



Engineering Specification

WC-45-H-C-*D-**

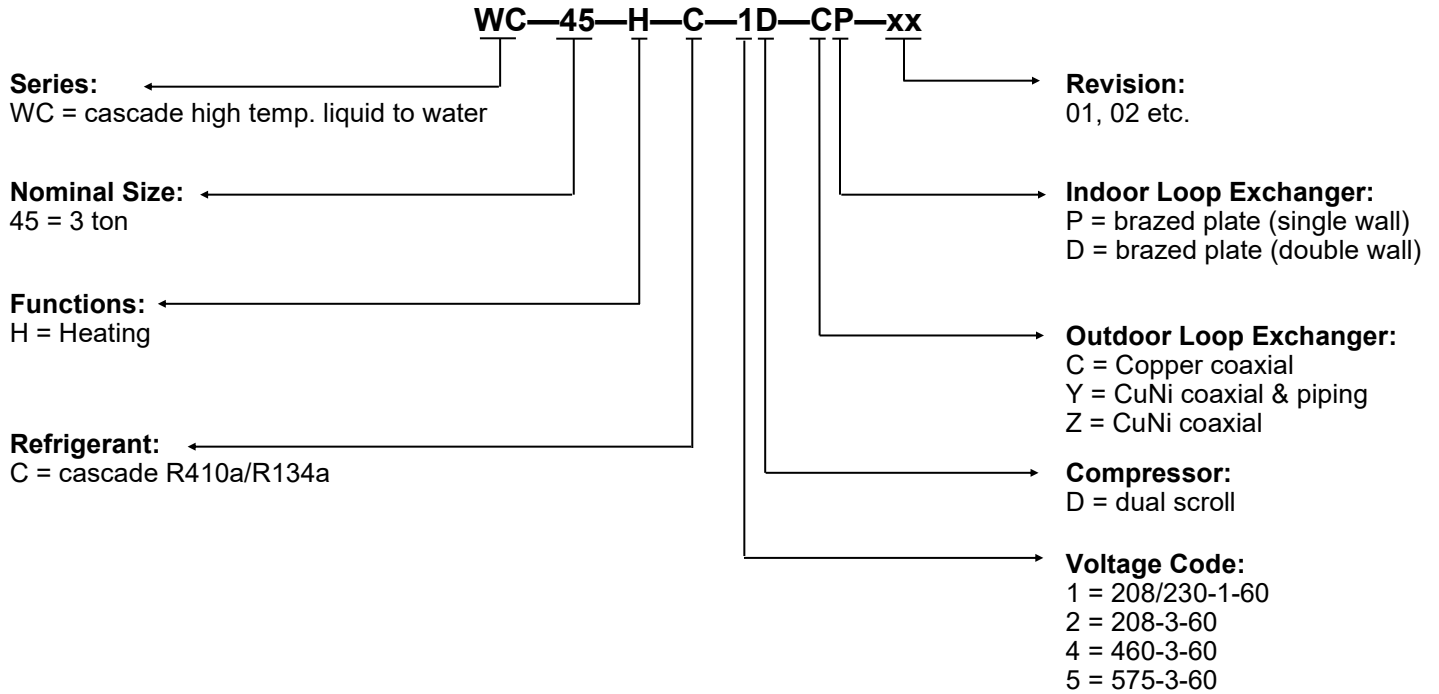
High Temperature Cascade Water to Water Heat Pump
60 Hz



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002244SPC-02

Model Nomenclature



APPLICATION TABLE										
MODEL SIZE	FUNCTION	REFRIGERANT	VOLTAGE	COMPRESSOR	OUTDOOR COIL	INDOOR COIL	REVISIONS			
WC-45	H	C	1 2 4 5	D	C Y Z	P D	04			
This manual applies only to the models and revisions listed in this table.										

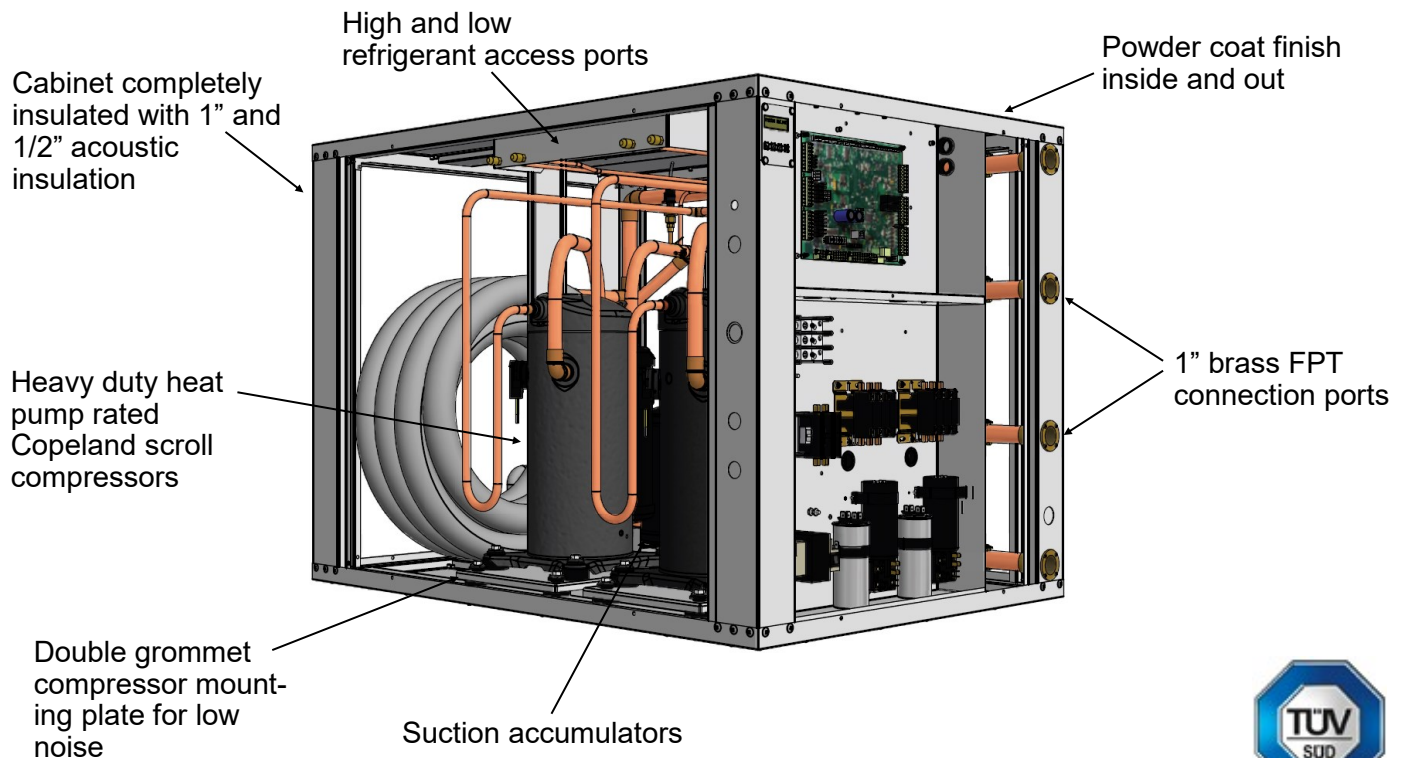
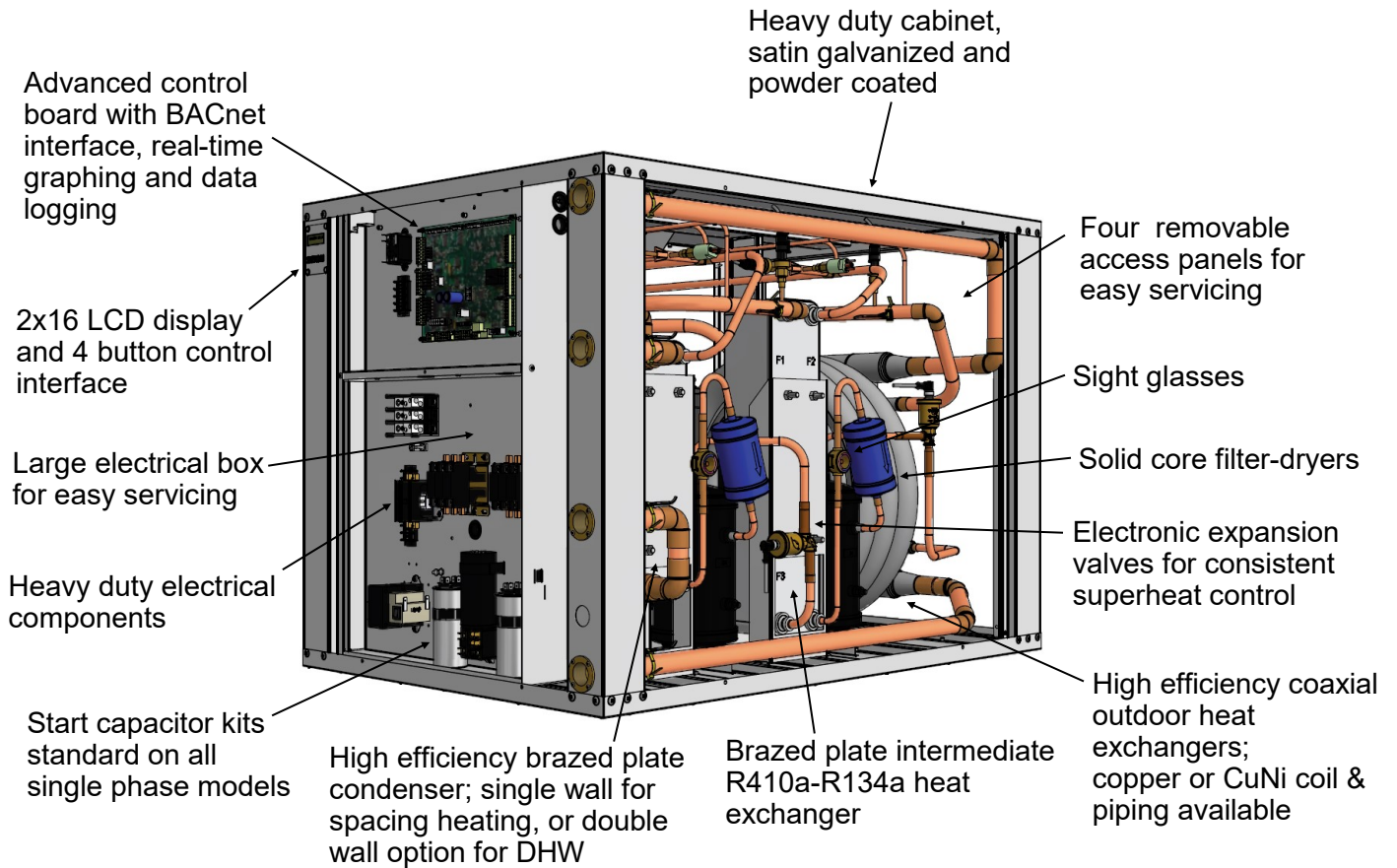
Design Features

- Two refrigerant circuits, with each doing half the temperature lift; results in a true geothermal unit that can heat water to 160° F / 71° C on the indoor loop
- Lower-temp R410a and higher-temp R134a circuits exchange heat through an intermediate brazed plate heat exchanger
- Two Copeland scroll compressors with start capacitor kits on single phase models
- Outdoor loop: coaxial heat exchanger, with CuNi option available
- Indoor loop: brazed plate condenser, with double wall option available for direct heating of domestic hot water
- 18/20ga satin galvanized cabinet with reinforcing channel stiffeners, powder coat finish
- Acoustically insulated cabinet (1" and 1/2" thick)
- Completely insulated heat exchangers and piping
- Four removable access panels
- Refrigeration service ports located inside unit (1/4" Schrader)
- Oversized electrical box for clarity and easy service
- Component layout allows easy access for service
- 1" Brass FPT fittings for Outdoor Loop and Indoor Loop connections
- Dual grommet mounting system for compressors reduces noise and vibration
- Suction line accumulators
- Liquid line filter-dryers
- Liquid line sight glasses
- Electronic Expansion Valves (EEVs)
- Refrigerant high and low pressure sensors
- Suction line temperature sensors
- Manual reset high pressure controls
- Temperature sensors on all 4 water lines
- Control transformer with resettable breaker or fuse protection
- 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 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)
- TUV listed for electrical certification

Available Accessories

- Hydronic buffer tank with 12, 15, or 20kW of electric backup elements
- Circulator pump module with loop / unit isolation valves (230VAC) for ground loop applications
- Barbed P/T port adapters for heat pump
- Anti-vibration pad for under unit
- Compressor sound jackets
- Secure Start modules
- 1" water valve (slow closing or solenoid) & wiring harness for open loop applications
- CuNi heat exchanger option for outdoor loop
- Double wall condenser option for direct domestic hot water heating
- Outdoor temperature sensor with enclosure, for outdoor reset functionality
- Compressor current sensors

Design Features



Specifications

Electrical Specifications												
Code	Power Supply			Compressor (R410a)		Compressor (R134a)		Circulators	FLA	MCA	Max. Breaker	Min. Wire
	V-ø-Hz	MIN	MAX	RLA	LRA	RLA	LRA	Max A	Amps	Amps	Amps	ga
1	208/230-1-60	187	253	13.5	72	15.4	87	5.0	29.1	38.0	50	#8-2*
2	208-3-60	187	229	8.9	58	10.8	73	5.0	19.9	27.6	40	#8-3*
4	460-3-60	414	506	4.2	38	5.8	38	-	10.2	11.7	15	#14-3
5	575-3-60	518	632	3.5	24	4.2	28	-	7.9	9.0	15	#14-3

*one additional conductor required if connecting 115VAC circulators to unit.

Refrigerant Charge				
MODEL	R410a		R134a	
	lb.	kg	lb.	kg
WC-45	4.0	1.8	4.0	1.8

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

Shipping Information				
MODEL	WEIGHT lb. (kg)	DIMENSIONS in (cm)		
		L	W	H
WC-45	410 (186)	46 (117)	36 (91)	35 (89)

WC-Series Operating Temperature Limits					
Loop	Mode	Parameter	(°F)	(°C)	Note
Indoor	Heating	Minimum EWT	70 - 110	21 - 43	Use formula (Outdoor ELT + 20°F) or (Outdoor ELT + 11°C).
	Heating	Maximum LWT	160	71	
Outdoor (Water)	Heating	Minimum ELT	39	4	
	Heating	Maximum ELT	70	21	Reduce flow above this temp. to limit refrigerant suction pressure.
Outdoor (Antifreeze)	Heating	Minimum ELT	23	-5	Adequate antifreeze protection required.
	Heating	Maximum ELT	70	21	Reduce flow above this temp. to limit refrigerant suction pressure.

Values in this table are for rated liquid flow values.
EWT - Entering Water Temp., LWT - Leaving Water Temp., ELT - Entering Liquid Temp., LLT - Leaving Liquid Temp.

Pressure Drop Data			INDOOR Single wall option (water 140°F)		INDOOR Double wall option (water 140°F)		OUTDOOR (water 50°F)		OUTDOOR (15% methanol 32°F)		OUTDOOR (35% propylene glycol 32°F)	
	gpm	L/s	psi	kPa	psi	kPa	psi	kPa	psi	kPa	psi	kPa
WC-45	6	0.38	0.8	5.3	0.8	5.5	1.7	12	2.0	14	2.6	18
	7	0.44	1.0	7.1	1.0	6.9	2.1	14	2.5	17	3.3	23
	8	0.50	1.3	9.1	1.3	9.0	2.8	19	3.0	21	4.0	27
	9	0.57	1.7	12	1.6	11	3.5	24	3.8	26	5.0	34
	10	0.63	2.0	14	1.9	13	4.0	28	4.7	32	6.2	43
	11	0.69	2.4	17	2.3	16	4.6	32	5.5	38	7.2	50
	12	0.76	2.9	20	2.7	19	5.5	38	6.6	45	8.7	60
	13	0.82	3.3	23	3.1	21	6.2	43	7.4	51	9.7	67

Performance Tables

WC-45-H-C-*D-** 60 Hz, ZP25K6E-PFV / ZR32K5E-PFV

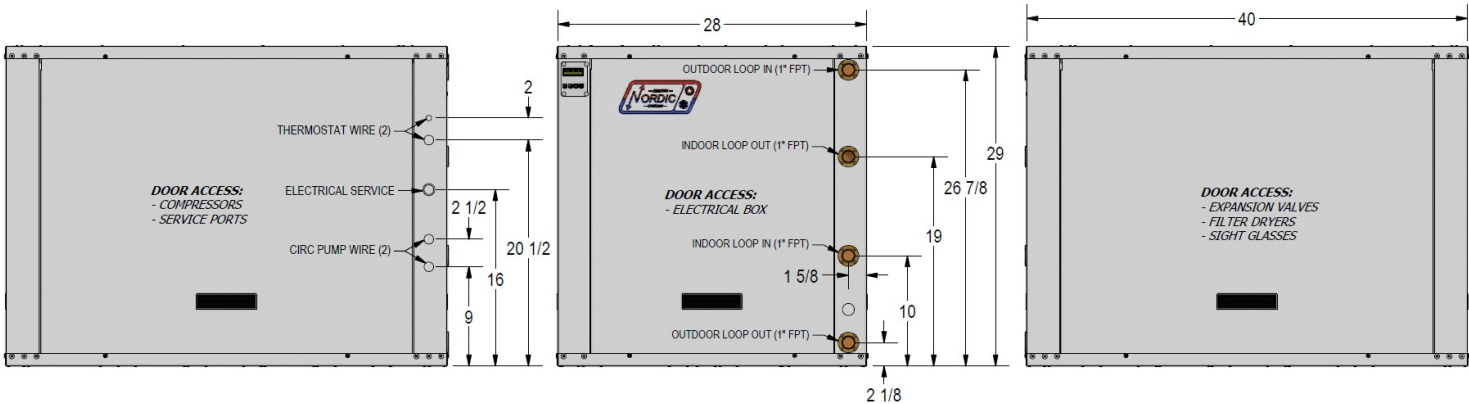
	OUTDOOR LOOP (35% Propylene Glycol)						ELECTRICAL	INDOOR LOOP (Water)						
	ELT (°F)	Evap. Temp.	Flow (gpm)	LLT (°F)	Delta T (°F)	Heat Abs. (Btu/hr)	Input Power (W)	EWT (°F)	Cond. Temp.	Flow (gpm)	LWT (°F)	Delta T (°F)	Heating (Btu/hr)	COP _H
HEATING	25	14	10	21	3.6	16,500	3,380	114	122	10	120	5.6	28,100	2.43
	30	18	10	26	3.8	17,900	3,460	114	124	10		6.0	29,700	2.52
	35	23	10	31	4.2	19,300	3,650	114	124	10		6.4	31,800	2.56
	40	27	10	36	4.5	21,100	3,850	113	126	10		6.9	34,200	2.60
	45	33	10	40	4.6	22,600	3,950	113	127	10		7.2	36,100	2.68
	50	37	10	45	4.8	23,900	3,900	113	128	10		7.5	37,200	2.80
	25	14	10	21	3.7	16,900	3,900	134	143	10	140	6.0	30,100	2.27
	30	19	10	26	3.8	17,900	3,960	134	144	10		6.4	31,400	2.32
	35	24	10	31	4.1	19,000	4,160	133	144	10		6.6	33,200	2.34
	40	28	10	36	4.4	20,300	4,390	133	145	10		7.1	35,300	2.36
	45	32	10	41	4.4	21,800	4,510	133	146	10		7.4	37,200	2.42
	50	36	10	45	4.6	23,100	4,460	132	148	10		7.8	38,300	2.52
	25	15	10	21	3.6	16,600	4,550	154	165	10	160	6.4	32,100	2.07
	30	19	10	26	3.8	17,700	4,620	153	166	10		6.8	33,400	2.12
	35	24	10	31	4.1	18,700	4,840	153	166	10		7.1	35,300	2.14
	40	29	10	36	4.3	20,100	5,090	152	167	10		7.6	37,500	2.16
	45	33	10	41	4.4	21,600	5,230	152	168	10		7.8	39,500	2.21
	50	36	10	45	4.6	23,000	5,180	152	169	10		8.2	40,700	2.30

METRIC

	OUTDOOR LOOP (35% Propylene Glycol)						ELECTRICAL	INDOOR LOOP (Water)						
	ELT (°C)	Evap. Temp.	Flow (L/s)	LLT (°C)	Delta T (°C)	Heat Abs. (W)	Input Power (W)	EWT (°C)	Cond. Temp.	Flow (L/s)	LWT (°C)	Delta T (°C)	Heating (W)	COP _H
HEATING (METRIC)	-3.9	-9.9	0.63	-5.9	2.0	4,800	3,380	45.8	50.2	0.63	49	3.1	8,200	2.43
	-1.1	-7.6	0.63	-3.2	2.1	5,200	3,460	45.6	50.8	0.63		3.3	8,700	2.52
	1.7	-5.1	0.63	-0.7	2.3	5,700	3,650	45.4	51.3	0.63		3.5	9,300	2.56
	4.4	-2.8	0.63	1.9	2.5	6,200	3,850	45.0	52.0	0.63		3.8	10,000	2.60
	7.2	-0.1	0.63	4.7	2.5	6,600	3,950	44.9	52.5	0.63		4.0	10,600	2.68
	10.0	2.5	0.63	7.4	2.6	7,000	3,900	44.7	53.2	0.63		4.2	10,900	2.80
	-3.9	-9.8	0.63	-5.9	2.0	4,900	3,900	56.7	61.6	0.63	60	3.3	8,800	2.27
	-1.1	-7.3	0.63	-3.2	2.1	5,200	3,960	56.5	62.2	0.63		3.5	9,200	2.32
	1.7	-4.6	0.63	-0.6	2.3	5,600	4,160	56.3	62.4	0.63		3.7	9,700	2.34
	4.4	-2.1	0.63	2.0	2.4	5,900	4,390	56.0	62.9	0.63		4.0	10,300	2.36
	7.2	0.2	0.63	4.8	2.4	6,400	4,510	55.9	63.1	0.63		4.1	10,900	2.42
	10.0	2.3	0.63	7.4	2.6	6,800	4,460	55.7	64.2	0.63		4.3	11,200	2.52
	-3.9	-9.7	0.63	-5.9	2.0	4,900	4,550	67.6	73.8	0.63	71	3.5	9,400	2.07
	-1.1	-7.1	0.63	-3.2	2.1	5,200	4,620	67.4	74.3	0.63		3.8	9,800	2.12
	1.7	-4.3	0.63	-0.6	2.3	5,500	4,840	67.2	74.6	0.63		3.9	10,300	2.14
	4.4	-1.6	0.63	2.0	2.4	5,900	5,090	66.9	75.1	0.63		4.2	11,000	2.16
	7.2	0.4	0.63	4.8	2.4	6,300	5,230	66.8	75.3	0.63		4.3	11,600	2.21
	10.0	2.4	0.63	7.5	2.5	6,700	5,180	66.5	76.1	0.63		4.6	11,900	2.30

Dimensions

All dimensions in inches.



LEFT SIDE:
> 24" service access
clearance required

FRONT:
> 24" service access
clearance required

RIGHT SIDE:
> 24" service access
clearance required

BACK:
no clearance required

Electrical Box Layout (208/230-1-60)

SYSTEM CONTROL DESCRIPTION

System Control by BACNet or External Control Signals		
BACNet Object	External	Activation
SYSTEM_Y1A	Y1A	Compressor

BACNet INTERFACE CONNECTIONS (MS/TP RS-485)

Use twisted pair shielded, conductor cable to connect the BACNet connections to the control board connector.
A - Communication (+)
B - Communication (-)
GND - Ground

EXTERNAL CONTROL CONNECTIONS (24VAC)

If using an external aquastat ("Signals" control method), use an 18-3 cable for these right side board connections to control compressor demand:
RA - 24VAC Hot
CA - Common (for use with RA to power aquastat)
Y1A - Compressor

A dry contact connection between R/RA and an external control connection (Y1A) will activate the external control signal input to the control board.

POWER SUPPLY CONNECTIONS

*NOTE: Neutral (N) is only required if connecting 115VAC circulators.
The heat pump itself does not require a neutral.

208/230/115VAC CONNECTIONS		
Wire	Colour	Contactor (Label)
Line 2	Red	L2
Neutral*	White	N*
Line 1	Black	L1

Connect "GND" to Gnd. Lug

CIRCULATOR CONNECTIONS (230/115VAC)

REFER TO LABEL IN UNIT FOR MAX LOAD (AMPS)
Connect 115VAC circulators to 115V
Connect 230VAC circulators to 230V

AUXILIARY HEAT CONTROL CONNECTIONS

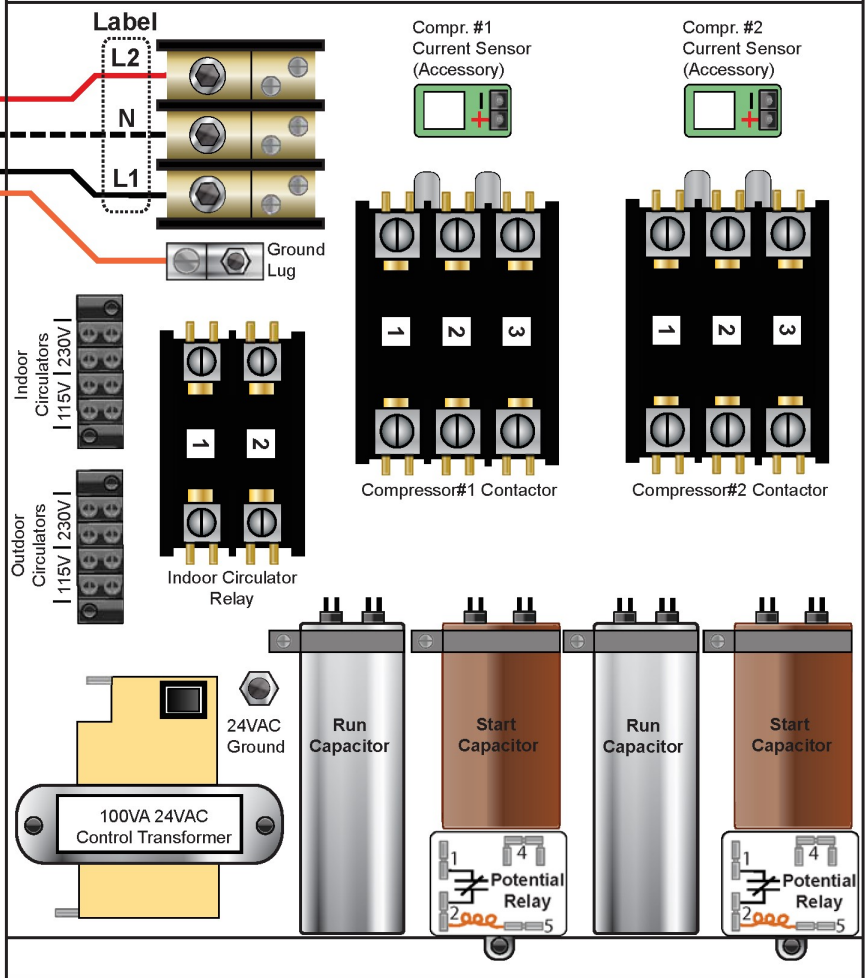
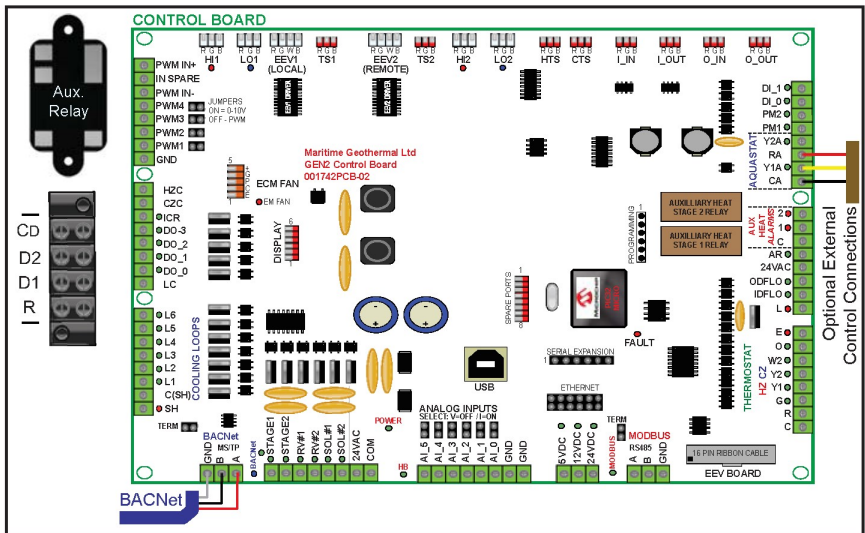
Use an 18-2 cable.
Choose one of two types of auxiliary heat connections. In either case, default is "ON".
Tank's temperature limiter must remain in place.
D2 : Dry contacts, closed during call for auxiliary heat
D1 :

Cd : To use tank element contactor that has a 24VAC coil, jumper R to D1 and connect contactor coil between D2 and Co.
D2 :
D1 :
R :

NOTE: In case of a control system short or overload, rectify the problem and press the black button on the transformer to reset the built-in breaker.

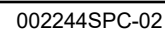
NOTE: For 208VAC move the red wire connected to the 240 terminal of the transformer to the 208 terminal.

WC-Series Electrical Box Diagram
208/230-1-60



Drawn By C. GEDDES				Date 19 JUN 2015	MARITIME GEOTHERMAL LTD. P.O. Box 2555 170 Plantation Rd. Petitcodiac, NB CANADA E4Z 6H4
Checked By C. GEDDES				Date 19 JUN 2015	
Eng. Approved By C. GEDDES				Date 19 JUN 2015	
Mfg. Approved By				Date	
Approved By				Date	Drawing Name WC--H-C-1D-- Electrical Box Diagram
Size LET				Drawing Number 001985ELB	
Drawing Rev 03				Sheet 1 / 1	

03	000297	D. RHEAULT	D. RHEAULT	07 JAN 2022
02	000256	D. RHEAULT	D. RHEAULT	01 OCT 2017
01	Initial Release	C. GEDDES	C. GEDDES	19 JUN 2015
REV	ECO#	IMPL BY	APVD BY	DATE



Electrical Box Layout (208-3-60)

SYSTEM CONTROL DESCRIPTION

System Control by BACNet or External Control Signals		
BACNet Object	External	Activation
SYSTEM_Y1A	Y1A	Compressor

BACNet INTERFACE CONNECTIONS (MS/TP RS-485)

Use twisted pair shielded, conductor cable to connect the BACNet connections to the control board connector.

A - Communication (+)
B - Communication (-)
GND - Ground

EXTERNAL CONTROL CONNECTIONS (24VAC)

If using an external aquastat ("Signals" control method), use an 18-3 cable for these right side board connections to control compressor demand:

RA - 24VAC Hot
CA - Common (for use with RA to power aquastat)
Y1A - Compressor

A dry contact connection between R/RA and an external control connection (Y1A) will activate the external control signal input to the control board.

POWER SUPPLY CONNECTIONS

*NOTE: Neutral (N) is only required if connecting 115VAC circulators. The heat pump itself does not require a neutral.

208/115VAC CONNECTIONS

Wire	Colour	Contactor (Label)
Neutral*	White	N*
Line 3	Red	L3
Line 2	Blue	L2
Line 1	Black	L1

Connect "GND" to Gnd.Lug

CIRCULATOR CONNECTIONS (230/115VAC)

REFER TO LABEL IN UNIT FOR MAX LOAD (AMPS)
Connect 115VAC circulators to 115V
Connect 230VAC circulators to 230V

AUXILIARY HEAT CONTROL CONNECTIONS

Use an 18-2 cable.
Choose one of two types of auxiliary heat connections. In either case, default is "ON".

Tank's temperature limiter must remain in place.

D2 : Dry contacts, closed during call for auxiliary heat

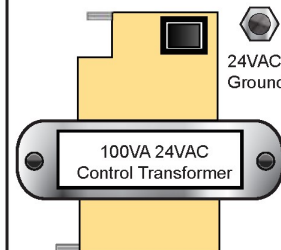
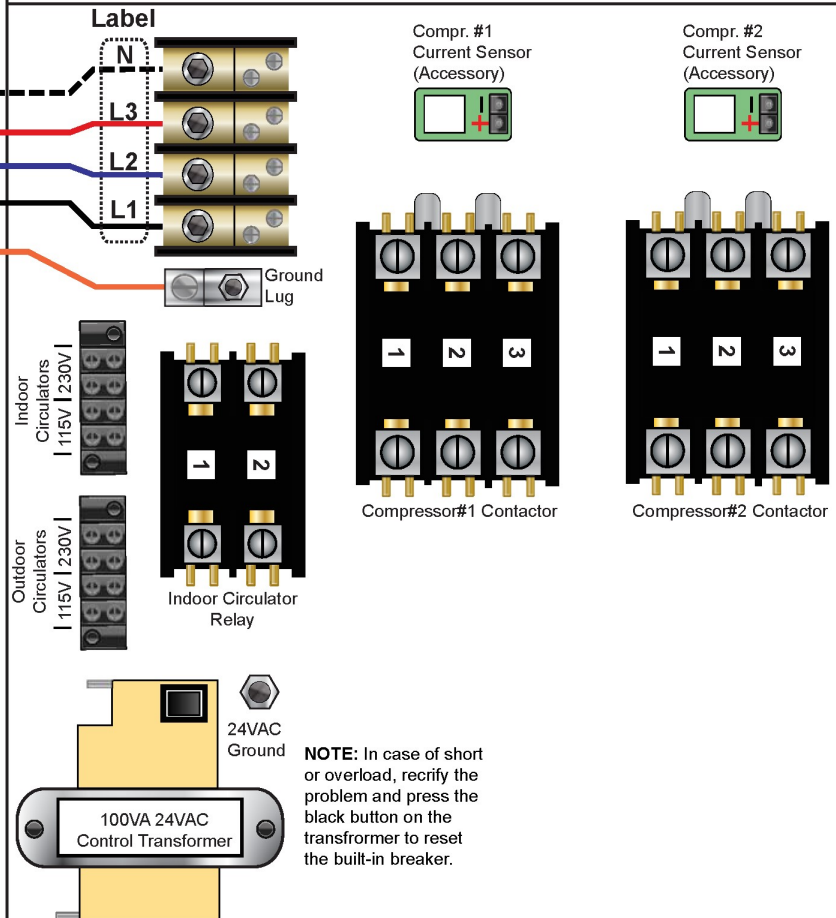
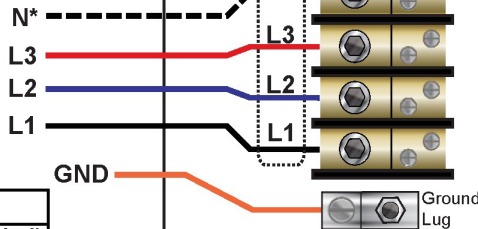
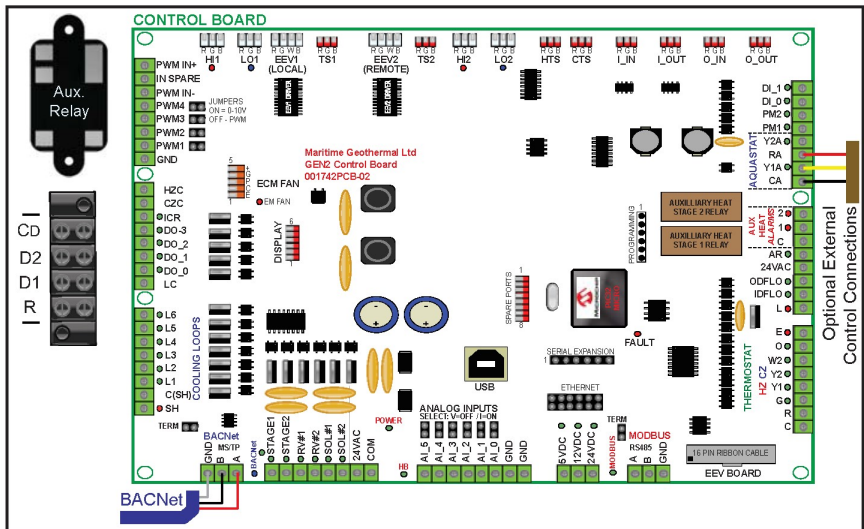
D1 : Dry contacts, closed during call for auxiliary heat

CD : To use tank element contactor that has a 24VAC coil, jumper R to D1 and connect contactor coil between D2 and Co.

R : To use tank element contactor that has a 24VAC coil, jumper R to D1 and connect contactor coil between D2 and Co.

WC-Series Electrical Box Diagram

208-3-60



NOTE: In case of short or overload, rectify the problem and press the black button on the transformer to reset the built-in breaker.

Drawn By	C. GEDDES	Date	29 JUN 2016
Checked By	C. GEDDES	Date	29 JUN 2016
Eng. Approved By	C. GEDDES	Date	29 JUN 2016
Mfg. Approved By		Date	
Approved By		Date	

MARITIME GEOTHERMAL LTD.		P.O. Box 2555 170 Plantation Rd. Petitcodiac, NB CANADA E4Z 6H4
Drawing Name		WC-**-H-C-2D-** Electrical Box Diagram
Size	Drawing Number	Drawing Rev Sheet
LET	002162ELB	03 1 / 1

WC-Series Schematic Diagram 460-3-60

Power Supply: 460VAC (L1, L2, L3) with 460VAC and 460VAC phases. Ground (GND) is connected to the system.

Compressor Connections:

- Compressor#1 (R410a):** L3 to T, L2 to T, L1 to T. (YEL or BLU) to 2.
- Compressor#2 (R134a):** L3 to T, L2 to T, L1 to T. (YEL or BLU) to 2.

Control Board (Maritime Geothermal Ltd GEN2 Control Board 001742PCB-02):

- STAGE 1 (R410a):** HIGH LOW, TS1, TS2, TS3, TS4, TS5, TS6, TS7, TS8, TS9, TS10, TS11, TS12, TS13, TS14, TS15, TS16, TS17, TS18, TS19, TS20, TS21, TS22, TS23, TS24, TS25, TS26, TS27, TS28, TS29, TS30, TS31, TS32, TS33, TS34, TS35, TS36, TS37, TS38, TS39, TS40, TS41, TS42, TS43, TS44, TS45, TS46, TS47, TS48, TS49, TS50, TS51, TS52, TS53, TS54, TS55, TS56, TS57, TS58, TS59, TS60, TS61, TS62, TS63, TS64, TS65, TS66, TS67, TS68, TS69, TS70, TS71, TS72, TS73, TS74, TS75, TS76, TS77, TS78, TS79, TS80, TS81, TS82, TS83, TS84, TS85, TS86, TS87, TS88, TS89, TS90, TS91, TS92, TS93, TS94, TS95, TS96, TS97, TS98, TS99, TS100, TS101, TS102, TS103, TS104, TS105, TS106, TS107, TS108, TS109, TS110, TS111, TS112, TS113, TS114, TS115, TS116, TS117, TS118, TS119, TS120, TS121, TS122, TS123, TS124, TS125, TS126, TS127, TS128, TS129, TS130, TS131, TS132, TS133, TS134, TS135, TS136, TS137, TS138, TS139, TS140, TS141, TS142, TS143, TS144, TS145, TS146, TS147, TS148, TS149, TS150, TS151, TS152, TS153, TS154, 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Electrical Box Layout (460-3-60)

SYSTEM CONTROL DESCRIPTION

System Control by BACNet or External Control Signals		
BACNet Object	External	Activation
SYSTEM_Y1A	Y1A	Compressor

BACNet INTERFACE CONNECTIONS (MS/TP RS-485)

Use twisted pair shielded, conductor cable to connect the BACNet connections to the control board connector.

A - Communication (+)
B - Communication (-)
GND - Ground

EXTERNAL CONTROL CONNECTIONS (24VAC)

If using an external aquastat ("Signals" control method), use an 18-3 cable for these right side board connections to control compressor demand:

RA - 24VAC Hot
CA - Common (for use with RA to power aquastat)
Y1A - Compressor

A dry contact connection between R/RA and an external control connection (Y1A) will activate the external control signal input to the control board.

POWER SUPPLY CONNECTIONS

460VAC CONNECTIONS		
Wire	Colour	Contactors (Label)
Line 3	Red	L3
Line 2	Blue	L2
Line 1	Black	L1

Connect "GND" to Ground Lug

INDOOR CIRCULATOR CONTROL (24VAC)

Use an 18-2 conductor cable. Connect the output signals as per the descriptions below:

GND - 24VAC Common
ICR - 24VAC Indoor Circulator Control (Hot)

ICR is used for sampling when system is operating under the Setpoint Control method. May be used to power a contactor or relay. **Max load 500mA.**

AUXILIARY HEAT CONTROL CONNECTIONS

Use an 18-2 cable.

Choose one of two types of auxiliary heat connections. In either case, default is "ON".

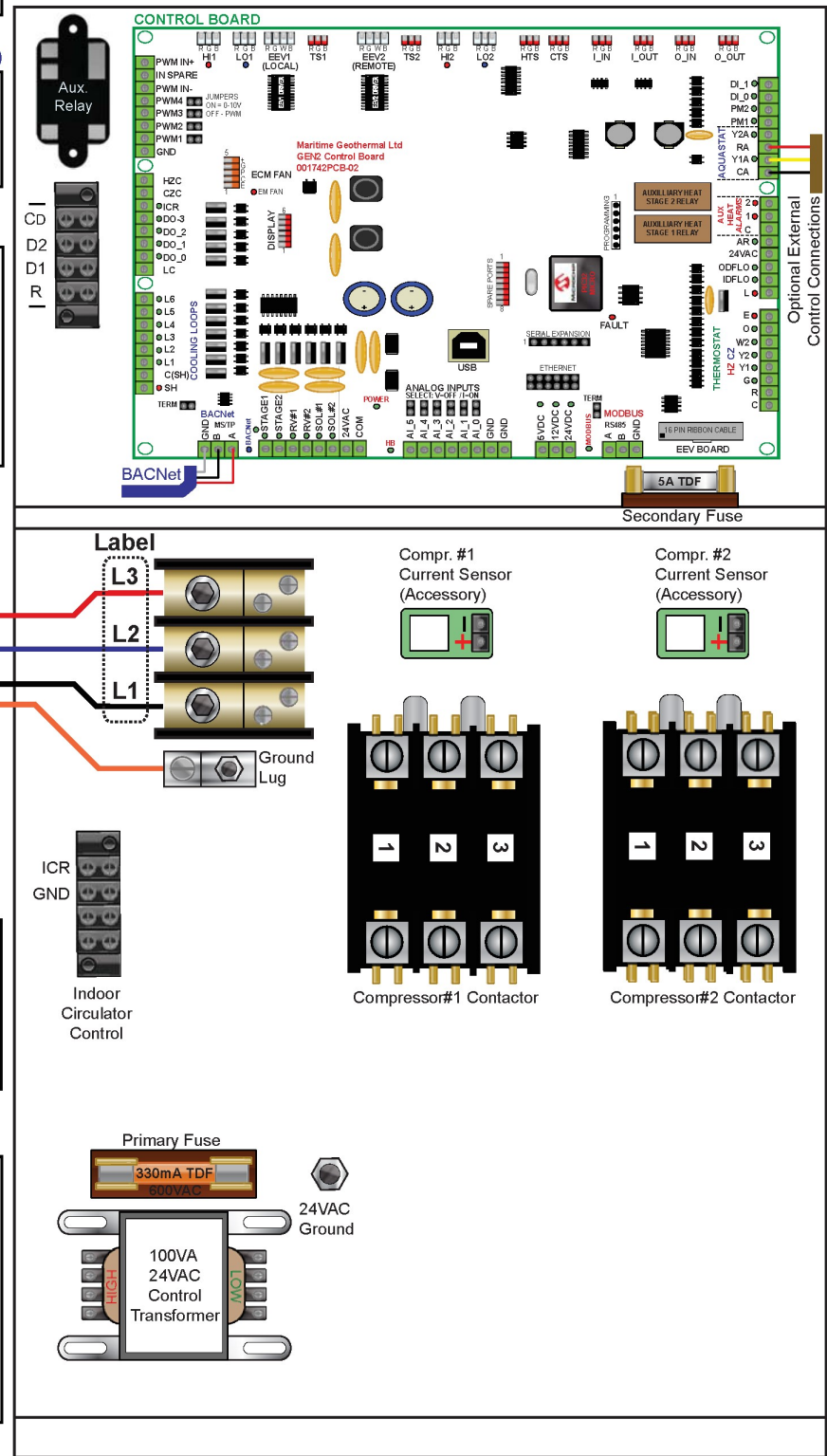
Tank's temperature limiter must remain in place.

D2 :
D1 : Dry contacts, closed during call for auxiliary heat

CD :
D2 : To use tank element contactor that has a 24VAC coil, jumper R to D1 and connect contactor coil between D2 and Co.
D1 :
R :

03	000297	D. RHEAULT	D. RHEAULT	07 JAN 2022
02	000256	D. RHEAULT	D. RHEAULT	01 OCT 2017
01	Initial Release	C. GEDDES	C. GEDDES	29 JUN 2016
REV	ECO#	IMPL BY	APVD BY	DATE

WC-Series Electrical Box Diagram
460-3-60



WC-Series Schematic Diagram
575-3-60

Power Supply: 575VAC (L1, L2, L3) and 24VAC (Control Transformer, 100VA, 250mA Fuse). Grounding (GND) is indicated throughout.

Indoor Unit Components: Compressor#1 (R410a), Compressor#2 (R134a), and their respective contactors (R410a, R134a). The diagram shows the internal wiring for these compressors, including common (C), line (L), and terminal (T) connections.

Outdoor Unit Components: Includes temperature sensors (RTD, TS1, TS2), pressure sensors, and a control board (GEN2) with various input/output terminals. The control board is labeled "Maritime Geothermal Ltd GEN2 Control Board 001742PCB-02".

Control Board (GEN2) Details: The board features numerous terminals for sensors, relays, and communication. Key sections include:

- Pressure Sensors:** HI, LO, and EV1 terminals.
- Temperature Sensors:** RTD, TS1, and TS2 terminals.
- Relays:** HI, LO, and EV1 terminals.
- Communication:** BACnet, Modbus, and Ethernet ports.
- Power and Grounding:** 24VAC, GND, and ICR terminals.

Optional Features:

- Display Board:** Maritime Geothermal Ltd GEN2 Display Board 001743PCB-01.
- Aquastat:** Optional Aquastat Connections (White).
- Summer Setback Switch:** Field Installed SUMMER SETBACK switch: close switch to enable summer setback mode.

Well Valve Connections:

- WELL - Slow Close EBV (Electronic Ball Valve):** 6-pin terminal block with connections for C, W/Y, E, E, and two unlabeled terminals.
- WELL - Solenoid Valve:** 6-pin terminal block with connections for 1, 2, and 3.
- LOOP - No Valve:** 6-pin terminal block with connections for 1, 2, 3, 4, 5, and 6.

Legend:

- (White/Black Stripe)
- (White)
- (Water Valve End Switch)

Notes:

- NOTE: Temperature sensors are mounted to the water lines inside the unit.
- NOTE: Low Pressure Select: 0 = Open Loop, 1 = Closed Loop.
- NOTE: Remove AL_0 jumper.
- NOTE: Remove AL_1 jumper.
- NOTE: Remove AL_5 and/or AL_4 Jumpers.

REV	ECO#	IMPL BY	APVD BY	DATE
03	000297	D. RHEAULT	D. RHEAULT	07 JAN 2022
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01	Initial Release	C. GEDDES	C. GEDDES	29 JUN 2016

Electrical Box Layout (575-3-60)

WC-Series Electrical Box Diagram 575-3-60

SYSTEM CONTROL DESCRIPTION

System Control by BACNet or External Control Signals		
BACNet Object	External	Activation
SYSTEM_Y1A	Y1A	Compressor

BACNet INTERFACE CONNECTIONS (MS/TP RS-485)

Use twisted pair shielded, conductor cable to connect the BACNet connections to the control board connector.

A - Communication (+)

B - Communication (-)

GND - Ground

EXTERNAL CONTROL CONNECTIONS (24VAC)

If using an external aquastat ("Signals" control method), use an 18-3 cable for these right side board connections to control compressor demand:

RA - 24VAC Hot

CA - Common (for use with RA to power aquastat)

Y1A - Compressor

A dry contact connection between R/RA and an external control connection (Y1A) will activate the external control signal input to the control board.

POWER SUPPLY CONNECTIONS

575VAC CONNECTIONS		
Wire	Colour	Contact (Label)
Line 3	Red	L3
Line 2	Blue	L2
Line 1	Black	L1
Connect "GND" to Ground Lug		

INDOOR CIRCULATOR CONTROL (24VAC)

Use an 18-2 conductor cable. Connect the output signals as per the descriptions below:

GND - 24VAC Common

ICR - 24VAC Indoor Circulator Control (Hot)

ICR is used for sampling when system is operating under the Setpoint Control method. May be used to power a contactor or relay. **Max load 500mA.**

AUXILIARY HEAT CONTROL CONNECTIONS

Use an 18-2 cable.

Choose one of two types of auxiliary heat connections. In either case, default is "ON".

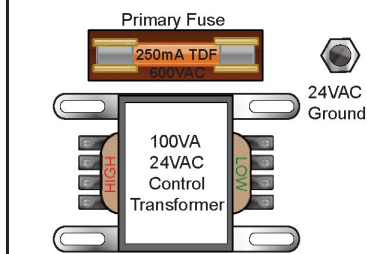
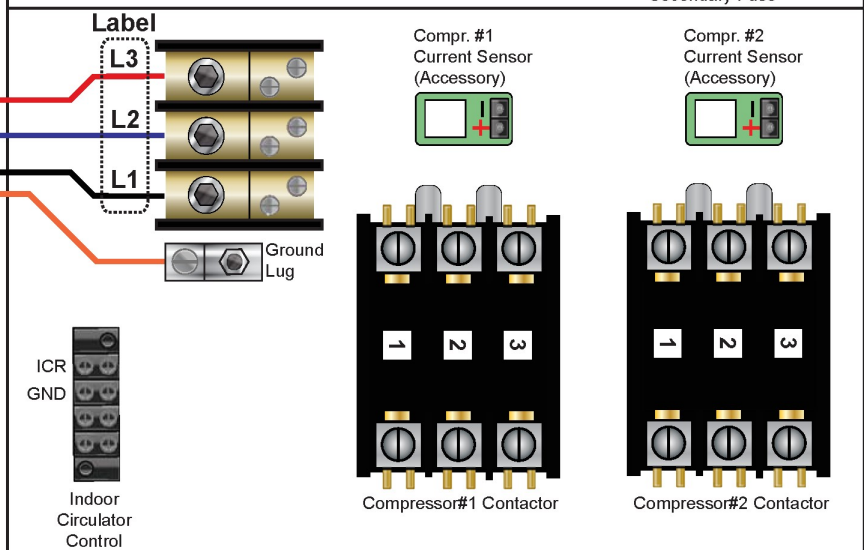
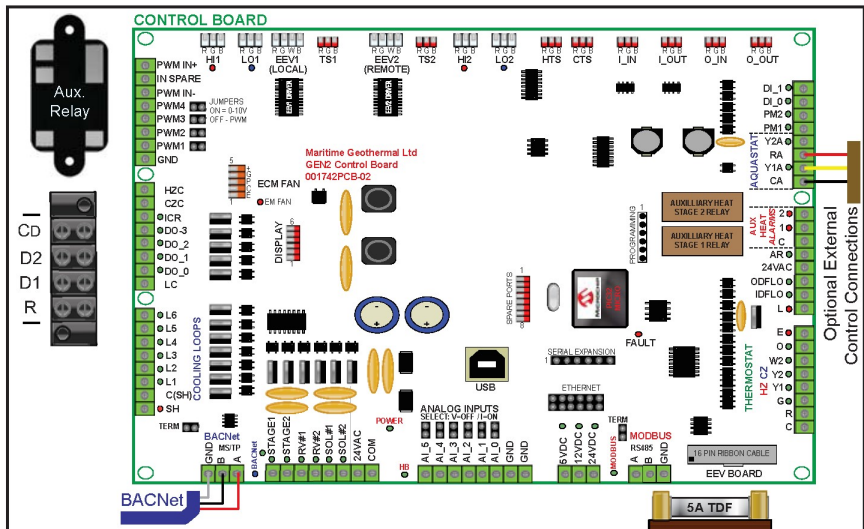
Tank's temperature limiter must remain in place.

D2 : Dry contacts, closed during call for auxiliary heat

D1 : Dry contacts, closed during call for auxiliary heat

Cd : To use tank element contactor that has a 24VAC coil, jumper R to D1 and connect contactor coil between D2 and Co.

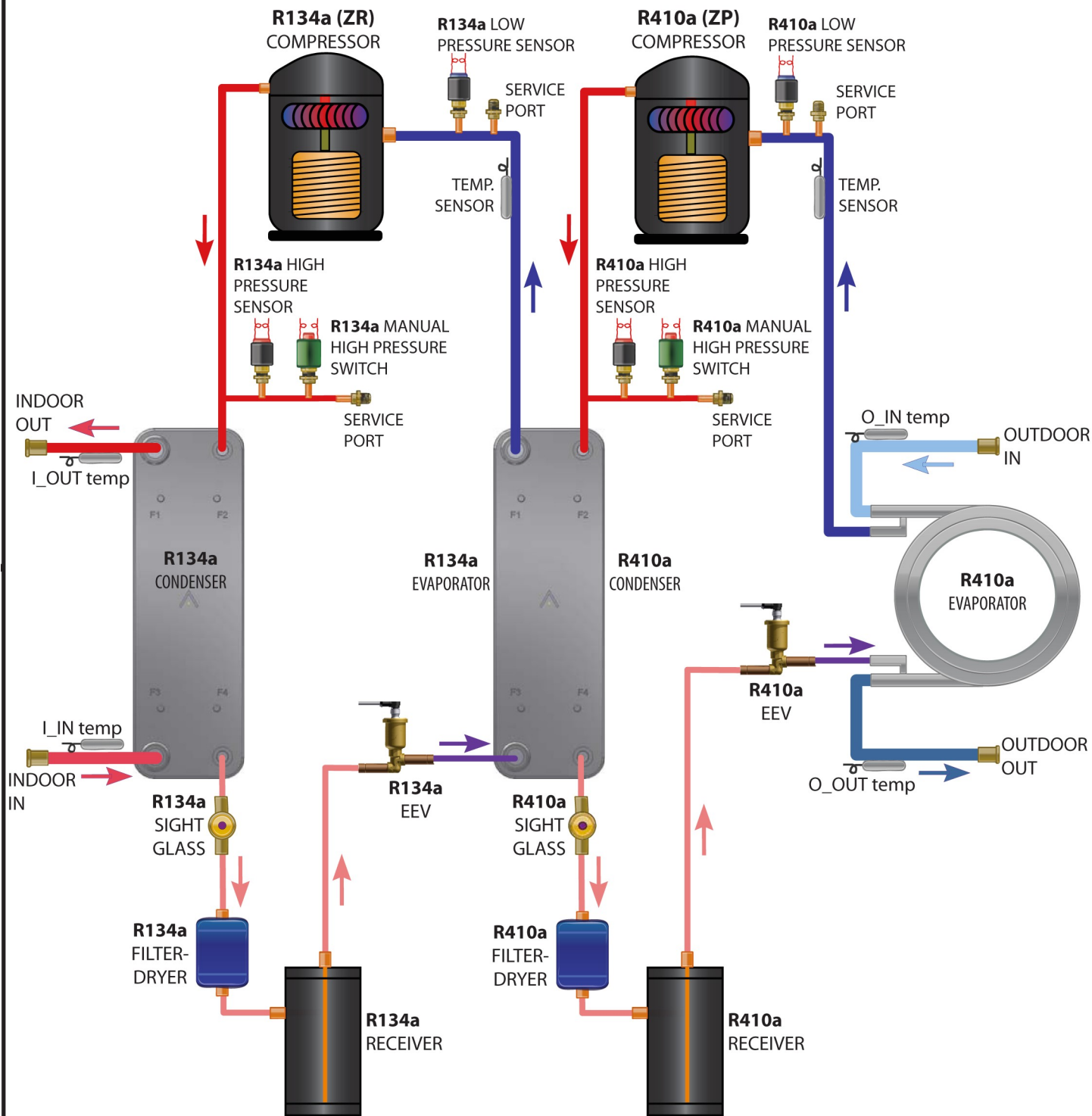
D2 : To use tank element contactor that has a 24VAC coil, jumper R to D1 and connect contactor coil between D2 and Co.



Drawn By C. GEDDES	Date 29 JUN 2016
Checked By C. GEDDES	Date 29 JUN 2016
Eng. Approved By C. GEDDES	Date 29 JUN 2016
Mfg. Approved By	Date
Approved By	Date

MARITIME GEOTHERMAL LTD.		P.O. Box 2555 170 Plantation Rd. Petitcodiac, NB CANADA E4Z 6H4
Drawing Name		WC-**-H-C-5D-**- Electrical Box Diagram
Size LET	Drawing Number 002166ELB	Drawing Rev 03
		Sheet 1 / 1

WC-Series Refrigeration Circuit



					Drawn By DAN RHEULT	Date 22-JUN-2015	<div>MARITIME GEOTHERMAL LTD.<div>P.O. Box 2555 170 Plantation Rd. Pettitcodiac, NB CANADA E4Z 6H4</div></div>						
					Checked By DAN RHEULT	Date 22-JUN-2015							
					Eng. Approved By	Date	Drawing Name						
							WC-Series Refrigeration Circuit						
					Mfg. Approved By	Date							
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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
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.

via the

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 **Installation and Service Manual**.

Engineering Guide Specifications

General

The liquid source water-to-water heat pump shall be a single packaged cascade high temperature heating unit. The unit shall be listed by a nationally recognized safety-testing lab (NRTL), such as ETL, TUV, 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), if any. 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 "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 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 four 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 two sealed refrigerant circuits, containing hermetic motor scroll compressors, Electronic Expansion Valves (EEVs), coaxial outdoor loop heat exchanger, brazed plate intermediate refrigerant-to-refrigerant and indoor loop heat exchangers, factory installed high and low pressure sensors, manual reset high pressure switches, service ports, liquid line filter-dryers, sight glasses, and suction accumulators.

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 outdoor water to refrigerant heat exchanger shall consist of a steel outer jacket with twisted copper inner tube. The indoor brazed plate heat exchangers shall consist of stainless steel plates and nickel or copper brazing. All heat exchangers shall be 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.

The electronic expansion valves 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 one set of primary water in and water out connections. The primary connection type shall be 1" 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 contactors, 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.

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 or 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 must be properly installed and maintained in accordance with MARITIME GEOTHERMAL LTD. guidelines.
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.

If a geothermal heat pump manufactured by MARITIME GEOTHERMAL LTD. fails to conform to this warranty, 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 to conform to this warranty; (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 fails to conform to this warranty and the alleged defects were not caused by accident, misuse, neglect, alteration, improper installation, repair or improper testing. 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.