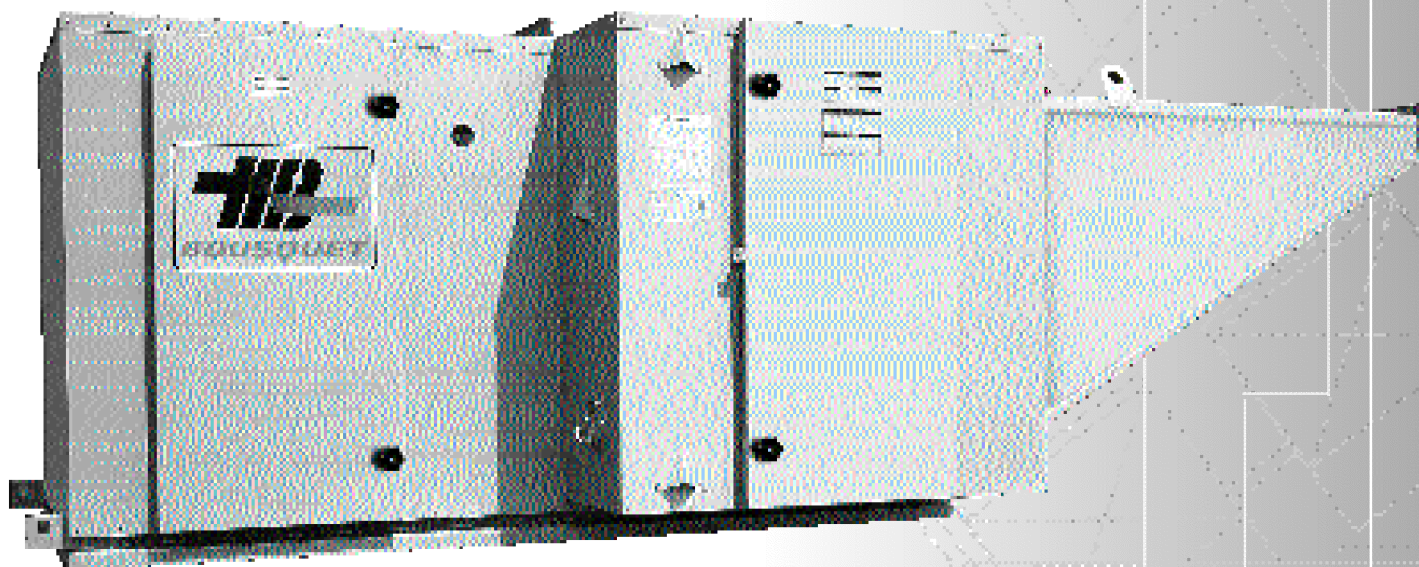


# Direct gas-fired make-up air heater



**SDM SERIES**  
INDOOR OR OUTDOOR  
INSTALLATION



---

## INSTALLATION AND SERVICE MANUAL

 **MANUFACTURED BY:**  
**BOUSQUET**  
BROTHERS LIMITED



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2121, Nobel Street  
Sainte-Julie, Quebec CANADA  
J3E 1Z9  
Toll-free: 1-800-363-9197  
Telephone: (514) 874-9050  
Fax: (450) 649-8756  
E-mail: [bousquet@bousquet.ca](mailto:bousquet@bousquet.ca)

## **INSTALLATION AND SERVICE MANUAL FOR THE DIRECT GAS-FIRED MAKE-UP AIR HEATERS SDM SERIES**

PROJECT: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

MODEL: \_\_\_\_\_

SERIAL NUMBER: \_\_\_\_\_

INSTALLER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

INSTALLATION DATE: \_\_\_\_\_

MANUFACTURER:	BOUSQUET BROTHERS LTD
ADDRESS:	2121 NOBEL STREET SAINTE-JULIE, QUEBEC CANADA J3E 1Z9
TOLL-FREE:	1-800-363-9197
TELEPHONE:	(514) 874-9050
FAX:	(450) 649-8756
E-MAIL:	bousquet@bousquet.ca

**THIS INSTRUCTION MANUAL MUST ALWAYS BE AVAILABLE  
AND KEPT WITH THE HEATER AT ALL TIMES.**

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## **CODES REGULATING DIRECT GAS-FIRED MAKE-UP AIR HEATERS**

Direct gas-fired make-up air heaters must be installed according to local installation codes for gas equipment and any provincial or state regulations applying to this category of equipment. Moreover, when suspending this unit, the following ANSI standards must be followed: ANSI/NFPA 409-1985 for aircraft hangars; ANSI/NFPA 88A-1985 for public garages; ANSI/NFPA 88B-1985 for vehicle repair garages. Electrical installations must meet the standards stated in the local electrical code for this category of equipment.

All indoor and outdoor electrical installations must comply with the electric diagrams of the heater. For more information, refer to the start-up instructions, operating sequence and adjustment instructions.

### **WARNING**

#### **THIS AIR HEATER MUST ALWAYS:**

- Be used only to heat up outside air (100% fresh air); neither air return or recirculation are allowed;
- Be used only to replace air exhausted from a building or through process equipment;
- Supply air at a temperature not exceeding 24°C (75°F) or as stated in the applicable local code.

**THIS HEATER IS NOT A SPACE HEATER AND SHOULD NOT BE USED AS SUCH.**

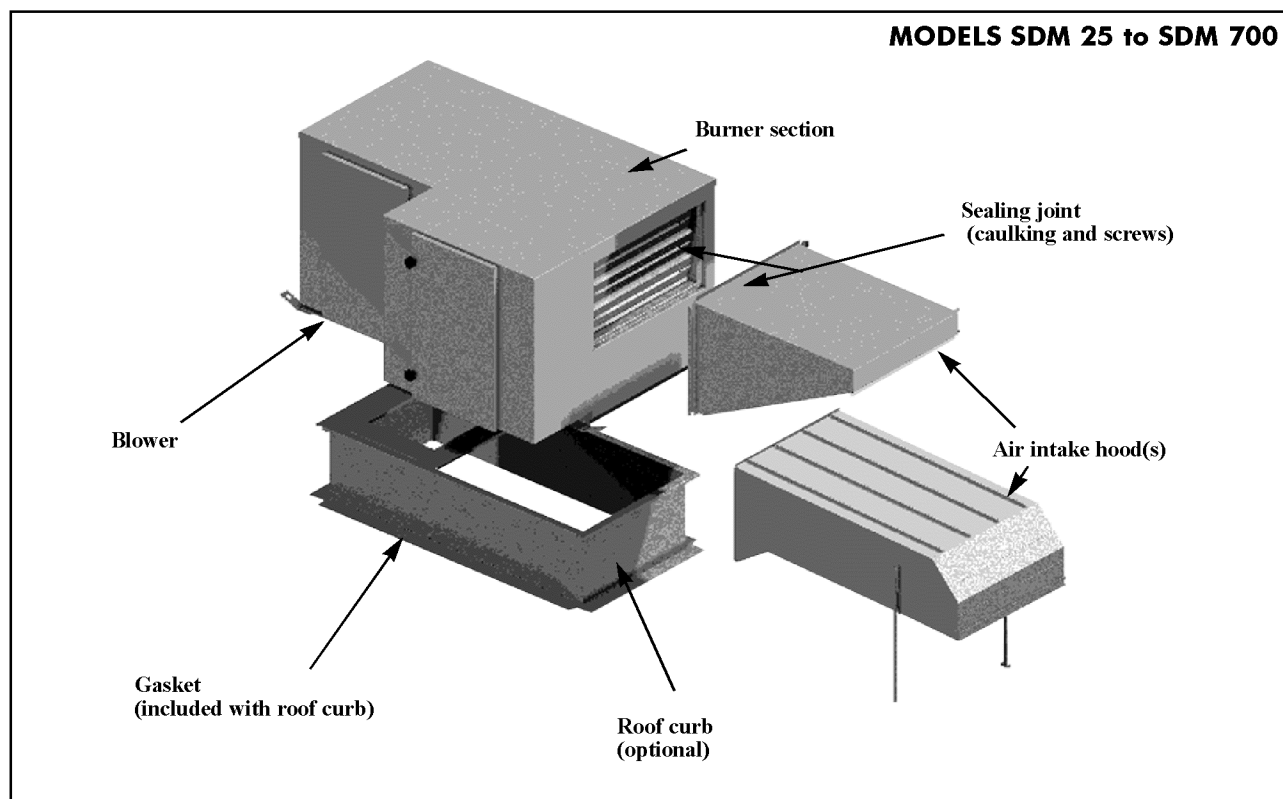
### **IMPORTANT**

A minimum clearance of one inch between the heater and any combustible material is required all around the heater.

Allow for sufficient clearance on both sides of the heater to enable its maintenance.

## INSTALLATION INSTRUCTIONS

### 1) HEATER INSTALLATION



The air intake must be located and oriented in order to prevent infiltration of snow, rain, flammable and toxic gas as well as any other harmful material in the make-up air heater.

When the heater is hung over a work area, it must be installed at an adequate height. The installation of a maintenance platform might be required.

When air ducts or plenums directly connected to the make-up air heater may trap gas, an initial purge cycle equivalent to at least four air changes is required before proceeding to ignition.

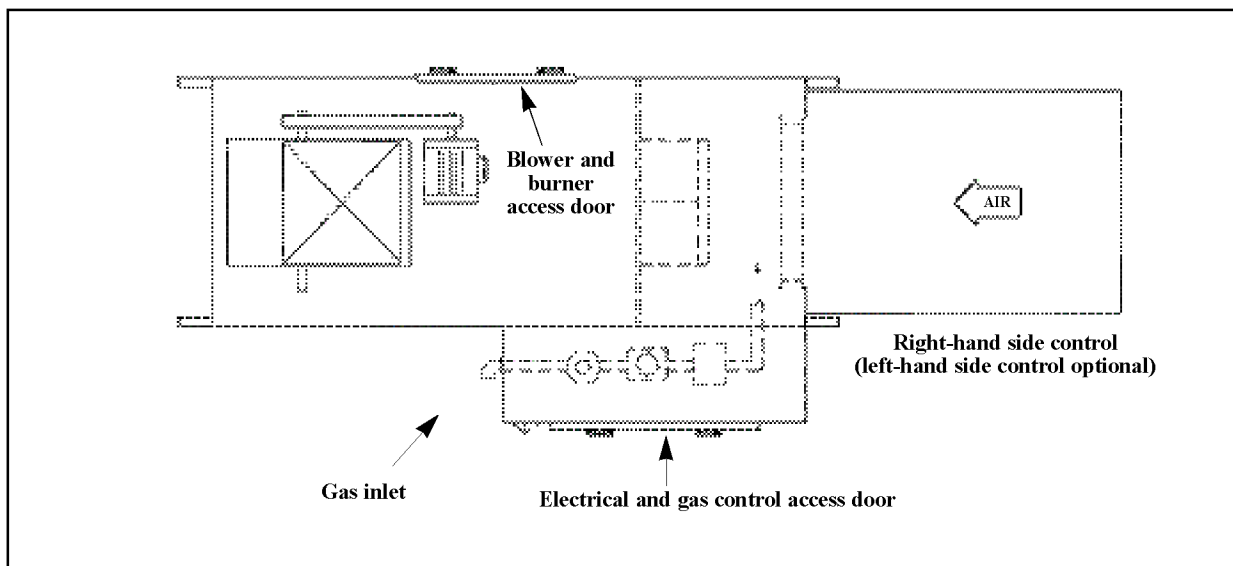
The heater will not operate (interlocked) unless the corresponding exhaust system is in operation.

When fire dampers are used in the ducts, they must be equipped with an electric switch wired to the safety control circuit of the unit, so that the make-up air heater shuts down if fire is detected in the ducts. These electric switches must be wired so that the safety circuit is energized only when the fire damper is completely open.

If the unit is not factory equipped with a low temperature thermostat, then it is recommended that one be installed in order to prevent any damage due to freezing.

## 2) GAS PIPING CONNECTION

In the case of units installed indoors, the bleed valve and vent must be piped individually to the outdoors, according to code CGA-B149 or other local codes in effect.



GAS CONNECTIONS PIPE SIZE (NPT) <sup>1</sup>				
CAPACITY	Ø Gas inlet (½ psig or 14 inches of water)		Ø Gas inlet (2 psig or 56 inches of water)	
	inches	mm	inches	mm
750 MBTU/H OR LESS	¾	19	--	--
From 751 to 1000 MBTU/H	1	25	--	--
From 1001 to 2500 MBTU/H	1 ½	38	1 ½	38
From 2501 to 5000 MBTU/H	2	51	1 ½	38
5001 MBTU/H OR MORE	3	76	2	51

VENT CONNECTOR AND BLEED VALVE PIPE SIZE (NPT)				
CAPACITY	Ø Vent <sup>3,4</sup>		Ø Bleed valve <sup>3</sup> (optional)	
	inches	mm	inches	mm
750 MBTU/H OR LESS	½	13	¾	19
From 751 to 1000 MBTU/H	½	13	¾	19
From 1001 to 2500 MBTU/H	½	13	¾	19
From 2501 to 5000 MBTU/H	½	13	1	25
5001 MBTU/H OR MORE	¾	19	1 ½	38

1. The table above should not be used to size the gas supply line.
2. If the gas inlet pressure exceeds ½ psig (14 inches of water), a high-pressure regulator must be installed. This regulator must be suitable to modulate in a ratio of 40:1 to properly regulate gas pressure at low fire.
3. The purge and regulator vents must be piped separately to the outdoors.
4. For indoor installation only.

## MAKE-UP AIR HEATER MAINTENANCE

CHECK LIST	INSPECTION			
	WEEKLY	MONTHLY	SEMI-ANNUALLY	ANNUALLY
Inspect the filters; replace them if necessary.	●			
Ensure that no flammable material is stored near the heater.	●			
Ensure that nothing obstructs the air inlet and outlet of the heater.	●			
Check the flame and combustion quality.		●		
Check belts; adjust or replace them if necessary.		●		
Lubricate blower and motor bearings as needed.		●		
Ensure that the fresh air dampers are completely open.			●	
Ensure that all safety controls are operational.			●	
Check the high limit temperature switch.				●
Ensure that there are no gas leaks in the piping (fittings and valves).				●
Inspect all electric connections.				●
Ensure that the blower and motor are firmly anchored.				●
Inspect the flame detector and pilot ignitor electrode; change if necessary.				●
Inspect the burner and clean the orifices if necessary.				●

### IMPORTANT

#### BEFORE START-UP AND AFTER 8 HOURS OF OPERATION

- Check bearing alignment and lubrication;
- Check bearing clamps;
- Check alignment and tension of belts.

#### AFTER 24 HOURS OF OPERATION

- Check tension of belts.



## **HEATER SHUTDOWN**

### **A) EXTENDED SHUTDOWN**

When the heater is shutdown for an extended period of time, it is recommended that the gas and electric power supply be shut off.

Before turning on the heater after an extended shutdown, make sure the air is purged from the gas pipes and that the gas pressure is adequate. An inspection is recommended to make sure that everything is in order.

### **B) HEATER EMERGENCY SHUTDOWN**

When the heater shuts down due to an emergency, the main power disconnect should be turned OFF and gas supply, shut off by closing the gas supply hand valve located in the main gas supply line to the heater.

### **C) TURNING ON THE HEATER AFTER A FLAME FAILURE ALARM**

After a flame failure alarm, the following checks must be performed:

1. Set the main power switch to OFF;
2. Ensure that all gas supply hand valves are open;
3. Check the blower belts; replace or adjust them if necessary;
4. Check flame safeguard relay and fire rod condition;
5. Check condition of filters and replace them if necessary;
6. Ensure that nothing obstructs the air inlet and outlet of the heater;
7. Ensure that nothing prevents proper operation of inlet or outlet air dampers;
8. Turn ON main disconnect;
9. Press the reset button of the flame safeguard relay;
10. Ensure that the air inlet and outlet dampers are operating properly;
11. Ensure that the blower motor is operating;
12. Ensure that the pilot ignites properly.

If the heater still does not start, call the manufacturer or an authorized service company for assistance.

## START-UP INSTRUCTIONS

### WARNING

The following information should only be used by a qualified technician for gas equipment installation (with qualification cards) with knowledge in electricity and ventilation.

### WARNING

Smoking is not recommended during the heater start-up.



### RECOMMENDED TOOLS

- Voltmeter
- Ammeter
- Temperature reading device
- Tachometer (blower or motor speed [rpm])
- Air pressure gauge (scale from 0 to 2 inches of water)
- Gas pressure gauge (scale from -2 to 20 inches of water)

## START-UP INSTRUCTIONS

### 1) GAS INLET PRESSURE ADJUSTMENT

- Ensure that the gas inlet pressure complies with the following table:

MODEL	NATURAL GAS	PROPANE GAZ
25 / 50 / 75	Min. : 7 inches of water (1742 Pa) Max. : 14 inches of water (3484 Pa)	Min. : 6 inches of water (1493 Pa) Max. : 8 inches of water (1991 Pa)
100	Min. : 8 inches of water (1991 Pa) Max. : 14 inches of water (3484 Pa)	
150 / 200 / 300 / 375 450 / 550 / 700	Min. : 13 inches of water (3235 Pa) Max. : 14 inches of water (3484 Pa)	Min. : 11 inches of water (2734 Pa) Max. : 14 inches of water (3484 Pa)

- Ensure that the air is completely purged from the gas piping.
- The gas inlet pressure must be taken when the burner is off and when it is operating at high fire. The difference in pressure should not exceed 1 inch of water (249 Pa).
- While the burner is in operation, ensure that there are no gas leaks in the entire piping using a leak detection fluid.

### 2) BLOWER ADJUSTMENT

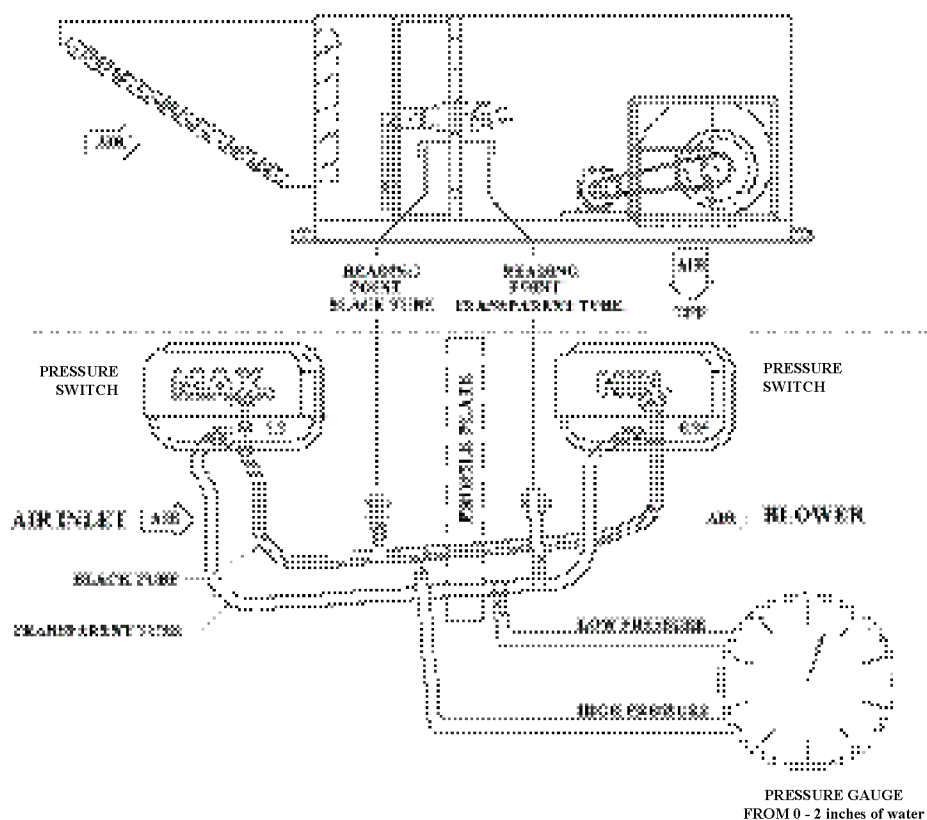
- Check the voltage at main disconnect switch.
- Check blower rotation and modify connections if necessary.
- Ensure that the contactor overload relays are set according to the full load amperage indicated on the motor name plate.
- Check alignment and tension of belts.
- When dampers are completely open and burner controller is not activated, read the voltage and amperage of the blower motor.

### 3) BURNER AIR DIFFERENTIAL PRESSURE ADJUSTMENT

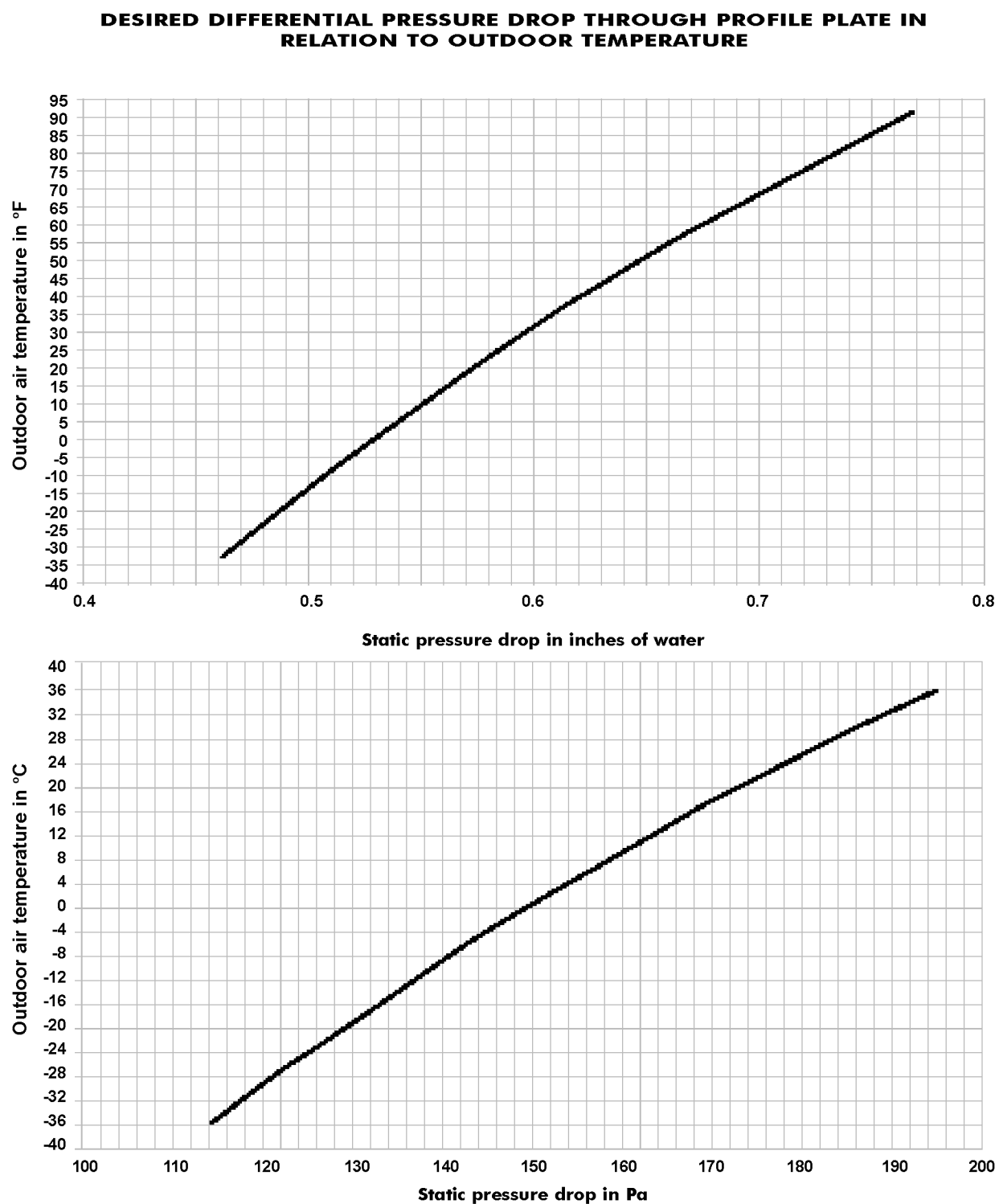
**NOTE:** Always read the air differential pressure when the filters are clean.

- For direct gas-fired burners, the airflow rate through the burner is very important. If the air differential pressure at the burner profile plate is too high or too low, the unit will not function properly. This could produce an excess of carbon monoxide (CO) or trigger a FLAME FAILURE alarm.
- To measure the differential pressure at the burner profile plate, the blower must be in operation and discharge air temperature maintained at 70°F (21°C). In winter, to maintain this temperature, the burner must be in operation and the temperature selector set at 70°F (21°C).
- Using an air pressure gauge, read the differential pressure as shown in **FIGURE 1**.

**Figure 1**

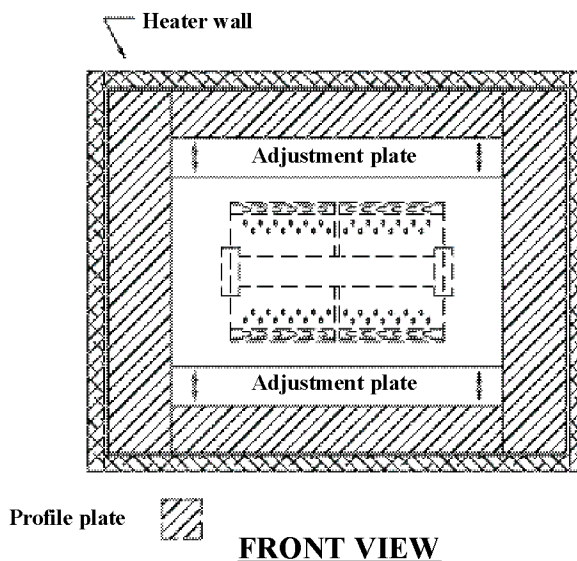


- The value of the differential pressure drop observed through the profile plate must correspond to the value indicated in the graph below..



- If heater supplies the specified airflow rate and the pressure differential is greater or smaller than the desired pressure drop, the adjustment plates of the burner profile plate must be repositioned.

**Figure 2**



**WARNING:** Cut off power supply before making any adjustment.

If differential pressure obtained is under the desired value:

- Reduce the opening of the profile plate by moving the adjustment plates closer to the burner.

If differential pressure obtained is over the desired value:

- Increase the opening of the profile plate by moving the adjustment plates away from the burner.

**NOTE:** For a single volume system, both adjustment plates should be equidistant from the burner.

- Then, read the differential pressure again and repeat the operation if necessary.

**NOTE:** These adjustments may change the airflow rate in the ventilation system. Check the airflow rate again to ensure that the proper amount of air is obtained. (Air balancing test)

- The adjustment plates of the profile plate must not be used to adjust the final system airflow rate. When the airflow rate must be modified, another set of pulleys may be required.

#### 4) PILOT ADJUSTMENT

- The pilot is factory-set.
- When adjusting the pilot gas pressure with the regulator, the main burner should not be in operation (close the main burner gas supply hand valve).
- Adjust the pilot regulator to obtain a good reading of the flame signal (5-10 VDC).

#### 5) BURNER ADJUSTMENT - HIGH FIRE

- Set the maximum capacity of the burner according to the desired maximum temperature rise, which is the adjustment method recommended by the manufacturer.

*Example of calculation of the maximum temperature rise:*

Minimum outside temperature: -20°F (-29°C)

Desired final temperature: 70°F (21°C)

**Temperature rise ( $\Delta T$ ): 90°F (50 °C)**

- When the outside temperature does not allow for the simulation of the specified temperature rise across the burner, adjust its maximum capacity according to the required gas pressure indicated on the name plate of the unit.
- The adjustment is made using the main burner pressure regulator (figure 3). For units with a capacity over 1000 MBH, use the regulator included in the MAXITROL modulating valve (see MAXITROL service manual) (figure 4).

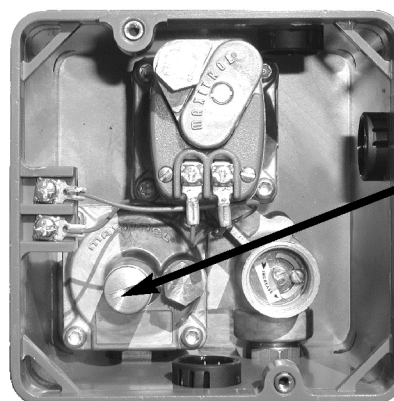
**NOTE:** Turning the adjustment screw clockwise ↻ increases the gas pressure to the burner.

Turning the adjustment screw counterclockwise ↺ decreases the gas pressure to the burner.

**NOTE:** With the MAXITROL series 14 device, disconnect terminal 4 to obtain the maximum capacity of the burner.

**Figure 4**

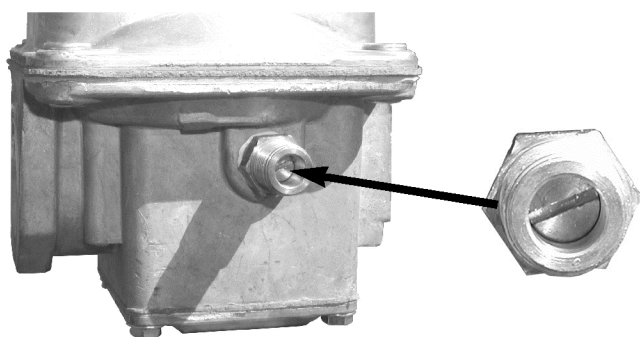
**Figure 3**



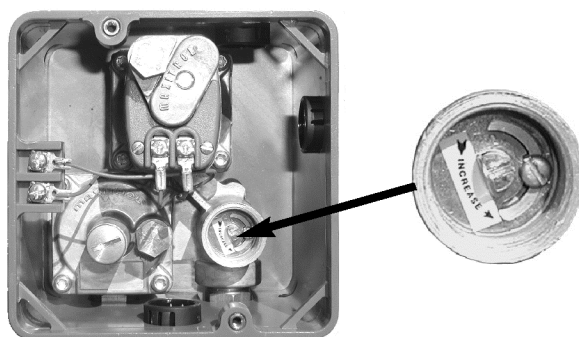
Regulator

## 6) BURNER ADJUSTMENT - LOW FIRE

- After having set the burner at high fire, disconnect terminal 8 from the MAXITROL amplifier to set the burner at low fire.
- Set the burner at low fire with the adjusting screw intended for this purpose and located on the MAXITROL modulating valve (see MAXITROL service manual); the burner should then be lit over its entire length.
- After having set the burner at low fire, the unit must be turned off and then turned back on to ensure that it is lit over its entire length.



**M511 AND ES371**



**MR212**

**FOR ANY OTHER INFORMATION,  
REFER TO THE MAXITROL DOCUMENTATION.**

## 7) FINAL AIR TEMPERATURE ADJUSTMENT

- Set the **MAXITROL** temperature selector (**TD 114**) to the desired final temperature (refer to local code for maximum temperature allowed). This selector is located either in the control panel on the unit or in the remote control station.

**NOTE :** When the **MAXITROL** temperature selector (**TD 114**) is installed in a remote control station, the wires used to make the connections must be shielded wires (with metal sheath).

### **WARNING**

With an adequate leak detection fluid, ensure that there are no gas leaks in the piping. Make the necessary repairs if needed.

Do not let the heater operate if a gas leak is detected.



## **MAKE-UP AIR HEATER OPERATING SEQUENCE**

### ***Operating sequence for a single volume heater***

*(For guidance only)*

#### **STARTING UP THE BLOWER**

- 1.** Set the STOP/BLOWER/BURNER switch to BLOWER.
- 2.** The interlock contact provides the proof that the exhaust fan is in operation.
- 3.** The fresh air intake damper opens.
- 4.** The damper end switch closes.
- 5.** The blower motor starter is energized.
- 6.** The blower is in operation.

#### **STARTING UP THE BURNER**

- 1.** Set the STOP/BLOWER/BURNER switch to BURNER.
- 2.** If the outside temperature is under 70°F, the outside temperature selector allows for the FIREYE flame safeguard relay to be energized.
- 3.** Authorization for pilot to ignite is complete when the low and high air pressure differential and high temperature limit switches are closed.
- 4.** The burner then starts.
- 5.** The MAXITROL series 14 controller modulates the burner to maintain the selected set point of the temperature selector (TD114).

## **MAKE-UP HEATER OPERATING SEQUENCE**

### ***Operating sequence for a double volume heater***

*(For guidance only)*

#### **STARTING UP THE BLOWER**

- 1.** Set the STOP/BLOWER/BURNER switch to BLOWER.
- 2.** The two interlock contacts provide the proof that the exhaust fans are in low or high volume mode.
- 3.** The fresh air intake damper opens.
- 4.** The contact indicating that the damper is open in low or high volume mode closes.
- 5.** The blower motor starter is energized.
- 6.** The blower is in operation.

#### **STARTING UP THE BURNER**

- 1.** Set the STOP/BLOWER/BURNER switch to BURNER.
- 2.** If the outside temperature is under 70°F, the outside temperature selector allows for the FIREYE flame safeguard relay to be energized.
- 3.** The burner then starts.
- 4.** In low volume mode, the outside air damper is partially open to a predetermined position for the desired airflow rate; the profile plate damper opens partially and modulates to maintain the required air pressure drop across the burner.
- 5.** In high volume mode, the outside air damper opens completely; the profile plate damper opens wider and modulates its position to maintain the required air pressure drop across the burner.

## TROUBLESHOOTING

### 1- FIREYE FLAME SAFEGUARD RELAY

#### A) NORMAL OPERATING SEQUENCE

- The FIREYE flame safeguard relay includes five lights to indicate that the operating sequence is normal and also to show a burner malfunction.

#### NORMAL OPERATING SEQUENCE

1. The OPR CTRL light is on when there is a heating demand and terminal 7 is energized.
2. The AIR FLOW light is on when all the safety devices as well as the low and high air pressure and high temperature limit switches are closed and terminal 6 is energized.
3. The PTFL light is on only during the pilot ignition cycle.
4. The FLAME light is on only when the flame safeguard relay detects a flame signal and is not in alarm mode.
5. The ALARM light flashes when a malfunction is detected.

#### NOTE:

1. During an alarm, the ALARM light that corresponds to the malfunction flashes at intervals of one second. The status of the other four lights indicates the type of malfunction (see table on next page).
2. Pressing down the reset button brings the flame safeguard relay back to its normal operating mode.

## TROUBLESHOOTING

### B) STATUS OF WARNING LIGHTS (FIREYE)

The table below lists the most important trouble codes concerning the operation of the unit.  
 (Refer to the manufacturer for any code not listed in this table.)

(REFER TO FIREYE TROUBLESHOOTING CHECK LIST TO ESTABLISH DIAGNOSTIC.)

TROUBLE CODES	TROUBLE DESCRIPTION (ALARM)	OPR CTRL	AIR FLOW	PTFI	FLAME	ALARM
6	FREQUENCY NOISE	●	○	○	●	*
7	FLAME FAILURE (PTFI)	○	●	●	●	*
19	FLAME FAILURE (MTFI)	○	○	●	●	*
21	OPEN AIR PRESSURE SWITCH	●	●	●	○	*
54	GROUND FAULT	○	○	○	●	*
55	FAULTY PROGRAMMER	○	○	●	○	*
56	FAULTY AMPLIFIER	●	○	○	○	*

LIGHT :      ○ = **OFF**  
                  ● = **ON**  
                  \* = **FLASHING**

## TROUBLESHOOTING

### 2-HONEYWELL FLAME SAFEGUARD RELAY

#### **NORMAL OPERATING SEQUENCE**

- The HONEYWELL flame safeguard relay includes five lights to indicate that the operating sequence is normal. When flashing, the ALARM light indicates a burner malfunction. To identify the anomaly, use the HONEYWELL S7800A keyboard display module.

#### **NORMAL OPERATING SEQUENCE**

1. The POWER light flashes to indicate that the flame safeguard relay is energized and that there is no heating demand.
2. The PILOT light is on when there is a heating demand and the pilot control valve coil as well as the ignition transformer are energized.
3. The FLAME light is on when the flame safeguard relay detects a pilot flame signal during 10 seconds.
4. The MAIN light is on when the flame safeguard relay detects a stable flame signal during 10 seconds and all safety devices, low and high air pressure as well as high temperature limit switches are closed between terminals 6 and 7.
5. The ALARM light flashes when a malfunction is detected.

(REFER TO TROUBLESHOOTING CHECK LIST TO ESTABLISH DIAGNOSTIC.)

#### **NOTE:**

Pressing down the reset button brings the flame safeguard relay back to its normal operating mode.



**NOTE:** Refer to the normal operating sequence and the service check list below to identify possible causes of problems. The Honeywell S7800A keyboard module displays the following trouble codes which are the most important ones with regard to the operation of the heater. (Refer to the manufacturer for any code not listed below.)

<b>FIREYE AND HONEYWELL TROUBLESHOOTING CHECK LIST</b>	
<b>SYMPTOMS</b>	<b>ACTIONS</b>
<ul style="list-style-type: none"> <li>✓ The blower is not in operation.</li> <li>✓ The burner is not in operation.</li> <li>✓ The fresh air damper is closed.</li> </ul>	<ol style="list-style-type: none"> <li>1. Turn ON main disconnect switch.</li> <li>2. Check the input voltage.</li> <li>3. Check 120-volt secondary circuit fuse.</li> <li>4. Check the position of the switch on the remote control panel; it should be set to BURNER.</li> <li>5. Check the contactor indicating that the exhaust fan is in operation.</li> <li>6. Press down the reset button of the (FIREYE or HONEYWELL) flame safeguard relay if an ALARM light flashes.</li> <li>7. Check the adjustment of the overload relay of the blower motor; re-adjust it if necessary.</li> <li>8. Check the freeze protection control; its contact opens after around 300 seconds if the supplied temperature remains under 42°F. To start the heater, set the burner and blower switch located on the remote control panel to STOP and then to BURNER.</li> <li>9. Refer to the manufacturer.</li> </ol>
<ul style="list-style-type: none"> <li>✓ The blower is not in operation.</li> <li>✓ The burner is not in operation.</li> <li>✓ The fresh air damper is open.</li> </ul>	<ol style="list-style-type: none"> <li>1. Make sure that the fresh air damper switch is closed.</li> <li>2. Refer to the manufacturer.</li> </ol>
<ul style="list-style-type: none"> <li>✓ The blower is in operation.</li> <li>✓ The burner is not in operation.</li> <li>✓ The flame safeguard relay is operating normally.</li> </ul>	<ol style="list-style-type: none"> <li>1. Check if the auxiliary contact of the blower motor starter works.</li> <li>2. Check selector position on the remote control panel; it should be set to BURNER.</li> <li>3. Check the outside temperature thermostat; it prevents the burner from running if the outside temperature is over 70°F.</li> <li>4. Check the burner purge time delay relay.</li> <li>5. Refer to the manufacturer.</li> </ol>
<ul style="list-style-type: none"> <li>✓ Frequency noise CODE 6 FIREYE</li> </ul>	<ol style="list-style-type: none"> <li>1. Check if a high voltage source is located near the flame safeguard relay.</li> <li>2. Check electrical wiring from the building junction box to the heater.</li> <li>3. Refer to the manufacturer.</li> </ol>
<ul style="list-style-type: none"> <li>✓ Flame Failure (PTFL) CODE 7 FIREYE CODE 28 HONEYWELL NOTE: The flame safeguard relay goes into alarm mode during the pilot ignition cycle.</li> </ul>	<ol style="list-style-type: none"> <li>1. Check gas supply to the pilot.</li> <li>2. Check pilot ignition transformer.</li> <li>3. Check flame signal intensity (pilot only; it should range between 5 and 10 VDC for FIREYE or between 3 and 5 VDC for HONEYWELL).</li> <li>4. Check if manual and electric pilot gas supply valves are open.</li> <li>5. Check condition of the flame rod ceramic; replace the flame rod if necessary.</li> <li>6. Refer to the manufacturer.</li> <li>7. Check or replace the flame safeguard relay amplifier.</li> </ol>
<ul style="list-style-type: none"> <li>✓ Flame Failure (MTFI) CODE 19 FIREYE CODE 17 HONEYWELL NOTE: The flame safeguard relay goes into alarm mode during the main burner ignition period.</li> </ul>	<ol style="list-style-type: none"> <li>1. Check if there has been a gas supply cut-off while the heater was in operation.</li> <li>2. Check the inlet gas pressure while the burner is in operation.</li> <li>3. Check the intensity of the flame signal (while the burner is in operation; it should be between 5 and 10 VDC for FIREYE or between 3 and 5 VDC for HONEYWELL over the entire modulation range).</li> <li>4. Refer to the manufacturer.</li> </ol>
<ul style="list-style-type: none"> <li>✓ Flame Failure CODE 19 FIREYE NOTE: The flame safeguard relay goes into alarm mode during the first 10 seconds of the ignition cycle.</li> </ul>	<ol style="list-style-type: none"> <li>1. Check the main burner pipes and the electrical connections.</li> <li>2. Check condition of the flame rod ceramic; replace the flame rod if necessary.</li> <li>3. Check the intensity of the flame signal (between 5 and 10 VDC for FIREYE or between 3 and 5 VDC for HONEYWELL).</li> </ol>

## FIREYE AND HONEYWELL TROUBLESHOOTING CHECK LIST

SYMPTOMS	ACTIONS		
✓ CODE 21 Open air pressure switch  ✓ CODE 32 HONEYWELL  NOTE: While the heater is in operation, the safety contacts located between terminals 6 and 8 of the FIREYE relay and terminals 6 and 7 of the HONEYWELL relay must be closed.	There are three safety devices in series between terminals 6 and 7 of the HONEYWELL flame safeguard relay and between terminals 6 and 8 of the FIREYE flame safeguard relay.		
	A) <u>Low air pressure switch</u> (set at 0.25 inch of water) The low pressure air switch will open on an insufficient airflow and cause an alarm. Its contacts are normally open (N.O.) when the blower starts and they close if the differential pressure at the burner exceeds 0.25 inch of water (see the Start-up Instructions section for more information on the adjustment of the burner profile plate).	<u>AT START UP</u>  1. The static pressure drop in the air ducts is higher than specified. 2. Check the size of the pulleys and adjust or change them if necessary. 3. Adjust the opening of the profile plate if necessary. 4. Check the blower rotation.	<u>WHEN HEATER IS IN USE</u>  1. Check condition of filters. 2. Check condition of belts. 3. Look for duct work modifications. 4. Check fresh air damper operation. 5. Replace the defective switch. 6. Refer to the manufacturer.
	B) <u>High air pressure switch</u> (set at 1.2 inch of water) The high pressure air switch will open on an excessive airflow and cause an alarm. Its contacts are normally closed (N.C.) and open if the differential pressure at the burner exceeds 1.2 inches of water (see the Start-up Instructions section for more information on the adjustment of the burner profile plate).	<u>AT START UP OR WHEN THE HEATER IS IN USE</u>  1. The duct work static pressure drop is lower than specified. 2. Check size of pulleys and adjust or change them if necessary. 3. Adjust profile plate opening if necessary. 4. Replace the defective switch. 5. Refer to the manufacturer.	
	C) <u>Safety high temperature limit switch</u> (set at 160°F) Its contacts are normally closed (N.C.) and they open when the temperature of the air after the burner exceeds 160°F.	<u>AT START UP OR WHEN THE HEATER IS IN USE</u>  1. Check air temperature downstream of the burner (the safety high temperature limit switch opens at 160°F). 2. Check modulation of the Maxitrol valve and controls as well as the amplifier and temperature signal. 3. Check gas pressure at the burner when set at high fire. 4. Replace defective switch. 5. Refer to the manufacturer.	
✓ Ground fault CODE 54 FIREYE	1. Check for proper grounding of the heater and flame safeguard relay. 2. Check for faulty ground in the wiring between the heater and electrical distribution panel. 3. Refer to the manufacturer.		
✓ Faulty programmer CODE 55 FIREYE	1. Replace the programmer. 2. Refer to the manufacturer.		
Faulty amplifier CODE 56 FIREYE	1. Replace the amplifier. 2. Refer to the manufacturer.		
✓ Voltage drop COD 5 HONEYWELL	While heater is in operation, check voltage at relay. Check electrical connections and relay installation. Refer to the manufacturer.		
✓ Ground fault CODE 109 HONEYWELL	1. Check for proper grounding of the flame safeguard relay. 2. The main current and neutral wires are inverted. 3. Refer to the manufacturer.		

## MAXITROL TROUBLESHOOTING CHECK LIST

SYMPTOMS	POSSIBLE CAUSES	ON-SITE CHECKS	ACTIONS
A. No gas flow	1. Modulating valve improperly installed or defective	1. The arrow on the side of the valve must point in the direction of the gas flow.	1. Install the valve properly.
B. Continuous low fire (electronic problem)	2. No voltage to the amplifier 3. Open circuit in TD114 (circuit or wiring) 4. Short circuit in TS114 (circuit or wiring) 5. Defective amplifier	2. Check for 24 VAC supply at amplifier terminals 7 and 8. 3. Check for loose or broken wires between amplifier terminals 1 and 2 and between TD114 terminals 1 and 3. 4. Connect the test resistor between terminals 3 and 4 of the amplifier and disconnect the wiring. Follow Maxitrol analysis procedure. 5. Perform checks 2, 3 and 4.	2. Verify the power source. 3. Tighten connections or replace wiring. 4. If a modulating signal is obtained, check TS114 for short circuits. Replace the TS114 if necessary. 5. If steps 2, 3 and 4 do not solve the problem and a modulating signal is still not obtained, replace the amplifier.
C. Continuous low fire (electronic problem)	6. Short circuit or open circuit in the amplifier coil  7. Missing, jammed or improperly installed valve plunger	6. With control wires disconnected, check the resistance at the connecting terminals of the modulating valve.  7. Check the plunger; it should move freely upward.	6. Replace the modulating valve head if the resistance is not approximately 45-55 ohms for the M511 or ES371 valves and approximately 60-80 ohms for the MR212 valve.  7. Clean the plunger or replace it if necessary. Install it according to the instructions provided.
D. Low fire - Pulsating or erratic flame or improper capacity	8. Incorrect low fire adjustment 9. Excessive negative pressure at burner	8. Make sure that low fire is properly adjusted. There should be a low flame throughout the burner. 9. Shut off main gas supply and check the suction at the elbow located before the burner while the blower is in operation; the negative pressure should not exceed 1.5 inches of water for the M511.	8. Adjust the low fire. 9. If the negative pressure exceeds 1.5 inches of water, check for clogged filters or air inlet restrictions. Refer to the manufacturer for other suggestions.
E. Continuous high fire (electronic problem)	10. Short circuit in TD114 (circuit or wiring) 11. Open circuit in TS114/TS1007 (circuit or wiring) 12. Jumper not connected between terminals 2 and 3 of the amplifier	10. Check for short circuits at amplifier terminals 1 and 2 and TD114 terminals 1 and 3. 11. Check TS114 for open circuits. Follow step 4. 12. Make sure jumper is connected.	10. Correct wiring if necessary. 11. If a modulating signal is obtained, check TS114 for open circuits. Replace the TS114 if necessary. 12. Correct the wiring.
F. Continuous high fire (no electronic problem)	13. Foreign object holding the valve open 14. Jammed plunger	13. Remove valve bottom plate and inspect valve plunger and seat 14. Check the plunger; it should be clean, smooth and move freely in the valve.	13. Clean the seat. Clean the valve or replace it if necessary. 14. Clean the plunger or replace if necessary.
G. Abnormal high fire	15. Gas inlet pressure too low  16. Incorrect adjustment of regulator outlet pressure	15. Make sure that the minimum inlet pressure recommended by the manufacturer is respected. 16. Adjust the gas inlet pressure according to the manufacturer's specifications.	15. Increase the inlet pressure if possible. 16. Adjust the regulator to obtain the required pressure.



## MAXITROL TROUBLESHOOTING CHECK LIST

SYMPTOMS	POSSIBLE CAUSES	ON-SITE CHECKS	ACTIONS
H. Erratic or pulsating flame	17. Signal instability (hunting) 18. Air turbulence or TS114 installed in improper location 19. Control system wiring running along high voltage wires, causing induction 20. Faulty amplifier or incorrect input voltage	17. Adjust the amplifier sensitivity counterclockwise. 18. Follow step 4. Turn the TD114 button to check the entire modulation range. 19. Temporarily connect the TD114, TS114 and MR212 with new wires. Observe the burner operation. 20. Follow step 18. Note the DC voltage at the amplifier terminals.	17. If the flame is unstable, adjust the sensitivity of the amplifier to obtain an even flame. 18. If the flame remains unstable over the entire modulation range, change the location of the TS114. 19. If normal operation is restored, isolate the affected wires from the wires causing induction. 20. If the DC voltage is unstable over the entire modulation range, replace the amplifier. If unstable operation is noted over a small part of the range (2 or 3 volts only), this might indicate the occurrence of surges. Refer to the Maxitrol manufacturer.
I. Incorrect discharge air temperature	21. Incorrect wiring 22. System improperly adjusted 23. Air stratification 24. The room thermostat controls the burner	21. Check the electric connections. 22. The temperature sensed by the TS114 does not correspond to the TD114 setting. 23. The temperature sensed by the TS114 does not correspond to the desired average discharge air temperature. 24. Disconnect the room thermostat from terminal 2 of the TD114.	21. Correct wiring. 22. Adjust the TD114. 23. Move the TS114 to a location where the temperature corresponds to the desired average temperature. 24. Make sure that the temperature corresponds to the TD114 set point. Check the room thermostat setting and check wiring for short circuits
J. Burnt out transformer	25. Short circuit in the amplifier coil 26. Short circuit between the amplifier and the modulating valve	25. Check the resistance of the modulating valve head (with red wires disconnected on the MR212). 26. Check the wiring.	25. Replace the modulating valve head if the resistance is under 40 ohms. 26. Correct the wiring if a short circuit is found.
K. Discharge air temperature too low when the room thermostat controls the burner	27. Second temperature set point too low 28. Insufficient burner capacity	27. Check the setting of the second control point inside the TD114. 28. Make sure that the heater operates at high fire and that the gas inlet pressure corresponds to the manufacturer's specifications.	27. Set at desired temperature. 28. If the heater operates at high fire, the control signal cannot be increased. The burner may not be of sufficient capacity to provide the desired temperature rise.
L. No reaction from the modulating valve with 20 VDC between terminals 3 and 4	29. Faulty modulating valve 30. Broken wires between the amplifier and the modulating valve	29. Read voltage directly on the modulating valve; if 24 VDC, the valve is faulty. 30. Read voltage between terminals 5 and 6 of the amplifier; if 24 VDC, check for broken wires leading to the modulating valve.	29. Replace modulating valve. 30. Correct wiring.

### **WARNING**

Improper installation, modification, adjustment or maintenance may cause damage, injury or death. Carefully read the installation, start-up and maintenance instructions before installing or servicing this unit.

### **GAS ODOUR**

If a gas odour is detected:

- 1 : Open all windows;
- 2 : Do not touch any switches;
- 3 : Extinguish all open flames;
- 4 : Immediately notify your gas supplier.

### **WARNING**

Using or storing fuel or any other flammable liquid or gas in open containers near this unit is dangerous.