Ultra SX 96

HIGH · EFFICIENCY

Part No. 40408B093 Date 2-14-93

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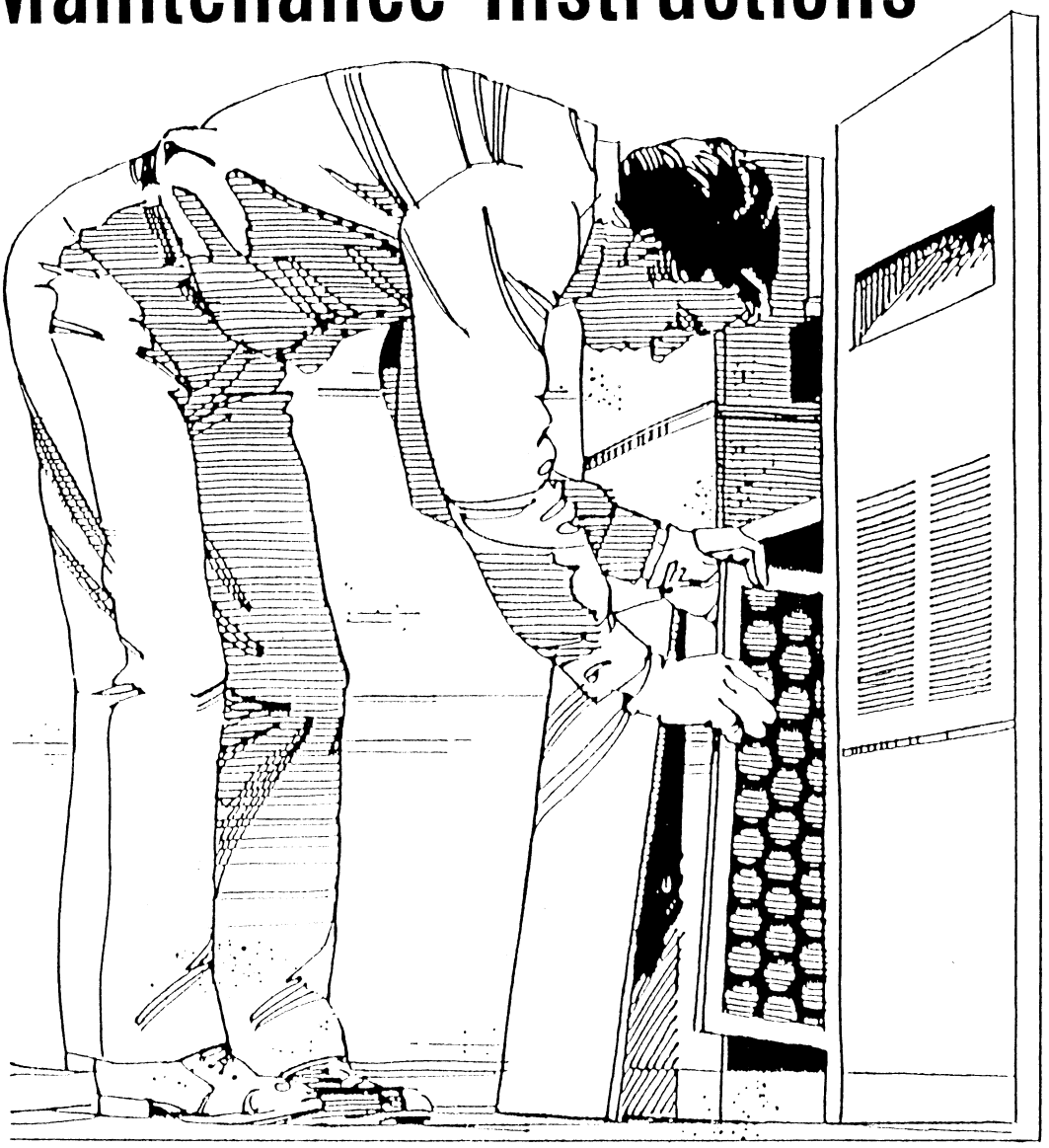
(GUK/GCK)

Installation and Maintenance Instructions



FOR YOUR SAFETY

If you smell gas:

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

FOR YOUR SAFETY

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

DESIGN AMERICAN GAS ASSOCIATION CERTIFIED

ARMSTRONG Air Conditioning Inc.

A LENNOX International Inc. Company

Bellevue, Ohio 44811

APPROVED

THESE INSTRUCTIONS MUST BE PLACED ON OR NEAR THE FURNACE IN A CONSPICUOUS PLACE.

GENERAL

The furnace design is certified by the American Gas Association in compliance with the latest edition of American National Standard Z21.47 Central Furnaces, and by the Canadian Gas Association in compliance with the latest edition of the National Standard of Canada CAN/CGA-2.3 Gas-Fired Gravity and Forced Air Central Furnaces, for operation with natural gas or propane gas. The GUK series has also been certified for compliance with American National Standard Z21.64 Direct Vent Central Furnaces. Consult the rating plate on your furnace for gas type before installing.

The maximum hourly heat loss of each heated space shall be calculated in accordance with the procedure described in the current manuals of Air Conditioning Contractors of America, or by any other recognized method which is suitable for local conditions, provided the results obtained are in substantial agreement with, and not less than, those obtained using the procedure described in the manuals. If the furnace is used in conjunction with a cooling unit, the furnace must be installed in parallel with, or on the upstream side of the evaporator coil to avoid condensation on the heating element. In a parallel installation, dampers or other means must be provided to prevent chilled air from entering the furnace. If the air control is manually operated, an interlock must be provided to prevent operation of either unit unless the dampers are in full heat or full cool position.

UNPACKING

FURNACE IS SHIPPED IN ONE PACKAGE COMPLETELY ASSEMBLED AND WIRED.

The thermostat is shipped in a separate carton when ordered. If any damage is found at time of delivery, proper notation should be made on the carrier's freight bill. Damage claims should be filed with the carrier at once. Claims of shortages should be filed with the seller within five (5) days. Check rating plate for correct model number, type of gas, and input.

INSTALLATION

This furnace should be installed in accordance with American National Standard Z223.1 - latest edition entitled "National Fuel Gas Code" (NFPA54), (in Canada, CAN/CGA B149.1 and .2 Installation Codes for gas burning appliances), and the requirements or codes of the local utility or other authority having jurisdiction, including local plumbing or wastewater codes. GUK models may be installed only as **upflow** furnaces. GCK models can be installed only as **downflow** furnaces.

LOCATION

To provide proper operation and satisfactory performance, care must be taken in choosing the location for this furnace. The atmosphere in which the furnace operates must be free of contaminants such as chlorides and sulfates.

NOTE: Unit must be level for proper condensate drainage.

WARNING: THIS FURNACE IS NOT APPROVED FOR INSTALLATION IN A MOBILE HOME. DO NOT INSTALL THIS FURNACE IN A MOBILE HOME. INSTALLATION IN A MOBILE HOME COULD CAUSE FIRE, PROPERTY DAMAGE AND PERSONAL INJURY.

All models are suitable for closet or utility room installation. The furnace shall be installed so that electrical components are protected from water.

This furnace is suitable for installation in buildings constructed on-site. This furnace should be centralized with respect to the heat distribution system as much as practicable. When installed in a utility room, the door of the room should be wide enough to allow the largest part of the furnace to enter, or to permit the replacement of another appliance, such as a water heater.

A gas fired furnace for installation in a residential garage must be installed so that the burner(s) and the ignition source are located not less than 18 inches above the floor. The furnace is to be located or protected to avoid physical damage by vehicles.

IMPORTANT

If furnace is to be installed in an attic or other insulated space, it must be kept free and clear of insulating materials.

The condensate drain system on this furnace is incorporated within the furnace and is self-priming. The condensate drain system **MUST NOT** be exposed to temperatures below 32° F.

CAUTION: Do not use this furnace as a heater in a building under construction. This furnace can be severely damaged due to the abnormal environment caused by construction. Chlorides from sources such as paint, stain or varnish, tile and counter cements, adhesives and foam insulation are abundant in a structure under construction and can be highly corrosive. Low return air temperature can cause condensation in the furnace and damage that can shorten the life of the furnace.

CLEARANCES

All servicing and cleaning of the furnace can be performed from the front. If installed in a closet or utility room, provide 24 inch clearance in front for service if the door to the room is not in line with the front of the furnace.

The following minimum clearances (inches) to combustibles must be maintained on all units:

Sides:	0″	Flue pipe:	0″
Rear:	0 ″	Plenum top:	1″
Front:	2″		

ACCESSIBILITY CLEARANCES MUST TAKE PRECEDENCE OVER FIRE PROTECTION CLEARANCES. PROVIDE SUFFICIENT CLEARANCE FOR CONDENSATE DRAIN TRAP ON GCK MODELS.

CAUTION: DO NOT STORE COMBUSTIBLE MATERIALS NEAR FURNACE OR WARM AIR DUCTS. THE MATERIAL MAY IGNITE BY SPONTANEOUS COMBUSTION CREATING A FIRE HAZARD.

THE AREA AROUND THE FURNACE MUST BE KEPT FREE AND CLEAR OF ALL COMBUSTIBLE MATERIALS INCLUDING GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS. THE HOMEOWNER SHOULD BE CAUTIONED THAT FURNACE AREA MUST NOT BE USED AS A BROOM CLOSET OR FOR ANY OTHER STORAGE PURPOSES.

GUK upflow furnaces may be installed on wood flooring; shall not be installed directly on carpeting, tile, or other combustible material other than wood flooring.

The counterflow GCK furnaces are certified for installation on combustible flooring provided a special base assembly is used. The part number for the special base is noted on the rating plate, located in the burner compartment. Check the part number on the base to make sure the proper base is available.

When counterflow unit is installed on a combustible floor, one (1) inch clearance must be provided between supply duct and floor.

COMBUSTION & VENTILATION AIR

WARNING: Insufficient combustion air can cause headaches, nausea, dizziness or asphyxiation. When considering combustion air requirements, enough air must also be provided to meet the need of all fuel-burning appliances and exhaust fans.

Adequate provisions for combustion air, ventilation of furnace and dilution of flue gases must be made. See air for combustion and ventilation sections of the National Fuel Gas Code, ANSI Z223.1 (latest edition) or CAN/CGA-149 Canadian Installation Codes (Latest edition) or applicable provisions of the local building codes.

The GUK series (90% upflow) can be installed either as a direct-vent or non direct-vent furnace. A direct-vent installation supplies all of the necessary air for combustion through the air intake pipe. A non direct-vent installation uses air for combustion from within the house.

When the GUK furnace is installed as direct-vent, provisions for ventilation air should follow the same requirements as if installed as non direct-vent. Proper ventilation air is necessary to maintain furnace component temperatures within acceptable limits.

UNCONFINED SPACE

When a furnace is installed in an unconfined space in a building, it can be assumed that the infiltration will be sufficient to supply the required air.

An unconfined space is defined as ''a space whose volume is more than 50 cubic feet per 1,000 BTU per hour of the combined input rating of all appliances installed in that space.''

If the furnace is installed in a ventilated attic or crawl space it is assumed that infiltration is sufficient to supply the required air. However, in a building of unusually tight construction, additional outdoor air should be provided.

CONFINED SPACE

A confined space is defined as ''a space whose volume is less than 50 cubic feet per 1,000 BTU per hour of the combined input rating of all appliances installed in that space.''

WARNING: AIR OPENINGS IN THE FRONT OF THE FURNACE MUST BE KEPT FREE OF OBSTRUCTIONS. ANY OBSTRUCTIONS MAY CAUSE IMPROPER OPERATION AND MAY RESULT IN A FIRE HAZARD OR CARBON MONOXIDE INJURY.

If the furnace is installed in a confined space within the building and combustion air is taken from the heated space, the combustion air and ventilating air must enter and leave the space through two (2) permanent openings of equal area. One (1) opening shall be located within twelve (12) inches of the ceiling and the other within twelve (12) inches of the floor, each having a free area of one (1) square inch per 1,000 BTU/HR of total input rating of all appliances within the space and not less than 100 square inches each. If the furnace is installed in a space within a building of tight construction, make-up air must be supplied from outdoors. In this case one (1) opening shall be within twelve (12) inches of the ceiling and one (1) opening within twelve (12) inches of the floor. Each opening shall have a free area of one (1) square inch per 4,000 BTU/HR if combustion air ducts are vertical. If horizontal combustion air ducts are run, one (1) square inch per 2,000 BTU/HR of the total input rating of all appliances within the enclosure is required.

CONTAMINATED COMBUSTION AIR

The recommended source of combustion air is outdoor air. However, the use of indoor air in most applications is acceptable if these guidelines are followed:

1. If the furnace is installed in a confined space, the necessary combustion air must come from the outdoors by way of attic, crawl space, air duct, or direct opening.

2. If indoor combustion air is used, there must be no exposure to any of the substances listed in item 5.

3. All provisions for indoor combustion air must meet the requirements for combustion air indicated in the National Fuel Gas Code, ANSI Z223.1 (latest edition), and/or any applicable local codes. IN CANADA: See CAN/CGA B149.1 & .2 Installation Codes.

4. The following types of installation will require OUTDOOR AIR for combustion, due to chemical exposures:

   Commercial buildings
   Buildings with indoor pools
   Furnaces installed in laundry rooms
   Furnaces installed near chemical storage areas

5. Exposure to the following substances in the combustion air supply will also require OUTDOOR AIR for combustion:

   Permanent wave solutions
   Chlorinated waxes and cleaners
   Chlorine based swimming pool chemicals
   Water softening chemicals
   De-icing salts or chemicals
   Carbon tetrachloride
   Halogen-type refrigerants
   Cleaning solvents (such as perchloroethylene)
   Printing inks, paint removers, varnishes, etc.
   Hydrochloric acid
   Cements and glues
   Anti-static fabric softeners for clothes dryers
   Masonry acid washing materials

VENTING

GENERAL:

The high efficiency of this furnace is accomplished by the removal of both sensible and latent heat from the flue gases. The removal of latent heat results in the condensation of moisture in the flue gases. This condensation occurs in the secondary heat exchanger and in the vent system. Therefore this furnace requires special venting considerations and the instructions must be followed to assure proper operation. All venting must be in accordance with codes having jurisdiction in your area and these instructions.

The GUK series (90% upflow) can be installed as direct vent or non-direct vent. The GCK series (90% counterflow) can be installed only as a non-direct vent unit. A direct vent installation acquires all the air necessary for combustion from outside the dwelling through an air intake pipe. A non-direct vent installation uses air from within the dwelling for combustion. For each type of installation special venting considerations must be followed. Refer to the section within these instructions for the type of furnace and venting being installed.

Venting system should be as short as possible with the least number of elbows as possible to do the job.

Vertical Venting:
Vertical vents should extend through the roof a minumum of two (2) feet and should not be obstructed for a minimum of ten (10) feet in any direction.

Horizontal Venting:
The vent (and air intake if applicable) shall terminate at least twelve (12) inches above grade or the maximum expected snow depth. The vent system shall terminate at least four (4) feet below, four (4) feet horizontally from, or one (1) foot above any door, window, or gravity air inlet into the building. The vent system shall terminate at least three (3) feet above any forced air inlet located within ten (10) feet.

The vent shall terminate a minimum horizontal clearance of four (4) feet (six (6) feet in Canada) from electric meters, regulators, and relief equipment or within six (6) feet of any gas service regulator vent outlet except with the approval of the authority having jurisdiction.

Materials:
This furnace has been approved for venting with schedule 40 minimum PVC (Polyvinyl Chloride), ABS (Acrylonitrile-Butadiene-Styrene), and CPVC (Chlorinated Polyvinyl Chloride) pipe and fittings. Preferred fittings are DWV style or long sweep. All joints are to be sealed gas tight with the appropriate cement. In areas where the vent and air intake pipes are exposed to abnormal stress or are subject to damage, schedule 80 pipe should be used.

This is a Category IV Furnace.

This furnace shall **not** be connected to any type B, BW, or L vent or vent connector and shall **not** be connected to any portion of a factory built or masonry chimney. This furnace is **not** to be common vented with any other appliance.

UPFLOW INSTALLATIONS—GUK SERIES

DIRECT VENT INSTALLATIONS-GUK ONLY:

A direct vent installation requires both a vent pipe and air intake pipe. This furnace as shipped from the factory has been set up for non-direct vent installation. To prepare the furnace for a

direct vent installation slight field conversion is required. Located the air intake socket that was included in the vent kit bag shipped with the furnace. Remove the front door and set aside. Remove the top filler panel of the furnace that is held in place with four (4) sheet metal screws. Remove the air inlet screen/restrictor located on the top of the burner enclosure. Using the four (4) screws that held the inlet screen/restrictor install the air intake socket in its place. Install the top filler panel removed earlier.

Vent/Air Intake Length and Size:
The size of the pipe and maximum equivalent length used for vent and air intake is dependent on the model of furnace being installed. Refer to Table 1 for the proper size and maximum equivalent length. Values for the vent and air intake maximum equivalent lengths shown in Table 1 are for each. For example: A GUK075D14 can use fifty (50) equivalent feet of two (2) inch pipe on both the vent and air intake pipes.

	PIPE SIZE		
MODEL	2 INCH	2.50 INCH	3 INCH
GUK050DXX	50	50	50
GUK075DXX	50	50	50
GUK100DXX	40	50	50
GUK125DXX	NA*	20	50

* NOT ALLOWED

Table 1: EQUIVALENT PIPE LENGTH (FEET)
FOR DIRECT VENT INSTALLATIONS

The minimum length certified for use with this furnace is five (5) feet and one elbow not including the vent and air intake terminals.

One 90° elbow is equivalent to five (5) feet of pipe. To determine the equivalent length multiply the number of elbows required, not including the vent terminal, and add this value to the length of straight pipe (feet). This value must be less than or equal to that shown in Table 1.

Example: 3-90° elbows

3 × 5 = 15

20 feet pipe

+ 20

35 equivalent feet

Therefore, both the vent and air intake are using 35 equivalent feet. Both the vent and air intake should be as short as possible to do the job.

Installation:

Install the condensate drain line to the unit as follows. The condensate can be drained from either side of the furnace. The unit is set up from the factory for draining out the right side. Should it be desired to drain the unit out the left side, remove the plastic pipe plug from the left side of the drain pan and install the plug in the right side. Install the 1/2 npt × 3/4 PVC adapter (supplied) in the drain on the side draining is to occur. Using 3/4 inch PVC pipe connect to the adapter just installed to just outside the unit. Install a 3/4″ PVC Tee as shown in Figure 1. From the Tee install the drain to the disposal area. The top of the Tee **must** be left open for proper condensate drainage.

Prime the trap system by slowly pouring 1/4 cup of water down the Y-trap. Connect the vent pipe to the top of the Y-trap using the supplied neoprene connecting clamp. For horizontal venting refer to Figure 2. For vertical venting refer to Figure 3. The vent pipe on horizontal runs must slope upward away from the furnace at a pitch of 1/4 inch per foot of run. Install a short nipple in the air intake socket. The nipple should be just long enough to protrude through the top panel by three (3) inches. Connect the air intake pipe to the nipple using the supplied neoprene connector. The vent and air intake pipe must be supported with mounting straps to prevent any weight load from the pipe being applied to the furnace components.

For vertical runs through confined spaces where the pipe cannot be inspected, it is recommended that the pipe be installed in a chase and appropriate fire stops.

NOTE: For proper operation the vent and air intake pipe must be installed in the same pressure zone. Therefore they must be on the same side of the house for horizontal venting applications within the parameters shown in Figure 2.

A screen should not be placed in the air intake termination. If a screen is installed, the air intake may freeze shut.

CAUTION: When passing the air intake pipe through a conditioned space, the cold air on the inside of the pipe may cause condensation to form on the outside. It may be necessary to insulate the air intake pipe to prevent this condensate which may drip and cause property damage or create safety issues.

On initial start up of the unit some of the water used to prime the trap system may have run down into the blower and cause noise.

This will clear itself after running the unit for a while.

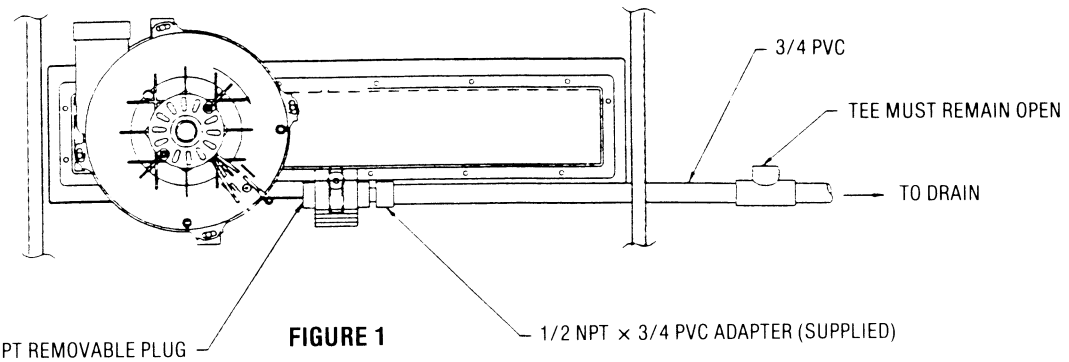
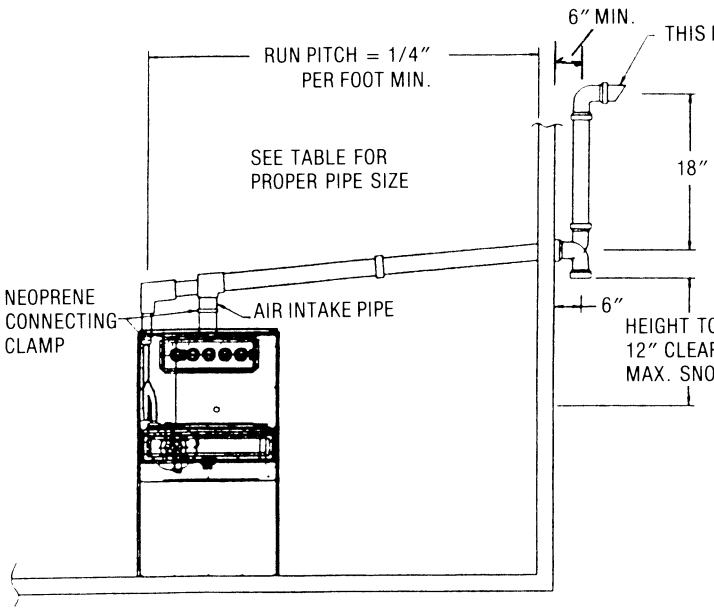


FIGURE 1



CAUTION:
THE VENT SYSTEM OF THIS FURNACE MUST BE SELF SUPPORTING AND NOT APPLY ANY WEIGHT LOAD TO THE COMBUSTION BLOWER

NOTE: DO NOT CEMENT AIR INTAKE PIPE INTO THE CONNECTOR ON BURNER BOX. USE HIGH TEMPERATURE RTV SILICON SEALANT SO THAT INTAKE PIPE CAN BE REMOVED IF SERVICE IS REQUIRED.

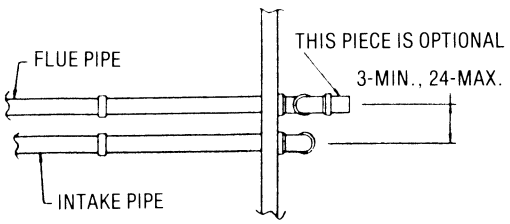
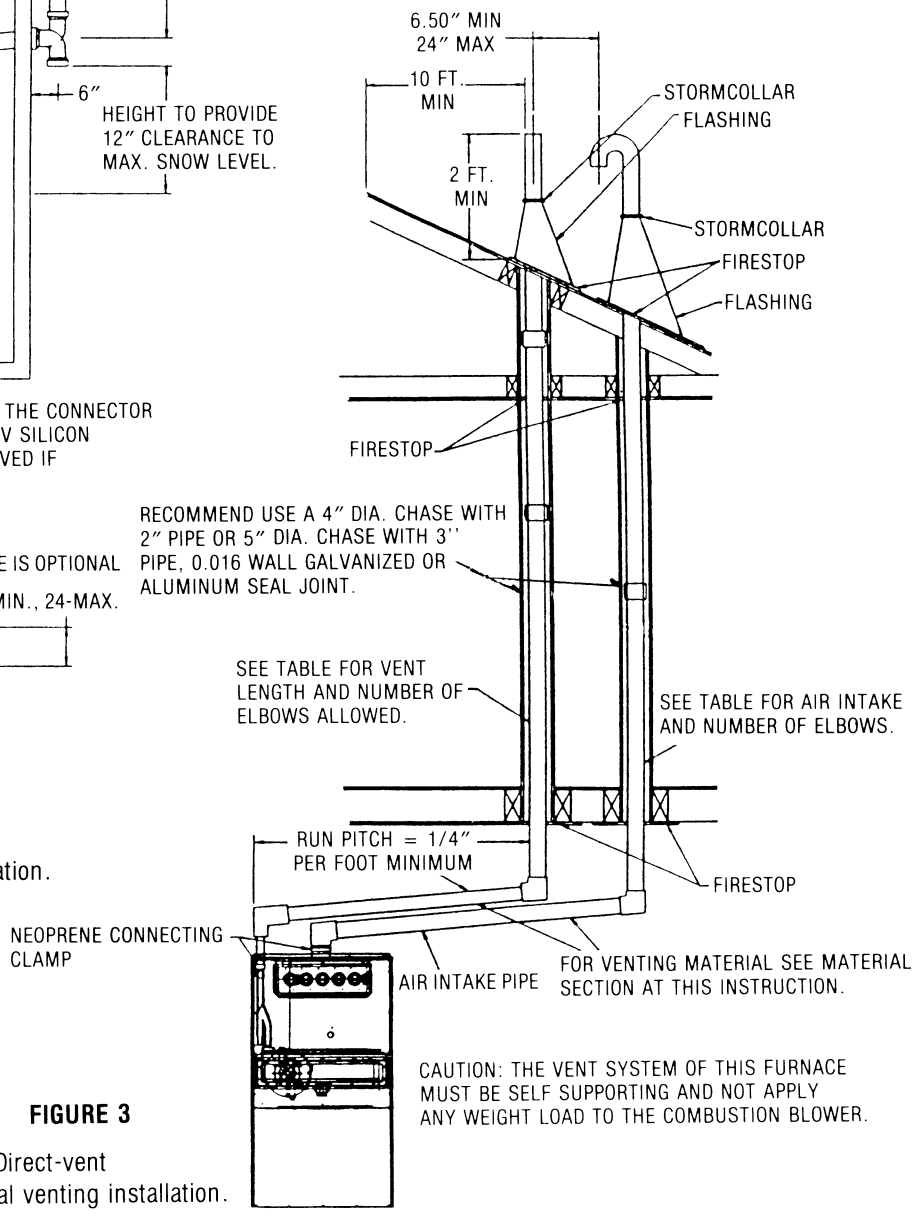


FIGURE 2

GUK Direct-vent horizontal venting installation.



CAUTION: THE VENT SYSTEM OF THIS FURNACE MUST BE SELF SUPPORTING AND NOT APPLY ANY WEIGHT LOAD TO THE COMBUSTION BLOWER.

FIGURE 3

GUK Direct-vent
vertical venting installation.

NON-DIRECT VENT INSTALLATIONS-GUK (UPFLOW) ONLY:

Vent Length and Size:
The size of the pipe and maximum equivalent length used for the vent is dependent on the model of furnace being installed. Refer to Table 2 for the proper size and maximum equivalent length.

The minimum length certified for use with this furnace is five (5) feet and one elbow not including the vent terminal. One 90° elbow is equivalent to five (5) feet of pipe. To determine the equivalent length multiply the number of elbows required, not including the vent terminal, and add this value to the length of straight pipe (feet). This value must be less than or equal to that shown in Table 2.

Example: 3-90° elbows

3 × 5 = 15

20 feet pipe

+ 20

35 equivalent feet

Therefore, both the vent is using 35 equivalent feet. The vent pipe should be as short as possible to do the job.

	PIPE SIZE		
MODEL	2 INCH	2.50 INCH	3 INCH
GUK050DXX	50	50	50
GUK075DXX	50	50	50
GUK100DXX	40	50	50
GUK125DXX	NA*	20	50

* NOT ALLOWED

Table 2: EQUIVALENT PIPE LENGTH (FEET)
FOR NON-DIRECT VENT INSTALLATIONS

Installation:
Install the condensate drain line to the unit as follows. The condensate can be drained from either side of the furnace. The unit is set up from the factory for draining out the right side. Should it be desired to drain the unit out the left side, remove the plastic pipe plug from the left side of the drain pan and install the plug in the right side.

Install the 1/2 npt × 3/4 PVC adapter (supplied) in the drain on the side draining is to occur. Using 3/4 inch PVC pipe connect to the adapter just installed to just outside the unit. Install a 3/4" PVC Tee as shown in Figure 1. From the Tee install the drain to the disposal area. The top of the Tee **must** be left open for proper condensate drainage.

Prime the trap system by slowly pouring 1/4 cup of water down the Y-trap. Connect the vent pipe to the top of the Y-trap using the supplied neoprene connecting clamp. For horizontal venting refer to Figure 4. For vertical venting refer to Figure 5. The vent pipe on horizontal runs must slope upward away from the furnace at a pitch of 1/4 inch per foot of run.

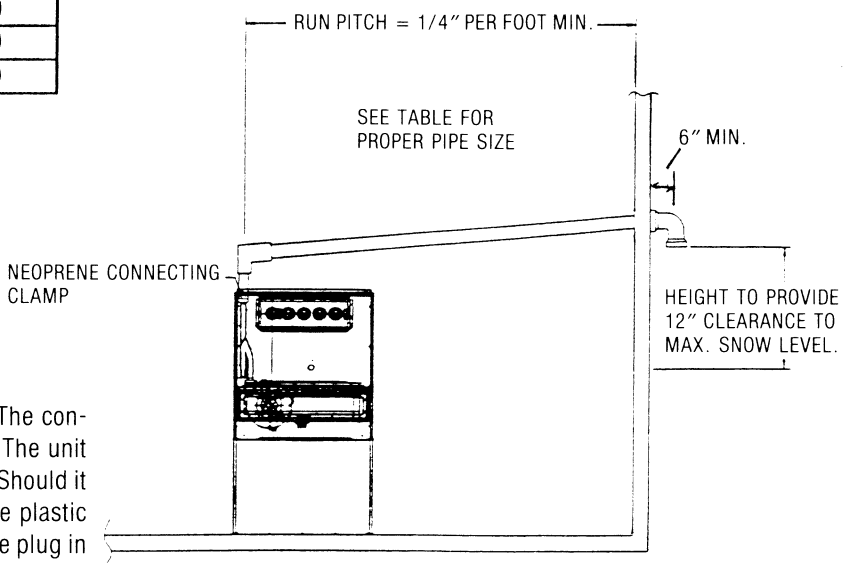
For vertical runs through confined spaces where the pipe cannot be inspected, it is recommended that the pipe be installed in a chase and appropriate fire stops.

On initial start up of the unit some of the water used to prime the trap system may have run down into the blower and cause noise.

This will clear itself after running the unit for a while.

FIGURE 4

GUK Non-direct-vent horizontal venting installation.



CAUTION:
THE VENT SYSTEM OF THIS FURNACE MUST BE SELF SUPPORTING AND NOT APPLY ANY WEIGHT LOAD TO THE COMBUSTION BLOWER.

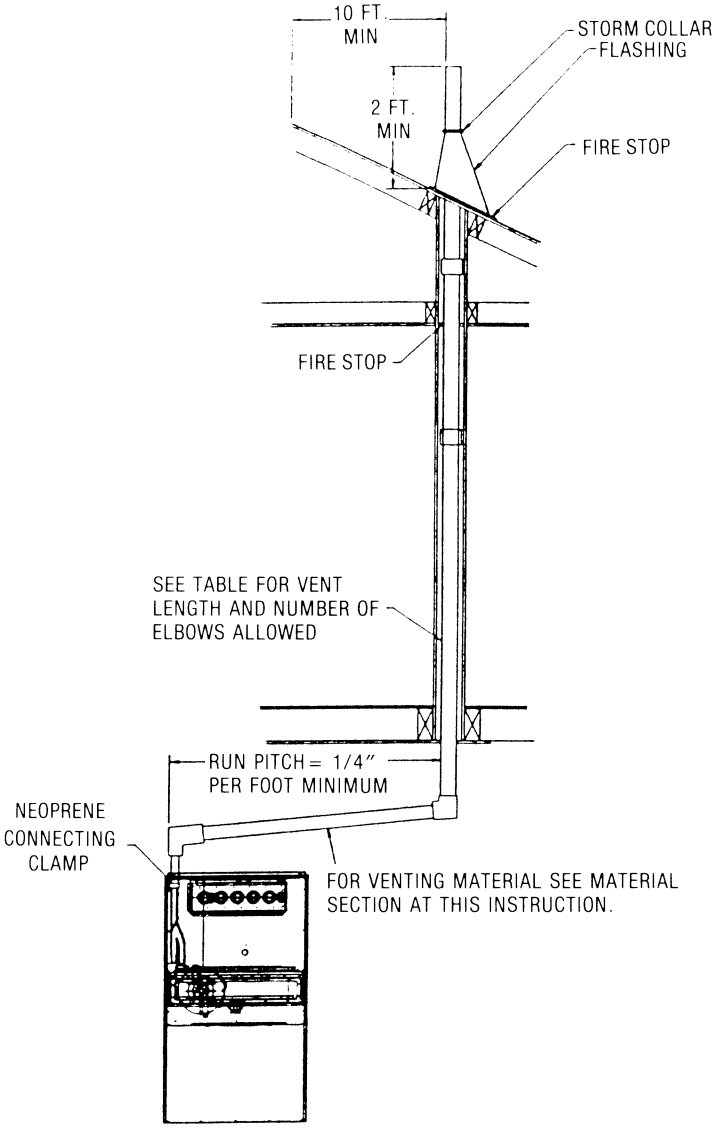


FIGURE 5

GUK Non-direct-vent vertical venting installation.

NON-DIRECT VENT INSTALLATIONS-GCK (COUNTERFLOW) ONLY:

Vent Length and Size:
The size of the pipe and maximum equivalent length used for the vent is dependent on the model of furnace being installed. Refer to Table 3 for the proper size and maximum equivalent length.

The minimum length certified for use with this furnace is five (5) feet and one elbow not including the vent terminal. One 90° elbow is equivalent to five (5) feet of pipe. To determine the equivalent length multiply the number of elbows required, not including the vent terminal, and add this value to the length of straight pipe (feet). This value must be less than or equal to that shown in Table 3.

Example: 3-90° elbows

3 × 5 = 15

20 feet pipe

+ 20

35 equivalent feet

Therefore, both the vent is using 35 equivalent feet. The vent system should be as short as possible to do the job.

	PIPE SIZE		
MODEL	2 INCH	2.50 INCH	3 INCH
GCK050DXX	50	50	50
GCK075DXX	50	50	50
GCK100DXX	50	50	50
GCK125DXX	NA*	50	50

* NOT ALLOWED

Table 3: EQUIVALENT PIPE LENGTH (FEET) FOR NON-DIRECT VENT INSTALLATIONS

Installation:
Install the condensate drain line to the unit as follows. The condensate can be drained from either side of the furnace. The unit is set up from the factory for draining out the right side. Should it be desired to drain the unit out the left side, remove the plastic pipe plug from the left side of the drain pan and install the plug in the right side. Install the 1/2 npt × 3/4 PVC adapter (supplied) in the drain on the side draining is to occur. Using 3/4 inch PVC pipe connect to the adapter just installed to just outside the unit. Install a 3/4" PVC Tee as shown in Figure 1. From the Tee install the drain to the diaposal area. The top of the Tee **must** be left open for proper condensate drainage.

Install a piece of two (2) inch pipe from the combustion blower vertically through the blower compartment and out the top filter panel. Refer to Figures 6 and 7. Be sure the grommets in the blower deck and top filter panel are in place to seal around the pipe. Use the supplied neoprene connector to connect the pipe to the combustion blower. Attach the Y-trap to the top of the

pipe just installed with the second neoprene connector. Connect the condensate drain line from the Y-trap to the drain pan using the tygon tubing. The tubing should run through the blower compartment as shown in Figures 6 and 7.

Prime the trap system by slowly pouring 1/4 cup of water down the Y-trap. Connect the vent pipe to the top of the Y-trap using the supplied neoprene connecting clamp. For horizontal venting refer to Figure 6. For vertical venting refer to Figure 7. The vent pipe on horizontal runs must slope upward away from the furnace at a pitch of 1/4 inch per foot of run.

For vertical runs through confined spaces where the pipe cannot be inspected, it is recommended that the pipe be installed in a chase and appropriate fire stops.

On initial start up of the unit some of the water used to prime the trap system may have run down into the blower and cause noise. This will clear itself after running the unit for a while.

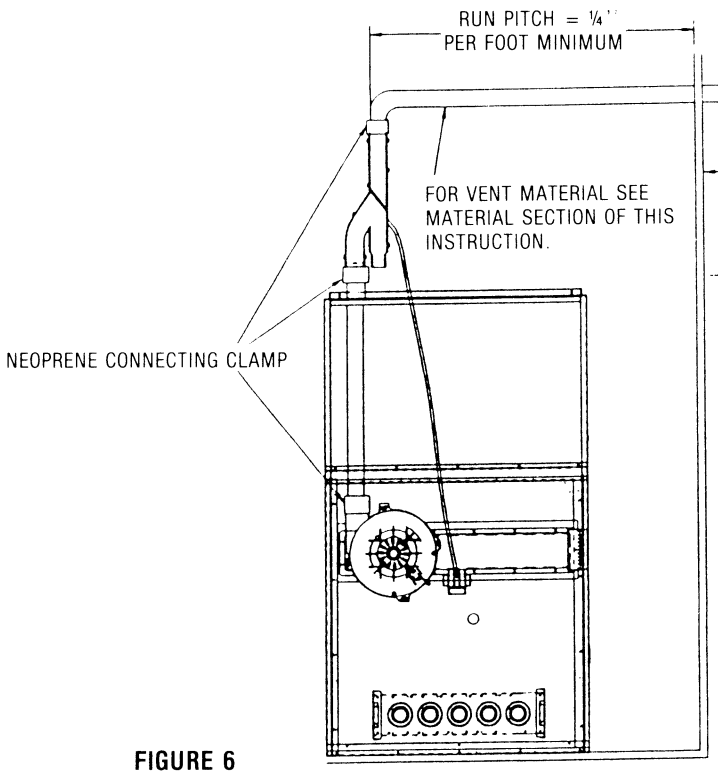


FIGURE 6

GCK horizontal venting installation.

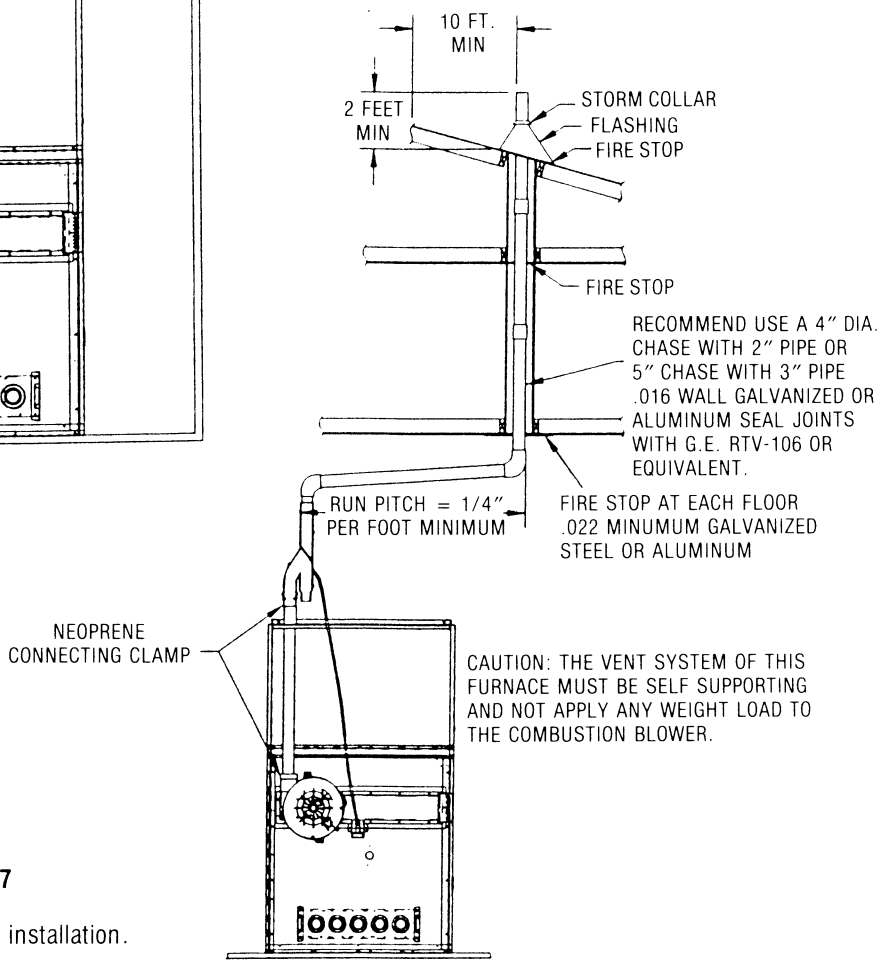


FIGURE 7

GCK vertical venting installation.

EXISTING VENT SYSTEMS

When an existing furnace is removed from a venting system serving other appliances, the venting system is likely to be too large to properly vent the remaining attached appliances. An improperly sized venting system can result in spillage of flue products into the living space, the formation of condensate, leakage, etc.

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

1. Seal any unused openings in the venting system.
2. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code, ANSI Z223.1 or the CAN/CGA B149 Installation Codes and these instructions. Determine that there is no blockage or restrictions, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. In so far as is practical, close all building doors and windows and all doors between the space in which the appliance(s) connected to the venting system are located and other spaces of the building. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Follow the lighting instructions. Place the appliance being inspected in operation. Adjust thermostat so appliance shall operate continuously.
5. Test for draft hood equipped appliance spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle.
6. After it has been determined that each appliance connected to the 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.
7. If improper venting is observed during any of the above tests, the venting system must be corrected.

See National Gas Code, ANSI Z223.1 (latest edition) to correct improper operation of common venting system (IN CANADA See CAN/CGA B149.1 & .2 Installation Codes).

CIRCULATING AIR SUPPLY

When the furnace is installed so that the supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air shall be handled by a duct or ducts sealed to the furnace casing and terminated outside the space containing the furnace.

If there is no complete return air duct system, the return air connection must be sealed to the furnace casing and run full size to a location outside the utility room or space housing the furnace to prevent a negative pressure on the venting system.

If the furnace is used in conjunction with a cooling unit, the furnace must be installed in parallel with, or on the upstream side of the evaporator coil to avoid condensation of the heating element. In a parallel installation, dampers or other means must be provided to prevent chilled air from entering the furnace. If the air control is manually operated, an interlock must be provided to prevent operation of either unit unless the dampers are in full heat or full cool position.

OUTLET DUCT

For Canadian units the outlet duct must provide a removable access panel. The opening should be accessible when the furnace is installed in service. Smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. The cover for the opening shall be attached in such a manner as to prevent leaks. The recommended opening size is 6″ × 14″ for all sizes.

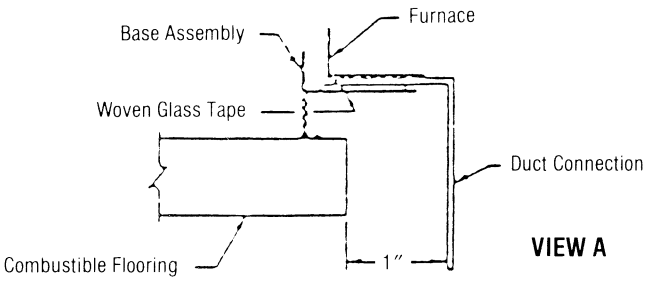
DUCT CONNECTION - COUNTERFLOW MODELS

If a unit is installed on a non-combustible floor, unit may be installed directly over supply duct or plenum.

If installation is made on a combustable floor, the special base assembly must be used. Cut hole on floor two (2) inches larger in each direction than duct size.

The four angles on the base assembly should recess into floor openings and base should rest on all four outside flanges. Construct duct connections with 1-1/2 inch - 2 inch right angle flanges and long enough to extend below floor joists. Drop duct connections through top of base assembly with right angle flanges in good contact with glass tape on top of base assembly. Carefully position furnace over right angle duct flanges. See View A.

A return air duct system is recommended. If the unit is installed in a confined space or closet, a return connection must be run, full size, to a location outside the closet. The air duct in the closet must be tight to prevent any entrance of air from the closet into the circulating air.



VIEW A

FILTERS

GUK SERIES: A filter rack and a washable filter are supplied with the furnace (models designed for more than 1600 CFM nominal air delivery include two of each). The filter rack is to be installed between the return air duct and the side of the furnace. Refer to Figure 8 and the instructions below:

1. Using the starter hole and corner embossments as a guide, mark and cut a full size opening in the side panel(s).
2. Using the filter rack as a template, mark and drill four 7/64″ diameter screw holes in the side panel(s).
3. With the filter access opening toward the front of the furnace, use sheet metal screws to fasten the rack(s) to the side panel(s).
4. Install the filter(s) in the rack(s), mesh side of filter towards furnace.

NOTE: Model HA7 External Filter Frame is available for single side return air connection in installations requiring more than 1600 CFM nominal air delivery.

NOTE: A bottom return air filter is available from the manufacturer.

GCK SERIES: Filters are not supplied with these furnaces. However, filters must be used; it is the installer's responsibility to install properly sized filters in accordance with Table 4.

GCK models have no provisions for installing filters inside the furnace; filters must be installed in the return air system.

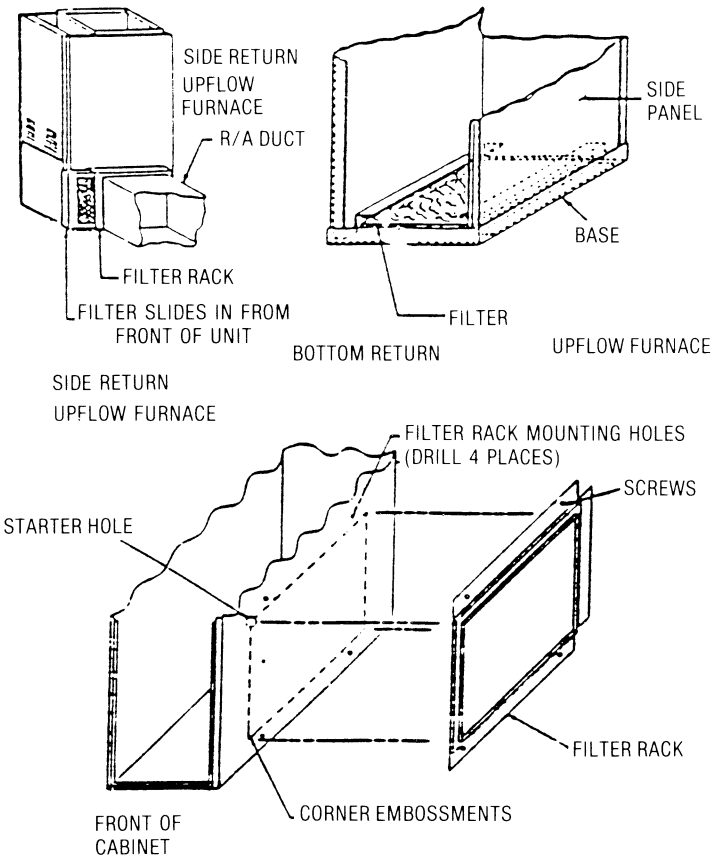


FIGURE 8

TABLE 4 MINIMUM FILTER REQUIREMENTS

AIRFLOW	DISPOSABLE FILTERS			PERMANENT FILTERS		
DESCRIPTOR	AREA	SIZE	QTY	AREA	SIZE	QTY
10	480	20 × 25	1	240	16 × 20	1
12	576	16 × 20	2	288	16 × 20	1
14	672	20 × 20	2	336	20 × 20	1
20	960	20 × 25	2	480	20 × 25	1

NOTES:

1. The Airflow Descriptor is the two digits following the ''D'' in the model number; e.g. ''20'' is the Airflow Descriptor for Model GUK125D20.
2. Areas are in square inches; sizes are in inches.
3. Areas and dimensions shown for permanent filters are based on filters rated at 600 feet per minute face velocity.
4. Typical filter sizes are shown; however, any combination of filters whose area equals or exceeds the minimum area shown is satisfactory.

UTILITY CONNECTIONS

ELECTRICAL

The furnace must be grounded and wired in accordance with the National Electric Code ANSI/NFPA No. 80 (latest edition), or with local codes, where they prevail. In Canada: Canadian Electrical Code. Part 1 CSA 22.1 (latest edition).

WARNING: DISCONNECT ELECTRICAL POWER AT THE FUSE BOX OR SERVICE PANEL BEFORE MAKING ELECTRICAL CONNECTIONS.

Connect ground to the furnace before making line voltage connections. Refer to furnace rating plate for electrical characteristics to be used in sizing field supply wiring and overcurrent protection.

The line voltage supply should be routed through a readily accessible disconnect located within sight of the furnace. A junction box on the furnace side panel is provided for line voltage connections. Refer to the wiring diagram(s) included with these instructions for proper connections.

NOTE: Proper polarity of the supply connections (''hot'' and ''neutral'') must be observed to ensure that safety controls provide the protection intended.

ALL WIRING SHOULD BE DONE IN ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE, ANSI/NFPA, NO. 70 IN CANADA: CSA C22.1 CANADIAN ELECTRICAL CODE, PART 1, OR WITH LOCAL CODES, WHERE THEY PREVAIL.

Using wiring with a temperature limitation for type T wire (63°F), (36°C) rise; run the 115 volt, 60 hertz electric power supply through a fused disconnect switch to the junction box of furnace and connect as shown in the wiring diagram, located on the inside of the blower access panel cover.

GAS SUPPLY AND PIPING

Refer to the furnace rating plate to make sure the furnace is equipped to burn the gas supplied (natural or propane). Any conversion of a natural gas unit to propane gas must be done by qualified personnel using a conversion kit available from the manufacturer, following the instructions in the conversion kit.

Gas supply piping should be installed in accordance with local codes and the regulations of the utility. Piping must be of adequate size to prevent undue pressure drop. Consult the local utility or gas supplier for complete details on special requirements for sizing gas piping.

Pipe connections must be tight, and a non-hardening pipe compound resistant to liquified petroleum gases should be used.

Connect the gas pipe to the furnace controls providing a ground joint union as close to the controls as is possible to facilitate removal of controls and manifold. Provide a drip leg on the outside of the furnace. A manual shut-off valve with a 1/8″ N.P.T. plugged tapping accessible for test gauge connections shall be installed in the gas line, outside the unit, five (5) feet above the floor or in accordance with any local codes. (Refer to Figure 9)

The pilot is factory connected and requires no additional piping. A pilot gum filter may be installed in the pilot supply line if required by the local utility company.

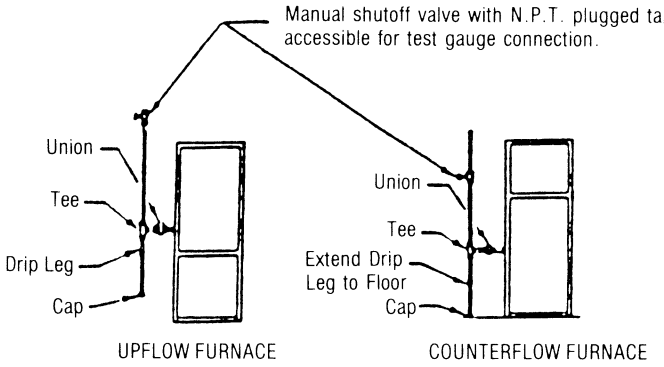


FIGURE 9

GAS SUPPLY PIPING (TESTING)

WARNING: The gas valve supplied with this furnace is rated at 1/2 PSIG maximum. Any higher pressure may rupture the pressure regulator diaphragm and may cause over-firing of the burners and improper burner operation. The over-firing may result in creation of carbon monoxide which may result in asphyxiation.

The furnace must be isolated from the gas-supply piping system by closing individual manual shut-off valve during any pressure testing of gas-supply piping system at test pressure equal to or less than 1/2 PSIG or 14″ W.C. If the piping system is to be tested at pressures in excess of ½ PSIG, the furnace and its individual shut-off valve must be disconnected from the gas-supply piping system.

After gas piping is complete, carefully check all piping connections (factory and field) for gas leaks. Use a leak detecting solution or other preferred means.

CAUTION: Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak detection has been completed.

WARNING: NEVER USE AN OPEN FLAME TO CHECK FOR GAS LEAKS. IF THERE IS A GAS LEAK, EXPLOSION OR INJURY CAN RESULT.

THERMOSTAT INSTALLATION

Install a room thermostat according to the instructions furnished with it. Select a location on an inside wall and not subject to drafts, direct sunshine, or other heat sources. The initial heat anticipator setting should be equal to the total current draw of the control circuit.

Low voltage thermostat connections are to be made to the blower control board as indicated on the wiring diagrams.

CONTINUOUS LOW SPEED BLOWER

If continuous blower operation on low speed is desired, connect the low speed motor tap to the ''CONT'' terminal on the blower control board (refer to furnace wiring diagram). The blower will operate on low speed whenever main power is connected to the furnace, except when it operates on heating or cooling speed during thermostat call for heat or cooling.

ACCESSORY CONNECTIONS

HUMIDIFIER

Terminals are provided on the blower control board for connection of a 115 volt humidifier. The ''HUM'' terminal is energized whenever the thermostat is calling for heat. Refer to the furnace wiring diagram for specific connection information.

ELECTRONIC AIR CLEANER

Terminals are provided on the blower control board for connection of a 115 volt electronic air cleaner. The ''EAC'' terminal is energized whenever the thermostat is calling for heat or cooling. Refer to the furnace wiring diagram for specific connection information.

TWINNING

The blower control board is designed to permit ''twinning'' of furnaces (two furnaces connected to a common supply and return air system, and controlled by one thermostat). An accessory kit must be ordered from the manufacturer. Specific wiring and operating instructions are included with the kit.

NOTE: EACH FURNACE MUST HAVE ITS OWN DEDICATED VENT SYSTEM.

FURNACE CHECK-OUT

Before leaving, the installer should make the following checks to ensure that the controls are functioning properly.

CHECKING AND ADJUSTING GAS INPUT

The minimum permissible gas supply pressure for the purpose of input adjustment is 5 inches W.C. for natural gas, 11 inches W.C. for propane gas.

GAS REGULATOR

Gas input must never exceed the value shown on the furnace rating plate. The furnace is equipped for rating input at a manifold pressure of 3.5 inches W.C. for natural gas, 10.0 inches W.C. for propane gas.

The manifold pressure can be measured by removing the pipe plug in the downstream side of the gas valve and connecting a water manometer or gauge.

Only small variation in gas input may be made by adjusting the regulator. In no case should the final manifold pressure vary more than 0.3″ W.C. from the above specified pressures.

Turn gas valve ON. To adjust the regulator, turn the adjusting screw on the regulator clockwise to increase pressure and input; counterclockwise to decrease pressure and input.

Check furnace rate by observing gas meter, when available, making sure all other gas appliances are turned off. The test hand on the meter should be timed for at least one revolution. Note the number of seconds for one revolution.

BTU/HR. INPUT EQUALS

$$\frac{\text{Cubic feet per revolution}}{\text{No. seconds per revolution}} \times 3600 \times \text{Heating Value}$$

The heating value of your gas can be obtained from your local utility company.

NOTE: For GUK series (90% upflow), the cap for the adjusting regulator and the burner box cover must be in place to check the input rate.

HIGH ALTITUDE

For U.S.A. Installation Only:

Ratings shown on the rating plate are for elevations up to 2,000 feet. For elevations above 2,000 feet, ratings should be reduced at a rate of four (4) percent for each 1,000 feet above sea level. See National Fuel Gas Code Z223.1 (latest edition).

For Canadian Installations:

For altitudes up to 4,500 feet no adjustment is required.

TEMPERATURE RISE

Check temperature rise and, if necessary, adjust blower speed to maintain temperature rise within the range shown on the unit rating plate.

SEQUENCE OF OPERATION

HEATING

A call for heat from the thermostat closes R to W on the blower control board, and the combustion blower is energized. The pressure switch senses normal combustion air flow, and closes. Power is then applied to the ignition control, which then energizes the pilot gas solenoid in the gas valve. Pilot ignition occurs, is sensed by the flame sensor, and the main gas valve is energized (spark is de-energized). Main burner ignition occurs.

NOTE: GUK 90% upflow furnaces have a 30 second delay before pilot ignition will commence.

Energizing of the main valve starts the ''blower on'' timing for the circulating blower. Approximately 30 seconds later (not adjustable), the heating speed of the blower is energized.

When the call for heat is satisfied, R to W is opened and the burners and combustion blower are de-energized. This starts the ''blower off'' timing for the circulating blower. After the selected (adjustable) time period elapses, the blower is de-energized.

In the event the limit control senses an abnormally high temperature and opens, the ignition control is de-energized, and the combustion blower and circulating blower heating speed continue to be energized.

COOLING

A call for cooling from the thermostat closes R to G on the blower control board and after a short delay, energized cooling speed on the circulating blower. When the call for cooling is satisfied, the blower is de-energized.

CONTROLS

Following is a description of the operation of some of the controls used in this furnace. All models use one of each control, except as noted.

PRESSURE SWITCH

The pressure switch is a normally open switch that monitors combustion air flow. Inadequate air flow resulting from excessive venting system restriction or a failed combustion blower will cause this switch to remain open.

ROLLOUT SWITCH

The rollout switch is a normally closed switch that opens when abnormal temperatures exist in the burner area. This can be caused by a restricted heat exchanger causing main butner flame to ''roll out'' into the vestibule area or burner box.

This switch must be manually reset by pushing the button on top to restore furnace operation.

LIMIT CONTROL

This is a normally closed control that opens if abnormally high circulating air temperatures occur. It is an automatic reset control.

AUXILIARY LIMIT CONTROL

This is a normally closed control that opens under abnormal ''reverse air flow'' conditions that could occur in a downflow installation if the circulation blower were to fail. It is an automatic reset control.

NOTE: GUK models do not include an auxiliary limit control.

INTERLOCK (BLOWER DOOR) SWITCH

When the blower door is removed, the interlock switch breaks the power supply to the burner controls and blower motor. The switch operation must be checked.

BLOWER CONTROL BOARD

This controls operation of the circulating air blower, and any accessories connected to it. It is factory set to provide a 120 second ''blower off'' delay on heating. This delay is adjustable: refer to Figure 10.

To change motor speed, refer to Figure 10 and use the following procedure.

1. Turn off electrical power to unit.

2. Refer to the wiring diagram and connect the desired speed tap for cooling and heating on the blower control board. Remaining speed taps must be connected to dummy terminals (M1, M2). If you want to use the same speed tap for both heating and cooling, install a piggyback terminal on the speed tap using a short jumper wire 1/4″ quick connect terminals on both ends to jumper the HEAT and COOL speed on the blower control board.

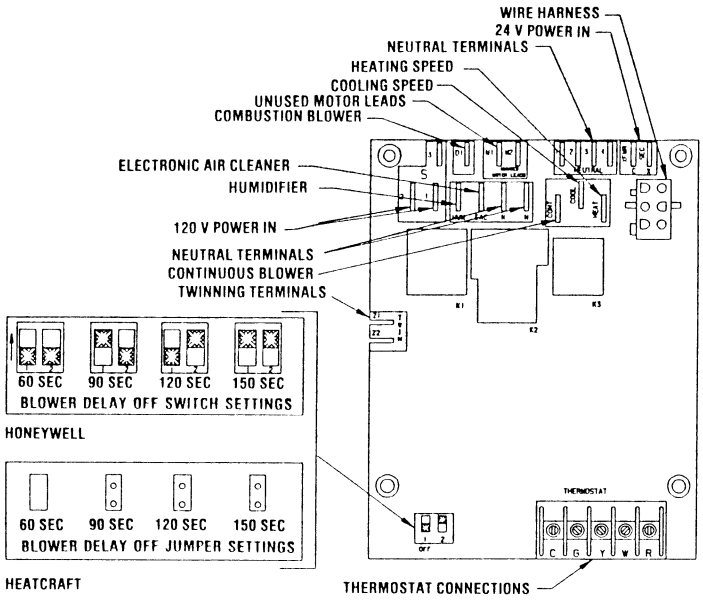


FIGURE 10
BLOWER CONTROL BOARD

START-UP PROCEDURE
LIGHTING INSTRUCTIONS

FOR YOUR SAFETY
READ BEFORE OPERATING

WARNING: IF YOU DO NOT FOLLOW THESE INSTRUCTIONS EXACTLY, A FIRE OR EXPLOSION MAY RESULT CAUSING PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE.

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do **not** try to light the pilot by hand.

B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Extinguish any open flame.
- Do not touch any electric 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.

C. Use only your hand to turn the gas control knob. Never use tools. If the knob will not turn by hand, don't try to repair it, call a qualified service technician.
CAUTION: FORCE OR ATTEMPTED REPAIR MAY RESULT IN A FIRE OR EXPLOSION.

D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and gas control which has been under water.

Refer to the Lighting Instruction label on the furnace for instructions on operating the specific controls used on your unit.

TO START THE FURNACE:

1. **CAUTION: Be sure that the manual gas control has been in the ''Off'' position for at least five minutes. Do not atempt to manually light the burner.**

2. Set room thermostat to lowest setting.

3. Turn gas control knob to the ''On'' position, or move gas control lever to the ''On'' position.

4. Replace control access door.

5. Turn on electrical power.

6. Set room thermostat to a point above room temperature to light main burners. After burners are lighted, set room thermostat to desired temperature.

TO SHUT DOWN FURNACE

1. Set room thermostat to lowest setting.

2. Shut off gas to main burners and pilot by turning knob to ''Off'' position or by depressing gas control lever and moving to the ''Off'' position.

WARNING: SHOULD OVERHEATING OCCUR OR THE GAS SUPPLY FAIL TO SHUT OFF, SHUT OFF THE MANUAL GAS VALVE TO THE APPLIANCE BEFORE SHUTTING OFF THE ELECTRICAL SUPPLY.

MAINTENANCE

WARNING: DISCONNECT MAIN ELECTRICAL POWER TO THE UNIT BEFORE ATTEMPTING ANY MAINTENANCE.

CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

Verify proper operation after servicing.

It is recommended that this furnace be inspected by a qualified service technician at the beginning of each heating season.

FILTERS

It is a good idea to check filters at least every six weeks. If they are dirty they should be replaced, or cleaned if you have a cleanable filter.

LUBRICATION

The blower motor and induced draft motor are prelubricated by the manufacturer and do not require further attention. Clean motor periodically to prevent the possibility of overheating due to an accumulation of dust and dirt on the windings or on the motor exterior. And, as suggested elsewhere in these instructions, the air filters should be kept clean because dirty filters can restrict airflow and the motor depends upon sufficient air flowing across and through it to keep from overheating.

MAIN BURNERS

Light burners and allow to operate for a few minutes to establish normal burning conditions. Check burner flame by observation. Flame should be predominantly blue in color, strong in appearance. Check that all burners are lit, and that the flame does not impinge on the sides of the heat exchanger.

Distorted flame or yellow tipping of the natural gas main burner flame, or long yellow tips on propane, may be caused by lint accumulation or dirt inside burner or burner ports, lint at air inlet between burner and manifold pipe or obstructions over main burner orifice. Use a soft brush or vacuum affected areas.

PILOT BURNER

(See Figure 11)

Pilot flame must surround the end of flame sensor and ground strap for proper operation of pilot safety circuit.

If pilot flame burns yellow it may be due to dirt or lint that has covered the lower portion of the burner. This can be removed with a soft brush or by vacuuming.

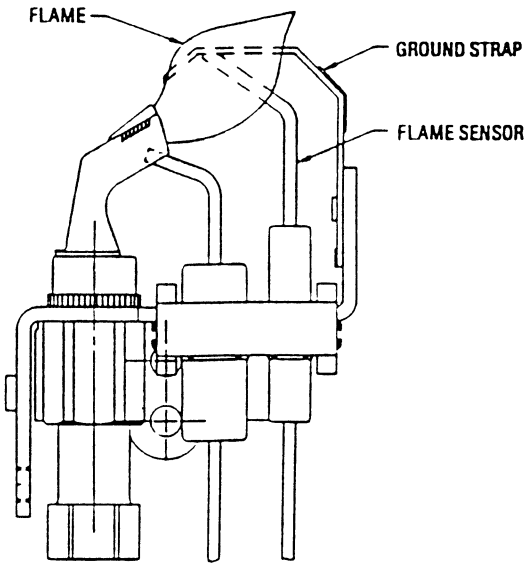


FIGURE 11
PILOT BURNER

REPAIR PARTS LIST

The following repair parts are available from your local Armstrong Air or Johnson Air-Ease Dealer. When ordering parts, include the complete furnace model number and serial numbers which are printed on the rating plate located on the furnace.

CONTROL GROUP

Transformer
Blower Control Board
High Limit Control
Auxiliary Limit (if used)
Gas Valve
Ignition Control
Flame Sensor
Pressure Switch
Blower Door Interlock Switch
Combustion Blower Assembly
Flame Roll-Out Protector Switch

HEAT EXCHANGER GROUP

Heat Exchanger - Primary
Heat Exchanger - Secondary
Condensate Drain Pan
Condensate Y-Trap

BLOWER GROUP

Blower Housing Assembly
Blower Wheel
Blower Motor
Blower Motor Mount
Blower Motor Capacitor

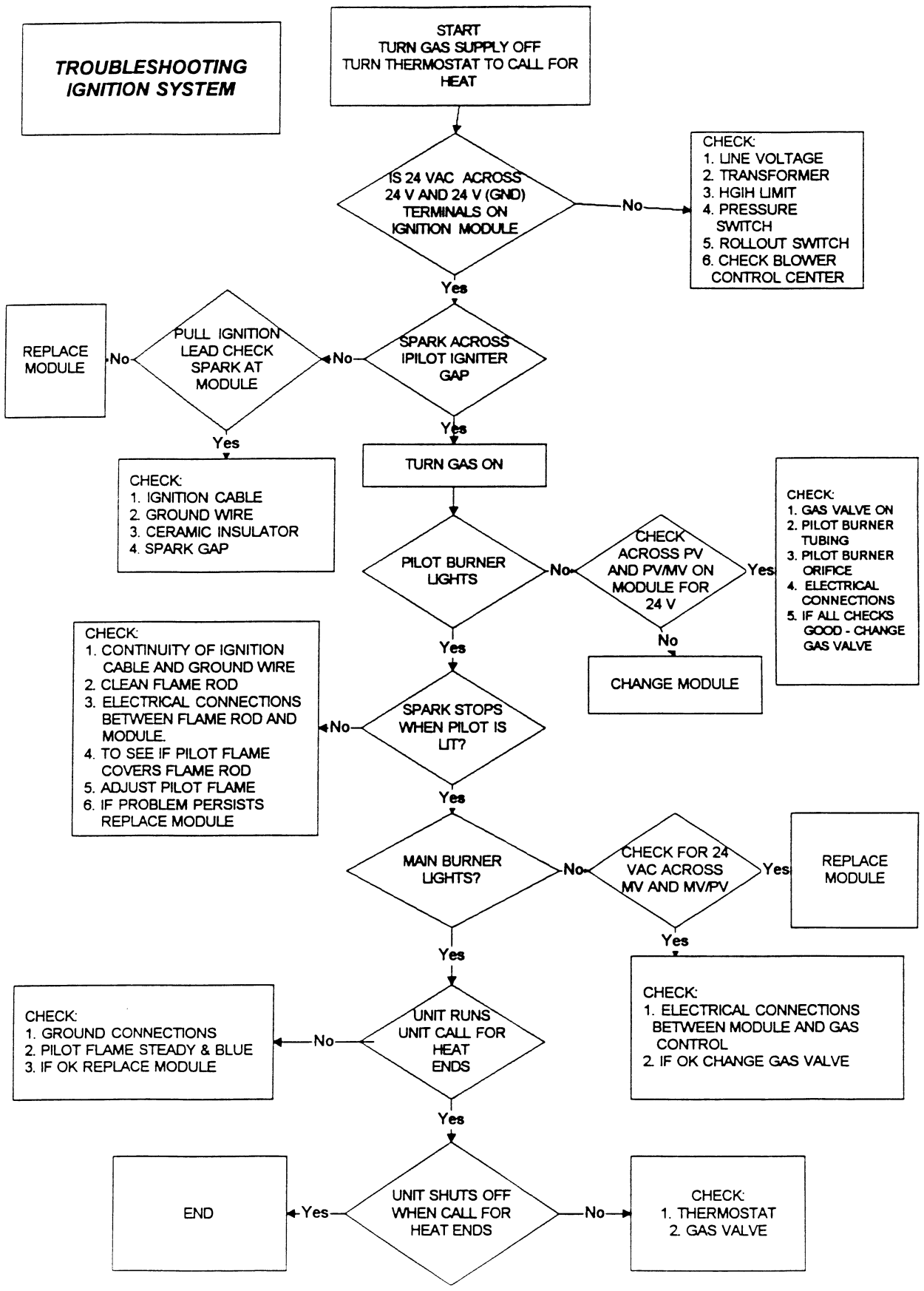
BURNER GROUP

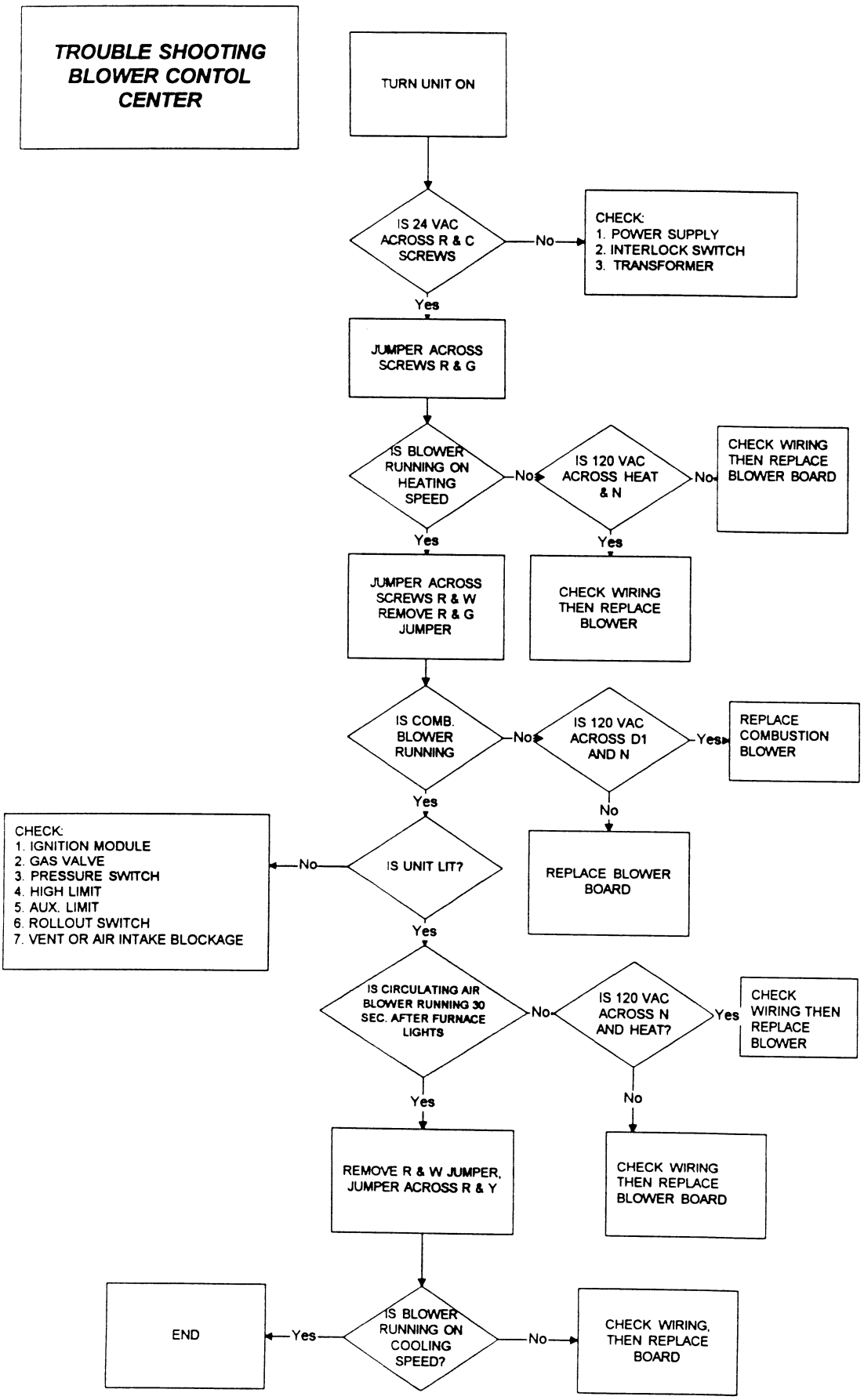
Gas Manifold
Main Burner Orifices
Pilot Burner Assembly (includes flame sensor)
Pilot Orifice
Main Burners

ACCESSORIES

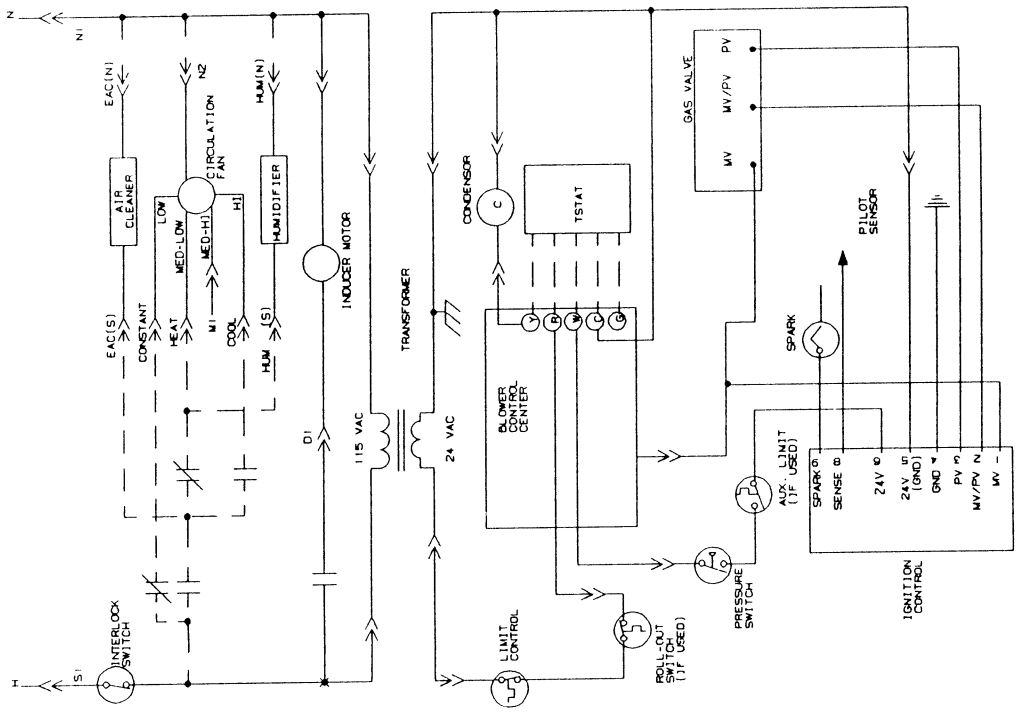
A516 Propane Conversion Kit (All)
HA7 Side Return Filter Frame Kit (GUK)
A525 Filter Kit (GCK)
A526 Twinning Kit (All)

WARNING: IMPROPER INSTALLATION, ADJUSTMENT, SERVICE, OR MAINTENANCE CAN CAUSE INJURY OR PROPERTY DAMAGE. CONSULT A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER FOR INFORMATION OR ASSISTANCE.

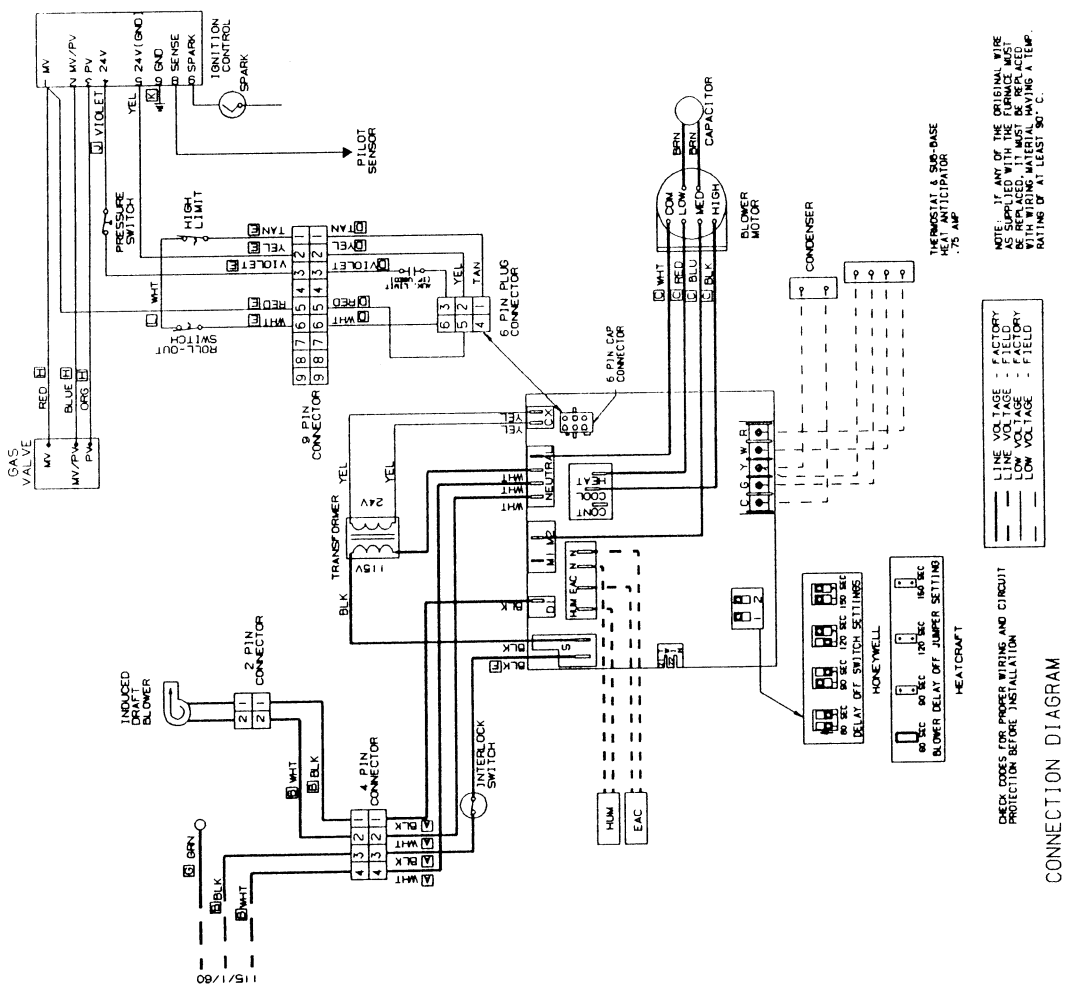

TROUBLESHOOTING IGNITION SYSTEM
START
TURN GAS SUPPLY OFF
TURN THERMOSTAT TO CALL FOR HEAT
IS 24 VAC ACROSS 24 V AND 24 V (GND) TERMINALS ON IGNITION MODULE
No
CHECK:
1. LINE VOLTAGE
2. TRANSFORMER
3. HGIH LIMIT
4. PRESSURE SWITCH
5. ROLLOUT SWITCH
6. CHECK BLOWER CONTROL CENTER
Yes
SPARK ACROSS IPILOT IGNITER GAP
No
PULL IGNITION LEAD CHECK SPARK AT MODULE
No
REPLACE MODULE
Yes
CHECK:
1. IGNITION CABLE
2. GROUND WIRE
3. CERAMIC INSULATOR
4. SPARK GAP
Yes
TURN GAS ON
PILOT BURNER LIGHTS
No
CHECK ACROSS PV AND PV/MV ON MODULE FOR 24 V
Yes
CHECK:
1. GAS VALVE ON
2. PILOT BURNER TUBING
3. PILOT BURNER ORIFICE
4. ELECTRICAL CONNECTIONS
5. IF ALL CHECKS GOOD - CHANGE GAS VALVE
No
CHANGE MODULE
Yes
SPARK STOPS WHEN PILOT IS LIT?
No
CHECK:
1. CONTINUITY OF IGNITION CABLE AND GROUND WIRE
2. CLEAN FLAME ROD
3. ELECTRICAL CONNECTIONS BETWEEN FLAME ROD AND MODULE.
4. TO SEE IF PILOT FLAME COVERS FLAME ROD
5. ADJUST PILOT FLAME
6. IF PROBLEM PERSISTS REPLACE MODULE
Yes
MAIN BURNER LIGHTS?
No
CHECK FOR 24 VAC ACROSS MV AND MV/PV
Yes
REPLACE MODULE
Yes
CHECK:
1. ELECTRICAL CONNECTIONS BETWEEN MODULE AND GAS CONTROL
2. IF OK CHANGE GAS VALVE
UNIT RUNS UNIT CALL FOR HEAT ENDS
No
CHECK:
1. GROUND CONNECTIONS
2. PILOT FLAME STEADY & BLUE
3. IF OK REPLACE MODULE
Yes
UNIT SHUTS OFF WHEN CALL FOR HEAT ENDS
Yes
END
No
CHECK:
1. THERMOSTAT
2. GAS VALVE


TROUBLE SHOOTING BLOWER CONTOL CENTER
TURN UNIT ON
IS 24 VAC ACROSS R & C SCREWS
No
CHECK:
1. POWER SUPPLY
2. INTERLOCK SWITCH
3. TRANSFORMER
Yes
JUMPER ACROSS SCREWS R & G
IS BLOWER RUNNING ON HEATING SPEED
No
IS 120 VAC ACROSS HEAT & N
No
CHECK WIRING THEN REPLACE BLOWER BOARD
Yes
Yes
JUMPER ACROSS SCREWS R & W REMOVE R & G JUMPER
CHECK WIRING THEN REPLACE BLOWER
IS COMB. BLOWER RUNNING
No
IS 120 VAC ACROSS D1 AND N
Yes
REPLACE COMBUSTION BLOWER
Yes
No
CHECK:
1. IGNITION MODULE
2. GAS VALVE
3. PRESSURE SWITCH
4. HIGH LIMIT
5. AUX. LIMIT
6. ROLLOUT SWITCH
7. VENT OR AIR INTAKE BLOCKAGE
No
IS UNIT LIT?
REPLACE BLOWER BOARD
Yes
IS CIRCULATING AIR BLOWER RUNNING 30 SEC. AFTER FURNACE LIGHTS
No
IS 120 VAC ACROSS N AND HEAT?
Yes
CHECK WIRING THEN REPLACE BLOWER
Yes
No
REMOVE R & W JUMPER, JUMPER ACROSS R & Y
CHECK WIRING THEN REPLACE BLOWER BOARD
END
Yes
IS BLOWER RUNNING ON COOLING SPEED?
No
CHECK WIRING, THEN REPLACE BOARD

GAS FIRED HEAT/COOL FURANCE - HONEYWELL SPARK IGNITION SYSTEM



WIRING SCHEMATIC



CONNECTION DIAGRAM