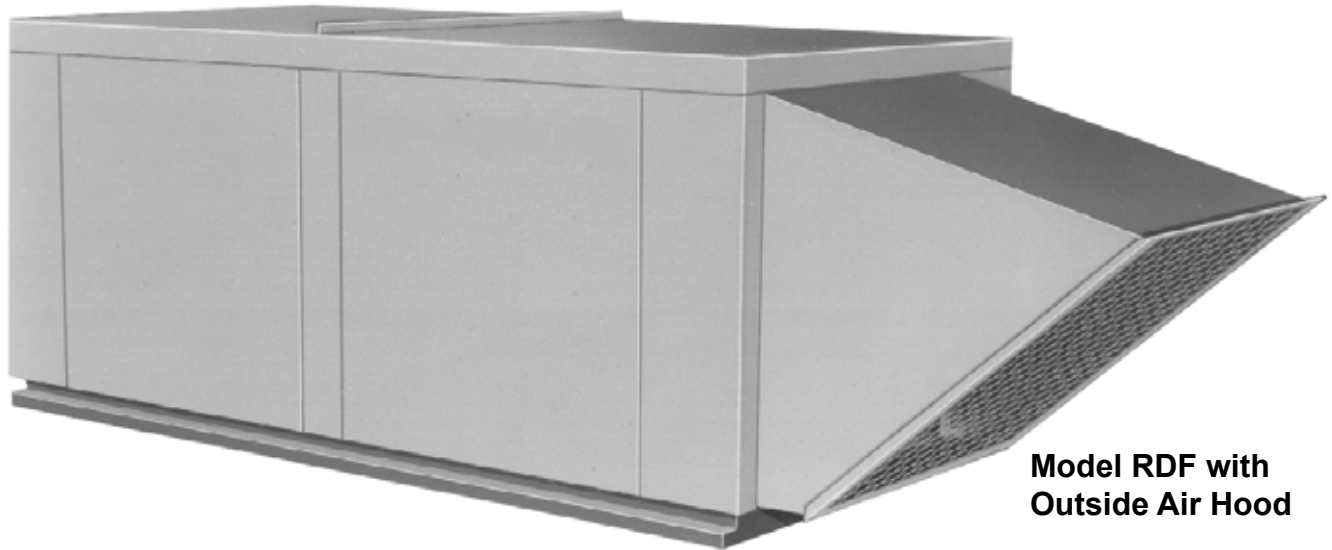




Applies to: Indoor or Outdoor, Gas, Direct-Fired
Makeup Air/Heating Systems
Model RDF Series 3

Installation



Model RDF with
Outside Air Hood

WARNING:

FIRE OR EXPLOSION HAZARD

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

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

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

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- **WHAT TO DO IF YOU SMELL GAS**
 - Do not try to light any appliance.
 - Do not touch any electrical switch; do not use any phone in your building.
 - Leave the building immediately.
 - Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

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1.0 General

1.1 Hazard Labels and Notices

There are warning labels on the unit and throughout this manual. For your safety, read the definitions below and comply with all boxes labeled CAUTION, WARNING, and DANGER during installation, operation, maintenance and service of this heater.

HAZARD INTENSITY LEVELS

Hazard Intensity Levels Apply to Warnings throughout this Manual

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

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

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

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

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

- (a) Flammable solids, liquids, and gases;
 - (b) Explosive materials; or
 - (c) Substances which may become toxic when exposed to heat.
-

1.2 General Description

The information in this manual applies to Model RDF Series 3 direct-fired makeup air heating systems. The typical system consists of a direct-fired, natural gas-fueled burner, and a draw-through blower housed in a weatherized cabinet. The system may be installed either indoors or outdoors.

This direct-fired makeup air system provides tempered makeup air. Makeup air is defined as air that enters a building or area due to negative pressure created by an air exhaust load in excess of the volume of entering air. This system warms the outside air and monitors the volume and temperature of the makeup air added to the building. The system may be used to provide ventilation in whole building or in spot applications. In whole building applications, adding controlled makeup air will cause less infiltration of dust and dirt; will eliminate continuous backdraft in chimneys and vents; and will reduce space heating fuel costs.

This system is available with various air control options to meet a wide range of application requirements. Depending on the air control option ordered, the supply air volume may be varied or the outside air may be supplemented with up to 75% building air (recirculation) for increased energy savings.

These systems are designed-certified to ANSI and CSA Standards. (**NOTE:** Optional recirculation is available for U.S. installations only; recirculation is not available for Canadian installations.)

In order to retain certification, the installer must adhere to the installation and operation requirements in the instruction manual. These direct-fired makeup air systems are not approved for residential use.

1.3 Warranty

Refer to the limited warranty information on the warranty card included in the "Owner's Envelope".

1.4 Installation Codes/ Requirements

Installation should be done by a qualified agency in accordance with the instructions in this manual and in compliance with all codes and requirements of authorities having jurisdiction. The qualified agency installing this system is responsible for the installation. These units must be installed in accordance with local building codes. In the absence of local codes, the unit must be installed in accordance with the National Fuel Gas Code ANSI Z223.1a (latest edition) or CAN/CGA B149, Installation Codes for Gas Burning Appliances. These codes are available from CSA Information Services, 1-800-463-6727.

Before installation, always consult authorities having local jurisdiction to verify that local codes and procedures are being followed.

The building should always provide adequate relief for the heater to operate at its rated capacity. It should be noted that this can be accomplished by taking into account, through standard engineering methods, the structure's designed infiltration rate; by providing properly sized relief openings; by interlocking a powered exhaust system; or by a combination of these methods. **Excessive recirculation or insufficient ventilation air which results in inadequate dilution of the combustion products generated by the heater may create hazardous concentrations of carbon dioxide, carbon monoxide, nitrogen dioxide, and other combustion products into the heated space.**

If the failure or malfunction of this heater creates a hazard to other fuel burning equipment in the building, interlock the system to open inlet dampers or other such devices.

Recirculation Requirements - Do not install a system with optional recirculation (building air) in the presence of flammable solids, liquids, or gases; explosive materials (i.e., grain dust, coal dust, gun powder, etc.); or substances which may become toxic when exposed to heat (i.e. refrigerants, aerosols, etc.). If a system with recirculation is being installed in an area where propane forklifts or other fossil fuel powered equipment are used, the ventilation requirements for that equipment **must** be met. Recirculation is not recommended in uninsulated buildings where outside temperatures fall below 32°F (0°C).

If in doubt regarding an application, consult the heater manufacturer's representative before installation.

1.0 General (cont'd)

2.0 Location

3.0 Uncrating/ Preparation

1.4 Installation Codes/Requirements (cont'd)

Codes for Special Installations: (1) Aircraft Hangar -- Installation in an aircraft hangar must be in accordance with the Standard for Aircraft Hangars, ANSI/NFPA 409 (latest edition) or CAN/CGA B149 Installation Codes; (2) Public Garage -- Installation in a public garage must be in accordance with the Standard for Parking Structures, ANSI/NFPA 88A (latest edition) or the Standard for Repair Garages, ANSI/NFPA 88B (latest edition) or in Canada with CAN/CGA B149 Installation Codes.

Location must comply with clearances in Paragraph 4.1. Makeup air should enter at the highest point practical. By doing this, the fresh air will entrain dust laden air at the ceiling and move it toward the point of exhaust. Also, fresh air directed downward from the roof or ceiling will mix with hot ceiling air resulting in improved distribution of heat in the building.

Always introduce fresh makeup air so that it moves across the greatest distance within the room or building before reaching an exhauster.

Immediately upon uncrating the unit, check the gas specifications and electrical voltage (system rating plate is in the control compartment) to be sure that they agree with the supply at the installation site. Check for any damage that may have been incurred during shipment. If damage is found, document the damage with the carrier and contact your distributor.

The following control parts are **shipped loose** inside the unit:

- a 3-position control switch mounted in a 4x4 junction box (except units with Option AG37) NOTE: If an optional remote console is ordered, this switch is mounted on the console; the console is shipped separately.

Depending on the gas and/or air controls selected, the following additional parts are shipped inside the unit or separately.

Gas Controls	Shipped-Loose Parts
Options AG30, AG32, AG33, AG47, AG48	*Remote Temperature Selector
Option AG31	*Remote Temperature Selector, Space Override Thermostat
Option AG36	Remote Console
Air Controls	Shipped-Loose Parts
Option AR19, AR22	*Potentiometer
Option AR20, AR23	Remote Pressure Sensor
Option AR32	Toggle Switch
Option AR36	Photohelic Pressure Sensor
Option AR37	Photohelic Pressure Sensor

*If an optional remote console is ordered, these controls are mounted on the console. The console is shipped separately.

On all sizes with an **optional dirty filter switch**, the tubing and clamps are shipped inside the cabinet.

Be sure that all shipped-separate accessories for the installation are available. Other shipped-separate accessories could include a roof curb, a remote console, an outside air hood, a disconnect switch, and/or an indoor filter cabinet.

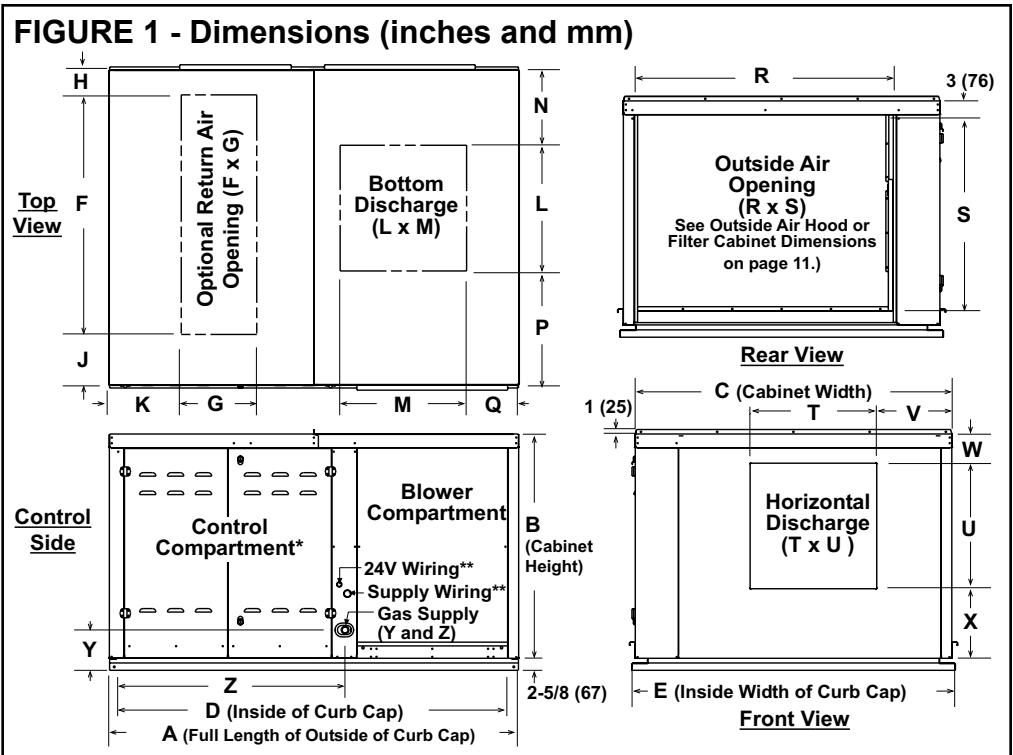
4.0 Clearances and Dimensions

4.1 Clearances

Clearance to combustibles is defined as the minimum distance from the heater to a surface or object that is necessary to ensure that a surface temperature of 90°F above the surrounding ambient temperature is not exceeded. In order to service the system, the minimum clearance on the control side of the unit must be equal to the width of the unit.

Clearances - inches (mm)				
Top	Control Side	Side Opposite Controls	Bottom	
			To Combustibles	To Non-Combustibles
3 (76)	Width of unit	3 (76)	3 (76)	0 - Curb

4.2 Dimensions



* RDF-2 and RDF-3 systems have double hinged doors as illustrated. Control compartment on RDF-1 has a single hinged door.

** Configuration is for RDF-2 and RDF-3. The supply connection on the RDF-1 systems is above the control wiring connection.

Dimensions (inches)												
Model Sizes	A	B	C	D	E	F	G	H	J	K	L	M
1-20-3, 1-40-3, 1-50-3, 1-65-3	88	37-1/8	44-3/16	84-13/16	45-1/2	24-1/2	10-1/2	5-7/16	14-9/32	15-5/8	21-29/32	19-1/8
2-80-3, 2-120-3	88	48-11/16	68-1/4	84-13/16	69-1/2	52	16-1/4	5-5/16	10-15/16	15-1/2	27-9/32	27-7/32
3-180-3, 3-260-3	135-3/4	61-5/8	82-9/16	132-9/16	83-1/8	64-9/16	19-1/16	5-5/32	13-13/32	21-5/8	37	37-3/32
Model Sizes	N	P	Q	R	S	T	U	V	W	X	Y	Z
1-20-3, 1-40-3, 1-50-3, 1-65-3	7-11/16	14-5/8	12-5/8	31-1/8	31-1/8	21-3/4	18-3/4	7-3/4	5-1/4	13-1/8	8-9/16	42-7/32
2-80-3, 2-120-3	16-5/16	24-21/32	11-7/32	55-3/16	42-5/8	27-1/4	27-1/4	16-5/32	6-11/32	15-3/32	8-3/4	48-15/16
3-180-3, 3-260-3	14-9/16	31-9/16	7-7/16	67-1/8	55-9/16	36-3/4	36-3/4	14-7/16	4	20-7/8	8-11/16	56
Dimensions (mm)												
Model Sizes	A	B	C	D	E	F	G	H	J	K	L	M
1-20-3, 1-40-3, 1-50-3, 1-65-3	2235	943	1122	2154	1156	622	267	138	363	397	556	486
2-80-3, 2-120-3	2235	1237	1734	2154	1765	1321	413	135	278	394	691	691
3-180-3, 3-260-3	3448	1565	2097	3367	2111	1640	484	131	341	549	940	942
Model Sizes	N	P	Q	R	S	T	U	V	W	X	Y	Z
1-20-3, 1-40-3, 1-50-3, 1-65-3	195	371	321	791	791	552	476	197	133	333	217	1072
2-80-3, 2-120-3	414	626	285	1402	1083	692	692	410	161	383	222	1243
3-180-3, 3-260-3	370	802	189	1705	1411	933	933	367	102	530	221	1422

5.0 Mounting

Mounting the system is the responsibility of the installer. Verify that the supporting structure has sufficient load-carrying capacity to support the weight.

Depending on the building and its use, determine whether or not additional measures should be taken to reduce the effect of blower vibration and/or noise.

When selecting a location for an outdoor installation, position the unit so that the air inlet will **NOT** be facing into the prevailing wind. A minimum of 14" (356mm) clearance is required from the bottom of the air inlet hood to the mounting surface.

Prior to installation, be sure that the method of support is in agreement with all local building codes. For both indoor and outdoor installations, check for service platform requirements. If an outdoor system is being installed with bottom discharge and/or return air, a full perimeter roof curb is recommended.

5.0 Mounting (cont'd)

5.1 Weights

NOTE: Net weights are approximate for the standard system. Optional equipment is not included.

Net Weight of Basic Model RDF System								
Sizes	1-20	1-40	1-50	1-65	2-80	2-120	3-180	3-260
lbs	915	925	935	950	1455	1505	2410	2480
kg	415	420	424	431	670	683	1093	1125

5.2 Rigging

All units are mounted on a full curb cap base furnished with four lifting lugs for attaching rigging. To prevent damage to the cabinet, use spreader bars with the rigging chains.

5.3 Mounting on Field-Supplied Supports

The system is equipped with a load-bearing curb cap which forms an integral part of the unit. The curb cap provides required clearance from combustibles. Whether the system is being mounted directly on a surface or being placed "up" on additional structure, the horizontal length must be supported by two 4x4 treated wooden rails. Refer to **FIGURE 2** for the appropriate lengths and spacing. When the system is placed on the rails, the curb cap "skirt" must fit over the edge of the boards with the rails setting inside the horizontal length of the curb cap.

If the rails are laid directly on the mounting surface, position them as shown in **FIGURE 3**. Set the system on the rails leaving the "ends" underneath open for ventilation.

If the wooden rails are not placed directly on a surface, cross-supports should be placed underneath the rails at the ends and at the cabinet "joint". Refer to **FIGURE 3**.

IMPORTANT NOTE: Mount an outdoor unit with a minimum of 14" clearance from the bottom of the inlet air hood to the mounting surface.

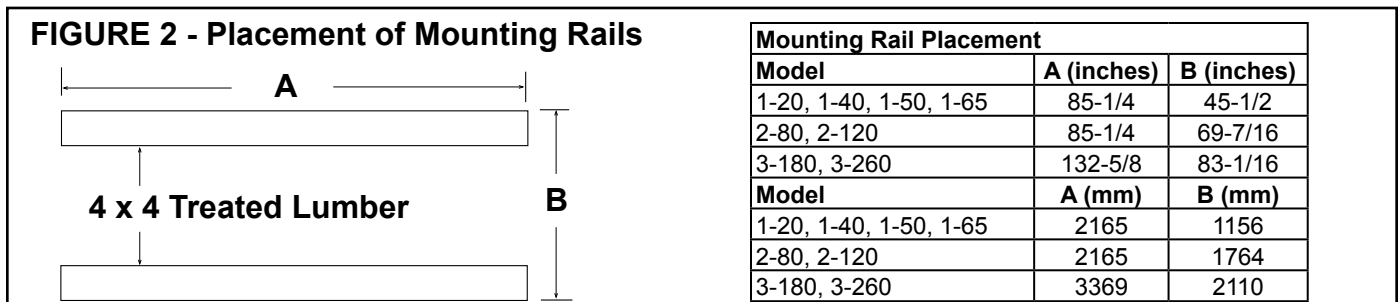
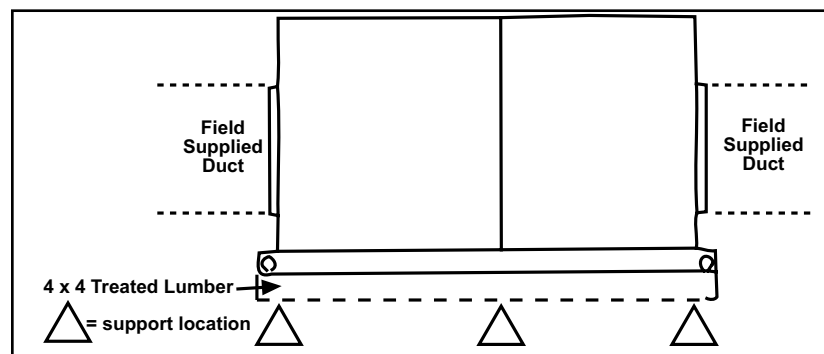


FIGURE 3 - Cross Support Mounting Requirements



5.4 Mounting on a Roof Curb

CAUTION: Before installing curb, recheck to be sure that the correct curb has been ordered. Be sure that the curb selected matches the unit ordered. Verify the dimensions of the curb received with the dimension table in **FIGURE 4**.

Roof Curb Dimensions for Model RDF Series 3

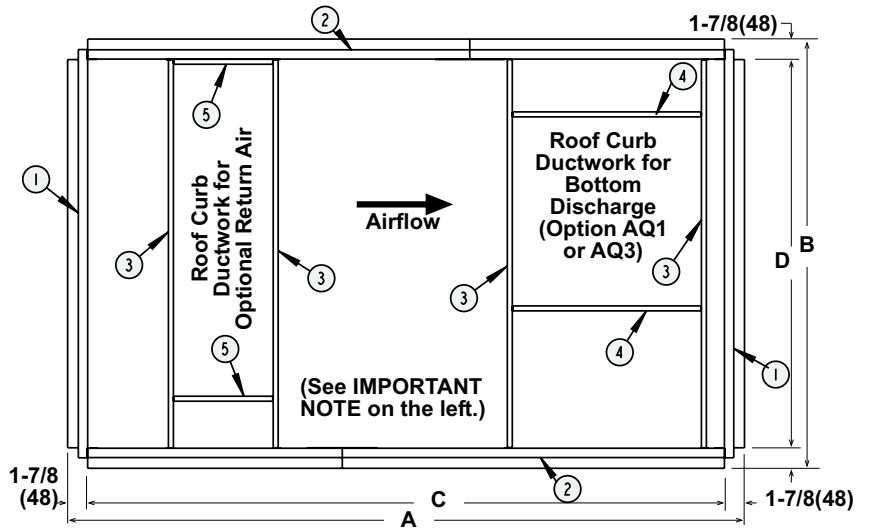
Whether the roof curb is Option CJ3 designed for the system or a field-supplied curb, the roof curb dimensions in **FIGURE 4** and the ductwork opening dimensions in **FIGURE 6** apply.

The roof curb designed for the system includes dividers that will create internal ductwork and duct connection flanges for ease of installation and so that the building ductwork can be attached before the system is set on the roof curb.

FIGURE 4 - Dimensions of Optional Roof Curb (Option CJ3) - Shipped Separately

IMPORTANT NOTE:

Area enclosed by roof curb must comply with clearance to combustible materials. If the roof is constructed of combustible materials, area within the roof curb must be ventilated, left open, or covered with non-combustible material which has an "R" value of at least 5. If area within curb is left open, higher radiated sound levels may result.



NOTE: Drawing is not proportional for all sizes.

Roof Curb Dimensions ($\pm 1/8"$ or 3mm) and Approximate Weights						
Sizes	1-20-3, 1-40-3, 1-50-3, 1-65-3		2-80-3, 2-120-3		3-180-3, 3-260-3	
	inches	mm	inches	mm	inches	mm
A	84-5/8	2149	84-5/8	2149	131-3/4	3346
B	43-5/8	1108	67-9/16	1716	82-1/16	2084
C	80-7/8	2054	80-7/8	2054	128	3251
D	39-7/8	1013	63-13/16	1621	78-5/16	1989
Height	16 inches (406 mm)					
Weight	171 lbs (78 kg)		224 lbs (102 kg)		307 lbs (139 kg)	

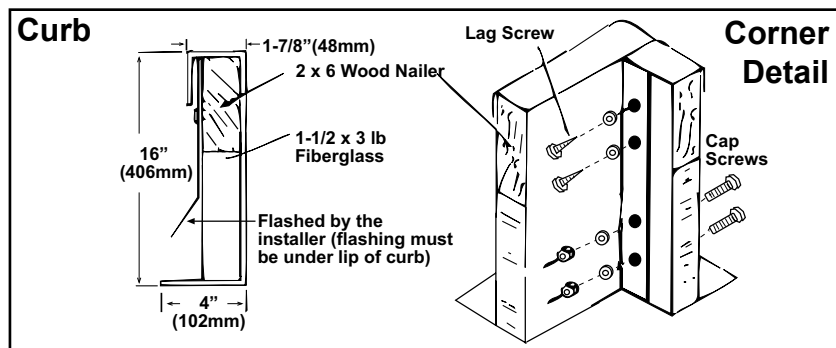
Components in Option CJ3 Roof Curb (Refer to FIGURE 4 to identify the Item)

Components in Roof Curb Option CJ3		
Roof Curb Frame and Internal Ductwork Dividers (See FIGURE 4.)		
Item	Qty	Description
1	2	Curb Front and Back Assemblies
2	2	Curb Side Assemblies
3	4	Full Width Curb Dividers -- two (2) for bottom discharge supply air duct opening and two (2) for optional return air duct opening
4	2	Cross Dividers for Bottom Discharge Supply Air Opening
5	2	Cross Dividers for Optional Return Air Opening
Roof Curb Corner Hardware		
For Top Two "Holes"	8	5/16" x 1" Lag Screws, P/N 16243
	8	5/16" Lockwasher, P/N 1333
For Bottom Two "Holes"	8	5/16" x 3/4" Hex Head Cap Screw, P/N 16247
	8	5/16" Lockwasher, P/N 1333
	8	5/16-18 Hex Nut, P/N 1035
Hardware to Assemble and Attach Dividers to make Ductwork Openings		
Qty of 64	#10 Sheetmetal Screws, P/N 11813	

Roof Curb Installation Instructions

1. If installing an Option CJ3 curb, follow these instructions. If installing a field-supplied curb, the curb must be level and must be sealed to the system curb cap.
2. Position the roof curb end assemblies and side assemblies as shown in the drawing in FIGURE 4. Fasten with bolts and lag screws as illustrated in the corner detail (FIGURE 5).

FIGURE 5 - Option CJ3 Roof Curb Cross Section and Corner Detail



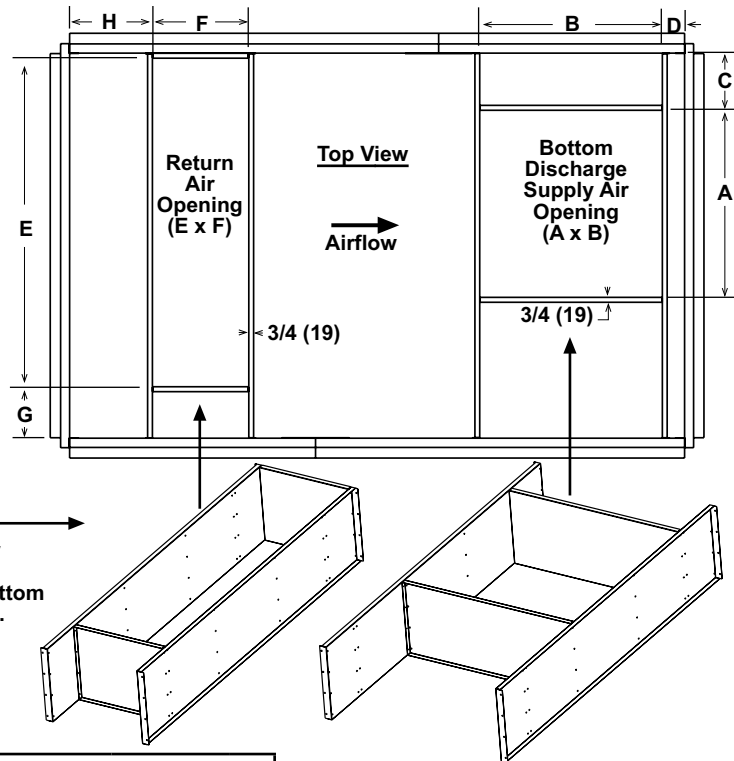
5.0 Mounting (cont'd)

5.4 Mounting on a Roof Curb (cont'd) Roof Curb Installation Instructions (cont'd)

FIGURE 6 - Divider Locations for Bottom Ductwork Openings

NOTES:

- Drawing is not proportional for all sizes.
- 3/4" (19mm) measurement is the width of the flanges where the roof curb mates with the heater. Flange surface must be sealed.
- When cutting duct openings in the roof, cut opening(s) 1" (25mm) larger than duct size opening for installation clearance.



Assembled Dividers for Optional Return Air Ductwork in the Roof Curb
Field-supplied ductwork may be either "dropped in" from the top resting on the top flange or be attached to the bottom flange, using the dividers as ductwork.

Roof Curb Duct Opening Dimensions (± 1/8" or 3mm)							
Sizes	1-20, 1-40, 1-50, 1-65		2-80, 2-120		3-180, 3-260		
	inches	mm	inches	mm	inches	mm	
A	23-11/32	593	28-13/32	722	38	965	A
B	20-1/8	511	28-11/32	720	38	965	B
C	5	127	13-15/32	342	11-19/32	294	C
D	10-1/4	260	7	178	4-5/8	117	D
E	25-1/2	648	54-11/16	1389	66-3/4	1695	E
F	11-1/2	292	17-23/32	432	20-1/16	510	F
G	11-15/32	291	8	203	10-15/32	266	G
H	11-1/32	280	11-3/32	282	17-1/4	438	H

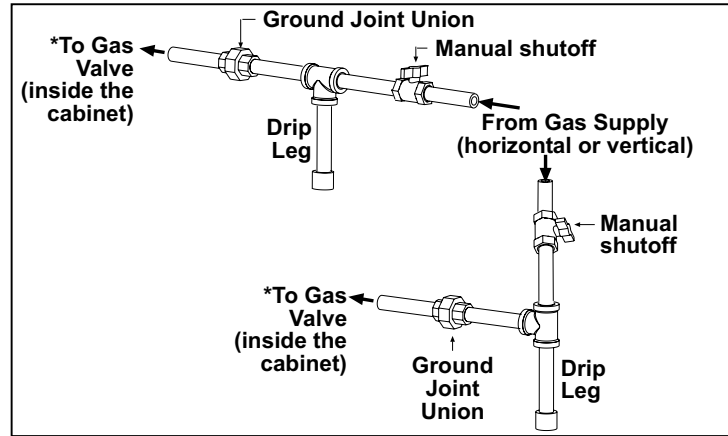
3. If the system has a bottom discharge and/or a return air inlet, use the sheetmetal screws to sub-assemble the dividers. Refer to the dimensions in **FIGURE 6** to appropriately position the roof curb dividers to create the needed duct opening flanges. Attach the dividers to the roof curb with sheetmetal screws. **NOTE:** If the system does not have a bottom discharge and/or a return air opening, the dividers for an opening that is not going to be used may be installed but are not required.
4. Check the assembly for squareness. The curb must be adjusted so that the diagonal measurements are equal within a tolerance of ± 1/8".
5. Level the roof curb. To ensure a good weatherproof seal between the unit curb cap and the roof curb, the roof curb must be leveled in both directions with no twist end to end. Shim as required and secure curb to the roof deck before installing flashing.
6. Install field-supplied flashing.
7. Before placing the RDF unit on the curb, apply furnished 1/4" x 1-1/4" foam sealant tape to the top perimeter surface of the curb, making good butt joints at corners. The sealant tape must be applied to the curb rails to prevent water leakage into the curb area due to blown rain and capillary action. Also place the foam sealant tape on the perimeter of the top surface of the duct opening(s), being sure to make good butt joints at corners. If installing ductwork from the top, it is recommended that tape be put on again after the ductwork is "dropped in", sealing below and above the duct flanges.

6.0 Mechanical

6.1 Gas Piping and Pressures

All piping must be in accordance with the requirements of the National Fuel Gas Code ANSI/Z223.1 (latest edition) or CSA B149.1 and B149.2. Gas supply piping installation must conform with good practice and with all local codes. Read this section of the installation manual to determine the minimum gas supply pressure required to provide a maximum gas capacity. Minimum gas supply pressure is also stated on the heater rating plate. The heater manifold terminates at the gas supply connection with a black iron pipe union. See **FIGURE 7**. Local codes may require a 6" condensate trap. Gas connection is either 1", 1-1/4", or 2" depending on the size of the system.

FIGURE 7 - Gas Supply Connection



WARNING: High pressure testing of supply lines is acceptable, provided the supply line has been disconnected from the unit and the pipe end is capped. See Hazard Levels, page 2.

Gas Supply Piping

Capacity of Piping - Cubic Feet per Hour based on 0.3" w.c. Pressure Drop														
Specific Gravity for Natural Gas -- 0.6 (Natural Gas -- 1000 BTU/Cubic Ft)														
Specific Gravity for Propane Gas -- 1.6 (Propane Gas -- 2550 BTU/Cubic Ft)														
Length of Pipe	Diameter of Pipe													
	1"		1-1/4"		1-1/2"		2"		2-1/2"		3"		4"	
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane
20'	350	214	730	445	1100	671	2100	1281	3300	2013	5900	3599	12000	7320
30'	285	174	590	360	890	543	1650	1007	2700	1647	4700	2867	9700	5917
40'	245	149	500	305	760	464	1450	885	2300	1403	4100	2501	8300	5063
50'	215	131	440	268	670	409	1270	775	2000	1220	3600	2196	7400	4514
60'	195	119	400	244	610	372	1105	674	1850	1129	3250	1983	6800	4148
70'	180	110	370	226	560	342	1050	641	1700	1037	3000	1830	6200	3782
80'	170	104	350	214	530	323	990	604	1600	976	2800	1708	5800	3538
90'	160	98	320	195	490	299	930	567	1500	915	2600	1586	5400	3294
100'	150	92	305	186	460	281	870	531	1400	854	2500	1525	5100	3111
125'	130	79	275	168	410	250	780	476	1250	763	2200	1342	4500	2745
150'	120	73	250	153	380	232	710	433	1130	689	2000	1220	4100	2501
175'	110	67	225	137	350	214	650	397	1050	641	1850	1129	3800	2318
200'	100	61	210	128	320	195	610	372	980	598	1700	1037	3500	2135

Note: When sizing supply lines, consider possibilities of future expansion and increased requirements. Refer to National Fuel Gas Code for additional information on line sizing.

WARNING: All components of the gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME.

Supply Pressure Requirement by Manifold Option

These direct-fired makeup air systems are designed to operate on a natural gas supply differential pressure range of a minimum of 4.3-5.0" w.c. plus the manifold pressure drop. Maximum supply pressure depends on specific unit firing rate and manifold selection. If the natural gas supply pressure is above the maximum allowed, it is necessary to install a field-supplied step-down gas regulator in the supply line. Order and install the appropriate Gas Regulator Kit, Option CZ1 (1") or CZ2 (1-1/2"). These kits include spring-loaded, lockup type regulators that comply with national and local codes specifying that type of regulator. Follow the instructions provided with the kit. Measure the gas pressure between the step-down regulator and the unit.

Maximum Supply Pressure by Manifold

Manifold Option BM75, BM76, BM77 - 1/2 psi

Manifold Option BM78, BM79 - 2 psi

Manifold Option BM80, BM81 - 5 psi

6.0 Mechanical (cont'd)

6.1 Gas Piping and Pressures (cont'd) Supply Pressure Requirement by Manifold Option (cont'd)

Minimum Supply Gas Pressure ("w.c.) for Full Fire																
Manifold Option	BM75				BM76		BM77		BM78		BM79		BM80		BM81	
with Gas Control Option	AG1		AG3		AG 30, 31, 32, 33, 36, 37, 47, 48, or 51											
Manifold Size	1"		1"		1"		1"		1"		1-1/4"		1-1/4"		2"	
MBH	Nat	Pro	Nat	Pro	Nat	Pro	Nat	Pro	Nat	Pro	Nat	Pro	Nat	Pro	Nat	Pro
250	4.0	1.4	4.0	N/A	4.1	1.6	4.3	1.5	4.4	1.6	4.6	1.6	4.5	1.6	5.1	1.8
500	5.3	1.9	5.0	N/A	5.8	2.3	6.2	2.2	6.0	2.3	5.2	1.9	5.0	1.7	5.3	1.9
750	7.5	2.7	6.8	N/A	8.5	3.3	9.5	3.3	8.4	3.3	6.1	2.3	5.7	2.0	5.5	1.9
1000					12.4	4.7			11.7	4.6	7.4	2.8	6.7	2.4	5.8	2.1
1250											9.1	3.5	8.0	2.9	6.2	2.2
1500											11.2	4.3	9.6	3.5	6.6	2.4
1750											13.6	5.3	11.5	4.2	7.2	2.6
2000											16.5	6.3	13.7	5.0	7.8	2.8
2500											23.3	8.9	18.9	7.0	9.4	3.4
3000															11.3	4.1

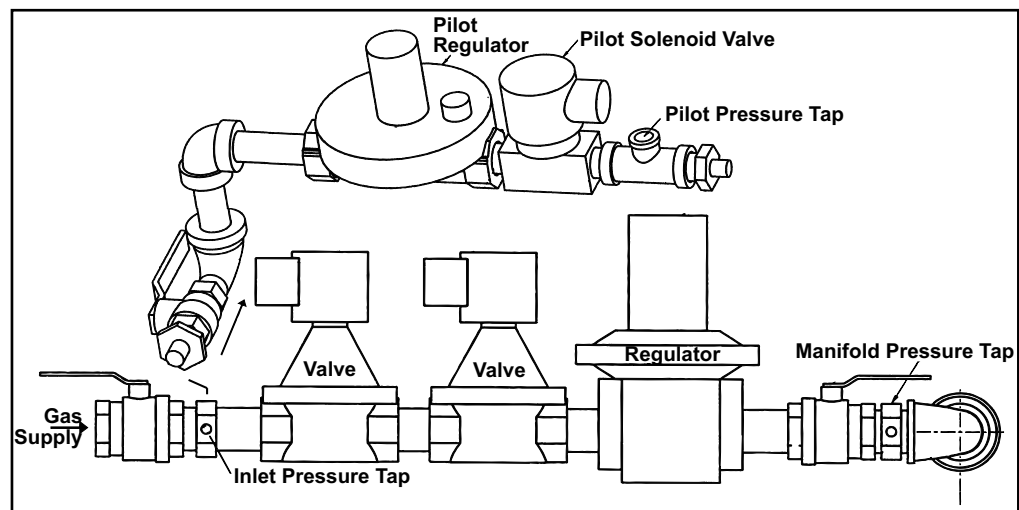
Pilot Supply Pressure

These systems are designed to operate on a natural gas pilot supply pressure of 3.5" w.c. or propane gas of 6.0" w.c. Measure both operating pressure and pilot supply pressure with the blower in operation.

Manifold Pressure

Manifold pressure is defined as the gas pressure as measured at the burner pressure tap. Measure manifold gas pressure with the blowers operating. Minimum gas pressure at the burner is typically 4.3" w.c. for natural gas or typically 1.5" w.c. for propane gas. High gas pressure switches included in the gas train monitor gas pressure downstream

FIGURE 8 - Pressure Tap Locations for Measuring Manifold and Pilot Pressure



Gas Pressure Switches

from the safety valves. If the gas pressure at this point on a system equipped with a high gas pressure switch (standard with Manifolds BM 78, 79, 80, and 81 or Option BP2 with other manifolds) exceeds the setpoint, the switch will open the electrical circuit to the burner, stopping all gas flow. The high gas pressure switch is a manual reset device.

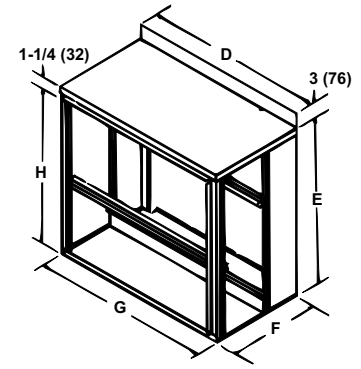
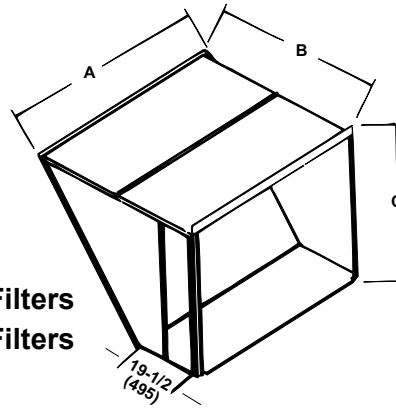
A low gas pressure switch (Option BP3) will shutoff the gas flow if the gas pressure drops below the setpoint of the low pressure switch. The low gas pressure switch will automatically reset when the gas pressure rises above the setpoint.

(NOTE: Model RDF units manufactured prior to April 1993 installed indoors with optional gas pressure switches require a 3/4" vent line to the outdoors. Beginning with units manufactured April 1993, the gas pressure switches incorporate a vent limiting device and do not require venting to the outdoors.)

6.2 Unit Inlet Air

6.2.1 Outside Air Hood or Indoor Filter Cabinet

FIGURE 9 - Dimensions and Weights



Option AS2, Outside Air Hood
 Option AS6, Outside Air Hood with 1" Filters
 Option AS7, Outside Air Hood with 2" Filters

Option AW3, Indoor Filter Cabinet with 1" Filters
 Option AW6, Indoor Filter Cabinet with 2" Filters

Dimensions						
Size	1-20, 1-40, 1-50, 1-65		2-80, 2-120		3-180, 3-260	
	inches	mm	inches	mm	inches	mm
A	38	965	62	1575	74-1/4	1886
B	55	1397	54	1372	64	1626
C	36	914	47-1/2	1207	61-3/8	1559
D	35-9/16	903	59-9/16	1513	71-9/16	1818
E	33-1/8	841	44-5/8	1133	58-1/2	1486
F	19-1/2	495	19-1/2	495	19-1/2	495
G (Duct Connection)	32-15/16	837	56-15/16	1446	69-3/8	1762
H (Duct Connection)	30-3/8	772	41-7/8	1064	57-7/16	1459

Weights and Filter Sizes													
Model Sizes	Filtr Qty	AS6, AW3	AS7, AW6	AS2		AS6		AS7		AW3		AW6	
		Filter Size		lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg
1-20, 1-40, 1-50, 1-65	3	12x35x1	12x35x2	225	102	250	113	270	122	100	45	120	54
2-80, 2-120	4	12x35x1	12x35x2	310	141	350	159	380	172	150	68	180	82
	4	12x24x1	12x24x2										
3-180, 3-260	12	12x35x1	12x35x2	400	181	450	204	490	222	200	91	240	109

Installation Instructions for Optional Screened Air Hood for Outdoor Units (Options AS2, AS6, AS7) and Filter Sections for Indoor Units (Options AW3, AW6)

CAUTION: It is recommended that the inlet to the outside air hood NOT be facing into prevailing wind.

All of these air inlet accessories are designed to be attached directly to the system cabinet. To prevent damage, it is recommended that the system be set in its permanent location before installing the air hood or filter cabinet option. All are shipped separately; installation requirements depend on the size (see below).

Provide a minimum of 14" (356mm) clearance from the bottom of the air hood to the mounting surface.

Hood and Filter Cabinet Options by ITEM and Application				
Item	Options	Description	For Sizes	Installation Requirements
1	AS2, AS6, AS7	Outdoor Screened Air Hood with & without filters	1-20, 1-40, 1-50, 1-65, 2-80, 2-120	Factory Assembled; Field Installed - Follow instructions below.
2	AS2, AS6, AS7	Outdoor Screened Air Hood with & without filters	3-180, 3-260	Field Assembled and Installed - Follow instructions pages 12 to 15.
3	AW3, AW6	Indoor Filter Cabinet with Filters	All	Factory Assembled; Field Installed - Follow instructions below.

Installation STEPS for ITEMS 1 and 3 in the Table above - Refer to FIGURE 10.

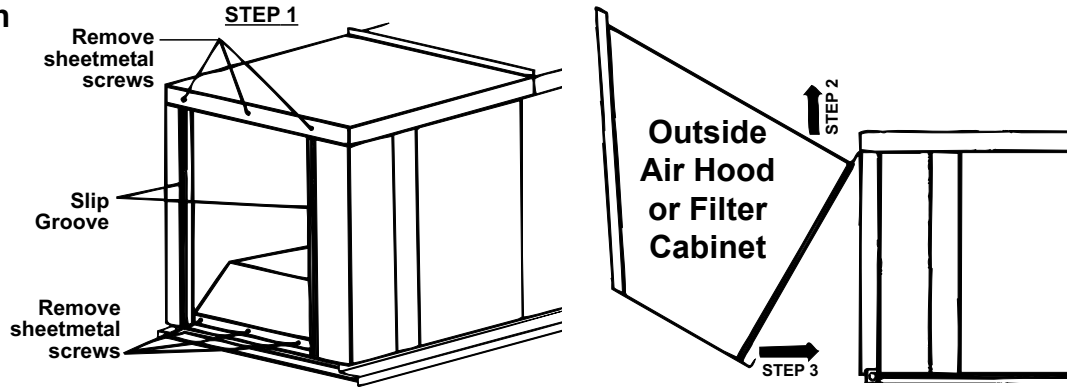
- 1) Remove the sheetmetal screws from the bottom rear inset and across the top rear of the cabinet.
- 2) Align edges of assembly to the slip grooves. Slide top edge of assembly under the lip formed by the top rear of the cabinet.
- 3) Rotate the inlet assembly so that it fits into the recess across the bottom of the cabinet. Replace all screws removed in Step 1.
- 4) If the system has filters with an optional dirty filter light, follow the instructions beginning on page 18 to attach the sensing tubes.

6.0 Mechanical (cont'd)

6.2 Unit Inlet Air (cont'd)

6.2.1 Outside Air Hood or Indoor Filter Cabinet (cont'd)

FIGURE 10 - Attach factory assembled Cabinet or Hood



Assembly and Installation Instructions for ITEM 2 in the Table on page 11 - Refer to FIGURES 11A-11N.

Option AS2, Outdoor Screened Air Hood without Filters - Pkg P/N 71150

Option AS6, Outdoor Screened Air Hood with 1" Filters - Pkg P/N 71152

Option AS7, Outdoor Screened Air Hood with 2" Filters - Pkg P/N 72627

Option Components (qty in parenthesis)	AS2	AS6	AS7
Top of Inlet Hood Cabinet Section		(1) 91575	
Top of Inlet Hood		(1) 91576	
Clamp for Top Seam (Hood to Cabinet)		(1) 91577	
Bottom of Hood Cabinet Section		(1) 91567	
Supports (2 pieces per leg)		(6) 91581	
Left Side of Hood		(1) 91568	
Right Side of Hood		(1) 91569	
Intermediate Posts - Cabinet Section		(2) 91578	
Rt/Lft Corner Post - Cabinet Section		(2) 91579	
Doors (Filter Access on AS6 and AS7)		(2) 91585	
Center Louver Top/Bottom Supports		(2) 91582	
Factory-assembled Louver Sections w/Screen		(2) 113003	
Top and Bottom Filter Channels	N/A	(2) 91580	(2) 94224
Pre-assembled Center Filter Channels	N/A	(5) 91586	(5) 94223
Top/Btm Filter Block Off Plate	N/A	(2) 91584	(2) 98764
Filter Block Off Sections	N/A	(6) 263784	(5) 263784
Permanent Filters	N/A	(12) 1", 87251	(10) 2", 94383
Sheetmetal Screws #10 x 1/2" long		(100) 11813	
Screws 1/4-20 x 5/8" long (bolt type)		(15) 10393	
Hex Nuts 1/4-20 (Keps)		(15) 7328	
Sheetmetal Screws #14-110 x 3/4" long		(3) 41463	
J Type Clip-On Nut		(5) 1849	

1. **Screened Air Inlet Hoods with Filters** (Options AS6 and AS7 for Sizes 3-180, 3-260) - Build filter racks and cabinet section; **follow all Steps**.

Screened Air Inlet Hood without Filters (Option AS2 for Sizes 3-180, 3-260) - Build cabinet section; skip Steps 1A, 1B, and 1C. **Start with Step 1D** ignoring filter rack illustrations.

Step 1A - Assemble Inner Side of Filter Rack

(Applies to Options AS6 and AS7 only; for Option AS2 without filters, proceed to Step 1D)

Parts Required -- Right corner post, left corner post, three of the five pre-assembled center filter channels, and twelve 1/2" long screws

Corner posts come with two sets of holes.

For 1" filters (Option AS6), attach the three filter channel assemblies using the holes in the corner posts closest to the inside.

For 2" filters (Option AS7), attach the three filter channel assemblies using the holes in the corner posts closest to the outside edge.

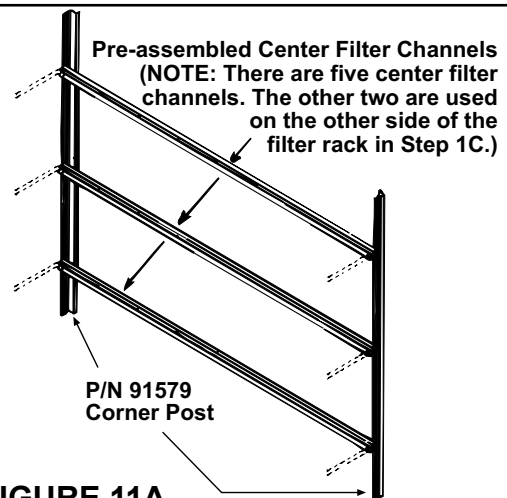
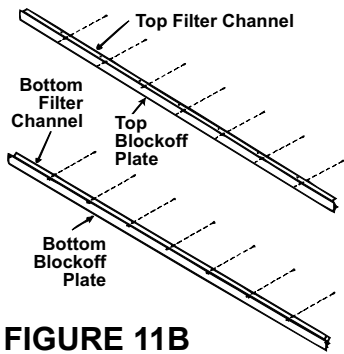


FIGURE 11A



Step 1 B - Sub-assemble Top and Bottom Filter Channels and Filter Blockoff Plates (AS6 & AS7)

Parts Required - Top and bottom filter channel; top and bottom filter blockoff plates; and 14 screws (1/2" long)

Assemble the top blockoff plate and the top filter channel being sure the filter channel groove is on the same side as the 90° bend in the blockoff plate but directed away from it. Use seven screws to attach the top blockoff plate to the top filter channel. Repeat the process with the bottom filter channel and bottom blockoff plate.

FIGURE 11B

Step 1C - Assemble Outer Side of Filter Rack (Options AS6 and AS7 only)

Parts Required - Two intermediate posts; two remaining pre-assembled center filter channels; the top and bottom filter channel/blockoff plate assemblies from Step 1B; and 12 sheetmetal screws (1/2" long)

For 1" filters (Option AS6), attach the channel assemblies to the holes closest to the inside of the intermediate posts.

For 2" filters (Option AS7), attach the channel assemblies to the holes closest to the outside edge of the posts.

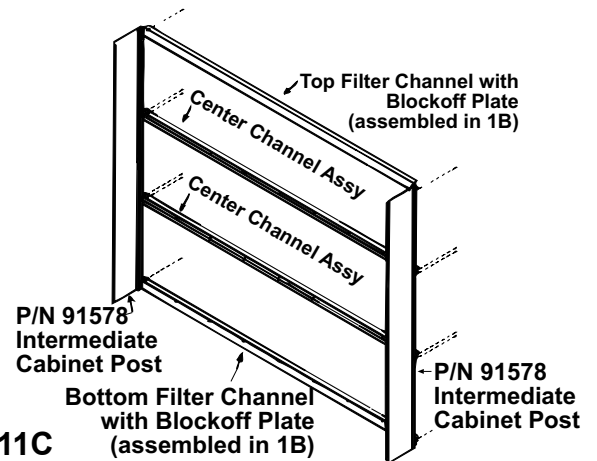


FIGURE 11C

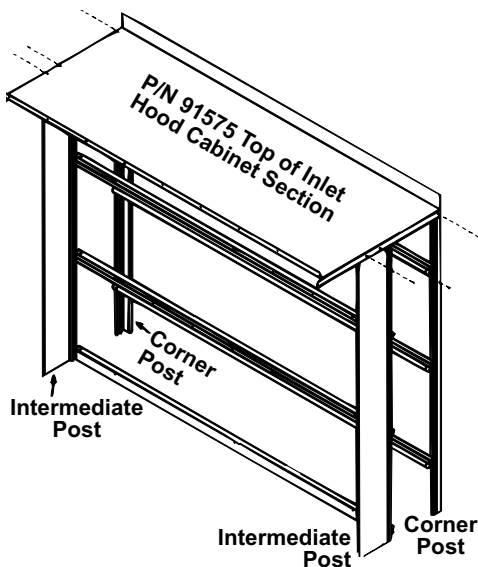


FIGURE 11D

Step 1D - Attach Cabinet Section To Corner Posts and Intermediate Posts (Options AS2, AS6, AS7)

Parts Required - Cabinet top; the two corner cabinet posts (if inlet hood with filters, posts will be sub-assembled to filter channels - Step 1A) (if AS2 with no filters, ignore illustrated filter rack); the two intermediate cabinet posts (if inlet hood with filters, posts will be sub-assembled to filter channels - Step 1C); and six 1/2" long sheetmetal screws. Attach cabinet section top to the four posts as illustrated.

Step 1E - Attach Cabinet Section Bottom

Parts Required - Subassembly from Step 1D; cabinet section bottom; and six 1/2" sheetmetal screws.

Position the cabinet section bottom to the inside of the four posts (corners). Attach as illustrated.

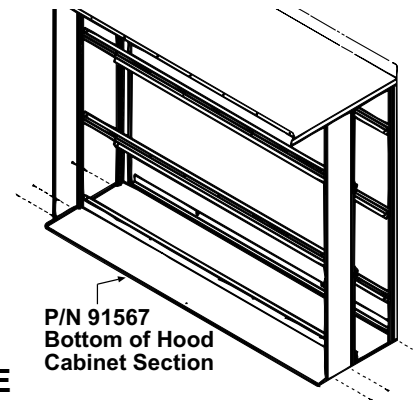


FIGURE 11E

2. Assemble and Install Support Legs

Step 2A - Sub-assemble Legs

Parts Required - Six support leg halves and six 5/8" bolts and nuts

Assemble support legs as illustrated. Adjust legs to shortest length and tighten bolts finger tight. Length of supports will be re-adjusted to suit the application after cabinet is installed.

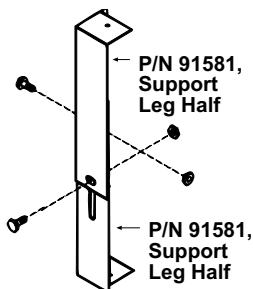


FIGURE 11F

Step 2B - Install Support Legs

Parts Required - Three sub-assembled legs and three 3/4" sheetmetal screws

Attach leg assemblies to cabinet bottom.

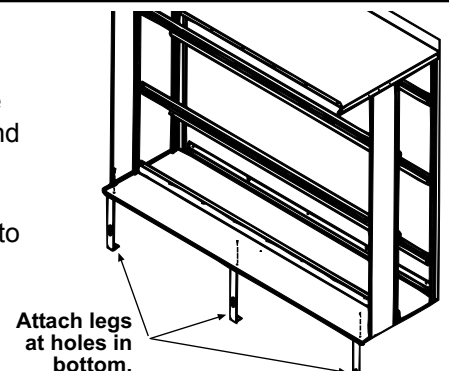


FIGURE 11G

**6.0 Mechanical
(cont'd)
6.2 Unit Inlet Air
(cont'd)**

**6.2.1 Outside Air Hood or Indoor Filter Cabinet (cont'd)
Assembly and Installation Instructions for ITEM 2 in the Table on
page 11 (cont'd)**

3. Attach Assembled Cabinet Section

Step 3 - Attach Filter Cabinet to System

On the air inlet opening side of the system cabinet, remove the sheetmetal screws from the bottom rear inset and the screws across the top edge.

Align the edges of the inlet hood cabinet section with the grooves in the system cabinet. Slide top edge of the inlet hood cabinet section underneath the edge of the system cabinet top.

Rotate the assembly so that it fits into the recess across the bottom of the cabinet opening. Attach by replacing the two corner screws and one center screw across the top, the three screws across the bottom, and one halfway up on each side as illustrated.

Adjust the support legs to the appropriate height and tighten bolts securely.

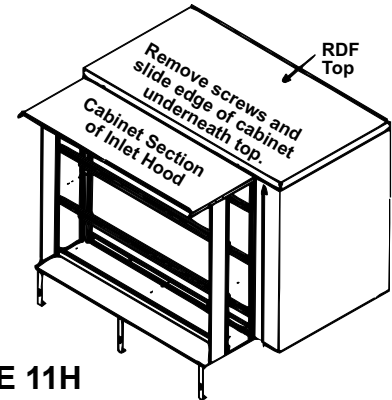


FIGURE 11H

4. Assemble Air Inlet Hood Section

Step 4A - Attach Hood Sides

Parts Required - Right and left triangular shaped sides and 18 sheetmetal screws (1/2" long)

Attach the sides to the intermediate posts and bottom panel of the installed cabinet section.

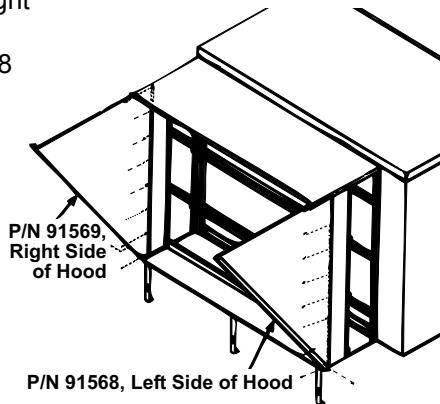


FIGURE 11J

Step 4B - Attach Hood Section Top

Parts Required - Hood section top and ten 1/2" long screws

Attach hood section top as illustrated.

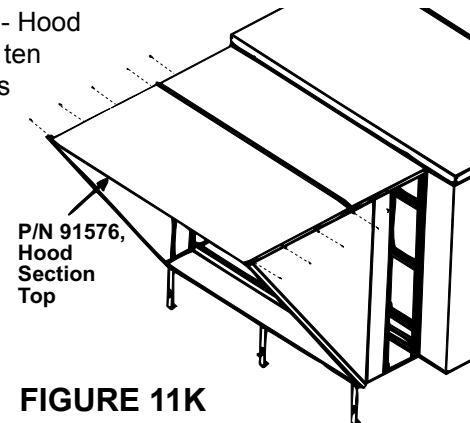


FIGURE 11K

Step 4C - Install Top Clamp

Parts Required - Top clamp and nine 5/8" long screws (bolt type) and nuts

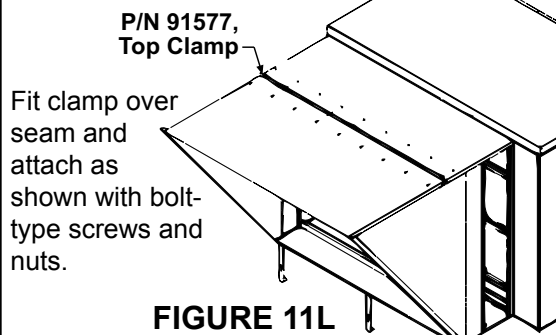


FIGURE 11L

Step 4D - Install Center Louver Supports

Parts Required - Center louver supports and four 1/2" long screws

At the holes in the center of the top and bottom of the hood, use the screws to attach the center louver supports inside the hood.

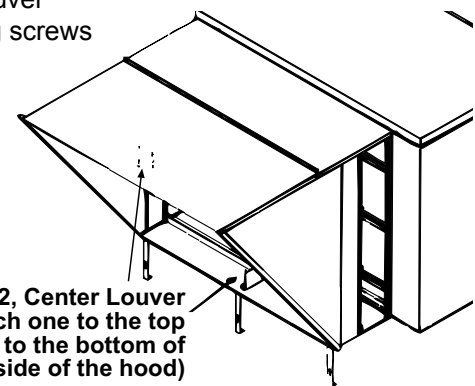


FIGURE 11M

Step 4E - Install Louvers

Parts Required - Two factory-assembled louver sections; 19 screws (1/2" long); and five Tinnerman clips

Position one louver section in the left side of the hood; attach it to the hood side and the center supports. Install the other louver section in the right side. In the center, join the two louver sections with five screws and clips.

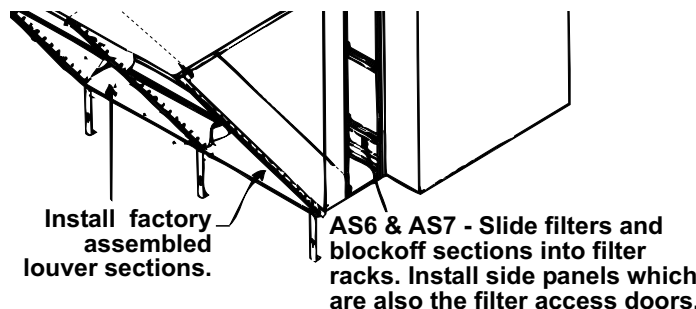


FIGURE 11N

Step 5. - Install Filters, Block Off Sections and Door Panels

On hoods with filters, position filters and blockoffs on filter racks.

If the system has an optional dirty filter switch, follow the instructions on page 19 to connect the sensing tubes. Slide the "door" panels into position on each side of the cabinet section. Fasten each panel with two 1/2" long screws.

6.2.2 Evaporative Cooling Module

If installing an evaporative cooling module, it is shipped separately. Follow the instructions in the manual with the evaporative cooling module.

6.3 Supply Air Discharge

Distribution of Makeup Air

Makeup air can be introduced to the building either through distribution ducts or through controlled pressurization with little or no ductwork. Makeup air should be introduced and maintained using the lowest possible air velocity. With ductwork distribution, this is accomplished using a multiplicity of discharge openings over the greatest centerline distance. When a makeup air system is automatically controlled to maintain a set building pressure, the entering air will travel naturally toward the relief areas at the perimeter walls using the building structure as the distribution ductwork.

Makeup air should enter at the highest point practical. By doing this, the fresh air will entrain dust laden air at the ceiling and move it toward the point of exhaust. Also, fresh air directed downward from the roof or ceiling will mix with hot ceiling air resulting in improved distribution of heat in the building.

Always introduce fresh makeup air so that it moves across the greatest distance within the room or building before reaching an exhaust.

Proper sizing of warm air ductwork is necessary to ensure a satisfactory heating installation. The recognized authority for such information is the Air Conditioning Contractors Association, 1228 17th Street, N.W., Washington, DC 20036. A manual covering duct sizing in detail may be purchased directly from them.

- The type of duct installation depends in part on the type of construction of the roof (wood joist, steelbar joist, steel truss, pre-cast concrete, etc.) and the ceiling (hung, flush, etc.).
- Rectangular ducts should be constructed of not lighter than No. 26 U.S. gauge galvanized iron or No. 24 B&S gauge aluminum.
- All duct sections 24" or wider, and over 48" in length, should be cross-broken on top and bottom and have seams or angle-iron braces. Joints should be S and drive strip or locked.
- Warm air ducts should not contact masonry walls. Insulate around all air ducts through masonry walls with not less than 1/2" of insulation.
- Insulate all exposed warm air ducts passing through an unheated space with at least 1/2" thickness of insulation.
- Duct Supports** - Suspend all ducts securely from adjacent building members. Do not support ducts from unit duct connections.
- Duct Connections** - At the heater, use a flexible canvas connection on indoor units to eliminate vibration transmission.
On outdoor roof curb, down discharge connections, either drop an appropriate sized and flanged duct into the roof curb prior to setting the unit or attach ductwork to the bottom flange (using curb dividers as ductwork). If dropping ductwork from the top, it is recommended that the top perimeter be sealed above and below the added ductwork. Do not use screws. See ductwork connection locations and sizing, pages 7 and 8.

On outdoor horizontal installations, the ducts can be slid over the flange of the heater and then sealed for an airtight and watertight fit. On horizontal duct-to-heater connections and connections to the flanges at the bottom of the curb, use sheetmetal screws to fasten ducts to the heater flange.

Use stiffening flanges around the perimeter of all duct connections.

- Return Air Duct** - The return air duct **must be sized for a pressure drop of .5" w.c. at 2440 fpm in order to balance the system.** If not sized properly, there may be difficulty in obtaining the desired airflow over the burner when the return air damper is full open.

Sizing and Installation of Distribution Ductwork

(See **FIGURE 1**, page 4, for duct opening dimensions.)

6.0 Mechanical (cont'd)

FIGURE 12 - Belt Tension

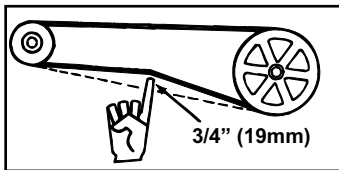
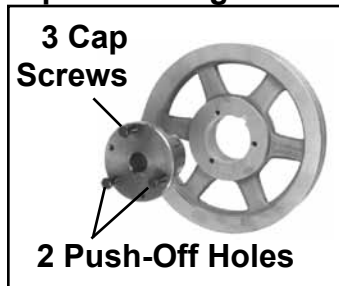


FIGURE 13 - Split Taper Bushing



6.4 Blowers, Drives, and Motors

Belt Tension - Check belt tension. Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. If adjustment is required, adjust belt tension by means of the adjusting screw on the motor base until the belt can be depressed 1/2" to 3/4" (**FIGURE 12**). Tighten the lock nut on the adjusting screw. Be sure the belt is aligned in the pulleys.

Motor and Belt Shipping Position for Sizes 2-80, 2-120, 3-180, 3-260 - To relieve tension on the motor mounting bracket, the belt(s) are taken off the motor and blower sheaves before shipping. The belt(s) are taped to the blower shaft to prevent loss or damage during shipment. Install the belt(s) and adjust for proper belt tension.

Blower Pulley - Size 2-80 and 2-120 systems equipped with 3 and 5 HP motors with a 15.4" diameter and larger blower pulley or a 7-1/2 HP and larger motor and all Size 3-180 and 3-260 systems are equipped with a split taper bushing in the blower pulley. The split taper bushings must be loosened in order to remove the pulley. Follow these instructions to loosen the bushing.

- 1) Notice that there are three cap screws in the bushing and two holes without screws, called push-off holes (See **FIGURE 13**).
- 2) Remove the three cap screws.
- 3) Put two of the cap screws into the two push-off holes. Tighten these two screws evenly until the pulley is loosened.
- 4) Pulley may now be removed from the shaft.

Blower Speed Adjustment - Units are set at the factory for the RPM required to meet the CFM and external static pressure specified on the order. If the estimated external static is incorrect, or changes are made to the duct system, the blower RPM may have to be changed. Motors are equipped with adjustable pitch pulleys which permit adjustment of blower speed. Instructions are included in Paragraph 9.0, Check-Test-Start for adjusting blower speed.

Blower Rotation - Each blower housing is marked for proper rotation. Instructions for checking blower rotation are included in the startup procedures in Paragraph 9.0.

Motor Loads - Use an ammeter to check motor amps. Amps may be adjusted downward by reducing blower RPM or by increasing duct system static pressure. For accurate amps, read the motor manufacturer's rating plate; amps will vary depending upon motor manufacturer. The chart below can be used for sizing line wiring.

Blower Motor Full Load Amps (open motors)						
Motor HP	115V/1	230V/1	208V/3	230V/3	460V/3	575V/3
1/2	9.8	4.9	2.2	2.0	1.0	N/A
3/4	13.8	6.9	3.1	2.8	1.4	N/A
1	16.0	8.0	4.1	3.6	1.8	1.4
1.5	N/A	10.0	5.75	5.2	2.6	2.0
2	N/A	N/A	7.5	6.8	3.4	2.4
3	N/A	N/A	10.6	9.6	4.8	3.6
5	N/A	N/A	16.8	15.2	7.6	5.4
7.5	N/A	N/A	21.0	19.0	9.5	8.4
10	N/A	N/A	29.0	25.2	12.6	10.4
15	N/A	N/A	42.0	40.0	20.0	16.0
20	N/A	N/A	53.0	50.0	25.0	20.0
25	N/A	N/A	66.0	63.0	31.5	26.0
30	N/A	N/A	78.0	74.0	37.0	28.5

CAUTION: The motor amp chart lists full load amp requirement of standard motor and standard controls. Optional controls will increase amp requirement. Add motor amps and control amps for approximate unit full load amps. System FLA is shown on the rating plate.

7.0 Electrical Supply and Wiring

All electrical wiring and connections including electrical grounding MUST be completed in accordance with local, state and national codes and regulations and with the National Electric Code (ANSI/NFPA 70) or in Canada the Canadian Electrical Code Part 1 C.S.A. C.22.1.

Run a separate line voltage supply directly from the building electrical panel to the disconnect switch for the system. All external wiring must be within approved conduit and have a minimum temperature rise rating of 60°C. For motor load amps, see Paragraph 6.4 or check the motor nameplate. System FLA is on the rating plate.

Specific wiring diagrams and complete instructions are packed with each unit and should be kept readily accessible in legible condition.

Wire Gauge - 100 ft (30M) maximum								
Full Load Amps	5	10	15	20	25	30	35	40
Wire Gauge	14	14	12	10	8	8	6	6

CAUTION: If any of the original wire in the unit must be replaced, the replacement wire must have a temperature rating of at least 105°C except for controls mounted in the discharge airstream which must be 150°C. See Hazard Levels, page 2.

Disconnect Switch

A safety disconnect is required. Refer to **FIGURE 14** for recommended location and install the disconnect switch in accordance with Article 430 of the National Electrical Code ANSI/NFPA 70 or in accordance with Canadian Electrical Code Part 1-C.S.A. Standard C22.1. When attaching the disconnect switch to the heater, use hardware with "teeth" to provide electrical grounding. The "teeth" should face the disconnect switch, scratching off the painted surface. Attach the disconnect tightly against the heater cabinet. Run cable so that it does not interfere with cabinet panels or doors. When providing or replacing fuses in a fusible disconnect switch, use dual element time delay fuses and size according to 1.25 times the maximum total input amps.

Convenience Outlet Option

When a convenience outlet option is included, an individual power supply must be provided to the receptacle. This circuit MUST BE on a ground fault breaker to meet requirements. All wiring to the convenience outlet must meet National Electrical Code ANSI/NFPA No. 70 (latest edition) or the Canadian Electrical Code Part 1-C.S.A. Standard C22.1. and any local or utility codes that may apply.

Control Wiring

A 7/8" diameter opening suitable for watertight conduit connection is provided as the entrance of 24-volt control wiring to the electrical compartment. For location, see **FIGURE 14**, page 18. Low voltage wiring must be in individual conduit, separated from primary high voltage wiring.

Volts	Wire Gauge	Total Wire Length	Distance from Unit to Control
Control Wiring Maximum Lengths (ft)			
24	18	150	75
24	16	250	125
24	14	350	175
Control Wiring Maximum Lengths (M)			
24	18	45.7	22.9
24	16	76.2	38.1
24	14	106.7	53.3

CAUTION: Supply voltage and 24-volt control wiring cannot be installed in the same conduit. Maxitrol systems will be adversely affected if control wiring is in conduit with supply voltage wiring. If required, field-supplied wiring between any Maxitrol components must be completed with shielded wiring.

A 3-position control switch mounted in a 4x4 box is supplied with each system (exception - not included with systems with Option AG37 designed for computer control), either packed loose inside the unit, or if an optional control console (Option RC13 or RC14; See **FIGURE 15**) is ordered, the switch is mounted on the console.

Control wiring requirements depend on the options selected. Follow the custom wiring diagram supplied with the system to connect any remote controls. In this paragraph,

7.0 Electrical Supply and Wiring (cont'd)

Control Wiring (cont'd)

there is a brief description of the optional electrical controls used for airflow. Refer to the operation manual, Form O-ADF/RDF, for additional control information.

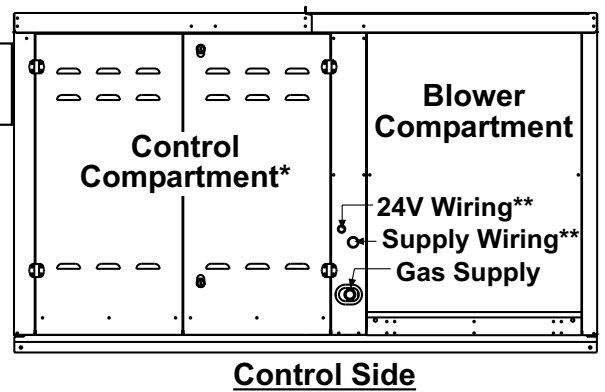
FIGURE 14 - Location of Gas Connection, Electrical Supply Connection, and Control Wiring Connections on RDF Series 3 Direct-Fired Systems

NOTES:

* RDF-2 and RDF-3 Series 3 systems have double hinged doors as illustrated. Control compartment on RDF-1 Series 3 systems has a single hinged door.

** Configuration shown is for RDF-2 and RDF-3 Series 3. The supply connection on the RDF-1 Series 3 systems is above the control wiring connection.

Disconnect Switch Location



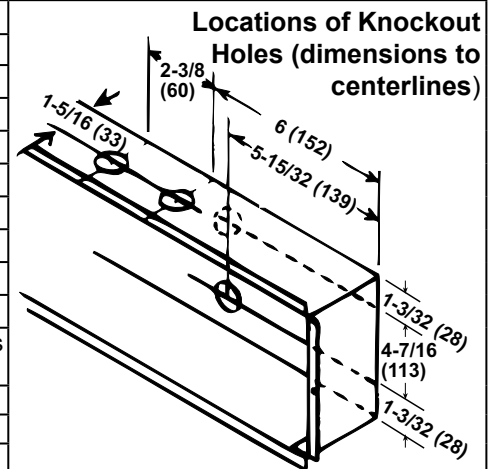
Remote Console

If ordered, the optional remote console is shipped separately. Remote consoles include terminal blocks for wiring. Depending on what gas control or inlet air options were ordered, the console could include a temperature selector and/or a potentiometer. If a dirty filter switch is ordered the indicator light is on the console. See FIGURE 15 for console size.

FIGURE 15 - Remote Console Dimensions

Technical Data of the Remote Console (Variations depend on options selected; consult custom wiring diagram for controls and to determine wiring required.)

Control Switch	Qty of Lights*	Temperature Selector**	Potentiometer***	Dimensions - inches (mm)		
				L****	H****	D
Yes	3	Yes	No	10-3/4 (273)	7-5/8 (194)	2-5/8 (67)
Yes	3	No	No	10-3/4 (273)	7-5/8 (194)	2-5/8 (67)
Yes	3	Yes	Yes	15-3/4 (400)	7-5/8 (194)	2-5/8 (67)
Yes	3	No	Yes	10-3/4 (273)	7-5/8 (194)	2-5/8 (67)
Yes	4	Yes	No	15-3/4 (400)	7-5/8 (194)	2-5/8 (67)
Yes	4	No	Yes	15-3/4 (400)	7-5/8 (194)	2-5/8 (67)
Yes	4	Yes	Yes	15-3/4 (400)	7-5/8 (194)	2-5/8 (67)
Yes	4	No	No	15-3/4 (400)	7-5/8 (194)	2-5/8 (67)



* 3 - Blower On, Burner On, and Safety Lockout on both RC13 and RC14; 4th light is Dirty Filter Indicator on Option RC14 only

** On the console with Gas Control Options AG 31, 32, 33, 47, or 48

*** On the console with Air Control Options AR19 or AR22

**** Subtract 1" (25mm) when recessing

FIGURE 16 - Option RC14 with Dirty Filter Light and Potentiometer



Dirty Filter Light

When a console with a dirty filter indicator is selected, the remote console includes a fourth light (dirty filter indicator light). The light is activated by an adjustable, single-pole/normally open differential pressure switch that senses air pressure across the filter bank. There are field-installation procedures that must be done for the proper operation of the dirty filter indicator light.

Dirty Filter Light Installation Instructions

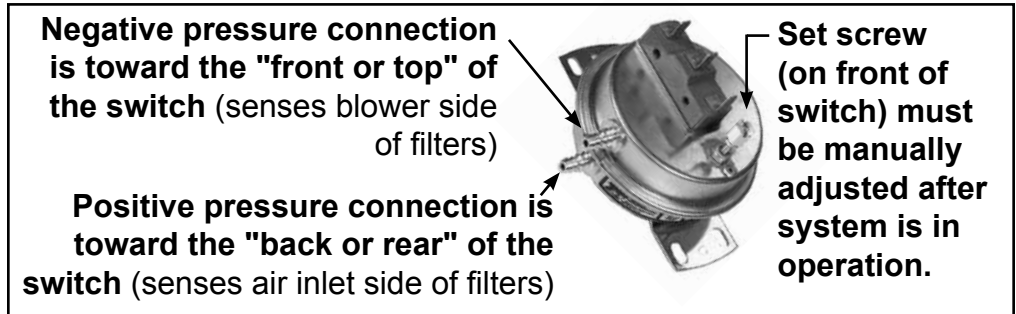
- **Before the system is operating**, connect the sensing tubes from the switch to their sensing locations in the field-installed filter cabinet. (Cabinet installation instructions are in Paragraph 6.2.)
 - 1) Run the tubes through the holes in the cabinet wall. Pull gently to extend the tubing to its entire length without stress.
 - 2) Position the tubing approximately at the center of the height of the filter rack.
 - 3) Identify the tube connected to the positive connection on the switch (**FIGURE 17**) as the positive pressure tube. Determine the length of tubing required to attach the **positive pressure tube so that it will sense pressure at the inlet side** of the filter rack. Identify the tube connected to the negative connection on the switch (**FIGURE 17**) as the negative pressure tube. Determine the length of tubing required to

attach the **negative pressure tube so that it will sense the pressure at the blower side** of the filter rack.

(NOTE: Tubing shipped is the same length for all sizes of systems; cut to the appropriate length for the smaller systems.)

- 4) If required, cut the tubing to the proper lengths. Using the clamps provided, attach the ends of the tubing to the filter rack at about center height being careful not to kink or compress the tubing.

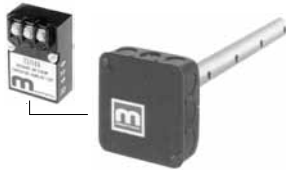
FIGURE 17 - Dirty Filter Pressure Switch



- **After the system is operating, the filter switch must be manually set.** With clean filters in place, blower doors closed, and blower in operation, increase the pressure setting by adjusting the set screw on the switch clockwise until the filter light is energized or the screw is bottomed out. At that point, adjust the set screw three full turns counterclockwise or until the screw is top ended. At that setpoint, the filter light will be activated at approximately 50% filter blockage.

8.0 Controls

FIGURE 18 - Discharge Sensor and Mixing Tube



Discharge Sensor (Maxitrol) for Gas Control Options AG30, AG31, AG32, AG33, AG47, AG48 - A discharge sensor may be shipped separately for field installation. Attach the discharge sensor and mixing tube in the ductwork about six feet (1.8 M) from the discharge opening of the system.

The sensor housing is not waterproof. If the installation is outdoors, field-fabricate a waterproof protective enclosure for the discharge sensor, being careful not to affect its air temperature sensing capability. If the ductwork is insulated, be sure that the sensing bulb is mounted so that it is fully exposed to the airstream being sensed.

Refer to the wiring diagram and connect the sensor to the terminal strip in the blower section electrical box. Use shielded wire to alleviate any electrical interference that may cause an erroneous discharge temperature reading.

FIGURE 19 - Control used for Outside Air Cutoff and Discharge Temperature Low Limit (Freezestat)



Outside Air Cutoff Control (Option BN2) - After sensing pilot flame, the burner ignites at its lowest input rate. The "amount of heat" required to reach the desired discharge temperature also depends on the temperature of the incoming outside air. The outside air cutoff (high ambient control) is factory set at 60°F (adjustable 25-250°F). The burner reacts differently depending on the entering air temperature and the setting on this control. The burner --

- may not ignite (pilot valve will not open);
 - If the actual temperature of the outside air is above the setpoint on the outside air control, the burner will not ignite.
- may modulate to satisfy discharge setting;
- would shutdown completely only on Option BN2 control, once burner has been fired; or
 - Modulating operation will depend on the temperature rise between the outside air and the discharge air setting.
- may remain on continuous low fire.
 - If the outside air control is set too high, the burner will continuously burn on low fire as long as the control switch is set to "winter".

When the outside air control is set properly for the climate, the system blower will continue to provide the required makeup air (ventilation) at the ambient outdoor temperature (burner not operating) even when the control switch is set to "winter".

If at startup, it is determined that the outside air cutoff control is not set properly, change the setting on the control (located in the main electrical compartment) and test for proper operation.

8.0 Controls (cont'd)

**FIGURE 20 -
Optional
Door Switch**



**FIGURE 21 -
Optional
Firestat**



**FIGURE 22 -
Optional
Potentiometer**



**FIGURE 23 -
Pressure Null
Switch**



Installation Instructions for Pressure Null Switch (See FIGURE 24):

Discharge Temperature Low Limit (Option BE2) - If the system has an optional low limit switch for discharge temperature (freezestat), the control is in the blower section electrical box. The sensing bulb must be field-mounted in the blower discharge duct connector. Uncoil the control and extend the bulb to the blower discharge, being careful to not interfere with any mechanical parts. Use the bulb holder provided and mount the sensor according to the manufacturer's instructions.

Door Switch (Option BX1) - If the system is to be used as an overhead door heater, an optional door switch (Option BX1) must be installed. The function of the switch is to energize and interlock the system when an outside overhead door reaches approximately 80% of full open travel. The switch will de-energize the system when the overhead door closes approximately 20%. Follow the installation instructions in the door switch option package and the wiring diagram.

Firestat (Option BD2) - If the system has an optional firestat, the control is factory installed in the heated airstream so that the sensor can be extended into the duct. The firestat requires manual reset and is installed in an accessible location.

Optional Potentiometer (applies to systems with Air Control Option AR19 for makeup air only or AR22 for outside and recirculation air)

- If the system includes Air Control Option AR19, the discharge damper is controlled by a manually set potentiometer. If the system includes Air Control Option AR22, the potentiometer controls the return air damper. The potentiometer is shipped loose in the control compartment, or if a remote console is ordered, it is mounted on the console. Follow the wiring diagram to connect the potentiometer.

Optional Pressure Null Switch (applies to systems with Air Control Option AR20 for makeup air only or AR23 for outside and recirculation air)

- If the system includes Air Control Option AR20, the discharge damper is controlled by a pressure null switch. If the system includes Air Control Option AR23, the pressure null switch controls the return air damper. The pressure null switch is shipped in the control cabinet. Refer to the following paragraphs and to the manufacturer's installation instructions to install and connect this switch.

The pressure null switch is Dwyer #1460-0 with a range of .01-.12" w.c. The pressure null switch is a diaphragm operated differential pressure switch used in makeup air applications to control building pressure. It maintains a selected positive or negative pressure setpoint by changing the amount of outside air being introduced to the building through the modulating outside air dampers. As more pressure is required in the building, the pressure null switch activates the damper motor driving the outside air damper towards the full open position and the recirculated air damper towards the closed position. Conversely, as less pressure is required, the switch drives the dampers in the opposite direction.

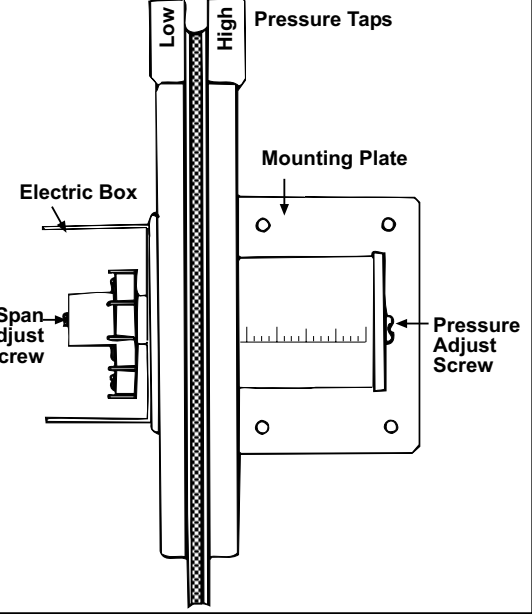
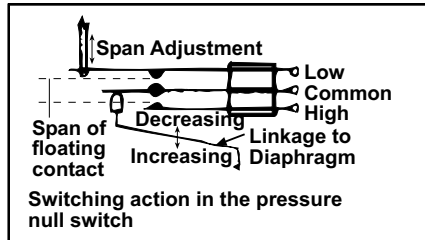
Select an indoor location free from excessive vibration where oil or water will not drip on the switch and where ambient temperature will be within a range of -30°F (dry air) to 110°F.

Mount the switch with the diaphragm in a vertical plane. The switch is position sensitive and is calibrated to operate properly when the diaphragm is vertical. Mount switch securely.

Connect the pressure taps on the top of the switch to sources of air pressure differential. Metal tubing with 1/4" O.D. is recommended but any tubing which will not unduly restrict the airflow can be used. To maintain a positive building pressure, vent the low pressure tap to the outdoors and allow the high pressure tap to monitor building pressure. To maintain a negative building pressure, reverse the functions of the high and low pressure taps. In either case, be sure that the outdoor vent is protected from the wind and screened from insects.

Adjustment of the Switch - The "high" actuation point of the null switch is indicated on a calibrated scale secured to the transparent range screw enclosure. Building pressure is set by turning the adjustment screw. The "low" actuation point is set by adjusting the span on the null by turning the span adjustment screw. The span range is .01 - .03" w.c.

FIGURE 24 - Pressure Null Switch included in Air Control Options AR20 and AR23



IMPORTANT: To eliminate shipping damage to the switch contacts, the manufacturer reduced the span adjustment to zero before shipping. The span should be adjusted prior to using the switch. (If the switch has been installed, disconnect the vent tube so that the null switch is in a neutral position.) Remove the switch electrical box cover and while observing the contacts, turn the span adjustment screw slowly in a clockwise direction. Continue turning the adjustment screw until you are able to see gaps between the common and both the low and high contacts. A minimum gap provides the greatest sensitivity. The wider the gap, the lower the sensitivity.

FIGURE 25 - Photohelic Pressure Switch



Optional Photohelic Pressure Switch (applies to systems with Air Control Option AR36 for makeup air only or AR37 for outside and recirculation air) - If the system includes Air Control Option AR36, the discharge damper is controlled by a photohelic pressure switch. If the system includes Air Control Option AR37, the photohelic pressure switch controls the return air damper. The photohelic pressure switch is shipped separately.

The photohelic switch uses relays to control between high and low pressure setpoints. When the pressure changes, reaching either setpoint, the beam from an LED to the limiting phototransistor will be cut off by the helix-driven light shield. The resulting signal change is electronically amplified to actuate its DPDT slave relay and switching occurs. Pressure rating is 0" w.c. to .25" w.c.

Mount the switch with the scale vertical in a location where the ambient temperature is between 20° and 120°F. Pneumatic pressure sensing lines may be run any distance. Refer to the manufacturer's installation instructions and the wiring diagram to install and connect this switch.

FIGURE 26 - Signal Conditioner



Optional Field-Provided Computer Control (applies to systems with Air Control Option AR33 or AR34 and/or with Gas Control Option AG37 or AG51) - If the system includes Air Control Option AR33, the discharge damper is controlled by a field-supplied 0-10VDC or 4-20 milliamp signal. If the system includes Air Control Option AR34, the computer controls the return air damper. With AG37, the gas valve and burner modulation are controlled by the field-supplied computer signal. With AG51, the gas valve and burner modulation and outside air damper are controlled by the field-supplied computer signal.

Follow the signal conditioner manufacturer's instructions included with the system for connecting to the field-provided control.

Optional Photoelectric Duct Smoke Detector - If the system has an optional photoelectric air duct smoke detector, the control is shipped separately for field installation. The sensor must be field-mounted in the discharge duct and electrically connected in the blower section electrical box. Follow the manufacturer's instructions and the wiring diagram for mounting and connecting the control.

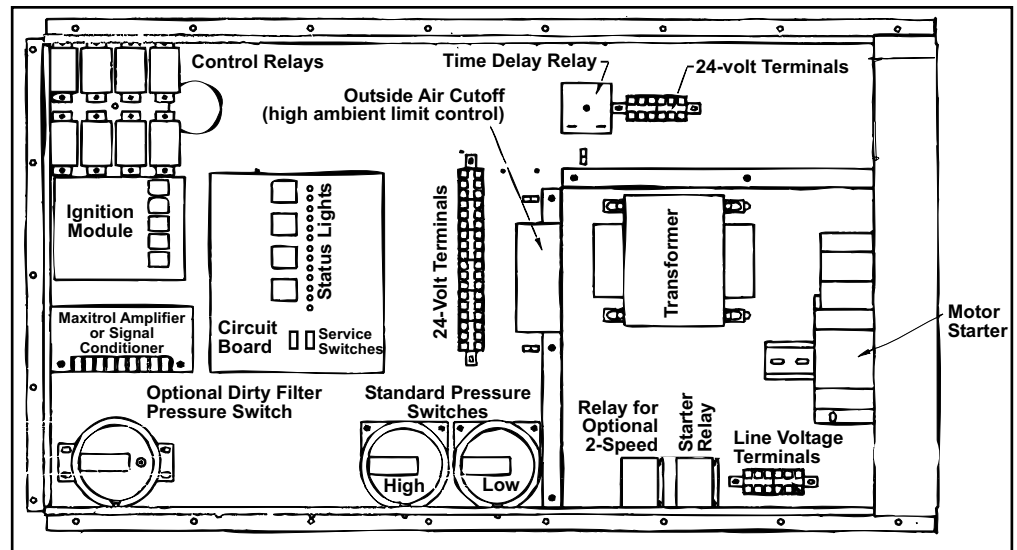
FIGURE 27 - Duct Smoke Detector (cover removed)



9.0 Check-Test Start

FIGURE 28 - Control Locations in the Electrical Compartment

(NOTE: Locations may not be identical, but controls should be similar.)



Check/Test/Startup Procedures (Follow Steps in Sequence)

IMPORTANT NOTE: These instructions are designed for systems manufactured beginning 8/2003 equipped with hot surface ignition and standard diagnostic lights. If the system being started was manufactured prior to 8/2003, contact your representative or the factory service department for appropriate startup procedures.

Before Startup

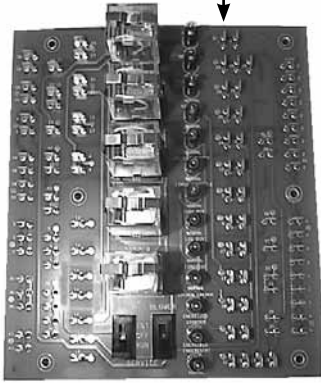
KEY to Check/Test/Startup Procedures:

- Procedure applies to all units.
- Procedure only applies to units with the optional component referred to in that procedure.

1. Check to be sure that all field-installed accessories are installed.
2. Check all field-installed wiring.
3. Check all ductwork for obstructions; open all diffusers.
4. Turn the three-position switch or optional summer/off/winter remote console switch to OFF position. To prevent someone from turning the system on, tape the switch leaving a note that it should be left in the OFF position.
5. If the system includes an air control with a remote potentiometer, set the position as follows::
 - Option AR19 (Variable Air Volume) - Turn full "open"
 - Option AR22 (Return Air) - Turn full "closed"
6. Check disconnect switch --
 - Turn disconnect switch OFF.
 - Check disconnect switch to be sure that it is tightly secured against the cabinet.
 - If disconnect is fusible, check that fuses are installed. If fuses are not installed, insert dual element time delay fuses sized 1.25 times the maximum total input amps. Verify continuity of fuses.
7. Open the hinged gas/electric control compartment door --
 - Close all manual gas valves.
 - Check all wiring and wiring connections on gas controls and electrical components.
 - If equipped with any manually reset devices such as an optional firestat limit switch, a high limit switch, and/or optional high gas pressure switch, reset devices. Check setpoint on the high ambient burner cutoff air control (60°F).
8. Open the hinged door to the blower compartment --
 - Remove any blocking and shipping supports.
 - Check that the blower belts are installed and have correct tension and that pulleys are in alignment and locked to the shaft (See Paragraph 6.4).
 - Inside the compartment, remove the cover from the limit switch junction box.
 - Reset manual limit switch.
 - Check wiring connections to limit switches, discharge air sensor, and motor.
 - Replace the junction box cover.
9. Turn ON gas supply valve and inlet manual shutoff valve on the manifold.
 - Leak test gas connections upstream of the electric gas valve. Be sure all connections are tight and leak tested. **WARNING: DO NOT TEST WITH OPEN FLAME.**
 - Turn OFF manual gas valves.
10. Turn blower service switch (Electrical Compartment, See **FIGURE 28**) to OFF position. If present, verify that damper test switch is in TEST position.

Startup

Diagnostic Lights



1. Prepare system for startup testing --

- Attach a slope gauge (0 to 1.0" scale) to the tubing connections in the control compartment. The two connections are located just left of the electrical box. Remove the caps on the 1/8" NPT test connections and attach the slope gauge. (The recommended method for attaching the slope gauge is to use field-supplied 1/8" female NPT x 1/4" OD barbed hose connections.)
- Connect a "U"-tube manometer to the main burner pressure tap.
- Check status lights (check at each step in the Startup procedure.)
Turn ON disconnect switch; "Circuit Control Power" light is lit; Turn OFF disconnect switch.
- Turn the disconnect switch **ON** and the blower service switch to **TEST** position. **"Control Switch Energized", "Starter Energized",** and if equipped with a freezestat, **"Freezestat"** lights are lit. After blower obtains normal speed, check for these lights - **"Outside Air Cutoff Normal"; "Low Air Pressure Normal", "Limit Controls Normal"; "High Air Pressure Normal";** and if equipped with options; **"Low Gas Pressure Normal";** and/or **"High Gas Pressure Normal".**
- Check for blower rotation. If the blower is turning backwards (see rotation arrows), do the following:
Turn the disconnect switch **OFF**
Single-phase units -- rewire motor per instructions on motor wiring plate
Three-phase units -- interchange any two motor leads at the contactor or starter
Turn disconnect switch **ON** and verify rotation.

2. Measure burner differential air pressure on the slope gauge installed in Preparation Step 1. With the blower operating, differential air should read between -.25" and -.75" w.c. If the slope gauge reading is not within the limits of these numbers, do one of the following:

If the slope gauge reading is greater than -.25" (such as -.10" w.c.), adjust the drive to increase the blower speed.

- (1) Turn disconnect switch OFF.
- (2) If equipped with a discharge damper, remove opposite side blower door panel.
Turn disconnect switch ON.
Check that discharge damper is full open by loosening or tightening the linkage.
Turn disconnect switch OFF.
Replace door panel.
Turn disconnect switch ON and recheck slope gauge.
Turn disconnect switch OFF.
- (3) If reading is still greater than -.25" w.c., adjust drive to increase fan RPM.
For systems with smaller than 7-1/2 HP motor
 - (a) Loosen belt tension and remove belt.
 - (b) Loosen the setscrew on the side of the pulley away from the motor.
 - (c) Turn adjustable half of the pulley inward to increase blower speed. One turn will change speed 8 to 10%.
 - (d) Tighten the setscrew on the flat portion of the pulley shaft.**For systems with 7-1/2 HP and larger motor**
 - (a) Slack off all belt tension by moving the motor toward driven shaft until the belts are free of grooves. For easiest adjustment, remove the belts from the grooves.
 - (b) On the outer locking ring, locate the two locking screws that are directly across from each other. Loosen, but do not remove, those two screws. Do not loosen any other screws.
 - (c) Adjust sheave to desired pitch diameter by turning the outer locking ring. One complete turn of the outer locking ring will result in .233" change in pitch diameter. To increase blower speed, decrease diameter. **CAUTION: Do not adjust sheaves in either direction to the point where moveable and stationary flanges are in contact.**
 - (d) Re-tighten the locking screws.

All Motor Sizes - Replace the belts and check belt tension. Be sure that belts are aligned in the pulley grooves and are not angled from pulley to pulley.

If the slope gauge reading is less than -.75" (such as -1.0" w.c.), adjust the drive to decrease the blower speed.

- (1) Turn disconnect switch OFF.
- (2) If equipped with a discharge damper, remove opposite side blower door panel.
Turn disconnect switch ON.
Check that discharge damper is full open by loosening or tightening the linkage.
Turn disconnect switch OFF.
Replace door panel.
Turn disconnect switch ON and recheck slope gauge.
Turn disconnect switch OFF.
- (3) If reading is still less than -.75" w.c., adjust drive to decrease fan RPM.
For systems with smaller than 7-1/2 HP motor
 - (a) Loosen belt tension and remove the belt.
 - (b) Loosen the setscrew on the side of the pulley away from the motor.
 - (c) Turn the adjustable half of the pulley outward to decrease blower speed. One turn will change speed 8% to 10%.
 - (d) Tighten the setscrew on flat portion of the pulley shaft.**For systems with 7-1/2 HP and larger motor**
 - (a) Slack off all belt tension by moving the motor toward driven shaft until the belts are free of grooves. For easiest adjustment, remove the belts from the grooves.
 - (b) On the outer locking ring, locate the two locking screws that are directly across from each other. Loosen, but do not remove, those two screws. Do not loosen any other screws.
 - (c) Adjust sheave to desired pitch diameter by turning the outer locking ring. One complete turn of the outer locking ring will result in .233" change in pitch diameter. To decrease blower speed, increase diameter. **CAUTION: Do not adjust sheaves in either direction to the point where moveable and stationary flanges are in contact.**
 - (d) Re-tighten the locking screws.

All Motor Sizes - Replace the belts and check belt tension. Be sure that belts are aligned in the pulley grooves and are not angled from pulley to pulley.

9.0 Check-Test Start (cont'd)

Startup (cont'd)

2. Measure burner differential air pressure (cont'd)

- Turn on the disconnect switch and re-check the slope gauge. If air pressure differential is within the limits of $-.25"$ to $-.75"$ w.c., no further adjustment is required. If the air pressure differential is not within those limits, re-adjust the blower speed.
- When the differential air pressure is within the limits, check the motor amp draw with an ammeter to be sure that the motor is not overloaded. Amps are shown on the motor nameplate.
- If an inlet or outlet duct system is attached to the heater, run the blower to purge the volume of air from the duct system with at least four air changes.
- Turn the blower switch to OFF and damper test switch to RUN. Turn the disconnect switch OFF. Disconnect the manometer and the slope gauge. Replace the caps.

DETERMINE the type of gas control system from the Model or Serial No. Suffix on the unit rating plate:

Suffix	Where	Option	Gas Control System
None	N/A	AG1	Single Stage with Air Controller
-2	Model No.	AG3	Two Stage with Two-Stage Ductstat
-MV-7	Serial No.	AG30 or AG31	Maxitrol Series #14 Outside Air Only (Amplifier A1014U-00)
-MV-8	Serial No.	AG32	Maxitrol Series #14A Outside Air Only (Amplifier A1014U-00)
-MV-9	Serial No.	AG33	Maxitrol Series #44 Outside Air Only (Amplifier A1044)
-MV-B	Serial No.	AG36	Paint Spray Booth System (Maxitrol 94)
-MV-C	Serial No.	AG37	Maxitrol Series #DDC for Outside Air Only (Signal Conditioner)
-MV-D	Serial No.	AG47	Maxitrol Series #14 Outside Air and Recirculation (Amplifier ADFM14)
-MV-E	Serial No.	AG48	Maxitrol Series #44 Outside Air and Recirculation (Amplifier ADFM44)
-MV-F	Serial No.	AG51	Maxitrol Series DDC for Outside Air and Recirculation

For units with Maxitrol Series 14 or 14A, remove and individually tape wires from Terminals 4 & 8 on the amplifier

For units with Maxitrol Series 44, remove and individually tape wires from Terminals 2, 4 and 8 on the amplifier

For units with Maxitrol Series DDC, the customer provided input signal must be 4-20 milliamps (conditioner dip switch "on") or 0-10 volt DC (conditioner dip switch "off")

3. Check pilot and burner ignition and pilot operation (hot surface ignition)

- Turn the disconnect switch ON. Turn blower service switch and burner service switch to TEST position.
- Observe for ignition through the viewport.
Check for lights - Lights listed in prior Steps should be energized. After 15-20 seconds, the **"Pilot Valve"** light will light to signal the pilot ignition, followed by the **"Main Valve"** light signaling main burner operation.
- With both the burner and blower operating, measure the gas pressure at the burner. Gas pressure should match the required manifold pressure listed on the rating plate. (If pressure does not match the required pressure, further testing is required in Step 5.) Remove the manometer.
- Leak test all connections in the pilot and main burner supply lines. **WARNING: DO NOT TEST WITH OPEN FLAME.**
- Check output of pilot flame signal. Microammeter reading should be .5 or greater.
- To check lockout feature of the pilot ignition system, turn pilot manual shutoff valve OFF. Pilot should lockout after two trials for ignition. To reset unit, open the valve and cycle the main disconnect switch.
- Turn OFF the manual gas valve. Wait 30 seconds for unit to cool. Return both burner and blower switch to OFF position. Turn OFF disconnect switch.

4. Check pilot pressure --

- To check pilot gas pressure, connect a "U"-tube manometer to the pressure tap on the downstream side of the pilot solenoid valve.
- Put BOTH the blower and burner switch in TEST position. Turn ON disconnect switch. Blower should be energized.
- Measure pilot gas pressure. Pilot pressure for natural gas should be 3.5" w.c.; pilot pressure for propane gas should be 6" w.c. Pilot pressure should be correct, but if the pressure is not correct, discontinue startup until the pilot gas pressure is regulated correctly.
(To adjust pilot pressure, remove the cap from the regulator. Turn adjustment clockwise to increase gas pressure or counterclockwise to decrease gas pressure.) When pressure is correct, shut off the gas, remove the manometer, and replace the pressure tap cap on the pilot solenoid valve.

5. Verification of inlet gas pressure -- If, with the blower and burner operating, the inlet main gas pressure measured in Step 3 does not correspond to the minimum stated on the rating plate, check the main burner inlet gas pressure. If the main inlet gas pressure is lower than stated on the rating plate, full burner firing rate will not be achieved. Check main gas supply service regulator for adjustment.

- Turn disconnect switch OFF.
 - Re-connect the "U"-tube manometer to the main burner pressure tap.
 - Turn pilot manual shutoff valve back ON.
 - Turn the disconnect switch ON; ignition sequence will occur.
 - Observe main burner. Light off should occur along the entire length of the burner.
 - After approximately one minute, record the gas pressure reading on the manometer.
- NOTE: High outside air temperature on high fire may cause the automatic high limit to trip. Manometer reading may only be available for a very short time.
- Turn disconnect switch OFF.
 - Remove the manometer and replace the plug.

Startup for Continuous Operation

- Remove all jumper wires and reconnect wires.
- Verify that the blower, burner, and damper switches are in RUN position.
 - CAUTION:** If blower or burner service switches are left in TEST position, they will override control from the remote console, switch, or automatic control.
- Check that all manual valves are ON.
- Close the control door panel; secure latches.
- Turn ON the disconnect switch. The system is now operational from the control switch, the remote console, or other type of optional automatic control.
 - CAUTION:** Burner will not operate if ambient air temperature is above setpoint of outside air control (factory setting is 60°F).

After Startup

- Return this manual to the owner's envelope. Keep for future reference.
 - To check for toxic vapors coming from the surrounding outside atmosphere or being produced by the installation (See **DANGER** below), it is recommended that the tempered makeup air entering the building be tested at its point of discharge from the heating unit. The table below shows limits for various substances including carbon monoxide.
- Certified, portable detector tubes may be used; follow the manufacturer's instructions.

Limits Based on Eight-Hour Exposure and a Five-Day Week (Guide Only)

Substance	Percent	PPM	
Acetaldehyde	.001	10	Note: At 100°F rise, the CO ₂ concentration will be about 2500 ppm.
Carbon Dioxide	.250	2500	
Carbon Monoxide	.001	10	
Formaldehyde	.000025	0.25	
Nitrogen Dioxide	.0001	1	
Sulphur Dioxide	.00005	0.5	

DANGER:

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

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

APPENDIX

Technical Data

Model Sizes	1-20-3	1-40-3	1-50-3	1-65-3	2-80-3	2-120-3	3-180-3	3-260-3
Maximum Capacity (MBH)	400	600	750	750	1500	1500	2500	3000
CFM Range	1,000 - 3,000	2,000 - 4,500	3,000 - 6,000	4,000 - 6,500	6,000 - 12,000	9,000 - 16,000	11,000 - 20,000	16,000 - 28,000
Maximum Temperature Rise	120°F	120°F	120°F	120°F	120°F	120°F	120°F	120°F
Maximum Discharge Temperature	120°F	120°F	120°F	120°F	120°F	120°F	120°F	120°F
Typical Control Amps (24V)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Net Weight (lbs)	915	925	935	950	1455	1505	2410	2480
Gas Connection (inches)	1	1	1	1	1 or 1-1/4	1 or 1-1/4	1, 1-1/4, or 2	1, 1-1/4, or 2

ADDITIONAL REFERENCES

See your Factory Distributor for the following forms:

- Operation/Maintenance/Service - **Form O-ADF/RFH (P/N 148385)**
- Replacement Parts - **Form P-RDF (P/N 270069)**
- Replacement Valves & Ignition Controls by Serial No. Code - **Form P-VALVES (P/N 263995)**

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INSTALLATION RECORD - to be completed by the Installer:

Installer:

Name _____
Company _____
Address _____

Phone _____

Distributor (company from which the unit was purchased):

Company _____
Contact _____
Address _____

Phone _____

Model _____ **Serial No.** _____ **Date of Installation** _____

SPECIFIC INSTALLATION NOTES: (i.e. Location, Amps, Gas Pressure, Temperature, Voltage, Adjustments, Warranty, etc.)

BUILDING OWNER OR MAINTENANCE PERSONNEL:

For service or repair

- Contact the installer listed above.
- If you need additional assistance, contact the Distributor listed above.
- For more information, contact your Factory Representative.

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O'Fallon, MO | Printed in U.S.A. (12/15)

Form I-RDF (12-15), PN 148384R7