REZNOR®

MAPS®

MAPS®dH™

Revision: O-MAPSIII&IV-CAB-ABC (06-19) PN257004R9
Supersedes: O-MAPSIII&IV Cabinets A/B/C (Version B.5)

Operation/Maintenance/Service

Applies to: Cabinet Sizes A, B, and C of MAPS®III Models RCB, RDB, RDCB, RDDB, RECB, REDB and MAPS®IV Models RCC, RDC, RDCC, RDDC, RECC, REDC

MAPS® Cabinet Sizes A, B, and C

R-410A Refrigerant

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.

Table of Contents

1.0 General

NOTE: To confirm that this booklet is applicable, refer to the list of model and cabinet sizes in paragraph 2.3, page 6.

This booklet includes operation, maintenance, and service information for cabinet sizes A, B, and C of the MAPS® III and MAPS® IV models listed below. 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.

The instructions in this manual apply to the following MAPS® models in cabinet A, B, and C sizes and model JHUP 250 and 300 duct furnace curb option.

Model		System Description
MAPS®III	MAPS®IV	
RCB	RCC	Makeup air cooling packaged system (1500–9000 cfm)
RDCB	RDCC	Makeup air cooling packaged system (1500–9000 cfm) with gas heat section (100–700 MBH)
RECB	RECC	Makeup air cooling packaged system (1500–9000 cfm) with electric heat section (10–88 kW)
RDB	RDC	Makeup air cooling and reheat pump reheat cycle packaged system (1500–9000 cfm)
RDDB	RDDC	Makeup air cooling and reheat pump reheat cycle packaged system (1500–9000 cfm) with gas heat section (100–700 MBH)
REDB	REDC	Makeup air cooling and reheat pump reheat cycle packaged system (1500-9000 cfm) with electric heat section (10–88 kW)
JHUP		Optional curb section with 250- or 300-MBH gas-fired duct furnace installed with model RDCB, RDCC, RDDB, or RDDC unit with size 250 or 700 heat section to provide 500 or 1000 MBH of heating
NOTE: MAPS®III models have staged cooling. MAPS®IV models have modulating cooling.		

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. Refer to 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** and follow the instructions in the referenced paragraphs 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 above).

If replacement parts are required, use only factory-authorized parts. For information, go to www.ReznorHVAC.com or call (800)-695-1901.

2.0 Maintenance Requirements (cont'd)

2.1 Maintenance Schedule

Important NOTE: If equipped with an optional energy recovery module, refer to the energy recovery module manual (form I-MAPSIII&IV-ER) for enthalpy wheel maintenance instructions.

Monthly

- □ Inspect filters; clean or replace as needed (refer to Paragraph 3.1).
- □ Inspect the condensate drain; clean as needed. For information, refer to the installation manual (form I-MAPSIII&IV).

Semi-Annually

- □ Inspect the unit blower and belts. Check belts for tension, wear, and alignment. Adjust or replace as needed. Clean dirt from blower and motor (refer to Paragraph 3.2).

Annually

NOTE: Redo the cooling startup procedures when the cooling season begins. Refer to the startup instructions in the installation manual (form I-MAPSIII&IV).

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 condensate drain pan. Clean the coil cabinet, clean the drain pan, and fill the trap.
- □ Inspect/clean condenser fans (refer to Paragraph 3.3).
- □ Inspect/clean all coils (refer to Paragraph 3.4).
- □ Check compressor operation (refer to Paragraph 3.6).
- □ Check refrigerant pressure and temperatures (superheat and subcool). These checks are done when the system is operating (refer to Paragraph 3.5).

Models RDCB, RDCC, RDDB, and RDDC with a gas heat section—beginning of the heating season (refer to Paragraph 4.0):

NOTE: A MAPS® B cabinet with 500 MBH of heat is a size 250 gas heat section plus an optional model JHUP curb duct furnace. A MAPS® C cabinet with 1000 MBH of heat is a size 700 gas heat section plus an optional model JHUP curb duct furnace. The same maintenance procedures apply to the duct furnaces.

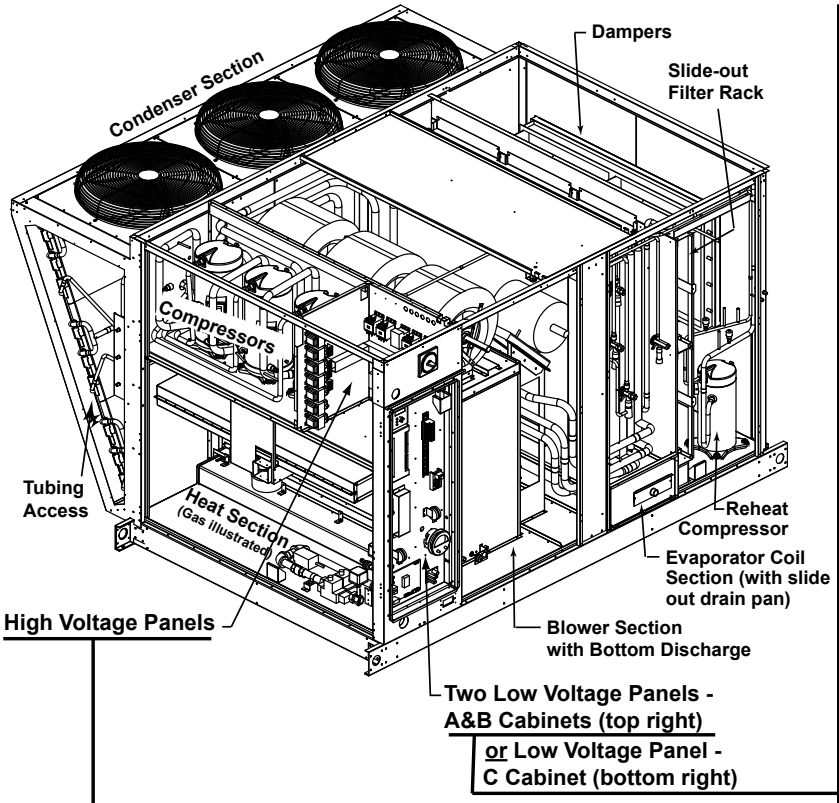
- □ Clean all dirt and grease from the combustion air openings and the venter assembly.
- □ Check the heat exchanger, burner, and venter for scale, dust, or lint accumulation. Clean as needed.
- □ Check the gas valves to ensure that gas flow is being shutoff completely.

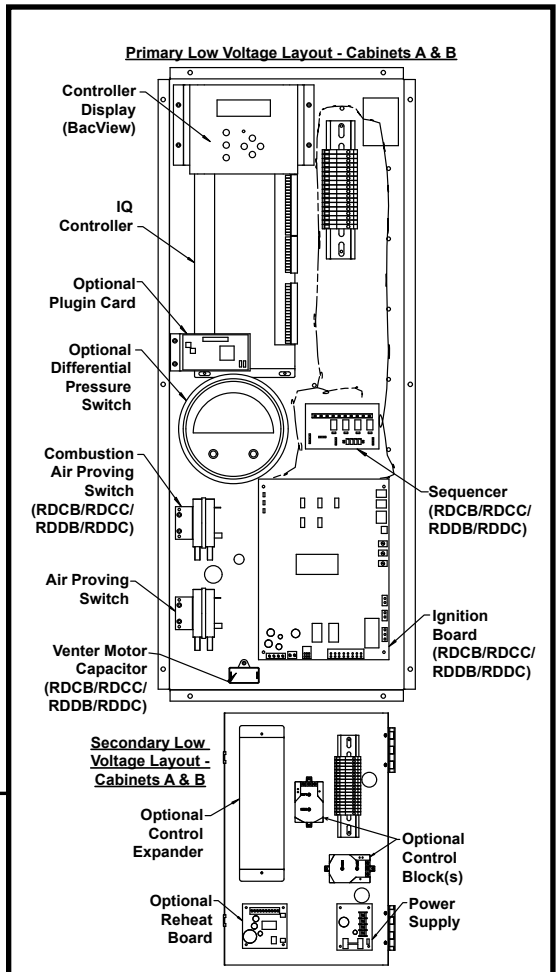
Models RECB, RECC, REDB, and REDC with an electric heat section—beginning of the heating season (refer to Paragraph 5.0):

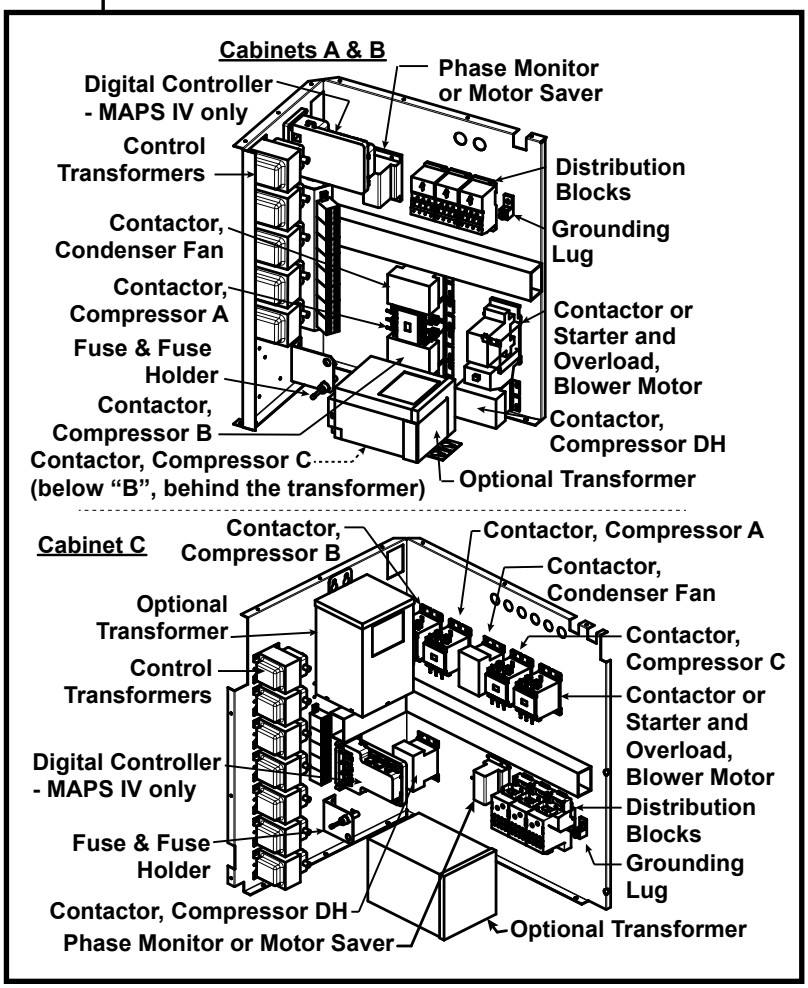
- □ Check wiring connections.
- □ Check the heat section and elements for dust or lint accumulation. Carefully clean as needed.

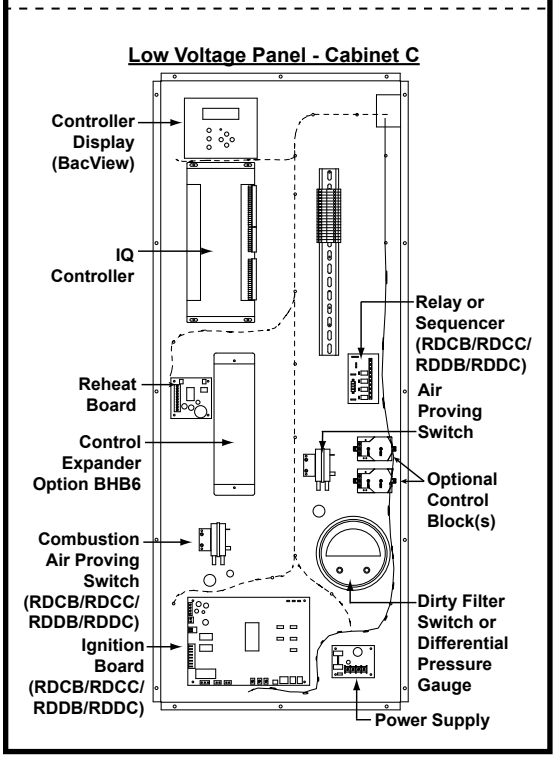
2.2 Control Locations

FIGURE 1. Showing Access (Panels Removed) and High and Low Voltage Control Locations (Including Control Options)









2.0 Maintenance Requirements (cont'd)

2.3 Cross-Reference of Models and Cabinet Sizes A, B, and C

DX Cooling Models RCB and RCC and DX with Reheat Models RDB and RDC

Model RCB	Model RCC	Cabinet Size
060		A
078	--	
090		
118	120	
136	--	
160		B
186	--	
200		
190		C
216	--	
298		
410		

Model RDB	Model RDC	Cabinet Size
084		A
102	--	
114		
142	144	
162	--	
184		B
--	196	
210	--	
222	--	
224	--	
236		
--	257	
248		C
262		
272	--	
288	--	
354		
370		
468		
482		

Model RDCB, RDDB, RDCC, and RDDC by Cabinet Size and Gas Heat Section Size

Model RDCB	Model RDCC	Gas Heat Section Size -100	-150	-200	-250	-300	-400	-500	-600	-700	-800	-1000
060		A	A	A	--	--	--	--	--	--	--	--
078	--	A	A	A	B	B		B*	--	--	--	--
090		A	A	A	B	B		B*	--	--	--	--
118	120	A	A	A	B	B		B*	--	--	--	--
136	--	A	A	A	B	B		B*	--	--	--	--
160		--	--	--	B	B		B*	--	--	--	--
186	--	--	--	--	B	B		B*	--	--	--	--
200		--	--	--	B	B		B*	--	--	--	--
190		--	--	--	--	--	C	C	C	C	--	C**
216	--	--	--	--	--	--	C	C	C	C	--	C**
298		--	--	--	--	--	C	C	C	C	--	C**
410		--	--	--	--	--	C	C	C	C	--	C**

Model RDDB	Model RDDC	Gas Heat Section Size -100	-150	-200	-250	-300	-400	-500	-600	-700	-800	-1000
084		A	A	A	--	--	--	--	--	--	--	--
102	--	A	A	A	B	B	--	--	--	--	--	--
114		A	A	A	B	B	--	--	--	--	--	--
142	144	A	A	A	B	B	--	--	--	--	--	--
162	--	--	A	A	B	B	--	--	--	--	--	--
184		--	--	--	B	B	--	--	--	--	--	--
--	196	--	--	--	B	B	--	--	--	--	--	--
210	--	--	--	--	B	B	--	--	--	--	--	--
222	--	--	--	--	B	B	--	--	--	--	--	--
224	--	--	--	--	B	B	--	--	--	--	--	--
236		--	--	--	B	B	--	--	--	--	--	--
--	257	--	--	--	B	B	--	--	--	--	--	--
248		--	--	--	--	--	C	C	C	C	--	C**
262		--	--	--	--	--	C	C	C	C	--	C**
272	--	--	--	--	--	--	C	C	C	C	--	C**
288	--	--	--	--	--	--	C	C	C	C	--	C**
354		--	--	--	--	--	C	C	C	C	--	C**
370		--	--	--	--	--	C	C	C	C	--	C**
468		--	--	--	--	--	C	C	C	C	--	C**
482		--	--	--	--	--	C	C	C	C	--	C**

Model RECB, REDB, RECC, and REDC by Electric Heat Module and Cabinet Size

Model RECB	Model RECC	Electric Heat Section -10S	-15S	-20S	-24S	-15	-20	-25	-30	-35	-39	-50	-60	-75	-88
060		A	A	A	A	A	A	A	A	A	A	--	--	--	--
078	--	--	A	A	A	A	B	A	A	B	A	B	B	B	--
090		--	A	A	A	A	B	A	A	B	A	B	B	B	B
118	120	--	A	A	A	A	B	A	A	B	A	B	B	B	B
136	--	--	A	A	A	A	B	A	A	B	A	B	B	B	B
160		--	--	--	--	B	B	B	B	B	B	B	B	B	B
186	--	--	--	--	--	B	B	B	B	B	B	B	B	B	B
200		--	--	--	--	--	B	B	B	B	B	B	B	B	B
190		--	--	--	--	--	--	--	--	--	C	C	C	C	C
216	--	--	--	--	--	--	--	--	--	--	C	C	C	C	C
298		--	--	--	--	--	--	--	--	--	C	C	C	C	C
410		--	--	--	--	--	--	--	--	--	C	C	C	C	C

Model REDB	Model REDC	Electric Heat Section -10S	-15S	-20S	-24S	-15	-20	-25	-30	-35	-39	-50	-60	-75	-88
084		A	A	A	A	A	B	A	A	B	A	B	B	B	--
102	--	--	A	A	A	A	B	A	A	B	A	B	B	B	B
114		--	A	A	A	A	B	A	A	B	A	B	B	B	B
142	144	--	A	A	A	A	B	A	A	B	A	B	B	B	B
162	--	--	--	--	--	A	B	A	A	B	A	B	B	B	B
184		--	--	--	--	B	B	B	B	B	B	B	B	B	B
--	196	--	--	--	--	--	B	B	B	B	B	B	B	B	B
210	--	--	--	--	--	--	B	B	B	B	B	B	B	B	B
222	--	--	--	--	--	--	B	B	B	B	B	B	B	B	B
224	--	--	--	--	--	--	B	B	B	B	B	B	B	B	B
236		--	--	--	--	--	B	B	B	B	B	B	B	B	B
--	257	--	--	--	--	--	B	B	B	B	B	B	B	B	B
248		--	--	--	--	--	--	--	--	--	C	C	C	C	C
262		--	--	--	--	--	--	--	--	--	C	C	C	C	C
272	--	--	--	--	--	--	--	--	--	--	C	C	C	C	C
288	--	--	--	--	--	--	--	--	--	--	C	C	C	C	C
354		--	--	--	--	--	--	--	--	--	C	C	C	C	C
370		--	--	--	--	--	--	--	--	--	C	C	C	C	C
468		--	--	--	--	--	--	--	--	--	C	C	C	C	C
482		--	--	--	--	--	--	--	--	--	C	C	C	C	C

***MAPS® B cabinet with 500 MBH of gas heat is size 250 MBH heat section plus option JH25 curb with 250-MBH duct furnace.**

****MAPS® C cabinet with 1000 MBH of gas heat is size 700 MBH heat section plus option JH30 curb with 300-MBH duct furnace.**

3.0 Maintenance and Service Procedures

3.1 Filters

The filter section is equipped with a slide out filter rack and 2- or 4-inch, pleated disposable or permanent aluminum filters. To remove filters, open the door and slide filters out. Replacement filters are listed in the table below. Do not use any other type of filters.

Cabinet Size		A						B			C		
Model Sizes		060/078/084/102			090/114/11//120/136/142/144/162			All Cabinet B			All Cabinet C		
Filter Description	Option	Qty	Size	PN	Qty	Size	PN	Qty	Size	PN	Qty	Size	PN
2-inch pleated, disposable	AW11	1	20 × 25 × 2	104113	2	16 × 20 × 2	104110	4	20 × 25 × 2	104113	6	20 × 25 × 2	104113
					2	20 × 20 × 2	104111						
4-inch pleated, disposable, MERV 8	AW21	1	20 × 25 × 4	205791	2	16 × 20 × 4	211127	4	20 × 25 × 4	205791	6	20 × 25 × 4	205791
					2	20 × 20 × 4	205790						
4-inch pleated, disposable, MERV 13	AW24	1	20 × 25 × 4	256663	2	16 × 20 × 4	256665	4	20 × 25 × 4	256663	6	20 × 25 × 4	256663
					2	20 × 20 × 4	256662						
2-inch permanent, aluminum	AW9	1	20 × 25 × 2	101623	2	16 × 20 × 2	101620	4	20 × 25 × 4	101623	6	20 × 25 × 2	101623
					2	20 × 20 × 2	101621						
4-inch permanent, aluminum	AW20	2	20 × 25 × 2	101623	4	16 × 20 × 2	101620	8	20 × 25 × 2	101623	12	20 × 25 × 2	101623
					4	20 × 20 × 2	101621						

If equipped with permanent aluminum filters, remove the filters, wash, rinse, allow to dry, and slide them back in the cabinet.

If equipped with pleated disposable filters, replace dirty filters. Exposure to humid makeup air can accelerate filter degradation. Systems with disposable filters require more frequent filter inspection.

Dirty Filter Switch (Options BE16 and BE18)

If equipped with a dirty filter switch or gauge, check the condition of the sensing tubes to be sure that they are not blocked. Check the wiring connections. To set a new switch (option BE18), refer to the installation manual (form I-MAPSIII&IV). The replacement switch is **PN 105507**.

Permanent Filters in the Outside Air Hood

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 2A or 2B**). When inspecting the inlet air filters, inspect the outside air hood filters. If cleaning is needed, remove the filters, clean, rinse, dry and reinstall.

NOTE: If it is more convenient to keep an extra clean set of filters, filter sizes and part numbers are shown in the illustration.

FIGURE 2A. Removing Filters from Outside Air Hood

1" Permanent Aluminum Filters for Outside Air Hood are listed by cabinet size A, B, or C (see cross-reference, page 6)

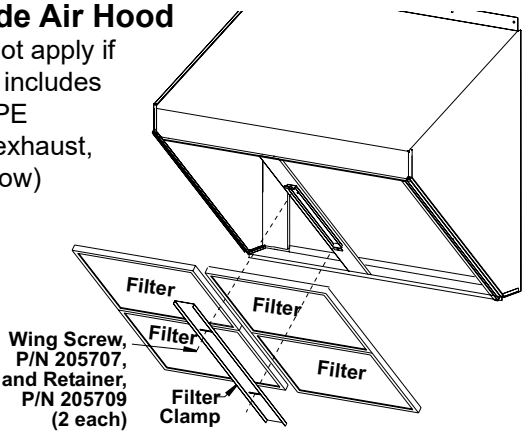
***A:** (4) 16 × 20, **PN 101607**

***B:** (4) 16 × 25, **PN 101609**

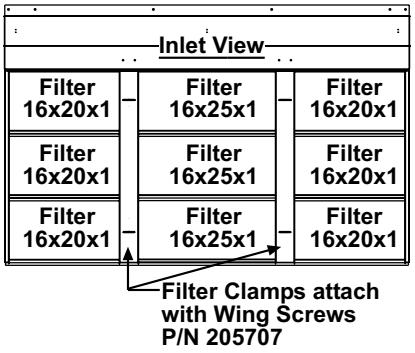
C: (3) 16 × 25, **PN 101609**; (6) 16 × 20, **PN 101607**

*Apply only to cabinet sizes A and B with outside air hood option AS16.

Cabinet Sizes A and B with Option AS16 Outside Air Hood
(does not apply if system includes option PE power exhaust, see below)



All Cabinet Size C with either Outside Air Hood Option AS16 or AS19



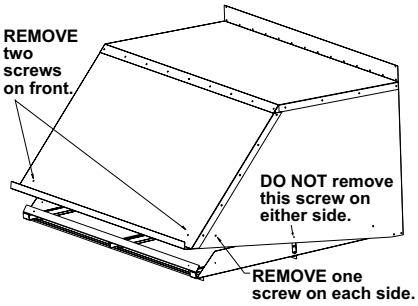
Instructions: Remove filters by loosening the wing screws and sliding the filter clamp(s). Clean with soap and water, allow to dry, and replace. If it is more convenient to keep an extra clean set of filters, quantities, filter sizes, and part numbers are listed.

FIGURE 2B. Removing Filters from Option AS19 Outside Air Hood Installed on Cabinet Size A or B with Power Exhaust Option PE1 or PE2

Instructions: **1)** Remove the four screws as illustrated. Lower the tray. **2)** Pull out filters. Clean with soap and water. Allow to dry. **3)** Slide clean dry filters into tray. **4)** Reposition tray and replace screws.

1" Aluminum Filters: ****A:** (4) 18 × 20, **PN 194903**; ****B:** (4) 20 × 25, **PN 101610**

**Apply only to cabinet sizes A and B with outside air hood option AS19.



Filters in Optional Energy Recovery Module

*See cross-reference of MAPS® models by cabinet size A, B, or C on page 6.

If equipped with an energy recovery module (option ER1A, ER1B, or ER1C), check both inlet and exhaust filters. Replace as needed.

Cabinet Size*	Inlet Air Filters (Merv 8)			Exhaust Air Filters (Merv 8)		
	Filter Type and Size	Qty	PN	Filter Type and Size	Qty	PN
A	Pleated 20 × 25 × 2	2	104113	Pleated 20 × 25 × 2	2	104113
B	Pleated 16 × 25 × 2	2	104112	Pleated 16 × 25 × 2	2	104112
	Pleated 12 × 25 × 2	2	114320	Pleated 12 × 25 × 2	2	114320
C	Pleated 16 × 25 × 2	2	104112	Pleated 16 × 25 × 2	2	104112
	Pleated 20 × 25 × 2	2	104113	Pleated 20 × 25 × 2	2	104113
	Pleated 16 × 16 × 2	1	104109	Pleated 16 × 16 × 2	1	104109
	Pleated 16 × 20 × 2	1	104110	Pleated 16 × 20 × 2	1	104110

3.2 Drive Components

CAUTION: If the blower is unused for more than three months, bearings with a grease fitting should be purged with new grease prior to startup.

Bearings: Bearings with a grease fitting should be lubricated twice a year with a high temperature, moisture-resistant grease (type NLGI-1 or -2 standard grease is recommended). Be sure to clean the grease fitting before adding grease. Add grease with a handgun until a slight bead of grease forms at the seal. Be careful not to unseat the seal by over lubricating. **NOTE: If unusual environmental conditions exist (temperatures below 32°F or above 200°F, moisture, or contaminants), more frequent lubrication is required.**

Setscrews: Check all of the setscrews (bearing/blower hubs and pulleys). Torque pulley setscrews a minimum of 110 inch-pounds to 130 inch-pounds maximum.

A bearing hub setscrew for a 1-3/8" to 1-3/4" shaft requires a 5/16" socket and a tightening torque of 165 inch-pounds.

Belts: Check belt for proper tension and wear. If needed, follow instructions to adjust belt tension. Replace worn belts.

3.0 Maintenance and Service Procedures (cont'd)

3.2 Drive Components (cont'd)

Belts (cont'd)

Blower systems are equipped with either Power Twist Plus® linked blower belt or a solid belt. The linked belts are designed in sections allowing for easy sizing and adjustment. The belt is sized at the factory for the proper tension. If the belt needs adjustment, the recommended method of shortening the belt length is to count the number of links and remove one link for every 24 (link is made up of two joining sections of belt). For easier removal of links, turn the belt inside out, but be sure to turn it back before installing.

If equipped with a solid belt, adjust the belt tension by turning the adjusting screw on the motor base until the belt can be depressed 1/2" (13 mm) on each side. After correct tension is achieved, retighten the locknut on the adjustment screw.

Proper belt tension is important to the long life of the belt and motor.

Be sure belts are aligned in the pulleys. If a belt is removed or replaced, be sure the directional arrows on the belt match the drive rotation.

Motor and Blower: Inspect the motor mounts periodically. Remove dust and dirt accumulation from the motor and wheel.

The blower has cast iron, pillowblock, sealed bearings. Under most operating conditions, relubrication is unnecessary. If lubrication is required, use a lubricant compatible to Shell Alvania #2 (lithium base, grade 2). Operating temperature range is −30 to 230°F.

If any drive parts need to be replaced, use only factory-authorized replacements designed for the application.

3.3 Condenser Fans

Depending on the size, there are two, three, or four fans in the condenser section. If parts need to be replaced, use only factory authorized replacement parts. See **FIGURE 3** for assembled dimensions and proper fan rotation.

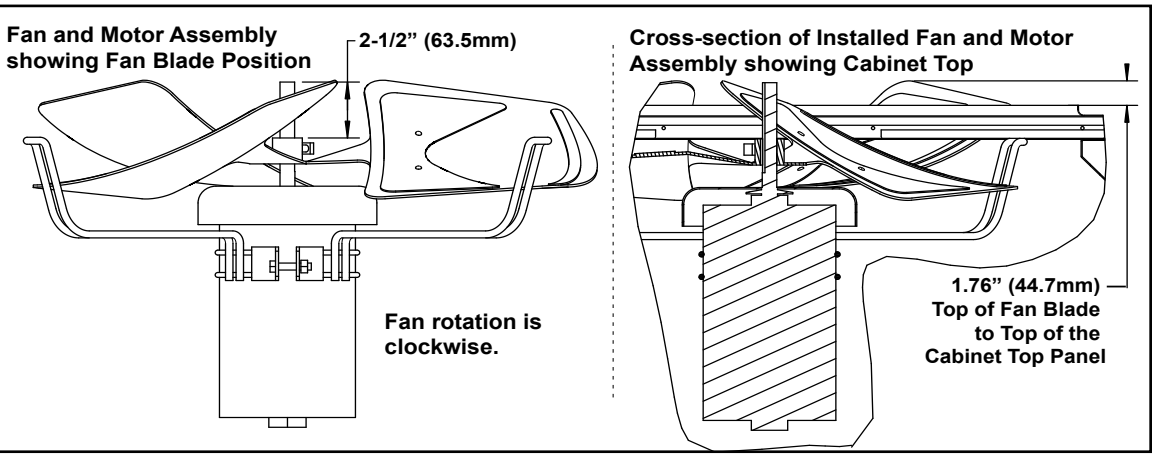


FIGURE 3. Condenser Fan Assembly Dimensions and Rotation

3.4 Coil Maintenance

The MAPS® cooling system is equipped with space-saving MACROCHANNEL® 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). For additional access for inspection and maintenance, remove the tubing access panel (see **FIGURE 1**, page 5).

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 access panels.
3. Use a soft brush to remove any dirt and debris from both sides of a 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 Check Refrigerant Pressure and Temperatures (Subcooling and Superheat)

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 3).

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. Method of disabling depends on the model and date of manufacture.

All MAPS®IV models and any MAPS®III model with a shutoff valve in the line between the compressor discharge and the hot gas bypass valve: 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.

MAPS®III models without a shutoff valve in the line between the compressor discharge and the hot gas bypass valve: Disable the hot gas bypass valve by removing the cover and adjusting the spring tension counterclockwise until the spring tension is relieved. **Count and record the number of turns** required so that you can return the bypass valve to its original setting. To check setting, refer to Paragraph 3.9.5.

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 10), 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 70–95°F (21–35°C) is 10–12°F (5.6–6.7°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.

3.0 Maintenance and Service Procedures (cont'd)

3.5 Check Refrigerant Pressure and Temperatures (cont'd)

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			

3.6 Compressor Operation, Maintenance, and Replacement

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 this scroll compressor be performed by a technician qualified in R-410A refrigerant (see Hazard Levels, page 3).

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 3).

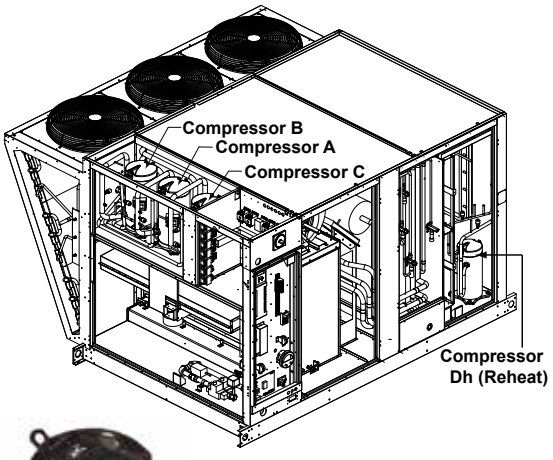
WARNINGS

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 3).

Compressor Staging (Cooling): applies to all MAPS®III models

Each **MAPS®III** system leaves the factory with the compressor staging sequence shown here for that model and size. The compressor will start based upon a call for cooling to maintain the discharge air temperature setpoint. There is a minimum 240 second ON and OFF time for each stage (not compressor).

FIGURE 4. Identification of Compressors by Circuit and Staging for MAPS®III Models



Compressor

Cabinet Size	Cooling Size (RCB)	Cooling/ Reheat Size (RDB)	Cooling Staging by Compressor Circuit				
			1st	2nd	3rd	4th	5th
A	060	084	B	A	A+B	—	
A or B	078	102	B	A	A+B		
	090	114	B	A	A+B		
	118	142	B	A	A+B		
	136	162	B	A	A+B		
B	160	184	B	A	A+B	A+B+C	—
	186	210	A	B	A+C	A+B	A+B+C
		222	A	B	A+C	A+B	A+B+C
	200	224	A	B	A+B	B+C	A+B+C
		236	A	B	A+B	B+C	A+B+C
C	190	248	A	B	A+B	—	
		262	A	B	A+B		
	216	272	B	B+C	A+B+C		
		288	B	B+C	A+B+C		
	298	354	B	A+B	B+C	A+B+C	—
		370	B	A+B	B+C	A+B+C	
	410	468	B	A+B	A+B+C	—	
		482	B	A+B	A+B+C		

NOTE: Staging listed by cooling only models RCB and RDB also applies to models RDCB and RDDB with gas heat and to models RECB and REDB with electric heat.

3.0 Maintenance/Service Procedures (cont'd)

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

Compressors and Crankcase Heater PNs by Voltage on MAPS®III Models

208–240/3/60		
Compressor		Crankcase Heater PN
Model	PN	
ZP24K5E	235095	216434
ZP36K5E	235096	216398
ZP54K5E	235008	216398
ZP57K3E	216686	216398
ZP72KCE	235009	216398
ZP83KCE	216689	216398
ZP137KCE	235010	216398
ZPT144KCE	235011	216398
ZP154KCE	220260	216402

480/3/60		
Compressor		Crankcase Heater PN
Model	PN	
ZP24K5E	235097	216436
ZP36K5E	235098	216400
ZP54K5E	235012	216400
ZP57K3E	216687	216400
ZP72KCE	235013	216400
ZP83KCE	216690	216400
ZP137KCE	235014	216404
ZPT144KCE	235015	216400
ZP154KCE	220261	216404

575/3/60		
Compressor		Crankcase Heater PN
Model	PN	
ZP24K5E	235099	216437
ZP36K5E	235100	216401
ZP54K5E	235016	216401
ZP57K3E	216688	216401
ZP72KCE	235018	216401
ZP83KCE	216691	216401
ZP137KCE	235019	216405
ZPT144KCE	235020	216401
ZP154KCE	220262	216405

Modulating Cooling (MAPS®IV Models)

NOTE: To identify MAPS®IV models, refer to paragraph 1.0.

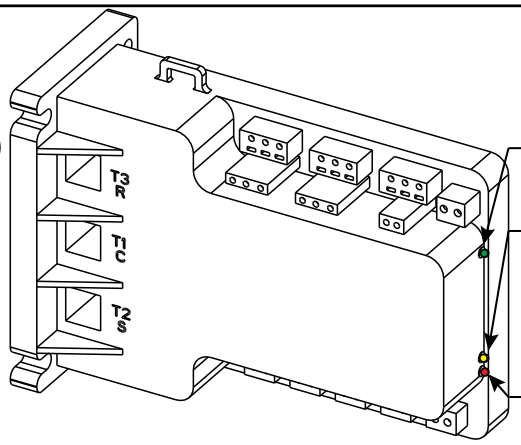
MAPS®IV units are equipped with a modulating capacity compressor and a digital controller to provide cooling modulation. The digital controller in the control compartment (see **FIGURE 1,** page 5) is the electronic interface between the compressor and the system controller. The compressor controller 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.

FIGURE 5. Compressor Digital Controller Located in Control Compartment (Interfaces Modulating Capacity Compressor With Unit Controller)

LED Color	LED State	Indicates
Green	Solid	24VAC power 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

NOTE: Refer to paragraph 7.2.



Compressor and Crankcase Heater PNs by Voltage on MAPS®IV Models

208-240/3/60		
Compressor		Crankcase Heater PN
Model	PN	
ZP24K5E	235095	216434
ZP36K5E	235096	216394
ZP54K5E	235008	216394
ZP57K3E	216686	216398
ZP61KCE	261235	216398
*ZPD61KCE	261145	216398
ZP72KCE	235009	216398
ZP83KCE	216689	216398
*ZPD83KCE	261147	216398
ZP137KCE	235010	216402
*ZPD137KCE	261153	216402
ZP154KCE	220260	216402
*ZPDT14MCE	262656	(2)216398

480/3/60		
Compressor		Crankcase Heater PN
Model	PN	
ZP24K5E	235097	216436
ZP36K5E	235098	216396
ZP54K5E	235012	216396
ZP57K3E	216687	216400
ZP61KCE	261236	216400
*ZPD61KCE	261146	216400
ZP72KCE	235013	216400
ZP83KCE	216690	216400
*ZPD83KCE	261148	216400
ZP137KCE	235014	216404
*ZPD137KCE	261154	216404
ZP154KCE	220261	216404
*ZPDT14MCE	262657	(2)216400

575/3/60		
Compressor		Crankcase Heater PN
Model	PN	
ZP24K5E	235099	216437
ZP36K5E	235100	216397
ZP54K5E	235016	216397
ZP57K3E	216688	216401
ZP72KCE	235018	216401
ZP83KCE	216691	216401
*ZPD83KCE	261149	216401
ZP137KCE	235019	216405
*ZPD137KCE	261155	216405
*ZPD61KCE	268531	216401
ZP61KCE	268532	216401
*ZPDT14MCE	268533	216401
* Modulating capacity compressor		

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 the Reznor HVAC Service Department for Reznor® products.

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 Reznor® specified replacement will void the product warranty. See part numbers for R-410A compressors in the tables on page 12.

□ **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.

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 3).

If the oil taken from the compressor and measured is found to be significantly

3.0 Maintenance/ Service Procedures (cont'd)

3.6 Compressor Maintenance (cont'd)

lower than listed in the table on page 14, 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
ZP24K5E	621	21
ZP36K5E	1124	38
ZP54KCE	1242	42
ZP57K3E	1715	58
ZP61KCE	1538	52
ZPD61KCE	1774	60
ZP72KCE	1774	60
ZP83KCE	1656	56
ZPD83KCE	1656	56
ZP137KCE	3253	110
ZPD137KCE	3135	106
ZPT144KCE	3312	112
ZP154KCE	3253	110
ZPDT14MCE	3135	106

Important NOTES: These R-410A compressors use a polyolester (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 (refer to ***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. Reuse 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 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: The 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 3).

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 3).

- ***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.

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 3).

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.*** **Check the Electrical System**

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.

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.

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: Refer to the crankcase heater PNs on page 12.**

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.

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

Refer to the applicable table (either MAPS®III or MAPS®IV) 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. Method of disabling depends on the model and date of manufacture.

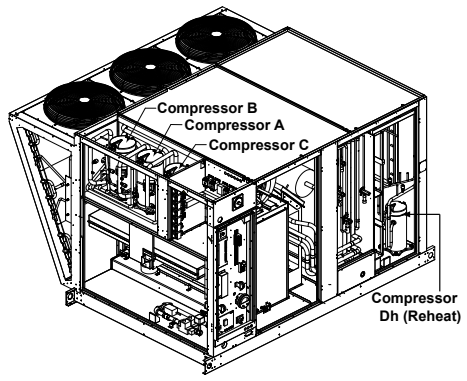
All MAPS®IV models and any MAPS®III model with a shutoff valve in the line between the compressor discharge and the hot gas bypass valve: Locate the shutoff valve. Disable the hot gas bypass valve by closing the shutoff valve. When measurements are complete, be sure to open the valve.

MAPS®III models without a shutoff valve in the line between the compressor discharge and the hot gas bypass valve: Disable the hot gas bypass valve by removing the cover and adjusting the spring tension counterclockwise until the spring tension is relieved. **Count and record the number of turns** required so that you can return the bypass valve to its original setting. To check setting, refer to Paragraph 3.9.5.

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 17, and to the instructions in Paragraph 3.5, page 9.

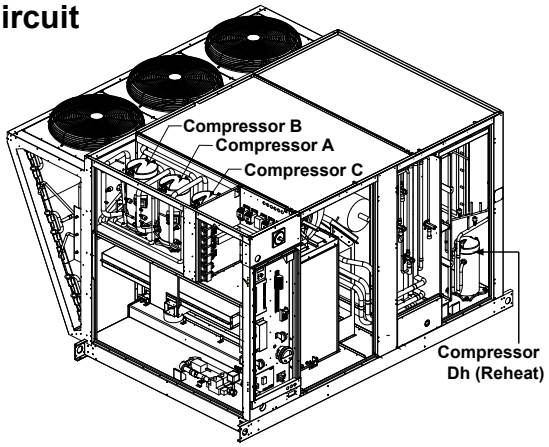
IMPORTANT: ***Do not release refrigerant to the atmosphere!*** **If required service procedures include the adding or removing of refrigerant, the qualified HVAC service technician must comply with all federal, state or provincial, and local laws.**

Approximate R410-A Refrigerant Charge (lb) for MAPS®IV Models by Size and Compressor for Each Circuit



Cabinet	RCC/ RDCC/ RECC	RDC/ RDDC/ REDC	R410-A Charge (lb) by Compressor Circuit			
			A	B	C	DH (Reheat)
A	060	084	—	5.4	—	1.6
A or B	090	114		6.3		2.9
	120	144	5.5	7.0		
B	160	184	6.0			2.9
		196				
	200	236	5.5	6.0	5.5	4.0
		257				3.8
C	190	248	9.0	11.0	N/A	7.5
		262				6.4
	298	—	11.5			N/A
	—	354	11.0			7.6
		370				6.4
	410	468	9.7	9.9	9.6	7.7
		482				6.4

Approximate R410-A Refrigerant Charge (lb) for MAPS®III Models by Size and Compressor for Each Circuit



Cabinet	RCB/ RDCB/ RECB	RDB/ RDDB/ REDB	R410-A Charge (lb) by Compressor Circuit			
			A	B	C	DH (Reheat)
A	060	084	4.3	4.0	—	4.2
A or B	078	102	5.2	4.0	—	
	090	114	5.7	4.8		
	118	142	6.5	4.8		
	136	162		5.7		
B	160	184	6.5	4.8	4.2	4.2
	186	210	5.2	6.0	5.2	
		222				6.0
	200	224	5.2	6.0		4.2
		236				6.0
C	190	248	8.0	10.5	—	9.5
		262				10.0
	216	272	11.0		8.5	9.5
		288				10.0
	298	354	11.0			9.5
		370				10.0
	410	468	10.5			9.5
		482				10.0

- ***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. Remeasure and recalculate 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. Remeasure and recalculate 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 3).

3.0 Maintenance/ Service Procedures (cont'd)

3.6 Compressor Maintenance (cont'd)

- **Step 10. System Startup (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 the circuit is equipped with an optional hot gas bypass valve, the valve must be disabled before measuring superheat and subcooling. Method of disabling depends on the model and date of manufacture.

NOTE: To identify MAPS®III and MAPS®IV models refer to paragraph 1.0.

All MAPS®IV models and any MAPS®III model with a shutoff valve in the line between the compressor discharge and the hot gas bypass valve: 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.

MAPS®III models without a shutoff valve in the line between the compressor discharge and the hot gas bypass valve: Disable the hot gas bypass valve by removing the cover and adjusting the spring tension counterclockwise until the spring tension is relieved. **Count and record the number of turns** required so that you can return the bypass valve to its original setting. To check setting, refer to Paragraph 3.9.5.

Follow the procedures in Paragraph 3.5 to check subcooling and superheat.

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.**

- ***Step 12*. Select the procedure that applies:**

IF the oil measured in ***step 2*** was significantly less than in the table on page 14 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 recharge 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 recharge 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 3).

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 14 or the acid test in ***step 2*** did not indicate a compressor burnout, continue to the review in ***step 13***.

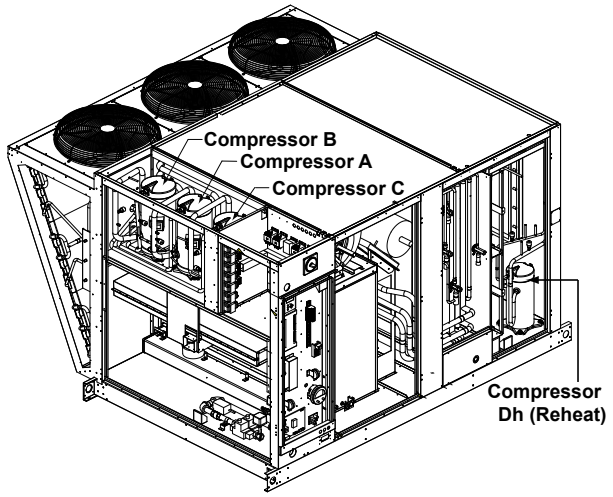
- ***Step 13*. Review *ALL steps* to ensure that nothing was overlooked.**

3.7 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 R410-A refrigerant and must be sized correctly for the application. All refrigerant service should be performed by a service technician qualified in R410-A refrigerant.

Replacement valve PNs by model, size, and circuit are listed in the following tables.

FIGURE 6. Thermostatic Expansion Valve



Cabinet	RCB/ RDCB/ RECB	RDB/ RDDB/ REDB	Thermostatic Expansion Valve PNs by Compressor Circuit			
			A	B	C	DH (Reheat)
A	060	084	220553	220552	—	220552
A or B	078	102	220554	220552	—	220552
	090	114		220553		
	118	142	220555	220553		
	136	162		220554		
B	160	184	220555	220554	220552	
	186	210	220554	220555	220554	220552
		222				220553
	200	224			220555	220552
		236				220553
C	190	248	234987	220558	N/A	234987
		262				
	216	272	220558		220555	
		288				
	298	354	220558			
		370				
	410	468				
		482				

Cabinet	RCC/ RDCC/ RECC	RDC/ RDDC/ REDC	Thermostatic Expansion Valve PNs by Compressor Circuit			
			A	B	C	DH (Reheat)
A	060	084	—	220554	—	220552
A or B	090	114	—	220555	—	
	120	144	220554			
B	160	184	220555		—	220552
		196				220553
	200	236	220554	220556	220554	220553
		257				234967
C	190	248	234967	261175	—	234987
		262				
	298	354	261175			
		370				
	410	468				
		482				

3.0 Maintenance/ Service Procedures (cont'd)

FIGURE 7. Damper Motor

3.8 Optional Dampers and Damper Controls

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 Motor (options AR8, AR2D, and AR2L)

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 Motor (options AR25, AR2G, AR2H, and AR2K)

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 the damper controls (options GF1–GF9), refer to installation manual (form I-MAPSIII&IV).

3.9 Other Controls

FIGURE 8. I/Q System Programmable Controller and Unit Module Interface with Display

Refer to the control instructions (form CP-MAPS D15/16/17/18) for information on the programmable controller.

3.9.1 Programmable Digital Controller and Sensors

BACview Display

I/Q System Controller

All MAPS® systems have a unit-mounted, 24-volt I/Q programmable controller. Depending on how it was ordered, the system is equipped for either neutral air/discharge air control (option D15) or space control with discharge air reset (option D16). In addition, MAPS®IV electric heat model RECC for process applications may have neutral air/discharge air control (option D17) or space control with discharge air reset (option D18). The controller is factory programmed to match the selection. Refer to the control instructions (form CP-MAPS D15/16/17/18) 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. Refer to the digital wiring requirements in the installation manual (form I-MAPSIII&IV).
If a controller needs to be replaced, it must be replaced with the same controller and software.

3.9.2 Air Proving Switch

Function: The airflow proving switch is a pressure switch that verifies to the main controller that the blower is operating.
Service: If the switch needs to be replaced, use a factory-authorized replacement designed for the application.

3.9.3 Motor Starter (Option AN10) or Variable Frequency Drive (Option VFD2)

Function: When the main controller calls for blower operation, either an IEC type starter with a contactor or a variable frequency drive (VFD) module responds to operate the motor.
The starter is in the high voltage control compartment. The VFD was field installed in a location that is no more than 50 feet (15M) away where the minimum temperature is 18°F (-9°C). Control of the variable frequency drive module is coordinated with the main controller, and depending on what was ordered, can function in response to temperature, CO2, or pressure controls.
Service: If a starter or contactor need replaced, use only the identical replacements that are designed to match the motor and voltage of the system.

If a VFD needs to be replaced, contact the factory service department. Be prepared to provide the model, serial, and wiring diagram number.

3.9.4 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.

3.9.5 Hot Gas Bypass Valve (Option AUC9)

FIGURE 9. Hot Gas Bypass Valve

Function: The hot gas bypass valve allows some of the refrigerant gas from the suction line to be rerouted directly to the evaporator coil providing for expanded compressor modulation at low outside air temperatures.

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 3).

If a hot gas bypass valve needs to be replaced, use only a factory-authorized replacement for R410-A refrigerant. All refrigerant service should be done by a qualified R410-A service technician.

3.9.6 Modulating Reheat (Option AUR1, Models RDB, RDC, RDDB, RDDC, REDB, and REDC

Function: Units with modulating reheat control (option AUR1) have a temperature control board with a potentiometer, an air temperature sensor, and an electric discharge bypass valve. When reheat is active, the sensor monitors the air temperature as it leaves the reheat coil. Based on the potentiometer setpoint, the board will open or close the bypass valve. If the leaving air temperature is higher than the setpoint, the board will open the valve adding refrigerant hot gas to the refrigerant liquid before it enters the pre-cool coil. This reduces the coil's ability to absorb the heat, and thus, the reheat coil's ability to reject. If the leaving air temperature is lower than the setpoint, the opposite occurs.

Service: Check the wiring connections at the board. The board is polarity sensitive; positive connects to terminal 1 and negative to terminal 2.

The valve may be tested by measuring the resistance of the leads. Remove the power and the leads from the board before testing. Resistance between the black and white leads should be about 75 ohms. Resistance between the green and red leads should be within 5% of the white and black.

Use only factory-authorized replacement parts.

4.0 Gas Heat Section Maintenance (Models RDCB, RDCC, RDDB, and RDDC)

This gas heater 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 relighting, 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).

4.1 Heat Exchanger, Burner, and Venter Maintenance

This gas heat section is equipped with a TCORE$^{2®}$ style heat exchanger and burner. 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.

4.0 Gas Heat Section Maintenance (Models RDCB, RDDC, RDDB, and RDDC) (cont'd)

4.1 Heat Exchanger, Burner, and Venter Maintenance (cont'd)

4.1.1 Instructions for Inspecting/Cleaning the Heat Exchanger and Burner

CAUTION: Use of eye protection is recommended.

NOTE: If the installation includes a *model JHUP curb duct furnace*, the inspection and cleaning procedures described in Paragraph 4.1 also apply to the duct furnace. For illustration of a curb duct furnace, refer to the installation manual (form I-MAPSIII&IV).

Heat Exchanger Maintenance: The outside of the heat exchanger is accessible by opening the blower section door and sliding the blower out of the unit. Remove any external dirt or dust accumulation. Visually check the heat exchanger for cracks or holes. If a crack or hole is observed, replace the heat exchanger.

NOTE: Inspection of the lower portion of the heat exchanger is done with the burner removed. Refer to the Burner Service section below for information on inspecting the lower portion of the heat exchanger.

Burner Maintenance: This furnace is equipped with a T$_{CORE}^{2®}$ style burner.

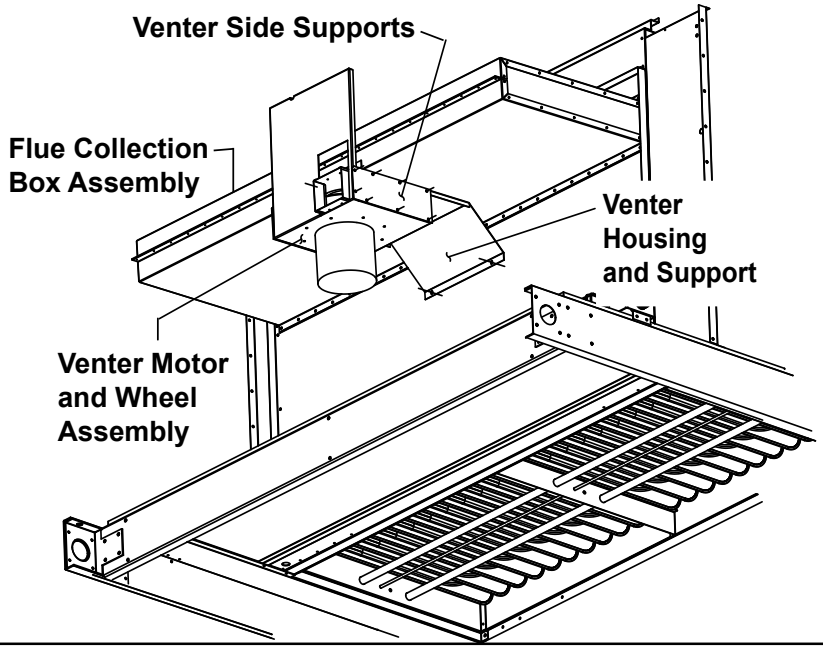
Inspect the gas heat section annually to determine if cleaning is necessary. If there is an accumulation of dirt, dust, and/or lint, clean the compartment and follow the instructions below to remove and clean the burner.

CAUTION: Use of eye protection is recommended.

Burner Removal Instructions (Refer to FIGURES 10 and 11)

1. Shut off the gas supply.
2. Turn off electric supply.
3. Remove the gas heat section access panel.
4. Remove the venter assembly. Disconnect the tubing. Mark and disconnect the three venter motor wires at the control board, capacitor wires at the capacitor (if applicable), and ground screw (located on the control panel). The venter motor and wheel assembly only can be removed. To remove the entire venter, also remove the side supports and venter housing.
5. **Disconnect the Gas Train:** At the gas valves, mark and disconnect the wires. Disconnect the gas supply line at the connection outside the furnace. Carefully remove the burner orifices and orifice adapter locking nuts. Remove the manifold brackets. Slide the complete gas train including valves and optional pressure switches out of the unit.
6. **Remove Burner Assembly:** Remove the screws above and below the burner assembly. Carefully pull the burner assembly out of the cabinet.

FIGURE 10. Heat Section (Panels Removed) Showing Venter Assembly and Flue Collection Box



OR, depending on the Cabinet size and date of manufacture, venter components may look more like the one shown below.

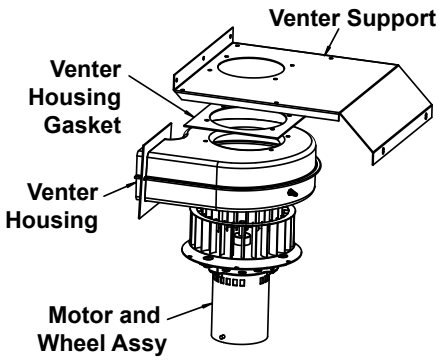
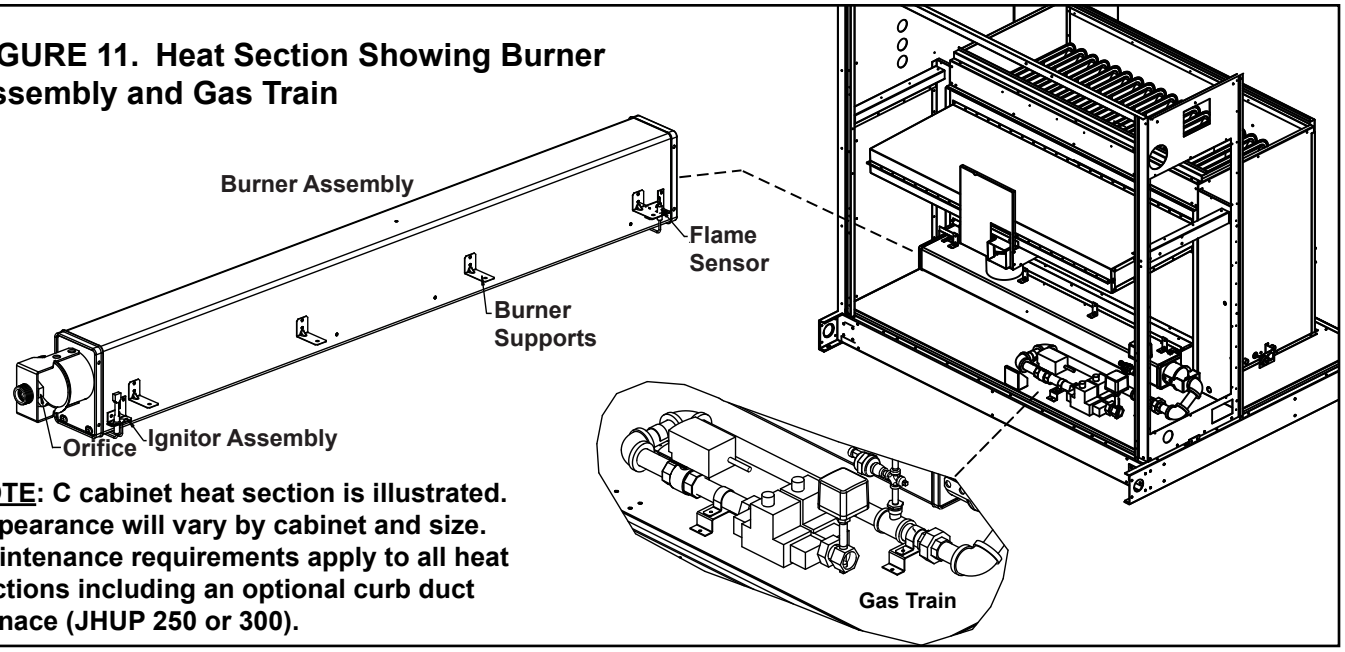


FIGURE 11. Heat Section Showing Burner Assembly and Gas Train



NOTE: C cabinet heat section is illustrated. Appearance will vary by cabinet and size. Maintenance requirements apply to all heat sections including an optional curb duct furnace (JHUP 250 or 300).

Inspect and Clean the Burner

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

With the burner assembly removed, shine a flashlight on the burner ribbons. Look for carbon buildup, scale, dust, lint, and/or anything that might restrict flow through the spaces between the burner ribbons. Holding the burner assembly so that any foreign material will fall away from the burner, use a stiff bristle brush to loosen and remove any foreign material(s). If the burner is excessively dirty, remove both of the burner end caps. Remove the screws that hold the end caps to the burner housing and lightly tap end caps to remove.

Clean all foreign material from the burner and venturi. After the burner is thoroughly cleaned, replace the end caps making certain that they are tight against the burner housing.

Inspect the Lower Portion of the Heat Exchanger (with burner assembly removed)

At the burner flame entrance of each tube, shine a bright light into each heat exchanger section. With the light shining into the heat exchanger, observe the outside for visible light. Repeat this procedure with each heat exchanger section. If any light is observed, replace the heat exchanger.

Burner Orifice

The burner orifice usually will not need to be replaced. If ordering a replacement orifice only, give BTUH content and specific gravity of gas, as well as the model and serial number of the unit and the orifice size. When removing or replacing the burner orifice be careful not to damage the venturi tube and/or the bracket.

Check the Ignitor and Flame Sensor

CAUTION: Due to high voltage on the spark wire and electrode, do not touch when energized (see Hazard Levels, page 3).

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 12**).

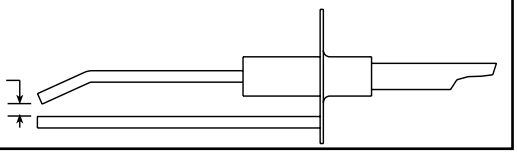
IMPORTANT: When reassembling, the brown ground wire must remain attached to the ignitor.

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 12. Ignitor Showing Required Spark Gap Measurement



4.0 Gas Heat Section Maintenance (cont'd)

4.1 Heat Exchanger, Burner, and Venter Maintenance (cont'd)

4.1.2 Maintenance Instructions for the Venter Motor and Wheel

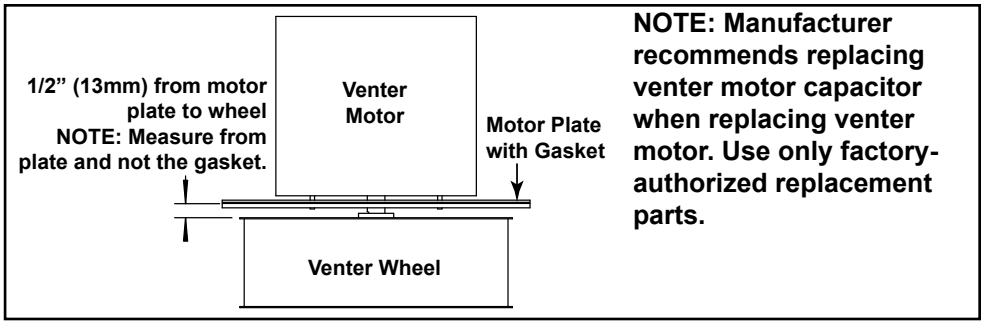
Follow the instructions below to remove the venter assembly. Keep all hardware removed to be used in reassembling and installing the replacement parts.

Note that during normal operation of this deep modulation control system, the current draw of the venter motor can exceed the full load amp rating on its nameplate. This condition is common when employing electronic wave-chopping technology to reduce the running speed of a single-phase type PSC alternating current motor. The technology reduces energy to the main winding by momentarily interrupting current for a variable amount of time, resulting in a reduction of the motor speed. The increased current is a result of increased slip, which is the difference between the rotation speeds of the rotor and stator fields. All motors used in MAPS® systems are custom designed and built for this unique modulating application and cannot be replaced with a non-approved motor. All prototype motors have been thoroughly tested with regards to temperature of the windings and bearings at all operating points and ambient conditions and approved by the manufacturer to assure the elevated current does not affect the normal motor life expectancy.

Instructions:

1. Turn off the gas and disconnect the electric power.
2. Open the gas heat section access panel and the electrical compartment.
3. Disconnect the three venter motor wires at the control board, capacitor wires at the capacitor (if applicable), and ground screw (located on the control panel).
4. Holding the venter motor, remove the three or four screws that attach the venter motor and wheel assembly. Remove the motor and wheel assembly.
5. Reassemble with the replacement venter motor and wheel assembly (see **FIGURE 13**, for proper spacing).
6. Follow the wiring diagram to reconnect the venter wires.
7. Close the access panels. Restore power to the gas heater and turn on the gas. Check for proper operation.

FIGURE 13. Venter Wheel Position on Shaft



If replacing venter parts, see **FIGURE 3** for proper spacing. If the motor plate gasket is damaged or deteriorated, replace it with **PN 222856**.

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

4.1.3 Reassemble the Heat Exchanger Panel, Burner, Gas Train, and Venter

Instructions to Reassemble Gas Heat Section (Refer to FIGURES 10 and 11)

1. **Reattach the Burner Assembly:** Slide the entire burner assembly into position. Insert all of the screws along the top and the bottom.
2. **Reattach the Gas Train:** Position the gas train so that the orifice adapter(s) are through the brackets. Attach the manifold to the manifold brackets. Install the orifice adapter nuts and the gas orifice(s) being careful not to damage the venturi tubes and/or the brackets. Reconnect the wires to the gas valve.
3. Reattach the venter assembly (if replacing venter parts, follow the instructions above). Reconnect the tubing and the wires.
4. Close the access panel.
5. 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.

4.2 Heat Section Controls

4.2.1 General

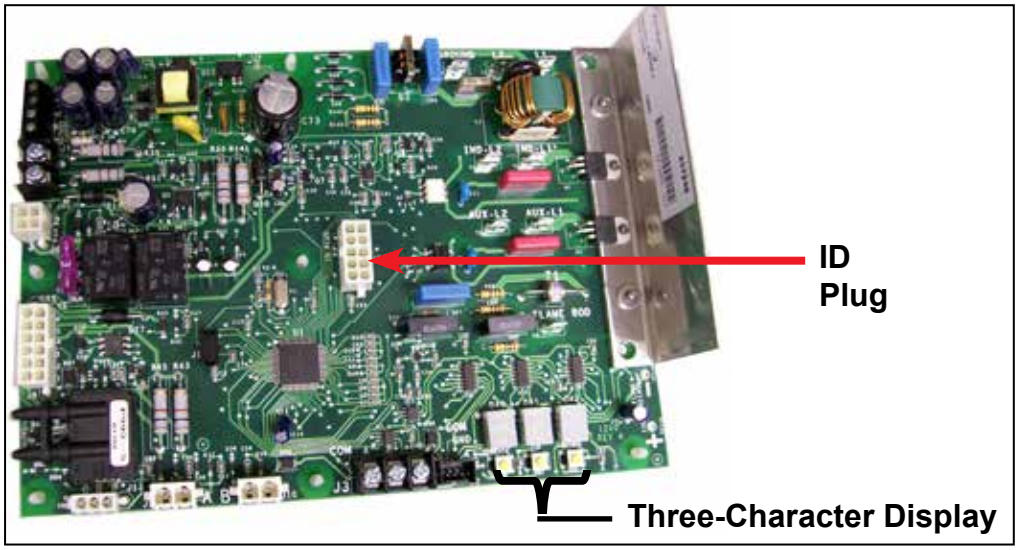
The heat section controls are in the low voltage compartment (see **FIGURE 1,** page 5).

4.2.2 Ignition System for Modulating Gas Control

The control module is located in the control compartment with an additional board to control spark that is attached directly to the side of the burner. Do not attempt to disassemble either board. However, each heating season check the lead wires for insulation deterioration and good connections.

If replacement is required, these boards must be replaced with identical parts.

FIGURE 14A. Ignition Control Module (Deep Modulation Board) in Electrical Compartment



IMPORTANT: The control module is **PN 257246 for all sizes of MAPS®III&IV cabinet C** heat sections and **PN 258319 on all MAPS®III&IV cabinet A and B** heat sections. However, the ID plug on each board is unique for each size of heat section. A replacement board will require either a new ID plug or reuse of the ID plug from the board being replaced.

The control has a built-in, self-diagnostic capability. The control continuously monitors its own operation and the operation of the heat section including direct spark ignition, safety and modulating valves, and venter motor speed. The three-character display on the control indicates the current system state, warnings, failures, and test modes.

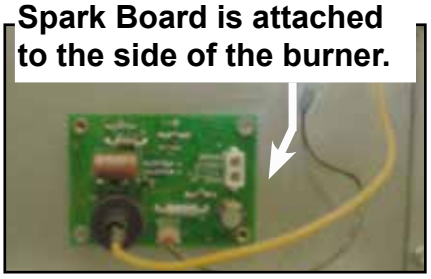
Controller LED Information (Displayed at Powerup)	
Display Info (example only)	**Description**
C CAb	Furnace series or model name, for example, C cabinet series
400	Heat section size
nAt or LP	Fuel type
1.01	Software version

NOTE: Operating and lockout error codes displayed on the ignition controller three-character display (FIGURE 14A) are listed in paragraph 7.3.3.

Normal Furnace Operation (LED Three-Character Display in FIGURE 14A)		
LED Display	Heat Mode	Description
OFF	OFF Mode (OFF)	System Idle: control board has power, no faults found, no call for heat
Pur	PURGE Mode (Pur)	System is purging heat exchanger: no gas on, no flame, inducer runs for specified purge timings; purge cycles occur immediately before and after each burner operation
Ign	IGNITION Mode (Ign)	System is initiating burner operation: igniter energized, modulating valve moved to ignition setting, gas on; maintained for trial-for-ignition period and for 5-second flame stabilization period
HEA	WARM-UP Mode (HEA)	Period between ignition and run: system checks completed before modulation control begins
run	RUN Mode (run)	Normal modulating operation
rEt	Ignition Retry (rEt)	System has had failed ignition attempt or has lost flame during burner operation and is beginning another ignition cycle

FIGURE 14B. Spark Ignition Board (PN 257975)

CAUTION: Due to high voltage on the spark wire and electrode, do not touch when energized (see Hazard Levels, page 3).



4.0 Gas Heat Section Maintenance (cont'd)

4.2 Heat Section Controls (cont'd)

4.2.2 Ignition System for Modulating Gas Control (cont'd)

Modulating Gas Control Sequence of Operation

1) Call for Heat: The IQ controller calls for heat (there is a closure between R and W and at least 2VDC to the analog input). The ignition system circuit board will check the modulating valve position and move to lightoff position. It checks to see that the limit switch is closed and the pressure switch is open. If the pressure switch is closed, the circuit board will wait indefinitely for the switch to open. If the switch is open, the circuit board proceeds to prepurge.

2) Prepurge: After the actuator moves to its lightoff position, the circuit board energizes the venter motor and waits for the pressure switch to close. If the pressure switch does not close at the beginning of a heat cycle, the venter motor will run for two minutes, then cycle off for 30 seconds, then on for 2 minutes, and so forth indefinitely.

When the pressure switch is proven closed, the venter motor ramps up to the appropriate lightoff speed and the circuit board begins the prepurge time. If flame is present any time while in prepurge, the prepurge time is restarted. If flame is present long enough to cause lockout, refer to the Troubleshooting Guide in Paragraph 7.3.2. The ignition system circuit board runs the venter motor for a 30-second prepurge time, then proceeds to the ignition trial period.

3) Ignition Trial Period: The ignition system circuit board energizes the spark and main gas valve. The venter remains energized. If flame is sensed during the first 6 seconds, the spark is de-energized. If flame has not been sensed during the first 6 seconds, the control de-energizes the spark output and keeps the gas valve energized for an additional one second flame proving period. If flame is not present after the flame proving period, the control de-energizes the gas valve and proceeds with three ignition retries as specified in “Abnormal Heat Cycle, Ignition Retry”. If flame is present, the circuit board proceeds to steady heat. After three retries, the board will lockout for one hour. It will require a cycling of power to reset before the 1-hour limit.

4) Modulating Heat: As long as the call for heat exists, the circuit board not only modulates the gas to precisely meet varying load conditions, but also modulates the combustion air to maintain stable performance and optimize thermal efficiency across the entire modulating range. Circuit board inputs are continuously monitored to ensure limit switch is closed and flame is established. When the call for heat is removed, the ignition system circuit board de-energizes the gas valve and begins postpurge timing.

5) Post Purge: The venter motor output remains on for a 45-second postpurge period after the system controller is satisfied.

4.3 Gas Train

See component identification in FIGURE 15A, 15B, or 15C.

Location: The gas train is visible with the heat section door open.

Service: Carefully remove external dirt from the valves and check the wiring connections. Annually, in preparation for the heating season, check the single-stage operating valve to be sure that it shuts gas flow off completely.

If any gas valves or other gas train components need to be replaced, they must be replaced with identical part or factory-authorized replacement.

FIGURE 15A. Components in Heat Section Gas Train (MAPS®III&IV Cabinet A, Heat Section Sizes 100, 150, and 200)

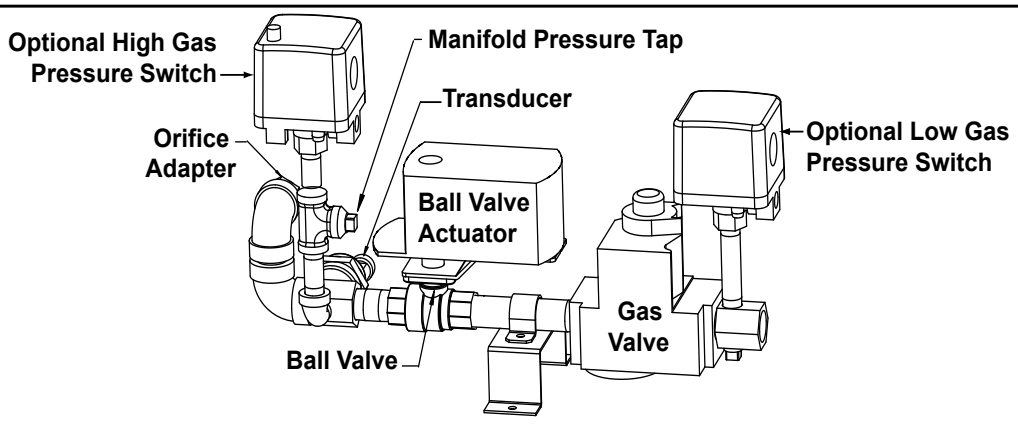


FIGURE 15B. Components in the Heat Section Gas Train (MAPS®III&IV Cabinet B, Heat Section Sizes 250 and 300)

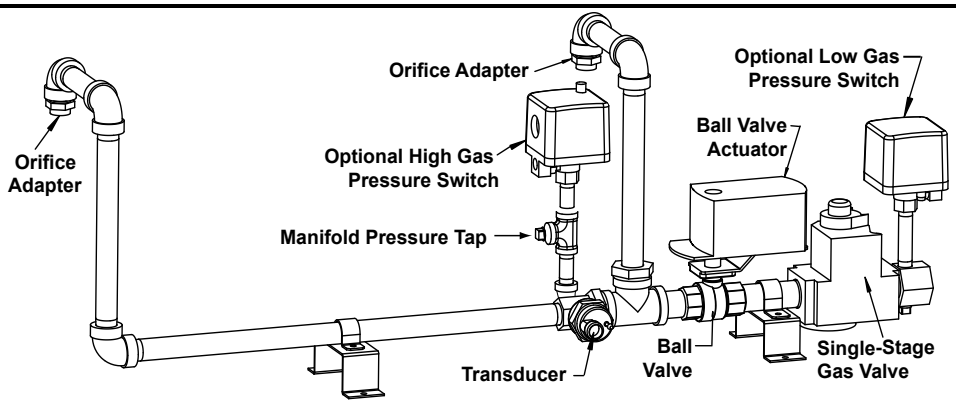
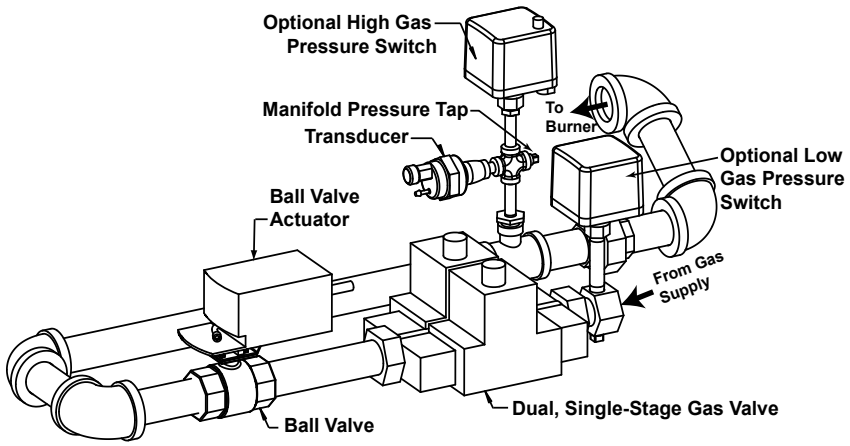


FIGURE 15C. Components in Heat Section Gas Train (MAPS®III&IV Cabinet C, Heat Section Sizes 400, 500, 600, and 700)



Single-Stage Operating Gas Valve: All gas trains have either a single-stage or a dual single-stage safety gas valve. The gas valve must be checked annually to ensure that it is shutting off gas flow completely; follow the instructions in box below.

FIGURE 16A. Top View of Single-Stage Gas Valves Used on Cabinet A or B Size

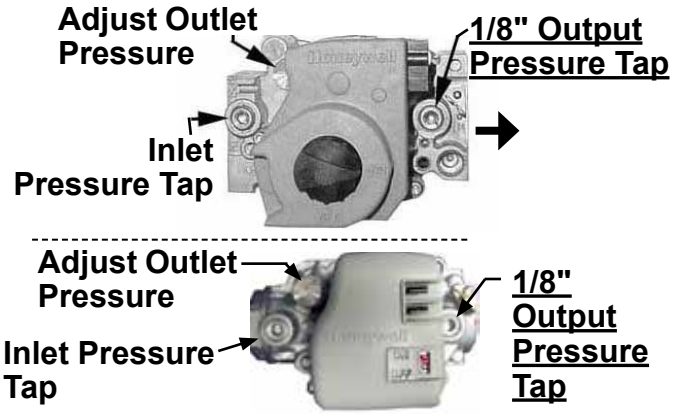
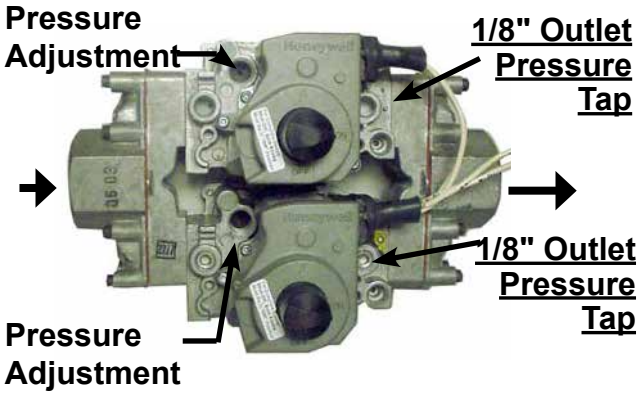


FIGURE 16B. Top View of Dual Single-Stage Gas Valve Used on Cabinet C Heat Section



Instructions:

1. Locate the 1/8" NPT pressure tap or taps on the combination valve.
2. Turn the knob(s) or switch to the OFF position to prevent flow to the manifold. Connect a manometer to each of the 1/8" outlet pressure taps (1 on the single-stage valve; 2 on the dual single-stage valve). **NOTE: Manometers (fluid-filled gauges) with inches water column scale are recommended.** Turn the heater off. On the valve, turn the knob(s) or switch to the ON position.
3. Use finger(s) to fully block the burner orifice(s). Continue blocking for several seconds and observe the manometers. If any pressure is indicated, the gas valve is leaking. A leaking gas valve must be replaced before the heater is put back in operation.

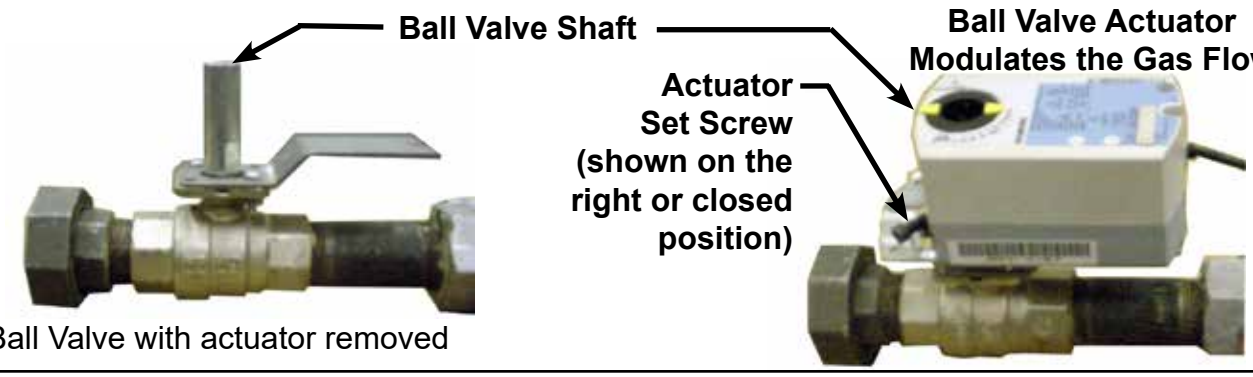
Modulating Valve

The gas train also has a ball valve with an actuator to control gas flow. The ball valve and actuator are located downstream of the regular or dual single-stage valve as shown in **FIGURE 17A**.

Carefully clean external dirt accumulation from the actuator.

FIGURE 17A. Ball Valve and Actuator in Gas Control Option AG70

FIGURE 17B. Ball Valve with Actuator in Modulating Gas Control (Option AG70) Manifold



Modulating System Gas Valve (Ball Valve and Actuator) Adjustment

Inspect the position of the ball valve shaft.

- ☐ In the fully open position, the dash marks on the top of the shaft should be aligned with the gas piping.
- ☐ In the fully closed position, the dash marks on the top of the shaft should be aligned at a 90-degree angle across the gas piping.

If the ball valve shaft is not properly aligned or if the manifold pressure does not match the settings in the chart below, the ball valve will need to be adjusted.

Manifold Pressures for MAPS®III&IV Gas Modulation System

Manifold Pressure (IN WC) Measured at Pressure Tap by Gas Transducer				
Cabinet	**Heat Section Size**	**Gas Type**	**High Setting (IN WC) 100% on ModHeat**	**Low Setting (IN WC) 0% on ModHeat**
A	100	Natural	3.4	0.15
	150			
	200			
	100	Propane	10.0	0.5
	150			
	200			
B	250	Natural	3.4	0.15
	300			
	250	Propane	10.0	0.45
	300			
C	400	Natural	3.4	0.2
	500			
	600			
	700			

<u>To adjust gas modulation follow instructions below</u>:

1. Checking modulation requires a manometer capable of reading to 0.10 IN WC Connect the manometer as instructed in step 1f below.
   To check and adjust the modulation system, the IQ controller must be in **Test Mode**. On the control display in the electrical compartment, follow the steps below to enter **Test Mode**.

a) Scroll down to Menus and press **Enter**.

b) Enter password (0000) using the **INC** button and the right arrow button and press **Enter**.

c) Scroll down to the **Service Menu** and press **Enter**.

d) Scroll down to **Test Mod**e and press **Enter**.

e) Scroll down to **Manual Test**; press **Enter**; press the **INC** button to change the command **from OFF to ON**; and press **Enter.**

f) After the system has completed the shutdown sequence, connect the gas manometer to the manifold pressure tap next to the transducer (see **FIGURE 15** and illustration below).

g) On the display, scroll down to **Heat Stg 1** and press **Enter**.

h) Scroll down to **ModHeat** which has a default setting of 100%.

2. With the **ModHeat** set at 100%, measure the manifold pressure. If the manifold pressure matches the High Setting value in the chart (page 28), continue to step 3. If the manifold pressure does not match the value in the chart and the ball valve is fully or close to fully open, adjust the pressure screw(s) on the Honeywell valve (see **FIGURE 16**) until the pressure matches the chart. Note, if the manifold has a dual valve, adjust both pressure screws so that they are the same. When the manifold pressure measured at the manometer matches the pressure listed in the chart, make a note for future reference of the position of the ball valve stem in relation to the dash marks on the actuator.

3. On the display, change the **ModHeat** setting to 0% modulation and allow the ball valve to go to its lowest setting. Check the manifold pressure on the manometer. If the manifold pressure matches the Low Setting value in the chart, skip to step 4. If the manifold pressure does not match the low (0%) value on the chart, the ball valve will need to be adjusted. Follow these steps:

   a) While the unit is still firing at 0% modulation, remove the ball valve actuator. To do this, locate the screw on the rear of the actuator and remove it. Loosen the actuator set screw (see **FIGURE 17B**), and carefully remove the actuator by lifting it straight up. Do not disconnect any wires.

   b) Using adjustable pliers, slowly turn the ball valve stem until the manifold pressure on the manometer matches the low setting on the chart.
   Important NOTE: If the valve is adjusted too far closed and the flame goes out, let the unit recycle and then manually open the ball valve to the 100% open position noted in step 2. When the unit is firing at full fire, reattach the actuator to the ball valve, and repeat the procedure beginning with step 2.

   c) When the manometer readings match the values in the chart and before reinstalling the actuator, the burr left on the ball valve stem from the previous set screw setting needs to be removed. Either lightly file the burr on the valve stem to prevent the set screw from returning to the previous position or remove the valve stem, rotate it 180° so that the set screw contacts the opposite side of the stem, and reinstall the valve stem.

   d) Reinstall the actuator making sure it is level on the ball valve mounting plate.

   e) Recheck the setting by going to full fire (Set **ModHeat** at 100%) and returning to 0% modulation (Set **ModHeat** at 0%). Measure the manifold pressure. The adjusted gas pressure should be close to the value in the chart on page 28. If not, repeat the procedure.

4. When the settings are in agreement with the chart and testing is complete, remove the manometer. Set **ModHeat** to 100%. Scroll the display back to **Test Mode** and press **Enter**. Disable **Test Mode** by pressing the **INC** button to change the command **from ON to OFF**; and press **Enter**.

Gas Manifold Transducer

Location: See FIGURE 15.

Function: The transducer reads the manifold pressure and sets the venter motor speed to precisely match the designed combustion settings.

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

Optional Gas Pressure Switches

Location: Low pressure switch is at the entrance to the gas train. The high pressure switch is at the burner end (see **FIGURE 15**).

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.

4.0 Gas Heat Section Maintenance (cont'd)

4.4 Other Gas Heat Section Controls/Sensors

Combustion Air Proving Switch

Location: See **FIGURE 1,** page 5, for location.

Function: The function of the pressure switch is to verify the calibration of the air pressure sensor mounted on the ignition control board. If the air pressure is not as required, the controller will shut down operation of the heat section.

Service: If it is determined that the pressure switch needs replacing, use only the factory-authorized replacement part that is designed for the model and size of gas heater being serviced.

The ignition board controls the entire combustion process by modulating both the gas and the combustion air supply. Combustion air pressure switches used are listed below.

- □ *B cabinet with 500 MBH of gas heat is size 250 heat section plus model JHUP-25 curb section duct furnace. Both furnaces have air proving switch.
- □ **C cabinet with 1000 MBH of gas heat is size 700 heat section plus model JHUP-30 curb section duct furnace. Both furnaces have combustion air proving switch.

Heat Section Size	Gas Type	Full Rate		Setpoint OFF	Label Color	Switch PN
		Light Off (Cold)	Equilibrium (Hot)			
100	Nat/Pro	1.30	1.30	0.80	Gray	197078
150	Nat/Pro	1.30	1.30	0.80	Gray	197078
200	Nat/Pro	1.30	1.30	0.80	Gray	197078
250 and JHUP-250	Natural	1.15	1.15	0.80	Gray	197078
	Propane	1.30	1.30	1.05	Brown	201160
300	Nat/Pro	1.40	1.40	1.15	Brown	201160
400	Natural	2.70	2.70	1.40	Red	201159
500	Natural	2.90	2.90	1.40	Red	201159
600	Natural	3.35	3.35	2.00	White	234054
700*	Natural	3.40	3.40	2.00	White	234054
JHUP-300*	Natural	0.70	0.70	0.50	Orange	196388

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 (see Hazard Levels, page 3).

Limit Control

Location: The limit control is located in the farthest downstream heater compartment with the capillary sensor extending across the discharge side of the heat exchanger.
NOTE: If the installation includes an option JHUP-30 curb section duct furnace, it also has a limit control (refer to the installation manual (form I-MAPSIII&IV) for the location).

Function: The limit control is a temperature sensitive safety device. If the temperature setting of the limit control is exceeded, the controller will shut down heat section operation.

Service: The limit switch will automatically reset when the temperature drops below the setpoint. However, the cause for the limit activating should be found and corrected. If it is determined that the limit control needs replacing, use only a factory-authorized replacement part that is designed for that heat section.

5.0 Electric Heat Section Maintenance (Models RECB, RECC, REDB and REDC)

WARNING

Turn off the power locking the disconnect switch. Allow the heating elements to cool.

CAUTION: Wearing eye protection is recommended when cleaning the heating elements and cabinet.

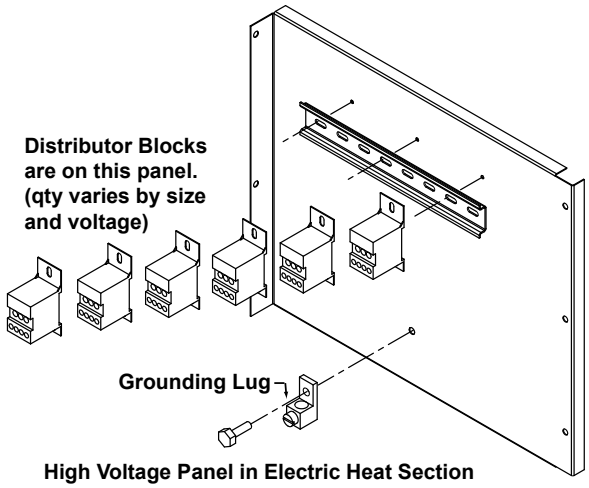
Electric Heating Elements and Controls

Service: Check the heating elements at the beginning of the heating season. The elements are assembled and attached to the electrical panel that is visible on the inner side of the electric heat section. Slide the panel out to access the elements. 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 a replacement is needed, order a complete heat section assembly.

Location: The additional high voltage panel in the electric heat section (see the control location illustration in **FIGURE 1,** page 5, and **FIGURE 18**, below). Quantities and types of distribution blocks, fuses, and contactors depend on the size of the unit.

If replacement parts are required, check with your distributor and use only factory-authorized replacements.

FIGURE 18. High Voltage Panel in Electric Heat Section (Models RECB, RECC, REDB, and REDC)



6.0 Energy Recovery Module (Option ER1)

If the MAPS® unit is equipped with an optional energy recovery module (option ER1A, ER1B, or ER1C), there are additional maintenance and service procedures unique to the energy recovery wheel.

Refer to the energy recovery module manual (form I-MAPSIII&IV-ER) for required maintenance instructions and service information.

7.0 Troubleshooting

7.1 Troubleshooting Refrigeration Circuit (All Models)

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.

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

Refer to the control instructions (form CP-MAPSD15/16/17/18) for information on the unit controller.

Refrigeration Circuit (All Models) Troubleshooting

Symptom	Probable Cause	Remedy
A. Compressor will not start	1. Power off, loose electrical connections or fuse open	Check disconnect switch, fuses, and wiring; repair/replace parts as necessary
	2. Compressor contactor not closing	Check voltage to contactor coil, transformer, slave relay, and system; replace parts as necessary
	3. Internal compressor thermal overload open	If compressor is hot, allow 2 hours to cool (refer to symptom D below)
	4. Compressor defective	Check compressor for electrical failure
		Compressor may be seized; check refrigerant; replace compressor as necessary
	5. High or low pressure switch open or defective	For high pressure (manual reset) switch: switch opens at 600 psi and will not reset above 400 psi; manually reset switch
		For low pressure (auto reset) switch: if switch does not reset and everything else is OK, replace switch (PN 216380)
B. Compressor starts but cuts out on low pressure (low pressure switch activates at 35 psig)	1. Low refrigerant charge	Check subcooling in accordance with Paragraph 3.5
	2. Airflow restricted	Check for dirty evaporator coil or filters, dampers closed, iced evaporator coil, and improper belt
		Check motor amps
		Check duct design
	3. Restriction in refrigerant line	Check subcooling and superheat in accordance with Paragraph 3.5
		Check thermal expansion valve operation
		Check for pressure drop across filter drier
	4. Defective low pressure switch	Switch should open at 35 psi and close at 50 psi; replace switch (PN 216380) as necessary
C. Compressor starts but cuts out on high pressure switch	1. Refrigerant overcharge	Check subcooling in accordance with Paragraph 3.5
	2. Condenser fan motor defective	Check fan motor
	3. Condenser coil inlet obstructed or dirty	Check coil and inlet clearances and for possible air recirculation
	4. Air or non-condensables in system	Check high side equalized pressure reading with equivalent outdoor temperature
	5. Defective high pressure switch	Switch opens at 600 psi, proof at 700 psi, and manual reset allowed below 400 psi; check and replace (PN 216379) as necessary
	6. Restriction in discharge or liquid line	Check subcooling and superheat in accordance with Paragraph 3.5
		Check thermal expansion valve operation
D. Compressor cuts out on thermal overload	1. Low voltage	Check voltage
	2. Sustained high discharge pressure	Check running amperage and conditions described in sypmtom I below
	3. High suction and discharge pressures	Check thermal expansion valve operation
		Check for air in system
	4. Defective compressor overload	If compressor is hot, allow 2 hours to cool; recheck for open circuit
	5. Improper refrigerant charge	Check subcooling in accordance with Paragraph 3.5
	6. Bearings or pistons too tight	Check for low oil level
	7. Allow time for compressor to cool	Check dome temperature of compressor
E. Noisy compressor	1. Reverse rotation	Check at startup; if suction pressure rises and discharge pressure drops, shut down compressor and switch three-phase wiring connections
	2. Refrigerant overcharge	Check pressures and subcooling in accordance with Paragraph 3.5
	3. Liquid floodback	Check thermal expansion valve setting
		Check subcooling for refrigerant overcharge in accordance with Paragraph 3.5
	4. Tubing rattle	Dampen tubing vibration by taping or clamping; carefully bend tubing away from contact where possible
	5. Compressor defective	Check internal parts; replace defective part(s) or compressor
F. Noisy unit operation	1. Blower rotational noise	Check blower, motor, and drive for faulty adjustment or for noisy bearings, loose parts, and/or blower out-of-balance
	2. Air noise	Check ductwork for too high air velocity
	3. Chattering contactor	Check for adequate control voltage, wiring shorts or breaks, or faulty contact points
	4. Tubing rattle	Dampen tubing vibration by taping or clamping; carefully bend tubing away from contact where possible
G. High suction pressure	1. Excessive load on evaporator coil	Check superheat in accordance with Paragraph 3.5
		Check for high entering wet bulb temperature
		Check for excessive air
	2. Compressor is unloaded	Check head pressure
		Check thermal expansion valve; if valve is not functioning properly, check pressure drop across filter drier
	3. Thermal expansion valve bulb not secured to suction line or valve defective	Check thermal expansion valve; ensure that bulb is attached properly and insulated

Symptom	Probable Cause	Remedy
H. High discharge pressure	1. Refrigerant overcharge	Check subcooling in accordance with Paragraph 3.5; adjust refrigerant charge
	2. Thermal expansion valve setting	Check superheat in accordance with Paragraph 3.5; adjust valve as necessary
	2. Air inlet to condenser dirty or obstructed	Check for proper clearances and possible air recirculating
	4. Condenser fan motor defective	Check condenser fan motor(s)
I. Suction pressure is too low	1. Refrigerant undercharge	Check subcooling in accordance with Paragraph 3.5; add refrigerant as necessary
	2. Thermal expansion valve setting	Check superheat in accordance with Paragraph 3.5; adjust valve as necessary
	3. Blower running backward	Interchange any two wires from three-phase disconnect
	4. Loose blower, pulley, or belts	Check drive pulley alignment and belt tension; adjust as necessary
	5. Dirty filter	Check filter and evaporator coil
	6. Too little air flow or low entering air temperature	Check airflow and entering air wet bulb conditions
	7. Restriction in suction or liquid line	Check refrigerant circuit for restriction
J. Head pressure too low	1. Insufficient refrigerant charge	Check subcooling in accordance with Paragraph 3.5
		Check for leak, repair, and add refrigerant as necessary
	2. Defective or improperly adjusted thermal expansion valve	Check superheat in accordance with Paragraph 3.5; adjust valve as necessary
	3. Low suction pressure	Refer to symptom I above
	4. Defective compressor	Refer to symptom G above
K. Compressor short cycles	1. Improper refrigerant charge	Check subcooling and superheat in accordance with Paragraph 3.5
	2. Defective high or low pressure control	Check high or low pressure switch
	3. Liquid floodback	Possible tight bearings, see above
	4. Defective thermal expansion valve	Check superheat in accordance with Paragraph 3.5
		Check thermal expansion valve; replace valve as necessary
	5. Poor air distribution	Check ductwork for recirculating air
	6. High discharge pressure	Refer to symptom H above
	7. Leaking discharge valves in compressor	Refer to symptom G above
L. Running cycle is too long or unit operates continuously	1. Refrigeration undercharged	Check subcooling in accordance with Paragraph 3.5; add refrigerant as necessary
	2. Dirty filter or evaporator coil	Check filter, coil, and airflow; clean and/or replace as necessary
	3. Dirty or clogged condenser coil	Check coil and airflow; clean as necessary
	4. Air or other non-condensables in system	Check equalized high side pressure with equivalent outdoor temperature
	5. Defective compressor	Refer to symptom G above
	6. Restriction in suction and liquid line	Check for restrictions in refrigerant circuit
	7. Control contacts stuck	Check wiring
M. Supply air temperature is too high	1. Refrigerant undercharge or leak in system	Check subcooling in accordance with Paragraph 3.5
		Check for leak, repair, and add refrigerant as necessary
	2. Evaporator plugged with dirt or ice	Check evaporator, airflow, and filter; clean as necessary
	3. Improperly adjusted or defective thermal expansion valve	Check superheat in accordance with Paragraph 3.5; adjust valve as necessary
		Check thermal expansion valve bulb placement and insulation
	4. Defective compressor	Check compressor for proper operation
	5. High discharge pressure	Refer to symptom H above
	6. Airflow is too high	Check external static pressure
N. Supply air temperature is too low	1. Airflow is too low	Check evaporator coil and 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	Check entering air wet bulb conditions
O. Liquid line is too hot	1. Refrigerant undercharge	Check subcooling
	2. High discharge pressure	Refer to symptom H above

7.2 Troubleshooting Compressor Digital Controller (All MAPS® IV Models)

NOTE: To identify MAPS®IV models, refer to paragraph 1.0.

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 result in compressor (contactor and unloader valve) being de-energized.

Compressor Digital Controller LEDs

LED State		Indication	Description
Color	Code		
Green	Solid	Power (24VAC present at power terminals)	Modulating capacity compressor starts only when demand signal input is above 1.45VDC and no ALERTS (red LED flashes) are active
	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 seconds at startup
Red	Not lit	No abnormal operation alerts	
	Two flashes	High discharge temperature alert (thermistor temperature >268°F or thermistor is short circuited)	Modulating capacity compressor is be allowed to restart after 30-minute delay and after thermistor temperature is below 250°F
			Compressor will lockout after five alerts within 4 hours and can only be reset by cycling 24VAC power OFF and ON

(continued)

7.2 Troubleshooting Compressor Digital Controller (All MAPS® IV Models) (cont'd)

Compressor Digital Controller LEDs (cont'd)

LED State		Indication	Description
Color	Code		
Red	Three flashes	Compressor protector trip (demand signal >1.44VDC and no compressor current)	Possible causes: internal overload, fuse or breaker, compressor wiring
			After 2-minute anti-short cycle timer has timed out, controller attempts to restart compressor as long as demand is above 1.44VDC
			No lockout feature
	Four flashes	Locked rotor alert	Locked rotor sensed by controller on four consecutive startups
			Lockout occurs and can only be reset by cycling 24VAC power OFF and ON
	Five flashes	Demand signal loss (<0.5VDC)	When demand signal input rises to >0.5VDC, alarm code resets
			When demand reaches >1.44VDC and anti-short cycle timer has timed out, modulating capacity compressor restarts
	Six flashes	Discharge thermistor fault (no signal being received)	Modulating compressor capacity limited to 50%; reconnect or replace thermistor
	Seven flashes	Unloader solenoid valve fault	
	Eight flashes	Compressor contactor fault (compressor running on <1.44VDC demand signal)	Modulating compressor runs unloaded
			Alarm resets when current is no longer detected while system demand signal is <1.44VDC
	Nine flashes	Low 24vac supply to controller (<18.5VAC)	Alarm resets when supply voltage to controller rises to >19.5VAC
All	Solid	Digital compressor controller failure	Test installed digital compressor controller to verify that it is working properly
All	Flashing	24VAC supply too low for operation	**Input Test:** 24VAC must be supplied to 24VAC and 24COM **1)** Thermistor input: disconnect thermistor (T1 and T2); LED should display code 6 **2)** Demand input: disconnect unit controller (C1 and C2); LED should display code 5 unless previous alert code was present
			Output Test: 24VAC must be supplied to 24VAC and 24COM and 24–250VAC must be supplied to L1 and L2 **1)** Contactor output: while controller is powered off (no supply voltage to 24VAC and 24COM), disconnect signal wire from C1 and C2, add jumper wires from P3 to C2 and from P1 to C1, and reapply power to 24VAC and 24COM (if normal function is occurring, voltage across M1 and M2 should be same as across L1 and L2 unless LED ALERT code is present) **2)** Unloader output: while controller is modulating unloader solenoid (whenever yellow LED is lit), voltage across U1 and U2 should be same as across L1 and L2

7.3 Troubleshooting Heat Section

7.3.1 Electric Heat Section Troubleshooting (Models RECB, RECC, REDB, and REDC)

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

7.3.2 Gas Heat Section Troubleshooting (Models RDCB, RDCC, RDDB, and RDDC)

Symptom	Probable Cause	Remedy
Venter motor will not start	1. No power to unit	Turn on power
		Check supply fuses or main circuit breaker
	2. No 24V power to ignition system circuit board	Turn up thermostat and check control transformer output
	3. Integrated circuit board fuse blown	Correct cause and replace fuse
	4. No power to venter motor	Tighten connections at circuit board and/or motor terminals
	5. Integrated circuit board defective	Replace integrated circuit board
	6. Defective venter motor or capacitor	Replace defective part(s)*
Burner will not light	1. Manual valve not open	Open manual valve
	2. Air in the gas line	Bleed gas line (initial startup only)
	3. Gas pressure too high or too low	Adjust gas pressure in accordance with installation manual (form I-MAPSIII&IV)
	4. No spark	Proceed as follows:
	a) Loose wire connections	Ensure that all wire connections are solid
	b) Transformer failure	Ensure that 24 volts is available
	c) Incorrect spark gap	Maintain spark gap at 1/8 inch
	d) Spark cable shorted to ground	Replace worn or grounded spark cable
	e) Spark electrode shorted to ground	Replace ceramic spark electrode if it is cracked or grounded
	f) Burner not grounded	Ensure that circuit board is grounded to ignitor
	g) Ignition system circuit board not grounded	Ensure that circuit board is grounded to furnace chassis
	h) Unit not properly grounded	Ensure that unit is properly field-grounded to earth ground and is properly phased (L1 to hot lead L2 to neutral)
	i) Ignition system circuit board fuse blown	Correct cause and replace fuse
	j) Modulation system out of acceptance range	Review error codes on board (refer to pages 36–39)
	j) Faulty circuit board	If 24V power is available to circuit board and all other causes have been eliminated, replace board
	5. Lockout device interrupting control circuit by above causes	Reset lockout by interrupting control
	6. Combustion air proving switch not closing	Remove obstructions from vent
		Replace faulty tubing to pressure switch
	7. Faulty combustion air proving switch	Replace combustion air proving switch
	8. Valve not operating	Proceed as follows:
	a) Defective valve	If 24V power is measured at valve connections and valve remains closed, replace valve
	b) Loose wire connections	Check and tighten all wiring connections
	9. Circuit board does not power valves	Proceed as follows:
	a) Loose wire connections	Check and tighten all wiring connections
	b) Flame sensor grounded	Ensure that flame sensor lead is not grounded
		Ensure that flame sensor insulation or ceramic is not cracked; replace as required
	c) Gas pressure too high or too low	Adjust gas pressure in accordance with installation manual (form I-MAPSIII&IV)
	d) Cracked ceramic at sensor	Replace sensor
Burner cycles on and off	1. Gas pressure too high or too low	Adjust gas pressure in accordance with installation manual (form I-MAPSIII&IV)
	2. Burner not grounded	Ensure that integrated circuit board is grounded to ignitor
	3. Circuit board not grounded	Ensure that integrated circuit board is grounded to furnace chassis
	4. Faulty integrated circuit board	If 24V power is available to circuit board and all other causes have been eliminated, replace board
	5. Combustion air proving switch not closing	Ensure that unit is properly vented
		Remove obstruction(s) from vent
		Replace faulty tubing to pressure switch
	6. Faulty combustion air proving switch	Replace combustion air proving switch
	7. Flame sensor grounded	Ensure that flame sensor lead is not grounded
		Ensure that flame sensor insulation or ceramic is not cracked; replace as required
	8. Cracked ceramic at sensor	Replace sensor
	9. Incorrect polarity	Reverse line volt leads to integrated circuit board
No heat while heater is operating	1. Incorrect valve outlet pressure	Adjust alve outlet pressure in accordance with installation manual (form I-MAPSIII&IV)
	2. Cycling on limit control	Check air throughput
Venter motor will not run	1. Circuit open	Check wiring and connections
	2. Defective integrated circuit board	Replace board
	3. Defective motor	Replace motor
Venter motor cuts out on overload	1. Low or high voltage supply	Correct electric supply
	2. Defective motor or capacitor	Replace defective part(s)*

*It is recommended that the capacitor be replaced when replacing the motor (refer to paragraph 4.1.2).

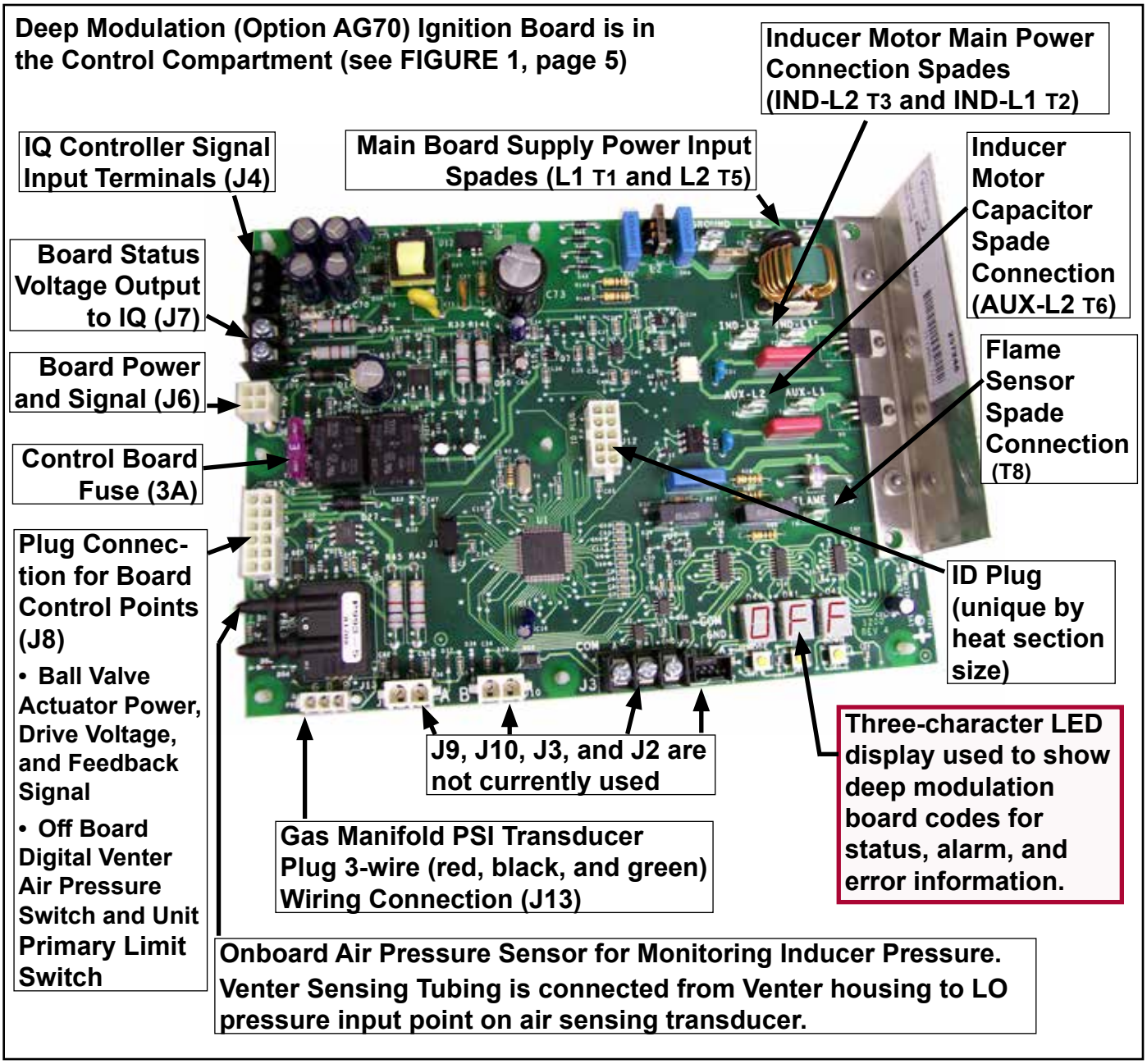
7.3 Troubleshooting Heat Section (cont'd)

7.3.3 Troubleshooting Modulating Control Module used on Cabinet A, B, and C Gas Heat Sections

The control that operates the furnace in a MAPS®III cabinet A, B, and C has a built-in, self-diagnostic capability. The control continuously monitors its own operation and the operation of the system. The LED on the control indicates the current state, warnings, failures, and test modes.

Normal Furnace Operation Display		
LED Display	**Heat Mode**	**Description**
OFF	OFF Mode (OFF)	System Idle: control board has power, no faults found, no call for heat
Pur	PURGE Mode (Pur)	System is purging heat exchanger: no gas on, no flame, venter motor runs for specified purge timings
		Purge cycles occur immediately before and after each burner operation
Ign	IGNITION Mode (Ign)	System is initiating burner operation: ignitor energized, modulating valve moved to ignition setting, gas on; maintained for trial-for-ignition period and for 5-second flame stabilization period
HEA	WARM-UP Mode (HEA) (Board Self Check)	Period between ignition and run: system checks completed before modulation control begins
run	RUN Mode (run)	Normal modulating operation
rEt	Ignition Retry (rEt)	System has had failed ignition attempt or has lost flame during burner operation
		System is beginning another ignition cycle

Deep Modulation (Option AG70) Ignition Board is in the Control Compartment (see FIGURE 1, page 5)



Gas Heat Section Modulating Control FUNCTIONAL ALERTS

Code	Alert	Description	Probable Cause	Remedy
A01	Failed ignition attempt (AO1) *Maximum number of allowed retries not met*	Flame could not be established during trial for ignition period. This alert indicates that maximum number of retries has not been exceeded and furnace operation will continue with another ignition attempt.	Refer to E01 in LOCKOUT ERRORS section, pages 38–39	
A02	Lost Flame (AO2)	Flame sensor signal has been lost after flame is established during call for heat. This alert is displayed during RECYCLE period prior to next ignition attempt.	A. Flame sensor coated	1. Clean flame rod sensor
			B. Flame sensor improperly mounted or grounded	1. Check flame sensor wiring integrity and ceramic for cracks
				2. Reinstall/replace flame sensor
			C. Unstable flame pattern	1. Verify that spacing between burner body and burner shield is equal across entire length of burner
				2. Check that seals between heat exchanger header and heat exchanger tubes are sound (refer to Paragraph 4.1.1)
				3. Ensure that heat section door gasket is in place and doors are properly aligned
			D. Insufficient intermediate gas manifold pressure through main gas safety valve	1. Check for faulty gas valve wiring
				2. Check 24VAC to gas valve assembly
				3. Check inlet pressure to safety gas valve
				4. Check outlet pressure from safety gas valve
				5. Replace safety gas valve if faulty
			E. Insufficient gas manifold pressure to burner through modulating ball valve assembly	1. Check voltage to gas valve actuator (2–10VDC depending on model)
				2. Check alignment and setscrew connection between ball valve and actuator (refer to Paragraph 4.3)
A03	Insufficient Combustion Air (AO3) *Furnace functional*	Furnace cannot achieve desired combustion air flow due to blockage or high-altitude operation, resulting in de-rate of furnace.	A. High altitude operation	1. Normal operation; furnace automatically de-rates for high-altitude conditions
			B. Partially blocked vent	1 Check air inlet and outlet for blockage
				2. Check venting configuration for excessive venting length, improper sizing, etc
			C. Leak in sensing hose	1. Check sensing hose for cracks, crimps, or loose connections
			D. Low line Voltage	1. Check line voltage to control board; voltage should be within 10% of nameplate
			E. Faulty venter assembly	1. Verify that venter assembly is functioning properly (refer to sensing pressure chart on page 30)
A04	Limited Low Fire (AO4)	Automatic adaptive program is currently limiting lower range of modulation at avoid flame loss at minimum fire conditions. Alert is displayed during run cycle once flame-out condition has triggered Limited Low Fire function. This function is reset by cycling power to board.	A. Low gas line pressure	1. Ensure gas supply is connected to furnace and check for proper line pressure
			B. Insufficient intermediate gas manifold pressure through gas safety valve	1. Check for faulty gas valve wiring
				2. Check 24VAC to gas valve assembly
				3. Check inlet pressure to safety gas valve
				4. Check outlet pressure from safety gas valve; adjust as necessary
				5. Replace safety gas valve if faulty
			C. Faulty burner operation	1. Check burner orifice for proper size and blockage
			D. Faulty flame sensor	1. Check flame rod wiring and connections
				2. Check for proper alignment of flame rod
				3. Clean flame rod sensor
			E. Improper alignment of the modulating actuator and the gas ball valve	1. Check that alignment of actuator to ball valve is correct; valve must be in fully-open position when actuator is energized (ACTUATOR DRIVE = 9.6VDC or greater)
				2. Ensure that setscrew on actuator is tightened to ball valve stem
			F. Blocked or improper venting	1. Check air inlet and outlet for blockage
				2. Check venting configuration for excessive venting length, improper sizing, etc
			G. Improper jumper connection on IQ UI-12 causing AO-4 to show on BacView as alarm and disables heat sequence	1. Verify that the IQ heating feedback input is set to receive the ignition board voltage output of 0-10VDC from terminals J7 by making sure jumpers are set to receive 0-10VDC signal on UI-12 of the IQ controller
A05	Weak Flame Signal (AO5)	Flame signal level is less than optimal for this furnace. Maintenance of flame sensing components is advised.	A. Flame sensor coated	1. Clean flame rod sensor
			B. Flame sensor improperly mounted or grounded	1. Check flame sensor wiring integrity and ceramic for cracks
				2. Reinstall/replace flame sensor
			C. Unstable flame pattern	1. Verify that spacing between burner body and burner shield is equal across entire length of burner
				2. Check that seals between heat exchanger header and heat exchanger tubes are sound (refer to Paragraph 4.1.1)
				3. Ensure that heat section door gasket is in place and that door is properly aligned

(continued)

7.3 Troubleshooting Heat Section (cont'd)

7.3.3 Troubleshooting Modulating Control Module used on Cabinet A, B, and C Gas Heat Sections (cont'd)

Gas Heat Section Modulating Control LOCKOUT ERRORS				
Code	**Alert**	**Description**	**Probable Cause**	**Remedy**
888	Ignition Board Failure (888)	Ignition board startup checks have detected error.	A. Faulty transformer	1. Check 24V transformer for correct output
				2. Check connections and wiring to control board and other components connected to 24V source
				3. Replace if necessary
			B. Faulty control board	1. Turn off power to furnace, wait 30 seconds and turn power back on; retry ignition sequence and see if system responds
				2. Replace control board if necessary
E01	Failed Ignition (EO1) *Maximum Retries (3) Exceeded*	Flame could not be established during multiple trial-for-ignition periods (3). Maximum number of retries has been exceeded and furnace is in lockout condition. System Shutdown alarm lockout will need to be reset through BacView interface or IQ controller will need to be power cycled.	A. Insufficient gas line pressure	1. Ensure that gas supply is connected to furnace and check for proper line pressure
			B Gas valve control turned OFF	1. Turn gas valve to ON position
			C. No spark from direct spark ignition	1. Check ignition voltage (115VAC from board to transformer) and wiring
				2. Check 24VAC transformer for DSI board
			D. Insufficient intermediate gas manifold pressure through gas safety valve	1. Check for faulty gas valve wiring
				2. Check 24VAC to gas valve assembly
				3. Check inlet pressure to safety gas valve
				4. Check outlet pressure from safety gas valve; adjust as needed
				5. Replace safety gas valve if faulty
			E. Insufficient gas manifold pressure to burner through modulating ball valve assembly	1. Check voltage to gas valve actuator (7–10VDC depending on model)
				2. Check alignment and setscrew connection between ball valve and actuator (refer to Paragraph 4.3)
			F. Burners do not light	1. Check spark rod assembly for proper location, spark gap, etc.
				2. Verify that spacing between burner body and burner shield is equal across entire length of burner
				3. Check burner orifice for proper size and blockage
			G. Burners light and remain lit for about 5 seconds	1. Check flame rod wiring and connections
				2. Check for proper alignment of flame rod
				3. Clean flame rod sensor
E02	Primary Limit/Fuse Failure (EO2)	Control board safety fuse has blown or primary temperature limit has opened, indicating that safe operating temperatures for this furnace have been exceeded.	A. Improper circulating airflow	1. Check filter/replace if dirty
				2. Check for improperly-sized duct system
				3. Check for faulty blower motor
				4. Check for faulty blower motor wiring
			B. Primary limit switch failure	1. Check for an open primary limit switch at ambient temperature
			C. Fuse is blown	1. Check and replace fuse on board
				2. Ensure that fuse socket is tight; crimp fuse terminals if necessary
			D. Faulty primary limit switch wiring	1. Check primary limit wiring continuity from switch to control board
E03	Modulation Valve Failure (EO3)	Control lost position feedback from modulating gas valve actuator.	A. Faulty modulation valve actuator wiring	1. Ensure that wiring is connected per unit wiring diagram
				2. Check for loose pins or bad connections
				3. Check for frayed wiring or shorts to ground
			B. Modulation valve actuator failure	1. Ensure that actuator has 24V power
				2. Ensure that actuator is receiving signal from control board (2–10VDC)
				3. Check for actuator feedback to control board (2–10VDC)
E04	Air Sensor Failure (EO4) *Pressure Sensor Reading Low*	Air sensor reading is too low for operating conditions or air pressure switch closed when sensor indicates low flow. *Pressure switch MUST be open prior to venter activation*.	A. Faulty wiring or connections	1. Check pressure switch wiring
				2. Check inducer wiring
				3. Check for plugged or disconnected vacuum hose(s)
			B. Faulty pressure switch	1. Replace pressure switch
			C. Faulty pressure sensor, located on board	1. Replace board
E05	Air Sensor Failure (EO5) *Pressure Sensor Reading High*	Air sensor reading is too high when venter is off or air pressure switch open when sensor indicates high flow. *Pressure switch MUST close to initiate ignition sequence.*	A. Faulty wiring or hose connections	1. Check pressure switch wiring
				2. Check venter motor wiring
				3. Check for broken or disconnected vacuum hose(s)
			B. Blocked or improper venting	1. Check air inlet and outlet for blockage
				2. Check venting configuration for excessive venting length, improper sizing, etc.
			C. Faulty pressure switch	1. Replace pressure switch

Gas Heat Section Modulating Control LOCKOUT ERRORS (cont'd)

Code	Alert	Description	Probable Cause	Remedy
E06	Gas Sensor Failure (EO6) *Pressure Sensor Reading Low*	Gas transducer reading is too low compared to expected value for modulating gas valve actuator position. *When furnace is operating at 75% or higher (>8VDC analog input voltage) manifold pressure sensor must read 1.4 IN WC or higher.*	A. Modulating actuator/ball valve not properly aligned	1. Perform modulating system gas valve alignment procedure (refer to Paragraph 4.3)
			B. Line pressure too low	1. Ensure that line pressure is properly adjusted for gas type and application; correct as necessary
			C. Intermediate regulated pressure to low	1. Ensure that safety gas valve(s) are properly adjusted to specified outlet pressure; adjust as necessary in accordance with installation manual (form I-MAPSIII&IV)
			D. Wrong gas pressure sensor installed	1. Ensure that proper gas transducer—either natural gas or propane—is installed; replace as necessary
			E. Gas pressure sensor faulty	1. Ensure that gas manifold transducer is installed properly and is wired in accordance with unit wiring diagram; replace as necessary
E07	Gas Sensor Failure (EO7) *Pressure Sensor Reading High*	Gas transducer reading is too high compared to expected value for modulating gas valve actuator position. *When furnace is operating at 75% or lower (<8VDC analog input voltage) manifold pressure sensor must read 2.8 IN WC or lower.*	A. Modulating actuator/ball valve not properly aligned	1. Perform modulating system gas valve alignment procedure (refer to Paragraph 4.3)
			B. Line pressure too high	1. Ensure that line pressure is properly adjusted for gas type and application; correct as necessary
			C. Intermediate regulated pressure too high	1. Ensure that safety gas valve(s) are properly adjusted to specified outlet pressure; adjust as necessary in accordance with installation manual (form I-MAPSIII&IV)
			D. Wrong gas pressure sensor installed	1. Ensure that gas sensor—either natural gas or propane—is installed; replace as necessary
			E. Gas pressure sensor faulty	1. Ensure that gas sensor is installed properly and is wired in accordance with unit wiring diagram; replace as necessary
E08	Improper Flame Signal (EO8)	Control senses flame present when gas valve is commanded off.	A. Flame remains lit in OFF cycle	1. Gas valve leaks—check wiring to remove continuous 24V to gas valve
				2. Gas valve is stuck open—remove, repair, or replace gas valve
E09	No Firing Rate Input (EO9)	Call for heat is sensed (R and W closed) but firing rate is below defined voltage threshold for furnace operation.	A. Faulty wiring to Analog+ and Analog– terminals	1. Ensure that wiring is connected in accordance with unit wiring diagram
				2. Check for loose pins or bad connections
				3. Check for frayed wiring or shorts to ground
			B. No signal from source	1. Check firing rate input voltage—must be greater than 1.5VDC
				2. Troubleshoot controller providing firing rate input to deep modulation ignition control board
Eid	Invalid I.D. Plug (Eid)	Installed ID plug is not valid for this control board.	A. Incorrect ID plug installed	1. Ensure that ID plug is correct for furnace—check label
				2. Ensure that ID plug is properly inserted into mating connector on control board
				3. With ID plug installed, cycle power to furnace; board will display ID plug identity at powerup
				4. Install correct ID plug as necessary

INDEX

REFERENCES: The Installation Manual, Control Instructions, this Operation/Maintenance Manual, and applicable supplier instructions are shipped with the unit. The literature listed below is also currently available at www.ReznorHVAC.com.

- Installation Manual (form I-MAPSIII&IV) applies to cabinets A, B, C, and D
- Control Instructions (form CP-MAPS D15/16/17/18)
- Replacement Parts (form P-MAPSIII&IV)
- Energy Recovery Module Manual (form I-MAPSIII&IV-ER)

Record installation information on the back of the installation manual (form I-MAPSIII&IV).

Keep all booklets for future reference.

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