BULLDOG HEAT PUMP

Design Manual

SpaceKeeper Horizontal

SpaceKeeper Vertical

SpaceKeeper Horizontal

Models: SKH008-100

(3/4 – 8½ tons)

SpaceKeeper Vertical

Models: SKV 008 – 480

(3/4 – 40 tons)

www.bulldogheatpump.com

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Gen 5D is a part of the new Bulldog product line and will be available January 2021 *

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The BULLDOG Heat Pump Advantage

Why use a BULLDOG Heat Pump?

CGC Group makes the BULLDOG Heat Pump, the most productive, worry-free heat pump in the building industry.

With BULLDOG you get a heat pump that works harder, longer, with less hassle and energy than any other heat pump on the market.

Because a Hydronic Heating system offers design flexibility and benefits that a reversing WSHP doesn't:

- It is quieter
- It has better heat sharing capability
- It is more reliable
- It uses less electricity
- It is equipped with modulating heat
- 40-70% lower heating costs
- It has lower failure rates
- It has fewer moving parts

Because a compressor that doesn't operate in heating:

- Doesn't make any noise
- Doesn't fail
- Doesn't consume any power
- Has lower operating costs
- Lasts longer

A BULLDOG system delivers benefits for the building owner, the occupants, and the budget:

- Dry cooler capability
- Dehumidification
- Smaller emergency generator
- Fewer water loops
- Fresh air delivered directly to occupied space
- Small footprint
- Chassis change out in minutes
- Low flow rate

What makes the BULLDOG system different and why is this significant to Geothermal?

The BULLDOG Geothermal system has a positive impact on the design and operation of the geothermal field. It allows for greater design flexibility that can help bring the geothermal field back to a balanced mode. This is accomplished with a design that allows for ALL HVAC equipment to be placed on one common fluid loop, which prevents overheating of the geothermal field and may result in a smaller geothermal field in cooling dominant building with significant capital cost reductions.

For more details, please refer to *"Geothermal Design Guide, Benefits of the BULLDOG System".*

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BULLDOG Heat Pump System Design

The BULLDOG Heat Pump System is a combination of two traditional commercial HVAC building technologies. The system combines conventional water cooled air conditioning and hydronic space heating, all in one package.

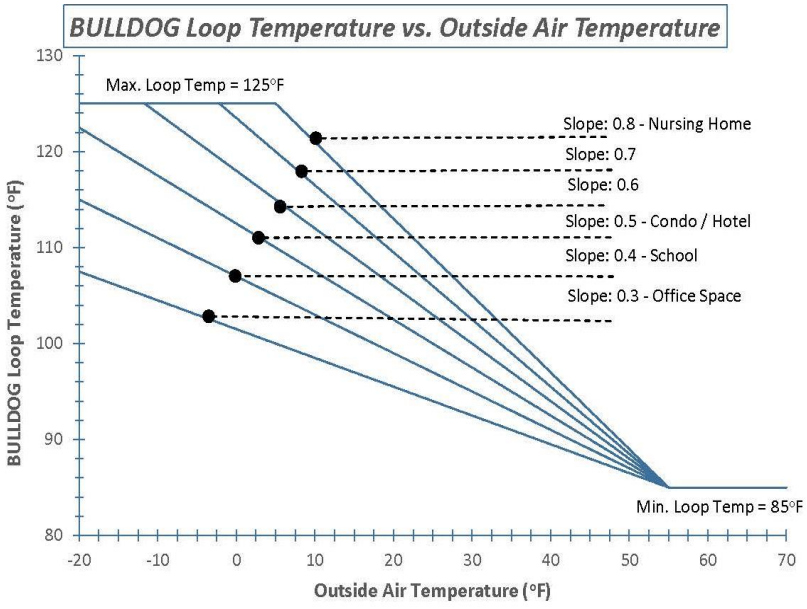
A BULLDOG unit operates as a fan coil in heating and a water cooled DX unit in cooling. The compressors do not operate in the heating mode. They can cool or heat any space at any time of the year. Instead of a refrigerant reversing valve for heating, the BULLDOG unit diverts the loop fluid to a hydronic heating coil located inside the unit.

The loop fluid varies in temperature depending on outdoor ambient conditions. As the ambient temperature gets colder, the loop fluid temperature is increased.

In order to have available heat at all times and in all zones, the BULLDOG loop temperature is maintained at 85°F (30°C) at an ambient temperature above 55°F; this will enable any unit to produce a minimum of 30% of its rated heating capacity. As the outside air temperature falls below 55°F (13°C) the loop temperature is increased. The nominal rate of increase is 0.40 degree increase in loop temperature for every degree drop in ambient. As such the loop temperature will be 104°F (40°C) at 8°F (-13°C) outside.

The advantage of the BULLDOG system is that the heating/cooling ratios can be tailored to the actual loads. To optimize the efficiency of the system the reset rate can be adjusted to follow loading. For example: when the cooling requirements of each zone are much higher than the heating loads, the set point reset rate can range from .25 to .40 degree increase per degree drop in ambient. Then at 15°F ambient, the loop temperature would be less than 100°F. Similarly, installations such as a seniors residence where heating is the dominant load, the set point reset rate can be steeper, perhaps as high as .75 degrees per degree ambient drop. Additionally, the set point reset rate start point can be moved several degrees higher or lower to suit the application.

The CGC Group offers a prepackaged system controller that is programmed to accommodate most system arrangements. Custom sequences can be programmed into the panel. The BULLDOG system controller has Modbus RTU and can be connected to a BACnet interface, allowing for it to be integrated into most BAS systems provided by others.



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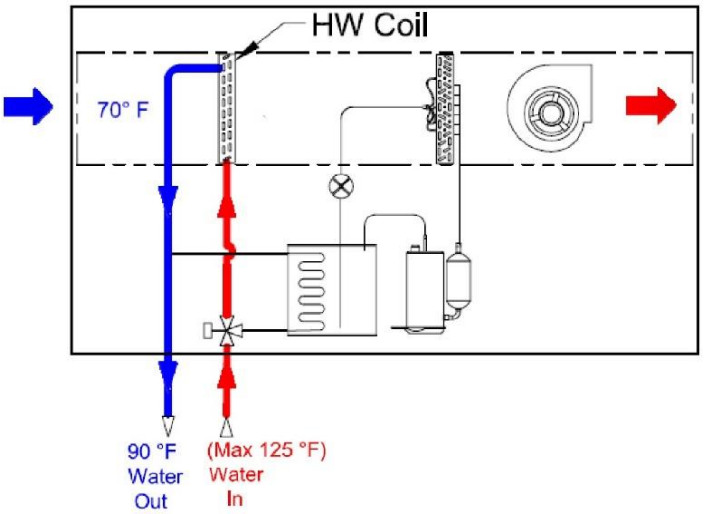
Heating Cycle

The BULLDOG System's straightforward design derives maximum efficiency from existing principles.

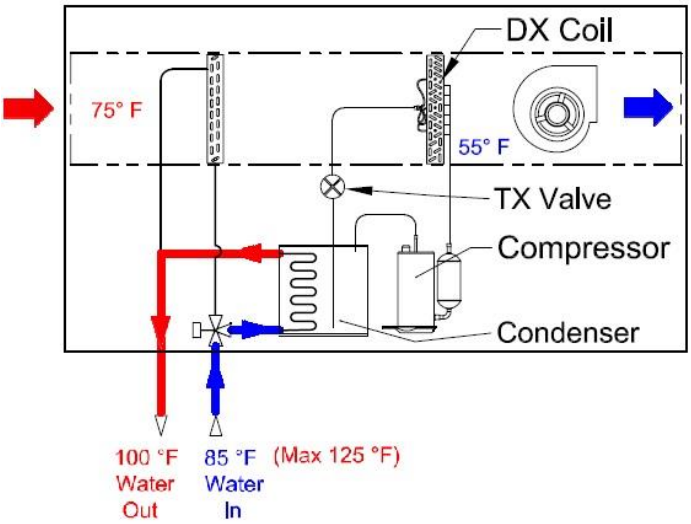
The heating cycle consists of a high efficiency fan motor drawing air over a simple hot water coil. This is the same mechanism employed by common fan coil units. Because the water loop temperature is scheduled to outdoor air temperature, maximum heat output is available when it is most needed (ie. – when it is coldest outside). As the outdoor air temperature rises, loop water temperatures are lowered to gain cooling efficiency.



Cooling Cycle

The best HVAC designs are only as good as the level of comfort they provide. Here the BULLDOG System once again excels, making cooling available year round through an ultra-quiet design.

The compressors are connected through a refrigeration piping system to a standard DX cooling coil. The heat removed from the air is rejected from the unit into the water loop via simple condenser.



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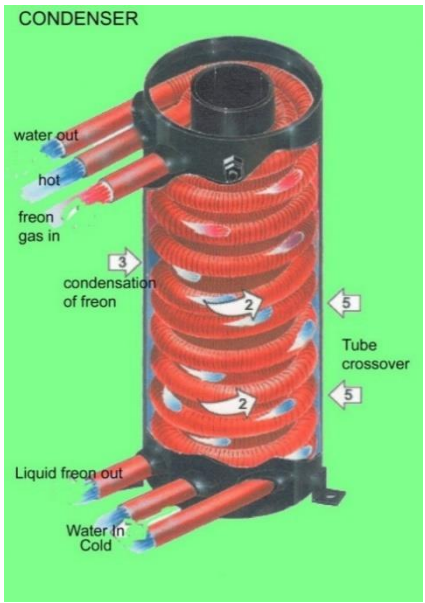
Low Water Flow

We use better condensers than other manufacturers.

All manufacturers of regular WSHP use the heat exchanger on the left. It's a coaxial condenser and must also operate as an evaporator in the heating mode. The Bulldog is optimized for cooling mode only by utilizing a more effective condenser – the shell and tube on the right.

Effective capacity at only 2gpm/ton
Results:

- Smaller pumps
- **Smaller cooling towers**
- Smaller pipes
- Less electrical consumption
- Can tolerate higher EWT (125°F)
- Can operate with a **Dry Cooler** instead of Evaporative Tower thereby eliminating water make up and water treatment chemicals (and the threat of Legionella)
- Potentially smaller geothermal field
- Less prone to fouling



BULLDOG HEAT PUMP
No other heat pump does more, with less.

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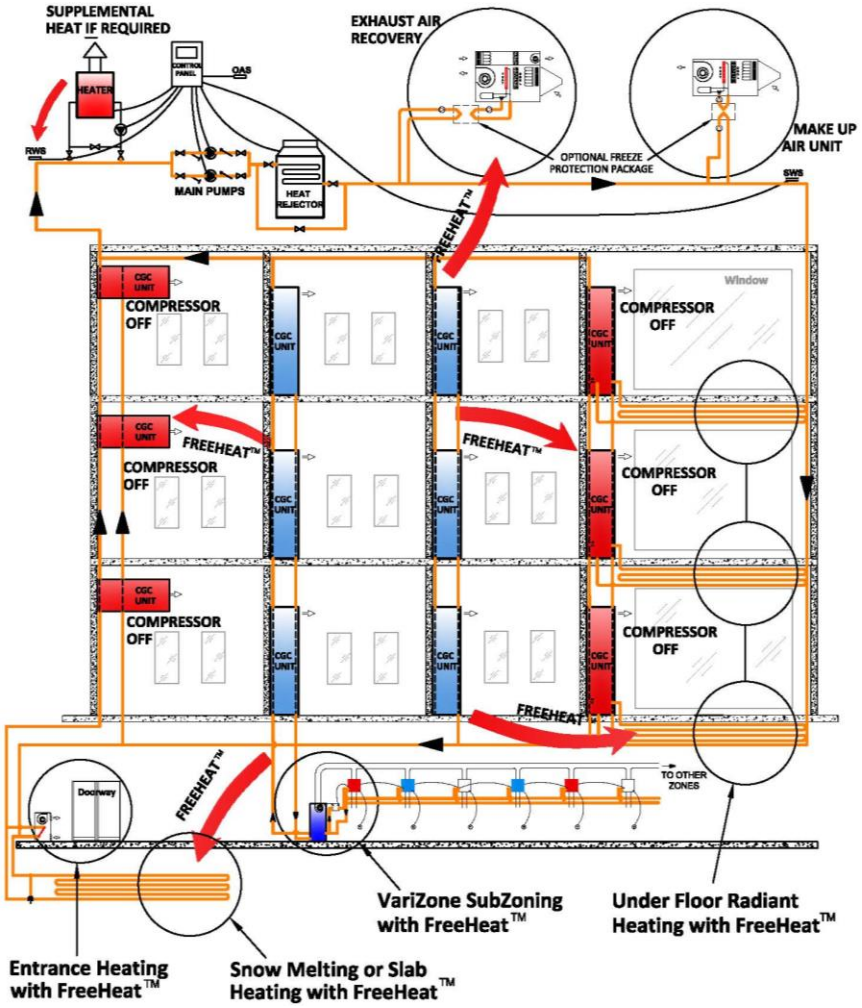
FreeHeat™

FreeHeat™ is defined as the process of reclaiming the heat generated within a building to directly satisfy the heating needs of the building, without additional energy input.

The BULLDOG Heat Pump System conserves heat within the fluid loop instead of rejecting it to the atmosphere through a heat sink. This FreeHeat™ can then be used for various building heating requirements. Even with elevated fluid temperatures (maximum 125°F), the BULLDOG Heat Pump is still able to perform mechanical cooling.

An example of how the BULLDOG design can take advantage of FreeHeat™ is for treating ventilation air. The cost to treat make up air constitutes a significant portion of the buildings total annual energy budget. Many buildings operate gas fired Make-Up Air units while simultaneously rejecting condenser heat to a heat sink. The energy consumed by the heat sink or tower can be significant. With the BULLDOG System, FreeHeat™ is used to treat the fresh air instead of rejecting the heat. This eliminates the consumption of a fuel source to heat the fresh air during shoulder season.



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SKH/SKV Model Nomenclature

SKH 070 C 4 - 3 1 0 X -21,41,61

UNIT MODELS

SKH - Horizontal Ceiling Unit

SKV - Vertical Closet Unit

Size

Size 1	008, 010, 012, 015, 018
Size 2	020, 024, 030, 036
Size 3	042, 048, 060
Size 4	070, 080, 100
Size 5	120, 150
Size 6	180, 240
Size 7	280, 320
Size 8	400, 480

OPTIONS

S - Standard Product, No Options
X - Product with Options
A - Custom Product

Reserved

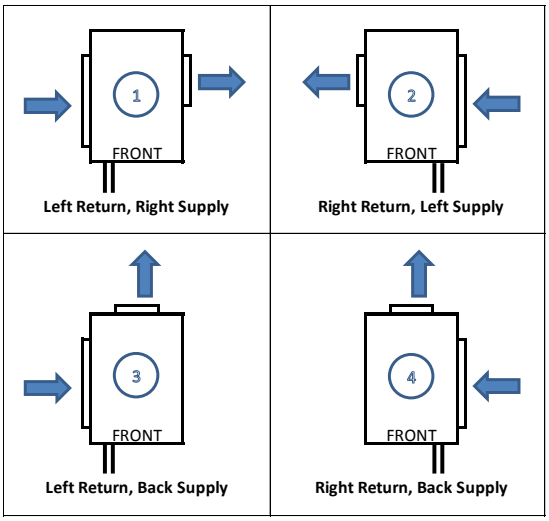
Product Revision

Arrangement

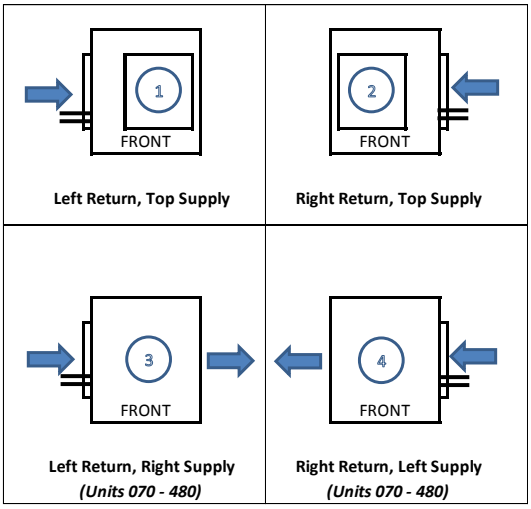
4 - R410a

POWER SUPPLY

A 115/60/1
B 208-230/60/1
C 208-230/60/3
E 460/60/3
F 575/60/3



SKH Arrangements



SKV Arrangements

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SpaceKeeper Horizontal – Technical Information

Model No. SKH---		008	010	012	015	018	020	024	030	036	042	048	060	070	080	100
PERFORMANCE																
Nominal Airflow	**cfm**	280	320	400	500	600	700	800	1,000	1,200	1,400	1,600	2,000	2,400	2,800	3,200
	(l/s)	*(132)*	*(151)*	*(189)*	*(236)*	*(283)*	*(330)*	*(378)*	*(472)*	*(566)*	*(661)*	*(755)*	*(944)*	*(1,133)*	*(1,321)*	*(1,510)*
Cooling Capacity	**BTU/hr**	8,621	9,597	11,983	13,997	15,513	18,545	23,329	27,257	31,807	41,236	48,973	57,836	69,175	78,647	93,285
(ISO 13256-1) [1]	***(kW)***	*(2.53)*	*(2.81)*	*(3.51)*	*(4.10)*	*(4.55)*	*(5.43)*	*(6.84)*	*(7.99)*	*(9.32)*	*(12.08)*	*(14.35)*	*(16.95)*	*(20.27)*	*(23.04)*	*(27.33)*
EER (ISO 13256-1) [1]		14.9	14.2	14.1	13.4	13.9	15.7	16.3	15.4	14.5	16.5	16.6	15.0	15.3	14.4	13.5
Heating Capacity at Nominal Airflow [2]	**BTU/hr**	11,798	13,421	15,839	18,747	21,394	28,110	31,519	37,246	42,449	52,138	57,494	67,292	93,328	104,312	117,060
	(kW)	*(3.46)*	*(3.93)*	*(4.64)*	*(5.49)*	*(6.27)*	*(8.24)*	*(9.24)*	*(10.91)*	*(12.44)*	*(15.28)*	*(16.85)*	*(19.72)*	*(27.34)*	*(30.56)*	*(34.30)*

(1) Cooling Capacities based upon 80.6°F DB, 66.2°F WB entering air temperature, EWT of 86°F.
ISO 13256-1 applies to unit size 008 to 060. SKH070-100 cooling capacities are biased upon: 80.6°F DB, 66.2°F WB entering air temperature, EWT of 86°F, 2gpm/ton, nominal airflow and 0.5 inch w.g. ESP.

(2) Heating Capacities based upon 68°F entering air temperature, EWT of 120°F, 2gpm/ ton and nominal airflow

MECHANICAL INFORMATION																
Fan Section																
Type & Quantity		Forward Curved DWDI x1					Forward Curved DWDI x1				Forward Curved DWDI x1			Forward Curved DWDI x1		
Standard Fan Motor Power Rating (hp)		1/4hp for PSC and 1/3hp for EC motors					1/3	1/3	1/3	1/2	1/2	1/2	3/4	1-1/2	2	3
DX Coil, Heating Coil and Filter																
DX Coil - No of Rows / FPI		3 rows / 12 FPI					3 rows / 12 FPI				3 rows / 12 FPI			3 rows / 12 FPI		
Heating Coil - No of Rows / FPI		2 rows / 12 FPI					2 rows / 12 FPI				2 rows / 12 FPI			2 rows / 12 FPI		
Standard Return Air Filter	***Type***	1" thick Pleated					1" thick Pleated				1" thick Pleated			2" thick Pleated, MERV 8		
	Size & Quantity	14"x20" , 1 filter					16"x25" , 1 filter				16"x20" , 2 filters			16"x24" (1) filter & 20"x24" (2) filters		
Compressor and Condenser																
Compressor Type & Quantity		Rotary x 1					Scroll x 1				Scroll x 1			Scroll x 1		
Condenser Type & Quantity		Shell and Tube x 1					Shell and Tube x 1				Shell and Tube x 1			Shell and Tube x 2		
Water Inlet / Outlet		1/2" FPT					1/2" FPT				3/4" FPT			1-1/4" FPT		
Condensate drain		3/4" FPT					3/4" FPT				3/4" FPT			3/4" FPT		
Unit's Total Water Volume	**US gal *(L)***	0.625 *(2.4)*	0.625 *(2.4)*	0.705 *(2.7)*	0.705 *(2.7)*	0.705 *(2.7)*	1.182 *(4.5)*	1.182 *(4.5)*	1.182 *(4.5)*	1.182 *(4.5)*	1.721 *(6.5)*	1.721 *(6.5)*	1.721 *(6.5)*	2.781 *(10.5)*	2.781 *(10.5)*	3.023*(11.4)*
Refrigerant (410a) charge	**oz. *(kg)***	27 *(0.77)*	27 *(0.77)*	30 *(0.85)*	35 *(0.99)*	45 *(1.28)*	32 *(0.91)*	40 *(1.13)*	45 *(1.28)*	50 *(1.42)*	50 *(1.42)*	60 *(1.70)*	70 *(1.98)*	80 *(2.27)*	90 *(2.55)*	100 *(2.83)*
ELECTRICAL INFORMATION																
Unit's MCA/ MOP	***115V - 1 Ph - 60 Hz***	8.8/20.0	9.9/20.0	11.6/20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	208-230V - 1 Ph - 60 Hz	5.6/15.0	6.3/15.0	7.4/15.0	11.9/15.0	13.9/15.0	15.3/20.0	17.5/20.0	20.2/25.0	25.0/25.0	31.3/40.0	36.4/40.0	43.5/50.0	51.5/60.0	583/60.0	72.9/80.0
	265-277V - 1 Ph - 60 Hz	4.4/15.0	4.9/15.0	5.8/15.0	9.4/15.0	10.9/15.0	12.0/20.0	13.7/20.0	15.9/20.0	19.6/25.0	NA	NA	NA	NA	NA	NA
	208-230V - 3 Ph - 60 Hz	NA	NA	NA	NA	NA	NA	11.4/20.0	13.0/20.0	16.0/20.0	19.7/20.0	23.6/25.0	27.8/30.0	29.7/40.0	33.7/40.0	42.1/50.0
	460V - 3 Ph - 60 Hz	NA	NA	NA	NA	NA	NA	5.2/15.0	5.9/15.0	7.2/15.0	8.9/15.0	10.7/15.0	12.6/15.0	13.5/20.0	15.3/20.0	19.1/25.0
	575V - 3 Ph - 60 Hz	NA	NA	NA	NA	NA	NA	NA	NA	5.8/15.0	7.1/15.0	8.5/15.0	10.0/15.0	10.8/20.0	12.2/20.0	15.2/20.0
PHYSICAL DETAILS																
Dimensions (L x W x H)		29"x 22" x 15" *(737 x 559 x 381mm)*					38" x 22" x 18" *(965 x 559 x 457mm)*				45" x 32" x 22" *(1143 x 813 x 559mm*			64" x 36" x 24" *(1635 x 914 x 610mm)*		
Weight, lbs (kg)		160 *(73)*	160 *(73)*	160 *(73)*	160 *(73)*	160 *(73)*	235 *(107)*	235 *(107)*	235 *(107)*	235 *(107)*	375 *(170)*	375 *(170)*	375 *(170)*	600 *(272)*	600 *(272)*	600 *(272)*

BULLDOG HEAT PUMP

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SpaceKeeper Vertical – Technical Information

Model No. SKV---		008	010	012	015	018	020	024	030	036	042	048	060	070	080	100
PERFORMANCE																
Nominal Airflow	**cfm**	280	320	400	500	600	700	800	1,000	1,200	1,400	1,600	2,000	2,400	2,800	3,200
	(l/s)	*(132)*	*(151)*	*(189)*	*(236)*	*(283)*	*(330)*	*(378)*	*(472)*	*(566)*	*(661)*	*(755)*	*(944)*	*(1,133)*	*(1,321)*	*(1,510)*
Cooling Capacity	**BTU/hr**	8,601	9,532	21,190	14,438	17,108	18,850	23,089	26,241	30,112	41,125	49,842	55,403	71,041	80,691	94,923
(ISO 13256-1) [1]	***(kW)***	*(2.52)*	*(2.79)*	*(6.21)*	*(4.23)*	*(5.01)*	*(5.52)*	*(6.77)*	*(7.69)*	*(8.82)*	*(12.05)*	*(14.60)*	*(16.23)*	*(20.81)*	*(23.64)*	*(27.81)*
EER (ISO 13256-1) [1]		14.9	14.2	14.1	13.4	13.9	15.7	16.3	15.4	14.5	16.5	16.6	15.0	15.6	14.7	13.7
Heating Capacity at Nominal Airflow [2]	**BTU/hr**	12,105	13,795	16,342	19,411	22,222	27,920	29,914	35,159	39,888	53,336	58928	69,204	92,316	103,146	115,772
	(kW)	*(3.55)*	*(4.04)*	*(4.79)*	*(5.69)*	*(6.51)*	*(8.18)*	*(8.76)*	*(10.30)*	*(11.69)*	*(15.63)*	*(17.27)*	*(20.28)*	*(27.05)*	*(30.22)*	*(33.92)*

(1) Cooling Capacities based upon 80.6°F DB, 66.2°F WB entering air temperature, EWT of 86°F.
ISO 13256-1 applies to unit size 008 to 060. SKH070-100 cooling capacities are bbased upon: 80.6°F DB, 66.2°F WB entering air temperature, EWT of 86°F, 2gpm/ton, nominal airflow and 0.5 inch wg. ESP.

(2) Heating Capacities based upon 68°F entering air temperature, EWT of 120°F, 2gpm/ ton and nominal airflow

MECHANICAL INFORMATION																
Fan Section																
Type & Quantity		Forward Curved DWDI x1					Forward Curved DWDI x1				Forward Curved DWDI x1			Forward Curved DWDI x1		
Standard Fan Motor Power Rating (hp)		1/4hp for PSC and 1/3hp for EC motors					1/3	1/3	1/3	1/2	1/2	1/2	3/4	1-1/2	2	3
DX Coil, Heating Coil and Filter																
DX Coil - No of Rows / FPI		3 rows / 12 FPI					3 rows / 12 FPI				3 rows / 12 FPI			3 rows / 12 FPI		
Heating Coil - No of Rows / FPI		2 rows / 12 FPI					2 rows / 12 FPI				2 rows / 12 FPI			2 rows / 12 FPI		
Standard Return Air Filter	***Type***	1" thick Pleated					1" thick Pleated				1" thick Pleated			2" thick Pleated, MERV 8		
	Size & Quantity	16"x20" , 1 filter					16"x25" , 1 filter				16"x24" (1) filter & 20"x24"(1) filter			16"x24" (4) filters		
Compressor and Condenser																
Compressor Type & Quantity		Rotary x 1					Scroll x 1				Scroll x 1			Scroll x 1		
Condenser Type & Quantity		Shell and Tube x 1					Shell and Tube x 1				Shell and Tube x 1			Shell and Tube x 2		
Water Inlet / Outlet		1/2" FPT					1/2" FPT				3/4" FPT			1-1/4" FPT		
Condensate drain		3/4" FPT					3/4" FPT				3/4" FPT			3/4" FPT		
Unit's Total Water Volume	**US gal *(L)***	0.843 *(3.2)*	0.843 *(3.2)*	0.922 *(3.5)*	0.922 *(3.5)*	0.922 *(3.5)*	1.430 *(5.4)*	1.430 (5.4)	1.430 (5.4)	1.430 (5.4)	2.208 *(8.4)*	2.208 *(8.4)*	2.208 *(8.4)*	3.528 *(13.4)*	3.528 *(13.4)*	3.770 *(14.3)*
Refrigerant (410a) charge	**oz. *(kg)***	27 *(0.77)*	27 *(0.77)*	30 *(0.85)*	35 *(0.99)*	45 *(1.28)*	32 *(0.91)*	40 *(1.13)*	45 *(1.28)*	50 *(1.42)*	50 *(1.42)*	60 *(1.70)*	70 *(1.98)*	80 *(2.27)*	90 *(2.55)*	100 *(2.83)*
ELECTRICAL INFORMATION																
Unit's MCA/ MOP	***115V - 1 Ph - 60 Hz***	8.7/20.0	9.2/20.0	11.8/20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	208-230V - 1 Ph - 60 Hz	5.5/15.0	5.9/15.0	7.5/15.0	10.7/15.0	11.8/15.0	14.9/20.0	16.1/20.0	20.2/25.0	24.7/25.0	31.1/40.0	36.4/40.0	42.7/50.0	515/60.0	58.3/60.0	73.1/80.0
	265-277V - 1 Ph - 60 Hz	4.3/15.0	4.6/15.0	5.9/15.0	8.4/15.0	9.3/15.0	11.7/20.0	12.7/20.0	15.9/20.0	19.4/25.0	NA	NA	NA	NA	NA	NA
	208-230V - 3 Ph - 60 Hz	NA	NA	NA	NA	NA	NA	10.6/20.0	13.0/20.0	15.8/20.0	19.6/20.0	23.6/25.0	27.3/30.0	29.7/40.0	33.7/40.0	42.2/50.0
	460V - 3 Ph - 60 Hz	NA	NA	NA	NA	NA	NA	4.8/15.0	5.9/15.0	7.2/15.0	8.9/15.0	10.7/15.0	12.4/15.0	13.5/20.0	15.3/20.0	19.1/25.0
	575V - 3 Ph - 60 Hz	NA	NA	NA	NA	NA	NA	NA	NA	5.7/15.0	7.1/15.0	8.5/15.0	9.9/15.0	108/200	12.2/20.0	153/20.0
PHYSICAL DETAILS																
Dimensions (L x W x H)		17"x 17" x 48" *(432 x 432 x 1219mm)*					20" x 20" x 57" *(508 x 508 x 1448mm)*				4" x 24" x 59 3/8" *(610 x 610 x 1508mm*			32" x 32" x 72" *(813 x 813 x 1829mm)*		
Weight, lbs (kg)		175 *(79)*	175 *(79)*	175 *(79)*	175 *(79)*	175 *(79)*	240 *(109)*	240 *(109)*	240 *(109)*	240 *(109)*	325 *(147)*	325 *(147)*	325 *(147)*	600 *(272)*	600 *(272)*	600 *(272)*

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Model No. SKV---		120	150	180	240	280	320	360	400	480
PERFORMANCE										
Nominal Airflow	**cfm**	4,000	5,000	6,000	8,000	9,200	10,500	12,000	14,000	16,000
	(l/s)	*(1,888)*	*(2,360)*	*(2,832)*	*(3,775)*	*(4,342)*	*(4,955)*	*(5,663)*	*(6,607)*	*(7,551)*
Cooling Capacity [1]	**BTU/hr**	114,732	131,096	195,994	219,976	259,966	301,090	325,200	364,891	423,601
	(kW)	*(33.62)*	*(38.41)*	*(57.43)*	*(64.45)*	*(76.17)*	*(88.22)*	*(95.28)*	*(106.91)*	*(124.11)*
EER		12.9	12.0	13.9	13.3	14.3	14.1	12.5	11.9	11.5
Heating Capacity at Nominal Airflow [2]	**BTU/hr**	157,379	184,885	236,260	291,701	346,460	381,878	451,664	505,394	555,430
	(kW)	*(46.11)*	*(54.17)*	*(69.22)*	*(85.47)*	*(101.51)*	*(111.89)*	*(132.34)*	*(148.08)*	*(162.74)*
MECHANICAL INFORMATION										
Fan Section										
Type & Quantity		Belt Driven x 1		Belt Driven x 2		Belt Driven x 2		Consult Factory		
Standard Fan Motor Power Rating (hp)		5	5	3 (x2)	3 (x2)	5 (x2)	5 (x2)			
DX Coil, Heating Coil and Filter										
DX Coil - No of Rows / FPI		3 rows / 12 FPI		3 rows / 12 FPI		3 rows / 12 FPI		3 rows / 12 FPI		
Heating Coil - No of Rows / FPI		2 rows / 12 FPI		2 rows / 12 FPI		2 rows / 12 FPI		2 rows / 12 FPI		
Standard Return Air Filter	***Type***	2" thick Pleated, MERV 8		2" thick Pleated, MERV 8		2" thick Pleated, MERV 8		2" thick Pleated, MERV 8		
	Size & Quantity	20" x 24", 4 filters		20"x24" (2) filters & 24"x24" (4) filters		20"x24", 8 filters		24"x24", 12 filters		
Compressor and Condenser										
Compressor Type & Quantity		Scroll - 2 circuits		Scroll - 2 circuits		Scroll - 2 circuits		Scroll - 2 circuits		
Condenser Type & Quantity		Shell and Tube x 2		Shell and Tube x 2		Shell and Tube x 4		Shell and Tube x 4		
Water Inlet / Outlet		1 1/4" FPT	1 1/2" FPT	1 1/2" FPT	2" FPT	2" FPT	2" FPT	2" FPT	2" FPT	2" FPT
Condensate drain		3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT	3/4" FPT
Unit's Total Water Volume	**US gal *(L)***	4.468 *(16.9)*	4.468 *(16.9)*	7.054 *(26.7)*	7.417 *(28.1)*	7.456 *(28.2)*	7.456 *(28.2)*	Consult Factory		
Refrigerant (410a) charge	**oz. *(kg) per circuit***	70 *(1.98)*	70 *(1.98)*	120 *(3.40)*	125 *(3.54)*	125 *(3.54)*	140 *(3.97)*	Consult Factory		
ELECTRICAL INFORMATION										
Unit's MCA/ MOP	***208-230V - 3 Ph - 60 Hz***	51.4/60.0	59.3/60.0	85.5/100.0	91.8/100.0	112.1/125.0	124.3/125.0	129.2/150.0	151.9/175.0	188.2/200.0
	460V - 3 Ph - 60 Hz	23.3/30.0	26.8/40.0	38.7/40.0	41.5/50.0	50.7/60.0	56.2/60.0	58.4/60.0	68.7/80.0	85.1/100.0
	575V - 3 Ph - 60 Hz	18.6/25.0	21.4/30.0	30.9/40.0	33.2/40.0	40.6/50.0	45.0/50.0	46.7/50.0	55.0/60.0	68.1/70.0
PHYSICAL DETAILS										
Dimensions (L x W x H)		44"x32"x72" *(1118x813x1829mm)*		70"x32"x72" *(1778x813x1829mm)*		82"x32"x72" *(2082x813x1829mm)*		100 1/8" x 39 7/8" x 89 1/8" *(2543 x 1013 x 2264mm)*		
Weight, lbs (kg)		1000 *(454)*	1000 *(454)*	1100 *(500)*	1100 (500)	1400 *(635)*	1500 (680)	2000 *(907)*	2000 *(907)*	2000 *(907)*

(1) Cooling Capacities are bbased upon: 80.6°F DB, 66.2°F WB entering air temperature, EWT of 86°F, 2gpm/ton, nominal airflow and 1.0 inch w.g. ESP.

(2) Heating Capacities based upon 68°F entering air temperature, EWT of 120°F, 2gpm/ ton and nominal airflow

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SpaceKeeper Horizontal – General Performance

		EC Motor										Belt Drive		
Model		SKH008	SKH010	SKH012	SKH015	SKH018	SKH020	SKH024	SKH030	SKH036	SKH042	SKH048	SKH060	SKH070	SKH080	SKH100
Air Flow	(CFM)	280	320	400	500	600	700	800	1,000	1,200	1,400	1,600	2,000	2,400	2,800	3,200
Fluid Flow	(gpm)	1.4	1.7	2	2.5	3	3.5	4	5	6	7	8	10	12	14	16
80°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKH008-060 and 0.50 inch W.G. on SKH070-100***														
COOLING	Total Capacity (BTU/h)	8,350	9,831	12,263	15,088	17,079	18,946	23,429	28,501	34,226	42,642	48,628	59,432	71,628	81,454	96,424
	Sensible (BTU/h)	6,894	8,126	10,132	12,299	14,448	16,628	19,688	24,229	28,877	35,149	39,870	48,828	59,436	68,582	78,551
	Total Power (W)	555	677	855	1,063	1,309	1,232	1,562	2,011	2,560	2,812	3,349	4,086	4,230	5,147	6,551
	LAT (DB/WB) (°F)	57.9/57.1	57.2/56.4	57.3/56.4	57.9/57.1	58.4/57.6	58.7/57.9	57.9/57.1	58.3/57.5	58.4/57.6	57.5/56.7	57.6/56.8	58.1/57.3	57.8/57.0	58.0/57.2	58.0/57.2
	Operating EER	15.1	14.5	14.3	14.2	13.1	15.4	15.0	14.2	13.4	15.2	14.5	14.5	16.9	15.8	14.7
HEATING	Total Capacity (BTU/h)	2,269	2,581	3,046	3,605	4,114	5,406	6,061	7,163	8,163	10,027	11,057	12,941	17,948	20,060	22,512
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	643	879	1,174
	LAT (°F)	77.5	77.4	77.0	76.6	76.3	77.1	77.0	76.6	76.3	76.6	76.4	76.0	76.9	76.6	76.5
	LWT (°F)	76.8	77.0	77.0	77.1	77.3	76.9	77.0	77.1	77.3	77.1	77.2	77.4	77.0	77.1	77.2
85°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKH008-060 and 0.50 inch W.G. on SKH070-100***														
COOLING	Total Capacity (BTU/h)	8,065	9,495	11,903	14,644	16,537	18,353	22,712	27,660	33,156	41,347	47,164	57,680	69,586	79,118	93,817
	Sensible (BTU/h)	6,840	7,908	9,871	12,214	14,345	16,514	19,551	24,068	28,672	34,227	38,819	48,492	59,045	68,135	78,052
	Total Power (W)	583	711	896	1,121	1,368	1,308	1,655	2,124	2,700	2,963	3,530	4,300	4,470	5,398	6,840
	LAT (DB/WB) (°F)	58.1/57.3	57.8/57.0	57.9/57.1	58.1/57.3	58.6/57.8	58.9/58.1	58.1/57.3	58.4/57.6	58.6/57.8	58.1/57.3	58.2/57.4	58.3/57.4	57.9/57.1	58.2/57.4	58.1/57.3
	Operating EER	13.8	13.4	13.3	13.1	12.1	14.0	13.7	13.0	12.3	14.0	13.4	13.4	15.6	14.7	13.7
HEATING	Total Capacity (BTU/h)	3,403	3,872	4,569	5,408	6,171	8,109	9,092	10,744	12,245	15,040	16,585	19,411	26,921	30,090	33,767
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	643	879	1,174
	LAT (°F)	81.2	81.2	80.5	80.0	79.5	80.7	80.5	79.9	79.4	79.9	79.6	78.9	80.3	79.9	79.7
	LWT (°F)	80.1	80.4	80.4	80.7	80.9	80.4	80.5	80.7	80.9	80.7	80.9	81.1	80.5	80.7	80.8
90°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKH008-060 and 0.50 inch W.G. on SKH070-100***														
COOLING	Total Capacity (BTU/h)	7,768	9,153	11,527	14,202	15,984	17,749	21,979	26,798	32,054	40,026	45,676	55,883	67,514	76,747	91,121
	Sensible (BTU/h)	6,783	7,842	9,799	12,130	13,950	16,399	19,411	23,422	27,883	33,974	38,534	48,148	58,648	67,681	77,536
	Total Power (W)	612	745	937	1,181	1,428	1,388	1,754	2,245	2,849	3,123	3,723	4,525	4,724	5,664	7,149
	LAT (DB/WB) (°F)	58.3/57.5	58.0/57.2	58.0/57.2	58.2/57.4	59.2/58.4	59.0/58.2	58.2/57.4	59.0/58.2	59.2/58.4	58.2/57.4	58.4/57.6	58.4/57.6	58.1/57.3	58.3/57.5	58.3/57.5
	Operating EER	12.7	12.3	12.3	12.0	11.2	12.8	12.5	11.9	11.3	12.8	12.3	12.3	14.3	13.5	12.7
HEATING	Total Capacity (BTU/h)	4,538	5,162	6,092	7,210	8,228	10,812	12,123	14,325	16,326	20,053	22,113	25,882	35,895	40,120	45,023
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	643	879	1,174
	LAT (°F)	84.9	84.9	84.0	83.3	82.6	84.2	84.0	83.2	82.5	83.2	82.7	81.9	83.8	83.2	83.0
	LWT (°F)	83.5	83.9	83.9	84.2	84.5	83.8	83.9	84.3	84.6	84.3	84.5	84.8	84.0	84.3	84.4

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		EC Motor												Belt Drive		
Model		SKH008	SKH010	SKH012	SKH015	SKH018	SKH020	SKH024	SKH030	SKH036	SKH042	SKH048	SKH060	SKH070	SKH080	SKH100
Air Flow	(CFM)	280	320	400	500	600	700	800	1,000	1,200	1,400	1,600	2,000	2,400	2,800	3,200
Fluid Flow	(gpm)	1.4	1.7	2	2.5	3	3.5	4	5	6	7	8	10	12	14	16
100°F EWT		Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKH008-060 and 0.50 inch W.G. on SKH070-100														
COOLING	Total Capacity (BTU/h)	7,160	8,454	10,716	13,292	14,853	16,500	20,463	24,991	29,737	37,312	42,596	52,138	63,247	71,861	85,479
	Sensible (BTU/h)	6,531	7,554	9,450	11,715	13,733	15,822	18,735	23,075	27,439	32,780	37,173	46,467	56,674	65,396	74,914
	Total Power (W)	672	815	1,024	1,313	1,550	1,563	1,971	2,517	3,182	3,479	4,152	5,022	5,280	6,246	7,835
	LAT (DB/WB) (°F)	59.1/58.3	58.8/58.0	58.8/58.0	59.0/58.2	59.5/58.7	59.8/59.0	59.0/58.2	59.3/58.5	59.5/58.7	59.0/58.2	59.2/58.4	59.2/58.4	58.8/58.0	59.1/58.3	59.0/58.2
	Operating EER	10.7	10.4	10.5	10.1	9.6	10.6	10.4	9.9	9.3	10.7	10.3	10.4	12.0	11.5	10.9
HEATING	Total Capacity (BTU/h)	6,806	7,743	9,138	10,816	12,343	16,217	18,184	21,488	24,490	30,080	33,170	38,822	53,843	60,180	67,535
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	643	879	1,174
	LAT (°F)	92.4	92.3	91.1	89.9	89.0	91.4	90.9	89.8	88.8	89.8	89.1	87.9	90.7	89.8	89.5
	LWT (°F)	90.3	90.9	90.9	91.3	91.8	90.7	90.9	91.4	91.8	91.4	91.7	92.2	91.0	91.4	91.6
105°F EWT		Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKH008-060 and 0.50 inch W.G. on SKH070-100														
COOLING	Total Capacity (BTU/h)	6,856	8,101	10,273	12,805	14,275	15,855	19,677	24,034	28,515	35,920	40,984	50,184	61,036	69,327	82,540
	Sensible (BTU/h)	6,473	7,487	9,366	11,621	13,622	15,699	18,584	22,892	27,205	32,513	36,865	46,093	56,251	64,911	74,351
	Total Power (W)	703	851	1,069	1,387	1,612	1,659	2,090	2,669	3,370	3,677	4,389	5,298	5,584	6,565	8,217
	LAT (DB/WB) (°F)	59.3/58.5	59.0/58.2	59.0/58.2	59.2/58.4	59.7/58.9	59.9/59.1	59.2/58.4	59.5/58.7	59.7/58.9	59.2/58.4	59.4/58.6	59.4/58.6	59.0/58.2	59.2/58.4	59.2/58.4
	Operating EER	9.8	9.5	9.6	9.2	8.9	9.6	9.4	9.0	8.5	9.8	9.3	9.5	10.9	10.6	10.0
HEATING	Total Capacity (BTU/h)	7,941	9,034	10,661	12,618	14,400	18,920	21,215	25,069	28,571	35,093	38,698	45,293	62,817	70,210	78,791
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	643	879	1,174
	LAT (°F)	96.1	96.0	94.6	93.3	92.1	94.9	94.4	93.1	91.9	93.1	92.3	90.9	94.1	93.1	92.7
	LWT (°F)	93.7	94.4	94.3	94.9	95.4	94.2	94.4	95.0	95.5	95.0	95.3	95.9	94.5	95.0	95.2

		EC Motor												Belt Drive		
Model		SKH008	SKH010	SKH012	SKH015	SKH018	SKH020	SKH024	SKH030	SKH036	SKH042	SKH048	SKH060	SKH070	SKH080	SKH100
Air Flow	(CFM)	280	320	400	500	600	700	800	1,000	1,200	1,400	1,600	2,000	2,400	2,800	3,200
Fluid Flow	(gpm)	1.4	1.7	2	2.5	3	3.5	4	5	6	7	8	10	12	14	16
110°F EWT		Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKH008-060 and 0.50 inch W.G. on SKH070-100														
COOLING	Total Capacity (BTU/h)	6,560	7,748	9,801	12,284	13,691	15,193	18,871	23,034	27,246	34,508	39,313	48,170	58,763	66,721	79,526
	Sensible (BTU/h)	6,282	7,265	9,275	11,521	13,221	15,193	18,045	22,219	26,384	32,243	36,545	45,707	55,815	63,063	73,773
	Total Power (W)	734	887	1,117	1,466	1,674	1,763	2,219	2,835	3,574	3,890	4,643	5,596	5,907	6,903	8,629
	LAT (DB/WB) (°F)	59.9/59.1	59.7/58.9	59.2/58.4	59.4/58.6	60.3/59.5	60.6/59.3	59.8/59.0	60.1/59.3	60.3/59.5	59.4/58.6	59.5/58.7	59.5/58.7	59.2/58.4	59.8/59.0	59.4/58.5
	Operating EER	8.9	8.7	8.8	8.4	8.2	8.6	8.5	8.1	7.6	8.9	8.5	8.6	9.9	9.7	9.2
HEATING	Total Capacity (BTU/h)	9,075	10,324	12,184	14,421	16,457	21,623	24,246	28,650	32,653	40,106	44,226	51,763	71,790	80,240	90,046
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	643	879	1,174
	LAT (°F)	99.9	99.7	98.1	96.6	95.3	98.5	97.9	96.4	95.1	96.4	95.5	93.9	97.6	96.4	95.9
	LWT (°F)	97.0	97.9	97.8	98.5	99.0	97.6	97.9	98.5	99.1	98.5	98.9	99.6	98.0	98.5	98.7
120°F EWT		Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKH008-060 and 0.50 inch W.G. on SKH070-100														
COOLING	Total Capacity (BTU/h)	6,005	7,050	8,758	11,106	12,506	13,816	17,192	20,883	24,554	31,624	35,756	43,950	53,998	61,257	73,291
	Sensible (BTU/h)	6,005	7,050	8,758	11,055	12,506	13,816	17,192	20,883	24,554	31,016	35,093	43,935	53,747	61,257	71,038
	Total Power (W)	797	962	1,222	1,646	1,799	1,993	2,507	3,209	4,039	4,366	5,204	6,269	6,613	7,643	9,550
	LAT (DB/WB) (°F)	60.8/59.5	60.3/59.3	60.4/59.3	60.2/59.4	61.4/60.4	62.4/60.2	60.8/59.9	61.4/60.2	61.7/60.5	60.2/59.4	60.4/59.6	60.4/59.5	60.0/59.2	60.4/59.4	60.1/59.3
	Operating EER	7.5	7.3	7.2	6.7	7.0	6.9	6.9	6.5	6.1	7.2	6.9	7.0	8.2	8.0	7.7
HEATING	Total Capacity (BTU/h)	11,344	12,905	15,230	18,026	20,571	27,029	30,307	35,813	40,816	50,133	55,283	64,704	89,738	100,300	112,558
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	643	879	1,174
	LAT (°F)	107.3	107.2	105.1	103.2	101.6	105.6	104.9	103.0	101.3	103.0	101.8	99.8	104.5	103.0	102.4
	LWT (°F)	103.8	104.8	104.8	105.6	106.3	104.6	104.8	105.7	106.4	105.7	106.2	107.1	105.0	105.7	105.9

EWT: Entering Water Temperature
LWT: Leaving Water Temperature
EAT: Entering Air Temperature
LAT: Leaving Air Temperature
DB: Dry Bulb
WB: Wet Bulb

Water l/s = 0.06309 x gpm US
Water Pressure Drop kPa = 2.989 x ft. water
W = 0.29307 x BTU/h
°C = (°F - 32) / 1.8
Air l/s = 0.4719 x cfm
Air Pressure Drop Pa = 249.1 x inch W.G.

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SpaceKeeper Vertical – General Performance

		EC Motor									Belt Drive		
Model		SKV008	SKV010	SKV012	SKV015	SKV018	SKV020	SKV024	SKV030	SKV036	SKV042	SKV048	SKV060	SKV070	SKV080	SKV100
Air Flow	(CFM)	280	320	400	500	600	700	800	1,000	1,200	1,400	1,600	2,000	2,400	2,800	3,200
Fluid Flow	(gpm)	1.4	1.7	2	2.5	3	3.5	4	5	6	7	8	10	12	14	16
80°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKV008-060 and 0.50 inch W.G. on SKV070-100***														
COOLING	Total Capacity (BTU/h)	8,311	9,778	12,496	15,565	17,419	19,431	23,731	27,963	33,131	41,106	49,641	57,242	72,914	82,936	98,101
	Sensible (BTU/h)	6,887	7,962	10,177	12,632	14,514	17,058	19,746	24,126	28,667	34,181	40,064	48,408	59,683	68,869	80,417
	Total Power (W)	544	664	856	1,041	1,289	1,218	1,456	2,008	2,527	2,809	3,354	4,074	4,234	5,151	6,572
	LAT (DB/WB) (°F)	57.9/57.1	57.7/56.9	57.2/56.3	57.3/56.5	58.3/57.5	58.1/57.3	57.9/57.0	58.4/57.6	58.6/57.8	58.1/57.3	57.5/56.7	58.3/57.5	57.7/56.9	57.9/57.1	57.4/56.6
	Operating EER	15.3	14.7	14.6	15.0	13.5	16.0	16.3	13.9	13.1	14.6	14.8	14.1	17.2	16.1	14.9
HEATING	Total Capacity (BTU/h)	2,328	2,653	3,143	3,733	4,273	5,369	5,753	6,761	7,671	10,257	11,332	13,308	17,753	19,836	22,264
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	642	878	1,173
	LAT (°F)	77.7	77.6	77.2	76.9	76.6	77.1	76.6	76.2	75.9	76.8	76.5	76.1	76.8	76.5	76.4
	LWT (°F)	76.7	76.9	76.9	77.0	77.2	76.9	77.1	77.3	77.4	77.1	77.2	77.3	77.0	77.2	77.2
85°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKV008-060 and 0.50 inch W.G. on SKV070-100***														
COOLING	Total Capacity (BTU/h)	8,036	9,452	12,130	15,111	16,878	18,830	23,032	27,135	32,093	39,850	48,154	55,545	70,840	80,563	95,462
	Sensible (BTU/h)	6,834	7,900	9,914	12,304	14,410	16,606	19,612	23,968	27,890	33,940	39,779	48,083	59,286	68,414	78,370
	Total Power (W)	572	697	897	1,098	1,349	1,294	1,545	2,122	2,664	2,960	3,535	4,287	4,475	5,403	6,860
	LAT (DB/WB) (°F)	58.1/57.3	57.8/57.0	57.8/57.0	57.9/57.1	58.5/57.7	58.7/57.9	58.0/57.2	58.5/57.7	59.2/58.4	58.3/57.5	57.7/56.9	58.4/57.6	57.8/57.0	58.1/57.3	58.0/57.2
	Operating EER	14.0	13.6	13.5	13.8	12.5	14.6	14.9	12.8	12.0	13.5	13.6	13.0	15.8	14.9	13.9
HEATING	Total Capacity (BTU/h)	3,492	3,979	4,714	5,599	6,410	8,054	8,629	10,142	11,506	15,386	16,999	19,963	26,630	29,754	33,396
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	642	878	1,173
	LAT (°F)	81.5	81.5	80.9	80.3	79.8	80.6	79.9	79.3	78.8	80.1	79.8	79.2	80.2	79.8	79.6
	LWT (°F)	80.0	80.3	80.3	80.5	80.7	80.4	80.7	80.9	81.2	80.6	80.8	81.0	80.6	80.7	80.8
90°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKV008-060 and 0.50 inch W.G. on SKV070-100***														
COOLING	Total Capacity (BTU/h)	7,749	9,118	11,748	14,663	16,326	18,218	22,322	26,286	31,023	38,569	46,643	53,804	68,736	78,155	92,733
	Sensible (BTU/h)	6,779	7,836	9,841	12,218	14,304	16,488	19,476	23,324	27,685	33,695	38,719	46,786	58,883	67,953	77,848
	Total Power (W)	601	731	939	1,157	1,409	1,374	1,641	2,243	2,811	3,121	3,728	4,511	4,729	5,669	7,169
	LAT (DB/WB) (°F)	58.3/57.5	58.0/57.2	57.9/57.1	58.1/57.3	58.6/57.8	58.9/58.1	58.2/57.4	59.1/58.3	59.3/58.5	58.4/57.6	58.3/57.5	59.0/58.2	58.0/57.2	58.2/57.4	58.2/57.4
	Operating EER	12.9	12.5	12.5	12.7	11.6	13.3	13.6	11.7	11.0	12.4	12.5	11.9	14.5	13.8	12.9
HEATING	Total Capacity (BTU/h)	4,656	5,306	6,285	7,466	8,547	10,738	11,505	13,523	15,342	20,514	22,665	26,617	35,506	39,672	44,528
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	642	878	1,173
	LAT (°F)	85.3	85.3	84.5	83.8	83.1	84.1	83.3	82.5	81.8	83.5	83.1	82.3	83.6	83.1	82.8
	LWT (°F)	83.3	83.8	83.7	84.0	84.3	83.9	84.2	84.6	84.9	84.1	84.3	84.7	84.1	84.3	84.4

BULLDOG HEAT PUMP
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		EC Motor												Belt Drive		
Model		SKV008	SKV010	SKV012	SKV015	SKV018	SKV020	SKV024	SKV030	SKV036	SKV042	SKV048	SKV060	SKV070	SKV080	SKV100
Air Flow	(CFM)	280	320	400	500	600	700	800	1,000	1,200	1,400	1,600	2,000	2,400	2,800	3,200
Fluid Flow	(gpm)	1.4	1.7	2	2.5	3	3.5	4	5	6	7	8	10	12	14	16
100°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKV008-060 and 0.50 inch W.G. on SKV070-100***														
COOLING	Total Capacity (BTU/h)	7,151	8,434	10,922	13,749	15,194	16,955	20,865	24,503	28,775	35,935	43,515	50,173	64,407	73,198	87,019
	Sensible (BTU/h)	6,530	7,551	9,490	12,043	13,798	15,909	18,812	22,982	27,255	32,516	38,120	46,091	56,898	65,655	76,753
	Total Power (W)	659	800	1,026	1,286	1,531	1,546	1,853	2,515	3,140	3,476	4,156	5,006	5,285	6,251	7,855
	LAT (DB/WB) (°F)	59.1/58.3	58.9/58.0	58.7/57.9	58.4/57.6	59.4/58.6	59.7/58.8	58.9/58.1	59.4/58.6	59.7/58.9	59.2/58.4	58.6/57.8	59.4/58.6	58.7/57.9	59.0/58.2	58.5/57.7
	Operating EER	10.8	10.5	10.6	10.7	9.9	11.0	11.3	9.7	9.2	10.3	10.5	10.0	12.2	11.7	11.1
HEATING	Total Capacity (BTU/h)	6,983	7,958	9,428	11,198	12,820	16,108	17,258	20,284	23,012	30,771	33,997	39,925	53,259	59,507	66,791
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	642	878	1,173
	LAT (°F)	93.0	92.9	91.7	90.6	89.7	91.2	89.9	88.7	87.7	90.3	89.6	88.4	90.5	89.6	89.2
	LWT (°F)	90.0	90.6	90.6	91.0	91.5	90.8	91.4	91.9	92.3	91.2	91.5	92.0	91.1	91.5	91.7
105°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKV008-060 and 0.50 inch W.G. on SKV070-100***														
COOLING	Total Capacity (BTU/h)	6,851	8,087	10,471	13,265	14,616	16,302	20,114	23,557	27,589	34,585	41,879	48,276	62,166	70,630	84,043
	Sensible (BTU/h)	6,472	7,484	9,404	11,709	13,688	15,784	18,668	22,319	26,449	32,258	37,036	45,728	56,469	65,163	74,642
	Total Power (W)	689	835	1,072	1,357	1,593	1,641	1,971	2,668	3,326	3,674	4,393	5,282	5,588	6,569	8,237
	LAT (DB/WB) (°F)	59.3/58.5	59.0/58.2	58.9/58.1	59.0/58.2	59.6/58.8	59.8/59.0	59.1/58.3	60.0/59.2	60.3/59.5	59.4/58.6	59.3/58.5	59.5/58.7	58.9/58.1	59.2/58.3	59.1/58.3
	Operating EER	9.9	9.7	9.8	9.8	9.2	9.9	10.2	8.8	8.3	9.4	9.5	9.1	11.1	10.8	10.2
HEATING	Total Capacity (BTU/h)	8,147	9,285	10,999	13,065	14,957	18,792	20,134	23,665	26,848	35,900	39,663	46,579	62,136	69,425	77,923
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	642	878	1,173
	LAT (°F)	96.8	96.7	95.3	94.1	93.0	94.7	93.2	91.8	90.6	93.6	92.8	91.5	93.9	92.9	92.4
	LWT (°F)	93.4	94.1	94.0	94.5	95.0	94.3	94.9	95.5	96.1	94.7	95.1	95.7	94.6	95.1	95.3

		EC Motor												Belt Drive		
Model		SKV008	SKV010	SKV012	SKV015	SKV018	SKV020	SKV024	SKV030	SKV036	SKV042	SKV048	SKV060	SKV070	SKV080	SKV100
Air Flow	(CFM)	280	320	400	500	600	700	800	1,000	1,200	1,400	1,600	2,000	2,400	2,800	3,200
Fluid Flow	(gpm)	1.4	1.7	2	2.5	3	3.5	4	5	6	7	8	10	12	14	16
110°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKV008-060 and 0.50 inch W.G. on SKV070-100***														
COOLING	Total Capacity (BTU/h)	6,556	7,740	9,991	12,750	14,031	15,634	19,347	22,569	26,357	33,214	40,182	46,321	59,864	67,991	80,991
	Sensible (BTU/h)	6,281	7,264	9,312	11,611	13,287	15,634	18,136	22,130	26,213	31,321	36,711	44,390	56,028	64,657	74,057
	Total Power (W)	720	870	1,121	1,434	1,655	1,743	2,097	2,834	3,528	3,887	4,647	5,580	5,910	6,906	8,648
	LAT (DB/WB) (°F)	59.9/59.1	59.7/58.9	59.1/58.3	59.2/58.4	60.2/59.4	60.0/59.2	59.7/58.9	60.2/59.4	60.5/59.7	60.0/59.2	59.5/58.6	60.1/59.3	59.1/58.3	59.3/58.5	59.3/58.5
	Operating EER	9.1	8.9	8.9	8.9	8.5	9.0	9.2	8.0	7.5	8.5	8.6	8.3	10.1	9.8	9.4
HEATING	Total Capacity (BTU/h)	9,311	10,611	12,570	14,931	17,094	21,477	23,010	27,046	30,683	41,028	45,330	53,234	71,012	79,343	89,055
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	642	878	1,173
	LAT (°F)	100.6	100.6	99.0	97.5	96.3	98.3	96.5	94.9	93.6	97.0	96.1	94.5	97.3	96.1	95.6
	LWT (°F)	96.7	97.5	97.4	98.1	98.6	97.7	98.5	99.2	99.8	98.3	98.7	99.4	98.2	98.7	98.9
120°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 0.25 inch W.G. External Static Pressure on SKV008-060 and 0.50 inch W.G. on SKV070-100***														
COOLING	Total Capacity (BTU/h)	5,998	7,052	8,929	11,592	12,844	14,246	17,757	20,438	23,741	30,416	36,574	42,220	55,044	62,464	74,674
	Sensible (BTU/h)	5,998	7,052	8,916	11,148	12,844	14,246	17,757	20,438	23,741	30,416	35,249	42,220	53,949	62,250	71,306
	Total Power (W)	782	944	1,227	1,608	1,780	1,970	2,377	3,209	3,988	4,363	5,208	6,253	6,615	7,644	9,568
	LAT (DB/WB) (°F)	60.9/59.5	60.3/59.3	60.1/59.3	60.1/59.2	60.9/59.7	61.8/60.1	60.1/59.3	61.8/60.3	62.4/60.6	60.6/59.5	60.3/59.5	61.1/60.2	59.9/59.1	60.1/59.3	60.1/59.3
	Operating EER	7.7	7.5	7.3	7.2	7.2	7.2	7.5	6.4	6.0	7.0	7.0	6.8	8.3	8.2	7.8
HEATING	Total Capacity (BTU/h)	11,639	13,264	15,713	18,664	21,367	26,846	28,763	33,807	38,354	51,285	56,662	66,542	88,765	99,179	111,319
	Total Power (W)	89	88	118	176	252	187	228	369	517	506	680	773	642	878	1,173
	LAT (°F)	108.3	108.2	106.2	104.4	102.8	105.3	103.1	101.2	99.5	103.8	102.6	100.7	104.1	102.6	102.1
	LWT (°F)	103.4	104.4	104.3	105.1	105.8	104.7	105.6	106.5	107.2	105.3	105.8	106.7	105.2	105.8	106.1

EWT: Entering Water Temperature
LWT: Leaving Water Temperature
EAT: Entering Air Temperature
LAT: Leaving Air Temperature
DB: Dry Bulb
WB: Wet Bulb

Water l/s = 0.06309 x gpm US
Water Pressure Drop kPa = 2.989 x ft. water
W = 0.29307 x BTU/h
°C = (°F - 32) / 1.8
Air l/s = 0.4719 x cfm
Air Pressure Drop Pa = 249.1 x inch W.G.

BULLDOG HEAT PUMP

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Belt Drive

Dual Scroll Compressors

Model		SKV120	SKV150	SKV180	SKV240	SKV280	SKV320	SKV360	SKV400	SKV480
Air Flow	(CFM)	4,000	5,000	6,000	8,000	9,200	10,500	12,000	14,000	16,000
Fluid Flow	(gpm)	20	25	30	40	48	56	60	70	80
80^{0}F EWT		***Cooling: 80.6/66.2^{0}F (DB/WB) EAT, Heating: 70^{0}F EAT, Water Only, 1.0 inch W.G. External Static Pressure on SKV120-320 & 2.0 inch on SKV360-480***								
COOLING	Total Capacity (BTU/h)	118,904	135,983	202,522	228,318	268,885	310,168	337,762	378,818	437,692
	Sensible (BTU/h)	96,582	117,009	157,691	191,100	222,110	252,956	281,178	323,562	368,639
	Total Power (W)	8,401	10,332	13,441	15,733	17,267	20,395	25,010	29,548	35,561
	LAT (DB/WB) (°F)	58.3/57.5	59.0/58.2	56.4/55.6	58.6/57.8	58.3/57.5	58.4/57.6	59.0/58.2	59.3/58.5	59.4/58.6
	Operating EER	14.2	13.2	15.1	14.5	15.6	15.2	13.5	12.8	12.3
HEATING	Total Capacity (BTU/h)	30,265	35,555	45,435	56,096	66,627	73,438	86,858	97,191	106,813
	Total Power (W)	1,939	2,895	2,408	3,968	4,150	5,162	7,614	9,450	11,549
	LAT (°F)	77.0	76.6	77.0	76.5	76.7	76.4	76.7	76.4	76.2
	LWT (°F)	77.0	77.2	77.0	77.2	77.2	77.4	77.1	77.2	77.3
85^{0}F EWT		***Cooling: 80.6/66.2^{0}F (DB/WB) EAT, Heating: 70^{0}F EAT, Water Only, 1.0 inch W.G. External Static Pressure on SKV120-320 & 2.0 inch on SKV360-480***								
COOLING	Total Capacity (BTU/h)	115,436	131,918	197,100	221,360	261,462	302,670	327,300	367,214	426,006
	Sensible (BTU/h)	95,918	116,230	152,729	189,767	220,689	251,520	279,174	321,340	366,401
	Total Power (W)	8,819	10,824	14,021	16,366	18,000	21,183	25,914	30,515	36,597
	LAT (DB/WB) (°F)	58.5/57.7	59.2/58.4	57.1/56.3	58.7/57.9	58.5/57.7	58.5/57.7	59.2/58.4	59.4/58.6	59.5/58.7
	Operating EER	13.1	12.2	14.1	13.5	14.5	14.3	12.6	12.0	11.6
HEATING	Total Capacity (BTU/h)	45,398	53,332	68,152	84,145	99,941	110,157	130,288	145,787	160,220
	Total Power (W)	1,939	2,895	2,408	3,968	4,150	5,162	7,614	9,450	11,549
	LAT (°F)	80.5	79.8	80.5	79.7	80.0	79.7	80.0	79.6	79.2
	LWT (°F)	80.5	80.7	80.5	80.8	80.8	81.1	80.7	80.8	81.0
90^{0}F EWT		***Cooling: 80.6/66.2^{0}F (DB/WB) EAT, Heating: 70^{0}F EAT, Water Only, 1.0 inch W.G. External Static Pressure on SKV120-320 & 2.0 inch on SKV360-480***								
COOLING	Total Capacity (BTU/h)	111,879	127,772	191,496	214,457	253,940	294,511	316,760	355,579	413,758
	Sensible (BTU/h)	95,237	113,028	151,655	188,445	219,248	249,957	277,155	312,368	356,349
	Total Power (W)	9,260	11,349	14,642	17,035	18,779	22,060	26,884	31,556	37,728
	LAT (DB/WB) (°F)	58.7/57.9	59.8/59.0	57.3/56.5	58.9/58.1	58.6/57.8	58.7/57.9	59.3/58.5	60.0/59.2	60.1/59.3
	Operating EER	12.1	11.3	13.1	12.6	13.5	13.4	11.8	11.3	11.0
HEATING	Total Capacity (BTU/h)	60,530	71,110	90,869	112,193	133,254	146,876	173,717	194,382	213,627
	Total Power (W)	1,939	2,895	2,408	3,968	4,150	5,162	7,614	9,450	11,549
	LAT (°F)	83.9	83.1	84.0	82.9	83.3	82.9	83.3	82.8	82.3
	LWT (°F)	83.9	84.3	83.9	84.4	84.4	84.8	84.2	84.4	84.7

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Belt Drive											
		Dual Scroll Compressors									
Model		SKV120	SKV150	SKV180	SKV240	SKV280	SKV320	SKV360	SKV400	SKV480	
Air Flow	*(CFM)*	4,000	5,000	6,000	8,000	9,200	10,500	12,000	14,000	16,000	
Fluid Flow	*(gpm)*	20	25	30	40	48	56	60	70	80	
100°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 1.0 inch W.G. External Static Pressure on SKV120-320 & 2.0 inch on SKV360-480***									
COOLING	Total Capacity	*(BTU/h)*	104,472	119,186	179,766	200,671	238,470	276,367	295,309	331,962	387,610
	Sensible	*(BTU/h)*	91,891	111,383	146,519	181,951	211,854	241,424	267,267	307,844	351,340
	Total Power	*(W)*	10,227	12,520	16,023	18,502	20,506	24,084	29,044	33,883	40,291
	LAT (DB/WB)	*(°F)*	59.4/58.6	60.1/59.3	58.1/57.3	59.6/58.8	59.4/58.6	59.4/58.6	60.1/59.3	60.3/59.5	60.4/59.6
	Operating EER		10.2	9.5	11.2	10.8	11.6	11.5	10.2	9.8	9.6
HEATING	Total Capacity	*(BTU/h)*	90,796	106,664	136,304	168,289	199,881	220,314	260,575	291,574	320,440
	Total Power	*(W)*	1,939	2,895	2,408	3,968	4,150	5,162	7,614	9,450	11,549
	LAT	*(°F)*	90.9	89.7	90.9	89.4	90.0	89.3	90.0	89.2	88.5
	LWT	*(°F)*	90.9	91.5	90.9	91.6	91.7	92.1	91.3	91.7	92.0
105°F EWT		***Cooling: 80.6/66.2°F (DB/WB) EAT, Heating: 70°F EAT, Water Only, 1.0 inch W.G. External Static Pressure on SKV120-320 & 2.0 inch on SKV360-480***									
COOLING	Total Capacity	*(BTU/h)*	100,609	114,722	173,656	193,713	230,455	266,460	284,331	319,849	373,723
	Sensible	*(BTU/h)*	91,151	108,120	145,348	180,619	210,318	239,527	265,164	298,781	348,680
	Total Power	*(W)*	10,763	13,176	16,793	19,310	21,465	25,231	30,243	35,176	41,731
	LAT (DB/WB)	*(°F)*	59.6/58.8	60.7/59.9	58.3/57.5	59.8/59.0	59.5/58.7	59.6/58.8	60.2/59.4	60.9/60.1	60.5/59.7
	Operating EER		9.3	8.7	10.3	10.0	10.7	10.6	9.4	9.1	9.0
HEATING	Total Capacity	*(BTU/h)*	105,928	124,442	159,021	196,337	233,195	257,033	304,004	340,169	373,847
	Total Power	*(W)*	1,939	2,895	2,408	3,968	4,150	5,162	7,614	9,450	11,549
	LAT	*(°F)*	94.4	92.9	94.4	92.6	93.4	92.6	93.3	92.4	91.5
	LWT	*(°F)*	94.4	95.0	94.4	95.2	95.3	95.8	94.9	95.3	95.7

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Belt Drive

Dual Scroll Compressors

		SKV120	SKV150	SKV180	SKV240	SKV280	SKV320	SKV360	SKV400	SKV480
Model		4,000	5,000	6,000	8,000	9,200	10,500	12,000	14,000	16,000
Air Flow	*(CFM)*	20	25	30	40	48	56	60	70	80
Fluid Flow	*(gpm)*									
110^{0}F EWT		***Cooling: 80.6/66.2^{0}F (DB/WB) EAT, Heating: 70^{0}F EAT, Water Only, 1.0 inch W.G. External Static Pressure on SKV120-320 & 2.0 inch on SKV360-480***								
COOLING	**Total Capacity** *(BTU/h)*	96,629	110,128	167,390	186,662	222,209	256,046	273,139	307,447	359,304
	Sensible *(BTU/h)*	90,389	107,240	144,148	175,415	208,739	237,532	257,241	296,406	338,212
	Total Power *(W)*	11,341	13,886	17,621	20,176	22,497	26,470	31,525	36,562	43,282
	LAT (DB/WB) *(°F)*	59.8/59.0	60.8/60.0	58.5/57.7	60.4/59.6	59.7/58.9	59.8/58.9	60.8/60.0	61.1/60.3	61.1/60.3
	Operating EER	8.5	7.9	9.5	9.3	9.9	9.7	8.7	8.4	8.3
HEATING	**Total Capacity** *(BTU/h)*	121,061	142,219	181,738	224,386	266,508	293,752	347,434	388,765	427,254
	Total Power *(W)*	1,939	2,895	2,408	3,968	4,150	5,162	7,614	9,450	11,549
	LAT *(°F)*	97.9	96.2	97.9	95.9	96.7	95.8	96.7	95.6	94.6
	LWT *(°F)*	97.9	98.6	97.9	98.8	98.9	99.5	98.4	98.9	99.3
120^{0}F EWT		***Cooling: 80.6/66.2^{0}F (DB/WB) EAT, Heating: 70^{0}F EAT, Water Only, 1.0 inch W.G. External Static Pressure on SKV120-320 & 2.0 inch on SKV360-480***								
COOLING	**Total Capacity** *(BTU/h)*	88,294	100,499	154,419	172,131	204,895	233,841	249,975	281,515	328,891
	Sensible *(BTU/h)*	86,866	100,499	138,774	172,131	200,991	228,221	249,975	281,515	328,891
	Total Power *(W)*	12,644	15,490	19,474	22,100	24,804	29,223	34,362	39,622	46,732
	LAT (DB/WB) *(°F)*	60.6/59.8	62.1/60.9	59.3/58.5	60.8/59.9	60.5/59.7	60.6/59.8	61.4/60.4	62.1/61.1	61.7/60.6
	Operating EER	7.0	6.5	7.9	7.8	8.3	8.0	7.3	7.1	7.0
HEATING	**Total Capacity** *(BTU/h)*	151,326	177,774	227,173	280,482	333,135	367,190	434,292	485,956	534,067
	Total Power *(W)*	1,939	2,895	2,408	3,968	4,150	5,162	7,614	9,450	11,549
	LAT *(°F)*	104.9	102.8	104.9	102.3	103.4	102.2	103.4	102.0	100.8
	LWT *(°F)*	104.9	105.8	104.9	106.0	106.1	106.9	105.5	106.1	106.6

EWT: Entering Water Temperature
LWT: Leaving Water Temperature
EAT: Entering Air Temperature
LAT: Leaving Air Temperature
DB: Dry Bulb
WB: Wet Bulb

Water l/s = 0.06309 x gpm US
Water Pressure Drop kPa = 2.989 x ft. water
W = 0.29307 x BTU/h
°C = (°F - 32) / 1.8
Air l/s = 0.4719 x cfm
Air Pressure Drop Pa = 249.1 x inch W.G.

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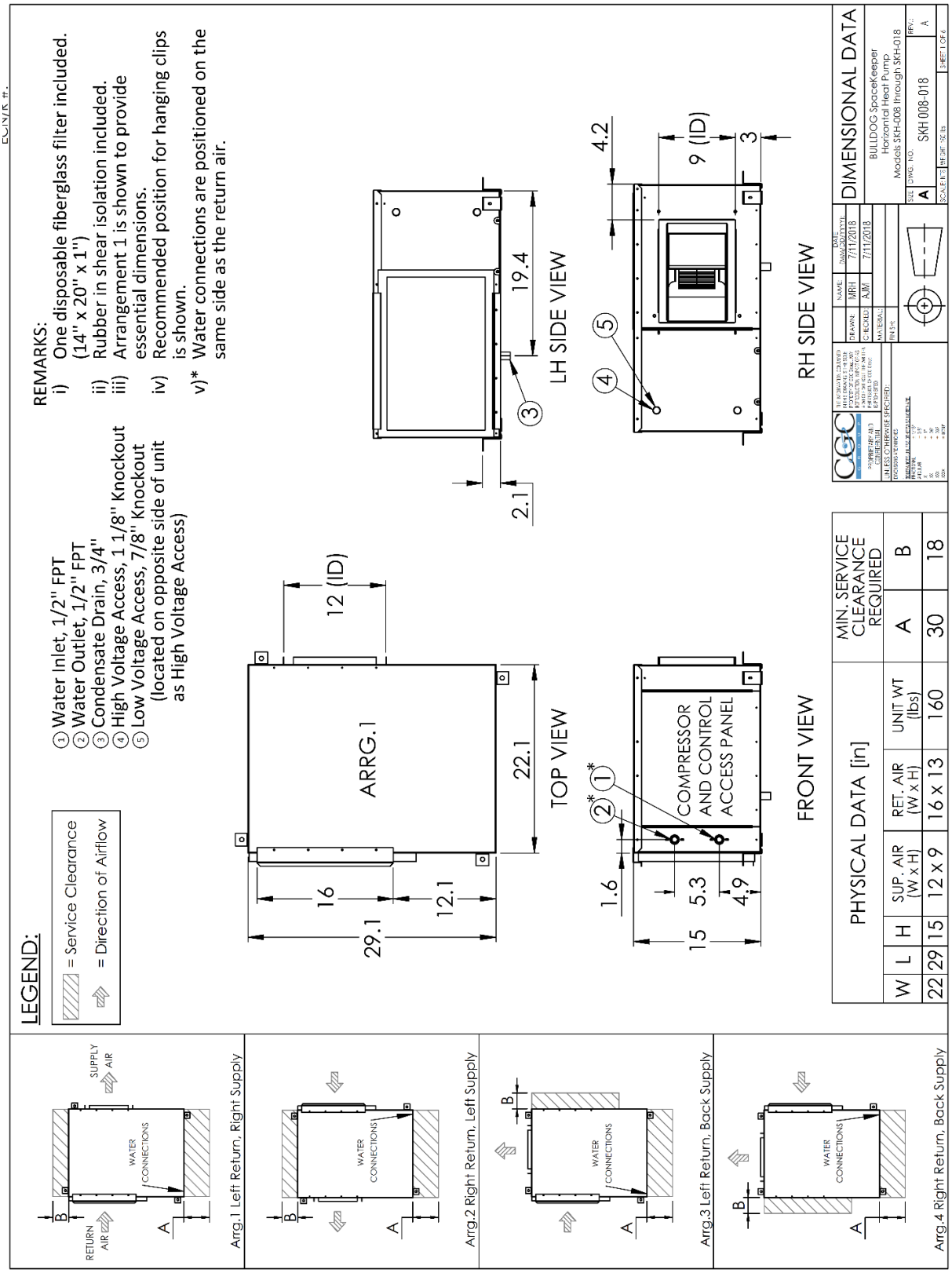
SpaceKeeper Horizontal Detail Drawings



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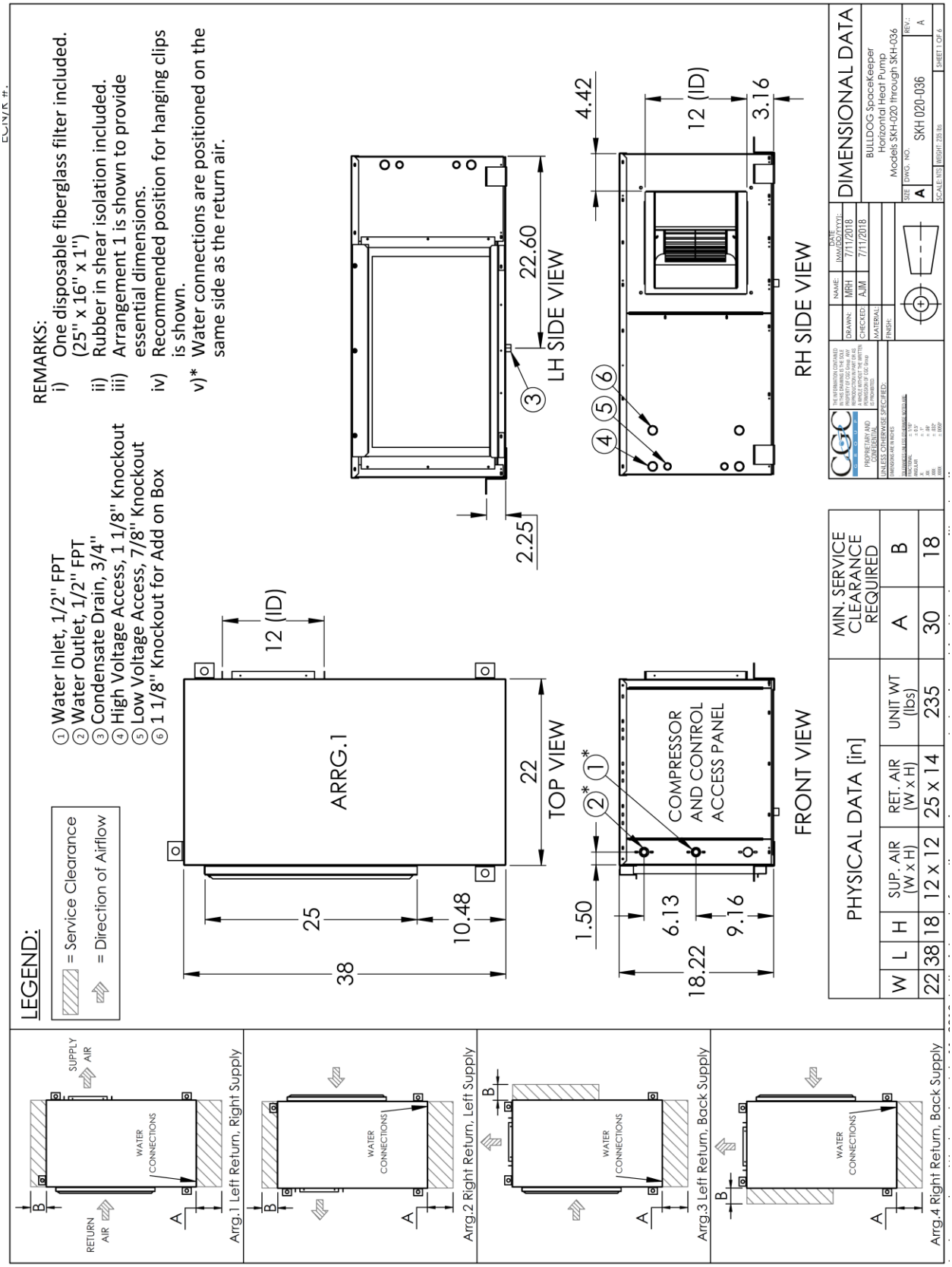

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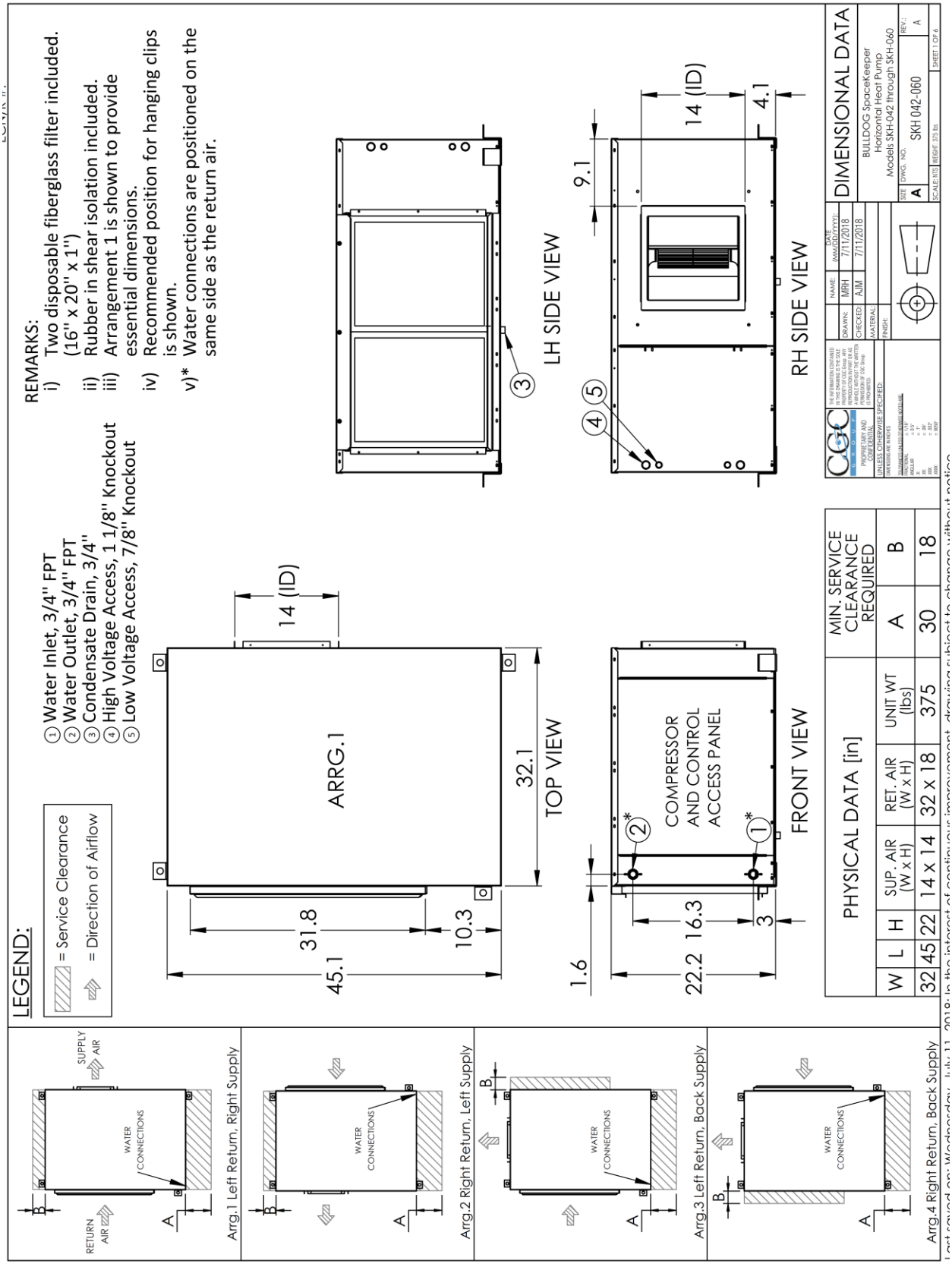

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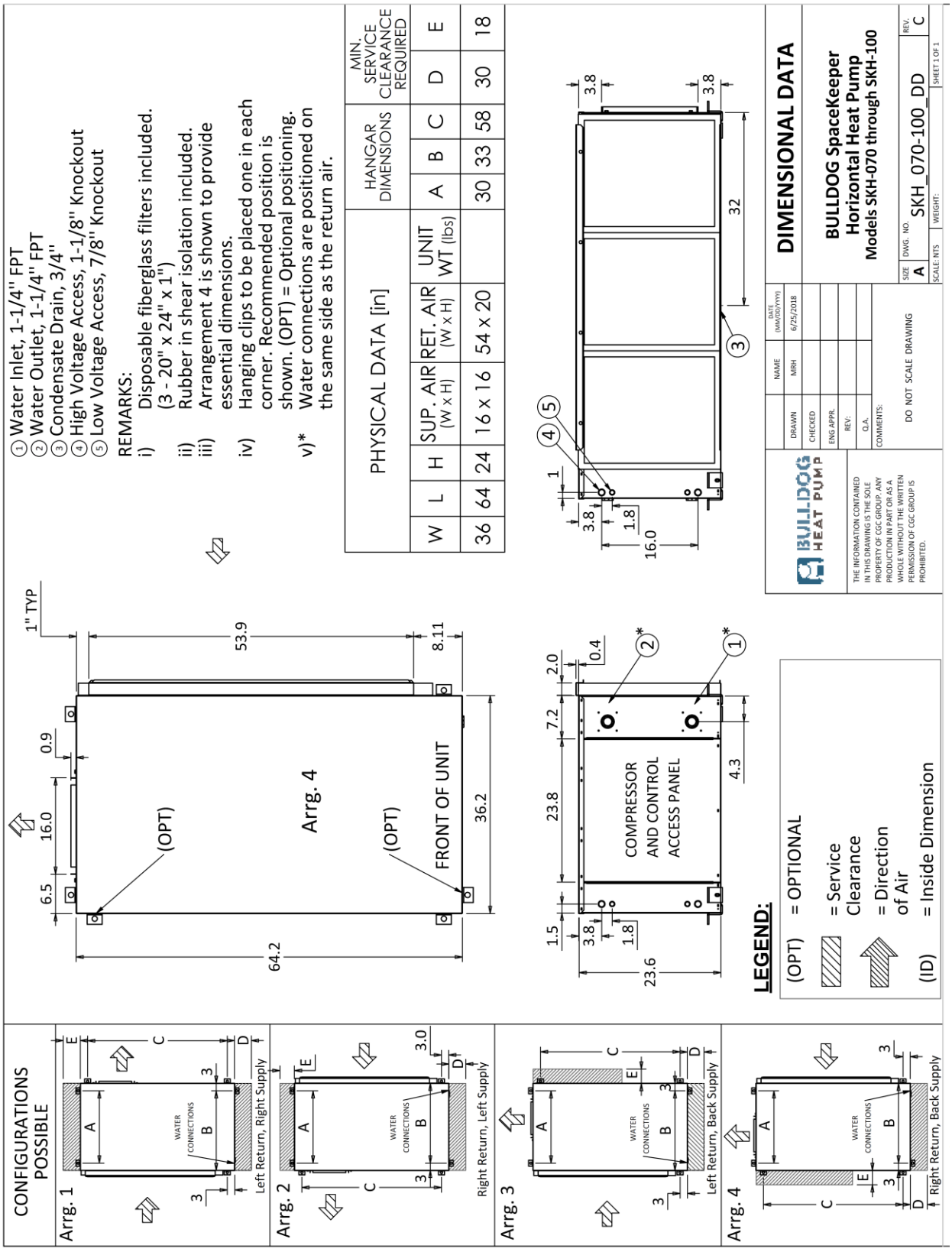

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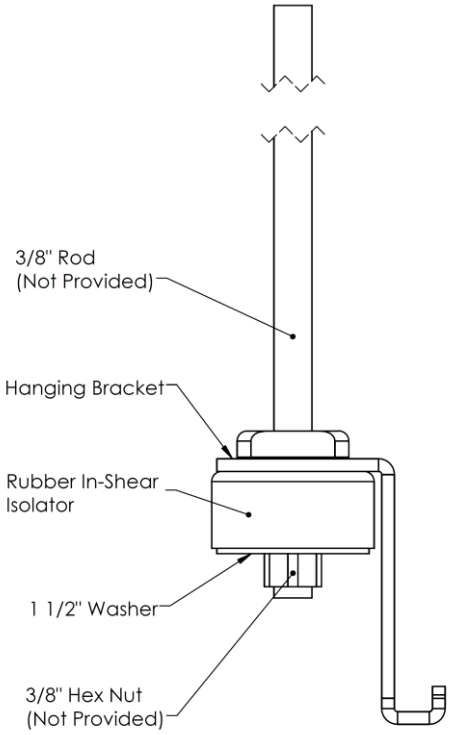
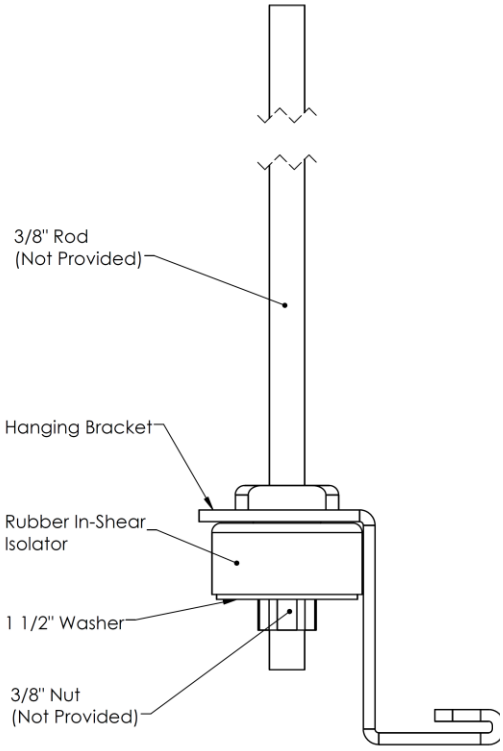
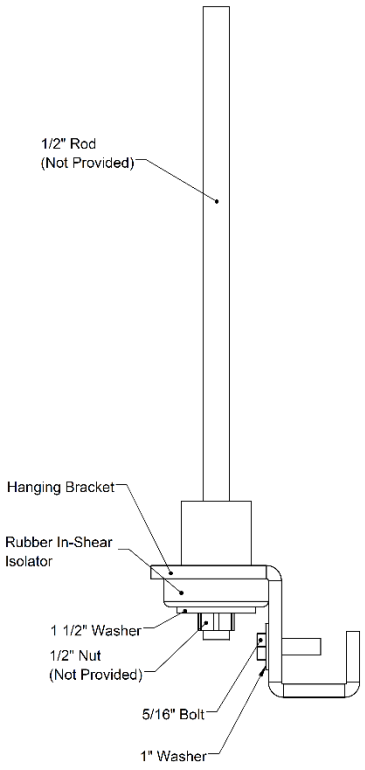
SKH Hanging Assembly



SKH008-018 Hanging Assembly



SKH020-060 Hanging Assembly



SKH070-100 Hanging Assembly

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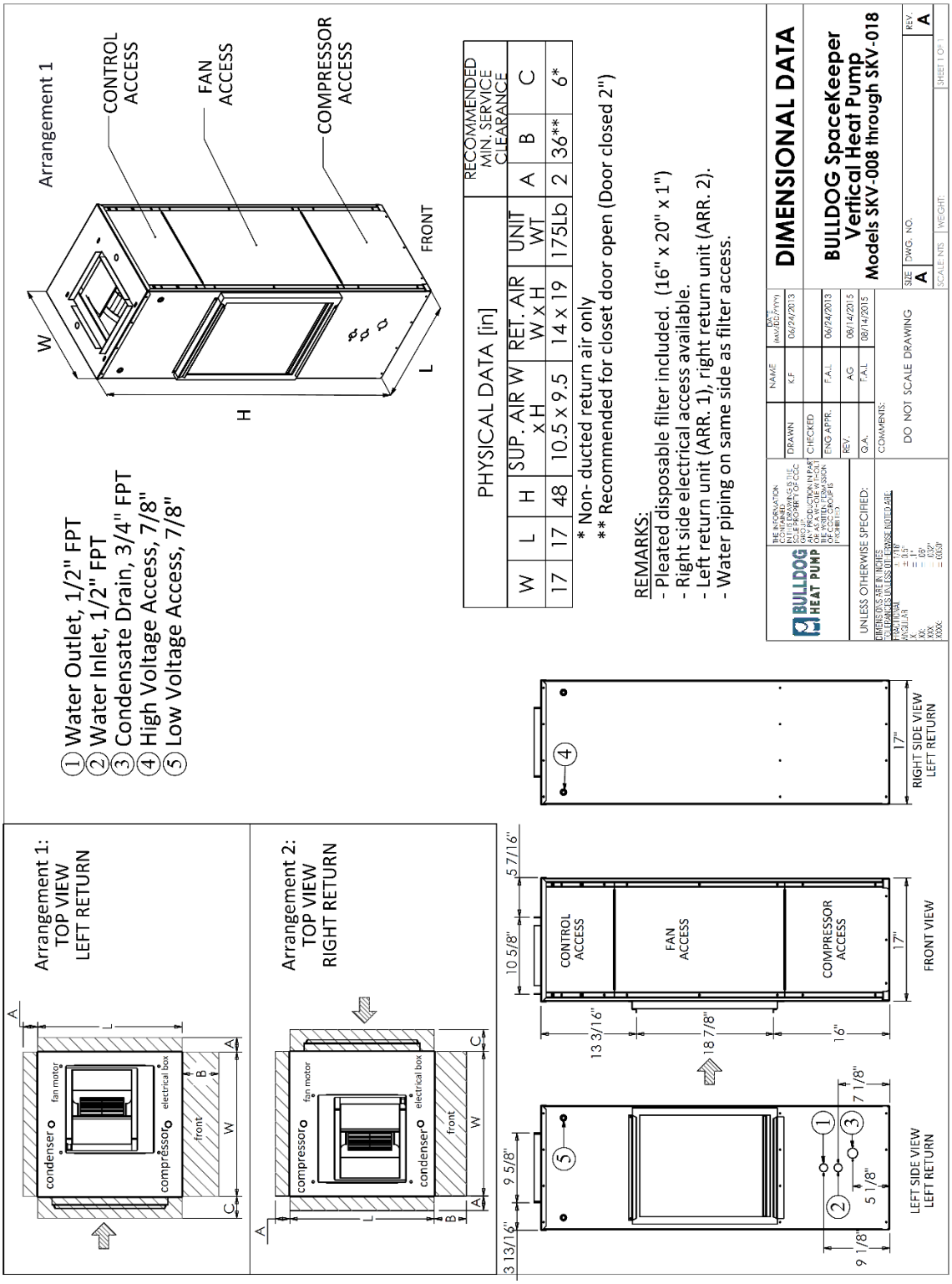
SKV Detail Drawings



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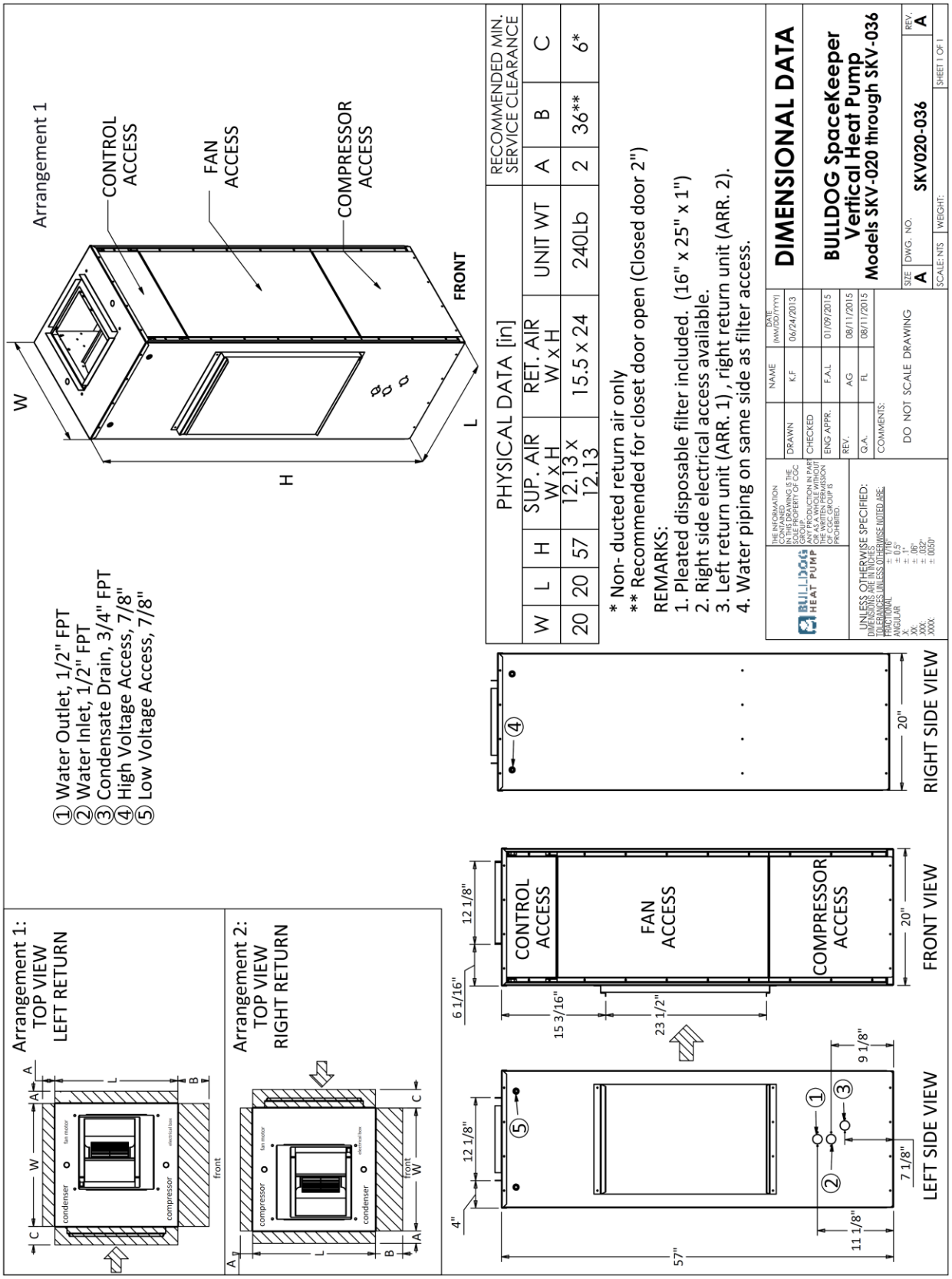

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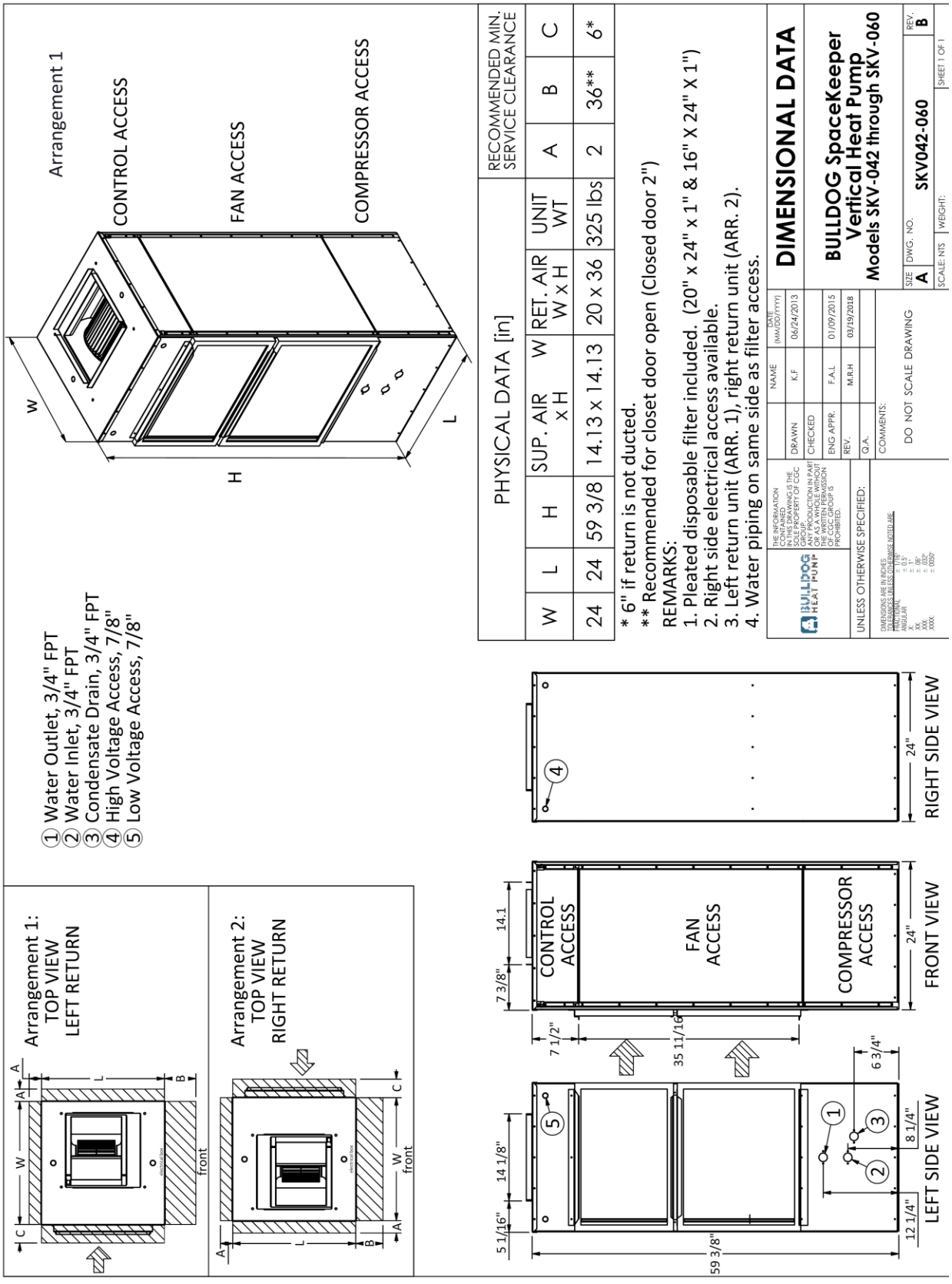

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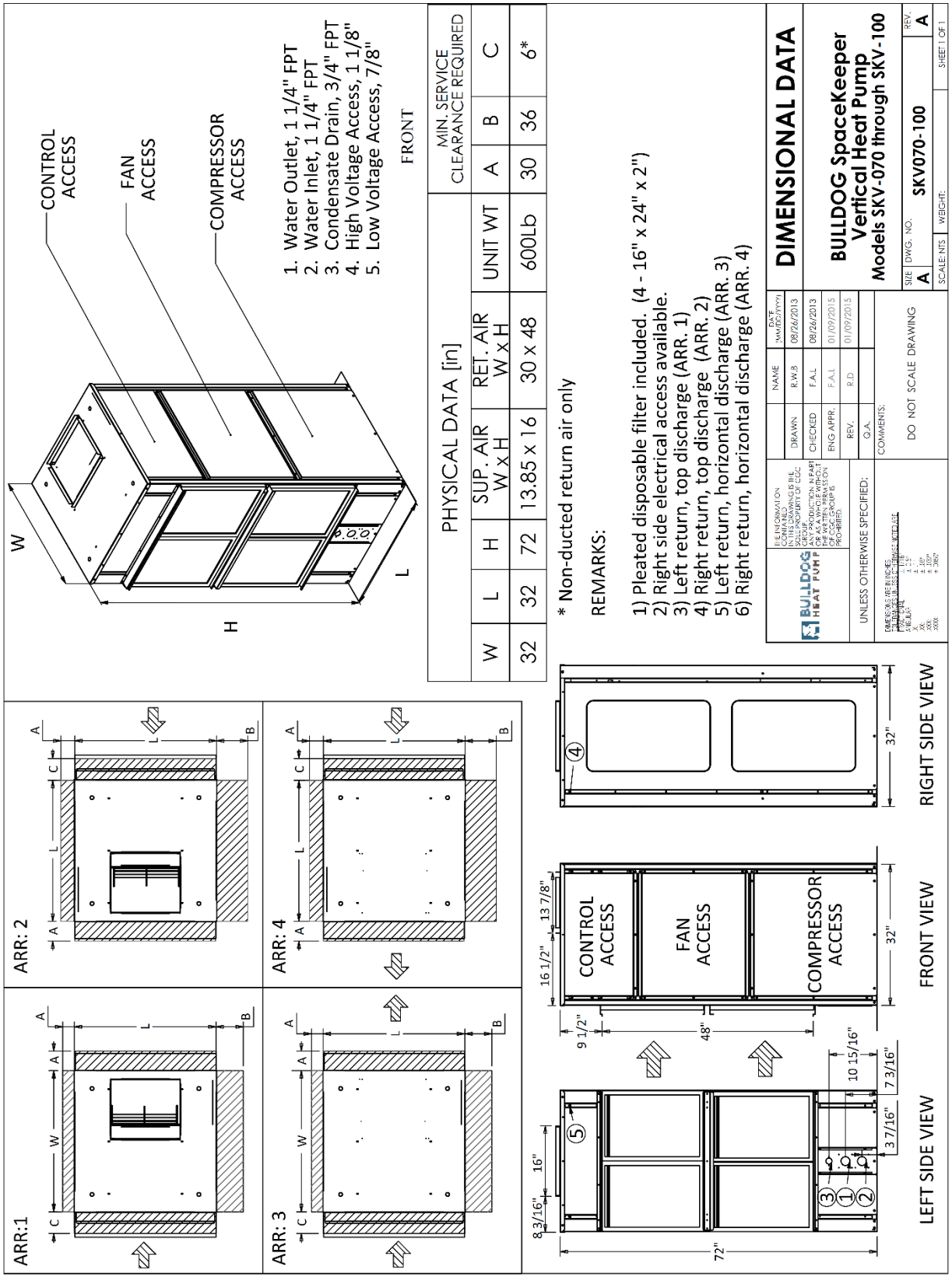

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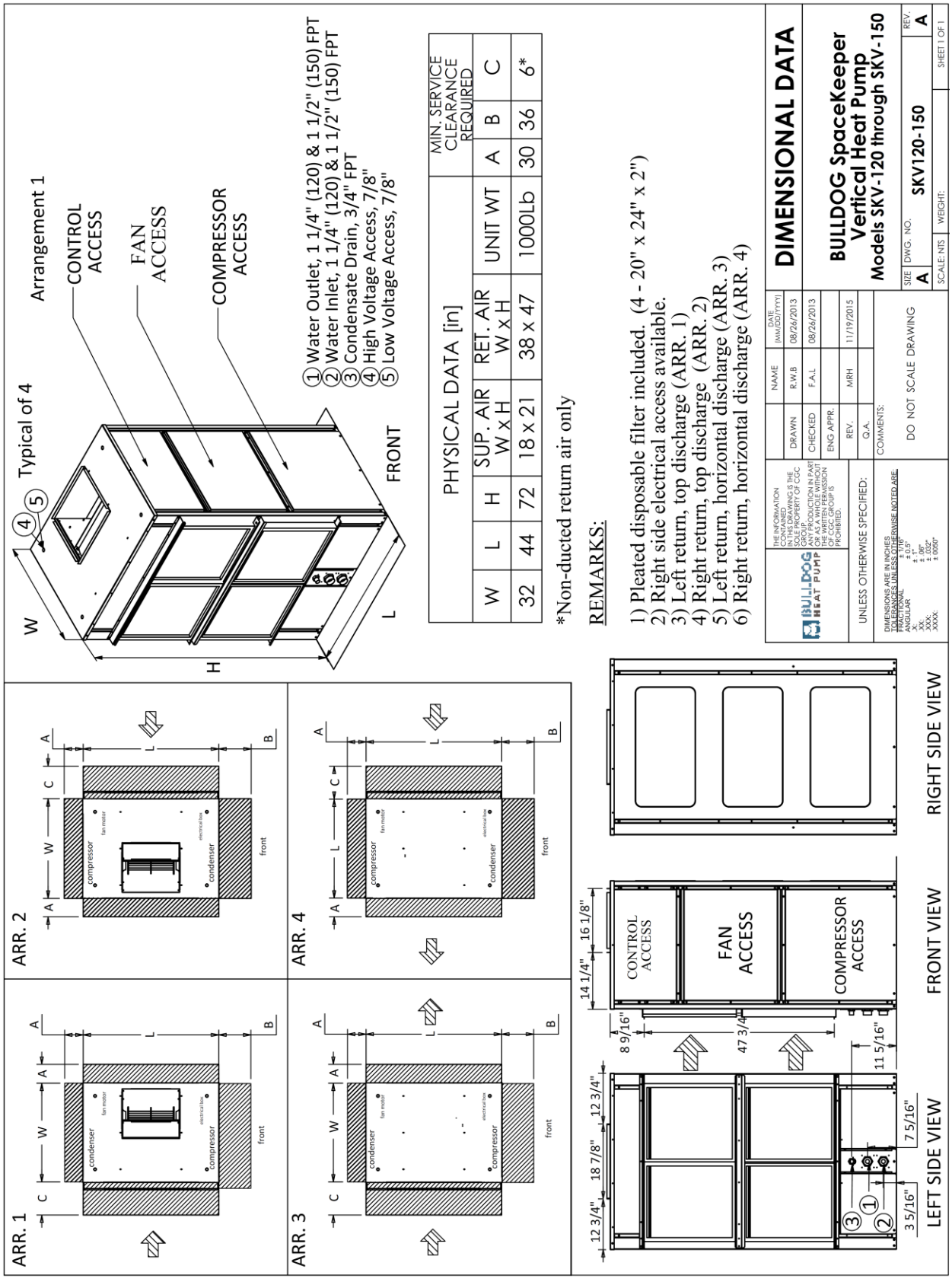

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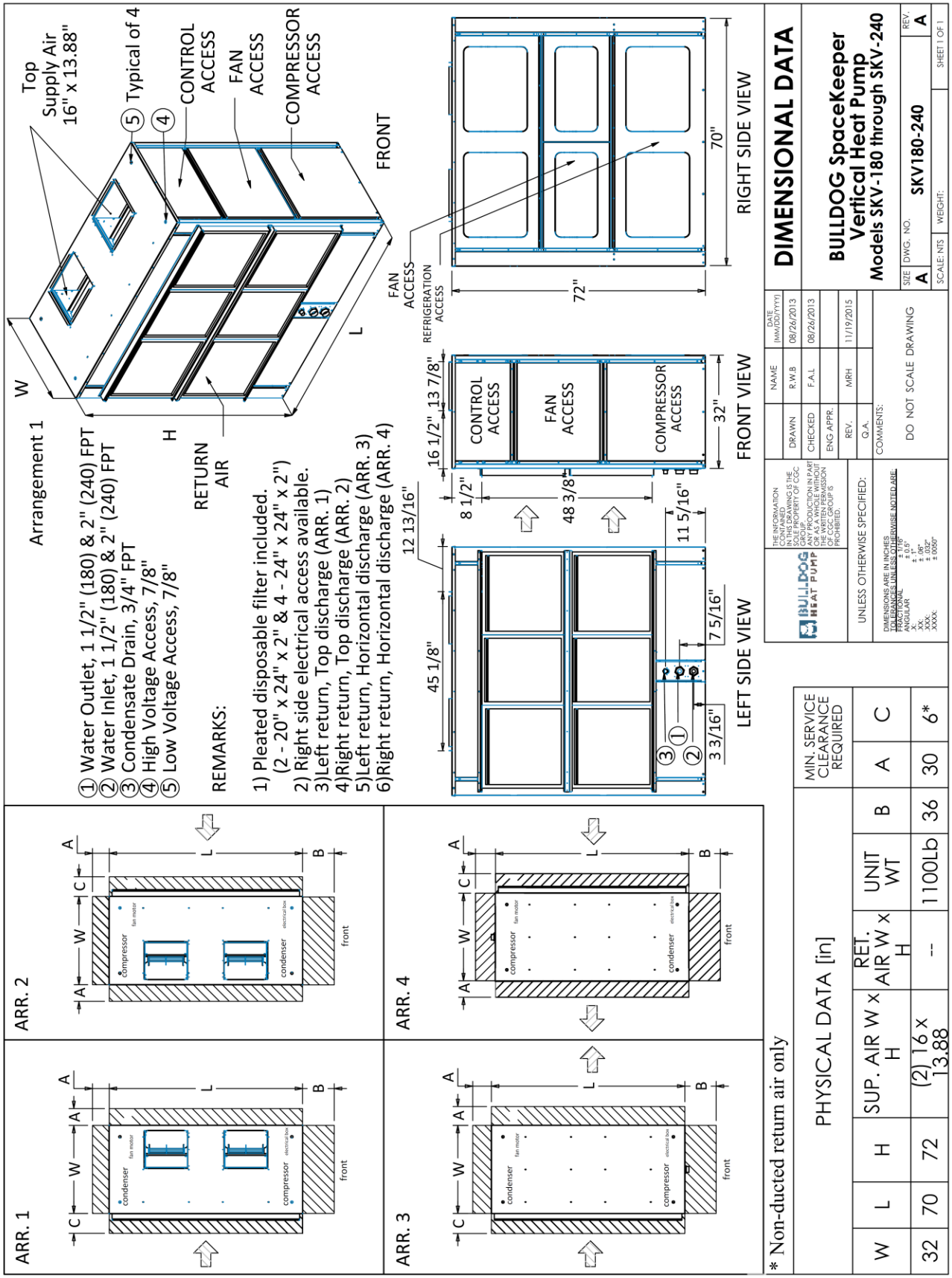

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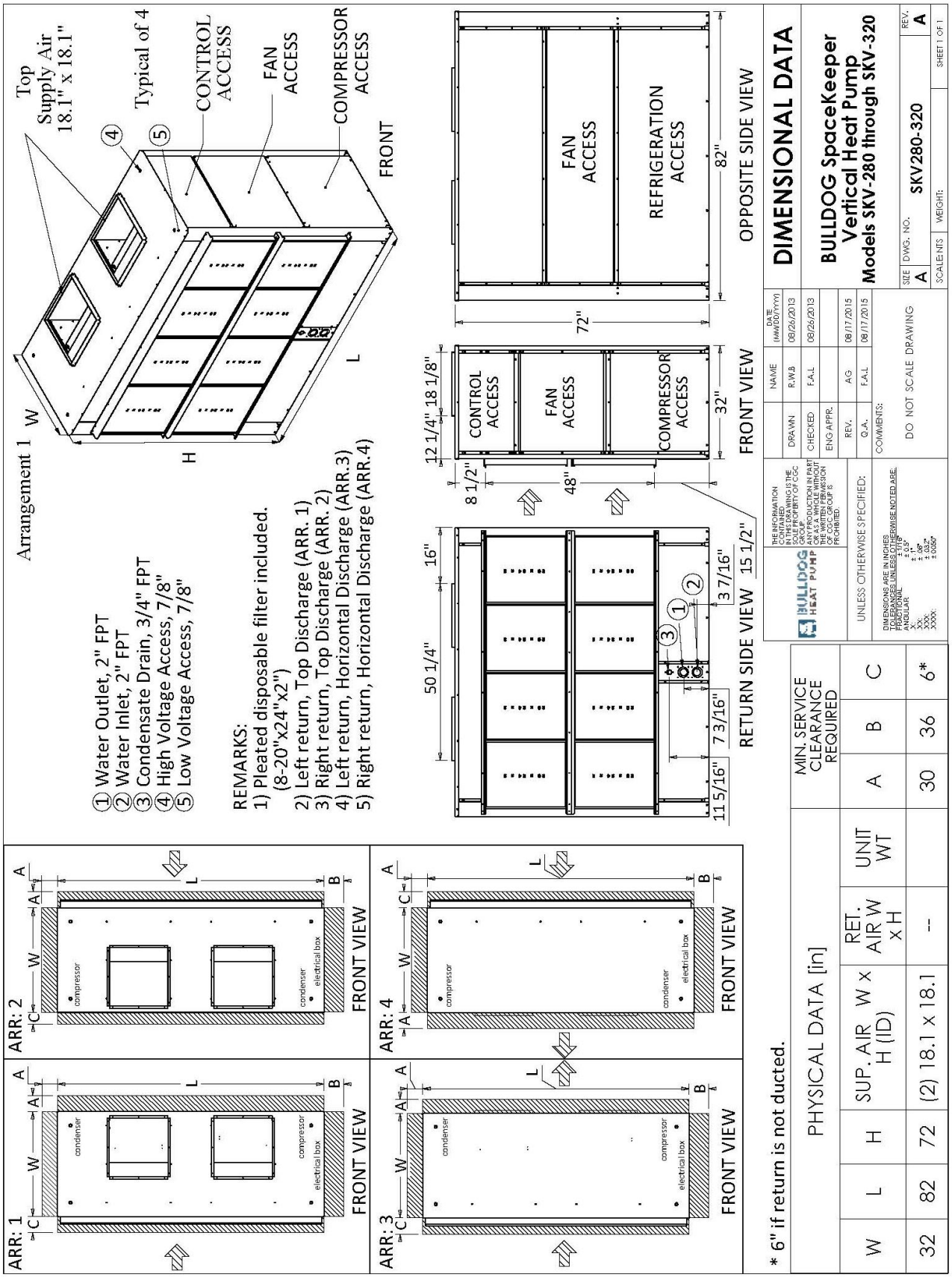

W	L	H	SUP. AIR W x H (ID)	RET. AIR W x H	UNIT WT	A	B	C
32	82	72	(2) 18.1 x 18.1	--		30	36	6*

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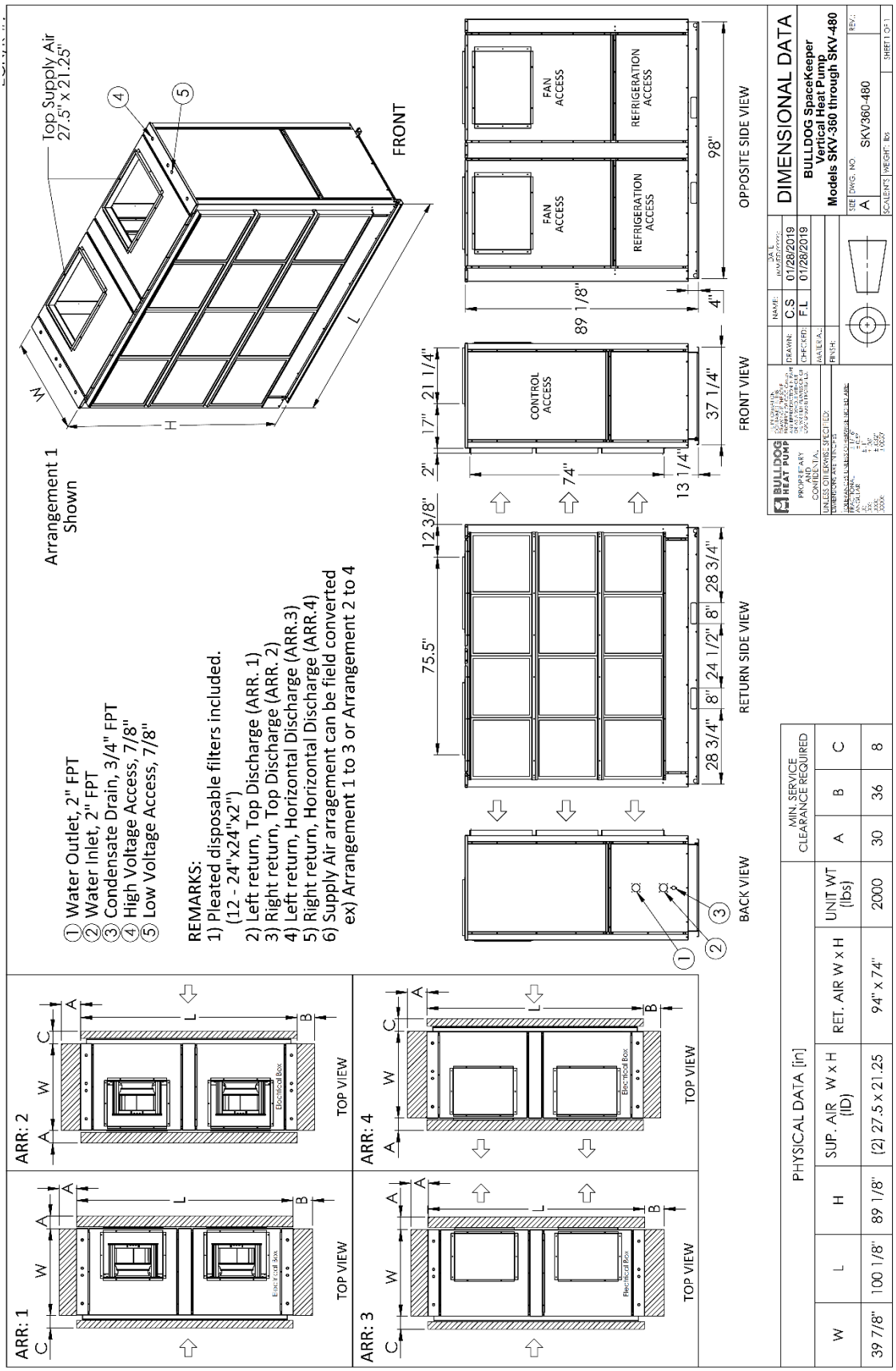

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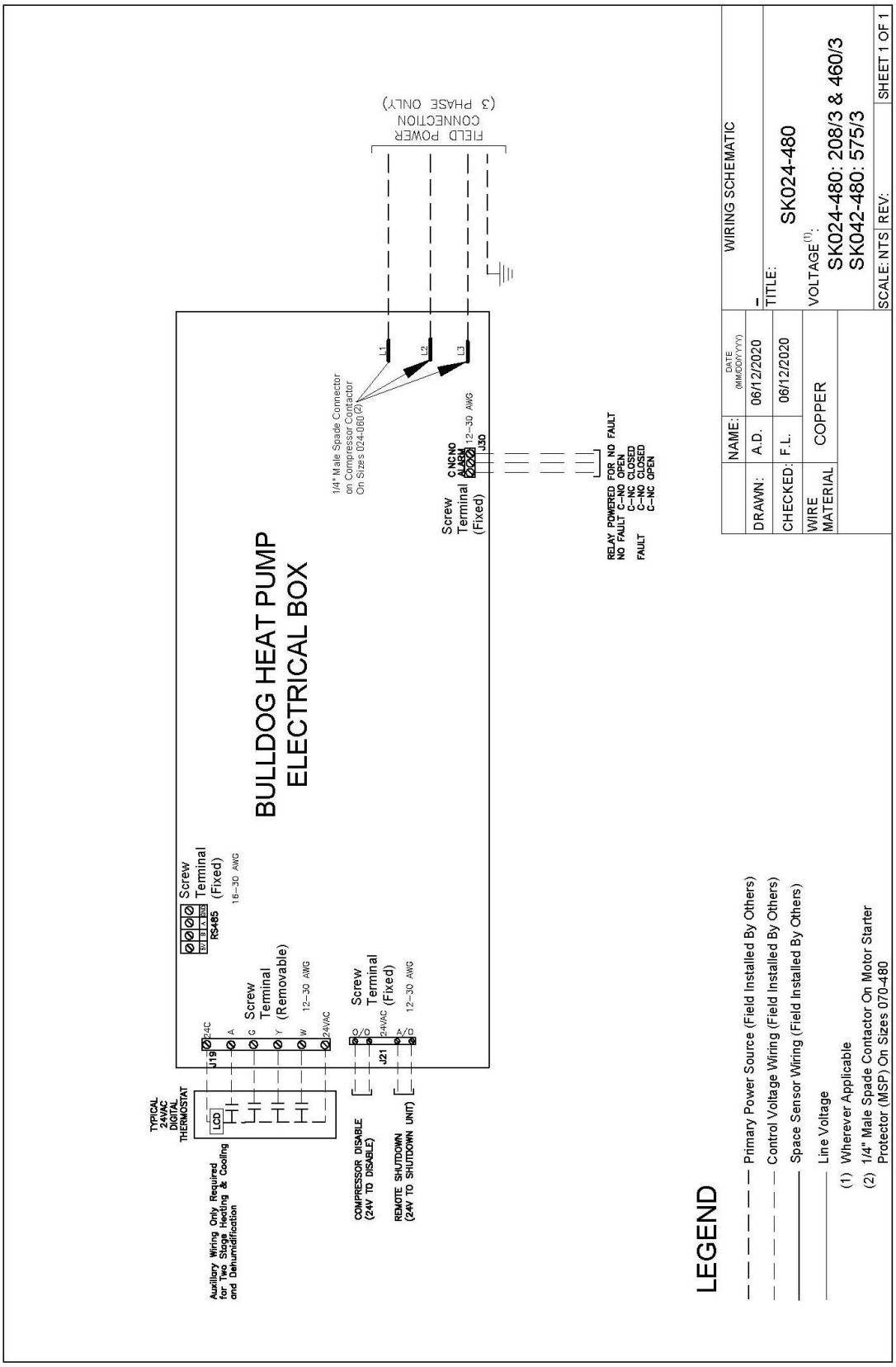
SKH/SKV Wiring Schematic



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SKH/ SKV – Detailed Options List

MISCELLANEOUS:			
Option	**Available**	**Description**	**Option notes**
2	**SKV/SKH**	**Extended 5 year compressor warranty**	This option provides an extended compressor only warranty for an additional 4 years. Shipping costs are not included. (parts only)
3	**SKV/SKH**	**Extended 5 year refrigerant circuit warranty**	This option provides an extended warranty for an additional 4 years for all refrigeration components including the compressor, the evaporator, the condenser, the TX valve, and the pressure switches. It does not include piping or refrigerant. Shipping costs are not included (parts only).
4	**SKV 008-060**	**Painted cabinet**	This option provides a painted cabinet for SKV008-060. (standard for SKV070-480)
6	**SKV/SKH**	**Acoustigaurd™ Noise-Blok**	Noise-Blok is a thin, dense, 2 pound per square foot noise barrier material used to line the inside compressor base of the SKH/V. This flexible, mineral filled sheeting is used in conjunction with the standard acoustic liner on the heat pump base and provides additional sound attenuation.
7.X	**SKV/SKH**	**Ducted Filter Box**	Can accommodate 1, 2 or 4" filter and allows return air ducting to heat pump with minimal leakage.

REFRIGERATION:			
Option	**Available**	**Description**	**Option notes**
10	**SKV/SKH**	**Two step scroll**	This option provides for two stage cooling capability through a two-step, single compressor that provides 30% capacity reduction when operating on first stage. (70% capacity). Internal controls are included to provide two stage operations. A two-stage thermostat is required. This is not available with option 40.
13	**SKV 070-480**	**Tandem scroll set**	This option provides improved part load efficiency over option 14. This is achieved using tandem compressors with one refrigeration circuit but two stages. The improvement in efficiency results when the system operates one compressor with the full size evaporator and condenser.
14	**SKV0 70-100**		This option provides dual independent refrigeration circuits for partial redundancy. If an issue should affect one compressor circuit the other circuit is available to operate partial cooling until the unit can be repaired. Dual refrigeration circuits are standard on SKV120-480
15	**SKV/SKH**	**Sight glass**	This option provides a sight glass in the refrigeration circuit. Standard in sizes 070-480
16	**SKV/SKH**	**Hot gas bypass**	Option provides hot gas bypass for low load situations when partial cooling is required but the resulting compressor operation would create low pressure issues. Hot gas bypass injects hot refrigerant gas directly into the direct expansion distributor inducing a false load on the evaporator, warming it and increasing the suction pressure. Use this option when a two stage compressor is still not enough turn down for the cooling requirements.

CONTROLS:			
Option	**Available**	**Description**	**Option notes**
20	**SKV/SKH**	**Aux heating stage**	Heating output is tied to aux input. It is used for aux heat in some other part of space.
21	**SKV/SKH**	**Condensate overflow protection**	This option will provide a solid state condensate sensor that will terminate cooling operation if the drain-pan level rises too high. Condensate overflow alarm changes the state of the alarm lockout relay for remote monitoring.
22	**SKV/SKH**	**Set up to 230 V/1**	Select this option if the volt units are to operate at 230 volts single phase.
23	**SKV/SKH**	**High % outside air control includes: Modulating valve, DAT sensor, and Flex controller**	This option is for high percentage of untreated fresh air being introduced through the unit. It provides a discharge air temperature sensor controlling a 3-way modulating valve to maintain a set point discharge air temperature. When the unit is in a fan only call – the modulating heat valve maintains the discharge air temperature at the set point. If there is no call, the modulating valve moves to 50% open allowing water to cycle to maintain a minimum temperature in the coils. Consult with factory. This option is not compatible with demand flow (option 41).
24	**SKV/SKH**	**Mount third party DDC**	Select this option to have third party DDC controllers mounted on or in the unit. Included is a box to hold the controller and isolation transformer if there is no available space. Alarm signal will be provided to the DDC controller. The controller transmits calls and lockout signals to the onboard heat pump controller. Size of controller box adds to overall dimensions. For special wiring requirements, consult factory.

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PACKAGES:			
Option	**Available**	**Description**	**Option notes**
33	**SKV/SKH**	**VAV control**	• Motor VAV configuration (Option 61V) • Two step compressor (Option 10) • Hot gas bypass (Option 16) • Flex board (Option 32) • Software • Hot water coil in reheat position
34	**SKV/SKH**	**VAV control no heating**	• Motor VAV configuration (Option 61V) • Two step compressor (Option 10) • Hot gas bypass (Option 16) • Flex board (Option 32) • Software • Deleting heating coil
35	**SKV/SKH 008-060**	**Discharge heating control**	• Modulating valve (Option 53C/D) • Discharge temperature control • Flex board (Option 32)
36	**SKV/SKH 008-060**	**Outside air ventilation unit**	• Modulating valve (Option 53C/D) • Discharge temperature control • Flex board (Option 32) • Two step compressor (Option 10) • Hot gas bypass (Option 16) • Software • Deleting heating coil
37	**SKV/SKH 008-060**	**Variable airflow outside ventilation unit**	• Motor VAV configuration (Option 61V) • Modulating valve (Option 53C/D) • Discharge temperature control • Flex board (Option 32) • Two step compressor (Option 10) • Hot gas bypass (Option 16) • Software • Hot water coil in reheat position

WATER SIDE:			
Option	**Available**	**Description**	**Option notes**
40	**SKV/SKH**	**Pump or valve flow control signal**	Select this option to provide a 24VAC signal for the control of a valve or a pump (supplied by others) to provide flow only during a heating or cooling call. Not available with option 10. Consult factory.
41	**SKV/SKH**	**Demand flow control**	This option is required for variable volume pumping systems. This option also provides an auto flow valve which is an automatic throttling valve that controls the amount of water through the unit when it is either heating or cooling.
41A	**SKV/SKH**	**Demand flow - auto flow valve not included**	This option is required for variable volume pumping systems. Auto flow valve is not included with this option.
41H	**SKV/SKH**	**Demand flow Hays flow control valve**	This option is required for variable volume pumping systems. A Hays auto flow valve is used instead of the standard auto flow valve and is used as an automatic throttling valve that controls the amount of water through the unit when it is either heating or cooling.
42	**SKV/SKH**	**Auto flow limiting control**	This option provides an auto flow valve which is an automatic throttling valve that controls the amount of water through the unit when it is either heating or cooling.
42H	**SKV/SKH**	**Hays auto flow limiting control**	This option provides a Hays auto flow valve to our standard unit. The auto flow valve is an automatic throttling valve that controls the amount of water through the unit when it is either heating or cooling.
44	**SKV/SKH**	**Cooling only unit**	This option provides a water-regulating valve. The unit becomes a demand flow unit. Heating coil is omitted.
45	**SKV/SKH**	**FreeCool unit**	This option provides a controller programmed to allow for non-compressor based cooling if the supply water is sufficiently cool (<45°F). Includes a water-regulating valve. The unit becomes a demand flow unit.
48	**SKV/SKH**	**High close off rated valve**	This option provides an alternative valve(s) with higher close-off pressure ratings

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WATER SIDE:			
Option	**Available**	**Description**	**Option notes**
53C	**SKV/SKH**	**Modulating heat valve - Continuous flow**	This option provides a modulating valve for heating with continuous flow. Autoflow valve not included. Requires a 2-10V signal by others.
53D	**SKV/SKH**	**Modulating heat valve - Demand flow**	This option provides a modulating valve for heating with demand flow. Requires a 2-10V signal by others. Autoflow valve not included.
54C	**SKV/SKH**	**Dehumidification control with constant flow**	This option provides the heating coil in the reheat position for dehumidification. Internal controls are provided but a thermostat/humidistat is required. Thermostat must utilize a third output to energize dehumidification. Thermostats that activate simultaneously the heat and cool calls to energize dehumidification will not work. Autoflow valve not included.
54D	**SKV/SKH**	**Dehumidification control with demand flow**	This option provides the heating coil in the reheat position for dehumidification. Internal controls are provided but a thermostat/humidistat is required. Thermostat/humidistat must utilize a third output to energize dehumidification. Thermostats that activate simultaneously the heat and cool calls to energize dehumidification will not work. Minimum load required for sizes 008 to 036. Autoflow valve not included.
59	**SKV/SKH**	**7/8" Condensate hose**	This option provides the unit with a 3/4" condensate hose – swaged on one end to 7/8".

AIRSIDE:			
Option	**Available**	**Description**	**Option notes**
60	**SKV/SKH**	**Oversized fan motor**	This option provides an oversized motor and is available only for the SKV and SKH series of units.
61	**SKV/SKH**	**EC Motor (ECM)**	This option provides an EC motor on direct drive units. Consult factory on details regarding voltage, speed and size requirements.
61E	**SKV/SKH**	**Constant volume EC motor**	Select this option for an EC motor that provides constant volume on direct drive units. Consult factory on details regarding voltage, speed and size requirements. Must choose at the time of order.
61V	**SKV/SKH**	**Variable volume EC motor – heating only**	Select this option for an EC motor that provides variable air volume in heating mode only. Note air volume may be varied in fan only mode as well. A 0-10vdc signal and logic by others. Consult factory for variable air volume in cooling.
62	**SKV/SKH**	**Variable Frequency Drive**	Select this option for variable frequency drives for the belt drive fans in the 070 thru 480 sizes.
64	**SKV/SKH**	**Mixing box with economizer control**	Select this option for an economizer package for the Bulldog SKV and SKH heat pumps. Economizer package includes return air fan with EC motor, return air, fresh air and exhaust air dampers and 24V AC actuators in an insulated box as well as Flex controller with LCD display. Economizer relays heat/cool fan calls to heat pump.
65	**SKV/SKH**	**High speed fan**	This option is a single speed fan and allows the heat pump to run on high speed for heat calls, cool calls, and fan only calls. It can provide high CFM capability at all times.
66	**SKV/SKH**	**100% OA package**	This package includes option 23, a pre filter, and 65 % bag filters, ducted filter box.
68.X	**SKV/SKH**	**MERV 7 or 8 filters**	This option provides MERV 7 or 8 filters as opposed to the standard filters. 1" or 2" thickness options. Order as 68.1 for 1" filter, 68.2 for a 2" filter.
69.X	**SKV/SKH**	**MERV 13 filters**	This option provides MERV 13 filters as opposed to the standard filters. 1", 2", or 4" thickness options. Order as 69.1 for 1" filter, 69.2 for a 2" filter or 69.4 for 4" filter.

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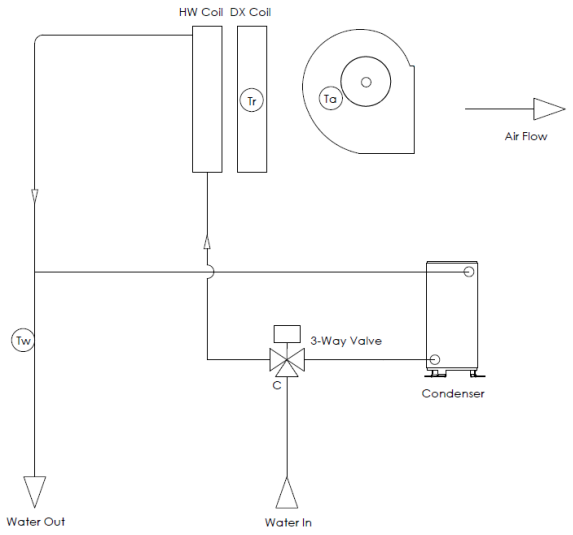
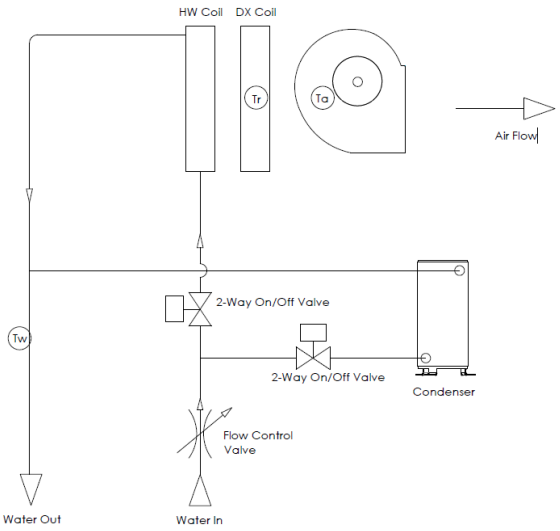
SKH/SKV Options and Accessories – Piping Schematics

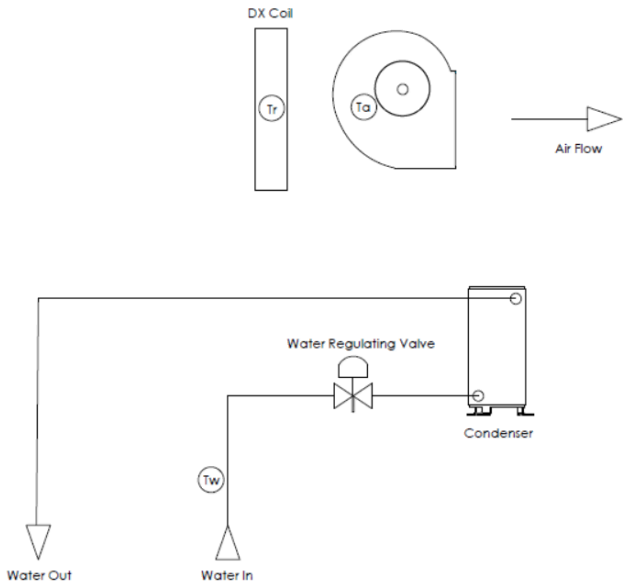
Standard



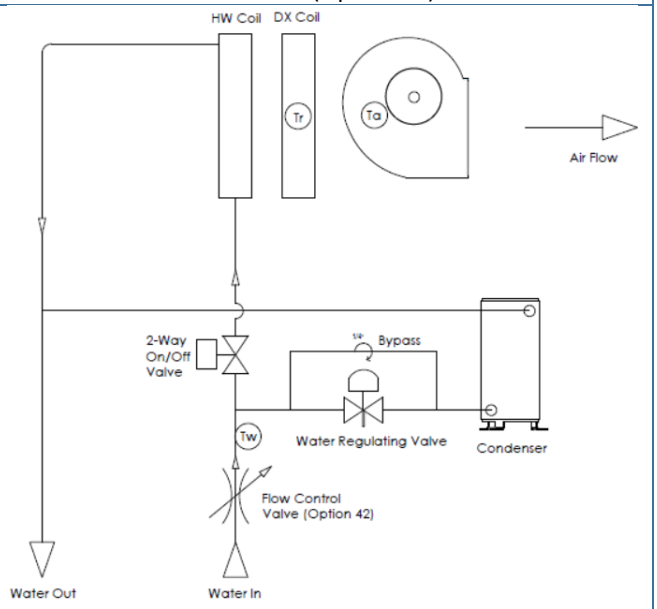
Demand Flow Control (Option 41)



Cooling Only (Option 44)



FreeCool (Option 45)



BULLDOG HEAT PUMP
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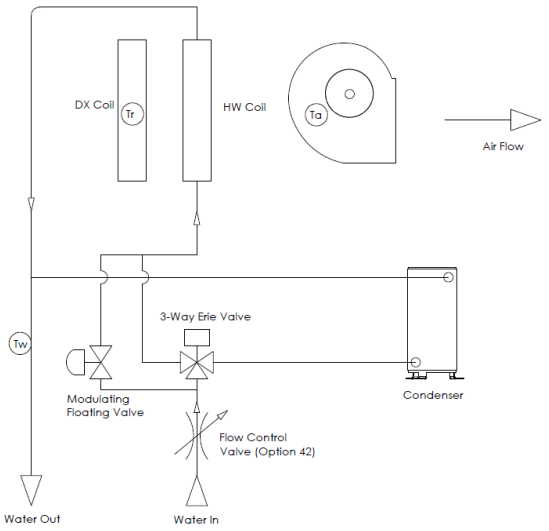
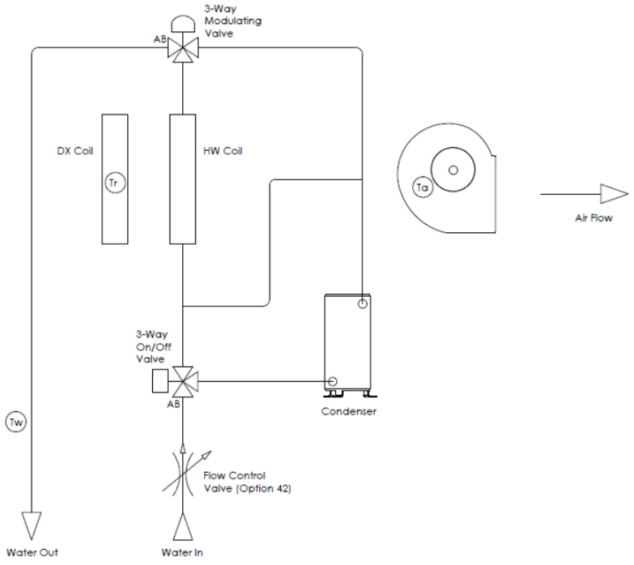
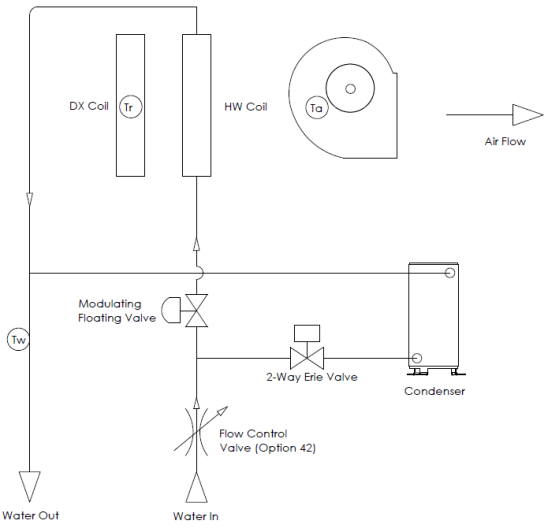
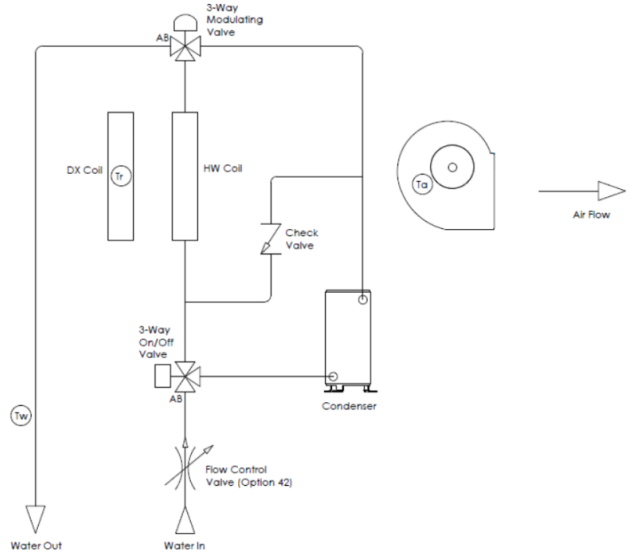
Dehumidification – Constant Flow (Option 54C)	Dehumidification – Constant Flow (Option 54C)
	
Unit sizes 008-036	*Unit sizes 042-480*

Dehumidification – Demand Flow (Option 54D)	Dehumidification – Demand Flow (Option 54D)
	
Unit sizes 008-036	*Unit sizes 042-480*

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SKH/SKV Options and Accessories – Thermostats

MODEL	DESCRIPTION
SC2010L 	• Single stage heat / cool • Single stage heat pump • No Auxiliary Heat • Non-Programmable • Manual Change Over (MCO) • Large display with backlight
SC3010L 	• Single stage heat / cool • Single stage heat pump • No Auxiliary Heat • Programmable • Manual Change Over (MCO) • Large display with backlight
SC4010L 	• Single stage heat / cool • Single stage heat pump • No Auxiliary Heat • Non-Programmable • Automatic / Manual Change Over (ACO/ MCO) • Large display with backlight
SC4811L 	• 2-stage heat / cool • Single or dual stage heat pump • With Auxiliary Heat • Non-Programmable • Automatic / Manual Change Over (ACO/ MCO) • Large display with backlight
SC5010L (ERV Compatible) 	• Single stage heat / cool • Single stage heat pump • No Auxiliary Heat • Programmable • Automatic/ Manual Change Over (ACO/ MCO) • Large display with backlight
SC5811L (ERV Compatible) 	• 2-stage heat / cool • Single or dual stage heat pump • With Auxiliary Heat • Programmable • Automatic/ Manual Change Over (ACO/ MCO) • Large display with backlight

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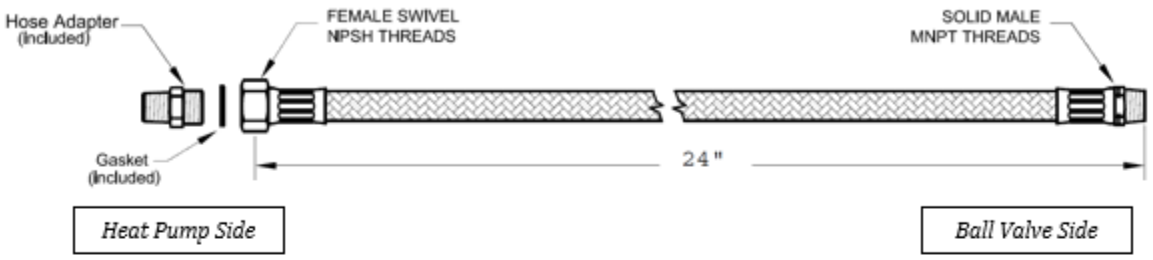
SKH/SKV Options and Accessories- Hoses and Ball Valves



* Swivel Ends: Hand tighten followed by 1/4 turn by wrench

Size	CGC Part #	Connections	Kit WT (lbs)	Working Pressure (PSI)	Thread (pitch/IN)	Cv
½" x 24"	H01	½"F x ½"M	0.74	400	14	3.5
¾" x 24"	H02	¾"F x ¾"M	1.44	400	14	12.8
1 ¼" x 24"	H03	1 ¼"F x 1 ¼"M	3.24	300	11 ½	29.0
1 ½" x 24"	H04	1 ½"F x 1 ½"M	4.07	300	11 ½	54.0
2" x 24"	H05	2"F x 2"M	5.83	300	11 1/2	68.0

MATERIALS

Core:	KEVLAR® Reinforced EPDM for H01 & H02 RAYON Reinforced EPDM for H03, H04 & H05
Braid:	Stainless Steel
Fitting:	Brass OT58
Ferrule:	Stainless Steel
Shaft:	Brass, Blowout-proof
Seals:	EPDM
Adapter:	Brass

DESIGN DATA

1) All connections are fire rated.
   Applicable Standard: ASTM E 84-00
   (NFPA 255, ANSI/UL 723 & UBC 8-1)
2) Fittings: Brass, MNPT
3) Seals: Gaskets

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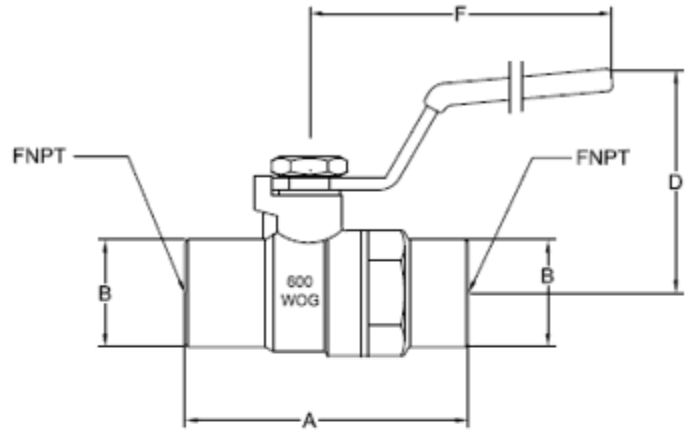

Size	CGC Part #	A	B	D	F	WT (lbs)	Cv
½"	BV1 (ACC-0250)	2.0"	½"	1.85"	3.35"	0.35	8
¾"	BV2 (ACC-0214)	2.2"	¾"	2.05"	3.54"	0.50	14
1 ¼"	BV3 (ACC-0221)	3.0"	1 ¼"	2.39"	4.53"	1.00	59
1 ½"	BV4 (ACC-0205)	3.5"	1 ½"	2.89"	5.55"	1.92	118
2"	BV5 (ACC-0219)	3.8"	2"	3.15"	5.55"	2.50	155

MATERIALS & DESIGN DATA

Body:	Hot forged brass ASTM B283, 600 WOG, 325°F
Shaft:	Brass, Blowout proof
Handle & Nut:	Zinc Plated / PVC Coated
Ball:	Hard chrome plated Brass
Ball Seals:	Teflon
Shaft Seals:	Dual FKM O-Rings

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SKH/SKV Guide Specifications

Part 1: General

1.1 The HVAC system is based on BULLDOG Heat Pump System.

1.2 The system will automatically provide the availability of heating or cooling functions 24 hours a day, 365 days a year without need for changeover.

1.3 Model selection and performance shall be in accordance with the schedule on the drawings.

1.4 Mechanical cooling shall be enabled with Entering Condenser Water below 125^{o}F and 2 GPM/ton.

1.5 Each unit/chassis shall be pressure tested with Nitrogen on both the refrigerant and fluid (water) circuits followed by a helium leak detection program for both circuits. Units are then attached to the vacuum system for at least 2 hours and monitored.

1.6 Each unit shall be run tested for a minimum of 15 minutes with a water/glycol solution to ensure 100% functionality in all modes of operation. Individual units/chassis shall be self-contained and complete when shipped from the factory.

1.7 Units shall be safety certified and bear a seal of approval from one of UL/ULC/ETL or ESA. All units must be AHRI certified and meet ASHRAE 90.1 minimum standard.

1.8 Manufacturer shall warrant the parts only of each unit for a period of 12 months from the start-up date or 18 months from the unit shipment date whichever occurs first.

1.9 Commissioning of the BULDOG units(s) shall be performed by a CGC trained technician. A commissioning report shall be provided by the commissioning technician for review and approval by the owner's representative.

1.10 It is the contractor's responsibility to have the fluid system properly flushed and cleaned prior to commissioning.
1.11 Alternate proposals shall include consideration for equipment space requirements, pipe and equipment sizing, electrical installation impact, operation costs, sound implications and redesign fees.

Part 2: Mechanical Parts

2.1 Housing

2.1.1 The housing of the unit shall be constructed based on a frame and panel principle with removable panels for maximum service access.
**(OPTIONAL)* Painting of exterior panels on SKV008-060.

2.1.2 The unit shall be fabricated with heavy gauge steel with all Interior of cabinet lined with 1/2" acoustic insulation.

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(OPTIONAL) Additional acoustical liner shall be used to line the inside compressor base to provide additional sound attenuation.

2.1.3 The supply air opening shall be complete with discharge duct collar.

2.1.4 The service panels shall be easily removable and sufficiently large to allow access to all components.

2.1.5 The unit shall be provided complete with hanging brackets and rubber isolation.

2.1.6 SKH: The cabinet shall be field convertible from straight through air supply discharge to end supply air discharge configuration.
SKV: The cabinet shall be configured at the factory in either left or tight return.

2.2 Blower and Motor

2.2.1 The complete blower section including motor shall be easily accessible and removable for service.

2.2.2 The blower shall be statically and dynamically balanced.

2.2.3 The blower is directly driven by a PSC motor that has an integral thermal overload protection for units up to size 060.
(OPTIONAL) the fan motor shall be Electronically Commutated (EC).

2.2.4 The blower shall be belt driven by a three phase motor with integral thermal overload protection for unit sizes 070 and above. The belt drive blower motor fan speed shall be adjustable by means of variable pitch motor pulley. The fan shall be driven by a single drive belt which is sized for minimum 200% of the motor horsepower.
(OPTIONAL) The fan motor shall be equipped with a variable frequency drive (VFD) for sizes 070 and above.

2.2.5 The fan motor shall be open drip proof on all direct drive types and shall be totally enclosed fan cooled for belt driven types.

2.3 Filter

2.3.1 The filter chamber shall be an integral part of the system located on return air path and should be serviceable from the front/ rear of the unit.

2.3.2 The filter shall be standard capacity, 1 inch thick “Disposable” type shipped with unit sizes 008-060 and 2” standard on sizes 070 and above
(OPTIONAL) MERV 8 & MERV13 filters
(OPTIONAL) Ducted Filter Box

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2.4 Hydronic Heating Loop

2.4.1 The refrigerant circuit shall not operate in the heating mode.

2.4.2 Heating coil shall be aluminum fin and copper tube construction rated to withstand 300 PSI working pressure.
(OPTIONAL) The heating coil can be mounted in the reheat position for dehumidification – Humidistat by others.
(OPTIONAL) Modulating valve for heating
(OPTIONAL) For Cooling Only units, the heating coil can be omitted. This option provides a water-regulating valve.
(OPTIONAL) FreeCool units allow for non-compressor based cooling if the supply water is below 450°F

Part 3: Refrigeration Parts

3.1 Refrigeration System

3.1.1 The refrigeration circuit shall be available for operation on non-ozone depleting R410a refrigerant. Refrigeration circuit does not operate in heating mode. Reversing type Heat Pumps must supply a life time Parts & Labour Warranty on the Reversing Valve.

3.1.2 The refrigeration circuit shall have the following components:
• Thermal Expansion Valve with external equalizer
• Filter dryer
• High pressure cut-out
• High pressure service port
• Low pressure cut-out
• Low pressure service port
• Refrigerant Sight glass on unit sizes 070 and above
(OPTIONAL) Sight Glass on units up to size 060

3.1.3 The service ports shall be located to facilitate field service with unit in place.

3.1.4 All refrigerant piping shall be of type ACR copper pipe.

3.1.5 The refrigerant circuit and components shall be factory assembled in a sealed, leak and performance tested, properly charged system.

3.1.6 The sealed refrigerant circuit shall be certified for 600 PSIG working condensing pressure.

3.2 Compressor

3.2.1 The compressor shall be high efficiency sealed hermetic rotary type for sizes 008 – 018 and hermetic scroll type for sizes 020 and above. Sizes 120 and above are dual scroll compressors.

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(OPTIONAL) sizes 024 – 060 can be ordered with two-stage hermetic scroll compressors.

(OPTIONAL) sizes 070 – 100 can be ordered with tandem scroll set or dual refrigeration circuits.

(OPTIONAL) sizes 120 and up can be ordered with tandem scroll set.

3.2.2 The compressor shall be externally isolated on rubber mounts and connected to refrigerant circuit with floating piping to minimize sound transmission.

3.2.3 The compressor motor shall have integral thermal overload protection.

3.2.4 The compressor shall not operate in the heating mode.

3.2.5 The Compressor shall be provided with a 5 minute restart delay to avoid compressor short cycling and low pressure lockout.

3.3 Direct Expansion Evaporator Coil

3.3.1 The refrigerant to air heat exchanger shall be aluminum fin and copper tube construction rated to withstand 470 PSI refrigerant working pressure.

3.3.2 The coil shall have a maximum face velocity of 500 FPM.

3.3.3 A Stainless Steel insulated condensate drain pan shall be provided under the coil.

3.3.4 Condensate to drain out bottom of drain pan.

3.3.5 External condensate trap is required. Refer to the IOM for details.

3.4 Water Cooled Condenser Module

3.4.1 The condenser shall be high efficiency refrigerant-to-water heat exchanger of copper inner water tube, minimum ½ " diameter and steel refrigerant outer shell design rated to withstand 600 PSI refrigerant working pressure and 300 PSI water pressure.

3.4.2 The connections shall be female pipe thread mounted flush to the cabinet exterior.
(OPTIONAL) Stainless steel braided flexible Supply/ Return 24" hoses are available upon request.

3.5 Valve Configuration – Factory installed

All Units shall be supplied with a 3 way Valve for continuous flow.

(OPTIONAL) For variable volume pumping systems, all units shall be supplied with a flow limiting device and two 2 way control valves (1 for Heating and 1 for Cooling)

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Part 4: Control Systems

4.1 System

4.1.1 The unit shall be complete with a standard microprocessor controlled electronic circuit board.

4.1.2 The Control panel shall be supplied with individual 24 VAC control transformer.

4.1.3 The control board shall have LED indicators displaying thermostat call, unit operation and Alarms.

4.1.4 The control board shall operate with:
- A 24 volt thermostat
- Onboard fuse protection

4.1.5 A remote alarm contact is available for connection to alarm monitor by others – monitored and wired by others.

4.1.6 BMS override function is available to disable compressor only or disable unit. BMS override and wiring by others.

**(OPTIONAL)* 3rd party controllers supplied by others can be installed and wired in a box outside the unit. This may change the unit's overall dimensions.

**(OPTIONAL)* Condensate High Level Monitor and alarm is available.

**(OPTIONAL)* Different types of Bulldog thermostats are available upon request.

4.2 Alarms

The standard Control Panel shall have the following standard alarms:
- Low Coil Temperature
- High Leaving Water Temperature
- Low Discharge Air Temperature
- Low Refrigerant Pressure
- High Refrigerant Pressure
- High Condensate Level (Sensor OPTIONAL)

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Bulldog Line Card

BULLDOG HEAT PUMP
www.bulldogheatpump.com

InnKeeper Vertical Stack

IKV 008-018	¾ - 1½ tons	18"W x 14"D x 84"H

Risers not included in "W"
E-Series (IEV) high efficient model also available *

HomeKeeper Vertical Stack

HKV 016-030	1¼ - 2½ tons	20½"W x 20"D x 84"H
HKV 036-048	3 - 4 tons	24⅝"W x 24"D x 84"H

Risers not included in "W"
E-Series (HEV) high efficient model also available *

Vertical Stack with Energy Recovery Ventilator (ERV)

Small SpaceKeeper Vertical

SKV008-018	¾ - 1½ tons
SKV020-036	1¾ - 3 tons
SKV042-060	3½ - 5 tons

E-Series (SEV) high efficient model also available *

Large SpaceKeeper Vertical

SKV070-100	5½ - 8½ tons
SKV120-150	10 - 12½ tons
SKV180-240	15 - 20 tons
SKV280-320	23 - 26½ tons
SKV360-480	30 - 40 tons

SideWinder

SDW008-015	¾ - 1¼ tons

Slide out chassis for quick change out and repairs *

SpaceKeeper Console

SKC008-018	¾ - 1½ tons

SpaceKeeper Horizontal

SKH008-018	¾ - 1½ tons
SKH020-036	1¾ - 3 tons
SKH042-060	3½ - 5 tons
SKH070-100	5½ - 8½ tons

E-Series (SEH) high efficient model also available *

SlimKeeper

SLK008-015	¾ - 1¼ tons

11" High, no trap required *

Varipak Make-Up Air Units

4,000 CFM	10 - 20 tons
4,000-10,000 CFM	10 - 28 tons
12,000-25,000 CFM	20 - 125 tons
+ 25,000 CFM	Contact Factory

Varipak with Heat Wheel Option available *

KlassKeeper

KKV024-048	2-4 tons

Slide out chassis for quick change out and repairs outside of the classroom *

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