**WARNING:**

**FIRE OR EXPLOSION HAZARD**

Failure to follow safety warnings exactly could result in serious injury, death, or property damage.

Be sure to read and understand the installation, operation, and service instructions in this manual.

Improper installation, adjustment, alteration, service, or maintenance can cause serious injury, death, or property damage.

— Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

— **WHAT TO DO IF YOU SMELL GAS**
  * Do not try to light any appliance.
  * Do not touch any electrical switch; do not use any phone in your building.
  * Leave the building immediately.
  * Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier’s instructions.
  * If you cannot reach your gas supplier, call the fire department.

— Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

**KEEP THIS BOOKLET FOR MAINTENANCE AND SERVICE REFERENCE.**
1.0 General

The information in this manual applies to Model Series RDF and ADF direct-fired heating/makeup air systems. As with any gas burning equipment, regular maintenance procedures are required to ensure continued safety, reliability and efficiency of the installation.

If service is required, this system should be serviced only by a qualified service person. Service information in this booklet is intended as a guideline for a qualified gas-fired equipment service person.

1.1 Hazard Labels and Notices

This booklet includes operation, maintenance and service information. Before beginning any procedure, carefully review the information, paying particular attention to the warnings.

Definitions of Hazard Intensity Levels used in this Manual

<table>
<thead>
<tr>
<th>HAZARD INTENSITY LEVELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. DANGER: Failure to comply will result in severe personal injury or death and/or property damage.</td>
</tr>
<tr>
<td>2. WARNING: Failure to comply could result in severe personal injury or death and/or property damage.</td>
</tr>
<tr>
<td>3. CAUTION: Failure to comply could result in minor personal injury and/or property damage.</td>
</tr>
</tbody>
</table>

There are warning labels on the unit and throughout this manual. For your safety, comply with all warnings during installation, operation, maintenance, and service of this system.

1.2 Warnings and Requirements

WARNING: Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death. Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.

WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. See Hazard Levels, above.
2.0 Maintenance

2.1 Maintenance Requirements

This direct-fired makeup air system is designed to require only a minimum amount of maintenance. Some maintenance procedures outlined in this Section require inspection only and some require action. Frequency requirements of each maintenance procedure are listed in the Maintenance Schedule. Depending on the environment and the number of operating hours, more frequent inspection and/or cleaning may be required to certain components.

Although maintenance requirements are minimal, the routine maintenance procedures in this Section are necessary to ensure safe, reliable, and/or efficient operation. The paragraphs which follow discuss the components and systems that require routine inspection/maintenance. At the beginning of each paragraph, there is a code indicating why that maintenance procedure is necessary. The legend for that code is shown on the left.

WARNING: Disconnect all power to the system before doing any maintenance. Failure to do so may cause electrical shock, personal injury, or death.

### Maintenance Codes

- **S** = Safety (to avoid personal injury and/or property damage)
- **R** = Continued Reliability
- **E** = Efficient Operation

### Maintenance Schedule

#### See Chart, Paragraph 2.3.1
- **☐** Lubricate bearings, Paragraph 2.3.1

#### Quarterly
- **☐** Check the filters, Paragraph 2.3.2
- **☐** Check air pressure sensing tubes, Paragraph 2.3.4

#### Semi-Annually
- **☐** Check blower belts, Paragraph 2.3.1
- **☐** Verify gas pressures, Paragraph 2.3.3
- **☐** Clean air pressure sensing tubes, Paragraph 2.3.4
- **☐** Check indicator lights, Paragraph 2.3.5

#### Annually
- **☐** Check main burner and pilot assembly, Paragraph 2.3.6

---

DANGER: The gas burner in this direct gas-fired system is designed and equipped to provide safe, controlled complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion which produces carbon monoxide, a poisonous gas that can cause death.

Always comply with the combustion air requirements in the installation codes and operating instructions. The amount of air over the burner must be within the specified range. The burner profile plates are set at the factory to match CFM requirements. Do not adjust the burner profile plates without contacting the factory. FAILURE TO PROVIDE PROPER COMBUSTION AIR CAN RESULT IN A HEALTH HAZARD WHICH CAN CAUSE PROPERTY DAMAGE, SERIOUS INJURY, AND/OR DEATH. Direct-fired installations should provide for air changes as required by the applicable installation codes.

WARNING: On makeup air heaters which also recirculate room air, outside ventilation air must be provided in accordance with the information shown on the heater rating plate.

Recirculation of room air may be hazardous in the presence of:

1. Flammable solids, liquids, and gases;
2. Explosive materials (e.g. grain dust, coal dust, gun powder, etc.);
3. Substances which may become toxic when exposed to heat (e.g. refrigerants, aerosols, etc.).
2.0 Maintenance (cont’d)

2.3 Maintenance Procedures

Blower, motor and drive components are located in the blower cabinet. Remove the panels required to access the component(s) being serviced.

Blower Bearings

All blowers are Class I with pillow block bearings. Clean the fitting and add type NLG-2 or -2 standard grade 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.

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

R 2.3.1 Drive Components

FIGURE 1 - Belt Tension

3/4” (19mm)

FIGURE 2 - Gas Pressure Tap Locations

Blower Belts

Check belts for proper tension and wear. Adjust belt tension as needed. Replace worn belts.

Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. If adjustment is required, adjust belt tension by means of the adjusting screw on the motor base until the belt can be depressed 1/2” to 3/4” (FIGURE 1). Tighten the lock nut on the adjusting screw. Be sure the belt is aligned in the pulleys.

If the system includes filters, check the filters quarterly.

To access the filters, remove the filter cabinet door panels. Clean or replace as needed.

If filters are removed, be sure the blockoff plates are returned to the filter rack.

2.3.2 Filters

2.3.3 Manifold Gas Pressure

Semiannually, check the gas pressure to the burner and to the pilot. Measure both manifold pressure and pilot supply pressure with the blower in operation. Verify against pressures listed on the rating plate.

Recommended Bearing Lubrication Schedule

in Months

<table>
<thead>
<tr>
<th>RPM Range</th>
<th>Bearing Bore Diameter (Inches)</th>
<th>NOTE: If unusual environmental conditions exist (temperatures below 32°F or above 200°F; moisture; or contaminants) more frequent lubrication is required.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 to 1</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>&gt;1 to 1-1/2</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>&gt;1-1/2 to 1-15/16</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>5 months</td>
<td></td>
</tr>
<tr>
<td>1001-1500</td>
<td>5 months</td>
<td></td>
</tr>
<tr>
<td>1501-2000</td>
<td>4 months</td>
<td></td>
</tr>
</tbody>
</table>

Blower Belts

Check belts for proper tension and wear. Adjust belt tension as needed. Replace worn belts.

Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. If adjustment is required, adjust belt tension by means of the adjusting screw on the motor base until the belt can be depressed 1/2” to 3/4” (FIGURE 1). Tighten the lock nut on the adjusting screw. Be sure the belt is aligned in the pulleys.

If the system includes filters, check the filters quarterly.

To access the filters, remove the filter cabinet door panels. Clean or replace as needed.

If filters are removed, be sure the blockoff plates are returned to the filter rack.

2.3.2 Filters

Model RDF with Optional Filter Cabinet

<table>
<thead>
<tr>
<th>Type</th>
<th>Disposable</th>
<th>Permanent</th>
<th>Pleated Disposable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>1”</td>
<td>2”</td>
<td>1”</td>
</tr>
<tr>
<td>Model RDF with Optional Filter Cabinet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>-</td>
<td>(3)12x35</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>-</td>
<td>(4)12x35</td>
</tr>
<tr>
<td>3</td>
<td>-</td>
<td>-</td>
<td>(4)12x24</td>
</tr>
</tbody>
</table>

Model ADF/ADFH with Optional Filter Cabinet

<table>
<thead>
<tr>
<th>Gas Supply</th>
<th>Pilot Regulator</th>
<th>Pilot Solenoid Valve</th>
<th>Pilot Pressure Tap</th>
<th>Manifold Pressure Tap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve</td>
<td>Valve</td>
<td>Regulator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inlet Pressure Tap</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Form O-ADF/RDF, P/N 148385R1, Page 4
2.3.4 Air Pressure

Profile plate sensing tubes should be checked quarterly and cleaned no less than semi-annually. If the sensing tubes become even partially blocked, false pressure readings may be relayed.

To clean, remove the screened end caps and clean the screens and the tubes. Replace the clean end caps. Check the pressure differential across the profile plate using a slope gauge. To attach the slope gauge, open the control compartment door panel. Just below the junction box, locate the tubing connections. Remove the cap at each connection and attach the slope gauge using two field-supplied 1/4" x 1/8" female NPT barbed tubing connections. For instructions on measuring air pressure, see Paragraph 3.4. Air pressure differential should be between -.25" and -.75" w.c.

2.3.5 Circuit Indicator Board (check lights)

The circuit indicator board is located in the control compartment electrical box (See FIGURE 9, page 8). Check operation of all indicator lights by switching lights that are not lit with one that is currently lit. Replace any burned out indicator bulbs (P/N 125189).

FIGURE 3 - Circuit Indicator Board, P/N 151263

2.3.6 Main Burner and Pilot Assembly

CAUTION: Wear eye protection while pressure cleaning and drilling.

WARNING: Do not enlarge burner ports or performance may be drastically affected.

FIGURE 5 - Direct Fired Burner

WARNING: Burner profile plates are factory set to match CFM requirements. Do not adjust profile plates without contacting your Sales Representative for technical assistance.

NOTE: Model RDF units manufactured prior to 3/96 have a spark ignition system. Clean ultraviolet sensor and spark plug. Replace as needed.

FIGURE 4 - Burner End Plate showing Hot Surface Ignitor

For the most part, the burner and pilot are self cleaning. However, if the application is extremely dirty or dusty, cleaning of the burner and pilot may be necessary. Inspect the burner annually. Follow these instructions. If it is necessary to replace any parts, use only factory-authorized replacements.

1) Turn off the gas and power supply to the system.
2) Remove the door panels in the burner/control cabinet. Locate the pilot.

Burner - Full length of the burner is made up of a series of 6" or 12" burner sections.
2.3.7 Optional Evaporative Cooling Module

Media - Over time, excessive amounts of mineral deposits will begin to build up on the media. Annually, scale and dirt should be washed off the entering surface of the media. Remove the pad retainers and screen. (See Steps 1-3 and 6-8 of Media Replacement Instructions.) Clean the media using a garden hose, mild soap, and a soft bristled brush. When the media becomes too clogged with mineral deposits and dirt that it cannot be cleaned, the pads should be replaced. The average pad life is approximately three cooling seasons.

See charts and NOTE below for replacement media information. Follow the instructions and remove and replace pads as shown in FIGURE 6.

**Evaporative Cooling Media - Model ADF or ADFH with Option AS3, AS4, AS5, or AS8**

<table>
<thead>
<tr>
<th>ADF / ADFH</th>
<th>Media Pad Size &amp; Qty (inches)</th>
<th>Qty</th>
<th>Replacement P/N's (each) - 12&quot; media *</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>24 x 12</td>
<td>2</td>
<td>106021 106029</td>
</tr>
<tr>
<td></td>
<td>24 x 7-7/8</td>
<td>1</td>
<td>106022 106030</td>
</tr>
<tr>
<td>500</td>
<td>24 x 12</td>
<td>3</td>
<td>106021 106029</td>
</tr>
<tr>
<td></td>
<td>24 x 9-5/8</td>
<td>1</td>
<td>106025 106033</td>
</tr>
<tr>
<td>700/1200</td>
<td>48 x 12</td>
<td>4</td>
<td>107194 107201</td>
</tr>
<tr>
<td></td>
<td>48 x 8-5/8</td>
<td>1</td>
<td>107195 107202</td>
</tr>
</tbody>
</table>

*NOTE: 6" media is no longer available as a replacement part. Use size to obtain media from a local supplier.*

**Evaporative Cooling Media - Model RDF with attached Model REC Evaporative Cooling Module**

<table>
<thead>
<tr>
<th>REC</th>
<th>Media Pad Size &amp; Qty (inches)</th>
<th>Qty</th>
<th>Replacement P/N's (each) *</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>24x12</td>
<td>2</td>
<td>106021 106029</td>
</tr>
<tr>
<td></td>
<td>24x2-3/8</td>
<td>1</td>
<td>106022 106030</td>
</tr>
<tr>
<td>50</td>
<td>24x12</td>
<td>2</td>
<td>106021 106029</td>
</tr>
<tr>
<td></td>
<td>24x7-7/8</td>
<td>1</td>
<td>106023 106031</td>
</tr>
<tr>
<td>60</td>
<td>24x12</td>
<td>3</td>
<td>106021 106029</td>
</tr>
<tr>
<td></td>
<td>24x1-3/8</td>
<td>1</td>
<td>106024 106032</td>
</tr>
<tr>
<td>70</td>
<td>24x12</td>
<td>3</td>
<td>106021 106029</td>
</tr>
<tr>
<td></td>
<td>24x9-5/8</td>
<td>1</td>
<td>106025 106033</td>
</tr>
<tr>
<td>80</td>
<td>24x12</td>
<td>4</td>
<td>106021 106029</td>
</tr>
<tr>
<td></td>
<td>24x2-7/8</td>
<td>1</td>
<td>106026 106034</td>
</tr>
<tr>
<td>90</td>
<td>24x12</td>
<td>4</td>
<td>106021 106029</td>
</tr>
<tr>
<td></td>
<td>24x8-5/8</td>
<td>1</td>
<td>106027 106035</td>
</tr>
<tr>
<td>180</td>
<td>48x12</td>
<td>4</td>
<td>107194 107201</td>
</tr>
<tr>
<td></td>
<td>48x8-5/8</td>
<td>1</td>
<td>107195 107202</td>
</tr>
<tr>
<td>360</td>
<td>48x12</td>
<td>8</td>
<td>107194 107201</td>
</tr>
<tr>
<td></td>
<td>48x8-5/8</td>
<td>2</td>
<td>107195 107202</td>
</tr>
</tbody>
</table>

**Instructions for Replacing Evaporative Cooling Media**

1. Remove the three sheetmetal screws that hold the top pad retainer in place.
2. Release the top pad retainer from the cooling module.
3. Remove the three sheetmetal screws that hold the bottom pad retainer in place.
4. Release bottom pad retainer from the cooling module.
5. Disengage the screen retainers from the sides of the media.
6. Disengage inlet screen from media pads and remove.
7. Slide all media pads horizontally away from the cooling module until clear of bottom reservoir pan. Dispose of properly.

---

*NOTE:* 6" media is no longer available as a replacement part. Use size to obtain media from a local supplier.
6. Replace media by sliding media pads over both support rails until back stop is encountered. Media must be placed as shown in FIGURE 7.

7. Center screen on the incoming air side of the media.

8. Replace the two side screen retainers by fitting them between the side of the media pad and the side of the cooling module. The retainers should fit snugly, pinching the screen against the media pads.

9. Replace the bottom pad retainer by securing the retainer between the pad and the reservoir pan. Fasten with the three sheetmetal screws removed in Step 2.

10. Replace the top pad retainer by securing the retainer between the pad and top of the cooling module. Fasten with the three sheetmetal screws removed in Step 1.

Other Evaporative Cooling Module Maintenance


Water Feed Line and PVC Distribution Piping - Annually, the water supply line and PVC water distribution pipe should be flushed of debris and contaminants.

1. Remove the media pads following the media replacement instructions.

2. Remove the water feed line from the downstream side of the ball valve and unscrew the water bleed line barbed hose fitting.

3. Force a fresh water supply through the water inlet hose and thoroughly flush the distribution pipe.

4. Reassemble being careful to install media with air flow direction as shown in FIGURE 7.

Water Pump and Inlet Basket Screen (applies to system with float and pump control) -- Annually, the pump and inlet basket screen should be removed, disassembled, and cleaned.

WARNING: Do not expose pump motor or any part of the electrical box to water. Evaporative cooling pump is NOT submersible.

1. Disconnect the power supply to the unit.

FIGURE 8 - Remove Junction Box, Pump and Float Switch as an Assembly

Junction Box (Note: Only 208V unit will have a transformer in the junction box.)
2.0 Maintenance (cont’d)

2.3 Maintenance Procedures (cont’d)

2.3.7 Optional Evaporative Cooling Module (cont’d)

2. Remove the service panel and the junction box door. Disconnect the two-line voltage power supply wires from the terminal block inside the junction box.
3. Disconnect the water feed line hose from the upstream side of the ball valve.
4. Unscrew the four sheetmetal screws holding the junction box to the cooling module. Remove the junction box-pump-float switch assembly (See FIGURE 8).
5. Dislodge the inlet basket screen from the pump and clean any buildup of debris and dirt. Carefully remove the base cover plate from the bottom of the pump. Using a mild soap solution, wash all deposits from the inside of the pump and remove all debris from the impeller.
6. Reassemble the pump. Replace the parts in exact reverse order, being careful that everything is returned to its proper position.

3.0 Operation and Service

3.1 Control Locations

To service this system, it is necessary to understand the normal operation of the controls and the function of the diagnostic circuit board. Refer to the electrical box drawing in FIGURE 9 and to the individual illustrations to identify and locate each of the controls. The wiring diagrams for this unit are located in the main electrical box.

WARNING: Service work on this system should only be done by a qualified gas service person. The service information and the troubleshooting guides are intended as an aid to a qualified service person.

FIGURE 9 - Control Identification and Typical Locations

3.2 Electronic Circuit Board with Lights

Location: Control Compartment Electrical Box (See FIGURE 9)

Function: The diagnostic lights on the circuit board are designed to assist in troubleshooting. When the system is operating properly, the lights on the circuit board are lit. If the system fails to operate properly, all lights on the circuit board up to the one that represents the component or system that has failed will be lit. For more detailed information, refer to the Troubleshooting Guide in Paragraph 3.9..

Service: Replacing burned out bulbs is the only service required. If a bulb is not lit, check the bulb by switching it with a bulb that is lit.
3.3 Limit Safety Controls

Each unit has an automatic temperature activated limit control, a manual reset temperature activated limit control, and an electrical activated energy cutoff device.

- **Automatic Reset Limit Control**
  
  **Function:** If the temperature of the discharge air reaches the setpoint, the limit will open the circuit to the burner system and close all burner and pilot valves. The limit control will be activated if total airflow is reduced or if gas pressure surges at the burner causing excessive discharge air temperature. The system will restart when the discharge air temperature decreases below the setpoint.

  **Service:** Failure of this limit requires replacement of the control.

- **Manual Reset Limit Control**
  
  **Function:** The manual reset limit has a higher setting than the automatic limit and requires manual resetting to restart the system. If for any reason the automatic limit should fail to protect against overheating, the manual limit will shutdown the system. Should the manual reset limit activate, check the entire system to determine the cause. Make any necessary changes or adjustments before restarting the burner system. Restart of the unit can be done only after the limit has been cooled and the reset button depressed.

  **CAUTION:** If the manual reset limit activates, find and correct the cause before restarting the system.

  **Service:** Failure of this limit requires replacement of the control.

- **Emergency Cut Off Limit Control**
  
  **Function:** The emergency cut off is a fusible link high temperature limit which provides onetime redundant protection against overheating. If the temperature sensitive limit controls malfunction, the electrically activated emergency cutoff will shutdown the system.

  **Service:** If this limit activates, the manual limit control has failed and must be replaced. The cause for activating the emergency cut off limit control must be found and corrected before re-starting the system.

- **Low Airflow Switch**
  
  **Function:** The low airflow switch is a velocity pressure switch that monitors airflow across the burner. Until the airflow attains adequate volume for combustion, the switch remains open. When the switch recognizes adequate air volume, it closes, permitting both the pilot and burner to operate. Low pressure switch is normally open; it closes on pressure rise at .25” w.c. Do not alter or adjust setting.

### FIGURE 11 - Automatic Reset Limit Controls

<table>
<thead>
<tr>
<th>Model</th>
<th>P/N</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>RDF</td>
<td>86979</td>
<td>135°F</td>
</tr>
<tr>
<td>ADF</td>
<td>122856</td>
<td>130°F</td>
</tr>
<tr>
<td>ADFH</td>
<td>57953</td>
<td>170°F</td>
</tr>
</tbody>
</table>

### FIGURE 12 - Manual Reset Limit Controls

- **Model RDF**
  - Setting 150°F, P/N 82610
  - Reset Button

- **Model ADF**
  - Setting 135°F, P/N 122858
  - Setting 175°F, P/N 122990

### FIGURE 13 - ECO Limit Control

- **Setting** 305°F
  - P/N 82414

3.4 Air Pressure Switches

**Location:** Control Compartment Electrical Box (See FIGURE 9.)

- **Low Airflow Switch**
  
  **Function:** The low airflow switch is a velocity pressure switch that monitors airflow across the burner. Until the airflow attains adequate volume for combustion, the switch remains open. When the switch recognizes adequate air volume, it closes, permitting both the pilot and burner to operate. Low pressure switch is normally open; it closes on pressure rise at .25” w.c. Do not alter or adjust setting.
• High Airflow Switch

**Function:** The high airflow switch is a velocity pressure switch that monitors airflow across the burner. If the high airflow switch senses air velocity above the prescribed limit, it will shut down gas flow to the burner. High pressure switch is normally closed; it opens when pressure rises above .75" w.c. Do not alter or adjust setting.

**Low and High Airflow Sensing Pressure Check:** (requires slope gauge, several feet of 1/4" OD tubing and two 1/4" OD barbed tees.)

Attach a slope gauge (0 to 1.0" scale) to the tubing connections in the control compartment. The two connections are located below the electrical control box. Remove the caps on the 1/8" NPT test connections and attach the slope gauge. (The recommended method for attaching the slope gauge is to use field-supplied 1/8" female NPT x 1/4" O.D. barbed hose connections.)

A) If the system includes an optional discharge damper, before measuring burner differential air pressure, check to be sure that the damper is fully open.

B) With the blower operating, the pressure differential on the slope gauge should read between -.25" and -.75" w.c. If the slope gauge reading is within those limits, no adjustments are necessary. If pressure reading is not within limits, consult the factory.

C) When air pressure is within the proper range, turn the disconnect switch OFF. Disconnect the manometer and the slope gauge. Replace the caps removed to connect the slope gauge.

**Pressure Switches and Bypass Damper Airflow (Applies to Model RDF system with Air Control Option AR19, AR20, AR22, AR23, AR32, AR33, AR34, AR36, or AR37)**

Adjustment of the bypass damper is controlled by the same low and high pressure switches described above. With a bypass damper, the volume of outside air supplied to the building is controlled by a manually set potentiometer (Option AR19 and AR22) or automatically by a pressure null switch (Option AR20 or AR23), a photohelic pressure switch (Option AR36 or AR37), or a field-supplied computer signal (Option AR33 or AR34). With Options AR19, AR20, AR33, and AR36 the supply air is varied by adjusting the position of a damper at the blower discharge. With Options AR22, AR23, AR34, and AR37, a return air damper is adjusted to vary the volume of return air. The unit is arranged so that a fixed amount (20%) of the rated volume flows over the burner at a constant velocity. The remainder (80%) of the rated air volume flows either through a balancing bypass damper or a combination of bypass and return air dampers. As the supply air volume is varied by the return air or discharge damper, the balancing damper is adjusted to maintain the required air velocity over the burner. See Paragraph 3.7 for information about inlet air control options.

**Service:** If the pressure check determines that an airflow switch is not functioning properly, the switch cannot be serviced and must be replaced with an identical replacement. Low air pressure switch is P/N 203932; high air pressure switch is P/N 203933.

---

**3.5 Ignition System**

**Location:** Ignition Controller Module in the Control Compartment Electrical Box (See FIGURES 9 and 15); Ignitor and Flame Sensor on the Burner (See FIGURE 16.)

**FIGURE 14 - Air Pressure Switch**

**FIGURE 15 - Ignition Control Module in the Electrical Compartment, P/N 157953**

**FIGURE 16 - Pilot Plate Assy, Ignitor, P/N 121865, and Flame Sensor, P/N 134706, on the Burner**

**Hot Surface Ignition System with Prepurge Time Delay and Flame Sensor with Lockout**

**Function:** The ignition system including the controller, the hot surface ignitor, and the flame sensor function to ignite and prove the pilot flame. When there is a call for heat, the modular ignition controller is energized. When the controller reads 1.4 amps going to the hot surface ignitor, it opens the pilot valve for a 15-second trial for ignition. After the pilot flame rod senses pilot flame, the main gas valve is energized.
If the pilot flame rod does not sense a pilot flame, the controller shuts down the pilot valve for a 10-second interpurge and then opens it again for a second ignition trial. If pilot flame is not proven on the second trial, the ignition controller locks out and must be manually reset by an interruption of the main circuit (disconnect switch).

If the burner ordered is over three feet long (Model RDF with burner Option BL7, BL8, BL9, BL10, BL11, or BL13), a second flame rod is located at the end of the burner. After the main gas valve(s) is energized, a 15-second trial to prove the second flame is initiated. Failure to recognize and prove flame travel to the opposite end of the burner will result in a pre-purge and re-try for ignition.

**Service:** The modular ignition controller does an internal self-check each time that it is energized and will lockout if not found to be functioning properly. If the ignition controller locks out and there is no other cause, the controller module must be replaced.

### Direct-Fired Burner

**Function:** The design of the direct-fired burner and the controlled velocity of air at the burner ensure complete combustion through the full range of burner sizes and gas inputs as determined by the gas control system. The velocity of air is controlled by the profile plates and monitored by a standard low and high air pressure switch.

**Service:** Refer to Paragraph 2.3.6 for instructions on burner maintenance.

**WARNING:** Burner profile plates are factory set to match CFM requirements. Do not adjust profile plates without contacting your Sales Representative for technical assistance.

#### Makeup Air (100% Outside Air) Gas Control Systems

- **Single-Stage Gas Valve for Makeup Air (Option AG1) (750MBH maximum)**

  The standard 24-volt, single state gas valve has an integral automatic electric on-off valve, a pressure regulator, a safety pilot valve, and a manual shutoff. The valve operates in response to a call for heat from a unit-mounted air controller that monitors discharge air temperature. The controller has a built-in setpoint selector from 0° - 100°F. Due to different CFM settings and outside temperatures, the average downstream outlet temperature may not match the control setting exactly. After the installation is complete, adjust the setpoint to achieve the desired average outlet air temperature. See the valve manufacturer's literature provided in the owner's envelope for specifications, wiring, and operating information.

- **Two-Stage Gas Valve for Makeup Air (Option AG3) (750 MBH maximum)**

  The single-stage valve is replaced by a two-stage valve having low fire and high fire operation. The two-stage valve is controlled by a unit-mounted ductstat that monitors discharge air temperature. The ductstat has a built-in setpoint selector from 60°-110°F. Available for use with natural gas only. Due to different CFM settings and outside air temperatures, the average downstream outlet temperature may not match the ductstat setting exactly. After the installation is complete, adjust the setpoint of the ductstat to achieve the desired average outlet air temperature. See the valve manufacturer's literature provided in the owner's envelope for specifications, wiring, and operating information.

- **Electronic Modulation Gas Control for Makeup Air (100% Outside Air), Options AG30, AG31, AG32, AG33, AG35, AG36**

  Refer to the wiring diagrams in the main electrical box to determine which controls are on the system being serviced. **NOTE:** All field-supplied control wiring for Maxitrol controls must **not** be run inside conduit with line voltage wiring. To avoid any potential electrical interference, all field-supplied wiring for Maxitrol controls should be shielded wiring and must be grounded at the unit only.

  **Function:** These gas control systems provide heated makeup air at a temperature controlled by a discharge air sensor. Makeup air gas controls apply only to systems with 100% outside air. Each system is equipped with electronic modulation controls that modulate burner flame from 1/25th of full fire input to full fire.
3.0 Operation and Service (cont'd)

The electronic modulating-type gas controls act in response to discharge and/or room air temperature sensors to change the gas flow rate to the burner, thus lengthening or shortening the flame. The BTU output is varied (modulated) to maintain the required discharge air temperature.

These modulating gas control options are electronic because in all cases the gas valve acts to adjust the flow of the gas to the main burner in response to DC volts emanating from an amplifier. When the DC voltage is between 0 and 5 volts, the main valve seat is closed. Low fire flow is accomplished through a mechanical bypass. The low fire flow rate is set at the factory and should not need adjustment. However, if adjustment is necessary, refer to the Maxitrol literature that is included in the heater owner's envelope.

All of the electronic makeup air modulating gas control burner systems include low fire start. On an initial call for heat, the main burner ignites at its lowest input. During mild weather, the burner may then cycle off. Such full shutdown can be dictated by the outdoor ambient cutoff control. As the outside air temperature climbs above the setpoint of the outdoor ambient control, the burner control circuit is de-energized. When moderately cold outside air temperatures exist, the burner will modulate between low flame and high flame. Low fire start and the outdoor ambient control prevent the makeup air system from heating already warm air and providing "too much" heat to the building.

For troubleshooting guides and further explanation of Maxitrol Series 14 and 44 electronic modulation gas control systems, refer to the Maxitrol literature in the owner's envelope.

The Option AG30, AG31, AG32, and AG35 electronic modulation systems are comprised of Maxitrol Series 14 controls for makeup air. Options AG30 and AG31 systems electronically maintain a constant discharge air temperature in the range of 55-90°F. Option AG31 includes an overriding thermostat. Option AG32 system will maintain a constant discharge air temperature in the range of 80-130°F. Option AG35 maintains a discharge temperature range of 120-160°F.

3.6 Gas Train Including Burner, Gas Controls, Manifold Arrangements, and Gas Pressure Switches (cont'd)

Option AG33 electronic modulation system is comprised of Maxitrol Series 44 controls for makeup air. The low limit (20-60°F) and the high limit (60-140°F) for control of discharge air temperature are set at the amplifier located in the control compartment. The space temperature is set at the remote selectrastat (55-90°F range) located in the space. When the temperature is below the space temperature setpoint, the control system operates the burner to automatically adjust the discharge air temperature within the maximum and minimum limits set on the amplifier.

Option AG36 is a special application gas train that is designed for controlling the environment of a paint booth operation. The system includes a Maxitrol A1494 amplifier, discharge air temperature sensor, dual remote discharge air temperature selector (drying selector 80-140°F and a spray selector 60-90°F), and two switches to control the operation of the modulating gas valve.
• Electronic Modulation Makeup Air Gas Control Option AG37

**Function:** Control Option AG37 does not have a duct sensor or amplifier. Instead, a Maxitrol signal conditioner is activated by a customer-supplied input signal (either 4-20 milliamps or 0-10 volt) to control the modulation of the gas valve.

**FIGURE 23 - Components of the Gas Control System used in Option AG36 designed specifically for paint booths - controls are mounted on a remote console**

- **Selector, P/N 133230**
- **Amplifier, P/N 133229**
- **Maxitrol Signal Conditioner, P/N 134170**

**FIGURE 24 - Maxitrol Signal Conditioner for Computer Control**

**MAKEUP AIR WITH RECYCLING AIR GAS CONTROL SYSTEMS (RDF ONLY)**

- **Electronic Modulation Makeup Air with Recirculation Gas Control Options AG47, AG48, and AG51**

Refer to the wiring diagrams in the main electrical box to determine which controls are on the system being serviced. **NOTE:** All field-supplied control wiring for Maxitrol controls must **not** be run inside conduit with line voltage wiring. To avoid any potential electrical interference, all field-supplied wiring for Maxitrol controls should be shielded wiring and must be grounded at the unit only.

**Function:** These make up air with recirculation gas control systems provide a mix of outside and recirculated air heated to a temperature controlled by a discharge air sensor. Each system is equipped with electronic modulation controls that modulate burner flame from 1/25th of full fire input to full fire and adjust the outside air damper in response to outside and return air sensors.

Both the flow of the gas to the main burner and the outside (bypass) air damper position are adjusted in response to DC volts emanating from an amplifier. When the DC voltage is between 0 and 5 volts, the main valve seat is closed. Low fire gas flow is accomplished through a mechanical bypass. Minimum outside air is 25%. Carbon dioxide (CO₂) in the discharge air of the unit is maintained to a level in compliance with ANSI Z83.18 requirements.

For troubleshooting guides and further explanation of Maxitrol Series 14 and 44 electronic modulation gas control recirculation systems, refer to the Maxitrol literature in the owner's envelope.

**Option AG47** electronic modulation system is comprised of Maxitrol Series 14 controls for makeup air with recirculation. The system electronically operates the burner and/or the outside air damper to maintain a constant discharge air temperature in the range of 40-95°F.

**FIGURE 25 - Modulating Gas Valve - Options AG47 and AG48**

**FIGURE 26 - Maxitrol Series 14 Components used in Recirculation Air Gas Control Option AG47**

- **Amplifier, P/N 204454**
- **Selector, P/N 204455**
- **Discharge Air Sensor, P/N 204453**
- **Return Air Sensor, P/N 204452**
- **Outside Air Sensor, P/N 204452**

**Option AG48** electronic modulation system is comprised of Maxitrol Series 44 controls for makeup air with recirculation. The low limit (20-60°F) and the high limit (60-140°F) for control of discharge air temperature are set at the amplifier. The space temperature is set at the remote selectrastat (55-90°F range) located in the space. When the temperature is below the space temperature setpoint, the control system operates the burner and/or the outside air damper to automatically adjust the discharge air temperature within the maximum and minimum limits set on the amplifier.
3.0 Operation and Service (cont'd)
3.6 Gas Train Including Burner, Gas Controls, Manifold Arrangements, and Gas Pressure Switches (cont'd)

**FIGURE 27** - Maxitrol Series 44 Components used in Recirculation Air Gas Control Option AG48

- Amplifier, P/N 204450
- Selector, P/N 204451
- Discharge Air Sensor, P/N 204453
- Return Air Sensor, P/N 204452
- Outside Air Sensor, P/N 204452

**FIGURE 28** - Option AG51 includes Maxitrol Series 44 Components used in AG48 plus a Remote Sensor/Selector, P/N 204456

**Option AG51** electronic modulation system is comprised of the same Maxitrol Series 44 controls as Option AG48 plus a remote sensor/selector.

**Service - ALL Gas Controls**: Check all electrical connections. A qualified service person should refer to the control manufacturer's literature for assistance in identifying problems and determining the correct solution. None of the controls have field replaceable parts. All components must be replaced with identical replacement parts.

**Manifold Arrangements**

**Description**: The manifold is the gas train from the gas supply connection to the burner. The manifold selection ordered determines the manifold arrangement including all of the gas train components except the main control valve. Manifold arrangements are available for varying BTUH ranges and gas controls and meet ANSI, CSA, FM or GAP (former IRI) requirements.

All manifold arrangements include two 5psi rated manual shutoffs.

These systems are designed to operate on a natural gas supply differential pressure range of a minimum of 4.3-5.0" w.c. plus the manifold pressure drop. Maximum supply pressure depends on manifold selection; see below. If the gas supply pressure is above the maximum allowed, it is necessary to install a field-supplied step-down gas regulator in the supply line. Order and install the appropriate Gas Regulator Kit, Option C1 (1") or CZ2 (1-1/2"). Follow the instructions provided with the kit. Measure the gas pressure between the step-down regulator and the unit.

(Refer to the wiring diagram or rating plate to identify the manifold on the system being serviced.)

**Maximum Supply Pressure by Manifold**

The table right lists the minimum supply pressure required for manifold and gas control combinations. Refer to the wiring diagram to be sure which combination of options applies to the system being serviced.

<table>
<thead>
<tr>
<th>Minimum Supply Gas Pressure (<em>w.c.</em>) for Full Fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manifold Option</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>with Gas Control Option</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Manifold Size</td>
</tr>
<tr>
<td>MBH</td>
</tr>
<tr>
<td>250</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>750</td>
</tr>
<tr>
<td>1000</td>
</tr>
<tr>
<td>1250</td>
</tr>
<tr>
<td>1500</td>
</tr>
<tr>
<td>1750</td>
</tr>
<tr>
<td>2000</td>
</tr>
<tr>
<td>2500</td>
</tr>
<tr>
<td>3000</td>
</tr>
</tbody>
</table>

If the gas train includes either or both high and low gas pressure switches, the switches monitor gas pressure downstream from the safety valves.

If the gas pressure in a system equipped with a high gas pressure switch (standard with manifold Options BM78, 79, 80 and 81; Option BP2 with other manifolds) exceeds the setpoint, the switch will open the electrical circuit to the burner, stopping all gas flow. The high gas pressure switch is a manually reset device.

A low gas pressure switch (Option BP3) will shutoff the gas flow if the gas pressure drops below the setpoint of the low pressure switch. The low gas pressure switch will automatically reset when the gas pressure rises above the setpoint.
3.7 Inlet Air Controls

**Description:** The system is equipped with one of the 11 types of inlet air control arrangements listed below. All systems provide a constant flow of outside air across the burner at the required air volume (CFM). Refer to the wiring diagrams in the main electrical box to determine which controls are on the system being serviced.

- **Option AR1** - a constant supply of 100% makeup air
- **Option AR19** - 100% outside makeup air with variable supply air volume (CFM).
  The discharge damper controlling the variable air supply is controlled by a manually set remote potentiometer and can be varied from 100% to 20-25% of total rated airflow (CFM). In response to changes in the discharge damper setting, the bypass damper balances the volume of air so that the required fixed amount of air volume flows over the burner.
- **Option AR20** - 100% outside makeup air with variable supply air volume (CFM).
  The discharge damper controlling the variable air supply is automatically controlled by a building pressure sensor and can be varied from 100% to 20-25% of total rated airflow (CFM). In response to changes in the discharge damper setting, the bypass damper balances the volume of air so that the required fixed amount of air volume flows over the burner.
- **Option AR22** - a combination of outside makeup air and bypass return air including modulating return air and bypass air dampers. The volume of outside air is regulated by a remotely located, manually set potentiometer.
- **Option AR23** - a combination of outside makeup air and bypass return air including modulating return air and bypass air dampers. The volume of outside air is regulated automatically by a remotely located building pressure sensor.
- **Option AR33** - 100% outside makeup air with variable supply air volume (CFM).
  The discharge damper controlling the variable air supply is automatically controlled by a 0-10 VCD or 4-20 milliamp signal. In response to changes in the discharge damper setting, the bypass damper balances the volume of air so that the required fixed amount of air volume flows over the burner.
- **Option AR34** - a combination of outside makeup air and bypass return air including modulating return air and bypass air dampers. The volume of outside air is regulated by a 0-10 VCD or 4-20 milliamp signal.
- **Option AR36** - 100% outside makeup air with variable supply air volume (CFM).
  The discharge damper controlling the variable air supply is automatically controlled by a remotely located photohelic pressure sensor. In response to changes in the discharge damper setting, the bypass damper balances the volume of air so that the required fixed amount of air volume flows over the burner.
- **Option AR37** - a combination of outside makeup air and bypass return air including modulating return air and bypass air dampers. The volume of outside air is regulated by a remotely located photohelic pressure sensor.

**WARNING:** Burner profile plates are factory set to match CFM requirements. Do not adjust profile plates without contacting your Sales Representative for technical assistance.

### Airflow Dampers

**Function:** Dampers operate in response to controls to provide the rated flow of makeup air to the building. Minimum outside air is 20-25%.

**Service:** Clean all dampers of dust or dirt.

### Damper Motor

**Function:** The damper motor automatically actuates the return air, bypass, and/or discharge dampers in response to an electrical control device. The damper motor is direct-coupled to the dampers so there is no damper linkage to adjust.

**Service:** There is no service required on these motors other than external cleaning. If the motors need replaced, replace with an identical damper motor.
3.0 Operation and Service (cont’d)

3.7 Inlet Air Controls (cont’d)

Pressure Null Switch
(automatic building pressure sensor)

**Description/Function:**
The pressure null switch is a diaphragm operated differential pressure switch used in makeup air applications to automatically control building pressure. It maintains a selected positive or negative pressure setpoint by changing the amount of outside air being introduced to the building through modulating outside air damper. As more pressure is required in the building, the pressure null switch activates the damper motor driving the outside air damper towards the full open position (causing the bypass return air damper to go toward the closed position). Conversely, as less pressure is required, the switch drives the outside air damper in the opposite direction.

**Service:**
Clean the tubing and the screened ends of the pressure tap vents. Be sure that the switch is installed with the diaphragm in a vertical plane and that the pressure taps are sheltered from the wind. For further service, follow the manufacturer's instructions included with the switch.

3.8 Other Optional Controls

**Outside Air Cutoff Control (Option BN2)**

**Location:** The control is in the electrical box (FIGURE 9); the sensor is in the air inlet.

**Function:** After sensing pilot flame, the burner ignites at its lowest input rate. The "amount of heat" required to reach the desired discharge temperature also depends on the temperature of the incoming outside air. The outside air control is factory set at 60°F (adjustable 25-250°F). The burner reacts differently depending on the entering air temperature and the setting on the outside air control. The burner --

- may not ignite (pilot valve will not open);
- may modulate to satisfy discharge setting;
- would shutdown completely only on Option BN2 control, once burner has been fired;
- or

  Modulating operation will depend on the temperature rise between the outside air and the discharge air setting.

- may remain on continuous low fire.

If the actual temperature of the outside air is above the setpoint on the outside air control, the burner will not ignite.

When the outside air control is set too high, the burner will continuously burn on low fire as long as the control switch is set to "winter".

**Service:** If the control does not function properly, replace it with an identical switch.
Door Switch (Option BX1)

**Location:** The control is installed on an overhead door opening to control the operation of the heater to coincide with the opening and closing of the door.

**Function:** The function of the switch is to energize and interlock the heating unit when an outside overhead door reaches approximately 80% of full open travel. The switch will de-energize the furnace when the overhead door closes approximately 20%. The complete switch includes a limit switch electrically wired to the heater and a roller yoke for mechanical activation by a field-supplied trigger on the overhead door.

Dirty Filter Switch (component of Remote Console Option RC1)

**Location:** Switch is located in the main electrical box (See FIGURE 9); sensor tubes run to either side of the filter rack; indicator light is on the remote console.

**Function:** The dirty filter switch is a pressure switch that activates an indicator light on the remote console when the filters need cleaned or replaced (See Paragraph 2.3.2). This switch is only on systems with an optional console that includes a dirty filter light. The pressure switch is set during installation so that the light will be activated at approximately 50% filter blockage. Contacts should close at .17 to 5.0" w.c. ± .05" w.c.

**Service:** Clean the sensor tubes. If the dirty filter indicator system still does not function properly, check the setting of the switch. With clean filters in place, blower doors closed, and blower in operation, decrease the pressure setting by adjusting the setscrew on the switch clockwise until the filter light is energized or screw is bottomed out. At that point, adjust the setscrew three full turns counterclockwise or until the screw is top ended.

If it is determined that the switch needs replacing, use an identical switch. When a new switch is installed, it must be manually set; follow the instructions above.

Firestat (Option BD2 or BD4)

**Location:** Firestat in Option BD2 is factory-mounted in the unit. Firestat in Option BD4 is field-mounted on the return air ductwork with the sensor extending into the duct. This control requires manual reset so it should be mounted in an accessible location.

**Function:** The firestat will shut down the system if the temperature at the sensor reaches 200°F. The switch must be manually reset.

**Service:** Clean the external surface. Check the wiring and connections.

Photoelectric Smoke Detector (Option SA1)

**Location:** Field-mounted in the discharge ductwork.

**Function:** The detector will shut down the system if smoke is detected in the discharge ductwork.

**Service:** Clean the external surface. Check the wiring and connections.

Low Temperature Limit (Freezestat), Option BE2

**Location:** The control is in the blower section electrical box; the sensing bulb is field-mounted in the discharge duct.

**Function:** The freezestat will shut down the system if the discharge temperature falls below the setpoint. The switch is automatic and will startup the heater when the temperature reaches the setpoint.

**Service:** Clean the external surface. Check the wiring and connections. Freezestat Controller is P/N 126170.
### 3.0 Operation and Service (cont'd)

#### 3.9 Troubleshooting

**Chart 1 - System Troubleshooting (Check the diagnostic lights.)**

<table>
<thead>
<tr>
<th>Symptom or Problem</th>
<th>Cause and Remedy</th>
</tr>
</thead>
</table>
| 1. Disconnect switch is closed, but "control power" light is not lit. | 1. Fuses are missing or blown in disconnect switch - replace fuses.  
2. Transformer not wired according to diagram - check wiring.  
3. Secondary 8A fuse (on transformer) is missing or blown - replace fuse.  
4. Indicator light is burned out - replace bulb (P/N 125189). |
| 2. Disconnect switch is closed, but "firestat normal" light is not lit. | 1. See causes and remedies for Problem 1 above.  
2. Optional control relay or door switch contacts are open - to test, jump terminals 3 to 4 or 1 to 2.  
3. Firestat option not ordered - verify order/wiring diagram.  
4. Firestat manual reset tripped - reset firestat control. |
| 3. Disconnect closed, blower switch in test position, "firestat" light is lit, but "freezestat" light is not lit. | 1. Freezestat option not ordered - verify order/wiring diagram.  
2. Freezestat relay contacts are open - check setting on control.  
3. Indicator bulb is burned out - replace bulb (P/N 125189). |
| 4. Disconnect closed, blower switch in test position, "firestat" and "freezestat" lights are lit, but "starter energized" light is not lit and the blower motor is not operating. | 1. End switch on damper motor not closed - check end switch wiring.  
2. Faulty damper relay - replace relay.  
3. Damper motor miswired - rewire damper motor per wiring diagram. |
| 5. Disconnect closed, blower switch in test position, "firestat", "freezestat" and "starter energized" lights are lit, but the blower motor is not operating. | 1. Blower motor not wired correctly - check wiring diagram on motor.  
2. Faulty motor starter - replace (check coil first).  
3. Faulty blower motor relay - replace relay. |
| 6. Disconnect closed; blower switch in test position; "firestat", "freezestat" and "starter energized" lights are lit and the blower motor is operating; but the "low air" light is not lit. | 1. Low air switch open - verify pressure drop at burner.  
2. Indicator light is burned out - replace bulb (P/N 125189).  
3. Faulty low air switch - replace pressure switch (P/N 203932). |
| 7. Disconnect closed; blower switch in test position; "firestat", "freezestat", "starter energized" and "low air" lights are lit and the blower motor is operating; but the "high air" light is not lit. | 1. High air switch open - verify pressure drop at burner.  
2. Indicator light is burned out - replace bulb (P/N 125189).  
3. High air switch option not ordered - verify order/wiring diagram.  
4. Faulty high air switch - replace pressure switch (P/N 203933). |
| 8. Disconnect closed; blower switch in test position; "firestat", "freezestat", "starter energized", "low air" and "high air" are lit; but the "limit control normal" light is not lit. | 1. Indicator light is burned out - replace bulb (P/N 125189).  
2. Tripped manual reset limit control(s) - reset manual control.  
3. Faulty manual limit control(s) - replace limit control. |
| 9. Disconnect closed; blower switch in test position; "firestat", "freezestat", "starter energized", "low air", "high air" and "limit control normal" lights are lit; but the "ambient (outside air) cutoff normal" light is not lit. | 1. Indicator light is burned out - replace bulb (P/N 125189).  
2. High ambient control option not ordered - verify order/wiring diagram.  
3. High ambient control contacts open - check setting on control. |
| 10. Disconnect closed; blower switch in test position; "firestat", "freezestat", "starter energized", "low air", "high air", "limit control normal" and "ambient (outside air) cutoff normal" lights are lit; but the "low gas pressure normal" light is not lit. | 1. Indicator light is burned out - replace bulb (P/N 125189).  
2. Low gas pressure switch option not ordered - verify order/wiring diagram.  
3. Low gas pressure switch contacts open - check setting on control.  
4. Low gas pressure switch contacts open - check gas pressure.  
5. Faulty gas pressure switch - replace gas pressure switch. |
| 11. Disconnect closed; blower switch in test position; "firestat", "freezestat", "starter energized", "low air", "high air", "limit controls normal", "ambient (outside air) cutoff normal" and "low gas pressure normal" lights are lit; but the "high gas pressure normal" light is not lit. | 1. Indicator light is burned out - replace bulb (P/N 125189).  
2. High gas pressure switch option not ordered - verify order/wiring diagram.  
3. High gas pressure switch contacts open - check setting on control.  
4. High gas pressure switch contacts open - check gas pressure.  
6. Faulty gas pressure switch - replace gas pressure switch. |
| 12. Disconnect closed; blower and burner switches in run position; control switch is in "winter" position; "control power", "high gas normal", "low gas normal", "firestat normal", "system switch energized"; "starter energized" and "freezestat normal" lights are lit; but igniter is not becoming energized or beginning to glow. | 1. Lack of power at L1 on ignition module - ECO blown, find cause then replace ECO.  
2. Faulty burner enable relay - replace relay.  
3. Low stage relay contacts are not closed - check air controller or thermostat setting.  
4. Faulty low stage relay - replace relay.  
5. Faulty hot surface ignitor - check continuity at the ignition module and circuit board. If reading is greater than 5-6 ohms, replace ignitor.  
6. Faulty ignition module - replace entire module. |
| 13. Disconnect closed; blower and burner switches in run position; control switch is in "winter" position; "control power", "high gas normal", "low gas normal", "firestat normal", "system switch energized"; "starter energized" and "freezestat normal" lights are lit; but igniter is not reaching 1.4A threshold - check voltage and current to ignitor.  
1. Ignitor not reaching 1.4A threshold - check voltage and current to ignitor.  
2. Faulty hot surface ignitor - check continuity, replace ignitor.  
3. Faulty ignition module - replace entire module. |
| 14. Disconnect closed; blower and burner switches in run position; control switch is in "winter" position; "control power", "high gas normal", "low gas normal", "firestat normal", "system switch energized"; "starter energized" and "freezestat normal" lights are lit; ignitor has reached 1.4A and has opened the pilot valve bringing on the "pilot valve normal" light; but the pilot flame is not present. (After two trials the unit will go into safety lockout requiring cycling of the main disconnect switch.) | 1. Air in pilot gas line - bleed pilot line.  
2. Inadequate pilot gas pressure - verify pilot gas pressure (3.5" w.c.)  
3. Faulty pilot valve - replace pilot solenoid valve.  
4. Faulty ignition module - replace entire module.
15. Disconnect closed; blower and burner switches in run position; control switch is in "winter" position; all status lights are lit except "main valve normal" light. The pilot flame is present and stable, but the (low stage portion or) main gas valve will not open, or rapid cycling of the main valve is occurring.

1. Microamp signal on flame rod is inadequate - check position and condition of flame rod and signal (minimum 0.5 microamps required.)
2. Grounding for unit or flame rod inadequate - check ground path.
3. Faulty main gas valve - replace main gas valve.
4. Faulty ignition module - replace ignition module.
5. Inadequate main gas pressure - verify main burner pressure.

16. Disconnect closed; blower and burner switches in run position; control switch is in "winter" position; all status lights are lit; the pilot flame and low fire on the main burner are present and stable, but the unit will not progress to a high fire condition.

1. Faulty main gas valve - replace main gas valve.
2. Inadequate timing on high fire time delay relay - adjust setting.
3. Faulty high fire time delay relay - replace time delay relay.
4. High stage relay contacts are not closed - check control setting.
5. Inadequate main gas pressure - verify main burner gas pressure.
6. Faulty high stage relay - replace relay.
7. Faulty ignition module - replace entire module.

REFERENCE: For service and troubleshooting information on the electrical controls, refer to the manufacturer's literature covering that component. Component literature is included in the literature envelope.

Chart 2 - Troubleshooting Optional Evaporative Cooling Module

WARNING: Disconnect the power before servicing the cooling module. Failure to do so can cause electrical shock, personal injury or death.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Probable Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Float &amp; Pump Control System - Pump does not run. Control is calling for cooling and reservoir is full.</td>
<td>1. Electrical connections</td>
<td>1. Verify all electrical connections. See Wiring Diagram.</td>
</tr>
<tr>
<td></td>
<td>2. Electric float switch on pump</td>
<td>2. Check position of the actuators on the electric float switch.</td>
</tr>
<tr>
<td></td>
<td>3. Dirty pump</td>
<td>3. Clean pump. See Paragraph 2.3.7.</td>
</tr>
<tr>
<td>Float &amp; Pump Control System - Required water level (3”) not maintained</td>
<td>1. Float valve</td>
<td>1. Adjust float valve. Refer to the installation manual.</td>
</tr>
<tr>
<td></td>
<td>2. Optional drain and fill valves</td>
<td>2. Check valve for proper operation.</td>
</tr>
<tr>
<td></td>
<td>3. Incorrect overflow pipe nipple - should be 3-1/2”</td>
<td>3. Replace pipe nipple.</td>
</tr>
<tr>
<td></td>
<td>2. Media pads need cleaned or replaced.</td>
<td>2. Clean or replace media pads. See Paragraph 2.3.7.</td>
</tr>
<tr>
<td>Water not distributing evenly</td>
<td>1. Distribution line clogged</td>
<td>1. Flush distribution line. See Paragraph 2.3.7.</td>
</tr>
<tr>
<td></td>
<td>2. Holes in distribution line turned</td>
<td>2. Check position of distribution line. Holes should be spraying upward. If not positioned with holes toward top, adjust position of PVC line.</td>
</tr>
<tr>
<td></td>
<td>3. Incorrect voltage to pump (float and pump control system)</td>
<td>3. Check voltage at pump terminal in cooling module junction box.</td>
</tr>
<tr>
<td>Media pads becoming clogged and discolored quickly (scale/salt deposits) and/or rapid deterioration of the float switch (Float and Pump Control System)</td>
<td>1. Bleed off line clogged</td>
<td>1. Clean bleed line.</td>
</tr>
<tr>
<td></td>
<td>3. Inadequate bleed off</td>
<td>3. A uniform build-up of minerals on the entering air face of the media indicates insufficient bleed off. Increase the rate until the mineral deposits dissipate.</td>
</tr>
<tr>
<td>Water blowoff from media pads or water being pulled from reservoir</td>
<td>1. Media pads installed incorrectly</td>
<td>1. Install media pads correctly. See Paragraph 2.3.7.</td>
</tr>
<tr>
<td></td>
<td>2. Requires moisture elimination pad (over 600 FPM)</td>
<td>2. Install moisture elimination pad. Consult factory.</td>
</tr>
<tr>
<td></td>
<td>3. Water level not 3 inches (float and pump control system)</td>
<td>3. See second problem listed above (Required water level not being maintained.)</td>
</tr>
</tbody>
</table>

References

The following forms are available at www.RezSpec.com:
Installation Manuals:
Model RDF, Form I-RDF
Models ADF/ADFH, Form I-ADF
Replacement Parts Manual:
Form P-ADF/DV/RDF
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