



Installation Operation and Maintenance

Make Up Air Unit



VariPak

Models: VPA0XX – VPA7XX

VPROXX – VPR7XX



www.bulldogheatpump.com



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Installation Operation Maintenance Manual is Subject to Change without Notice
Last Modified: 2017/04/27

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INFORMATION

General Safety

WARNING: Indicates a potentially hazardous situation which if not avoided could result in death or serious injury.

CAUTION: Indicates a potentially hazardous situation which if not avoided could result in minor or moderate injury. It also indicates unsafe practice that could cause product or property damage.

NOTICE: Notification of installation, operation or maintenance information.

WARNING: Installation and servicing of this equipment can be hazardous due to system pressure and electrical components. **ONLY** trained and qualified personnel should install, repair, or service the equipment

WARNING: The installation of VariPak Make Up Air Units and all associated components, parts and accessories that make up the installation shall be in accordance with the regulations of authorities having jurisdiction and **MUST** conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with **ALL** applicable codes and regulations.

WARNING: Disconnect all electrical power including remote disconnect and discharge all energy storing devices before servicing. Follow proper lock out/tag out procedures to ensure that power cannot be turned “ON”. When working with live electrical components, have a qualified licensed electrician or other individual who has been trained in handling live electrical components perform these tasks. Failure to follow this warning could result in death or serious injury.



Receiving Equipment

The equipment ships from the factory FOB with the transport company. Irrespective of who arranges or pays for the freight, the person receiving the product at the jobsite is responsible for inspecting for damage and reporting on the same immediately. Reporting of the damage on the waybill when signing for acceptance of the shipment is mandatory. If possible, pictures should be taken. Local product representative must then be immediately notified. Failure to note damage on the waybill at time of signing may jeopardize any claim.

Lifting/Rigging

Units must be lifted from the bottom. Fork lift slots are provided for horizontal transportation. Lift from the compressor side.

Hoisting must be done from the lifting slots located on the lower corner frame. Spreader bars must be utilized on the lifting straps to prevent unit damage.

The unit must at all times be stored in an upright position, as indicated in the attached drawings in Appendix A.

Failure to maintain the unit in an upright position may result in permanent damage to the unit. Dropping the unit or exposing it to extreme shock or vibration may also result in permanent damage to the interior components and piping. Do not stack units.

The unit should be stored in a non-corrosive environment sheltered from conditions of extreme temperature or humidity. Subjecting the unit to conditions of this nature may result in significantly reduced performance, reliability, and operational life.

The VPA models are intended for indoor use while the VPR models are equipped with an outdoor air intake hood and intended for outdoor use. The unit is designed to protect internal components from damage due to the elements.

CAUTION: Sheet metal parts may have sharp edges. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing units.

Weight/Dimension/Clearance

SEE APPENDIX A - Details



INSTALLATION

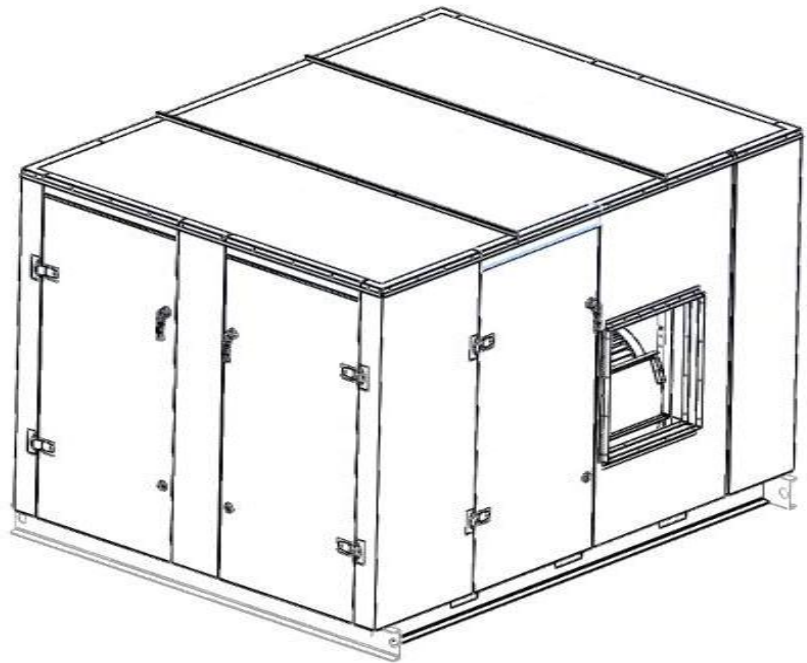
The installation of all Make Up Air Units and components and accessories must be in accordance with local codes and all regulations of all governing authorities having jurisdiction. The manufacturer recommends the following installation procedures. It is the responsibility of the installing contractor to comply with all applicable codes and regulations.

General Installation Checklist

1. Remove packaging and inspect the unit. Check for shipping damage or material shortage; file a freight claim and notify appropriate sales representative immediately if damage is found.

NOTE: Piping directly to rooftop units is recommended

2. Verify the correct model, voltage as indicated by the model number.
3. Verify that the power supply complies with the nameplate specification.
4. Connect properly sized and protected power supply wiring to the disconnect (supplied by CGC).
5. Install proper grounding wires to an earth ground.
6. Ensure precautions for coil freeze protection are in effect.



Location

Determine floor mount location with clearances, as shown in Appendix A.

1. If the unit is located in areas subject to freezing, ensure proper precautions are taken for freeze protection.

Placement

1. Position the Make Up Air Unit ensuring the unit is properly leveled.
2. Ensure that proper clearances are present in order to allow for the removal of all filters (see Appendix A for clearances).
3. Provide access for fan and fan motor maintenance and for servicing the compressor and coils.
4. Provide access to water valves, fittings, and discharge collar as well as for all electrical connections.

PIPING

CAUTION: Piping must comply with all applicable codes.

1. Make pipe connections, female threaded, at unit labeled supply & return.
NOTE: The normal loop operating temperature is between 85°F (29°C) and 125°F (51°C).
2. Connect condensate drain(s) and trap as per next page.

WARNING: Piping must comply with all applicable codes

WIRING

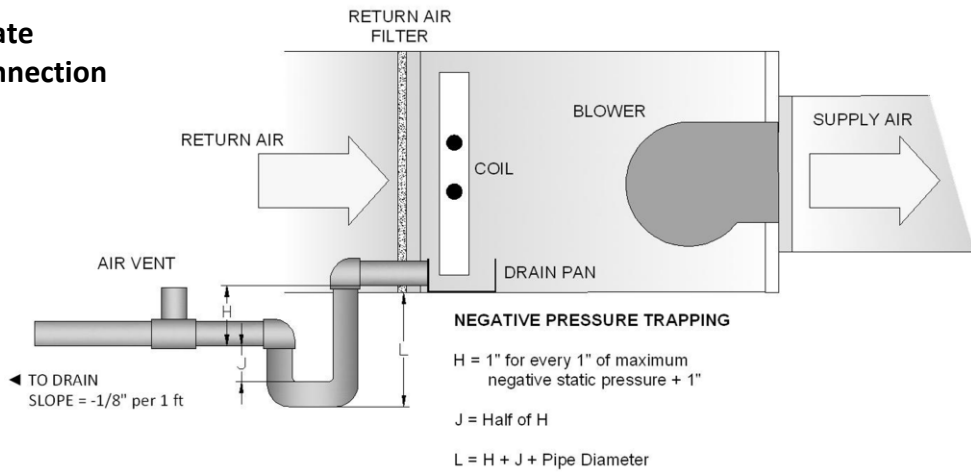
1. Wire indoor space temperature sensor (factory supplied, field installed and wired by others) to digital controller located inside the unit control panel. Connect sensor wires as indicated by the wiring diagram.
2. Install Fire alarm shutdown relay into control panel as indicated on wiring diagram. If not installed, a jumper is required.
3. Connect power at power distribution block located within control panel.

WARNING: To avoid possible injury or death due to electrical shock or contact with moving part, open the power supply disconnect switch and secure it in the “OFF” position for the complete duration of the installation. Follow proper lock out/ tag out procedures to ensure the power cannot be inadvertently energized.

CAUTION: Use only copper conductors for field installed electrical wiring. Unit terminals are not designed to accept other types of conductors.



**Condensate
Drain Connection**



Standard Condensate Connection Dimensions				
Model	CFM	H	J	L
VPX0	4000	1.75	0.875	4.125
VPX1	5000	2.25	1.125	5.375
VPX2	7500	2.25	1.125	5.375
VPX3	10000	2.25	1.125	5.375
VPX4	12000	2.00	1.000	5.500
VPX5	16000	2.25	1.125	5.875
VPX6	20000	2.25	1.125	6.375
VPX7	25000	2.50	1.250	6.750



OPERATION – DETAILED

General:

The Bulldog Make Up Air Unit performs DX cooling with a water cooled refrigeration circuit.

The Bulldog Make Up Air Unit performs hydronic heating with a hot water/glycol coil.

Damper and Fan Control:

Upon initial startup or on any restart, the damper will open after a delay of approximately one minute; the fan is activated following an additional delay of one minute. All remaining outputs will be enabled after this time period.

On units that have **OPTIONAL** VFD-equipped fans, an external signal will be required to vary the fan speed in accordance with the specific design objectives. In the absence of an external signal, the VFD-equipped fan will be given a simple enable signal, allowing the end user to set a fixed speed using the VFD's onboard display.

PID Controller:

The PID controllers provide the primary control mechanism for the sequencing of the heating and cooling units. Through the use of sensors, the controllers gather temperature information which is then compared to the temperature set-point. Based upon the results of this comparison, the controllers produce an output that is expressed as a percentage value which is used to trigger different stages of heating or cooling.

Heating:

Heating mode is enabled when the outside air temperature (OAT) is less than 64°F, and disabled when the OAT is greater than 68°F. In heating mode, a PID controller reads the space temperature and compares it with the space heating set point. The results of this comparison will control the position of the heating valve.

In applications where there is no space sensor installed, the unit will run to maintain a fixed DAT that is adjustable through the onboard display.

Cooling:

Cooling mode is enabled when the OAT is greater than 70°F, and is disabled when the OAT drops below 66°F. In cooling mode, a PID controller reads the space temperature and compares it with the space cooling set point. The results of this comparison will control the staging of the compressors.

In applications where there is no space sensor installed, the unit will activate the various compressor stages based upon OAT thresholds. For example, compressor stage 1 will be activated



if OAT > 72°F, compressor stage 2 will be activated if OAT > 77 °F.

NOTE: Without a space sensor to control heating/cooling, the space can become over-heated or over-cooled due to heat loads or losses in the space. A space sensor is strongly recommended to avoid this potential problem.

Pressure Alarms:

If the controller detects an open high pressure switch an alarm is triggered and all compressors are deactivated. If the controller detects an open low pressure switch that persists beyond 30 seconds an alarm is triggered and all compressors are deactivated. The compressors will remain inactive for a minimum of 5-minutes even if the high or low pressure switches close.

If there are three high pressure alarms, or three low pressure alarms within a period of 24 hours the compressors will be permanently locked out until power is cycled to the unit. In the event of a permanent lockout, a qualified service technician should be informed of the fault condition.



COMMISSION & START UP

System Flushing:

Proper system cleaning and flushing is an important aspect of the commissioning and start up procedure for Make Up Air Units. Ensure the system has been flushed properly. This prevents fouling of the unit heat exchangers.

NOTE: Do not use water when flushing the system. Make Up Air Units are subjected to outside conditions which may damage the internal components if proper freeze-protection measures have not been taken. Hydronic coils are not 100% drainable.

System Fluid:

Ensure that system water temperature is within an acceptable range to facilitate start-up (80°F - 120°F) for cooling and (100°F – 140°F) for heating.

System Water pH:

System water should have a neutral pH balance of approximately 7.5 which will extend the life of the hoses, heat exchangers, and other water side accessories.

Water Flow Rate:

Open all isolation valves to the unit. Ensure that the entering and leaving fluid temperatures of the Make Up Air Unit in operation are acceptable. There is typically an 8 to 12 degree drop or rise in temperature, depending on whether the unit is in cooling or heating. Under extreme conditions, slight variances in the temperature may be noted.

Freeze Protection from Water System:

Ensure that freeze protection is provided for the Make Up Air Unit loop system. Inadequate freeze protection can lead to coil damage.

NOTE: A potential situation may occur during construction where the system fluid loop is drained after being cleaned, flushed and tested. Make Up Air Units will not completely drain and may hold fluid in the condenser or heating coil. Extensive damage may result to internal components if the



system fluid freezes unless adequate glycol is added.

Remove Air from System Fluid Loop:

Air in the system impairs unit operation and can cause erosion in the system piping.

Clean Unit Filters:

Confirm that the unit filters that are being used are clean. This contributes to the proper operation of the unit by ensuring that there is adequate air flow across the coil. A vacuum may be used to remove any debris or dirt lodged in or on the units.

SAFETY NOTE:

In the following part of the procedure it will be necessary to access the areas around the electrical wiring and the circuit board. Do not adjust or remove any board connections or wiring connections to other components without first powering down the unit. Disconnects are usually within reach of the unit. **Exercise caution at all times.**

Verify Fan Rotation & Compressor Operation (3-Phase):

With the power OFF, remove the front panel and the electrical panel cover. Remove any interlock blocks and turn power ON to the unit with the electrical disconnect.

Ensure that the correct standby protocol is in place - the following board lights will come on in standby: *Power, HP, LP, and Alarm.*

Inspect the fan section to ensure that it is clear of any debris and that the fan rotates freely. Bulldog Make Up Air Units come equipped with a 3-phase fan and compressor that are matched to each other as well as the other internal components. Although internal connections to the fan and compressor are made at the factory, variances in power supply in the field will require that both components be tested for correct operation. The procedure is outlined below:

- Using a screwdriver with an insulated handle, push and hold in the manual plastic button of the fan contactor for a few seconds, making sure not to touch any of the metal parts. This will cause the fan to rotate.
- The correct rotation will have the fan vanes rotating *towards* the housing exit.
- If the rotation is incorrect, power OFF the unit and switch two of the three wires at the main unit power entrance. Power ON the unit and again using the screwdriver, press the contactor for a few seconds to activate the fan. The rotation should now be reversed.



At this stage, the rotation of the compressor(s) will need to be verified as follows:

- Using a screwdriver with an insulated handle, push and hold in the manual plastic button of the compressor contactor, making sure not to touch any of the metal parts. This will cause the compressor to start and the following checks will verify correct operation:
 - The discharge from the compressor (top most line) will become hot almost immediately.
 - There will be a cloudy refrigerant surge visible in the sight glass.
 - The compressor noise will have a distinctive whirring sound and not be overly loud.
 - There will be no run-on, or idling-on of the compressor motor when you release the manual button of the contactor.
 - If a compressor is equipped with phase rotation monitors they will indicate phase rotation immediately.
- If the above signs are not present, then power OFF the unit using the disconnect and switch around two of the three wires at the contactor that feed the compressor (typically black wires at the lower edge of the contactor). Power ON the unit and perform the check again.

If the operation is correct, power OFF the unit and replace the thermostat block, the electrical panel cover, and the front panel of the unit.



MAINTENANCE

WARNING:

To prevent injury or death due to electrical shock or contact with moving parts, disconnect the power to unit before servicing.

Inspect Filters:

Establish a regular maintenance schedule. Clean filters frequently and replace as required. A vacuum can be used to clean filters as well as the surface of coil components.

To remove the filters from the unit, open the filter access panel and slide out all sets of filters.

Check Fan motors Annually:

Examine pulleys for dirt, and check the belt tensions. All Make Up Air Unit fan motors are permanently lubricated when shipped from the factory. Do not oil fan motors. The fans in these units also have grease fittings that should be checked annually for adequate levels of grease.

Amperage Check on Compressor and Fan Motor:

Current draw on this equipment should not exceed normal full load or rated load amps by more than 10 percent of the values noted on the unit nameplate.

Safety Control Reset:

All Bulldog Make Up Air Units include high and low pressure switches to prevent the machine from operating in abnormal conditions of temperature or water flow. If multiple pressure alarms occur within a 24 hour period, the compressor operation will be permanently locked out until the unit is reset or power is disconnected for 20 seconds.

NOTE: If the heat pump must be reset more than twice, check the unit for a dirty air filter, abnormal entering water temperature, inadequate water flow (delta T method), or internal malfunctions that may be causing high or low pressure conditions. If the unit continues to alarm, contact a trained service technician and ensure the problems are resolved before continuing use of the unit.



SAMPLE WIRING DIAGRAM



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APPENDIX A

Dimensional Drawings



VPK1

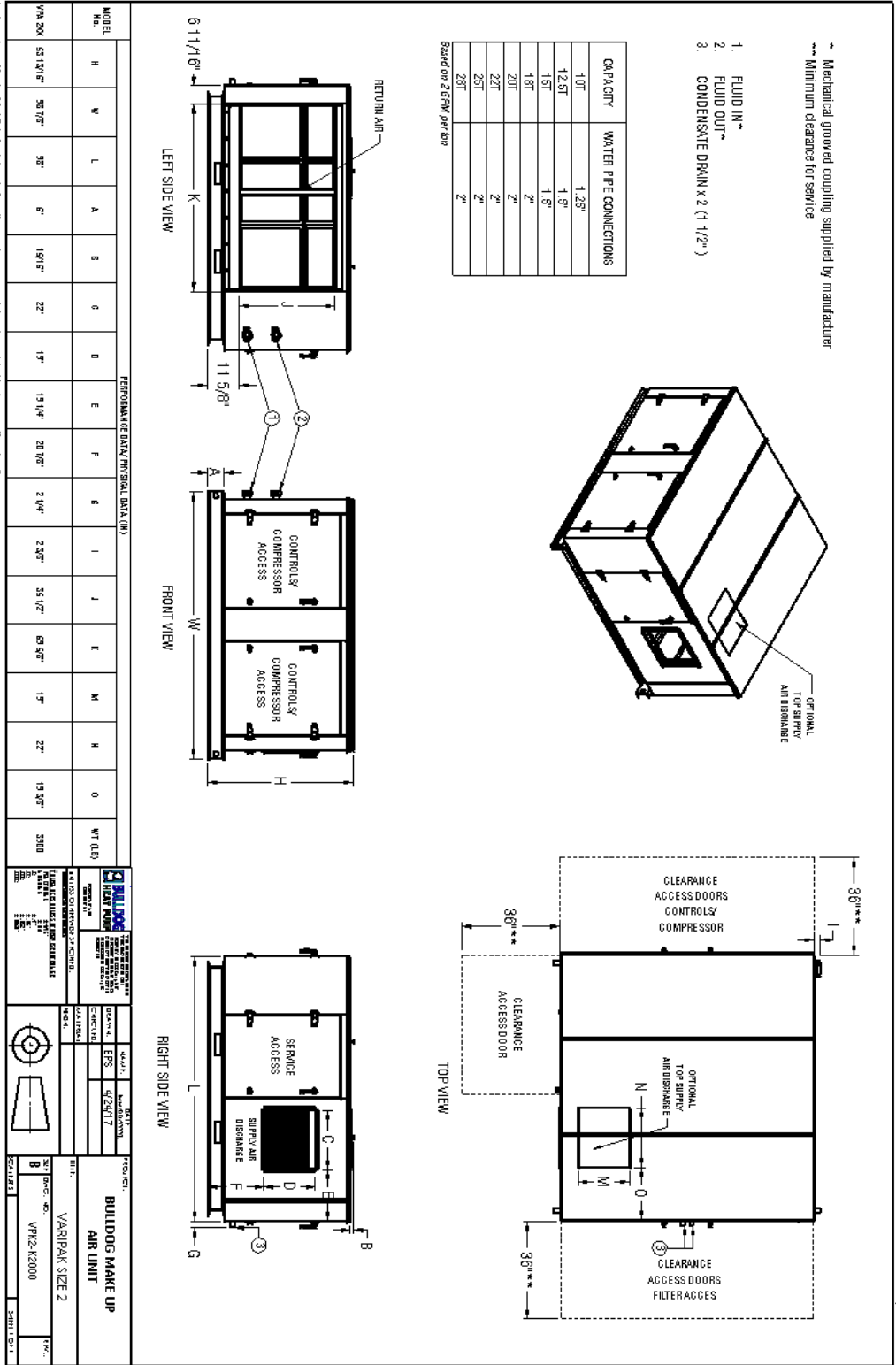
Consult Factory

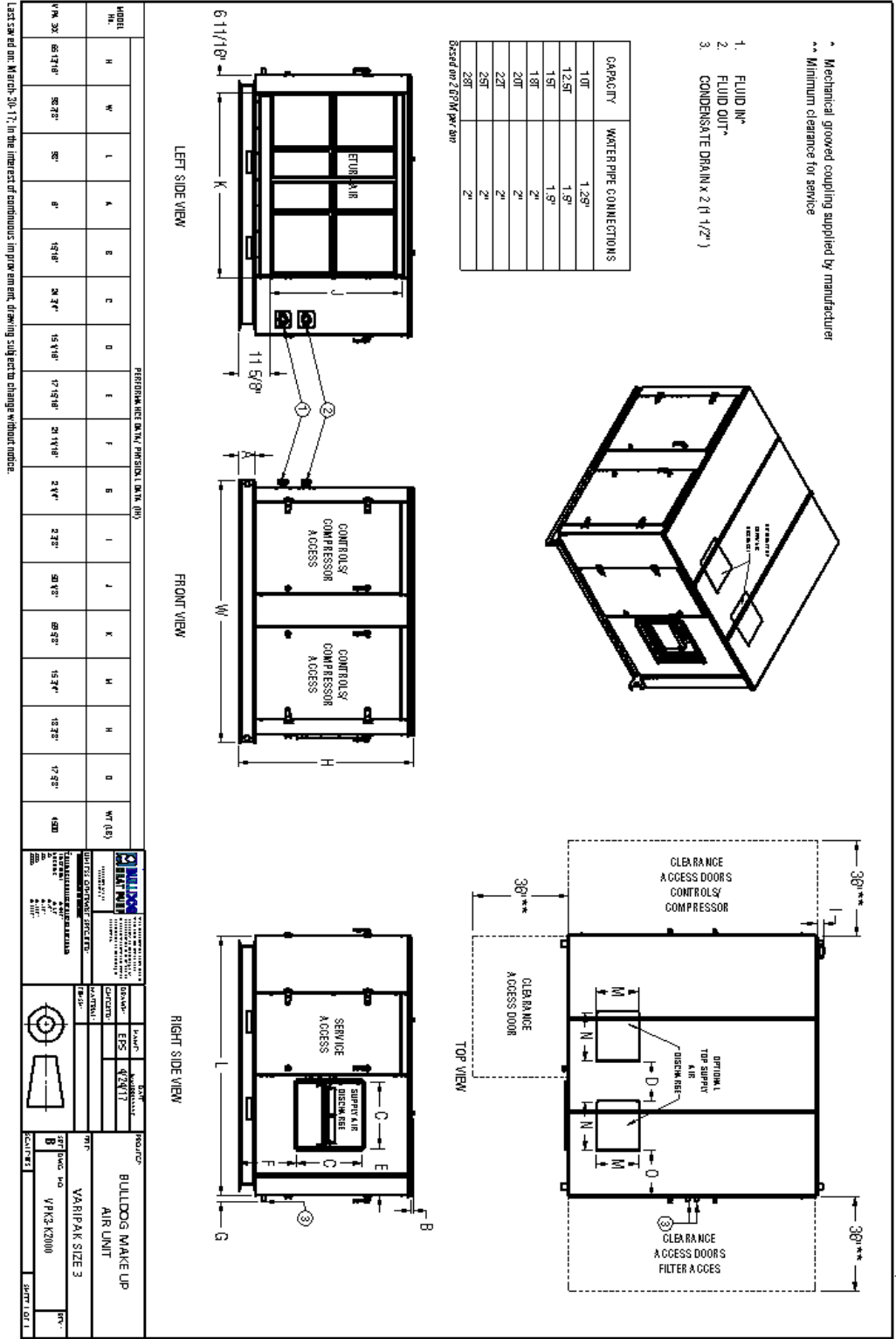


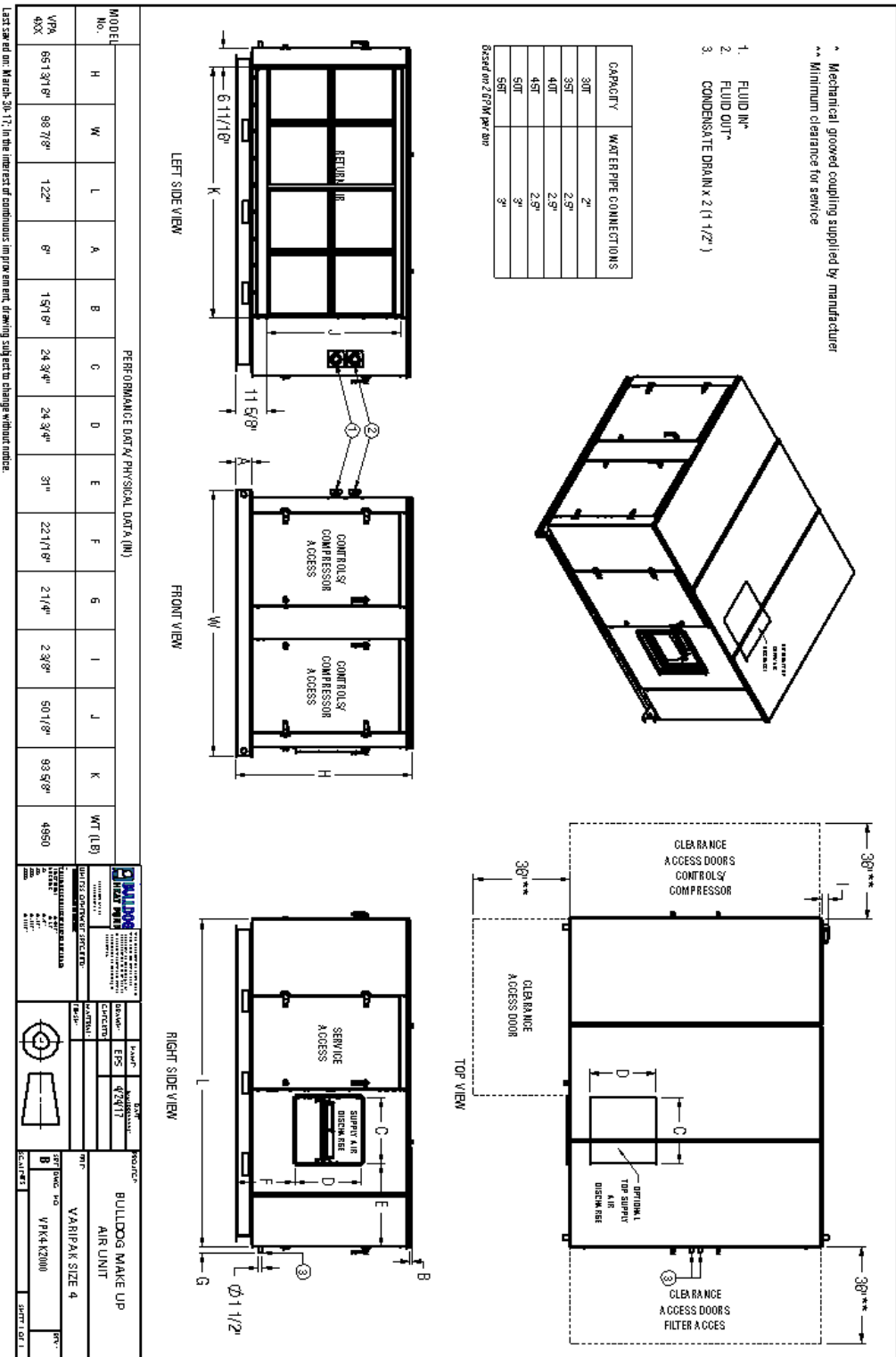
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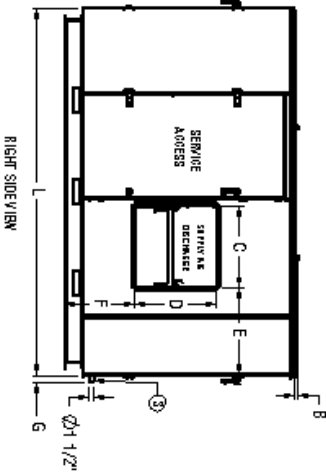
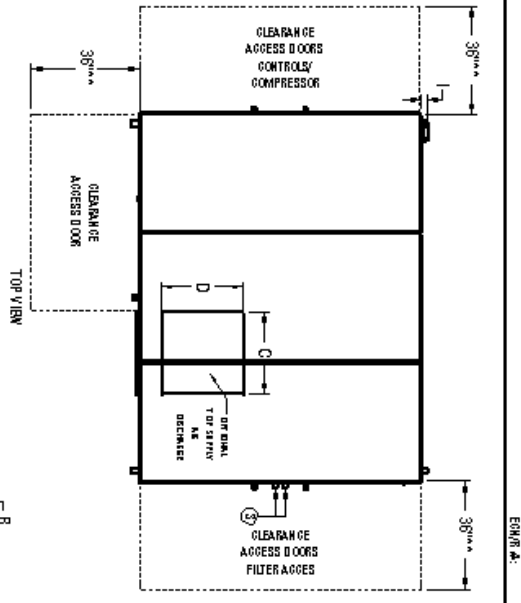
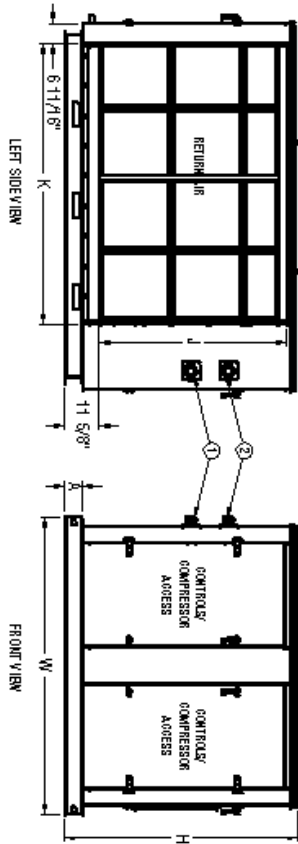
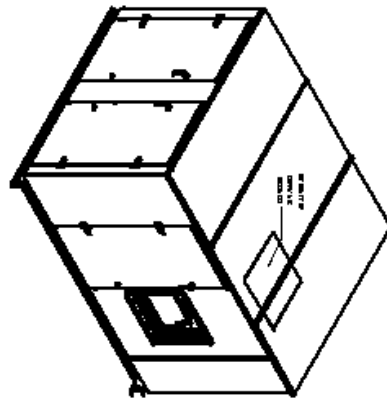






CAPACITY	WATER PIPE CONNECTIONS
30T	2"
35T	2.5"
40T	2.5"
45T	2.5"
50T	3"
55T	3"

- 1. FLUID IN*
 - 2. FLUID OUT**
 - 3. CONDENSATE DRAIN** (1 1/2")
- * Mechanical ground coupling supplied by manufacturer
 ** Minimum clearance for service



MODEL No.	PERFORMANCE DATA/ PHYSICAL DATA (IN)											WT (LB)		
	H	W	L	A	B	C	D	E	F	G	I		J	K
VAR 30K	77 13/16"	30 7/8"	122"	6"	15 1/16"	27 1/4"	27 1/4"	29"	23 5/16"	2 1/4"	2.3/8"	62 1/4"	35 5/8"	5400

Unit shown on Model 30K-17. In the interest of continuous improvement, drawing subject to change without notice.

	BULLDOG	HEAT PUMP	VARIABLE FREQUENCY DRIVE	ELECTRIC	AIR UNIT	VARIPAK SERIES							
	771316	3078	122	6	15116	2714	2714	29	23516	214	238	6214	3558



VPK6

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VPK7

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