



Engineering Specification

R-65-HACW-P-*T*-*SDE*F Liquid to Air Geothermal Heat Pump 60 Hz

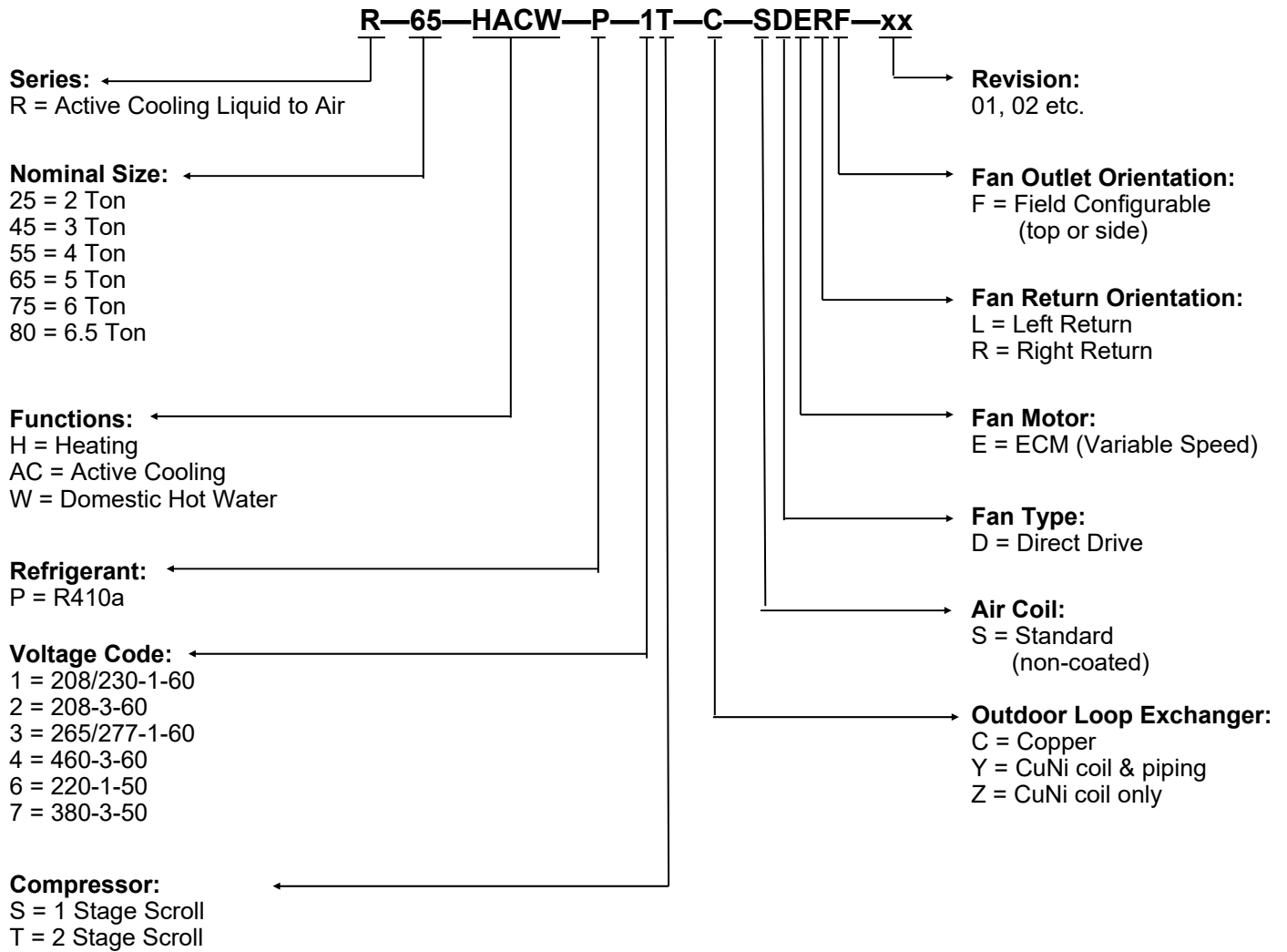


Maritime Geothermal Ltd.
P.O. Box 2555, 170 Plantation Road
Petitcodiac, NB E4Z 6H4
(506) 756-8135



info@nordicghp.com
www.nordicghp.com
002029SPC-07

Model Nomenclature



APPLICATION TABLE

MODEL	FUNCTION	REFRIGERANT	VOLTAGE	COMPRESSOR	OUTDOOR COIL	FAN/CASE	REVISIONS				
R-65	HACW	P	1	T	C Y Z	SDELF SDERF	16				
			2	T			16				
			3	T			16				
			4	T			16				

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

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

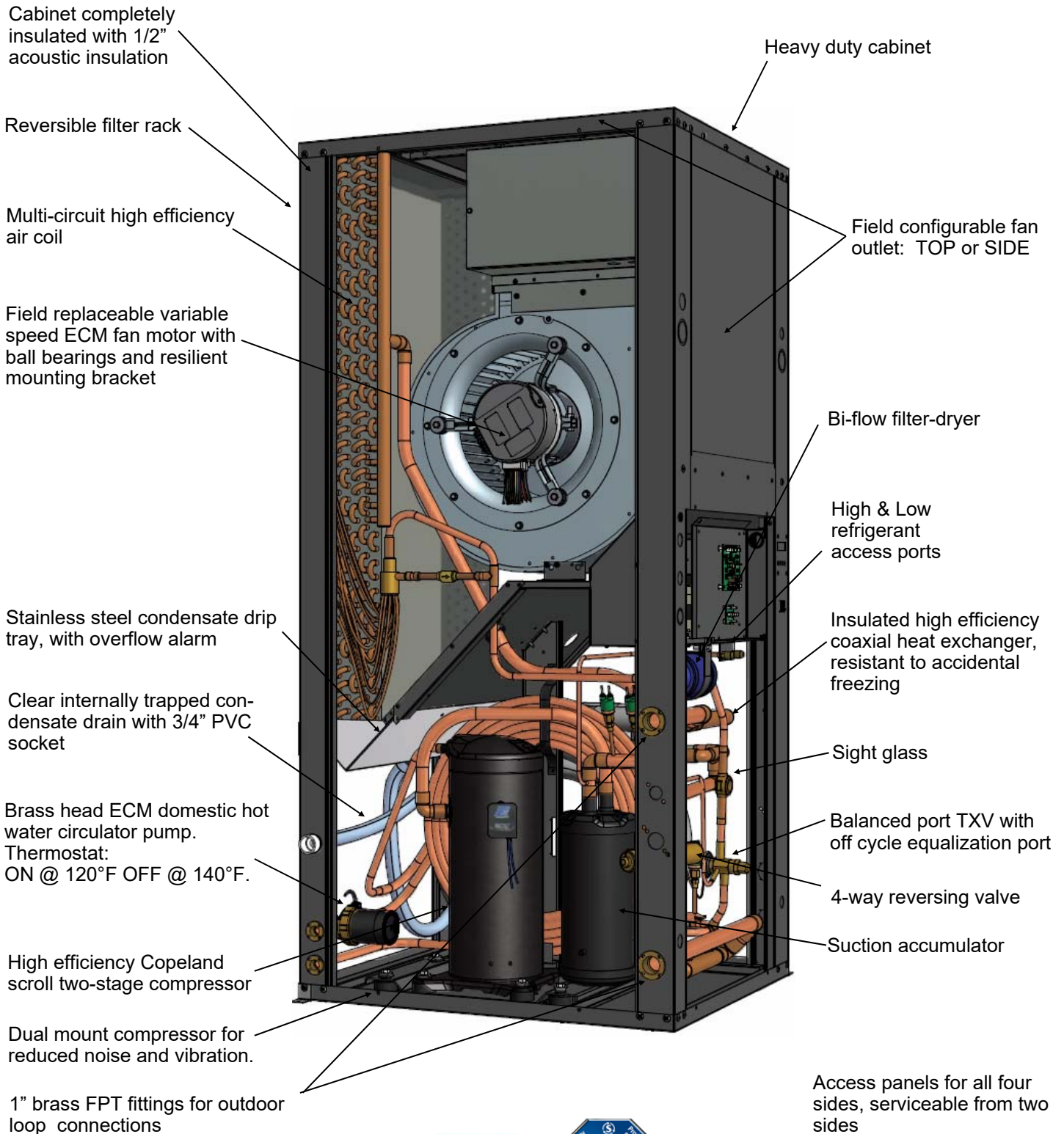
Design Features

- Energy Star rated
- AHRI certified for performance
- TUV certified for safety (CSA 22.2 No 236-05)
- Satin galvanized steel cabinet
- Powder coat finish
- Acoustically insulated cabinet (1/2")
- All connections located on same side
- Access panels for all four sides, serviceable from two sides
- ECM fan motor with single side service access
- Field configurable fan outlet position: top or side
- Optional plenum heater can be internally mounted with top fan outlet configuration
- Reversible air filter rack
- Stainless steel condensate drip tray
- Clear condensate drain with 3/4" PVC socket connection, internally trapped
- Multi-circuit high efficiency air coil
- Refrigeration service ports located inside unit (1/4" Schrader)
- Insulated coaxial heat exchanger and piping, available in copper or cupro-nickel (CuNi)
- 1" brass FPT fittings for loop connections
- Provisions for powering pump module for ground loop applications
- Two-stage scroll compressor with start capacitor kit on single phase models
- Dual-grommet-mounted compressor for reduced noise and vibration
- Suction line accumulator
- Liquid line filter-dryer
- Liquid line sight glass
- Balanced port thermostatic expansion valve (TXV) with internal bleed
- 4-way reversing valve
- High and low pressure safety controls
- Control board with random start, anti-short cycle timer, auto-retry and permanent lockout mode
- Brownout and condensate overflow protection standard
- Electrical box layout and schematic diagrams
- Double wall Domestic Hot Water (DHW) desuperheater suitable for heating potable water
- Brass head ECM circulator for domestic hot water circuit uses less than half the power of traditional circulating pumps and allows motor replacement without tools
- 1/2" brass FPT fittings for Domestic Hot Water connections

Available Accessories

- 3-stage heat / 2-stage cool programmable thermostat, Wifi and standard versions
- 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 jacket
- Secure Start module
- Passive electrostatic cleanable permanent air filter
- 1" water valve (slow closing or solenoid) & wiring harness for open loop applications
- Electric plenum heaters 5 / 7 / 10 / 15 / 20 kW, internally mountable for top fan outlet configuration

Design Features



Provisions for powering pump module for ground loop applications

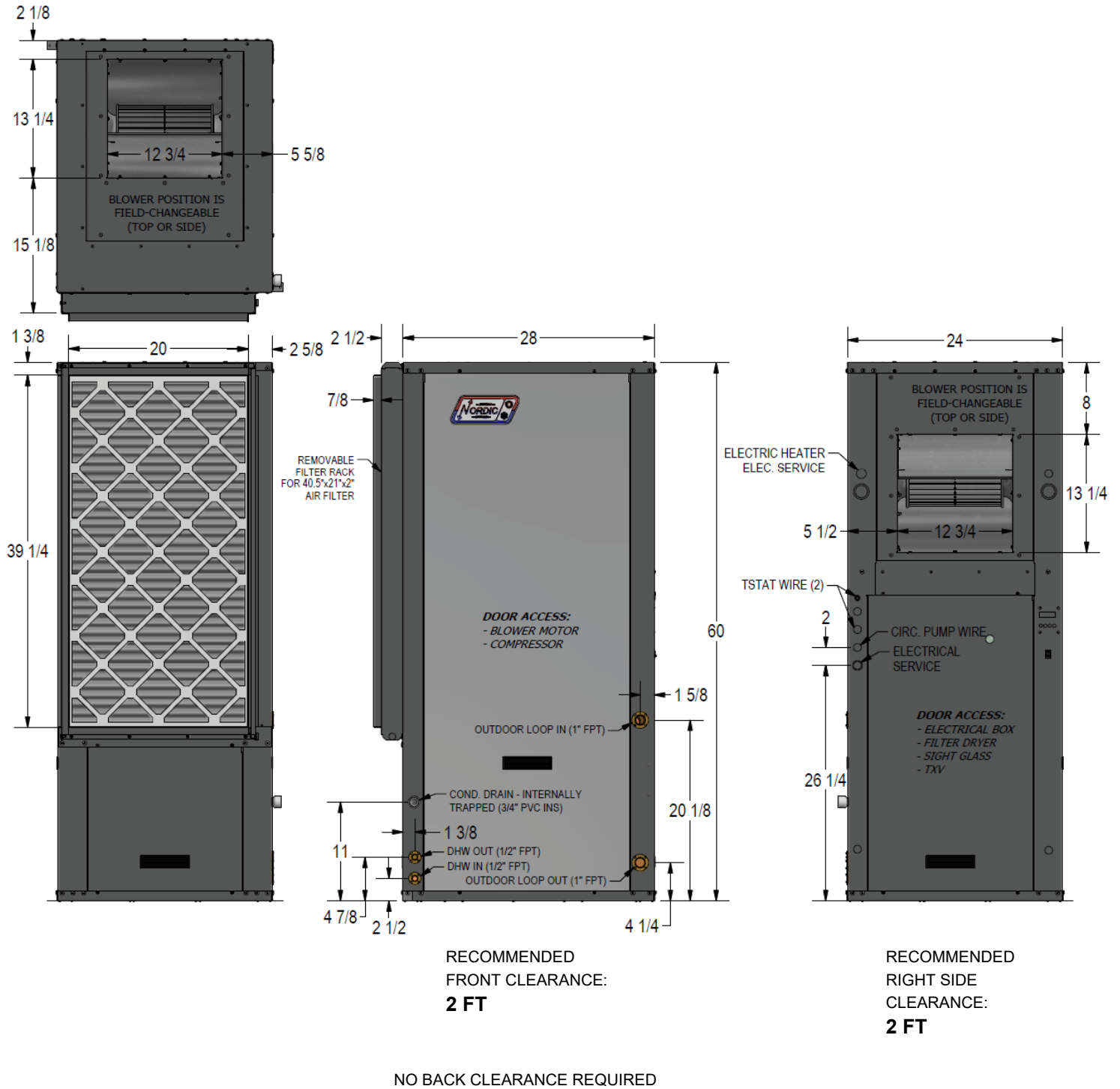
Optional water valve for ground water installations



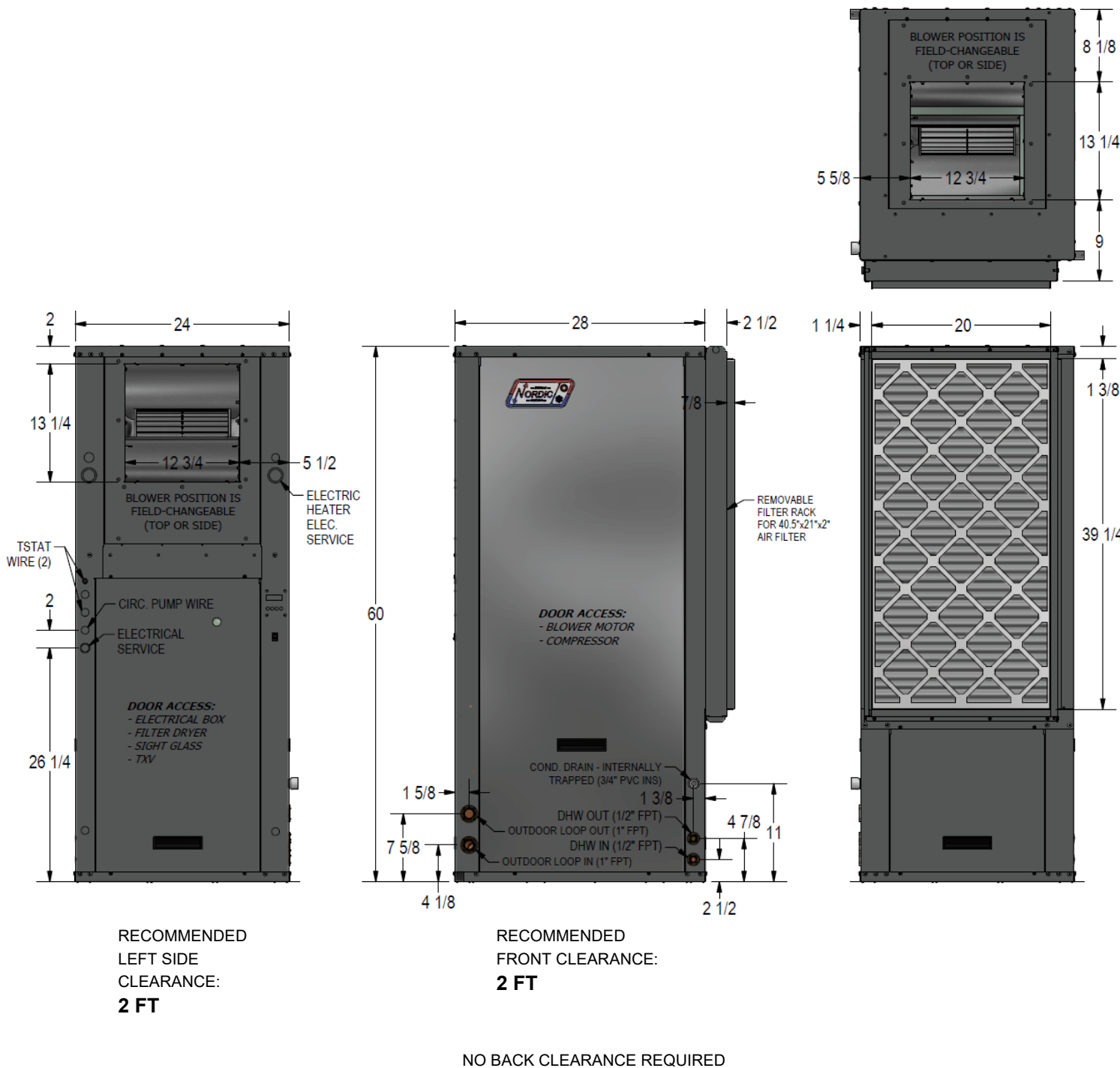
Fault monitoring board with random start, lock-out indicator, anti-short cycle timer, & brownout protection

Start capacitor kit standard on all single phase models

Dimensions (Left Return)



Dimensions (Right Return)



Specifications

Electrical Specifications											
Code	Power Supply			Compressor		Fan	Outd. Circ.	FLA	MCA	Maximum Fuse/Breaker	Minimum Wire Size
	V-ø-Hz	MIN	MAX	RLA	LRA	RLA	Max A	Amps	Amps	Amps	ga
1	208/230-1-60	187	253	22.8	147	5.5	5.0	34.1	39.8	60	#6-2*
2	208-3-60	187	253	16.5	110	5.5	5.0	27.8	31.9	40	#8-3*
3	265/277-1-60	226	304	22.4	130	5.5	-	28.1	33.7	50	#8-2
4	460-3-60	391	529	7.2	52	5.5	-	13.5	15.3	20	#12-4

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

Refrigerant Charge				
MODEL	lb	kg	Refrigerant	Oil Type
R-65	10.0	4.5	R410a	POE

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

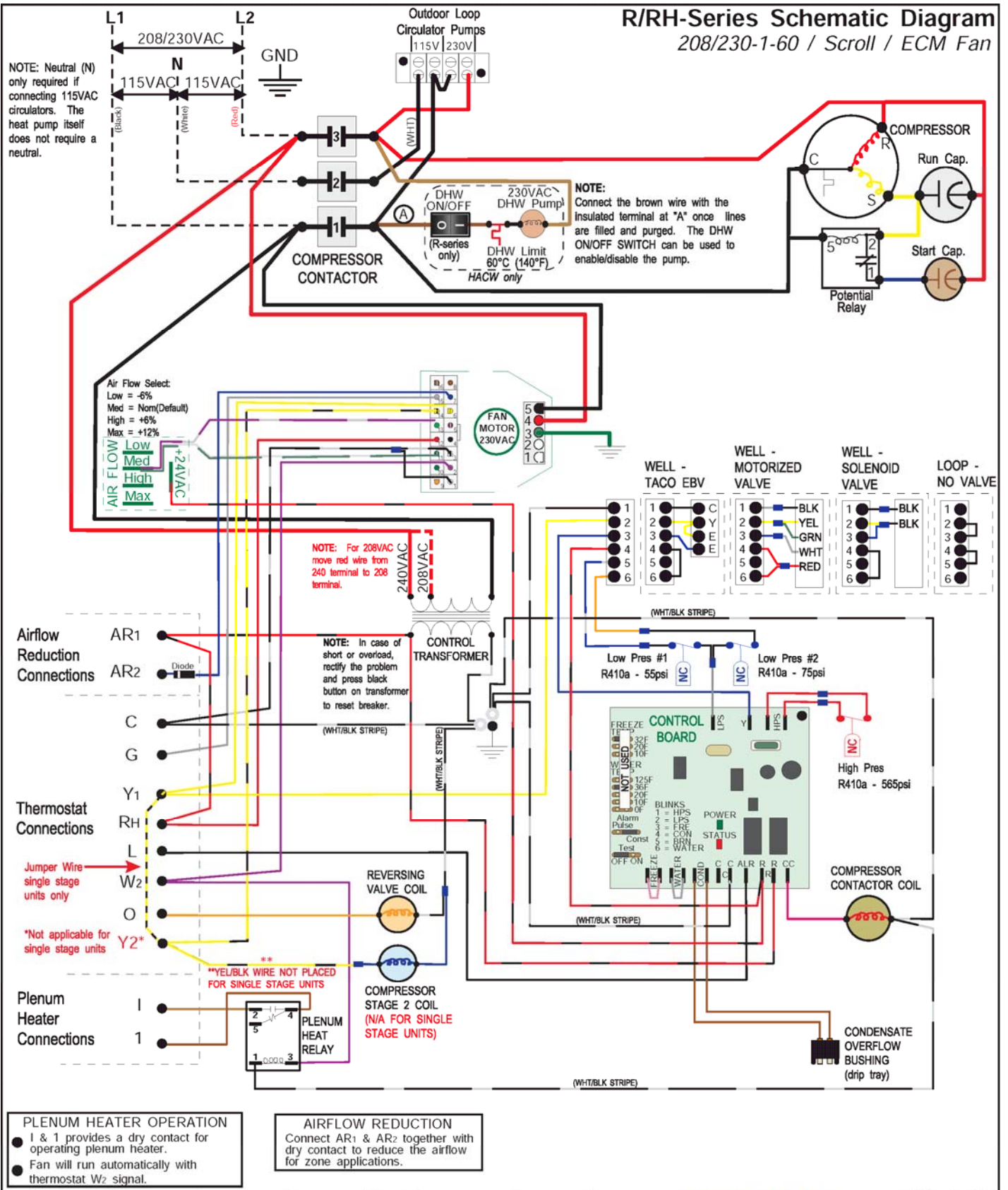
Shipping Information				
MODEL	WEIGHT lb. (kg)	DIMENSIONS in (cm)		
		L	W	H
R-65	490 (222)	44 (112)	36 (91)	66 (167)

Operating Temperature Limits					
Loop	Mode	Parameter	°F	°C	Note
OUTDOOR (ground loop)	Heating (water/open loop)	Minimum ELT	41	5	
	Heating (antifreeze/ground loop)	Minimum ELT	23	-5	Adequate antifreeze concentration required.
	Heating	Maximum ELT	80	27	Reduce flow above this temperature.
	Cooling	Minimum ELT	41	5	Flow reduction may be required.
	Cooling	Maximum ELT	110	43	
INDOOR (air duct)	Heating	Minimum EAT	60	16	Reduce air flow if necessary during heating startup.
	Heating	Maximum EAT	100	38	
	Cooling	Minimum EAT	50	10	
	Cooling	Maximum EAT	100	38	Reduce air flow if necessary during cooling startup.

* Values in this table are for rated liquid and airflow values.

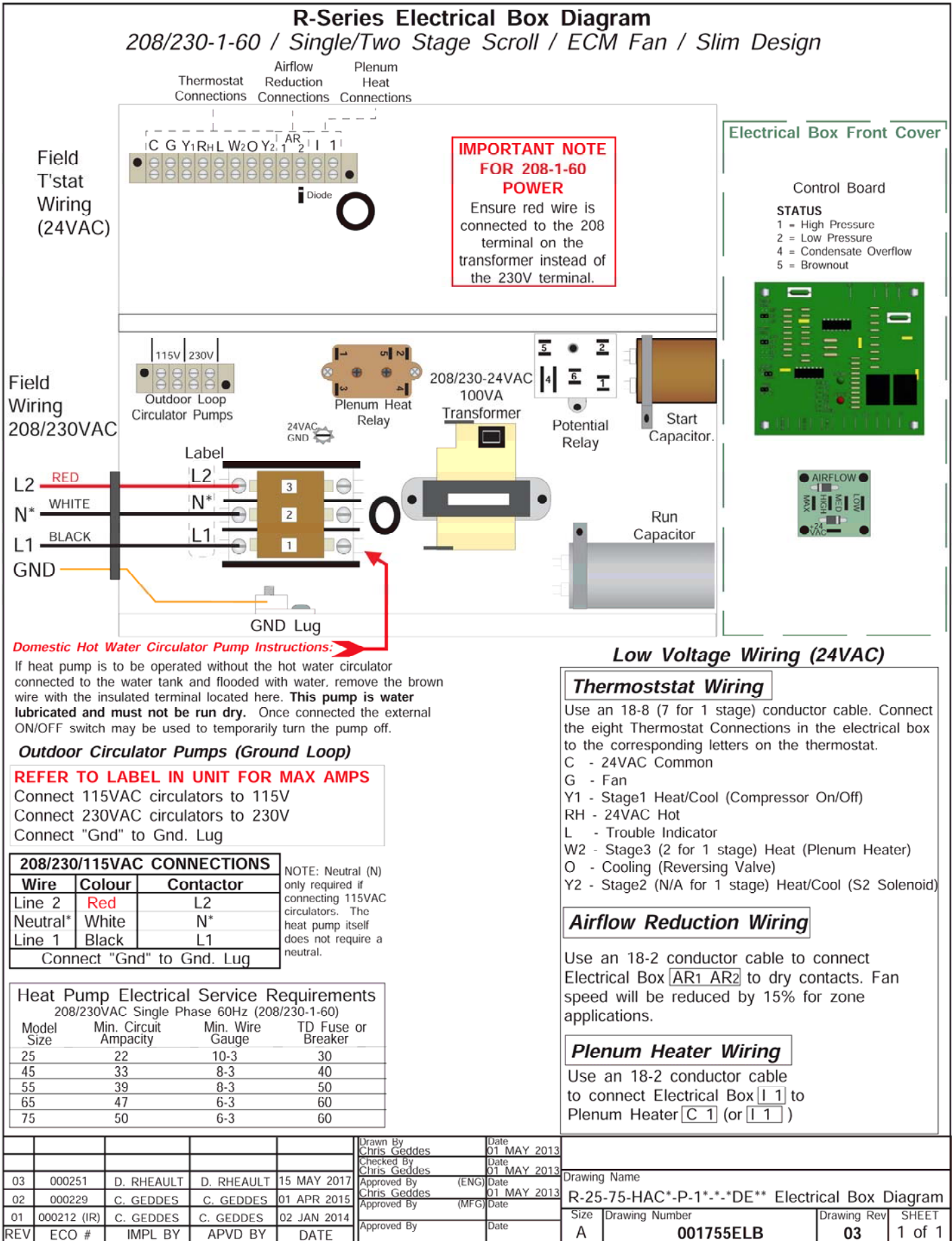
Loop Pressure Drop Data			Water 104°F		Water 50°F		15% Methanol 32°F		35% prop. glycol 32°F	
	gpm	L/s	psi	kPa	psi	kPa	psi	kPa	psi	kPa
R-65	6	0.38	1.1	7.6	1.2	8.3	1.3	9.0	1.7	12
	7	0.44	1.4	10	1.5	10	1.8	12	2.4	16
	8	0.50	1.8	12	1.9	13	2.2	15	2.9	20
	9	0.57	2.1	14	2.3	16	2.7	19	3.6	24
	10	0.63	2.4	17	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

Wiring Diagram (208/230-1-60)

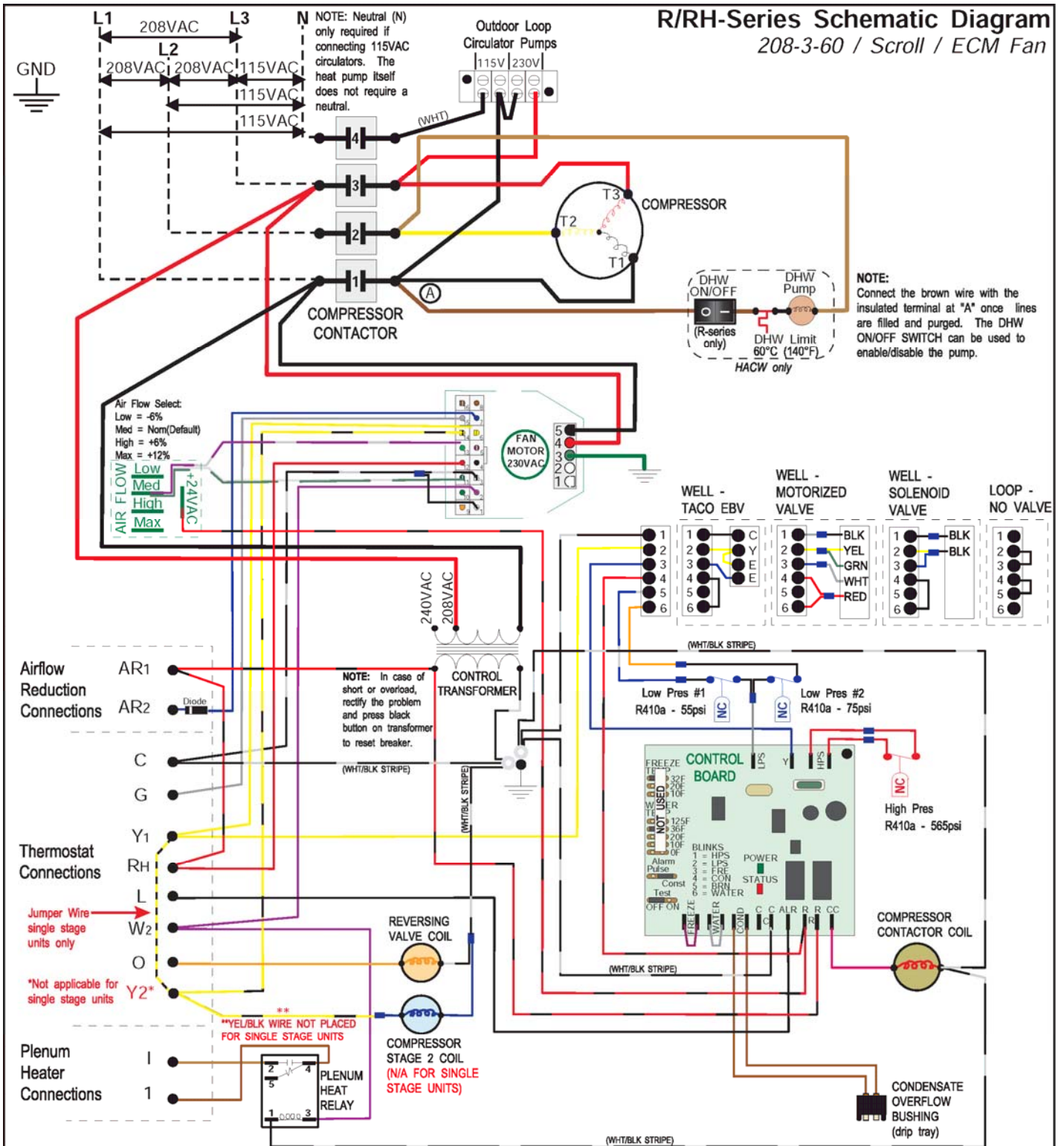


05	000305	D. RHEAULT	D. RHEAULT	6 SEP 2022	Drawn By Chris Geddes	Date 01 MAY 2013	MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4
04	000294	D. RHEAULT	D. RHEAULT	1 NOV 2021	Checked By Chris Geddes	Date 01 MAY 2013	
03	000251	D. RHEAULT	D. RHEAULT	15 MAY 2017	Approved By Chris Geddes (ENG)	Date 01 MAY 2013	
02	000229	C. GEDDES	C. GEDDES	01 APR 2015	Approved By Chris Geddes (MFG)	Date	
01	000212 (IR)	C. GEDDES	C. GEDDES	01 MAY 2013	Approved By	Date	
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date	
Drawing Name R/RH-**-HAC*-P-1**-*DE** Schematic Diagram							
Size A		Drawing Number 001754SCH			Drawing Rev 05		SHEET 1 of 1

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



Wiring Diagram (208-3-60)



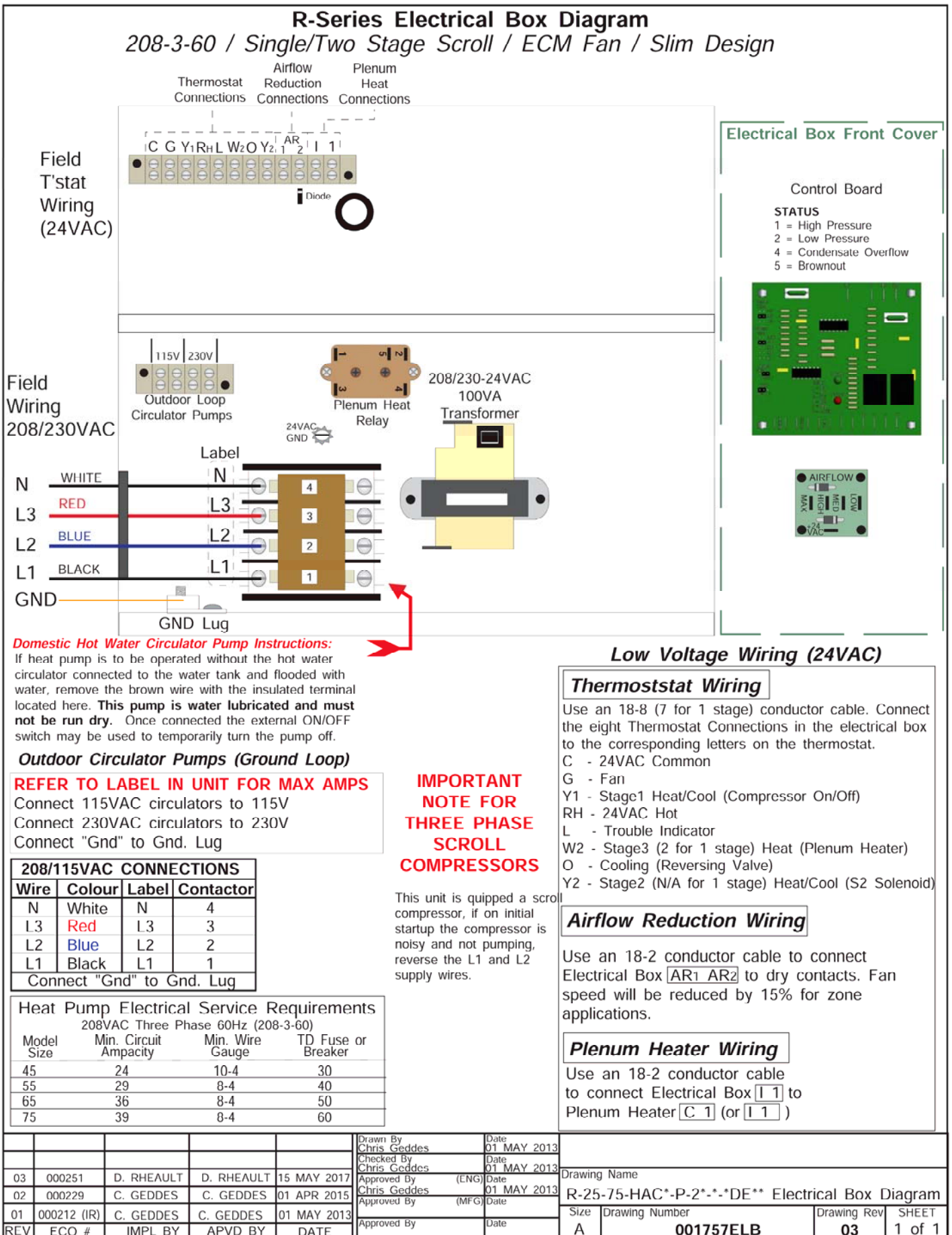
PLENUM HEATER OPERATION

- I & 1 provides a dry contact for operating plenum heater.
- Fan will run automatically with thermostat W₂ signal.

AIRFLOW REDUCTION
Connect AR₁ & AR₂ together with dry contact to reduce the airflow for zone applications.

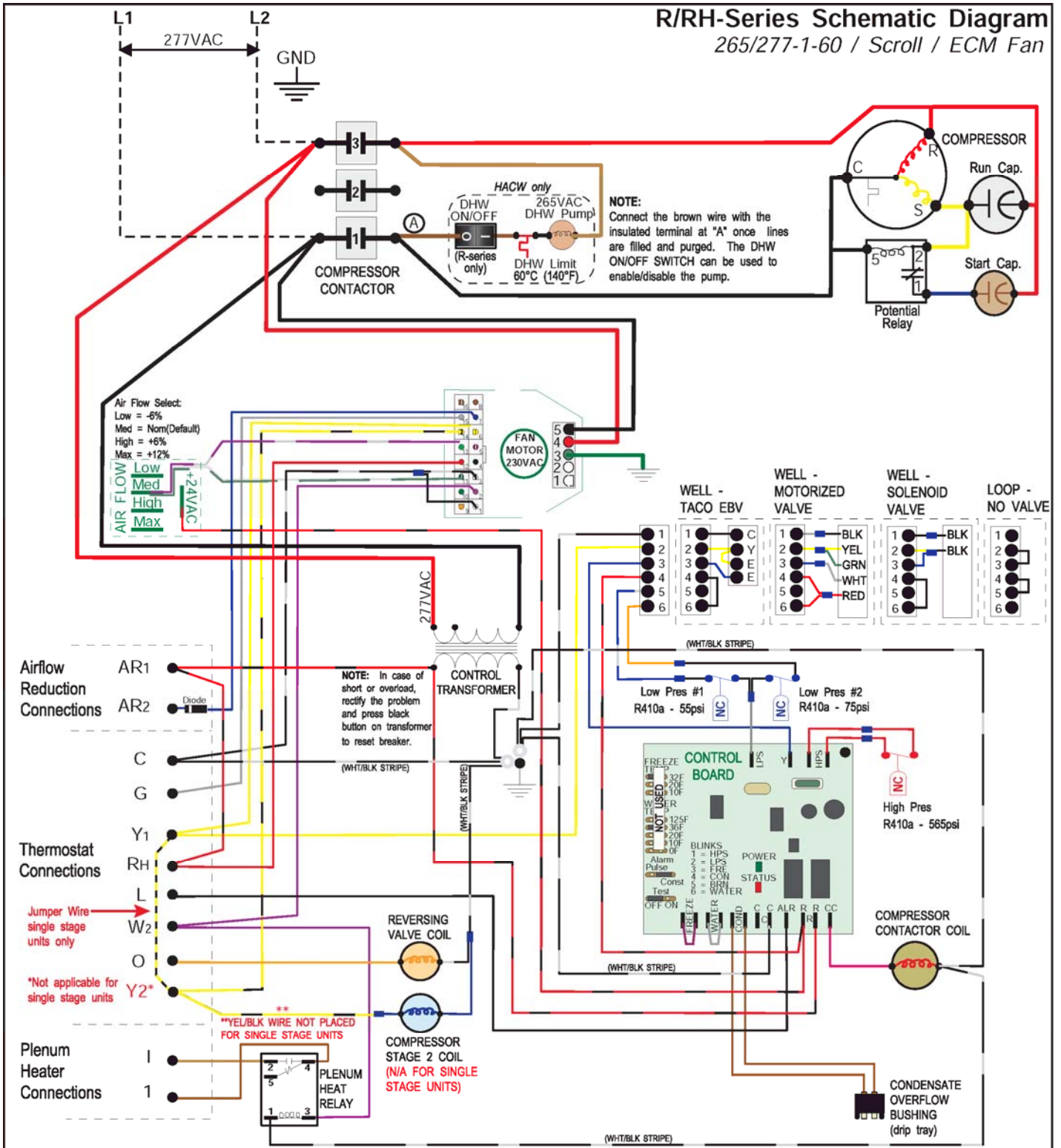
05	000305	D. RHEAULT	D. RHEAULT	6 SEP 2022	Drawn By Chris Geddes	Date 01 MAY 2013	MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4
04	000294	D. RHEAULT	D. RHEAULT	1 NOV 2021	Checked By Chris Geddes	Date 01 MAY 2013	
03	000251	D. RHEAULT	D. RHEAULT	15 MAY 2017	Approved By Chris Geddes (ENG)	Date 01 MAY 2013	
02	000229	C. GEDDES	C. GEDDES	01 APR 2015	Approved By Chris Geddes (MFG)	Date	
01	000212 (IR)	C. GEDDES	C. GEDDES	01 MAY 2013	Approved By	Date	
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date	
					Size A	Drawing Number 001756SCH	Drawing Rev 05
					SHEET 1 of 1		

Electrical Box Layout (208-3-60)



Wiring Diagram (265/277-1-60)

R/RH-Series Schematic Diagram 265/277-1-60 / Scroll / ECM Fan



05	000305	D. RHEAULT	D. RHEAULT	6 SEP 2022	Drawn By Chris Geddes	Date 14 JUN 2016	MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4
04	000294	D. RHEAULT	D. RHEAULT	1 NOV 2021	Checked By Chris Geddes	Date 14 JUN 2016	
03	000251	D. RHEAULT	D. RHEAULT	15 MAY 2017	Approved By Chris Geddes (ENG)	Date 14 JUN 2016	
01	IR	C. GEDDES	C. GEDDES	14 JUN 2016	Approved By (MFG)	Date	
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date	Drawing Name R/RH-**-HAC*-P-3*-**DE** Schematic Diagram Size A Drawing Number 002113SCH Drawing Rev 05 SHEET 1 of 1

R-Series Electrical Box Diagram

277-1-60 / Single/Two Stage Scroll / ECM Fan / Slim Design

Field T'stat Wiring (24VAC)

Field Wiring 277VAC

Electrical Box Front Cover

Control Board

STATUS

- 1 = High Pressure
- 2 = Low Pressure
- 4 = Condensate Overflow
- 5 = Brownout

Domestic Hot Water Circulator Pump Instructions (HACW only):

If heat pump is to be operated without the hot water circulator connected to the water tank and flooded with water, remove the brown wire with the insulated terminal located here. **This pump is water lubricated and must not be run dry.** Once connected the external ON/OFF switch may be used to temporarily turn the pump off.

Low Voltage Wiring (24VAC)

Thermostat Wiring

Use an 18-8 (7 for 1 stage) conductor cable. Connect the eight Thermostat Connections in the electrical box to the corresponding letters on the thermostat.

- C - 24VAC Common
- G - Fan
- Y1 - Stage1 Heat/Cool (Compressor On/Off)
- RH - 24VAC Hot
- L - Trouble Indicator
- W2 - Stage3 (2 for 1 stage) Heat (Plenum Heater)
- O - Cooling (Reversing Valve)
- Y2 - Stage2 (N/A for 1 stage) Heat/Cool (S2 Solenoid)

Airflow Reduction Wiring

Use an 18-2 conductor cable to connect Electrical Box [AR1 AR2] to dry contacts. Fan speed will be reduced by 15% for zone applications.

Plenum Heater Wiring

Use an 18-2 conductor cable to connect Electrical Box [I 1] to Plenum Heater [C 1] (or [I 1])

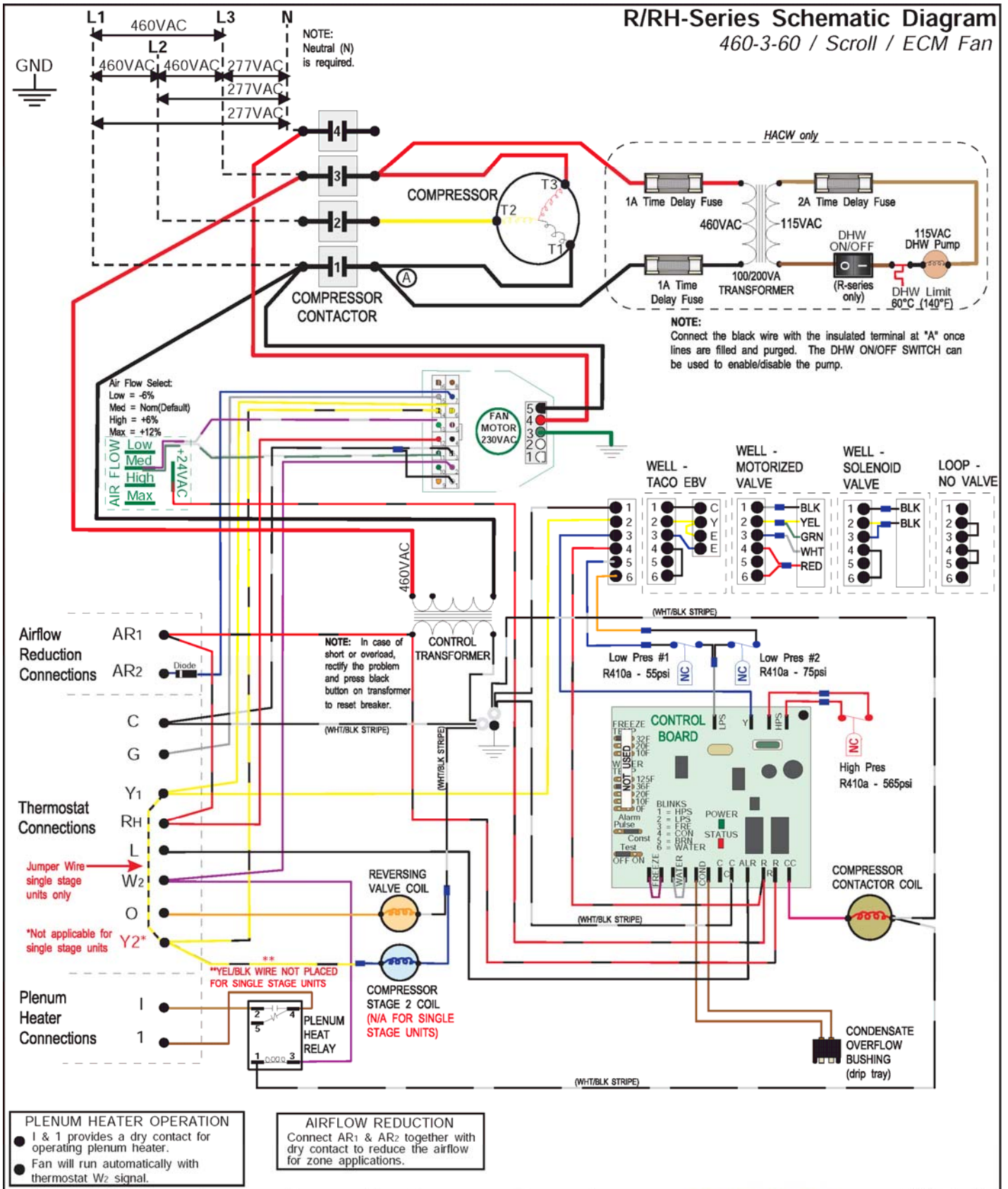
277VAC CONNECTIONS			
Wire	Colour	Contact	
Line 2	Red	L2	
Line 1	Black	L1	

Connect "Gnd" to Gnd. Lug

Heat Pump Electrical Service Requirements 277VAC Single Phase 60Hz (277-1-60)			
Model Size	Min. Circuit Ampacity	Min. Wire Gauge	TD Fuse or Breaker
25	14	12-2	20
45	20	10-2	30
55	24	8-2	40
65	34	8-2	50
75	N/A	N/A	N/A

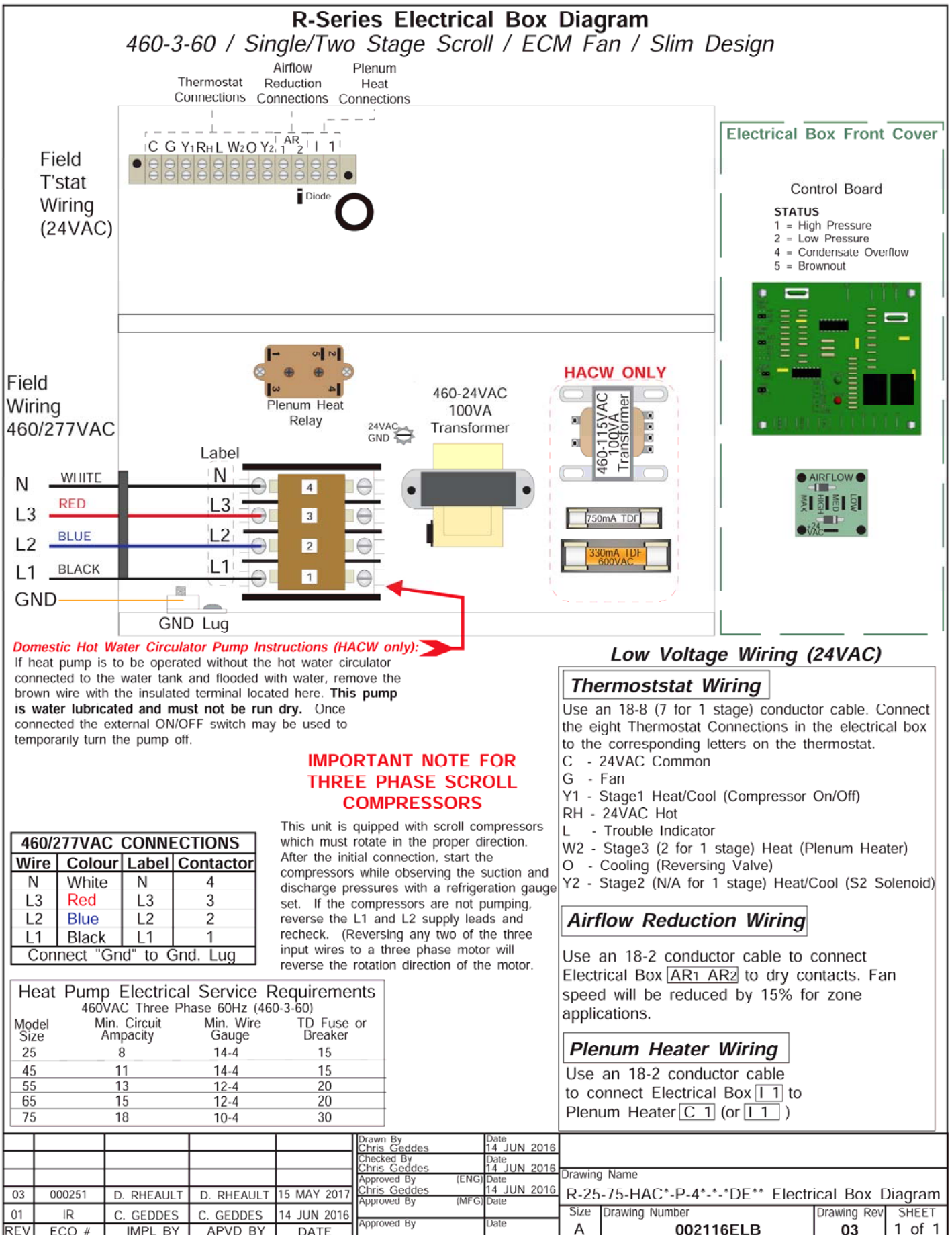
REV	ECO #	IMPL BY	APVD BY	DATE	Drawn By Chris Geddes Date 14 JUN 2016 Checked By Chris Geddes Date 14 JUN 2016 Approved By (ENG) Chris Geddes Date 14 JUN 2016 Approved By (MFG) Chris Geddes Date 14 JUN 2016 Approved By Chris Geddes Date 14 JUN 2016	Drawing Name R-25-75-HAC*-P-3*-DE** Electrical Box Diagram Size A Drawing Number 002114ELB Drawing Rev 03 SHEET 1 of 1
-----	-------	---------	---------	------	--	--

Wiring Diagram (460-3-60)

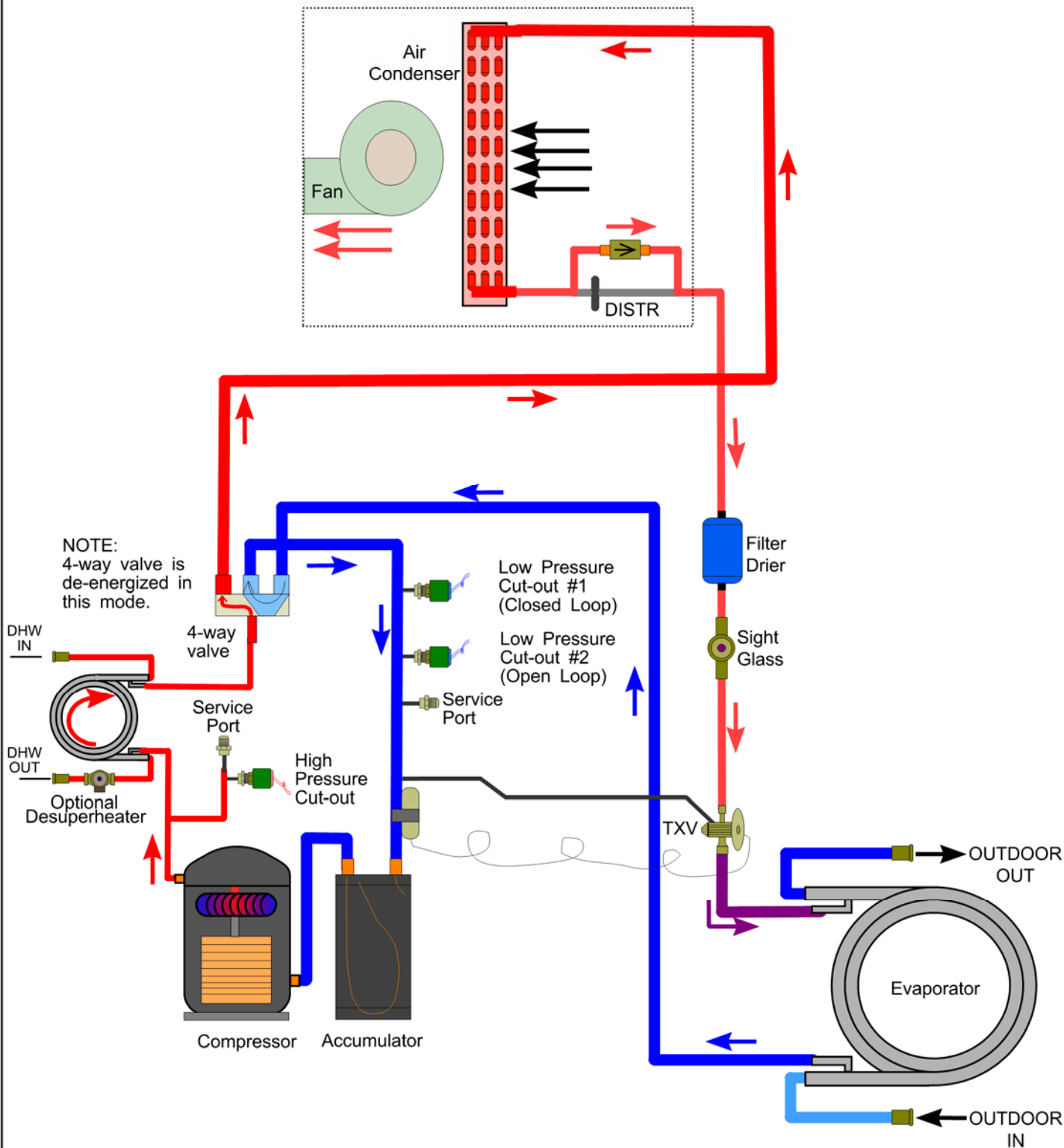


05	000305	D. RHEAULT	D. RHEAULT	6 SEP 2022	Drawn By Chris Geddes	Date 14 JUN 2016	MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4
04	000294	D. RHEAULT	D. RHEAULT	1 NOV 2021	Checked By Chris Geddes	Date 14 JUN 2016	
03	000251	D. RHEAULT	D. RHEAULT	15 MAY 2017	Approved By Chris Geddes (ENG)	Date 14 JUN 2016	
01	IR	C. GEDDES	C. GEDDES	14 JUN 2016	Approved By (MFG)	Date	
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date	Drawing Name R/RH-**-HAC*-P-4*-**DE** Schematic Diagram Size A Drawing Number 002115SCH Drawing Rev 05 SHEET 1 of 1

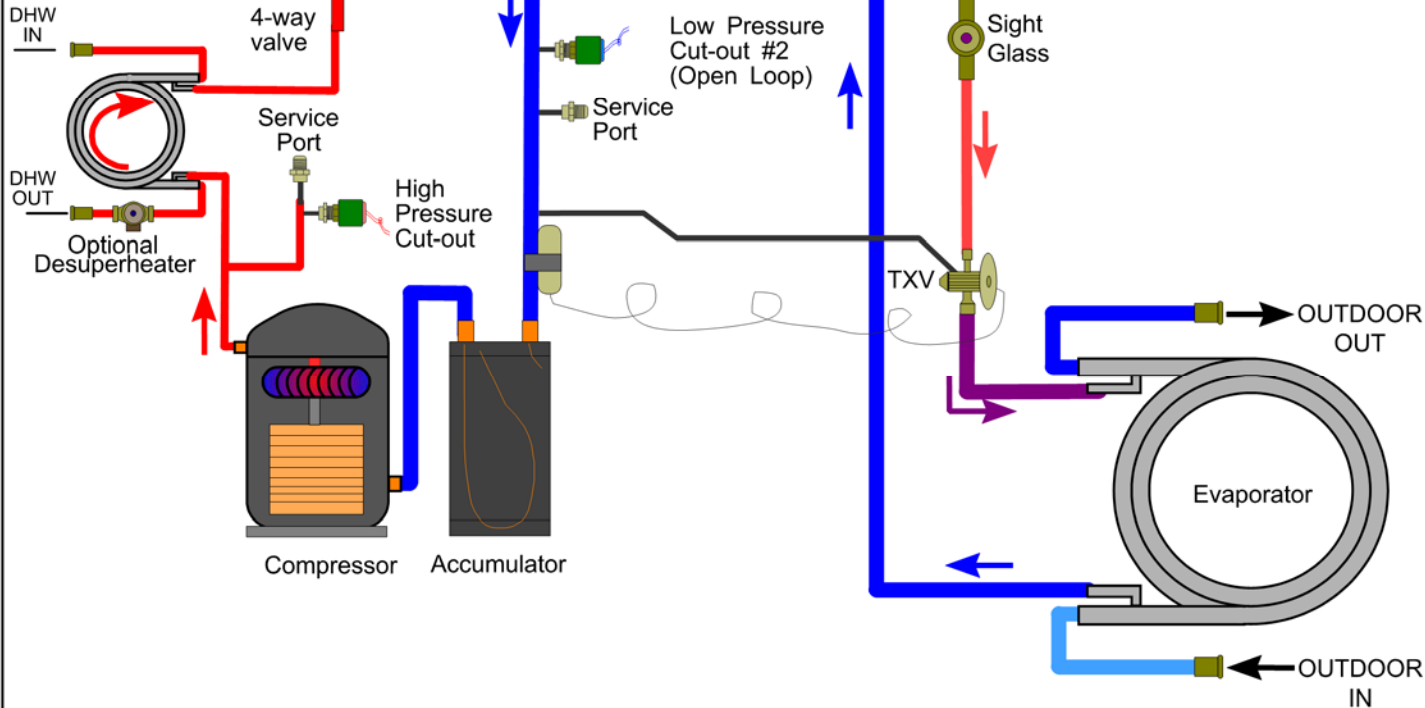
Electrical Box Layout (460-3-60)



R(H)-Series Refrigeration Circuit - Heating Mode

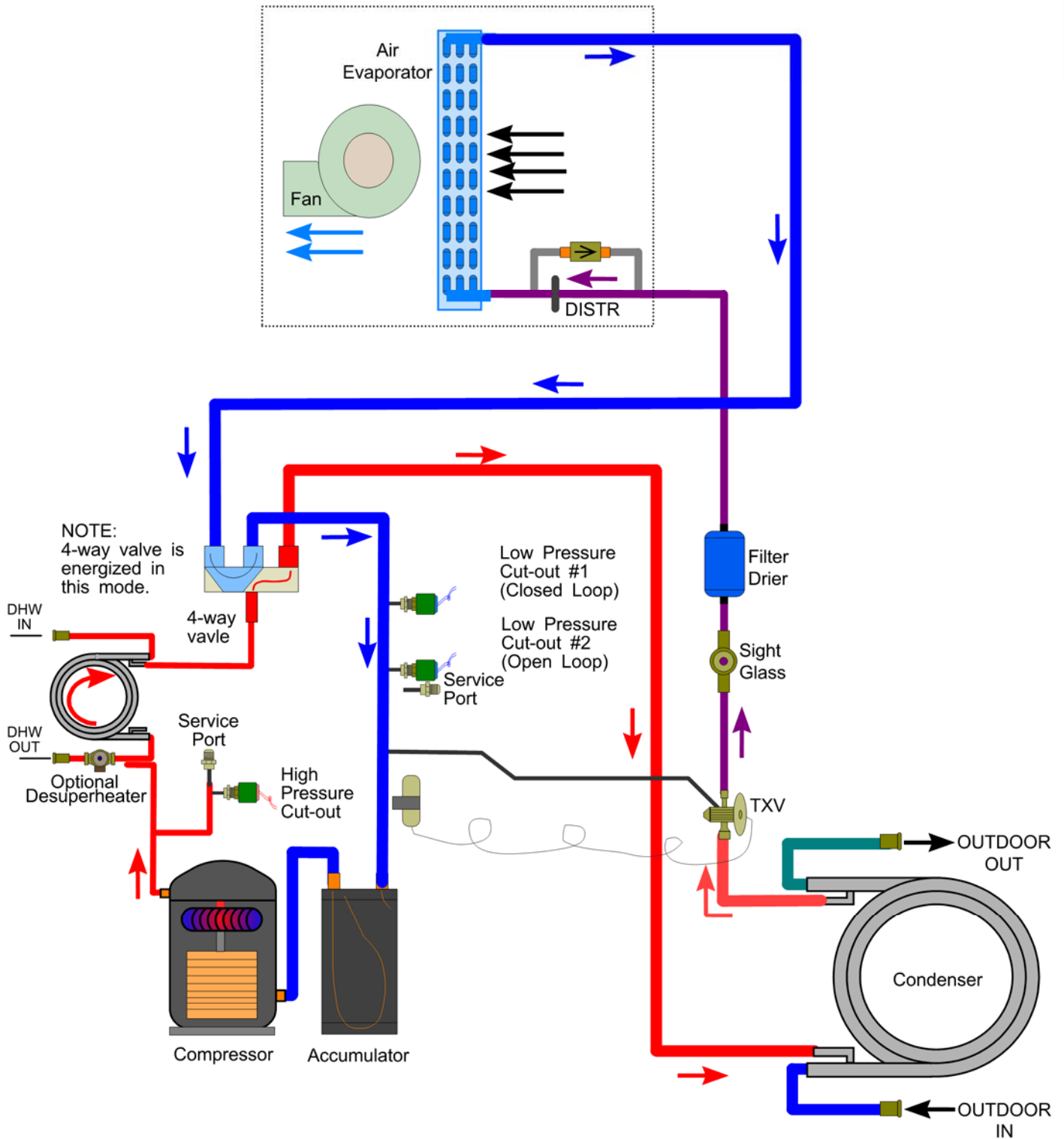


NOTE:
4-way valve is
de-energized in
this mode.



					Drawn By Chris Geddes	Date 25 JAN 10	MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4	
					Checked By Chris Geddes	Date 25 JAN 10		
03	000212	D. RHEAULT	C. GEDDES	01 JAN 2014	Approved By Chris Geddes	(ENG) Date 25 JAN 10	Drawing Name R(H)-Series Refrigeration Circuit Diagram - Heating Mode	
02	000203	C. GEDDES	D. RHEAULT	26 SEP 12	Approved By Chris Geddes	(MFG) Date		
01	Initial Release	C. GEDDES	C. GEDDES	25 JAN 10	Approved By	Date	Size A	Drawing Number 001207RCD
REV	ECO #	IMPL BY	APVD BY	DATE			Drawing Rev 03	SHEET 1 of 1

R(H)-Series Refrigeration Circuit - Cooling Mode



					Drawn By Chris Geddes	Date 25 JAN 10	MARITIME GEOTHERMAL LTD. 170 Plantation Rd. Petitcodiac, NB E4Z 6H4	
					Checked By Chris Geddes	Date 25 JAN 10		
03	000212	C. GEDDES	C. GEDDES	01 JAN 2014	Approved By (ENG)	Date 25 JAN 10	Drawing Name R(H)-Series Refrigeration Circuit Diagram - Cooling Mode	
02	000203	D. RHEAULT	D. RHEAULT	26 SEP 12	Approved By (MFG)	Date		
01	Initial Release	C. GEDDES	C. GEDDES	25 JAN 10	Approved By	Date	Size A	Drawing Number 001208RCD
REV	ECO #	IMPL BY	APVD BY	DATE			Drawing Rev 03	SHEET 1 of 1

Standard Capacity Ratings

Standards C13256-1 / ISO13256-1 / ARI 13256-1

Standard Capacity Ratings - Ground Loop Heating*											60Hz	
EAT 68°F (20°C)		* 15% NaCl by Weight Ground Loop Fluid							STAGE 1 - ELT 41°F (5°C) STAGE 2 - ELT 32°F (0°C)			
Model	Nominal Size	Liquid Flow		Pressure Drop		Mode	Airflow		Input Energy	Capacity		COP _H
	tons	gpm	L/s	psi	kPa		cfm	L/s		Watts	Btu/hr	
R-65	5	14.0	0.88	5.3	36.5	Stage 1	1540	727	2,565	35,900	10.5	4.0
						Stage 2	1900	897	3,390	44,000	12.9	3.7

Standard Capacity Ratings - Ground Water Heating												60Hz
EAT 68°F (20°C)										ELT 50°F (10°C)		
Model	Nominal Size	Liquid Flow		Pressure Drop		Mode	Airflow		Input Energy	Capacity		COP _H
	tons	gpm	L/s	psi	kPa		cfm	L/s		Watts	Btu/hr	
R-65	5	14.0	0.88	4.3	29.7	Stage 1	1540	727	2,670	42,800	12.5	4.6
						Stage 2	1900	897	3,740	58,700	17.2	4.5

Standard Capacity Ratings - Ground Loop Cooling*												60Hz	
EAT 80.6°F (27°C) * 15% NaCl by Weight Ground Loop Fluid											STAGE 1 - ELT 68°F (20°C) STAGE 2 - ELT 77°F (25°C)		
Model	Size	Liquid Flow		Pressure Drop		Mode	Airflow		Input Energy	Capacity		COP _c	EER
	tons	gpm	L/s	psi	kPa		cfm	L/s	Watts	Btu/hr	kW	W/W	Btu/W
R-65	5	14.0	0.88	4.1	28.2	Stage 1	1540	727	1,910	45,500	13.3	6.6	22.6
						Stage 2	1900	897	3,445	57,600	16.9	4.9	16.8

Standard Capacity Ratings - Ground Water Cooling												60Hz	
EAT 80.6°F (27°C)										ELT 59°F (15°C)			
Model	Size	Liquid Flow		Pressure Drop		Mode	Airflow		Input Energy	Capacity		COP _c	EER
	tons	gpm	L/s	psi	kPa		cfm	L/s	Watts	Btu/hr	kW	W/W	Btu/W
R-65	5	14.0	0.88	4.1	28.0	Stage 1	1540	727	1,705	47,200	13.8	8.0	27.1
						Stage 2	1900	897	2,865	62,600	18.3	6.3	21.5

Performance Tables

R-65-HACW-P-1T R410a, 60 Hz, ZPS51K5E-PFV

HEATING	OUTDOOR LOOP (15% Methanol)						ELECTRICAL			INDOOR LOOP (Air)						
	ELT (°F)	Evap. Temp.	Flow (gpm)	LLT (°F)	Delta T (°F)	Heat Abs. (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT (°F)	Cond. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Heating (Btu/hr)	COP _H
	26	15	14	21	4.8	31,644	14.9	300	3,573	68	97	1,900	91	22.6	43,391	3.56
	32	20	14	27	5.2	34,798	15.3	300	3,667		99	1,900	92	24.4	46,866	3.74
	38	25	14	32	5.7	37,954	15.9	300	3,806		102	1,900	94	26.3	50,495	3.89
	44	30	14	38	6.4	42,566	16.3	300	3,903		104	1,900	97	28.9	55,440	4.16
	49	35	14	42	6.8	47,314	16.9	300	4,045		107	1,900	99	31.0	60,717	4.40
	55	40	14	48	7.4	51,599	17.4	300	4,144		109	1,900	101	33.4	65,344	4.62
	61	45	14	53	8.0	56,159	17.8	300	4,247		111	1,900	104	35.9	70,253	4.85
	67	50	14	58	8.7	61,001	18.3	300	4,353		113	1,900	107	38.6	75,456	5.08

COOLING	OUTDOOR LOOP (15% Methanol)						ELECTRICAL			INDOOR LOOP (Air @ 46% RH)								
	ELT (°F)	Cond. Temp.	Flow (gpm)	LLT (°F)	Delta T (°F)	Heat Rej. (Btu/hr)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT (°F)	Evap. Temp.	Airflow (cfm)	LAT (°F)	Delta T (°F)	Latent (Btu/hr)	Sensible (Btu/hr)	Cooling (Btu/hr)	EER
	49	70	14	60	11.1	77,969	10.8	325	2,663	80.6	45	1,900	56	24.6	19,665	49,095	68,760	25.8
	54	75	14	65	11.1	77,594	11.6	325	2,864		45	1,900	56	24.2	19,362	48,337	67,698	23.6
	59	80	14	70	11.0	77,174	12.4	325	3,067		45	1,900	57	23.8	19,043	47,542	66,585	21.7
	64	85	14	75	10.8	75,547	13.2	325	3,186		46	1,900	58	23.1	18,462	46,091	64,553	20.3
	70	90	14	81	11.1	73,856	14.0	325	3,307		46	1,900	58	22.6	18,682	43,799	62,481	18.9
	75	95	14	86	11.0	73,315	14.8	325	3,513		46	1,900	59	22.1	18,309	42,926	61,235	17.4
	80	100	14	91	10.9	72,743	15.7	325	3,728		47	1,900	59	21.7	17,919	42,012	59,931	16.1
	85	105	14	96	10.8	72,145	16.6	325	3,952		47	1,900	59	21.2	17,512	41,056	58,567	14.8

METRIC

HEATING	OUTDOOR LOOP (15% Methanol)						ELECTRICAL			INDOOR LOOP (Air)						
	ELT (°C)	Evap. Temp.	Flow (L/s)	LLT (°C)	Delta T (°C)	Heat Abs. (W)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT (°C)	Cond. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Heating (W)	COP _H
	-3.3	-9.4	0.88	-6.0	2.6	9,272	14.9	300	3,573	20	36.1	900	32.6	12.6	12,713	3.56
	0.0	-6.7	0.88	-2.9	2.9	10,196	15.3	300	3,667		37.2	900	33.6	13.6	13,732	3.74
	3.3	-3.9	0.88	0.2	3.2	11,120	15.9	300	3,806		38.9	900	34.6	14.6	14,795	3.89
	6.7	-1.1	0.88	3.1	3.6	12,472	16.3	300	3,903		40.0	900	36.1	16.1	16,244	4.16
	9.4	1.7	0.88	5.7	3.8	13,863	16.9	300	4,045		41.7	900	37.2	17.2	17,790	4.40
	12.8	4.4	0.88	8.7	4.1	15,118	17.4	300	4,144		42.8	900	38.5	18.5	19,146	4.62
	16.1	7.2	0.88	11.7	4.5	16,455	17.8	300	4,247		43.9	900	39.9	19.9	20,584	4.85
	19.4	10.0	0.88	14.6	4.8	17,873	18.3	300	4,353		45.0	900	41.4	21.4	22,108	5.08

COOLING	OUTDOOR LOOP (15% Methanol)						ELECTRICAL			INDOOR LOOP (Air @ 46% RH)								
	ELT (°C)	Cond. Temp.	Flow (L/s)	LLT (°C)	Delta T (°C)	Heat Rej. (W)	Compressor Current (A)	Fan (W)	Input Power (W)	EAT (°C)	Evap. Temp.	Airflow (L/s)	LAT (°C)	Delta T (°C)	Latent (W)	Sensible (W)	Cooling (W)	COP _c
	9.4	21.1	0.88	15.6	6.2	22,845	10.8	325	2,663	27	7.1	900	13.3	13.7	5,762	14,385	20,147	7.56
	12.2	23.9	0.88	18.4	6.2	22,735	11.6	325	2,864		7.3	900	13.5	13.5	5,673	14,163	19,835	6.93
	15.0	26.7	0.88	21.1	6.1	22,612	12.4	325	3,067		7.4	900	13.8	13.2	5,580	13,930	19,509	6.36
	17.8	29.4	0.88	23.8	6.0	22,135	13.2	325	3,186		7.6	900	14.2	12.8	5,409	13,504	18,914	5.94
	21.1	32.2	0.88	27.3	6.2	21,640	14.0	325	3,307		7.8	900	14.4	12.6	5,474	12,833	18,307	5.54
	23.9	35.0	0.88	30.0	6.1	21,481	14.8	325	3,513		7.9	900	14.7	12.3	5,365	12,577	17,942	5.11
	26.7	37.8	0.88	32.7	6.1	21,314	15.7	325	3,728		8.1	900	15.0	12.0	5,250	12,309	17,560	4.71
	29.4	40.6	0.88	35.5	6.0	21,138	16.6	325	3,952		8.3	900	15.2	11.8	5,131	12,029	17,160	4.34

Airflow Data

MED Airflow (nominal)												
	STAGE 2				STAGE 1				FAN ONLY (Recirculation)			
Model	Full		AR1-AR2 reduction		Full		AR1-AR2 reduction		Full		AR1-AR2 reduction	
	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
25	800	378	680	321	680	321	578	273	448	211	381	180
45	1200	566	1020	481	1030	486	876	413	672	317	571	270
55	1500	708	1275	602	1240	585	1054	497	840	396	714	337
65	1900	897	1615	762	1540	727	1309	618	1064	502	904	427
75	2100	991	1785	842	1660	783	1411	666	1176	555	1000	472
80	2400	1133	2040	963	N/A	N/A	N/A	N/A	1344	634	1142	539

LOW Airflow (-6%)												
	STAGE 2				STAGE 1				FAN ONLY (Recirculation)			
Model	Full		AR1-AR2 reduction		Full		AR1-AR2 reduction		Full		AR1-AR2 reduction	
	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
25	752	355	639	302	639	302	543	256	421	199	358	169
45	1128	532	959	453	968	457	823	388	632	298	537	253
55	1410	665	1199	566	1166	550	991	468	790	373	671	317
65	1786	843	1518	716	1448	683	1230	581	1000	472	850	401
75	1974	932	1678	792	1560	736	1326	626	1105	522	940	443
80	2256	1065	1918	905	N/A	N/A	N/A	N/A	1263	596	1074	507

HIGH Airflow (+6%)												
	STAGE 2				STAGE 1				FAN ONLY (Recirculation)			
Model	Full		AR1-AR2 reduction		Full		AR1-AR2 reduction		Full		AR1-AR2 reduction	
	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
25	848	400	721	340	721	340	613	289	475	224	404	191
45	1272	600	1081	510	1092	515	928	438	712	336	605	286
55	1590	750	1352	638	1314	620	1117	527	890	420	757	357
65	2014	951	1712	808	1632	770	1388	655	1128	532	959	452
75	2226	1051	1892	893	1760	830	1496	706	1400	661	1190	562
80	2500	1180	2162	1021	N/A	N/A	N/A	N/A	1425	672	1211	572

MAX Airflow (+12%)												
	STAGE 2				STAGE 1				FAN ONLY (Recirculation)			
Model	Full		AR1-AR2 reduction		Full		AR1-AR2 reduction		Full		AR1-AR2 reduction	
	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s	cfm	L/s
25	896	423	762	359	762	359	647	306	502	237	426	201
45	1344	634	1142	539	1154	544	981	463	753	355	640	302
55	1680	793	1428	674	1389	655	1180	557	941	444	800	377
65	2128	1004	1809	854	1725	814	1466	692	1192	562	1013	478
75	2352	1110	1999	944	1859	877	1580	746	1317	622	1120	528
80	2500	1180	2285	1078	N/A	N/A	N/A	N/A	1505	710	1279	604

Maximum external static pressure (all model sizes): 0.50 inH₂O

Engineering Guide Specifications

General

The liquid source reversing water-to-air 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, 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 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 through the outdoor loop and air circulating through the indoor loop. 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 and air flow are not acceptable. The units shall be warranted by the manufacturer against defects in materials and workmanship in accordance with the warranty section at the end of this document. Optional extended factory warranty coverage may be available.

Cabinet

Each unit shall be enclosed in a sheet metal cabinet. Cabinet shall be constructed of powder coated galvanized sheet metal of minimum 20 gauge. Sheet metal gauge shall be higher where structurally required. Design and construction of cabinet shall be such that it is rigid and passes the CSA/UL Loading Test requirements (200 lb roof test and 25 lb guard test). All panels shall be lined with minimum 1/2 inch [12.7 mm] thick acoustic type glass fiber insulation. All insulation shall meet the fire retardant provisions of NFPA 90A. This material shall also provide acoustical benefit. The unit must have a minimum of three access panels for serviceability of the compressor compartment. Units having only one access panel to compressor/heat exchangers/expansion device/refrigerant piping shall not be acceptable. The electrical box shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic grommets.

Refrigerant Circuit

All units shall contain only one sealed refrigerant circuit, containing a hermetic motor scroll compressor, coaxial heat exchanger, refrigerant to air exchanger, thermostatic expansion valve (TXV), reversing valve, factory installed high and low pressure safety switches, service ports, liquid line filter-dryer, sight glass, desuperheating heat exchanger, and suction accumulator.

Compressors shall be specified for heat pump duty with internal 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 refrigerant to air heat exchanger shall be a multi-circuit design with copper tubing and aluminum fins with refrigerant distributor for cooling mode. It shall be designed and certified for 650 psig [4482kPa] working pressure on the refrigerant side.

The thermostatic expansion valve shall be a balanced port bi-flow type with internal bleed and shall provide proper superheat control over the unit's operating range with minimal deviation from the superheat setpoint.

Fan/Blower

The blower shall be a squirrel cage type, constructed of corrosion resistant material, with unobstructed removable venturi to allow one-side servicing of fan motor. The fan return may be specified as left or right at the time of manufacture. The fan may be top or side discharge and is field configurable.

The fan motor shall be direct drive electrically commutated motor (ECM) with soft start, variable speed, and constant airflow functionality that maintains selected air flow up to the maximum external static as indicated in the ECM Fan Air Flow Tables section of his specification.

Auxiliary Heat (Plenum Heater)

With the fan configured as top discharge, an optional plenum heater may be field installed inside the air compartment of the unit. Provisions for mounting and electrical connections are supplied. Installations requiring side discharge requires the plenum heater to be mounted external to the unit.

Condensate Tray

The condensate tray shall be made of stainless steel and be large enough to catch any condensation that may drip from the refrigerant to air exchanger during cooling operation. The condensate drain shall be clear tubing with a 3/4" PVC female socket fitting for external drain connection.

Piping and Connections

The unit shall have one set of primary water in and water out connections (outdoor loop). The primary connection type shall be 1" nominal female National Pipe Thread (NPT). Domestic hot water (desuperheater) water connectors shall be 1/2" 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 a 24 volt alternating current (24VAC) 75VA class II control transformer with resettable breaker for short circuit protection for providing power to all internal controls as well as a remote thermostat. Terminal strips with screw terminals shall be provided for field control wiring, power supply line connections and 115/230VAC power supply for outdoor loop (ground loop) circulators. Units shall be name-plated for use with time delay fuses or circuit breakers.

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. A test jumper shall be provided to disable this delay for unit commissioning and testing purposes. The unit shall revert to normal operation after a time delay if the test jumper is accidentally left in place.
2. Random compressor start delay of 0-120 seconds (in addition to 5 minute anti-short cycle timer) on unit power up to facilitate starting multiple units on one disconnect switch or after a power failure.
3. Compressor shutdown for high or low refrigerant pressures.
4. Condensate overflow protection, using two contacts in the drip tray (not a mechanical or electronic switch).
5. Low grid voltage or 'brownout' protection, which will prevent compressor operation if low voltage is detected.
6. Automatic intelligent reset: unit shall automatically restart 5 minutes after a trip if the fault has cleared. Should a fault reoccur again within 60 minutes then a permanent lockout shall occur, requiring cycling of the power to the unit in order to reset.
6. Tap board for airflow adjustment for the following settings: Nominal, -6%, +6% and +12%
7. Dry contact input for overall air flow reduction of 15% for zoning 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: R-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 Petitscodiac, 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 RECEIVED 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 limitation 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 Petitscodiac, 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.