INSTALLATION INSTRUCTIONS

ZHD092 7-1/2 Ton
ZHD102 8-1/2 Ton
ZHD120 10 Ton

HEAT PUMP PACKAGED UNITS

508730-01
2/2025

R-454B

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer or equivalent, service agency, or the supplier.

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⚠ WARNING

To prevent serious injury or death:

1- Lock-out/tag-out before performing maintenance.

2- If system power is required (e.g., smoke detector maintenance), disable power to blower, remove fan belt where applicable, and ensure all controllers and thermostats are set to the OFF position before performing maintenance.

3- Always keep hands, hair, clothing, jewelery, tools, etc., away from moving parts.

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE

⚠ CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

⚠ WARNING

Only manufacturer approved auxiliary devices are permitted to be installed in this unit.

⚠ WARNING

If this appliance is conditioning a space with an area smaller than TAmin or stored in a space with an area smaller than Amin as defined by this instruction, then that space must be without continuously operating open flames (e.g. an operating gas appliance) or other potential ignition sources (e.g. an operating electric heater or similar hot surface). A flame-producing device may be installed in the same space if the device is provided with an effective flame arrest system.

⚠ CAUTION

Auxiliary devices which may be a potential ignition source shall not be installed in the duct work. Examples of such potential ignition sources are hot surfaces with a temperature exceeding 700°C and electric switching devices.

⚠ CAUTION

The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction

⚠ CAUTION

Children should be supervised not to play with the appliance.

⚠ CAUTION

Any personnel installing, decommissioning, or performaing maintenance on the unit must be properly trained with A2L refrigerants.

⚠ CAUTION

Servicing shall be performed only as recommended by the manufacturer.

⚠ WARNING

•This appliance must be installed in accordance with local and national wiring regulations.

•If the appliance is not fitted with an option for full disconnection from power, a means of disconnection must be incorporated in the fixed wiring in accordance with national and local wiring regulations.

⚠ CAUTION

Leak Detection System installed. Unit must be powered except for service.

⚠ WARNING

•Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

•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).

•Do not pierce or burn.

•Be aware that refrigerants may not contain an odor

⚠ WARNING

Ducts connected to an appliance shall not contain a potential ignition source.

⚠ IMPORTANT

Pipe work, including piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and be in compliance with national and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.

⚠ IMPORTANT

Refrigerant sensors for refrigerant detection systems shall only be replaced with sensors specified by the appliance manufacture.

⚠ CAUTION

This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.

A2L Refrigerant Considerations

Ensure that the work area is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects, taking into account the effects of aging or continual vibration from sources such as compressors or fans.

Under no circumstances shall potential sources of ignition be used when searching for or detecting refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work. If a leak is suspected, all naked flames shall be removed/ extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

When breaking into the refrigerant circuit to make repairs or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practices be followed since flammability is a consideration. The following procedure shall be adhered to:

-Safely remove refrigerant following local and national regulations.

-Evacuate the circuit.

-Purge the circuit with inert gas.

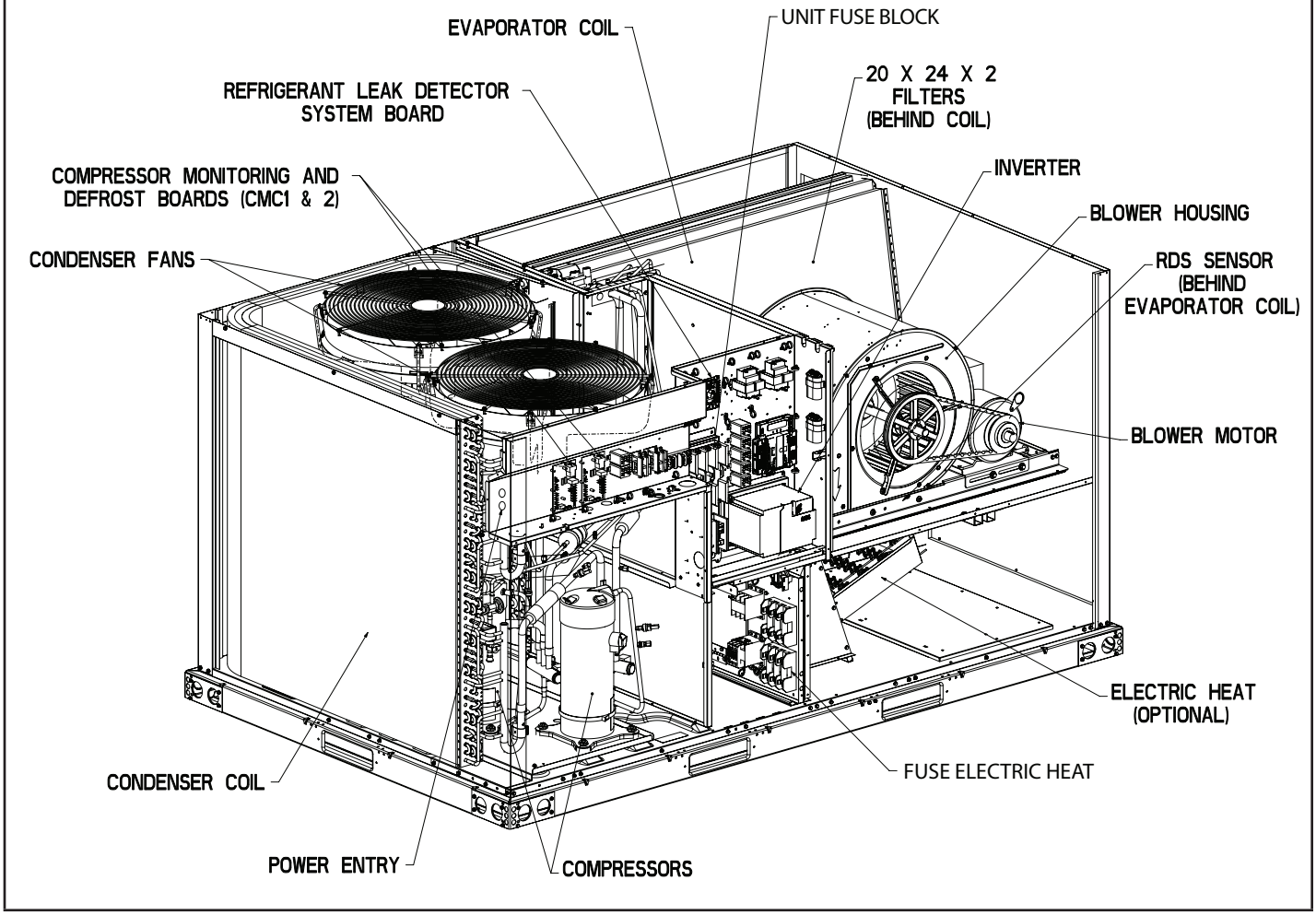
-Evacuate.

-Purge the circuit with inert gas.

-Open the circuit

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. Refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be vented down to atmospheric pressure to enable work to take place. Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.

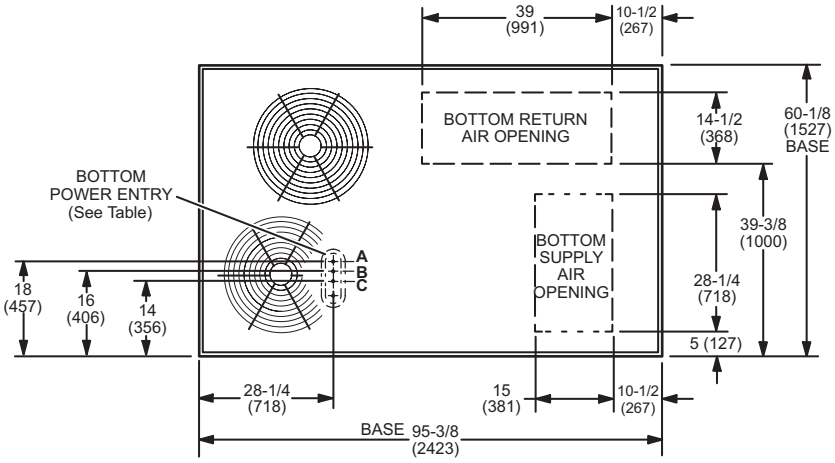
ZHD092-120 Parts Arrangement



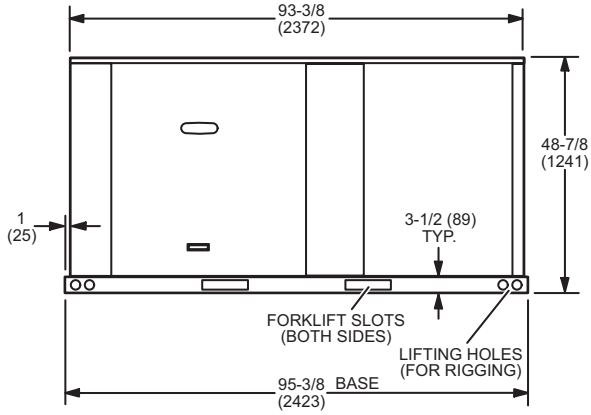
BOTTOM POWER ENTRY

Holes required for Optional Bottom Power Entry Kit

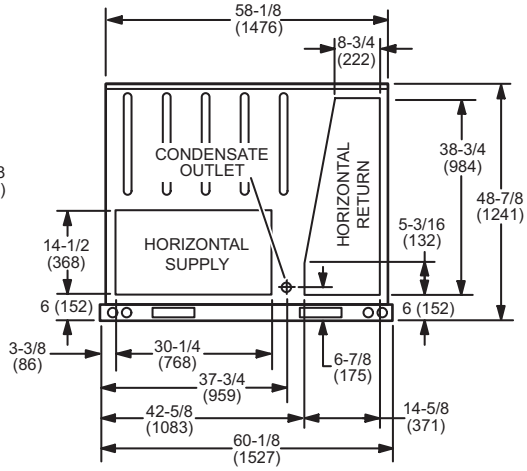
	Threaded Conduit Fittings (Provided in Kit)	Wire Use	Hole Diameter Required in Unit Base (Max.)
A	1/2	ACC.	7/8 (23)
B	1/2	24V	7/8 (23)
C	1-1/4	POWER	1-3/4 (44)



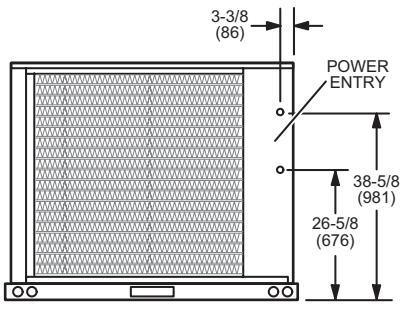
TOP VIEW



FRONT VIEW



END VIEW



END VIEW

⚠ CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

Shipping and Packing List

Package 1 of 1 contains:

1 - Assembled unit

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

General

These instructions are intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

The ZH packaged rooftop units are available in 7-1/2, 8-1/2 and 10 ton cooling capacities. Optional electric heat is available.

Units are equipped with a factory-installed supply air inverter (VFD). During cooling, the blower will operate at one of three speeds depending on the demand. Wen demand is low, the blower will operate at low speed. When demand is higher, the blower will operate at either medium or high speed depending on the cooling demand. During a heating demand, the blower will operate at high speed.

Availability of units and options varies by brand.

Requirements

See FIGURE 1 for unit clearances.

Use of this unit as a construction heater or air conditioner is not recommended during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

⚠ IMPORTANT

The Clean Air Act of 1990 bans the intentional venting of refrigerant (CFC's and HCFC's) as of July 1, 1992. Approved methods of recovery, recycling or reclaiming must be followed. Fines and/or incarceration may be levied for non-compliance.

⚠ WARNING

Electric shock hazard and danger of explosion. Can cause injury, death or product or property damage. Turn off gas and electrical power to unit before performing any maintenance or servicing operations on the unit. Follow lighting instructions attached to unit when putting unit back into operation and after service or maintenance.

UNIT CLEARANCES

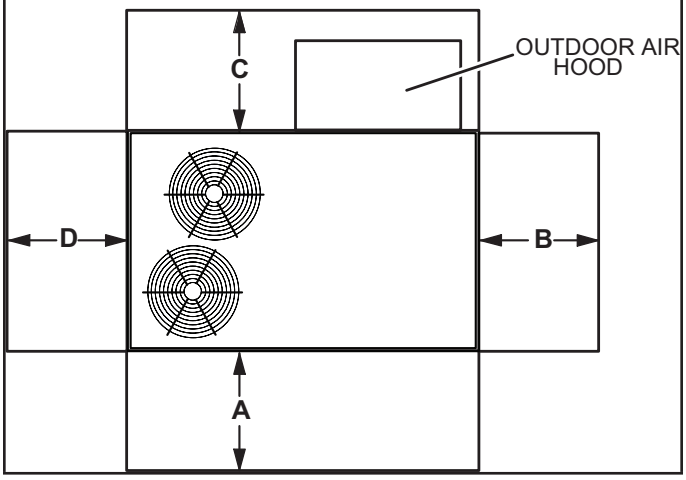


FIGURE 1

[1]Unit Clearance	A in.(mm)	B in.(mm)	C in.(mm)	D in.(mm)	Top Clearance
Service Clearance	36 (914)	36 (914)	60 (1524)	36 (914)	Unob-structed
Minimum Operation Clearance	36 (914)	36 (914)	60 (1524)	36 (914)	Unob-structed

NOTE - *Entire perimeter of unit base requires support when elevated above mounting surface.*

[1]**Service Clearance** - Required for removal of serviceable parts
Minimum Operation Clearance - Required clearance for proper unit operation.

⚠ NOTICE

Roof Damage!

This system contains both refrigerant and oil. Some rubber roofing material may absorb oil, causing the rubber to swell. Bubbles in the rubber roofing material can cause leaks. Protect the roof surface to avoid exposure to refrigerant and oil during service and installation. Failure to follow this notice could result in damage to roof surface.

Minimum R454B Space and CFM Requirements

Minimum Airflow[1]		
Unit	Q_{min}(CFM)	Q_{min}(m^3h)
ZHD092	394	669
ZHD102	392	666
ZHD120	376	638

Refrigerant Charge R-454B		
Unit	M_c(lbs)	M_c(kg)
ZHD092	13.56	6.7
ZHD102	13.94	6.7
ZHD120	16.13	6.4

*[1] **NOTE -** The minimum airflow is the lowest CFM allowed during venting operation (leak mitigation).*

Minimum Room Area of Conditioned Space[2]		
Unit	TA_{min}(ft^2)	TA_{min}(m^2)
ZHD092	218	20.3
ZHD102	217	20.2
ZHD120	208	19.3

[2] NOTE - The minimum room area of conditioned space is the smallest area the unit can service.

Altitude Adjustment Factor[3]									
Halt	0	200	400	600	800	1000	1200	1400	1600
AF	1	1	1	1	1.02	1.05	1.04	1.1	1.12
Halt	1600	1800	2000	2200	2400	2600	2800	3000	3200
AF	1.12	1.15	1.18	1.21	1.25	1.28	1.32	1.36	1.4

*[3] **NOTE -** Use the Altitude Adjustment Factor to adjust the values in the tables above to different altitudes. Find the relevant altitude above sea level in the two "Halt" rows and then multiply the value needed from the tables above by the altitude factor number. Example: For the minimum airflow in CFM for* an ZHD092 at 1000 ft. above see level, multiply 394 by 1.05 to get 413.7 CFM *as the new Q_{min}.*

If this unit has been used for heating or cooling of buildings or structures under construction, the following conditions must be met or the warranty will be void:

- A room thermostat must control the unit. The use of fixed jumpers that will provide continuous heating or cooling is not allowed.
- A pre-filter must be installed at the entry to the return air duct.
- The return air duct must be provided and sealed to the unit.
- Return air temperature range between 55°F (13°C) and 80°F (27°C) must be maintained.
- Air filters must be replaced and pre-filters must be removed upon construction completion.
- The input rate and temperature rise must be set per the unit rating plate.
- The heat exchanger, components, duct system, air filters and evaporator coil must be thoroughly cleaned following final construction clean-up.
- The unit operating conditions (including airflow, cooling operation, ignition, input rate, temperature rise and venting) must be verified according to these installation instructions.

This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Unit Support

In downflow discharge installations, install the unit on a non-combustible surface only. Unit may be installed on combustible surfaces when used in horizontal discharge applications or in downflow discharge applications when installed on an Z1CURB roof mounting frame.

NOTE - *Securely fasten roof frame to roof per local codes.*

A-Downflow Discharge Application

Roof Mounting with Z1CURB

1 - The Z1CURB roof mounting frame must be installed, flashed and sealed in accordance with the instructions provided with the frame.

2 - The Z1CURB roof mounting frame should be square and level to 1/16” per linear foot (5mm per linear meter) in any direction.

3 - Duct must be attached to the roof mounting frame and not to the unit; supply and return plenums must be installed before setting the unit.

Installer’s Roof Mounting Frame

Many types of roof frames can be used to install the unit depending upon different roof structures. Items to keep in mind when using the building frame or supports are:

1 - The base is fully enclosed and insulated, so an enclosed frame is not required.

2 - The frames or supports must be constructed with non-combustible materials and should be square and level to 1/16” per linear foot (5mm per linear meter) in any direction.

3 - Frame or supports must be high enough to prevent any form of moisture from entering unit. Recommended minimum frame height is 14” (356mm).

4 - Duct must be attached to the roof mounting frame and not to the unit. Supply and return plenums must be installed before setting the unit.

5 - Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

NOTE - *When installing a unit on a combustible surface for downflow discharge applications, an Z1CURB roof mounting frame is required.*

B-Horizontal Discharge Applications

1 - Specified installation clearances must be maintained when installing units. Refer to FIGURE 1.

2 - Top of support slab should be approximately 4” (102mm) above the finished grade and located so no run-off water from higher ground can collect around the unit.

3 - Units require support along all four sides of unit base. Supports must be constructed of steel or suitably treated wood materials.

Duct Connection

All exterior ducts, joints and openings in roof or building walls must be insulated and weather-proofed with flashing and sealing compounds in accordance with applicable codes. Any duct passing through an unconditioned space must be insulated.

⚠ CAUTION

In downflow applications, do not drill or punch holes in base of unit. Leaking in roof may occur if unit base is punctured.

Rigging Unit for Lifting

Rig unit for lifting by attaching four cables to holes in unit base rail. See FIGURE 2.

1 - Detach wooden base protection before rigging.

2 - Connect rigging to the unit base using both holes in each corner.

3 - All panels must be in place for rigging.

4 - Place field-provided H-style pick in place just above top edge of unit. Frame must be of adequate strength and length. (H-style pick prevents damage to unit.)

5 - All Units

Partially lift unit and remove five (5) L-brackets which secure the protective base board. See FIGURE 2.

IMPORTANT - Protective wooden base board must be removed before setting unit.

6 - New roof curbs (89-3/8" in length)

Remove the three alignment brackets shown in FIGURE 3.

7 - Existing roof curbs (81-3/4" in length)

Set unit on roof curb positioning alignment brackets as shown in FIGURE 3.

RIGGING - ALL UNITS

Unit	*Weight	
	Lbs.	Kg.
ZHD 092-102	1225	556
ZHD 120	1290	585

*Maximum weight with all available installed accessories.

IMPORTANT - ALL PANELS MUST BE IN PLACE FOR RIGGING.

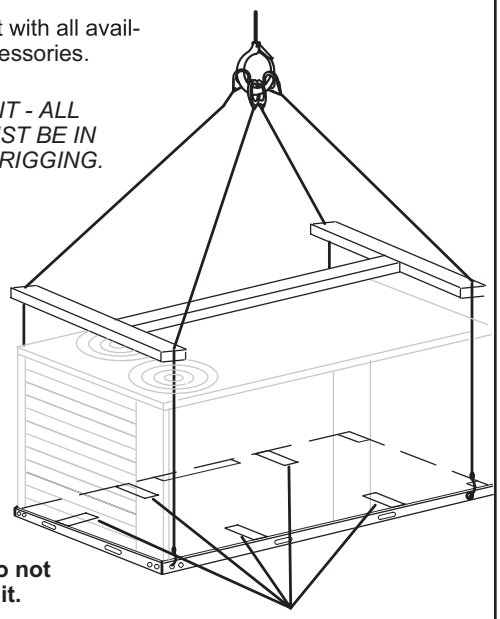


FIGURE 2

UNIT ALIGNMENT BRACKETS

NEW ROOF CURBS (89-3/8" IN LENGTH):
Remove all three brackets.

EXISTING ROOF CURBS (81-3/4" LONG):
Set unit on roof curb positioning alignment brackets as shown.

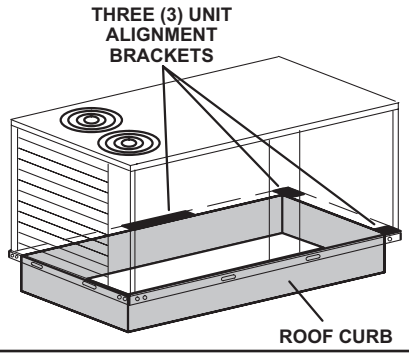


FIGURE 3

Condensate Drains

Make drain connection to the 3/4" N.P.T. drain coupling provided on unit.

NOTE - *The drain pan is made with a glass reinforced engineered plastic capable of withstanding typical joint torque but can be damaged with excessive force. Tighten pipe nipple hand tight and turn an additional quarter turn.*

A trap must be installed between drain connection and an open vent for proper condensate removal. See FIGURE 4. It is sometimes acceptable to drain condensate onto the roof or grade; however, a tee should be fitted to the trap to direct condensate downward. The condensate line must be vented. Check local codes concerning condensate disposal. Refer to page 5 for condensate drain location.

Units are shipped with the drain coupling facing the right side of the unit. The unit can be installed in either downflow or horizontal air discharge regardless of condensate drain location.

CONDENSATE DRAIN CONNECTION

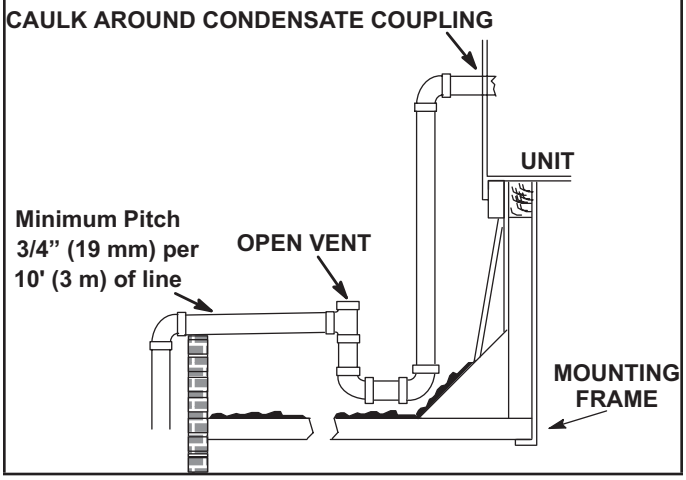


FIGURE 4

Electrical Connections

POWER SUPPLY

A-Wiring

Do not apply power or close disconnect switch until installation is complete. Refer to start-up directions. Refer closely to unit wiring diagram.

Refer to unit nameplate for minimum circuit ampacity and maximum fuse size.

1 - 230/460/575 volt units are factory wired. For 208V supply, disconnect the pink wire (230V) at all control power transformer(s). Reconnect the pink wire (208V). Tape the exposed end of the 230V pink wire.

2 - Route power through the bottom power entry area and connect to L1, L2, and L3 on the bottom of TB13 in control box. Route power to S48 disconnect switch when the option is factory-installed. See unit wiring diagram.

B-Unbalanced Three-Phase Voltage - VFD Units Only

Units equipped with an optional inverter (VFD) are designed to operate on balanced, three-phase power. Operating units on unbalanced three-phase power will reduce the reliability of all electrical components in the unit. This is not a deficiency in the design of the inverter or a manufacturing issue with the equipment; unbalanced power is a result of the power delivery system supplied by the local utility company.

Factory-installed inverters are sized to drive blower motors with an equivalent current rating using balanced three-phase power. When unbalanced three-phase power is supplied; the installer must replace the existing factory-installed inverter with an inverter that has a higher current rating to allow for the imbalance. Use TABLE 1 to determine the appropriate replacement inverter.

TABLE 1
INVERTER UP-SIZING

Factory-Installed Inverter HP	Replacement Inverter HP
2	5
3	7-1/2
5	10

CONTROL WIRING

Connect either a thermostat, room/zone sensor, or direct digital controller; one of the three are required for unit function. Refer to the literature provided with each device and the following information.

NOTE - *Optional wireless sensors are available for use with this unit.*

A-Thermostat Location

Room thermostat mounts vertically on a standard 2” X 4” handy box or on any non-conductive flat surface.

Locate thermostat approximately 5 feet (1524mm) above the floor in an area with good air circulation at average temperature. Avoid locating the room thermostat where it might be affected by:

- drafts or dead spots behind doors and in corners
- hot or cold air from ducts
- radiant heat from sun or appliances
- concealed pipes and chimneys

B-Control Wiring

1 - Route thermostat cable or wires from subbase to control box (refer to unit dimensions to locate bottom and side power entry).

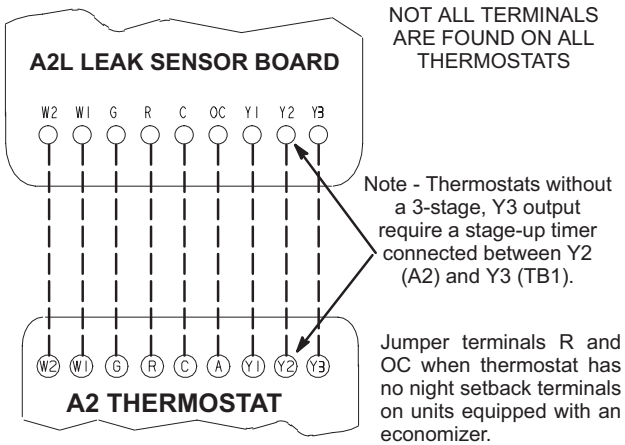
IMPORTANT - Unless field thermostat wires are rated for maximum unit voltage, they must be routed away from line voltage wiring. Use wire ties located near the lower left corner of the controls hat section to secure thermostat cable.

Use 18 AWG wire for all applications using remotely installed electro-mechanical and electronic thermostats.

2 - Install thermostat assembly in accordance with instructions provided with thermostat.

3 - Connect thermostat wiring to screw terminal strip labeled P1 on the Refrigerant Leak Sensor Board located near the center top of the control panel. Wire as shown in FIGURE 5 for electro-mechanical and electronic thermostats. If using other temperature control devices or energy management systems see instructions and wiring diagram provided by manufacturer.

24 VOLT FIELD WIRING WITH ELECTRONIC AND ELECTRO-MECHANICAL THERMOSTATS



Note - On electro-mechanical thermostats set anticipator at 0.1 amps.

FIGURE 5

IMPORTANT-Terminal connections at the wall plate or subbase must be made securely. Loose control wire connections may allow unit to operate but not with proper response to room demand.

Unit Power-Up

1 - Make sure that unit is installed in accordance with the installation instructions and applicable codes.

2 - Inspect all electrical wiring, both field and factory-installed, for loose connections. Tighten as required.

3 - Check to ensure that refrigerant lines do not rub against the cabinet or against other refrigerant lines.

4 - Check voltage at main unit power connection. Voltage must be within range listed on nameplate. If not, consult power company and have voltage condition corrected before starting unit.

5 - Make sure filters are in place before start-up.

6 - Make sure there is no heating, cooling, or blower demand from thermostat. Apply power to unit.

Blower Operation and Adjustments

A-Three Scroll Compressor Voltage Phasing

Three phase scroll compressors must be phased sequentially to ensure correct compressor and blower rotation and operation. Compressor and blower are wired in phase at the factory. Power wires are color-coded as follows: line 1-red, line 2-yellow, line 3-blue.

1 - Observe suction and discharge pressures and blower rotation on unit start-up.

If pressure differential is not observed or blower rotation is not correct:

2 - Suction pressure must drop, discharge pressure must rise, and blower rotation must match rotation marking.

3 - Disconnect all remote electrical power supplies.

4 - Reverse any two field-installed wires connected to the line side of K3, TB2 or F4. Do not reverse wires at blower contactor or compressors.

5 - Make sure the connections are tight.

Discharge and suction pressures should operate at their normal start-up ranges.

B-Blower Operation

Initiate blower demand at thermostat according to instructions provided with thermostat. Unit will cycle on thermostat demand. The following steps apply to applications using a typical electro-mechanical thermostat.

1 - Blower operation is manually set at the thermostat subbase fan switch. With fan switch in **ON** position, blowers will operate continuously.

2 - With fan switch in **AUTO** position, the blowers will cycle with demand. Blowers and entire unit will be off when system switch is in **OFF** position.

C-Determining Unit CFM

1 - The following measurements must be made with a dry indoor coil and air filters in place.

Initiate high speed blower without a cooling demand. Disconnect high pressure switches S4 and S7. Run the blower with Y1, Y2, and Y3 demands.

2 - Measure the indoor blower shaft RPM.

3 - With all access panels in place, measure static pressure external to unit (from supply to return). Blower performance data is based on static pressure readings taken in locations shown in FIGURE 6.

NOTE - *Static pressure readings can vary if not taken where shown.*

D-Blower Options

Units are equipped with one of two factory-installed blower options.

ZHD120 Units are equipped with an inverter (VFD) Controlled Blower motor providing three-speed blower operation. The blower will operate at high speed with a Y3 thermostat demand, Medium speed with a Y2 and Low speed with a Y1 thermostat demand. Low speed operation delivers approximately ⅔ of the air volume of high speed. Blower will run on Low-Speed w/ G Thermostat demand. Blower will run High-Speed with W1 and/or W2 Thermostat demand.

Three-speed blower operation results in lower energy consumption.

ZHD092/102 Units are equipped with two-stage blowers. The blower will operate at high speed with a Y3 thermostat demand and low speed with a Y2 or Y1 thermostat demand. Low speed operation delivers approximately ⅔ of the air volume of high speed. Two-speed blower. Blower will run on Low-Speed w/ G Thermostat demand. Blower will run High-Speed with W1 and/or W2 Thermostat demand. operation results in lower energy consumption.

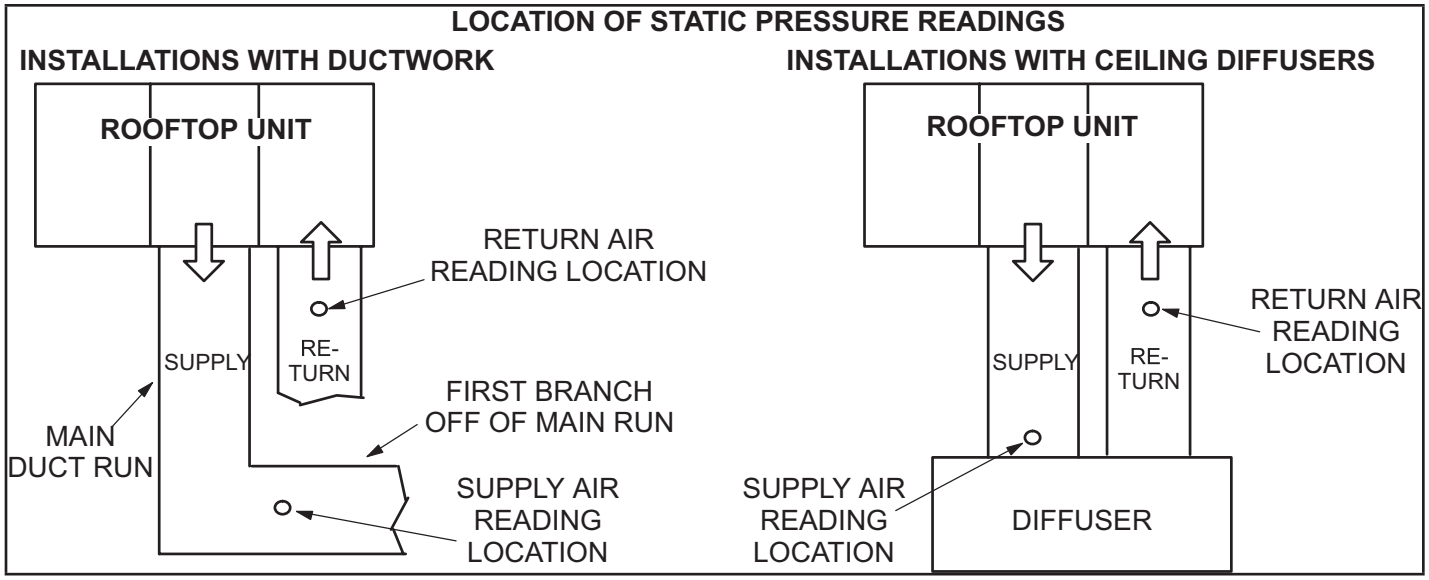


FIGURE 6

4 - Referring to page 14, use static pressure and RPM readings to determine unit CFM. Use page 15 when installing units with any of the optional accessories listed.

5 - The blower RPM can be adjusted at the motor pulley. Loosen Allen screw and turn adjustable pulley clockwise to increase CFM. Turn counterclockwise to decrease CFM. See FIGURE 7. Do not exceed minimum and maximum number of pulley turns as shown in TABLE 2.

6 - Units Equipped With An Inverter -

Reconnect high pressure switches S4 and S7.

TABLE 2
MINIMUM AND MAXIMUM PULLEY ADJUSTMENT

Belt	Min. Turns Open	Max. Turns Open
A section	0	5
B section	1*	6

*No minimum number of turns open when B belt is used on pulleys 6” O.D. or larger.

D-Blower Belt Adjustment

Maximum life and wear can be obtained from belts only if proper pulley alignment and belt tension are maintained. Tension new belts after a 24-48 hour period of operation. This will allow belt to stretch and seat in the pulley grooves. Make sure blower and motor pulleys are aligned as shown in FIGURE 8.

1 - Loosen four bolts securing motor base to mounting frame. See FIGURE 7.

2 - To increase belt tension -

Turn both adjusting bolts to the right, or clockwise, to move the motor outward and tighten the belt. This increases the distance between the blower motor and the blower housing.

To loosen belt tension -

Turn the adjusting bolts to the left, or counterclockwise to loosen belt tension.

IMPORTANT - Align top edges of blower motor base and mounting frame base parallel before tightening two bolts on the other side of base. Motor shaft and blower shaft must be parallel.

3 - Tighten two bolts on each side of the motor mounting base. This secures the mounting base to the frame.

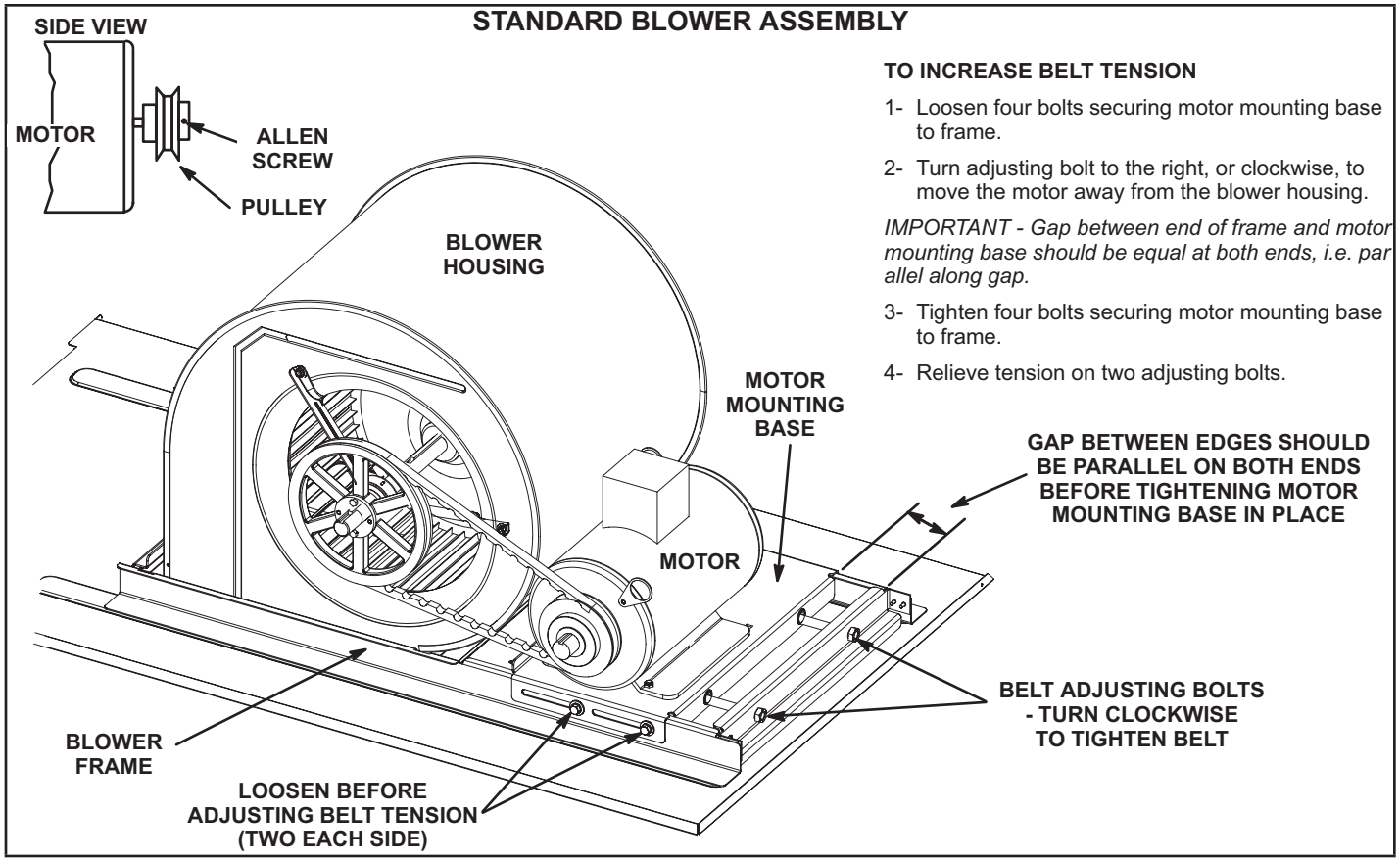


FIGURE 7

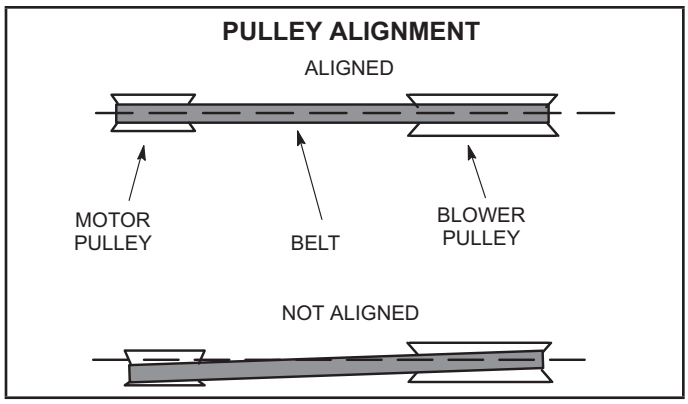


FIGURE 8

E-Check Belt Tension

Overtensioning belts shortens belt and bearing life. Check belt tension as follows:

1 - Measure span length X. See FIGURE 9.

2 - Apply perpendicular force to center of span (X) with enough pressure to deflect belt 1/64" for every inch of span length or 1.5mm per 100mm of span length.

Example: Deflection distance of a 40" span would be 40/64" or 5/8".

Example: Deflection distance of a 400mm span would be 6mm.

3 - Measure belt deflection force. For a new 2 and 3hp belt, the deflection force should be 5.0-7.0 lbs. (35-48kPa). For a new 5hp belt, the deflection force should be 7-10lbs. (48-69kPa).

A force below these values indicates an undertensioned belt. A force above these values indicates an overtensioned belt.

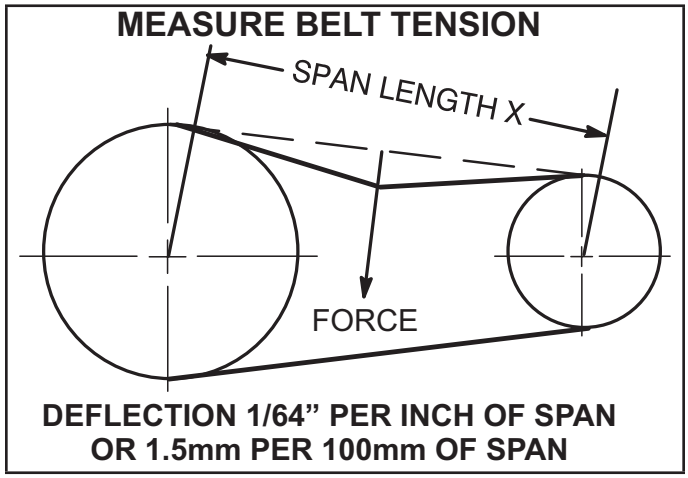


FIGURE 9

F-Field-Furnished Blower Drives

For field-furnished blower drives, use page 14 to determine BHP and RPM required. Reference TABLE 3 for drive component manufacturer's numbers.

BLOWER DATA

092S, 102S, 120S STANDARD EFFICIENCY BELT DRIVE BLOWER − BASE UNIT

BLOWER TABLE INCLUDES RESISTANCE FOR BASE UNIT ONLY (NO HEAT SECTION) WITH DRY INDOOR COIL AND AIR FILTERS IN PLACE. FOR ALL UNITS ADD:

1− Wet indoor coil air resistance of selected unit.

2− Any factory installed options air resistance (heat section, economizer, etc.)

3− Any field installed accessories air resistance (duct resistance, diffuser, etc.)

Then determine from blower table blower motor output required.

See page 15 for blower motors and drives.

See page 15 for wet coil and option/accessory air resistance data.

MINIMUM AIR VOLUME REQUIRED FOR USE WITH OPTIONAL ELECTRIC HEAT (Maximum Static Pressure - 2.0 in. w.g.) 15 kW, 22.5 kW - 2065 cfm

30 kW - 2250 cfm

45 kW - 2625 cfm

60 kW - 3500 cfm

Total Air Volume cfm	Total Static Pressure - in. w.g.																									
	0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		1.8		2.0		2.2		2.4		2.6	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
2000	542	0.43	602	0.60	664	0.75	732	0.89	802	1.02	869	1.15	927	1.27	979	1.41	1029	1.57	1079	1.75	1129	1.95	1179	2.15	1230	2.37
2250	560	0.55	619	0.71	681	0.86	748	1.00	817	1.14	882	1.27	939	1.41	991	1.57	1041	1.74	1090	1.93	1140	2.13	1190	2.35	1241	2.57
2500	579	0.68	637	0.83	699	0.98	766	1.12	834	1.26	897	1.41	953	1.57	1005	1.74	1054	1.92	1103	2.12	1152	2.33	1202	2.55	1254	2.79
2750	599	0.81	657	0.97	719	1.11	785	1.25	851	1.41	913	1.57	968	1.74	1020	1.93	1068	2.13	1116	2.34	1165	2.56	1215	2.78	1268	3.01
3000	620	0.95	678	1.11	741	1.25	806	1.40	870	1.58	930	1.75	985	1.94	1036	2.14	1084	2.36	1131	2.58	1180	2.80	1230	3.02	1283	3.26
3250	643	1.10	701	1.26	764	1.41	828	1.57	891	1.76	950	1.95	1003	2.16	1053	2.38	1100	2.61	1148	2.83	1196	3.06	1246	3.29	1299	3.52
3500	667	1.26	726	1.43	788	1.58	851	1.77	913	1.97	970	2.17	1023	2.41	1071	2.65	1118	2.88	1165	3.11	1213	3.33	1264	3.57	1317	3.81
3750	693	1.44	752	1.61	813	1.78	876	1.98	936	2.20	992	2.43	1043	2.68	1091	2.93	1137	3.17	1183	3.40	1232	3.64	1284	3.88	1338	4.13
4000	720	1.65	779	1.82	840	2.00	902	2.22	961	2.46	1015	2.71	1064	2.98	1111	3.24	1156	3.48	1203	3.72	1253	3.96	1305	4.22	1359	4.48
4250	748	1.86	807	2.04	868	2.24	929	2.48	986	2.75	1038	3.02	1086	3.30	1132	3.57	1177	3.81	1224	4.05	1274	4.31	1327	4.57	1382	4.85
4500	778	2.09	837	2.28	898	2.51	957	2.78	1012	3.07	1062	3.37	1108	3.65	1154	3.92	1199	4.17	1247	4.41	1297	4.67	1350	4.94	1405	5.22
4750	809	2.34	868	2.56	929	2.82	986	3.12	1038	3.43	1087	3.74	1132	4.03	1177	4.29	1223	4.54	1270	4.79	1321	5.04	1374	5.31	1428	5.58
5000	841	2.62	901	2.87	960	3.17	1015	3.50	1065	3.83	1112	4.14	1157	4.43	1201	4.69	1247	4.94	1295	5.18	1345	5.42	1398	5.68	---	---
5250	875	2.93	935	3.23	992	3.56	1044	3.91	1092	4.26	1138	4.57	1182	4.85	1226	5.10	1272	5.34	1320	5.57	---	---	---	---	---	---
5500	911	3.30	969	3.63	1024	4.00	1074	4.37	1120	4.71	1165	5.02	1208	5.29	1253	5.53	---	---	---	---	---	---	---	---	---	---
5750	948	3.71	1004	4.08	1056	4.48	1104	4.85	1148	5.19	1192	5.49	1235	5.74	---	---	---	---	---	---	---	---	---	---	---	---
6000	985	4.18	1039	4.59	1088	5.00	1134	5.37	1177	5.69	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6250	1022	4.70	1073	5.14	1120	5.54	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

BLOWER DATA

FACTORY INSTALLED BELT DRIVE KIT SPECIFICATIONS

Nominal hp	Maximum hp	Drive Kit Number	RPM Range
2	2.3	1	590 - 890
2	2.3	2	800 - 1105
2	2.3	3	795 - 1195
3	3.45	4	730 - 970
3	3.45	5	940 - 1200
3	3.45	6	1015 - 1300
5	5.75	10	900 - 1135
5	5.75	11	1040 - 1315
5	5.75	12	1125 - 1425

NOTE - *Using total air volume and system static pressure requirements determine from blower performance tables rpm and motor output required. Maximum usable output of motors furnished are shown. In Canada, nominal motor output is also maximum usable motor output. If motors of comparable output are used, be sure to keep within the service factor limitations outlined on the motor nameplate.*

NOTE - *Units equipped with option are limited to a motor service factor of 1.0.*

POWER EXHAUST FAN PERFORMANCE

Return Air System Static Pressure	Air Volume Exhausted
in. w.g.	cfm
0	3175
0.05	2955
0.10	2685
0.15	2410
0.20	2165
0.25	1920
0.30	1420
0.35	1200

FACTORY INSTALLED OPTIONS/FIELD INSTALLED ACCESSORY AIR RESISTANCE - in. w.g.

Air Volume cfm	Wet Indoor Coil	Electric Heat	Economizer	Filters		Return Air Adapter Plate
				MERV 8	MERV 13	
1750	0.04	0.03	0.05	0.01	0.03	0.00
2000	0.05	0.03	0.06	0.01	0.03	0.00
2250	0.06	0.04	0.08	0.01	0.04	0.00
2500	0.07	0.04	0.11	0.01	0.05	0.00
2750	0.08	0.05	0.12	0.02	0.05	0.00
3000	0.09	0.06	0.13	0.02	0.06	0.02
3250	0.10	0.06	0.15	0.02	0.06	0.02
3500	0.11	0.09	0.15	0.03	0.07	0.04
3750	0.13	0.09	0.15	0.03	0.08	0.07
4000	0.14	0.09	0.19	0.04	0.08	0.09
4250	0.15	0.13	0.19	0.04	0.09	0.11
4500	0.17	0.14	0.22	0.04	0.09	0.12
4750	0.18	0.17	0.25	0.05	0.10	0.16
5000	0.20	0.20	0.29	0.06	0.10	0.18
5250	0.22	0.22	0.32	0.06	0.11	0.19
5500	0.23	0.25	0.34	0.07	0.12	0.22
5750	0.25	0.31	0.45	0.07	0.12	0.25
6000	0.27	0.33	0.52	0.08	0.13	0.27

TABLE 3
MANUFACTURER'S NUMBERS

DRIVE NO.	DRIVE COMPONENTS					
	ADJUSTABLE SHEAVE		FIXED SHEAVE		BELT	
	BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.	BROWNING NO.	OEM PART NO.
1	1VP34x7/8	31K6901	AK61x1	100244-20	A44	44L5501
2	1VP40x7/8	79J0301	AK59x1	31K6801	AX45	100245-23
3	1VP34x7/8	31K6901	AK46x1	100244-17	A41	100245-18
4	1VP44x7/8	P-8-1488	AK74x1	100244-21	AX48	100245-50
5	1VP50x7/8	P-8-2187	AK69x1	37L4701	AX48	100245-50
6	1VP50x7/8	P-8-2187	AK64x1	12L2501	AX46	31K7101
10	1VP50x1-1/8	P-8-1977	BK77x1	49K4001	BX50	100245-49
11	1VP50x1-1/8	P-8-1977	BK67x1	100244-24	BX46	100245-48
12	1VP50x1-1/8	P-8-1977	BK62x1	100244-23	BX46	100245-48

Heating Start-Up

1 - Set thermostat or temperature control device to initiate a first-stage heating demand.

A first-stage heating demand (W1) will energize compressors 1 and 2. Both outdoor fans are energized with a W1 demand.

NOTE - *L1 and L2 reversing valves are de-energized in the heating mode.*

ZHD Units With Optional Electric Heat -

An increased heating demand (W2) will energize electric heat. Electric heat is also energized during the defrost cycle (W1) to maintain discharge air temperature.

Cooling Start-Up

A-Operation

Supply Air Inverter Units - Refer to the Supply Air Inverter Start-Up section.

1 - Initiate first and second stage cooling demands according to instructions provided with thermostat.

2 - No Economizer Installed in Unit -

A first-stage cooling demand (Y1) will energize compressor 1 and both condenser fans. An increased cooling demand (Y2) will energize compressor 2.

Units Equipped With Economizer -

When outdoor air is acceptable, a first-stage cooling demand (Y1) will energize the economizer. An increased cooling demand (Y2) will energize compressor 1 and both condenser fans. When outdoor air is not acceptable unit will operate as though no economizer is installed.

3 - Units contain two refrigerant circuits or stages. See FIGURE 10.

4 - Each refrigerant circuit is separately charged with R-454B refrigerant. See unit rating plate for correct amount of charge.

5 - Refer to Cooling Operation and Adjustment section for proper method to check refrigerant charge.

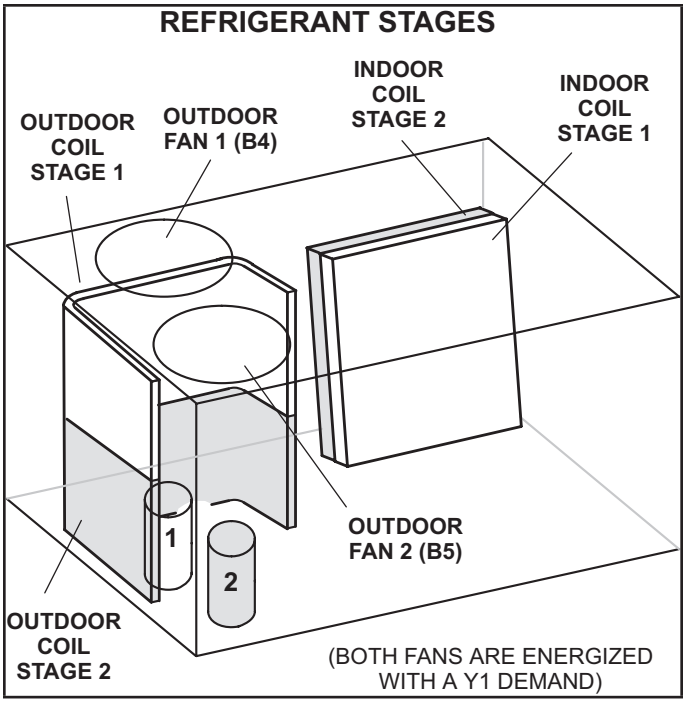


FIGURE 10

B-Refrigerant Charge and Check

REFRIGERANT CHARGE AND CHECK

WARNING - Do not exceed nameplate charge under any condition.

This unit is factory charged and should require no further adjustment. If the system requires additional refrigerant, reclaim the charge, evacuate the system, and add required nameplate charge.

C-R454B Refrigerant

Units charged with R454B refrigerant operate at lower pressures than R410A. The expansion valve and liquid line dryer provided with the unit are approved for use with R454B.

R454B refrigerant is stored in a gray cylinder.

⚠ CAUTION

Mineral oils are not compatible with R454B. If oil must be added, it must be a polyolester oil.

Manifold gauge sets used with systems charged with R454B refrigerant must be capable of handling various system operating pressures. The gauges should be rated for use with pressures of 0-800 on the high side and a low side of 30" vacuum to 250 psi with dampened speed to 500 psi. Gauge hoses must be rated for use at up to 800 psi of pressure with a 4000 psi burst rating.

Refrigerant Charge R-454B		
Unit	M_c(lbs)	M_c(kg)
ZHD092	13.56	6.7
ZHD102	13.94	6.7
ZHD120	16.13	6.4

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the unit is earth grounded prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the unit.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

- When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.
- When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i. e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery
- The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants including, when applicable, flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.
- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.
- If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

NOTE - *System charging is not recommended below 60°F (15°C). In temperatures below 60°F (15°C), the charge must be weighed into the system.*

If weighing facilities are not available, or to check the charge, use the following procedure:

1 - Make sure outdoor coil is clean. Attach gauge manifolds and operate unit at full CFM in cooling mode with economizer disabled until system stabilizes (approximately five minutes). Make sure all outdoor air dampers are closed.

2 - Compare the normal operating pressures to the pressures obtained from the gauges. Check unit components if there are significant differences.

3 - Measure the outdoor ambient temperature and the suction pressure. Refer to the charging curve to determine a target liquid temperature.

NOTE - *Pressures are listed for sea level applications.*

4 - Use the same thermometer to accurately measure the liquid temperature (in the outdoor section).

- If measured liquid temperature is higher than the target liquid temperature, add refrigerant to the system.
- If measured liquid temperature is lower than the target liquid temperature, recover some refrigerant from the system..

5 - Add or remove charge in increments. Allow the system to stabilize each time refrigerant is added or removed.

6 - Continue the process until measured liquid temperature agrees with the target liquid temperature. Do not go below the target liquid temperature when adjusting charge. Note that suction pressure can change as charge is adjusted.

TABLE 4 581375-01
ZHD092 NORMAL OPERATION PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1			CIRCUIT 2		
	Discharge ±10 psig	Suction ±5 psig	Appr. Temp +1°F	Discharge ±10 psig	Suction ±5 psig	Appr. Temp +1°F
65°F	229	122	6.9	233	123	6.8
75°F	271	127	6.9	271	126	6.8
85°F	315	130	6.9	309	127	6.8
95°F	361	132	6.9	354	129	6.8
105°F	410	135	6.9	403	131	6.8
115°F	460	139	6.9	458	133	6.8

TABLE 5 581376-01
ZHD102 NORMAL OPERATION PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1			CIRCUIT 2		
	Discharge ±10 psig	Suction ±5 psig	Appr. Temp +1°F	Discharge ±10 psig	Suction ±5 psig	Appr. Temp +1°F
65°F	243	119	9.7	232	121	6.9
75°F	285	123	9.7	270	125	6.9
85°F	329	127	9.7	311	128	6.9
95°F	378	130	9.7	358	132	6.9
105°F	430	134	9.7	408	135	6.9
115°F	483	136	9.7	462	138	6.9

TABLE 6 581377-01
ZHD120 NORMAL OPERATION PRESSURES

Outdoor Coil Entering Air Temp	CIRCUIT 1			CIRCUIT 2		
	Discharge ±10 psig	Suction ±5 psig	Appr. Temp +1°F	Discharge ±10 psig	Suction ±5 psig	Appr. Temp +1°F
65°F	237	118	11.6	247	114	13.1
75°F	273	122	11.6	284	117	13.1
85°F	316	126	11.6	328	120	13.1
95°F	361	128	11.6	372	121	13.1
105°F	413	130	11.6	424	124	13.1
115°F	467	132	11.6	480	128	13.1

7 - Use the following approach method along with the normal operating pressures to confirm readings.

CHARGE VERIFICATION - APPROACH METHOD - AHRI TESTING

1 - Using the same thermometer, compare liquid temperature to outdoor ambient temperature.

2 - Approach Temperature = Liquid temperature (at condenser outlet) minus ambient temperature.

3 - Approach temperature should match values in TABLE 7. An approach temperature greater than this value indicates an undercharge. An approach temperature less than this value indicates an overcharge.

4 - The approach method is not valid for grossly over or undercharged systems. Use TABLE 7 as a guide for typical operating pressures.

TABLE 7
APPROACH TEMPERATURE

Unit	Liquid Temp. Minus Ambient Temp.	
	1st Stage	2nd Stage
092S	5°F ± 1 (2.8°C ± 0.5)	4°F ± 1 (2.2°C ± 0.5)
102S	5°F ± 1 (2.8°C ± 0.5)	5°F ± 1 (2.8°C ± 0.5)
120S	4°F ± 1 (2.2°C ± 0.5)	7°F ± 1 (3.9°C ± 0.5)

C-Compressor Controls

1 - High Pressure Switches (S4, S7)

Compressor circuits are protected by a high pressure switch which cuts out at 640 psig ± 10 psig (4413 kPa ± 70 kPa).

2 - Defrost Switches (S6, S9)

Defrost switches close to initiate defrost when liquid line temperature falls to 35°F (1.7°C). The defrost switch is located on the liquid line between the outdoor expansion valve and the distributor

3 - Defrost Termination Switch (S104)

Defrost pressure switch opens to terminate defrost when vapor (discharge pressure during cooling and defrost) pressure reaches 450 psig (3103 kPa).

4 - Compressor Monitoring and Defrost Controls (CMC1 & CMC2)

The unit is equipped with two CMC control boards (CMC1 & CMC2 for compressors B1 and B2 respectively) which has the combined function of a time/temperature defrost control, defrost relay, anti-short cycle timed off control, high- and low-pressure switch system control, manufacturing test mode, and field connection terminal strip. Inputs will include thermostat commands, and pressure controls.

Integral features include:

- On board defrost relays (fan, reversing valve, aux. Heat).
- Anti-short cycle timed-off control with compressor contactor driver.
- Field connection 24-volt class 2 screw terminal strip.
- Factory terminals arrangement.
- Led diagnostic indicators.
- Manufacturing test mode.
- High- and low-pressure switch monitoring, with 5-strike lockout.
- Field selectable frost accumulation timing.
- Field selectable compressor delay (remove jumper to disable).

The board will work with the different switch and sensors to monitoring and control the compressor.

CMC1 will be engage for the whole defrost process and monitoring compressor B1, while CMC2 will be only monitoring compressor B2

Defrost is liquid line temperature initiated and operates for 14 minutes unless terminated by vapor line pressure drop.

When the liquid line temperature drops below 35°F, the defrost switch closes and signals the defrost control that a defrost cycle is needed. If the defrost switch is still closed after 60 minutes (default), a defrost cycle begins and operates for 14 minutes. The defrost pressure switch can terminate the defrost cycle before the 14 minutes elapses if vapor pressure reaches 450 ± 10 psi.

Electric heat is energized during defrost to maintain discharge air temperature.

Electric Heat Start-Up

Optional electric heat will stage on and cycle with thermostat demand. Number of stages of electric heat will vary depending on electric heat assembly. See electric heat wiring diagram on unit for sequence of operation.

Refrigerant Leak Detection System

This unit is equipped with a Refrigerant Leak Detection System. The system consists of the RDS Non-Communicating Blower Control Board (RDSC) in the control compartment and a R454B Refrigerant Sensor near the coil. The Modes of Operation for the RDS Non-Communicating Blower Control Board are Initializing, Normal, Leak Detected, and Fault.

MODES OF OPERATION

Initializing

The RDS Non-Communicating Blower Control Board is establishing connection with the refrigerant detection sensor and sensor is “warming up”.

Normal

The HVAC system is functioning normally, i.e., responding to thermostat demand signals. The RDS Non-Communicating Blower Control Board has not detected a refrigerant leak.

Leak Detected (Mitigation)

When the RDS Non-Communicating Blower Control Board detects a refrigerant leak:

1 - The RDS Non-Communicating Blower Control Board shuts off the (R) output (24VAC power) to the thermostat, which de-energizes the outdoor unit compressor and heat sources, such as gas and/or electric strip heat. No heating or cooling demands will be met.

2 - The RDS Non-Communicating Blower Control Board activates the blower ventilation speed (G). The blower purges refrigerant from the cabinet, plenum, and ductwork.

3 - After the RDS Non-Communicating Blower Control Board determines the refrigerant levels are below the safety threshold, the blower will continue to function for an additional seven (7) minutes.

4 - After the blower sequence is complete, the HVAC system resumes normal operation.

NOTE - *The HVAC system may not maintain a cooling or heating setpoint if a significant leak exists. Any refrigerant leaks that remain unaddressed for an extended time may cause the HVAC system to shut down on a low refrigerant pressure limit condition.*

Fault/Service

When a fault is detected within the RDS Non-Communicating Blower Control Board, the indoor blower engages and remains engaged at a constant output until the fault is cleared.

DIAGNOSTIC CODES / TROUBLESHOOTING

The RDS Non-Communicating Blower Control Board is equipped with a multicolor LED. The LED signals the operational state of the RDS Non-Communicating Blower Control Board. To review the operational states, refer to TABLE 8, LED Operational Modes / Troubleshooting, for details.

Red diagnostic codes indicate a specific RDS Non-Communicating Blower Control Board issue. To determine the issue and possible troubleshooting actions, refer to TABLE 9, Red LED Diagnostic Codes / Troubleshooting.

The RDS Non-Communicating Blower Control Board is equipped with a Test/Reset button. The Test button can be used to complete several functions, depending on the mode of operation of the RDS Non-Communicating Blower Control Board. TABLE 10 lists the functions of the Test button during each mode of operation.

TABLE 8

LED Operational Modes / Troubleshooting

Operating Mode	LED Status	Action
Initializing	Flashing green	None
Monitoring	Solid green*	None
Mitigation (Leak Detected)	Flashing blue	Check coil tubes for leak. Repair the issue and restart the equipment.
Fault / Service	Solid blue, interrupted by red flash code	Refer to table for troubleshooting guidance.

*Solid green interrupted by a blue flash indicates the mitigation process has previously occurred.

TABLE 9

Red LED Diagnostic Codes / Troubleshooting

Red Wink	Applies to Individual Sensor(s)	Issue	Action
1	Yes	RDS Sensor Fault	Replace sensor
2	No	VFD alarm / Drain pan overflow	Check VFD for alarms, remedy alarms present. If float switch is installed, verify proper switch mounting location, depth in pan, unobstructed condensate drain line; correct as needed.
3	Yes	Incompatible sensor installed	Replace sensor
4	Yes	Sensor communication issue	Check sensor connection. Ensure connection is clean and tight
5	No	R-input not available	Check for 24VAC power connected to thermostat R terminal on the RDSC. 24VAC power should only be provided at A194-R quick connection for the RDSC to function.
6	No	Invalid configuration of sensor count	Not applicable

TABLE 10

Test Button Functions

Operation Mode	Press the Test button to...	Press	Action
Monitoring	Trigger a leak detection response. Verify all equipment is wired correctly into the RDSC (after installation).	Short	Clear purge-counter if prior mitigation has occured; test mitigation.
		Long	Reset control.
Mitigating (Leak Detected)	Reset the RDSC to a normal mode of operation after a previous leak has been detected and purged from the HVAC system.	Short	If testing mitigation, end test.
Fault/Service	Reset the RDSC after troubleshooting and resolving a fault condition. If the fault is not resolved, the RDSC will enter the Fault mode again.	Short	Reevaluate fault condition - if cleared, return to monitoring, otherwise update indicator.
		Long	Reset control.

RDS SENSORS

Units are equipped with factory-installed RDS Sensors located on different points on the unit. The RDS sensors provide the Unit Controller with continuous readings for leaked refrigerant concentration levels and sensor health status (Good or Fault). These readings are used to modify unit operation to disperse the leaked refrigerant and to remove possible ignition sources. In addition, the Unit Controller uses these readings to initiate alarms to alert the operator of a refrigerant leak or faulty sensor(s).

Each sensor must be specifically placed for proper unit operation and to initiate valid alarms. To identify sensor locations see TABLE 11.

TABLE 11

RDS Sensor Figures

Model	Qty.	Type	Figure
ZHD036-060	1 sensor	INDOOR SENSOR	FIGURE 11

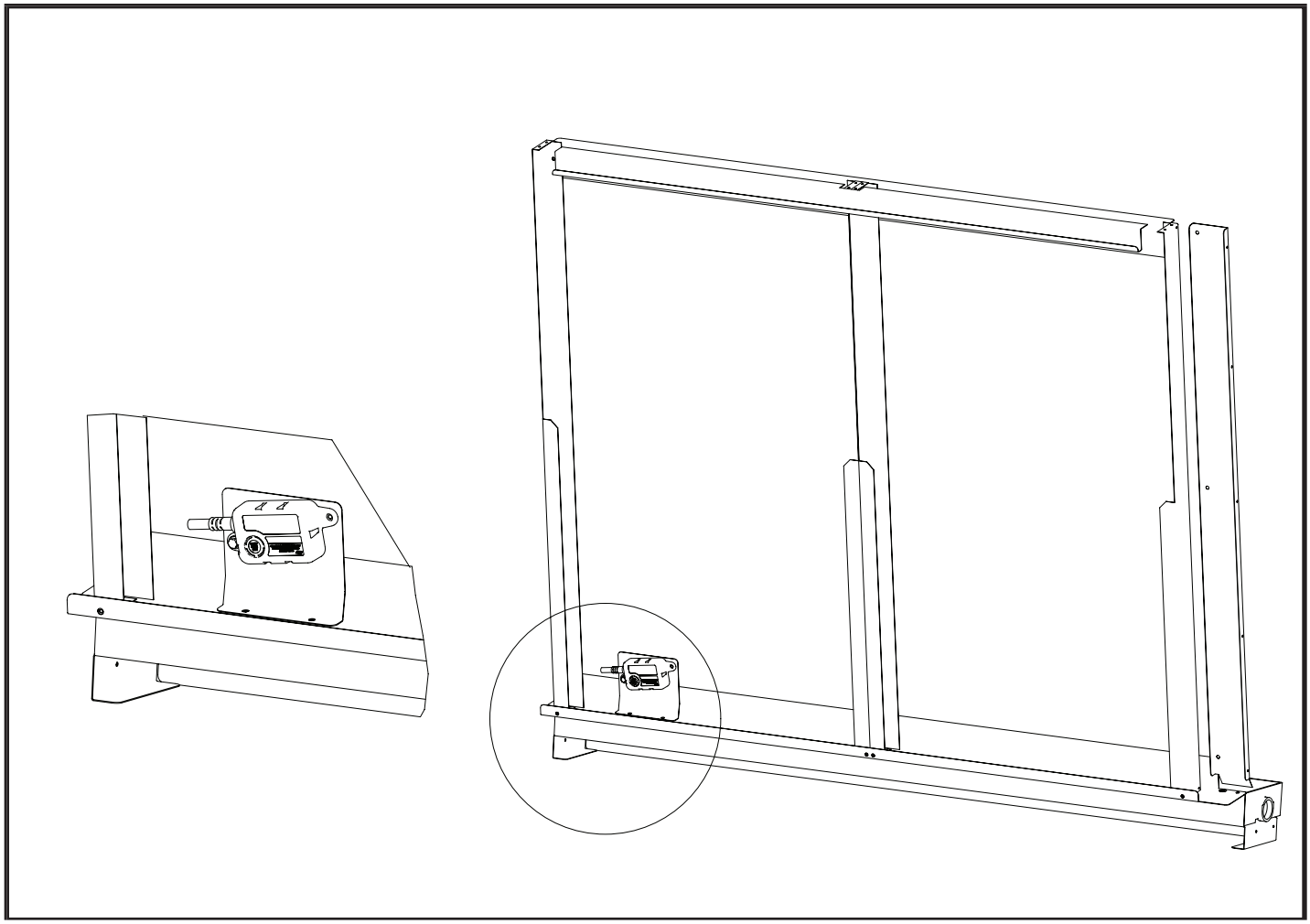


FIGURE 11

SENSOR MAINTENANCE

It is recommended to check the state of the sensor every 6 months, at the beginning of each cooling and heating season.

- Check that the sensor cable is in good condition.
- Ensure that the sensor opening is clear and free of debris.
  - DO NOT use abrasive cleaning solutions or detergents to clean sensor opening.
  - DO NOT use flammable compressed air solutions to clean the sensor opening.
  - DO NOT vacuum sensor inlet opening, as this could cause damage to the sensor internal components.
- Replace sensor if the opening is not clean or free of debris.

NOTE - *When cleaning the evaporator coil, remove the sensor from the coil. Recommended method is removal of bracket with sensor attached.*

See FIGURE 12 for an example of a clear, unobstructed sensor inlet.

FIGURE 12

Defrost Control Board

The defrost thermostat, defrost pressure switch and the defrost control board work together to ensure that the heat pump outdoor coil does not ice excessively during the heating mode.

Compressor Accumulated Run-Time Interval

The defrost control will not energize a defrost cycle unless the unit has been operating in heating mode for an accumulated 60 minutes (default) on 100269-02 boards; 90 minutes (default) on 100269-04 boards. The run time interval can be changed by moving the jumper on the CMC board timing pins. See FIGURE 13.

The defrost interval can be adjusted to 30, 60, or 90 minutes. The defrost timing jumper is factory-installed to provide a 60-minute defrost interval. If the timing selector jumper is not in place, the control defaults to a 90-minute defrost interval.

Defrost Test Option

A TEST option is provided for troubleshooting. The TEST mode may be started any time the unit is in heating mode and the defrost thermostat is closed or jumpered. If the timing jumper is in the TEST position at power-up, the defrost control will ignore the test pins.

When the jumper is placed across the TEST pins for two seconds, the control will enter the defrost mode. If the jumper is removed before an additional 5-second period has elapsed (7 seconds total), the unit will remain in defrost mode until the defrost pressure switch opens or 14 minutes have passed. If the jumper is not removed until after the additional 5-second period has elapsed, the defrost will terminate and the test option will not function again until the jumper is removed and re-applied.

Diagnostic LEDs

The defrost board uses two LEDs for diagnostics. The LEDs flash a specific sequence according to the diagnosis. See TABLE 12.

TABLE 12
Defrost Control Board Diagnostic LED

DS2 Green	DS1 Red	Condition
OFF	OFF	Power
Simultaneous Slow Flash		Normal operation
Alternating Slow Flash		5-min. anti-short cycle delay
Fault and Lockout Codes		
OFF	Slow Flash	Loss-of-Charge Fault
OFF	ON	Loss-of-Charge Lockout
Slow Flash	OFF	High Pressure Fault
ON	OFF	High Pressure Lockout

DEFROST CONTROL BOARD CMC1

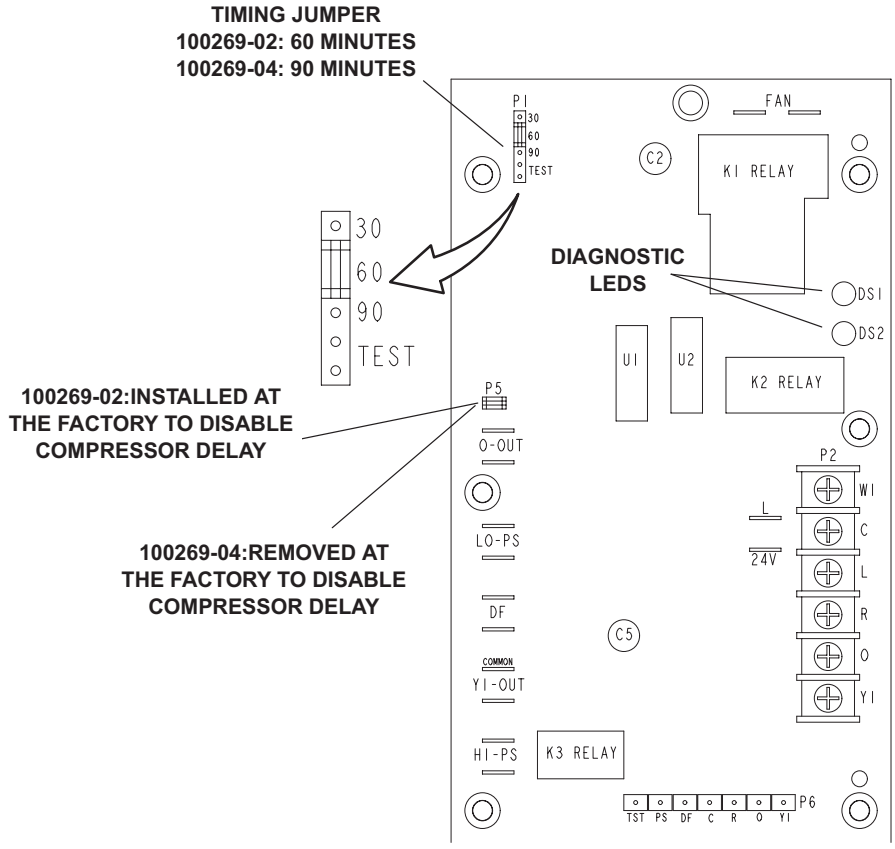


FIGURE 13

Preventative Maintenance / Repair

IMPORTANT MAINTENANCE / REPAIR SAFETY INSTRUCTIONS

Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized.

Work shall be undertaken under a controlled procedure to minimize the risk of a flammable gas or vapor being present while the work is being performed.

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times, the manufacturer’s maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer’s technical department for assistance.

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:

– that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking

– that no live electrical components and wiring are exposed while charging, recovering or purging the system

– that there is continuity of earth bonding

The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:

– the actual REFRIGERANT CHARGE is in accordance with the room size within which the refrigerant containing parts are installed;

– the ventilation machinery and outlets are operating adequately and are not obstructed;

– if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;

– marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;

– refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

During repairs to sealed electrical components, the components shall be replaced. Replacement parts shall be in accordance with the manufacturer’s specifications.

During repairs to intrinsically safe components, the components must be replaced. Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

The unit should be inspected once a year by a qualified service technician.

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

A-Filters

Units are equipped with 20 X 24 X 2” temporary filters which must be replaced prior to building occupation. Refer to local codes or appropriate jurisdiction for approved filters.

To change filters, open filter access panel on back side of unit. See FIGURE 14. Lift filter stop to remove filters. See FIGURE 15.

⚠ WARNING

Units are shipped from the factory with temporary filters. Replace filters before building is occupied. Damage to unit could result if filters are not replaced with approved filters. Refer to appropriate codes.

Approved filters should be checked monthly and replaced when necessary. Take note of air flow direction marking on filter frame when reinstalling filters. See FIGURE 15.

NOTE - *Filters must be U.L.C. certified or equivalent for use in Canada.*

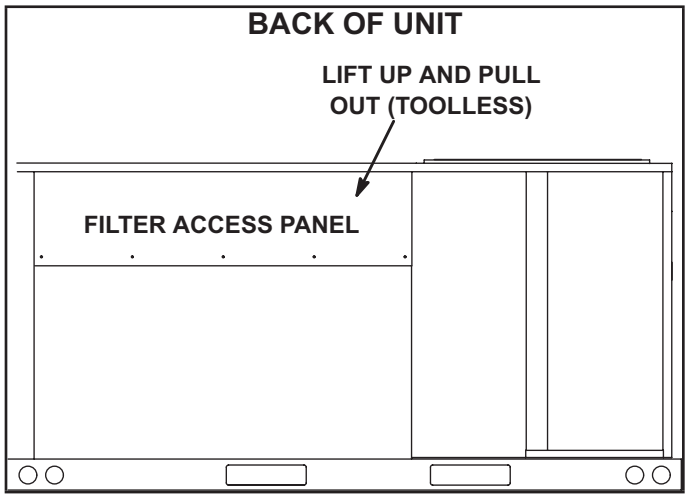


FIGURE 14

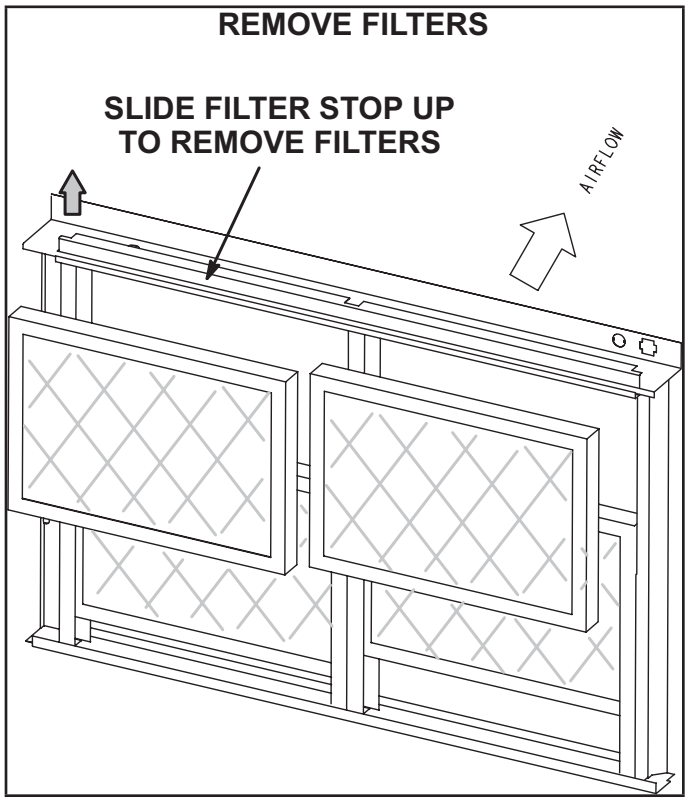


FIGURE 15

B-Lubrication

All motors are lubricated at the factory. No further lubrication is required.

C-Indoor Coil

Inspect and clean coil at beginning of each cooling season. Clean using mild detergent or commercial coil cleaner. Flush coil and condensate drain with water taking care not to get insulation, filters and return air ducts wet.

D-Outdoor Coil

Clean outdoor coil annually with detergent or commercial coil cleaner and inspect monthly during the cooling season.

Outdoor coils are made of single and two formed slabs.

On units with two slabs, dirt and debris may become trapped between the slabs. To clean between slabs, carefully separate coil slabs and wash them thoroughly. See FIGURE 16. Flush coils with water following cleaning.

NOTE - *Remove all screws and gaskets prior to cleaning procedure and replace upon completion.*

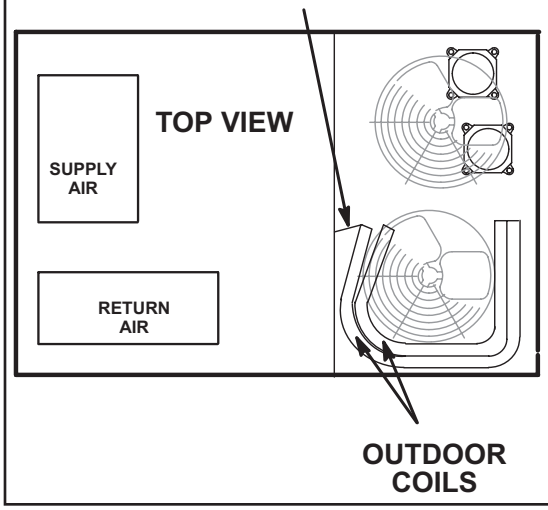
E-Supply Air Blower Wheel

Annually inspect supply air blower wheel for accumulated dirt or dust. Turn off power before attempting to remove access panel or to clean blower wheel.

F-Filter Drier

The unit is equipped with a biflow filter drier. if replacement is necessary, order another of like design.

CLEAN OUTDOOR COIL



1- Remove screws securing coil end plate to mullion.

2- Remove wire ties connecting coils slabs and separate slabs 3-4” (76-102mm).

3- Clean coils with detergent or commercial coil cleaner.

4- Rinse thoroughly with water and reassemble.

5- Secure coil slabs together using field-provided wire ties.

FIGURE 16

G-Replacement Fuses

See the following tables for the proper replacement fuse sizes.

ELECTRIC HEAT REPLACEMENT FUSES				
	Electric Heat	Qty.	Rating	
			Amp	Volt
1	ZIEH0075AN1Y	3	25A	250
2	ZIEH0075AN1G	3	15A	600
3	ZIEH0075AN1J	3	10A	600
4	ZIEH0150AN1Y	3	50A	250
5	ZIEH0150AN1G	3	25A	600
6	ZIEH0150AN1J	3	20A	600
7	ZIEH0225AN1Y	3 ea.	25A / 50A	250
8	ZIEH0225AN1G	3 ea.	15A / 25A	600
9	ZIEH0225AN1J	3 ea.	20A / 10A	600
10	ZIEH300AN1Y	6	50A	250
11	ZIEH300AN1G	6	25A	600
12	ZIEH300AN1J	6	20A	600
13	ZIEH0450AN1Y	3 / 6	50A / 60A	250
14	ZIEH0450AN1G	3 ea.	25A / 50A	600
15	ZIEH0450AN1J	3 ea.	20A / 40A	600
16	ZIEH0600AN1Y	12	60A	250
17	ZIEH0600AN1G	6	50A	600
18	ZIEH0600AN1J	6	40A	600

TABLE 13

ZHD 092													
Electric Heat Size			7.5 KW						15 KW					
Unit Voltage			208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph		208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Power Exhaust Option			W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.
Diagram Key	Class	Blower HP	Amps						Amps					
F4	RK or K	2HP	50	50	25	25	20	20	50	50	25	25	20	20
F4	RK or K	3HP	50	50	25	25	20	20	50	50	25	25	20	20
F4	RK or K	5HP	60	60	30	30	25	25	60	60	30	30	25	25

TABLE 14

ZHD 092 continued														
Electric Heat Size			22.5 KW						30 KW					
Unit Voltage			208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph		208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Power Exhaust Option			W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.
Diagram Key	Class	Blower HP	Amps						Amps					
F4	RK or K	2HP	50	50	25	25	20	20	50	50	25	25	20	20
F4	RK or K	3HP	50	50	25	25	20	20	50	50	25	25	20	20
F4	RK or K	5HP	60	60	30	30	25	25	60	60	30	30	25	25

TABLE 15

ZHD 092 continued								
Electric Heat Size			45 KW					
Unit Voltage			208/230V - 3 Ph		460V - 3Ph		575V - 3Ph	
Power Exhaust Option			W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.
Diagram Key	Class	Blower HP	Amps					
F4	RK or K	2HP	50	50	25	25	20	20
F4	RK or K	3HP	50	50	25	25	20	20
F4	RK or K	5HP	60	60	30	30	25	25

TABLE 16

ZHD 102														
Electric Heat Size			7.5 KW						15 KW					
Unit Voltage			208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph		208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Power Exhaust Option			W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.
Diagram Key	Class	Blower HP	Amps						Amps					
F4	RK or K	2HP	50	50	25	25	20	20	50	50	25	25	20	20
F4	RK or K	3HP	50	50	25	25	20	20	50	50	25	25	20	20
F4	RK or K	5HP	60	60	30	30	25	25	60	60	30	30	25	25

TABLE 17

ZHD 102 continued														
Electric Heat Size			22.5 KW						30 KW					
Unit Voltage			208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph		208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Power Exhaust Option			W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.
Diagram Key	Class	Blower HP	Amps						Amps					
F4	RK or K	2HP	50	50	25	25	20	20	50	50	25	25	20	20
F4	RK or K	3HP	50	50	25	25	20	20	50	50	25	25	20	20
F4	RK or K	5HP	60	60	30	30	25	25	60	60	30	30	25	25

TABLE 18

ZHD 102 continued								
Electric Heat Size			45 KW					
Unit Voltage			208/230V - 3 Ph		460V - 3Ph		575V - 3Ph	
Power Exhaust Option			W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.
Diagram Key	Class	Blower HP	Amps					
F4	RK or K	2HP	50	50	25	25	20	20
F4	RK or K	3HP	50	50	25	25	20	20
F4	RK or K	5HP	60	60	30	30	25	25

TABLE 19

ZHD 120								
Electric Heat Size			15 KW					
Unit Voltage			208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Power Exhaust Option			W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.
Diagram Key	Class	Blower HP	Amps					
F4	RK or K	2HP	60	60	30	25	25	20
F4	RK or K	3HP	60	60	30	30	25	25
F4	RK or K	5HP	70	70	30	30	25	25

TABLE 20

ZHD 120 continued														
Electric Heat Size			22.5 KW						30 KW					
Unit Voltage			208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph		208/230V - 3 Ph		460V - 3 Ph		575V - 3 Ph	
Power Exhaust Option			W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.
Diagram Key	Class	Blower HP	Amps						Amps					
F4	RK or K	2HP	60	60	30	25	25	20	60	60	30	25	25	20
F4	RK or K	3HP	60	60	30	30	25	25	60	60	30	30	25	25
F4	RK or K	5HP	70	70	30	30	25	25	70	70	30	30	25	25

TABLE 21

ZHD 120 continued														
Electric Heat Size			45 KW						60 KW					
Unit Voltage			208/230V - 3 Ph		460V - 3Ph		575V - 3Ph		208/230V - 3 Ph		460V - 3Ph		575V - 3Ph	
Power Exhaust Option			W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.	W / P.E.	W / O P.E.
Dia-gram Key	Class	Blower HP	Amps											
F4	RK or K	2HP	60	60	30	25	25	20	60	60	30	25	25	20
F4	RK or K	3HP	60	60	30	30	25	25	60	60	30	30	25	25
F4	RK or K	5HP	70	70	30	30	25	25	70	70	30	30	25	25

Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely.

Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before starting decommissioning.

a) Become familiar with the equipment and its operation.

b) Isolate system electrically.

c) Before attempting the procedure, ensure that:

- mechanical handling equipment is available, if required, for handling refrigerant cylinders;
- all personal protective equipment is available and being used correctly;
- the recovery process is supervised at all times by a competent person;
- recovery equipment and cylinders conform to the appropriate standards.

d) Pump down refrigerant system, if possible.

e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.

f) Make sure that cylinder is situated on the scales before recovery takes place.

g) Start the recovery machine and operate in accordance with instructions.

h) Do not overfill cylinders (no more than 80% volume liquid charge).

i) Do not exceed the maximum working pressure of the cylinder, even temporarily.

j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.

k) Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked.

⚠ IMPORTANT

Equipment shall be labelled stating that it has been decommissioned and emptied of refrigerant. The label shall be signed and dated. Ensure that there are labels on the equipment that state the flammability of the refrigerant used.

START-UP REPORT

Job Name:_____

Store No._____Start-Up Date:_____

Address:_____

City:_____State:_____

Start-Up Contractor:_____

Technician:_____

Model No.:_____

Serial No.:_____

RTU No.:_____ Catalog No.:_____

Inspections and Checks

Damage? Yes No R454B ☐

If yes, reported to:_____

_____

Verify factory and field-installed accessories.

Check electrical connections. Tighten if necessary.

Supply voltage: L1-L2_____L1-L3_____L2-L3_____

If unit contains a 208-230/240 volt transformer:
Check primary transformer tap ☐
Transformer secondary voltage: _____

Cooling Checks

Compressor Rotation ☐ Ambient Temp._____Return Air Temp._____ Supply Air Temp._____

	Compressor Amps			Compressor Volts			Pressures		Condenser Fan Amps			CC Heater Amps
	L1	L2	L3	L1-L2	L1-L3	L2-L3	Disch.	Suct.	L1	L2	L3	L1
1												
2												
3												
4												

Blower Checks

Pulley/Belt Alignment ☐ Blower Rotation ☐
Set Screws Tight ☐ Belt Tension ☐

Nameplate Amps:_____ Volts:_____

Motor	Amps	Volts
	L1_____	L1-L2_____
	L2_____	L1-L3_____
	L3_____	L2-L3_____

Heating Checks - Gas

Fuel type: Nat. ☐ LP ☐ Inlet Pressure:_____in. w.c.

Return Air Temp.:_____ Supply Air Temp.:_____

Altitude:_____ Primary Limits Operate: ☐

CO_2%:

Gas Valve	Manifold Pressure	
	Low Fire	High Fire
GV1		
GV2		

Control Type

Heating Checks - Electric

Return Air Temp.:_____ Supply Air Temp.:_____
Limits Operate: ☐

	Amps						
	L1	L2	L3		L1	L2	L3
1				10			
2				11			
3				12			
4				13			
5				14			
6				15			
7				16			
8				17			
9				18			

Accessory Checks

Power Exhaust Amps

1 _____ 2 _____ None ☐

Economizer Operation

Min. Pos. ☐ Motor travel full open/close ☐