

GAS DIRECT-FIRED MAKEUP AIR/HEATING SYSTEM INSTALLATION, OPERATION, AND MAINTENANCE

DISCONTINUED MODELS ADF AND ADFH



⚠ DANGER ⚠

FIRE OR EXPLOSION HAZARD

- Failure to follow safety warnings exactly could result in serious injury, death, or property damage.
- Improper installation, adjustment, alteration, service, or maintenance can cause serious injury, death, or property damage.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.
- Be sure to read and understand the installation, operation, and service instructions in this manual.
- 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.

DO NOT DESTROY. PLEASE READ CAREFULLY. KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.

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1.0 General

Hazard Intensity Levels Apply to Warnings throughout this Manual

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

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.

1.2 General Description

The information in this manual applies to Model ADF and Model ADFH in Sizes 300, 500, 700 and 1200. Both Model ADF and ADFH are direct-fired makeup air heating systems. Model ADFH is designed with a high discharge air temperature.

These systems consist of a direct-fired, gas-fueled burner and a draw-through blower housed in a weatherized cabinet. The systems may be installed either indoors or outdoors and are available for use with either natural or propane gas.

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 (or cools if equipped with an evaporative cooling module) 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.

1.3 Warranty

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

1.4 Installation Codes

These systems are design-certified to ANSI and CSA Standards. 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.

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.

This direct-fired makeup air system must be installed in accordance with local building codes. In the absence of local codes, in the United States, the unit must be installed in accordance with the National Fuel Gas Code (latest edition). A Canadian installation must be in accordance with the CAN/CGA B149.1 and B149.2 Installation Code for Gas Burning Appliances and Equipment. These codes are available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements. 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. 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.

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.

2.0 Location

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 exhaust.

3.0 Uncrating and Preparation

3.1 Uncrating and Inspecting

Check for any damage that may have been incurred during shipment. If damage is found, document the damage with the carrier and immediately contact an authorized Reznor® distributor.

Check the gas specifications and electrical voltage (system rating plate is in the control compartment) to be sure that they agree with the utilities at the installation site.

Locate the 4x4 junction box with a 3-position switch shipped inside the unit. (**NOTE:** Two exceptions - 1) If an optional remote console was ordered, this switch is mounted on the console which is shipped separately. 2) If gas control Option AG37 was ordered, the junction box is not included)

3.2 Preparing for Installation

Shipped-Separate Components

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

Gas Control Options	Shipped-Loose Parts
AG30, AG32, AG33, AG35	*Temperature Selector , Discharge Air Sensor
AG31	*Temperature Selector, Discharge Air Sensor, Space Override Thermostat
AG36	Remote Console
AG49, AG50	Control Switch, P/N 29054

*If an optional remote console is ordered, this control may have been ordered to be mounted on the console. The console is shipped separately.

Be sure that all shipped-separate accessories for the installation are available. Shipped-separate accessories could include a roof curb, an indoor filter cabinet, an outside air hood, a disconnect switch, a supply gas regulator, a door switch, an evaporative cooling module, a fill and drain or freeze kit, and/or a water hammer arrestor.

Be sure that all necessary equipment, tools, and manpower are available at the installation site.

4.0. Clearances and Dimensions

4.1 Clearances to Combustibles

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.

Top	Control Side*	Opposite Side	Bottom
0	0	0	0

*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.

4.2 Dimensions

4.2.1 Dimensions of Models ADF/ADFH Sizes 300 and 500

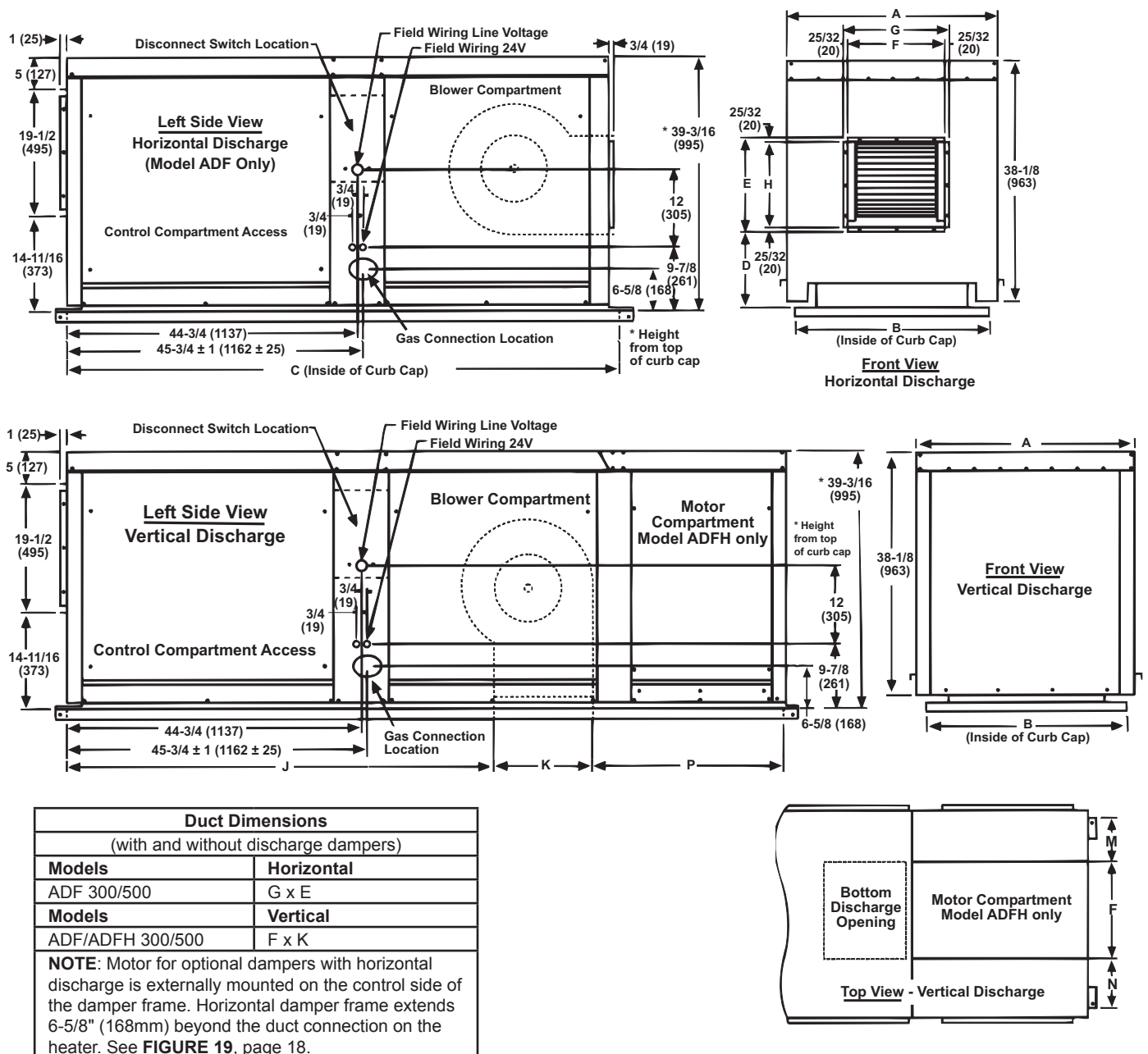
** Models ADFH 300/500 have a motor compartment required for high temperature discharge. Models 300/500 with optional vertical discharge have same cabinet length as the standard horizontal discharge unit.

Dimensions (inches) - Illustration in FIGURE 1A (Sizes 300 and 500)						
Models	Horizontal Discharge		Vertical** Discharge			
	ADF300	ADF500	ADF300	ADF500	ADFH300	ADFH500
A	34	47-3/4	34	47-3/4	34	47-3/4
B	31-1/16	44-13/16	31-1/16	44-13/16	31-1/16	44-13/16
C	85-13/16	85-13/16	85-13/16	85-13/16	109-1/2	109-1/2
D	11-27/32	12-11/16	-	-	-	-
E	15-5/16	17-11/16	-	-	-	-
F (inside)	15-15/16	14-13/16	15-15/16	14-13/16	15-15/16	14-13/16
G	17-1/2	16-3/8	-	-	-	-
H (inside)	13-3/4	16-1/8	-	-	-	-
J	-	-	64-19/32	62-11/32	64-19/32	62-11/32
K	-	-	13-13/16	16-1/16	13-13/16	16-1/16
M	-	-	7	8-1/8	7	8-1/8
N	-	-	8-1/8	21-3/4	8-1/8	21-3/4
P	-	-	7-13/32	7-13/32	31-3/32	31-3/32

** Models ADFH 300/500 have a motor compartment required for high temperature discharge.
Models 300/500 with optional vertical discharge have same cabinet length as the standard horizontal discharge unit.

Dimensions (mm) - Illustration in FIGURE 1A (Sizes 300 & 500)						
Models	Horizontal Discharge		Vertical** Discharge			
	ADF300	ADF500	ADF300	ADF500	ADFH300	ADFH500
A	34	1213	864	1213	864	1213
B	789	1138	789	1138	789	1138
C	2180	2180	2180	2180	2781	2781
D	301	322	-	-	-	-
E	389	449	-	-	-	-
F (inside)	405	376	405	376	405	376
G	445	416	-	-	-	-
H (inside)	349	408	-	-	-	-
J	-	-	1640	1584	1640	1584
K	-	-	351	408	351	408
M	-	-	178	206	178	206
N	-	-	206	552	206	552
P	-	-	188	188	790	790

FIGURE 1A - Dimensions of Models ADF/ADFH 300 and 500 - inches (mm)



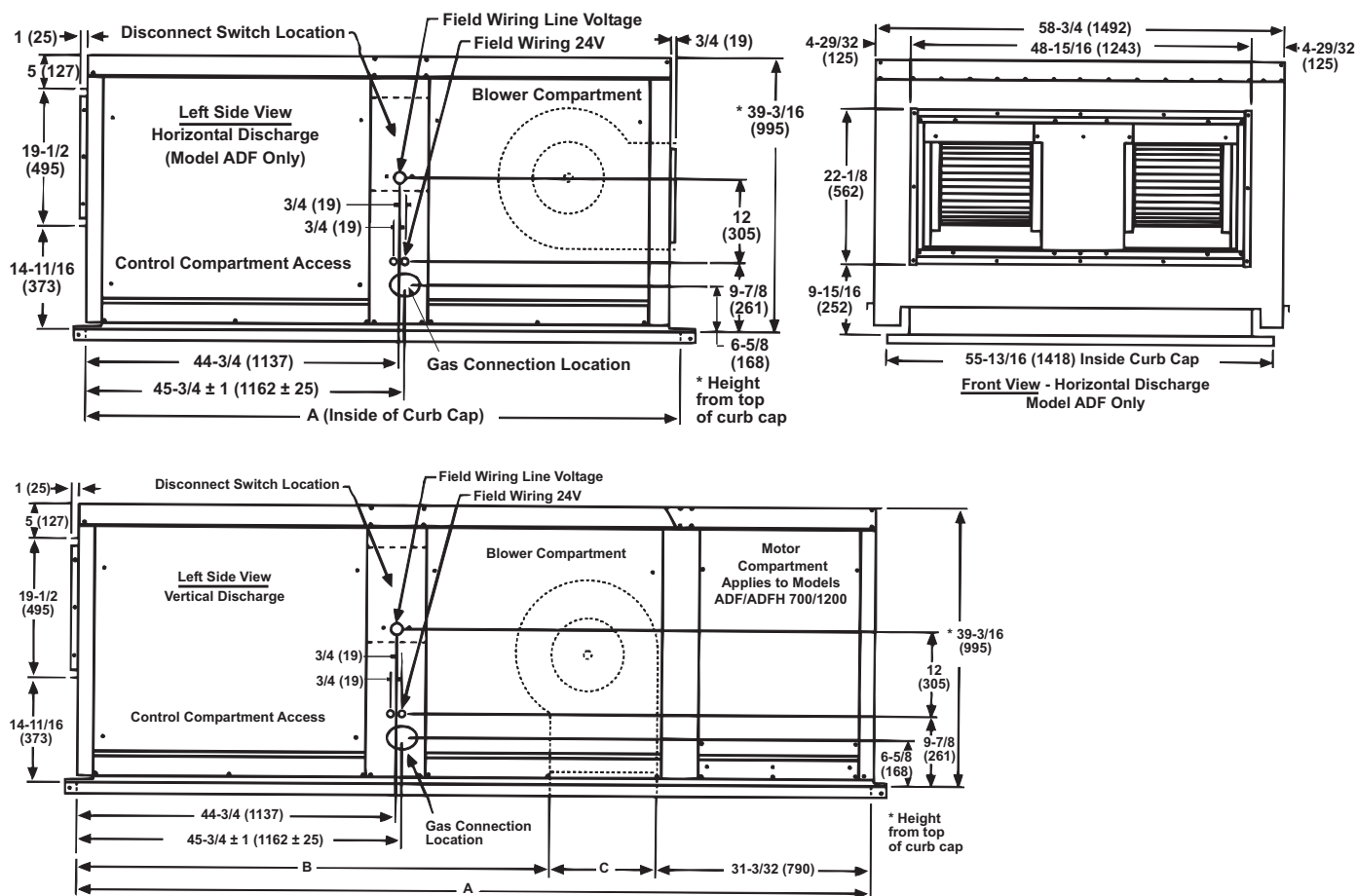
4.0. Clearances and Dimensions (cont'd)

4.2 Dimensions (cont'd)

4.2.2 Dimensions of Models ADF/ADFH Sizes 700 and 1200

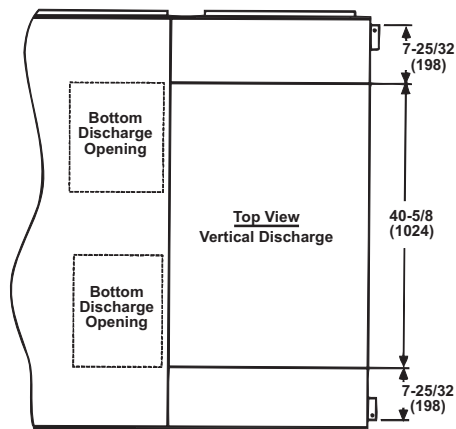
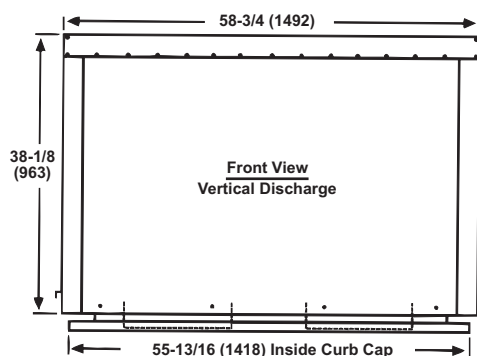
Dimensions (inches) - FIGURE 1B				Dimensions (mm) - FIGURE 1B			
	Horizontal Discharge	Vertical Discharge			Horizontal Discharge	Vertical Discharge	
Models	ADF	ADF/ADFH	ADF/ADFH	Models	ADF	ADF/ADFH	ADF/ADFH
Size	700/1200	700	1200	Size	700/1200	700	1200
A	92-1/8	117-1/32	117-1/32	A	2340	2973	2973
B	-	72-1/8	69-7/8	B	-	1832	1775
C	-	13-13/16	16-1/16	C	-	351	408

FIGURE 1B - Dimensions of Models ADF/ADFH 700 and 1200 - inches (mm)



Duct Dimensions	
(with and without discharge dampers)	
Models	Horizontal
ADF 700/1200	48x15/16x22-1/8 (1243x562)
Models	Vertical
ADF/ADFH 700/1200	Cx40-15/16 (Cx1024)

NOTE: Motor for optional dampers with horizontal discharge is externally mounted on the control side of the damper frame. Horizontal damper frame extends 6-5/8" (168mm) beyond the duct connection on the heater. See **FIGURE 19**, page 18.



5. Mounting

Mounting is the responsibility of the installer.

Depending on the building and its use, determine whether or not additional field measures should be taken to reduce the effect of blower vibration and/or noise. Determining the need for and installing vibration isolation is the responsibility of the installer.

When selecting a location for an outdoor installation, position the unit so that the air inlet will **NOT** be facing into the prevailing wind.

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.

5.1 Weights

Verify that the supporting structure has sufficient load-carrying capacity to support the weight.

NOTE: Net weights are approximate for the standard cabinet, blowers, and base. **Optional equipment is not included and can add *substantial* weight to the figure in the table.**

Net Weight - lbs (kg)			
Model	ADF	ADF	ADFH
Discharge	Horizontal	Vertical	Vertical
Size 300	700 (318)	700 (318)	790 (358)
Size 500	775 (352)	775 (352)	885 (401)
Size 700	930 (422)	1080 (490)	1080 (490)
Size 1200	950 (431)	1100 (499)	1100 (499)

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. 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 a surface, position them as shown in **FIGURE 2**. 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 or a minimum of 9" service clearance from the bottom of an evaporative cooling module to the mounting surface (Evaporative cooling module for Sizes 700 and 1200 must be mounted. Leg height adjusts from 9" to 16". See Paragraph 6.2.4 for additional information.)

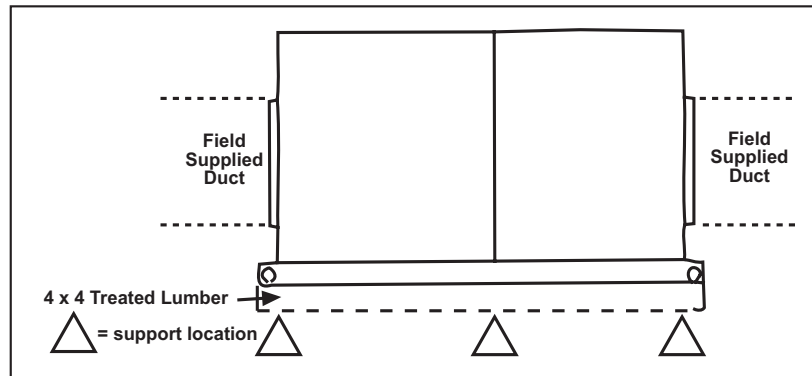
FIGURE 2 - Placement of Mounting Rails

	Discharge	Horizontal	Vertical		Both
	Model	ADF	ADF	ADFH	ADF/ADFH
	Dimension A (inches)				B (inches)
	300	85-13/16	85-13/16	109-1/2	31-1/16
	500	85-13/16	85-13/16	109-1/2	44-13/16
	700	92-1/8	117-1/32	117-1/32	55-13/16
	1200	92-1/8	117-1/32	117-1/32	55-13/16
	Dimension A (mm)				B (mm)
	300	39	39	50	14
	500	39	39	50	20
	700	42	53	53	25
	1200	42	53	53	25

5.0 Mounting (cont'd)

5.3 Mounting on Field-Supplied Supports (cont'd)

FIGURE 3 - Cross Support Mounting Requirements



5.4 Mounting on a Roof Curb

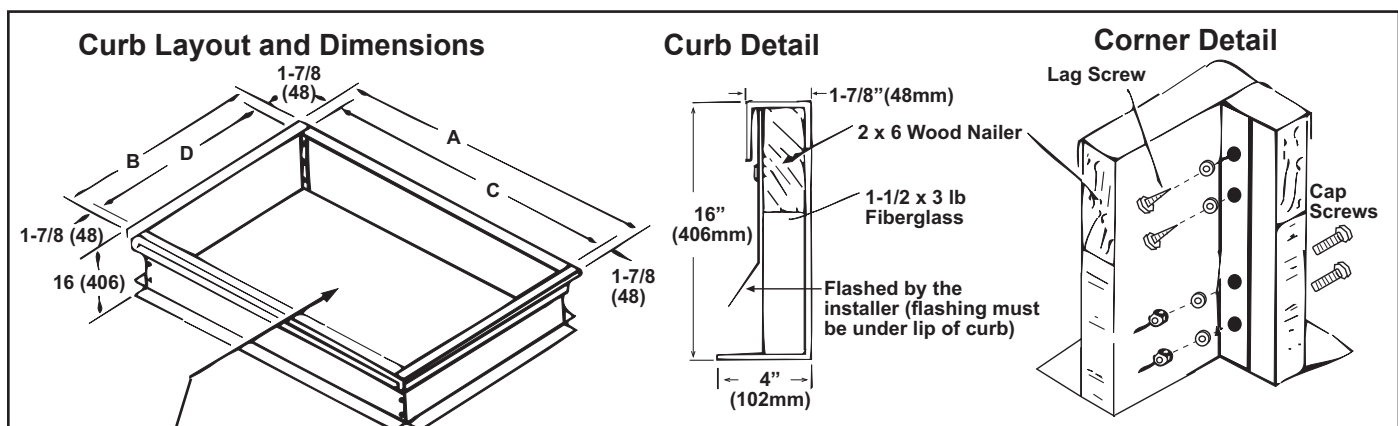
CAUTION: Before assembly, re-check to be sure that the correct curb has been ordered. Be sure that the curb selected matches the unit ordered. Verify the dimensions of the curb received with the curb dimension table, FIGURE 4.

Installation Instructions for 16" Optional Roof Curb (Option CJ3) - Refer to FIGURE 4

NOTE: Curb rail sections and hardware for assembling curb are provided with optional roof curb. Insulation and flashing are field supplied.

1. Position the curb cross rails as shown in the assembly illustration in **FIGURE 4**. Fasten curbing pieces with bolts and lag screws as illustrated in the corner detail.
2. Check the assembly for squareness. The curb must be adjusted so that the diagonal measurements are equal within a tolerance of $\pm 1/8"$.
3. Level the roof curb. To ensure a good weatherproof seal between the 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 roof deck before installing flashing.
4. Install field-supplied flashing.
5. Before placing the unit into position, apply furnished $1/4" \times 1-1/4"$ foam sealant tape to the top surface of the curb, making good butt joints at the corners. The unit must be sealed to the curb to prevent water leakage into the curb area due to blowing rain and capillary action.

FIGURE 4 - Optional Roof Curb (Shipped separately to be field assembled)

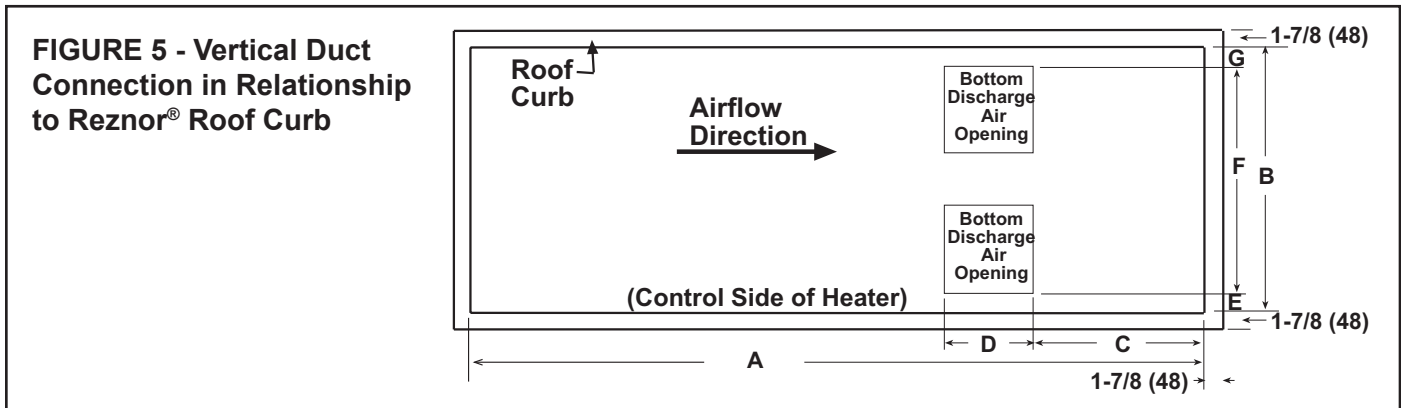


IMPORTANT: Area enclosed by roof curb must comply with clearance to combustible materials. If roof is constructed of combustible materials, area within curb must be either ventilated, left open, or covered with non-combustible material which has an "R" value of at least 5.0. If area within curb is left open, higher radiated sound levels may result.

Model	ADF300	ADF500	ADFH300	ADFH500	ADF700/1200		ADFH700/1200
Discharge	Horizontal or Vertical		Vertical Only		Horizontal	Vertical	Vertical Only
Roof Curb Dimensions (inches) - FIGURE 4							
A	84-9/16	84-9/16	108-1/4	108-1/4	90-7/8	115-25/32	115-25/32
B	29-13/16	43-9/16	29-13/16	43-9/16	54-1/2	54-1/2	54-1/2
C*	80-13/16	80-13/16	104-1/2	104-1/2	87-1/8	112-1/32	112-1/32
D*	26-1/16	39-13/16	26-1/16	39-13/16	50-13/16	50-13/16	50-13/16
Roof Curb Dimensions (mm) - FIGURE 4							
A	2148	2148	2750	2750	2308	2941	2941
B	757	1106	757	1106	1384	1384	1384
C*	2053	2053	2654	2654	2213	2846	2846
D*	662	1011	662	1011	1291	1291	1291
*C and D are roof opening dimensions.							

Bottom (Vertical) Duct Connections

If the system being installed has a vertical discharge, the duct opening has flanges for connection to field-installed ductwork. See **FIGURE 5** for duct opening and spacing in relationship to currently manufactured Reznor® roof curbs.



Dimensions - inches (mm)							
Model	A	B	C	D	E	F	G
ADF300	80-13/16 (2053)	26-1/16 (662)	4-25/32 (121)	13-13/16 (351)	5-5/8 (143)	15-15/16 (405)	4-1/2 (114)
ADF500	80-13/16 (2053)	39-13/16 (935)	4-25/32 (121)	16-1/16 (408)	19-1/4 (489)	14-13/16 (376)	5-3/4 (146)
ADF700	112-1/32 (2846)	50-13/16 (1291)	28-19/32 (726)	13-13/16 (351)	5-5/16 (135)	40-5/16 (1024)	5-5/16 (135)
ADF1200	112-1/32 (2846)	50-13/16 (1291)	28-19/32 (726)	16-1/16 (408)	5-5/16 (135)	40-5/16 (1024)	5-5/16 (135)
ADFH300	104-1/2 (2654)	26-1/16 (662)	28-19/32 (726)	13-13/16 (351)	5-5/8 (143)	15-15/16 (405)	4-1/2 (114)
ADFH500	104-1/2 (2654)	39-13/16 (935)	28-19/32 (726)	16-1/16 (408)	19-1/4 (489)	14-13/16 (376)	5-3/4 (146)
ADFH700	112-1/32 (2846)	50-13/16 (1291)	28-19/32 (726)	13-13/16 (351)	5-5/16 (135)	40-5/16 (1024)	5-5/16 (135)
ADFH1200	112-1/32 (2846)	50-13/16 (1291)	28-19/32 (726)	16-1/16 (408)	5-5/16 (135)	40-5/16 (1024)	5-5/16 (135)

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). Gas supply piping installation must conform with good practice and with all local codes.

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.

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 6**. 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.

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.

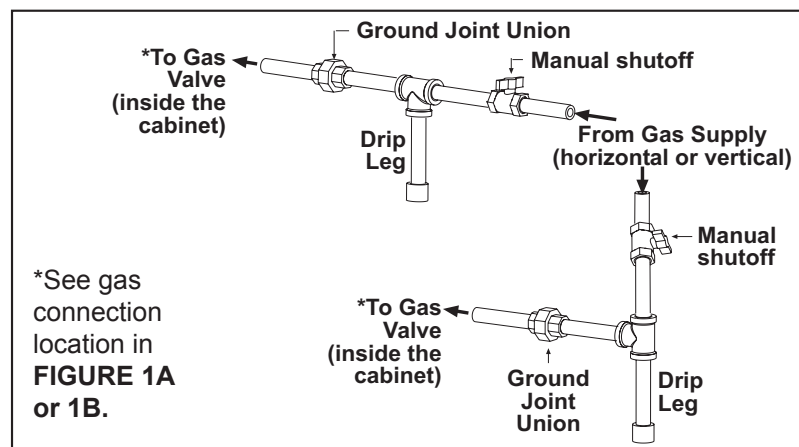
6.0 Mechanical (cont'd)

6.1 Gas Piping and Pressures (cont'd) 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													
	3/4"		1"		1-1/4"		1-1/2"		2"		2-1/2"		3"	
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane
20'	190	116	350	214	730	445	1100	671	2100	1281	3300	2013	5900	3599
30'	152	93	285	174	590	360	890	543	1650	1007	2700	1647	4700	2867
40'	130	79	245	149	500	305	760	464	1450	885	2300	1403	4100	2501
50'	115	70	215	131	440	268	670	409	1270	775	2000	1220	3600	2196
60'	105	64	195	119	400	244	610	372	1105	674	1850	1129	3250	1983
70'	96	59	180	110	370	226	560	342	1050	641	1700	1037	3000	1830
80'	90	55	170	104	350	214	530	323	990	604	1600	976	2800	1708
90'	84	51	160	98	320	195	490	299	930	567	1500	915	2600	1586
100'	79	48	150	92	305	186	460	281	870	531	1400	854	2500	1525
125'	72	44	130	79	275	168	410	250	780	476	1250	763	2200	1342
150'	64	39	120	73	250	153	380	232	710	433	1130	689	2000	1220
175'	59	36	110	67	225	137	350	214	650	397	1050	641	1850	1129
200'	55	34	100	61	210	128	320	195	610	372	980	598	1700	1037

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.

FIGURE 6 - Gas Supply Connection



Supply Pressure

These direct-fired makeup air systems are designed to operate on a natural gas supply pressure range of a minimum of 6" w.c. to a maximum of 28" w.c. 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"). 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 - 1/2 psi

Manifold Option BM78, BM79 - 2 psi

Minimum Supply Gas Pressure for Full Fire										
Manifold Option	BM75				BM76		BM78		BM79	
with Gas Control Option	AG1		AG3		AG 30, 31, 32, 33, 35, 36, or 37		AG 30, 31, 32, 33, 35, 36, or 37			
Manifold Size	1"		1"		1"		1"		1-1/4"	
MBH	Nat	Pro	Nat	Pro	Nat	Pro	Nat	Pro	Nat	Pro
250	4.0	1.4	4.0	N/A	4.1	1.6	4.4	1.6	4.6	1.6
500	5.3	1.9	5.0	N/A	5.8	2.3	6.0	2.3	5.2	1.9
750	7.5	2.7	6.8	N/A	8.5	3.3	8.4	3.3	6.1	2.3
1000	--	--	--	--	12.4	4.7	11.7	4.6	7.4	2.8
1250	--	--	--	--	--	--	--	--	9.1	3.5

Pilot Supply Pressure

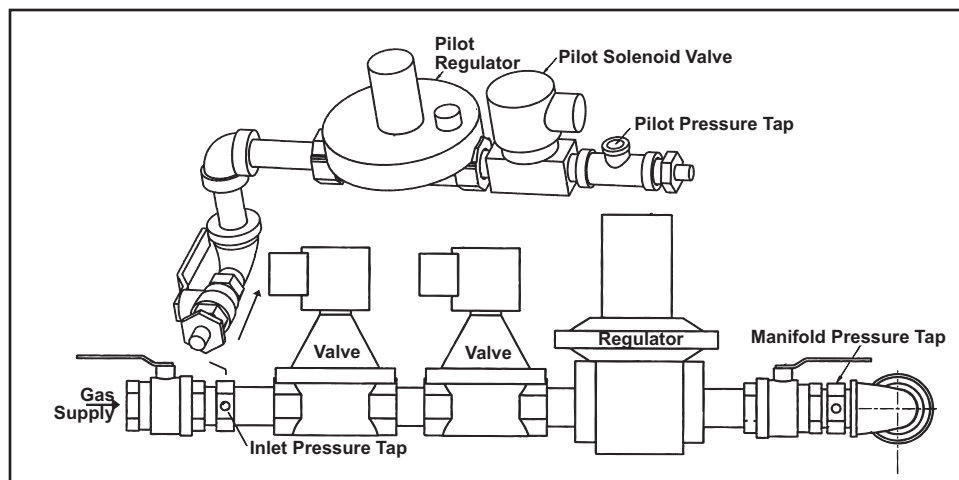
These systems are designed to operate on a natural gas pilot supply pressure of 3.5" w.c. or a propane gas pilot supply pressure of 6" w.c.

Measure both operating pressure and pilot supply pressure with the blowers 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.

FIGURE 7 - Pressure Tap Locations for Measuring Manifold and Pilot Pressure



Gas Pressure Switches

Gas pressure switches included in the gas train monitor gas pressure downstream 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 and 79 or optional (BP2 or BP4) 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.

An optional low gas pressure switch (Option BP3 or BP4) 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.

6.2 Unit Inlet Air

6.2.1 Screened Outside Air Hood without Filters (Option AS2)

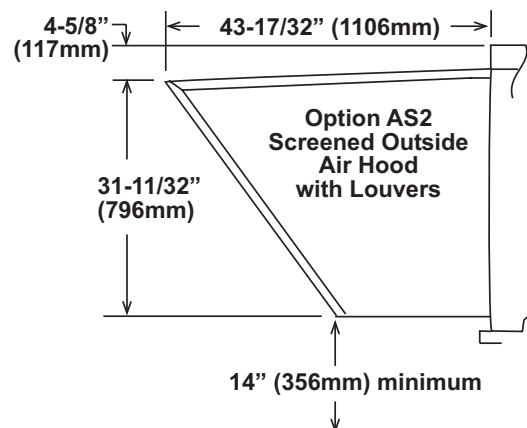
Option AS2, Screened Outside Air Hood, is a weatherized hood designed to be field-assembled and installed around the inlet air opening. The air hood includes a pre-assembled louver assembly designed to help eliminate moisture from the inlet air. Complete instructions are packaged with the air hood option.

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

FIGURE 8A - Dimensions of Outside Air Hood Option AS2

Outside air hood is shipped separately for field installation. Dimensions are the same for all sizes.

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



6.0 Mechanical (cont'd)

6.2 Unit Inlet Air (cont'd)

6.2.1 Screened Outside Air Hood without Filters (cont'd)

Installation Instructions

(Refer to Air Hood Assembly Drawing in FIGURE 8B. All screw ends except those across the bottom should be inside the air hood.)

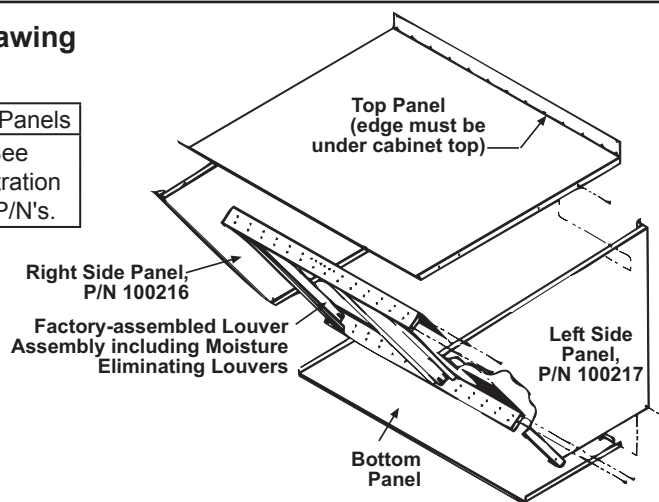
To avoid possible damage, it is recommended that the outside air hood be installed after the unit has been placed on the roof. The air hood should be installed before the heater is operated. Do not install the air hood while the heater or blower is in operation.

1. **Install Top Panel** - On the air inlet end of the cabinet, remove the row of factory-installed screws attaching the cabinet top. Slide the air hood top panel underneath the edge of the cabinet top. The edge of the air hood top panel **must** be between the cabinet top and end panel. Reinsert all of the sheet metal screws.
2. **Install Side Panels** - Slide the air hood right side panel into the slot between the cabinet end panel and corner leg. Be sure that the side panel is underneath and to the inside of the air hood top panel. Attach to the cabinet and the air hood top using the required number of self-drilling sheet metal screws. Repeat with the left side panel.

FIGURE 8B - Component P/N's and Assembly Drawing of Option AS2, Outside Air Hood Without Filters

Size	Top Panel	Bottom Panel	Louver Assy	Side Panels
300	100228	100235	103774	See illustration for P/N's.
500	100230	100237	103776	
700 & 1200	100232	100239	103778	

NOTE: Either a Reznor® designed optional air inlet hood or evaporative cooling module is required on outdoor installations to ensure complete weather resistance and to retain certification.



3. **Install Bottom Panel** - Position the air hood bottom panel so that it is to the inside of the two side panels and above the factory-installed support angle. Attach to both side panels.

If the bottom panel does not rest tightly against the support angle, follow these instructions to adjust the position of the support angle:

- a) Slightly loosen (do not remove) the support angle screws.
- b) Slide the support angle up (holes are slotted) so that it is against the bottom panel.
- c) Tighten the screws.

Attach the support angle to the air hood bottom panel. The bottom panel of the air hood and the support angle should be tight together; do not draw with the sheet-metal screws.

4. **Install the Louver Assembly** - With the intake screen toward the inside of the hood, position the pre-assembled vertical louver assembly in the inlet opening of the air hood. Using the remaining sheet metal screws, attach the louver assembly to the air hood side panels using the holes provided.

Screened air hoods are available with a filter rack and 2" disposable filters, 1" or 2" permanent filters, or 2" disposable pleated filters. Screened air hoods with filters are shipped factory-assembled for field installation. To avoid possible damage, it is recommended that the outside air hood be installed after the unit is in its permanent location. The dimensions are shown in FIGURE 9B.

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

Follow the instructions below to attach the outside air hood to the inlet air end of the system cabinet.

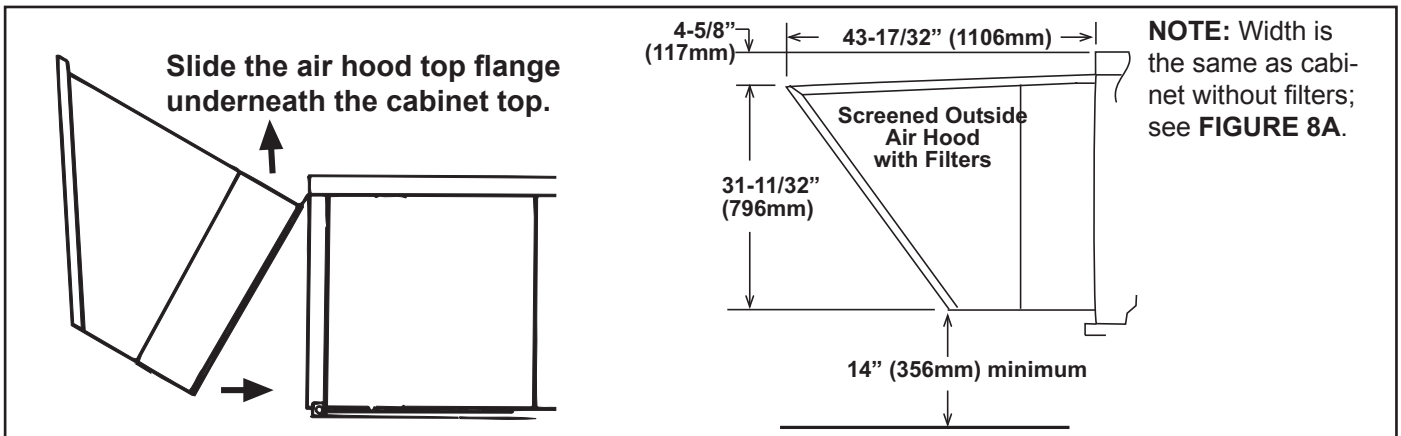
6.2.2 Screened Outside Air Hood with Filters - Options AS6, AS7, AS10, AS12

FIGURE 9A - Optional Screened Outside Air Hood with Filters

Factory assembled and shipped separately for field installation.



FIGURE 9B - Installation and Dimensions of Outside Air Hood with Filters

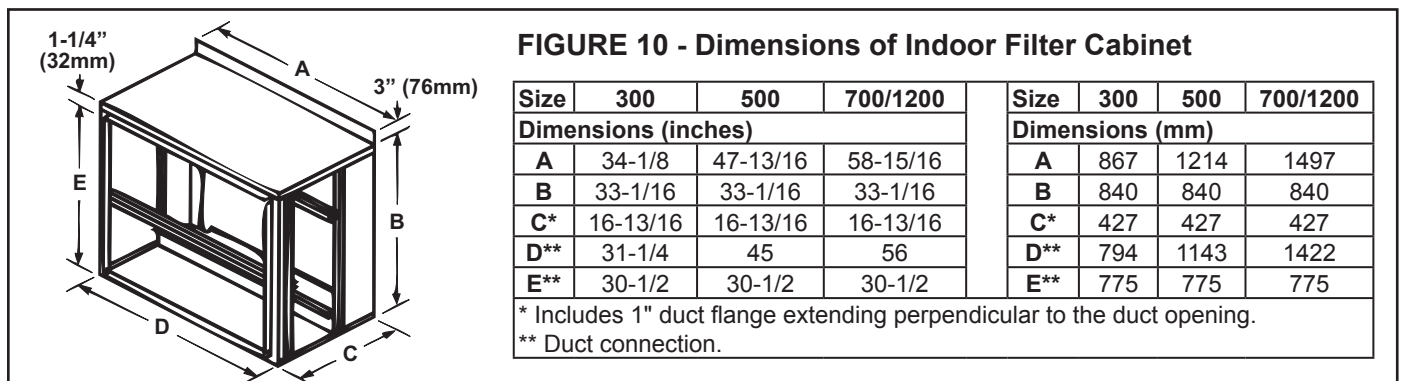


6.2.3 Indoor Filter Cabinet - Options AW3, AW6, AW13, AW15

The optional filter cabinets are designed for field attachment to systems that are installed indoors. The cabinet has a 1" duct flange for attachment of ductwork to bring in outside makeup air to the system. The cabinet is available with 1" or 2" permanent, 2" disposable, or 2" pleated disposable filters. There is a filter access door on both sides of the cabinet.

Installation Instructions: The cabinet and filter racks with filters are factory assembled and shipped separately for attachment to the system at the job site.

1. On the inlet end of the system, remove the row of factory-installed screws attaching the cabinet top.
2. Tip the assembled filter cabinet slightly and slide the top flange underneath the cabinet top. (Refer to **FIGURE 9B** above.)



The filter cabinet flange must be between the cabinet top and the end panel. Slide the side flanges into the slots between the corner posts and the end panel.

6.0 Mechanical (cont'd)

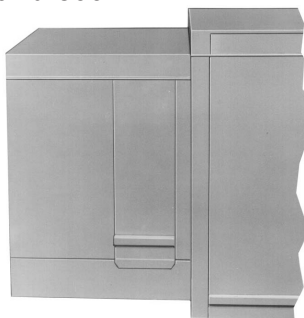
6.2 Unit Inlet Air (cont'd)

6.2.3 Indoor Filter Cabinet (cont'd)

3. Re-insert all of the screws across the top of the cabinet.
4. The filter cabinet should be resting on the factory-installed support angle across the bottom of the cabinet. If the cabinet does not rest tightly against the support angle, follow these instructions to adjust the position of the support angle:
 - a) Slightly loosen (do not remove) the support angle screws.
 - b) Slide the support angle up (holes are slotted) so that it is against the bottom panel.
 - c) Tighten the screws.
5. If equipped with an optional dirty filter switch, locate the coil of clear tubing attached to the dirty filter switch in the electrical compartment. Extend the tubing to the air entering side of the filter rack. Attach the end of the tubing being careful that it is not compressed or kinked. (See Paragraph 7.3 for switch details.)

6.2.4 Evaporative Cooling Module - Options AS4 and AS8

**FIGURE 11A -
Factory-installed
Evaporative Cooling
Module Option on
Models ADF/ADFH 300
and 500**



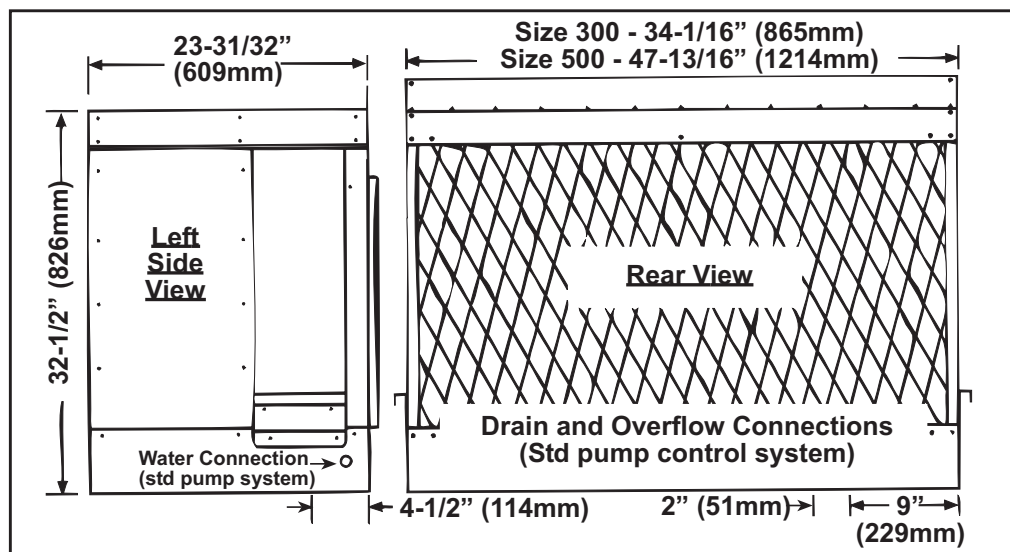
Evaporative cooling provides excellent comfort cooling at low initial equipment and installation costs and low operating and maintenance costs. Direct evaporative cooling works on the principles that water in direct contact with a moving airstream will eventually evaporate if the droplets have long enough exposure and that the evaporation will lower the air temperature.

The optional evaporative cooling module is equipped with high efficiency pad media of either 12" rigid cellulose or 12" rigid glass fiber. 12" media provides 90% efficiency. Efficiency value is stated at maximum allowable CFM (without the optional moisture elimination pad) and with an inlet dry bulb temperature of 95°F and an inlet wet bulb temperature of 65°F. Evaporative cooling efficiency is a function of inlet temperature (wet and dry bulbs) and of face velocity through the pads. The stated cooling efficiency will rise with the decrease of velocity and increase of inlet temperature. Moisture elimination pads (Option ASA1) may be used on all units but are required on high CFM units (velocity above 6000 FPM) as listed in the table below.

Model/Size	Moisture Elimination Pad Required Size on the Evaporative Cooling Module at
ADF/ADFH 300	3200 CFM
ADF/ADFH 500	4500 CFM
ADF/ADFH 700	11200 CFM
ADF/ADFH 1200	11200 CFM

Models ADF/ADFH 300/500 - When ordered with an evaporative cooling option, Sizes 300 and 500 are shipped as a factory-assembled makeup air heating/evaporative cooling system. The module is factory installed including all wiring connections (See **FIGURE 11A**). Follow the instructions in this section for water connections and water flow adjustments.

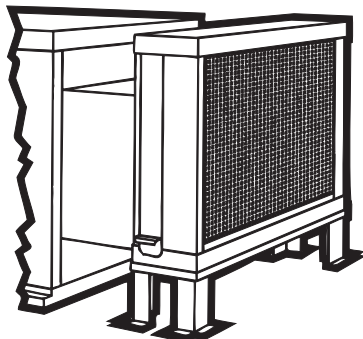
**FIGURE 11B -
Dimensions of optional
evaporative cooling
module factory-installed
on Sizes 300 and 500**



Models ADF/ADFH 700/1200 - The evaporative cooling module for Sizes 700 and 1200 is assembled at the factory and shipped separately for field-connection to the makeup air system cabinet. The shipped separate option includes the cooling module,

FIGURE 12 - Optional Evaporative Cooling Module on an ADF/ADFH 700 or 1200.

Assembled module is shipped separately for field installation.



Evaporative Cooling Module Water Connections and Adjustments

FIGURE 13 - Connect Fresh Water Supply to Inlet of Float Valve

an adjustable base, and the transition ductwork between the cooling module and the cabinet. Complete installation instructions including dimensions are packaged with the evaporative cooling module package.

Included in the cooling module installation booklet is a preparation checklist. All items in that checklist should be addressed prior to beginning installation of the evaporative cooling module. Four of those items are listed below.



Adjustable Leg Height
16" maximum; 9" minimum

- ☐ Make certain the roof or platform is capable of handling the additional load of a full cooling module reservoir.

Wts of Evaporative Cooling Module w/ Wet Media & Full Reservoir

Module with 12" rigid cellulose media (Option AS4). 431 lbs (196 kg)

Module with 12" rigid glass fiber media (Option AS8) 514 lbs (233 kg)

- ☐ Make certain the roof is level and free of debris where the cooling module will be mounted.
- ☐ Do not mount directly on soft tar roofs where the legs could sink and tilt the cooling module. Provide a weather-resistant, solid wood or metal base under the cooling module support legs.
- ☐ Make certain that there will be adequate clearance between the bottom of the reservoir and the roof (or platform) to allow for drain and overflow pipe connections.

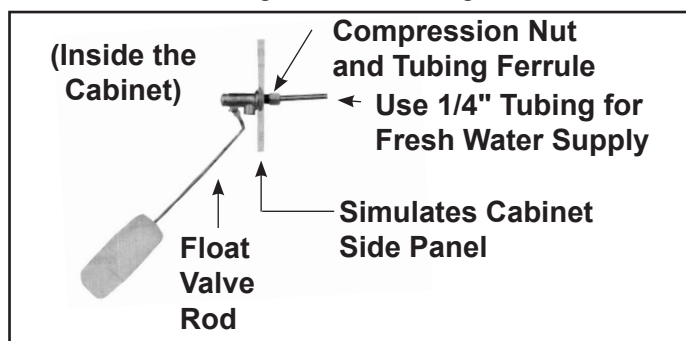
All Sizes - If an optional fill and drain kit is part of the installation, the kit is shipped separately. Connect the fill and drain kit as illustrated in **FIGURE 14**.

WARNINGS: Water reservoir must be drained and pump motor turned off when outside temperature falls below 32°F. Pump must never be operated without water in the reservoir. See Hazard levels, page 2.

Supply and Drain Water Connections

Float Valve (FIGURE 13) - In a module with pump and float controls, a float valve maintains the appropriate water level in the reservoir.

Use a field-supplied 1/4" diameter tubing with a compression nut and tubing ferrule to connect the fresh water supply to the inlet of the float valve. See **FIGURE 13**. Place nut and ferrule over tubing and insert tubing into the float valve stem. Tighten nut securely.



AquaSaver® Timed Metering Control System - If the cooling module is equipped with an optional timed metering system, connect a 1/2" water line to the fitting on the side of the cooling module.

Due to various water pressures and installation conditions, the water supply line may bang abruptly when the solenoid valve in the AquaSaver system closes. This banging can be minimized by installing an optional water hammer arrestor in the supply line. If installing an optional water hammer arrestor, select an indoor (above 32°F) location, either horizontal or vertical, in line with and as close to the solenoid valve as possible. Follow the manufacturer's instructions to install and maintain the water hammer arrestor.

6.0 Mechanical (cont'd)

6.2 Unit Inlet Air (cont'd)

6.2.4 Evaporative Cooling Module - Options AS4 and AS8 (cont'd)

FIGURE 14 - Water Connections including Optional Drain and Fill Kit

Supply and Drain Water Connections (cont'd)

All Cooling Modules - A manual water shutoff should be installed upstream of the inlet, at a convenient non-freezing location, to allow the water supply to be turned on and off. If necessary, install a bleed line between the manual valve and the cooling module inlet to allow drainage of the line between the shutoff valve and the cooling module.

All cooling modules are equipped with an overflow and drain fitting. The fittings are in the cabinet bottom and come complete with a locknut and a sealing gasket. Check these fittings for tightness before installing the overflow and drain piping. The drain and overflow fitting will accommodate a 3/4" garden hose thread and is tapped with a 1/2" female pipe thread for iron pipe.

An optional automatic fill and drain kit (Option CT1) is available that will automatically release supply water to the cooling module when a call for cooling is made and will drain all water from the reservoir when the cooling switch is deactivated or a cooling thermostat is satisfied. See **FIGURE 14**. If installing an optional fill and drain kit, follow the instructions. Consult the wiring diagram for electrical connections.

Instructions for Installing Optional Fill & Drain Kit

NOTE: Follow this part of the instructions included in the valve packages for attaching valves to the water line only. The remainder of the instructions with the valves do not apply to this type of application.

Water Line Connections (See illustration)

Supply (3-Way Valve) Connections - connect the water supply line to "B" (normally closed). Connect the water drain line to "A" (normally open). Connect the middle outlet to supply the water to the cooling module reservoir.

Drain (2-Way Valve) Connections - Connect the drain pipe from the reservoir to "A". Connect the outlet side to "B" and connect into drain lines from the cooling reservoir and the supply valve.

WARNING: Risk of electrical shock. Disconnect the power.

Electrical Connection (requires black and white 14-gauge wires) - Refer to furnace wiring diagram:

1. Refer to the wiring diagram for terminal connections (NOTE: If kit is not ordered with the system, connections will not be shown on the diagram. Terminal connections are specific to each system. Contact the factory for terminal connections. Be prepared to provide all model information.)
2. Run field-supplied black wire from the electrical compartment (terminal on the wiring diagram) of the evaporative cooling module and connect to the black wire on both the 3-way and the 2-way valve.
3. Run field-supplied white wire from the electrical compartment (terminal on the wiring diagram) of the evaporative cooling module and connect to the white wire on both the 3-way and the 2-way valve.

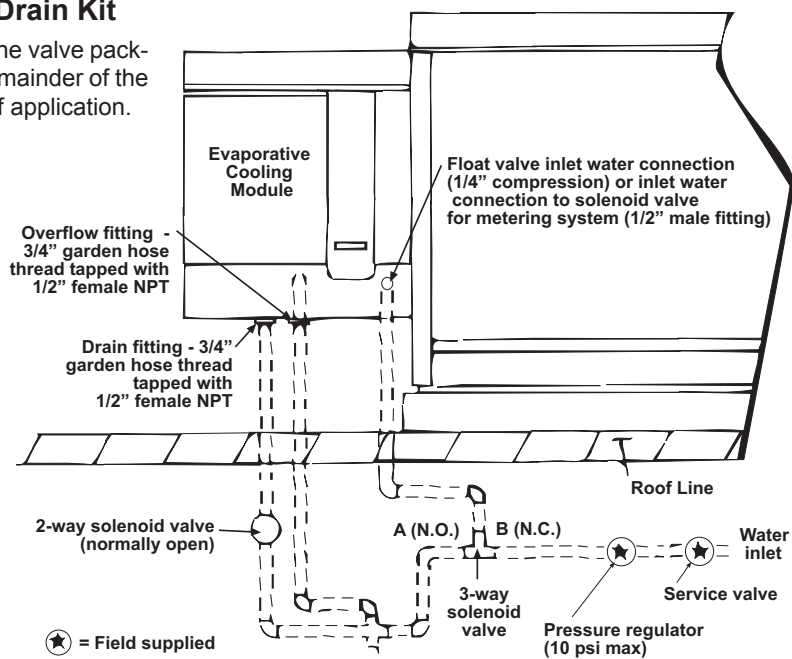
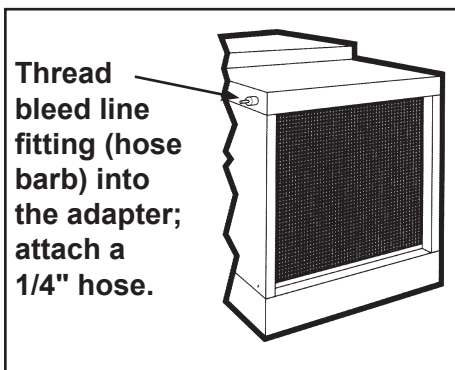


FIGURE 15 - Bleed Line Fitting



Bleed Line Connection (Does not apply to module with optional timed metering system.)

- Shipped in the evaporative cooling module bottom pan, find a 1/4" I.D. x 1/2" N.P.T. nylon bleed line fitting (hose barb). Thread the fitting into the female adapter located opposite the pump/inlet side of the water distribution line. The hose barb will protrude from the side of the cabinet (**FIGURE 15**). Attach a 1/4" I.D. hose to the barb and run the hose to the nearest drain.

Discharging a quantity of water by "bleed off" will limit the concentration of undesirable minerals in the water being circulated through the cooling module. Minerals buildup because evaporation only releases "pure water vapor" causing the concentration of contaminants in the water to increase as the evaporation process continues to occur. The minerals accumulate on the media, in the water lines, on the pump, and in the reservoir. Adequate bleed off is important to maintaining an efficiently operating evaporative cooling system.

Filling & Adjusting the Water Level in the Reservoir

FIGURE 16 - Disconnect the power and adjust the water flow with the ball valve.



WARNING: Adjust ball valve only when the power is disconnected from the system. Failure to do so can cause electrical shock, personal injury, or death.

FIGURE 17 - Adjust Water Flow with the Ball Valve in FIGURE 16

Float and Pump Control System -- Turn on the water supply. Check for good flow. When the float valve (**FIGURE 13**) shuts off the water supply, measure the water depth. The depth of the water should be approximately 3". It may be necessary to adjust the float valve to obtain the proper water level or to free the float valve from obstructions. To adjust the float valve, simply bend the rod upward to raise the water level or downward to decrease the water level.

Adjusting Water Flow Over Pads

Proper water flow over the evaporative cooling media is critical to extend the life and maintain the efficiency of the pads. Follow the instructions to adjust water flow.

CAUTION: Do not flood the media pads with extreme quantities of water for long periods as this will cause premature breakdown of the media. An even flow from top to bottom of the media with the least amount of water is all that is required to assure maximum efficiency and media life span. More water does not provide more evaporation or more cooling.

Float and Pump Control System - Using the ball valve, located in the middle of the length of hose running from the pump to the distribution line inlet (**FIGURE 16**), adjust the valve handle to allow the flow to completely dampen the media pads from top to bottom.

Operate the unit watching the water flow. After 15 minutes with the blower in operation, the water should have completely dampened the pads but should not be flowing off the entering side of the media. If water is flowing off the entering side of the media, turn the system off, disconnect the power, and reduce the entering water flow.

AquaSaver® Timed Metering Control System - Check water flow and pad wetting time at maximum air flow and wet bulb depression to assure complete wetting of the media at the extreme operating conditions.

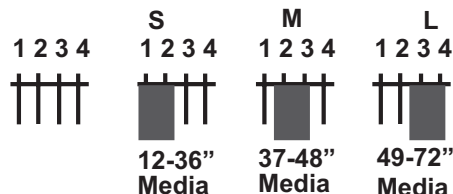
In addition to adjusting water flow, the timing of the water on/off cycle can be adjusted. Water flow and timing adjustments are correct when **1)** the water rises from the holes in the sprinkler pipe (See **FIGURE 17**) consistently along the entire pipe length, **2)** the media pads wet evenly after a few "ON" cycles (no dry spots or dry streaks), and **3)** a slight amount of excess water collects at the drain at the completion of the "ON" cycle.

1) AquaSaver® Water Flow Adjustment - Using the ball valve illustrated in **FIGURE 16**, adjust the water flow depending on the pad height.

Pad Height	A = Water rise from PVC Sprinkler Pipe
24"	1/8" to 1/2"
48"	1/4" to 1/2"

2) AquaSaver® Timer Adjustment - At any given temperature, the media pads should completely wet from top to bottom during the ON cycle. The micro-processor has three pre-set timing settings based on media size. The appropriate setting is selected by changing the position of the suitcase jumper at J2 on the micro-processor (**FIGURE 18**). Remove the cover and check the setting.

FIGURE 18 - AquaSaver® Micro-processor Control



If the jumper is at the appropriate location for the media, replace the cover. If the jumper needs to be moved, move it to the appropriate setting. The setting will go into effect when the power is restored.

Check the "ON" timing; the media pads should be wet from top to bottom during the ON cycle.

If the pre-set timing is not suitable for the application, follow the instructions supplied with the micro-processor to change the calibration of the ON and/or OFF cycle.

6.0 Mechanical (cont'd)

6.3 Supply Air Discharge

6.3.1 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.

Sizing and Installation of Distribution Ductwork - 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, 2800 Shirlington Road, Suite 300, Arlington, VA 22206 (www.acca.org). A manual covering duct sizing in detail may be purchased directly from them.

Installing Ducts (See Paragraph 4.2 for duct connection dimensions.):

- ☐ 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 installations, the ducts can be slid over the flange of the heater and then sealed for an airtight and watertight fit. On duct-to-heater connections, use sheetmetal screws to fasten ducts to the heater flange. Use stiffening flanges around the perimeter of the duct connections.

6.3.2 Two-Position Discharge Dampers, Option AQ4

**FIGURE 19 - Model
ADF with Horizontal,
Two-Position Discharge
Damper, Option AQ4**

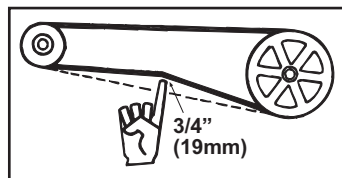
A Model ADF unit ordered with Option AQ4 has a factory installed horizontal open/closed discharge damper. The direct-coupled damper motor is rated for low ambient temperature and is externally mounted on the control side of the damper frame. The horizontal damper frame extends 6-5/8" (168mm) beyond the heater duct connection as illustrated in **FIGURE 19**.



The two-position (open/closed) vertical discharge damper (**Option AQ3**) is available on both Model ADF and ADFH. Discharge dampers are open when the unit is operating and are closed when the unit is shut down.

6.4 Blowers, Drives, and Blower Motors

FIGURE 20 - 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" or 3/4" (**FIGURE 20**). Be sure the belt is aligned in the pulleys.

Motor Pulleys and Blower Speed - 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 9.2, Startup, for adjusting blower speed.

Blower Rotation - Each blower housing is marked for proper rotation. Checking blower rotation is included in Startup, Paragraph 9.2

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. The open motor amp chart below can be used for sizing line wiring. For accurate amps, read the motor manufacturer's rating plate; amps will vary depending upon type of motor and motor manufacturer.

Blower Motor Full Load Amps (open motors)						
HP	115/1	230/1	208/3	230/3	460/3	575/3
1/2	8.8	4.4	2.1	2	1	--
3/4	11	5.5	2.9	2.6	1.3	--
1	13	7.5	3.7	3.2	1.6	1.4
1-1/2	15	7.5	5.6	5	2.7	2
2	N/A	N/A	7	6.6	3.3	2.4
3	N/A	N/A	9.1	8.4	4.2	3.6
5	N/A	N/A	13.4	13.2	6.6	5.4
7-1/2	N/A	N/A	22	21	10.5	8.4
10	N/A	N/A	30	26	13	10.4
15	N/A	N/A	43.1	39	19.5	16
20	N/A	N/A	58.7	53	26.5	21.2

7.0 Electrical and Wiring

7.2 Supply Wiring

7.1 General

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.

Wire Gauge Sizes - 100 ft maximum								
FLA	5	10	15	20	25	30	35	40
Wire Gauge	14	14	12	10	8	8	6	6

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, check the motor nameplate.

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

Disconnect Switch - A safety disconnect is required. An outdoor installation requires a weatherproof disconnect switch. Install either an optional UL-listed disconnect or a field-supplied equivalent. 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. (Refer to **FIGURE 21**.)

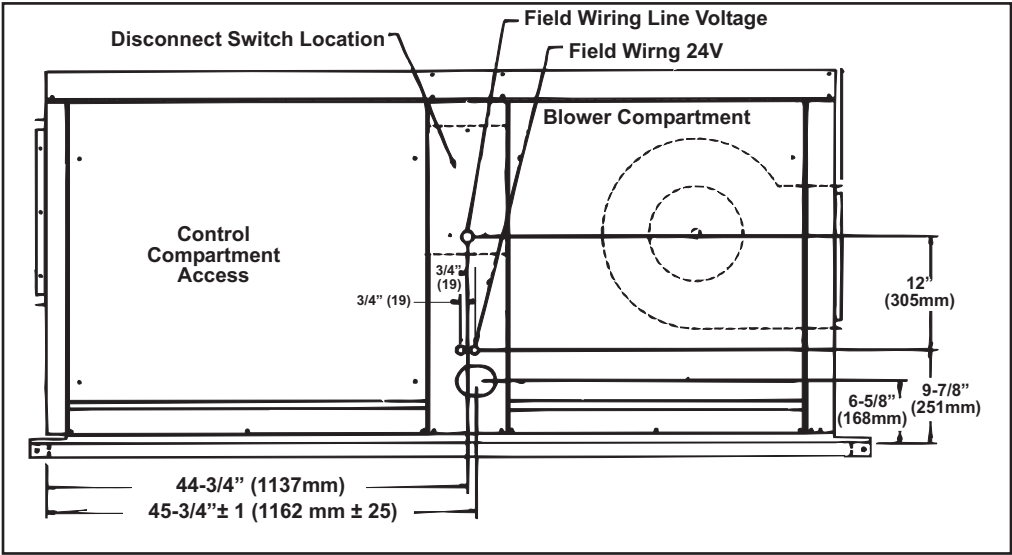
When providing or replacing fuses in a fusible disconnect switch, use dual element time delay fuses and size 1.25 times the maximum total input amp as stated on the unit rating plate.

7.0 Electrical and Wiring (cont'd)

7.2 Supply Wiring (cont'd)

FIGURE 21- Disconnect Switch Location and Wiring Connection Locations (Model ADF is illustrated; same dimensions/locations apply to Model ADFH)

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.



7.3 Control Wiring

Refer to **FIGURE 21** for location of control wiring connection. Low voltage wiring must be in individual conduit, separated from primary high voltage wiring.

A 3-position control switch is supplied with each system, either packed loose inside the unit, or if an optional control console 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. For additional reference, the control manufacturer's instructions are included in the owner's envelope.

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

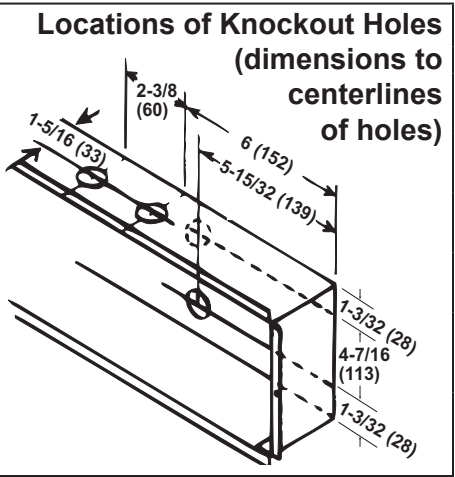
Remote Console



FIGURE 22 - Remote Console Dimensions (Dimensions, components, and wiring required depend on options selected; refer to the wiring diagram to identify options.)

The optional remote console is shipped separately. Remote consoles include terminal blocks for wiring. If ordered with a remote console, the toggle switch is mounted on the console and depending on what gas control option was ordered, the console could include a temperature selector. If a dirty filter switch is ordered the indicator light is on the console. See **FIGURE 22** for console size.

Control Switch	Qty of Lights*	Temperature Selector**	Dimensions - inches (mm)		
			L****	H****	D
Yes	3	Yes	10-3/4 (273)	7-5/8 (194)	2-5/8 (67)
Yes	3	No	10-3/4 (273)	7-5/8 (194)	2-5/8 (67)
Yes	4	Yes	15-3/4 (400)	7-5/8 (194)	2-5/8 (67)
Yes	4	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, or 35					
**** Subtract 1" (16mm) when recessing					



Dirty Filter Light (on the Remote Console)

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 proper operation of the dirty filter indicator light.

Dirty Filter Switch Installation Instructions

- **Before the system is operating**, connect the sensing tubes from the switch to their sensing locations in the field-installed filter cabinet.
 - 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 23**) 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 23**) 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.
- **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.

**FIGURE 23 -
Dirty Filter
Pressure Switch**

**Negative pressure connection
is toward the "front or top" of
the switch** (senses blower side
of filters)

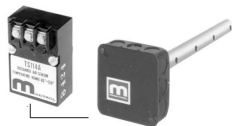
**Positive pressure connection is toward the
"back or bottom" of the switch** (senses air
inlet side of filters)



**Set screw (on front
of switch) must be
manually adjusted after
system is in operation.**

8.0 Controls

Discharge Sensor and Mixing Tube



Discharge Temperature Sensor (Maxitrol) for Gas Control Options AG30, AG31, AG32, AG33, and AG36

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.

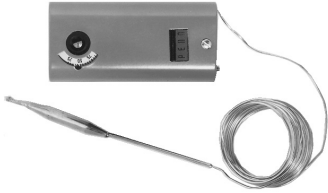
Refer to the wiring diagram and connect the sensor to the terminal strip in the blower section electrical box. Use shielded wire to alleviate any electrical interference that may cause an erroneous discharge temperature reading.

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

8.0 Controls (cont'd)

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



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;
- may shutdown; or
Burner shutdown 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.

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.

Optional Door Switch



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.

Optional Firestat



Firestat (Option BD5)

If the system has an optional firestat, the control is shipped separately for field installation. Mount it on the discharge ductwork so that the sensor extends into the duct. This control requires manual reset so should be installed in an accessible location. Follow the manufacturer's instructions and the wiring diagram to mount the firestat and connect the wires in the blower section electrical box. The firestat is a manually reset control; check reset when starting the unit.

Optional Field-Provided Computer Control (with Option AG37 only)

If the system includes Gas Control Option AG37, the gas valve and burner modulation are controlled by a field-supplied 0-10VDC or 4-20 milliamp computer signal. Follow the signal conditioner manufacturer's instructions included with the system for connecting to the field-provided control.

9.0 Commissioning and Startup

9.1 Checks Before Startup

- ☐1. Check to be sure that all field-installed accessories are installed. If equipped with an optional dirty filter switch, check that the sensor tubing shipped in the unit is extended through the filter rack and attached correctly.
- ☐2. Check all field-installed wiring.
- ☐3. Check all ductwork for obstructions; open all diffusers.
- ☐4. Turn the remote 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.

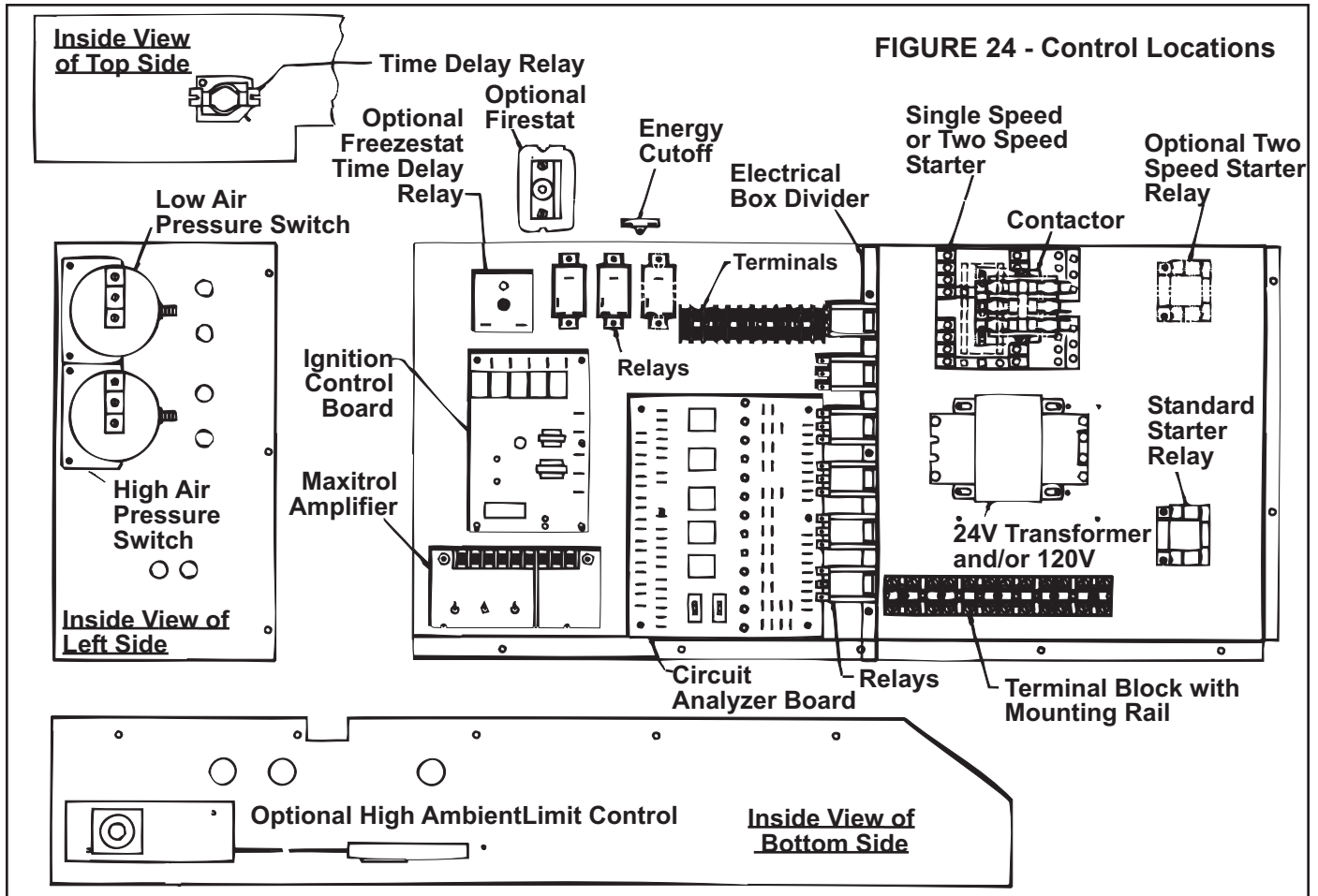
5. Check Disconnect Switch --

- ☐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 correct fuses. Verify continuity of fuses.

6. Open the hinged gas/electrical control compartment door --

- ☐ Close all manual gas valves.
- ☐ Open hinged electrical panel cover.
- ☐ Check all wiring and wiring connections on gas controls and electrical components.
- ☐ If equipped with any manually reset devices such as a firestat limit switch, or high gas pressure switch, reset devices.



7. Open the hinged blower compartment door --

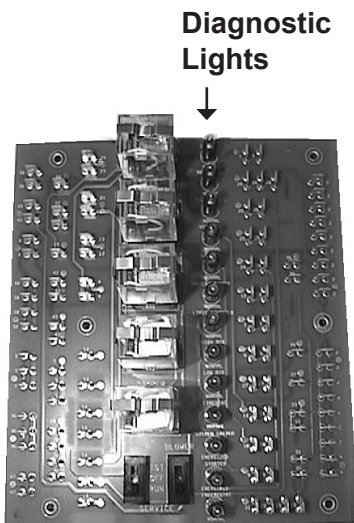
- ☐ Remove any blocking and shipping supports.
- ☐ Check all fasteners for tightness and all parts to be sure they are secure.
- ☐ Rotate the blower wheel to be sure that no parts are rubbing. Check for and remove any obstructions and/or foreign material that may damage the blower wheel.
- ☐ Check that the blower belts have correct tension (See Paragraph 6.4) and that pulleys are in alignment and locked to the shaft.
- ☐ Remove the cover from the limit switch junction box; reset manual limit switch.
- ☐ Check wiring connections to limit switch, discharge air sensor, and motor.
- ☐ Close blower compartment door panel; secure latches.

8. Turn ON gas supply valve and 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.

9.0 Commisioning and Startup (cont'd)

9.2 Startup



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
- ☐ Set BOTH the blower and burner service switches (located on the electronic circuit board) to the OFF position.

2. Observe status lights on the electronic circuit board (assuming an optional control relay is installed) --

- ☐ Turn ON power to the system at the disconnect switch.
- ☐ Check the electronic circuit board. One light should be lit - **"Control Power"**.
- ☐ Turn OFF the disconnect switch.
- ☐ If the system has an optional relay (check wiring diagram), remove the wire from Terminal 3 and Terminal 4 that connects the circuit to the optional "control relay" contacts. Place a jumper wire from that Terminal 4 to empty Terminal 3.
- ☐ Turn ON the disconnect switch. One or two lights should be lit - **"Control Power"** - plus if equipped with a firestat - **"Firestat Normal"**

3. Check blower switch and blower rotation.

- ☐ Place the blower switch (on the electronic circuit board) in TEST position. This will bring on one or two additional lights - **"Starter Energized"** - and if equipped with a freezestat - **"Freezestat Normal"**.

NOTE: If unit is equipped with a discharge damper, the damper will begin to open.

When the damper reaches 80% open, the blower motor will be energized and **then** the **"Starter Energized"** light will be actuated. After the blower obtains normal speed (minimum .2" positive air pressure), the low air proving switch will close and the following lights will be energized: **"Low Air Pressure Normal"**; **"Limit Controls Normal"**; and if these options are included, **"High Air Pressure Normal"**; **"Outside Air Cutoff Normal"**; **"Low Gas Pressure Normal"**; **"High Gas Pressure Normal"**.

- ☐ Check blower rotation. If blower is turning backwards (see rotation arrows), do the following.

- ☐ (A) Turn disconnect switch OFF and:

Single-phase units - rewire the motor per instructions on the motor plate.

Three-phase units - interchange any two motor leads at the motor contactor or starter.

- ☐ (B) Turn disconnect switch ON and verify correct blower rotation.

- ☐ Check blower operation to be sure there is no excessive vibration. If excessive vibration is present, re-check belt tension, pulley alignment, bearing alignment, blower wheel balance, and that components are attached securely. Determine and eliminate the cause of excessive vibration before the system is put into operation.

4. Measure burner differential air pressure on the slope gauge Measure burner differential air pressure on the slope gauge (connected to the unit in Startup Step 1) .

- ☐ (A) If the system includes an optional discharge damper, before measuring burner differential air pressure, check that the damper is fully open.

- (1) Turn the disconnect switch OFF.
- (2) Vertical Discharge - On the control side of the unit, open blower door.
- (3) Horizontal or Vertical Discharge - Check damper. If not fully open, adjust damper to the fully open position.
- (4) Vertical Discharge - Close the door panel and secure the latches.
- (5) Turn ON the disconnect switch.

- ☐ (B) With the blower operating, the pressure differential on the slope gauge should read between .25" and .75" w.c. If the slope gauge reading is within those limits, no adjustment is necessary. If the slope gauge reading is not within these limits, do the following:

If the slope gauge reading is <i>greater than</i> -.25" (such as -.10" w.c.), adjust the drive to increase the blower speed. (1) Turn disconnect switch OFF. (2) For systems with smaller than 7-1/2 HP motor (a) Loosen belt tension and remove belt. (b) Loosen the set screw on the side of the pulley away from the motor. (c) Turn adjustable half of the pulley inward to increase blower speed. One turn of the pulley will change speed 8 to 10%. (d) Tighten the set screw 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 <i>less than</i> -.75" (such as -1.0" w.c.), adjust the drive to decrease the blower speed. (1) Turn disconnect switch OFF. (2) For systems with smaller than 7-1/2 HP motor (a) Loosen belt tension and remove the belt. (b) Loosen the set screw 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 of the pulley will change speed 8% to 10%. (d) Tighten the set screw 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 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.
---	--

- ☐ (C) 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 the limits, re-adjust the blower speed.
- ☐ (D) 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.
- ☐ (E) 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.
- ☐ (F) If the system includes an optional dirty filter light, while the blower continues to operate, set the switch so that the indicator light (on the remote console) will activate at approximately 50% filter blockage. Calibrate the switch to this measurement by turning 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 this setting the contacts will close causing the light to signal that the filters require cleaning at approximately 50% blockage.
- ☐ (G) Turn the disconnect switch OFF. Disconnect the manometer and the slope gauge. Replace caps removed to connect the slope gauge and the plug in the gas pressure tap.

5. Check pilot and burner ignition --

- ☐ Turn the disconnect switch ON. (Lights as explained in Startup Steps 2 and 3 should be energized). Put the burner switch (on the electronic circuit board) in TEST position. 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. All lights should be lit **except "System Switch" (12 lights total)**.
- ☐ 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 7.) Remove the manometer.
- ☐ Leak test all connections in the pilot and main burner supply lines. **WARNING: DO NOT TEST WITH OPEN FLAME.**
- ☐ 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.

9.0 Commissioning and Startup (cont'd)

9.2 Startup (cont'd)

6. Check pilot pressure and operation --

- ☐ 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 blower and burner switches in TEST position. Turn ON disconnect switch. After blower reaches speed, **all** lights should be lit **except** "Pilot Valve" and "Main Valve". Turn on the gas supply. **After 15-20 seconds**, the **"Pilot Valve"** light will be energized, followed by the **"Main Valve"** light.
- ☐ Measure pilot gas pressure. Pilot pressure for natural gas should be 3.5" w.c.; 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.
- ☐ 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, cycle the main disconnect switch.

7. Verification of inlet gas pressure --

If, with the blower and burner operating, the main inlet gas pressure measured in Step 4 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 that stated on the rating plate, full burner firing 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 the 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.
- ☐ Calculate the required burner differential gas pressure. Differential gas pressure is the figure used when determining minimum gas supply pressure. Add differential gas pressure plus the drop in gas pressure as it flows through the gas train (See Paragraph 6.1) to determine the minimum required supply pressure of inlet gas. For maximum firing rate, a minimum of 4.3" w.c. of actual measured natural gas pressure is required at the burner (If maximum firing is not required divide the actual input rate by the maximum rate, square the answer, and multiply by 4.3" w.c. to determine the required gas pressure at less than maximum capacity.)
- ☐ Turn disconnect switch OFF. If the gas pressure is determined to be adequate, continue with the startup of the system. If the gas pressure is not adequate for the system, discontinue startup until the gas pressure problem is resolved.
- ☐ Remove the manometer and replace the plug.

9.3 Startup for Continuous Operation

- ☐ If connected in Startup Step 2, remove the jumper wire running from Terminal 3 to Terminal 4. Re-connect the optional "control relay" contacts to Terminal 3 and Terminal 4.
- ☐ Put BOTH the burner and blower switches in RUN position.
- ☐ Close the electrical box and close the control door panel. Secure latches.
- ☐ Turn ON the disconnect switch. The system is now operational from the control switch, the remote console, and/or other type of optional automatic control.

9.4 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, 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 5-Day Week (Guide Only)

Substance.....	Percent....	PPM	Substance.....	Percent....	PPM
Acetaldehyde	.001	10	Formaldehyde	.000025.....	0.25
Carbon Dioxide	.250	2500	Nitrogen Dioxide	.0001	1
Carbon Monoxide....	.001	10	Sulphur Dioxide.....	.00005.....	0.5

Note: At 100°F rise the CO₂ concentration will be in the order of 2500 ppm.

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 the factory. **FAILURE TO PROVIDE PROPER COMBUSTION AIR CAN RESULT IN A HEALTH HAZARD WHICH CAN CAUSE PROPERTY DAMAGE, SERIOUS INJURY, AND/OR DEATH.** A direct-fired installation must provide for air changes as required by the applicable installation codes.

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1.0 General

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

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

1.1 Hazard Labels and Notices

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

Definitions of Hazard Intensity Levels used in this Manual

HAZARD INTENSITY LEVELS

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

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

1.2 Warnings and Requirements

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

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

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

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

- (a) Flammable solids, liquids, and gases;
- (b) Explosive materials (e.g. grain dust, coal dust, gun powder, etc.); or
- (c) Substances which may become toxic when exposed to heat (e.g. refrigerants, aerosols, etc.).

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

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

2.0 Maintenance

2.1 Maintenance Requirements

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

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

Maintenance Codes

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

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

2.2 Maintenance Schedule

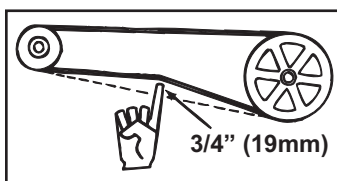
See Chart, Paragraph 2.3.1	☐ Lubricate bearings, Paragraph 2.3.1
Quarterly	☐ Check the filters, Paragraph 2.3.2
	☐ Check air pressure sensing tubes, Paragraph 2.3.4
Semi-Annually	☐ Check blower belts, Paragraph 2.3.1
	☐ Verify gas pressures, Paragraph 2.3.3
	☐ Clean air pressure sensing tubes, Paragraph 2.3.4
	☐ Check indicator lights, Paragraph 2.3.5
Annually	☐ Check main burner and pilot assembly, Paragraph 2.3.6

2.0 Maintenance (cont'd)

2.3 Maintenance Procedures

Recommended Bearing Lubrication Schedule in Months

FIGURE 1 - Belt Tension



R E 2.3.2 Filters

Quantity and Size of Filters by Model

Type	Disposable		Permanent		Pleated Disposable	
Thickness	1"	2"	1"	2"	1"	2"
Model RDF with Optional Filter Cabinet						
1	-	-	(3)12x35	(4)12x35	-	-
2	-	-	(4)12x35	(4)12x35	-	-
3	-	-	(4)12x24	(4)12x24	-	-
3	-	-	(12)12x35	(10)12x35	-	-
Model ADF/ADFH with Optional Filter Cabinet						
300	(5)12x30-5/8	(5)12x30-5/8	(10)10x16	(10)10x16	(5)12x32	(5)12x32
500	(5)12x20	(5)12x20	(5)12x20	(5)12x20	(5)12x20	(5)12x20
	(5)12x25	(5)12x25	(5)12x25	(5)12x25	(5)12x26	(5)12x26
700, 1200	(5)12x25	(5)12x25	(5)12x25	(5)12x25	(5)12x25	(5)12x25
	(5)12x30-5/8	(5)12x30-5/8	(5)12x32	(5)12x32	(5)12x32	(5)12x32

S 2.3.3 Manifold Gas Pressure

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

R 2.3.1 Drive Components

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

Blower Bearings

All blowers are Class I with pillow block bearings. Clean the fitting and add type NLG-2 or -2 standard grade grease. Add grease with a handgun until a slight bead of grease forms at the seal. Be careful not to unseat the seal by over lubricating.

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

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

Blower Belts

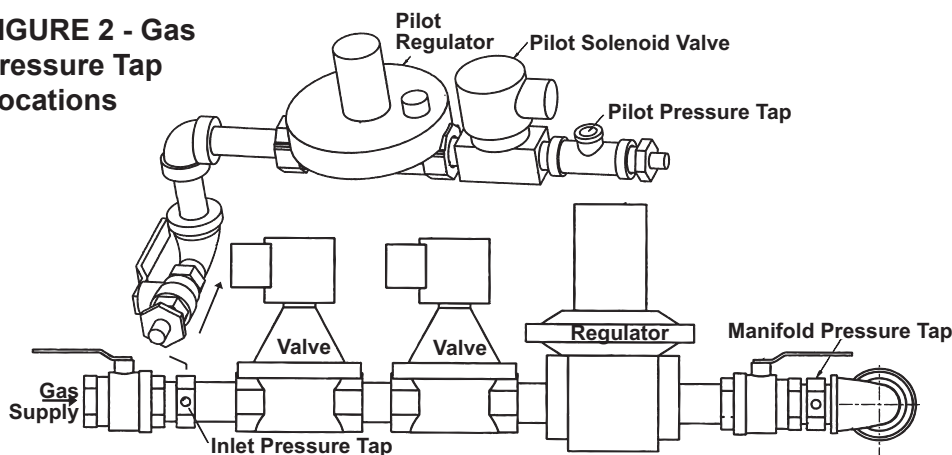
Check belts for proper tension and wear. Adjust belt tension as needed. Replace worn belts.

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

If the system includes filters, check the filters quarterly.

To access the filters, remove the filter cabinet door panels. Clean or replace as needed. If filters are removed, be sure the blockoff plates are returned to the filter rack.

**FIGURE 2 - Gas
Pressure Tap
Locations**



S

2.3.4 Air Pressure

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

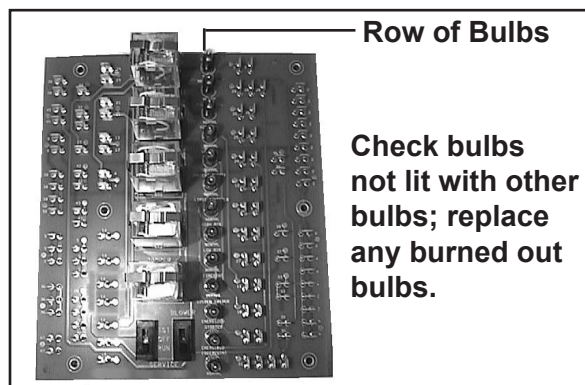
To clean, remove the screened end caps and clean the screens and the tubes. Replace the clean end caps. Check the pressure differential across the profile plate using a slope gauge. To attach the slope gauge, open the control compartment door panel. Just below the junction box, locate the tubing connections.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

R

2.3.5 Circuit Indicator Board (check lights)

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

FIGURE 3 - Circuit Indicator Board, P/N 151263



S

2.3.6 Main Burner and Pilot Assembly

CAUTION: Wear eye protection while pressure cleaning and drilling.

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

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

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

FIGURE 4 - Burner End Plate showing Hot Surface Ignitor

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

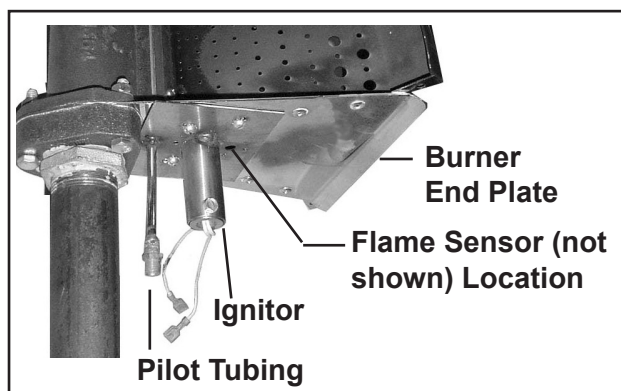
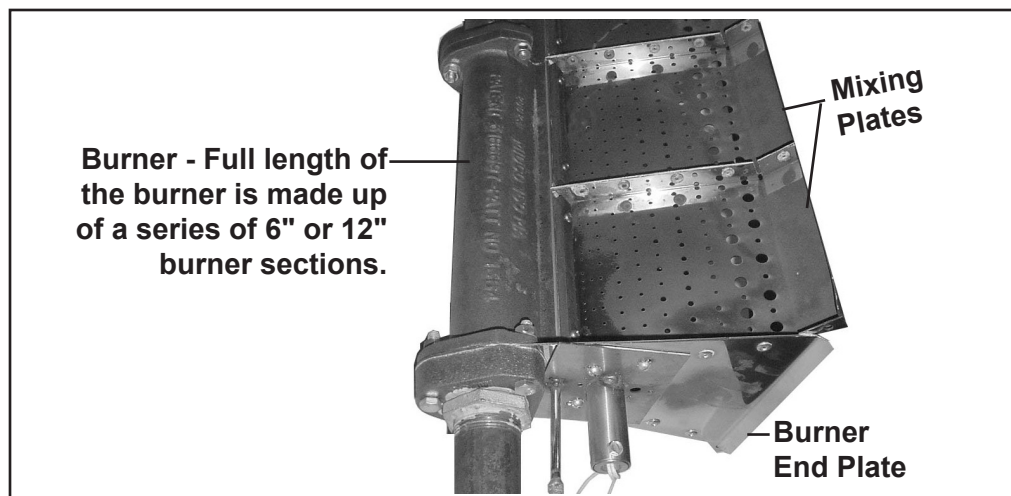


FIGURE 5 - Direct Fired Burner

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



2.0 Maintenance (cont'd)

2.3 Maintenance Procedures (cont'd)

CAUTION: Wear eye protection while pressure cleaning and drilling.

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



2.3.7 Optional Evaporative Cooling Module

Instructions for Replacing Evaporative Cooling Media

2.3.6 Main Burner and Pilot Assembly (cont'd)

- 3) Disconnect the two ignition wires (male and female quick connections) and disconnect the flame sensor lead at the burner. Remove the setscrew located in the ignitor tube (setscrew holds the brass bushing in place). Carefully remove the brass bushing and the ignitor.

Check the hot surface ignitor for cracks or unusual deterioration. Check the flame rod for integrity. Replace the flame rod (**P/N 134706**) and/or the hot surface ignitor (**P/N 121865**) if not in good condition.

- 4) Clean the burner and pilot by back-flushing, using high pressure air (40-80 lbs). Continue until dust particles are completely expelled from both the upstream and downstream sides of the burner.

If air pressure does not unplug burner orifices or pilot tube, drill burner orifices with a Size #50 drill and/or pilot tube with a Size #55 drill.

Inspect the upstream and downstream sides of the mixing plates. Remove any accumulation of scale or foreign material with a wire brush. If any mixing plate fasteners are loose or missing, tighten or replace. Always use zinc plated or stainless fasteners.

If any cracks are present, replace that mixing plate. Because of the effect of flame temperature on the metal, fasteners may be difficult to remove. Be careful not to damage the gaskets that go between the mixing plates and the burner body. The gaskets are designed to overlap approximately 1/16" for airtight seal.

- 5) Follow Steps in reverse order to re-install the pilot assembly. Close all panels and check for proper operation.

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

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

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

ADF / ADFH	Media Pad Size & Qty		Replacement P/N's (each) - 12" media *	
	(inches)	Qty	Cellulose	Glass Fiber
300	24 x 12	2	106021	106029
	24 x 7-7/8	1	106022	106030
500	24 x 12	3	106021	106029
	24 x 9-5/8	1	106025	106033
700/	48 x 12	4	107194	107201
1200	48 x 8-5/8	1	107195	107202

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

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

REC	Media Pad		Replacement P/N's (each) *	
	Size	Qty	12" Cellulose	12" Glass Fiber
40	24x12	2	106021	106029
	24x2-3/8	1	106022	106030
50	24x12	2	106021	106029
	24x7-7/8	1	106023	106031
60	24x12	3	106021	106029
	24x1-3/8	1	106024	106032
70	24x12	3	106021	106029
	24x9-5/8	1	106025	106033
80	24x12	4	106021	106029
	24x2-7/8	1	106026	106034
90	24x12	4	106021	106029
	24x8-5/8	1	106027	106035
180	48x12	4	107194	107201
	48x8-5/8	1	107195	107202
360	48x12	8	107194	107201
	48x8-5/8	2	107195	107202

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

FIGURE 6 - Removal and Replacement of Evaporative Cooling Module Media

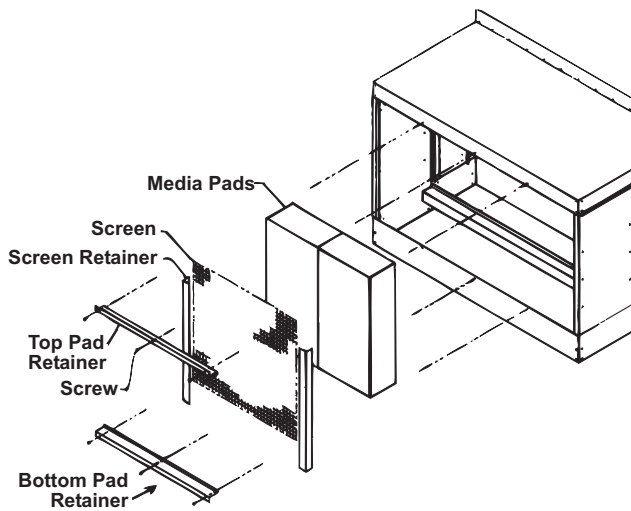
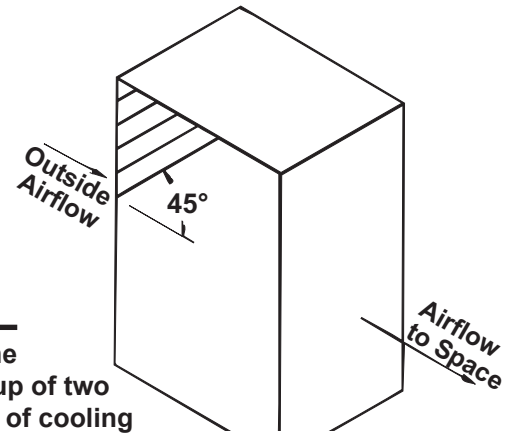


FIGURE 7 - Media must be installed with 45° angle sloping downward toward the incoming outside air.



IMPORTANT: The media is made up of two different sheets of cooling material. Each sheet has its own unique angle. When replacing the cooling media, **BE CERTAIN** that the 45° angle slopes downward toward the incoming outside air (as illustrated above). If the media is not installed properly, water blowoff from the media pads will occur.

6. Replace media by sliding media pads over both support rails until back stop is encountered. Media **must** be placed as shown in **FIGURE 7**.
7. Center screen on the incoming air side of the media.
8. Replace the two side screen retainers by fitting them between the side of the media pad and the side of the cooling module. The retainers should fit snugly, pinching the screen against the media pads.
9. Replace the bottom pad retainer by securing the retainer between the pad and the reservoir pan. Fasten with the three sheetmetal screws removed in Step 2.
10. Replace the top pad retainer by securing the retainer between the pad and top of the cooling module. Fasten with the three sheetmetal screws removed in Step 1.

Other Evaporative Cooling Module Maintenance

REFERENCE:
Evaporative Cooling Module Troubleshooting Guide, Paragraph 3.9, page 19, Chart 2.

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

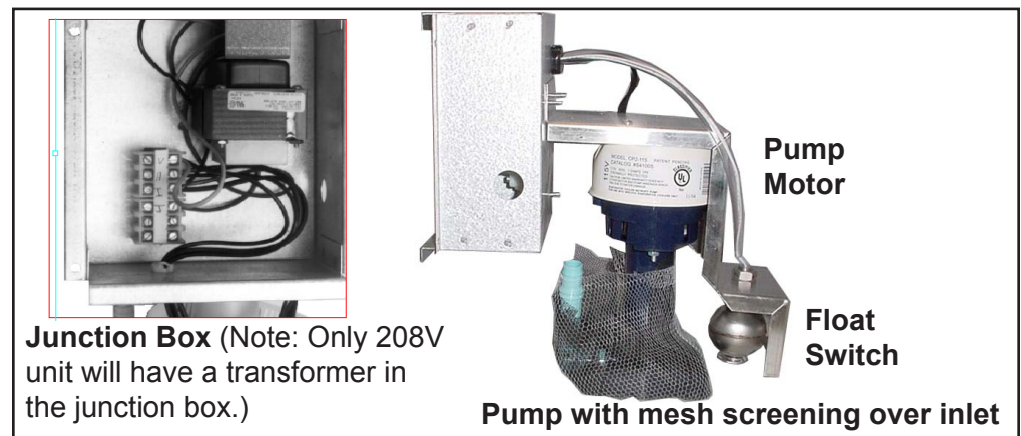
1. Remove the media pads following the media replacement instructions.
2. Remove the water feed line from the downstream side of the ball valve and unscrew the water bleed line barbed hose fitting.
3. Force a fresh water supply through the water inlet hose and thoroughly flush the distribution pipe.
4. Reassemble being careful to install media with air flow direction as shown in **FIGURE 7**.

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

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

1. Disconnect the power supply to the unit.

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



2.0 Maintenance (cont'd)

2.3 Maintenance Procedures (cont'd)

3.0 Operation and Service

2.3.7 Optional Evaporative Cooling Module (cont'd)

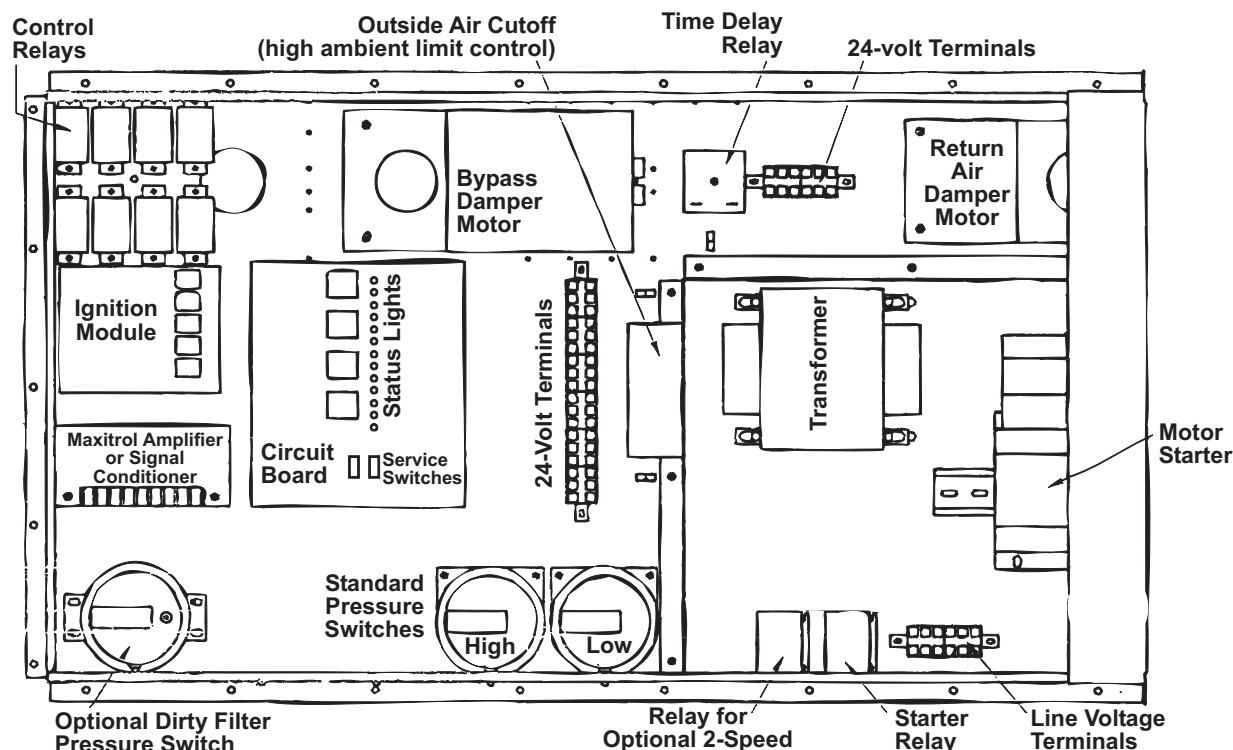
2. Remove the service panel and the junction box door. Disconnect the two-line voltage power supply wires from the terminal block inside the junction box.
3. Disconnect the water feed line hose from the upstream side of the ball valve.
4. Unscrew the four sheetmetal screws holding the junction box to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

3.1 Control Locations

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

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

FIGURE 9 - Control Identification and Typical Locations

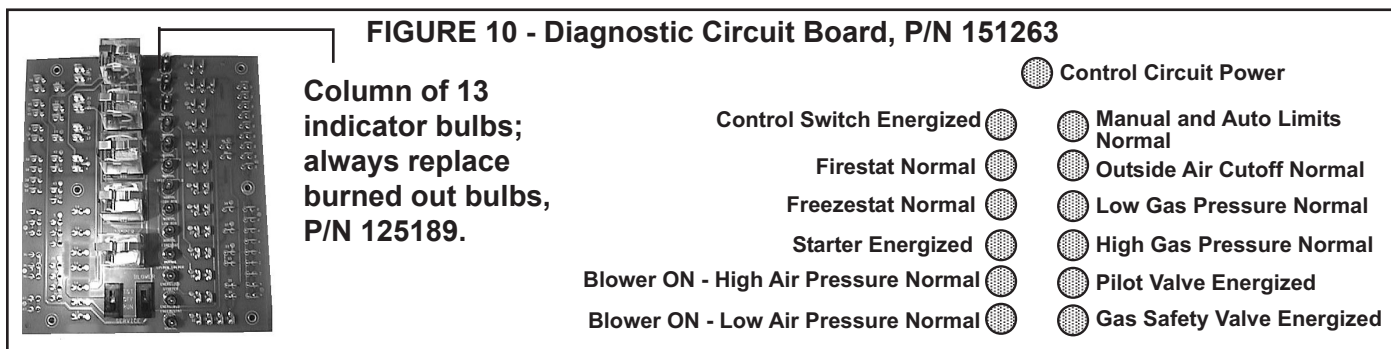


3.2 Electronic Circuit Board with Lights

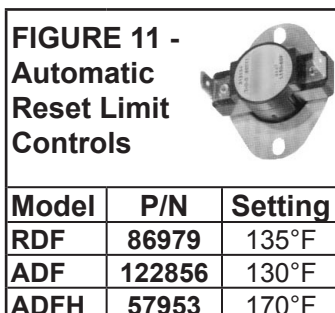
Location: Control Compartment Electrical Box (See **FIGURE 9**)

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

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



3.3 Limit Safety Controls



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

• Automatic Reset Limit Control

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

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

• Manual Reset Limit Control

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

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

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

FIGURE 12 - Manual Reset Limit Controls

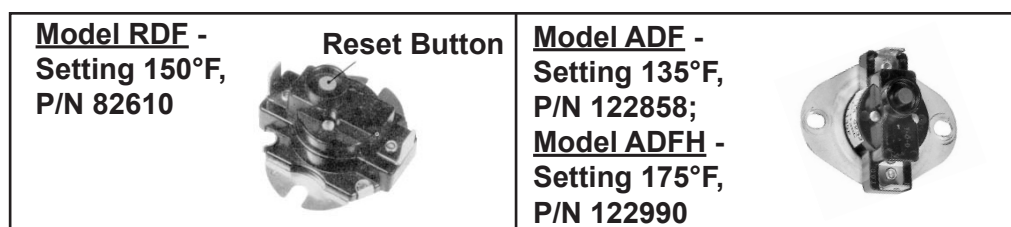
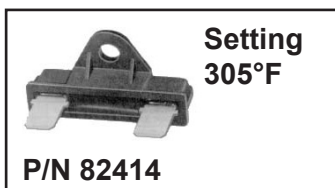


FIGURE 13 - ECO Limit Control



• Emergency Cut Off Limit Control

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

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

3.4 Air Pressure Switches

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

• Low Airflow Switch

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

3.0 Operation and Service (cont'd)

3.4 Air Pressure Switches (cont'd)

FIGURE 14 - Air Pressure Switch



• High Airflow Switch

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

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

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

- A) If the system includes an optional discharge damper, before measuring burner differential air pressure, check to be sure that the damper is fully open.
- B) With the blower operating, the pressure differential on the slope gauge should read between -.25" and -.75" w.c. If the slope gauge reading is within those limits, no adjustments are necessary. If pressure reading is not within limits, consult the factory.
- C) When air pressure is within the proper range, turn the disconnect switch OFF. Disconnect the manometer and the slope gauge. Replace the caps removed to connect the slope gauge.

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

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

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

3.5 Ignition System

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

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

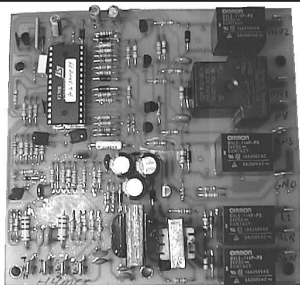
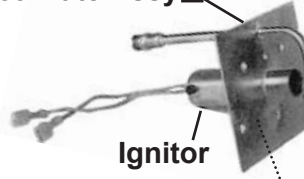
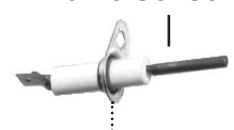


FIGURE 16 - Ignitor, P/N 121865, and Flame Sensor, P/N 134706, on the Burner

Pilot Plate Assy



Flame Sensor



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

Function: The ignition system including the controller, the hot surface ignitor, and the flame sensor function to ignite and prove the pilot flame. When there is a call for heat, the modular ignition controller is energized. When the controller reads 1.4 amps going to the hot surface ignitor, it opens the pilot valve for a 15-second trial for ignition. After the pilot flame rod senses pilot flame, the main gas valve is energized.

3.6 Gas Train Including Burner, Gas Controls, Manifold Arrangements, and Gas Pressure Switches

FIGURE 17 - Single-Stage Gas Valve and Discharge Air Controller in Makeup Air Gas Control System, Option AG1



FIGURE 18 - Two-Stage Gas Valve and Discharge Ductstat in Makeup Air Gas Control System, Option AG3



If the pilot flame rod does not sense a pilot flame, the controller shuts down the pilot valve for a 10-second interpurge and then opens it again for a second ignition trial. If pilot flame is not proven on the second trial, the ignition controller locks out and must be manually reset by an interruption of the main circuit (disconnect switch).

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

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

Direct-Fired Burner

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

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

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

Makeup Air (100% Outside Air) Gas Control Systems

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

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

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

The single-stage valve is replaced by a two-stage valve having low fire and high fire operation. The two-stage valve is controlled by a unit-mounted ductstat that monitors discharge air temperature. The ductstat has a built-in setpoint selector from 60°-110°F. Available for use with natural gas only.

Due to different CFM settings and outside air temperatures, the average downstream outlet temperature may not match the ductstat setting exactly. After the installation is complete, adjust the setpoint of the ductstat to achieve the desired average outlet air temperature. See the valve manufacturer's literature provided in the owner's envelope for specifications, wiring, and operating information.

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

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

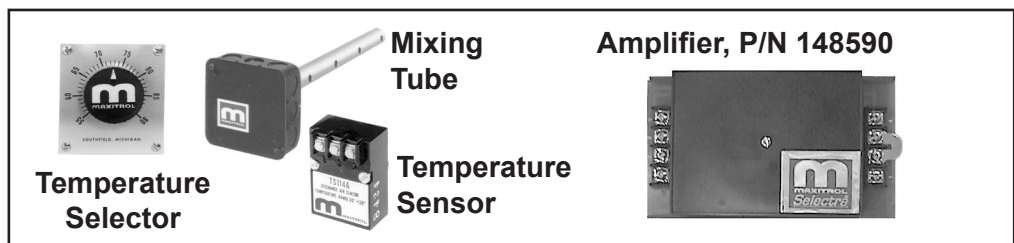
Function: These gas control systems provide heated makeup air at a temperature controlled by a discharge air sensor. Makeup air gas controls apply only to systems with 100% outside air. Each system is equipped with electronic modulation controls that modulate burner flame from 1/25th of full fire input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

3.0 Operation and Service (cont'd)

FIGURE 20 - Modulating Gas Valve - Options AG30, AG31, AG32, AG33, AG35, AG36

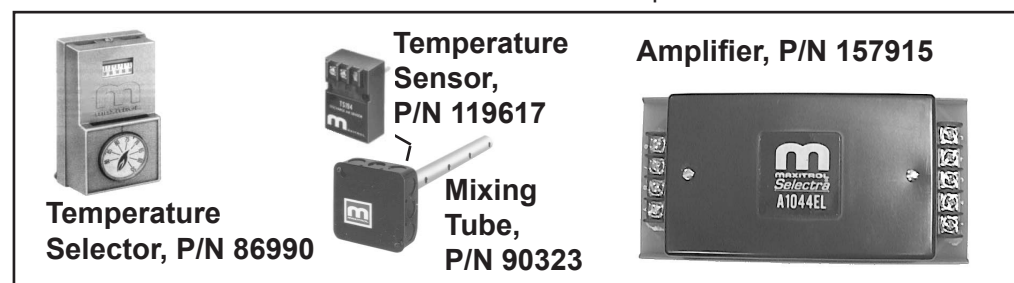


FIGURE 21 - Maxitrol Series 14 Components used in Makeup Air Gas Control Options AG30, AG31, AG32, AG35



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

FIGURE 22 - Maxitrol Series 44 Components used in Makeup Air Gas Control Option AG33



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

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

**Selector,
P/N 133230**



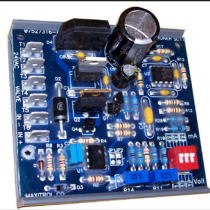
**Amplifier,
P/N 133229**



FIGURE 24 - Maxitrol Signal Conditioner for Computer Control

• **Electronic Modulation Makeup Air Gas Control Option AG37**

**Maxitrol Signal Conditioner,
P/N 134170**



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

FIGURE 25 - Modulating Gas Valve - Options AG47 and AG48



Makeup Air with Recirculation Air Gas Control Systems (RDF only)

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

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

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

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

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

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

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



Amplifier, P/N 204454



**Selector,
P/N 204455**



**Discharge Air Sensor,
P/N 204453**



**Return Air Sensor,
P/N 204452
Outside Air Sensor,
P/N 204452**

Option AG48 electronic modulation system is comprised of Maxitrol Series 44 controls for makeup air with recirculation. The low limit (20-60°F) and the high limit (60-140°F) for control of discharge air temperature are set at the amplifier. The space temperature is set at the remote selectstat (55-90°F range) located in the space. When the temperature is below the space temperature setpoint, the control system operates the burner and/or the outside air damper to automatically adjust the discharge air temperature within the maximum and minimum limits set on the amplifier.

3.0 Operation and Service (cont'd)

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

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



Amplifier, P/N 204450



**Selector,
P/N 204451**



**Discharge
Air Sensor,
P/N 204453**



**Return Air Sensor,
P/N 204452
Outside Air Sensor,
P/N 204452**

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

FIGURE 28 - Option
AG51 includes Maxitrol
Series 44 Components
used in AG48 plus a
Remote Sensor



**Remote
Sensor/
Selector,
P/N 204456**

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

Manifold Arrangements

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

All manifold arrangements include two 5psi rated manual shutoffs.

These systems are designed to operate on a natural gas supply differential pressure range of a minimum of 4.3-5.0" w.c. plus the manifold pressure drop. Maximum supply pressure depends on manifold selection; see below. If the gas supply pressure is above the maximum allowed, it is necessary to install a field-supplied step-down gas regulator in the supply line. Order and install the appropriate Gas Regulator Kit, Option CZ1 (1") or CZ2 (1-1/2"). Follow the instructions provided with the kit. Measure the gas pressure between the step-down regulator and the unit.

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

Manifold Option BM75, BM76 - 1/2 psi
Manifold Option BM78, BM79 - 2 psi
Manifold Option BM80, BM81 - 5 psi

Maximum Supply Pressure by Manifold

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

Minimum Supply Gas Pressure ("w.c.) for Full Fire														
Manifold Option	BM75				BM76		BM78		BM79		BM80		BM81	
with Gas Control Option	AG1		AG3		AG 30, 31, 32, 33, 35, 36, 37, 47, 48, or 51		AG 30, 31, 32, 33, 35, 36, 37, 47, 48, or 51							
Manifold Size	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
250	4.0	1.4	4.0	N/A	4.1	1.6	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	6.0	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	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

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

If the gas pressure in a system equipped with a high gas pressure switch (standard with manifold Options BM 78, 79, 80 and 81; Option BP2 with other manifolds) exceeds the setpoint, the switch will open the electrical circuit to the burner, stopping all gas flow. The high gas pressure switch is a manually reset device.

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

FIGURE 29 - Gas Pressure Switches

Low Gas Pressure Switch, P/N 204375 (automatic)



High Gas Pressure Switch, P/N 204297 (manual reset)



(NOTE: Both high and low gas pressure switches incorporate a vent limiting device and do not require venting to the outdoors when used in an indoor installation.)

3.7 Inlet Air Controls

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

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

●**Option AR1** - a constant supply of **100% makeup air**

●**Option AR19** - **100% outside makeup air** with variable supply air volume (CFM). The discharge damper controlling the variable air supply is controlled by a manually set remote potentiometer and can be varied from 100% to 20-25% of total rated airflow (CFM). In response to changes in the discharge damper setting, the bypass damper balances the volume of air so that the required fixed amount of air volume flows over the burner.

●**Option AR20** - **100% outside makeup air** with variable supply air volume (CFM). The discharge damper controlling the variable air supply is automatically controlled by a building pressure sensor and can be varied from 100% to 20-25% of total rated airflow (CFM). In response to changes in the discharge damper setting, the bypass damper balances the volume of air so that the required fixed amount of air volume flows over the burner.

●**Option AR22** - a combination of **outside makeup air and bypass return air** including modulating return air and bypass air dampers. The volume of outside air is regulated by a remotely located, manually set potentiometer.

●**Option AR23** - a combination of **outside makeup air and bypass return air** including modulating return air and bypass air dampers. The volume of outside air is regulated automatically by a remotely located building pressure sensor.

●**Option AR33** - **100% outside makeup air** with variable supply air volume (CFM). The discharge damper controlling the variable air supply is automatically controlled by a 0-10 VCD or 4-20 milliamp signal. In response to changes in the discharge damper setting, the bypass damper balances the volume of air so that the required fixed amount of air volume flows over the burner.

●**Option AR34** - a combination of **outside makeup air and bypass return air** including modulating return air and bypass air dampers. The volume of outside air is regulated by a 0-10 VCD or 4-20 milliamp signal.

●**Option AR36** - **100% outside makeup air** with variable supply air volume (CFM). The discharge damper controlling the variable air supply is automatically controlled by a remotely located photohelic pressure sensor. In response to changes in the discharge damper setting, the bypass damper balances the volume of air so that the required fixed amount of air volume flows over the burner.

●**Option AR37** - a combination of **outside makeup air and bypass return air** including modulating return air and bypass air dampers. The volume of outside air is regulated by a remotely located photohelic pressure sensor.

Airflow Dampers

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

Service: Clean all dampers of dust or dirt.

Damper Motor

FIGURE 30 - Damper Motor



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

Service: There is no service required on these motors other than external cleaning. If the motors need replaced, replace with an identical damper motor.

3.0 Operation and Service (cont'd)

3.7 Inlet Air Controls (cont'd)

Pressure Null Switch (automatic building pressure sensor)



FIGURE 32 - Pressure Null Switch, P/N 88052

Photohelic Pressure Switch (automatic building pressure sensor)



FIGURE 33 - Photohelic Pressure Sensor, P/N 159893

3.8 Other Optional Controls

FIGURE 34 - Outside Air Cutoff Control, P/N 126170



Potentiometer

FIGURE 31 - Potentiometer, P/N 16110



Function: The potentiometer is a manually set switch that operates either the discharge damper (Option AR19) or the return air damper (Option AR22) providing a mixture of return and outside air. It is a remotely located switch that requires manual adjustment.

Service: If the potentiometer does not function properly, replace it with an identical switch.

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

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

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

Service: Clean the tubing and the screened ends of the pressure tap vents.

If the interior of the switch is protected from dust, dirt, corrosive gases and fluids, years of trouble-free service may be expected. Zero adjustment should be checked and reset occasionally to maintain accuracy; follow the manufacturer's instructions included with the switch.

There are no field-repairable parts in this switch. If the switch should require repair, contact either the system or the switch manufacturer concerning switch replacement or repair.

Outside Air Cutoff Control (Option BN2)

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

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

- may not ignite (pilot valve will not open);
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".

Service: If the control does not function properly, replace it with an identical switch.

**FIGURE 35 -
Door Switch,
P/N 124253**



Door Switch (Option BX1)

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

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

**FIGURE 36 - Dirty Filter
Pressure Switch,
P/N 105507**



Dirty Filter Switch (component of Remote Console Option RC14)

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

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

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

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

**FIGURE 37 -
Firestat,
P/N 42782**



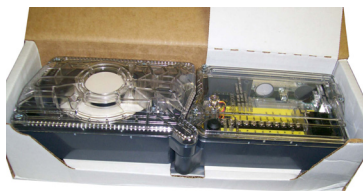
Firestat (Option BD2 or BD4)

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

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

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

**FIGURE 38 -
Photoelectric Smoke
Detector (cover
removed), P/N 159553,
used with sampling
tube, P/N 159714**



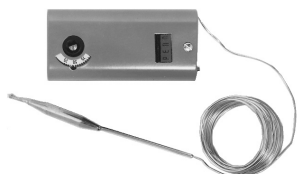
Photoelectric Smoke Detector (Option SA1)

Location: Field-mounted in the discharge ductwork.

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

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

FIGURE 39 - P/N 126170



Low Temperature Limit (Freezestat), Option BE2

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

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

Service: Clean the external surface. Check the wiring and connections. Freezestat Controller is P/N **126170**.

3.0 Operation and Service (cont'd)

3.9 Troubleshooting

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

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

15. Disconnect closed; blower and burner switches in run position; control switch is in "winter" position; all status lights are lit except "main valve normal" light. The pilot flame is present and stable, but the (low stage portion or) main gas valve will not open, or rapid cycling of the main valve is occurring.	1. Microamp signal on flame rod is inadequate - check position and condition of flame rod and signal (minimum 0.5 microamps required.)
	2. Grounding for unit or flame rod inadequate - check ground path.
	3. Faulty main gas valve - replace main gas valve.
	4. Faulty ignition module - replace ignition module.
	5. Inadequate main gas pressure - verify main burner pressure.
16. Disconnect closed; blower and burner switches in run position; control switch is in "winter" position; all status lights are lit; the pilot flame and low fire on the main burner are present and stable, but the unit will not progress to a high fire condition.	1. Faulty main gas valve - replace main gas valve.
	2. Inadequate timing on high fire time delay relay - adjust setting.
	3. Faulty high fire time delay relay - replace time delay relay.
	4. High stage relay contacts are not closed - check control setting.
	5. Inadequate main gas pressure - verify main burner gas pressure.
	6. Faulty high stage relay - replace relay.
	7. Faulty ignition module - replace entire module.

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

Chart 2 - Troubleshooting Optional Evaporative Cooling Module

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

Problem	Probable Cause	Remedy
Float & Pump Control System - Pump does not run. Control is calling for cooling and reservoir is full.	1. Electrical connections	1. Verify all electrical connections. See Wiring Diagram.
	2. Electric float switch on pump	2. Check position of the actuators on the electric float switch.
	3. Dirty pump	3. Clean pump. See Paragraph 2.3.7.
	4. Defective pump	4. Replace pump.
Float & Pump Control System - Required water level (3") not maintained	1. Float valve	1. Adjust float valve. Refer to the installation manual.
	2. Optional drain and fill valves	2. Check valve for proper operation.
	3. Incorrect overflow pipe nipple - should be 3-1/2"	3. Replace pipe nipple.
	4. Drain leaking	4. Tighten drain plug.
Water running off of media pads	1. Excessive water flow	1. Adjust ball valve in distribution line. Refer to installation manual.
	2. Media pads need cleaned or replaced.	2. Clean or replace media pads. See Paragraph 2.3.7.
Water not distributing evenly	1. Distribution line clogged	1. Flush distribution line. See Paragraph 2.3.7.
	2. Holes in distribution line turned	2. Check position of distribution line. Holes should be spraying upward. If not positioned with holes toward top, adjust position of PVC line.
	3. Incorrect voltage to pump (float and pump control system)	3. Check voltage at pump terminal in cooling module junction box.
Media pads becoming clogged and discolored quickly (scale/salt deposits) and/or rapid deterioration of the float switch (Float and Pump Control System)	1. Bleed off line clogged	1. Clean bleed line.
	2. Excessive water flow	2. Reduce flow by adjusting ball valve in distribution line. Refer to installation manual.
	3. Inadequate bleed off	3. A uniform build-up of minerals on the entering air face of the media indicates insufficient bleed off. Increase the rate until the mineral deposits dissipate.
Water blowoff from media pads or water being pulled from reservoir	1. Media pads installed incorrectly	1. Install media pads correctly. See Paragraph 2.3.7.
	2. Requires moisture elimination pad (over 600 FPM)	2. Install moisture elimination pad. Consult factory.
	3. Water level not 3 inches (float and pump control system)	3. See second problem listed above (Required water level not being maintained.)

INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)

Model	Serial No.	Date of Installation	Notes
	Installer	Distributor	
Name			
Company			
Address			
Phone No.			

For more information on Reznor HVAC products:

- Contact your local Reznor representative at 1-800-695-1901
- Refer to the technical specifications, manuals, and consumer materials found at www.reznorhvac.com

