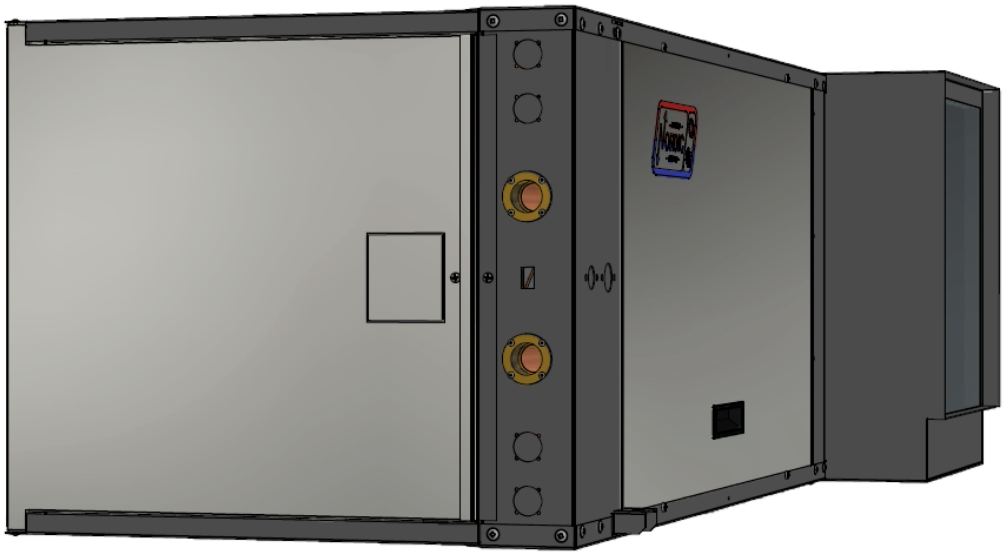
MARITIME GEOTHERMAL LTD.

Engineering Specification

RH-65-HRC-P-*T-*-SDE**
Horizontal Liquid to Air Heat Pump with Hot Gas Reheat
60 Hz



C SP US

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Model Nomenclature

RH—65—HRC—P—1T—C—SDERS—xx

Series:
RH = liquid to air (horizontal)

Nominal Size:
65 = 51 compressor

Functions:
H = heating
RC = active cooling w/ hot gas reheat

Refrigerant:
P = R410a

Voltage Code:
1 = 208/230-1-60
2 = 208-3-60
3 = 277-1-60
4 = 460-3-60
6 = 220-1-50
7 = 380-3-50

Compressor:
S = 1 stage scroll
T = 2 stage scroll

Revision:
01, 02 etc.

Air Supply Orientation:
S = side discharge
B = back (end) discharge

Air Return Orientation:
L = left return
R = right return

Fan Motor:
E = ECM (variable speed)

Fan Type:
D = direct drive

Air Coil:
S = standard (non-coated)
K = e-coated

Outdoor Loop Exchanger:
C = copper
Y = CuNi coil & piping
Z = CuNi coil only

APPLICATION TABLE

MODEL	FUNCTION	REFRIGERANT	VOLTAGE	COMPRESSOR	OUTDOOR COIL	FAN/CASE	REVISIONS				
RH-65	HRC	P	1 2 3 4	T	C Y Z	SDELS SDELB SDERS SDERB	01				

This document 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 .

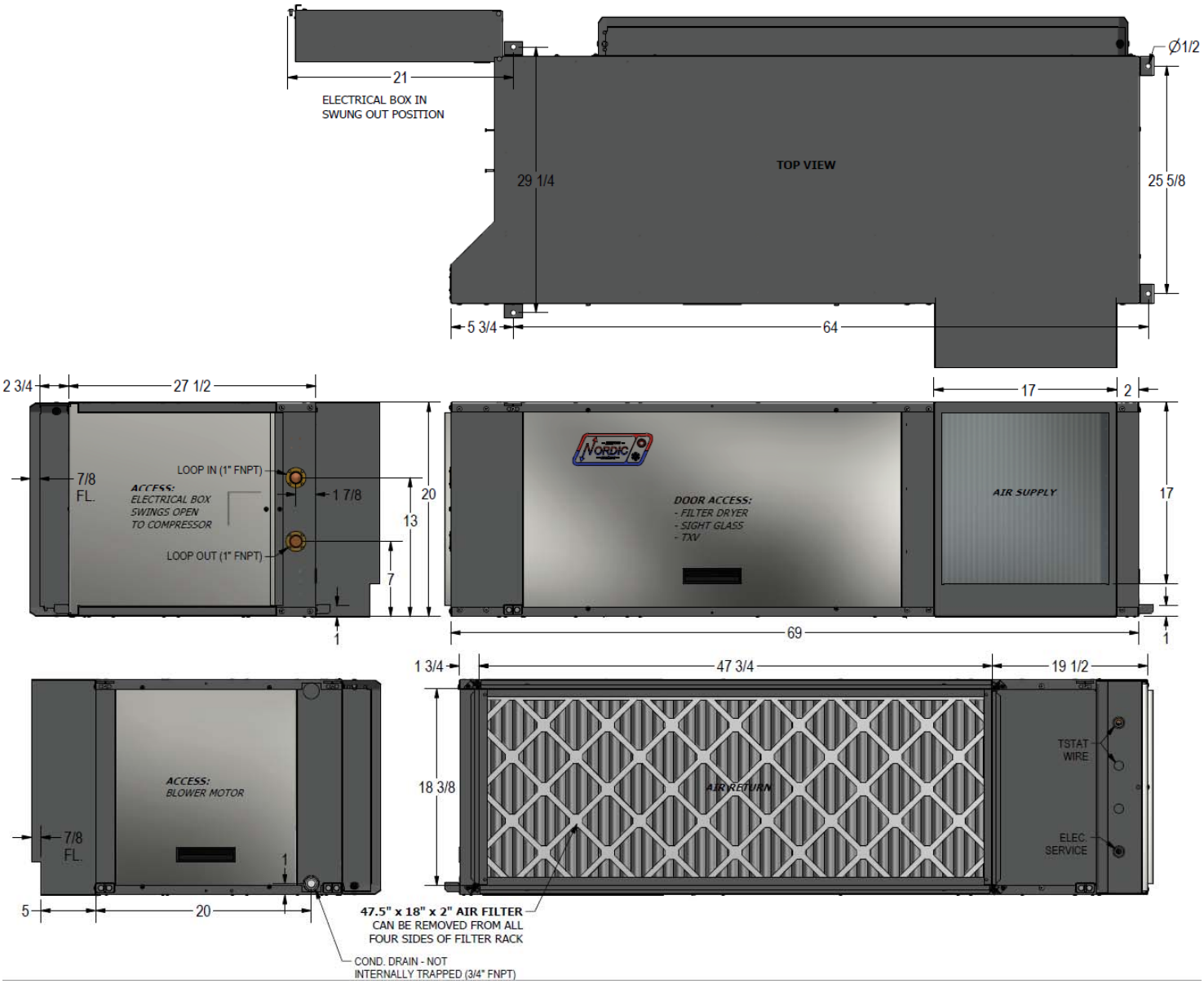
Design Features

- Energy Star rated
- AHRI certified for performance
- CSA certified for safety (CSA 22.2 No 236-05)
- Satin galvanized steel cabinet, with hangers for concealed ceiling mounting
- Powder coat finish
- Acoustically insulated cabinet (1/2”)
- Standard horizontal heat pump layout, with left or right air return
- Air supply opposite return, or back/end (from factory)
- ECM direct drive blower
- Air filter rack, with all 4 sides removable for air filter change from any side
- Stainless steel condensate drip tray
- Direct hoseless condensate drain with 3/4” female NPT threaded connection, not internally trapped
- Condensate overflow protection standard
- Multi-circuit high efficiency air coil
- Refrigeration service ports located inside unit (1/4” Schrader)
- Insulated coaxial heat exchanger, available in copper or cupro-nickel (CuNi) inner tube and/or CuNi piping
- 1” brass FPT fittings for loop connections
- Provisions for powering pump module for ground loop applications
- Two-stage scroll compressor
- 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
- Two 4-way reversing valves, one for cooling and one for hot gas defrost
- 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

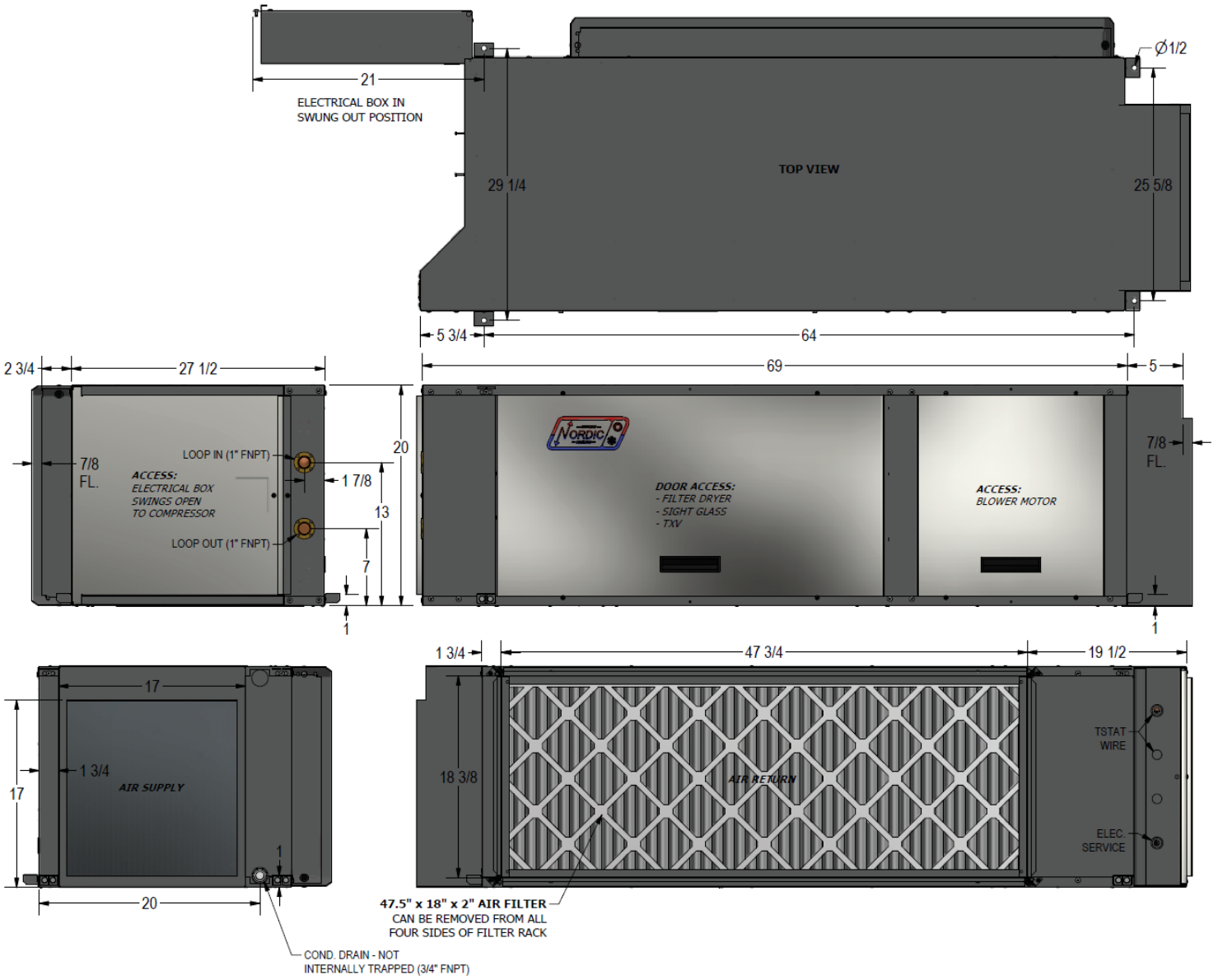
Available Accessories

- 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
- 1” water valve (slow closing or solenoid) & wiring harness for open loop applications
- Electric plenum heaters 5 / 7 / 10 / 15 / 20 kW, for external mounting

Dimensions (Left Return, Side Supply)



Dimensions (Left Return, Back/End Supply)



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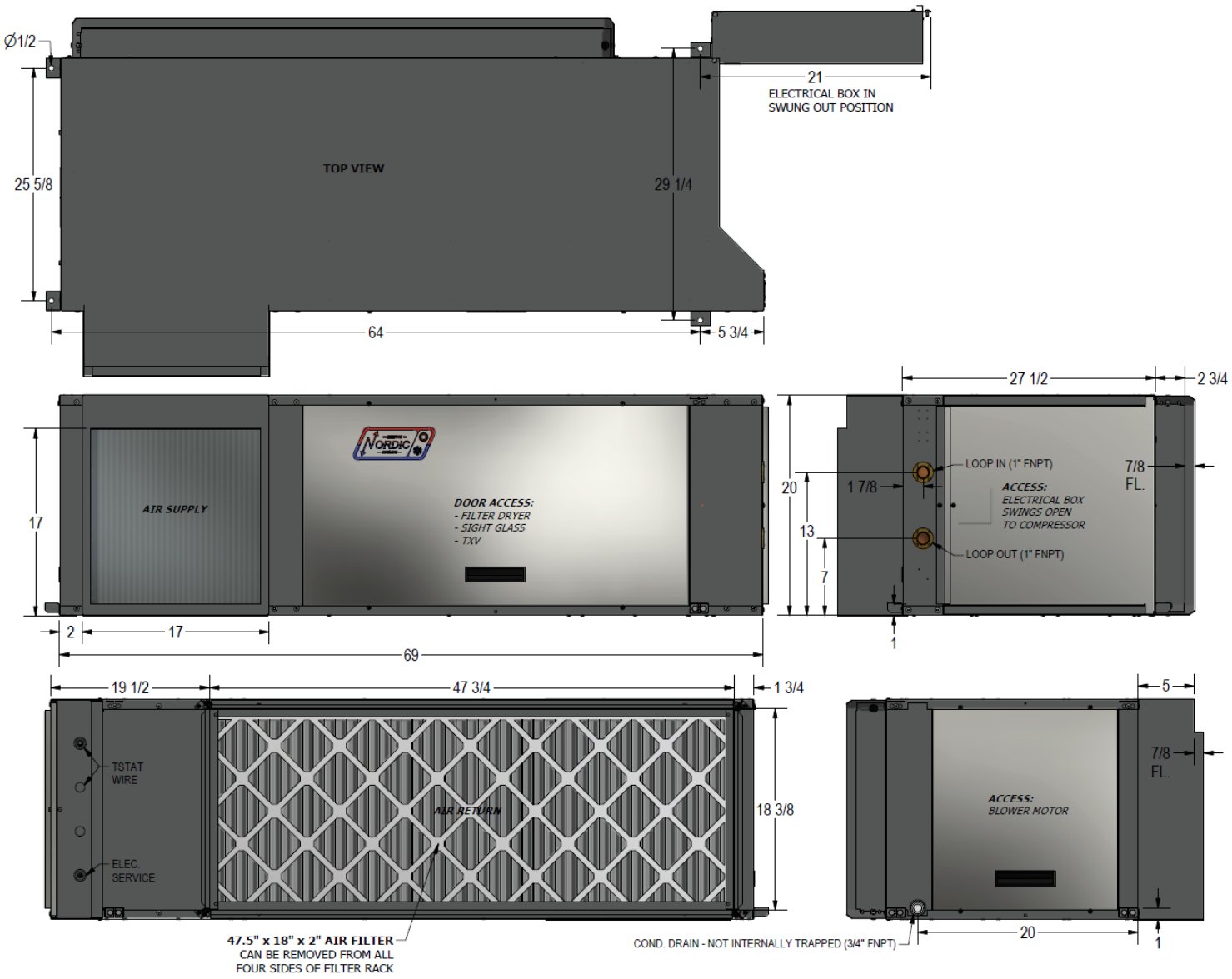
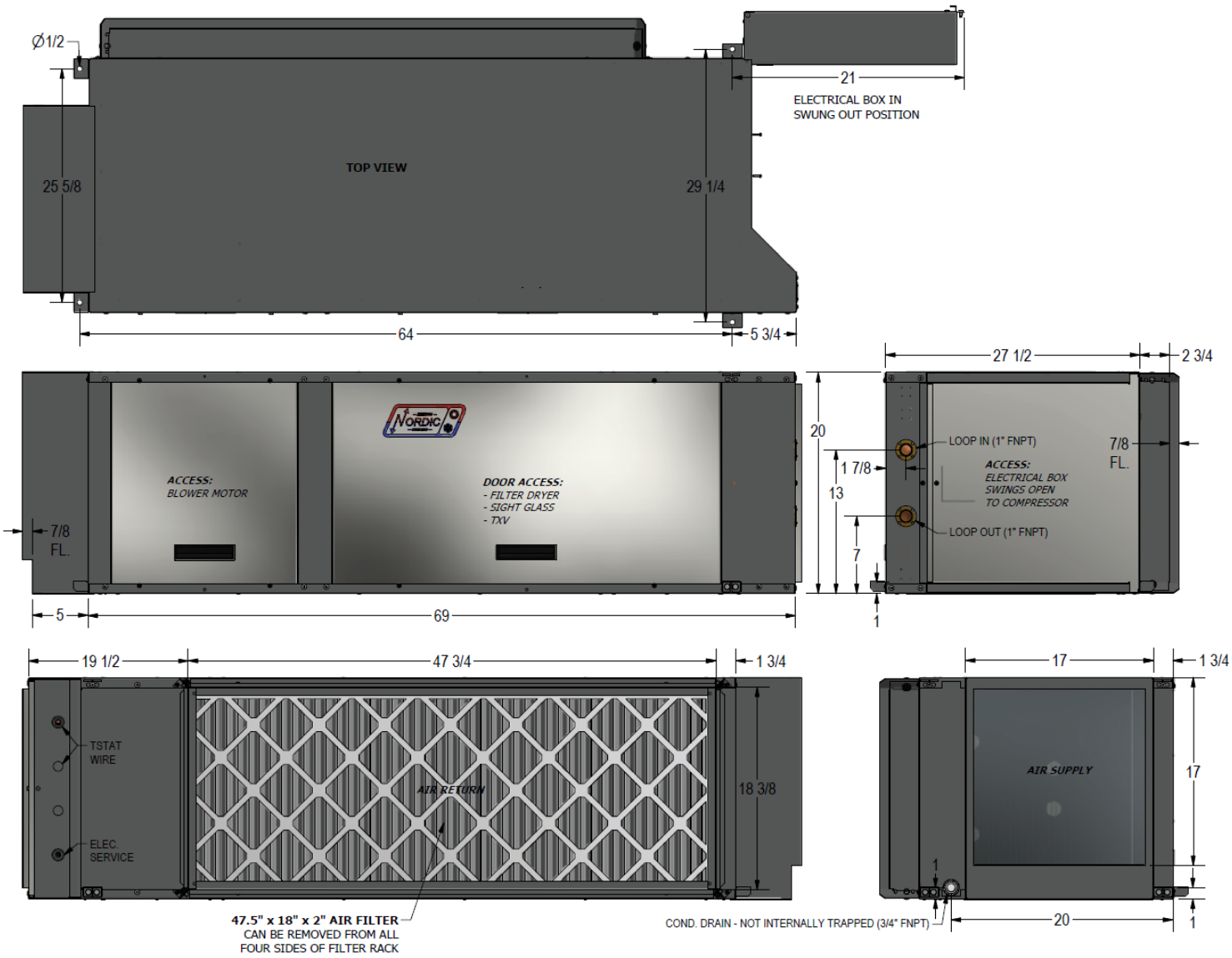


Dimensions (Right Return, Back/End Supply)



Specifications

Electrical Data											
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	27.1	153	5.5	5.0	38.4	45.2	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
RH-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.				

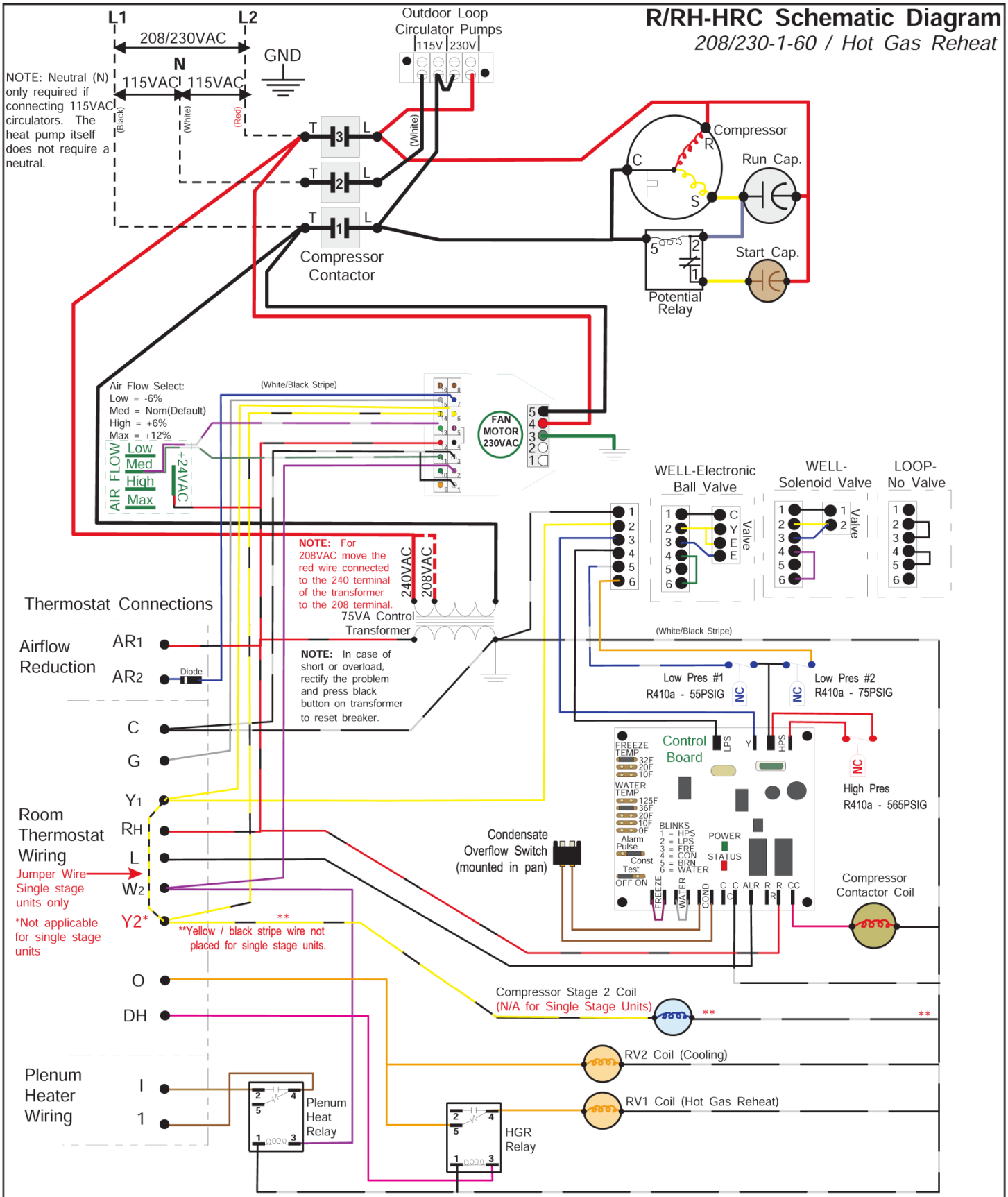
Shipping Information				
MODEL	WEIGHT	DIMENSIONS in (cm)		
	lb. (kg)	L	W	H
RH-65	540 (245)	76 (193)	41 (104)	26 (66)

Operating Temperature Limits					
Loop	Parameter	Mode	(°F)	(°C)	Note
Outdoor	Minimum ELT	Heating / Cooling	41	5	Ground water system.
	Minimum ELT	Heating / Cooling	23	-5	Ground loop system. Adequate freeze protection required.
	Maximum ELT	Heating	80	27	
	Maximum ELT	Cooling	110	43	
Indoor (Duct)	Minimum EAT	Heating / Cooling	60	16	Reduce air flow if necessary during heating startup.
	Maximum EAT	Heating	80	27	
* Values in this table are for rated liquid and airflow values.					

Pressure Drop Data					
FLOW		Water @ 50°F		15% Methanol @ 32°F	
gpm	L/s	psi	kPa	psi	kPa
6	**0.38**	1.2	8.3	1.3	9.0
7	**0.44**	1.5	10	1.8	12
8	**0.50**	1.9	13	2.2	15
9	**0.57**	2.3	16	2.7	19
10	**0.63**	2.6	**18**	3.3	**23**
11	**0.69**	3.2	22	4.0	28
12	**0.76**	3.9	27	4.6	32
13	**0.82**	4.4	30	5.2	36
14	**0.88**	**5.0**	**34**	**5.8**	**40**
15	**0.82**	5.7	39	6.5	45
16	**0.88**	6.5	45	7.3	50

R/RH-HRC Schematic Diagram

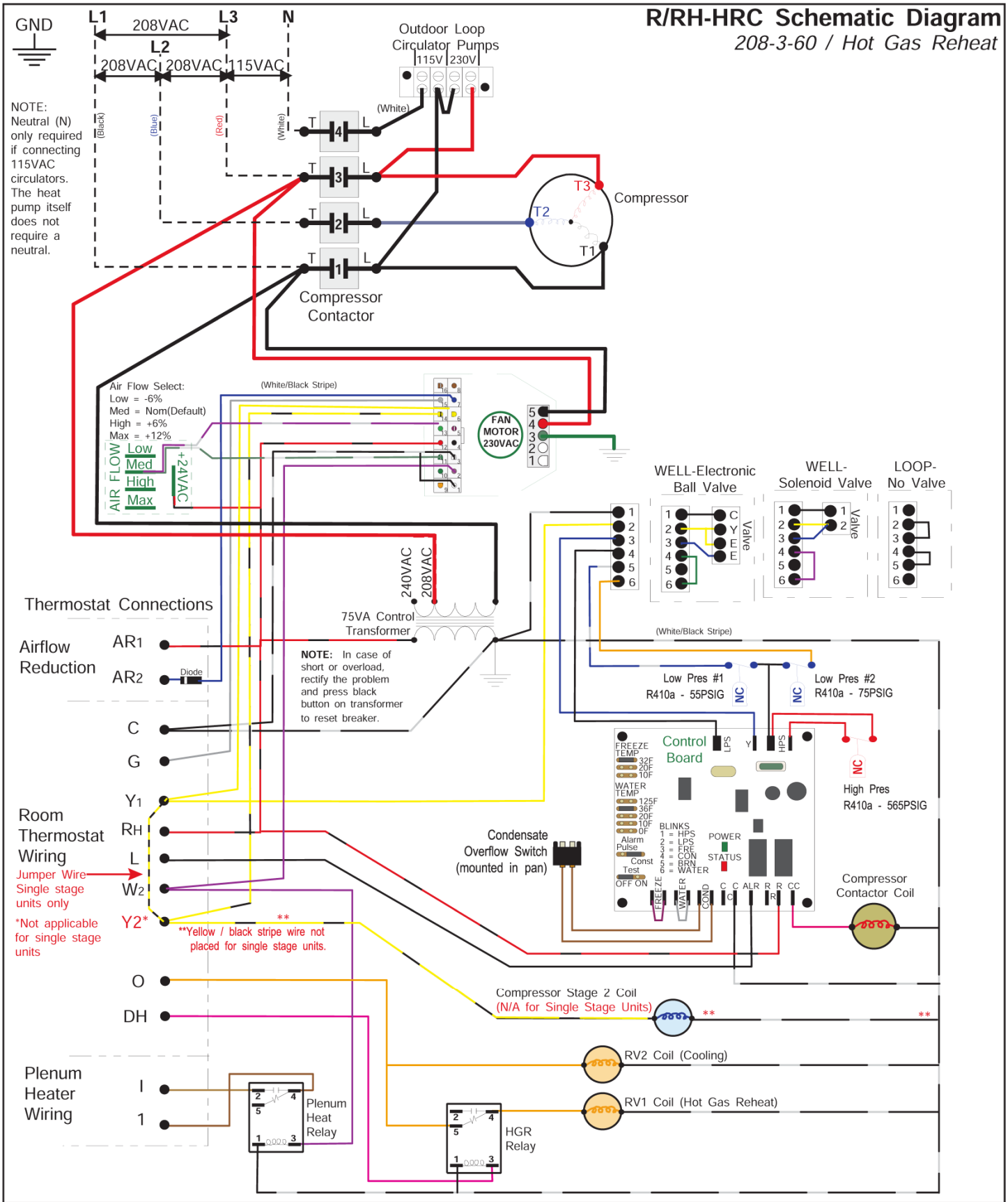
208/230-1-60 / Hot Gas Reheat



					Drawn By Dan Rheault	Date 20-Aug-2018	
					Checked By Dan Rheault	Date 20-Aug-2018	
					Approved By (ENG) Dan Rheault	Date 20-Aug-2018	Drawing Name: R/RH-HRC Schematic Diagram 208/230-1-60
01	Initial Rel.	D. RHEAULT	D. RHEAULT	20-Aug-2018	Approved By (MFG)	Date	Size: A / Drawing Number: 002328SCH / Drawing Rev: 01 / SHEET: 1 of 1
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date	

R/RH-HRC Schematic Diagram

208-3-60 / Hot Gas Reheat



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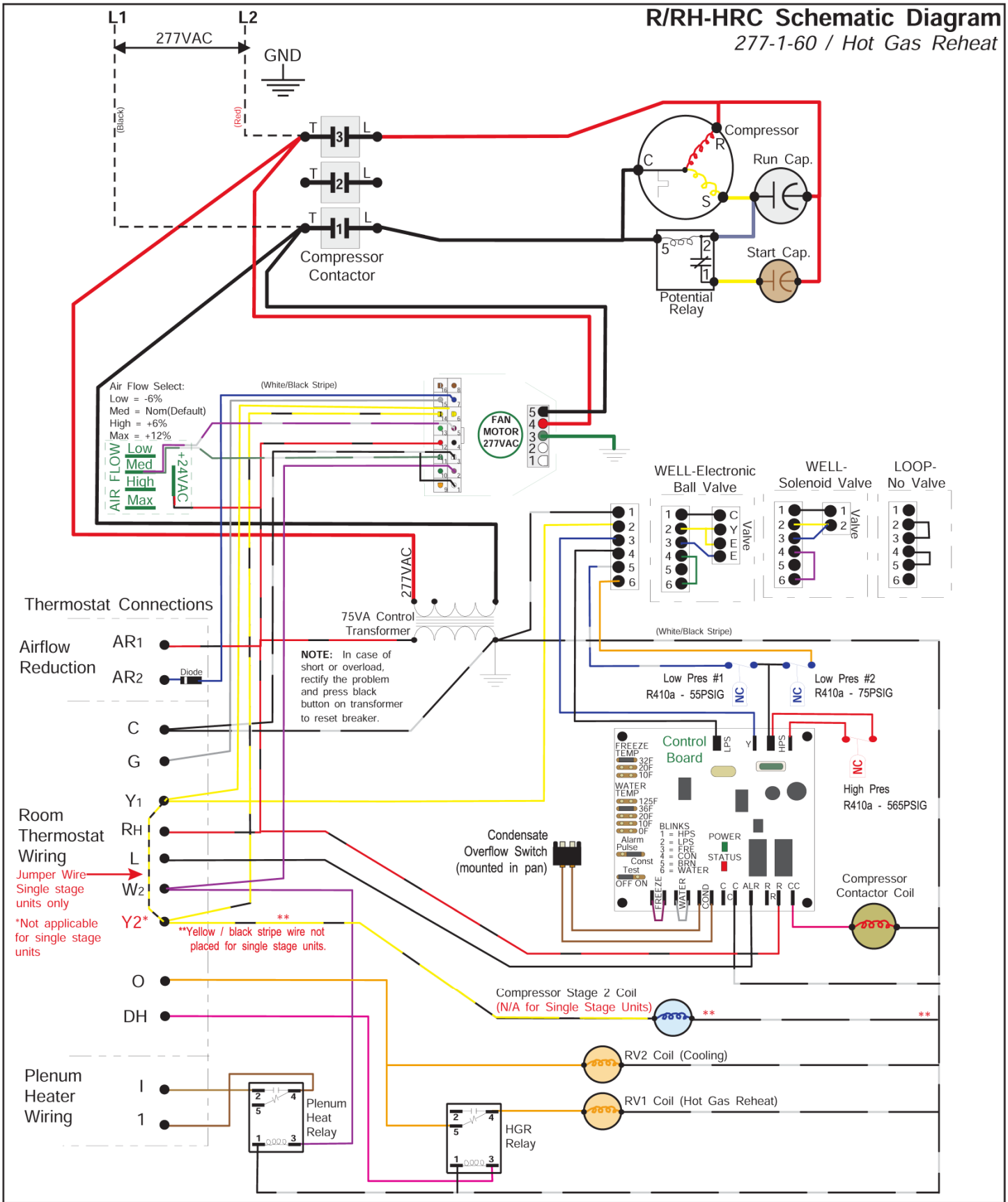
					Approved By (ENG) Dan Rheault	Date 20-Aug-2018	Drawing Name R/RH-HRC Schematic Diagram 208-3-60	
					Approved By (MFG)	Date		
01	Initial Rel.	D. RHEAULT	D. RHEAULT	20-Aug-2018	Approved By	Date	Size A / Drawing Number 002330SCH / Drawing Rev 01 / SHEET 1 of 1	
REV	ECO #	IMPL BY	APVD BY	DATE				

R/RH-HRC Schematic Diagram

277-1-60 / Hot Gas Reheat



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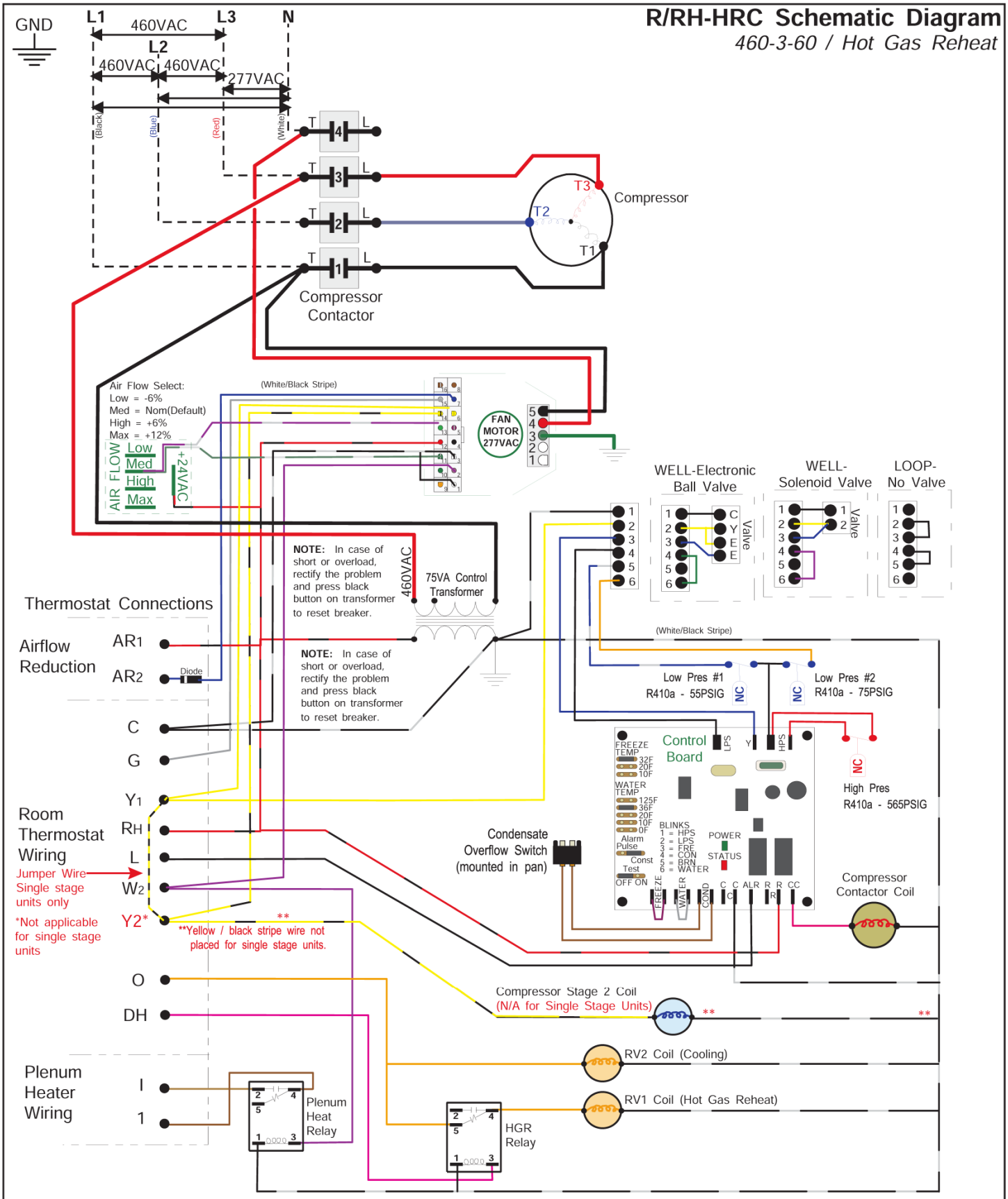
					Approved By (ENG) Dan Rheault	Date 20-Aug-2018	Drawing Name R/RH-HRC Schematic Diagram 277-1-60	
					Approved By (MFG)	Date		
01	Initial Rel.	D. RHEAULT	D. RHEAULT	20-Aug-2018	Approved By	Date	Size A	Drawing Number 002332SCH	Drawing Rev 01	SHEET 1 of 1
REV	ECO #	IMPL BY	APVD BY	DATE						

R/RH-HRC Schematic Diagram

460-3-60 / Hot Gas Reheat



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					Approved By (ENG) Dan Rheault	Date 20-Aug-2018	Drawing Name R/RH-HRC Schematic Diagram 208-3-60		
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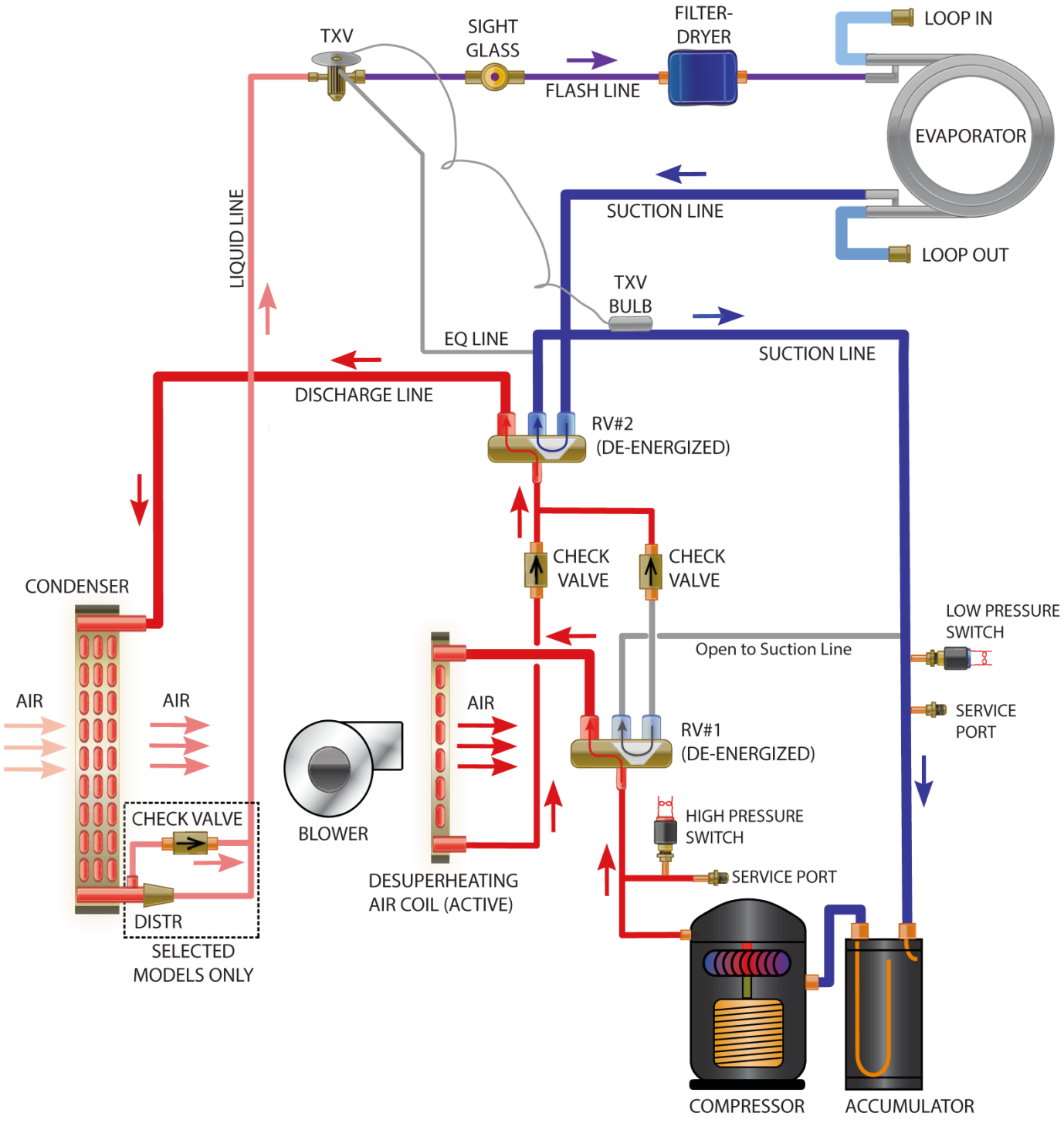
REV	ECO #	IMPL BY	APVD BY	DATE	Approved By	Date				

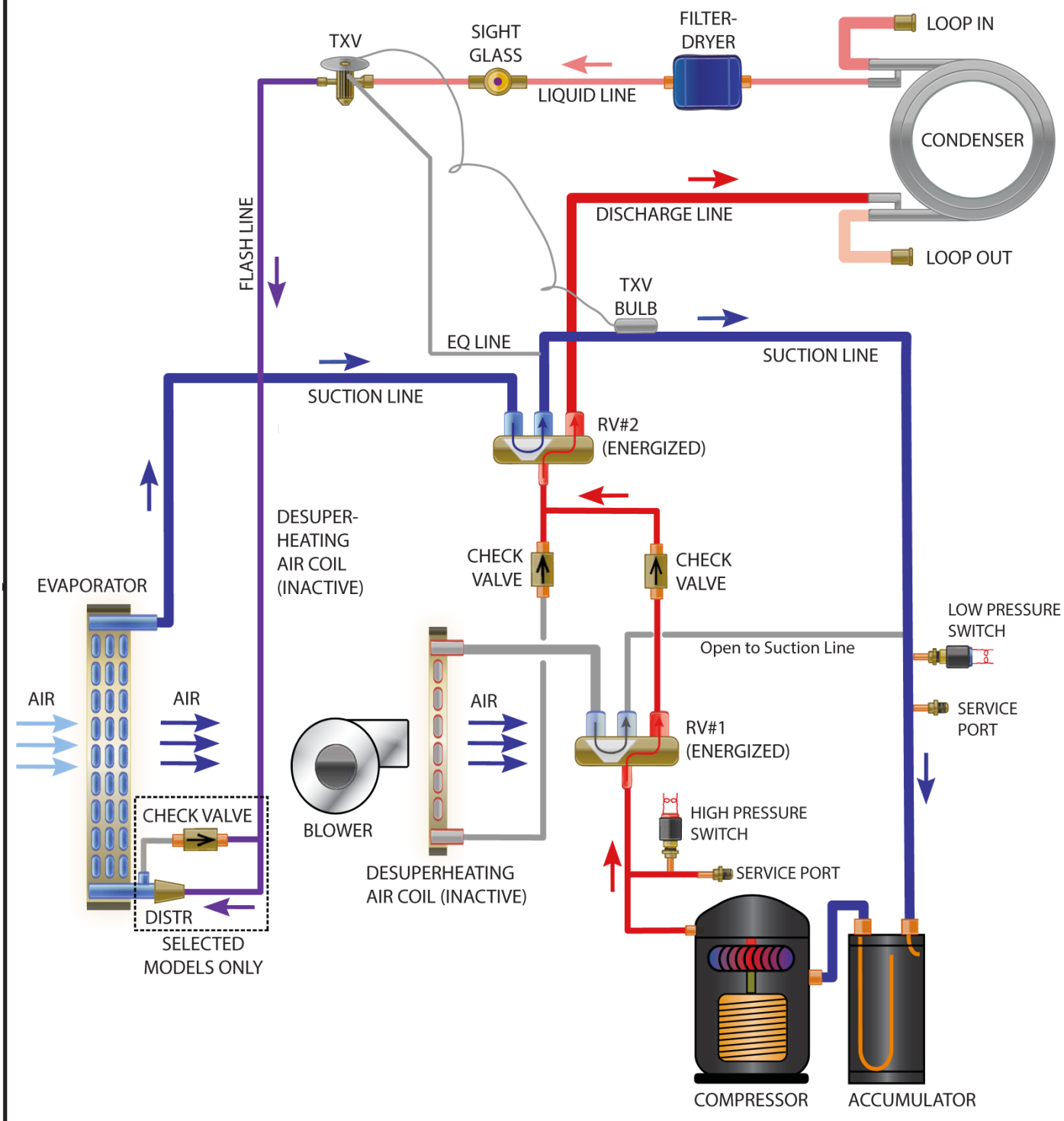
R/RH Series with Hot Gas Reheat
Heating Mode



REV	ECO#	IMPL BY	APVD BY	DATE
01	Initial Release	Dan Rheault	Dan Rheault	13-Aug-2018
00	Prelim. Release	Dan Rheault	Dan Rheault	19-Feb-2016

Drawn By: Dan Rheault	Date: 19-Feb-2016	MARITIME GEOTHERMAL LTD.	P.O. Box 2555, 170 Plantation Rd., Petitcodiac, NB CANADA E4Z 6H4
Checked By: Dan Rheault	Date: 19-Feb-2016	Drawing Name: R/RH Series with Hot Gas Reheat - Heating Mode	
Eng. Approved By	Date: 16 JUL 2014		
Mfg. Approved By	Date		
Approved By	Date	Size: LET	Drawing Number: 002045RCD / Drawing Revision: 01 / Sheet: 1 / 1

R/RH Series with Hot Gas Reheat
Cooling Mode

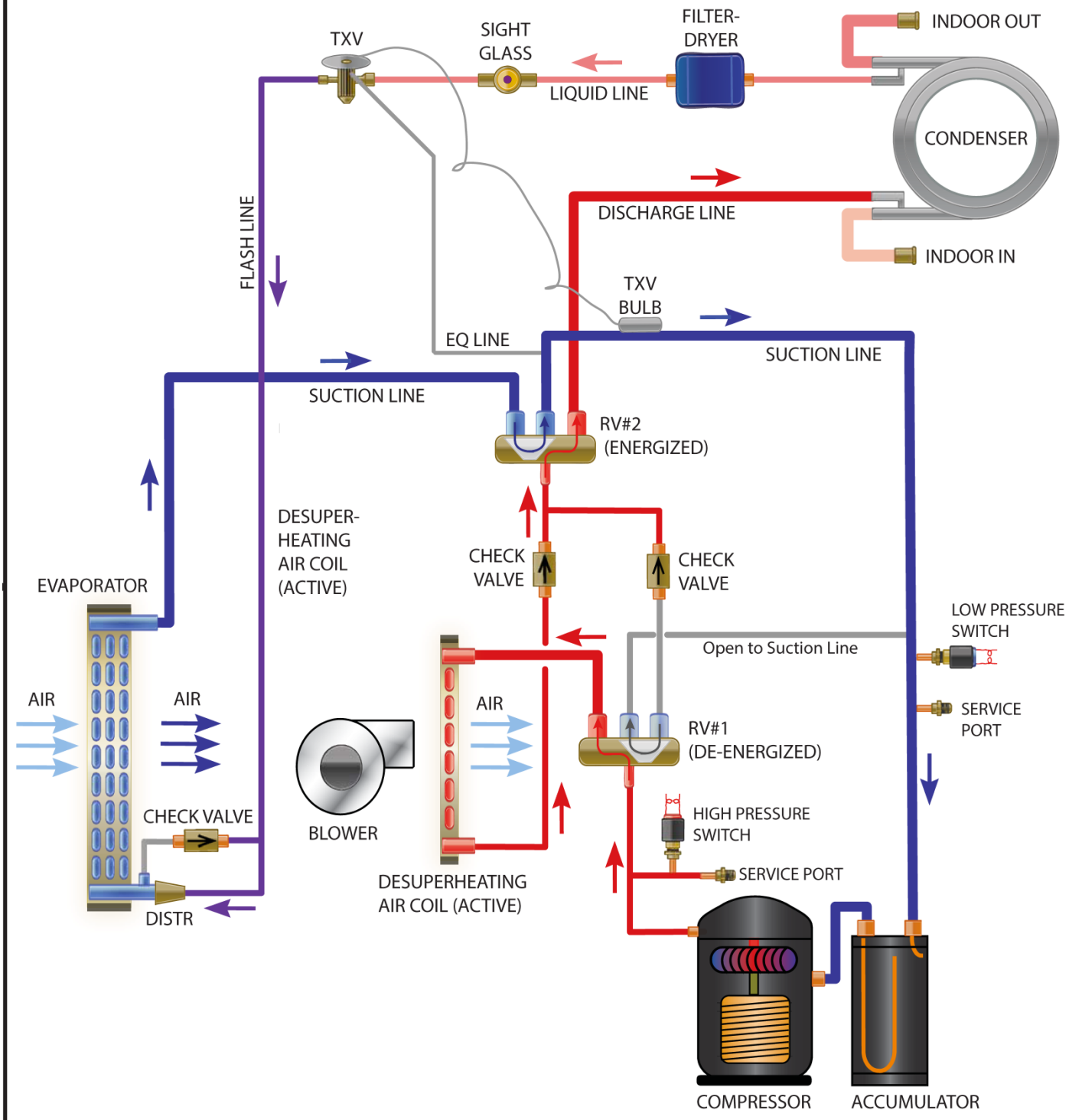


REV	ECO#	IMPL BY	APVD BY	DATE
01	Initial Release	Dan Rheault	Dan Rheault	13-Aug-2018
00	Prelim. Release	Dan Rheault	Dan Rheault	19-Feb-2016

Drawn By: Dan Rheault	Date: 19-Feb-2016	MARITIME GEOTHERMAL LTD.	P.O. Box 2555, 170 Plantation Rd., Petitcodiac, NB CANADA E4Z 6H4
Checked By: Dan Rheault	Date: 19-Feb-2016	Drawing Name: R/RH Series with Hot Gas Reheat - Cooling Mode	
Eng. Approved By	Date: 16 JUL 2014		
Mfg. Approved By	Date		
Approved By	Date	Size: LET	Drawing Number: 002046RCD / Drawing Revision: 01 / Sheet: 1 / 1

R/RH Series with Hot Gas Reheat

Cooling Mode, Hot Gas Reheat Active



REV	ECO#	IMPL BY	APVD BY	DATE
01	Initial Release	Dan Rheault	Dan Rheault	13-Aug-2018
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Checked By: Dan Rheault	Date: 19-Feb-2016	Drawing Name: R/RH Series with Hot Gas Reheat - Cooling Mode, Hot Gas Reheat Active	
Eng. Approved By	Date: 16 JUL 2014		
Mfg. Approved By	Date		
Approved By	Date	Size: LET	Drawing Number: 002047RCD / Drawing Revision: 01 / Sheet: 1 / 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	kW	W/W
RH-65	5	14.0	0.88	5.3	36.5	Stage 1	1540	727	2,565	35,900	10.5	4.1
						Stage 2	1900	897	3,390	44,000	12.8	3.8

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	kW	W/W
RH-65	5	14.0	0.88	4.3	29.7	Stage 1	1540	727	2,670	42,800	12.5	4.7
						Stage 2	1900	897	3,740	58,700	17.2	4.6

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	
RH-65	5	14.0	0.88	4.1	28.2	Stage 1	1540	727	1,910	45,500	13.3	6.7	23.8	
						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	
RH-65	5	14.0	0.88	4.1	28.0	Stage 1	1540	727	1,705	47,200	13.8	8.1	27.5	
						Stage 2	1900	897	2,865	62,600	18.3	6.4	21.8	

Performance Tables

Heating Mode

RH-65-H-P-1T*** — **R410a 60 Hz**

Source Data (Outdoor Loop)						Power Consumption					Sink Data (Indoor Loop)					
ELT	Evap. Temp	Flow	LLT	Delta T	HAB	Compressor		Fan	Effective	**COPh**	EAT	Cond. Temp.	Air Flow	LAT	Delta T	**Net Output**
°F	°F	gpm	°F	°F	Btu/hr	Watts	Amps*	Watts	Watts	**W/W**	°F	°F	cfm	°F	°F	**Btu/hr**
°C	°C	L/s	°C	°C	Watts						°C	°C	L/s	°C	°C	**Watts**
26.0	15	14.0	21.2	4.8	31,644	3,290	14.9	300	3,573	**3.56**	68	97	1,900	90.6	22.6	**43,391**
-3.3	-9.4	0.883	-6.0	2.6	9,272						20.0	36.1	897	32.6	12.6	**12,713**
32.0	20	14.0	26.8	5.2	34,798	3,384	15.3	300	3,667	**3.74**	68	99	1,900	92.4	24.4	**46,866**
0.0	-6.7	0.883	-2.9	2.9	10,196						20.0	37.2	897	33.6	13.6	**13,732**
38.0	25	14.0	32.3	5.7	37,954	3,522	15.9	300	3,806	**3.89**	68	102	1,900	94.3	26.3	**50,495**
3.3	-3.9	0.883	0.2	3.2	11,120						20.0	38.9	897	34.6	14.6	**14,795**
44.0	30	14.0	37.6	6.4	42,566	3,620	16.3	300	3,903	**4.16**	68	104	1,900	96.9	28.9	**55,440**
6.7	-1.1	0.883	3.1	3.6	12,472						20.0	40.0	897	36.1	16.1	**16,244**
49.0	35	14.0	42.2	6.8	47,314	3,765	16.9	300	4,045	**4.40**	68	107	1,900	99.0	31.0	**60,717**
9.4	1.7	0.883	5.7	3.8	13,863						20.0	41.7	897	37.2	17.2	**17,790**
55.0	40	14.0	47.6	7.4	51,599	3,865	17.4	300	4,144	**4.62**	68	109	1,900	101.4	33.4	**65,344**
12.8	4.4	0.883	8.7	4.1	15,118						20.0	42.8	897	38.5	18.5	**19,146**
61.0	45	14.0	53.0	8.0	56,159	3,968	17.8	300	4,247	**4.85**	68	111	1,900	103.9	35.9	**70,253**
16.1	7.2	0.883	11.7	4.5	16,455						20.0	43.9	897	39.9	19.9	**20,584**
67.0	50	14.0	58.3	8.7	61,001	4,074	18.3	300	4,353	**5.08**	68	113	1,900	106.6	38.6	**75,456**
19.4	10.0	0.883	14.6	4.8	17,873						20.0	45.0	897	41.4	21.4	**22,108**

Compressor: ZPS51K5E-PFV

* @ 49.7Pa (0.20inH2o) Ext. Static

Cooling Mode

RH-65-H-P-1T*** — **R410a 60 Hz**

Source Data (Indoor Loop)								Power Consumption					Sink Data (Outdoor Loop)					
EAT	Evap. Temp	Airflow	LAT	Delta T	Latent	Sensible	**HAB**	Compressor		Fan	Effec-tive	**Effi-ciency**	ELT	Cond. Temp.	Flow	LLT	Delta T	Rejection
°F	°F	cfm	°F	°F	Btu/hr	Btu/hr	**Btu/hr**	Watts	Amps*	Watts	Watts	**EER**	°F	°F	gpm	°F	°F	Btu/hr
°C	°C	L/s	°C	°C	Watts	Watts	**Watts**					**COPc**	°C	°C	L/s	°C	°C	Watts
80.6	44.8	1,900	56.0	24.6	19,665	49,095	**68,760**	2,373	10.8	325	2,663	**25.8**	49	70	14.0	60.1	11.1	77,969
27.0	7.1	897	13.3	13.7	5,762	14,385	**20,147**					**7.56**	9.4	21.1	0.883	15.6	6.2	22,845
80.6	45.1	1,900	56.4	24.2	19,362	48,337	**67,698**	2,574	11.6	325	2,864	**23.6**	54	75	14.0	65.1	11.1	77,594
27.0	7.3	897	13.5	13.5	5,673	14,163	**19,835**					**6.93**	12.2	23.9	0.883	18.4	6.2	22,735
80.6	45.4	1,900	56.8	23.8	19,043	47,542	**66,585**	2,777	12.4	325	3,067	**21.7**	59	80	14.0	70.0	11.0	77,174
27.0	7.4	897	13.8	13.2	5,580	13,930	**19,509**					**6.36**	15.0	26.7	0.883	21.1	6.1	22,612
80.6	45.7	1,900	57.5	23.1	18,462	46,091	**64,553**	2,896	13.2	325	3,186	**20.3**	64	85	14.0	74.8	10.8	75,547
27.0	7.6	897	14.2	12.8	5,409	13,504	**18,914**					**5.94**	17.8	29.4	0.883	23.8	6.0	22,135
80.6	46	1,900	58.0	22.6	18,682	43,799	**62,481**	3,008	14.0	325	3,307	**18.9**	70	90	14.0	81.1	11.1	73,856
27.0	7.8	897	14.4	12.6	5,474	12,833	**18,307**					**5.54**	21.1	32.2	0.883	27.3	6.2	21,640
80.6	46	1,900	58.5	22.1	18,309	42,926	**61,235**	3,214	14.8	325	3,513	**17.4**	75	95	14.0	86.0	11.0	73,315
27.0	7.9	897	14.7	12.3	5,365	12,577	**17,942**					**5.11**	23.9	35.0	0.883	30.0	6.1	21,481
80.6	47	1,900	58.9	21.7	17,919	42,012	**59,931**	3,429	15.7	325	3,728	**16.1**	80	100	14.0	90.9	10.9	72,743
27.0	8.1	897	15.0	12.0	5,250	12,309	**17,560**					**4.71**	26.7	37.8	0.883	32.7	6.1	21,314
80.6	47	1,900	59.4	21.2	17,512	41,056	**58,567**	3,653	16.6	325	3,952	**14.8**	85	105	14.0	95.8	10.8	72,145
27.0	8.3	897	15.2	11.8	5,131	12,029	**17,160**					**4.34**	29.4	40.6	0.883	35.5	6.0	21,138

Compressor: ZPS51K5E-PFV

* @ 49.7Pa (0.20inH2o) Ext. Static

General

The liquid source reversing water-to-air heat pump shall be a single packaged reverse-cycle heating/cooling unit. The unit shall be listed by a nationally recognized safety-testing laboratory or agency, such as ETL Testing Laboratory, Underwriters Laboratory (UL), or Canadian Standards Association (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 two 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.

Hot gas reheat functionality shall be provided through the use of an additional desuperheating air coil, which can be turned on and off by a dry contact (24VAC thermostat signal). When not in use, the hot gas reheat coil shall be scavenged to ensure stable operation of the refrigeration circuit. Piping shall be arranged so that oil logging does not occur when the hot gas reheat coil is not in use. The reheat coil shall be positioned so it is not in line of sight of the main air coil, to prevent thermal short-circuit due to unwanted radiant heat transfer.

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. The entire blower shall be removable without disconnecting supply duct to allow servicing of fan motor. The air return may be specified as left or right at the time of manufacture. The airflow may be side or back (end) discharge and shall be field configurable.

The fan motors shall be direct drive electrically commutated motor (ECM) type, with soft start and variable speed functionality.

Auxiliary Heat (Plenum Heater)

Provisions for controlling an externally mounted electric air heater shall be supplied.

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 a 3/4" female NPT fitting for external drain connection.

Piping and Connections

The unit shall have one set of primary water in and water out connections (source/outdoor loop). 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 a 24 volt alternating current (24VAC) min. 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 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.

LIMITED WARRANTY

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

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

This warranty is subject to the following conditions:

1. The geothermal heat pump(s) must be properly installed and maintained in accordance with MARITIME GEOTHERMAL LTD.'s guidelines. Improper installation **includes but is not limited to** the following conditions:
   - Indoor or outdoor loop flow lower than listed in engineering specification or as expressly approved by MARITIME GEOTHERMAL LTD.
   - Operating the heat pump either manually or with automated controls so that the unit is forced to function outside its normal operating range or in a fashion which directly or indirectly leads to failure of components or the entire heat pump
   - Disabling of safety controls
   - Insufficient loop antifreeze concentration for loop temperature, or antifreeze concentration incorrectly set in control board
   - Fouled heat exchangers due to poor water quality
   - Failure to use strainers or clean them regularly
   - Impact or physical damage sustained by the heat pump
   - Poor refrigeration maintenance practices, including brazing without nitrogen flow, or using wrong braze/flux
   - Incorrect voltage or missing phase supplied to unit
   - Unit modified electrically or mechanically from factory supplied condition
   - Water quality outside of recommended limits (e.g. salinity or pH)
   - Unit not mounted with supplied anti-vibration grommets or optional spring feet
   - Corrosion damage due to corrosive ambient environment
   - Failure due to excessive cycling caused by improper mechanical setup or improperly programmed external controller
   - Physical loads or pressures placed on unit from external equipment
2. The installer must complete the **Startup Record** and return it to MARITIME GEOTHERMAL LTD. within 21 days of unit installation.
3. For new construction, it is the responsibility of the building or general contractor to supply temporary heat to the structure prior to occupancy. Geothermal heat pumps are designed to provide heat only to the completely finished and insulated structure. Startup of the unit shall not be scheduled prior to completion of construction and final duct installation for validation of this warranty.
4. It is the customer's responsibility to supply the proper quantity and quality of water or properly sized ground loop with adequate freeze protection.

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