YORK®	DEDICATED OUTSIDE AIR SYSTEMS (DOAS)	
OPERATION, MAINTENANCE, SERVICE	Supersedes: 100.55-NOM1 (1214)	Form 100.55-NOM1 (915)

MODELS JDHA AND JDMA

MODEL JDHA

MODEL JDMA

R-410A

DANGER

This unit contains R-410A high pressure refrigerant. Hazards exist that could result in personal injury or death. Installation, maintenance, and service should only be performed by an HVAC technician qualified in R-410A refrigerant and using proper tools and equipment. Due to much higher pressure of R-410A refrigerant, DO NOT USE service equipment or tools designed for R22 refrigerant.

IMPORTANT: Do not release refrigerant to the atmosphere! If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified HVAC technician.

Issue Date:
September 29, 2015

Table of Contents

1.0 General

This booklet includes operation, maintenance, and service information for Model JDHA and Model JDMA. Before beginning any procedure, carefully review the information, paying particular attention to the warnings. Handling of refrigerant should only be performed by a certified HVAC technician with knowledge of the requirements of R-410A refrigerant and in compliance with all codes and requirements of authorities having jurisdiction.

Definitions of Hazard Intensity Levels used in this Manual

There are warning labels on the unit and throughout this manual. For your safety, comply with all warnings during installation, operation, and service of this system. See definitions of Hazard Intensity Levels of warnings below.

HAZARD INTENSITY LEVELS

1. **DANGER:** Failure to comply will result in severe personal injury or death and/or property damage.
2. **WARNING:** Failure to comply could result in severe personal injury or death and/or property damage.
3. **CAUTION:** Failure to comply could result in minor personal injury and/or property damage.

2.0 Maintenance Requirements

To ensure long life and satisfactory performance, a system that is operating under normal conditions should be inspected according to the Maintenance Schedule in Paragraph 2.1. If in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent inspection is recommended.

Refer to the illustration in **FIGURE 1**, shown on page 4 and follow the instructions in the paragraphs referenced below to maintain this equipment. Maintenance requirements apply to all Models and Sizes unless noted.

IMPORTANT: Do not release refrigerant to the atmosphere! If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified HVAC technician familiar with R-410A refrigerant.

WARNING

Lock power OFF before performing any maintenance procedure (except where power is required such as checking refrigerant pressure and temperature). Lock disconnect switch in OFF position. If the system has a gas heat section, when you turn off the power supply, turn off the gas. See Hazard Levels on page 2.

If replacement parts are required, use only factory-authorized parts. For information, contact your local distributor.

2.1 Maintenance Schedule

Monthly

- □ Inspect all filters; clean or replace as needed. See Paragraph 3.1.
- □ Inspect the cooling coil condensate drain; clean as needed. For information, see Paragraph 3.5.

Annually

All Models - Beginning of the cooling season or more frequently in year-round cooling climate:

- □ Inspect the wiring for any damaged wire. Replace damaged wiring.
- □ Inspect the cooling coil condensate drain pan. Clean the coil cabinet, clean the drain pan, and fill the trap.
- □ Inspect/clean condenser fans. See Paragraph 3.4.
- □ Inspect/clean all coils. See Paragraph 3.5.
- □ Check refrigerant temperatures and pressures (superheat and subcooling). These checks are done when the unit is operating. See Paragraph 3.6.
- □ Check compressor operation. See Paragraph 3.7.

Systems with the Optional energy recovery wheel: See Paragraph 4.0.

- □ Inspect the wheel and clean as needed.
- □ Check wheel RPM and drive components.
- □ Check wheel seals.

Systems with the Optional gas heat section (beginning of the heating season) - See Paragraph 5.0:

- □ Clean all dirt and grease from the combustion air openings and the venter assembly.
- □ Check the heat exchanger, burner, and venter for scale, dust, or lint accumulation. Clean as needed.
- □ Check the gas valves to ensure that gas flow is being shutoff completely.

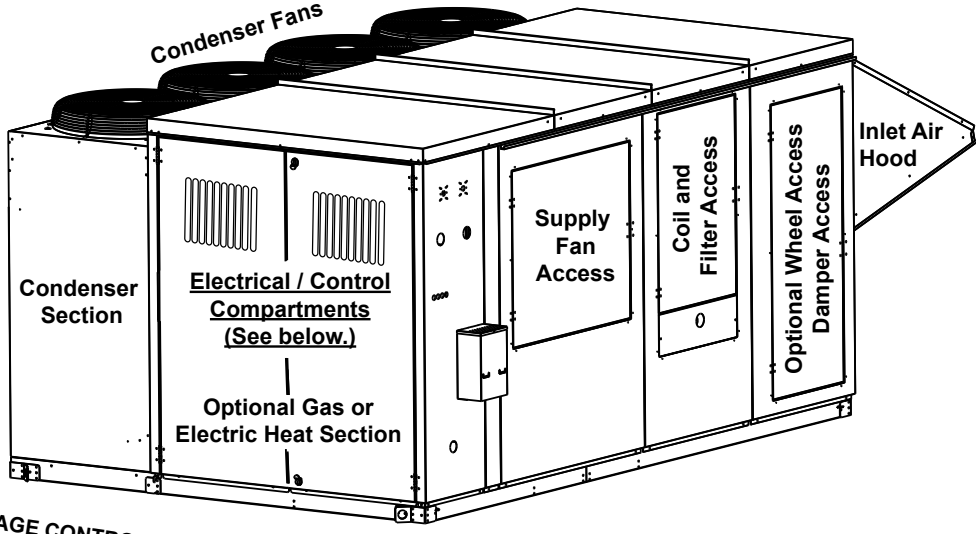
Systems with the Optional electric heat section (beginning of the heating season) - See Paragraph 6.0:

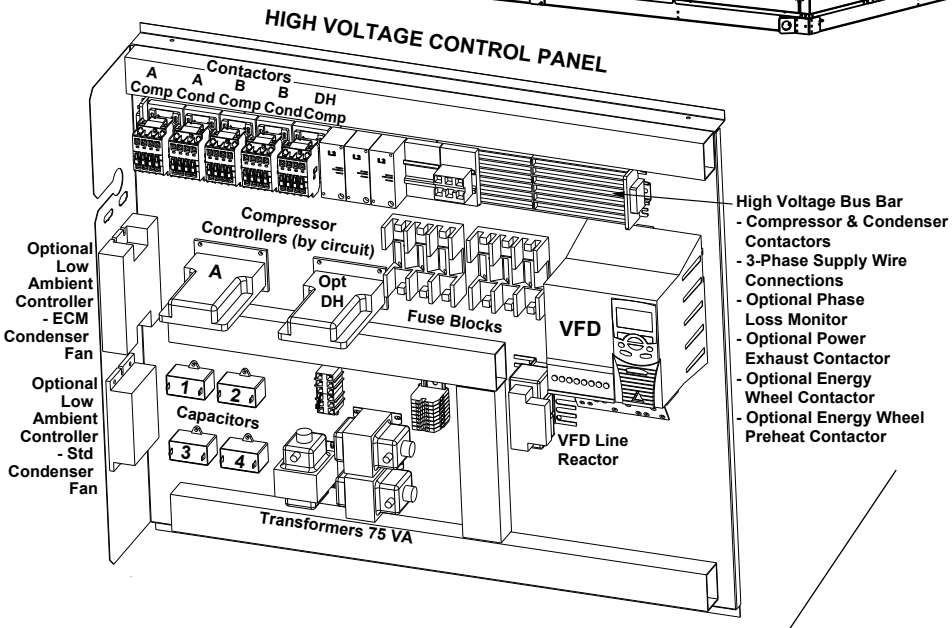
- □ Check wiring connections.
- □ Check the heat section and elements for dust or lint accumulation. Clean as needed.

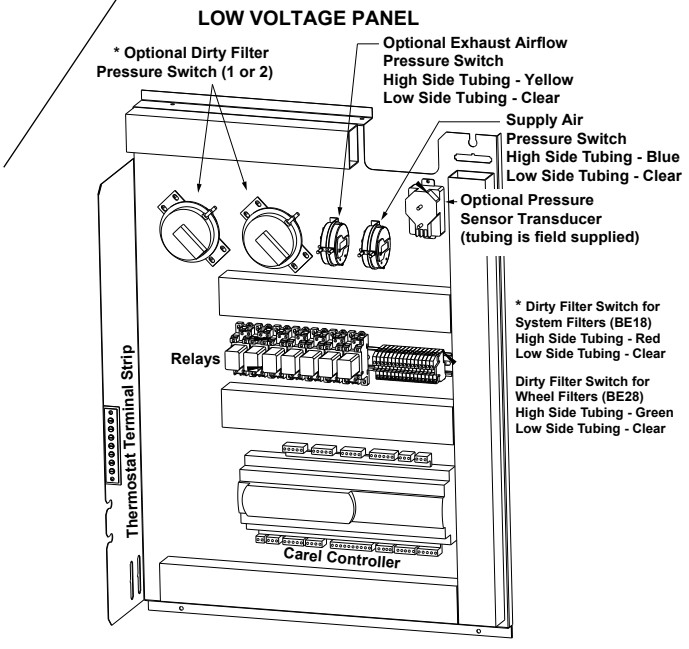
2.0 Maintenance Requirements (cont'd)

2.2 Control Locations

FIGURE 1 - Access Doors and High and Low Voltage Control Locations







Gas Heat Section Controls

Ignition controller and combustion air pressure switch are located on the side wall next to the gas manifold and burner. See **FIGURE 23**, page 32.

2.3 Cabinet Size 1 or 2 by Model & Size Cross-Referenced to Heat Section Size & Type

Model		JDHA									JDMA									
Size		60	90	120	150	180	210	240	300	360	60	90	120	150	180	210	240	300	360	
Nominal Cooling Capacity (Tons)		5	7.5	10	12.5	15	17.5	20	25	30	5	7.5	10	12.5	15	17.5	20	25	30	
	Opt Code																			Opt Code
Standard Efficiency Gas Heat Section	H50	1	1	1	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	H50
	H75	1	1	1	1	2	--	--	--	--	1	1	1	--	--	--	--	--	--	H75
	H100	1	1	1	1	2	2	2	--	--	1	1	1	1	--	--	--	--	--	H100
	H102*	1	1	1	1	2	2	2	--	--	1	1	1	1	--	--	--	--	--	H102*
	H125*	1	1	1	1	2	2	2	--	--	1	1	1	1	2	--	--	--	--	H125*
	H150*	1	1	1	1	2	2	2	--	--	1	1	1	1	2	2	--	--	--	H150*
	H175*	1	1	1	1	2	2	2	--	--	1	1	1	1	2	2	2	--	--	H175*
	H200	--	1	1	1	2	2	2	3	3	1	1	1	1	2	2	2	3	3	H200
	H202*	--	1	1	1	2	2	2	3	3	1	1	1	1	2	2	2	3	3	H202*
	H300	--	1	1	1	2	2	2	3	3	--	1	1	1	2	2	2	3	3	H300
	H400	--	--	1	1	2	2	2	3	3	--	--	1	1	2	2	2	3	3	H400
	H402*	--	--	1	1	2	2	2	3	3	--	--	1	1	2	2	2	3	3	H402*
	H502*	--	--	--	--	2	2	2	3	3	--	--	--	--	2	2	2	3	3	H502*
	H602*	--	--	--	--	2	2	2	3	3	--	--	--	--	2	2	2	3	3	H602*
	H702*	--	--	--	--	--	--	--	3	3	--	--	--	--	--	--	--	3	3	H702*
	H802*	--	--	--	--	--	--	--	3	3	--	--	--	--	--	--	--	3	3	H802*
High Efficiency Gas Heat Section	G150	1	1	1	1	2	2	2	--	--	1	1	1	1	2	2	2	--	--	G150
	G225	1	1	1	1	2	2	2	3	3	1	1	1	1	2	2	2	3	3	G225
	G300	--	1	1	1	2	2	2	3	3	--	--	1	1	2	2	2	3	3	G300
	G302*	--	1	1	1	2	2	2	3	3	--	--	1	1	2	2	2	3	3	G302*
	G372*	--	--	--	--	2	2	2	3	3	--	--	--	--	2	2	2	3	3	G372*
	G452*	--	--	--	--	2	2	2	3	3	--	--	--	--	2	2	2	3	3	G452*
	G525*	--	--	--	--	--	--	--	3	3	--	--	--	--	--	--	--	3	3	G525*
	G602*	--	--	--	--	--	--	--	3	3	--	--	--	--	--	--	--	3	3	G602*
Electric Heat Section	E20	1	1	1	1	2	2	2	--	--	1	1	1	1	2	2	2	--	--	E20
	E30	1	1	1	1	2	2	2	3	3	1	1	1	1	2	2	2	3	3	E30
	E40	--	1	1	1	2	2	2	3	3	--	1	1	1	2	2	2	3	3	E40
	E50	--	1	1	1	2	2	2	3	3	--	1	1	1	2	2	2	3	3	E50
	E60	--	1	1	1	2	2	2	3	3	--	1	1	1	2	2	2	3	3	E60
	E70	--	--	1	1	2	2	2	3	3	--	--	1	1	2	2	2	3	3	E70
	E80	--	--	1	1	2	2	2	3	3	--	--	1	1	2	2	2	3	3	E80
	E90	--	--	1	1	2	2	2	3	3	--	--	1	1	2	2	2	3	3	E90
	E120	--	--	--	--	2	2	2	3	3	--	--	--	--	2	2	2	3	3	E120

* Gas heat sections with dual furnaces.

3.0 Maintenance and Service Procedures - Unit & Cooling Components

3.1 Filters

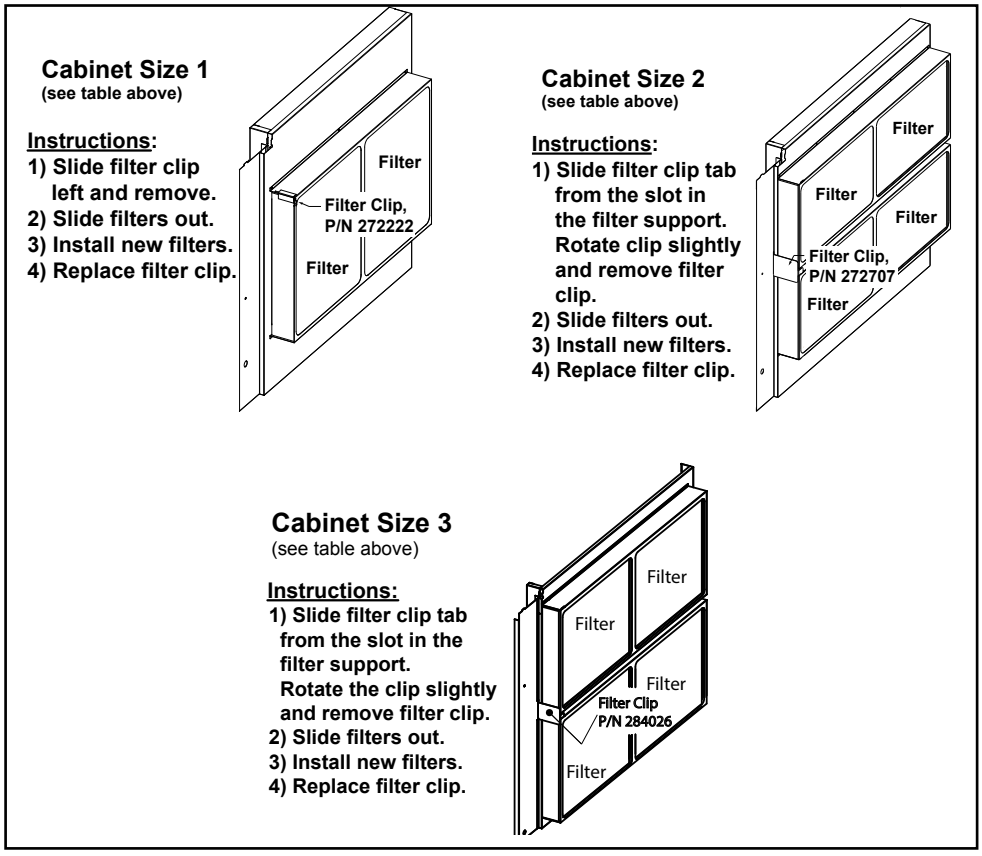
Systems with disposable filters require more frequent filter inspection. Exposure to humid makeup air can accelerate filter degradation. Replace filters when needed using the same type of filters as the original.

Supply Air Filters - The supply air filters are 4-inch pleated disposable filters. Replacement filters are listed in the table below. Do not use any other type of filters.

Replacement Filters by Model Size and Cabinet Size			4" Disposable Pleated		MERV 8	MERV 13
Cabinet Size	Model(s)	Model Sizes	Qty	Size	P/N	P/N
1	JDHA & JDMA	060	1	16 x 25	211128	256666
		090, 120, 150	2	20 x 24	222480	260828
2	JDHA & JDMA	180, 210, 240	4	16 x 25	211128	256666
3	JDHA & JDMA	300 & 360	4	25 x 29	235757	235758

To access supply air filters, open the cooling coil / filter door. Follow the instructions that apply.

FIGURE 2 - Installing Replacement Supply Air Filters



3.1 Filters (cont'd)

Energy Recovery Wheel Filters - The energy recovery wheel has two 1-inch filters in both the supply and exhaust airstreams. Replacements are listed below. Size of filter is determined by CFM. Permanent filters may be washed and dried and re-used.

To access filters, open the wheel door. Slide the filters out of the filter racks.

Do not operate the system without filters in place.

Filter Application by Cabinet & ER Wheel Sizes

Cabinet Size	ER Wheel Size	Model	Model Size	Qty	Filter Size	1" Permanent P/N
1	30" dia	JDHA & JDMA	060, 090, 120, 150	4	16 x 16	104102
	36" dia		090, 120, 150	4	20 x 20	101608
2	36" dia	JDHA & JDMA	180, 210, 240	4	20 x 25	101610
	46" dia	JDHA & JDMA	180, 210, 240	4	25 x25	119779
3	52"dia	JDHA	300, 360	4	16 x 20	101607
				4	20 x 20	101608
				2	16 x 25	101609
				2	20 x 25	101610
	58"dia	JDHA & JDMA	300, 360	4	16 x 20	101607
				4	20 x 20	101608
				2	16 x 25	101609
				2	20 x 25	101610

Dirty Filter Switch (Options BE18 or BE28)

Systems may be equipped with a dirty filter pressure switch (Option BE18) that will trigger an alarm when the resistance through the inlet air filters indicates that filter replacement is required. Systems with an energy recovery wheel may be equipped with two dirty filter pressure switches (Option BE28), one for the inlet air filters and one for the energy recovery wheel supply filters.

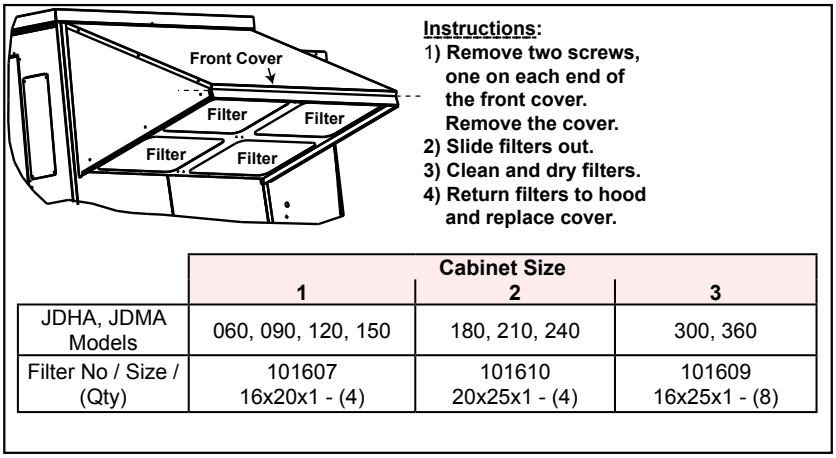
When performing maintenance, check the condition of the sensing tubes to be sure that they are not blocked. Check the wiring connections. To set a new dirty filter switch, see Installation/Operation Manual (Doc No 300537), Paragraph 8.3. Replacement switch is **P/N 105507**.

Permanent Filters in the Outside Air Hood (Option AS16)

If equipped with an outside air hood, there are 1" permanent, aluminum filters at the entrance of the hood. The filters act as a moisture eliminator and bird screen. See **FIGURE 3**, shown below. When inspecting the inlet air filters, inspect the outside air hood filters. If cleaning is needed, remove the filters, clean, rinse, dry and re-install.

NOTE: If it is more convenient to keep an extra clean set of filters, filter sizes and part numbers are listed below.

FIGURE 3 - Removing and Installing Filters in the Outside Air Hood



	Cabinet Size 1	2	3
JDHA, JDMA Models	060, 090, 120, 150	180, 210, 240	300, 360
Filter No / Size / (Qty)	101607 16x20x1 - (4)	101610 20x25x1 - (4)	101609 16x25x1 - (8)

3.0 Maintenance and Service Procedures - Unit & Cooling Components (cont'd)

3.2 Supply Fan and Variable Frequency Drive

Fan motors are permanently lubricated; lubrication is not required, During maintenance, remove any accumulation of dirt and grease. The fan CFM was checked and balanced at startup. To recheck, follow the instructions in the Installation/Operation manual, Doc No 300537, Paragraph 10.3.

If service is required, the supply fan is mounted on a sled that will slide out of the cabinet.

Supply fan in "slide out" position

Instructions for sliding out the supply fan:

1. Turn off the power and lock the disconnect switch.
2. Open the supply fan door and the cooling cabinet door.
3. The flexible duct joining the supply fan to the cooling compartment is visible. Locate the metal flange holding the duct to the cabinet. Remove the two screws from fan sled (locations shown in picture on the left) and the flange to free the duct so that it can be slid out with the fan.
4. Open the electrical box on the fan. Mark and disconnect the wires.
5. Carefully slide the complete fan sled out of the cabinet.
6. When service is complete, slide the sled into the cabinet. Re-connect the wires and re-attach the flange to hold the flexible duct in place. If the pressure tube was removed during service, be sure to re-attach it securely. Reinstall two screws into the fan sled.

Variable Frequency Drive

Function: When the main controller calls for supply fan operation, a variable frequency drive (VFD) responds to operate the motor.

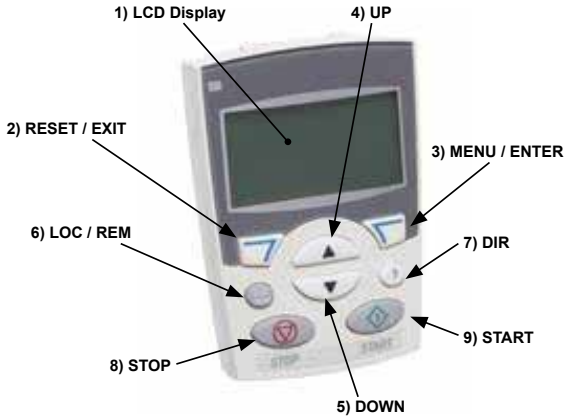
The VFD is located on the high voltage electrical panel (See **FIGURE** 1, page 4). Control of the variable frequency drive module is dictated by the main controller, and depending on what was ordered, can function in response to temperature, CO_2, or pressure controls. !

Service: Remove any dirt or dust. Check the wire connections. If a VFD needs to be replaced, use a factory-authorized replacement designed for the application.

FIGURE 4 - VFD Display

Variable Frequency Drive Model ACS550

Variable Frequency Drive Model ACS355



Code	Control Panel Display	
1	LCD display - Divided into 5 areas	Upper left - Control location
		Upper right - unit of the displayed value
		Center - Parameters and signal values, menus and alarm codes
		Lower left and center - Operation state
		Lower right - Motor rotation
2	RESET / EXIT	Resets faults and exits to higher menus
3	MENU / ENTER	Menu selection and saves value
4	UP	Scrolls up through menu / list
		Increases value of parameters or reference values
5	DOWN	Scrolls down through menu / list
		Decreases value of parameters or reference values
6	LOC / REM - VFD controlled by main controller	
7	DIR - Changes the direction of the motor	
8	STOP - Stops the drive	
9	START - Starts the drive	

3.0 Maintenance and Service Procedures - Unit & Cooling (cont'd)
3.2 Supply Fan and Variable Frequency Drive (cont'd)

Air Proving Switch P/N 234712 Set Point 0.10 I.W.C.

Function: The airflow proving switch is a pressure switch that verifies to the main controller that the supply fan is operating. If equipped with power exhaust or an energy recovery wheel, there is a second air proving switch that verifies the exhaust fan is operating. See location in **FIGURE 1**, page 4.

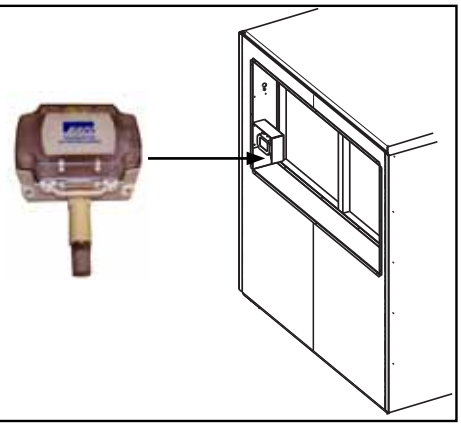
Service: If a switch needs to be replaced, use a factory-authorized replacement designed for the application.

Outside Air Humidity and Temperature Sensor

Function: All systems have an outside air humidity and temperature sensor in the outside air inlet. The sensor is wired to the system controller in the electrical compartment.

Service: Check the wiring. If the sensor needs replaced, use a factory-authorized replacement designed for the application.

FIGURE 5 - Outdoor Air Sensor, P/N 222754, is mounted in the outside air inlet (behind the hood)



3.3 Optional Dampers and Damper Actuator

Inlet Air Dampers

Location: Dampers and damper motors are located in the inlet air opening.
Function: Dampers operate in response to a variety of controls (GF Options).
Service: Clean dampers and controls of dust and dirt.

2-Position Damper Actuator (Options AR7, AR8, AR2D, AR2L, AR2Y)

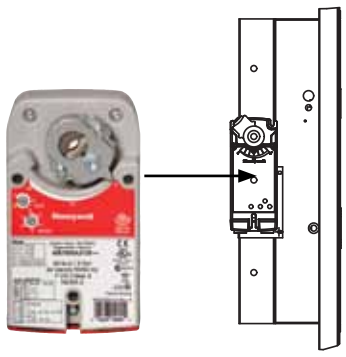
Function: The 2-position damper motor opens and closes the dampers in response to unit operation or a field-supplied time clock. The motor closes the dampers on heater shutdown.

Modulating Damper Actuator (Options AR25, AR2G, AR2H, AR2M)

Function: The modulating damper motor actuates the dampers in response to the selected control with actuation from input switch settings.
The motor closes the inlet dampers on heater shutdown.

Service: Other than external cleaning, there is no service required on the dampers or the damper motor. If the damper, control, or motor need to be replaced, replace with a factory-authorized replacement.
For additional information on damper controls (Options GF 1-9), see the system Installation/Operation manual, Doc No 300537.

FIGURE 6 - Damper Actuator is mounted on the damper frame and is accessible through the Damper Access Door (See FIGURE 1, page 4).

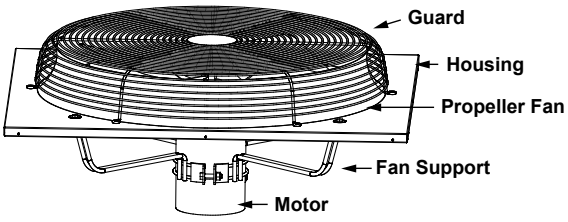


3.0 Maintenance and Service Procedures - Unit & Cooling (cont'd)

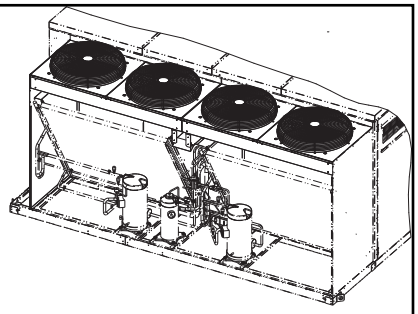
3.4 Condenser Fans

Depending on the model size, there are two or four condenser fans. Fan motors may be either standard efficiency or ECM speed control. If parts need to be replaced, use only factory authorized replacement parts.

FIGURE 7 - Condenser Fans



Condenser Fan Section Assembly



3.5 Coils and Related Cooling Components

The DX cooling system is equipped with copper finned coils. Inspect all cooling system coils at the beginning of the cooling season or more often if needed. Follow the cleaning instructions below. If additional cleaning is required or if a coil must be removed for any reason, consult the factory. Be prepared to provide rating plate and specific installation information.

Condensing Coil Access - The condensing coils are visible on the side of the unit (below the condenser fans).

Condenser Coil Cleaning Instructions

1. Verify that the electrical power has been turned off and the disconnect switch locked.
2. Use a soft brush to remove any dirt and debris from the coils.
3. Spray with cold or warm (not hot) water and a cleaning solution (non-acid based coil cleaner is recommended). Due to possible damage to the coil, **DO NOT** use high pressure spray.
4. When clean, rinse with cool, clean water.

Evaporator Coil Access - The evaporative coils can be accessed by opening the coil cabinet door.

Inspect coils for debris, dirt, grease, lint, pollen, mold, or any element which would obstruct heat transfer or airflow. Inspect coils and tubing for physical damage. Inspect feeders, piping connections, coil headers, and return bends for signs of fatigue, rubbing, and physical damage.

Clean the coils annually, or more often if needed. Use the proper tools and follow the instructions carefully to avoid damaging the coil. Use of a non-acid based coil cleaner is recommended. Due to possible damage to the coil, **DO NOT** use high pressure spray.

Evaporator Coil Cleaning Instructions:

1. Verify that the electrical power has been turned off and the disconnect switch locked.
2. Open the cooling coil door.
3. Use a soft brush to remove any dirt and debris from both sides of the coil.
4. Spray with cold or warm (not hot) water and a cleaning solution (non-acid based coil cleaner is recommended). Due to possible damage to the coil, **DO NOT** use high pressure spray. First spray the leaving airflow side, then the inlet airflow side.

   As much as possible, spray the solution perpendicular to the face of the coil.

   Follow the instructions on the cleaning solution. When cleaning process is complete, rinse both sides with cool, clean water.

3.5 Coils and Related Components (cont'd)

Condensate Drain Use and Maintenance

Seasonal Usage - At the beginning of the cooling season, inspect and clean the entire cooling coil cabinet including the condensate drain pan. Thoroughly clean dirt, algae, grease, and other contaminants. Inspect condensate drain pan, trap, and piping; fill trap with water to ensure proper operation. During a wintertime shutdown of the cooling system, it may be desirable to disconnect and remove all water from the trap and drain to prevent freeze damage. If local building codes permit, trap may be filled with an antifreeze solution. Or, piping may be designed with freeze plugs or other freeze protection methods (such as a heat tape).

Year Round Usage - Climates or applications with cooling requirements year round require more frequent inspections of the cooling coil cabinet and condensate drains. Depending on climate, freeze protection of the trap may be required during non-cooling days.

Thermostatic Expansion Valves

All refrigeration circuits have a thermostatic expansion valve. Thermostatic expansion valves do not have replaceable parts. If a replacement valve is required, it must be for R-410A refrigerant and must be sized correctly for the application. All refrigerant service should be performed by a service technician qualified in R-410A refrigerant.

Replacement valve P/N's by Model, size, and circuit are listed in the table. Locations are shown in **FIGURES 8** through **14**, shown on pages 11 through 14.

Thermostatic Expansion Valve

Thermostat Expansion (TXV) Valves by Circuit and P/N				
Model / Size	**A**	**B**	**DH - Low Enthalpy**	**DH - High Enthalpy**
JDHA & JDMA 060	234987	--	207303	--
JDHA 090	220556	--	--	207303
JDMA 090	220556	--	207303	--
JDHA & JDMA 120	234987	234987	--	207303
JDHA & JDMA 150	220555	220555	--	207303
JDHA & JDMA 180	220555	220555	207303	234960
JDHA & JDMA 210	220556	220556	207303	234960
JDHA & JDMA 240	220556	220556	207303	234960
JDHA & JDMA 300	261175	221175	234960	235729
JDHA & JDMA 360	220558	220558	234960	235729

Refrigerant Circuits - Standard Cooling without Optional Bypass Valve or Reheat

FIGURE 8 - Cooling Circuit - Models JDHA and JDMA Sizes 060 and 090

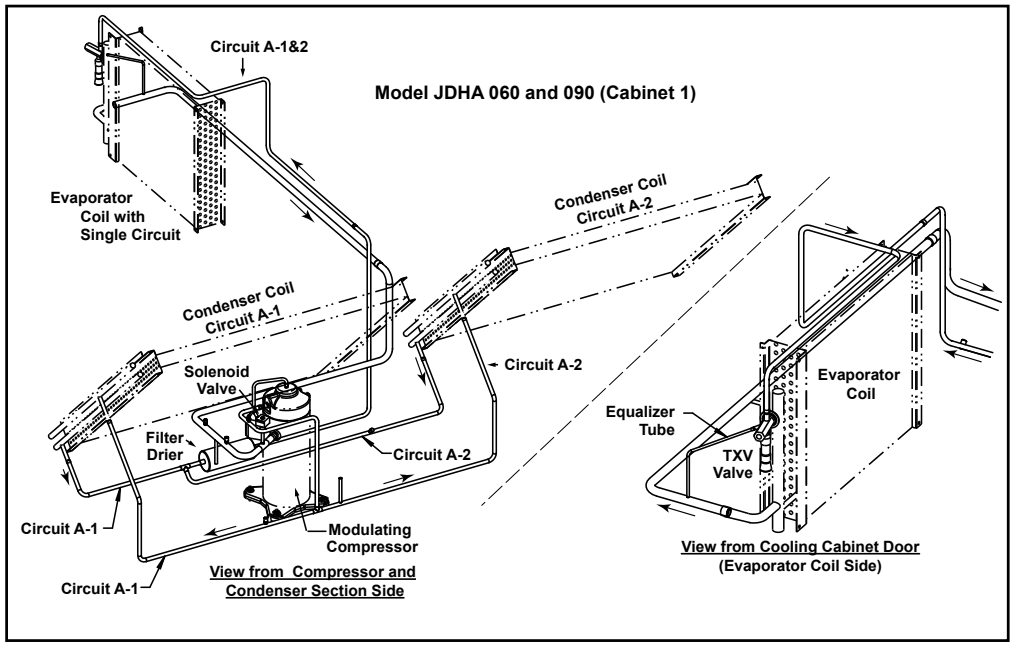


FIGURE 9 - Cooling Circuits - Models JDHA and JDMA Sizes 120 and 150

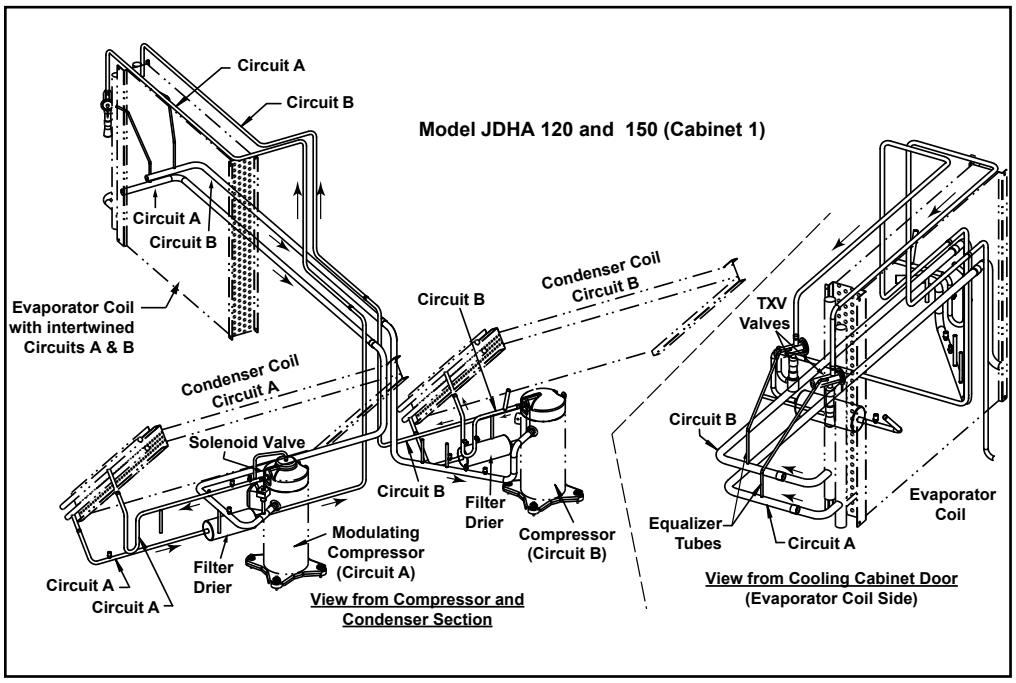


FIGURE 10 - Cooling Circuits - Models JDHA and JDMA Sizes 180, 210, and 240

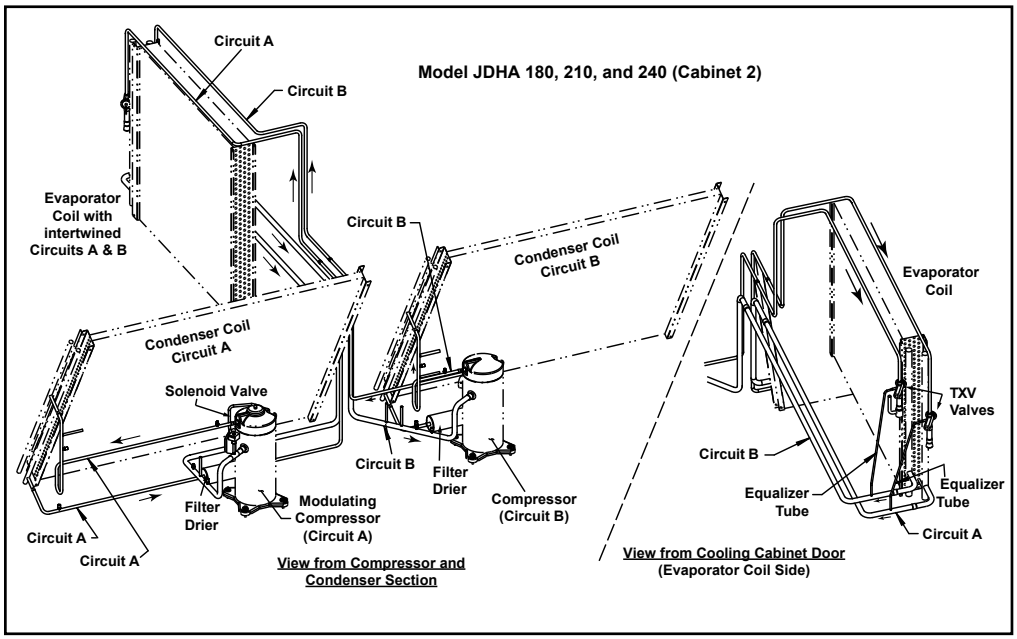
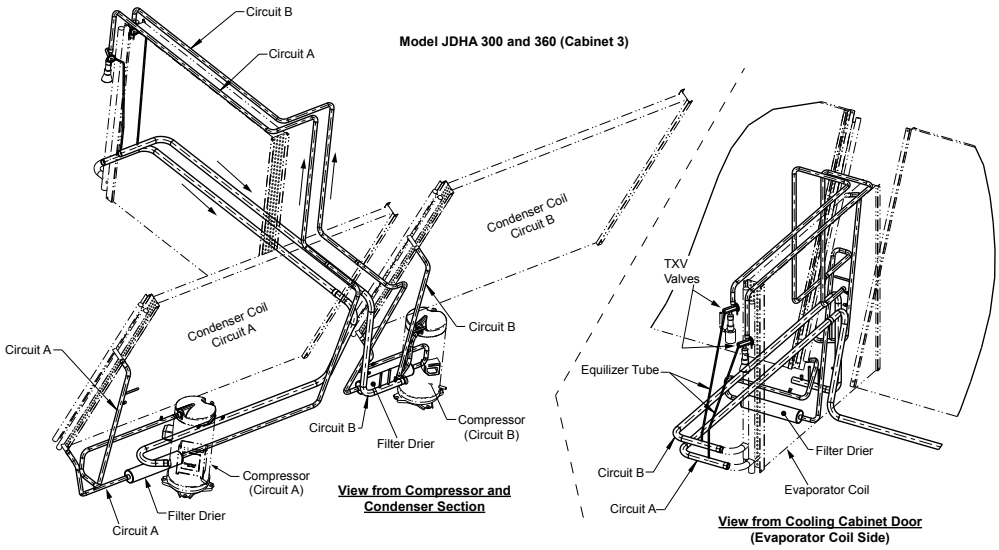


FIGURE 12 - Cooling Circuits - Models JDHA and jDMA Sizes 300 and 360



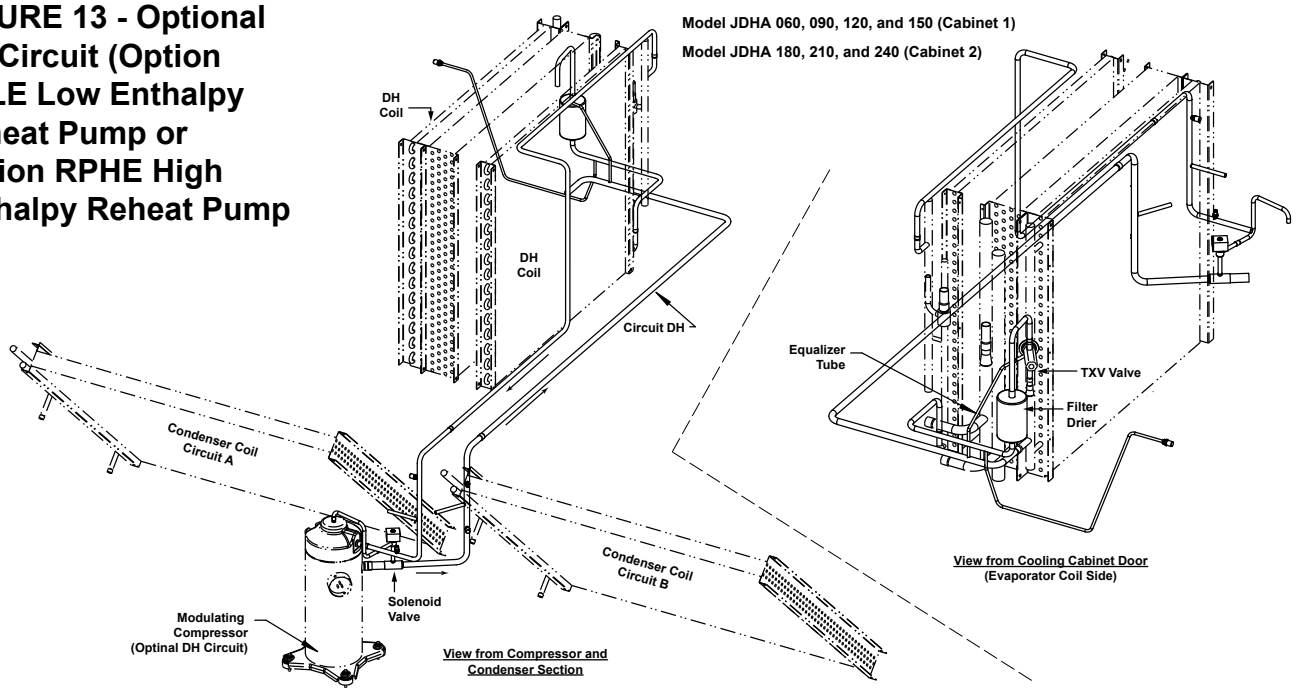
Optional Modulating Reheat (Low Enthalpy Option RPLE or High Enthalpy Option RPHE)

Function: Units equipped with optional reheat have a dedicated refrigerant system (DH circuit) that precools the incoming air then directly uses the condenser waste heat to reheat the air after it passes through the DX cooling coil. The reheat system precooling evaporator coil is upstream of the main evaporator coil and the reheat condenser coil is downstream. The upstream "precool" coil tempers outside air and lowers the wet bulb depression of the air entering the main evaporator coil. The heat removed at the precool coil is rejected to the downstream "reheat" coil.

Operation of the DH circuit is controlled by the digital controller in the electrical compartment. See **FIGURE 1**(shown on page 4) and **Figures 13 and 14** (shown on pages 13 & 14). The digital controller interfaces with the system controller and provides protection and diagnostics for compressor operation.

Service: See Troubleshooting Chart in Paragraph 7.2 for identification of alarm codes. Use only factory-authorized replacement parts.

FIGURE 13 - Optional DH Circuit (Option RPLE Low Enthalpy Reheat Pump or Option RPHE High Enthalpy Reheat Pump



Optional Modulating Reheat (cont'd)

FIGURE 14 - Optional DH Circuit (Option RPLE Low Enthalpy Reheat Pump or Option RPHE High Enthalpy Reheat Pump

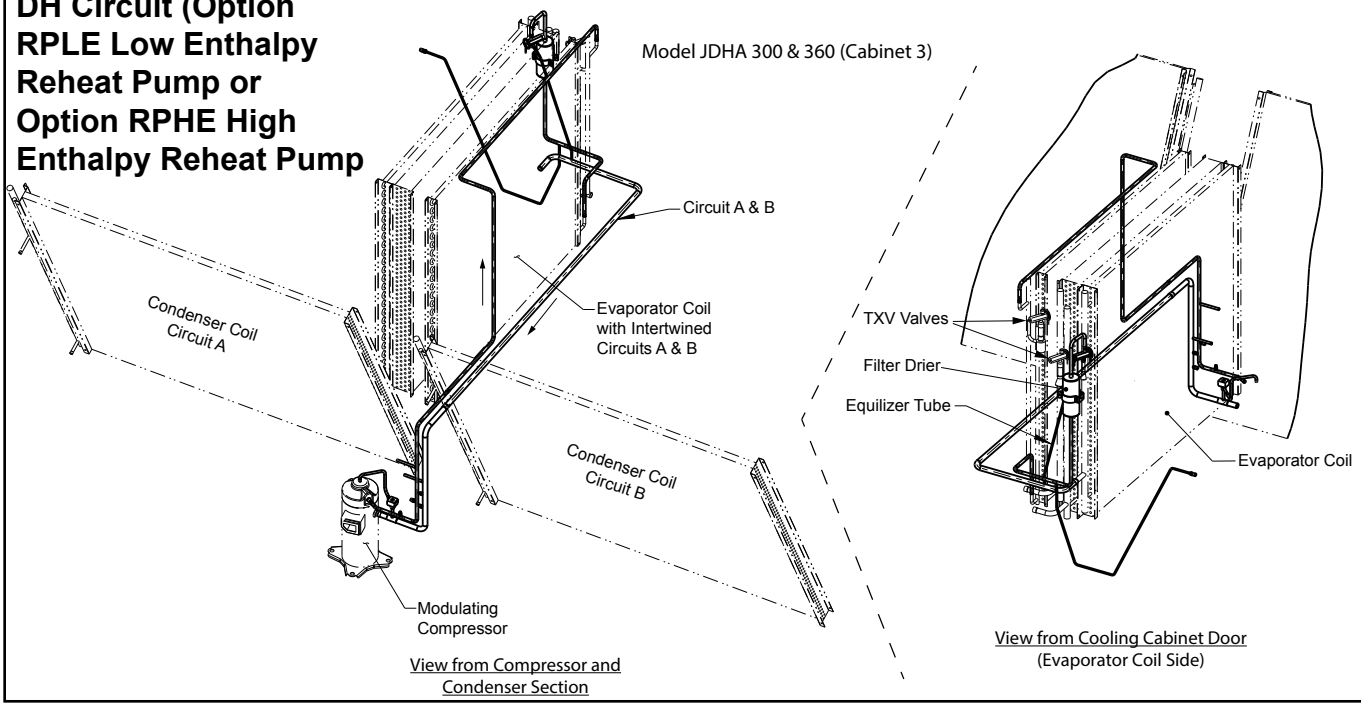
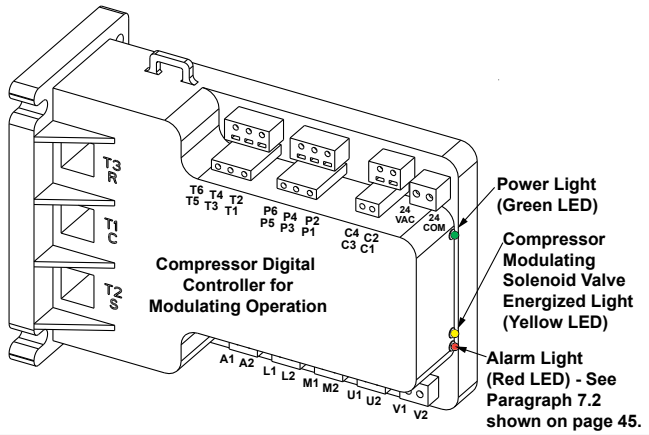


FIGURE 15 - Digital Controller for DH Circuit Compressor, P/N 266067



LED Color	LED State	Indicates
Green	Solid	Power (24VAC present at power terminals)
Green	Flashing	Anti-short cycle timer is active
Yellow	Solid	Unloader (Solenoid valve is energized; compressor capacity is 0.)
Red	Not lit	No abnormal operation alerts
Red	Flashing	See Paragraph 7.2

Optional Hot Gas Bypass Valve (Option AUC8)

Hot Gas Bypass Valve

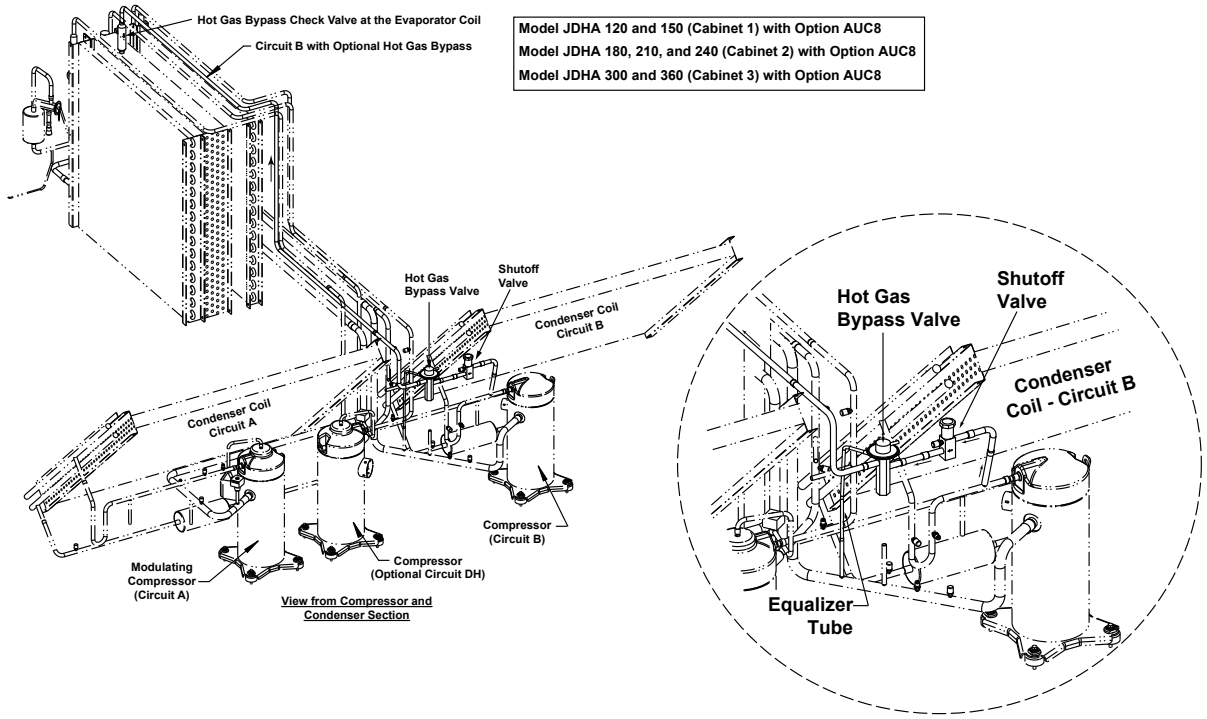
Function: The hot gas bypass valve allows some of the refrigerant gas from the suction line to be re-routed directly to the evaporator coil providing for expanded compressor modulation at low outside air temperatures. Hot gas bypass is only on the non-modulating compressor circuit (Circuit B). See **FIGURE 16** on page 15.

Service: To check the hot gas bypass valve setting, connect a pressure gauge to the suction line and block the entering air to the evaporator coil. Suction pressure will drop, and the hot gas bypass valve should begin to open at a approximately 115 psi and will be fully open at 95 psi. When the valve begins to open it will be hot to the touch (see caution below).

CAUTION: Touching the operating hot gas bypass valve can cause a burn. Use caution when checking and adjusting the valve. See Hazard Levels, page 2.

If a hot gas bypass valve needs to be replaced, use only a factory-authorized replacement for R-410A refrigerant. All refrigerant service should be done by a qualified R-410A service technician.

FIGURE 16 - Cooling Circuit B with Optional Bypass Valve (Option AUC8)



Low Ambient Control, Option BE8

If equipped with low ambient control, cooling is allowed to operate with an outside air temperature as low as 35°F (1.7°C).

Low Ambient Control for standard condenser fans (Option BE8 with Fan Option CUF3)

The electronic head pressure control modulates condenser fan motor speed in low temperatures, varying the air volume through the condenser to regulate head pressure. This model's dual sensor input allows for the control of one or two independent refrigerant circuits sharing the same fan motor(s). Only open, drip proof, PSC or Shaded Pole motors are applicable for motor speed regulation. The Controller monitors the liquid line temperature(degrees of excessive sub-cooling) which is directly proportional to the head pressure. Speed modulation begins at 80°F liquid line and proportionally reduces the fan to minimum speed once the liquid line temperature reaches 50°F. Motor is turned off at liquid temperatures below or equal to 50°F. At 53°F the fan restarts at full speed; then modulates to minimum speed. When the liquid temperature is 50°F and below the condenser fan motor will cycle between minimum RPM and off to maintain proper condenser temperature (head pressure). The above describes a 30ºF span (80ºF to 50ºF) function; a 25ºF span is also available. The 25ºF span is recommended for High Efficiency systems; 30ºF span for typical systems. Variable condenser airflow is modulated from full to minimum speed over the selected span.

Option BE Pressure Controller with Fan Option CUF3, P/N 261041

Temperature to Resistance Table

Use Temperature to Resistance table shown on right to verify proper sensor operation.

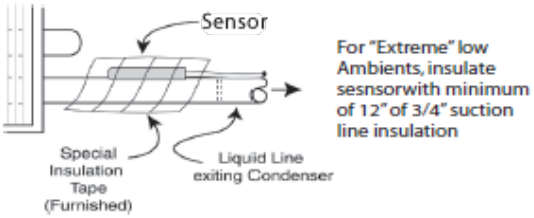
Temp °F	Sensor (Ohms)	Temp °F	Sensor (Ohms)	Temp °F	Sensor (Ohms)
40.0	26,109	64.0	13,823	88.0	7,680
42.0	24,712	66.0	13,139	90.0	7,332
44.0	23,398	68.0	12,492	92.0	6,997
46.0	22,160	70.0	11,881	94.0	6,679
48.0	20,996	72.0	11,3033	96.0	6,378
50.0	19,899	74.0	10,8509	98.0	6,092
52.0	18,872	76.0	10,2095	100.0	5,820
54.0	17,903	78.0	9,750	102.0	5,561
56.0	16,990	80.0	9,287	104.0	5,316
58.0	16,128	82.0	8,848	106.0	5,094
60.0	15,315	84.0	8,433	108.0	4,873
62.0	14,547	86.0	8,057	110.0	4,662

Temperature to Resistance Table - Key Point Values

3.0 Maintenance and Service Procedures - Unit & Cooling (cont'd)
3.5 Coils and Related Components (cont'd)
Low Ambient Control, Option BE8 (cont'd)

Installation of Liquid Line Sensor(s)

Install sensor(s) to the top of the liquid line where the line exits the condenser coil as shown below in sketch. A liquid line sensor and head pressure controller will be required for each independent refrigerant circuit. Units equipped with 2 sets of dual condenser fans will require a head pressure controller and a liquid line sensor for each set.



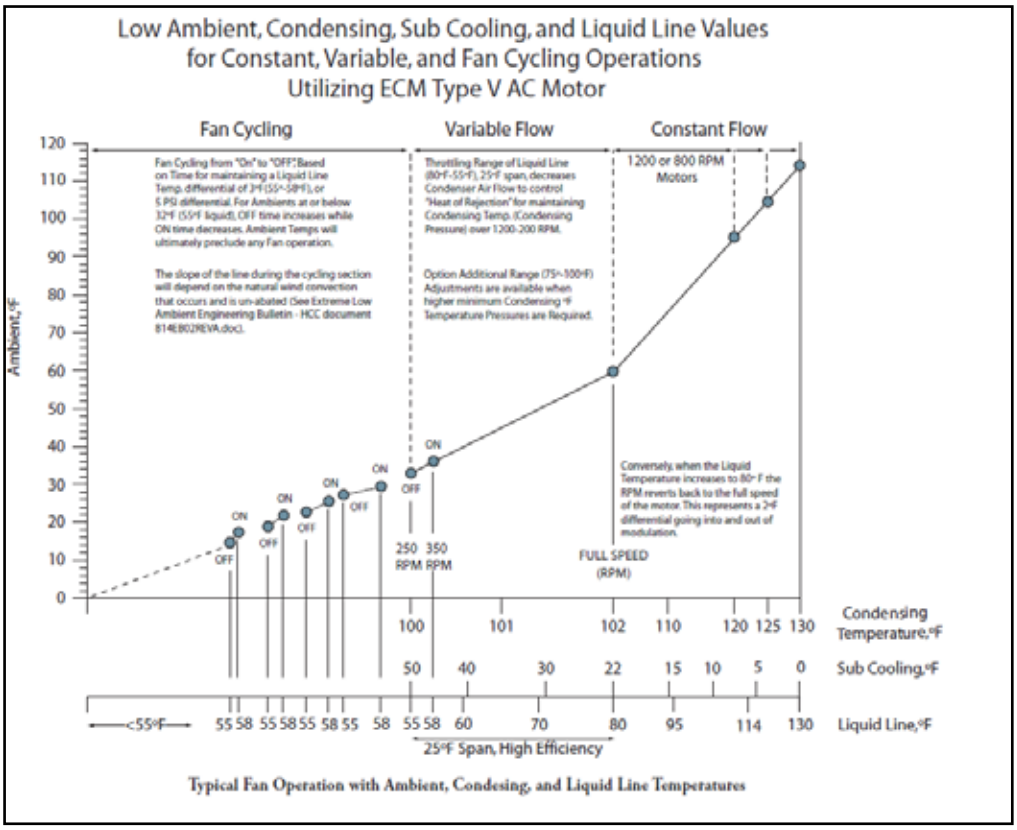
Low Ambient Control, Option BE8

Option BE Pressure Controller with ECM Fan Option CUF4, P/N 272460

Low Ambient Control for standard condenser fans (Option BE8 with ECM Fan Option CUF4)

Fan(s) modulation from full speed occurs at 80°F liquid line, and reaches minimum speed at 55°F liquid line. The ECM motor cycles "OFF" for all liquid line °F temperatures of 55°F or below, and cycles "ON" at 58° liquid line. This differential represents approximately 3°F condensing temperature variation. Matching these operating parameters to your ECM motor may require specific customization. Consult factory for more information.

Assuming a 200 RPM minimum speed, and 1,200 RPM full motor speed, the motor cycles "OFF" at 200 RPM and back "ON" at 300 RPM and then modulates back to 200 RPM before cycling off. The motor remains "OFF" for longer and longer periods of time as the outdoor air ambient temperature continues to fall below 30°F. Modulated minimum speed cycling continues until the requirement for cycling ends.



Typical Fan Operation with Ambient, Condesing, and Liquid Line Temperatures

Temperature to Resistance Table

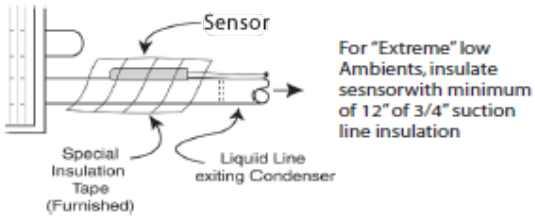
Use Temperature to Resistance table shown below to verify proper sensor operation.

Temp °F	Sensor (Ohms)	Temp °F	Sensor (Ohms)	Temp °F	Sensor (Ohms)
28.0	36,627	56.0	16,990	84.0	8,433
30.0	34,582	58.0	16,128	86.0	8,056
32.0	32,660	60.0	15,315	88.0	7,685
34.0	30,869	62.0	14,547	90.0	7,332
36.0	29,180	64.0	13,823	92.0	6,997
38.0	27,600	66.0	13,139	94.0	6,679
40.0	26,109	68.0	12,492	96.0	6,378
42.0	24,712	70.0	11,881	98.0	6,092
44.0	23,398	72.0	11,3033	100.0	5,820
46.0	22,160	74.0	10,8509	102.0	5,561
48.0	20,996	76.0	10,2095	104.0	5,316
50.0	19,899	78.0	9,750	106.0	5,094
52.0	18,872	80.0	9,287	108.0	4,873
54.0	17,903	82.0	8,848	110.0	4,662

Temperature to Resistance Table - Key Point Values

Installation of Liquid Line Sensor(s)

Install sensor(s) to the top of the liquid line where the line exits the condenser coil as shown below in sketch. A liquid line sensor will be required for each independent refrigerant circuit. Both liquid line sensors will be connected to one head pressure controller.



3.6 Check Refrigerant Pressure and Temperatures (subcooling and superheat)

The cooling system is charged and set at the factory to provide cooling as designed and to meet the requirements of the application. The procedures below for checking subcooling and superheat are not required under normal conditions and should only be performed as a service function by a qualified technician.

Two important requirements before checking superheat and subcooling:

1) This unit has fully intertwined refrigerant circuits and each circuit MUST be isolated before measuring its temperature. Another active circuit will influence the reading and make it impossible to determine accurate superheat and subcooling.

2) If the circuit is equipped with an optional hot gas bypass valve, the valve must be disabled before measuring superheat and subcooling. Locate the shutoff valve. Disable the hot gas bypass valve by closing the shutoff valve. When measurements are complete, be sure to open the valve.

DANGER

These refrigeration circuits are high pressure systems. Hazards exist that could result in personal injury or death. Removal, installation, and service of this scroll compressor must be performed by a technician qualified in R-410A refrigerant. DO NOT USE service equipment or tools designed for R22 refrigerant. See Hazard Levels, page 2.

Check SUBCOOLING

Measure and record temperature and pressure of the liquid line at the condenser coil outlet.

STEP 1) Record Measurements: Temperature = _____°F (°C) and Pressure = _____ psig

STEP 2) From Temperature/Pressure Conversion Chart (page 19), convert Measured Pressure (STEP 1) to _____°F (°C)

STEP 3) Subtract Measured Temperature (STEP 1) from Temperature from Conversion Chart (STEP 2)
_____°F (°C) - _____°F (°C) = _____°F (°C) degrees of Subcooling

Recommended subcooling with outdoor temperature range of 70 to 95°F (21 to 35°C) is 10 to 12 degrees F (5.6 to 6.7 degrees C).

Too much subcooling indicates a refrigerant overcharge. To reduce the subcooling, remove excess refrigerant. Too little subcooling indicates a refrigerant undercharge. To increase subcooling, slowly add R-410A refrigerant.

WARNING

Do not release refrigerant to the atmosphere. When adding or removing refrigerant, the qualified technician must comply with all national, state/province, and local laws.

Determine SUPERHEAT

Measure and record temperature (insulate probe from surrounding air temperature) and pressure in the suction line at the compressor inlet.

STEP 1) Record Measurements: Temperature = _____°F (°C) and Pressure = _____ psig

STEP 2) From Temperature/Pressure Conversion Chart (below), convert Measured Pressure (STEP 1) to _____°F (°C)

STEP 3) Subtract Measured Temperature (STEP 1) from Temperature from Conversion Table (STEP 2)
_____°F (°C) - _____°F (°C) = _____°F (°C) degrees of Superheat

Recommended superheat range is 8 to 12 degrees F (4.5 to 6.7 degrees C).

Typically, too much superheat indicates that the evaporator coil is undercharged. Too little superheat typically indicates that the evaporator coil is overcharged and may potentially flood liquid refrigerant to the compressor. To reduce the superheat, adjust the thermal expansion valve by turning the adjusting stem counterclockwise. To increase the superheat, adjust the thermal expansion valve by turning the adjusting stem clockwise

Temperature/Pressure Conversion Chart

R-410A Refrigerant			R-410A Refrigerant			R-410A Refrigerant			R-410A Refrigerant			R-410A Refrigerant		
Pressure	Temperature		Pressure	Temperature		Pressure	Temperature		Pressure	Temperature		Pressure	Temperature	
PSI	°F	°C	PSI	°F	°C	PSI	°F	°C	PSI	°F	°C	PSI	°F	°C
1.8	-55	-48.3	49.5	1	-17.2	77.0	19	-7.2	112.2	37	2.8	218.2	75	23.9
4.3	-50	-45.6	50.9	2	-16.7	78.7	20	-6.7	114.4	38	3.3	235.9	80	26.7
7.0	-45	-42.8	52.2	3	-16.1	80.5	21	-6.1	116.7	39	3.9	254.6	85	29.4
10.1	-40	-40.0	53.6	4	-15.6	82.3	22	-5.6	118.9	40	4.4	274.3	90	32.2
13.5	-35	-37.2	55.0	5	-15.0	84.1	23	-5.0	121.2	41	5.0	295.0	95	35.0
17.2	-30	-34.4	56.4	6	-14.4	85.9	24	-4.4	123.6	42	5.6	316.9	100	37.8
21.4	-25	-31.7	57.9	7	-13.9	87.8	25	-3.9	125.9	43	6.1	339.9	105	40.6
25.9	-20	-28.9	59.3	8	-13.3	89.7	26	-3.3	128.3	44	6.7	364.1	110	43.3
27.8	-18	-27.8	60.8	9	-12.8	91.6	27	-2.8	130.7	45	7.2	389.6	115	46.1
29.7	-16	-26.7	62.3	10	-12.2	93.5	28	-2.2	133.2	46	7.8	416.4	120	48.9
31.8	-14	-25.6	63.9	11	-11.7	95.5	29	-1.7	135.6	47	8.3	444.5	125	51.7
33.9	-12	-24.4	65.4	12	-11.1	97.5	30	-1.1	138.2	48	8.9	474.0	130	54.4
36.1	-10	-23.3	67.0	13	-10.6	99.5	31	-0.6	140.7	49	9.4	505.0	135	57.2
38.4	-8	-22.2	68.6	14	-10.0	101.6	32	0.0	143.3	50	10.0	537.6	140	60.0
40.7	-6	-21.1	70.2	15	-9.4	103.6	33	0.6	156.6	55	12.8	571.7	145	62.8
43.1	-4	-20.0	71.9	16	-8.9	105.7	34	1.1	170.7	60	15.6	607.6	150	65.6
45.6	-2	-18.9	73.5	17	-8.3	107.9	35	1.7	185.7	65	18.3	645.2	155	68.3
48.2	0	-17.8	75.2	18	-7.8	110.0	36	2.2	201.5	70	21.1			

3.7 Compressor Operation, Maintenance, and Replacement

Compressors

All systems have a modulating capacity digital scroll compressor in Circuit A with a digital compressor controller in the electric/control compartment. Circuit B has a digital scroll compressor controlled by staging. If equipped with an optional reheat circuit, it is equipped with a modulating capacity digital scroll compressor with a separate digital compressor controller in the electric/control compartment.

All compressors have crankcase heaters which must be powered up for 24 hours prior to operating the compressor.

WARNINGS

For your safety, wear eye protection, gloves, and protective clothing when handling refrigerant and oil and when brazing. Have a fire extinguisher nearby. See Hazard Levels, page 2.

DANGER

Never use oxygen to pressurize a refrigeration system. Oxygen can explode on contact with oil and could result in personal injury or death. When using high pressure gas such as nitrogen for this purpose, ALWAYS USE A PRESSURE REGULATOR that can control the pressure down to 1 or 2 psig. Failure to use a regulator will result in extremely high pressure which could exceed the burst pressure of the compressor or other system components and result in personal injury or death. See Hazard Levels, page 2.

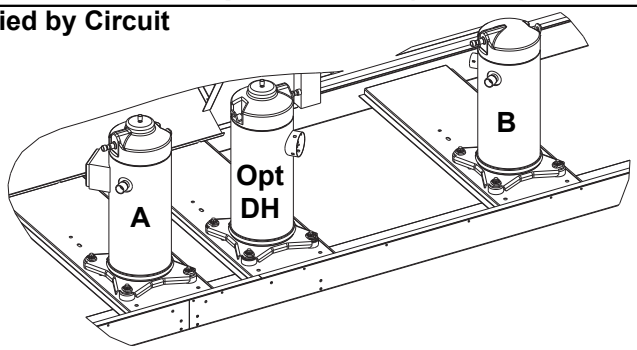
DANGER

The refrigeration circuits are high pressure systems. Hazards exist that could result in personal injury or death. It is therefore required that the removal and installation of these compressors be performed by a technician qualified in R-410A refrigerant. See Hazard Levels, page 2.

3.0 Maintenance/Service Procedures - Unit & Cooling (cont'd)
3.7 Compressor Operation, Maintenance, and Replacement (cont'd)

FIGURE 17 - Compressors Identified by Circuit

Compressor



Compressor Identity Key	
P/N	Model No.
216454	ZP182KCE-TW5
216455	ZP182KCE-TWD
216456	ZP182KCE-TWE
216689	ZP83KCE-TF5
216690	ZP83KCE-TFD
216691	ZP83KCE-TFE
216695	ZP120KCE-TF5
216696	ZP120KCE-TFD
216697	ZP120KCE-TFE
235009	ZP72KCE-TF5
235010	ZP137KCE-TF5
235013	ZP72KCE-TFD
235014	ZP137KCE-TFD
235018	ZP72KCE-TFE
235019	ZP137KCE-TFE
259288	ZPD34K5E-TF5
259355	ZPD34K5E-TFD
261147	ZPD83KCE-TF5
261148	ZPD83KCE-TFD
261149	ZPD83KCE-TFE
261153	ZPD137KCE-TF5
261154	ZPD137KCE-TFD
261155	ZPD137KCE-TFE
262801	ZPD51K5E-TF5
262802	ZPD51K5E-TFD
262803	ZPD51K5E-TFE
262804	ZPD72KCE-TF5
262805	ZPD72KCE-TFD
262806	ZPD72KCE-TFE
262807	ZPD103KCE-TF5
262808	ZPD103KCE-TFD
262809	ZPD103KCE-TFE
262810	ZPD182KCE-TW5
262811	ZPD182KCE-TWD
262812	ZPD182KCE-TWE
262813	ZP51K5E-TF5
262814	ZP51K5E-TFD
262815	ZP51K5E-TFE
262816	ZP103KCE-TF5
262817	ZP103KCE-TFD
262818	ZP103KCE-TFE
266061	ZPD120KCE-TF5
266062	ZPD120KCE-TFD
266063	ZPD120KCE-TFE
272634	ZPD51K5E-TF5
272635	ZPD34K5E-TFE

Model/ Size	Voltage	Circuit A		Circuit B		Optional DH Circuit (Reheat)			
						Low Enthalpy		High Enthalpy	
		Modulating Compressor	Crankcase Heater	Compressor	Crankcase Heater	Compressor	Crankcase Heater	Compressor	Crankcase Heater
JDHA & JDMA 60	208-240/1/60	**272634**	**216394**	--	--	--	--	--	--
	208-240/3/60	**262801**	**216394**	--	--	**259288**	**216394**	**259288**	**216394**
	480/3/60	**262802**	**216396**	--	--	**259355**	**216396**	**259355**	**216396**
	575/3/60	**262803**	**216397**	--	--	**272635**	**216397**	**272635**	**216397**
JDHA & JDMA 90	208-240/3/60	**261147**	**216398**	--	--	**259288**	**216394**	**259288**	**216394**
	480/3/60	**261148**	**216400**	--	--	**259355**	**216396**	**259355**	**216396**
	575/3/60	**261149**	**216401**	--	--	**272635**	**216397**	**272635**	**216397**
JDHA & JDMA 120	208-240/3/60	**262801**	**216394**	**262813**	**216394**	**259288**	**216394**	**259288**	**216394**
	480/3/60	**262802**	**216396**	**262814**	**216396**	**259355**	**216396**	**259355**	**216396**
	575/3/60	**262803**	**216397**	**262815**	**216397**	**272635**	**216397**	**272635**	**216397**
JDHA & JDMA 150	208-240/3/60	**262804**	**216398**	**235009**	**216398**	**259288**	**216394**	**259288**	**216394**
	480/3/60	**262805**	**216400**	**235013**	**216400**	**259355**	**216396**	**259355**	**216396**
	575/3/60	**262806**	**216401**	**235018**	**216401**	**272635**	**216397**	**272635**	**216397**
JDHA 180	208-240/3/60	**262801**	**216394**	**262813**	**216394**	**259288**	**216394**	**262801**	**216394**
	480/3/60	**262802**	**216396**	**262814**	**216396**	**259355**	**216396**	**262802**	**216396**
	575/3/60	**262803**	**216397**	**262815**	**216397**	**272635**	**216397**	**262803**	**216397**
JDMA 180	208-240/3/60	**261147**	**216398**	**216689**	**216398**	**259288**	**216394**	**262801**	**216394**
	480/3/60	**261148**	**216400**	**216690**	**216400**	**259355**	**216396**	**262802**	**216396**
	575/3/60	**261149**	**216401**	**216691**	**216401**	**272635**	**216397**	**262803**	**216397**
JDHA & JDMA 210	208-240/3/60	**262807**	**216402**	**262816**	**206402**	**259288**	**216394**	**262801**	**216394**
	480/3/60	**262808**	**216404**	**262817**	**206404**	**259355**	**216396**	**262802**	**216396**
	575/3/60	**262809**	**216405**	**262818**	**216405**	**272635**	**216397**	**262803**	**216397**
JDHA & JDMA 240	208-240/3/60	**266061**	**216402**	**216695**	**216402**	**259288**	**216394**	**262801**	**216394**
	480/3/60	**266062**	**216404**	**216696**	**216404**	**259355**	**216396**	**262802**	**216396**
	575/3/60	**266063**	**216405**	**216697**	**216405**	**272635**	**216397**	**262803**	**216397**
JDHA & JDMA 300	208-230/3/60	**261153**	**216402**	**235010**	**216402**	**262801**	**216394**	**262804**	**216398**
	460/3/60	**261154**	**216404**	**235014**	**216404**	**262802**	**216396**	**262805**	**216400**
	575/3/60	**261155**	**216405**	**235019**	**216405**	**262803**	**216397**	**262806**	**216401**
JDHA & JDMA 360	208-230/3/60	**262810**	**216402**	**216454**	**216402**	**262801**	**216394**	**262804**	**216398**
	460/3/60	**262811**	**216404**	**216455**	**216404**	**262802**	**216396**	**262805**	**216400**
	575/3/60	**262812**	**216405**	**216456**	**216405**	**262803**	**216397**	**262806**	**216401**

Modulating Cooling

Circuit A has a modulating capacity compressor. Each modulating compressor has a digital controller. The digital controller in the electrical compartment (See **FIGURE 1** on page 4, and **FIGURE 15,** page 14) is the electronic interface between the compressor and the system controller. The compressor controller is connected to the unit controller to provide protection and diagnostics for modulating compressor operation.

After a compressor shutdown, a two-minute anti-short cycle timer in the compressor controller delays the compressor restart. The unit controller has a five-minute compressor on/off time. The delay times are concurrent so total delay time is five minutes.

Compressor Replacement

WARNINGS

For your safety, wear eye protection, gloves, and protective clothing when handling refrigerant and oil and when brazing. Have a fire extinguisher nearby. See Hazard Levels, page 2.

Compressor Handling

Do not lift compressor by copper tubing. To prevent internal damage, compressors ***must ALWAYS be held upright.***

The following instructions include major points of consideration that will ensure proper installation and protect you from potential personal injury. Please use the following 13 steps as a checklist, taking each item in order before proceeding to the next. If more information is required, contact your local distributor.

WARNING

To avoid electrical shock, power to the compressor(s) MUST REMAIN OFF during performance of Steps 1 through 9 below. LOCK DISCONNECT SWITCH OFF (open).

- **Step 1. Verify Proper Application**

  Verify that the replacement compressor is identical to the model being replaced. All system components are matched to the compressor. Replacing a compressor with a model other than the manufacturer specified replacement will void the product warranty. See part numbers for R-410A compressors in the tables on page 20.

- **Step 2. Determine Cause of Initial Failure and Remove the Compressor**

  In order to prevent a second failure, the cause of the original failure must be determined. Identify the cause and make the necessary repairs.

CAUTION: DO NOT LIFT compressor by copper tubing; damage will occur. Compressor must remain upright.

WARNING

Wear eye protection and gloves when handling refrigerant or oil and when brazing.

a) BEFORE REMOVING THE FAULTY COMPRESSOR, remove refrigerant charge using proper recovery procedures. Call 1-800-441-9450 for the name of the nearest Dupont authorized distributor or 1-800-ASK-KLEA (IGI) for information on their refrigerant reclaim programs.
b) Disconnect wires. All compressor wiring is connected using a black molded plastic plug. Remove the plug from the compressor.
c) Open access ports so that pressure does not build up in the system. Before unbrazing stubs from the compressor, cut suction and discharge tubing with a tubing cutter.

WARNING

Have a fire extinguisher near. The compressor contains oil. There is a risk of fire when unbrazing stubs.

3.7 Compressor Operation, Maintenance, and Replacement (cont'd)

Use a high temperature torch to disconnect the suction line and the discharge line from the compressor.

d) Remove the mounting bolts and the compressor. Save the mounting hardware to attach the grommets and sleeves shipped with the replacement compressor.

e) To test for acid and to assure excess oil does not remain in the circuit, remove oil from the failed compressor. Measure the amount of oil.

CAUTION: In addition to the required eye protection and gloves, care should be taken in handling POE oil because it may cause damage to certain plastics and roofing materials. See Hazard Levels, page 2.

If the oil taken from the compressor and measured is found to be significantly lower than listed in the table below, clean the excess oil through use of suction and liquid line filter driers. Beginning in Step 4, follow the same procedure as for burnout cleanup.

Use an acid test kit to check the oil for acid. If acid is found, beginning in ***Step 4***, follow procedures indicated for burnout cleanup.

Dispose of oil and compressor using an approved environmentally safe disposal method.

Compressor Oil Charge (POE Oil)

Compressor Model	cc	oz
ZP51K5E-TF5	1124	38
ZP51K5E-TFD	1124	38
ZP51K5E-TFE	1124	38
ZP72KCE-TF5	1656	56
ZP72KCE-TFD	1656	56
ZP72KCE-TFE	1656	56
ZP83KCE-TF5	1656	56
ZP83KCE-TFD	1656	56
ZP83KCE-TFE	1656	56
ZP103KCE-TF5	3135	106
ZP103KCE-TFD	3135	106
ZP103KCE-TFE	3135	106
ZP120KCE-TF5	3135	106
ZP120KCE-TFD	3135	106
ZP120KCE-TFE	3135	106
ZP137KCE-TF5	3135	106
ZP137KCE-TFD	3135	106
ZP137KCE-TFE	3135	106
ZP182KCE-TW5	3135	106
ZP182KCE-TWD	3135	106
ZP182KCE-TWE	3135	106
ZPD34K5E-PFV	1124	38
ZPD34K5E-TF5	1124	38
ZPD34K5E-TFD	1124	38

Compressor Model	cc	oz
ZPD34K5E-TFE	1124	38
ZPD51K5E-PFV	1124	38
ZPD51K5E-TF5	1124	38
ZPD51K5E-TFD	1124	38
ZPD51K5E-TFE	1124	38
ZPD72KCE-TF5	1774	60
ZPD72KCE-TFD	1774	60
ZPD72KCE-TFE	1774	60
ZPD83KCE-TF5	1656	56
ZPD83KCE-TFD	1656	56
ZPD83KCE-TFE	1656	56
ZPD103KCE-TF5	3135	106
ZPD103KCE-TFD	3135	106
ZPD103KCE-TFE	3135	106
ZPD120KCE-TF5	3135	106
ZPD120KCE-TFD	3135	106
ZPD120KCE-TFE	3135	106
ZPD137KCE-TF5	3135	106
ZPD137KCE-TFD	3135	106
ZPD137KCE-TFE	3135	106
ZPD182KCE-TW5	3135	106
ZPD182KCE-TWD	3135	106
ZPD182KCE-TWE	3135	106

Important NOTES: These R-410A compressors use a polyester (POE) lubricant. Types of recommended POE oil are Copeland Ultra 22 CC, Copeland Ultra 32 CC, Copeland Ultra 32-3MAF, Mobil EAL, Arctic 22 CC, Uniqema Emkarate RL32CF, or Uniqema RL32-3MAF.

POE oil absorbs moisture much quicker and to a greater degree than standard mineral oil. The compressor must not be left open longer than 15 minutes during replacement. During installation the system must be swept with an inert gas such as dry nitrogen to keep moisture from entering the compressor and prevent the formation of oxides.

- ***Step 3*. Mount the Replacement Compressor**

Do not remove the dust cover or rubber shipping plugs until all other system connections are complete (i.e. new liquid line filter drier(s) installed and all tubing changes made - see *Steps 4 and 5*). The amount of time the compressor is open to the atmosphere must be kept to a minimum.

Use the new mounting grommets and sleeves that are shipped with the compressor to mount it. The sleeves will prevent over compression of the grommets. Re-use the mounting bolts from the compressor that was removed. The mounting bolts will bottom out when tight.

- ***Step 4*. Install New Filter Driers** (Select procedure that applies.)

IF the oil measured in ***Step 2*** was not significantly less than the amount shown in the table above or the test for acid in ***Step 2* did NOT indicate burnout** , install a new R-410A refrigerant liquid line filter drier. The filter drier must be rated for no less than 600 psig and be the proper size for the circuit. Because R-410A refrigerant requires POE oil which absorbs moisture quickly, it is important to

3.7 Compressor Operation, Maintenance, and Replacement (cont'd)

change the filter drier any time the circuit is opened.
It is recommended to use a tubing cutter when cutting out a filter drier as the desiccant absorbs and holds moisture better when it is cool. Heat from a torch may cause moisture to leave the filter and be absorbed in the oil. Be careful to keep dirt, filings, and other contaminants out of the system.

Continue to ***Step 5***.

IF the oil measured in ***Step 2*** was significantly less than shown in the table above or the test for acid in ***Step* 2 did indicate compressor burnout**, do the following:

a) Install a liquid line filter drier. If there is acid, install an acid removing filter drier. Size the acid-removing filter drier at least one capacity size larger than normally required for the circuit.

b) Install a temporary filter drier in the suction line. When there is acid, a 100% activated alumina suction filter drier is recommended. The suction line drier should be sized properly for the circuit and have a service access fitting to monitor pressure drop across the drier. (NOTE: Suction line filter drier must be removed after 72 hours of operation.)
Step 12 includes the remaining procedures required for cleanup of a burnout.
Continue to Step 5.

- ***Step 5*. Braze on Suction and Discharge Lines**

CAUTION: Do not leave system open to the atmosphere any longer than minimum required for installation. POE oil in the compressors is extremely susceptible to moisture absorption. Always keep ends of tubing sealed during installation. See Hazard Levels, page 2.

Brazing materials must be able to withstand the high pressure of R-410A refrigerant. A high temperature, silver phosphate type brazing with 5% or greater alloy is recommended.

To prevent oxidation, purge tubing with 2-3 psig of regulated dry nitrogen while it is being brazed. Open the service valve as needed to release the nitrogen. Do not allow moisture to enter the system.

The installer is responsible for brazing and for complying with appropriate standard refrigerant piping procedures.

CAUTION: All brazing should be done using a 2-3 psig dry nitrogen purge flowing through the pipe being brazed.

CAUTION: When brazing, protect all painted surfaces and components from excessive heat. Wet wrap all valves but do not allow moisture to enter the tubing. See Hazard Levels, page 2.

- ***Step 6*. Check System for Leaks**

After installation is complete, pressurize the circuit with helium or dry nitrogen to approximately 150 psi (maximum pressure is 450 psi). Check for leaks using soap bubbles or other leak-detecting methods.

- ***Step 7*. Evacuate the Circuit**

Evacuate one circuit at a time. Use a vacuum pump and micron gauge. Each circuit must be evacuated to hold a 500 micron vacuum. Vacuum must be pulled on both the discharge (high) and suction (low) side. Do the suction side first; and the compressor discharge side second. To establish that a circuit is leak-free and moisture-free, a standing vacuum test is recommended. Close off the valve to the vacuum pump and observe the micron gauge. If the vacuum gauge does not rise above 500 microns in one minute, the evacuation should be complete. If the vacuum gauge does rise above 500 microns in one minute, evacuation is incomplete or the circuit has a leak. Repeat as needed until evacuation is complete. The evacuation process must be done on each circuit.

NOTE: Evacuation will not remove moisture from POE oil. Moisture must be prevented from getting in the oil.
Continue and/or repeat ***Steps 6 and 7*** until evacuation is complete.

3.7 Compressor Operation, Maintenance, and Replacement (cont'd)

CAUTION: Do not use the replacement compressor as an evacuation assist and *never* apply voltage to a compressor while it is in a vacuum. See Hazard Levels, page 2.

Moisture and air are harmful to the system because they increase the condensing temperature, raise the discharge gas temperature, cause formation of acids, and cause oil breakdown.

CAUTION: Do not leave a circuit open to the atmosphere any longer than minimum required for installation. POE oil in the compressor is extremely susceptible to moisture absorption. Evacuation will not remove moisture from POE oil.

- ***Step 8*. Electrical System Check**

After the system has been evacuated, reconnect the electrical plug to the compressor or the wires to the compressor terminals. It is a normal practice to replace all starting components any time a compressor is changed.

WARNING

Do not apply voltage to the compressor when the plug is removed or terminals disconnected.

Crankcase Heater - Connect the crankcase heater. The crankcase heater is energized continuously and is extremely important to proper compressor operation and long life. **NOTE:** See crankcase heater P/N's on page 20.

The crankcase heater must be energized for at least 24 hours before starting the unit or after a power outage of more than 8 hours. Be sure to disable cooling controls before turning on power to warm up crankcase heaters.

CAUTION: Crankcase heaters must be allowed to warm up for at least 24 hours prior to startup. Disable cooling controls before turning on power to warm up crankcase heaters.

- ***Step 9***. Charge the System (Use R-410A refrigerant only.)

Refer to the table for the approximate amount of refrigerant required. Follow the instructions below to charge the circuit. R-410A refrigerant MUST BE charged as a LIQUID.

NOTE: Outdoor temperature must be between 70-95°F (21-35°C) for verifying superheat and subcooling. If temperature is not within this range, consult the factory service department before charging.

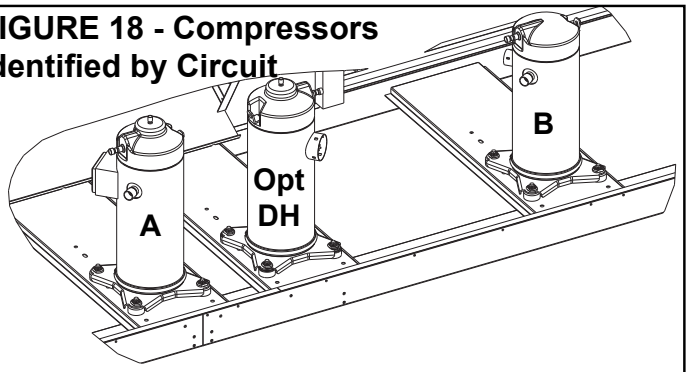
If equipped with an optional hot gas bypass, disable the hot gas bypass valve before charging. Locate the shutoff valve between the compressor discharge and the hot gas bypass valve. Disable the hot gas bypass valve by closing the shutoff valve. When measurements are complete, be sure to open the valve.

Liquid charge the high side to 80%. With the system running, add the balance of the charge to the correct superheat and subcooling values. Refer to ***Step 11***, page 26, and the instructions in Paragraph 3.6.

IMPORTANT: *Do not release refrigerant to the atmosphere!* If required service procedures include the adding or removing of refrigerant, the qualified HVAC service technician must comply with all national, state or provincial, and local laws.

Approximate R-410A Refrigerant Charge (lbs) for by Size and Compressor for Each Circuit

FIGURE 18 - Compressors Identified by Circuit



Model	Size	R-410A Charge (lbs) by Compressor Circuit			
		A	B	DH (Reheat)	
				Low Enthalpy	High Enthalpy
JDHA and JDMA	060	15	--	5	5
	090	15	--	5	5
	120	8	8	5	5
	150	8	8	5	5
	180	15	15	5	5
	210	15	15	5	5
	240	15	15	5	5
	300	19	19	6	8
	360	19	19	6	8

- ***Step 10.*** **System Startup**

Assure voltage to compressor does not drop below minimum allowable voltage (e.g. 187 volts for 230/208-3-60, 415 volts for 460/3/60, 518 volts for 575/3/60) during the period the compressor is trying to start. **If a low voltage or voltage imbalance condition exists, the electrical problem must be determined and corrected prior to operating the unit**.

Voltage Imbalance - Voltage imbalance is becoming a more common problem. In a 3-phase system, excessive voltage imbalance between phases will cause motors to overheat and compressors to fail. Maximum allowable imbalance is 2%. To determine voltage imbalance, measure and record the voltage of all three phases. Take the measurements at the compressor terminals with the compressor operating.

Voltage Imbalance Formula:

Key:	V1, V2, V3 = line voltages as measured
	VA (Average)= (V1 + V2+ V3) / 3
	VD = Line Voltage (V1, V2, or V3 that deviates farthest from average (VA)
Formula:	% of Voltage Imbalance = [100 (VA - VD)] / VA

If the imbalance is within the 2% tolerance, voltage imbalance is not a problem and the system may be operated. If the imbalance exceeds the 2% tolerance, follow the procedures below.

Solutions to Voltage Imbalance:

The cause for a voltage imbalance problem can originate at the power company or can be caused inside the building. Try the following on-site solution to determine if the problem can be easily resolved.

Roll the connections at the compressor terminals one forward. Connect the wire now on Terminal 1 to Terminal 2, 2 to 3, and 3 to 1. Re-measure and re-calculate the voltage imbalance. If the imbalance is within 2%, the system may be operated.

If the imbalance is not within tolerance, roll the connections one more forward. Re-measure and re-calculate the voltage imbalance. If the imbalance is within 2%, the system may be operated. If the voltage imbalance still exceeds 2%, do not start the system. Contact the building owner or person responsible to have an electrician analyze the buildings's power supply and load distribution.

Power Supply Voltage Phasing - Connect refrigerant pressure gauges to the suction and discharge lines of the compressors and an electric meter to the power supply.

CAUTION: Be sure to connect pressure gauges to the suction and discharge lines before system startup so that compressor rotation can be checked immediately. Scroll compressors will be destroyed if allowed to operate in the wrong direction. See Hazard Levels, page 2.

3.7 Compressor Operation, Maintenance, and Replacement (cont'd)

Record the ambient temperature. Adjust the system controller so that a call for cooling exists.

NOTE: Outdoor ambient lockouts may prevent mechanical cooling. Temporarily override lockouts by lowering the cooling setpoint. When testing is complete, reset the controller.

Because it is possible to unknowingly connect 3-phase power in such a way as to cause the scroll compressor or blower to rotate in reverse, it is very important to check this on startup.

Check Compressors - Immediately at startup, observe the gauges. If the suction pressure rises and discharge pressure drops, the compressor is operating in reverse and must be shut down. Turn off the power and switch the 3-phase line voltage wiring connections before restarting the unit.

Important: If allowed to operate for several minutes in reverse, the compressor's internal protector will trip. If a compressor is repeatedly allowed to restart and run in reverse, the compressor will be permanently damaged.

- ***Step 11***. **Check Subcooling and Superheat**

Superheat is the verification that the evaporator coil is properly using the refrigerant supplied. Too much superheat indicates that the coil is undercharged. Too little superheat indicates that the coil is overcharged and potentially flooding liquid refrigerant to the compressor.

Subcooling is the measurement of liquid refrigerant stored in the condenser coil. Too much subcooling indicates a system overcharge. Too little subcooling indicates a system undercharge and may not provide the thermal expansion valve with a full column of liquid refrigerant for proper operation.

Two important requirements before checking superheat and subcooling:

1) This unit has fully intertwined refrigerant circuits and each circuit MUST be isolated before measuring its temperature. Another active circuit will influence the reading and make it impossible to determine accurate superheat and subcooling.

2) If equipped with an optional hot gas bypass, disable the hot gas bypass valve before charging. Locate the shutoff valve between the compressor discharge and the hot gas bypass valve. Disable the hot gas bypass valve by closing the shutoff valve. When measurements are complete, be sure to open the valve.

IMPORTANT: *Do not release refrigerant to the atmosphere!* If required service procedures include the adding or removing of refrigerant, the qualified HVAC service technician must comply with all federal, state or provincial, and local laws.

Follow the procedures in Paragraph 3.6 to check subcooling and superheat.

- ***Step 12*. (Select the procedure that applies.)**

IF the oil measured in Step 2 was significantly less than in the table on page 22 or the acid test in Step 2 indicated a burnout, do the following:

a) Operate the unit for several hours. Check the pressure drop through the temporary suction line filter drier. If the pressure drop exceeds 8 psig, recover the refrigerant, replace the suction line filter drier with the same type as removed, replace the liquid line filter drier, evacuate the circuit, and re-charge with the recovered refrigerant.
Continue to monitor the pressure drop through the suction line filter drier and repeat the process above until the pressure does not exceed 8 psig after several hours of operation. (**NOTE**: System must be allowed to run no more than 72 hours with a suction line filter drier.)

b) Allow the system to operate for 4-8 hours. Recover the refrigerant and take an oil sample. Retest the oil for acid.

c) If the test for acid is negative, remove the suction line filter drier, replace the liquid line drier, evacuate, and re-charge the system with the recovered refrigerant.
If the test indicates acid, replace both the liquid line filter drier and the suction line filter drier and repeat b) and c).

CAUTION: After cleanup is complete, remove the suction line filter drier. See Hazard Levels, page 2.

d) Verify subcooling and superheat (refer to ***Step 11***).

e) When the system is operating properly, remove the gauges.

Or, IF the oil measured in ***Step 2*** was not significantly less than that shown in the table on page 22 or the acid test in ***Step 2*** did not indicate a compressor burnout, continue to the review in ***Step 13***.

- ***Step 13*** **. Review *ALL Steps* to ensure that nothing was overlooked.**

3.8 Other Controls

3.8.1 Programmable Digital Controller and Sensors

System Programmable Controller with Integral Display

All systems have a unit-mounted, 24-volt programmable controller. The controller is factory programmed to match the control selection on the order (Option D19 for space temperature control or Option D21 for makeup air control). See the appropriate control instruction manual, Form CP-Y D19 or CP-Y D21, for more details.
Some sensors are standard and others will depend on option selection.
Service: If a sensor needs to be replaced, use only a factory authorized replacement part designed for the purpose.

If a controller needs to be replaced, it must be replaced with the same controller and software. Contact your distributor or the factory service department for details.

3.8.2 Voltage Protection, Option PL4

Function: Phase loss and low or high voltage can cause damage to electrical components. This safety control monitors phase loss and voltage and shuts down the unit when its limits are exceeded. The device is auto reset and allows the unit to restart when the power conditions are corrected.

4.0 Maintenance/Service Procedures - Power Exhaust and Energy Recovery

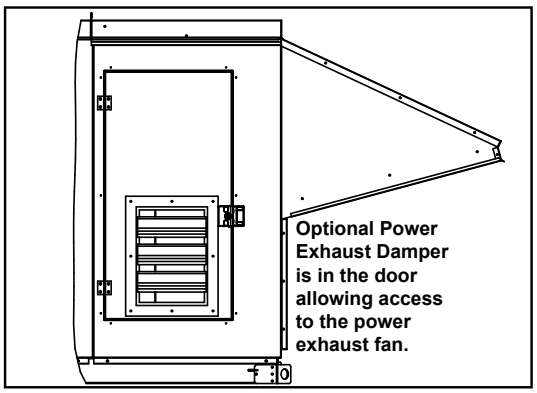
The system may be equipped with either an integral power exhaust or an energy recovery wheel with an attached power exhaust module.

4.1 Power Exhaust, Option PE

If equipped with optional power exhaust, there is an ECM fan in the exhaust airstream and gravity dampers in the opening on the corner of the "access" side of the system. The power exhaust fan operation is from a constant volume, in response to a building pressure sensor, or by an adjustable offset to the supply fan. Adjustments and settings are through the system controller.

Service: Power exhaust fan motor is permanently lubricated; lubrication is not required, During maintenance, remove any accumulation of dirt and grease from the fan and dampers. The exhaust fan CFM was checked and balanced at startup. To recheck, follow the instructions in the Installation/Operation manual, Doc No 300537, Paragraph 10.3.

FIGURE 19 - Exhaust Damper Location for either gravity or power exhaust



4.0 Maintenance/Service Procedures - Power Exhaust & Energy Recovery (cont'd)

4.2 Energy Recovery Wheel, Option EW

The energy recovery wheel including power exhaust is an integral part of the system.

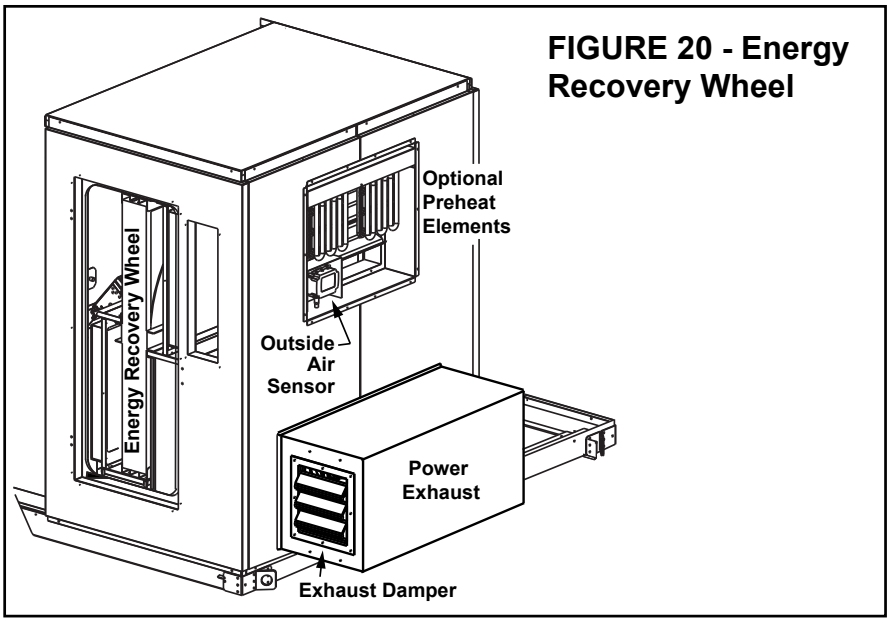


FIGURE 20 - Energy Recovery Wheel

Check Wheel RPM - The wheel should rotate slowly at approximately 53 rpm. If rotation is not normal, see the wheel maintenance information that follows. Perform service as needed and/or replace any defective parts.

Wheel Maintenance - How often the wheel needs to be cleaned depends on its environment. Because the wheel rotates between two opposing airstreams, it is self-cleaning of most dry dirt and dust and will remain efficient for a long period of time. However, when the wheel is exposed to oils, tars, or greases in either the supply or exhaust airstream, the surface will become “sticky” and will hold the dirt and dust. Over time the air passages will become blocked causing loss of recovery, excessive pressure drop, and loss of energy savings.

According to the manufacturer, a wheel operating in a “clean” environment may not require annual cleaning, but a wheel in a “contaminated” environment may require multiple cleanings a year to maintain airflow and recovery. The segmented design of the wheel not only provides for easier cleaning but also allows for replacement of individual dirty segments. (See replacement P/N’s on page 30).

Removing, Cleaning, and Replacing Wheel Segments - The segments are the “heat exchangers” of the energy recovery wheel. Segments must be handled with care and should never be dropped. Segments may require “slight” persuasion during installation and removal but NEVER be forced or banged with a hammer or similar tool.

Instructions:

- □ Turn off power to the unit and lock the disconnect switch open.
- □ Slide the wheel cassette out of the cabinet (refer to illustration, page 4) NOTE: Some models may require the removing of a sheet metal blockoff in order to access the energy recovery wheel.
  Remove the wheel segments (from the pulley side of the wheel)
- □ Rotate the wheel to position the first segment to be removed at the top. On both sides of the segment, unlock and open the two retaining straps.
- □ Using hand pressure only and supporting the segment, from the motor side push the wheel segment. On the pulley side, lift the segment out of the spokes. Lay, do not drop, the segment on a flat surface
- □ Rotate the wheel so that the segment on the opposite side is on the top. Repeat the procedure and remove the segment. Continue the procedure of keeping the balanced open and filled segments opposite each other and remove all of the segments.

4.2 Energy Recovery Wheel, Option EW (cont'd)

□ **Clean the Wheel Segments**

□ Gently brush off any loose dirt and dust.

□ To wash the segments, use a non-acid based (evaporator) coil cleaner or alkaline detergent solution. Non-acid based coil cleaner concentrate in a 5% solution is recommended by the manufacturer. Do not use any of the following as they may cause damage to the wheel.
DO NOT use an acid based cleaner.
DO NOT use aromatic solvents.
DO NOT use temperatures in excess of 170°F.
DO NOT use a pressure washer.
DO NOT use steam.
Soak the segments in the cleaning solution until grease and tar deposits are loosened. An overnight soak may be required to adequately loosen heavy deposits of oil based contaminants.

CAUTION

DO NOT use acid based cleaner, aromatic solvent, steam, temperatures in excess of 170°F, or a pressure washer, as damage to the wheel may occur.

Rinse the dirty solution from each segment until the water runs clear. **NOTE:** Some staining of the desiccant may remain and is not harmful to performance. Allow excess water to drain from the segments before reinstalling them in the wheel. (**NOTE**: A small amount of water will dry out in the airflow.)

□ **Replace or Re-install Clean Wheel Segments** (from pulley side of wheel)

□ Remove any dirt or dust from the wheel frame and cassette and the slide-in area of the cabinet.

WARNING

Weight of the installed segments will cause the wheel to accelerate in rotation. Failure to maintain control of the wheel rotation while re-installing all segments could cause severe injury to fingers or hand caught between revolving spokes and the bearing support beam. Insert the handle of a hammer or other such tool through the spokes above or below the bearing support as a stop to limit rotation of an unbalanced wheel.

a) Position one segment opening at the top of the cassette. Insert a “stop” (see warning above) to hold the wheel in place. Unlock and open the segment retaining brackets on both sides of the opening. Position a clean segment with the imbedded stiffeners toward the motor side of the wheel. Holding the segment as vertically as possible and centered between the spokes, insert the nose of the segment downward between the hub plates. Ease the segment down until its outer rim clears the inside of the wheel rim and press it inward against the spoke flanges. Close and latch the retaining brackets. Make sure each retaining bracket is fully engaged under the catch.

b) Remove the stop and slowly rotate the installed segment to the bottom of the wheel. Re-insert the stop and repeat the procedure to put a segment in the top position. Continue the procedure, balancing the wheel by installing opposite segments, until all of the segments are in place.

c) While the wheel cassette is out, follow the instructions below to check the seals and the drive components.

d) After all wheel maintenance is complete, slide the casette back into the cabinet. Re-connect the motor wire. Being sure the cassette is positioned properly, replace the center post.

Checking the Seals

Checking the Wheel Seals - The seals are on the center support that goes across the diameter of the wheel. There are two seals on each side of the wheel with one seal on each side of the hub. Seals are metal strips with insulation on the surface closest to the wheel. The purpose of the seals is to minimize the transfer of air between the counter flowing airstreams.

After any wheel service and during maintenance, check the seal adjustment. Adjusting the seals will require a screwdriver and a piece of paper.

□ If the wheel has not been removed from the cabinet, turn off power to the unit, lock the disconnect switch open and slide the wheel out of the cabinet.

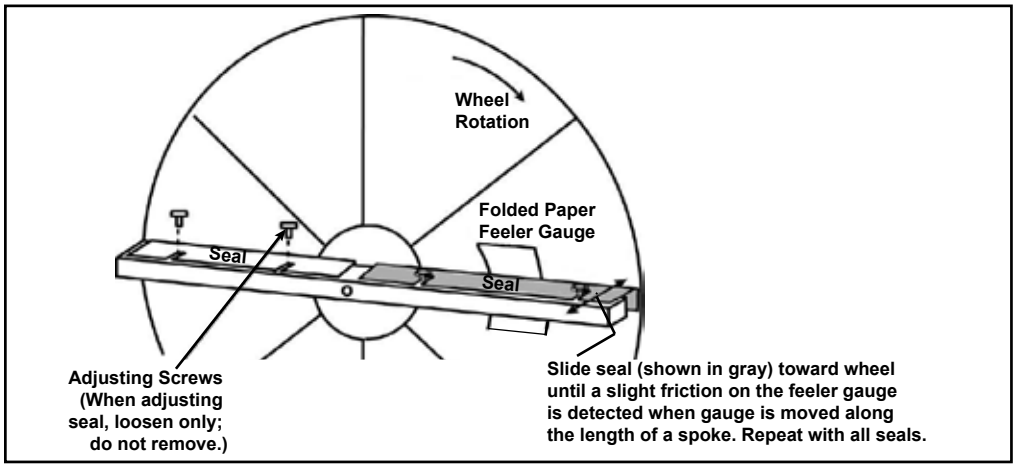
□ Each seal strip has adjustable retaining screws that allow the insulation to move toward or away from the wheel. Refer to the illustration below, and follow the instructions below to adjust the seals.

□ On one seal, loosen the seal retaining screws just enough to slide the seal strip.

4.0 Maintenance/Service Procedures - Power Exhaust & Energy Recovery (cont'd)

4.2 Energy Recovery Wheel, Option EW (cont'd)

FIGURE 21 - Checking the Seals (cont'd)



- □ Fold the piece of paper to use as a feeler gauge. Position the folded paper between the wheel surface and the seal. Turn the wheel so that the seal is lined up with a segment spoke.
- □ Adjust the seal toward the wheel surface and slide the feeler gauge (folded paper) along the length of the spoke. When a slight friction is detected on the feeler gauge (folded paper), tighten the screws. Recheck the clearance with the feeler gauge.
- □ Repeat the procedure on the other three seals.
- □ When the unit is started, start and stop the wheel several times to verify seal adjustment and to confirm that the belt is tracking properly on the wheel rim. The belt should be approximately 1/4” from the outer edge of the rim.

Check Wheel Drive Components

Motor - The motor bearings are pre-lubricated and do not need additional lubrication. Clean any dirt from the air cooling ports in the motor housing.

Pulley - The pulley is secured to the drive motor shaft by a set screw. The set screw is secured with removable Locktite to prevent loosening. Confirm the set screw is secure.

Belt - The belt is of urethane stretch material and is designed to provide constant tension. There is no type of adjustment. Inspect the belt for proper tracking and tension. If a belt needs replaced, it must be replaced with a factory-authorized replacement (see P/N’s below). Follow the wheel manufacturer’s instructions.

NOTE: A properly tensioned belt will turn the wheel immediately after power is applied with no visible slippage during startup. The belt should track approximately 1/4” from the outer edge of the rim. If the belt or any other component needs replaced, use only factory-authorized replacement designed for the purpose. Follow instructions provided by the wheel manufacturer.

Wheel Replacement Parts

Part	30" Wheel	36" Wheel	46" Wheel	52" Wheel	58" Wheel
Belt	235370	235371	235372	295000	Contact Factory for Details
Wheel Motor	235373 (208/230/1)	235374 (208-230/460/3) 235375 (575/3)			
Segment	262495	262497	235376	295001	
Segment Set	262496	262498	235377	295002	

Optional Preheat (frost Control)

If equipped with optional preheat, one or two 10kw electric heat modules are located in the inlet air stream. Preheat operation is controlled by the system controller and is commanded ON when the supply air discharge sensor signals a temperature reading of 33°F (0.56°C).

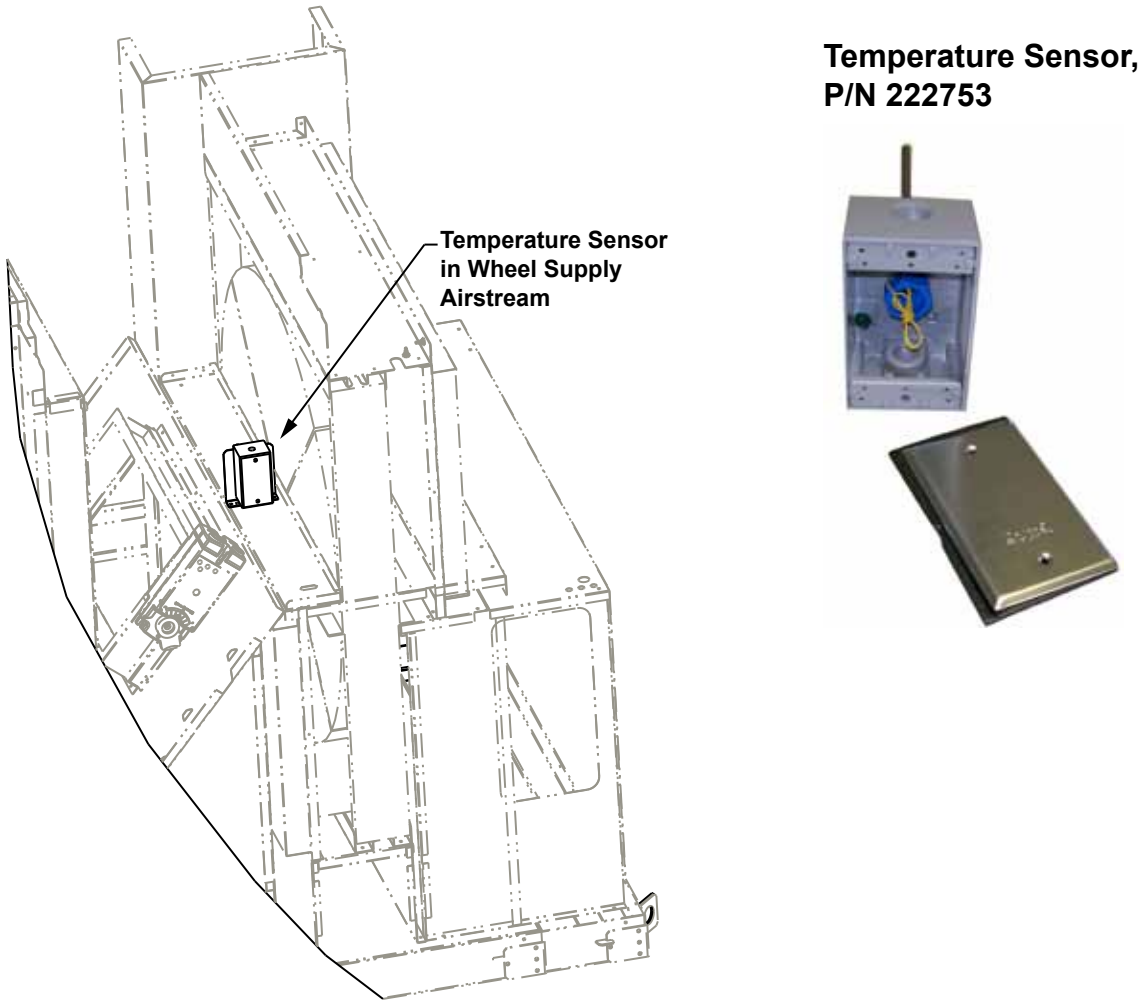
Optional Frost Control Electric Element	
Part Number	Voltage
273793	230/1/60
272505	208-230/3/60
272506	460/3/60
272507	575/3/60

Wheel Supply Air Discharge Sensor

The supply air discharge sensor monitors wheel operation and if equipped with preheat, controls operation of the electric heat module(s). The supply air discharge sensor is a probe sensor located in the wheel discharge.

Service: Check the wiring. If the sensor needs to be replaced, use only a factory authorized replacement part designed for the purpose.

FIGURE 22 - Location of the Wheel Supply Air Discharge Sensor



5.0 Maintenance/Service Procedures - Gas Heat Section

This gas heat section will operate with a minimum of maintenance. To ensure long life and satisfactory performance, a heater that is operated under normal conditions should be inspected and cleaned at the start of each heating season. If the heater is operating in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent maintenance is recommended.
When any service is completed, be careful to reassemble correctly to ensure that no unsafe conditions are created. When re-lighting, always follow the lighting instructions on the furnace.

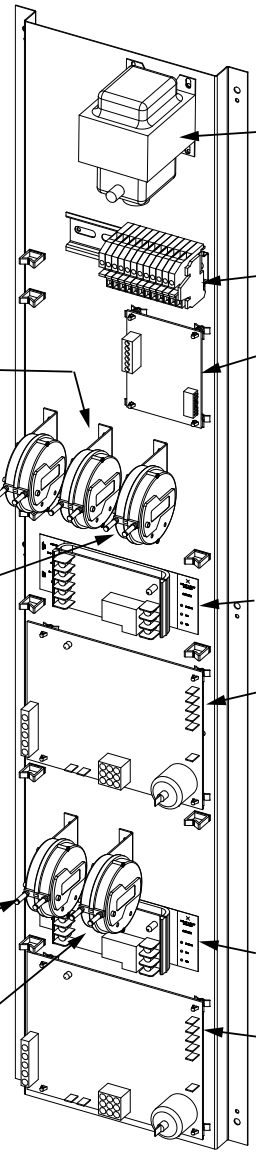
WARNING

Turn off the power before performing maintenance procedures. Lock disconnect switch in OFF position. When you turn off the power supply, turn off the gas at the external manual valve. See Hazard Levels, page 2.

5.1 Gas Heat Controls

The gas heat section controls are located on the left wall of the gas heat section. Check all wiring connections and verify sequence of operation.

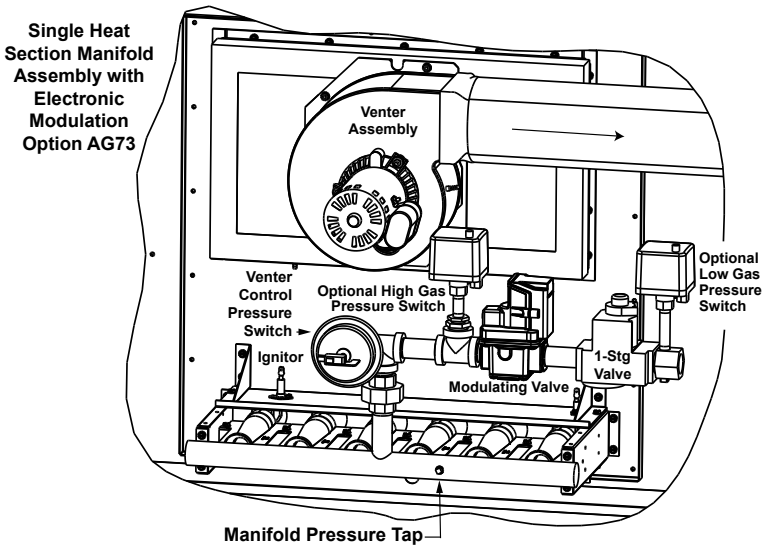
FIGURE 23 - Gas Heat Controls

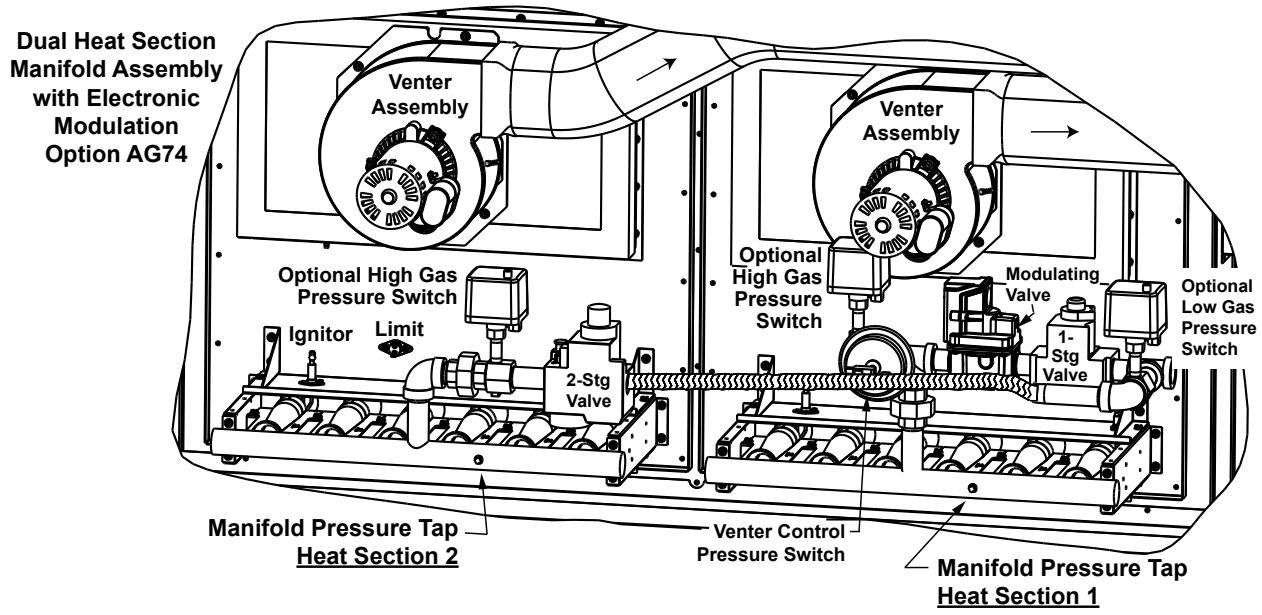


5.1 Gas Heat Controls (cont'd)

FIGURE 25 - Furnaces with Modulating Control Option AG73 (5:1 control, single heat section) and Option AG74 (10:1 control, dual heat sections)

NOTE: Heat sections illustrated are standard efficiency, non-condensing furnaces. Controls for condensing furnaces are the same.





Gas Control Modulating (5:1, Option AG73 or 10:1, Option AG74 - applies to all models)

Sequence of Operation

1) W1 is energized and the DS1 control module verifies that the pressure switches are open.
2) Inducer (venter) is energized for pre-purge and the DS1 control module verifies that the low and high pressure switches are closed.
3) After the pre-purge period has elapsed (20 seconds), the DS1 control module energizes the trial for ignition period (17 seconds).
4) **After blower-on delay (30 seconds from flame detected), the control will energize the blower (supply fan).**
5) If W2 is energized, the high gas output will energize and the control will check for high pressure switch input.
6) After W1 and W2 are de-energized, the controller will run the blower-off delay (120 seconds) and return to standby mode.

NOTE: For detailed information on the sequence of operation for the heat sections, refer to section 3.5 Heating Staging Control, in the Model JDHA Manual for Space Temperature Control System Options D19 (form CP-Y-D19) or option D21 (form CP-Y-D21).

Vent Temperature Limit Switch

Vent Temperature Limit Switch (High Efficiency Models Only)

The vent temperature limit switch is located on the discharge of the combustion air blower (venter) and its purpose is to prevent the vent gas temperature from exceeding a temperature that will harm the PVC vent pipe. If the vent temperature limit switch is activated, the cause must be determined and corrected before the heater is placed back into operation. Activation of the manually reset vent temperature limit switch could be caused by one or more of the following:

- Manifold gas pressure too high
- The heat content of the fuel being burned is too high
- Reduced circulating airflow due to dirty and/or plugged air moving components
- Excess dirt on the heat exchangers
- Failed heat exchanger(s)

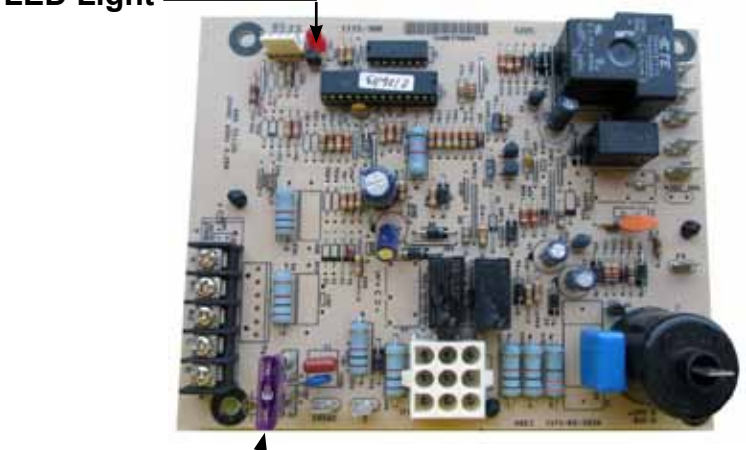
After the cause is determined and corrected, depress the red button on the switch to reset it.

LED Flash Codes for DSI Control Module

Flash Code	Description
Fast Flash	Normal operation
Steady OFF	No power, blown fuse, or defective board
1	Low pressure switch stuck open
2	Low pressure switch stuck closed
3	High pressure switch stuck open
4	High pressure switch stuck closed
5	Limit switch open
6	Ignition lockout (failed ignition)
7	Too many (5) limit switch losses
8	Too many (5) flame losses
9	Too many (3) high pressure switch losses during one call for heat

DSI Control Module P/N 272626

IMPORTANT: When using a multimeter to troubleshoot the 24 volt circuit, place the meter's test leads into the 5 or 9 pin connectors located on the ignition control. Do not remove connectors or terminals from the electrical components. Doing so can result in misinterpreted readings due to the ignition control board's fault mode monitoring circuits.



Operating Gas Valve -

Depending on the heat section and gas control selected, all gas trains have one or two single-stage and/or two-stage combination gas valves. These gas valves must be checked annually to ensure that they are shutting off gas flow completely; follow the instructions below.

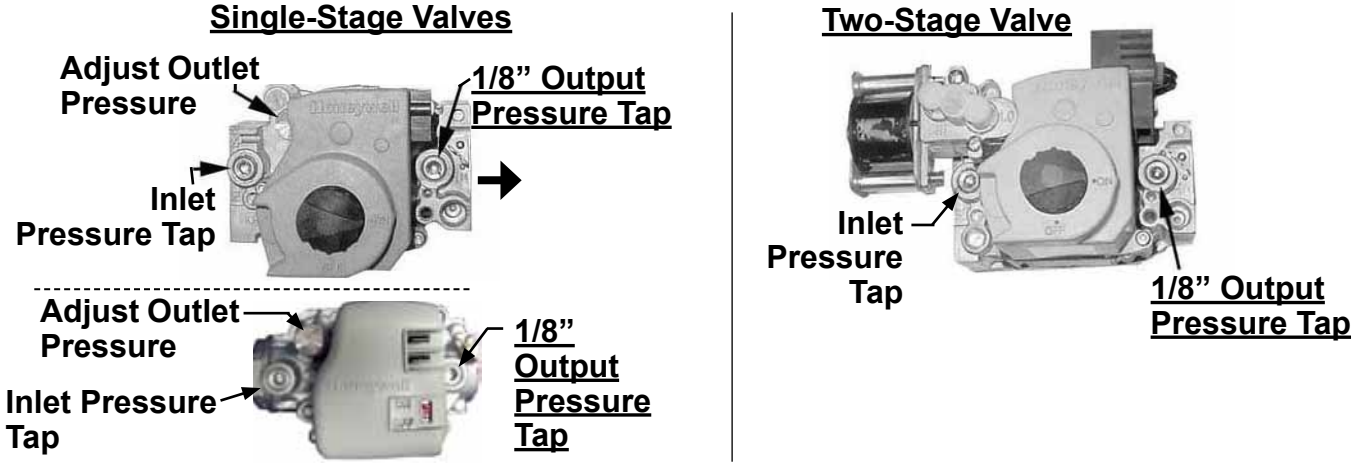
Instructions:

1. Locate the 1/8" NPT pressure taps on the combination gas valve.
2. **Check the Manual Gas Valve** - With the manual valve turned off to prevent flow to the gas valve, connect a manometer to the 1/8" inlet pressure tap in the combination valve. **NOTE:** A digital manometer is recommended.

   With the field-installed manual valve remaining closed, fire the unit on Test mode & allow the unit to go through one trial for ignition. Turn off and observe the manometer for two to three minutes for an indication of gas pressure. No pressure should be indicated on the manometer.

   If the manometer indicates a gas pressure, the field-installed manual gas valve must be replaced or repaired before the combination gas valve can be checked.
3. **Check the Combination Valve - If the manometer does not indicate gas pressure**, slowly open the tested field-installed manual gas valve. After the manometer's indicated gas pressure has reached equilibrium, close the manual shutoff valve. Observe the gas pressure. There should be no loss of gas pressure on the manometer. If the manometer indicates a loss of pressure, replace the combination gas valve before placing the heater in operation.

FIGURE 26 - Top View of Two Types of Single-Stage Gas Valves and a Two-Stage Valve



Modulating Valve - in Modulating Gas Control Options AG73 and AG74

Function: The modulating valve responds to the 2 to 10 VDC signal from the controller to modulate the gas pressure to the burner.

Service: The modulating gas valve has no field maintenance requirements except careful removal of external dirt accumulation and checking wiring connections.

Modulating Valve in Options AG73 and AG74			
Part No	**Size**	**Single Heat Section**	**Dual Heat Sections**
273587	1/2"	H50, H75, & H100	H102, H125, H150, H175 & H202
271840	1/2"	G150, H200 & H300 (propane)	G302, H402, H502 (propane), & H602 (propane)
273588	3/4"	G225 (natural), G300 (natural), H300 (natural), & H400	G372 (natural), G452 (natural), G525, G602, H502 (natural), H602 (natural), H702 & H802

5.0 Maintenance/Service Procedures - Gas Heat Section (cont'd)
5.1 Gas Heat Controls (cont'd)

Optional Gas Pressure Switches

Low P/N 204375 **High P/N 204279**

Location: Low pressure switch is at the entrance to the gas train. The high pressure switch is at the burner end. See **FIGURE 25**, page 33.

Function: Monitors gas pressure and shuts down the heat section if gas pressure becomes too low or too high. The low pressure switch is an auto reset type and is set at 50% of the maximum manifold pressure. The high pressure switch requires manual reset and is set at 125% of manifold pressure.

Service: There are no replaceable parts and the settings are non-adjustable. If replacement is required, use identical factory-authorized safety switches.

Condensate Drain Trap P/N 271064

Condensate Drain - High Efficiency Heat Section

Check the condensate drain.

Clean the drain and trap:

1. Open the cleaning ports and use the brush provided to clean the drain.
2. To clean the trap and float, unscrew the retaining ring and remove the bottom section of the trap. Remove the float and spring. Clean the parts with soapy water.
3. Reassemble the trap by inserting the spring and float into the bottom trap section. Position the bottom section in to the top and secure with the retaining ring.
4. Reconnect the trap and check for proper flow.

Condensate Drain Pressure Switch

P/N 234712
Set Point 0.10 I.W.C.

Condensate Drain Pressure Switch (See FIGURE 23, page 32)

Function: If the condensate drain is blocked causing the sensing pressure to be outside the switch setpoint, the pressure switch will shutoff the gas valve. The gas valve will remain off until the problem is corrected.

Service: If it is determined that the condensate pressure switch needs replacing, use only a factory-authorized replacement part that is designed for the heater. See **FIGURE 23,** page 32 for location.

5.2 Combustion Air and Venting

Combustion Air Proving Switch (see table on pages 37 & 38)

The gas heat section is power vented. Presence of combustion air pressure is monitored by a combustion air proving switch located in the heat section.

The combustion air proving switch is a pressure sensitive switch that monitors air pressure to ensure that proper combustion air is available. The switch is single pole/single throw with the normally open contacts closing when the proper airflow is sensed in the system.

On start-up when the heater is cold, the sensing pressure is at the most negative level, and as the heater and flue system warm up, the sensing pressure becomes less negative. After the system has reached equilibrium (about 20 minutes), the sensing pressure levels off.

If a restriction causes the sensing pressure to be outside the switch setpoint, the pressure switch will function to shut off the main burners. The main burners will remain off until the system has cooled and/or the flue system resistance is reduced. The table on page 37 lists the approximate water column negative pressure readings and switch set points for sea level operating conditions.

DANGER

Safe operation requires proper venting flow. Never bypass the combustion air proving switch or attempt to operate the heat section without the venter running and proper flow in the vent system. Hazardous condition could result.

Service: if the pressure switch needs to be replaced, use a factory-authorized replacement designed for the application.

5.2 Combustion Air and Venting (cont'd)

Combustion Air Switches for Sea Level to 6000 ft. (1830 m)														
Heat Section Option	Heat Size(s) (Btuh)	High Pressure Switch					Low Pressure Switch (AG73 & AG74 Only)							
		Startup Cold	Equilibrium Hot	Setpoint Off	Label Color	Switch P/N	Startup Cold	Equilibrium Hot	Setpoint Off	Label Color	Switch P/N	230, 460, 575V % Full Speed of Venter Mtr	208V % Full Speed of Venter Mtr
		Negative Pressure (iwc)					Negative Pressure (iwc)						
H50	50,000	3.10	2.00	1.50	Yellow	273360	3.50	1.30	0.75	Yellow	205443	74	82
H75	75,000	3.30	1.60	1.40	Red	201159	3.30	1.30	1.00	Brown	201160	74	82
H100	100,000	3.40	1.70	1.40	Red	201159	3.40	1.20	1.00	Brown	201160	74	82
H102*	50,000	3.10	2.00	1.50	Yellow	273360	3.50	1.30	0.75	Yellow	205443	74	82
H125*	50,000	3.10	2.00	1.50	Yellow	273360	(No low pressure switch on this furnace)						
	75,000	3.30	1.60	1.40	Red	201159	3.30	1.30	1.00	Brown	201160	74	82
H150*	75,000	3.40	1.60	1.40	Red	201159	3.30	1.30	1.00	Brown	201160	74	82
H175*	75,000	3.30	1.60	1.40	Red	201159	(No low pressure switch on this furnace)						
	100,000	3.40	1.70	1.40	Red	201159	3.40	1.20	1.00	Brown	201160	74	82
H200	200,000	3.80	1.80	1.40	Red	201159	3.80	0.90	0.75	Yellow	205443	42	54
H202*	100,000	3.40	1.70	1.40	Red	201159	3.40	1.20	1.00	Brown	201160	74	82
H300	300,000	3.90	1.90	1.50	Yellow	273360	3.90	0.90	0.75	yellow	205443	48	56
H400	400,000	3.80	1.80	1.50	Yellow	273360	3.80	1.00	0.80	Gray	197078	58	64
H402*	200,000	3.80	1.80	1.40	Red	201159	3.80	0.90	0.75	Yellow	205443	42	54
H502	200,000	3.80	1.80	1.40	Red	201159	(No low pressure switch on this furnace)						
	300,000	3.90	1.90	1.50	Yellow	273360	3.90	0.90	0.75	Yellow	205443	48	56
H602*	300,000	3.90	1.90	1.50	Yellow	273360	3.90	0.90	0.75	Yellow	205443	42	56
H702	300,000	3.90	1.90	1.50	Yellow	273360	(No low pressure switch on this furnace)						
	400,000	3.80	1.80	1.50	Yellow	273360	3.80	1.00	0.80	Gray	197078	58	64
H802*	400,000	3.80	1.80	1.50	Yellow	273360	3.80	1.00	0.80	Gray	197078	58	64
G150	150,000	2.70	2.20	1.40	Red	201159	2.70	1.70	0.10	White	234712	61	74
G225	225,000	2.90	2.50	1.40	Red	201159	2.90	1.30	0.10	White	234712	61	74
G300	300,000	2.70	2.50	1.30	White	201161	2.70	0.90	0.10	White	234712	61	74
G302*	150,000	2.70	2.20	1.40	Red	201159	2.70	1.70	0.10	White	234712	61	74
G372	150,000	2.70	2.20	1.40	Red	201159	(No low pressure switch on this furnace)						
	225,000	2.90	2.50	1.40	Red	201159	2.90	1.30	0.10	White	234712	61	74
G452*	225,000	2.90	2.50	1.40	Red	201159	2.90	1.30	0.10	White	234712	61	74
G525	225,000	2.90	2.20	1.40	Red	201159	(No low pressure switch on this furnace)						
	300,000	2.70	2.50	1.30	White	201161	2.70	0.90	0.10	White	234712	61	74
G602*	300,000	2.70	2.50	1.30	White	201161	2.70	0.90	0.10	White	234712	61	74

Combustion Air Switches for Above 6000 ft. (1830 m)									
Heat Section Option	Heat Size(s) (Btuh)	High Pressure Switch			Heat Section Option	Heat Size(s) (Btuh)	High Pressure Switch		
		Setpoint Off	Label Color	Switch P/N			Setpoint Off	Label Color	Switch P/N
		Negative Pressure (iwc)					Negative Pressure (iwc)		
H50	50,000	1.45	Orange	273555	H702*	300,000	1.45	Orange	273555
H75	75,000	1.35	Green	273554		400,000	1.45	Orange	273555
H100	100,000	1.35	Green	273554	H802	400,000	1.45	Orange	273555
H102*	50,000	1.45	Orange	273555	G150	150,000	1.35	Green	273554
H125*	50,000	1.45	Orange	273555	G225	225,000	1.35	Green	273554
	75,000	1.35	Green	273554	G300	300,000	1.25	Blue	273553
H150*	75,000	1.35	Green	273554	G302	150,000	1.35	Green	273554
H602*	300,000	1.45	Orange	273555					

Combustion Air Switches for Above 6000 ft. (1830 m) - (cont'd)									
Heat Section Option	Heat Size(s) (Btuh)	High Pressure Switch			Heat Section Option	Heat Size(s) (Btuh)	High Pressure Switch		
		Setpoint Off	Label Color	Switch P/N			Setpoint Off	Label Color	Switch P/N
		Negative Pressure (iwc)					Negative Pressure (iwc)		
H175*	75,000	1.35	Green	273554	G372*	150,000	1.35	Green	273554
	100,000	1.35	Green	273554		225,000	1.35	Green	273554
H200	200,000	1.35	Green	273554	G452*	225,000	1.35	Green	273554
H202*	100,000	1.35	Green	273554	G452*	225,000	1.35	Green	273554
H300	300,000	1.45	Orange	273555	G525	225,000	1.35	Green	273554
H400	400,000	1.45	Green	273555		300,000	1.25	Blue	273553
H402*	200,000	1.35	Green	273554	G602	300,000	1.25	Blue	273553
H502*	200,000	1.35	Green	273554					
	300,000	1.45	Orange	273555					

***** Heat sections with dual furnaces. When only one size is listed, both furnaces are the same size and two identical high pressure switches are used. Dual furnace heat sections with electronic modulation Option AG74 have one low pressure switch.

Combustion Air Inlet Openings

The combustion air inlet openings are located in the doors on the control end of the unit.

Keep all openings clean and free of obstructions.

Temperature Limit Control

All gas furnaces are equipped with a temperature activated auto reset limit control. Depending on size, the control is factory set at either 200°F or 250°F and is non-adjustable. If the setpoint is reached, the limit control will interrupt the electric supply to the gas valve. This safety device provides protection in the case of a lack of airflow due to dirty filters or a restriction at the inlet or outlet.

The limit control switch is mounted on the side of the heat exchanger

High Temperature Limit Control, Auto Reset

CAUTION: The auto reset limit control will continue to shut down the heat section until the cause is corrected. Never by-pass the limit control; hazardous conditions could result.

Service: If the limit switch needs to be replaced, use a factory-authorized replacement designed for the application.

Ignitor and Flame Sensor

Ignitor - Locate the ignitor. Disconnect the wire; remove the screw and the ignitor. Clean the ignitor assembly with an emery cloth.

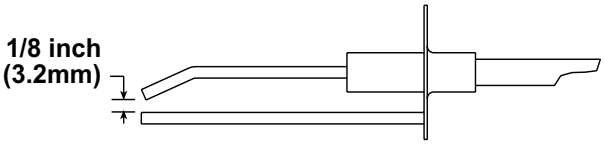
Spark gap must be maintained to 1/8". See **FIGURE 27** shown below.

Flame Sensor - Locate the flame sensor on the burner. Disconnect the wires; remove the screws and the flame sensor. Clean with an emery cloth.

Ignitor

Flame Sensor

FIGURE 27 - Ignitor showing required Spark Gap Measurement



5.3 Vent Maintenance and Operation

Vent Maintenance

Remove dirt and grease from the venter motor housing. The venter motor is permanently lubricated; do not lubricate. Carefully clean the venter wheel assembly, being cautious not to bend the wheel.

Check the vent at least once a year. Clean the terminal screen. If equipped with optional vertical vent extension, inspection should include all joints, seams, and the terminal. Replace any defective parts.

Venter Speed Board

Venter Speed Board Options AG73 and AG74 - Modulating gas controls have a proprietary electronically controlled venter system that provides the required volume of combustion air and correct gas pressure to maintain thermal efficiency during periods of modulation. Change of venter speed is controlled by an electronic board located on the heat section control panel (See **FIGURE 23,** page 32). The venter system always operates at high speed during pre-purge and post-purge periods. Speed selection occurs after there is a call for burner ignition.

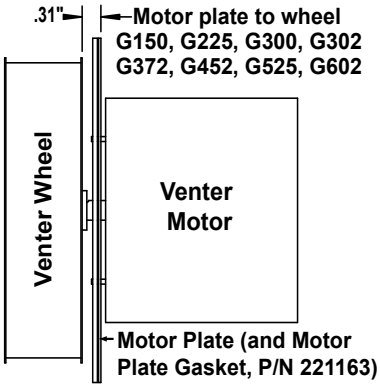
Maintenance Instructions for the Venter Motor and Wheel

Remove dirt and grease from the motor casing, the venter housing, pressure sensing tap, and the venter wheel. Venter motor bearings are permanently lubricated.

Follow these instructions for replacement of the venter motor and wheel assembly. Keep all hardware removed to be used in re-assembling and installing the replacement parts.

1. Turn off the gas and disconnect the electric power.
2. Open the burner/control compartment door panel.
3. Disconnect the two or three venter motor wires at the DSI control or the venter speed control board, capacitor wires at the capacitor (if applicable), and ground screw (located on the control panel).
4. On high efficiency (90%) condensing heat section, holding the venter motor, remove the screws that attach the venter motor mounting plate to the venter housing. Remove the motor and wheel assembly from the heater.

   On standard efficiency (80%) non-condensing heat section, remove the venter housing assembly by removing the screws that attach it to the flue wrapper.
5. Re-assemble with the replacement venter motor and wheel assembly. See **FIGURE 28** shown below for correct spacing. If there is a motor plate gasket, check it. If the gasket is damaged, replace it.



NOTES:

1) Manufacturer recommends replacing venter motor capacitor when replacing venter motor.

2) On standard efficiency (80%) non-condensing heat section, venter motor and wheel assembly cannot be disassembled.

FIGURE 28 - Venter Wheel Position on the Shaft (High Efficiency Models)

6. Follow the wiring diagram to connect the venter wires.
7. Close the door panel. Restore power to the heater and turn on the gas. Light, following the instructions on the lighting instruction plate. Check for proper operation.

5.4 Burner and Heat Exchanger

(Requires a wire brush, cleaning cloth, an automotive type aerosol degreaser or refrigerant coil cleaner, and compressed air)

NOTE: If any of the burner components are damaged or deteriorated, replace the burner assembly.

Inspect the gas heat section annually to determine if cleaning is necessary. If there is an accumulation of dirt, dust, and/or lint, clean the compartment.

CAUTION: Use of eye protection is recommended.

Inspect and Clean the Burner

1. Shut the gas supply off upstream of the combination valve.
2. Turn off the electric supply.
3. Open the burner access door.
4. Disconnect the union and remove the gas pipe from the inlet of the gas valve.
5. Mark and disconnect the electrical wires to the gas valve. Disconnect the tubing from the static tap on the burner cover.
6. Remove the screws that attach the manifold to the burner rack. Slide the manifold from the burner rack.

Excessive dirt buildup on and inside the ports on a burner could cause fuel gas to spill out the back of the burner tube. Fuel gas spilling out of the back of a burner tube will cause gas odor, and if not corrected, could eventually cause a fire/explosion hazard. To prevent fuel gas spilling from the back of a burner tube, check the burner ports at least annually and clean if necessary. Remove any soot deposits from the burners with a wire brush. Clean the ports with an aerosol degreaser and/or compressed air. Wipe the inside of the burner tubes clean. (Cleaning the burners with an aerosol degreaser is highly recommended as the degreaser will retard future buildup of dirt.)

Inspect the cleaned burner rack for any damage or deterioration. If a burner has any damage or signs of deterioration, replace it.

Clean the burner orifices with air pressure. Do not ream orifices.

After cleaning, re-assemble the heater and test for proper operation.

Heat Exchanger Maintenance

Access the heat exchanger by removing the manifold burner rack, flue wrapper and disconnecting the vent. Use a brush and/or an air hose to remove accumulated dust and grease deposits.

There should be no soot deposits. If sooting exists, check for improper gas manifold pressure and for obstructions in the vent.

Re-Assemble the Heat Exchanger Panel, Burner, Gas Train, and Venter

Instructions to Re-Assemble the Gas Heat Section

Re-attach the Burner Rack Assembly - Slide the entire burner rack assembly into position. Insert all of the screws.

1. Re-attach the Gas Train - Position the gas train so that the orifices are centered in the burners. Attach the manifold to the burner rack assembly. Re-connect the wires to the gas valve.
2. Re-attach the flue wrapper & venter assembly. (If replacing venter parts, follow the instructions above.) Re-connect the tubing and the wires.
3. Close the access door.
4. Reconnect the gas supply at the union outside of the cabinet. Leak test the connection with leak detecting solution. Turn on the electric. Turn on the gas. Check for proper operation.

6.0 Maintenance/Service Procedures - Electric Heat Section

Electric Heating Operation, Elements and Controls

Single Heating Element (Each heat section includes an assembly of single elements)

A call for mechanical heat will occur when the discharge air temperature is 5°F(2.8°C) below the active setpoint. When the OAT is below 65°F/18°C (Heating Lockout SP), the unit enables the mechanical heat to maintain the active setpoint. The modulated heat output will be set to 30% output and NO8 will be ON. The system will remain in this state for 30 seconds. After the initial timer has expired, the unit will stage as shown in the staging chart and the PID loop will activate. Stages should be assumed cumulative from the previous stage.

Electric Heat Staging				
PI Loop Control: All Statements Must Be True To Activate or De-Activate. All stages will have an adjustable min ON and OFF time.				
Stage	Outputs	Increase Inter-Stg Timer	Activate	De-activate *(No timers to de-activate except as shown.)*
Stg 1	Y4 = 30% for 30 seconds & NO8 = ON		DAT 5°F (2.8°C) below setpoint (Y4 Modulates, PI Loop)	Y4 < 10% Modulation & DAT 5°F (2.8°C) above setpoint for 10 mins
Stg 2	NO9 = ON	5 min	Y4 > 70% Modulation & DAT 5°F(2.8°C) below setpoint	Y4 < 55% Modulation & DAT 5°F(2.8°C) above setpoint
Stg 3	NO10 = ON	5 min	Y4 > 75% Modulation & DAT 5°F(2.8°C) below setpoint	Y4 < 65% Modulation & DAT 5°F(2.8°C) above setpoint
Stg 4	NO11 = ON	5 min	Y4 > 80% Modulation & DAT 5°F(2.8°C) below setpoint	Y4 < 70% Modulation & DAT 5°F(2.8°C) above setpoint
Stg 5	NO12 = ON	5 min	Y4 > 85% Modulation & DAT 5°F(2.8°C) below setpoint	Y4 < 75% Modulation & DAT 5°F(2.8°C) above setpoint
Stg 6	NO13 = ON	5 min	Y4 > 90% Modulation & DAT 5°F(2.8°C) below setpoint	Y4 < 80% Modulation & DAT 5°F(2.8°C) above setpoint
All parameters are factory level access.				

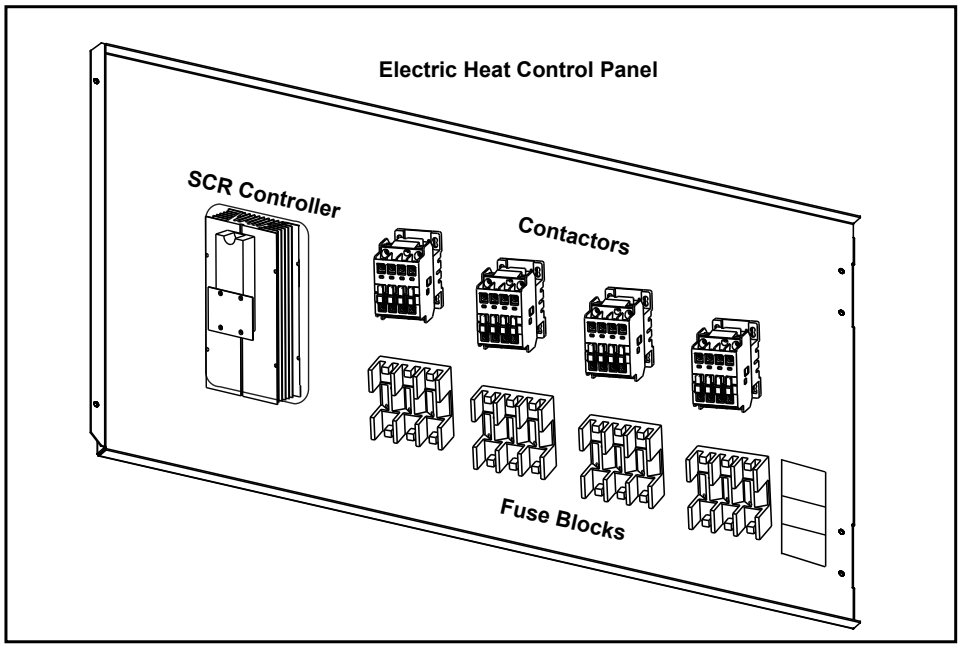
DANGER

High voltages are present on the Electric Heat Control Panel components shown below in FIGURE 29.

Location: See the control location illustration in **FIGURE 1,** page 4, and **FIGURE 29**, shown below for the electric heat section panel. The distribution blocks, fuses, contactors and optional SCR controller are mounted on the panel. The quantities and locations of these items depend on the size of the unit.

To access the electric heat elements, remove two screws on the left side of the hinged electric heat control panel.

FIGURE 29 - Electric Heat Control Panel Illustration (NOTE: Danger High Voltage)



Service: Carefully clean all dust and dirt from the heating elements using a brush or steel wool. With a vacuum or air hose, clean the inside of the cabinet especially the bottom and sides where dirt and dust will accumulate.
If replacement parts are required, check with your distributor and use only factory-authorized replacements.

7.0 Troubleshooting

7.1 Troubleshooting - Refrigeration

IMPORTANT: ***Do not release refrigerant to the atmosphere!*** If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified HVAC technician.

See Control Instructions, Form CP-Y-D19 or Form CP-Y - D21, for information on the unit controller.

NOTE: Unit is equipped with a phase loss/phase reversal control. If system does not start, check phase of electrical supply.

General Refrigeration Circuit		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
A. Compressor will not start.	1. Power off, loose electrical connections or fuse open.	1. Check disconnect switch, fuses and wiring. Replace parts or repair as necessary
	2. Compressor contactor not closing.	2. Check voltage to contactor coil, transformer, slave relay, system. Replace parts as necessary.
	3. Internal compressor thermal overload open.	3. If compressor is hot, allow 2 hours to cool. See D. Below.
	4. Compressor defective.	4. Check compressor for electrical failure. Compressor may be seized; check refrigerant. If necessary, replace compressor.
	5. High or low pressure switch open or defective.	5. If manual reset (high pressure), reset switch. (Switch opens at 600 psi and will not reset above 400 psi.) If auto reset (low pressure) does not reset and everything else is OK, replace low pressure switch, **P/N 216380**.
B. Compressor starts but cuts out on low pressure (low pressure switch activates at 35 psig.)	1. Low refrigerant charge.	1. Check subcooling; see Paragraph 3.6.
	2. Airflow restricted.	2. Check for dirty evaporator coil, dirty filters, dampers closed, iced evaporator coil, and/or improper belt. Check motor amps. Check duct design.
	3. Restriction in refrigerant line.	3. Check subcooling and superheat (Paragraph 3.6). Check operation of the thermal expansion valve. Check for pressure drop across the filter drier.
	4. Defective low pressure switch.	4. Check switch (opens 35 psi; closes 50 psi). If defective, replace low pressure switch, **P/N 216380**.
C. Compressor starts but cuts out on high pressure switch.	1. Refrigerant overcharge.	1. Check subcooling; see Paragraph 3.6.
	2. Condenser fan motor defective.	2. Check fan motor.
	3. Condenser coil inlet obstructed or dirty.	3. Check coil and inlet clearances and for possible air recirculation.
	4. Air or non-condensables in system.	4. Check high side equalized pressure reading with equivalent outdoor temperature.
	5. Defective high pressure switch.	5. Check switch (opens 600 psi; proof 700 psi; manual reset allowed below 400 psi). If defective, replace high pressure switch, **P/N 216379**.
	6. Restriction in discharge or liquid line.	6. Check subcooling and superheat (Paragraph 3.6). Check operation of thermal expansion valves.
D. Compressor cuts out on thermal overload.	1. Low voltage.	1. Check voltage.
	2. Sustained high discharge pressure.	2. Check running amperage and conditions described in I.
	3. High suction and discharge pressures.	3. Check thermal expansion valve operation, check for air in system.
	4. Defective compressor overload.	4. If compressor is hot, allow compressor to cool for two hours. Recheck for open circuit.
	5. Improper refrigerant charge.	5. Check subcooling (Paragraph 3.6).
	6. Bearings or pistons too tight.	6. Check for low oil level.
	7. Allow time for compressor to cool.	7. Check dome temperature of the compressor.
E. Noisy compressor.	1. Reverse rotation.	1. Check at startup. If the suction pressure rises and discharge pressure drops, shut down the compressor. Switch the 3-phase wiring connections.
	2. Refrigerant overcharge.	2. Check pressures and subcooling (Paragraph 3.6).
	3. Liquid flood back.	3. Check thermal expansion valve setting. Check subcooling for refrigerant overcharge (Paragraph 3.6).
	4. Tubing rattle.	4. Dampen tubing vibration by taping or clamping. Carefully bend tubing away from contact where possible.
	5. Compressor defective.	5. Check internal parts. Replace defective parts or compressor.

7.1 Troubleshooting - Refrigeration (cont'd)

General Refrigeration Circuit (cont'd)		
SYMPTOM	**POSSIBLE CAUSE**	**REMEDY**
F. Noisy unit operation.	1. Blower rotational noise.	1. Check blower, motor and drive for faulty adjustment or noisy bearings, loose parts, and/or blower out of balance.
	2. Air noise.	2. Check duct work. Air velocity too high.
	3. Chattering contactor.	3. Check for adequate control voltage; check for shorts or breaks; check contact points.
	4. Tubing rattle.	4. Dampen by taping or clamping, carefully bend tubing away from contact when possible.
G. High suction pressure.	1. Excessive load on evaporator coil.	1. Check superheat (Paragraph 3.6). Check for high entering wet bulb temperature. Check for excessive air.
	2. Compressor is unloaded.	2. Check head pressure. Check thermal expansion valve. If valve is not functioning properly, check pressure drop across filter drier.
	3. Expansion valve bulb not secured to suction line or valve defective.	3. Check the thermal expansion valve; ensure bulb is attached properly and insulated
H. High discharge pressure.	1. Refrigerant overcharge	1. Check subcooling. (Paragraph 3.6) Adjust refrigerant charge.
	2. Thermal expansion valve setting	2. Check superheat and adjust valve as needed.
	2. Air inlet to condenser dirty or obstructed.	3. Check for proper clearances and possible air recirculating.
	4. Condenser fan motor defective.	4. Check condenser fan motor(s).
I. Suction pressure is too low.	1. Refrigerant undercharge.	1. Check subcooling. (Paragraph 3.6) Add refrigerant as needed.
	2. Thermal expansion valve setting	2. Check superheat and adjust valve as needed.
	3. Blower running backward.	3. Interchange any two wires from 3 phase disconnect.
	4. Loose blower, pulley, or belts.	4. Check drive pulley alignment and belt tension.
	5. Dirty filter.	5. Check filter and evaporator coil.
	6. Too little air flow or low entering air temperature.	6. Check airflow and entering air wet bulb conditions.
	7. Restriction in suction or liquid line.	7. Check refrigerant circuit for restriction.
J. Head Pressure too low.	1. Insufficient refrigerant charge.	1. Check subcooling (Paragraph 3.6). Check for leak. Repair and add refrigerant.
	2. Defective or improperly adjusted expansion valve.	2. Check superheat (Paragraph 3.6) and adjust thermal expansion valve.
	3. Low suction pressure.	3. See “I. Suction pressure too low” above.
	4. Defective compressor.	4. See "G. High suction pressure” above.
K. Compressor short cycles..	1. Improper refrigerant charge.	1. Check subcooling and superheat. (Paragraph 3.6)
	2. Defective high or low pressure control.	2. Check high or low pressure switch.
	3. Liquid flood back.	3. Possible tight bearings, see above.
	4. Defective expansion valve.	4. Check superheat and thermal expansion valve.
	5. Poor air distribution.	5. Check duct work for recirculating.
	6. High discharge pressure.	6. See “H. High discharge pressure” above.
	7. Leaking discharge valves in compressor.	7. See “G. High suction pressure” above.
L. Running cycle is too long or unit operates continuously..	1. Refrigeration undercharged.	1. Check subcooling (Paragraph 3.6) and add refrigerant.
	2. Dirty filter or evaporator coil.	2. Check filter, coil, and airflow. Clean and/or replace.
	3. Dirty or clogged condenser coil.	3. Check coil and airflow. Clean.
	4. Air or other non-condensables in system.	4. Check equalized high side pressure with equivalent outdoor temperature.
	5. Defective compressor.	5. See “G. High suction pressure” above.
	6. Restriction in suction and liquid line.	6. Check for restrictions in refrigerant circuit.
	7. Control contacts stuck.	7. Check wiring.
M. Supply air temperature is too high.	1. Refrigerant undercharge or leak in system.	1. Check subcooling (Paragraph 3.6). Check for leak. Repair and add refrigerant.
	2. Evaporator plugged with dirt or ice.	2. Check evaporator, airflow, and filter. Clean.
	3. Improperly adjusted or defective expansion valve.	3. Check superheat (Paragraph 3.6) and adjust thermal expansion valve. Check expansion valve bulb placement and insulation.
	4. Defective compressor.	4. Check compressor for proper operation.
	5. High discharge pressure.	5. See “H. High discharge pressure” above.
	6. Airflow is too high.	6. Check external static pressure.
N. Supply air temperature is too low.	1. Airflow is too low.	1. Check evaporator coil; check filters; check for closed dampers or grills; check drive for loose parts, belts, or misalignment; and check external static pressure.
	2. Return air temperature too low.	2. Check entering air wet bulb conditions.
O. Liquid line is too hot.	1. Refrigerant undercharge.	1. Check subcooling.
	2. High discharge pressure.	2. See H. above.

7.0 Troubleshooting (cont'd)

7.2 Troubleshooting Compressor Digital Controller

General - The digital controller is located in the electrical compartment and acts as the interface between the digital compressor and the unit controller. If the unit interface display indicates critical Alarm Code 17, Modulating Capacity Compressor Failure, check the LED lights on the digital controller.

The alert code (red LED flashes) on the digital controller remains active and the compressor de-energized until the reset conditions have been met or the 24VAC power is cycled off and on. All Codes except 6 flashes result in compressor (contactor and unloader valve) being de-energized.

Compressor Digital Controller LED's

LED State		Indicates	Additional Information
Color	**CODE**		
Green	Solid	Power (24VAC present at power terminals)	Modulating capacity compressor starts only when demand signal input is above 1.45 VDC and no ALERTS (red LED flashes) are active.
Green.	Flashing	Anti-short cycle timer is active	
Yellow	Solid	Unloader (Solenoid valve is energized; compressor capacity is 0.)	Modulating capacity compressor always unloads for 0.1 second at startup.
Red	Not lit	No abnormal operation alerts	
Red	2 Flashes	High Discharge Temperature Alert (thermistor temperature above 268°F or thermistor is short circuited)	Modulating capacity compressor will be allowed to restart after a 30-minute delay and after the thermistor temperature is below 250°F. Compressor will lockout after 5 alerts within 4 hours and can only be reset by cycling the 24VAC power off and on.
Red	3 Flashes	Compressor Protector Trip (demand signal >1.44VDC & no compressor current)	Possible causes - internal overload, fuse or breaker, compressor wiring. After 2-minute anti-short cycle timer the controller will attempt to restart the compressor as long as demand is above 1.44VDC. No lockout feature.
Red	4 Flashes	Locked Rotor Alert	Locked rotor sensed by controller on four consecutive start-ups. Lockout occurs and can only be reset by cycling 24VAC power off and on.
Red	5 Flashes	Demand Signal Loss (below 0.5VDC)	When demand signal input rises above 0.5VDC, alarm code will reset. When demand reaches above 1.44VDC and anti-short cycle timer has timed out, modulating capacity compressor will restart.
Red	6 Flashes	Discharge Thermistor Fault (no signal being received)	Modulating compressor capacity limited to 50%. Re-connect or replace thermistor.
Red	7 Flashes	Unloader Solenoid Valve Fault	
Red	8 Flashes	Compressor Contactor Fault (compressor running on less than 1.44VDC demand signal)	Modulating compressor will run unloaded. Alarm will be reset when current is no longer detected while system demand signal is below 1.44VDC.
Red	9 Flashes	Low 24VAC supply to controller (below 18.5VAC)	Alarm will reset when supply voltage to controller rises above 19.5VAC.

7.2 Troubleshooting Compressor Digital Controller (cont'd)

LED State		Indicates	Additional Information
Color	**CODE**		
All	Solid	Digital compressor controller failure	The installed digital compressor controller can be tested to verify that it is working properly. In each test, 24VAC must be supplied to 24VAC and 24COM. For output test, 24-250VAC must be supplied to L1 and L2. Input Tests - 1) Thermistor Input - Disconnect thermistor (T1 & T2); LED should display Code 6.; and 2) Demand Input - Disconnect unit controller (C1 & C2); LED should display Code 5 unless a previous alert code was present. Output Tests - 1) Contactor Output - while the controller is powered off (no supply voltage to 24VAC and 24COM), disconnect signal wire from C1 & C2; add jumper wires from P3 to C2 and from P1 to C1; re-apply power to 24VAC and 24COM. If functioning normally, same voltage should be read across M1 and M2 as across L1 and L2, unless an LED ALERT code is present.; and 2) Unloader Output - while controller is modulating the unloader solenoid (whenever the yellow LED is lit), voltage across U1 and U2 should be the same as L1 and L2.
All	Flashing	24VAC Supply too low for operation	

7.3 Troubleshooting the Heat Section

7.3.1 General Troubleshooting - Electric Heat Section (Option E__)

PROBLEM	PROBABLE CAUSE	REMEDY
Unit does not operate	1. No power to unit	1. Turn on power; check supply fuses or main circuit breaker.
	2. Blown fuses	2. Check and replace if necessary.
	3. Defective or incorrect wiring.	3. Check wiring and connections. Refer to wiring diagram provided with unit.
	4. Defective or burned out control transformer	4. Check secondary voltage with voltmeter. Replace if necessary.
Fan operates but element does not heat	1. Dirty filters	1. Check filters and clean or replace if necessary.
	2. Defective air proving switch	2. Check and replace if necessary.
	3. Blown element fuses	3. Check and replace element fuses if necessary.
Insufficient heat	1. Burned out element	1. Turn off power and check element resistance with ohmmeter. Replace if open.
	2. Blown fuses	2. Check and replace if necessary.
	3. Cycling on limit control	3.
		a) Check air throughput (temperature rise).
		b) Check motor rpm against nameplate rating. Replace motor if speed is too slow.
		c) Defective limit control. Check wiring and connections. Check continuity through control and replace if necessary.
	4. Defective or incorrect wiring.	4. Check wiring and connections. Refer to wiring diagram provided with unit.

7.0 Troubleshooting (cont'd)

7.3.2 General Troubleshooting - Gas Heat Section - (Option G__ or H__)

PROBLEM	PROBABLE CAUSE	REMEDY
Venter motor will not start	1. No power to unit.	1. Turn on power; check supply fuses or main circuit breaker.
	2. No 24 volt power to ignition system circuit board.	2. Turn up thermostat; check control transformer output.
	3. Integrated circuit board fuse blown.	3. Correct cause; replace fuse.
	4. No power to venter motor.	4. Tighten connections at circuit board and/or motor terminals.
	5. Integrated circuit board defective.	5. Replace integrated circuit board.
	6. Defective venter motor or capacitor	6. Replace defective parts. Recommend replacing capacitor when replacing motor. See Paragraph 5.2.
Burner will not light	1. Manual valve not open.	1. Open manual valve.
	2. Air in the gas line.	2. Bleed gas line (initial startup only).
	3. Gas pressure too high or too low.	3. See Installation/Operation manual, Doc No 300537, Paragraph 9.2.1.
	4. No Spark:	4.
	a) Loose wire connections.	a) Be certain all wire connections are solid.
	b) Transformer failure.	b) Be sure 24 volts is available.
	c) Incorrect spark gap.	c) Maintain spark gap at 1/8".
	d) Spark cable shorted to ground.	d) Replace worn or grounded spark cable.
	e) Spark electrode shorted to ground.	e) Replace if ceramic spark electrode is cracked or grounded.
	f) Ignition system circuit board not grounded.	f) Make certain circuit board is grounded to furnace chassis.
	g) Unit not properly grounded.	g) Make certain unit is properly field grounded to earth ground and properly phased (L1 to hot lead L2 to neutral).
	h) Ignition system circuit board fuse blown.	h) Correct cause; replace fuse.
	i) Modulation system out of acceptance range	i) Review error codes on board; refer to page 34.
	j) Faulty circuit board.	j) If 24 volt is available to the circuit board and all other causes have been eliminated, replace board.
	5. Lockout device interrupting control circuit by above causes.	5. Reset lockout by interrupting control.
	6. Combustion air proving switch not closing	6. Clean venter wheel.
		a) Remove obstructions from vent.
		b) Replace faulty tubing to pressure switch.
	7. Faulty combustion air proving switch.	7. Replace combustion air proving switch.
	8. Valve not operating.	8.
	a) Defective valve.	a) If 24 volt is measured at the valve connections and valve remains closed, replace valve.
	b) Loose wire connections	b) Check and tighten all wiring connections.
	9. Circuit board does not power valves.	9.
	a) Loose wire connections.	a) Check and tighten all wiring connections.
	b) Flame sensor grounded.	b) Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required.
	c) Incorrect gas pressure.	c) See Installation/Operation manual, Doc No 300537, Paragraph 9.2.1.
	d) Cracked ceramic at sensor.	d) Replace sensor.
Burner cycles on and off	1. Gas pressure too high or too low.	1. See Installation/Operation manual, Doc No 300537, Paragraph 9.2.1.
	2. Circuit board not grounded.	2. Make certain integrated circuit board is grounded to furnace chassis.
	3. Faulty integrated circuit board	3. If 24 volt is available to the circuit board and all other causes have been eliminated, replace board.
	4. Combustion air proving switch not closing.	4. Clean venter wheel.
		a) Make sure unit is properly vented.
		b) Remove obstructions from vent.
		c) Replace faulty tubing to pressure switch.
	5. Faulty combustion air proving switch.	5. Replace combustion air proving switch.
	6. Flame sensor grounded.	6. Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required.
	7. Cracked ceramic at sensor.	7. Replace sensor.
	8. Incorrect polarity.	8. Reverse line volt leads to integrated circuit board.
Venter motor will not run	1. Circuit open.	1. Check wiring and connections.
	2. Defective integrated circuit board.	2. Replace board.
	3. Defective motor.	3. Replace motor.
Venter motor cuts out on overload	1. Low or high voltage supply.	1. Correct electric supply.
	2. Defective motor or capacitor.	2. Replace defective parts. Recommend replacing capacitor when replacing motor. See Paragraph 5.2

NOTES

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