPTION*	
		water 130°F	**water 104°F**	**water 50°F**	**15% methanol 32°F**	**35% prop. glycol 32°F**	**DHW 140°F**	**DHW 50°F**
	L/s	kPa	kPa	kPa	kPa	kPa	kPa	kPa
W-140	**1.3**	5	5	5	6	8	**5**	**5**
	1.4	5	5	6	7	9	6	6
	1.5	6	6	7	8	10	7	8
	1.6	7	7	8	9	12	8	9
	1.8	8	9	9	10	13	9	10
	1.9	10	10	10	12	15	11	12
	2.0	11	11	12	13	17	12	13
	2.1	**12**	**12**	**13**	**15**	**19**	14	15
	2.3	14	14	14	16	21	15	16

Performance Tables - W-Series (US UNITS)

W-140-H**-X-*S-P*

R454b, 60 Hz, GSD60137VL (460-3-60)

*Compressor current is for 460-3-60.
Multiply by 2.2 for 208-3-60, by 0.8 for 575-3-60.

	EVAPORATOR LOOP *(35% Propylene Glycol)*						ELECTRICAL		CONDENSER 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**
HEATING	25	15	34	21	-4.0	62,400	12.6	8,893	104	114	34	110	5.5	**92,300**	**3.04**
	30	19	34	26	-4.5	70,800	12.7	8,951		114	34	110	6.0	**100,900**	**3.30**
	35	24	34	30	-5.1	80,000	12.8	9,020		115	34	111	6.5	**110,300**	**3.58**
	40	29	34	34	-5.7	89,900	12.9	9,097		116	34	111	7.1	**120,500**	**3.88**
	45	33	34	39	-6.4	100,700	13.0	9,176		116	34	112	7.8	**131,600**	**4.20**
	50	38	34	43	-7.1	112,400	13.1	9,284		117	34	113	8.5	**143,700**	**4.54**
	55	43	34	47	-7.9	124,800	13.3	9,413		118	34	113	9.3	**156,500**	**4.87**
	60	47	34	51	-8.7	138,600	13.5	9,563		118	34	114	10.1	**170,900**	**5.24**
	65	52	34	55	-9.7	153,400	13.7	9,758		119	34	115	11.0	**186,300**	**5.60**
	70	57	34	59	-10.6	169,300	14.0	9,992		120	34	116	12.0	**203,000**	**5.95**
	25	15	34	21	-3.6	56,800	13.7	9,805	115	124	34	120	5.3	**89,800**	**2.68**
	30	20	34	26	-4.1	64,900	13.8	9,882	114	124	34		5.8	**98,200**	**2.91**
	35	24	34	30	-4.7	73,900	13.9	9,950	114	124	34		6.4	**107,400**	**3.16**
	40	29	34	35	-5.3	83,700	14.1	10,039	113	124	34		7.0	**117,500**	**3.43**
	45	34	34	39	-6.0	94,400	14.2	10,130	112	125	34		7.6	**128,500**	**3.72**
	50	38	34	43	-6.7	105,900	14.3	10,253	112	125	34		8.3	**140,500**	**4.02**
	55	43	34	48	-7.5	118,500	14.5	10,390	111	125	34		9.1	**153,600**	**4.33**
	60	48	34	52	-8.3	132,100	14.8	10,571	110	125	34		10.0	**167,800**	**4.65**
	65	53	34	56	-9.3	147,000	15.0	10,778	109	126	34		10.9	**183,400**	**4.99**
	70	57	34	60	-10.2	162,900	15.4	11,040	108	126	34		11.9	**200,200**	**5.31**
DHW	25	12	34	21	-3.6	56,700	17.9	12,899	130	138	**20**	**140 (DHW)**	10.2	**100,300**	**2.28**
	30	17	34	26	-4.0	63,700	17.5	12,616	129	138	**20**		10.8	**106,300**	**2.47**
	35	22	34	31	-4.5	71,100	17.1	12,328	129	138	**20**		11.4	**112,700**	**2.68**
	40	27	34	35	-5.0	78,800	16.7	12,058	128	138	**20**		12.1	**119,500**	**2.90**
	45	32	34	40	-5.5	87,200	16.4	11,781	127	139	**20**		12.9	**127,000**	**3.16**
	50	37	34	44	-6.1	95,900	16.0	11,519	126	139	**20**		13.7	**134,800**	**3.43**
	55	41	34	48	-6.6	105,100	15.6	11,273	126	139	**20**		14.5	**143,200**	**3.72**
	60	46	34	53	-7.3	115,200	15.3	11,054	125	139	**20**		15.5	**152,600**	**4.05**
	65	51	34	57	-7.9	125,600	15.1	10,870	124	139	**20**		16.5	**162,300**	**4.38**
	70	56	34	61	-8.6	136,900	14.8	10,706	122	140	**20**		17.6	**173,100**	**4.74**

	EVAPORATOR LOOP *(Water)*						ELECTRICAL		CONDENSER LOOP *(35% Propylene Glycol)*						
	ELT (°F)	Evap. Temp.	Flow (gpm)	LLT (°F)	Delta T (°F)	**Cooling** (Btu/hr)	Compressor Current (A)*	Input Power (W)	EWT (°F)	Cond. Temp.	Flow (gpm)	LWT (°F)	Delta T (°F)	Heat Rej. (Btu/hr)	**EER**
COOLING	54	35	34	45	-8.2	139,400	8.6	5,611	50	72	34	60	10.0	**158,100**	**24.8**
		35	34	46	-8.0	136,900	9.1	5,991	55	78	34	65	9.9	**156,900**	**22.9**
		36	34	46	-7.9	134,200	9.6	6,414	60	83	34	70	9.8	**155,600**	**20.9**
		36	34	46	-7.8	131,900	10.2	6,881	65	88	34	75	9.8	**154,900**	**19.2**
		37	34	46	-7.6	129,200	10.9	7,403	70	93	34	80	9.7	**154,000**	**17.5**
		37	34	46	-7.5	126,800	11.6	7,977	75	99	34	85	9.7	**153,600**	**15.9**
		38	34	46	-7.3	124,200	12.4	8,617	80	104	34	90	9.6	**153,200**	**14.4**
		38	34	46	-7.2	121,700	13.3	9,319	85	109	34	95	9.6	**153,100**	**13.1**
		39	34	47	-7.0	118,900	14.4	10,100	90	114	34	100	9.6	**153,000**	**11.8**
		40	34	47	-6.8	116,200	15.5	10,953	95	120	34	105	9.6	**153,200**	**10.6**

Performance Tables - W-Series (METRIC UNITS)

W-140-H**-X-*S-P*

R454b, 60 Hz, GSD60137VL (460-3-60)

*Compressor current is for 460-3-60.
Multiply by 2.2 for 208-3-60, by 0.8 for 575-3-60.

METRIC

	EVAPORATOR LOOP *(35% Propylene Glycol)*						ELECTRICAL		CONDENSER 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**
HEATING	-3.9	-9.7	2.1	-6.1	-2.2	18.3	12.6	8,893	40	45.3	2.1	43.1	3.1	**27.1**	**3.04**
	-1.1	-7.1	2.1	-3.6	-2.5	20.7	12.7	8,951		45.7	2.1	43.3	3.3	**29.6**	**3.30**
	1.7	-4.4	2.1	-1.1	-2.8	23.4	12.8	9,020		46.1	2.1	43.6	3.6	**32.3**	**3.58**
	4.4	-1.8	2.1	1.2	-3.2	26.3	12.9	9,097		46.4	2.1	43.9	3.9	**35.3**	**3.88**
	7.2	0.8	2.1	3.6	-3.6	29.5	13.0	9,176		46.8	2.1	44.3	4.3	**38.6**	**4.20**
	10.0	3.4	2.1	6.1	-3.9	32.9	13.1	9,284		47.2	2.1	44.7	4.7	**42.1**	**4.54**
	12.7	5.9	2.1	8.3	-4.4	36.6	13.3	9,413		47.6	2.1	45.2	5.2	**45.9**	**4.87**
	15.5	8.6	2.1	10.7	-4.8	40.6	13.5	9,563		47.9	2.1	45.6	5.6	**50.1**	**5.24**
	18.3	11.2	2.1	12.9	-5.4	45.0	13.7	9,758		48.3	2.1	46.1	6.1	**54.6**	**5.60**
	21.1	13.8	2.1	15.2	-5.9	49.6	14.0	9,992		48.7	2.1	46.7	6.7	**59.5**	**5.95**
	-3.9	-9.6	2.1	-5.9	-2.0	16.6	13.7	9,805	45.9	50.8	2.1	49	2.9	**26.3**	**2.68**
	-1.1	-6.9	2.1	-3.4	-2.3	19.0	13.8	9,882	45.7	51.0	2.1		3.2	**28.8**	**2.91**
	1.7	-4.3	2.1	-0.9	-2.6	21.7	13.9	9,950	45.3	51.1	2.1		3.6	**31.5**	**3.16**
	4.4	-1.7	2.1	1.5	-2.9	24.5	14.1	10,039	45.0	51.3	2.1		3.9	**34.4**	**3.43**
	7.2	0.9	2.1	3.9	-3.3	27.7	14.2	10,130	44.7	51.4	2.1		4.2	**37.7**	**3.72**
	10.0	3.6	2.1	6.3	-3.7	31.0	14.3	10,253	44.3	51.6	2.1		4.6	**41.2**	**4.02**
	12.8	6.2	2.1	8.6	-4.2	34.7	14.5	10,390	43.8	51.7	2.1		5.1	**45.0**	**4.33**
	15.6	8.8	2.1	11.0	-4.6	38.7	14.8	10,571	43.3	51.8	2.1		5.6	**49.2**	**4.65**
	18.3	11.4	2.1	13.1	-5.2	43.1	15.0	10,778	42.8	51.9	2.1		6.1	**53.8**	**4.99**
	21.1	14.0	2.1	15.4	-5.7	47.7	15.4	11,040	42.3	52.1	2.1		6.6	**58.7**	**5.31**
DHW	-3.9	-11.2	2.1	-5.9	-2.0	16.6	17.9	12,899	54.3	58.7	**1.3**	**60 (DHW)**	5.7	**29.4**	**2.28**
	-1.1	-8.5	2.1	-3.3	-2.2	18.7	17.5	12,616	54.0	58.8	**1.3**		6.0	**31.2**	**2.47**
	1.7	-5.7	2.1	-0.8	-2.5	20.8	17.1	12,328	53.7	58.9	**1.3**		6.3	**33.0**	**2.68**
	4.4	-3.0	2.1	1.6	-2.8	23.1	16.7	12,058	53.3	59.1	**1.3**		6.7	**35.0**	**2.90**
	7.2	-0.2	2.1	4.1	-3.1	25.6	16.4	11,781	52.8	59.2	**1.3**		7.2	**37.2**	**3.16**
	10.0	2.5	2.1	6.6	-3.4	28.1	16.0	11,519	52.4	59.3	**1.3**		7.6	**39.5**	**3.43**
	12.8	5.2	2.1	9.1	-3.7	30.8	15.6	11,273	51.9	59.4	**1.3**		8.1	**42.0**	**3.72**
	15.6	8.0	2.1	11.5	-4.1	33.8	15.3	11,054	51.4	59.5	**1.3**		8.6	**44.7**	**4.05**
	18.3	10.7	2.1	13.9	-4.4	36.8	15.1	10,870	50.8	59.7	**1.3**		9.2	**47.6**	**4.38**
	21.1	13.5	2.1	16.3	-4.8	40.1	14.8	10,706	50.2	59.8	**1.3**		9.8	**50.7**	**4.74**

	EVAPORATOR LOOP *(Water)*						ELECTRICAL		CONDENSER LOOP *(35% Propylene Glycol)*						
	ELT (°C)	Evap. Temp.	Flow (L/s)	LLT (°C)	Delta T (°C)	**Cooling** (kW)	Compressor Current (A)*	Input Power (W)	EWT (°C)	Cond. Temp.	Flow (L/s)	LWT (°C)	Delta T (°C)	Heat Rej. (kW)	**COP_C**
COOLING	12	1	2.1	7.4	-4.6	40.9	8.6	5,611	10.0	22	2.1	15.6	5.6	**46.3**	**7.27**
		2	2.1	7.6	-4.4	40.1	9.1	5,991	12.8	25	2.1	18.3	5.5	**46.0**	**6.71**
		2	2.1	7.6	-4.4	39.3	9.6	6,414	15.6	28	2.1	21.0	5.4	**45.6**	**6.13**
		2	2.1	7.7	-4.3	38.7	10.2	6,881	18.3	31	2.1	23.7	5.4	**45.4**	**5.63**
		3	2.1	7.8	-4.2	37.9	10.9	7,403	21.1	34	2.1	26.5	5.4	**45.1**	**5.13**
		3	2.1	7.8	-4.2	37.2	11.6	7,977	23.9	37	2.1	29.3	5.4	**45.0**	**4.66**
		3	2.1	7.9	-4.1	36.4	12.4	8,617	26.7	40	2.1	32.0	5.3	**44.9**	**4.22**
		4	2.1	8.0	-4.0	35.7	13.3	9,319	29.4	43	2.1	34.7	5.3	**44.9**	**3.84**
		4	2.1	8.1	-3.9	34.9	14.4	10,100	32.2	46	2.1	37.5	5.3	**44.8**	**3.46**
		4	2.1	8.2	-3.8	34.1	15.5	10,953	35.0	49	2.1	40.3	5.3	**44.9**	**3.11**

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.

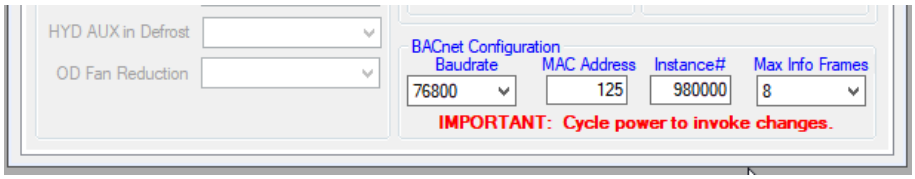
The connector on the control board is a three wire removable screw connector. The signals are as follows:
A: Communications line (+) (right pin)
B: Communications line (-) (middle pin)
C: Ground connection (left pin)

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.

For tables listing BACnet objects, refer to **Application, Installation, and Service Manual**.

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.

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

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) Heat pumps / chillers built or sold by MG for one (1) year from the Warranty Inception Date (as defined below).
(3) Compressors of above units for five (5) years 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 RECIEVED 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.