Standard and Modular Direct Fired Heaters

Installation, Operation, and Maintenance Manual

Modular Direct Fired Heater

Standard Direct Fired Heater

Direct Fired Module

FOR YOUR SAFETY

If you smell gas:

1. **Open windows.**
2. **Don't touch electrical switches.**
3. **Extinguish any open flames.**
4. **Immediately call your gas supplier.**

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

RECEIVING AND INSPECTION

Upon receiving unit, check for any interior and exterior damage, and if found, report it immediately to the carrier. Also check that all accessory items are accounted for and are damage free. Turn the blower wheel by hand to verify free rotation and check the damper (if supplied) for free operation.

WARNING!!

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment. ALWAYS disconnect power and gas prior to working on heater.

Save these instructions. This document is the property of the owner of this equipment and is required for future maintenance. Leave this document with the owner when installation or service is complete.

TABLE OF CONTENTS

WARRANTY

This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.

INSTALLATION

It is imperative that this unit is installed and operated with the designed airflow, gas, and electrical supply in accordance with this manual. If there are any questions about any items, please call the service department at **1-866-784-6900** for warranty and technical support issues.

Mechanical

WARNING: DO NOT RAISE VENTILATOR BY THE INTAKE HOOD, BLOWER OR MOTOR SHAFT, OR BEARINGS – USE LIFTING LUGS PROVIDED OR A SLING

Site Preparation

1. Provide clearance around installation site to safely rig and lift equipment into its final position. Supports must adequately support equipment. Refer to manufacturer's estimated weights.
2. Consider general service and installation space when locating unit.
3. Locate unit close to the space it will serve to reduce long, twisted duct runs.
4. Do not allow air intake to face prevailing winds. Support unit above ground or at roof level high enough to prevent precipitation from being drawn into its inlet. The inlet must also be located at least 10 feet away from any exhaust vents. The heater inlet shall be located in accordance with the applicable building code provisions for ventilation air. All air to the heater must be ducted from the outdoors. Recirculation of room air is not permitted. If in doubt regarding the application, consult the manufacturer.

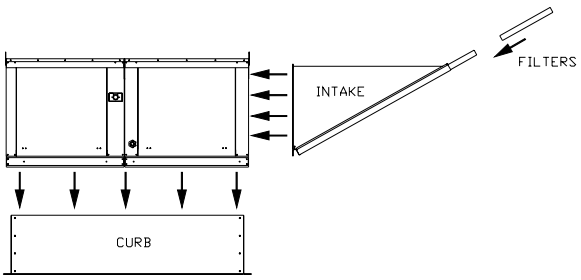
CLEARANCES

The top, back, and front surfaces of this heater may not be installed less than 6" from combustible materials. The heater base may be installed on combustible surfaces. Allow 24" minimum service clearance on both sides of this heater.

Assembly

Intakes and curbs are shipped unassembled. Upon unit arrival, follow the following procedure to assemble the intake to the heater:

1. Apply silicone or weather-proof gasket on the back side of the flanges of the intake hood or v-bank intake.
2. Screw the flanges of the intake hood or v-bank to the unit with the supplied sheet metal screws. If the unit is a modular unit with a v-bank or evaporative cooler section, the v-bank or evaporative cooler will bolt to the heater with the bolts provided.



Curb and Ductwork

This fan was specified for a specific CFM and static pressure. The ductwork attached to this unit will significantly affect the airflow performance. Flexible ductwork and square elbows should not be used. Also, transitions and turns in ductwork near the fan outlet will cause system effect and will drastically increase the static pressure and reduce airflow. The chart below shows the minimum fan outlet duct sizes and straight lengths recommended for optimal fan performance. **Follow SMACNA guides and recommendations for the remaining duct run.** Fans designed for rooftop installation should be installed on a prefabricated or factory built roof curb. Follow curb manufacturer's instructions for proper curb installation. The unit should be installed on a curb and/or rail elevated not less than 20" above any surface. Be sure duct connection and fan outlet are properly aligned and sealed. Secure fan to curb

through vertical portion of the ventilator base assembly flange using a minimum of eight (8) lug screws, anchor bolts, or other suitable fasteners (not furnished). Shims may be required depending upon curb installation and roofing material. Check all fasteners for tightness. The diagrams below show different mechanical installation configurations.

Recommended Supply Ductwork Sizes

Blower Size	Duct Size	Straight Duct Length
10	14 x 14	48 in.
12	16 x 16	54 in.
15	20 x 20	72 in.
18	24 x 24	86 in.
20	26 x 26	108 in.
25	32 x 32	168 in.

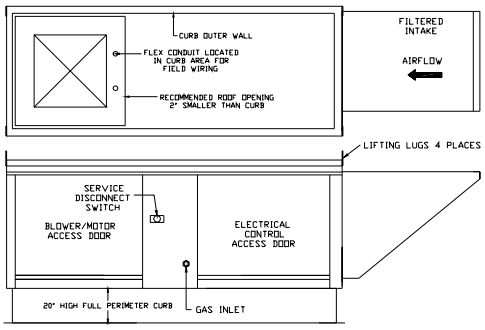
Adequate building relief shall be provided so as to not over pressurize the building when the heating system is operating at its rated capacity. This can be accomplished by taking into account, through standard engineering methods, the structure's designed infiltration rate; by providing properly sized relief openings; or by interlocking a powered exhaust system; or by a combination of these methods.

Heaters installed with intake ductwork must be purged to replace at least four air changes of the volume of the intake duct.

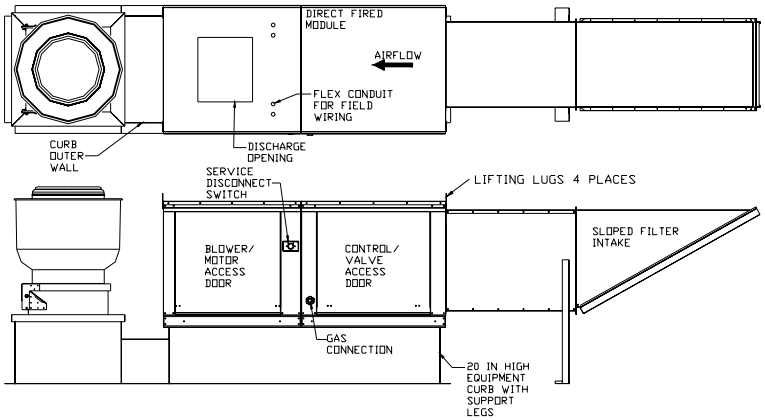
If the failure or malfunction of this heater creates a hazard to other fuel burning equipment in the building (e.g. when the heater is providing make up air to a boiler room), the unit is to be interlocked to open inlet air dampers or other such devices.

Units being installed in **airplane hangars** should be installed in accordance with the Standard for Aircraft Hangars, ANSI/NFPA 409. Units being installed in **public garages** should be installed in accordance with the Standard for Parking Structures, ANSI/NFPA 88A, or the Standard for Repair Garages, ANSI/NFPA 88B, and with CAN/CGA B149 Installation Codes.

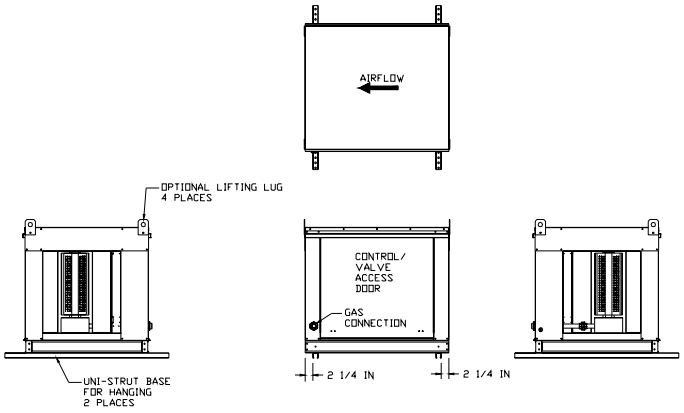
Roof Mount Installation



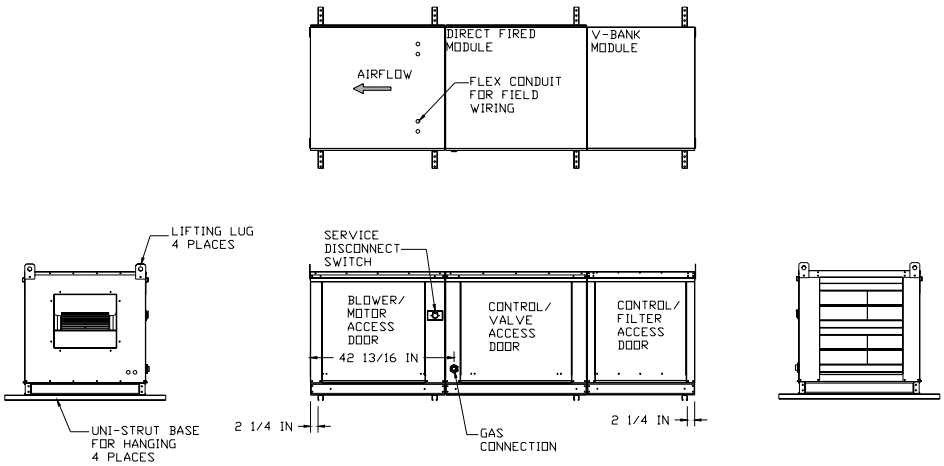
Installation with Exhaust Fan



Direct Fired Module Installation



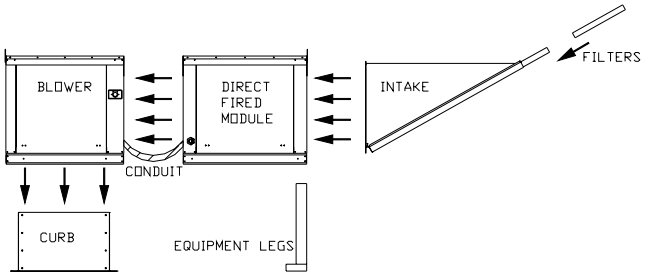
Indoor (INLINE) Installation



Heat Module Add-On Installation

Modular heat units shipped to add heat onto existing blower only applications require field mechanical and wiring installation.

1. Remove existing filter intake and lifting lugs from blower section intake side.
2. Attach heat module to blower intake using the provided sheet metal screws and bolts. Tighten screws and bolts securely to compress the gasket between the heat module and the blower module.
3. Support and level the end of the heat module (end opposite the blower) with the provided equipment legs/rails.
4. Attach the filter hood to the intake side of the heater module.
5. Drill a hole in the discharge of the blower large enough to insert the Maxitrol mixing tube and discharge sensor (if provided). Install the Maxitrol mixing tube in the proper airflow direction. The airflow direction is labeled on the Maxitrol mixing tube.
6. Wire the sensor as indicated on the supplied wiring schematic. Run all wiring within metal conduit. Supply 120V AC to terminals 1 and N in the direct fired module.
7. Follow the start up instructions located in this manual.



Gas

Installation of gas piping must conform with local building codes, or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) – latest edition. In Canada, installation must be in accordance with CAN/CGA-B149.1 for natural gas units and CAN/CGA-B149.2 for propane units.

WARNING: INLET GAS PRESSURE MUST NOT EXCEED PRESSURE INDICATED ON NAMEPLATE. SEE UNIT NAMEPLATE FOR PROPER GAS SUPPLY PRESSURE AND GAS TYPE.

1. Always **disconnect power** before working on or near a heater. Lock and tag the disconnect switch or breaker to prevent accidental power up.
2. Piping to the unit should conform with local and national requirements for type and volume of gas handled, and pressure drop allowed in the line. Refer to the Gas Engineer's Handbook for gas line capacities.
3. The incoming pipe near the heater should be sized to match the connection on the outside of the unit. Unit inlet sizes are shown in the table to the right. Avoid multiple taps in the gas supply so the unit has a steady supply of gas at all times.
4. Install a ground joint union with brass seat and a manual shut-off valve external to the unit casing, as shown below, adjacent to the unit for emergency shut-off and easy servicing of controls.
5. Provide a sediment trap, as shown below, before each unit and where low spots in the pipe line cannot be avoided.
6. Blow out the gas line to remove debris before making connections. Purge line to remove air before attempting to start unit. Purging of air from gas lines should be performed as described in ANSI Z223.1-latest edition "National Fuel Gas Code", or in Canada in CAN/CGA-B149.
7. All field gas piping must be pressure/leak tested prior to unit operation. Use a non-corrosive bubble forming solution or equivalent for leak testing. The heater and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of ½ psi. The heater must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ psi.
8. This unit requires a constant **7 in. w.c. minimum natural gas supply,** when the unit is operating at maximum gas flow. If the gas supply exceeds **14 in. w.c.** (5 psi. for sizes 4-5 housings) it will damage the internal valve components, and if it is below 7 in. w.c., the heater may not perform to specifications.

Gas Connection Sizes

Unit Size	Gas Pipe Size (NPT)
Size 1	¾"
Size 2	1"
Size 3	1"
Size 4	1-1/4"
Size 5	1-1/2"

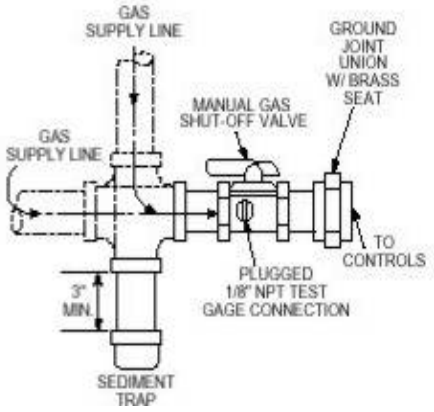
Gas Pressure Table

Gas Pressure Type	Gas Pressure
Size 1-3 Inlet Pressure	7 in. w.c. – 14 in. w.c.
Size 4-5 Inlet Pressure	7 in. w.c. – 5 psi.
Max. Manifold Pressure - Natural Gas	5 in. w.c. maximum
Max. Manifold Pressure - Propane	2.5 in. w.c. maximum

NOTICE

Refer to the heater rating plate for determining the minimum gas supply pressure for obtaining the maximum gas capacity for which this heater is specified.

Gas Connection Diagram



Electrical

Before connecting power to the heater, read and understand this entire section of this document. As-built wiring diagrams are furnished with each fan by the factory, and are attached to the door of the unit.

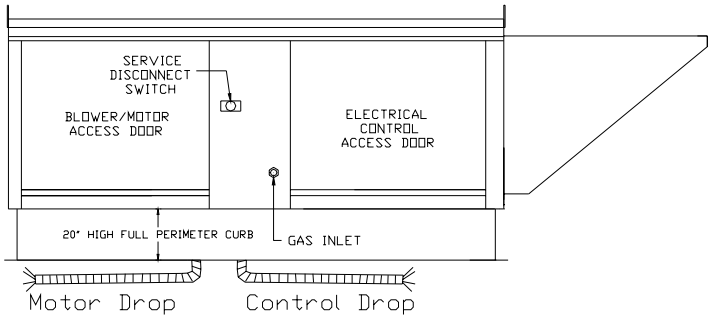
WARNING!!
Disconnect power before installing or servicing fan. High voltage electrical input is needed for this equipment. This work should be performed by a qualified electrician.

Electrical wiring and connections should be done in accordance with local ordnances and the National Electric Code, ANSI/NFPA70. Be sure the voltage and phase of the power supply and the wire amperage capacity is in accordance with the motor nameplate. For additional safety information refer to AMCA publication 410-96, *Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans.*

Copper Wire Ampacity

Wire Size AWG	Maximum Amps
14	20
12	25
10	30
8	40
6	55
4	70

1. Always **disconnect power** before working on or near a heater. Lock and tag the disconnect switch or breaker to prevent accidental power up.
2. An electrical drop containing the motor power wiring is shipped with every fan. The electrical drop should be brought through one of the conduit openings located in the base of the unit, run through the curb, and connected to a junction box inside the building.
3. A dedicated branch circuit should supply the motor circuit with short circuit protection according to the National Electric Code. This dedicated branch should be run to the junction box mentioned above and connected as shown in a following illustration labeled “Fan to Building Wiring Connection”.
4. Make certain that the power source is compatible with the requirements of your equipment. The heater nameplate identifies the **proper phase and voltage** of the motor.
5. Units shipped with an optional remote panel have two electrical circuit drops. It is important to run the motor wires in a separate conduit from the remote control wiring. The DC wires from the unit temperature controller, located in the control drop, should either be shielded cable or be run in a separate conduit.



6. Before connecting heater to the building power source, verify power line wiring is de-energized.
7. Secure the power cables to prevent contact with sharp objects.
8. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces or chemicals.
9. Before powering up the heater, check fan wheel for free rotation and make sure that the interior of the heater is free of loose debris or shipping materials.
10. If any of the original wire supplied with the heater must be replaced, it must be replaced with type TW wire or equivalent.

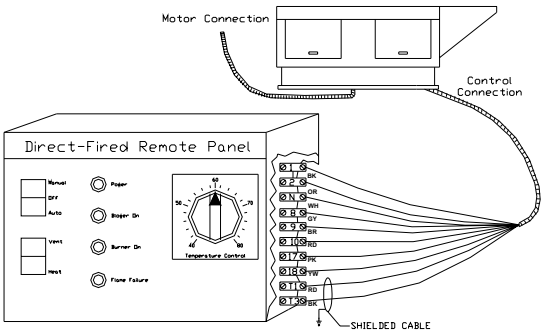
Motorized Intake Damper

On units shipped with the optional motorized intake damper, a power transformer is supplied with the unit if the main incoming voltage is greater than 120V. The damper motor is automatically energized when the main disconnect switch is in the ON position. **No external wiring to the damper motor is required**.

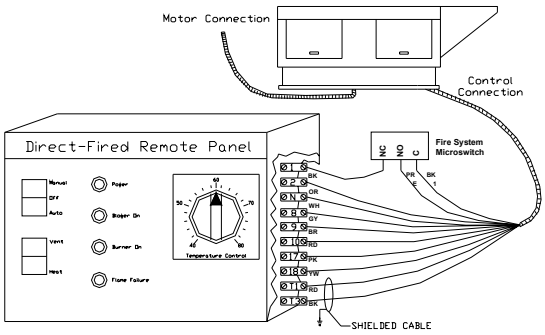
Remote Control Panel

On units shipped with the optional remote control panel, an electrical drop containing the panel wiring is provided with the heater. There is a terminal strip inside the remote panel that matches the terminals in the heater unit. The remote panel should be wired as shown below.

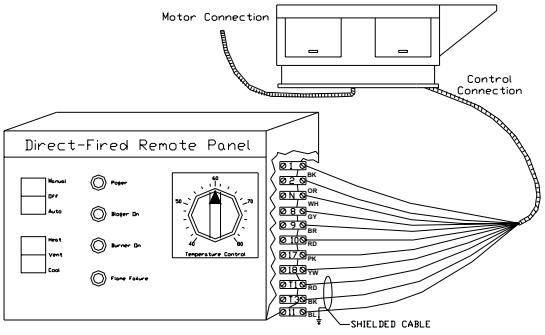
2-POSITION DIRECT FIRED REMOTE PANEL



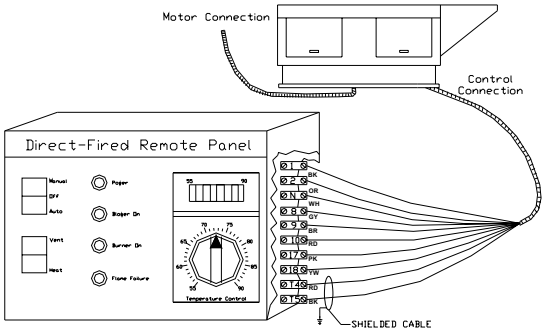
3-POSITION DIRECT FIRED REMOTE PANEL WITH EXHAUST ON IN FIRE CONTROL



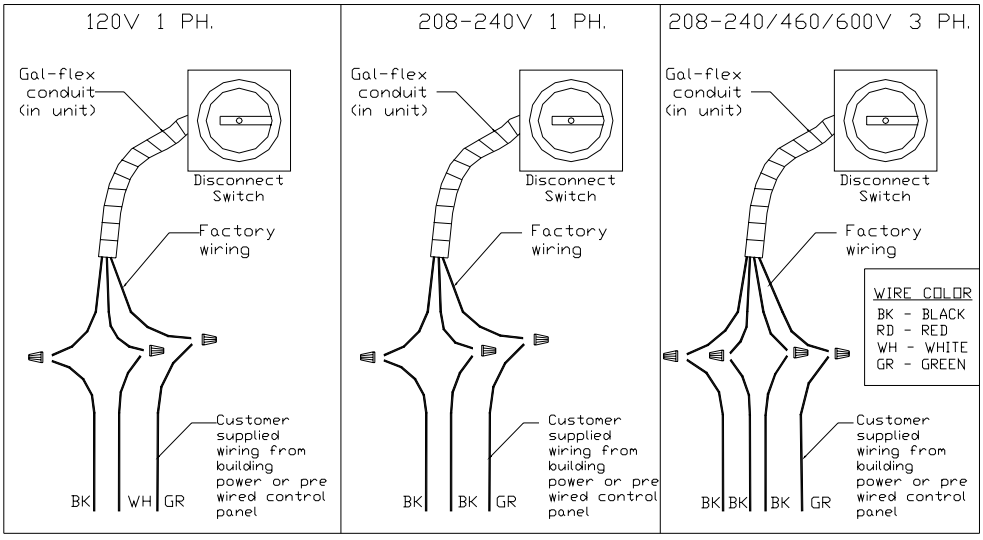
3-POSITION DIRECT FIRED REMOTE PANEL WITH COOLING CONTROL



3-POSITION DIRECT FIRED REMOTE PANEL WITH SPACE HEATING CONTROL



Fan to Building Wiring Connection



OPERATION

Prior to starting up or operating the heater, check all fasteners for tightness. In particular, check the set screw in the wheel hub, bearings and the fan sheaves (pulleys). With power and gas to the heater OFF or prior to connecting ventilator to power, turn the fan wheel by hand to be sure it is not striking the inlet or any obstacles. Re-center if necessary.

Start Up

Special Tools Required

- AC Voltage Meter
- Tachometer
- Standard Hand Tools
- Amperage Meter
- Manometer
- Differential Pressure Gauge

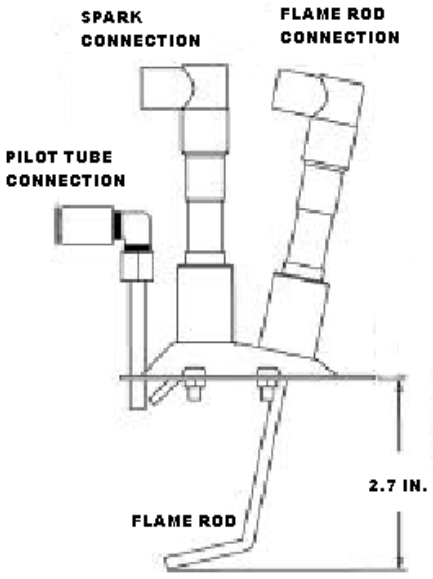
Start Up Procedure

1. Check all electrical connections for tightness and continuity.
2. Check pulley alignment and belt tension as described below.
3. Inspect the condition of the intake damper and damper linkage, if provided.
4. Inspect the air-stream for obstructions and install intake filters if missing.
5. Compare the supplied **motor voltage** with the fan's nameplate motor voltage. If this does not match, correct the problem.
6. Start the fan up, by turning the external disconnect to the **ON** position, and shut it **OFF** immediately to **check rotation of the wheel** with the directional arrow on the blower scroll. Reversed rotation will result in poor air performance, motor overloading and possible burnout. For units equipped with a single-phase motor check the motor wiring diagram to change rotation. For 3-phase motors, any two power leads can be interchanged to reverse motor direction.
7. When the fan is started up, observe the operation and check for any unusual noises.

Pilot Adjustment

1. Restart the fan and check the gas supply pressure at the inlet gas tap upstream of all electronic valves. The inlet pressure should be **7 in. - 14 in. w.c. (7 in. w.c. – 5 psi on Size 4-5 heaters)**. If the inlet pressure is too high, install an additional pressure regulator external to the unit.
2. Open the field installed manual gas shut-off valve and the manual main gas valve on the combination gas control valve.
3. Call for heat with the intake air thermostat (turn set-point to temperature above outside air) and allow the pilot to light. If the pilot does not light, purge the pilot line. If air purging is required, disconnect the pilot line at the outlet of the pilot valve.
4. Check the **pilot flame voltage** at the Flame Safety Control interface test jacks. A weak pilot flame can be caused by low gas pressure, or a dirty pilot orifice. To adjust the pilot flame, remove the cap from the pilot adjustment screw on the combination gas valve. Increase the pilot gas flow by turning the screw counter-clockwise. Decrease the pilot gas flow by turning the screw clockwise. The pilot DC voltage should read **12 VDC minimum and should typically be 15 VDC**.
5. Once the pilot has been established, open the main manual gas shut-off valve downstream of the electronic valves. Check to make sure that the main gas valve opens, and gas flows to the burner.

Pilot Assembly

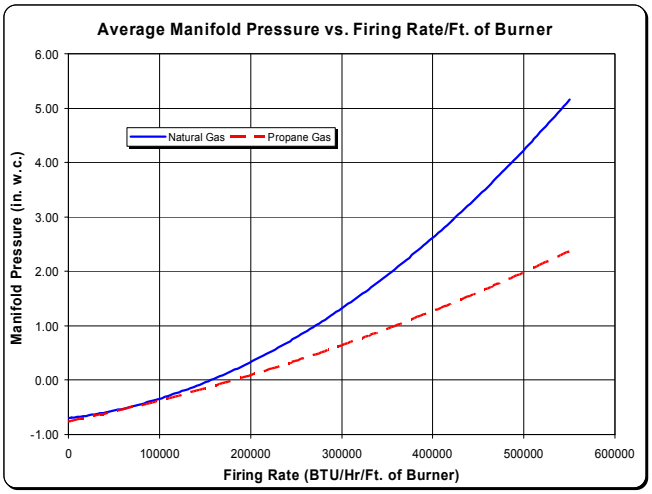


Main Burner Adjustment

Mod Valve Voltage Summary

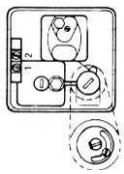
Volts DC	Firing Mode
0 to 5 VDC	Low Fire
5 to 15 VDC	Modulation
15 to 20 VDC	High Fire

1. Once the pilot has been properly established, the manifold gas pressure or temperature rise should be adjusted to jobsite conditions. The gas pressure regulator (integral to the combination gas control on size 1-3 heaters and located in the modulating valve on size 4-5 heaters) is adjusted at the factory for average gas conditions. It is important that the gas be supplied to the burner in accordance with the input rating on the rating plate.
2. Create a high fire call for heat. This should be done with the blower on and all gas controls on. High fire can be achieved by removing the wire at terminal **#4** (remove wires #2 and #4 for Maxitrol 44 systems) from the Maxitrol 14 amplifier.
3. The manifold pressure should be checked at the pressure tap downstream of the modulating valve. The graph to the right indicates the proper manifold pressure for the desired amount of BTUs per foot of burner. For natural gas systems, the high fire manifold pressure should not exceed **5 in. w.c.** For propane gas, the high fire manifold pressure should not exceed **2.5 in. w.c.** Another method of checking high fire is to measure the temperature rise of the unit. The temperature rise should be set to design conditions and typically is minimum 70°F.

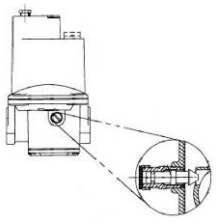


4. Remove the cap from the combination gas valve regulator adjustment (size 1-3) or the cap from the MR212 valve (size 4-5). Using the regulator pressure adjusting screw, adjust the high fire manifold pressure to 5 in. w.c. maximum for natural gas and 2.5 in. w.c. maximum for propane gas. High fire should be set to generate the desired temperature rise. If the high fire screw is at the end of its adjustment and more pressure is needed, then adjust the main building gas pressure regulator spring (located external to the unit) to achieve the proper manifold pressure. Turning the regulator screw clockwise will increase pressure and counter-clockwise will decrease pressure. **Remember - The high fire DC voltage should read 12 VDC minimum and should typically be 15 VDC on the Flame Safety Controller test jacks.**
5. Reconnect the wire on the Maxitrol 14 amplifier at terminal **#4** (wires #2 and #4 for Maxitrol 44).
6. The low fire manifold pressure must now be set. Low fire can be achieved by removing the wire at terminal **#5** from the Maxitrol 14 amplifier (remove #8 for Maxitrol 44). Check the low fire flame signal to ensure that the **DC voltage is 12 VDC minimum** on the Flame Safety Controller test jacks.
7. Using the bypass screw (located on the side of the M511 and M611 valves, and under the cap of the MR212 valve), adjust low the low fire manifold pressure until there is a very thin flame along the entire length of the burner. No dark spots should be seen in the burner. The burner may be observed through the view-port located on the external wall of the heater. Replace the cap to the Maxitrol valve and restore all of the original wiring on the Maxitrol amplifier and gas components.
8. A final gas leak check shall be performed to verify the gas-tightness of the heater's components and piping under normal operating conditions. This can be done by measuring the gas pressure at the ¼" gas plug just downstream of the modulating valve.

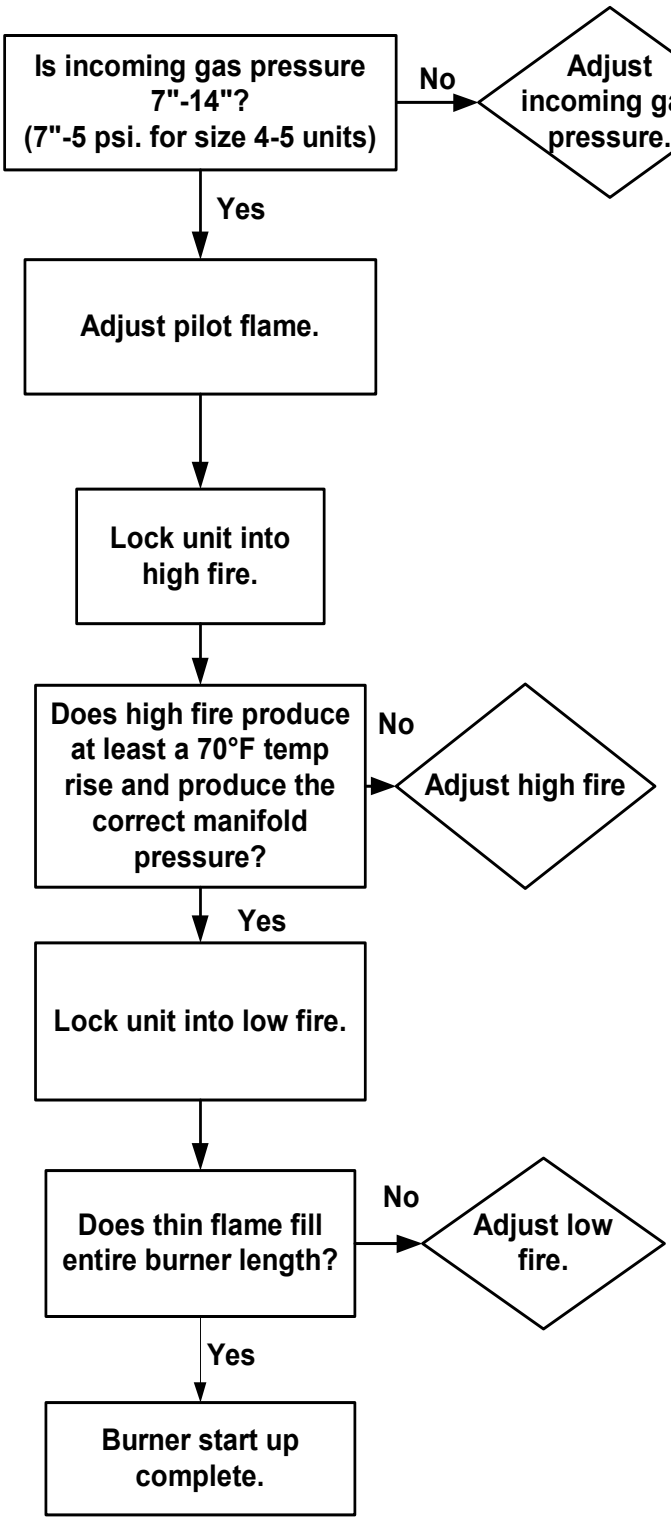
Maxitrol MR212 Low Fire Bypass Screw



Maxitrol M511 and M611 Low Fire Bypass Screw



Heater Start Up Summary



Setting incoming pressure:
Presure must be measured at first "T" in supply gas line before the first gas valve.

Adjusting the pilot:
The pilot DC signal should be 12 VDC minimum.

Adjusting high fire:
High fire manifold pressure should be 5" maximum for natural gas and 2.5" maximum for propane. High fire should produce at least a 70°F temperature rise. Remove wire #4 from the Maxitrol 14 amplifier (#2 and #4 for Maxitrol 44). This will drive the valve into its full open position. Adjust high fire with the regulator inside the unit. Turn clockwise to increase temperature rise. Ensure that DC flame signal is minimum 12 VDC. Replace the wires on the Maxitrol Amplifier.

Adjusting low fire:
Remove wire #5 from the Maxitrol 14 amplifier (#8 for Maxitrol 44). This will drive the valve into its lowest position. Adjust the low fire by turning the low fire bypass screw on the side of teh modulating valve for M511 and M611 models. For MR212 valves, the low and high fire are both under the valve cover. Refer to the included Maxitrol literature for more detailed information. Ensure that DC flame signal is minimum 12 VDC and that the enite length of burner is filled with a thin flame.

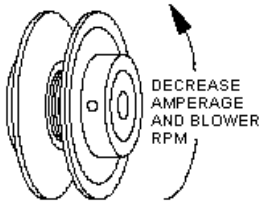
Final Start Up Procedure

1. With the air and burner systems in full operation and all ducts attached, measure the system airflow. Motor sheave (pulley) is variable pitch, and allows for an increase or decrease of the fan RPM to adjust the airflow, as shown in the illustration below. For your convenience, a RPM chart is included in the following pages.
2. Once the proper airflow is achieved, measure and record the fan speed with a reliable tachometer. **Caution - Excessive speed will result in motor overloading or bearing failure. Do not set fan RPMs higher than specified in the maximum RPM chart.** See the troubleshooting guide for more information.
3. Measure and record the **voltage** and **amperage** to the motor and compare with the motor nameplate to determine if the motor is operating under safe load condition.
4. Once the rpm of the ventilator has been properly set, disconnect power and recheck belt tension and pulley alignment as described below.

Maximum RPM and HP Chart

Blower Size	Maximum RPM	Maximum HP
10”	1800	2
12”	1500	3
15”	1400	5
18”	1200	5
20”	1000	10
25”	900	20

Pulley Adjustment Illustration



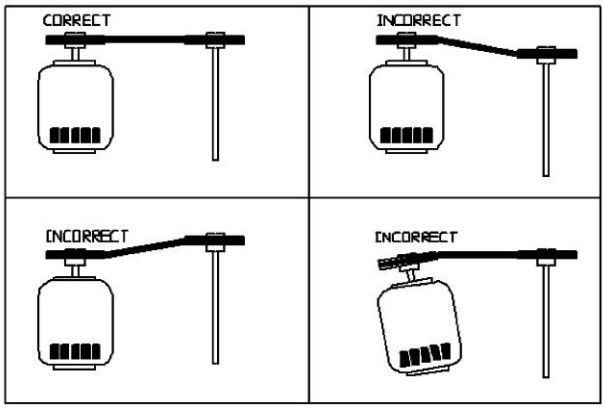
Pulley Adjustment

The adjustable motor pulley is factory set for the RPM specified. Speed can be increased by closing or decreased by opening the adjustable motor sheave. Two groove variable pitch pulleys must be adjusted an equal number of turns open or closed. Any increase in speed represents a substantial increase in horsepower required by the unit. Motor amperage should always be checked to avoid serious damage to the motor when the speed is varied. Always torque setscrews according to the setscrew torque chart.

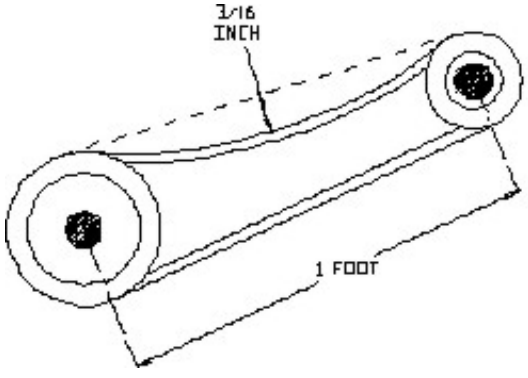
Pulley Setscrew Torque

Thread Size	Torque (IN/Lb)
No. 10 (bushing)	32
1/4” (bushing)	72
5/16”	130

Pulley Alignment



Proper Belt Tension



Pulley Combination Chart

Motor RPM 1725

10 - 20 IN. BLOWER**

1/3 to 1-1/2 HP — MOTOR PULLEY 1VL34 — Dd1 1.9 — Dd2 2.9 — Pd1 2 — Pd2 3

AX BELTS

			Open				TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
AK114	11	11.2	308	323	339	354	370	385	400	416	431	447	462

1/3 to 2 HP — MOTOR PULLEY 1VL40 — Dd1 2.4 — Dd2 3.4 — Pd1 2.6 — Pd2 3.6

AX BELTS

			Open				TURNS ON MOTOR PULLEY						Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
AK114	11	11.2	400	416	431	447	462	477	493	508	524	539	554
AK94	9	9.2	488	506	525	544	563	581	600	619	638	656	675
AK79	7.5	7.7	582	605	627	650	672	694	717	739	762	784	806
AK66	6.2	6.4	701	728	755	782	809	836	863	889	916	943	970
AK54	5	5.2	863	896	929	962	995	1028	1062	1095	1128	1161	1194
AK46	4.2	4.4	1019	1059	1098	1137	1176	1215	1255	1294	1333	1372	1411
AK39	3.5	3.7	1212	1259	1305	1352	1399	1445	1492	1539	1585	1632	1678
AK32	3	3.2	1402	1455	1509	1563	1617	1671	1725	1779	1833	1887	1941

3 to 5 HP — MOTOR PULLEY 2VP42 — Dd1 2.9 — Dd2 3.9 — Pd1 3 — Pd2 4

BX BELTS

			Open					TURNS ON MOTOR PULLEY							Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2BK160H	15.4	15.7	330	339	348	357	366	375	385	394	403	412	421	430	439
2BK140H	13.4	13.7	378	388	399	409	420	430	441	451	462	472	483	493	504
2BK120H	11.4	11.7	442	455	467	479	491	504	516	528	541	553	565	577	590
2BK110H	10.4	10.7	484	497	511	524	537	551	564	578	591	605	618	631	645
2BK100H	9.4	9.7	534	548	563	578	593	608	622	637	652	667	682	697	711
2BK90H	8.4	8.7	595	611	628	644	661	677	694	710	727	744	760	777	793
2BK80H	7.4	7.7	672	691	709	728	747	765	784	803	821	840	859	877	896
2BK70H	6.4	6.7	772	794	815	837	858	880	901	923	944	965	987	1008	1030
2BK60H	5.4	5.7	908	933	958	984	1009	1034	1059	1084	1110	1135	1160	1185	1211
2BK55H	4.9	5.2	995	1023	1050	1078	1106	1133	1161	1189	1216	1244	1272	1299	1327
2BK50H	4.4	4.7	1101	1132	1162	1193	1223	1254	1285	1315	1346	1376	1407	1438	1468

7-1/2 to 10 HP — MOTOR PULLEY 2VP60 — Dd1 4.3 — Dd2 5.5 — Pd1 4.7 — Pd2 5.9

BX BELTS

			Open					TURNS ON MOTOR PULLEY							Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2BK160H	15.4	15.7	516	527	538	549	560	571	582	593	604	615	626	637	648
2BK140H	13.4	13.7	592	604	617	630	642	655	667	680	693	705	718	730	743
2BK120H	11.4	11.7	693	708	722	737	752	767	781	796	811	826	840	855	870
2BK110H	10.4	10.7	758	774	790	806	822	838	854	871	887	903	919	935	951
2BK100H	9.4	9.7	836	854	871	889	907	925	943	960	978	996	1014	1031	1049
2BK90H	8.4	8.7	932	952	972	991	1011	1031	1051	1071	1091	1110	1130	1150	1170
2BK80H	7.4	7.7	1053	1075	1098	1120	1143	1165	1187	1210	1232	1255	1277	1299	1322

25 IN. BLOWER

3 to 5 HP — MOTOR PULLEY 2VP42 — Dd1 2.9 — Dd2 3.9 — Pd1 3 — Pd2 4

BX BELTS

			Open					TURNS ON MOTOR PULLEY							Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2B5V278	27.8	28.1	184	189	194	200	205	210	215	220	225	230	235	240	246
2B5V250	25	25.3	205	210	216	222	227	233	239	244	250	256	261	267	273
2B5V234	23.4	23.7	218	224	230	237	243	249	255	261	267	273	279	285	291
2B5V200	20	20.3	255	262	269	276	283	290	297	304	312	319	326	333	340
2B5V184	18.4	18.7	277	284	292	300	307	315	323	331	338	346	354	361	369
2B5V160	16	16.3	317	326	335	344	353	362	370	379	388	397	406	414	423
2B5V154	15.4	15.7	330	339	348	357	366	375	385	394	403	412	421	430	439
2B5V136	12.6	12.9	401	412	423	435	446	457	468	479	490	501	513	524	535
2B5V124	12.4	12.7	407	419	430	441	453	464	475	487	498	509	521	532	543
2B5V110	11	11.3	458	471	483	496	509	522	534	547	560	572	585	598	611

7-1/2 to 10 HP — MOTOR PULLEY 2VP60 — Dd1 4.3 — Dd2 5.5 — Pd1 4.7 — Pd2 5.9

BX BELTS

			Open					TURNS ON MOTOR PULLEY							Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2B5V278	27.8	28.1	289	295	301	307	313	319	325	331	338	344	350	356	362
2B5V250	25	25.3	320	327	334	341	348	355	361	368	375	382	389	395	402
2B5V234	23.4	23.7	342	349	357	364	371	378	386	393	400	408	415	422	429
2B5V200	20	20.3	399	408	416	425	433	442	450	459	467	476	484	493	501
2B5V184	18.4	18.7	434	443	452	461	470	480	489	498	507	517	526	535	544
2B5V160	16	16.3	497	508	519	529	540	550	561	571	582	593	603	614	624
2B5V154	15.4	15.7	516	527	538	549	560	571	582	593	604	615	626	637	648
2B5V136	12.6	12.9	628	642	655	669	682	695	709	722	735	749	762	776	789
2B5V124	12.4	12.7	638	652	666	679	693	706	720	733	747	761	774	788	801
2B5V110	11	11.3	717	733	748	763	779	794	809	824	840	855	870	885	901

15 to 20 HP — MOTOR PULLEY 2VP75 — Dd1 5.8 — Dd2 7 — Pd1 6.2 — Pd2 7.4

BX BELTS

			Open					TURNS ON MOTOR PULLEY							Closed
BLOWER PULLEY	DATUM DIAMETER	PITCH DIAMETER	6	5 1/2	5	4 1/2	4	3 1/2	3	2 1/2	2	1 1/2	1	1/2	0
2B5V278	27.8	28.1	381	387	393	399	405	411	417	424	430	436	442	448	454
2B5V250	25	25.3	423	430	436	443	450	457	464	470	477	484	491	498	505
2B5V234	23.4	23.7	451	459	466	473	480	488	495	502	509	517	524	531	539
2B5V200	20	20.3	527	535	544	552	561	569	578	586	595	603	612	620	629
2B5V184	18.4	18.7	572	581	590	600	609	618	627	636	646	655	664	673	683
2B5V160	16	16.3	656	667	677	688	698	709	720	730	741	751	762	773	783
2B5V154	15.4	15.7	681	692	703	714	725	736	747	758	769	780	791	802	813
2B5V136	12.6	12.9	829	842	856	869	883	896	909	923	936	949	963	976	990

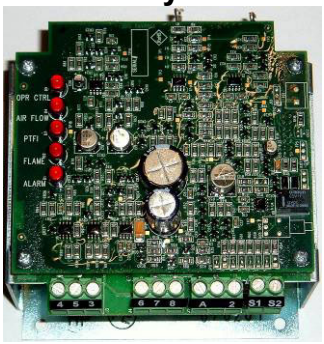
** 2HP Motors on 20 IN Blowers use 2VP42 Pulleys

Sequence of Operation

The direct-fired heater is most easily understood when broken down into smaller individual systems. There are two main systems, a make-up air fan and a heater. The make-up air fan consists of a blower and motor. The heater may be further broken down into two control systems, the Flame Safety Control (FSC) and the Modulating Gas System (MGS). The burner mixes air with the gas (Natural or LP) which heats the air.

Flame Safety Control

Flame Safety Controller



The first system to understand is the **Flame Safety Control**. The FSC is there ***only*** to monitor the flame, NOT to control temperature. The FSC uses a flame rectification sensor mounted on the pilot assembly to detect the presence of flame in the burner. Flame strength and presence can be measured at the FSC by reading the rectified flame signal. This is done by using a DC voltage meter attached to the test jacks on the top of the control. Flame is present when the DC voltage reads between **6 and 18 VDC**. Ideal flame intensity produces a signal of **12 VDC** or greater. The FSC is also wired into an airflow switch, which tells it whether there is proper airflow through the unit (not *just* any airflow, but *proper* airflow). Proper airflow occurs when there is a **.15 in. w.c. to .80 in. w.c. differential pressure drop across the burner**. When the airflow through the heater produces a pressure drop in this range, the FSC indicates so by illuminating the AIRFLOW LED. The FSC controls the opening of the redundant solenoid gas valves and the operation of the spark igniter to initiate a pilot flame upon start-up.

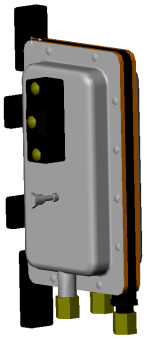
DC Flame Signal

DC Voltage	Flame Status
0 to 5 VDC	No Flame
6 to 11 VDC	Weak Flame
12 to 18 VDC	Strong Flame

The **OPR CTRL** LED indicates that there is power to the FSC. Next, the **AIRFLOW** LED will come on if there is proper airflow through the unit. Third, the unit will pause to purge any gasses or combustible vapors before attempting flame ignition. Then, there is a Pilot Trial For Ignition (PTFI) and the **PTFI** LED comes on. During PTFI, the FSC opens the pilot gas valve and allows gas to flow to the pilot assembly. At the same moment, the spark igniter is started, causing the spark to ignite the pilot gas. When the flamerod sensor detects the flame, it turns on the **FLAME** LED, turns off the PTFI LED, and powers the modulating gas system. This is the normal operating mode. The FSC continues to monitor the flame and airflow. Once this occurs, the unit is in a main flame cycle and thus powers the main gas valve and the modulating gas system. This is the normal operating mode. The FSC continues to monitor the flame and airflow. The last LED on the FSC is the **ALARM** LED. This will turn on when the FSC determines an unsafe condition has occurred, and will not allow the unit to recycle for heat until it has been properly reset. Anytime the FSC has gone into "Alarm" mode, the problem must be diagnosed and corrected to avoid future lockouts after resetting. To begin troubleshooting, or to reset the FSC, shut down power to the heater and restart the heater. This will clear the alarm from the flame safety.

Air Flow Switch

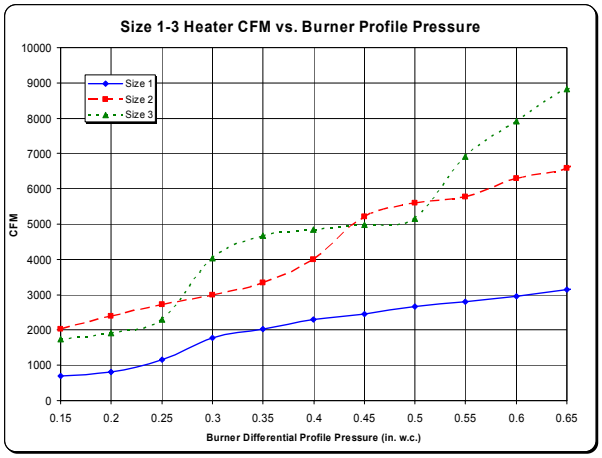
Air Flow Switch

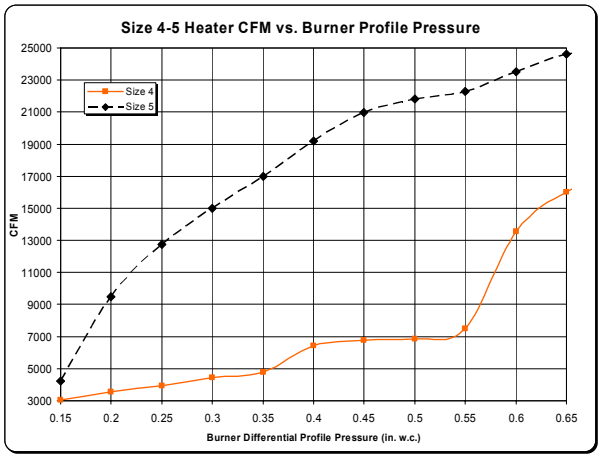


There are both high and low **airflow switches** contained within one housing measuring the pressure drop across the burner. This is to insure that there is proper airflow **(.15 in. w.c. to .80 in. w.c.**) across the burner and proper combustion at all times. Both switches are wired in series and have single pole double throw (one common contact, one normally open contact, and one normally closed contact) switches that are 'switched' by air pressure. There are two airflow tubes in the heater, located near the burner and profile plate assembly (profile plates surround the burner and control air into the burner section). In the case of clogged filters, blocked intake, excessive duct static pressure, or a broken belt, the correct burner differential pressure may not be achieved, not allowing the low

airflow switch to close. The high airflow switch protects against profile plate failures that cause excessive airflow through the burner. In the event that the pressure drop across the burner is not in the range of the airflow switch, gas flow to the burner is stopped by the Flame Safety Control.

The graphs below illustrate the approximate cfm going through the unit vs. the differential pressure measured by the airflow switch. Simply measure the differential profile pressure drop at the airflow tubes in the unit and match that value up to the matching unit curve below. This will show the cfms traveling through the burner and will indicate proper airflow or airflow problems (too much or not enough). **If the pressure drop is outside of the .15" to .80" range, the blower rpm should be adjusted to fix airflow**.





Modulating Gas System

The second system, the **Maxitrol modulating gas system,** consists of a temperature selector dial, a discharge air sensor, an amplifier, and a modulating gas valve. The two types of Maxitrol systems used are the Maxitrol 14 series or the Maxitrol 44 series. The Maxitrol 14 utilizes a discharge air sensor and modulates the Maxitrol gas valve to provide discharge air to match the selected temperature on the temperature selector. The Maxitrol 44 utilizes a room temperature sensor to control room temperature as well as a discharge air sensor in order to control the discharge air temperature. The modulating gas valve controls the amount of gas flow to the burner based on the temperature rise needed. When the modulating gas valve is all the way open and achieving the maximum BTUs and temperature rise of the unit, it is called "high fire".

Maxitrol 14 Amplifier

High Temperature Limit

One of the back up safety device is the **high temperature limit** switch. This switch is a mechanical thermostat that measures the temperature inside the unit downstream of the burner. If the factory-set temperature of **170°F** is exceeded, it will signal the FSC to turn off the burner. This requires a manual reset of the high temperature limit. This insures that the discharge does not exceed 185°F.

High Temperature Limit

Operation Summary

- With the blower already running and the airflow switch proven;
  - ✓ The outside air temperature falls below the setting of intake air thermostat
    or
  - ✓ The optional remote panel is set to "Manual" and "Heat" mode
- The FSC in energized and the following occurs;
  - ✓ FSC indicates that it has power by illuminating the OPR CTRL LED
  - ✓ FSC verifies proper Airflow

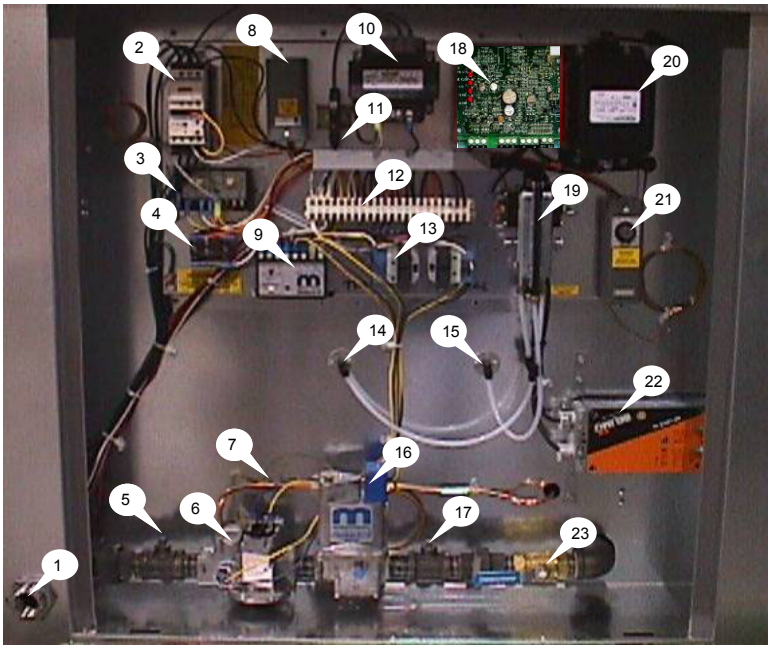
- ✓ Begins Pilot Trial For Ignition and turns on PTFI LED
- ✓ The pilot gas solenoid valve is opened, the spark igniter begins sparking, and the flamerod sensor watches for flame initiation
- ✓ When flame is established, the FLAME LED is illuminated and main valve opens and the FSC powers the Maxitrol system and gas flow begins modulating
- ✓ The FSC monitors the flame while the Maxitrol system adjusts to the selected temperature

- The Maxitrol system checks the discharge air temperature (and the room temperature for the Maxitrol 44) and regulates the gas going to the burner to satisfy the temperature setting. The Maxitrol system will modulate the main burner gas from 100% down to 5% as needed.

Optional Remote Panel Circuit

Components

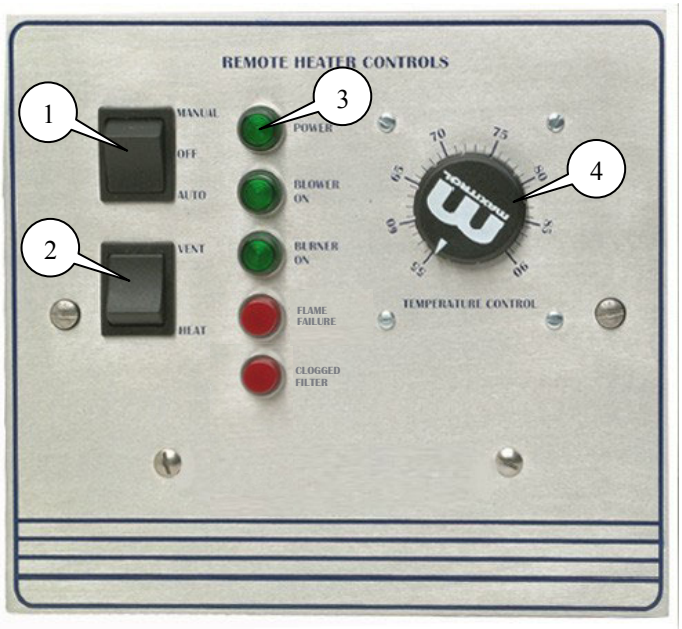
The following image and list outlines the typical direct fired heater components and their functions.



1. **Gas Inlet** – Main gas supply connection
2. **Motor Starter** – Contactor with overload protection to start and protect motor.
3. **Freeze-Stat Thermostat (Optional)** – De-energizes blower motor if the discharge air temperature falls below the set point.
4. **Cooling Interlock Relay (Optional)** – Energizes power to cooling circuit on call for cooling.
5. **Inlet Gas Pressure Tap** – Inlet gas pressure should be measured here.
6. **Combination Gas Valve** - A combination of redundant solenoid valves, pilot valve and gas regulator built into one unit.
7. **Pilot Tubing** – Pilot tube connection to combination gas valve.
8. **Manual Reset High Temperature Limit** – Safety device that prevents the heater from overheating.
9. **Maxitrol Modulating Amplifier** - Regulates temperature by modulating gas valve
10. **Power Transformer** – Installed when motor voltage > 120V. Used to provide 120V service to controls.
11. **Circuit Breaker** – Protects electrical components from high current spikes.
12. **Terminal Strip** – Central location to terminate control wiring. Should be used for troubleshooting.
13. **Control Transformer** – 120V primary; 24V secondary control transformer.
14. **Low Pressure Airflow Probe** – Measures profile pressure downstream of burner.
15. **High Pressure Airflow Probe** – Measures profile pressure upstream of burner.
16. **Modulating Gas Valve** – Modulates gas flow to burner to provide proper air temperature.
17. **Manifold Gas Pressure Tap** – Manifold gas pressure should be measured here.
18. **Flame Safety Control** – Initiates and monitors flame.
19. **Airflow Switch** – A safety device insuring proper air flow during burner operation.
20. **Ignition Transformer** – Produces high voltage spark to ignite flame.
21. **Intake Air Thermostat** – De-energize heating circuit when intake air exceeds set-point.
22. **Damper Actuator** – Motor containing end switch that opens intake damper.
23. **Manual Gas Shut-Off Valve** Allows gas flow to burner to be shut off to leak test gas train

Remote Panel Option

The Remote Panel is a device used to control the operation of the heater from a remote location. This unit is available in both a “2 Position” or “3 Position” configuration and with or without a cooling output. It also will accommodate both the Maxitrol discharge temperature dial and the Maxitrol space sensing Selectrastat. It is important to understand the following Remote Panel controls and uses:



1. **Manual/Off/Auto Switch** - Used to control blower operation and tempering mode of unit. The **AUTO** position allows the unit to “decide”, through the use of the intake air thermostat, whether or not heating is needed. The **MANUAL** position allows the user to control whether or not heat is needed. The **OFF** position will turn the blower off when a “3 Position” remote panel is ordered. The **OFF** position will disable all temperature controls when a “2 Position” remote panel is ordered and fan power is then controlled by the pre-wire package only.

2. **Heat/Vent Switch –** This switch is powered when the Manual/Off/Auto switch is in the **MANUAL** position. It is used to control the tempering mode of the unit. The **VENT** position will prevent the burner from operating and the heater will deliver untempered air. The **HEAT** position will force the burner on and the unit will heat the incoming air. This switch becomes a Heat/Vent/Cool switch when the cooling interlock is ordered. This option provides a 120V cooling output from the remote panel.

3. **Lights-** Displays the current status of unit features. The light definitions are as follows:

   POWER - Illuminated when there is power to Remote Panel.
   BLOWER ON - Illuminated when the blower motor is powered.
   BURNER ON - Illuminates after pilot flame has established and main valve is powered.
   FLAME FAILURE - Illuminated when the Flame Safety Control is in Alarm mode.
   CLOGGED FILTER – (Optional) Illuminated when the Intake Filters are Dirty.

4. **Temperature Control –** Controls the discharge temperature of a standard unit. The temperature dial is replaced with Maxitrol Selectrastat in Space Heating applications and is used to control the space temperature.

Troubleshooting

The following tables list causes and corrective actions for possible problems with direct fired heater units. Review these lists prior to consulting manufacturer.

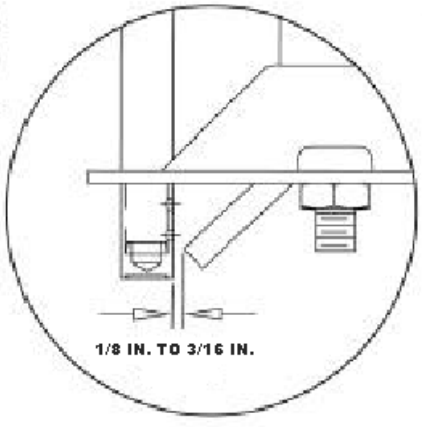
Airflow Troubleshooting Chart

Problem	Potential Cause	Corrective Action
Fan Inoperative	Blown fuse or open circuit breaker	Replace fuse or reset circuit breaker and check amps
	Disconnect switch in “Off” position	Turn to “On” position
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Broken fan belt	Replace belt
	Motor starter overloaded	Reset starter and check amps
	Remote panel set to “Off” Position	Set Remote Panel to “Manual” or “Auto” Position
Motor Overload	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Fan speed is too high	Reduce fan RPM
	Motor wired incorrectly	Check motor wiring to wiring diagram located on fan motor
	Overload in starter set too low	Set overload to motor FLA value
	Motor HP too low	Determine if HP is sufficient for job
	Duct static pressure lower than design	Reduce fan RPM
Insufficient Airflow	Fan rotating in the wrong direction	Be sure fan is rotating in the direction shown on rotation label
	Poor outlet conditions	There should be a straight clear duct at the outlet
	Intake damper not fully open	Inspect damper linkage and replace damper motor if needed
	Duct static pressure higher than design	Improve ductwork to eliminate or reduce duct losses
	Blower speed too low	Increase fan RPM. Do not overload motor
	Supply grills or registers closed	Open and adjust
	Dirty or clogged filters	Clean and/or replace
	Belt slippage	Adjust belt tension
Excessive Airflow	Blower speed to high	Reduce fan RPM
	Filters not installed	Install filters
	Duct static pressure lower than design	Reduce fan RPM
Excessive Vibration and Noise	Misaligned pulleys	Align pulleys
	Damaged or unbalanced wheel	Replace wheel
	Fan is operating in the unstable region of the fan curve	Refer to performance curve for fan
	Bearings need lubrication or replacement	Lubricate or replace
	Fan speed is too high	Reduce fan RPM
	Belts too loose, worn or oily	Inspect and replace if needed

Burner Troubleshooting Chart

Problem	Potential Cause	Corrective Action
Pilot Does Not Light/Stay Lit	Main gas if off	Open main gas valve
	Air in gas line	Purge gas line
	Dirt in pilot orifice	Clean orifice with compressed air
	Gas pressure out of range	Adjust to proper gas pressure
	Pilot valve is off	Turn pilot valve on
	Pilot orifice fitting leak	Tighten pilot orifice
	Excessive drafts	Re-direct draft away from unit
	Safety device has cut power	Check limits and airflow switch
	Dirty flame sensor	Clean flame sensor
	Remote panel in “Vent” mode	Change to “Heat” mode
	No spark at igniter	Check wiring, sensor, and ignition controller. Check spark gap as shown below.
Main Burner Does Not Light (Pilot is Lit)	Defective valve	Replace combination valve
	Loose valve wiring	Check wiring to valve
	Defective pilot sensor	Replace pilot sensor
	Shut off valve closed	Open shut off valve
	Defective flame safety controller	Replace flame safety controller
	Pilot fails as main gas valves open and main gas begins to flow	Plug the first burner port next to the pilot gas tube with burner cement
Not Enough Heat	Main gas pressure too low	Increase main gas pressure – do not exceed 14 in. w.c. inlet pressure (5 psi. on size 4-5 heater)
	Too much airflow	Decrease airflow if possible
	Burner undersized	Check design conditions
	Gas controls not wired properly	Check wiring
	Thermostat setting too low	Increase thermostat setting
	Thermostat malfunction	Check/replace thermostat
	Unit locked into low fire	Check wiring
Too Much Heat	Defective modulating gas valve	Check/replace modulating valve
	Thermostat setting too high	Decrease thermostat setting
	Unit locked into high fire	Check wiring
	Thermostat wired incorrectly	Check thermostat wiring

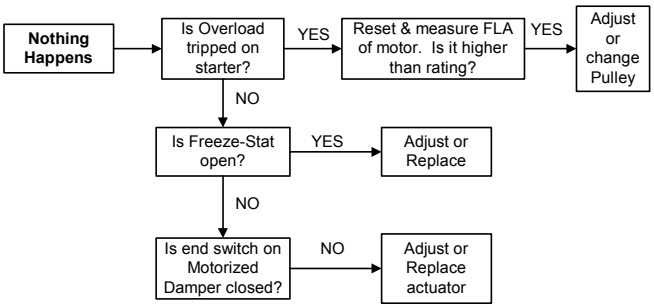
Proper Spark Gap

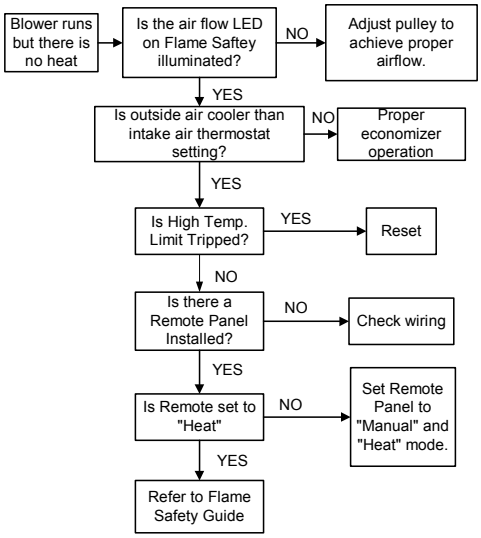


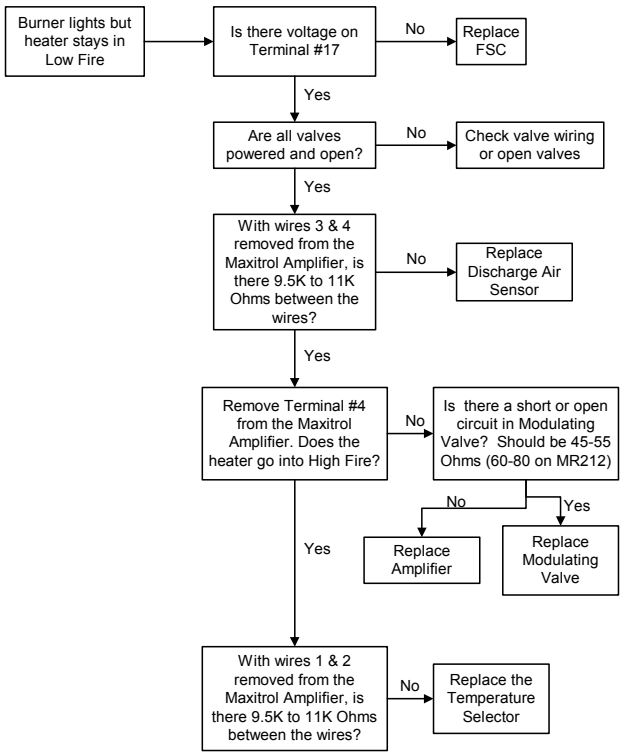
Remote Panel Troubleshooting Chart

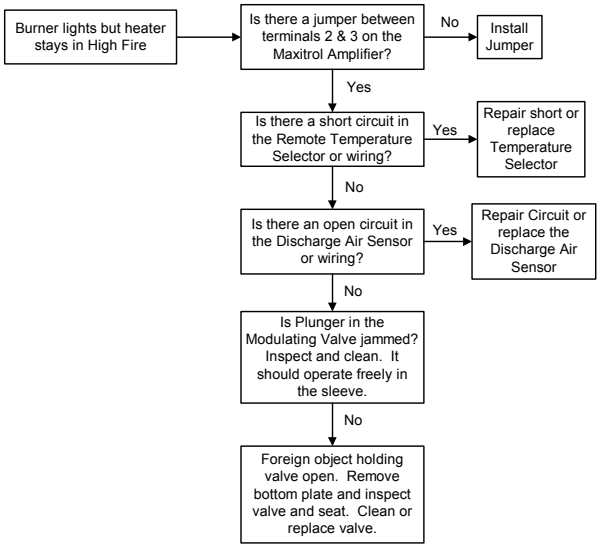
Light Indication	Condition	Possible Cause
No Lights	Power not available to Remote Panel	Bad voltage to unit
		Main disconnect in “OFF” Position
		Circuit breaker tripped
		Bad main transformer
POWER Light Only	Proper unit Off Operation	No problem
	No power to motor starter	Manual/Off/Auto Switch in “Off” Position (3 Position Remote Panels Only)
		Improper damper function
		Low Temperature Thermostat Timed Out (Option)
POWER Light and BLOWER ON Light	Proper Ventilation Operation	No Problem
	No Power to Flame Safety Controller	Manual/Off/Auto Switch in “Off” Position (2 Position Remote Panels Only)
		Heat/Vent Switch in “Vent” Position
		Gas Pressure Switch Tripped (option)
		High Temperature Limit Thermostat Tripped
		Manual/Off/Auto Switch in “Auto” Position and Intake Air Thermostat not Satisfied
	Improper Airflow	Insufficient Airflow
		Excessive Airflow
		Bad airflow switch
		Problem with air probes
		Problem with airflow tubing
		Broken Belt
POWER Light and BLOWER ON Light and BURNER ON Light	Proper Heating Operation	No Problem
CLOGGED FILTER Light On (Optional)	Filters Clogged	Filters Dirty or Need Replacement
FLAME FAILURE Light On	Flame Safety Alarm Activated	Combination Valve in “Off” Position (Unit Sizes 1-3)
	No Flame Detected during Pilot Establishment Period	Stuck Closed Gas Valve
		No or Low Gas Pressure
		Bad Spark Electrode
		Bad Ignition Transformer
		Flames Sensor Malfunction
		Clogged Pilot Orifices

Troubleshooting Flowcharts









MAINTENANCE

To guarantee trouble free operation of this heater, the manufacturer suggests following these guidelines. Most problems associated with fan failures are directly related to poor service and maintenance.

Please record any maintenance or service performed on this fan in the documentation section located at the end of this manual.

WARNING: DO NOT ATTEMPT MAINTENANCE ON THE HEATER UNTIL THE ELECTRICAL SUPPLY HAS BEEN COMPLETELY DISCONNECTED AND THE MAIN GAS SUPPLY VALVE HAS BEEN TURNED OFF.

General Maintenance

1. Fan inlet and approaches to ventilator should be kept clean and free from any obstruction.
2. Motors are normally permanently lubricated. Check bearings periodically. If they have grease fittings lubricate each season. Use caution when lubricating bearings, wipe the fittings clean, the unit should be rotated by hand while lubricating. **Caution: Use care when touching the exterior of an operating motor. Motors normally run hot and may be hot enough to be painful or cause injury.**
3. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.
4. Blowers require very little attention when moving clean air. Occasionally oil and dust may accumulate causing imbalance. If the fan is installed in a corrosive or dirty atmosphere, periodically inspect and clean the wheel, inlet and other moving parts to ensure smooth and safe operation.

Re-Setting Of The Unit

If the flame safety control is locked out (alarm light on), reset the unit by:

1. Turn OFF Power to the unit.
2. Turn Power to the unit back ON.

Emergency shutdown of unit

To shut down the unit in the event of an emergency do the following:

1. Turn power OFF to the unit from main building disconnect.
2. Turn the external disconnect switch to the OFF position.
3. CLOSE the inlet gas valve located on the heater.

Prolonged shutdown of the unit

For prolonged shutdown the following steps should be done:

1. Turn the external disconnect switch to the OFF position.
2. CLOSE the inlet gas valve located on the heater.

To re-start the unit the following steps should be done:

1. Turn the external disconnect switch to the ON position.
2. OPEN the inlet gas valve located on the heater.

2 weeks after startup

1. Belt tension should be checked after the first 2 weeks of fan operation. Belts tend to stretch and settle into pulleys after an initial start-up sequence. **Do not tension belts by changing the setting of the motor pulley**, this will change the fan speed and may damage the motor. To re-tension belts, turn the power to the fan motor OFF. Loosen the fasteners that hold the blower scroll plate to the blower. Rotate the motor to the left or right to adjust the belt tension. Belt tension should be adjusted to allow 1/64" of deflection per inch of belt span. Exercise extreme care when adjusting V-belts as not to misalign pulleys. Any misalignment will cause a sharp reduction in belt life and produce squeaky noises. Over-tightening will cause excessive belt and bearing wear as well as noise. Too little tension will cause slippage at startup and uneven wear. **Whenever belts are removed or installed, never force belts over pulleys without loosening motor first to relieve belt tension.** When replacing belts, use the same type as supplied by the manufacturer. On units shipped with double groove pulleys, matched belts should always be used.
2. All fasteners should be checked for tightness each time maintenance checks are preformed prior to restarting unit.

Every 3 months

1. Belt tension should be checked quarterly. See instructions in the previous maintenance section. Over-tightening will cause excessive bearing wear and noise. Too little tension will cause slippage at startup and uneven wear.
2. Filters need to be cleaned and/or replaced quarterly, and more often in severe conditions. Washable filters can be washed in warm soapy water. When re-installing filters, be sure to install with the **airflow in the correct direction** as indicated on the filter.

Filter Quantity Chart

Intake	16" x 20"	20" x 25"
Size 1 Sloped	3	
Size 2 Sloped		3
Size 3 Sloped	6	
Size 4 Sloped	10	
Size 5 Sloped		8
Size 1 V-Bank		3
Size 2 V-Bank	8	
Size 3 V-Bank		8
Size 4 V-Bank	15	
Size 5 V-Bank		12

Yearly

1. Inspect bearings for wear and deterioration. Replace if necessary.
2. Inspect belt wear and replace torn or worn belts.
3. Inspect bolts and set screws for tightness. Tighten as necessary.
4. Inspect motor for cleanliness. Clean exterior surfaces only. Remove dust and grease from the motor housing to ensure proper motor cooling. Remove dirt and grease from the wheel and housing to prevent imbalance and damage.
5. Check for gas leaks and repair if present.
6. Clean flame sensor by rubbing with steel wool to remove any rust build-up,
7. Clean burner with a wire brush and insure burner ports are free of debris. Then wipe the burner with a clean rag.

Burner Orifice Drill Size

Orifice	Drill Size
Gas Port	31
Air Port	43

Start-Up and Maintenance Documentation

START-UP AND MEASUREMENTS SHOULD BE PERFORMED AFTER THE SYSTEM HAS BEEN AIR BALANCED AND WITH THE HEAT ON (Warranty will be void without completion of this form)

Job Information

Job Name	
Address	
City	
State	
Zip	
Phone Number	
Fax Number	
Contact	
Purchase Date	

Service Company	
Address	
City	
State	
Zip	
Phone Number	
Fax Number	
Contact	
Start-Up Date	

Heater Information

Refer to the start-up procedure in this manual to complete this section.

Name Plate and Unit Information	
Model Number	
Serial Number	
Motor Volts	
Motor Hertz	
Motor Phase	
Motor FLA	
Motor HP	
Blower Pulley	
Motor Pulley	
Belt Number	
Gas Type	
Min. Btu/Hr	
Max. Btu/Hr	

Field Measured Information		
Motor Voltage		
Motor Amperage**		
RPM		
Burner Differential Pressure		in. w.c.
Pilot Flame Signal		VDC
Low Fire Flame Signal		VDC
High Fire Flame Signal		VDC
Gas Type		
High Fire Inlet Gas Pressure		in. w.c.
Low Fire Manifold Gas Pressure		in. w.c.
High Fire Manifold Gas Pressure		in. w.c.
Thermostat Set-Point		
Temperature Control	Discharge	
	Space	
Airflow Direction	Correct	
	Incorrect	

**If measured amps exceed the FLA rating on the nameplate, fan RPM must be reduced to decrease the measured amps below the nameplate FLA rating.

Maintenance Record

Date	Service Performed

Factory Service Department

Phone: 1-866-784-6900
Fax: 1-919-554-9374