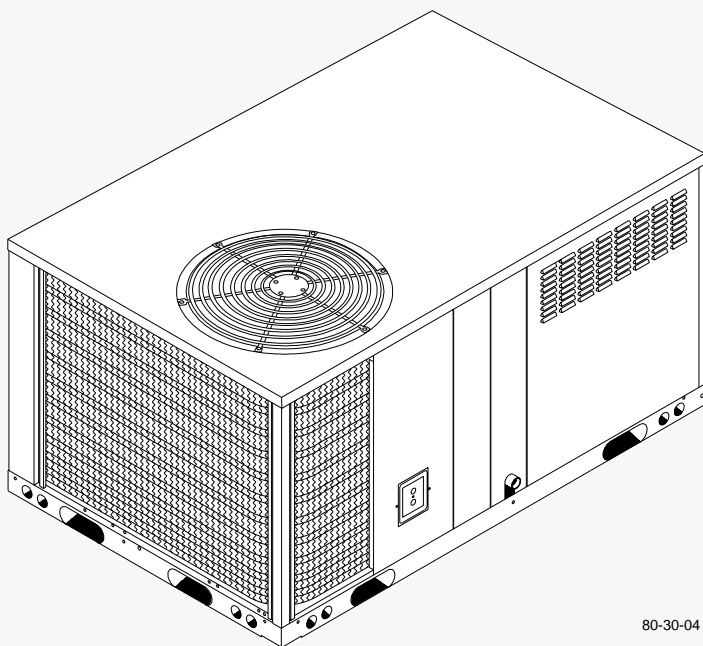


Installation Instructions



80-30-04

- Safety Labeling and Rules
- Installation Requirements
- Location/Clearances
- Gas Supply/Piping
- Air Distribution
- Wiring
- Ductwork Connections
- Start-Up
- Operation
- Maintenance
- Inspection
- Hoisting/Rigging



**3 thru 7-1/2 Ton
(Belt Drive Models)**

**COMBINATION UNITS
ELECTRIC COOL / GAS HEAT**

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1. Safety Labeling And Signal Words

DANGER, WARNING AND CAUTION

The signal words **DANGER**, **WARNING** and **CAUTION** are used to identify levels of hazard seriousness. The signal word **DANGER** is only used on product labels to signify an immediate hazard. The signal words **WARNING** and **CAUTION** will be used on product labels and throughout this manual and other manuals that may apply to the product.

SIGNAL WORDS

DANGER – Immediate hazards which **WILL** result in severe personal injury or death.

WARNING – Hazards or unsafe practices which **COULD** result in severe personal injury or death.

CAUTION – Hazards or unsafe practices which **COULD** result in minor personal injury or product or property damage.

Signal Words in Manuals

The signal word **WARNING** is used throughout this manual in the following manner:

WARNING

The signal word **CAUTION** is used throughout this manual in the following manner:

CAUTION

PRODUCT LABELING

Signal words are used in combination with colors and/or pictures on product labels. Following are examples of product labels with explanations of the colors used.

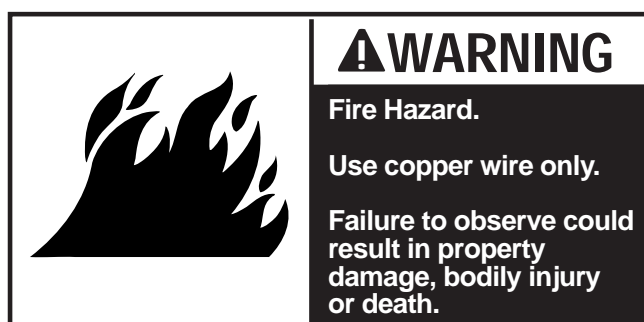
Danger Label

Black printing on a white background except the word **DANGER** which is white with a red background.



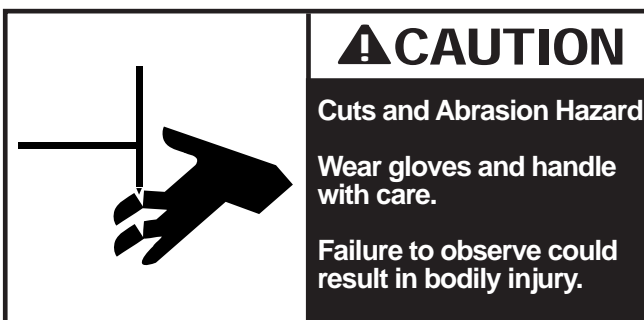
Warning Label

Black printing on a white background except the word **WARNING** which is black with an orange background.

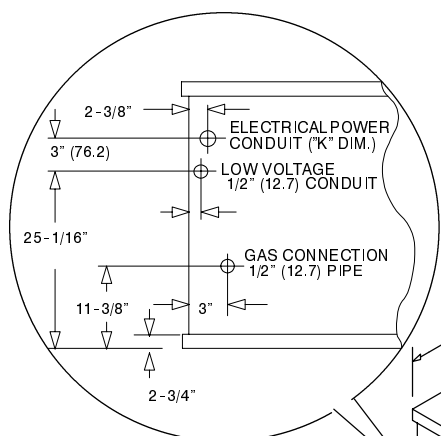


Caution Label

Black printing on a white background except the word **CAUTION** which is black with a yellow background.



"C" CHASSIS UNIT DIMENSIONS

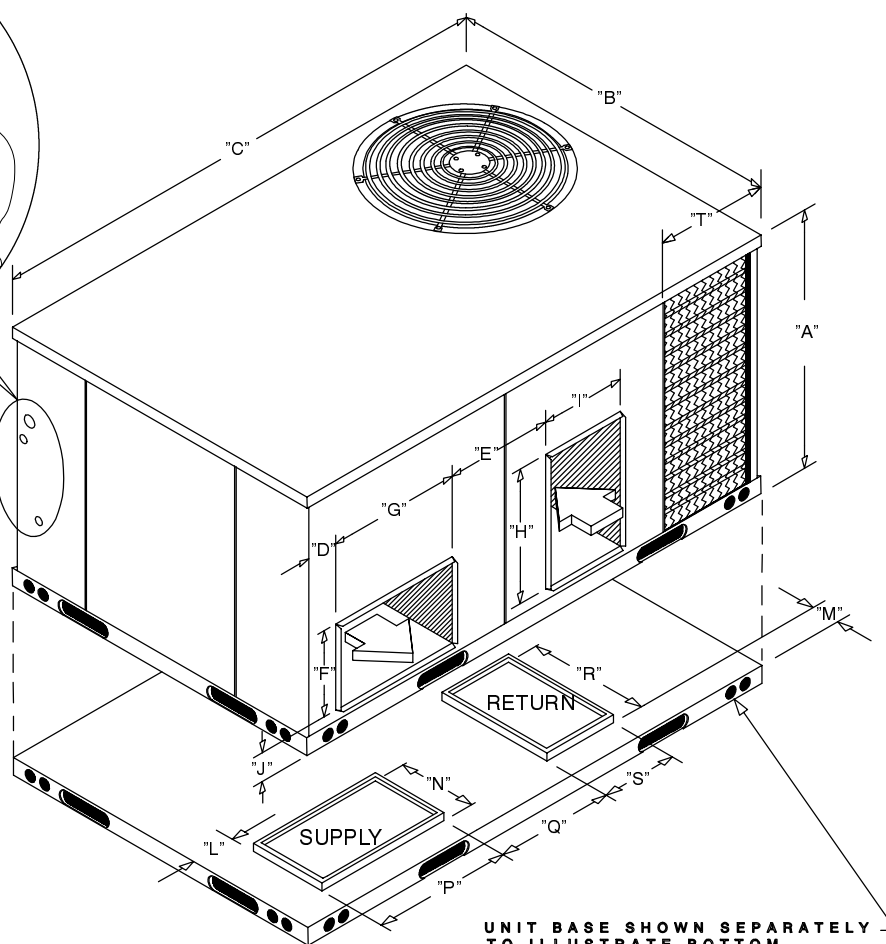


**COMBINATION GAS/
ELECTRIC UNITS
"C" Chassis
(47³/₈ x 73)**

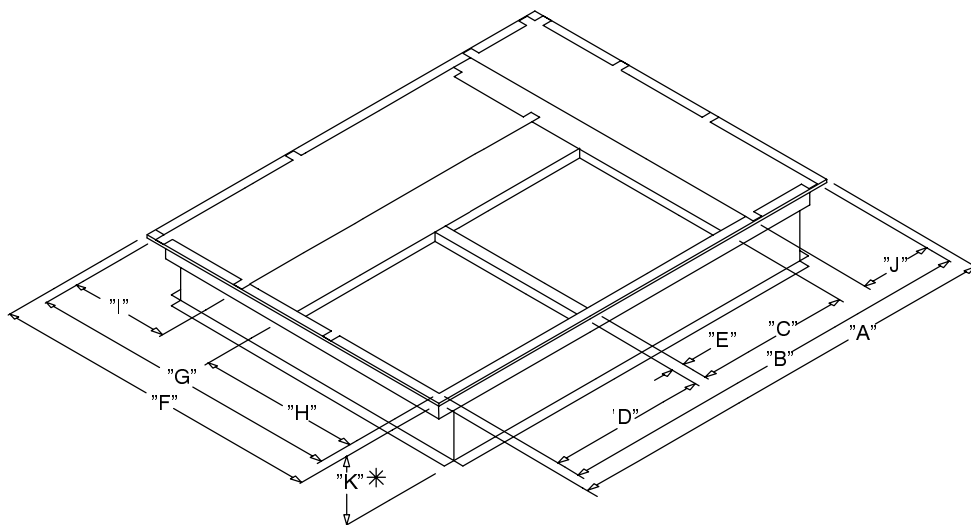
DIM.	INCHES	MILLIMETERS
A	36	914
B	47-3/8	1203
C	73	1354
D	4-5/8	117
E	15	361
F	12	307
G	18-3/4	476
H	18-3/4	476
I	12	306
J	4	102
K	1 & 1-1/4	25 & 31
L	4-1/4	108
M	5-1/4	133
N	12-1/4	311
P	19	483
Q	15	381
R	19	483
S	12-1/4	318
T	16-7/8	429

**ROOF CURB
for
"C" Chassis
(47³/₈ x 73)**

DIM.	INCHES	MILLIMETERS
A	67-3/4	1721
B	64-3/4	1645
C	23	584
D	23	584
E	2-1/2	64
F	42-3/4	1086
G	39-3/4	1010
H	23	584
I	12	305
J	12	305
K*	14	356



UNIT BASE SHOWN SEPARATELY
TO ILLUSTRATE BOTTOM
DUCT OPENINGS



* ROOF CURBS ARE ALSO AVAILABLE IN 8" (203) AND 24" (610) HEIGHTS (K DIMENSION).

2. Safe Installation Requirements

WARNING

Installation or repairs made by unqualified persons can result in hazards to you and others. Installation **MUST** conform with local building codes or, in the absence of local codes, with the ANSI Z223.1-1990 National Fuel Gas Code and the National Electrical Code NFPA70-1990 or in Canada the National Standard CAN/CGA B149.1 and CSA C.22.1 - Canadian Electrical Code Part 1.

The information contained in this manual is intended for use by a qualified service technician familiar with safety procedures and equipped with the proper tools and test instruments.

Failure to carefully read and follow all instructions in this manual can result in furnace malfunction, property damage, personal injury and/or death.

- Installation **MUST** conform to the most current version of the following standards or a superseding standard.

In the USA:

- ANSI Z223.1-1996 National Fuel Gas Code
- National Electrical Code NFPA70-1990

In Canada:

- National Standard CAN/CGA B149.1
- CSA C.22.1 - Canadian Electrical Code Part 1.
- Do **NOT** use this furnace as a construction heater.
- Use only the type of gas approved for this furnace (see rating plate).
- Do **NOT** use open flame to test for gas leak.
- Seal supply and return air ducts.

NOTE: It is the personal responsibility and obligation of the customer to contact a qualified installer to ensure that the installation is adequate and conforms to governing codes and ordinances.

CAUTION

It is recommended that a qualified service technician check the heat exchanger integrity every two (2) years, after the first four (4) years of operation.

Check Pre-existing Common Vent From Old Furnace

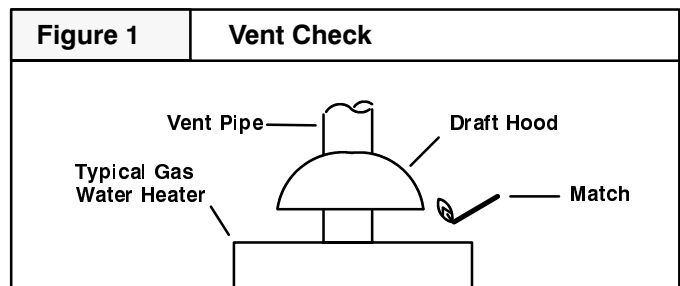
If the installation of the combination unit involves removing an existing furnace from a common vent with other appliances, the venting system will probably be too large for the remaining appliances and they will not vent properly.

The venting system **MUST** be checked according to the following procedure.

NOTE: The following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch to ensure there is no blockage or restriction, leakage, corrosion or other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building.
4. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do **NOT** operate a summer exhaust fan. Close fireplace dampers.
5. Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance will operate continuously.
6. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle. (see **Figure 1**). Flame or smoke should draw towards vent pipe.
7. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.
8. If improper venting is observed during any of the above tests, the common venting system **MUST** be corrected using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z223.1, 1996.

NOTE: If flame pulls towards draft hood, this indicates adequate venting.



3. Locating the Unit

The unit is designed for outdoor installation only. The unit may be installed on a concrete mounting base at ground level, or on a rooftop with an adequate platform or if using as a downflow model, with a roof curb. Typical installations are shown in **Figure 3** and **Figure 4**.

Access Panels

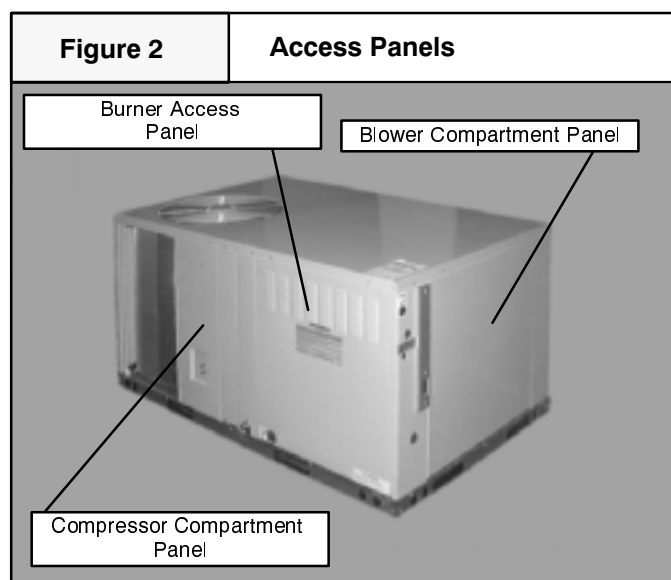
See **Figure 2** below for a general view of unit and location of access panels.

WARNING

Carbon monoxide poisoning hazard.

Keep blower door closed.

Failure to keep blower door closed can result in bodily injury and/or death.



Clearances

The location **MUST** allow for minimum clearances and should not be adjacent to a patio or other area where the unit's operating sound level might be objectionable. The combustion air inlet openings **MUST** not be obstructed (see **Figure 7**). In addition, local codes **MUST** be observed.

Clearances **MUST** be maintained from adjacent structures to provide adequate fire protection, adequate combustion air, and room for service personnel.

NOTE: Filter racks need a 26" minimum clearance at front of unit for removal of filters. See chart below if unit is going to be placed near combustible construction or materials.

While minimum clearances are acceptable for safety reasons, they may not allow adequate air circulation around the unit for proper operation in the cooling mode. Whenever

possible, it is desirable to allow additional clearance, especially around the condenser inlet and discharge openings.

Do **NOT** install the unit in a location that will permit discharged air from the condenser to recirculate to the condenser inlet.

CAUTION

Do NOT operate unit in a corrosive atmosphere containing chlorine, fluorine, or any other corrosive chemicals.

Minimum Clearances to Combustible Construction

Furnace Plenum	2"
Duct Side	6"
Condenser Inlet Side	30"
Blower Service (Rear)	30"
Control Service Side (Front Combustion Air Inlet)	30"
Clearance between 3 Ft. maximum overhang and Top of Unit	30"
Combustible Base (Wood or Class A, B or C roof covering material)	0"

Ground Level Installation

Provide a level wood platform (pressure treated) or a concrete mounting base at least 4" thick and separate from the building foundation. The base surface should be 4" above grade level in an area that is well drained.

CAUTION

Unit will NOT operate properly unless it is installed level front to rear and side to side.

Rooftop Installation

The existing roof structure **MUST** be adequate to support the weight of the unit or the roof **MUST** be reinforced. Check the weight of the unit in relation to the roof structure and local building codes or ordinances and reinforce if necessary.

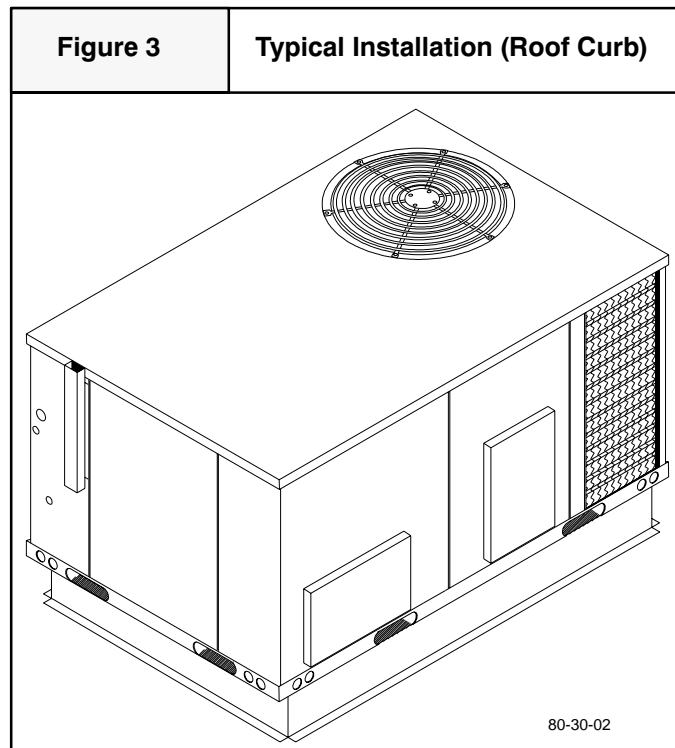
The unit **MUST** be situated to provide safe access for servicing. Support for the unit **MUST** be level and may consist of a platform or a combination of platform and roof beams or curb. The platform may be constructed of combustible material (wood only), or covered with Class A, B or C roof covering.

Hoisting

The unit should be hoisted with two lifting slings. Attach the slings to rigging shackles that have been hooked through holes in the base rail.

Place a short piece of 2x4 between unit and sling near the top edge to protect unit from damage. Two spreader bars **MUST** be used to keep slings from possibly crushing the sheet metal or damaging the unit. Make sure equipment is adequate for weight of unit, and that slings will not allow unit

to shift. Refer to **Figure 46**, last page of these instructions for illustrated rigging instructions.

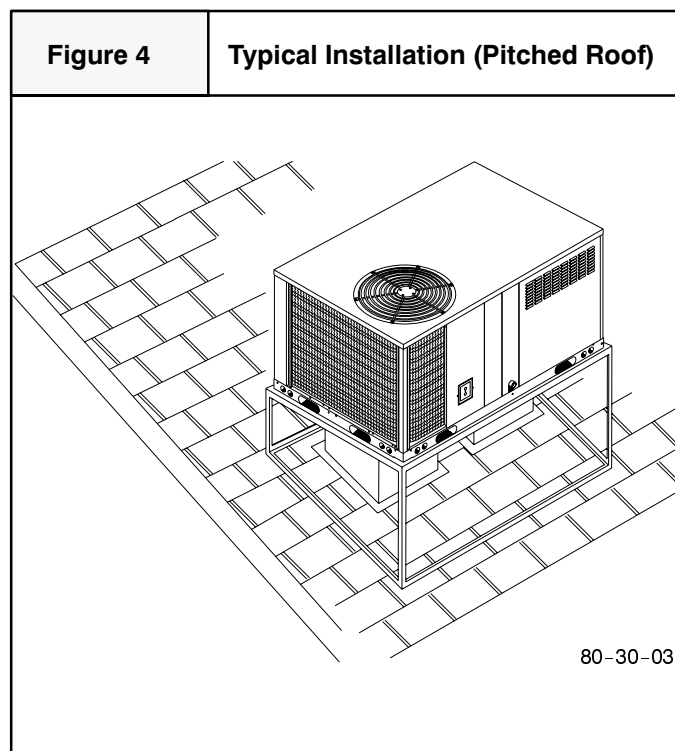


compartment and the supply air compartment. See **Figure 5** and **Figure 6**.

NOTE: Blockoff plate in the supply air compartment only contains one screw. If reinstalling plate, back part of plate **MUST** fit into mating dimples on flange. To reinstall, slant plate into dimples, then put plate into position and fasten with screw.

2. Install the removed plates on the horizontal return and supply air openings.
3. Install roof curb on your building. Be sure to follow all directions included with curb and all applicable building codes.
4. Install unit on the appropriate roof curb.

NOTE: It is the installer's personal responsibility to follow all local codes and ordinances and instructions contained herein, as well as instructions included with accessory items when installing unit.



Downflow Conversion

These units are adaptable to downflow use. To convert to downflow use, follow these steps:

1. Remove the blockoff plates found in the return air

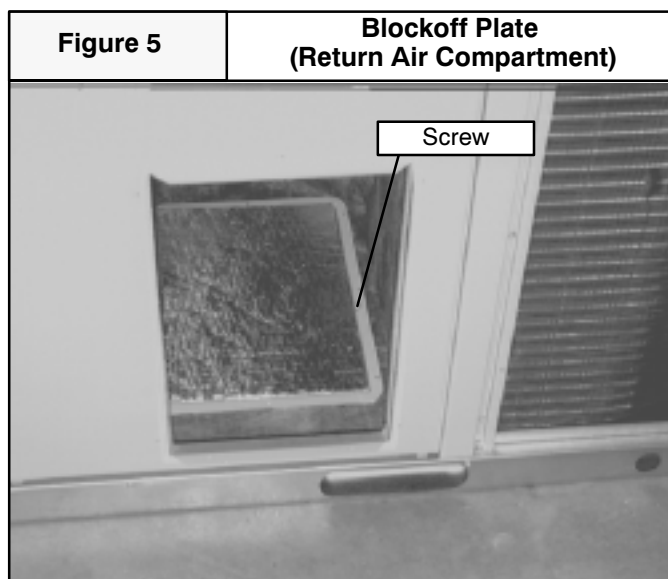


Figure 6

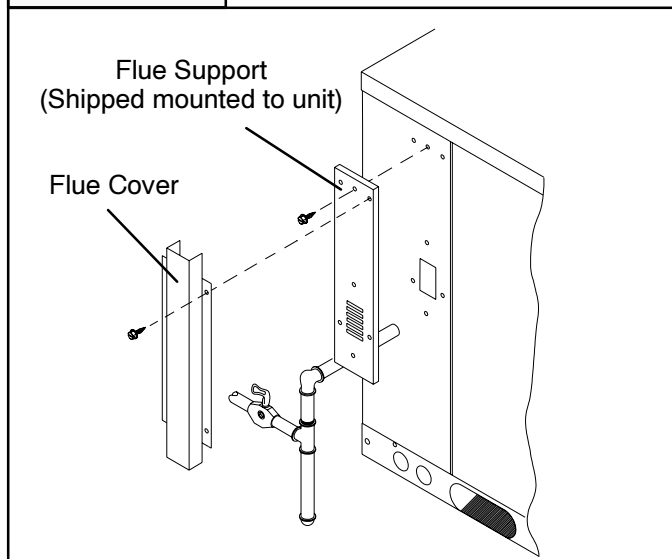
Blockoff Plate Removed
(Return Air Compartment)

Heating Vent Assembly

The flue cover is packed with screws in the return air compartment. Refer to **Figure 7** and assemble as shown.

Figure 7

Heating Vent Assembly



CAUTION

DO NOT OPERATE THE UNIT WITHOUT THE VENT ASSEMBLY INSTALLED

Condensate Trap

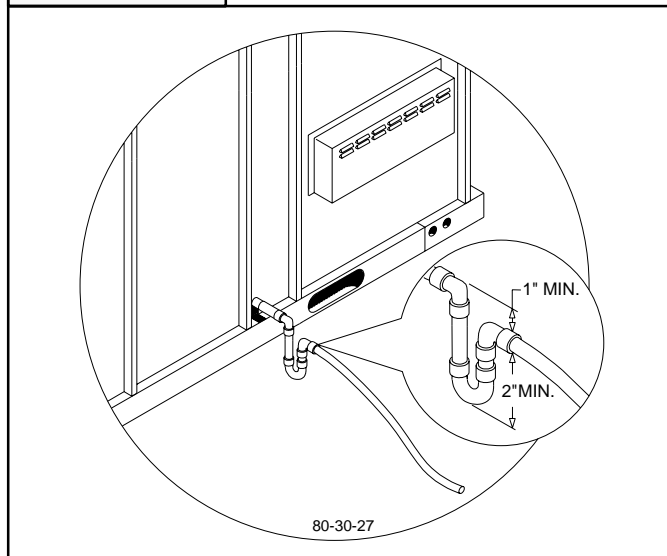
A condensate trap **MUST** be installed as near the unit as possible for proper drainage. Condensate trap **MUST** have proper height and fall as shown in **Figure 8**.

Condensate Drain

A $\frac{3}{4}$ " O.D. condensate drain connection is located at the front end of the unit. A $\frac{3}{4}$ " drain line **MUST** be installed if required by local codes or location of unit, and run to an open drain or other suitable disposal point.

Figure 8

Condensate Trap



4. Gas Supply and Piping

NOTE: Because there are many types of liquefied petroleum (LP) gases, the term LP as used in this manual refers to *propane* gas. If you intend to use any type of LP gas, proper precautions **MUST** be used in the handling, piping, and use of such gas. **NOTE:** In Canada, LP installations **MUST** be performed by licensed LP installers.

The UL/CSA Rating Plate located on the side panel on the unit contains the model number, type of gas and gas input rating, and other important information.

WARNING

Fire and/or explosion hazard.

Make certain the unit is equipped to operate on the type of gas available. Models designated as natural gas are to be used with natural gas only. Models designated for use with liquefied petroleum (LP) gas are shipped with orifices sized for commercially pure propane gas. They MUST not be used with butane or a mixture of butane and propane unless properly sized orifices are installed by a licensed LP installer.

Failure to follow this warning can result in property damage, personal injury, and/or death.

Gas Pressures

1. Do **NOT** allow minimum gas supply pressure to fall below the minimums. Doing so will decrease input to furnace. Refer to **Figure 9** for gas supply pressures.
2. Gas input **MUST NOT** exceed rated input shown on rating plate.
3. Do **NOT** allow pressures to exceed the maximum limits as listed in **Figure 9**.

NOTE: If gas supply pressures are not correct, contact your gas supplier.

Figure 9	Gas Pressures	
	Natural Gas	LP Gas
Minimum Supply	4.5" W.C. (1120 Pa)	11" W.C. (2740 Pa)
Recommended	7" W.C. (1740 Pa)	11" W.C. (2740 Pa)
Maximum	13" W.C. (3230 Pa)	13" W.C. (3230 Pa)
Manifold Pressure	3.5" W.C. (870 Pa)* *7-1/2 ton should be set at 3.6" W.C.	10" W.C. (2490 Pa)

Manifold Pressures

Manifold pressures are covered in the startup procedure section. Refer to *Start-Up Procedures*.

Gas Piping

The gas supply line **MUST** be of adequate size to handle the Btu/hr requirements and length of the run for the unit being installed. Determine the minimum pipe size for natural gas from the table in **Figure 10** or **Figure 12**. Base the length of the run from the gas meter or source to the unit.

Gas Pipe Size

Btu ratings of all other gas appliances **MUST** be considered for sizing of main gas line. Check gas line to installation for compliance with local codes or, in the absence of local codes, with the National Fuel Gas Code ANSI Z223.1-1996 and in Canada the National Standard CAN/CGA B149.1 current editions.

Figure 10	Gas Pipe Size, Length and Btu/hr Capacity for Schedule 40 Iron Pipe (English)				
NATURAL GAS					
Pipe Length (Includes Fittings)	Btu/hr (in thousands)				
	3/4"	1"	1 1/4"	1 1/2"	2"
20'	190	350	730	1,100	2,100
40'	130	245	500	760	1,450
60'	105	195	400	610	1,150
LP GAS*					
Pipe Length (Includes Fittings)	Btu/hr (in thousands)				
	1/2"	3/4"	1"	1 1/4"	1 1/2"
20'	189	393	732	1,496	2,299
40'	129	267	504	1,039	1,559
60'	103	217	409	834	1,275
<p>* If copper tubing is used, see the following applicable publications to determine type and size requirements:</p> <p> In the United States, the National Fuel Gas Code ANSI Z223.1-1996.</p> <p> In Canada, the National Standard CAN/CGA B149.1; latest edition.</p>					

Figure 11	Orifice Sizes		
Gas Type	Specific Gravity	Btu/ft ³ (kJ/L)	Pilot Orifice Sizes
Natural	0.6	1000	.018#
Propane	1.53	2500	.012#

#Adjust pilot flame as needed

TABLE 1: Equivalent Orifice Sizes at High Altitudes
(Includes 4% input reduction for each 1,000 ft.)

Natural Gas Manifold Orifice Size Required by Elevation								
BTU INPUT	0' - 2000'	2000' - 4000'	4500' - 5000'	6000'	7000'	8000'	9000'	10000'
40,000 to 60,000	44	45	46	47	47	48	48	49
90,000 to 150,000	43	44	45	45	46	47	47	48
LP Gas Manifold Orifice Size Required by Elevation								
BTU INPUT	0' - 2000'	2000' - 4000'	4500' - 5000'	6000'	7000'	8000'	9000'	10000'
40,000 to 60,000	55	56	56	56	56	56	56	57
90,000 to 150,000	54	55	55	55	55	56	56	56

* 2-1/2 & 3 Ton with 3 burners.

** 3-1/2 & 4 ton with 4 burners.

Orifices

Orifice Sizes

Orifice sizes **MUST** be matched to the heating value of the gas (see **Figure 11**). Check with your gas supplier and the National Fuel Gas Code ANSI Z223.1-1996 and in Canada the National Standard CAN/CGA B149.1; current edition.

NOTE: An LP Conversion Kit **MUST** be used for conversion to LP gas.

NOTE: For elevations above 2000 feet (610 meters), the Btu input rating **MUST** be reduced by 4% for each 1000 feet (305 meters) above sea level, unless the gas supplier's Btu/ft³ content has already been adjusted for altitude. Check **Table 1** for the proper orifice sizes and consult the *Parts List* for the proper orifice part numbers.

Figure 12		Gas Pipe Size, Length and kW Capacity for Schedule 40 Iron Pipe (Metric)				
NATURAL GAS						
Pipe Length (Includes Fittings)	kW**					
	3/4"	1"	1 1/4"	1 1/2"	2"	
6.1m	56	103	214	322	615	
12.2m	38	72	147	223	425	
18.3m	31	57	117	179	337	
LP GAS*						
Pipe Length (Includes Fittings)	kW**					
	1/2"	3/4"	1"	1 1/4"	1 1/2"	
6.1m	55	115	215	438	674	
12.2m	38	78	148	305	457	
18.3m	30	64	120	244	374	
<p>* If copper tubing is used, see the following applicable publications to determine type and size requirements: In the United States, the National Fuel Gas Code ANSI Z223.1-1996. In Canada, the National Standard CAN/CGA B149.1; latest edition.</p> <p>** kW (Kilowatts) is the metric equivalent of Btu/hr.</p>						

Changing Orifices

WARNING

Electrical shock, fire and/or explosion hazard.

Shut off electric power at unit disconnect or service panel and shut off gas at manual shut off valve before beginning the following procedure.

Changing orifices requires a qualified service technician.

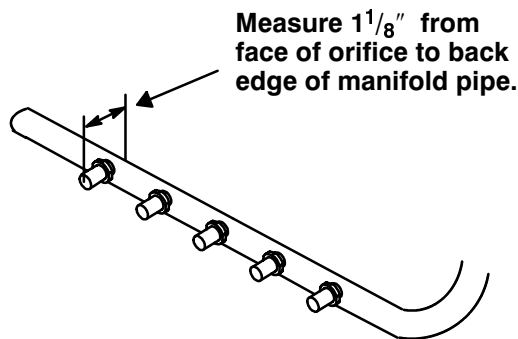
Failure to follow this warning can result in property damage, personal injury, and/or death.

1. Shut **OFF** gas at manual shut off valve.
2. Shut **OFF** electric power at unit disconnect or service panel.
3. Remove the burner access panel.
4. Disconnect the gas line from the gas valve.

5. Disconnect the wires from the gas valve.
6. Disconnect the pilot tubing from the gas valve.
7. Remove the four screws holding the manifold to the manifold brackets.
8. Carefully remove the manifold with the gas valve attached.
9. Remove the orifices from the manifold with a $\frac{7}{16}$ " box end or socket wrench.
10. Check to be sure that the size of each orifice is correct for the Btu input desired.

Figure 13

Manifold/Orifice Measurement



11. Install the correct orifices. Gauge the size of the orifices with a new twist drill bit of the correct size.

Make sure that the orifices go in straight so that they form a right angle (90°) to the manifold pipe.

Tighten the orifices so that there is a $1\frac{1}{8}$ " distance between the faces of the orifices to the back of the manifold pipe.

Measure the distance with a set of calipers. If you do not have a calipers, you can use an adjustable wrench and measure between the face of the jaws.

12. Reassemble in reverse order.

Piping at Unit

Connections

NOTE: Refer to **Figure 15** for the general layout at the furnace. The rules listed apply to natural and LP gas pipe installations.

1. If installation is for LP gas, have LP gas installer use **TWO-STAGE REGULATION** and make all connections from storage tank to unit.

2. Use black iron or steel pipe and fittings or other pipe approved by local code.

NOTE: If a flexible gas connector is used, it **MUST** be acceptable to local authority. Connector **MUST NOT** be used inside the furnace or be secured or supported by the furnace or ductwork. Connectors **MUST** comply with one of the following standards or a superseding standard:

- ANSI Z21.24a-1983, *Metal Connectors for Gas Appliances*.
- ANSI Z21.45b-1983, *Flexible Connectors of Other Than All-Metal Construction for Gas Appliances*.

WARNING

Fire and/or explosion hazard.

Gas connector **MUST** be properly installed and can **NOT** be used inside the furnace.

Failure to do so can result in property damage, bodily injury or death.

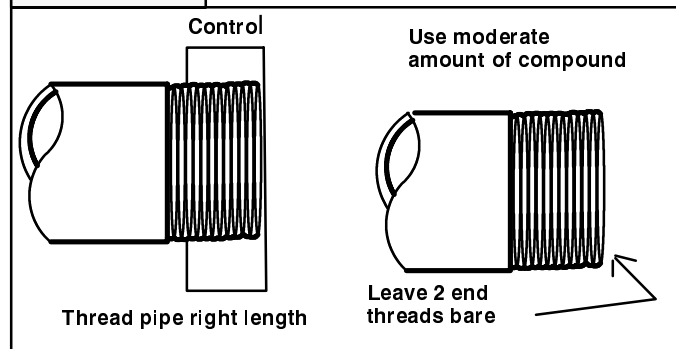
3. Use pipe joint compound on external (male) threads **ONLY**. Joint compound **MUST** be resistant to any chemical action of LP gases (**Figure 14**).
4. Use ground joint unions and install a drip leg no less than 3 inches long to trap dirt and moisture before it can enter gas valve.
5. Use a flat jawed wrench on gas valve when making connections to prevent gas valve from turning. Do **NOT** use a pipe wrench on the gas valve body.

CAUTION

Overtightening assembly may cause damage to the gas valve and/or wiring and may misalign the burners.

Figure 14

Proper Piping Practice



6. Install a manual shutoff valve and tighten all joints securely.

LP Connection Requirements

1. Have a licensed LP gas dealer make all connections at storage tank and check all connections from tank to furnace.

- If copper tubing is used, it **MUST** comply with limitation set in National Fuel Gas Code ANSI Z223.1-1996 or in Canada the National Standard CAN/CGA B149.1; current edition..
- Two-stage regulation of LP gas is required.

Leak Check

- Gas pressure **MUST NOT** exceed $\frac{1}{2}$ PSIG (3450 Pa). Checking gas piping above $\frac{1}{2}$ PSIG (3450 Pa) requires the gas valve and manual shutoff valve to be disconnected during testing.
- When checking gas piping to furnace, shut **OFF** manual shutoff valve to furnace.
- Test all pipes for leaks.

WARNING

Fire and/or explosion hazard.

Never exceed specified pressures. Higher pressures may damage the gas valve. Such damage may result in overfiring and possible heat exchanger failure.

Failure to follow this warning can result in property damage, personal injury, and/or death.

- Apply soap suds (or a liquid detergent) to each joint. Bubbles forming indicate a leak.

5. Electrical Wiring

WARNING

Electrical shock hazard.

Disconnect power at fuse box or service panel before making any electrical connections. Unit **MUST** be grounded to electrical service panel.

Failure to follow this warning can result in property damage, personal injury, and/or death.

WARNING

Fire and/or explosion hazard.

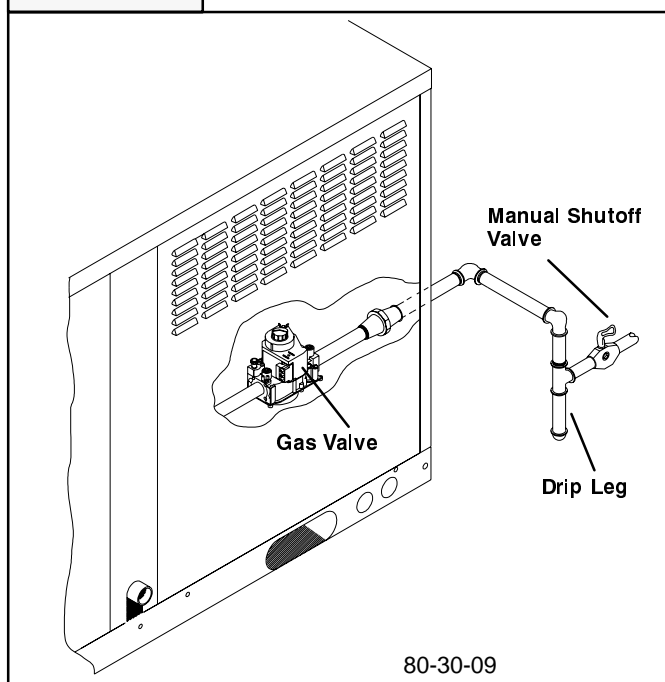
Do **NOT** use a match or open flame to test for leaks.

An open flame or spark can result in property damage, personal injury and/or death.

- Make sure pilot tube and burner orifices are checked for leakage.
- Correct even the smallest leak at once.

Figure 15

Piping at Unit for Natural Gas



NOTE: All electrical work **MUST** conform with the requirements of local codes and ordinances and the National Electrical Code ANSI/NFPA-No. 70-1990 or current edition. Provide line voltage power supply from a separate protected circuit with a disconnect switch (when required) located within sight of the unit. Supply voltage, amperage, wire, fuse and disconnect switch sizes **MUST** conform with specifications in the *Technical Data* and with unit rating plate.

All exposed wiring or connections **MUST** be made with weatherproof cable or wire unless installed in conduit. Wiring **MUST** be protected from possible mechanical damage.

Connections for line voltage are made in the unit control box. Low voltage connections are made outside the control

box. For access, remove the burner access panel and the control box cover. See **Figure 2**.

Low Voltage Wiring

Low voltage wiring connections for the thermostat are made at the 24V terminal board outside the control box. Refer to the wiring diagram for the applicable model and the instructions included with the thermostat.

Thermostat

NOTE: Do NOT attempt to use a thermostat designed for electric heat or heat pump use. Such thermostats will NOT control the unit properly.

The location of the thermostat has an important effect on the operation of the unit. **FOLLOW THE INSTRUCTIONS INCLUDED WITH THE THERMOSTAT FOR CORRECT LOCATION, MOUNTING, AND WIRING.**

Heat Anticipator

Set the thermostat heat anticipator to .58 in accordance with thermostat instructions.

blower **OFF** timing is preset at 140 seconds. If desired, the fan **ON** delay and **OFF** delay can be reset to obtain the longest delay times while still maintaining comfort levels. See Dip Switch settings drawing.

NOTE: It is recommended to achieve maximum efficiency that the fan control be set to turn on at 30 seconds after the burners light.

Line Voltage Wiring

Connections for line voltage are made in the unit control box. For access, remove the burner access panel and the control box cover.

Do **NOT** complete line voltage connections until unit is permanently grounded. All line voltage connections and the ground connection **MUST** be made with copper wire.

Ground Connections

A ground lug is installed in the control box for the ground connection. Use a copper conductor of the appropriate size from the unit to a grounded connection in the electrical service panel.

Line Connections

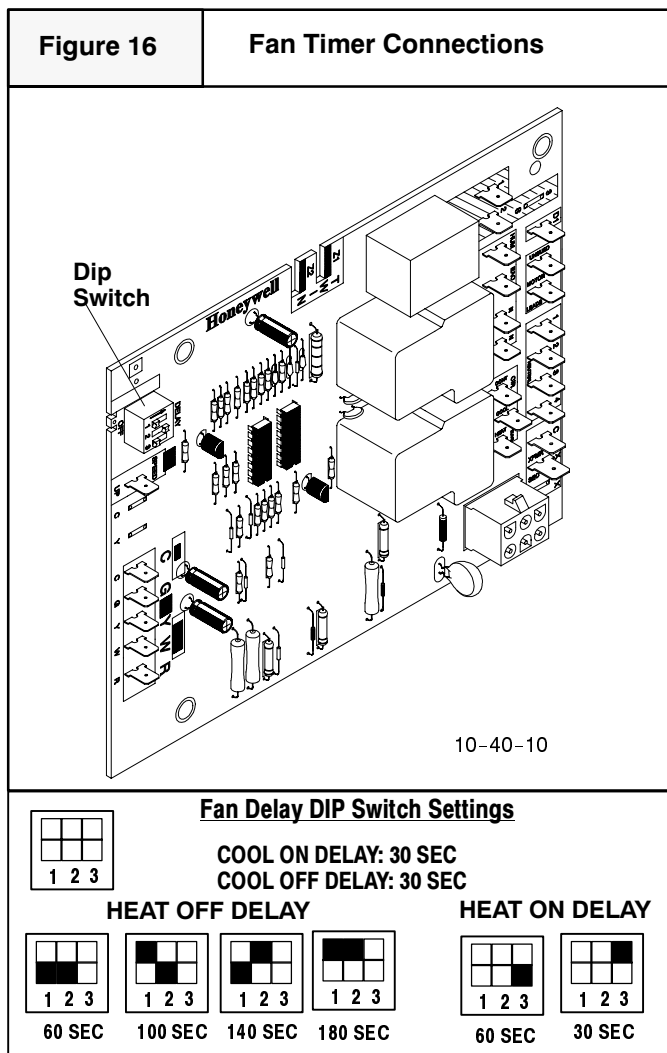
Complete the line service connections to the contactor 'L' terminals inside the control box. Refer to applicable wiring diagram in *Technical Data*. Check all screw terminals to ensure they are tight.

Field Installed Equipment

Wiring to be done in the field between the unit and devices not attached to the unit, or between separate devices which are field installed and located, shall conform with the temperature limitations for type of wire used and shall be installed with the manufacturer's instructions and the National Electrical Code as it applies to such devices.

Final Electrical Check

Make a final wiring check to be sure system is correctly wired. Inspect field installed wiring and the routing to ensure that rubbing or chafing due to vibration will not occur.



FAN CONTROL

The fan control is preset at the factory with an adjustable blower **ON** delay of 30 seconds in the heating mode. The

6. Air Distribution System

Ductwork

NOTE: The total heat loss from the structure as expressed in total Btu/hr(Kw) **MUST** be calculated by manufacturer's method or in accordance with "A.S.H.R.A.E. Guide" or "Manual N - Load Calculations" published by the Air Conditioning Contractors of America or in Canada H.R.A.I. "Manual N". The total heat loss calculated should be equal to or less than the unit heating capacity, output based on D.O.E. test procedures, steady state efficiency times input.

Ductwork, supply registers, and return air grilles **MUST** be designed and sized to handle the greater of the units heating or cooling air volume requirements. If the unit is connected to an existing system, the ductwork **MUST** be checked to make sure it is adequate. Extra runs or larger duct sizes may have to be installed. **Use only non-combustible type insulation on supply plenum or supply ductwork within 6 feet(2m) of unit.**

Maximum recommended velocity in supply trunk ducts is 1000 feet (305m) per minute and 800 feet (244m) per minute in return trunk ducts. Velocity in branches should not exceed 800 feet (244m) per minute supply and 600 feet (183m) per minute in the return.

Ductwork installed outdoors should have a minimum of 2" (50.8mm) of fiberglass insulation and a weatherproof vapor barrier. It should also be protected against damage. Caulk and flashing, or other means adequate to provide a permanent weather seal should be used.

Ductwork installed in attics or other areas exposed to outside temperatures should be installed with a minimum of 2" (50.8mm) fiberglass insulation and have an indoor type vapor barrier.

The use of flexible, **non-combustible** connectors between main trunk ducts and supply and return air plenums is recommended to minimize vibration transmission .

NOTE: Connect supply and return air plenums to unit in a manner that will allow the top of the unit to be removed without removing plenums. Plenums **MUST** be *individually* sealed to unit casing.

Filters

CAUTION

Do NOT operate the unit without all filters in place.

All air **MUST** pass through a filter before entering the unit. Electronic air cleaner, optional filter racks, or other accessible filter arrangements **MUST** be installed in the return air ductwork.

NOTE: If the unit has an economizer or any other type of outdoor air damper, disposable filters **MUST** be used in the internal filter racks.

For replacement filter sizes and instructions, see *Air Filters*.

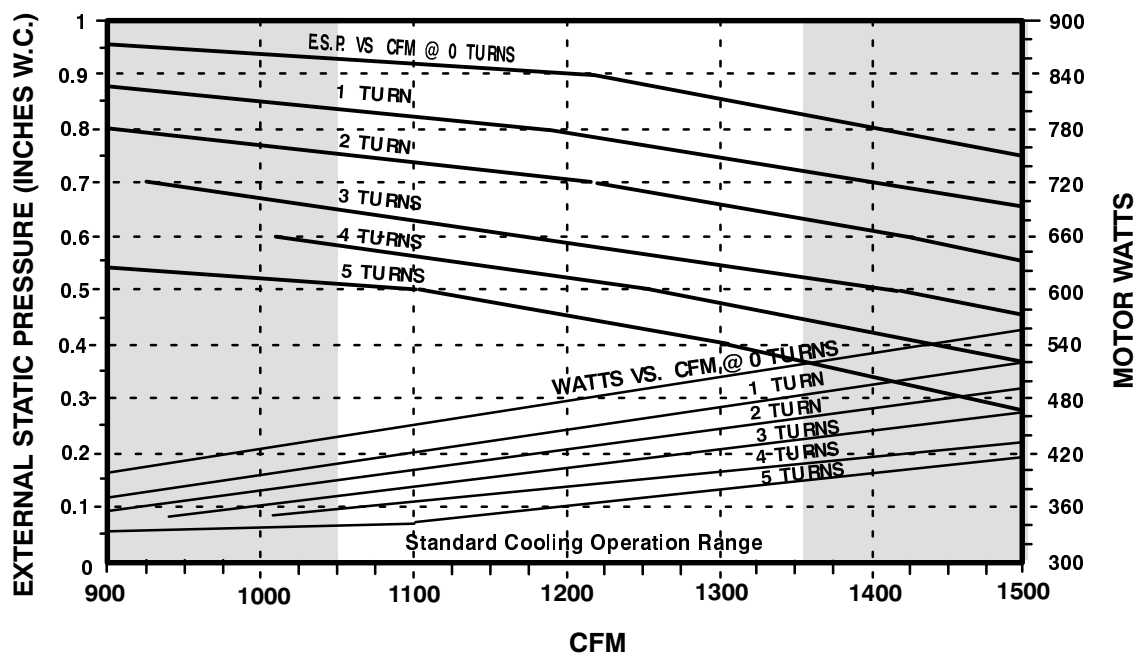
Circulating Blower

Determining Pulley Turns

1. From the system design, determine the external static pressure (ESP) for the supply ducts, return ducts and registers, diffusers, grilles, dampers, heaters and special filters (if any).
2. If unit is to be set up in cooling mode, add .08" W.C. (20 Pa) for wet coil operation to the total ESP determined in Step 1.
3. From the system design, determine the desired air-flow in CFM (L/s).
4. To determine the pulley turns necessary to obtain the desired CFM (L/s), go to the Circulating Blower Performance Data graph for the unit.

Figure 17

Circulating Blower Performance Data - 3 Ton Units 208 Volts



NOTES: 1) Maximum motor Watts is 787 Watts. 2) Maximum blower speed is 1400 RPM. 3) Contact factory for applications requiring operation outside standard cooling operating range. 4) Airflow data is based on dry coil with filters. 5) Pulley turns refers to turns out. In other words, 0 turns is a narrower sheave than 5 turns. 6) Blower speed MUST be set to give the correct air temperature rise through the unit as marked on the Rating Plate on in the *Technical Support Manual*

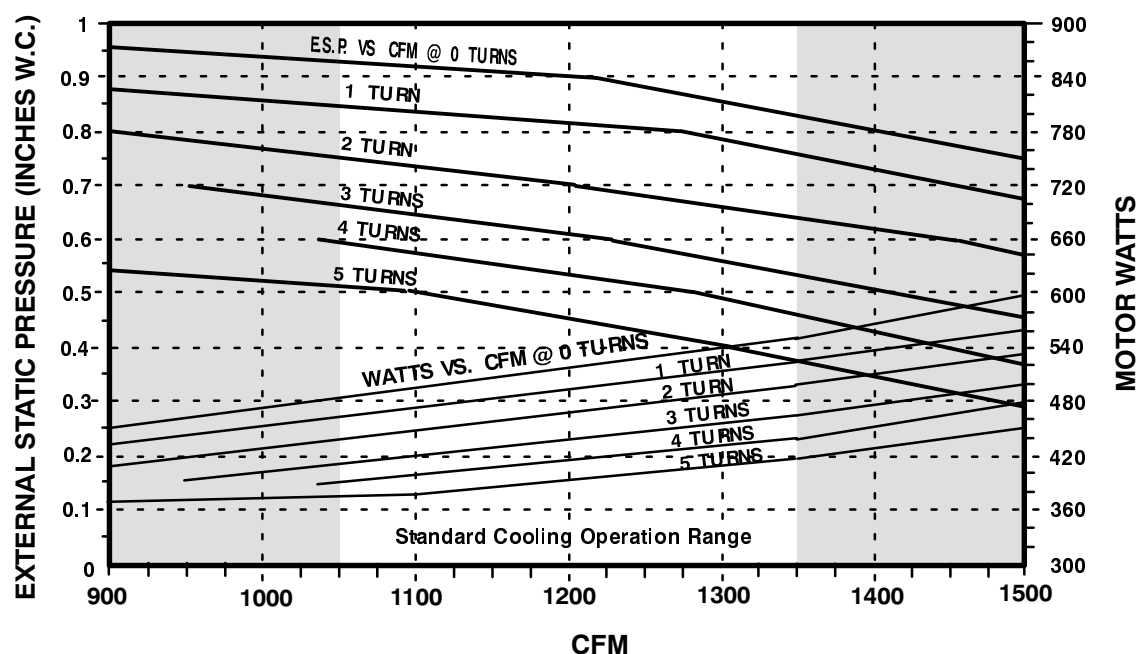
NUMBER OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN														
	.2			.4			.6			.8			1.0		
	CFM	WATTS	RPM	CFM	WATTS	RPM	CFM	WATTS	RPM	CFM	WATTS	RPM	CFM	WATTS	RPM
0										1421	535	920			
1							1614	552	880	1183	448	888			
2							1418	470	844						
3				1587	478	804	1206	399	809						
4				1446	419	766									
5	1615	433	724	1301	375	727									

PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH .75 HP STD PULLEY	909	878	842	807	768	730

FACTORY SETTING TURNS OPEN	
.75 HP STD PULLEY	5

Figure 18

Circulating Blower Performance Data - 3 Ton Units 230 / 460 Volts



NOTES: 1) Maximum motor Watts is 808 Watts. 2) Maximum blower speed is 1400 RPM. 3) Contact factory for applications requiring operation outside standard cooling operating range. 4) Airflow data is based on dry coil with filters. 5) Pulley turns refers to turns out. In other words, 0 turns is a narrower sheave than 5 turns. 6) Blower speed MUST be set to give the correct air temperature rise through the unit as marked on the Rating Plate on in the *Technical Support Manual*

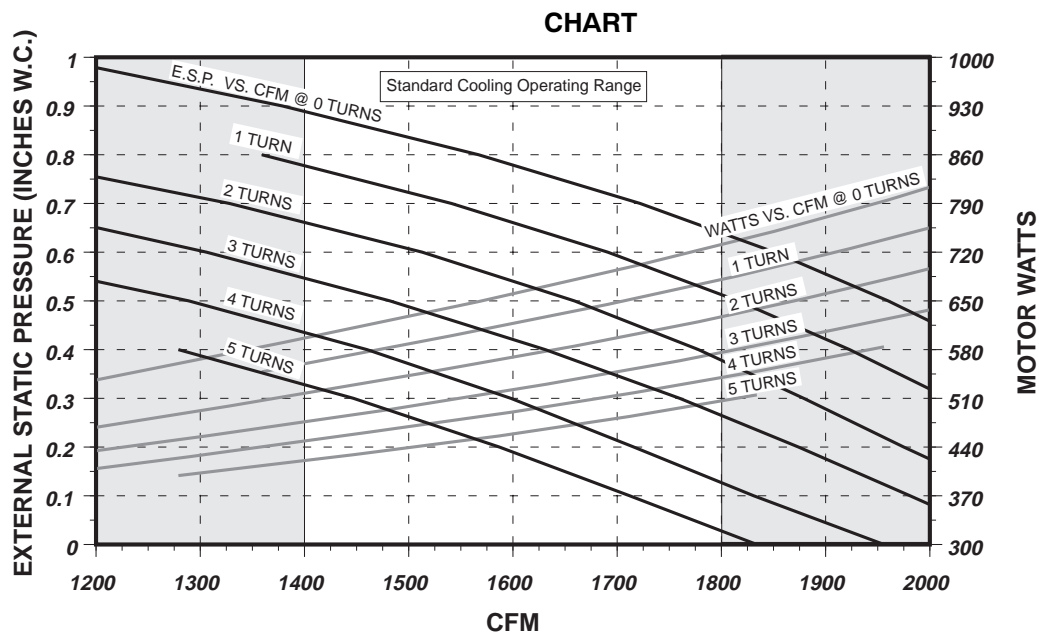
NUMBER OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN														
	.2			.4			.6			.8			1.0		
	CFM	WATTS	RPM	CFM	WATTS	RPM	CFM	WATTS	RPM	CFM	WATTS	RPM	CFM	WATTS	RPM
0										1420	575	925			
1							1623	594	885	1264	509	891			
2							1453	521	848						
3				1599	520	807	1222	442	811						
4				1455	467	769	1032	393	772						
5	1604	467	727	1318	418	730									

PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH .75 HP STD PULLEY	915	883	846	809	771	732

FACTORY SETTING TURNS OPEN	
.75 HP STD PULLEY	5

Figure 19

Circulating Blower Performance Data - 4 Ton Units 208 Volts (115 MBTUH Heat Input)

**NOTES:**

1. Maximum motor Watts is 928 Watts.
2. Airflow based on dry coil, horizontal flow, with filters.
3. For downflow SCFM, use a .15 static drop.
4. Pulley turns refer to turns out. I.E. 0 turns is a *narrower* sheave than 5 turns.
5. For applications requiring operation in shaded areas, contact the factory.
6. Maximum blower wheel speed is 1400 RPM.
7. The blower speed **MUST** be set to give the correct air temperature rise through the unit as marked on the Rating Plate or Technical Support Manual.

TABLE

NO. OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES W.C.														
	.2			.4			.6			.8			1.0		
	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM
0							1851	750	952	1567	649	960			
1							1691	645	913	1359	548	920			
2				1778	620	867	1513	546	871						
3				1631	530	822									
4	1716	518	774	1460	461	777									
5	1587	456	725												

TURNS/RPM CONVERSION TABLE

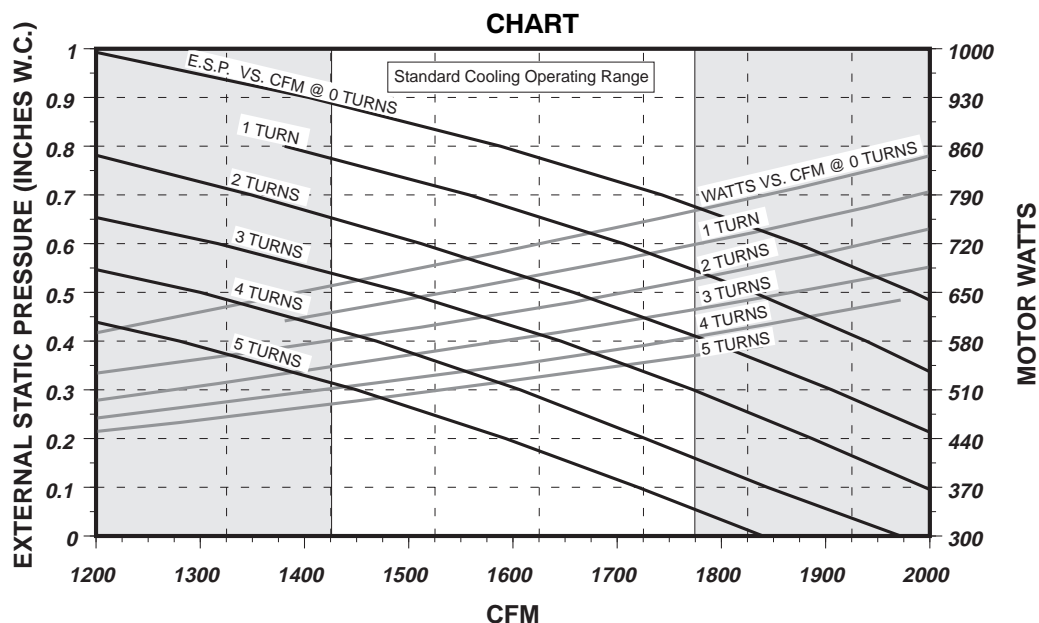
PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH .75 HP STD PULLEY	950	910	870	825	780	730

W = Watts

UNIT	FACTORY SETTING TURNS OPEN
PGB048D	.75 HP STD PULLEY 3.5
PGB048F	.75 HP STD PULLEY 2

Figure 20

Circulating Blower Performance Data - 4 Ton Units 230/460/575 Volts (115 MBTUH Heat Input)

**NOTES:**

- Maximum motor Watts is 962 Watts.
- Airflow based on dry coil, horizontal flow, with filters.
- For downflow SCFM, use a .15 static drop.
- Pulley turns refer to turns out. I.E. 0 turns is a *narrower* sheave than 5 turns.
- For applications requiring operation in shaded areas, contact the factory.
- Maximum blower wheel speed is 1400 RPM.
- The blower speed **MUST** be set to give the correct air temperature rise through the unit as marked on the Rating Plate or Technical Support Manual.

TABLE

NO. OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES W.C.														
	.2			.4			.6			.8			1.0		
	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM
0							1873	800	959	1588	708	965			
1							1706	698	919	1381	609	925			
2				1788	673	870	1512	600	874						
3				1646	593	825	1317	519	829						
4	1727	574	776	1469	520	778									
5	1593	522	728												

TURNS/RPM CONVERSION TABLE

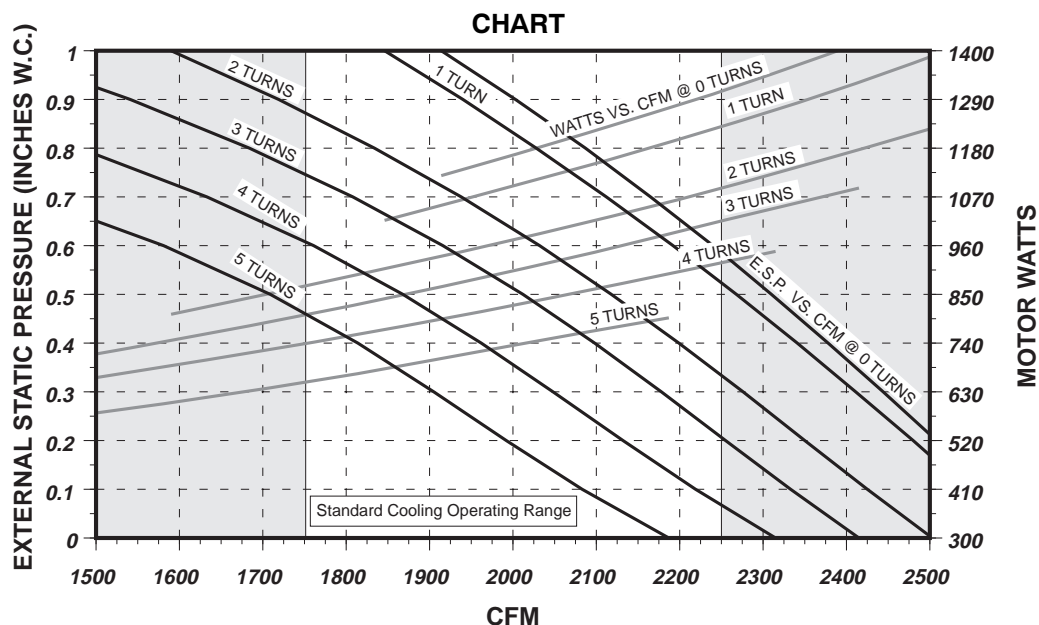
PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH .75 HP STD PULLEY	960	920	875	825	780	730

W = Watts

UNIT	FACTORY SETTING TURNS OPEN
PGB048D	.75 HP STD PULLEY 3.5
PGB048F	.75 HP STD PULLEY 2

Figure 21

Circulating Blower Performance Data - 5 Ton Units 208 Volts (150 MBTUH)



NOTES:

1. Maximum motor Watts is 1486 Watts.
2. Airflow based on dry coil, horizontal flow, with filters.
3. For downflow SCFM, use a .15 static drop.
4. Pulley turns refer to turns out. I.E. 0 turns is a *narrower* sheave than 5 turns.
5. For applications requiring operation in shaded areas, contact the factory.
6. Maximum blower wheel speed is 1400 RPM.
7. The blower speed **MUST** be set to give the correct air temperature rise through the unit as marked on the Rating Plate or Technical Support Manual.

TABLE

NO. OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES W.C.														
	.2			.4			.6			.8			1.0		
	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM
0							2240	1302	1153	2087	1213	1163	1914	1118	1174
1							2192	1196	1127	2028	1109	1137	1846	1017	1145
2				2199	1064	1074	2032	987	1082	1834	903	1089			
3	2255	1018	1025	2098	945	1031	1916	868	1037						
4	2132	875	982	1962	811	986	1761	742	991						
5	1992	732	938	1814	671	942									

TURNS/RPM CONVERSION TABLE

PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH 1 HP STD PULLEY	1145	1120	1080	1035	990	945

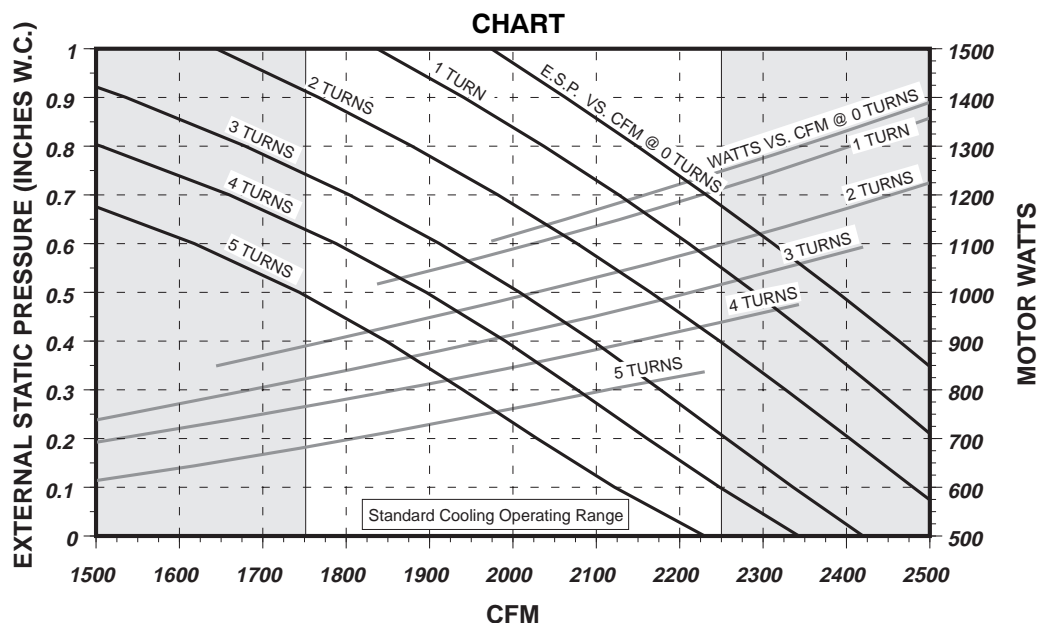
W = Watts

FACTORY SETTING TURNS OPEN

1 HP STD PULLEY 2.5

Figure 22

Circulating Blower Performance Data - 5 Ton Units 230/460/575 Volts (150 MBTUH Heat Input)

**NOTES:**

- Maximum motor Watts is 1454 Watts.
- Airflow based on dry coil, horizontal flow, with filters.
- For downflow SCFM, use a .15 static drop.
- Pulley turns refer to turns out. I.E. 0 turns is a *narrower* sheave than 5 turns.
- For applications requiring operation in shaded areas, contact the factory.
- Maximum blower wheel speed is 1400 RPM.
- The blower speed **MUST** be set to give the correct air temperature rise through the unit as marked on the Rating Plate or Technical Support Manual.

TABLE

NO. OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES W.C.														
	.2			.4			.6			.8			1.0		
	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM
0							2312	1282	1179	2149	1195	1186	1974	1105	1193
1							2211	1192	1147	2037	1106	1153	1837	1017	1158
2				2248	1097	1087	2077	1021	1091	1879	940	1096			
3	2256	1019	1037	2096	950	1042	1912	880	1046						
4	2161	905	990	1991	843	993	1788	777	996						
5	2029	771	944	1848	712	946									

TURNS/RPM CONVERSION TABLE

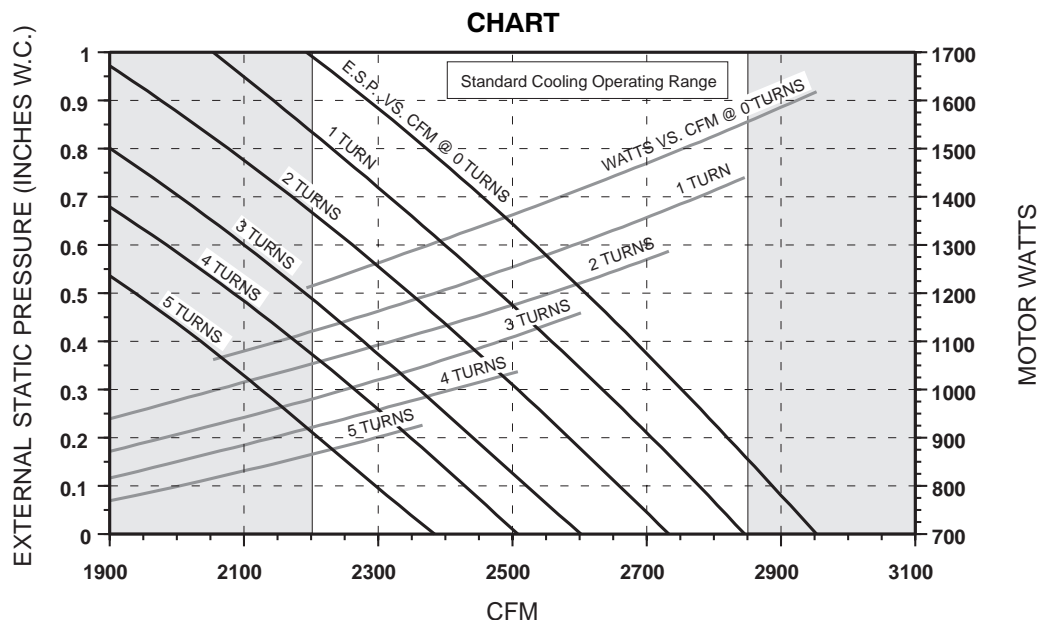
PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH 1 HP STD PULLEY	1175	1145	1090	1045	1000	950

W = Watts

FACTORY SETTING TURNS OPEN

1 HP STD PULLEY 2.5

Figure 23

Circulating Blower Performance Data - 6¹/₃ Ton Units 208 Volts (115 MBTUH Heat Input)**NOTES:**

1. Maximum motor Watts is 1538 Watts.
2. Airflow based on dry coil, horizontal flow, with filters.
3. For downflow SCFM, use a .15 static drop.
4. Pulley turns refer to turns out. I.E. 0 turns is a *narrower* sheave than 5 turns.
5. For applications requiring operation in shaded areas, contact the factory.
6. Maximum blower wheel speed is 1400 RPM.
7. The blower speed **MUST** be set to give the correct air temperature rise through the unit as marked on the Rating Plate or Technical Support Manual.

TABLE

NO. OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES W.C.														
	.2			.4			.6			.8			1.0		
	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM
0	2820	1538	1239	2682	1460	1242	2534	1380	1246	2372	1298	1249			
1	2707	1361	1198	2558	1283	1200	2399	1207	1203	2231	1133	1205			
2	2584	1213	1154	2429	1145	1156	2262	1077	1158						
3	2441	1081	1108	2278	1011	1110									
4	2348	976	1061												
5	2211	863	1014												

TURNS/RPM CONVERSION TABLE

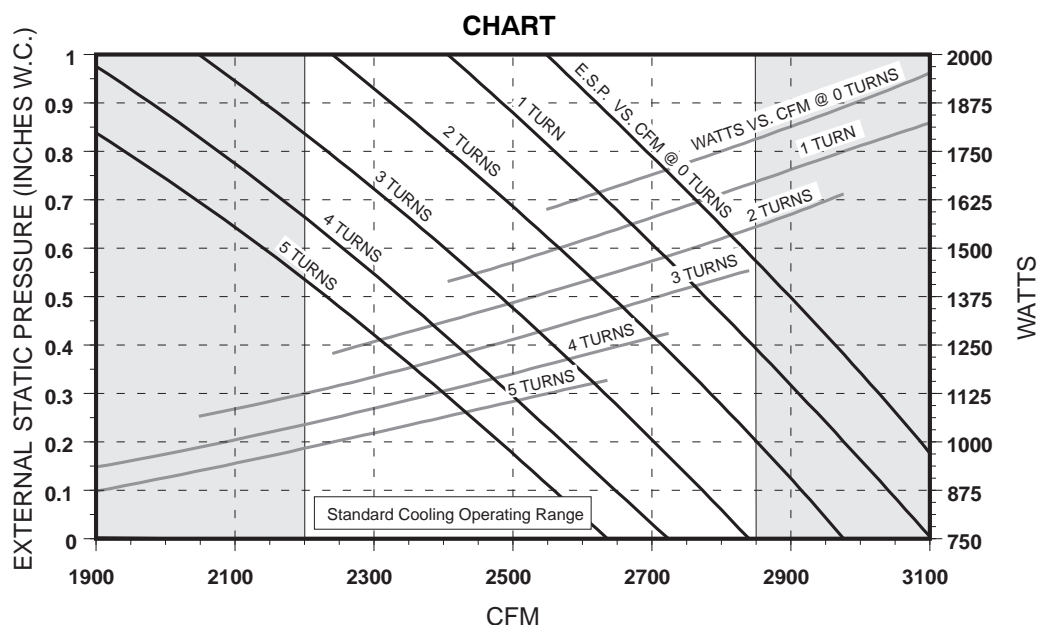
PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH 2 HP STD PULLEY	1245	1202	1157	1111	1064	1017

W = Watts

FACTORY SETTING TURNS OPEN

2 HP STD PULLEY 4

Figure 24

Circulating Blower Performance Data - 6¹/₃ Ton Units 208 Volts (150 MBTUH Heat Input)**NOTES:**

1. Maximum motor Watts is 1942 Watts.
2. Airflow based on dry coil, horizontal flow, with filters.
3. For downflow SCFM, use a .15 static drop.
4. Pulley turns refer to turns out. I.E. 0 turns is a *narrower* sheave than 5 turns.
5. For applications requiring operation in shaded areas, contact the factory.
6. Maximum blower wheel speed is 1400 RPM.
7. The blower speed **MUST** be set to give the correct air temperature rise through the unit as marked on the Rating Plate or Technical Support Manual.

TABLE

NO. OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES W.C.														
	.2			.4			.6			.8			1.0		
	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM
0							2832	1770	1346	2692	1685	1349	2548	1600	1354
1							2706	1583	1302	2560	1497	1306	2406	1414	1310
2				2715	1475	1254	2567	1395	1257	2408	1313	1259	2240	1228	1263
3	2703	1372	1203	2558	1295	1206	2402	1216	1210	2233	1138	1212			
4	2572	1210	1154	2418	1139	1157	2255	1067	1160						
5	2481	1097	1104	2318	1030	1106									

TURNS/RPM CONVERSION TABLE

PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH 2 HP STD PULLEY	1344	1301	1256	1208	1159	1108

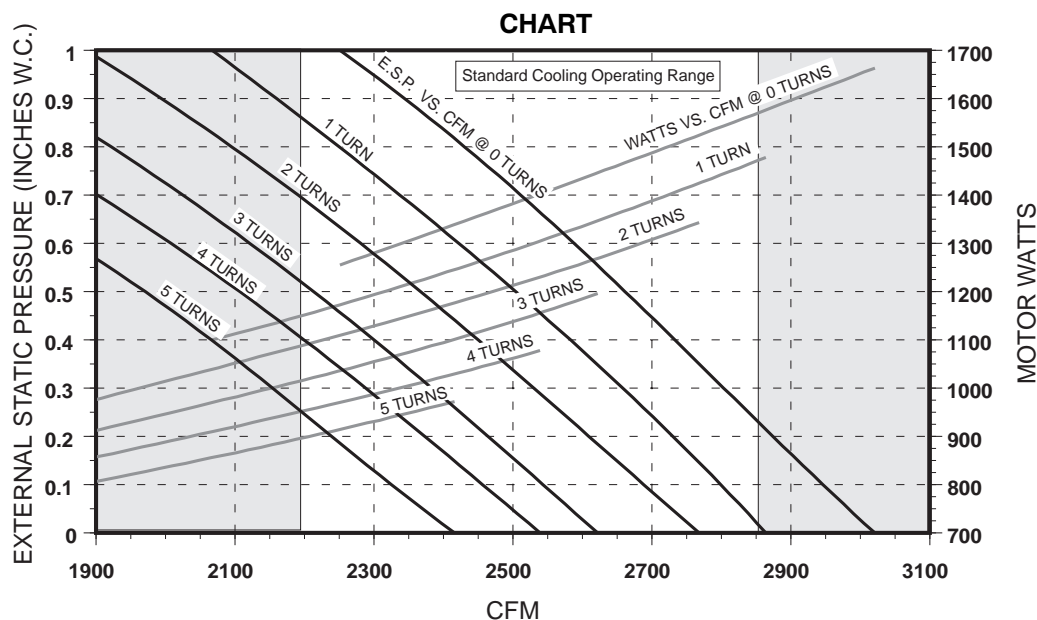
W = Watts

FACTORY SETTING TURNS OPEN

2 HP STD PULLEY 4

Figure 25

Circulating Blower Performance Data - 6¹/₃ Ton Units 230/460/575 Volts (115 MBTUH Heat Input)

**NOTES:**

1. Maximum motor Watts is 1582 Watts.
2. Airflow based on dry coil, horizontal flow, with filters.
3. For downflow SCFM, use a .15 static drop.
4. Pulley turns refer to turns out. I.E. 0 turns is a *narrower* sheave than 5 turns.
5. For applications requiring operation in shaded areas, contact the factory.
6. Maximum blower wheel speed is 1400 RPM.
7. The blower speed **MUST** be set to give the correct air temperature rise through the unit as marked on the Rating Plate or Technical Support Manual.

TABLE

NO. OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES W.C.														
	.2			.4			.6			.8			1.0		
	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM
0				2733	1505	1250	2588	1428	1253	2430	1346	1255	2251	1255	1258
1	2730	1404	1205	2583	1327	1207	2422	1248	1209	2250	1172	1211			
2	2609	1263	1159	2450	1191	1161	2281	1121	1163						
3	2464	1122	1112	2300	1055	1114									
4	2373	1013	1065	2199	953	1067									
5	2239	910	1017												

TURNS/RPM CONVERSION TABLE

PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH 2 HP STD PULLEY	1255	1210	1165	1115	1070	1020

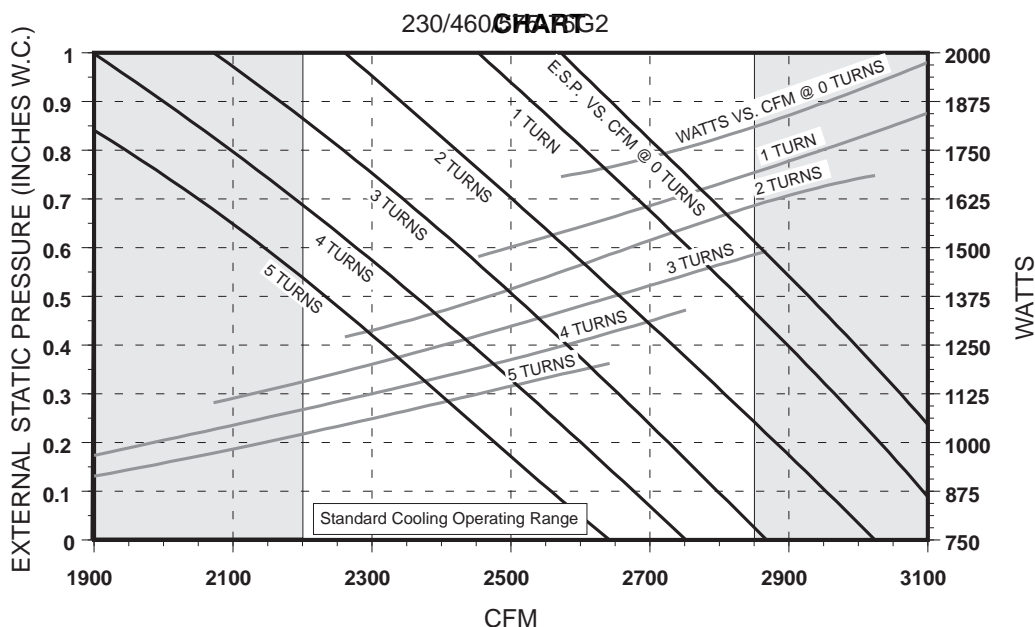
W = Watts

FACTORY SETTING TURNS OPEN

2 HP STD PULLEY 4

Figure 26

Circulating Blower Performance Data - 6¹/₃ Ton Units 230/460/575 Volts (150 MBTUH Heat Input)

**NOTES:**

1. Maximum motor Watts is 1991 Watts.
2. Airflow based on dry coil, horizontal flow, with filters.
3. For downflow SCFM, use a .15 static drop.
4. Pulley turns refer to turns out. I.E. 0 turns is a *narrower* sheave than 5 turns.
5. For applications requiring operation in shaded areas, contact the factory.
6. Maximum blower wheel speed is 1400 RPM.
7. The blower speed **MUST** be set to give the correct air temperature rise through the unit as marked on the Rating Plate or Technical Support Manual.

TABLE

NO. OF TURNS	EXTERNAL STATIC PRESSURE IN INCHES W.C.														
	.2			.4			.6			.8			1.0		
	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM	CFM	W	WHL RPM
0										2716	1739	1361	2572	1682	1365
1							2756	1639	1313	2607	1557	1315	2453	1477	1317
2				2733	1539	1262	2580	1443	1265	2422	1349	1267	2261	1271	1269
3	2727	1417	1211	2581	1340	1213	2427	1261	1215	2259	1182	1217			
4	2601	1261	1160	2444	1187	1162	2277	1116	1164						
5	2477	1135	1109	2317	1068	1111									

TURNS/RPM CONVERSION TABLE

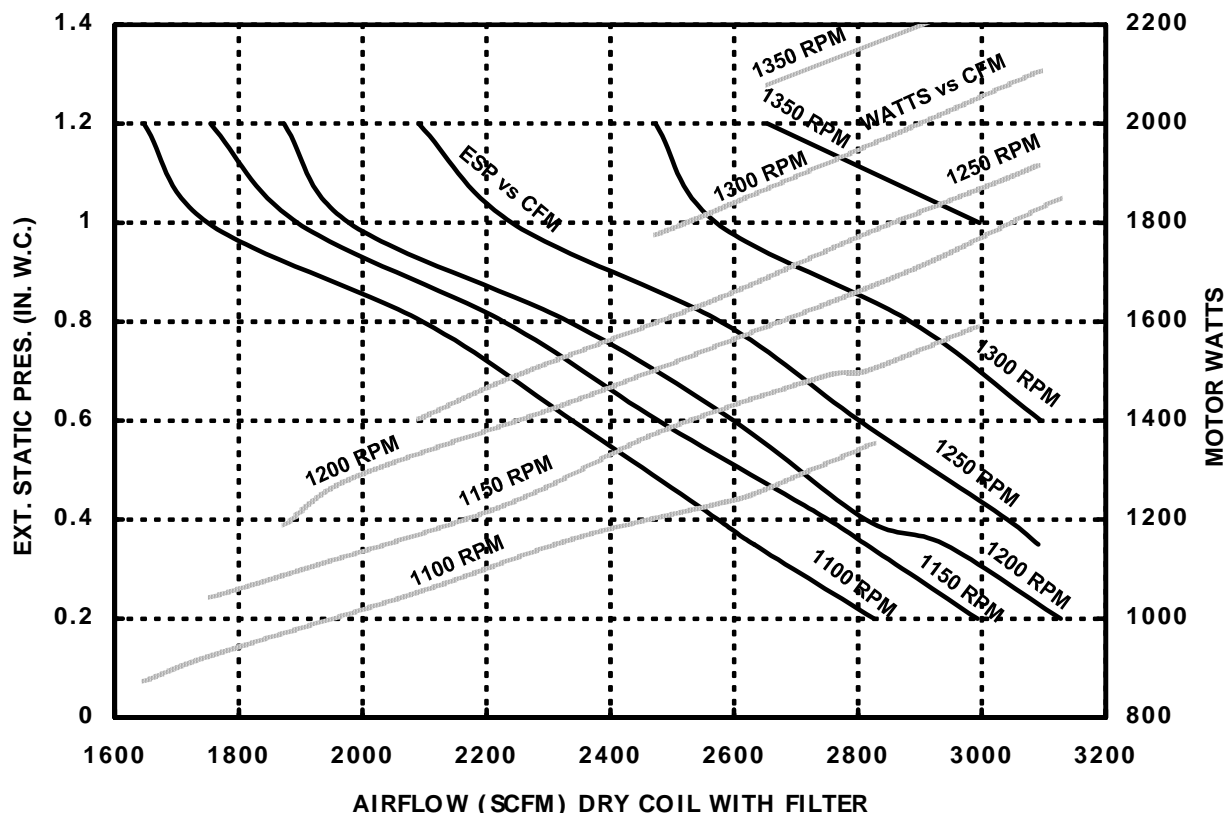
PULLEY TURNS OPEN	0	1	2	3	4	5
RPM WITH 2 HP STD PULLEY	1360	1310	1265	1215	1165	1115

W = Watts

FACTORY SETTING TURNS OPEN

2 HP STD PULLEY 4

BELT DRIVE BLOWER PERFORMANCE DATA - 7-1/2 TON UNIT, 230, 460 Volt



NOTES: 1) Maximum motor Watts is 2158 Watts at 208V, and 2246 Watts at 230-460V. 2) Maximum blower speed is 1400 RPM. 3) Contact factory for applications requiring operation outside standard cooling operating range. 4) Airflow data is based on dry coil with filters. 5) Pulley turns refers to turns out. In other words, 0 turns is a narrower sheave than 5 turns. 6) Blower speed MUST be set to give the correct air temperature rise through the unit as marked on the Rating Plate. 7) Add 0.05 in. ESP for 208 volt operation.

VOLTS	TURNS OPEN	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN											
		.2			.4			.6			.8		
		CFM	WATTS	RPM	CFM	WATTS	RPM	CFM	WATTS	RPM	CFM	WATTS	RPM
230 / 460	0												
	1							3095	2107	1295	2885	1992	1297
	2				3041	1890	1240	2802	1772	1242	2578	1649	1245
	3	3127	1850	1180	2812	1667	1190	2599	1564	1192	2333	1436	1195
	4	2993	1590	1126	2752	1492	1133	2478	1376	1136	2228	1228	1140
	5	2826	1355	1075	2574	1232	1080	2339	1161	1082	2097	1056	1085

VOLTS	TURNS OPEN	EXTERNAL STATIC PRESSURE IN INCHES WATER COLUMN					
		1.0			1.2		
		CFM	WATTS	RPM	CFM	WATTS	RPM
230 / 460	0	2996	2246	1345	2654	2077	1355
	1	2571	1825	1300	2473	1775	1305
	2	2241	1487	1253	2091	1403	1255
	3	1978	1281	1196	1873	1188	1200
	4	1895	1096	1142	1754	1043	1145
	5	1750	923	1088	1647	873	1090

VOLTAGE	PULLEY TURNS OPEN	0	1	2*	3	4	5
230 - 460	RPM WITH 2 HP STD PULLEY	1344	1299	1245	1191	1136	1082

* Factory Setting Turns Open

7. Adjustable Belt Drive Blower

WARNING

Personal injury hazard.

Use extreme care during the following procedures and obey Safety Information.

Failure to do so may result in personal injury.

The following safety rules **MUST** always be followed when working near belt drive.

Always Turn The Power Off

Turn the power to the unit **OFF** before you begin working on it.

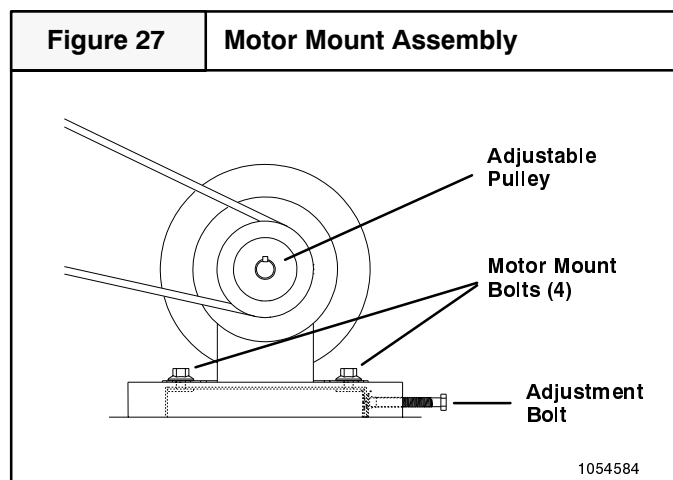
Always Wear Protective Clothing

NEVER wear loose or bulky clothes, such as neckties, exposed shirttails, loose sleeves, or lab coats around belt drives. Wear gloves while inspecting sheaves to avoid nicks, burrs, or sharply worn pulley edges.

The blower speed is changed by adjusting the variable speed pulley mounted on the blower motor.

If the blower speed needed is different than the speed of the blower as shipped, follow the steps below to change the blower speed. Before changing the blower speed, read the above safety rules first.

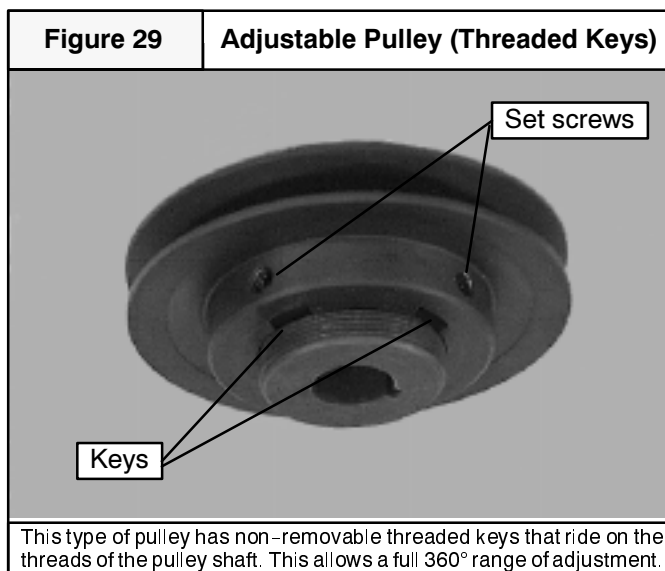
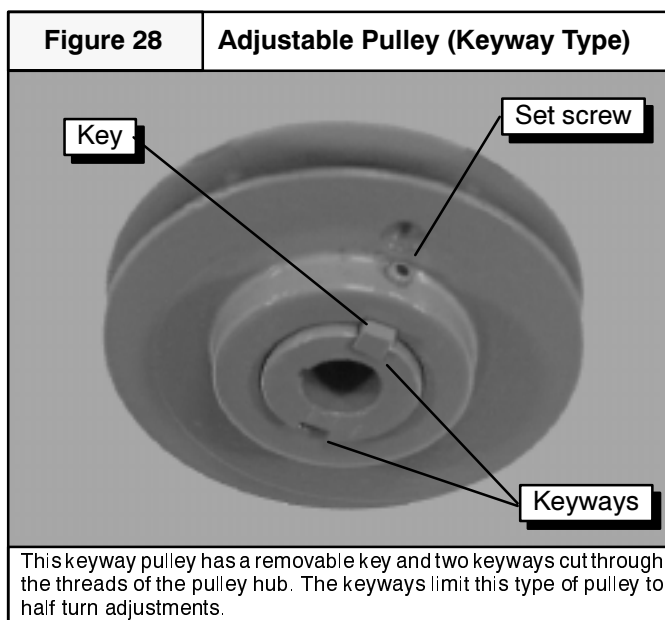
7. Turn electric power **OFF**.
8. Remove the side blower access panel (see **Figure 2** on **Page 6**)



9. Loosen the four motor mount bolts.
10. Turn the motor adjustment bolt counterclockwise until the belt is slack enough to come off easily (see **Figure 27**).
11. Remove the belt. Do **NOT** pry off belt.

12. Loosen set screw(s) on the outer half of the adjustable pulley.

The unit has one of two different types of adjustable pulleys (see **Figure 28** and **Figure 29**).



13. Remove key if unit has a keyway type pulley.
14. To set the blower for a desired CFM (L/s), first turn the outer half of the adjustable pulley clockwise until it meets the inner half of the pulley.
15. Turn the outer half of the adjustable pulley counterclockwise the correct number of turns to obtain the desired CFM (L/s).

NOTE: To increase the blower speed, turn the outer half of the adjustable pulley clockwise. To decrease the blower

speed, turn the outer half of the adjustable pulley counter-clockwise.

16. Replace key if unit has keyway type pulley.

17. Tighten set screw(s).

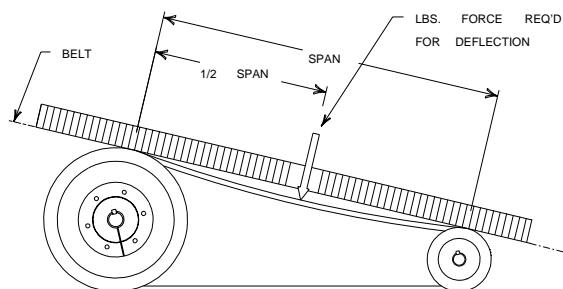
18. Put on belt.

19. Turn motor adjustment bolt clockwise until the belt has enough tension at the proper deflection. Use one of the commercially available belt tension gauges to set the correct tension at the proper deflection (see **Figure 30**).

Figure 30

Checking Tension and Deflection

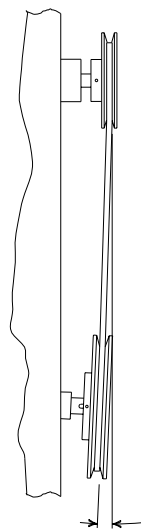
Belt Tension Chart	
MODEL	POUNDS TENSION FOR $\frac{1}{4}$ " DEFLECTION
7-1/2 ton	3.5 - 4
6-1/3 ton	3 - 3.5
5 Ton	2.5 - 3
3 & 4 Ton	2 - 2.5



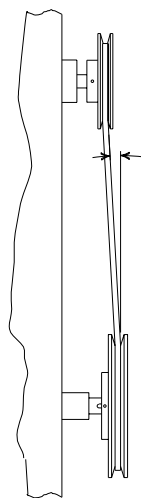
1054584

Figure 31

Checking Pulley Alignment



Misaligned



Misaligned

1054584

20. Use a straight-edge (angle iron, straight piece of board or anything with a good straight surface or edge) to check the alignment of the blower pulley with blower motor pulley (see **Figure 31**).

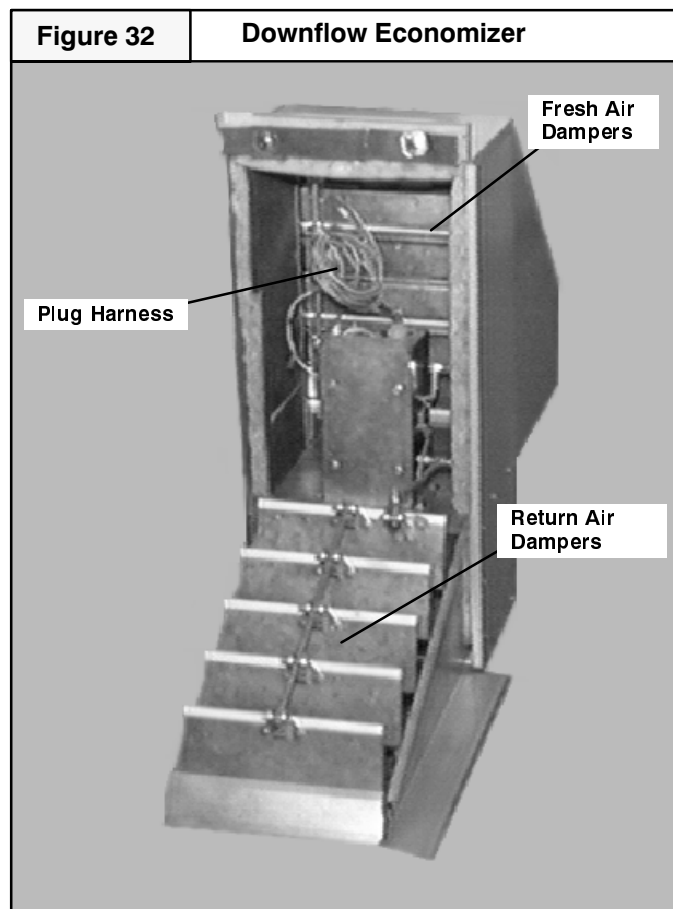
It may be necessary to back the tension off the belt temporarily and tighten one of the motor mount bolts before it is possible to adjust the angle of the blower motor.

21. Tighten all four blower motor mount bolts.

8. Economizer

The purpose of an economizer is to:

- Provide cool outside air to the conditioned space during the cooling cycle to minimize the use of the compressors.
- Bring outside air into the conditioned space to meet minimum fresh air requirements whenever the circulation blower is running.



Theory of Operation

The economizer has two sets of dampers that are mechanically linked together. The fresh air dampers regulate the intake of outside air and the return air dampers regulate the flow of return air (see **Figure 32**). When the fresh air dampers modulate open, the linkage causes the return air dampers to modulate closed.

The economizer is controlled by a logic module which field connects to the unit controls through a plug harness. The logic module also controls the compressor staging based on the thermostat input.

The minimum opening position of the fresh air dampers is field adjustable. It is set on the logic module of modulating economizers or on the actuator motor of three-position economizers.

The enthalpy sensor is factory installed on the fresh air dampers of the economizer. The enthalpy change-over point is adjustable on the logic module.

A discharge air sensor is field installed in the blower inlet. The discharge air sensor keeps the discharge air above 56°F (13.3°C).

A positive pressure is created when the fresh air dampers open and the return dampers close. This pressure must be vented or the air will not circulate properly. This is the function of the barometric relief damper. A positive pressure forces the barometric relief damper to swing open.

The fresh air dampers open to the minimum position for outside air whenever the circulation blower is **ON**.

When the thermostat is in the **FAN AUTO** position, the fresh air dampers will close completely whenever heating or cooling is not called for.

If Using a 2-Stage Thermostat

On a call for cooling, if the economizer outdoor air sensor determines that the outside air is cool enough (and in the case of an enthalpy sensor, dry enough), the fresh air dampers will modulate open and the return air dampers will modulate closed.

If the conditioned space is not being maintained at the selected temperature, the thermostat will make **Y2** and call for second stage cooling by energizing the economizer logic module at the low voltage terminal board. This energizes **Y1** and contactor which energizes the condenser fan and compressor for cooling to assist the economizer.

NOTE FOR 6-1/3 UNITS ONLY: Contactor C2 cannot be energized to operate compressor 2 while the economizer is still energized since Circuit 1 is activating the economizer and Circuit 2 is activating compressor 1.

If the thermostat is still calling for cooling and the outside air warms to above the setting for economizer operation:

- A. The economizer dampers will close to the minimum position for outside air and remain there.
- B. Contactor C1 will remain energized and compressor 1 will continue to run.
- C. Contactor C2 will close and compressor 2 will start.

If Using a Single-Stage Thermostat

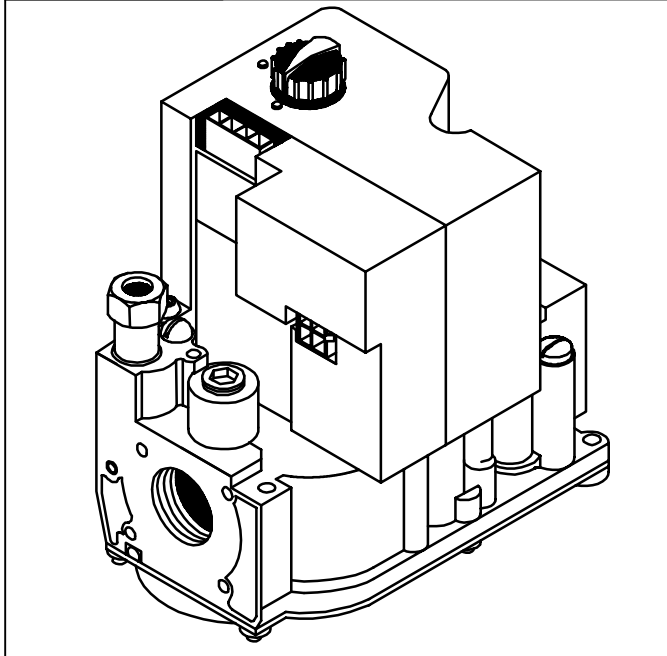
When using a single stage thermostat, all steps as outlined above will be followed with the exception of the following:

The compressor will only be energized when the outside air reaches a temperature above the preset limit of the economizer. When ambient conditions are **NOT** suitable for economizer operation, **ONLY** the compressor will run, and the economizer will **NOT** be energized.

9. Start-up Procedures

Figure 33

Honeywell Gas Valve



WARNING

Fire and/or explosion hazard.

Do NOT attempt to light the pilot or burner with a match or flame of any kind.

Failure to follow this warning can result in property damage, personal injury, and/or death.

Check Before Starting

1. Check that setting of the variable speed pulley is running at the correct heating and cooling speeds.
2. Check to see that clean, properly sized air filters are installed.
3. Replace all service access panels.

Reverse Rotation (Scroll Compressors Only)

Three phase scroll compressor equipped units **CAN** run in reverse if improperly wired. If the compressor makes an unusually loud noise, or if high and low side pressures are nearly identical, this indicates reverse rotation. To correct, reverse any two wires at line voltage connections **ONLY**. Do **NOT** rewire any circuits inside the unit to attempt correction of reverse rotation.

Manifold Gas Pressure Adjustment

NOTE: Make adjustment to manifold pressure with burners operating.

WARNING

Fire and/or explosion hazard.

Do NOT adjust manifold pressure more than ± 0.3 inches water column to obtain rated input.

Failure to properly set input pressure can result in property damage, personal injury and/or death.

WARNING

Fire or explosion hazard.

Turn OFF gas at shut off before connecting U-tube manometer.

Failure to properly seal duct can result in personal injury and/or death.

1. With gas **OFF**, Connect U-Tube manometer to tapped opening on gas valve. Use manometer with a 0 to 12 inches water column range.

Figure 34

Manifold Pressure Settings

Gas Type	Manifold Pressure
Natural	3.5 Inches Water Column (870 Pa) *
Propane	10 Inches Water Column (2490 Pa)
* 7-1/2 ton set to 3.6 inches Water Column	

2. Turn gas **ON** and remove adjustment screw cover on gas valve. Turn counterclockwise to decrease pressure and clockwise to increase.

NOTE: Adjustment screw cover **MUST** be placed on gas valve before reading manifold pressure and operating furnace.

WARNING

Fire and/or explosion hazard.

Do NOT adjust manifold pressure more than ± 0.3 inches water column to obtain rated input.

Failure to properly set input pressure can result in property damage, personal injury and/or death.

3. Set pressure to value shown in Figure 34, ± 0.07 kPa (0.3 inches) water column. Pressure is also listed on furnace rating plate. In **NO** case should final manifold pressure vary more than ± 0.07 kPa (0.3 inches) water column.

Circulating Air Blower

Check the unit's operation as outlined in the following instructions. If any unusual sparking, odors or unusual noises are encountered, shut off electric power immediately. Recheck for wiring errors, or obstructions in or near blower motors.

1. Set thermostat Heat-Cool selector to **OFF**.
2. Set thermostat fan switch to **AUTO**.
3. Turn electric power **ON**. Nothing should start running.
4. Turn manual gas valve **ON**.
5. Turn gas control valve **ON**.
6. Set thermostat fan switch to **ON**. After 30 seconds, the circulating air blower should come **ON**.
7. Reset thermostat fan switch to **AUTO**. After 30 seconds, the circulating air blower should go **OFF**. Nothing should be running.

Heating

1. Adjust thermostat setting above room temperature and set thermostat selector to **HEAT**. The combustion air blower should come **ON**.
2. The ignitor should begin to glow and pilot flame should light.

NOTE: On a call for heat the ignitor and pilot valve will remain energized until a flame is detected by the flame sensor. It may take several minutes to purge the air out of the gas lines at initial start-up of the unit.

3. Once the flame sensor detects that a flame is present, the hot surface ignitor will de-energize and the main burners will light from the pilot.
4. 30 seconds after the burners light, the circulating blower should begin to run.

WARNING

Fire and/or explosion hazard.

Do NOT attempt to light the pilot or burner with a match or flame of any kind.

Failure to follow this warning can result in property damage, personal injury, and/or death.

Temperature Rise Check

NOTE: Air temperature rise is the temperature difference between supply and return air. With a properly designed distribution system, the proper amount of temperature rise will normally be obtained when the unit is operating at rated input with the recommended blower speed.

1. To check the temperature rise through the unit, place thermometers in the supply and return air ducts as close to the unit as possible.
2. Open **ALL** registers and duct dampers. Operate unit **AT LEAST** 15 minutes before taking readings.

If the correct amount of temperature rise is not obtained when operating on the recommended blower speed, it may be necessary to change the blower speed. A faster blower

speed will decrease the temperature rise. A slower blower speed will increase the temperature rise.

NOTE: The blower speed **MUST** be set to give the correct air temperature rise through the furnace as marked on the rating plate.

3. After 15 minutes of operation check the limit control function by blocking the return air grille(s).
4. After several minutes the main burners and pilot should go **OFF**. The circulating air blower should continue to run.

5. Remove air restrictions. Pilot and main burners should relight after a cool down period of a few minutes.

NOTE: The maximum outlet air setting for all models is 175°F.

6. Adjust the thermostat setting below room temperature.
7. Pilot and main burners and combustion air blower should go **OFF**.
8. The circulating air blower should continue to run for 60, 100, 140 or 180 seconds. This time is adjustable.
9. Set thermostat Heat-Cool selector to **OFF**.

Cooling

1. Turn electric power **OFF**.
2. Set thermostat Heat-Cool select to **COOL**.
3. Adjust thermostat setting to below room temperature.
4. Turn power **ON**, for approximately 10 minutes, then **OFF**. During power application check the following:
 - a. Contactor – Contacts Closing
 - b. Compressor – **ON**
 - c. Condenser fan motor – **ON**
 - d. Circulating Air Blower – **ON** after a 30 second delay
5. Turn power **OFF**, check the following:
 - a. Contactor contacts opening.
 - b. Compressor – **OFF**
 - c. Condenser fan motor – **OFF**
 - d. Circulating blower – **OFF**

10. Operation

WARNING

Electrical shock hazard.

Turn off electric power supply at disconnect switch or service panel before removing any access or service panel from unit.

Failure to follow this warning can result in property damage, personal injury, and/or death.

Controls and Features

High and Low Pressure Switches

High and low pressure switches are provided on these units which will shut down the system when high pressures exceed 420 psi and low system pressures fall below 5 psi. The switches automatically reset after a fault. They are accessed through the compressor compartment access panel.

Fan Cycle Pressure Switch Port (optional)

If your unit will be operated in low ambient conditions (below 40° F) and you elect to install a low ambient fan cycle control, you can find the low ambient pressure port located on the discharge line just inside the compressor compartment panel opening.

Freeze Protection Thermostat

The freeze protection thermostat is located on the evaporator coil bends on the burner side of the unit. It is designed to shut down the cooling operation if the evaporator coil temperature falls below 35° F.

Filter Drier

A liquid line filter drier is located inside the compressor compartment access panel opening. Be certain to replace filter driers with the correct size and type as found in the *Technical Data Sheets* available from your dealer.

Economizer Plug

A pre-wired economizer plug is located just inside the return air opening.

Starting the Unit After Shutdown

Heating

1. Set thermostat to **OFF**.
2. Remove burner compartment access panel. Locate gas control valve knob (**Pg 6, Figure 2**), and turn to **OFF**. Wait 5 minutes.
3. Turn gas control knob to **ON**. (Honeywell valve must be depressed to turn). Replace burner compartment access panel. Turn manual gas valve to supply pipe **ON**.
4. Turn electric power **ON**.

5. Set thermostat to **HEAT** and to desired temperature. Unit will come on and operate automatically under control of the thermostat. Never attempt to light the pilot manually.

WARNING

Fire and/or explosion hazard

Do not operate the unit on heating (except during service checks) unless all access panels are securely fastened in place. Abnormal and possibly hazardous burner operation could result.

Failure to follow this warning can result in property damage, personal injury, and/or death.

Cooling

Set thermostat to desired temperature and set system switch to **COOL**. The unit will come on and operate automatically under control of the thermostat. Close all doors and windows. The unit may run continuously for several hours or longer on the initial run because of residual heat and moisture in the house. This is normal for any air conditioning system.

CAUTION

Do not operate on cooling when outdoor temperature is below 40°F. This is necessary to prevent possible damage to the compressor.

Turning The Unit Off

1. Set the thermostat switch and **OFF** fan switch to **AUTO**. To restart, set to **HEAT** or **COOL** and temperature desired.
2. To shut the unit down completely, turn electric power **OFF**. Turn manual gas valve off.

CAUTION

To prevent heat exchanger damage, wait at least 2 minutes after blower stops before shutting off power to unit.

NOTE: If the furnace overheats or fails to shut off, turn **OFF** the manual gas valve for the furnace then wait at least 2 minutes before turning off electric power.

Thermostat Fan Switch Operation

With the selector switch in the **ON** position the circulating air blower will run continuously (after a 30 second delay at the speed used for heating. In the **AUTO** position the blower will only be on during each heating or cooling cycle.

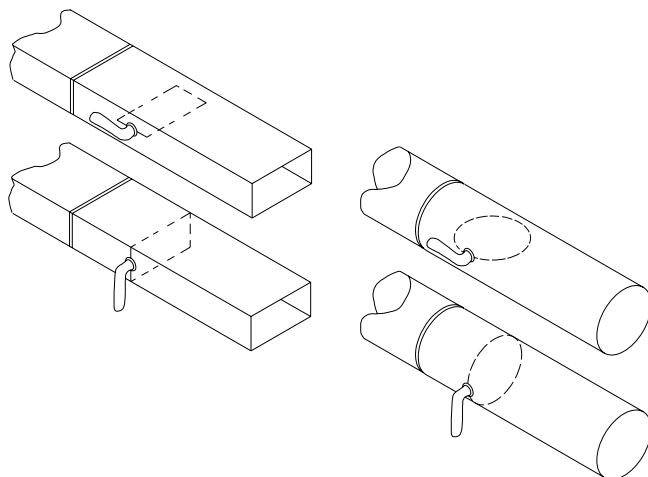
Adjusting Room Temperatures

If the temperature in individual rooms is not as desired, balance the system by adjusting the dampers in the branch ducts. Adjust a little at a time and wait a day after each

change to judge the effect. Once the dampers are adjusted for normal weather conditions, it is best to leave them that way. Compensate for temporary weather changes by adjusting the thermostat setting.

Figure 35

Typical Branch Duct Dampers



11. Maintenance

Monthly Maintenance and Inspection Checks

Air Filters

CAUTION

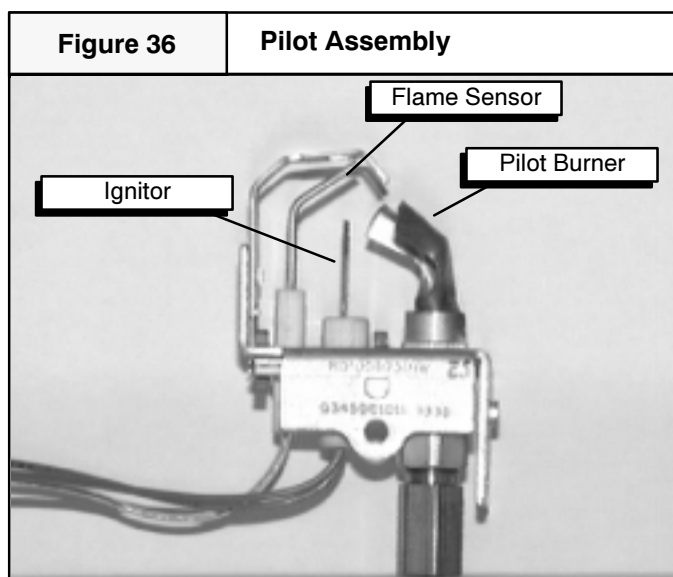
Do NOT operate without air filters.

Inspect filters at least monthly and replace or clean as required. Washable filters may be cleaned by soaking in mild detergent and rinsing with cold water. Replace filters with the arrows on the side pointing in the direction of air flow. Dirty filters are the most common cause of inadequate heating or cooling performance, and of compressor failures.

Refer to **Figure 40** to illustrate location of filter racks and filter access panel. Filters should be removed and replaced through this access panel.

Heating Season Checks (Monthly)

Pilot Flame



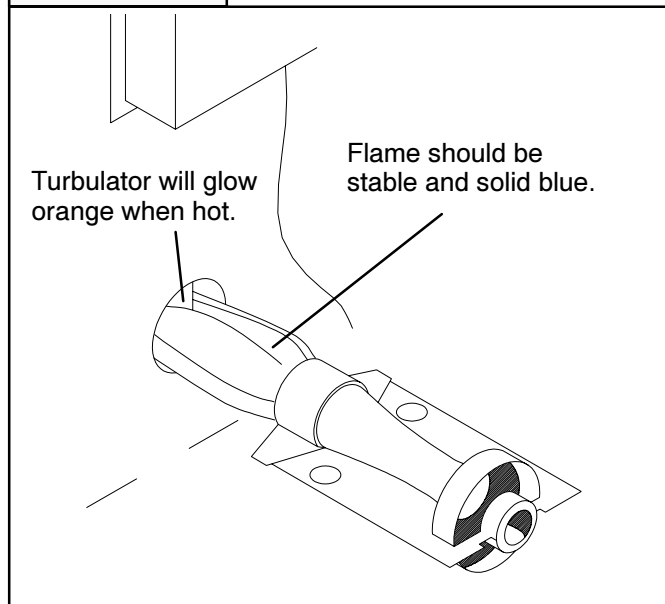
While the main burner is on, the flame should envelop the upper part of the flame sensor, as shown in **Figure 36**.

Main Burner Flame

Flames should be stable and solid blue, (dust may cause orange tips or they may have wisps of yellow, but they **MUST** not have solid yellow tips). They should extend directly into the heat exchanger tubes and the turbulators should glow orange (after about five minutes of operation). Main burner flame should be inspected monthly.

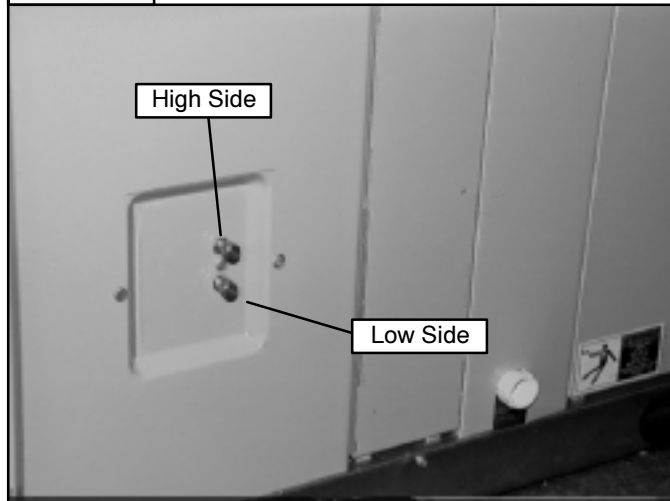
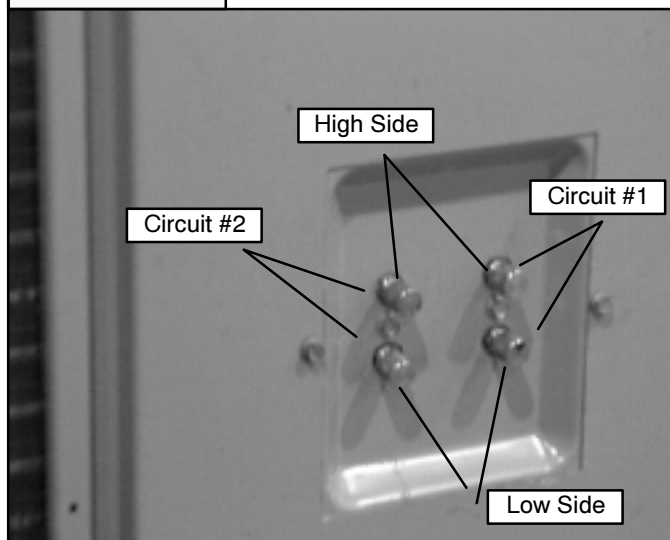
Figure 37

Normal Flame



Refrigeration Access Ports

This unit is equipped with refrigeration access ports mounted on the side of the unit. Refer to **Figure 38** and **Figure 39** for identification of ports. The 6-1/3 ton models have two compressors and two refrigeration circuits with the ports identified as Circuit #1 or #2.

Figure 38 Typical Access Ports (3-5, 7-1/2 Tons)**Figure 39** Typical Access Ports (6 1/3 Tons)**Figure 40** Access to Built-In Filters

Vent Assembly

WARNING

Burn hazard.

Flue cover may be hot! Allow adequate time for flue cover to cool.

Failure to follow this warning can result in property damage or personal injury.

Using a light and mirror (as required) inspect the inside of the vent hood and the inlet air opening in the burner compartment. Look for soot and severe rust or corrosion and any obstructions due to leaves, spider webs, etc. Clean as required.

Cooling Season Checks (Monthly)

Condenser Coil

Keep the condenser inlet and outlet area clean and free of leaves, grass clippings or other debris. Grass should be kept short in front of the condenser inlet. Shrubby **MUST** be trimmed back so it is no closer than 30 inches to unit.

Condensate Drain

Check for condensate drainage. Clean as required.

NOTE: When unit is operating in cooling mode under high humidity ambient conditions, condensate can form in the burner compartment and may drip from front of the compartment. This condition is **NOT** harmful to unit.

Annual Maintenance and Inspection

WARNING

Electrical shock hazard.

Turn off electric power supply at disconnect switch or service panel before removing any access or service panel from unit.

Failure to follow this warning can result in property damage, personal injury, and/or death.

The annual inspection should include lubrication and cleaning as required to ensure efficient operation of the unit. To simplify access, remove all access panels and the top from the unit if possible.

Condenser Fan Motor

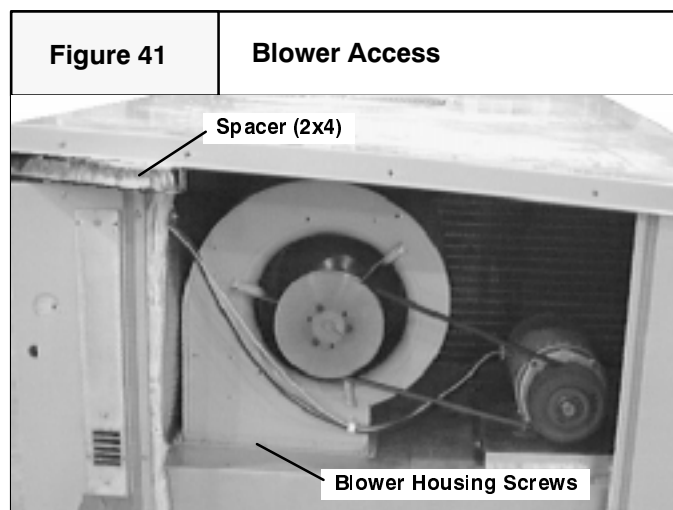
Oil the condenser fan motor after five years of operation and every five years thereafter.

Use SAE 10W30 motor oil. To oil, remove the hole plugs from the motor end bells and add several drops (approximately 1/2 teaspoonful) of oil with a squeeze type, flexible tube oiler. Replace hole plugs after oiling. Do not over oil.

CAUTION

Do not use 3 in 1 oil, penetrating oil, WD40 or similar oils to oil motor bearings.

Clean the surrounding area and the condenser and evaporator coils. Use caution to avoid damage to coil fins.



Blower Access for Servicing

Refer to **Figure 41** and **Figure 42** for a view of blower motor and compartment.

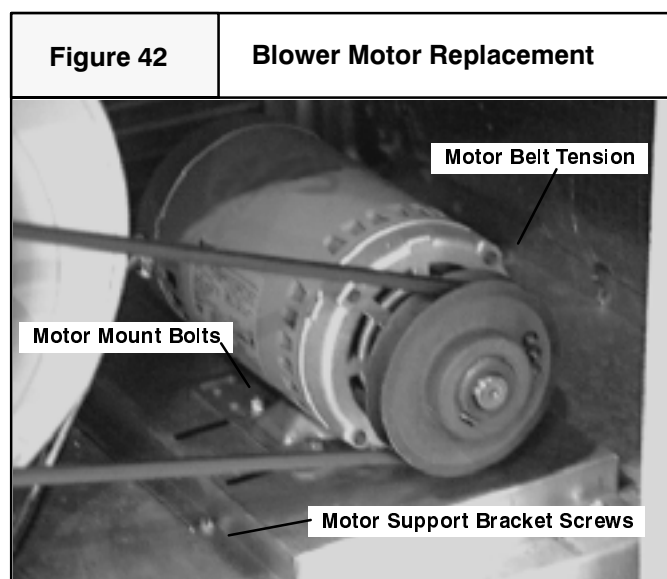
1. Remove the blower access panel.

Blower Motor Replacement

2. Refer to Air Distribution Section for instructions on removing belt tension and motor sheave, then loosen the motor mounts and remove belt.
3. Remove the screws securing the blower motor support bracket, slide motor out and then remove the motor mount bolts and the electrical wiring at the motor end bell.

Blower Assembly

4. Refer to Step 2, then remove the screws securing the blower housing to the blower deck.
5. Remove all screws around rim of unit top, (except screws which are inaccessible because of proximity to structure).
6. Raise unit top at corner of unit closest to blower approximately 2" and place a sturdy brace between top and unit corner. See **Figure 41**. A 2X4 piece of wood is ideal for this.
7. Disconnect any wires from housing and slide housing out of unit.



Circulating Air Blower

Visually inspect the blower wheel for accumulations of dirt or lint. Clean the compartment and the blower wheel. If accumulation is excessive on blower wheel, or does not easily remove, it will be necessary to remove the blower assembly.

Burners / Heat Exchangers / Flue Gas Passages

To inspect the burners, heat exchanger and interior flue gas passages, use a light and small mirror on an extension handle.

Check the exterior of the heat exchanger and the interior flue gas passages for any evidence of deterioration due to corrosion, cracking or other causes. If signs of scaling or sooting exist, remove the burners and clean the heat exchanger, as required.

Inspection And Cleaning Of Burner Assembly/Heat Exchangers/Flue Gas Passages

For Qualified Service Technician Only

See **Figure 45** for identification of parts.

1. Disconnect electrical power to unit.
2. Turn **OFF** gas at manual shut off valve.
3. Remove burner access panel.
4. Remove the vent assembly flue cover.
5. Disconnect gas pipe at union.
6. Disconnect wires from gas valve, note connections.
7. Remove screws that secure the flame shield and remove gas control valve, manifold and burners as an assembly.
8. Remove collector box, injector plate, and restrictor plate, including gaskets. See **Figure 44**.
9. Hold the burner assembly vertically and lightly tap it against a wood block. Clean also with a stiff brush. Severe cases of lint clogging may require washing the burners in hot water.
10. Remove turbulators and clean with small brush. Reinspect after cleaning and replace turbulators if defective.
11. Clean flue gas passages by using small brushes and a vacuum cleaner. It may be necessary to fabricate handle extensions for the brushes to reach the areas that require cleaning. Reinspect after cleaning and replace the heat exchanger if defective.
12. Reinstall parts and gaskets in reverse order. On spark to pilot models check the spark gap. $\frac{1}{8}$ inch is required between the igniter and pilot hood.
13. Turn gas on and check for leaks.
14. Install all access panels, turn power on and check for normal operation.

Figure 43

Access to Burners

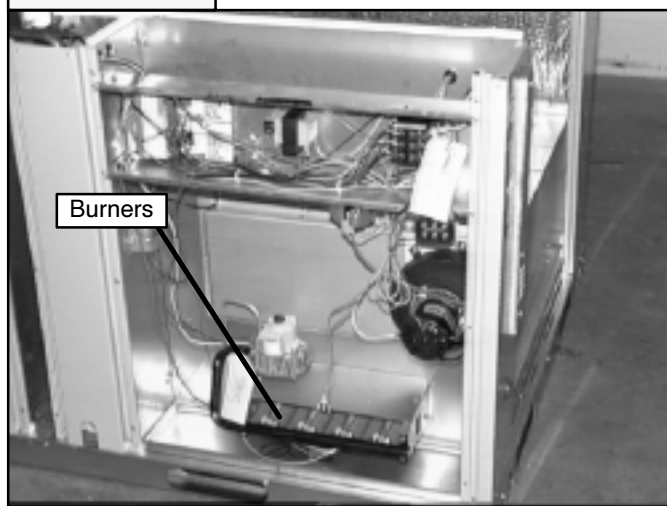


Figure 44

Burners, Valve, and Burner Box Removed

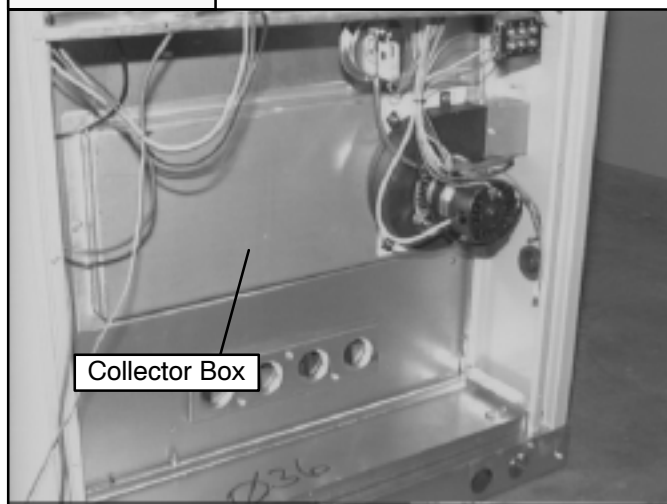
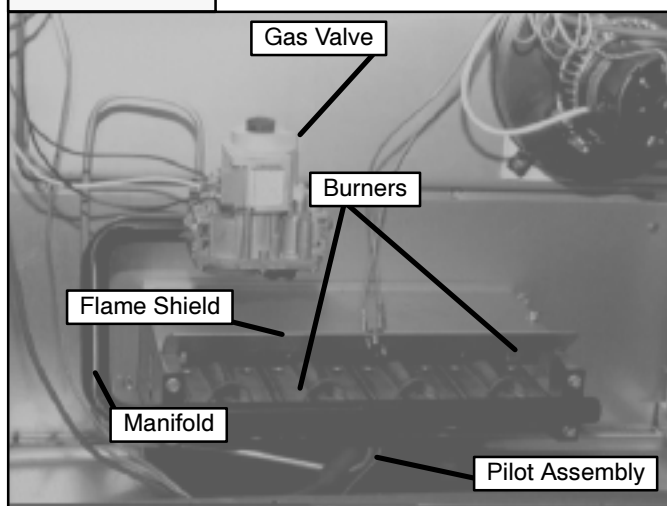


Figure 45

Burner Assembly Removed



12. Rigging Instructions

Figure 46

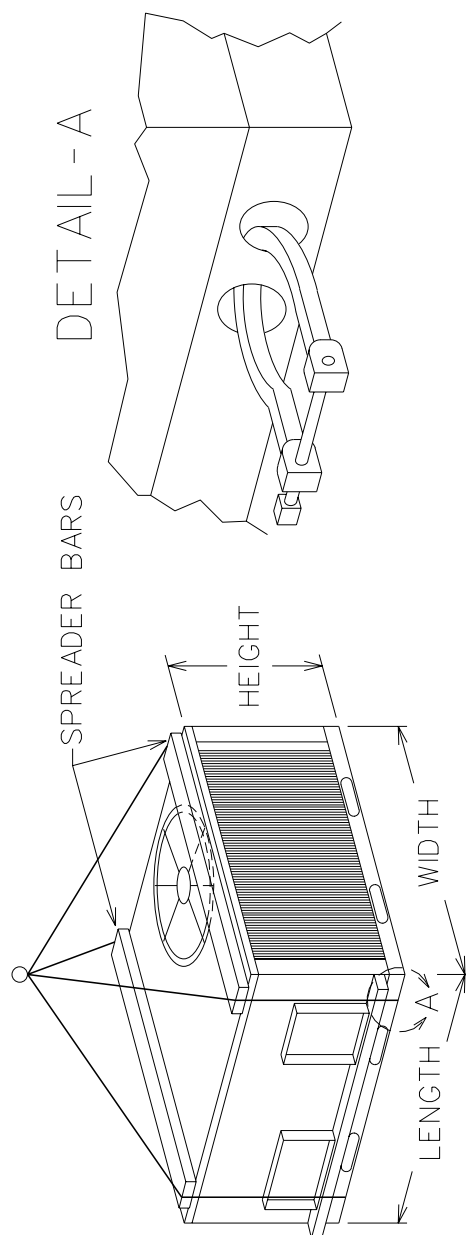
Rigging Instructions

RIGGING INSTRUCTIONS

⚠ WARNING

FAILURE TO FOLLOW THESE INSTRUCTIONS
CAN RESULT IN PROPERTY DAMAGE,
BODILY INJURY OR DEATH.

- ALL PANELS MUST BE IN PLACE WHEN RIGGING AND LIFTING.
- HOOK RIGGING SHACKLES THROUGH HOLES IN BASE RAIL, AS SHOWN IN DETAIL -A.
- USE SPREADER BARS, WHEN RIGGING, TO PREVENT UNIT DAMAGE.
- BE SURE RIGGING AND SHACKLES ARE SUFFICIENT TO HANDLE WEIGHT LISTED BELOW.



CABINET	COOLING CAPACITY RANGE	LENGTH		WIDTH		HEIGHT		MAX. WEIGHT	
		IN	MM	IN	MM	IN	MM	LB	KG
B	1.5 - 3.5 TONS	48.00	1219	48.00	1219	33.00	838	450	204
C	3 - 7-1/2 TON	73.00	1854	48.00	1219	36.50	927	800	363