BULLDOG HEAT PUMP

www.bulldogheatpump.com

VERTICAL STACK REVERSING UNITS | UNIVERSAL CABINET

INSTALLATION OPERATION MAINTENANCE MANUAL

MODELS:

IRV008-IRV018 AND HRV016-HRV048
60HZ – R-454B

All BULLDOG heat pumps are charged with the mildly flammable refrigerant R454B. Before attempting to install, operate, or service the equipment, read this manual carefully and take all necessary precautions.

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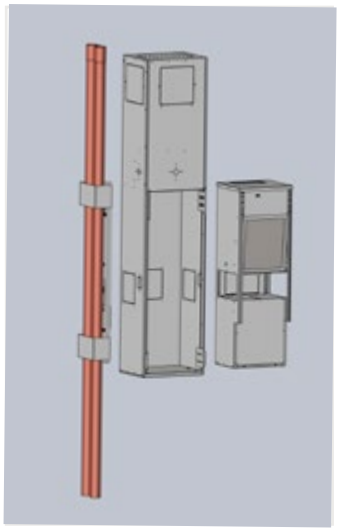

InnKeeper/HomeKeeper
Models: IRV 008-018
HRV016-048
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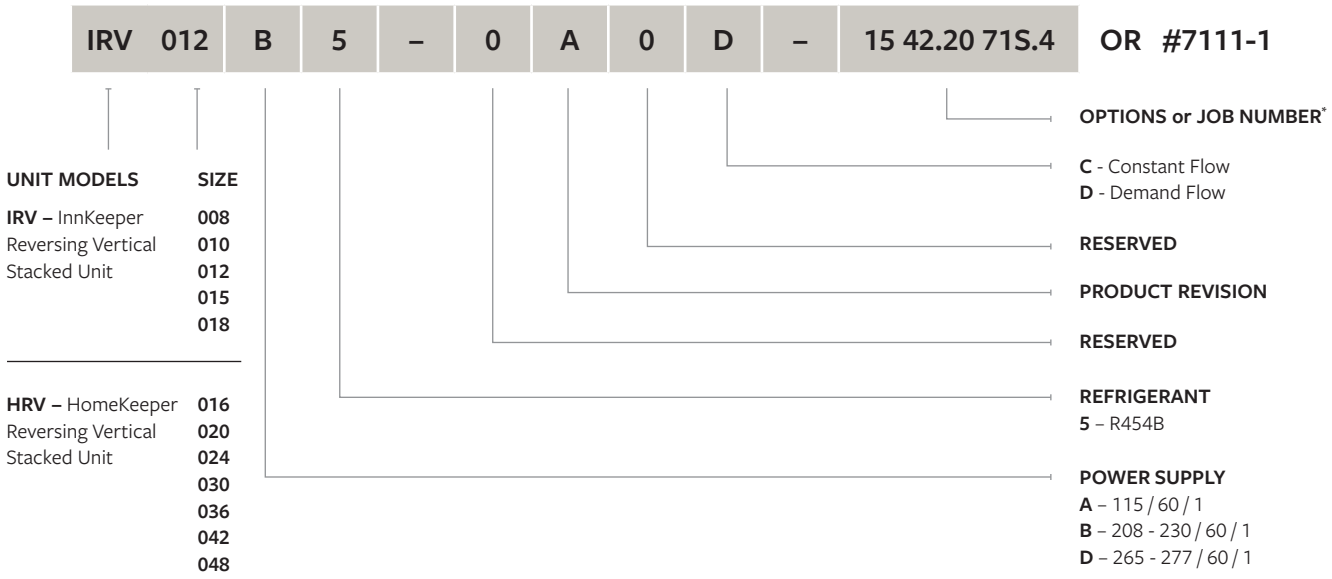
CHASSIS NOMENCLATURE



*JOB NUMBER: Used when a piece of equipment is customized

Handling and Storage Information

HANDLING

Care must be taken in handling the cabinet, chassis, risers, and other accessories to ensure that this equipment does not sustain any damage. It is recommended that the chassis, and cabinet be transported individually on a two-wheel cart.

The protective shipping packaging should remain on the chassis, and cabinet until they are ready for installation. During construction, the unit must not be run and shall be sheltered from contaminants and debris such as drywall dust, wood chips, and paint that could damage the fan or block the cooling/heating coil which may result in diminished performance.

STORAGE

The cabinet should be stored upside down to prevent damaging the foam gaskets on the underside of the cabinet. The cabinet, risers, and chassis should be stored in a non-corrosive environment sheltered from conditions of extreme temperature or humidity. Subjecting the unit, and risers to conditions of this nature may result in significantly reduced performance, reliability, and operational life.

The chassis must be stored in an upright position at all times with the compressor section towards the ground and the fan section oriented upwards.

Failure to maintain the chassis in an upright position may result in permanent damage to the unit. Dropping the chassis or exposing it to extreme shock or vibration may also result in permanent damage to the interior components and piping.

The appliance shall be stored in such a way that it is protected from mechanical damage.

The appliance shall be stored in a room without continuously operating ignition sources (for example: Open flames, an operating gas appliance or an operating electric heater).

Appliance shall be stored in well-ventilated area where room size corresponds to the room area as specified for operation. Appliances stored in unventilated areas shall comply with the space requirements as outlined in this manual.

Dropping the unit or exposing it to extreme shock or vibration may also result in permanent damage to the interior components of the unit. The unit is intended for interior use only and should be stored indoors at all times to protect it from the elements and to help eliminate the potential growth of indoor air quality (IAQ) contaminants. If indoor storage is not possible, the equipment may be stored outdoors during the summer months **only,** if the following provisions are met:

1. The equipment must be placed on a dry surface, or raised off the ground in a manner which allows for air-circulation beneath the unit.
2. A waterproof tarp must be used to cover the equipment in order to provide protection from the elements. Continuous ventilation to the units must be provided to help prevent moisture accumulation on the interior and exterior surfaces. Moisture buildup on, or within the unit's insulation may result.
3. The chassis and units must be stored in their original packaging.
4. The individual units shall not be stacked on top of one another. If the unit was previously in use, ensure that all water in the coil has been blown out and that all hose connections are plugged during storage.

UNIT CLEARANCE

The vertical stack product has a sound-dampening front cover panel. The sound-dampening panel slides off with minimal service clearance, however, in the event of chassis replacement the front service entrance must permit straight horizontal removal of the chassis. The return air path must be unobstructed during operation.

The installation of all vertical stack product and components and accessories must be in accordance with all local code and 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. It is the responsibility of the installing contractor to ensure adequate service clearance for regular maintenance or for repair in place is exercised. The installing contractor will be responsible for removing the unit if it is not serviceable in place.

NOTE

The installer/contractor is responsible to install and wire according to local code.

⚠ WARNING

Failure to ground the unit might result in electric shock and serious damage

Unit Installation

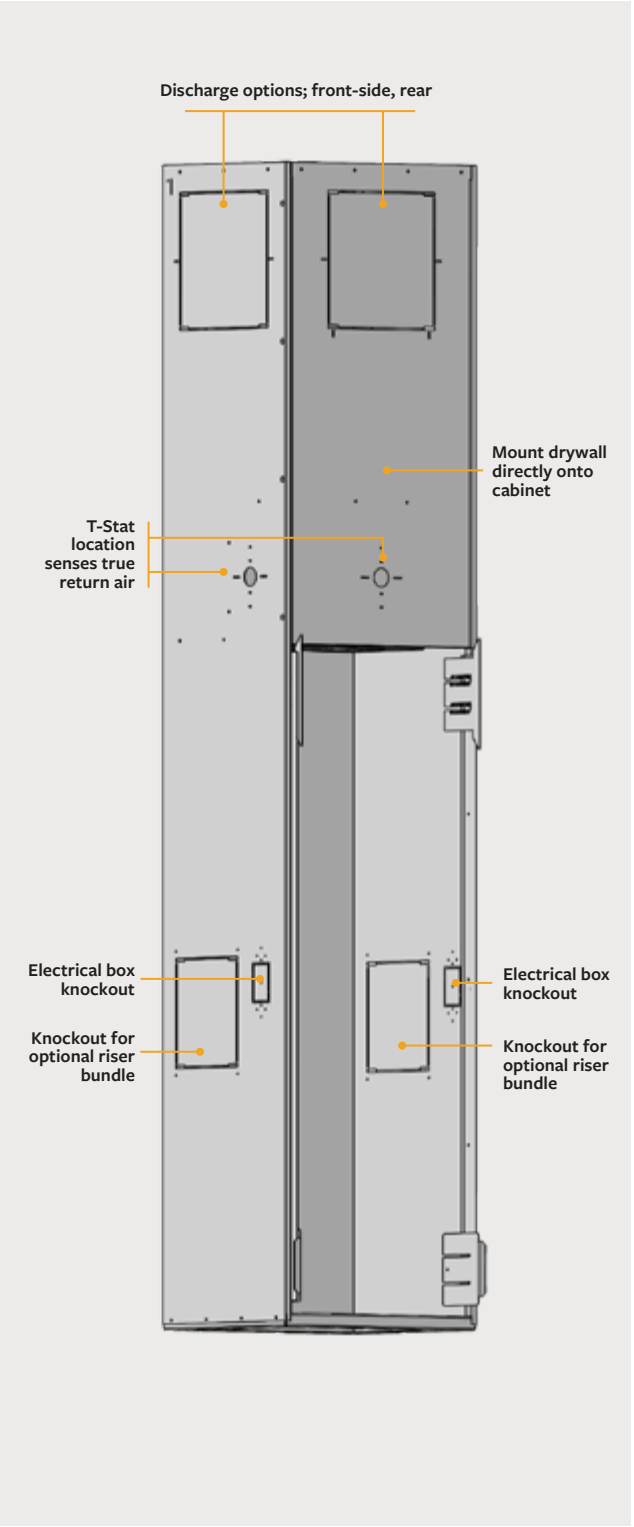
The information below details the correct installation procedure for a universal vertical stack unit. Please read this document in its entirety prior to proceeding with unit installation. Specific site conditions may warrant variations in locations and dimensions.

General Installation Checklist

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

   NOTE: The chassis, and front panel are separate from the cabinet and risers.

2. Verify the correct model and voltage as indicated by the model number.
3. Verify the installation location of the unit using the sheet metal template that is provided.
4. Verify that the power supply complies with the nameplate specification.
5. Connect properly sized and protected power supply wiring to the electrical receptacle in the cabinet.
6. Install proper grounding wires to an earth ground on the cabinet as well as the receptacle.



Location

Determine cabinet location using manufacturer supplied template (when requested).

1. Locate core holes for risers using supplied template.
2. Locate unit in an indoor area. The ambient temperature surrounding the unit must not be less than 45°F (7°C). Do not locate the unit in areas that may be subjected to freezing temperatures.

Cabinet Placement

1. Review riser schedule to identify cabinet type and location.
2. Position the cabinet.
   - Shim cabinet to level, then anchor the cabinet with concrete bolts to floor (See **Figure 2**).
   - If installing a cabinet with a base extension, bolt the extension to the concrete floor (See **Figure 3**).
3. The riser knockout to be left exposed for riser installation.

FIGURE 2 – STANDARD CABINET

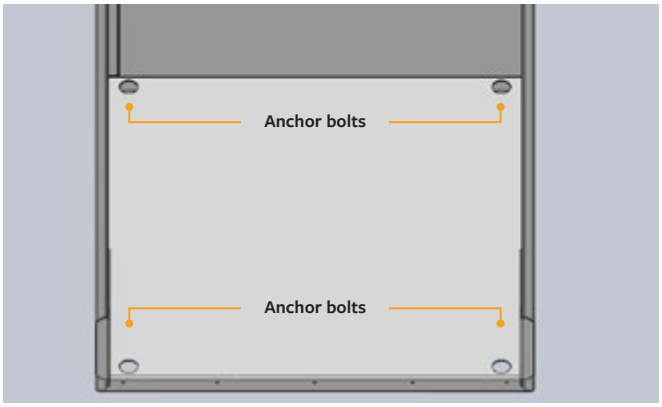
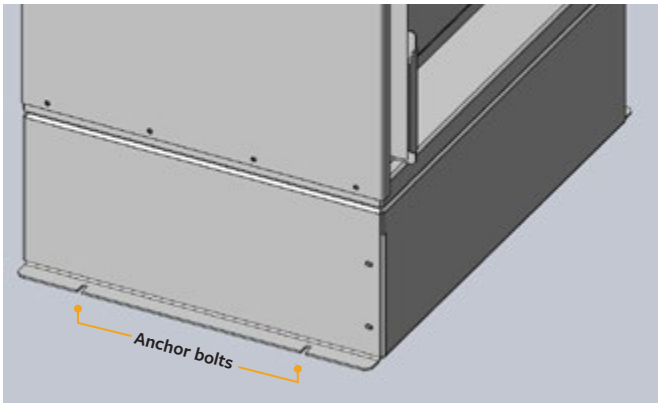


FIGURE 3 – OPTIONAL BASE EXTENSION



Riser Bundle Installation (When Ordered)

1. The supply and return risers are standard type “M” copper. Type “L” copper is optional. The condensate riser is a type “M” copper.
2. Risers are factory swaged expanded top end to accept riser from the unit above to minimize field brazing. The factory will also pre-install service isolation ball valves on the supply and return risers.
3. The risers are pre-bundled with a metal channel and cabinet with neoprene isolation to prevent metal-to-metal contact with housing.
4. Match unit location with riser bundle nomenclature, as indicated by the manufacturer supplied riser schedule, and the label affixed to the riser bundle.
5. Refer to **Figure 6 (pg. 8)** for positioning of risers pertaining to floor-to-floor installment. The riser diameter shall be shown on plans. Riser length and schedule shall be coordinated with the mechanical contractor.
6. Hang the rider bundle slip fit connection onto the riser Knockout on the cabinet, see **Figure 4.**
7. Align and insert riser into swage top end of the risers below. Do not scrape or dent the risers during positioning.
8. The risers’ bottom ends should slide approximately 2″ of the 3” swage top ends. This will allow for the floor-to-floor variations and prevent the riser joints from bottoming out.
9. Expansion allowance is not needed as the difference between the summer to winter temperature change is minimal.
10. Braze riser joints with Sil-Fos or 95/5 tin antimony solder. Perform a system leak test.
11. A fire stop may be required for the riser openings in the floors. Consult local fire codes for dictation on appropriate requirements.
12. Refer to **Figure 7 (pg. 9)** for typical riser location.

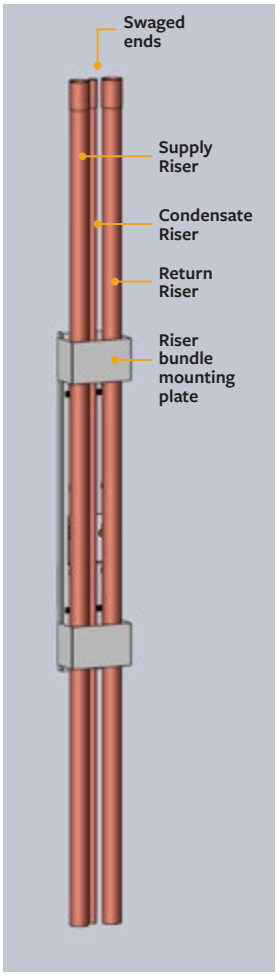


FIGURE 4

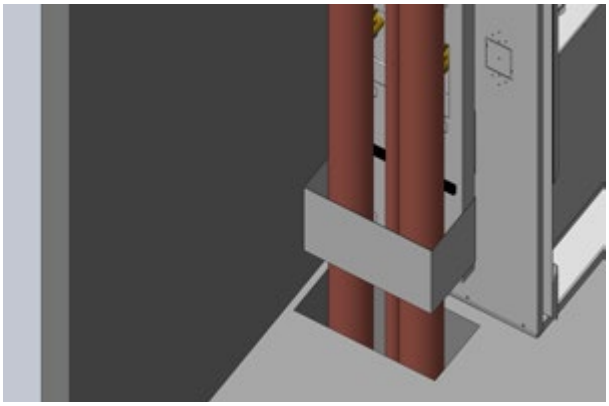
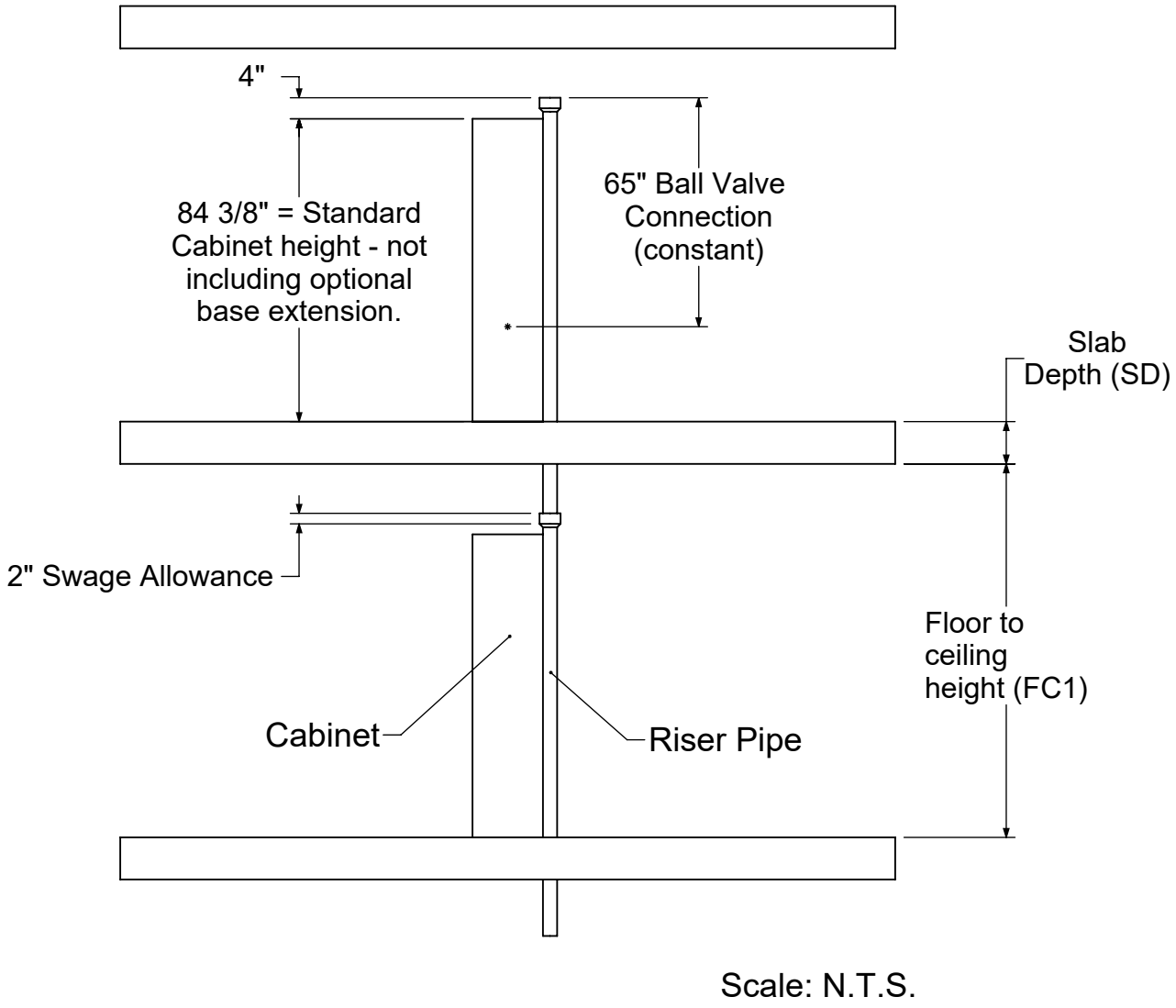


FIGURE 5

RISER DRAWING

FIGURE 6



Electrical Wiring

MAIN WIRING

Electrical connections are made to the cabinet. Cabinets have knockouts for a standard single gang electrical box. Receptacle may be included with unit if ordered. Box must not protrude into cabinet more than ½" or it will interfere with the chassis installation or removal.

Receptacles required to match factory supplied cord are as follows:

Current (A)	Models	Phase	NEMA Configuration	Voltage (V)	Part #	Configuration
15	IRV008–IRV018	1	6-15R	208–230	PWR-0401	
20	HRV016–HRV024	1	6-20R	208–230	PWR-0402	
25–30	HRV030–HRV042	1	L6-30R	208–230	PWR-0404	
40	HRV048	1	6-50R	208–230	PWR-0430	

NOTE: Ensure that the ground wire is fastened to the cabinet **and** receptacle.

CONTROL WIRING

DO NOT use Heat Pump configuration on thermostats. Set thermostat to Gas or ELC.

See **Figure 8** for Standard Control wiring of a single stage heat, single stage cool thermostat wiring.

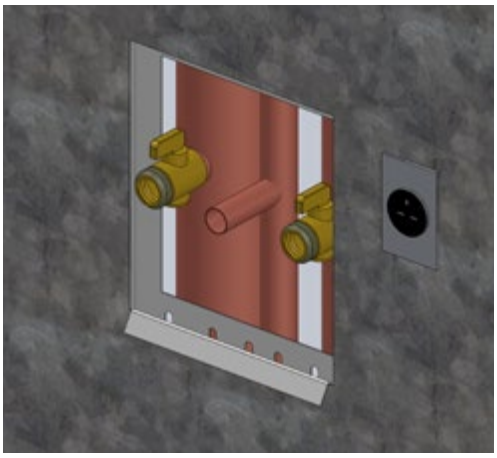


FIGURE 7

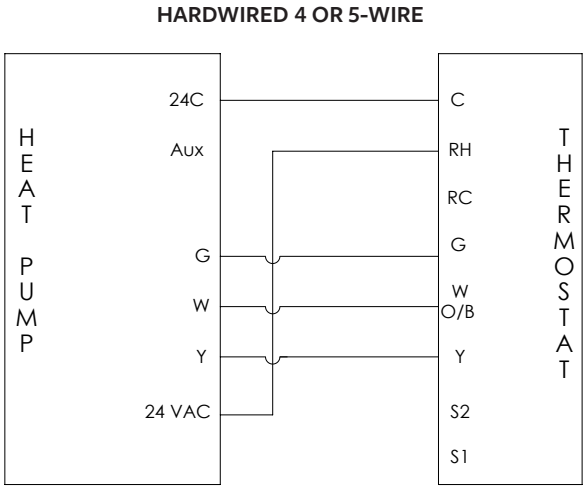


FIGURE 8

⚠ WARNING

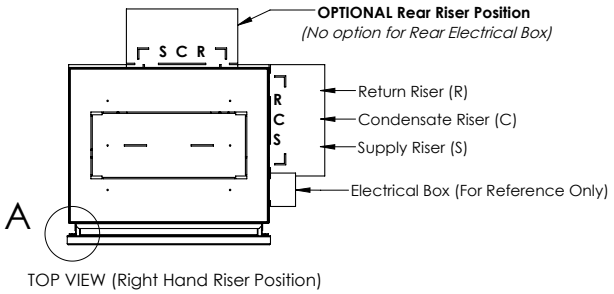
All field wiring must be done in accordance with the relevant national, fire, safety, and electrical codes.

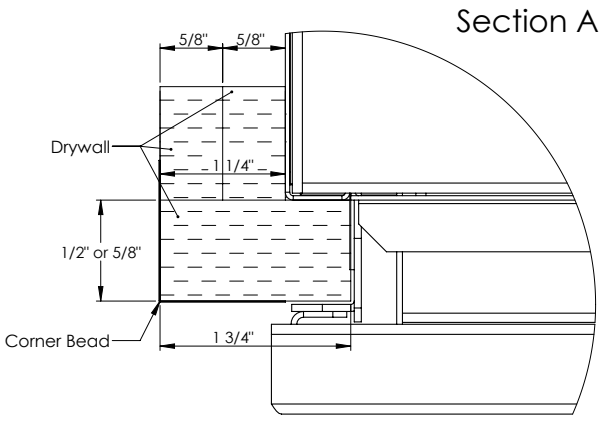
⚠ WARNING

Ductwork should be free of any source of ignition

Dry Walling and Chassis Installation

1. Attach drywall to front of unit to ensure the proper fit of acoustic panel as shown in **Figure 9**.
2. Glue or attach drywall with screws to the front of cabinet.
3. It is permissible to glue or screw drywall directly to the side of the cabinet as long as the riser bundle is not on that side. Please note that the drywall screw must not be longer than the drywall thickness plus a maximum 3/8".
4. Use studs to frame in the riser side of the cabinet where necessary. Keep screws away from the riser pipes.
5. Mount thermostat and connect to the thermostat wire. Ensure that the thermostat is not mounted in direct sunlight, or within the supply airstream of the heat pump unit.
6. Install chassis.
7. Connect Supply/Return hoses and condensate line to risers ensuring condensate hose as a trap. See **Figure 10**.
8. Perform a leak test and ensure that the hose clamp on the condensate line is tight.
9. Wire thermostat to control board. Connect power cord at cabinet electrical box.





Arrangement of Drywall Required to Make Flush with Unit.
To Be Done on Opposite Side of Riser Position.
(Can Also be Completed Through the Use of Steel Studs)

FIGURE 9

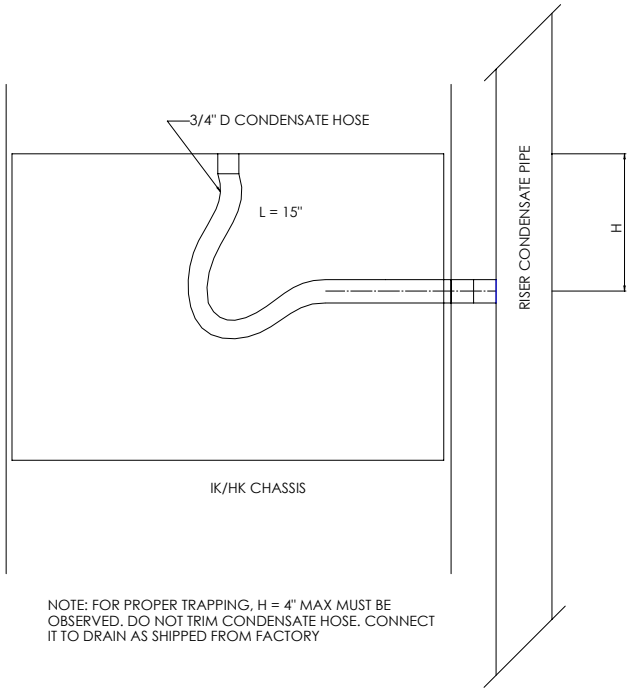
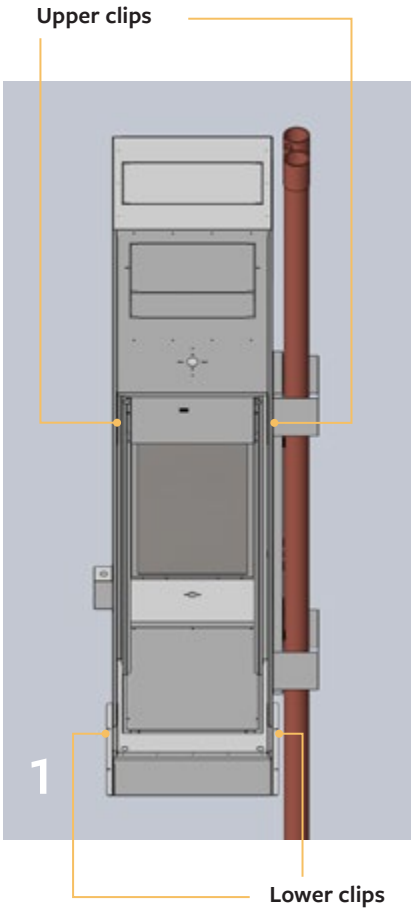
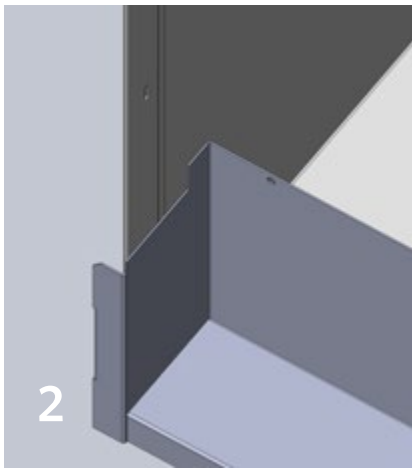


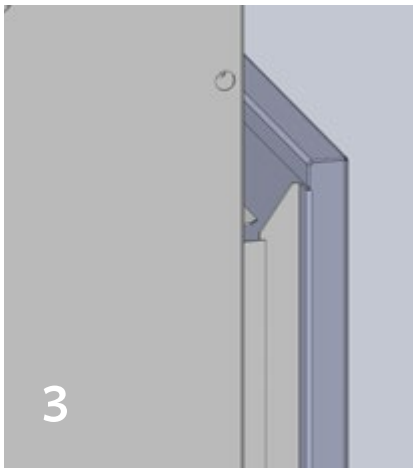
FIGURE 10

Standard Panel and Boot Installation

1. Locate the two upper and lower clips and fix them to the cabinet.
2. Locate the boot and lock it into place at the base of the unit using the lower clips to secure it.
3. Hang the front panel on upper clips. Lock front panel into top of boot.







Unit Operation

CAUTION: To avoid fouled machinery, extensive unit clean up, and void warranty, do not operate units without air filters in place, and do not operate units during the construction process.

The BULLDOG Heat Pump provides year round cooling and heating controlled by your in-suite wall mounted thermostat.

The Bulldog Heat Pump works on the principals of the refrigeration cycle. The cycle employes a 4-way reversing valve to switch operation between heating and cooling modes.

In cooling mode, the reversing valve is energized, directing hot discharge gas from the compressor to the water-to-refrigerant heat exchanger, where heat energy is rejected to the water loop. The cooled refrigerant then flows to the refrigerant-to-air heat exchanger (evaporator), where it absorbs heat from the conditioned space. After absorbing this heat, the refrigerant returns to the compressor suction side, completing the refrigeration cycle.

In heating mode, hot refrigerant from the compressor flows through the refrigerant-to-air heat exchanger, which operates as the condenser and delivers heat to the space. The refrigerant then passes through the water-to-refrigerant heat exchanger, which operates as the evaporator, absorbing heat from the building's water loop before returning to the compressor.

To ensure correct operation, centralized equipment located within the building mechanical room is automatically controlled to provide each heat pump unit with water that is at the proper temperature and flow rate.

Fan Operation

Each heat pump has a two-speed fan operations. The fan operates as follows:

LOW Speed:
First stage of heating and cooling mode (Thermostat Setting: Fan Automatic)
Fan only operation (Thermostat Setting: Fan On)

HIGH Speed:
The operation for second stage heating and cooling modes (compressor on).

Heating Operation

Heating operations start when the suite temperature falls below the heating set-point provided by the thermostat.

The fan operates at a low speed for three minutes. After three minutes, the reversing valve will activate to the heating position and the water valve will open. After two more minutes, the fan will switch to high speed and the compressor will start running for at least 150 seconds (2.5 minutes).

Heating operations stop once the space temperature setpoint is reached and the thermostat deactivates the heating call . An anti-recycle timer will prevent switching to cooling mode for 10 minutes after heating operations have ceased.

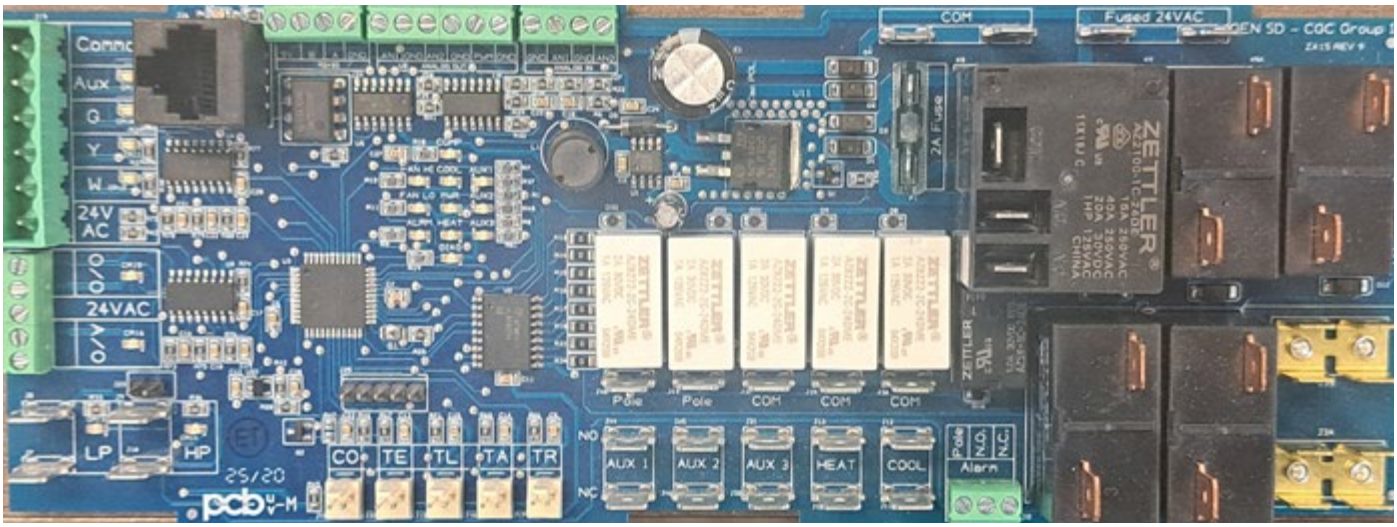
Cooling Operation

To enable cooling operation, manual changeover thermostats (MCO) must be set to "Cool" mode, and automatic changeover thermostats (ACO) should be set to "Auto" or Cool mode. The suite temperature must rise above the cool set-point temperature for the cooling operation to become activated.

The fan operates at a low speed for three minutes. After three minutes, the reversing valve will activate to the cooling position and the water valve will open. After two more minutes, the fan will switch to high speed and the compressor will start running for at least 150 seconds (2.5 minutes).

Cooling operations stop once the space temperature setpoint is reached and the thermostat deactivates the cooling call . An anti-recycle timer will prevent switching to heating mode for 10 minutes after cooling operations have ceased.

Unit Operation (cont'd)



Digital Outputs

The unit circuit board incorporates 9 relay outputs with the following uses:

- K1 – n/a
- K2 – n/a
- K3 – n/a
- K4 – Water Valve Relay
- K5 – Reversing Valve Relay
- K6 – Alarm Relay (ALARM)
- K7 – Low Fan Relay
- K8 – High Fan Relay
- K9 & K9A – Compressor Relays

Each of these relays has, in parallel, a green LED indicator that illuminates when the relay is energized.

Digital Inputs

The board incorporates digital inputs that are opto-coupled to a 24V AC source. These inputs have amber LED indicators that illuminate when an input is present. These inputs include:

- High-Pressure Switch
- Low-Pressure Switch
- Heat Call (W on thermostat terminal)
- Cool Call (Y on thermostat terminal)
- Fan Call (G on thermostat terminal)
- Auxiliary (A on thermostat terminal)
- Compressor shutdown (24V AC signal thru O/O). Providing a continuous 24V potential to O/O will terminate and prevent compressor operation.
- Unit shutdown (24V AC signal thru A/O). Providing a continuous 24V AC potential to A/O will terminate and prevent unit operation. This can be used for a simple night shutdown.

In both arrangements, a single 24V AC signal can shut down many units. ¼ va is required per unit.

Unit Operation (cont'd)

Analog Inputs

- TA – Discharge Air Temperature
- TR – Refrigerant Temperature
- TL – Leaving Water (system fluid) Temperature
- TE – n/a
- CO – Condensate Level

TA, TR, TL &TE are 10kΩ NTC thermistors.
These Inputs do not have LED indicators.

Fan Operation

- A call on "G" for the fan will cause the fan to operate continuously at low fan speed.
- A call on "W" for heating will run the fan at low speed for 10 minutes, then switch to high speed, coupled with compressor operation.
- A call on "Y" for cooling will run the fan at low speed for 2 minutes, then switch to high speed, coupled with compressor operation.
- Both high & low fan relays, and their associated LEDs, are energized when the fan is at high speed.

Compressor Start-Up

After a call for cooling or heating, a series of checks is performed before the compressor starts up. These checks include:

- Power ON timer – Compressor operation is delayed for approximately 5 minutes after power restoration. This prevents all units from coming on-line at the same time once power is restored. It also prevents the compressor from jolting due to intermittent power.
- Anti-Recycle timer – There is an 8-minute anti-recycle delay timer that allows the refrigeration cycle to achieve pressure equalization so that the compressor is unloaded upon start-up and the compressor will run longer cycles.
- High-Pressure Switch – The high refrigerant pressure switch must be closed before starting. HP LED will be ON.
- Low-Pressure Switch – The low refrigerant pressure switch operates primarily as a loss-of-charge protector. It must be closed for the compressor to start, and the LP LED will be ON.
- There is a minimum start up temperature for cooling, and a maximum startup temperature for heating which must be achieved before the compressor cycle can begin.

Heating

A call on "W" for heat will open the water valve through K4 and turn on the fan at low speed through K7 then switch to high speed, coupled with compressor operation.

A series of checks is performed before and after the compressor starts. These checks include:

a. Refrigerant Suction Temperature Sensor (TR)

The TR sensor will prevent compressor operation if the suction temperature is below 35°F (1.7°C) or above 110°F (43.3°C).

During compressor operation, If TR drops below 35°F, the compressor will be disabled. The actual compressor restart will be delayed for 10 minutes by the anti-recycle timer.

Ten minutes after the temperature rises above 35°F, the compressor will be enabled as soon as the temperature rises above 65°F. Restart will be delayed for 10 minutes by the anti-recycle timer. A flash code of 2 will be initiated upon a low refrigerant temperature shutdown.

b. Water Temperature Sensor (TL)

The TL will prevent compressor operation if the leaving water temperature is below 35°F (1.7°C) or above 120°F (48.9°C).

Unit Operation (cont'd)

Once the compressor is in operation for two minutes, TL will stop compressor operation if the outgoing system fluid temperature is below 35°F (1.7°C) or above 95°F (35°C). The actual compressor restart will be delayed for 10 minutes by the anti-recycle timer. A flash code of 3 will be initiated upon a high outgoing system fluid temperature shutdown.

c. Air Temperature Sensor (TA)

The TA sensor delays compressor operation until the air flowing through the unit is below 130°F (54.4°C).

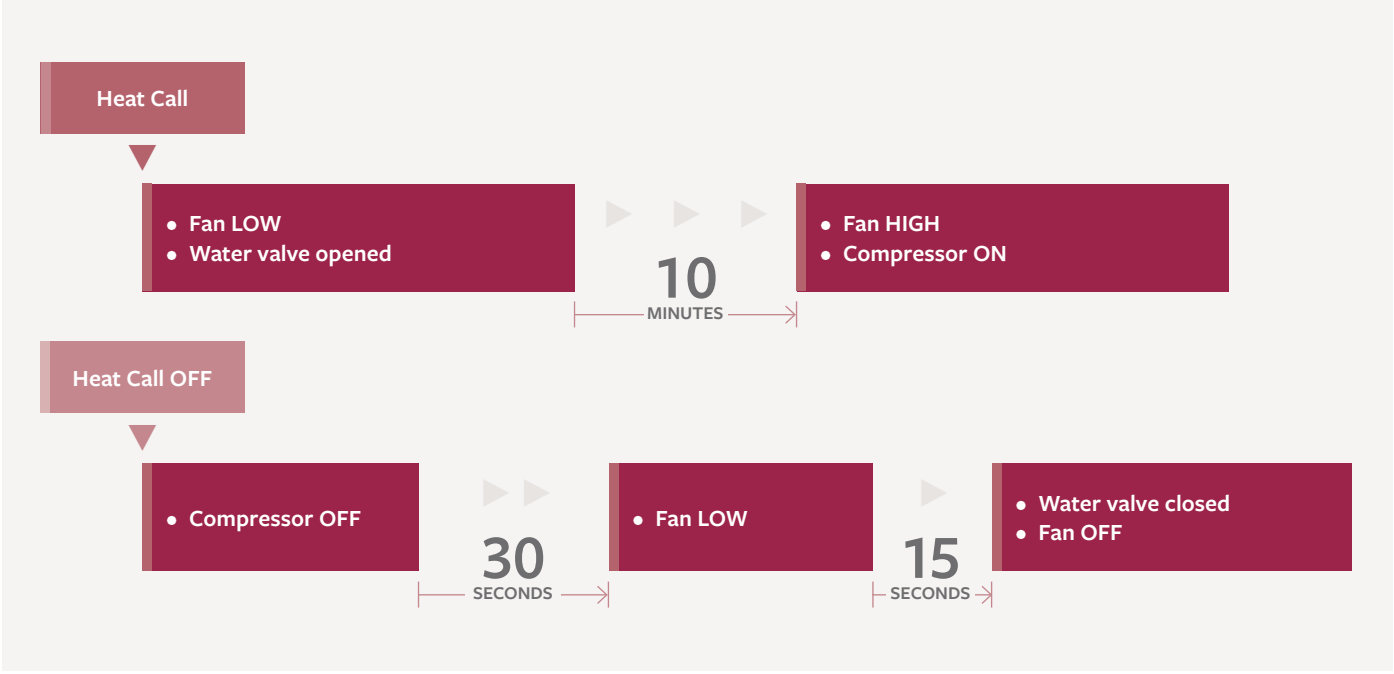
After 2 minutes of compressor operation, the TA sensor will stop the compressor if the air flowing through the unit is below 40°F (4.4°C) or above 150°F (65.5°C).

Refer to point (e) in the Detailed Heating and Cooling Operation section.

After 10 minutes the compressor will be enabled when the temperature drops below 100°F. The compressor restart will be delayed for 10 minutes by the anti-recycle timer. A flash code of 4 will be initiated upon a low-discharge air temperature shutdown.

Note: When the Heat call "W" is terminated:

1. The compressor will turn off after the minimum runtime of 150 seconds.
2. The fan will drop to low speed after 30 seconds.
3. The fan will stop after a further 15 seconds if there is no Call for Fan (G), and the water valve will close.



Unit Operation (cont'd)

Cooling

A call on "Y" for cooling will open the water valve, energize the reversing valve and turn on the fan at low speed, then switch to high speed, coupled with compressor operation.

A series of checks is performed before and after the compressor starts. These checks include:

a. Refrigerant Suction Temperature Sensor (TR)

The TR sensor will prevent compressor operation if the coil temperature is below 35°F (1.7°C) or above 100°F (37.8°C).

Once the compressor is in operation for two minutes, TR will stop compressor operation if the outgoing refrigerant temperature is below 35°F (1.7°C) or above 80°F (26.7°C).

Ten minutes after the temperature rises above 35°F, and the compressor will be enabled as soon as the temperature rises above 65°F. Restart will be delayed for 10 minutes by the anti-recycle timer.

A flash code of 2 will be initiated upon a low refrigerant temperature shutdown.

b. Water Temperature Sensor (TL)

The TL sensor will prevent compressor operation if the outgoing water temperature is above 125°F (51.6°C).

Once the compressor is in operation for two minutes, TL will stop compressor operation if the outgoing system fluid temperature is below 50°F (10°C) or above 140°F (60°C).

If the leaving fluid temperature falls below 120°F for 10 minutes the compressor will be enabled. The actual compressor restart will be delayed for 10 minutes by the anti-recycle timer. A flash code of 3 will be initiated upon a high outgoing system fluid temperature shutdown.

c. Air Temperature Sensor (TA)

The TA sensor will prevent compressor operation if the air flowing through the unit is below 40°F (4.44°C) or above 100°F (37.8°C).

After two minutes of compressor operation, the TA sensor will stop the compressor if the air flowing through the unit is below 35°F (1.7°C) or above 90°F (32.3°C).

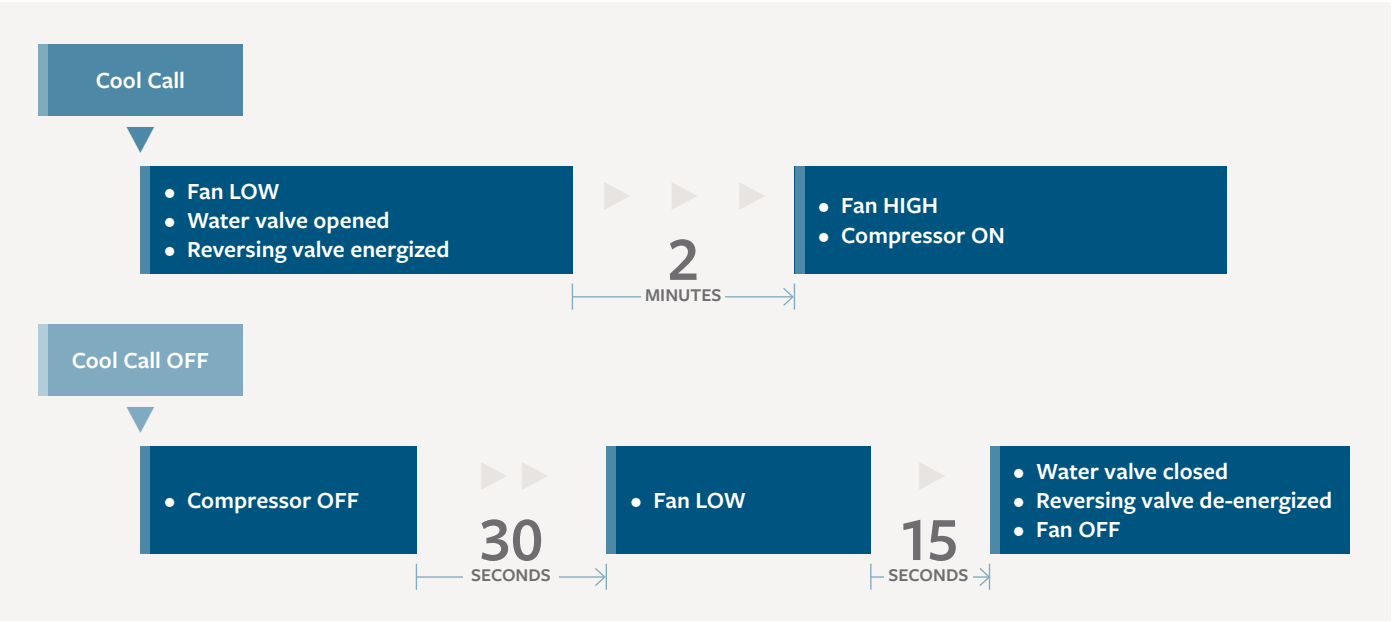
After 10 minutes, the compressor will be enabled when the temperature drops below 100°F.

The compressor restart will be delayed for 10 minutes by the anti-recycle timer. A flash code of 4 will be initiated upon a low-discharge air temperature shutdown.

Note: When the Cool call "Y" is terminated:

1. The compressor will turn off after the minimum runtime of 150 seconds.
2. The fan will drop to low speed after 30 seconds.
3. The fan will stop after a further 15 seconds if there is no Call for Fan (G).
4. The reversing valve will de-energize and the water valve will close.

Unit Operation (cont'd)



SAFETY PROTECTION TEMPERATURE LIMITS

	Heating mode		Cooling mode	
	Before the compressor starts	2 minutes after the compressor starts	Before the compressor starts	2 minutes after the compressor starts
TL	35–120°F	35–95°F	35–125°F	50–140°F
TR	35–110°F	35–100°F	35–100°F	35–80°F
TA	40–130°F	40–150°F	40–100°F	35–90°F

Compressor Safeties

During the operation of the compressor, monitoring of the refrigerant cycle continues. The following malfunctions will cause the compressor to shut down:

a. If the head pressure exceeds the set point of the high-pressure switch, it will open, and the control board will terminate the compressor operation within 10 seconds. At this time, flash code 6 will be initiated on the red diagnostic LED. Compressor operation will resume in accordance with the "Intelligent Reset" algorithm.

b. **Intelligent Reset Algorithm –** If a low or high-pressure switch opens, the compressor will be shut down. There is a 10-minute delay after the pressure switch clears, before the system is automatically reset. If there is a cool call-in place and all other temperatures are within the start parameters, the compressor will be put back into operation.

Should either of the pressure switches open again, the shutdown procedure will cycle again, followed by a restart. The intelligent reset will allow two open switch shutdowns and restarts in 24 hours, but a third shutdown within 24 hours will put the refrigeration system into a full and hard lockout, requiring a power down to reset.

If two or fewer pressure switch open shutdowns occur within 24 hours, they will be reset and will not contribute to a future hard lockout. (A hard lockout will prevent compressor operation until the controls are powered down for at least 20 seconds, while a soft lockout is a compressor shutdown that will be restored once the conditions causing the shutdown have been rectified.

Unit Operation (cont'd)

c. During the compressor operation, the suction temperature, system fluid temperature and discharge air temperature are continuously monitored.

d. The system checks the condensate level status every 5 seconds, if the condensate level goes high for more than 1 minute, the Condensate alarm will be triggered. The compressor operation is immediately terminated, and at the same time the fan will be stopped for 30 seconds and then will be restarted. After the condensate level is back to normal for more than 20 minutes, the operation will return to normal.

Note: The last flash code will be maintained in memory for 1 week or until the unit controls are powered down. The flash code will continue for a maximum of 48 hours or until the problem has cleared and the compressor has been put into operation. If a cooling call is in place, it must be disengaged before the cause of the last alarm shutdown can be identified.

Call Errors

There are several control algorithms to prevent cycling and problematic operation. These are:

1. **Double Call Error –** If thermostat connections or setup are incorrect, resulting in a simultaneous call for both heating and cooling, the unit will not operate. This condition can be observed on the thermostat connection LEDs. Flash code 10 will be initiated. It will clear automatically after 1 minute.
2. **Reverse Cycle Call –** Poorly located automatic changeover thermostats (i.e. thermostats mounted on a wall opposite a discharge grill, or a thermostat in a doorway to outside) can trigger heating and cooling mode changes many times an hour. The CGC controller has a 10-minute anti-mode change timer for both heating and cooling mode changes. The controller will not accept a change in mode until 10 minutes have elapsed since the termination of the opposite call.

Shutdown Output

The BULLDOG board has an optional input terminal strip that allows for two types of remote shutdown. These are compressor shutdown and unit shutdown.

The advantage of these inputs is that many units can be connected in parallel and when powered by an independent 24VAC signal one or both actions can be implemented. Common uses are:

- Duty cycling for demand control
- Global night setback
- Heating-only mode during emergency power periods
- Loss of flow in the fluid loop

The BULLDOG controller is also set up so these shutdown functions can be initiated individually with onboard 24V power. This capability allows unit or compressor shutdown based on a door switch, a light switch, or an occupancy switch. A separate 24V power supply is required if two or more units are being shut down.

Fault Alarm Output

The BULLDOG board includes fault alarm indication and output functionality. The fault alarm relay provides both normally open and normally closed contacts, allowing fault conditions to be transmitted to external systems.

Note: The fault alarm relay is energized during normal operation and de-energized during a fault condition. Therefore, if the unit is not powered, the board fuse is blown, or the electronics are damaged, a fault condition will be indicated.

The fault relay is paralleled with the Fault LED, which remains ON when no fault condition exists. Additional fault conditions include:

- Hard lockout due to a high- or low-pressure switch remaining open for 20 minutes or longerwhether the unit is in cooling or heating. Under extreme conditions, slight variances in the temperature may be noted.

Commission & Start Up

System Flushing

Proper system cleaning and flushing is an important aspect of the commissioning and startup procedure for the units. Ensure the system has been flushed properly. This prevents fouling of the unit's heat exchangers. It is common for debris to settle out in areas of the system where there is low flow or low fluid velocity. This causes nuisance alarms as a result of a fouling heat pump. It is necessary to flush these units out as they appear to contain debris build up. This is the responsibility of the contractor and not a heat pump defect.

NOTE: Hydronic coils are not 100% drainable.

OPERATING LIMITS

Reversing Bulldog WSHPs – Air Limits*		Cooling	Heating
		DB WB	DB
Entering Air Temperature (°F)	Min	65 56	50
	Common Design EAT	75 63	68
	Max	90 71	85

Reversing Bulldog WSHPs – Fluid Limits*		Cooling	Heating
Entering Fluid Temperature (°F)	Min**	55	55
	Common Design EFT	85–90	68–70
	Max	120	90
Nominal GPM/Ton		3	

* Maximum and minimum values may not be combined. If one value is set to a maximum or minimum limit, the other condition must remain within the standard operating range and cannot exceed standard conditions.

**Operating below the dew point requires optional insulation

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 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 outdoor portion of the loop water system. Inadequate freeze protection can lead to coil damage.

NOTE: A potential issue may arise during construction where the system fluid loop is drained after being cleaned, flushed and tested. BULLDOG vertical stack 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.

Commission & Start Up (cont'd)

Remove Air from System Fluid Loop

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

Air Balancing

Air balancing of the system should be performed while the unit's fan is operating at high-speed. In order to ensure the fan is operating at high-speed, the unit must be placed into cool mode.

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.

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.

Fan Rotation

Inspect the fan section to ensure that it is free and clear of any debris and that the fan rotates freely.

NOTE: This equipment is designed for indoor installation ONLY.

Start-up

To register the unit warranty proper start-up is required by a factory approved technician. The following items must be recorded and returned to the factory to register the warranty. The factory reserves the right to refuse warranty if these details are not provided.

START UP RECORD

Page _____

Project: _____ Date: _____ Tech: _____

Location _____	HEAT	EWT _____	COOL	EWT _____	Fan Amps _____
Model No. _____		EAT _____		LWT _____	Compr Amps _____
Serial No. _____		LAT _____		EAT _____	Cond. Trap _____
Voltage _____		Valve ☐		LAT _____	S/R Correct ☐
				Sight Glass ☐	Fan Rotation ☐
				Belt Tension ☐	Comp Rotation ☐
Remarks					

S/R = Supply and Return

Location _____	HEAT	EWT _____	COOL	EWT _____	Fan Amps _____
Model No. _____		EAT _____		LWT _____	Compr Amps _____
Serial No. _____		LAT _____		EAT _____	Cond. Trap _____
Voltage _____		Valve ☐		LAT _____	S/R Correct ☐
				Sight Glass ☐	Fan Rotation ☐
				Belt Tension ☐	Comp Rotation ☐
Remarks					

S/R = Supply and Return

Location _____	HEAT	EWT _____	COOL	EWT _____	Fan Amps _____
Model No. _____		EAT _____		LWT _____	Compr Amps _____
Serial No. _____		LAT _____		EAT _____	Cond. Trap _____
Voltage _____		Valve ☐		LAT _____	S/R Correct ☐
				Sight Glass ☐	Fan Rotation ☐
				Belt Tension ☐	Comp Rotation ☐
Remarks					

S/R = Supply and Return

Operational Expectations

The BULLDOG Heat Pump is engineered to deliver reliable heating and cooling performance immediately upon installation. In some instances, however, factors such as transportation or handling damage, service valve leakage, or system-related issues may affect initial operation.

During commissioning, the unit should be allowed to operate for a minimum of 15 minutes in each mode before collecting or evaluating performance data. To preserve sealed-system integrity, refrigeration service gauges should not be installed during initial startup unless abnormal operation is observed.

If a qualified commissioning agent suspects an operational issue, the factory must be notified promptly for guidance before performing any refrigerant circuit service. Water-side analysis shall be performed first, including verification of proper flow rates, and entering and leaving water temperatures to ensure conditions are within specified limits.

If water-side conditions are confirmed and performance concerns persist, refrigerant-side troubleshooting may be required. The factory may request that a manifold refrigeration gauge be connected to the unit, along with thermocouples, to measure key operating parameters, including high and low refrigerant pressures, superheat and subcooling.

When evaluating refrigerant system performance, reference the applicable operating charts for expected temperature ranges. **For additional assistance, contact the Customer Experience team or factory technical support.**

Maintenance

⚠ CAUTION

Maintenace shall only be conducted by trained and qualified personnel

⚠ WARNING

This appliance is not intended for use by indiviuals without the proper experience and knowledge. Children must be supervised to ensure they do not tamper with the appliance.

⚠ CAUTION

The appliance if factory charged with the correct amount of R-454B that is indicated on the rating label. Do not attempt to top off refrigerant. In case a charge adjustment is required, reclaim the existing charge and recharge the unit with the same amount given on the rating label.

⚠ CAUTION

Prior to starting any maintenance work, using an appropriate refrigerant leak detector, the area should be checked for the presence of refrigerant. Ensure a proper fire extinguisher is within reach.

⚠ WARNING

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

All maintenance or service works should be carried out according to the manufacturer's recommendations and the related documents.

Do not attempt to repair sealed electrical components or intrinsically protected components, if damaged they must be replaced with new ones.

Bulldog heat pumps are equipped with brazed plate type heat exchangers. To protect the heat exchanger from debris, each unit is supplied with a 20-mesh strainer installed at the water inlet of the heat exchanger. Inspection and cleaning of the strainer is crucial to the proper operation of the unit.

In case of replacement, only approved brazed plate heat exchangers and strainers shall be used.

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 filter from the unit, remove the front service entrance and slide out the filter component.

Check Fan Motors Annually

Make sure to inspect fan motors for unusual signs of wear. All CGC BULLDOG Heat Pump fan motors are permanently lubricated when shipped from the factory. Do not oil the fan motors.

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 CGC BULLDOG Heat Pump Systems include high and low pressure switches to prevent the machine from operating under abnormal conditions of temperature or water flow. If multiple pressure alarms occur in 24 hours, 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 (ΔT 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 re-setting the unit again.

ΔT Method: The **normal water temperature differential** for a BULLDOG Heat Pump is 8–15°F (4.4–8.3°C) in heating and 10–15°F (5.5–8.3°C) in cooling.

Drain Pan and Condensate Hose

Make sure to inspect and clean if necessary, the condensate hose and drain pan on a regular basis.

Decommissioning Instructions

1. Preparation

- Ensure you have the necessary personal protective equipment (PPE) such as gloves, safety glasses, and flame-resistant clothing.
- Verify that all tools and equipment are rated for use with A2L refrigerants.

2. Safety Precautions

- Ensure the area is well-ventilated to prevent the accumulation of refrigerant gases.
- Remove any potential ignition sources from the vicinity, as A2L refrigerants are mildly flammable.
- Use appropriate signage to indicate that decommissioning work is in progress.

3. Refrigerant Recovery

- Connect the recovery machine to the refrigeration system using hoses rated for A2L refrigerants.
- Recover the refrigerant into a recovery cylinder designed for A2L refrigerants. Ensure the cylinder is not overfilled.
- Use a refrigerant leak detector to check for any leaks during the recovery process.

4. System Evacuation

- After recovering the refrigerant, purge the system with an inert gas such as nitrogen to remove any remaining refrigerant.
- Evacuate the system to a deep vacuum to ensure all refrigerant and moisture are removed.

5. Disassembly

- Carefully disassemble the refrigeration equipment, ensuring that all components are depressurized and free of refrigerant.
- Cap and seal all open piping and components to prevent contamination and moisture ingress.

6. Disposal

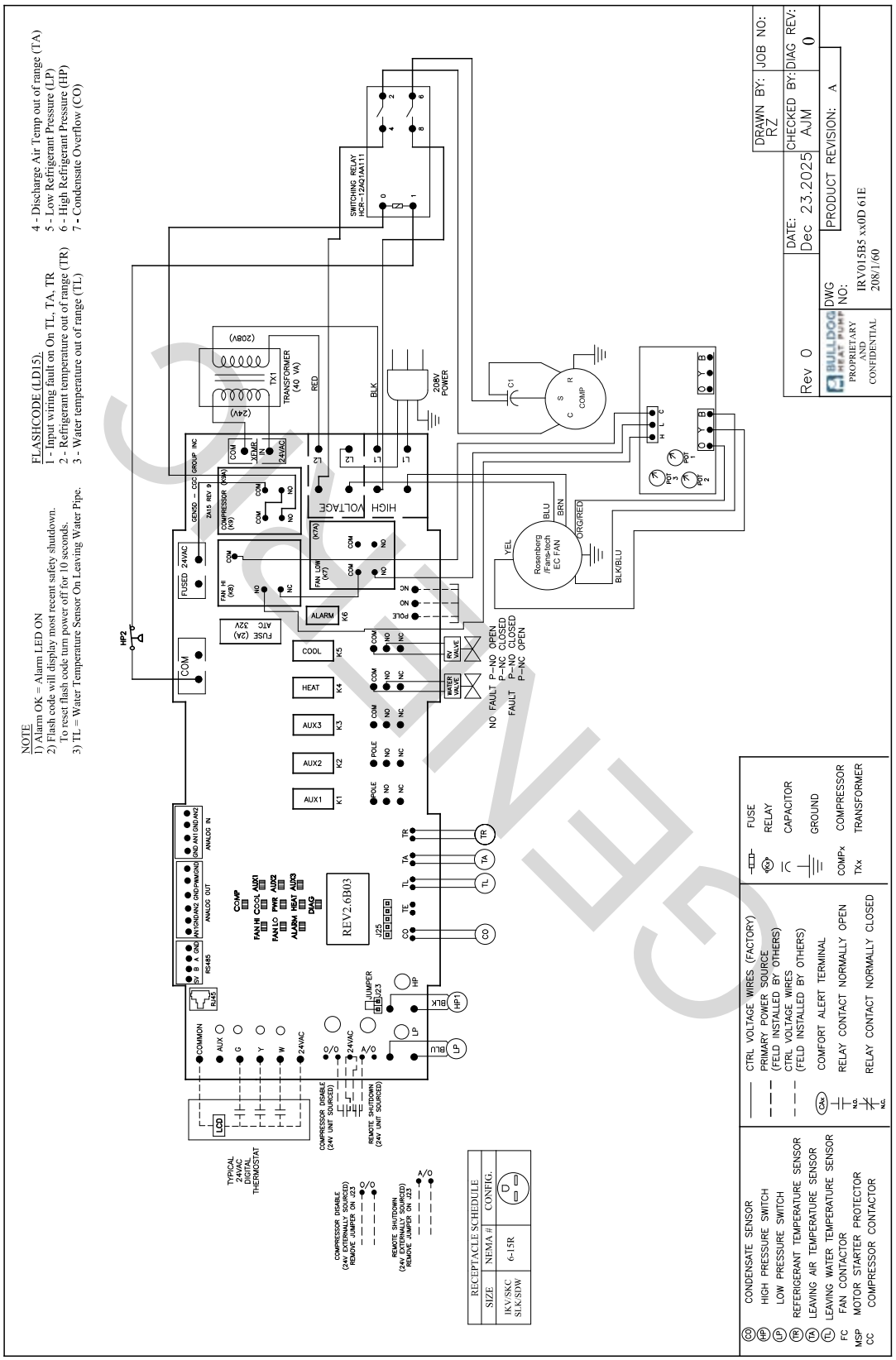
- Dispose of the recovered refrigerant in accordance with local regulations and guidelines.
- Recycle or dispose of the refrigeration equipment components as per environmental regulations.

7. Documentation

- Complete all necessary documentation, including records of the recovered refrigerant quantity and the disposal method.

Maintain records for future reference and regulatory compliance.

GENERIC WIRING DIAGRAM FOR IRV008-018



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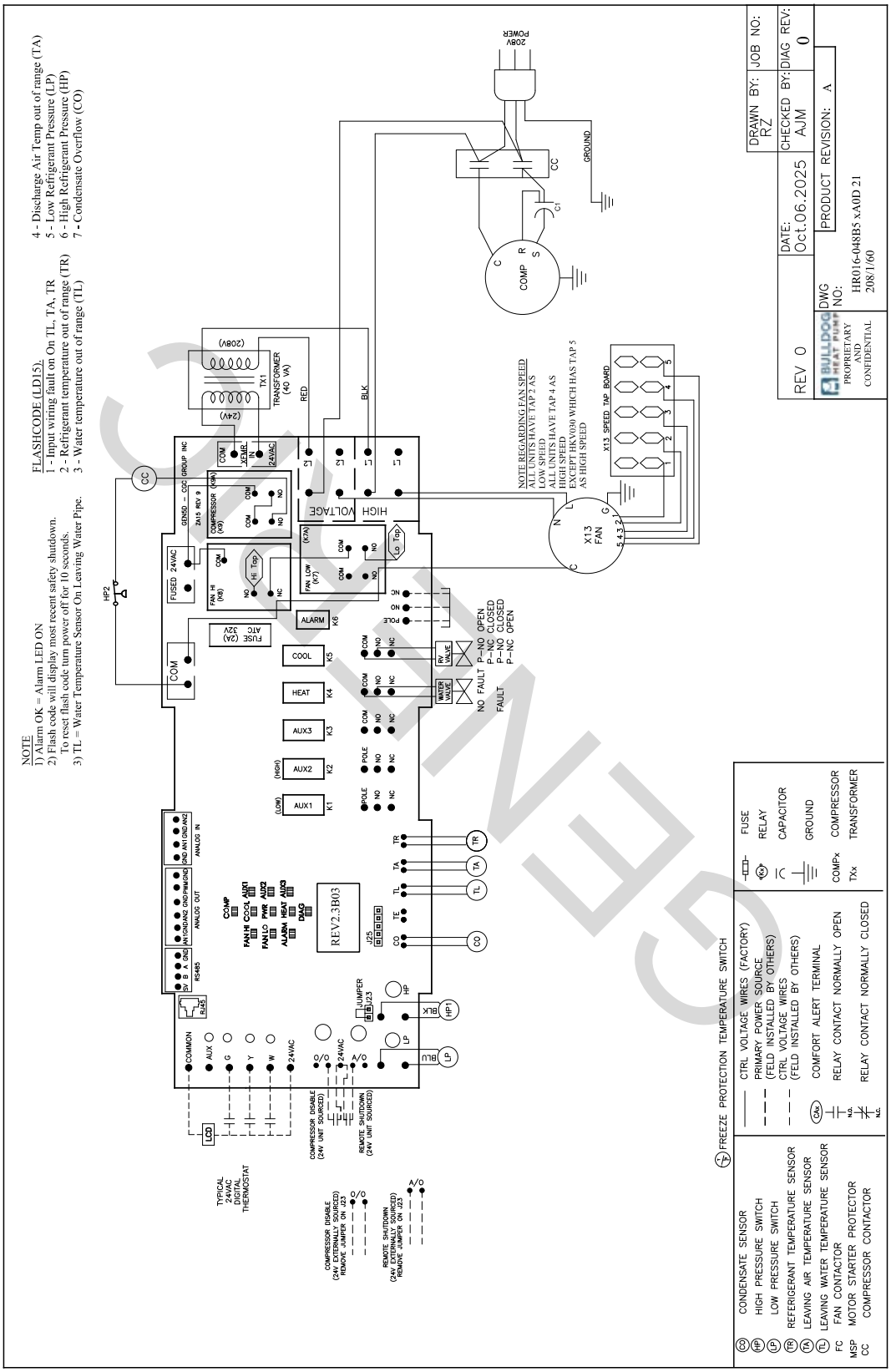
GENERIC WIRING DIAGRAM FOR HRV016-048



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DIAGNOSIS TABLE

Code (No. of Flashes)	Diagnosis LED	Reason	Possible Cause
0	None	No Alarm (Alarm LED is on)	
1	Sensor Fault	Sensor TR, TL, or TA is faulty	• One or more temperature sensors are damaged or disconnected
2	High/Low Refrigerant Coil Temperature (TR) (No Lockout will occur)	The refrigerant coil is approaching cold temperature (35°F) or exceeding high temperature (100°F). Disable the compressor to prevent the buildup of ice on the coil. TR sensor is screwed into the evaporator coil frame.	• Restricted airflow through the unit • Dirty air filter • Problem with the fan motor, e.g. No high fan operation • Cold air entering the unit (<60°F) • Air recirculation • Low condensing water loop temperature
3	High/Low Leaving Water Temperature (TL) (No Lockout will occur)	The leaving water temperature is either too hot or too cold for proper compressor operation in cooling mode. TL sensor is strapped on the "Water Out" pipe in the chassis compressor compartment	• Entering water is either below 60°F or above 125°F. Check fluid temperature. • Inadequate fluid flow through the unit causes the leaving water temperature to be above 140°F when the compressor is running. Ensure all water valves are open. Back-flush the unit. Verify proper flow (15°F ΔT for 2 GPM/ton flow)
4	High/Low Discharge Air Temperature (TA) (No Lockout will occur)	The discharge air temperature falls below 40°F or exceeds 100°F in cooling mode. Disables the compressor to prevent a more serious low-pressure lockout alarm. TA sensors are screwed into the supply fan housing.	• Restricted airflow through the unit • Dirty air filter • Problem with the fan motor • Cold air entering the unit (<60°F) • No high fan speed or no fan operation
5	Low Refrigerant Pressure (LP) (Lockout after 3 faults in 24 hours)	Low suction pressure causes the low-pressure switch to open. (opens at 60 +/- 3 psi, closes at 90 +/- 3 psi)	• Restricted airflow through the unit. • Dirty air filter • Problem with the fan motor • Low refrigerant charge • Possible refrigerant leak
6	High Refrigerant Pressure (HP) (Lockout after 3 faults in 24 hours)	High pressure causes the high-pressure switch to open. (opens at 600 +/- 10 psi (R410A), closes at 450 +/- 10 psi)	• Entering water is above 125°F. Check fluid temperature. • Inadequate fluid flow. Ensure all water valves are open. Back flush the unit. Verify proper flow (150°F ΔT) • "Water In" & "Water Out" pipe connections may be reversed • Unit overcharged with refrigerant (flooding condenser)
7	Condensate Overflow (CO)	The water level in the drain pan is high	• Blocked drain line • Pinched condensate hose • Dirty air filter • Insufficient U-trap • Condensate line double-trapped
8	Water Leak Detector (option 85)	Moisture detected in the cabinet's (secondary) drain pan	• Check for possible water leak from pipes, hoses, fittings or coils
9	DAT for units with an Electric heater is too high (option 8)	The leaving discharge air temperature is too high	• Check fan operation • Check electric heater wiring

HEADQUARTERS
104 – 6700 Century Ave.,
Mississauga, ON L5N 6A4
905-568-1661 | 888-220-5551

PLANT LOCATIONS
850 Gartshore St.,
Fergus, ON N1M 2W7
Phone: 519-843-5411

680 Gartshore St.,
Fergus, ON N1M 3H6

www.bulldogheatpump.com

ISO 9001:2015 & ISO 14001:2015

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