

Amana

AIR COMMAND 90/95

Model GUC-C and GUX-B (Upflow)

HIGH EFFICIENCY GAS FIRED WARM AIR FURNACE INSTALLATION and OPERATION INSTRUCTIONS

IMPORTANT TO THE INSTALLER

Before installing this unit please read this manual to familiarize yourself on the specific items which must be adhered to such as maximum external static pressure to unit, air temperature rise, min. or max. cfm and motor speed connections. Affix these Installation Instructions adjacent to the furnace.

TO THE OWNER

It is important that you fill out the owner's registration card and mail it today. This will assist Amana in contacting you if any service or warranty information should change in the future. When filling in the registration card, be sure to include the Model, Manufacturing and Serial Numbers, plus the installation date.

Your warranty certificate is also supplied with the unit. Read the warranty carefully and note what is covered. Keep the warranty certificate in a safe place, so you can find it, if necessary.

If additional operating instructions are required, call the dealer through whom the purchase was made.

Keep this literature in a safe place for future reference.

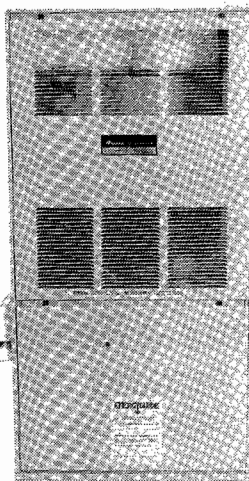


WARNING

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the furnace before shutting off the electrical supply.



RECOGNIZE THIS SYMBOL AS A SAFETY PRECAUTION



WARNING: If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- 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
 - Extinguish any open flame.
 - Do not try to light any appliance.
 - Do not touch any electrical switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency or the gas supplier.

THE INSTALLATION AND SERVICING OF THIS EQUIPMENT SHOULD BE PERFORMED ONLY
BY QUALIFIED, EXPERIENCED TECHNICIANS.

Due to our policy of continual product improvement, the right is reserved to change specifications and design without notice.

EFFECTIVE: MARCH, 1992

replaces 1002628
Part No. 10318704

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Amana Refrigeration, Inc.
Amana, Iowa 52204

I. SAFETY AND UNIT LOCATION



RECOGNIZE THIS SYMBOL AS A SAFETY PRECAUTION



WARNING

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage or death. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.



WARNING

This product contains or produces a chemical or chemicals which may cause serious illness or death and which are known to the State of California to cause cancer, birth defects or other reproductive harm.



CAUTION

This unit should not be used as a "construction heater" during the finishing phases of construction on a new structure. This type of use may result in premature failure of the unit due to extremely low return air temperatures and exposure to corrosive or very dirty atmospheres.

LOCATING THE FURNACE



WARNING

To avoid possible equipment damage, fire, personal injury or death, the following points must be observed when installing the unit.



When the furnace is used in connection with a cooling unit, the furnace must be upstream of or in parallel with the cooling unit. For details, see page 14.



The furnace must be installed in a location where all electrical components are protected from water and condensation.



The furnace must be set on a level floor to enable the condensate produced to drain properly. If the floor may become wet or damp at times, the furnace should be supported above the floor on a concrete base sized approximately 1½" larger than the base of the furnace.



Do not install the furnace where combustion air for the furnace is frequently heavily contaminated with compounds containing chlorine or fluorine. Common sources of such compounds include: indoor swimming pools and chlorine bleaches; paint strippers, adhesives, paints, varnishes, sealers, waxes (which are not yet dried) and solvents used during construction and remodeling. Various commercial and industrial processes may also be sources of chlorine/fluorine compounds.



If the furnace is installed near an area which will be frequently contaminated by chlorine/fluorine compounds, the furnace should be sealed from this area so that little contaminated air can reach the furnace. The furnace must still have an adequate supply of combustion air, either from a neighboring uncontaminated room or from outdoors. For details, see "AIR REQUIREMENTS" Section IV.



The furnace should be as centralized as is practical with respect to the air distribution system.

Provisions must be made for venting combustion products outdoors through an approved venting system as outlined in this manual. The length of flue pipe could be a limiting factor in locating the furnace. (See FLUE PIPING, Section V.)



Allow clearances from the enclosure as shown in TABLE 1 (page 5) for fire protection, proper operation, and service access. These clearances must be permanently maintained. The combustion and ventilating air openings in the front and top panels of the furnace must never be obstructed.



When installed in a residential garage the furnace must be positioned so the burners and ignition source are located not less than 18 inches above the floor and protected from physical damage by vehicles.



This furnace produces condensate as it operates. Do not locate the furnace or its condensate drainage system in an area which will be subject to below freezing temperatures.



Do not install the furnace directly on carpeting, tile or combustible material other than wood flooring.



When the furnace is heating, the temperature of the return air entering the furnace must be between 55°F and 100°F.

II. SPECIFICATIONS

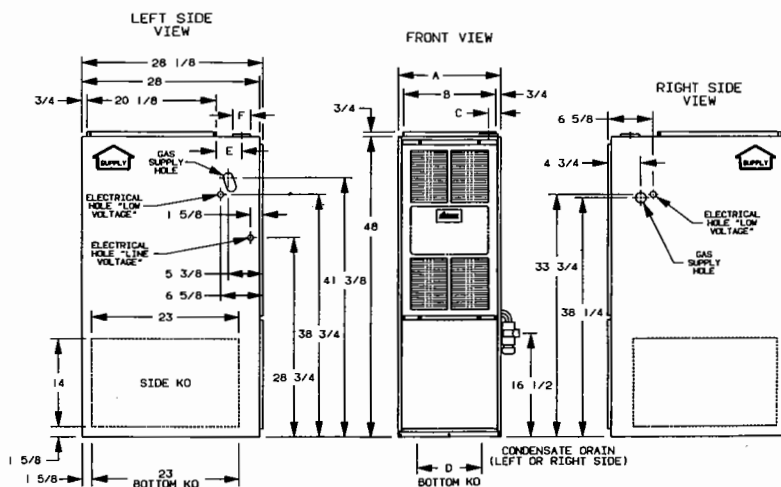
GUC-C Induced Draft Gas Furnace

Upflow Model	BTUH		Temp. Rise Range, °F	Number of Burners	F.L.A. (4)	Blower D x W	Blower HP	Blower Speeds	Max. CFM @ .5 ESP	Filters			Pressure Switch Setting (5)	Net Weight	App. Ship Weight
	Input	Output								Size	Type	Qty.			
GUC045C30C	(1) 45,000 (2) 45,000 (3) 40,500	(1) 43,000 (2) 43,400 (3) 39,100	25-55	2	15.1	10x8	1/8	3	1295	16x25x1	Semi-Permanent	1	-1.20±.10	145	162
GUC070C30C	(1) 70,000 (2) 70,000 (3) 63,000	(1) 65,000 (2) 66,400 (3) 59,800	35-65	3	14.3	10x8	1/8	4	1270	16x25x1	Semi-Permanent	1	-1.05±.10	159	177
GUC070C40C	(1) 70,000 (2) 70,000 (3) 63,000	(1) 65,000 (2) 66,400 (3) 59,800	35-65	3	17.3	10x10	3/4	4	1650	16x25x1	Semi-Permanent	1	-1.05±.10	168	185
GUC090C35C	(1) 90,000 (2) 90,000 (3) 81,000	(1) 83,000 (2) 85,700 (3) 77,100	35-65	4	13.2	10x8	1/2	4	1400	16x25x1	Semi-Permanent	1	-1.20±.10	181	201
GUC090C50C	(1) 90,000 (2) 90,000 (3) 81,000	(1) 84,000 (2) 85,700 (3) 77,100	35-65	4	17.4	10x10	3/4	4	2000	16x25x1	Semi-Permanent	2	-1.20±.10	190	210
GUC115C50C	(1)115,000 (2)115,000 (3)103,500	(1)107,000 (2)107,500 (3) 96,800	35-65	5	17.4	10x10	3/4	4	2000	16x25x1	Semi-Permanent	2	-.75±.07	215	235

- (1) For United States installations
 (2) For Canadian installation at 0-2000 ft.
 (3) For Canadian installation at 0-4500 ft.
 (4) Includes 5 amps drawn by ignitor during 21-second start-up cycle.
 (5) As shipped for installations below 4000 feet.

Flame sensor output is 1 to 4 microamps at 115 volts.

UPFLOW



	A	B	C	D	E	F
GUC045	16 1/2	15	2	10 1/2	4 1/4	2 3/8
GUC070	20 1/2	19	2	14 1/2	4 1/4	2 3/8
GUC090	24 1/2	23	2	18 1/2	4 1/4	2 3/8
GUC115	24 1/2	23	2	18 1/2	4 1/4	2 3/8

NOTES:

- All furnaces have a redundant gas valve and blower door inter-lock switch.
- All furnaces are manufactured for use on 120V, 60 Hertz and single phase electrical power supply.
- Important:** While the data is presented as a guide it is very important to electrically connect the unit properly size fuses and wires, in accordance with the National Electrical Code and/or all Existing Local Codes.
- Performance figures are based on Department of Energy information and requirements under continuous operating conditions. Performance will vary with weather conditions and use.
- Drain connections must conform to local codes.

Specifications subject to change without notice.



Amana GUC Series Forced Air Central Furnace Design Complies With Requirements Embodied In The American National Standard Shown Below.

ANSI Z21.47 Central Furnaces

CFM & Temperature Rise vs. External Static Pressure

Model	Motor Speed	External Static Pressure, Inches Water Column													
		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
		CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise
GUC045C30C	LO	980	40	970	40	940	42	900	44	865	44	810	47	790	52
	MED	1275	—	1200	—	1175	—	1125	—	1055	36	975	39	870	43
	HI	1500	—	1440	—	1375	—	1295	—	1210	—	1120	—	1010	37
GUC070C30C	LO	820	—	800	—	785	—	755	—	730	—	680	—	635	—
	MED-LO	1000	61	985	62	960	63	920	—	880	—	815	—	725	—
	MED	1245	45	1205	51	1165	52	1115	55	1050	56	980	60	880	—
GUC070C40C	LO	1350	45	1325	46	1275	48	1200	51	1145	51	1045	56	800	—
	MED-LO	1525	40	1480	41	1425	43	1350	45	1280	46	1200	49	1100	53
	MED	1680	36	1615	38	1560	39	1480	41	1400	42	1310	45	1200	49
GUC090C35C	LO	1055	—	1040	—	1000	—	970	—	930	—	870	—	800	—
	MED-LO	1325	57	1290	59	1250	61	1195	63	1145	—	1080	—	990	—
	MED	1615	47	1545	49	1485	51	1425	53	1345	56	1260	60	1170	—
GUC090C50C	LO	1825	41	1750	43	1670	45	1590	48	1500	50	1400	54	1310	58
	MED-LO	1465	53	1450	54	1400	56	1350	58	1280	59	1195	64	1050	—
	MED	1700	46	1670	47	1625	48	1565	50	1500	51	1400	54	1255	60
GUC115C50C	LO	1900	41	1865	42	1805	43	1735	45	1635	46	1590	48	1465	52
	MED	2250	—	2175	36	2085	38	2000	39	1890	40	1780	43	1640	46
	HI	1455	—	1440	—	1390	—	1350	—	1290	—	1220	—	1115	—
GUC115C50C	MED-LO	1690	59	1665	60	1610	62	1555	64	1485	—	1390	—	1245	—
	MED	1920	52	1865	54	1805	55	1730	58	1650	59	1535	63	1355	—
	HI	2280	44	2190	46	2100	48	2000	50	1880	51	1755	55	1600	60

NOTE:

1. CFM in chart above, is with filter(s) as shipped with furnace. If furnace is shipped with two side return filters, this chart assumes both filters are used.
2. INSTALLATION IS TO BE ADJUSTED TO OBTAIN TEMPERATURE RISE WITHIN THE RANGE SPECIFIED ON THE RATING PLATE.
3. The above chart is for information only. For satisfactory operation, external static pressure should not exceed value shown on rating plate. The shaded area indicates ranges in excess of maximum external static pressure allowable when heating.
4. The above chart is for U.S. furnaces installed at 0-2000 feet. At higher altitudes, a properly derated unit will have approximately the same temperature rise at a particular CFM, while the ESP at that CFM will be lower.

CLEARANCES TO COMBUSTIBLE SURFACES (inches)

TABLE 1

Front	6
Left side	1
Right side	1
Rear	0
Top	1
Flue	0
Floor	C

C = Combustible Floor (Wood Only)

ACCESSIBILITY CLEARANCES (MINIMUM)

36" at front is required for servicing or cleaning.

NOTE: In all cases accessibility clearance shall take precedence over clearances from the enclosure where accessibility clearances are greater.

II. SPECIFICATIONS (cont.)

GUX-B Induced Draft Gas Furnace

Upflow Model	BTUH		Temp. Rise Range, °F	Number of Burners	F.L.A. (4)	Blower D x W	Blower HP	Blower Speeds	Max. CFM @ .5 ESP	Filters			Pressure Switch Setting (5)	Net Weight	Approx. Ship Weight
	Input	Output								Size	Type	Qty.			
GUX045B30A	(1) 45,000 (2) 45,000 (3) 40,500	(1) 43,000 (2) 43,400 (3) 39,600	35-65	2	15.0	10x8	1/3	3	1325	16x25x1	Semi-Permanent	1	-1.45±.12	145	162
GUX070B30A	(1) 70,000 (2) 70,000 (3) 63,000	(1) 67,000 (2) 67,600 (3) 60,800	40-70	3	14.2	10x8	1/3	4	1290	16x25x1	Semi-Permanent	1	-1.20±.10	159	177
GUX070B40A	(1) 70,000 (2) 70,000 (3) 63,000	(1) 67,000 (2) 68,200 (3) 61,400	35-65	3	17.2	10x10	3/4	4	1590	16x25x1	Semi-Permanent	1	-1.20±.10	168	185
GUX090B35A	(1) 90,000 (2) 90,000 (3) 81,000	(1) 86,000 (2) 87,000 (3) 78,300	40-70	4	15.2	10x8	1/2	4	1580	16x25x1	Semi-Permanent	1	-1.45±.12	181	201
GUX090B50A	(1) 90,000 (2) 90,000 (3) 81,000	(1) 87,000 (2) 87,300 (3) 78,600	35-65	4	17.2	10x10	3/4	4	1945	16x25x1	Semi-Permanent	2	-1.45±.12	190	210
GUX115B50A	(1)115,000 (2)115,000 (3)103,500	(1)110,000 (2)111,100 (3)100,000	40-70	5	17.2	11x10	3/4	4	2075	16x25x1	Semi-Permanent	2	-1.20±.10	215	235

(1) For United States installations

(2) For Canadian installation at 0-2000 ft.

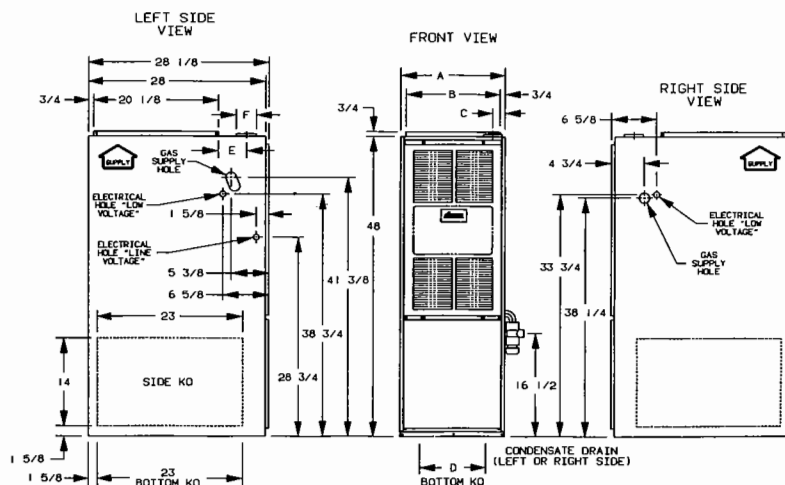
(3) For Canadian installation at 0-4500 ft.

(4) Includes 5 amps drawn by ignitor during 21-second start-up cycle.

(5) As shipped for installations below 4000 feet.

Flame sensor output is 1 to 4 microamps at 115 volts.

UPFLOW



NOTES:

1. All furnaces have a redundant gas valve and blower door inter-lock switch.
2. All furnaces are manufactured for use on 120V, 60 Hertz and single phase electrical power supply.
3. **Important:** While the data is presented as a guide, it is very important to electrically connect the unit and properly size fuses and wires in accordance with the National Electrical Code and/or all Existing Local Codes.
4. Performance figures are based on Department of Energy information and requirements under continuous operating conditions. Performance will vary with weather conditions and use.
5. Drain connections must conform to local codes.

Specifications subject to change without notice.



Amana GUX Series Forced Air Central Furnace Design Complies With Requirements Embodied In The American National Standard Shown Below.

ANSI Z21.47 Central Furnaces

CFM & Temperature Rise vs. External Static Pressure

Model	Motor Speed	External Static Pressure, Inches Water Column													
		0.2		0.3		0.4		0.5		0.6		0.7		0.8	
		CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise	CFM	Rise
GUX045B30A	LO	970	41	955	41	940	42	905	44	870	45	815	49	685	58
	MED	1230	—	1200	—	1160	—	1125	—	1070	37	1000	40	930	43
	HI	1525	—	1455	—	1390	—	1325	—	1245	—	1180	—	1090	36
GUX070B30A	LO	760	—	740	—	720	—	700	—	650	—	600	—	525	—
	MED-LO	990	62	975	63	930	66	900	68	845	—	780	—	675	—
	MED	1275	48	1230	50	1175	52	1115	55	1030	60	950	65	860	—
	HI	1510	41	1445	43	1370	45	1290	48	1200	51	1115	55	1015	61
GUX070B40A	LO	1315	47	1275	48	1250	49	1180	52	1085	57	975	—	745	—
	MED-LO	1490	41	1450	42	1385	44	1320	47	1235	50	1100	56	615	—
	MED	1635	38	1575	39	1500	41	1440	43	1325	46	1215	51	865	—
	HI	1845	—	1765	—	1680	37	1590	39	1470	42	1375	45	1175	52
GUX090B35A	LO	965	—	950	—	925	—	890	—	850	—	800	—	740	—
	MED-LO	1250	63	1220	65	1185	67	1140	69	1100	—	1045	—	975	—
	MED	1575	50	1515	52	1460	54	1390	57	1325	60	1235	64	1145	69
	HI	1800	44	1740	45	1665	48	1580	50	1490	53	1400	57	1315	60
GUX090B50A	LO	1440	55	1410	56	1360	58	1310	60	1245	64	1175	—	1080	—
	MED-LO	1715	46	1670	47	1610	49	1545	51	1475	54	1345	59	1250	63
	MED	1930	41	1870	42	1800	44	1715	46	1610	49	1575	52	1420	56
	HI	2230	36	2145	37	2050	39	1945	41	1815	44	1710	46	1610	49
GUX115B50A	LO	1300	—	1275	—	1255	—	1215	—	1175	—	1115	—	1060	—
	MED-LO	1560	65	1530	66	1480	68	1430	—	1380	—	1330	—	1255	—
	MED	1840	55	1800	56	1750	58	1690	60	1620	62	1545	65	1465	69
	HI	2325	44	2240	45	2150	47	2075	49	1965	51	1865	54	1750	58

NOTE:

1. CFM in chart above, is with filter(s) as shipped with furnace. If furnace is shipped with two side return filters, this chart assumes both filters are used.
2. INSTALLATION IS TO BE ADJUSTED TO OBTAIN TEMPERATURE RISE WITHIN THE RANGE SPECIFIED ON THE RATING PLATE.
3. The above chart is for information only. For satisfactory operation, external static pressure should not exceed value shown on rating plate. The shaded area indicates ranges in excess of maximum external static pressure allowable when heating.
4. The above chart is for U.S. furnaces installed at 0-2000 feet. At higher altitudes, a properly derated unit will have approximately the same temperature rise at a particular CFM, while the ESP at that CFM will be lower.

CLEARANCES TO COMBUSTIBLE SURFACES (inches)

TABLE 1

Front	6
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C = Combustible Floor (Wood Only)

ACCESSIBILITY CLEARANCES (MINIMUM)

36" at front is required for servicing or cleaning.

NOTE: In all cases accessibility clearance shall take precedence over clearances from the enclosure where accessibility clearances are greater.

III. GENERAL INFORMATION



WARNING

Property damage, bodily injury, or death from hazards such as fire, explosion, smoke, soot, condensation, electrical shock, or carbon monoxide may result from improper installation, repair, operation, or maintenance on this product.



WARNING

To avoid fire, property damage, and personal injury, do not install this unit in a mobile home, trailer, or recreational vehicle.

This is an upflow type furnace. To assure that your unit operates safely and efficiently, it must be installed, operated, and maintained in accordance with these installation and operating instructions, all local building codes and ordinances, or, in their absence, with the latest edition of the National Fuel Gas Code, ANSI Z223.1*, in Canada with the CAN/CGA-B149 Installation Codes, local plumbing or waste water codes and other applicable local codes.

The rated heating capacity of the furnace should be greater than or equal to the total heat loss of the area to be heated. The total heat loss should be calculated by an approved method or in accordance with "A.S.H.R.A.E. Guide" or "Manual J-Load Calculations" published by the Air Conditioning Contractors of America.

*Obtain from:
American National Standards Institute
1430 Broadway
New York, NY 10018

TRANSPORTATION DAMAGE

All furnaces are securely packed in shipping containers approved by the National Safe Transit Committee. The carton should be checked upon arrival for external damage. If damage is found, a request for inspection by carrier's agent should be made in writing immediately.

The furnace should be carefully inspected upon arrival for damage and bolts or screws which may have loosened in transit. In the event of damage, the consignee should:

1. Make notation on delivery receipt of any visible damage to shipment or container.
2. Notify carrier promptly and request an inspection.
3. In case of concealed damage, carrier should be notified as soon as possible — preferably within 5 days.
4. File the claim with the following supporting documents within the 9-month statute of limitations:
 - a. Original Bill of Lading, certified copy, or indemnity bond.
 - b. Original paid freight bill or indemnity in lieu thereof.
 - c. Original invoice or certified copy thereof, showing trade and other discounts or reductions.
 - d. Copy of the inspection report issued by carrier's representative at the time damage is reported to the carrier.

The carrier is responsible for making prompt inspection of damage and for a thorough investigation of each claim. The distributor or manufacturer will not accept claims from dealers for transportation damage.

LOCATING THE THERMOSTAT

Thermostat should be mounted 4 to 5 feet above the floor, on inside wall of the living room, dining room, or a hallway that has good air circulation from the other rooms being controlled by the thermostat.

Movement of air should not be obstructed by furniture, door, draperies, etc. The thermostat should not be mounted where it will be affected by drafts, hot or cold water pipes or air ducts in walls, radiant heat from fireplace, lamps, the sun, T.V., etc. or on an outside wall. Consult the Instruction Sheet packaged with thermostat for mounting instructions.

IV. AIR REQUIREMENTS

COMBUSTION AND VENTILATION AIR



WARNING

Property damage, bodily injury or death may occur if the furnace and any other fuel-burning appliances are not provided with enough fresh air for proper combustion and ventilation of flue gases. Most homes require outside air to be supplied into the furnace area.

Improved construction and additional insulation in homes has reduced the heat loss and made these homes much tighter around doors and windows so that air infiltration is minimal. This creates a problem to supply combustion and ventilation air for gas fired or other fuel burning appliances. Any use of appliances that pull air out of the house (clothes dryers, exhaust fans, fireplaces, etc.) increases this problem and appliances could be starving for air.

In addition, these energy saving measures mean that your home will retain more water vapor and have a higher relative humidity. High humidity, especially during cold weather, may be damaging to buildings because condensation forms on windows and inside walls.

AIR REQUIREMENTS

Most homes will require that outside air be supplied to the furnace area by means of ventilation grilles or ducts connecting directly to the outdoors or spaces open to the outdoors such as attics or crawl spaces. The following information on air for combustion and ventilation is reproduced from the National Fuel Gas Code NFPA54/ANSI Z223.1 Section 5.3 or Canadian Installation Code and CANI-B149.2.

5.3.1 General:

(a) The provisions of 5.3 apply to gas utilization equipment installed in buildings and which require air for combustion, ventilation and dilution of flue gases from within the building. They do not apply to (1) direct vent equipment which is constructed and installed so that all air for combustion is obtained from the outside atmosphere and all flue gases are discharged to the outside atmosphere, or (2) enclosed furnaces which incorporate an integral total enclosure and use only outside air for combustion and dilution of flue gases.

(b) Equipment shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting and the maintenance of ambient temperature at safe limits under normal conditions of use. Equipment shall be located so as not to interfere with proper circulation of air. When normal infiltration does not provide the necessary air, outside air shall be introduced.

(c) In addition to air needed for combustion, process air shall be provided as required for: cooling of equipment or material, controlling dew point, heating, drying, oxidation or dilution, safety exhaust, odor control, and air for compressors.

(d) In addition to air needed for combustion, air shall be applied for ventilation, including all air required for comfort and proper working conditions for personnel.

(e) While all forms of building construction cannot be covered in detail, air for combustion, ventilation and dilution of flue gases for gas utilization equipment vented by natural draft normally may be obtained by application of one of the methods covered in 5.3.3 and 5.3.4.

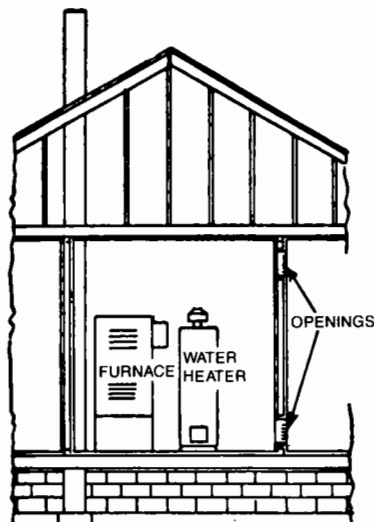
(f) Air requirements for the operation of exhaust fans, kitchen ventilation systems, clothes dryers, and fireplaces shall be considered in determining the adequacy of a space to provide combustion air requirements.

5.3.2 Equipment Located in Unconfined Spaces: In unconfined spaces (see definition below) in buildings, infiltration may be adequate to provide air for combustion, ventilation and dilution of flue gases. However, in buildings of tight construction (for example, weather stripping, heavily insulated, caulked, vapor barrier, etc.), additional air may need to be provided using the methods described in 5.3.3-b or 5.3.4.

Space, Unconfined. For purposes of this Code, a space whose volume is not less than 50 cubic feet per 1,000 Btu per hour of the aggregate input rating of all appliances installed in that space. Rooms communicating directly with the space in which the appliances are installed, through openings not furnished with doors, are considered a part of the unconfined space.

5.3.3 Equipment Located in Confined Spaces:

(a) *All Air from Inside the Building:* The confined space shall be provided with two permanent openings communicating directly with an additional room(s) of sufficient volume so that the combined volume of all spaces meets the criteria for an unconfined space. The total input of all gas utilization equipment installed in the combined space shall be considered in making this determination. Each opening shall have a minimum free area of 1 square inch per 1,000 Btu per hour of the total input rating of all gas utilization equipment in the confined space, but not less than 100 square inches. One opening shall be within 12 inches of the top and one within 12 inches of the bottom of the enclosure. (See Figure 1.)



Note: Each opening shall have a free area of not less than one square inch per 1,000 Btu per hour of the total input rating of all equipment in the enclosure, but not less than 100 square inches.

Fig. 1. Equipment Located in Confined Spaces; All Air from inside the Building. See 5.3.3-a.

(b) *All Air From Outdoors*: The confined space shall be provided with two permanent openings, one commencing within 12 inches of the top and one commencing within 12 inches of the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.

1. When directly communicating with the outdoors, each opening shall have a minimum free area of 1 square inch per 4,000 Btu per hour of total input rating of all equipment in the enclosure. (See Figure 2.)

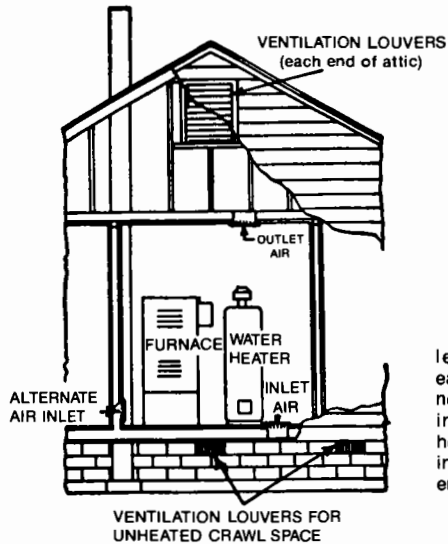


Fig. 2. Equipment Located in Confined Spaces; All Air from Outdoors — Inlet Air from Ventilated Crawl Space and Outlet Air to Ventilated Attic. See 5.3.3-b.

2. When communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4,000 Btu per hour of total input rating of all equipment in the enclosure. (See Figure 3.)

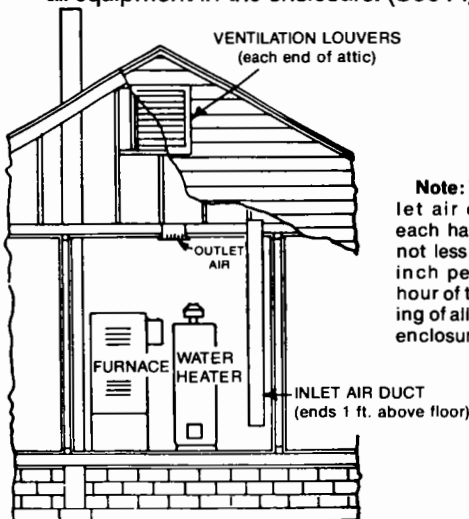
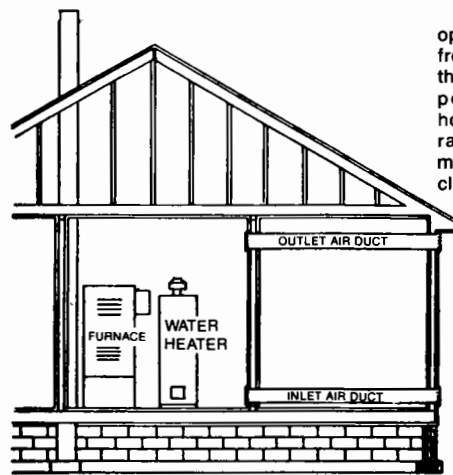


Fig. 3. Equipment Located in Confined Spaces; All Air from Outdoors Through Ventilated Attic. See 5.3.3-b.

3. When communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 square inch per 2,000 Btu per hour of total input rating of all equipment in the enclosure. (See Figure 4.)



Note: Each air duct opening shall have a free area of not less than one square inch per 2,000 Btu per hour of the total input rating of all equipment in the enclosure.*

*If the appliance room is located against an outside wall and the air openings communicate directly with the outdoors, each opening shall have a free area of not less than one square inch per 4,000 Btu per hour of the total input rating of all appliances in the enclosure.

Fig. 4. Equipment Located in Confined Spaces; All Air from Outdoors. See 5.3.3-b.

4. When ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts shall be not less than 3 inches.

5.3.4 Specially Engineered Installations:

The requirements of 5.3.3 shall not necessarily govern when special engineering, approved by the authority having jurisdiction, provides an adequate supply of air for combustion, ventilation, and dilution of flue gases.

5.3.5 Louvers and Grilles:

In calculating free area in 5.3.3, consideration shall be given to the blocking effect of louvers, grilles or screens protecting openings. Screens used shall not be smaller than $\frac{1}{4}$ inch mesh. If the free area through a design of louver or grille is known, it should be used in calculating the size opening required to provide the free area specified. If the design and free area is not known, it may be assumed that wood louvers will have 20-25 percent free area and metal louvers and grilles will have 60-75 percent free area. Louvers and grilles shall be fixed in the open position or interlocked with the equipment so that they are opened automatically during equipment operation.

5.3.6 Special Conditions Created by Mechanical Exhausting or Fireplaces:

Operation of exhaust fans, ventilation systems, clothes dryers, or fireplaces may create conditions requiring special attention to avoid unsatisfactory operation of installed gas utilization equipment.

V. FLUE PIPING



WARNING

Failure to follow these instructions can result in bodily injury or death from asphyxiation. Therefore, carefully read and follow all instructions given in this section.

In order to achieve high efficiency, the products of combustion from this furnace are cooled to the point where condensation takes place. Consequently, the venting must be done in a different manner and with different materials than with a conventional system. Two or three inch PVC Schedule 40 pipe meeting ASTM 1785, PVC primer and PVC solvent cement meeting ASTM D2564 specifications must be used. Only DWV type fittings meeting ASTM D2665 for socket dimensions and ASTM D3311 for exterior dimensions can be used. Carefully follow the manufacturer's instructions in cutting, cleaning and solvent cementing PVC or ABS pipe.

As an alternate to PVC pipe, primer, solvent cement, and fittings; ABS materials which are in compliance with the following specifications may be used: two or three inch ABS Schedule 40 pipe must meet ASTM D1527 and must be CSA listed. Solvent cement for ABS to ABS joints must meet ASTM D2235 and must be CSA listed. The solvent cement used for the PVC to ABS joint must meet ASTM D3138. Fittings must be DWV type fittings which meet ASTM D2661 and ASTM D3311 (exterior dimensions) and are CSA listed. Carefully follow the manufacturer's instructions in cutting, cleaning and solvent cementing PVC or ABS pipe.



WARNING

Solvent cements are combustible liquids and should be kept away from all ignition sources (ie: sparks, open flames and excessive heat). Avoid breathing cement vapors or contact with skin and eyes.

All 90 degree elbows must be medium ($\frac{1}{4}$ bend DWV) or long radius (long sweep $\frac{1}{4}$ bend DWV) types conforming to ASTM D3311. A medium radius ($\frac{1}{4}$ bend) elbow is $3\frac{1}{16}$ " minimum from the plane of one opening to the centerline of the other opening for 2" pipe ($4\frac{9}{16}$ " for 3" pipe). These dimensions are shown in Figure 5.

This furnace must not be connected to any type B, BW, or L vent or vent connector and must not be vented into any portion of a factory built or masonry chimney, except when used as a pathway for PVC pipe as described below.

Flexible couplings for joining PVC pipe (sometimes called "no hub connectors") have been used by some installers to connect the field supplied portion of the vent system to the furnace. Amana Refrigeration, Inc. does not encourage nor recommend using these connectors. However, if you do choose to use "no-hub connectors," the connectors must be gas tight, water tight, and able to withstand continuous exposure to the warm, moist, acidic flue products of the furnace.

It is the responsibility of the installer to follow the manufacturers' recommendations and to verify that all flue pipe con-

nectors used are compatible with the furnace flue products. In addition the connectors must possess adequate structural integrity to prevent flue pipe separations during furnace operation.

IMPORTANT

The length of the vent pipe affects the performance of the furnace and therefore must be carefully sized.

Just as with ductwork, the resistance of the flue pipe is measured in terms of equivalent feet. Equivalent feet is actual length of the pipe plus an additional three feet of pipe for a 90 degree medium radius elbow and $1\frac{1}{2}$ ft. for each 45 degree medium radius elbow. A 90 degree short radius elbow is equal to 10 feet of straight pipe. For this reason, the use of a short radius elbow should usually be avoided. **IN NO CASE SHOULD OVER 40 FT. OF ACTUAL 2" PIPE OR 52 EQUIVALENT FEET OF 2" PIPE BE USED.**

If the equivalent vent length is too long, a portion of the vent may be changed to a 3" pipe. The transition from 2" to 3" must be made in a vertical run.

A sample calculation is as follows (All elbows are medium radius):

SECTION	EQ. FT. OF 2" PIPE
Outdoor 2" elbow	3
Outdoor & through the wall pipe—2" pipe	3
2-45 degree elbows, 2"	3
4-90 degree elbows, 2"	12
36 feet 2" pipe	36
	57

This is greater than the 52 equivalent feet which is allowed. 3" pipe has only $\frac{1}{3}$ the pressure drop of 2" pipe. Changing a portion of the piping to 3" will change the pressure drop as follows:

SECTION	EQ. FT. OF 2" PIPE
Outdoor 3" elbow	1
Outdoor & through the wall pipe—3" pipe	1
2-45 degree elbows, 3"	1
4-90 degree elbows, 3"	4
33 feet of 3" pipe	11
3 feet of 2" pipe	3
	21

This is less than 52 equivalent feet of 2" pipe, so this will be satisfactory.

When the vent pipe goes through an outside wall, the vent must terminate at least one foot outside to keep moist combustion products away from the structure. The vent termination must be at least three feet above any forced air inlet located within ten feet. It must be at least four feet below, four feet horizontally from or one foot above any door, window, or gravity air inlet into any building. The vent must terminate at least one foot above ground level. If heavy snow is expected locally, this distance may need to be increased. The vent shall not terminate over public walkways, or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment. Drill a $2\frac{3}{8}$ " diameter hole through the wall. Cut a piece of PVC (ABS) pipe that is the thickness of the wall plus the depth of the sockets of the fittings to be installed on the inside and outside of the walls. To prevent the

vent pipe from moving and possibly damaging connections, locate the fitting on the inside wall and a coupling on the outside wall as shown in Fig. 5. To prevent condensate from freezing inside the PVC flue pipe in extremely cold conditions or in long outdoor runs, insulation may be required on the outside of the PVC pipe. Use $\frac{1}{2}$ " thickness closed cell foam insulation such as Armaflex or Insultube.

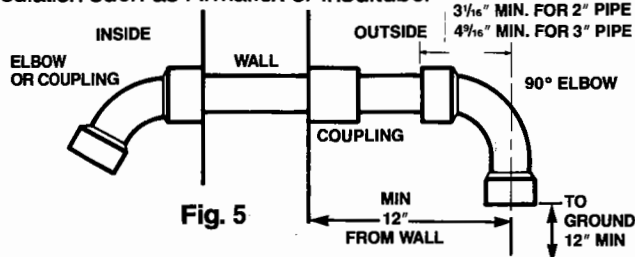


Fig. 5

In a basement installation, the vent pipe may be run between the joist spaces. If the vent must go below the joists, then the pipe must run up into the last joist space to go through the header. Two 45° elbows should be used rather than 90°s. The horizontal run must not have any sag that can hold condensate and should pitch up at least $\frac{1}{4}$ " per foot so that condensate will run back to the unit to drain. Support the horizontal run at least every three feet. Allow for some expansion and contraction from temperature fluctuations. The normal direction changes usually account for this, but if you have a long run followed by a short offset of less than 40 inches such as going up into the last joist space, the pipe should be tightly clamped to prevent flex loading on the fittings. Seal around the pipe on the outside wall with silicone caulking material.

If the vent is to be run vertically through the roof, it must extend at least 12 inches above the roof line and shall be at least 12 inches from any vertical wall. If heavy snow is expected to remain on the roof, these distances may need to be increased. The vent must be made tight where it penetrates the roof with a proper flashing such as used with a plastic plumbing vent. The vent may be run through an existing **unused** chimney; however, the pipe must be used all the way through to above the top of the existing chimney. The space between the vent pipe and the chimney must be closed with a weather tight, corrosion resistant flashing. **NEVER VENT WITH AN EXISTING APPLIANCE OR VENT USED BY A SOLID FUEL APPLIANCE.**

When an existing furnace is removed from a venting system serving other appliances, the venting system may be too large to properly vent the remaining attached appliances.

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.

- Seal any unused openings in the common venting system.
- Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
- Insofar as is practical, close all building 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. 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.

- Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance will operate continuously.
- Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar, or pipe.
- After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous conditions of use.
- If improper venting is observed during any of the above tests, the common venting system must be corrected in accordance with the latest edition of the National Fuel Gas Code, ANSI Z223.1.

If resizing any portion of the common venting system, use the appropriate table in Appendix G in the latest edition of the National Fuel Gas Code, ANSI Z223.1.



WARNING

Upon completion of the furnace installation, carefully inspect the entire flue system both inside and outside the furnace to assure it is properly sealed. Leaks in the flue system can result in serious personal injury or death due to exposure of flue products, including carbon monoxide.

ADDITIONAL CANADIAN VENTING REQUIREMENTS

In Canada venting shall conform to the requirements of the current CANI-B149 Installation Codes.

Use only C.S.A. listed 2" or 3" nominal diameter PVC or ABS pipe and fittings throughout.

The Minimum vent consists of 3 feet of straight pipe with 2 elbows (9 equivalent feet).

A single wall vent shall not be run vertically through the roof. Although, the vent may be run through an existing **unused** chimney as described in the previous venting section provided the space between the vent pipe and the chimney is insulated and closed with a weather tight, corrosion resistant flashing.

Cut all vent pipe at right angles. Remove inside and outside burr at each cut. Use cleaner to clean pipe and fitting socket. Use CSA listed cement to fasten pipe and fittings. Follow manufacturers cleaning and cementing instructions carefully to avoid leakage.

NOTE: ALL PIPING EXPOSED OUTDOORS OR IN UNHEATED AREAS MUST BE INSULATED WITH $\frac{1}{2}$ " THICK CLOSED CELL FOAM INSULATION SUCH AS "ARMAFLEX" OR "INSULTUBE."

The vent terminal shall NOT be located:

- Less than 12" above the finished grade line.
- Less than 36" from any building opening or any gas service regulator (for gas service regulators in the Province of Ontario, 72").
- Less than 72" from the combustion air inlet of another appliance.
- Directly above a gas utility meter or service regulator.
- Over a walkway unless 84" above grade.

VI. CONDENSATE PIPING

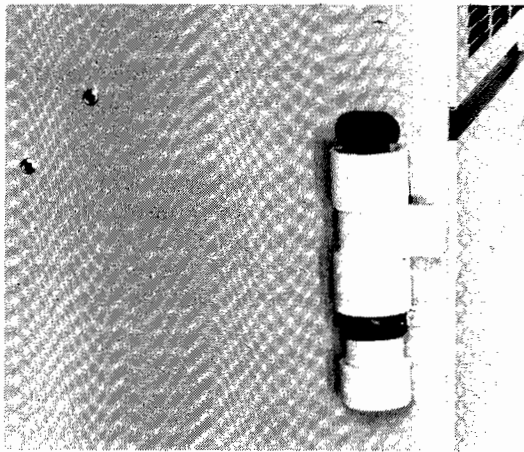


Fig. 6

CONDENSATE DRAIN

The Air Command 95 achieves its high efficiency by condensing some of the flue products into a slightly acidic water which must be piped to a drain. A drain well which is shipped with the furnace must be installed on the left or right side of the furnace cabinet, See Fig. 6, and installation instruction enclosed with standpipe kit. The condensate from the recuperator coil and the induced draft blower flows into this drain well which acts as a trap. No other trap must be used. A $\frac{3}{4}$ " PVC (or CPVC) pipe must be run from the side of the well to a drain, maintaining a horizontal downward slope in accordance with good plumbing practice. **DO NOT TRAP THIS LINE.**

PVC (or CPVC) pipe is recommended since it is corrosion resistant, rigid and not easily damaged. The drain line must not be routed outside where it could possibly freeze and become blocked. The top of the well must be left open so that any blockage in the drain line will be relieved out the top of the drain well and not back up in the unit.

VII. GAS PIPING

The rating plate is stamped with the model number, type of gas and gas input rating. Make sure the furnace is equipped to operate on the type of gas available.

INLET GAS PRESSURE	
NATURAL	MIN. 5.0", MAX. 10.0"
PROPANE	MIN. 11.0", MAX. 14.0"

Inlet Gas Pressure Must Not Exceed the Maximum Value Shown in Table Above.

The minimum supply pressure must not be varied downward because this could lead to unreliable ignition. In addition, gas input to the burners must not exceed the rated input shown on the rating plate. Overfiring of the furnace could result in premature heat exchanger failure.

HIGH ALTITUDE DERATE (U.S. Installations Only)

When this furnace is installed at altitudes above 2,000 feet the furnace input must be derated 4% for each 1,000 feet above sea level because the density of the air is reduced.

In some areas the gas supplier will derate the gas at a rate of 4% for each 1,000 feet above sea level. If he does not do so, smaller orifices will be required at altitudes above 3,500 feet (non-derated natural gas) or 4,500 feet (non-derated propane).

A different pressure switch is required at altitudes more than 4,000 feet above sea level. This is required regardless of the heat content of the fuel used.

High altitude kits can be purchased depending upon the altitude and the usage of propane or natural gas. Refer to the high altitude instruction manual included with this furnace to determine which high altitude components to use and also for detailed installation instructions.

Adjustment of the manifold pressure to a lower pressure reading than what is specified on the furnace nameplate is not a proper derate procedure. With a lower density of air and a lower manifold pressure at the burner orifice, the orifice will not aspirate the proper amount of air into the burner. This can cause incomplete combustion of the gas, flashback, and possible yellow tipping.

GAS PIPING



CAUTION

To avoid possible unsatisfactory operation or equipment damage due to underfiring of equipment, do not undersize the natural gas/propane piping from the meter/tank to the furnace. When sizing a trunk line per the tables, include all appliances on that line that could be operated simultaneously.

The gas pipe supplying the furnace must be properly sized based on the cubic feet per hour of gas flow required, specific gravity of the gas and length of the run. The gas line installation must comply with local codes, or in the absence of local codes, with the latest edition of the National Fuel Gas Code ANSI Z223.1 or CAN/COA B149 Installation Codes.

NATURAL GAS CAPACITY OF PIPE IN CUBIC FEET OF GAS PER HOUR (CFH)

Length of Pipe in Feet	Nominal Black Pipe Size				
	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	1 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "
10	132	278	520	1,050	1,600
20	92	190	350	730	1,100
30	73	152	285	590	980
40	63	130	245	500	760
50	56	115	215	440	670
60	50	105	195	400	610
70	46	96	180	370	560
80	43	90	170	350	530
90	40	84	160	320	490
100	38	79	150	305	460

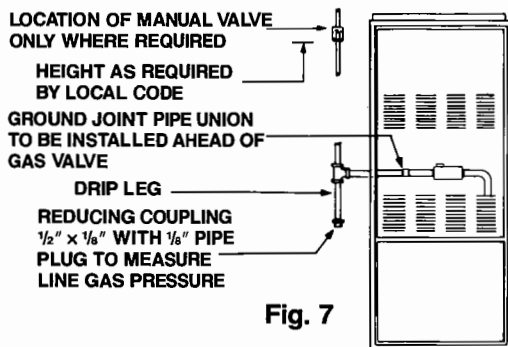
(Press. .5 Psig or less and Pressure Drop of 0.3" W.C.; Based on 0.60 Specific Gravity Gas)

$$\text{CFH} = \frac{\text{BTUH FURNACE INPUT}}{\text{CALORIFIC VALUE OF GAS}}$$

CONNECTING THE GAS PIPING - NATURAL GAS

Refer to Figure 7 for the general layout of the furnace. The following rules apply:

1. Use black iron or steel pipe and fittings for the building piping.
2. Use pipe joint compound on male threads only. Pipe joint compound must be resistant to the action of the fuel used.
3. Use ground joint unions.
4. Install a drip leg to trap dirt and moisture before it can enter the gas valve. The drip leg must be a minimum of three inches long.
5. Use two pipe wrenches when making connection to the gas valve to keep it from turning.
6. Install a manual shut-off valve. This shut-off valve should be conveniently located within (6) six feet of the unit, and between the meter and unit.
7. Tighten all joints securely.
8. The furnace shall be connected to the building piping by one of the following:
 - a. Rigid metallic pipe and fittings.
 - b. Semirigid metallic tubing and metallic fittings. Aluminum alloy tubing shall not be used in exterior locations.
 - c. Listed gas appliance connectors used in accordance with the terms of their listing that are completely in the same room as the equipment.
 - d. In "b" and "c" above, the connector or tubing shall be installed so as to be protected against physical and thermal damage. Aluminum-alloy tubing and connectors shall be coated to protect against external corrosion where they are in contact with masonry, plaster or insulation or are subject to repeated wettings by such liquids as water (except rain water), detergents or sewage.



When the gas piping enters through the left hand side of the furnace, the installer must supply the following fittings (starting from the gas valve):

- 90 degree elbow
- 1 1/2" close nipple
- 90 degree elbow
- Straight pipe to reach exterior of furnace. See Fig. 7A.

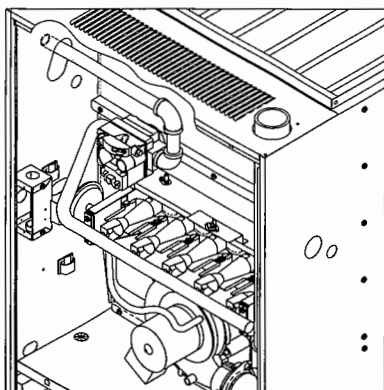


Fig. 7A — Gas inlet from the L.H. side

A ground joint union, drip leg, and manual shutoff valve must also be supplied by the installer. In some cases, the installer may also need to supply a transition piece from 1/2" to another pipe size.

When the gas piping enters through the right hand side of the furnace, the installer must supply straight pipe to reach exterior of furnace. See Fig. 7B.

A ground joint union, drip leg, and manual shutoff valve must also be supplied by the installer. In some cases, the installer may also need to supply a transition piece from 1/2" to another pipe size. To avoid the possibility of vibrations or noise, the gas piping should not come in contact with the flue pipe.

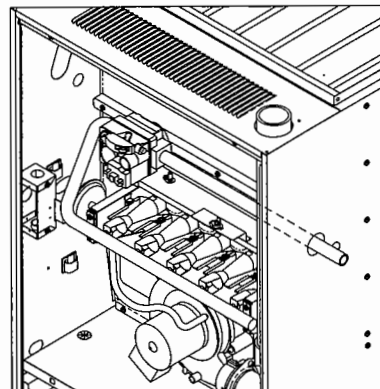


Fig. 7B — Gas inlet from the R.H. side

CHECKING THE GAS PIPING

CAUTION

To avoid the possibility of property damage, personal injury or fire, the following instructions must be performed regarding gas connections and pressure testing.

! The unit and its gas connections must be leak tested before placing in operation. Because of the danger of explosion or fire, never use a match or open flame to test for leaks. Never exceed specified pressures for testing. Higher pressure may damage the gas valve and cause overfiring which may result in heat exchanger failure.

! This unit and its individual shut-off valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 1/2 psig (3.48 kPa).

! This unit must be isolated from the gas supply system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3.48 kPa).

TANKS AND PIPING — PROPANE UNITS



WARNING PERSONAL INJURY HAZARD

Iron oxide (rust) can reduce the level of odorant in propane gas. A gas detecting device is the only reliable method to detect a propane gas leak. Contact your local propane supplier about installing a gas detecting warning device to alert you in the event that a gas leak should develop.

Failure to detect a propane gas leak could result in an **EXPLOSION** or **FIRE** which could cause **SERIOUS PERSONAL INJURY OR DEATH**.

All propane gas equipment must conform to the safety standards of the National Board of Fire Underwriters (See NBFU Manual 58) or Natural Standards of Canada B149.2, Installation Code for Propane Gas Burning Appliances and Equipment.

For satisfactory operation, propane gas pressure must be 10 inch W.C. at the furnace manifold with all gas appliances in operation. Maintaining proper gas pressure depends on three main factors:

1. Vaporization rate, which depends on (a) temperature of the liquid, and (b) "wetted surface" area of the container or containers.
2. Proper pressure regulation. (Two-stage regulation is recommended from the standpoint of both cost and efficiency.)
3. Pressure drop in lines between regulators, and between second stage regulator and the appliance. Pipe size required will depend on length of pipe run and total load of all appliances.

Complete information regarding tank sizing for vaporization, recommended regulator settings, and pipe sizing is available from most regulator manufacturers and propane gas suppliers.

Propane is an excellent solvent, and special pipe dope must be used when assembling piping for this gas as it will quickly dissolve white lead or most standard commercial compounds. Shellac base compounds resistant to the actions of liquified petroleum gases such as Gasolac, Stalactic, Clyde's or John Crane are satisfactory.

Refer to Fig. 8 for typical propane gas installations.



WARNING

If your propane gas furnace is installed in a basement, an excavated area or a confined space, we strongly recommend that you contact your propane supplier about installing a warning device that would alert you to a gas leak.

...Propane gas is heavier than air and any leaking gas can settle in any low areas or confined spaces.

TYPICAL PROPANE PIPING

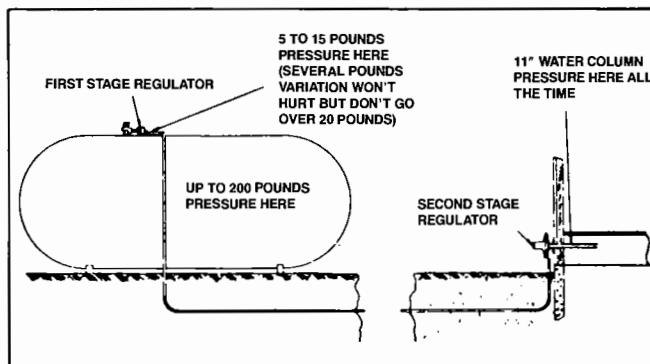


Fig. 8

PROPANE PIPING CHARTS

Sizing Between First and Second Stage Regulator
Maximum Propane Capacities listed are based on 2 PSIG Pressure Drop at 10 PSIG Setting. Capacities in 1,000 BTU/HR

PIPE OR TUBING LENGTH, FEET	TUBING SIZE, O.D., TYPE L						NOMINAL PIPE SIZE, SCHEDULE 40	
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/2"	2"
10	730	1,700	3,200	5,300	8,300	3,200	7,500	
20	500	1,100	2,200	3,700	5,800	2,200	4,200	
30	400	920	2,000	2,900	4,700	1,800	4,000	
40	370	850	1,700	2,700	4,100	1,600	3,700	
50	330	770	1,500	2,400	3,700	1,500	3,400	
60	300	700	1,300	2,200	3,300	1,300	3,100	
80	260	610	1,200	1,900	2,900	1,200	2,600	
100	220	540	1,000	1,700	2,600	1,000	2,300	
125	200	490	900	1,400	2,300	900	2,100	
150	190	430	830	1,300	2,100	830	1,900	
175	170	400	780	1,200	1,900	770	1,700	
200	160	380	730	1,100	1,800	720	1,500	

To Convert to Capacities at 15 PSIG Settings — Multiply by 1.130
To Convert to Capacities at 5 PSIG Settings — Multiply by 0.879

Sizing Between Single or Second Stage Regulator and Appliance*
Maximum Propane Capacities Listed are Based on 1/2" W.C. Pressure Drop at 11" W.C. Setting. Capacities in 1,000 BTU/HR

PIPE OR TUBING LENGTH, FEET	TUBING SIZE, O.D., TYPE L						NOMINAL PIPE SIZE, SCHEDULE 40					
	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"
10	39	92	199	329	501	935	275	567	1,071	2,205	3,307	
20	26	62	131	216	346	630	189	393	732	1,496	2,299	
30	21	50	107	181	277	500	152	315	590	1,212	1,858	
40	19	41	90	145	233	427	129	267	504	1,039	1,559	
50	18	37	79	131	198	376	114	237	448	913	1,417	
60	16	35	72	121	187	340	103	217	409	834	1,275	
80	13	29	62	104	155	289	89	185	346	724	1,086	
100	11	26	55	90	138	255	78	162	307	630	976	
125	10	24	48	81	122	224	69	146	275	567	866	
150	9	21	43	72	109	202	63	132	252	511	787	
200	8	19	39	66	100	187	54	112	209	439	665	
250	8	17	36	60	93	172	48	100	185	390	590	

*DATA IN ACCORDANCE WITH NFPA PAMPHLET NO. 54

...Propane gas odorant may fade, making the gas undetectable except with a warning device.

An undetected gas leak would create a danger of explosion or fire. If you suspect the presence of gas, follow the instructions on the cover of this manual. Failure to do so could result in **SERIOUS PERSONAL INJURY OR DEATH**.

VIII. ELECTRICAL WIRING



CAUTION

To avoid the risk of electrical shock, wiring to the unit must be properly polarized and grounded.



WARNING

To avoid electrical shock, injury or death, disconnect electrical power before changing any electrical wiring.

The wiring harness on this unit is furnished as an integral part of the furnace. Field alteration to comply with electrical codes should not be required.

LINE VOLTAGE WIRING

Power supply to the furnace must be N.E.C. Class 1, and must comply with all applicable codes. The furnace must be electrically grounded in accordance with the local codes or, in their absence, with the latest edition of the National Electrical Code, ANSI/NFPA No. 70, or in Canada, Canadian Electrical Code, C22.1, Part I. A fused disconnect must be provided and sized in accordance with the unit minimum circuit ampacity.

Line voltage wiring must enter through the left side of the furnace. See Fig. 9. Connect hot, neutral, and ground wires as shown in the wiring diagram located on the blower door of the unit. The ground screw is located inside of the junction box.

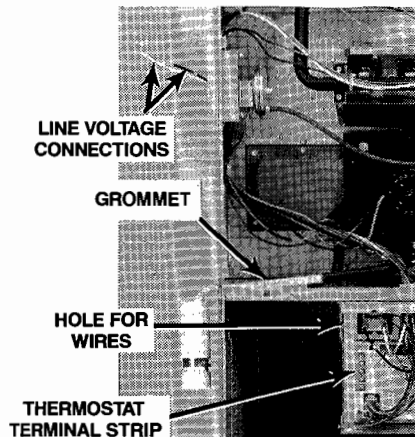


Fig. 9 — Field Wiring Connections

LINE VOLTAGE CONNECTION OF OPTIONAL HUMIDIFIER AND ELECTRONIC AIR CLEANER

The control module in this furnace is equipped with line voltage accessory terminals to be used for controlling the power to an optional field-supplied humidifier and/or electronic air cleaner.

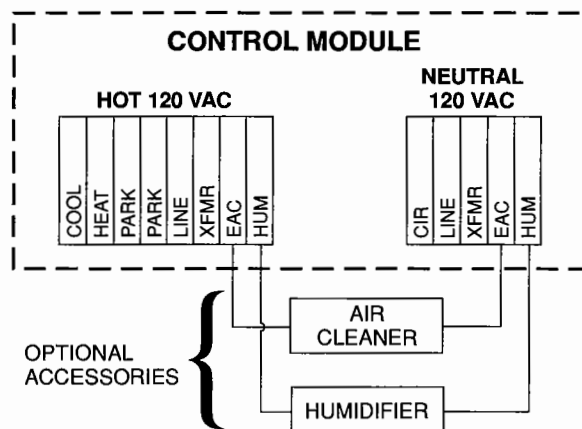
Accessory Load Specifications.

Air Cleaner: 1.0 Amp max. at 120 VAC

Humidifier: 1.0 Amp max. at 120 VAC

Accessory Installation. Follow the electronic air cleaner and humidifier manufacturers' instructions for mounting and electrically grounding these accessories. Check that the power supply to the furnace has been disconnected. Wire the accessories to the furnace control module as shown below. All connections to the control module are to be made through 1/4 (.250") receptacle (female) terminals.

If it is necessary for the installer to supply additional line voltage wiring to the inside of the furnace, the wiring must comply with all local codes. This wiring must have a minimum temperature rating of 105°C and must be routed away from the burner compartment. All line voltage wire splices must be made inside the furnace junction box.



Accessory Operation. The furnace control module energizes the humidifier whenever the combustion blower is energized (if there is an optional air cleaner on the system, the humidifier is **not** energized until the air cleaner is energized). The control module energizes the air cleaner whenever the air circulation blower is energized.

LOW VOLTAGE WIRING

Low voltage wiring may enter through either side of the furnace. See Section II for hole locations. Run the thermostat wires through either hole, down through a grommet in the blower deck, and through a hole provided in the left side of the ignition control box. See Fig. 9.

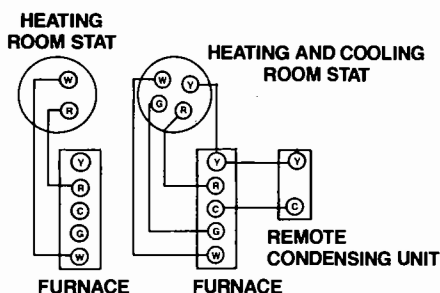


CAUTION

To avoid possible equipment malfunction, be careful to route the low voltage wires so as not to interfere with filter removal or other maintenance.

Low voltage wires may then be connected to the terminal strip as shown below.

TYPICAL FIELD WIRING (24V CONTROL CIRCUIT)



IX. CIRCULATING AIR AND FILTERS

DUCTWORK—AIR FLOW

Duct systems and register sizes must be properly designed for the C.F.M. and external static pressure rating of the furnace. Ductwork should be designed in accordance with the recommended methods of "Air Conditioning Contractors of America" Manual D.

A duct system should be installed in accordance with Standards of the National Board of Fire Underwriters for the Installation of Air Conditioning, Warm Air Heating and Ventilating Systems, Pamphlets No. 90A and 90B.

Furnace models GUC045C30, GUC070C30, GUC070C40, GUC090C35, GUX045B30, GUX070B30, GUX070B40, and GUX090B35 are shipped with one filter, (refer to pg. 4 or 6 for size), intended for the return air duct to be attached to either side of the furnace cabinet. If the return air duct is to be attached to the bottom of the furnace cabinet, the filter that was supplied with the furnace, may not be of the proper size. Refer to the chart below for filter sizes when using bottom return.

BOTTOM RETURN AIR FILTERS

Model	Filter Size	Type
GUC045C30, GUX045B30	14 x 25 x 1	P
GUC070C(30,40), GUX070B(30,40)	16 x 25 x 1	P
GUC090C(35,50), GUC115C50, GUX090B(35,50), GUX115B50	20 x 25 x 1	P

A 40VA transformer and auxiliary fan relay are built into the furnace so that it may be used with most cooling equipment.

Consult the wiring diagram for both 115V and 24V wiring details. The diagram is located inside of the blower compartment door and in Section XIV of this manual.

HEAT ANTICIPATOR SETTING

The heat anticipator in the room thermostat must be correctly adjusted to obtain the proper number of heating cycles per hour and to prevent the room temperature from "overshooting" the room thermostat setting. Heat anticipator must be at 0.7 amps.

The figure below shows how the filter is retained over the bottom return air opening.



Furnace models GUC090C50, GUC115C50, GUX090B50, and GUX115B50 are shipped with two filters (refer to pg. 4 or 6 for size). If these furnaces are to be operated at high speed, then two return air connections must be made. These may be made on both sides of the furnace cabinet, or on one side and the bottom. If one of the returns is connected to the bottom, refer to the chart above for proper filter size. Failure to have two return air connections, when these furnaces are operated on high speed, can result in insufficient airflow for air conditioning requirements and excessive air velocity through the filter. If these furnaces will not be run on high speed, one return air connection will be adequate.

Guide dimples locate the bottom or side cutouts. Use a straight edge to scribe lines connecting the dimples. Cut out the opening on these lines. For bottom return air connection, the bottom of the cabinet has to be removed before the furnace is positioned on the raised platform or set on top of the return air duct.

A closed return duct system must be used, with the return duct connected to the furnace. Supply and return duct connections to the unit may be made with flexible joints to minimize noise transmission. If a central return is used, a connec-

ting duct must be installed between the unit and the utility room wall so that the furnace blower will not interfere with combustion air or draft. The room, closet or alcove must not be used as a return air collecting chamber.

When the furnace is used in connection with a cooling unit the furnace must be installed in parallel with or on the upstream side of the cooling unit to avoid condensation in the heating element. With a parallel flow arrangement, the dampers or other means used to control the flow of air should be adequate to prevent chilled air from entering the furnace and, if manually operated, must be equipped with means to

prevent operation of either unit unless the damper is in the full heat or cool position.

When the furnace is heating, the temperature of the return air entering the furnace must be between 55°F and 100°F.

It is recommended that the outlet duct be provided with an access panel. This access panel should be large enough to inspect the air chamber above the heat exchanger for any smoke or combustion leaks. A cover should be attached tightly to prevent air leaks.

X. SEQUENCE OF OPERATION

NORMAL SEQUENCE

1. Thermostat calls for heat.
2. The combustion blower is energized.
3. The ignitor is energized and is allowed to preheat for 17 seconds.
4. The gas valve is energized, delivering gas to the burners and starting combustion.
5. The control checks for a signal from the flame sensor within seven seconds after the gas valve is energized. Gas will continue to flow only if a signal is present.
6. The control waits 30 seconds and turns on the air circulation blower to the speed that was selected for heating operation. At this time the optional humidifier and electronic air cleaner are also energized.
7. The thermostat is satisfied and opens.
8. The control de-energizes the gas valve.
9. After a 15 second delay, the combustion blower and optional humidifier are de-energized.
10. After another 75 second delay, the air circulation blower and optional electronic air cleaner are de-energized.

ABNORMAL OPERATION

1. **Internal Control Failure with White-Rodgers Control**
If the control determines it has an internal fault, it enters a locked-out state and the diagnostic light will **light continuously, with no flashes**. The control should be replaced.
2. **System Lockout**
If a flame is not sensed during the first 7 seconds after the gas valve is energized, the control turns off the gas. There will then be a 60 second delay while the combustion blower is energized to purge the heat exchanger. The ignitor will next be energized and preheated for 27 seconds. The gas valve will then be energized. If flame is not sensed in 7 seconds the gas valve will be de-energized and another purge will occur. The control will cycle the gas valve a total of three tries before it determines it cannot establish measurable combustion and enters a locked out state. If flame is sensed but lost after 10 seconds, the control will recycle this series of three tries four more times

before locking out. The diagnostic light will indicate this condition with **one short flash** followed by a longer pause. The control can be reset and brought out of lockout mode by turning the thermostat off and then back on.

3. **Pressure Switch Stuck Closed**

If the control senses the pressure switch is closed when the vent blower is off, it waits until the fault is corrected. The light code for this problem is **two short flashes** followed by a longer pause. The probable cause is a faulty pressure switch or wiring.

4. **Pressure Switch Stuck Open**

If, after the vent blower is energized, the pressure switch does not close, the control will keep the blower on and wait for the switch to close. The diagnostic light code for this problem is **three short flashes** followed by a pause. The probable cause is either a disconnected hose to the pressure switch, faulty pressure switch or wiring, or restricted flue piping.

5. **Open Limit Control**

If the limit control opens, the air circulation and vent blower will be turned on until the limit closes. The diagnostic light code for this is **four short flashes** followed by a pause. The probable cause is either: low conditioned air flow due to dirty filter or resistance in duct work, faulty limit, faulty blower, or blower speed set too low.

6. **Missing Jumper Wire**

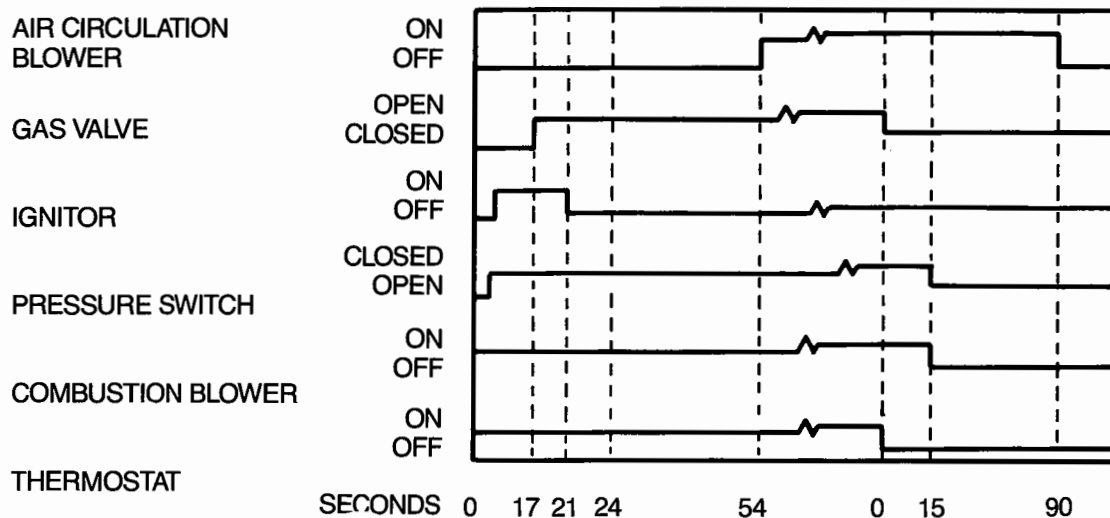
If the jumper between R01 and R02 is not present, the air circulation blower and vent blower will be energized all the time. The diagnostic light code for this is **five flashes** followed by a pause. The probable cause is a missing jumper.

7. **Flame Sensed with No Call for Heat**

If the control senses a flame when the gas valve is de-energized, it will run the air circulation blower and the vent blower continuously. The diagnostic light code for this is **continuous light flashing**. Probable cause is miswiring.

X SEQUENCE OF OPERATION (cont.)

TIMING CHART FOR NORMAL WHITE - RODGERS 50A50 OPERATION



Thermostat ON
 Gas Valve Opens
 Ignitor OFF
 End of trial for ignition.
 Gas valve would close
 if flame is not proven.
 Air Blower ON
 Thermostat OFF
 Combustion products
 purge ends.
 Air Blower OFF

WHITE RODGERS 50A50 CONTROL DIAGNOSTIC LIGHT SIGNAL MEANINGS

LIGHT SIGNAL	REFER TO ABNORMAL OPERATION NUMBER
Continuous Light	1. Internal Control Failure
1 Flash	2. System Lockout
2 Flashes	3. Pressure Switch Stuck Closed
3 Flashes	4. Pressure Switch Stuck Open
4 Flashes	5. Open Limit Control
5 Flashes	6. Missing Jumper Wire on control connector
Continuous Flashing	7. Flame Sensed No Call For heat

XI. START-UP AND ADJUSTMENT

GENERAL OPERATION

This furnace is equipped with an electronic ignition device which lights the burners. It also has a power vent blower to exhaust combustion products.

Keep the blower access door and upper access panel in place except for inspection and maintenance. An interlock switch prevents furnace operation if the blower door is not in place.

On new installations, or if a functional part such as the gas valve, pressure switch, or fan/limit control has been replaced, the operation of the furnace should be checked.

Check furnace operation as outlined in the following instructions. If any sparking, odors, or unusual noises are encountered, shut off electrical power and recheck for wiring errors, or obstructions in or near the blower motor. Various shipping materials must be removed before the blower motor is operated.

HEAT ANTICIPATOR SETTING

The heat anticipator in the room thermostat must be correctly adjusted to obtain the proper number of heating cycles per hour and to prevent the room temperature from "overshooting" the room thermostat setting. Heat anticipator must be set at 0.7 amps.

ROLL-OUT PROTECTION DEVICE (Fig. 10)

If the flames from the burners are not properly drawn into the heat exchanger, a protection device will open causing the gas valve to close. The protection device is located on the manifold assembly. (See Fig. 10). This device resets manually.



CAUTION

The cause must be investigated by a qualified servicer before any attempt is made to engage the roll-out protection device and turn the furnace back on.

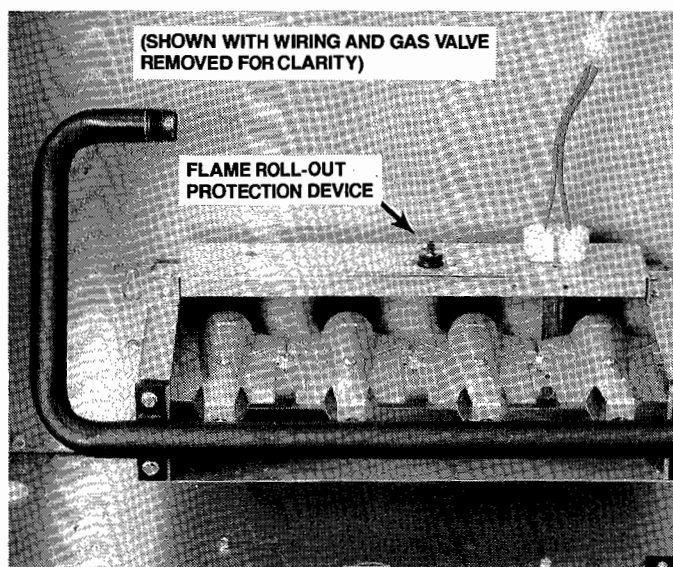


Fig. 10 — Flame Roll-Out Protection Device

ELECTRONIC CONTROL MODULE

This furnace is equipped with a self-diagnosing electronic control module. In the event a furnace component is not operating properly, the control module will repeatedly flash a red light on and off in a factory-programmed sequence, depending on the problem encountered.

If you suspect the furnace is not operating properly, look through the observation window in the blower access door and make note of the number of flashes in the sequence. Then see Section X for further information.

RESET AFTER CONTROL LOCK-OUT

If ignition has not been achieved for any reason after three ignition cycles, the electronic control module will lock-out the furnace. A lock-out causes both the air blower and the vent blower to run continuously, and ignition is no longer attempted. The control's diagnostic light will then repeatedly flash once and then pause. When this occurs, it may be necessary to reset the control by turning the thermostat setting below room temperature for thirty seconds and then returning the setting to the desired temperature. The control may also be reset after a lock-out by turning off the electrical disconnect switch to the furnace for thirty seconds.

IMPORTANT: If you have to frequently reset your furnace, it means that a problem exists that should be corrected. Contact a qualified servicer for further information.

OPERATING INSTRUCTIONS

1. Close the manual gas valve external to the furnace.
2. Turn off the electrical power supply to the furnace.
3. Set room thermostat to lowest possible setting.
4. Remove the door on the front of the furnace.
5. This furnace is equipped with an ignition device which automatically lights the burner. Do not try to light burner by hand.
6. Turn the gas control valve knob clockwise to the "Off" position for either the White Rodgers 36-E gas valve (Fig. 11B) or the Honeywell VR-8205 gas valve (Fig. 11A). For the Robertshaw 7200 gas valve, push in and slide the lever to the "Off" position (Fig. 11C). Do not force.
7. Wait 5 minutes to clear out any gas. Then smell for gas, including near the floor.
8. If you smell gas following the 5 minute waiting period in Step 7, follow the instructions on the cover of this manual. If you do not smell gas, then turn the gas control knob counterclockwise to the "On" position for either the White Rodgers 36-E gas valve (Fig. 11B) or the Honeywell VR-8205 gas valve (Fig. 11A). For the Robertshaw 7200 gas valve, push in and slide the lever to the "On" position (Fig. 11C). Do not force.

NOTE: There is an approximate 20 second delay between thermostat energizing and burner firing.

CHECK GAS INPUT AND PRESSURES

Gas supply pressure and manifold pressure with the burners operating must be as specified on the rating plate.

GAS VALVE

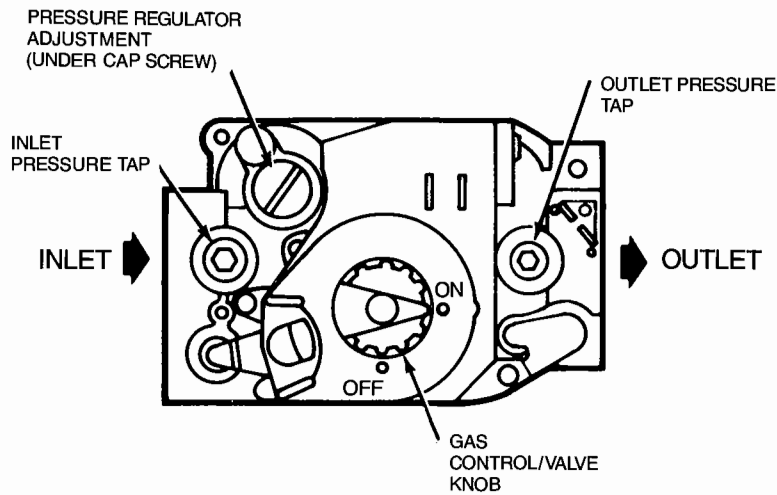


**FIG. 11A — HONEYWELL
MODEL: VR-8205**

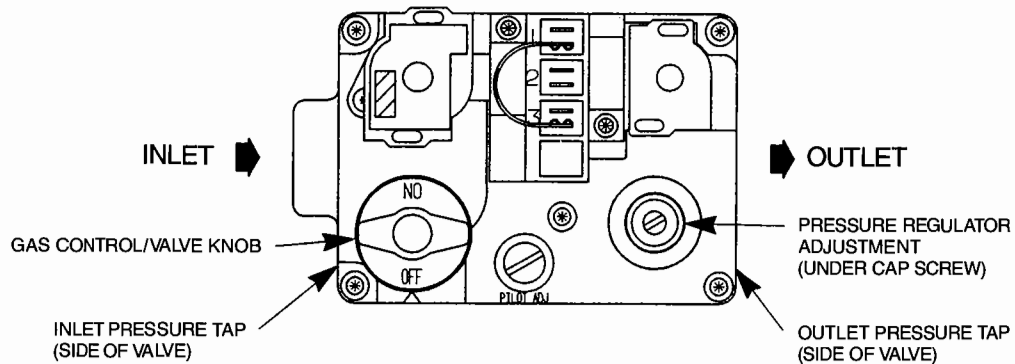


**FIG. 11B — WHITE RODGERS
MODEL: 36E36 TYPE 230**

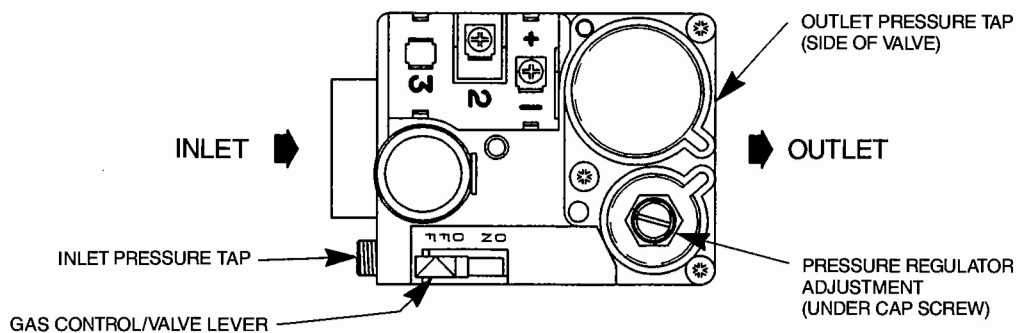


**FIG. 11C — ROBERTSHAW (GRAYSON)
MODEL: 7200**

CHECKING GAS PRESSURE

Gas inlet pressure should be checked and adjusted in accordance to the type of fuel being consumed.

WITH POWER AND GAS OFF:

1. Connect a water manometer or adequate gauge to the "inlet gas pressure" tap of the gas valve. (See Fig. 11:A,B,C.)

As an alternative method, inlet gas pressure can also be measured by removing the cap from the drip leg and installing a predrilled cap with a hose fitting. (See Fig. 12.)

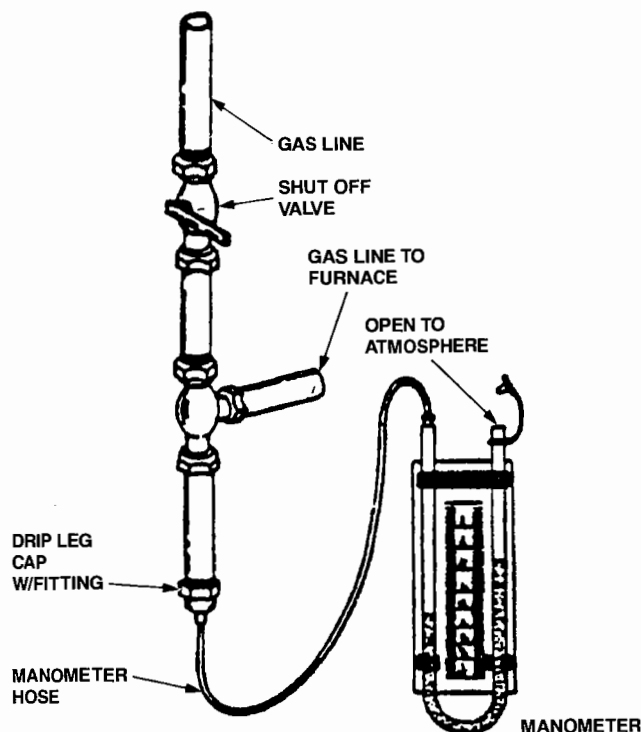
WITH POWER AND GAS ON:

2. Put furnace into heating cycle and turn on all other gas consuming appliances.

INLET GAS PRESSURE	
NATURAL	MIN. 5.0", MAX 10.0"
PROPANE	MIN. 11.0", MAX. 14.0"

Inlet Gas Pressure Must Not Exceed the Maximum Valve Shown in Table Above.

If operating pressures differ from above, make necessary pressure regulator adjustments, check piping size, etc., and or consult with local utility.



MEASURING INLET GAS PRESSURE
(ALTERNATE METHOD)

Fig. 12

CHECK THE MANIFOLD PRESSURE

A tapped opening is provided in the gas valve to facilitate measurement of the manifold pressure. ("Outlet Pressure Tap" in Figure 11A, 11B, or 11C.) A "U Tube" manometer having a scale range from 0 to 12 inches of water should be

used for this measurement. The manifold pressure must be measured with the burners operating.

To adjust the pressure regulator, remove the adjustment screw or cover on the gas valve. Turn out (counterclockwise) to decrease pressure, turn in (clockwise) to increase pressure. Only small variations in gas flow should be made by means of the pressure regulator adjustment. In no case should the final manifold pressure vary more than plus or minus 0.3 inches water column from the pressure specified on the furnace nameplate. Any major changes in flow should be made by changing the size of the burner orifice.

CHECK THE GAS INPUT (NATURAL GAS ONLY)

To measure the gas input using the gas meter proceed as follows:

1. Turn off gas supply to all other appliances except the furnace.
2. With the furnace operating, time the smallest dial on the meter for one complete revolution. If this is a 2 cubic foot dial, divide the seconds by 2; if it is a 1 cubic foot dial, use the seconds as is. This gives the seconds per cubic foot of gas being delivered to the furnace.
3. INPUT = GAS HTG VALUE $\times$ 3600 $\div$ SEC. PER CUBIC FOOT
Example: Natural gas with a heating value of 1000 BTU per cubic foot and 34 seconds per cubic foot as determined by Step 2, then:

$$\begin{aligned} \text{Input} &= 1000 \times 3600 \div 34 \\ &= 106,000 \text{ BTU per Hour} \end{aligned}$$

NOTE: BTU content of the gas should be obtained from the gas supplier.

This measured input must not be greater than the input indicated on the rating plate of the furnace.

4. Relight all other appliances turned off in step 1 above. Be sure all pilot burners are operating.

CHECK MAIN BURNER FLAME

Flames should be stable, soft and blue, (dust may cause orange tips but they must not be yellow). They should extend directly outward from the burner without curling, floating or lifting off. (Fig. 13)

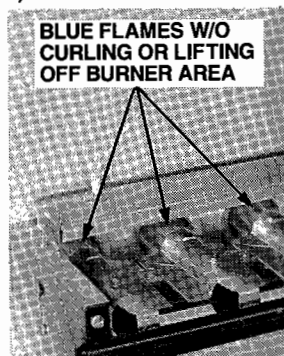


Fig. 13 — Burner Flame

CHECK TEMPERATURE RISE

Check the temperature rise through the unit by placing thermometers in supply and return air registers as close to the

furnace as possible. Thermometers must not be able to "see" the furnace's heat exchangers, or false readings could be obtained.

1. All registers must be open; all duct dampers must be in their final (fully or partially open) position, and the unit operated for 15 minutes before taking readings.
2. The temperature rise must be within the range specified on the rating plate.

NOTE: Air temperature rise is the temperature difference between supply and return air.

With a properly designed system, the proper amount of temperature rise will normally be obtained when the unit is operated at rated input with the recommended blower speed.

If the correct amount of temperature rise is not obtained, it may be necessary to change the blower speed. A higher blower speed will lower the temperature rise. A slower blower speed will increase the temperature rise.

NOTE: Blower speed must be set to give the correct air temperature rise through the furnace as marked on the rating plate.

CHANGING BLOWER SPEEDS



WARNING

To avoid electrical shock, injury or death, when changing speed taps turn off power to the furnace.

A multi-speed motor is used in the furnace blower. It provides easy speed selection for both heating and cooling air flow. Page 5 shows the CFM and E.S.P. relationship for proper selection of heating and cooling speeds.

Refer to the WIRING DIAGRAM on the furnace to connect the proper wires to the correct motor leads to the correct control terminals. All unused motor leads that are not connected to "park" terminals on the control must have taped.



WARNING

To avoid electrical shock, injury or death, disconnect electrical power before performing any maintenance.



CAUTION

If you must handle the ignitor, handle with care. Touching the ignitor body with bare fingers, rough handling, or vibration could result in early ignitor failure. Only a qualified servicer should ever handle the ignitor.

Have the furnace checked at least once every year, before the heating season begins, to be sure that there is adequate combustion air and that the vent system is working properly.

CHECK LIMIT AND FAN CONTROL



WARNING

To avoid premature failure of heat exchanger or possible property damage, injury or fire, do not adjust the limit control, which is factory preset.

Check limit control operation after 15 minutes of operation by blocking the return air grille(s).

1. After several minutes the main burners must go OFF. Blower will continue to run.
2. Remove air restrictions, and main burners will relight after a cooldown period of a few minutes.

Adjust the thermostat setting below room temperature.

1. Main burners must go off.
2. Circulating Air Blower will continue to run for 90 seconds.



CAUTION

This unit should not be used as a "construction heater" during the finishing phases of construction on a new structure. This type of use may result in premature failure of the unit due to extremely low return air temperatures and exposure to corrosive or very dirty atmospheres.

TO TURN OFF FURNACE

1. Set the thermostat to lowest setting.
2. Turn off the electrical power supply to the furnace.
3. Turn the gas control knob clockwise  to the "Off" position for either the White Rodgers 36-E gas valve (Fig. 11B) or the Honeywell VR-8205 gas valve (Fig. 11A). For the Robertshaw 7200 gas valve, push in and slide the lever to the "Off" position (Fig. 11C). Do not force.

XII. MAINTENANCE



WARNING

To avoid electrical shock, injury or death, disconnect electrical power before performing any maintenance.



CAUTION

If you must handle the ignitor, handle with care. Touching the ignitor body with bare fingers, rough handling, or vibration could result in early ignitor failure. Only a qualified servicer should ever handle the ignitor.

Have vent pipe checked to be sure it is not blocked by debris, which could permit fumes to enter the house. Replace any leaking sections of vent pipe.

AIR FILTER



WARNING

Never operate furnace without a filter installed as dust and lint will build up on internal parts resulting in loss of efficiency, equipment damage and possible fire.

This furnace is equipped with a permanent type washable high-velocity filter(s). Filter(s) should be inspected and cleaned every two months as required. If the replacement of the filter(s) becomes necessary, it must be replaced with a filter(s) of the same type and size.

Remember that dirty filters are the most common cause of inadequate heating or cooling performance.

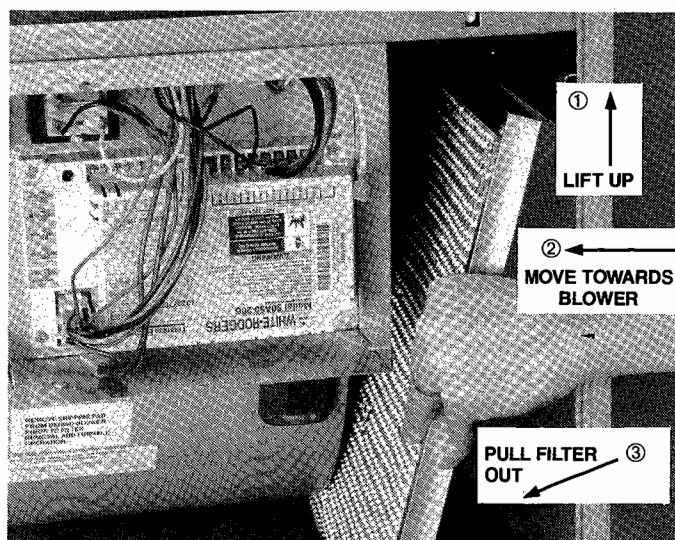


Fig. 14 — Filter Removal



WARNING

Disconnect the electrical power to the furnace before removing the filter or performing any other maintenance.

To remove the filter, turn the latches on lower door. Remove the door. The blower motor will automatically stop through the interlock switch.

To remove the filter, grasp the lower portion of the filter, lift up to disengage it from the lower railing, move towards blower, drop filter down. Pull filter outward. (Fig. 14)

The filter must be of the permanent washable type with dimensions of 16 x 25 x 1. (Side return(s) only.)

Use a vacuum cleaner to clean out the blower area and the adjacent area of the return air duct.

Clean, wash and dry the permanent filter. Both sides should then be sprayed with a dust adhesive as recommended on adhesive container. Re-install filter by placing it into the furnace along the side of the blower. Engage filter in the top rail, move towards side of furnace and drop it into the bottom rail. BE SURE AIRFLOW DIRECTION ARROW POINTS TOWARDS BLOWER.

When the filter is located in the bottom of the furnace on a bottom return system the filter is held in its location by a sheet metal retainer strap. To change or clean the filter, merely slide one end of the retainer towards the front and remove the filter.

BLOWER MOTOR (QUALIFIED SERVICER ONLY)

If desired, the blower motor may be oiled by adding 4 to 6 drops of SAE#20 oil to each oil port, once a year. TO AVOID PREMATURE MOTOR FAILURE, DO NOT OVER OIL.

(NOTE: Some blower motors which are permanently lubricated do not have oil ports. Oil cannot be added to these motors.)

VENT BLOWER MOTOR (QUALIFIED SERVICER ONLY)

If desired, the vent blower motor may be oiled annually with 6 drops of Anderoil 465 oil. (3 drops in each oil tube — Fig. 15) TO AVOID PREMATURE MOTOR FAILURE, DO NOT OVER OIL.

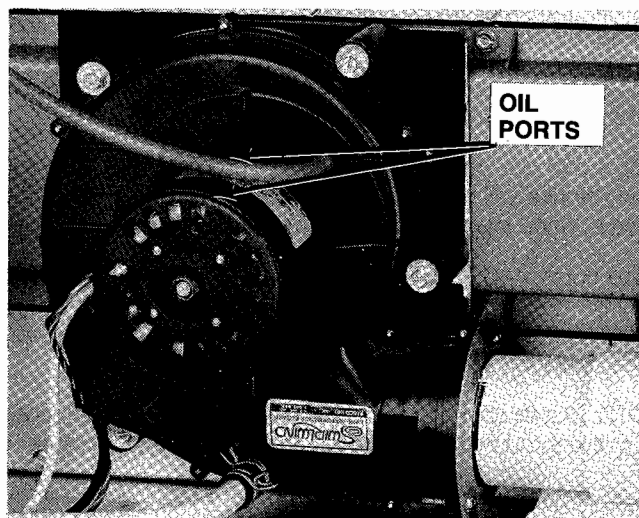


Fig. 15 — Vent Blower Motor

FLUE PASSAGES (QUALIFIED SERVICER ONLY)

At the start of each heating season, inspect and, if necessary, clean the furnace flue passages.

CLEANING FLUE PASSAGES (QUALIFIED SERVICER ONLY)

1. Turn off electrical power and the gas supply to the furnace.
2. Remove the burner assembly by disconnecting the gas line and removing the manifold brackets from the partition panel.
3. Remove the collector box insulation and then remove the collector box from the partition panel.
4. Disconnect the PVC vent from the induced draft blower so that the blower can be removed from the recuperator coil cover.
5. Remove the recuperator coil cover and remove the turbulators from the recuperator coil tubes.
6. The recuperator coil tubes can now be cleaned using a long handled round wire brush, such as a gun cleaning brush.
7. The primary heat exchanger tubes can be cleaned using a round wire brush attached to a length of high grade stainless steel cable, such as drain cleanout cable. Attach a variable speed reversible drill to the other end of the spring cable. Slowly rotate the cable with the drill and insert it into one of the primary heat exchanger tubes. While reversing the drill, work the cable in and out several times to obtain sufficient cleaning. Repeat for each tube.
8. When all heat exchanger tubes have been cleaned and the residue removed with a vacuum, replace all the parts in the reverse order in which they were removed.
9. To reduce the chances of repeated fouling of the flue passages, perform the steps listed in "Startup and Adjustment," Section XI.



WARNING

Electrical components are contained in both compartments. To avoid electrical injury or death, do not remove any internal compartment covers or attempt any adjustment. Contact a qualified servicer at once if an abnormal flame appearance should develop.

Periodically during the heating season make a visual check of the burner flames. Turn the furnace on at the thermostat. Wait a few minutes, since any dislodged dust will alter the normal flame appearance. Flames should be stable, quiet, soft and blue with slightly orange tips. They should not be yellow. They should extend directly outward from the burner ports without curling downward, floating or lifting off the ports. (See page 22, Fig. 13.)

XIII. FUNCTIONAL PARTS LIST

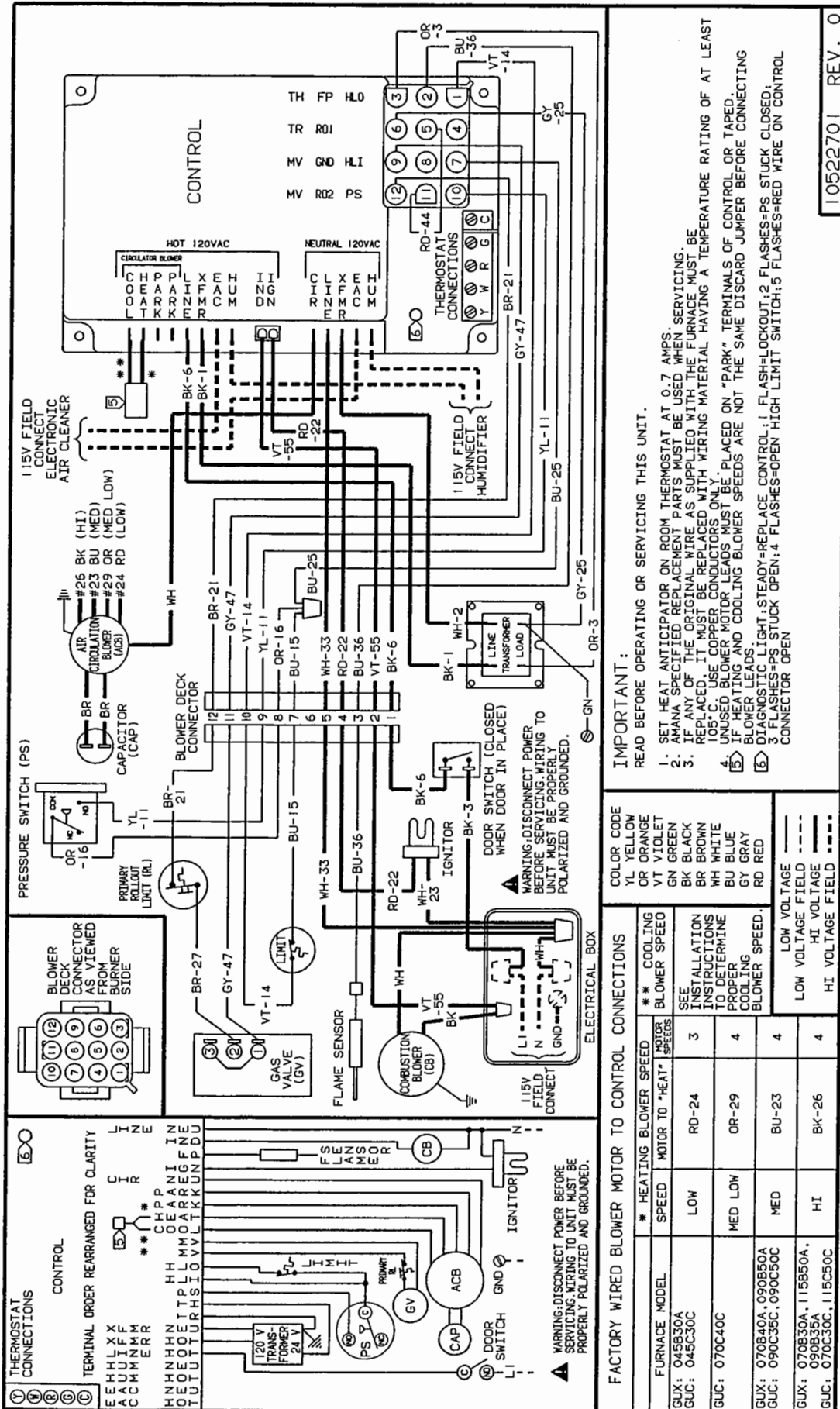
GENERAL INFORMATION

1. When ordering any of the listed functional parts, be sure to provide the furnace model, manufacturing, and serial numbers with the order.
2. Although only functional parts are shown in the parts list, all sheet metal parts, doors, etc. may be ordered by description.
3. Functional parts are available from your Amana distributor.

Gas Valve
Gas Orifice, Natural
Gas Orifice, LP
Burner
Ignitor
Flame Sensor
Ignitor Clip
Gas Manifold
Ignition Control
Fan Switch
Pressure Switch
Induced Draft Blower
Collector Box
Limit Switch
Coil Front Cover
Flame Roll-out SW

Recuperator Coil
Heat Exchanger
Door Switch
Transformer
Blower Relay
Combustion Relay
Terminal Board
Blower Wheel
Blower Housing
Blower Cutoff
Blower Mount Bracket
Capacitor
Filter 16 x 25 x 1,
Permanent

XIV. WIRING DIAGRAM



WARNING
Disconnect electrical power before servicing