

USERS INFORMATION MANUAL

WARNING

Fire or explosion hazard.

Information in this manual
MUST be followed exactly.

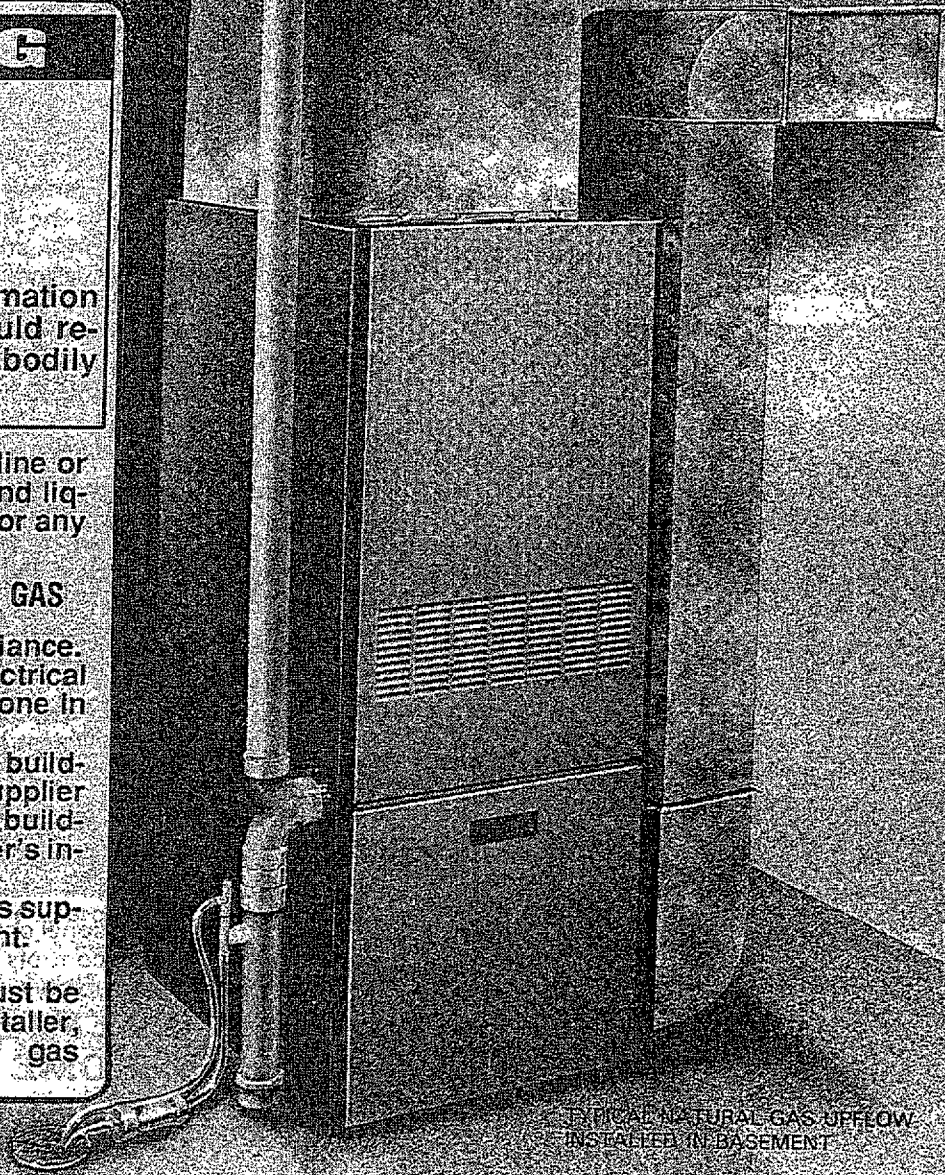
Failure to follow the information
in this manual exactly could re-
sult in property damage, bodily
injury, or death.

— Do not store or use gasoline or
other flammable vapors and liq-
uids in the vicinity of this or any
other appliance.

— WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical
switch; do not use any phone in
your building.
- Immediately evacuate the build-
ing and call your gas supplier
from a phone outside the build-
ing. Follow the gas supplier's in-
structions.
- If you cannot reach your gas sup-
plier, call the fire department.

— Installation and service must be
performed by a qualified installer,
service agency or the gas
supplier.



TYPICAL NATURAL GAS UPFLOW
INSTALLED IN BASEMENT

CONDENSING GAS FURNACES

SAVE THIS MANUAL FOR FUTURE REFERENCE

1008277
9-25-92
LP. 1

PRINTED IN U.S.A.

SAFETY REQUIREMENTS

Your furnace is built to provide many years of safe and dependable service, providing it is properly installed and maintained. However, abuse and/or improper use can shorten the life of the furnace and create hazards for you, the homeowner.

WARNING

IMPROPER INSTALLATION, ADJUSTMENT, OPERATION, SERVICE, REPAIR, MAINTENANCE, OR ALTERATION OF THIS PRODUCT MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY OR DEATH FROM HAZARDS SUCH AS FIRE, EXPLOSION, SMOKE, SOOT, CONDENSATION, ELECTRIC SHOCK OR CARBON MONOXIDE.

The following rules and recommendations should be followed to insure safe and efficient operation of your furnace.

1. Thoroughly read this manual and all labels on the furnace to help you understand how your furnace operates and the hazards involved with gas and electricity.
2. Do not use this furnace if any part has been under water. Immediately call a qualified service technician to inspect the furnace and to replace any part of the control system and any gas control which has been under water.
3. Make sure the furnace is always connected to an approved vent, in good condition, to carry combustion products outdoors.
4. Never obstruct the vent grilles, or other means that provide air to the furnace for proper combustion and ventilation of flue gases. If any structural changes are made, such as enclosing the furnace area, or if you add weather stripping, storm windows or another fuel burning appliance in the same area, have a qualified service agency check the combustion air supply.
5. Familiarize yourself with the possible air starvation signals outlined in the Combustion Air and Indoor Humidity section and perform the checks to determine if combustion air is adequate.
6. Maintain safety and service clearances from the furnace as listed on Furnace Clearance Label inside the cabinet. Keep the furnace room or area clean and free of combustible materials at all times. Never store gasoline, paint, aerosol cans, waxes, bleaches, dry cleaning fluid or items such as papers, rags, brooms or dust mops near the furnace.
7. If your furnace is installed in an area with loose fill or exposed insulation, the insulating material must be kept free and clear of furnace as some insulation is combustible. If additional insulation is added make sure the furnace area is checked.
8. Familiarize yourself with the controls that shut off the gas and electrical power to the furnace. If the furnace is to be shutdown, for any length of time, turn off both the gas and electrical power. For safety always turn them off before performing service or maintenance on the furnace.
9. Establish a regular service and maintenance schedule to insure efficient and safe operation of the furnace. It is recommended that you have a qualified service agency perform a complete check on the furnace, before each heating season. See Service Technician Checks.

SERVICE TECHNICIAN CHECKS

When the furnace is being inspected for condition and operation have the Service Technician check the following items.

For additional information the Service Technician can consult the installation instructions and applicable service manual for the furnace.

1. Check for adequate combustion air being supplied to the furnace area and all air openings into or from the furnace.
2. Check all flue gas passages including main and pilot burners, heat exchanger, and vent pipe.
3. Check gas pipe and all connections inside and leading to the furnace for leaks.
4. Check electrical wiring and connections.
5. Check supply and return air ducts for leakage, blockage and connections to furnace.
6. Check circulating air blower wheel and motor, clean and lubricate if required.

7. Perform an operational checkout on the furnace to be sure safety controls function and that furnace operates properly.

FREEZING TEMPERATURES AND YOUR HOME

Your furnace is equipped with safety devices that may keep it from operating if there are any abnormal conditions affecting the furnace and L.P. models may not operate if there is even a brief or slight interruption in the electric power or gas supply.

If your furnace remains shut down long enough during freezing temperatures, for water pipes to freeze it could result in serious water damage.

If your home will be unattended during this time you should take these precautions.

1. Shut the water off at the main inlet into your home and drain the water lines if possible.
2. Have someone check your home as often as necessary for temperature conditions that could cause water damage. Suggest they call a qualified service agency if required.

COMBUSTION AIR/INDOOR HUMIDITY

(How They Affect Your Safety and Comfort)

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.

Your home needs to breathe and the different temperatures and humidity ranges in your home during the year makes it necessary to be sensitive to air requirements and potential ventilation problems.

Because of high energy costs for home heating, new materials and methods are being used in construction and remodeling. The improved construction and additional insulation has made these homes much tighter around windows and doors so that air leakage is minimal. This may create a problem in supplying enough combustion and ventilation air for gas-fired or other fuel burning appliances. Fresh air is needed for combustion and ventilation of flue gases.

1. How do I know if my furnace or other appliances are receiving enough air for proper combustion and ventilation of flue gases?

Use the following checkout procedure to determine if the air leakage into your home is adequate to supply the needs of your appliances and fireplace. If you are uncertain about your ability to perform these checks contact your installing dealer or place of purchase.

A. Make the inspection as follows:

1. Close all doors and windows. If you have a fireplace, start a fire and wait until flames are burning vigorously.
2. Turn on all exhausting devices, such as: kitchen and bathroom exhaust fans - dryers (gas or electric)
3. Turn on all vented gas appliances, such as: heating equipment (includes any room heaters) water heaters.
4. Wait ten (10) minutes for drafts to stabilize.

An energy efficient home or a home using exhaust fans, fireplaces, clothes dryers, and gas appliances increases this problem and your appliances could be starving for air, which is unsafe.

This may result in more and more air being drawn from the house until fresh air is sucked in through an appliance flue or fireplace chimney. **Carbon monoxide can be the result.**

Carbon monoxide or "CO" is a colorless and odorless gas produced when fuel is not burned completely or when the flame does not receive sufficient oxygen.

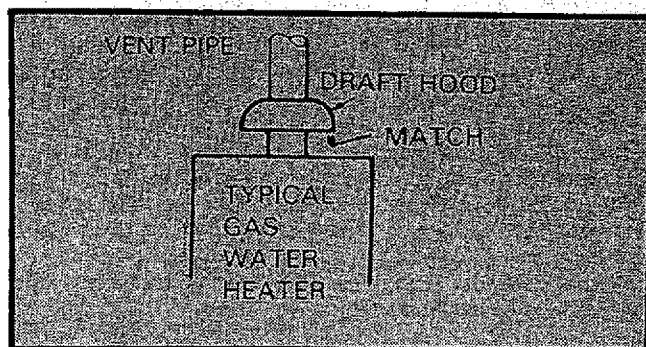
CARBON MONOXIDE CAN RESULT IN ASPHYXIATION.

Be aware of these air starvation signals:

1. Headaches-Nausea-Dizziness
2. Excessive humidity-Heavily frosted windows or a moist "clammy" feeling in the home.
3. Smoke from the fireplace won't draw up the chimney.
4. Flue gases won't draw up the appliance flue pipe.

5. Check for draft hood spillage at each appliance. (Hold a lighted match 2" from draft opening as shown for the typical gas water heater.)

FIG. 1 CHECK FOR DRAFT HOOD SPILLAGE



B. No Spillage -

If match flame pulls toward draft hood, this indicates sufficient infiltration air. Return exhausting devices and appliances to the condition you found them.

Combustion Air and Indoor Humidity (Cont.)

C. Draft Hood Spillage -

If there is spillage at a draft hood - (match goes out or flame wavers away from draft hood):

1. Check for plugged flue connectors and chimneys. Check and repair stoppage and test again.
2. If you have a fireplace, open a window or door near the fireplace and then check for spillage.
 - a. If spillage stops, do not use the fireplace until you can supply fresh air by a permanent duct.
3. If you have kitchen and bathroom exhaust fans turn them off and check for spillage.
 - a. If spillage stops, do not use exhaust fans until you can supply fresh air by a permanent duct. Circuit breakers for fans should be turned off.

WARNING

DRAFT HOOD SPILLAGE CAN CAUSE BODILY INJURY OR DEATH FROM ASPHYXIATION. SPILLAGE INDICATES THAT ADDITIONAL AIR MUST BE BROUGHT INTO THE STRUCTURE FROM THE OUTSIDE. KEEP A WINDOW OPEN (MINIMUM 2" NEAR THE APPLIANCE UNTIL A PERMANENT AIR DUCT IS INSTALLED. CONTACT A QUALIFIED SERVICE AGENCY.

4. Spillage means air starvation and a fresh air duct or air intakes must be installed to provide air directly to the furnace or other gas appliance. These must comply with local and state building codes or in their absence with the National Fuel Gas Code NFPA 54/ANSI Z223.1, current edition.

2. What is Relative Humidity and how do I know if it is too high or low?

Relative humidity is the amount of water vapor in the air relative to the amount the air can hold at the same temperature. Example: At 40% relative humidity, the air can hold 60% more moisture before it is saturated.

The colder the air, the less moisture it can hold. As air is warmed, its ability to hold moisture is increased. Example: A winter day, outdoor temperature 10°F, and relative humidity of 70%. If that air enters a home and is warmed to 72°F the relative humidity will drop to 6% (very dry) if no more moisture is added.

Relative humidity is important to your health and home as proper humidification helps cut down on incidences of respiratory illness and helps keep air cleaner and fresher.

HAS YOUR FURNACE BEEN REPLACED?

This furnace is very efficient and has a much smaller vent (flue) pipe with a blower in the venting system.

The smaller vent and blower increases the efficiency of the furnace but they will also decrease the amount of natural air infiltration into the house. This is because less air will escape up the vent system during the off cycle so less cold dry air will enter the house by infiltration. This in conjunction with other items may cause the humidity to raise to uncomfortable levels. This condition can usually be eliminated by minor changes in everyday routines, see "If Humidity Is Too High".

VISUAL METHODS OF GAUGING INDOOR HUMIDITY:

- Frequent fogging or excessive condensation on inside windows indicates the indoor humidity level is too high for outdoor weather conditions. Damage to the building may result if the condition persists. (Condensation on inside of storm windows indicates loose inside windows. Adding weatherstripping to tighten inside windows usually corrects this problem.)
- Drop three ice cubes into a glass of water and stir. If, within three minutes, moisture does not form on the glass, the air is too dry and a humidifier would be beneficial. (Do not perform this test in the kitchen, as cooking vapors may produce inaccurate results.)

A good relative humidity is one just high enough to barely start condensation along the lower edges or lower corners of the windows. More than that can be damaging.

IF HUMIDITY IS TOO HIGH....

Condensation occurs when warm, moist air contacts a cool surface (window or outside wall, for example), and drops of water or a coating of frost form. The condensation problem increases as the outside temperature decreases.

A high humidity level usually results from bathing or cooking, etc. Suggestions for correcting this problem:

1. Turn down or discontinue use of humidifier.
2. Use range and bathroom exhaust fans while cooking and bathing or open a door or window for a few minutes to bring in cool dryer air.
3. Cook with pans covered.
4. Take shorter baths or showers with cooler water.
5. Install a fresh air intake duct. Cold, dry air brought in from outside to the furnace area lowers the indoor humidity level.
6. If the above measures do not correct the problem, have appliances checked. A malfunctioning appliance can contribute water vapor to the house.
7. If the above items do not correct the problem consult a heating contractor about adding a heat recovery ventilator or air to air heat exchanger.

RECOMMENDED INDOOR HUMIDITY:

Use the following table as a guide. It shows the recommended maximum indoor humidity in relationship to the outdoor temperature.

TEMPERATURE	HUMIDITY
+ 20°F and above	35%
+ 10°F	30%
0°F	25%
-10°F	20%
-20°F	15%

YOUR FURNACE

Condensing furnaces have a higher efficiency rating than conventional gas furnaces, but are basically the same in design and operation. The major difference is the addition of a secondary heat exchanger which captures heat that would normally go out the furnace vent pipe.

By capturing this heat the flue gases are cooled to a point where most of the vapor (mainly water) condenses out and must be drained away. Because the gases are cooled down plastic pipe is used for the vent pipe in place of metal.

The following paragraphs and illustration will help you to understand the main parts of your furnace and how they operate.

DOOR INTERLOCK SWITCH

All of the electrical power for the furnace goes through the Door Interlock Switch and the furnace will not operate if the Blower Door is not properly in place.

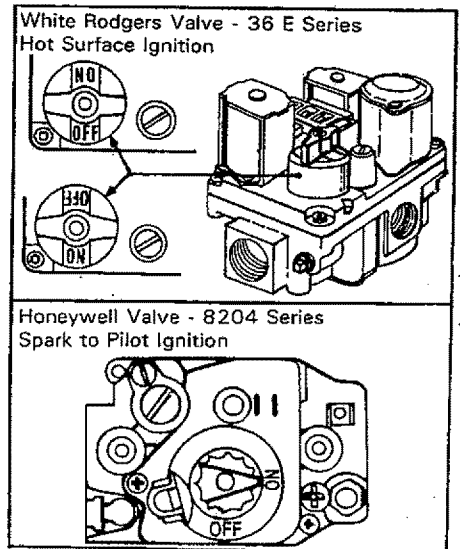
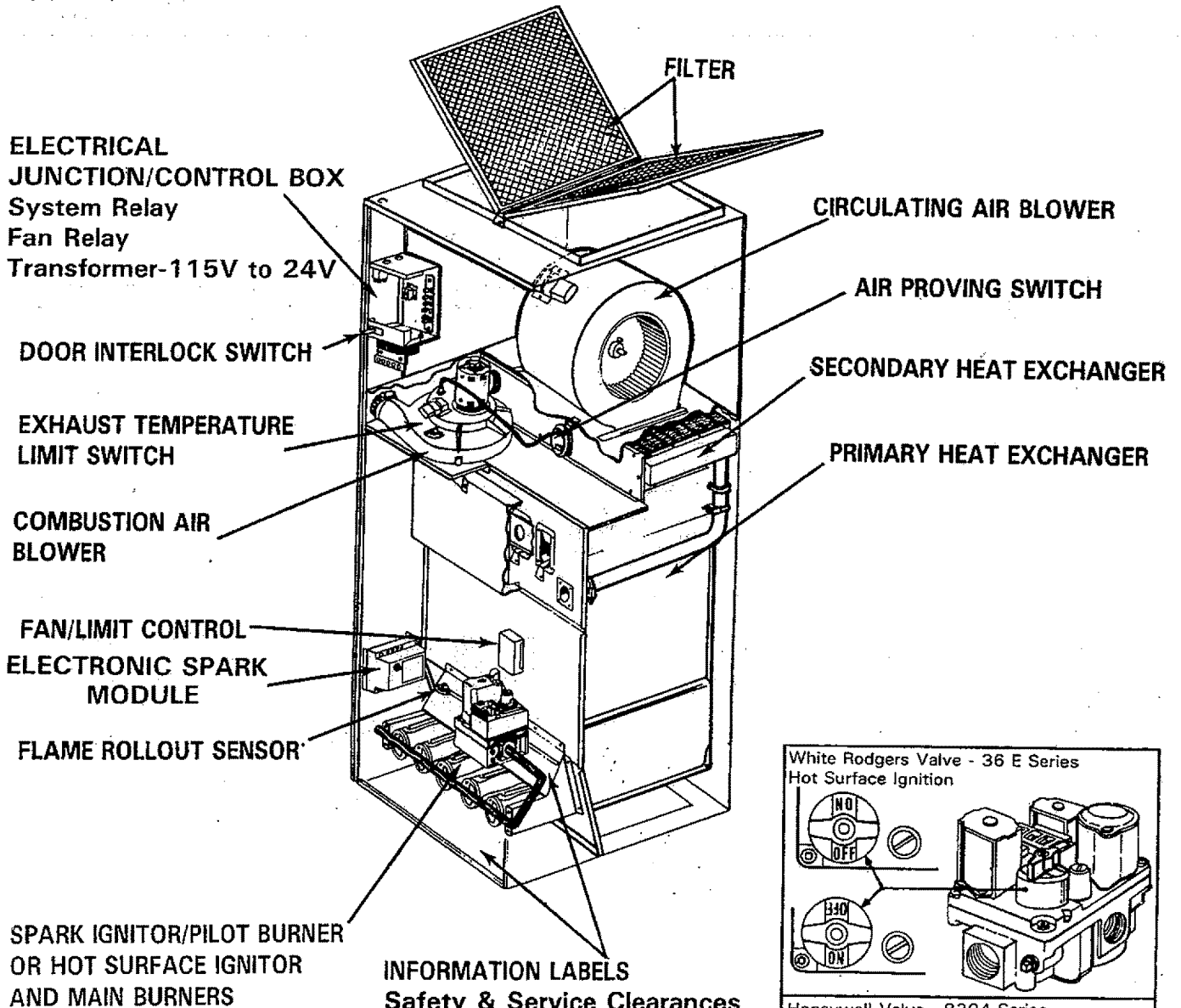


FIG. 2
TYPICAL COUNTERFLOW

Your Furnace (Cont.)

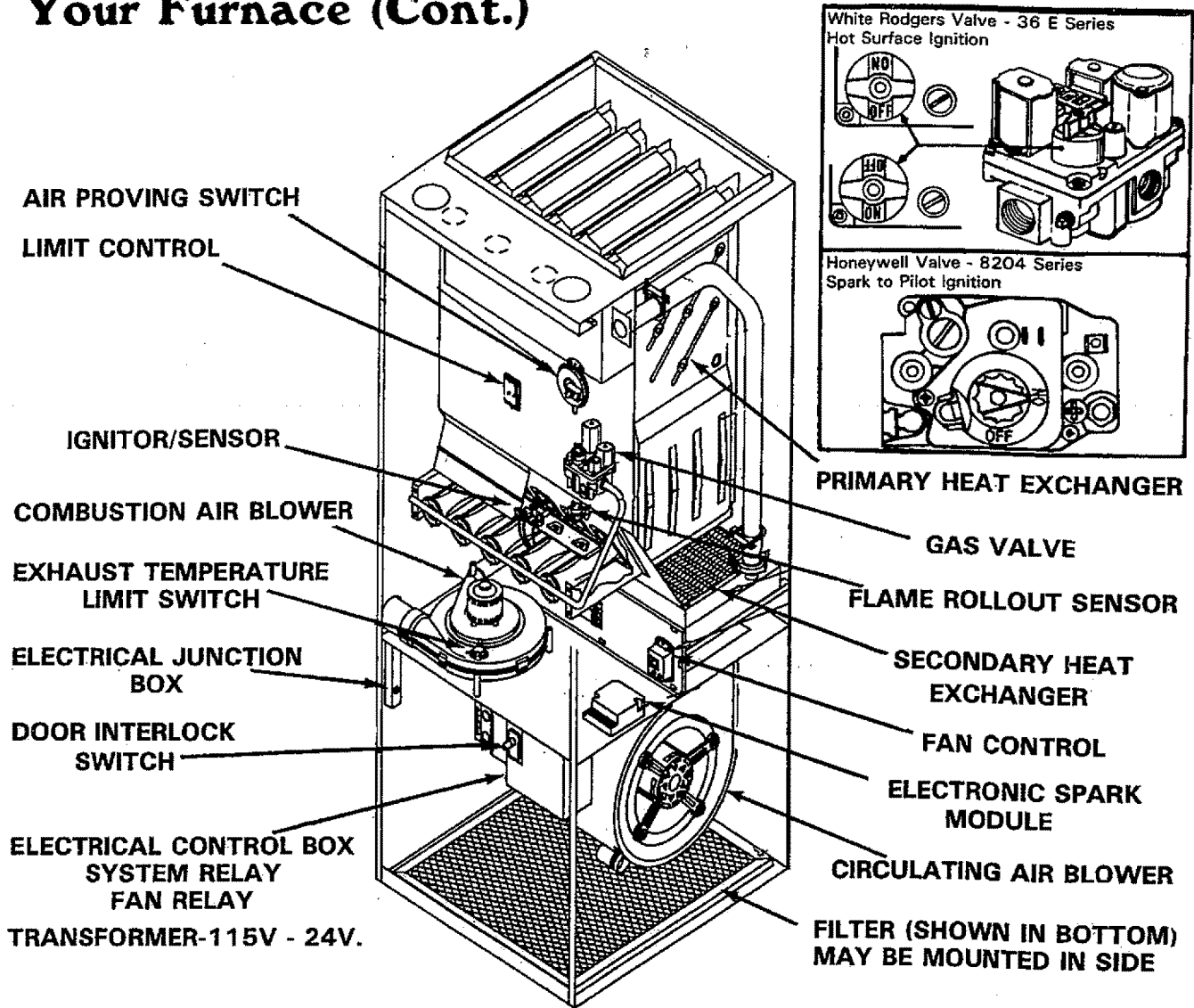


FIG. 3

TYPICAL UPFLOW

THERMOSTAT

See separate description under "Thermostat". As the temperature in your home drops the thermostat closes and completes a low voltage (24V) control circuit to the System Relay inside the control box. This relay closes and provides power to the Electronic Ignition Module, and Combustion Air Blower. The thermostat also completes a circuit to an internal heater inside the Fan/Limit Control. This allows more precise Fan "ON" control to help maintain comfortable temperatures in your home.

ELECTRONIC SPARK MODULE/GAS VALVE

When the thermostat calls for heat it completes a low voltage (24V) circuit to the electronic ignition module. The module either starts an electric spark or activates a hot surface ignitor to ignite the gas as the gas valve opens letting gas through to pilot or main burner. When the flame is firmly established the module will shut off. For safety it will automatically restart if the

flame is interrupted. If there is an abnormal function, the gas valve is designed to automatically shut off the gas.

COMBUSTION AIR BLOWER

The System Relay closes to start the Combustion Air Blower which exhausts the vent gases out through the vent pipe. The blower creates a pressure differential inside the furnace which provides the right amount of induced draft (air) to properly control combustion for maximum efficiency. This part of the system provides several safety features as the electrical circuit for the Electronic Ignition Module/Gas Valve must go through a Flame Roll Out Sensor, Air Proving Switch, Exhaust Temperature Limit Switch and the temperature limit portion of the Fan/Limit Control. If the right amount of air is not going through the furnace or if temperatures are too hot the electrical circuit to the Electronic Ignition Module/Gas Valve will be interrupted.

Your Furnace (Cont.)

CIRCULATING AIR BLOWER

The blower to circulate room air through the furnace starts as soon as the internal heater in the Fan/Limit control causes the fan switch portion to close completing the electrical circuit.

It shuts off when the Fan/Limit Control opens the electrical circuit. This means the blower comes on approximately 30 seconds after the furnace first starts and it continues to run until the furnace cools down. This helps to achieve the maximum comfort and efficiency from your furnace.

FAN RELAY

This relay provides electric power to the Circulating Air Blower for continuous blower operation (Thermostat Fan Switch set to "FAN ON") and for the blower to run if central air conditioning is installed.

FAN/LIMIT CONTROL

The Fan/Limit Control provides power to the Circulating Air Blower to keep it on, until the furnace cools down. The limit portion provides safety because it will open the low voltage control circuit, shutting the furnace down if it gets too hot.

The fan off setting can be adjusted if the fan remains on long enough that cool drafts are felt in the room after the furnace shuts off. Contact a Qualified Service Technician.

DRAIN TRAP ASSEMBLY

The drain trap has a float in it, that will cause the furnace to shut down if the drain lines become obstructed. If this happens the trap and lines must be taken apart and cleaned. See "Condensate Disposal" page 10.

Thermostat

Your furnace will not operate properly without a good quality, correctly installed thermostat. The thermostat location is very important as it must be sensing average room temperatures. It must not be exposed to hot or cold drafts or hot or cold spots on the wall, such as outside walls or a wall with pipes inside or openings into attic.

There are many types and styles of thermostats but the operation is usually similar. **BE SURE TO BECOME FAMILIAR WITH YOUR THERMOSTAT.** The simplest type of thermostat only starts and stops the furnace to maintain the proper room temperature. The most widely used types will control both heating and cooling functions and will have a Fan Switch with Auto and ON settings. On Auto, the Circulating Air Blower will cycle on/off with the furnace but if switched to ON it will run constantly whether or not the furnace is on.

In addition there are thermostats that automatically switch from Heating to Cooling and with night set-backs. The night set-back, or multiple set-back type, will lower the temperature at night or during the day when no one is at home.

HEATING:

Position the Thermostat System Switch on HEAT. Set the Fan Switch to AUTO for the blower to cycle ON/OFF. Select desired temperature setting and furnace will automatically start up and shut off as required to maintain that setting. Fan Switch may be positioned to ON for continuous air circulation only if that position maintains the same or a higher blower speed so you have the same or greater airflow.

CAUTION

Continuous Fan ON at too slow of a blower speed may cause improper furnace operation and possible damage to the heat exchanger.

HEATING ANTICIPATOR:

For more precise comfort control your thermostat may have an adjustable Heat Anticipator. (Some are not adjustable). For most homes the anticipator should be set on the value listed in the Tech Data Sheet which is found in the Furnace Technical Support Manual.

If your furnace cycles ON/OFF with very short ON intervals or if the OFF cycle is so long that room temperatures become uncomfortable the anticipator setting may need to be adjusted.

To Adjust:

Remove thermostat cover and locate anticipator. Check the setting. If not on the setting recommended for your furnace, move the lever to the proper setting and try it for a day or two.

To lengthen burner-on time move the indicator towards "Longer". To decrease burner-on time move in opposite direction.

NOTE

To accurately determine the effect do not adjust more than half a scale marking at a time and allow a day between adjustments.

COOLING:

For cooling simply position the system switch to COOL instead of HEAT and thermostat will function in the same manner to control cooling.

Operating Your Furnace

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

Before starting your furnace be sure you read and understand all of the procedures in this manual. Check to make sure the furnace filter is clean and correctly installed.

STARTING THE FURNACE

WARNING

DO NOT ATTEMPT TO LIGHT THE BURNER WITH A MATCH OR FLAME OF ANY KIND. YOU COULD BE INJURED.

See page 5 or 6 for location and illustration of gas valve.

1. Turn the thermostat to its lowest temperature setting or to OFF if equipped with a System Select Switch.
2. Turn Manual Shutoff Valve, in the gas line, to OFF position, should be a right angle or 90° to gas line.
3. Turn OFF electric power to furnace at disconnect switch or circuit breaker.
4. Remove furnace access panel, exposing gas controls and burner compartment.
5. Locate gas valve and identify settings. The valve is marked with ON — OFF positions.
6. Turn the knob all the way to OFF. Make sure it has been in OFF for at least 5 minutes before proceeding.
7. Turn the control knob to ON (Depress knob to turn on some Honeywell valves).
8. Replace access panels and doors.
9. Turn ON electric power for furnace.
10. Open the Manual Shutoff Valve in the gas-line.
11. Set thermostat to desired temperature and System Select Switch to HEAT if equipped.

The furnace will begin sparking to ignite the pilot flame or the hot surface ignitor will heat up to ignite the gas. When the system verifies a steady flame the ignition system will shut off.

With Spark to Pilot Ignition (System Retries)

The ignition system will spark to light the pilot for 90 seconds. If the pilot does not light within 90 seconds the system will shut off for 5 minutes and then it will try again for 90 seconds. It will continue to cycle until the pilot lights, (90 seconds ON/5 minutes OFF).

If the unit does not start after 3 tries or approximately 20 minutes, shut the unit off at the thermostat and call a qualified Service Agency.

WITH HOT SURFACE IGNITION SYSTEM

Furnace will make several attempts to lite before going into lockout. Each attempt requires a longer time with the total cycle taking approximately 8-10 minutes.

If air remaining in the lines on a new installation prevents the furnace from lighting ONE additional cycle may be tried. If furnace does not light, turn the thermostat to its lowest setting. Wait one minute, then turn it back up above the temperature shown on the thermometer. This starts the ignition cycle over again. **DO NOT REPEAT MORE THAN ONCE.** If furnace will not light, call a qualified Service Agency.

TURNING OFF THE FURNACE

1. Set the thermostat to the lowest setting or set System Select Switch to OFF if equipped.

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

EXTENDED SHUTDOWN

1. Set thermostat to lowest setting or set System Select Switch to OFF if equipped.
2. Turn Manual Shutoff Valve to off position, right angle or 90° to gas line.
3. Turn electric power off. (May be left "ON" for set-back or chronograph type thermostat with batteries, provided thermostat has a system select switch to place in the "OFF" position.)
4. Turn the gas valve control knob to "OFF".

Winter Shutdown

If there is the possibility of freezing temperatures, remove the condensate drain trap and empty to prevent freezing.

L P Model Furnaces

WARNING

If your L.P. (liquefied petroleum) gas furnace is installed in a basement, an excavated area or a confined space, we recommend that you contact your L.P. supplier about installing a warning device that would alert you to a gas leak. We recommend this because L.P. gas is heavier than air and any leaking gas can settle in any low areas or confined spaces. This L.P. gas would create a **DANGER OF EXPLOSION OR FIRE**. If you suspect the presence of gas, follow the instructions on the cover of this manual.

FURNACE MAINTENANCE

It is recommended that you have your furnace inspected and serviced on an annual basis (before the heating season) by a qualified service technician.

You may perform maintenance on the furnace yourself, but remember that certain mechanical and electrical skills and tools are required to properly perform maintenance on the furnace. Personal injury or death may result if you are not properly trained. You should call your installing dealer or place of purchase if you are uncertain about your ability to perform maintenance.

WARNING

TURN OFF ELECTRIC POWER TO FURNACE BEFORE PERFORMING ANY MAINTENANCE OR REMOVING PANELS BECAUSE OF THE DANGER OF ELECTRICAL SHOCK

AIR FILTERS — Monthly

The air filter(s) should be inspected at least monthly and cleaned or replaced as required. There are two types of filters most commonly used. The most widely used is the fiberglass disposable type which should be replaced before it becomes clogged. The other type commonly in use is the washable type constructed of aluminum mesh, foam, or reinforced fibers. Washable filters may be cleaned by soaking in mild detergent and rinsing with water.

NOTE

Some filters are marked with an arrow to indicate the proper direction of air flow through the filter. When installing the arrow must point in the direction of the air flow. Remember that dirty filters are the most common cause of inadequate heating or cooling performance.

The table on page 10 lists recommended sizes and types of filters that may be used with your furnace, based on the input rating and nominal tons of air conditioning that may be used with the furnace.

However, the furnace installer may have used a larger filter for additional air volume or if the furnace was installed for Heating Only with a remote filter cabinet or central return he may have installed a smaller filter. If air conditioning has been added since your furnace was installed, make sure the filter size is adequate.

Replacement filters should be of the same type and size to ensure adequate air flow and filtering, unless a disposable low velocity filter is replaced with a washable high velocity type.

Filter Replacement

The filter will normally be found inside the furnace blower compartment, see pages 5 and 6, but alternate locations may be a remote filter rack attached to the outside of the furnace, a separate return air cabinet attached to furnace or a remote filter grille.

Remote filter grilles and return air cabinets will usually have a hinged door or removable panel to be able to remove filter. Filter racks attached to the furnace will usually be made so the filter simply slides out one side for removal. Use only the same size filter. The type must be the same unless replacing a disposable low velocity type, with a washable high velocity type.

WARNING

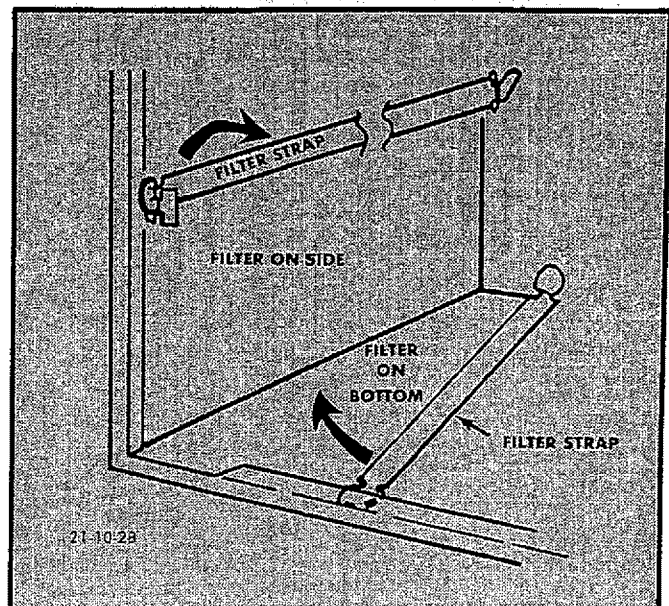
NEVER OPERATE FURNACE WITHOUT A FILTER INSTALLED AS DUST AND LINT WILL BUILD UP ON INTERNAL PARTS RESULTING IN LOSS OF EFFICIENCY, EQUIPMENT DAMAGE AND POSSIBLE FIRE.

Filter Replacement/Upflow (Hi-Boy)

See Figure 4

1. Turn off electric power for furnace at circuit breaker or disconnect switch.
2. Remove blower compartment door.
3. Pull back on filter clip and remove filter being careful not to dislodge dirt and debris from filter.
4. Inspect filter and replace or clean washable type. If filter is aluminum mesh it should be recoated with filter coating spray.
5. Reinstall filter under clips. If filter is marked for air flow direction make sure it's installed correctly.
6. Replace blower compartment door making sure that it's tightly closed.
7. Turn on electric power for the furnace.

FIGURE 4 FILTER REPLACEMENT



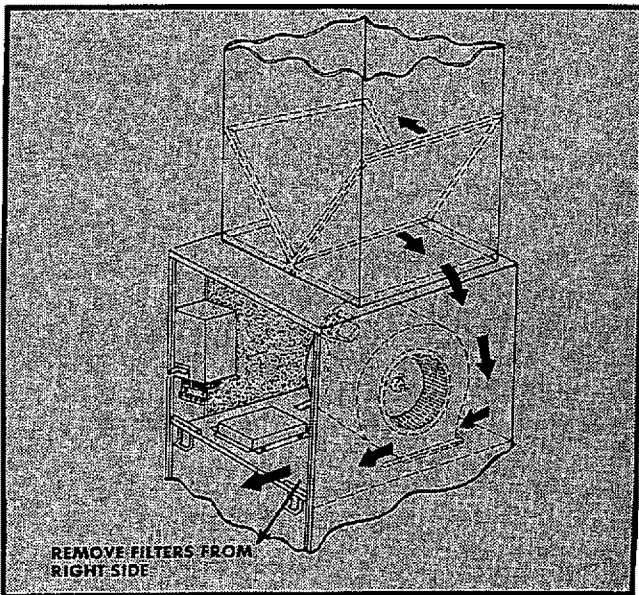
Furnace Maintenance (Cont.)

Filter Replacement/Counterflow

See Figure 5

1. Turn off electric power for furnace at circuit breaker or disconnect switch.
2. Remove blower compartment door.
3. Reach up through right side and lift upward and swing top of filter towards center of furnace then pull filter down and remove being careful not to dislodge dirt and debris from filter.
4. Inspect filter and replace or clean washable type. If filter is aluminum mesh it should be recoated with filter coating spray.

FIG. 5 COUNTERFLOW FILTER REPLACEMENT



5. Reinstall left filter first. If filter is marked for air flow direction make sure it's installed correctly.
6. Replace blower compartment door making sure that it's tightly closed.
7. Turn on electric power for the furnace.

FIG. 6 RECOMMENDED REMOTE FILTER SIZES

Nominal Tons Air Conditioning Nominal Air Flow Cubic Feet per Minute	Recommended Filter Sizes Sq. Inch Surface Area/Nominal Size		Furnace Size 1000 X BTUH
	Disposable Filters	Cleanable Filters	
Up Thru 2 Tons 800-900 CFM	432 20X25	260 15X20	40 50 75 (counterflow) (only)
2½ Tons 900-1100 CFM	480 20X30	288 14X25	40 50 75 100
3 Tons 1100-1300 CFM	576 14X25(2)	346 16X25	40 50 75 100
3½ Tons 1300-1500 CFM	672 16X25(2)	404 20X25	100 125 75 (upflow only)
4 Tons 1500-1700 CFM	768 20X25(2)	461 20X25	125 100 (upflow only)
4½ Tons 1700-1900 CFM	864 20X25(2)	519 24X25	125
5 Tons 1900-2100 CFM	960 20X30 (2)	576 24X25	125

CONDENSATE DISPOSAL Monthly/Annually

Your furnace has a condensate trap as part of the vent system. The moisture in the flue gases will condense and collect in the trap to go to an inside drain or be pumped to a sewer line using a condensate pump.

The Condensate Trap and Condensate Neutralizer Cartridge (if used) in the drain line leading from the trap will require some maintenance. Disassemble and clean trap and cartridge prior to each heating season or if drain line becomes plugged.

Inspect the drain line and overflow line at least monthly. If the Condensate Neutralizer Cartridge becomes plugged the condensate will flow through the overflow line. If this happens clean both cartridge and trap.

TO CLEAN: Disconnect the drain line cartridge and unscrew end cap from cartridge. Pour the neutralizer out and thoroughly flush neutralizer and inside of cartridge with water. Pour neutralizer back into cartridge, adding neutralizer if cartridge is less than ¾ full. Unscrew trap from Vent Connecting Tee and flush thoroughly with water, use soap if necessary to clean, **DO NOT USE** any kind of solvents. Make sure float is reinstalled in trap, Ref. Fig. 7.

Reassemble and seal threaded connections with silicone rubber (bathtub caulk) or pipe dope approved for plastic pipe.

See repair parts section in the Furnace Technical Support Manual, to order replacement neutralizer.

Do not use Condensate for any reason as it is acidic.

FURNACE CONDITION AND FLUE GAS PASSAGES/Monthly

A properly adjusted gas furnace should not require cleaning at frequent intervals, but it should be inspected regularly to ensure safe and efficient operation. A brief monthly inspection is recommended that does not require disassembly. In addition you should have the furnace inspected, and cleaned if required, by a qualified service technician annually.

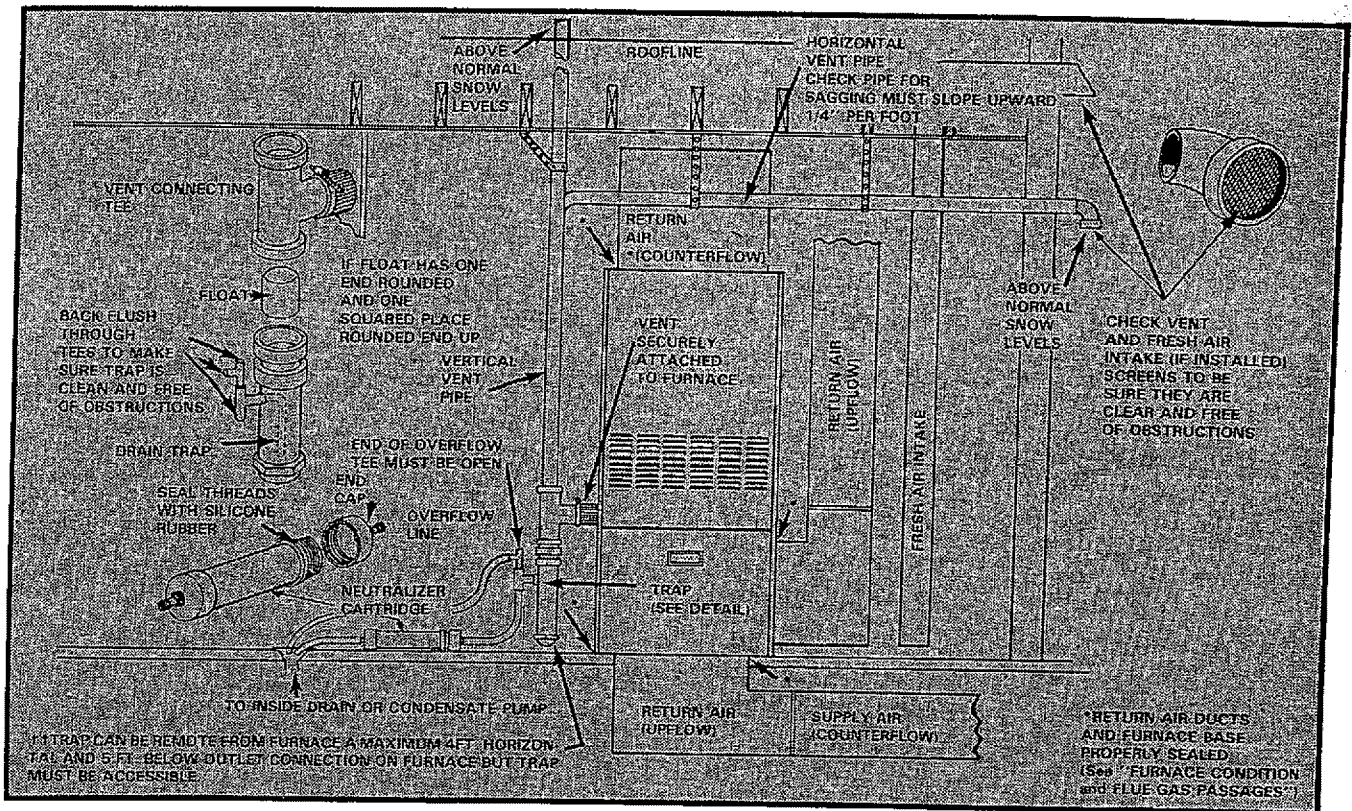
During the monthly inspection check the vent pipe and fresh air intake (if installed), to be sure they are clear and free of obstructions. Check vent pipe for evidence of condensate leakage, tight joints, secure attachment to furnace and sagging pipe.

Horizontal sections of pipe must slope upward 1/4" per foot except sections between furnace and drain trap when trap is not mounted directly on furnace. Any horizontal section (max. 4' long) must slope down a minimum of 1/4" per foot to trap. Vertical sections to trap can be a maximum of 5 feet.

Check return air duct to make sure it is sealed to furnace casing and that it is in good physical condition. It must terminate outside the space containing the furnace with no holes or inlets in furnace space.

Furnace Maintenance (Cont.)

FIG. 7 TYPICAL INSTALLATION



The floor or furnace base must be in good physical condition. For Upflow Furnace with a bottom return the floor or base area around the furnace must form a seal (no sagging, cracks defects etc.) to prevent air from being pulled in from furnace area, or any defect area must be sealed between floor or base and furnace.

Remove the front panel and use a flashlight to inspect the visible part of the heat exchanger, burners and ignitor. Check for loose soot and give particular attention to obvious deterioration from corrosion or other sources. Check for any signs of condensate leakage inside furnace cabinet.

If soot or deterioration is found or if there is evidence of condensate leakage inside furnace **DO NOT OPERATE FURNACE.**

Call a qualified service technician.

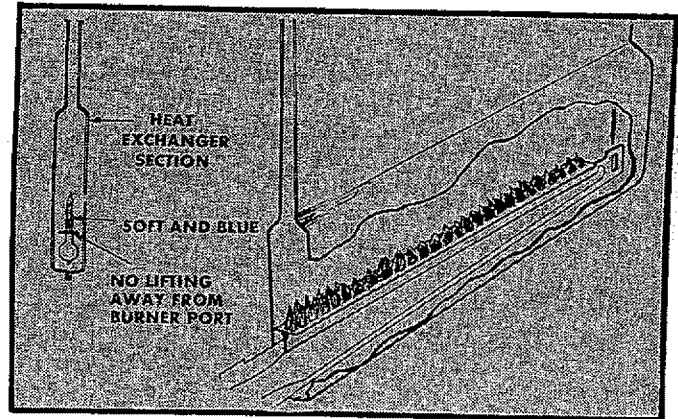
MAIN BURNER & PILOT FLAMES/Monthly

Allow furnace to run approximately 10 minutes then inspect the main burner flames and pilot flame (except furnaces with Hot Surface Ignition).

MAIN BURNER FLAMES should be stable, soft and blue, (dust may cause orange tips or they may have wisps of yellow but they must not have solid yellow tips). They should extend directly upward from burner without curling, floating or lifting off. They must not touch the sides of the heat exchanger.

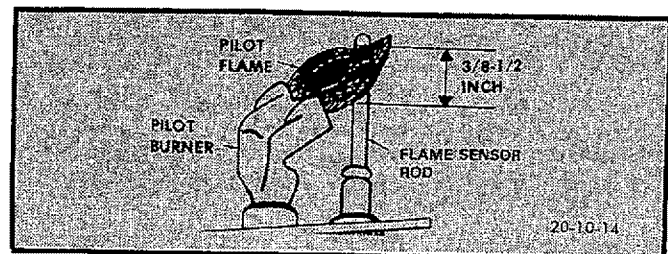
Contact a qualified service agency at once if an abnormal flame appearance should develop.

FIG. 8 MAIN BURNER FLAME



PILOT FLAME should surround 3/8" to 1/2" of the ignitor/sensor tip.

FIG. 9 PILOT FLAME



Furnace Maintenance (Cont.)

BLOWER MOTOR

Motor will require lubrication every five (5) years or normal operation. Add 1/2 teaspoon (2 cc) of SAE #10W30 motor oil to each motor bearing through oil tubes or by removing cap plugs in motor end bells.

CAUTION

DO NOT over oil or use 3 in 1 oil, penetrating oil, WD40 or similar oils on oil motor bearings. Use of these may damage these motors.

SERVICE HINTS

If your furnace fails to operate properly, you may avoid inconvenience and the cost of a service call by checking the following points before you call for service.

NO HEAT OR NOT ENOUGH HEAT...

POSSIBLE CAUSE

Thermostat not set correctly.

No electric power to furnace.

Filter is dirty.

Gas is shut off.

Warm air registers closed or blocked.

Return grilles blocked.

Vent Pipe is obstructed or Drain lines on Condensate Trap are obstructed causing float to rise and block vent pipe.

WHAT TO DO

Set above room temperature. On heating/cooling systems, turn system switch to "Heat"; fan switch to "Auto" or "On" (continuous fan operation).

Check fuse or circuit breaker. Replace blown fuse. Reset breaker. Turn switch on. Be sure blower access door is securely installed. Clean filter.

Turn gas valve on.

Open registers. Move rugs, furniture, other obstructions.

Furnace has a pressure switch in the vent system which interrupts the electrical circuit. If the furnace is vented horizontally check the outlet area to make sure it is not obstructed. Check drain lines and Condensate Trap.

FURNACE RECORD

Model No. _____

Furnace Size (Btuh) _____

Serial No. _____

Where Purchased _____ Date _____

Installer _____ Date _____

Dealer _____ Phone _____

Service History _____

Model No., Size, Serial No. etc. will be found on the Furnace Rating Plate, See Page 5.

USERS INFORMATION MANUAL

WARNING

Fire or explosion hazard.

Information in this manual
MUST be followed exactly.

Failure to follow the information
in this manual exactly could re-
sult in property damage, bodily
injury, or death.

— Do not store or use gasoline or
other flammable vapors and liq-
uids in the vicinity of this or any
other appliance.

— WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical
switch; do not use any phone in
your building.
- Immediately evacuate the build-
ing and call your gas supplier
from a phone outside the build-
ing. Follow the gas supplier's in-
structions.
- If you cannot reach your gas sup-
plier, call the fire department.

— Installation and service must be
performed by a qualified installer,
service agency or the gas
supplier.



CONDENSING GAS FURNACES

SAVE THIS MANUAL FOR FUTURE REFERENCE

1008277
9-25-92
LP. 1

PRINTED IN U.S.A.

SAFETY REQUIREMENTS

Your furnace is built to provide many years of safe and dependable service, providing it is properly installed and maintained. However, abuse and/or improper use can shorten the life of the furnace and create hazards for you, the homeowner.

WARNING

IMPROPER INSTALLATION, ADJUSTMENT, OPERATION, SERVICE, REPAIR, MAINTENANCE, OR ALTERATION OF THIS PRODUCT MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY OR DEATH FROM HAZARDS SUCH AS FIRE, EXPLOSION, SMOKE, SOOT, CONDENSATION, ELECTRIC SHOCK OR CARBON MONOXIDE.

The following rules and recommendations should be followed to insure safe and efficient operation of your furnace.

1. Thoroughly read this manual and all labels on the furnace to help you understand how your furnace operates and the hazards involved with gas and electricity.
2. Do not use this furnace if any part has been under water. Immediately call a qualified service technician to inspect the furnace and to replace any part of the control system and any gas control which has been under water.
3. Make sure the furnace is always connected to an approved vent, in good condition, to carry combustion products outdoors.
4. Never obstruct the vent grilles, or other means that provide air to the furnace for proper combustion and ventilation of flue gases.

If any structural changes are made, such as enclosing the furnace area, or if you add weather stripping, storm windows or another fuel burning appliance in the same area, have a qualified service agency check the combustion air supply.

5. Familiarize yourself with the possible air starvation signals outlined in the Combustion Air and Indoor Humidity section and perform the checks to determine if combustion air is adequate.
6. Maintain safety and service clearances from the furnace as listed on Furnace Clearance Label inside the cabinet. Keep the furnace room or area clean and free of combustible materials at all times. Never store gasoline, paint, aerosol cans, waxes, bleaches, dry cleaning fluid or items such as papers, rags, brooms or dust mops near the furnace.
7. If your furnace is installed in an area with loose fill or exposed insulation, the insulating material must be kept free and clear of furnace as some insulation is combustible. If additional insulation is added make sure the furnace area is checked.
8. Familiarize yourself with the controls that shut off the gas and electrical power to the furnace. If the furnace is to be shutdown, for any length of time, turn off both the gas and electrical power. For safety always turn them off before performing service or maintenance on the furnace.
9. Establish a regular service and maintenance schedule to insure efficient and safe operation of the furnace. It is recommended that you have a qualified service agency perform a complete check on the furnace, before each heating season. See Service Technician Checks.

SERVICE TECHNICIAN CHECKS

When the furnace is being inspected for condition and operation have the Service Technician check the following items.

For additional information the Service Technician can consult the installation instructions and applicable service manual for the furnace.

1. Check for adequate combustion air being supplied to the furnace area and all air openings into or from the furnace.
2. Check all flue gas passages including main and pilot burners, heat exchanger, and vent pipe.
3. Check gas pipe and all connections inside and leading to the furnace for leaks.
4. Check electrical wiring and connections.
5. Check supply and return air ducts for leakage, blockage and connections to furnace.
6. Check circulating air blower wheel and motor, clean and lubricate if required.

7. Perform an operational checkout on the furnace to be sure safety controls function and that furnace operates properly.

FREEZING TEMPERATURES AND YOUR HOME

Your furnace is equipped with safety devices that may keep it from operating if there are any abnormal conditions affecting the furnace and L.P. models may not operate if there is even a brief or slight interruption in the electric power or gas supply.

If your furnace remains shut down long enough during freezing temperatures, for water pipes to freeze it could result in serious water damage.

If your home will be unattended during this time you should take these precautions.

1. Shut the water off at the main inlet into your home and drain the water lines if possible.
2. Have someone check your home as often as necessary for temperature conditions that could cause water damage. Suggest they call a qualified service agency if required.

COMBUSTION AIR/INDOOR HUMIDITY

(How They Affect Your Safety and Comfort)

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.

Your home needs to breathe and the different temperatures and humidity ranges in your home during the year makes it necessary to be sensitive to air requirements and potential ventilation problems.

Because of high energy costs for home heating, new materials and methods are being used in construction and remodeling. The improved construction and additional insulation has made these homes much tighter around windows and doors so that air leakage is minimal. This may create a problem in supplying enough combustion and ventilation air for gas-fired or other fuel burning appliances. Fresh air is needed for combustion and ventilation of flue gases.

1. How do I know if my furnace or other appliances are receiving enough air for proper combustion and ventilation of flue gases?

Use the following checkout procedure to determine if the air leakage into your home is adequate to supply the needs of your appliances and fireplace. If you are uncertain about your ability to perform these checks contact your installing dealer or place of purchase.

A. Make the inspection as follows:

1. Close all doors and windows. If you have a fireplace, start a fire and wait until flames are burning vigorously.
2. Turn on all exhausting devices, such as: kitchen and bathroom exhaust fans - dryers (gas or electric)
3. Turn on all vented gas appliances, such as: heating equipment (includes any room heaters) water heaters.
4. Wait ten (10) minutes for drafts to stabilize.

An energy efficient home or a home using exhaust fans, fireplaces, clothes dryers, and gas appliances increases this problem and your appliances could be starving for air, which is unsafe.

This may result in more and more air being drawn from the house until fresh air is sucked in through an appliance flue or fireplace chimney. **Carbon monoxide can be the result.**

Carbon monoxide or "CO" is a colorless and odorless gas produced when fuel is not burned completely or when the flame does not receive sufficient oxygen.

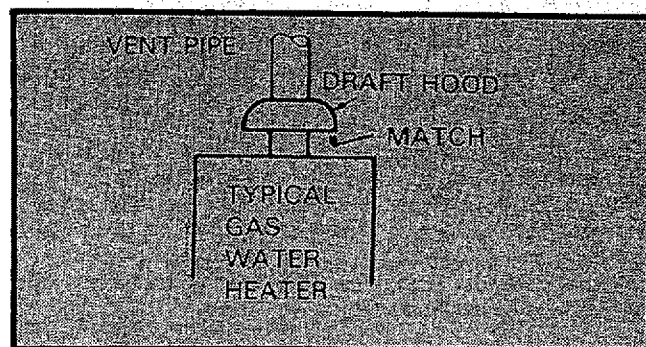
CARBON MONOXIDE CAN RESULT IN ASPHYXIATION.

Be aware of these air starvation signals:

1. Headaches-Nausea-Dizziness
2. Excessive humidity-Heavily frosted windows or a moist "clammy" feeling in the home.
3. Smoke from the fireplace won't draw up the chimney.
4. Flue gases won't draw up the appliance flue pipe.

5. Check for draft hood spillage at each appliance. (Hold a lighted match 2" from draft opening as shown for the typical gas water heater.)

FIG. 1 CHECK FOR DRAFT HOOD SPILLAGE



B. No Spillage -

If match flame pulls toward draft hood, this indicates sufficient infiltration air. Return exhausting devices and appliances to the condition you found them.

Combustion Air and Indoor Humidity (Cont.)

C. Draft Hood Spillage -

If there is spillage at a draft hood - (match goes out or flame wavers away from draft hood):

1. Check for plugged flue connectors and chimneys. Check and repair stoppage and test again.
2. If you have a fireplace, open a window or door near the fireplace and then check for spillage.
 - a. If spillage stops, do not use the fireplace until you can supply fresh air by a permanent duct.
3. If you have kitchen and bathroom exhaust fans turn them off and check for spillage.
 - a. If spillage stops, do not use exhaust fans until you can supply fresh air by a permanent duct. Circuit breakers for fans should be turned off.

WARNING

DRAFT HOOD SPILLAGE CAN CAUSE BODILY INJURY OR DEATH FROM ASPHYXIATION. SPILLAGE INDICATES THAT ADDITIONAL AIR MUST BE BROUGHT INTO THE STRUCTURE FROM THE OUTSIDE. KEEP A WINDOW OPEN (MINIMUM 2" NEAR THE APPLIANCE UNTIL A PERMANENT AIR DUCT IS INSTALLED. CONTACT A QUALIFIED SERVICE AGENCY.

4. Spillage means air starvation and a fresh air duct or air intakes must be installed to provide air directly to the furnace or other gas appliance. These must comply with local and state building codes or in their absence with the National Fuel Gas Code NFPA 54/ANSI Z223.1, current edition.

2. What is Relative Humidity and how do I know if it is too high or low?

Relative humidity is the amount of water vapor in the air relative to the amount the air can hold at the same temperature. Example: At 40% relative humidity, the air can hold 60% more moisture before it is saturated.

The colder the air, the less moisture it can hold. As air is warmed, its ability to hold moisture is increased. Example: A winter day, outdoor temperature 10°F, and relative humidity of 70%. If that air enters a home and is warmed to 72°F the relative humidity will drop to 6% (very dry) if no more moisture is added.

Relative humidity is important to your health and home as proper humidification helps cut down on incidences of respiratory illness and helps keep air cleaner and fresher.

HAS YOUR FURNACE BEEN REPLACED?

This furnace is very efficient and has a much smaller vent (flue) pipe with a blower in the venting system.

The smaller vent and blower increases the efficiency of the furnace but they will also decrease the amount of natural air infiltration into the house. This is because less air will escape up the vent system during the off cycle so less cold dry air will enter the house by infiltration. This in conjunction with other items may cause the humidity to raise to uncomfortable levels. This condition can usually be eliminated by minor changes in everyday routines, see "If Humidity Is Too High".

VISUAL METHODS OF GAUGING INDOOR HUMIDITY:

- Frequent fogging or excessive condensation on inside windows indicates the indoor humidity level is too high for outdoor weather conditions. Damage to the building may result if the condition persists. (Condensation on inside of storm windows indicates loose inside windows. Adding weatherstripping to tighten inside windows usually corrects this problem.)
- Drop three ice cubes into a glass of water and stir. If, within three minutes, moisture does not form on the glass, the air is too dry and a humidifier would be beneficial. (Do not perform this test in the kitchen, as cooking vapors may produce inaccurate results.)

A good relative humidity is one just high enough to barely start condensation along the lower edges or lower corners of the windows. More than that can be damaging.

IF HUMIDITY IS TOO HIGH....

Condensation occurs when warm, moist air contacts a cool surface (window or outside wall, for example), and drops of water or a coating of frost form. The condensation problem increases as the outside temperature decreases.

A high humidity level usually results from bathing or cooking, etc. Suggestions for correcting this problem:

1. Turn down or discontinue use of humidifier.
2. Use range and bathroom exhaust fans while cooking and bathing or open a door or window for a few minutes to bring in cool dryer air.
3. Cook with pans covered.
4. Take shorter baths or showers with cooler water.
5. Install a fresh air intake duct. Cold, dry air brought in from outside to the furnace area lowers the indoor humidity level.
6. If the above measures do not correct the problem, have appliances checked. A malfunctioning appliance can contribute water vapor to the house.
7. If the above items do not correct the problem consult a heating contractor about adding a heat recovery ventilator or air to air heat exchanger.

RECOMMENDED INDOOR HUMIDITY:

Use the following table as a guide. It shows the recommended maximum indoor humidity in relationship to the outdoor temperature.

TEMPERATURE	HUMIDITY
+ 20°F and above	35%
+ 10°F	30%
0°F	25%
-10°F	20%
-20°F	15%

YOUR FURNACE

Condensing furnaces have a higher efficiency rating than conventional gas furnaces, but are basically the same in design and operation. The major difference is the addition of a secondary heat exchanger which captures heat that would normally go out the furnace vent pipe.

By capturing this heat the flue gases are cooled to a point where most of the vapor (mainly water) condenses out and must be drained away. Because the gases are cooled down plastic pipe is used for the vent pipe in place of metal.

The following paragraphs and illustration will help you to understand the main parts of your furnace and how they operate.

DOOR INTERLOCK SWITCH

All of the electrical power for the furnace goes through the Door Interlock Switch and the furnace will not operate if the Blower Door is not properly in place.

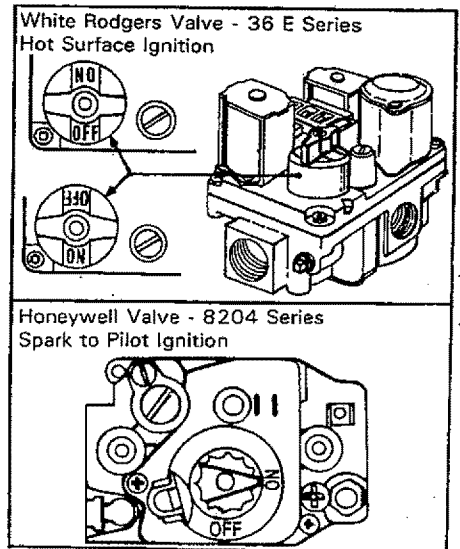
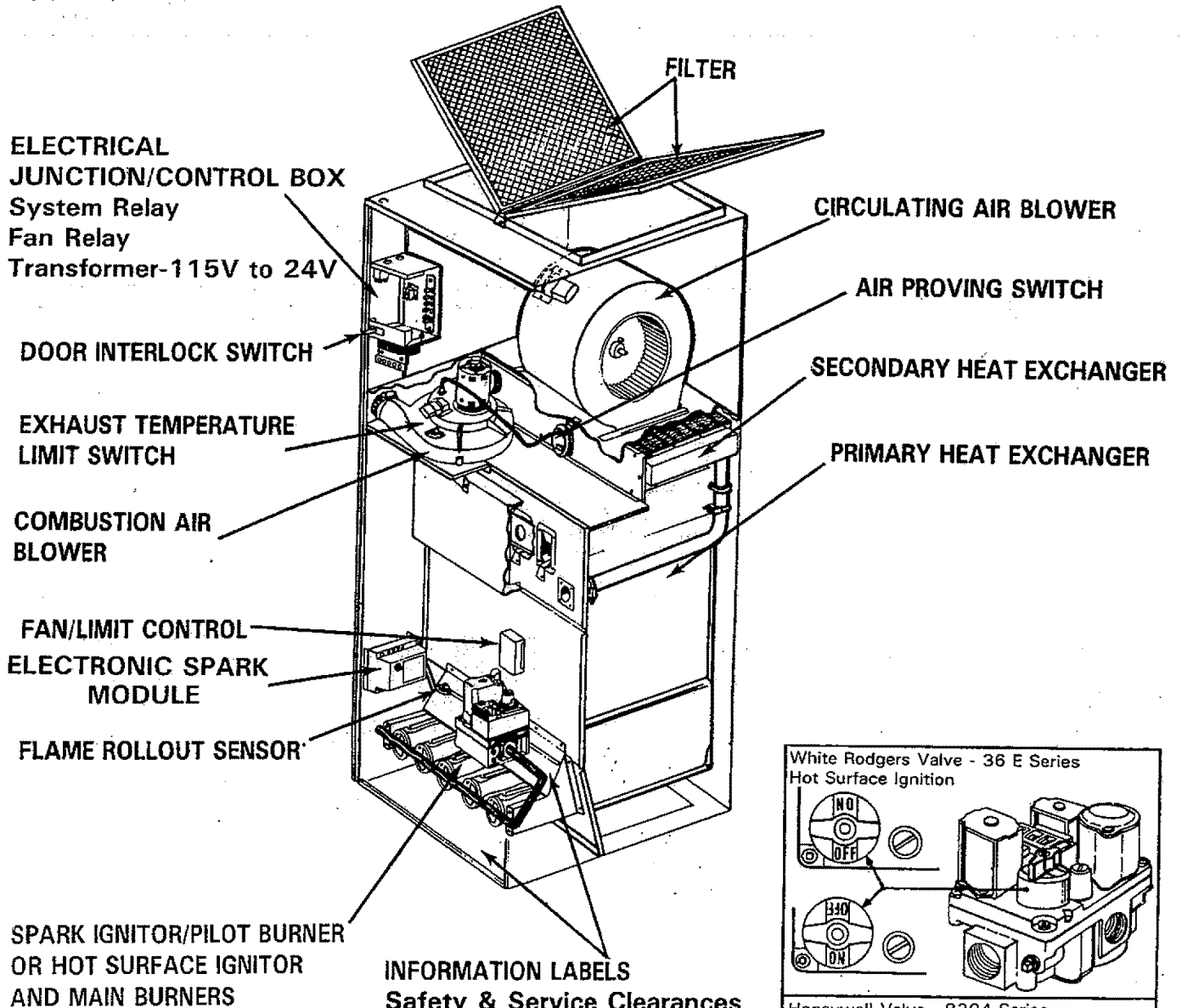


FIG. 2
TYPICAL COUNTERFLOW

Your Furnace (Cont.)

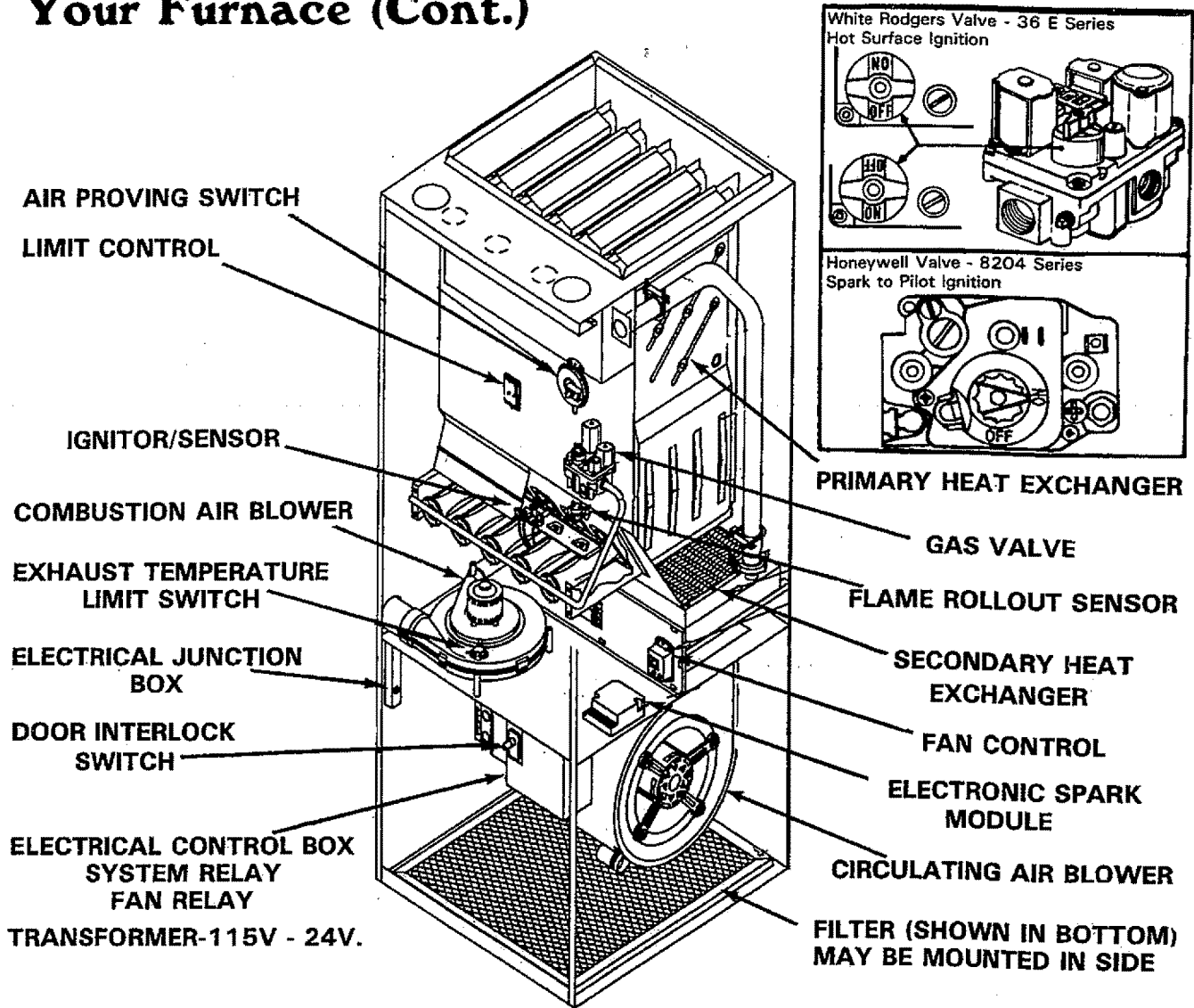


FIG. 3

TYPICAL UPFLOW

THERMOSTAT

See separate description under "Thermostat". As the temperature in your home drops the thermostat closes and completes a low voltage (24V) control circuit to the System Relay inside the control box. This relay closes and provides power to the Electronic Ignition Module, and Combustion Air Blower. The thermostat also completes a circuit to an internal heater inside the Fan/Limit Control. This allows more precise Fan "ON" control to help maintain comfortable temperatures in your home.

ELECTRONIC SPARK MODULE/GAS VALVE

When the thermostat calls for heat it completes a low voltage (24V) circuit to the electronic ignition module. The module either starts an electric spark or activates a hot surface ignitor to ignite the gas as the gas valve opens letting gas through to pilot or main burner. When the flame is firmly established the module will shut off. For safety it will automatically restart if the

flame is interrupted. If there is an abnormal function, the gas valve is designed to automatically shut off the gas.

COMBUSTION AIR BLOWER

The System Relay closes to start the Combustion Air Blower which exhausts the vent gases out through the vent pipe. The blower creates a pressure differential inside the furnace which provides the right amount of induced draft (air) to properly control combustion for maximum efficiency. This part of the system provides several safety features as the electrical circuit for the Electronic Ignition Module/Gas Valve must go through a Flame Roll Out Sensor, Air Proving Switch, Exhaust Temperature Limit Switch and the temperature limit portion of the Fan/Limit Control. If the right amount of air is not going through the furnace or if temperatures are too hot the electrical circuit to the Electronic Ignition Module/Gas Valve will be interrupted.

Your Furnace (Cont.)

CIRCULATING AIR BLOWER

The blower to circulate room air through the furnace starts as soon as the internal heater in the Fan/Limit control causes the fan switch portion to close completing the electrical circuit.

It shuts off when the Fan/Limit Control opens the electrical circuit. This means the blower comes on approximately 30 seconds after the furnace first starts and it continues to run until the furnace cools down. This helps to achieve the maximum comfort and efficiency from your furnace.

FAN RELAY

This relay provides electric power to the Circulating Air Blower for continuous blower operation (Thermostat Fan Switch set to "FAN ON") and for the blower to run if central air conditioning is installed.

FAN/LIMIT CONTROL

The Fan/Limit Control provides power to the Circulating Air Blower to keep it on, until the furnace cools down. The limit portion provides safety because it will open the low voltage control circuit, shutting the furnace down if it gets too hot.

The fan off setting can be adjusted if the fan remains on long enough that cool drafts are felt in the room after the furnace shuts off. Contact a Qualified Service Technician.

DRAIN TRAP ASSEMBLY

The drain trap has a float in it, that will cause the furnace to shut down if the drain lines become obstructed. If this happens the trap and lines must be taken apart and cleaned. See "Condensate Disposal" page 10.

Thermostat

Your furnace will not operate properly without a good quality, correctly installed thermostat. The thermostat location is very important as it must be sensing average room temperatures. It must not be exposed to hot or cold drafts or hot or cold spots on the wall, such as outside walls or a wall with pipes inside or openings into attic.

There are many types and styles of thermostats but the operation is usually similar. **BE SURE TO BECOME FAMILIAR WITH YOUR THERMOSTAT.** The simplest type of thermostat only starts and stops the furnace to maintain the proper room temperature. The most widely used types will control both heating and cooling functions and will have a Fan Switch with Auto and ON settings. On Auto, the Circulating Air Blower will cycle on/off with the furnace but if switched to ON it will run constantly whether or not the furnace is on.

In addition there are thermostats that automatically switch from Heating to Cooling and with night set-backs. The night set-back, or multiple set-back type, will lower the temperature at night or during the day when no one is at home.

HEATING:

Position the Thermostat System Switch on HEAT. Set the Fan Switch to AUTO for the blower to cycle ON/OFF. Select desired temperature setting and furnace will automatically start up and shut off as required to maintain that setting. Fan Switch may be positioned to ON for continuous air circulation only if that position maintains the same or a higher blower speed so you have the same or greater airflow.

CAUTION

Continuous Fan ON at too slow of a blower speed may cause improper furnace operation and possible damage to the heat exchanger.

HEATING ANTICIPATOR:

For more precise comfort control your thermostat may have an adjustable Heat Anticipator. (Some are not adjustable). For most homes the anticipator should be set on the value listed in the Tech Data Sheet which is found in the Furnace Technical Support Manual.

If your furnace cycles ON/OFF with very short ON intervals or if the OFF cycle is so long that room temperatures become uncomfortable the anticipator setting may need to be adjusted.

To Adjust:

Remove thermostat cover and locate anticipator. Check the setting. If not on the setting recommended for your furnace, move the lever to the proper setting and try it for a day or two.

To lengthen burner-on time move the indicator towards "Longer". To decrease burner-on time move in opposite direction.

NOTE

To accurately determine the effect do not adjust more than half a scale marking at a time and allow a day between adjustments.

COOLING:

For cooling simply position the system switch to COOL instead of HEAT and thermostat will function in the same manner to control cooling.

Operating Your Furnace

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

Before starting your furnace be sure you read and understand all of the procedures in this manual. Check to make sure the furnace filter is clean and correctly installed.

STARTING THE FURNACE

WARNING

DO NOT ATTEMPT TO LIGHT THE BURNER WITH A MATCH OR FLAME OF ANY KIND. YOU COULD BE INJURED.

See page 5 or 6 for location and illustration of gas valve.

1. Turn the thermostat to its lowest temperature setting or to OFF if equipped with a System Select Switch.
2. Turn Manual Shutoff Valve, in the gas line, to OFF position, should be a right angle or 90° to gas line.
3. Turn OFF electric power to furnace at disconnect switch or circuit breaker.
4. Remove furnace access panel, exposing gas controls and burner compartment.
5. Locate gas valve and identify settings. The valve is marked with ON — OFF positions.
6. Turn the knob all the way to OFF. Make sure it has been in OFF for at least 5 minutes before proceeding.
7. Turn the control knob to ON (Depress knob to turn on some Honeywell valves).
8. Replace access panels and doors.
9. Turn ON electric power for furnace.
10. Open the Manual Shutoff Valve in the gas-line.
11. Set thermostat to desired temperature and System Select Switch to HEAT if equipped.

The furnace will begin sparking to ignite the pilot flame or the hot surface ignitor will heat up to ignite the gas. When the system verifies a steady flame the ignition system will shut off.

With Spark to Pilot Ignition (System Retries)

The ignition system will spark to light the pilot for 90 seconds. If the pilot does not light within 90 seconds the system will shut off for 5 minutes and then it will try again for 90 seconds. It will continue to cycle until the pilot lights, (90 seconds ON/5 minutes OFF).

If the unit does not start after 3 tries or approximately 20 minutes, shut the unit off at the thermostat and call a qualified Service Agency.

WITH HOT SURFACE IGNITION SYSTEM

Furnace will make several attempts to lite before going into lockout. Each attempt requires a longer time with the total cycle taking approximately 8-10 minutes.

If air remaining in the lines on a new installation prevents the furnace from lighting ONE additional cycle may be tried. If furnace does not light, turn the thermostat to its lowest setting. Wait one minute, then turn it back up above the temperature shown on the thermometer. This starts the ignition cycle over again. **DO NOT REPEAT MORE THAN ONCE.** If furnace will not light, call a qualified Service Agency.

TURNING OFF THE FURNACE

1. Set the thermostat to the lowest setting or set System Select Switch to OFF if equipped.

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

EXTENDED SHUTDOWN

1. Set thermostat to lowest setting or set System Select Switch to OFF if equipped.
2. Turn Manual Shutoff Valve to off position, right angle or 90° to gas line.
3. Turn electric power off. (May be left "ON" for set-back or chronograph type thermostat with batteries, provided thermostat has a system select switch to place in the "OFF" position.)
4. Turn the gas valve control knob to "OFF".

Winter Shutdown

If there is the possibility of freezing temperatures, remove the condensate drain trap and empty to prevent freezing.

L P Model Furnaces

WARNING

If your L.P. (liquefied petroleum) gas furnace is installed in a basement, an excavated area or a confined space, we recommend that you contact your L.P. supplier about installing a warning device that would alert you to a gas leak. We recommend this because L.P. gas is heavier than air and any leaking gas can settle in any low areas or confined spaces. This L.P. gas would create a **DANGER OF EXPLOSION OR FIRE**. If you suspect the presence of gas, follow the instructions on the cover of this manual.

FURNACE MAINTENANCE

It is recommended that you have your furnace inspected and serviced on an annual basis (before the heating season) by a qualified service technician.

You may perform maintenance on the furnace yourself, but remember that certain mechanical and electrical skills and tools are required to properly perform maintenance on the furnace. Personal injury or death may result if you are not properly trained. You should call your installing dealer or place of purchase if you are uncertain about your ability to perform maintenance.

WARNING

TURN OFF ELECTRIC POWER TO FURNACE BEFORE PERFORMING ANY MAINTENANCE OR REMOVING PANELS BECAUSE OF THE DANGER OF ELECTRICAL SHOCK

AIR FILTERS — Monthly

The air filter(s) should be inspected at least monthly and cleaned or replaced as required. There are two types of filters most commonly used. The most widely used is the fiberglass disposable type which should be replaced before it becomes clogged. The other type commonly in use is the washable type constructed of aluminum mesh, foam, or reinforced fibers. Washable filters may be cleaned by soaking in mild detergent and rinsing with water.

NOTE

Some filters are marked with an arrow to indicate the proper direction of air flow through the filter. When installing the arrow must point in the direction of the air flow. Remember that dirty filters are the most common cause of inadequate heating or cooling performance.

The table on page 10 lists recommended sizes and types of filters that may be used with your furnace, based on the input rating and nominal tons of air conditioning that may be used with the furnace.

However, the furnace installer may have used a larger filter for additional air volume or if the furnace was installed for Heating Only with a remote filter cabinet or central return he may have installed a smaller filter. If air conditioning has been added since your furnace was installed, make sure the filter size is adequate.

Replacement filters should be of the same type and size to ensure adequate air flow and filtering, unless a disposable low velocity filter is replaced with a washable high velocity type.

Filter Replacement

The filter will normally be found inside the furnace blower compartment, see pages 5 and 6, but alternate locations may be a remote filter rack attached to the outside of the furnace, a separate return air cabinet attached to furnace or a remote filter grille.

Remote filter grilles and return air cabinets will usually have a hinged door or removable panel to be able to remove filter. Filter racks attached to the furnace will usually be made so the filter simply slides out one side for removal. Use only the same size filter. The type must be the same unless replacing a disposable low velocity type, with a washable high velocity type.

WARNING

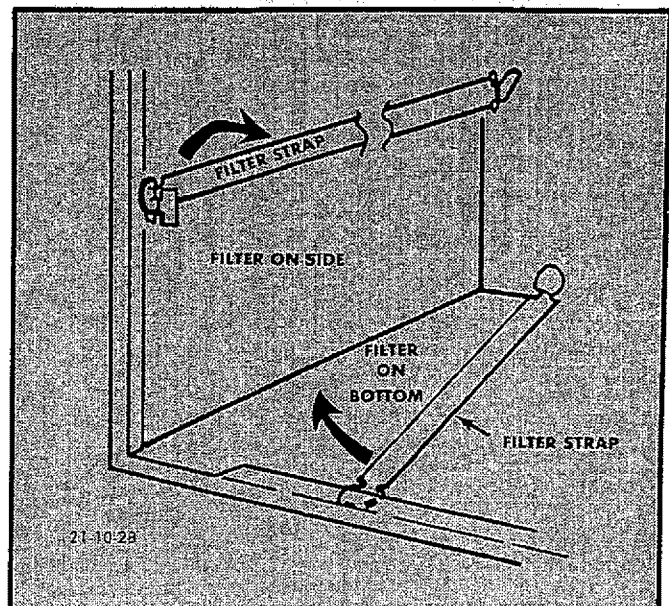
NEVER OPERATE FURNACE WITHOUT A FILTER INSTALLED AS DUST AND LINT WILL BUILD UP ON INTERNAL PARTS RESULTING IN LOSS OF EFFICIENCY, EQUIPMENT DAMAGE AND POSSIBLE FIRE.

Filter Replacement/Upflow (Hi-Boy)

See Figure 4

1. Turn off electric power for furnace at circuit breaker or disconnect switch.
2. Remove blower compartment door.
3. Pull back on filter clip and remove filter being careful not to dislodge dirt and debris from filter.
4. Inspect filter and replace or clean washable type. If filter is aluminum mesh it should be recoated with filter coating spray.
5. Reinstall filter under clips. If filter is marked for air flow direction make sure it's installed correctly.
6. Replace blower compartment door making sure that it's tightly closed.
7. Turn on electric power for the furnace.

FIGURE 4 FILTER REPLACEMENT



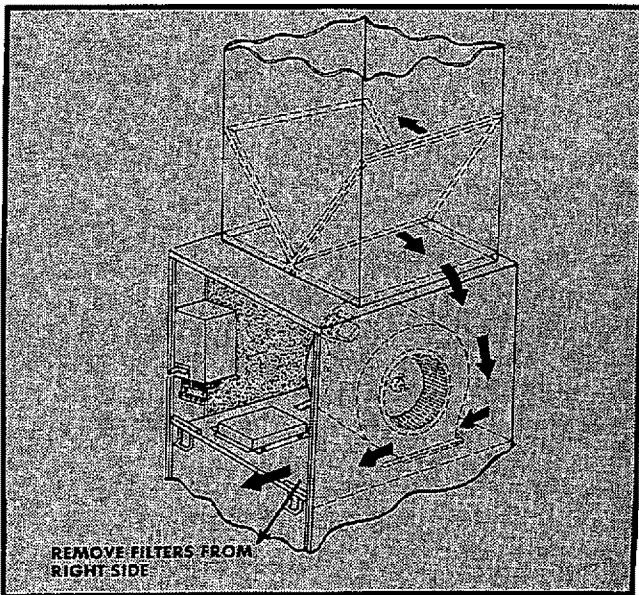
Furnace Maintenance (Cont.)

Filter Replacement/Counterflow

See Figure 5

1. Turn off electric power for furnace at circuit breaker or disconnect switch.
2. Remove blower compartment door.
3. Reach up through right side and lift upward and swing top of filter towards center of furnace then pull filter down and remove being careful not to dislodge dirt and debris from filter.
4. Inspect filter and replace or clean washable type. If filter is aluminum mesh it should be recoated with filter coating spray.

FIG. 5 COUNTERFLOW FILTER REPLACEMENT



5. Reinstall left filter first. If filter is marked for air flow direction make sure it's installed correctly.
6. Replace blower compartment door making sure that it's tightly closed.
7. Turn on electric power for the furnace.

FIG. 6 RECOMMENDED REMOTE FILTER SIZES

Nominal Tons Air Conditioning Nominal Air Flow Cubic Feet per Minute	Recommended Filter Sizes Sq. Inch Surface Area/Nominal Size		Furnace Size 1000 X BTUH
	Disposable Filters	Cleanable Filters	
Up Thru 2 Tons 800-900 CFM	432 20X25	260 15X20	40 50 75 (counterflow) (only)
2½ Tons 900-1100 CFM	480 20X30	288 14X25	40 50 75 100
3 Tons 1100-1300 CFM	576 14X25(2)	346 16X25	40 50 75 100
3½ Tons 1300-1500 CFM	672 16X25(2)	404 20X25	100 125 75 (upflow only)
4 Tons 1500-1700 CFM	768 20X25(2)	461 20X25	125 100 (upflow only)
4½ Tons 1700-1900 CFM	864 20X25(2)	519 24X25	125
5 Tons 1900-2100 CFM	960 20X30 (2)	576 24X25	125

CONDENSATE DISPOSAL Monthly/Annually

Your furnace has a condensate trap as part of the vent system. The moisture in the flue gases will condense and collect in the trap to go to an inside drain or be pumped to a sewer line using a condensate pump.

The Condensate Trap and Condensate Neutralizer Cartridge (if used) in the drain line leading from the trap will require some maintenance. Disassemble and clean trap and cartridge prior to each heating season or if drain line becomes plugged.

Inspect the drain line and overflow line at least monthly. If the Condensate Neutralizer Cartridge becomes plugged the condensate will flow through the overflow line. If this happens clean both cartridge and trap.

TO CLEAN: Disconnect the drain line cartridge and unscrew end cap from cartridge. Pour the neutralizer out and thoroughly flush neutralizer and inside of cartridge with water. Pour neutralizer back into cartridge, adding neutralizer if cartridge is less than ¾ full. Unscrew trap from Vent Connecting Tee and flush thoroughly with water, use soap if necessary to clean, **DO NOT USE** any kind of solvents. Make sure float is reinstalled in trap, Ref. Fig. 7.

Reassemble and seal threaded connections with silicone rubber (bathtub caulk) or pipe dope approved for plastic pipe.

See repair parts section in the Furnace Technical Support Manual, to order replacement neutralizer.

Do not use Condensate for any reason as it is acidic.

FURNACE CONDITION AND FLUE GAS PASSAGES/Monthly

A properly adjusted gas furnace should not require cleaning at frequent intervals, but it should be inspected regularly to ensure safe and efficient operation. A brief monthly inspection is recommended that does not require disassembly. In addition you should have the furnace inspected, and cleaned if required, by a qualified service technician annually.

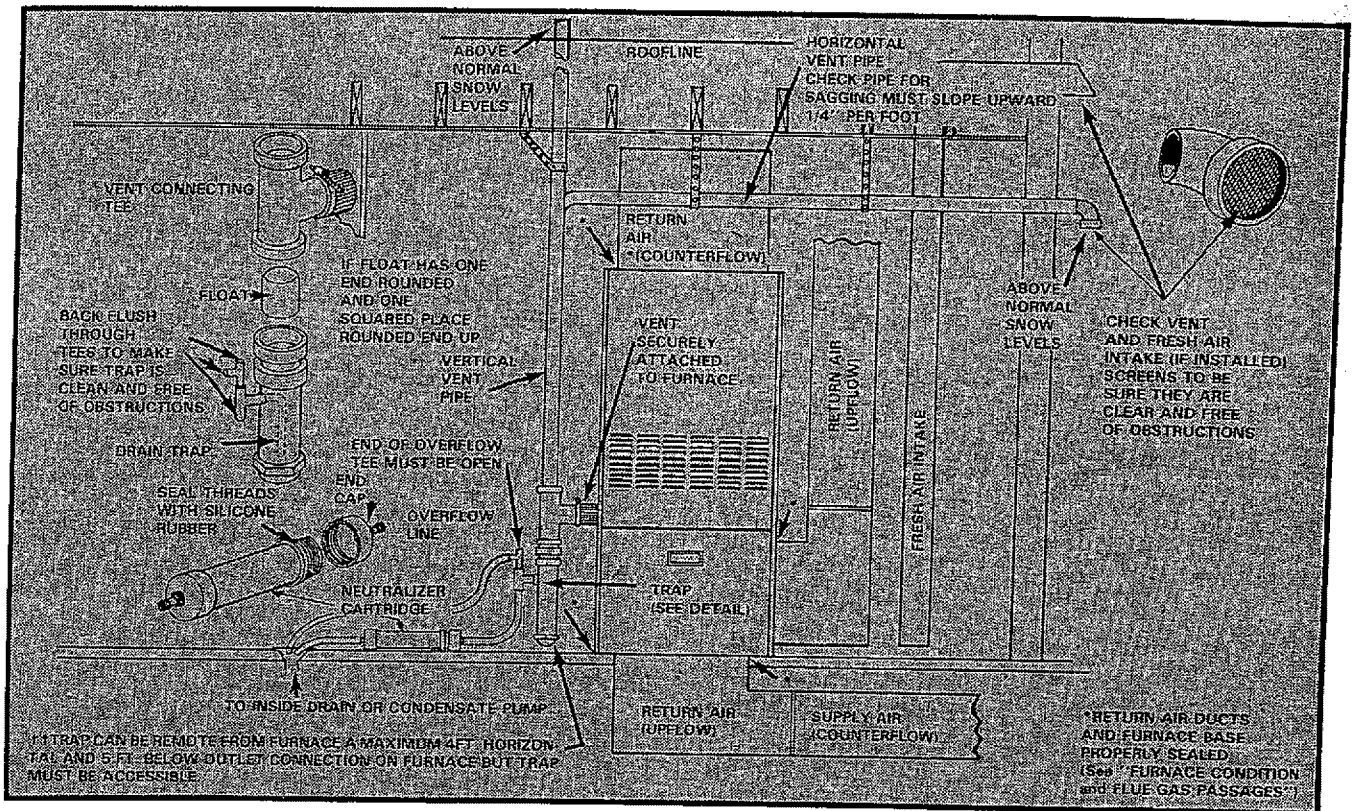
During the monthly inspection check the vent pipe and fresh air intake (if installed), to be sure they are clear and free of obstructions. Check vent pipe for evidence of condensate leakage, tight joints, secure attachment to furnace and sagging pipe.

Horizontal sections of pipe must slope upward 1/4" per foot except sections between furnace and drain trap when trap is not mounted directly on furnace. Any horizontal section (max. 4' long) must slope down a minimum of 1/4" per foot to trap. Vertical sections to trap can be a maximum of 5 feet.

Check return air duct to make sure it is sealed to furnace casing and that it is in good physical condition. It must terminate outside the space containing the furnace with no holes or inlets in furnace space.

Furnace Maintenance (Cont.)

FIG. 7 TYPICAL INSTALLATION



The floor or furnace base must be in good physical condition. For Upflow Furnace with a bottom return the floor or base area around the furnace must form a seal (no sagging, cracks defects etc.) to prevent air from being pulled in from furnace area, or any defect area must be sealed between floor or base and furnace.

Remove the front panel and use a flashlight to inspect the visible part of the heat exchanger, burners and ignitor. Check for loose soot and give particular attention to obvious deterioration from corrosion or other sources. Check for any signs of condensate leakage inside furnace cabinet.

If soot or deterioration is found or if there is evidence of condensate leakage inside furnace **DO NOT OPERATE FURNACE.**

Call a qualified service technician.

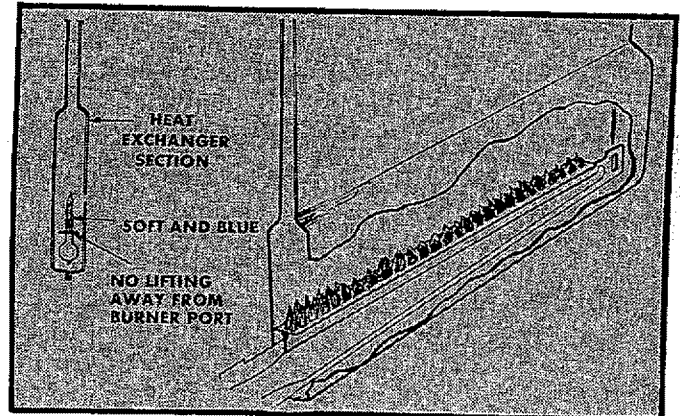
MAIN BURNER & PILOT FLAMES/Monthly

Allow furnace to run approximately 10 minutes then inspect the main burner flames and pilot flame (except furnaces with Hot Surface Ignition).

MAIN BURNER FLAMES should be stable, soft and blue, (dust may cause orange tips or they may have wisps of yellow but they must not have solid yellow tips). They should extend directly upward from burner without curling, floating or lifting off. They must not touch the sides of the heat exchanger.

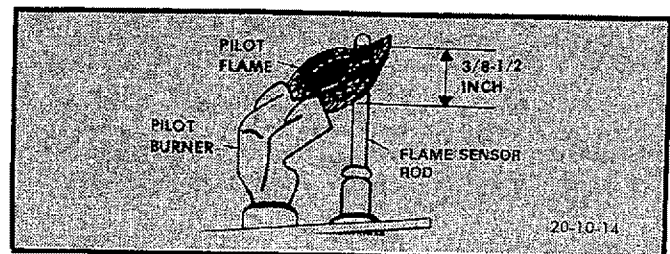
Contact a qualified service agency at once if an abnormal flame appearance should develop.

FIG. 8 MAIN BURNER FLAME



PILOT FLAME should surround 3/8" to 1/2" of the ignitor/sensor tip.

FIG. 9 PILOT FLAME



Furnace Maintenance (Cont.)

BLOWER MOTOR

Motor will require lubrication every five (5) years or normal operation. Add 1/2 teaspoon (2 cc) of SAE #10W30 motor oil to each motor bearing through oil tubes or by removing cap plugs in motor end bells.

CAUTION

DO NOT over oil or use 3 in 1 oil, penetrating oil, WD40 or similar oils on oil motor bearings. Use of these may damage these motors.

SERVICE HINTS

If your furnace fails to operate properly, you may avoid inconvenience and the cost of a service call by checking the following points before you call for service.

NO HEAT OR NOT ENOUGH HEAT...

POSSIBLE CAUSE

Thermostat not set correctly.

No electric power to furnace.

Filter is dirty.

Gas is shut off.

Warm air registers closed or blocked.

Return grilles blocked.

Vent Pipe is obstructed or Drain lines on Condensate Trap are obstructed causing float to rise and block vent pipe.

WHAT TO DO

Set above room temperature. On heating/cooling systems, turn system switch to "Heat"; fan switch to "Auto" or "On" (continuous fan operation).

Check fuse or circuit breaker. Replace blown fuse. Reset breaker. Turn switch on. Be sure blower access door is securely installed. Clean filter.

Turn gas valve on.

Open registers. Move rugs, furniture, other obstructions.

Furnace has a pressure switch in the vent system which interrupts the electrical circuit. If the furnace is vented horizontally check the outlet area to make sure it is not obstructed. Check drain lines and Condensate Trap.

FURNACE RECORD

Model No. _____

Furnace Size (Btuh) _____

Serial No. _____

Where Purchased _____ Date _____

Installer _____ Date _____

Dealer _____ Phone _____

Service History _____

Model No., Size, Serial No. etc. will be found on the Furnace Rating Plate, See Page 5.

USERS INFORMATION MANUAL

WARNING

Fire or explosion hazard.

Information in this manual
MUST be followed exactly.

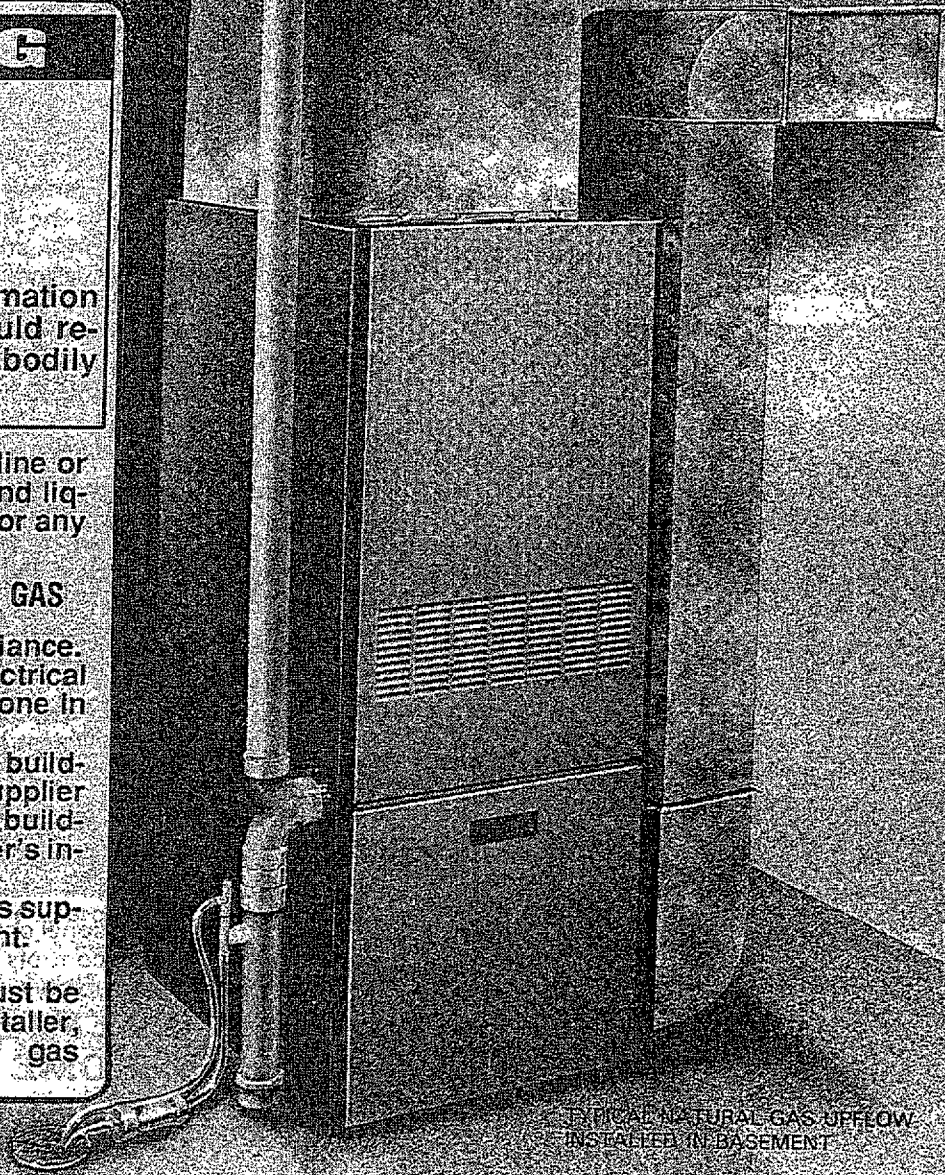
Failure to follow the information
in this manual exactly could re-
sult in property damage, bodily
injury, or death.

— Do not store or use gasoline or
other flammable vapors and liq-
uids in the vicinity of this or any
other appliance.

— WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical
switch; do not use any phone in
your building.
- Immediately evacuate the build-
ing and call your gas supplier
from a phone outside the build-
ing. Follow the gas supplier's in-
structions.
- If you cannot reach your gas sup-
plier, call the fire department.

— Installation and service must be
performed by a qualified installer,
service agency or the gas
supplier.



TYPICAL NATURAL GAS UPFLOW
INSTALLED IN BASEMENT

CONDENSING GAS FURNACES

SAVE THIS MANUAL FOR FUTURE REFERENCE

1008277
9-25-92
LP. 1

PRINTED IN U.S.A.

SAFETY REQUIREMENTS

Your furnace is built to provide many years of safe and dependable service, providing it is properly installed and maintained. However, abuse and/or improper use can shorten the life of the furnace and create hazards for you, the homeowner.

WARNING

IMPROPER INSTALLATION, ADJUSTMENT, OPERATION, SERVICE, REPAIR, MAINTENANCE, OR ALTERATION OF THIS PRODUCT MAY RESULT IN PROPERTY DAMAGE, BODILY INJURY OR DEATH FROM HAZARDS SUCH AS FIRE, EXPLOSION, SMOKE, SOOT, CONDENSATION, ELECTRIC SHOCK OR CARBON MONOXIDE.

The following rules and recommendations should be followed to insure safe and efficient operation of your furnace.

1. Thoroughly read this manual and all labels on the furnace to help you understand how your furnace operates and the hazards involved with gas and electricity.
2. Do not use this furnace if any part has been under water. Immediately call a qualified service technician to inspect the furnace and to replace any part of the control system and any gas control which has been under water.
3. Make sure the furnace is always connected to an approved vent, in good condition, to carry combustion products outdoors.
4. Never obstruct the vent grilles, or other means that provide air to the furnace for proper combustion and ventilation of flue gases.

If any structural changes are made, such as enclosing the furnace area, or if you add weather stripping, storm windows or another fuel burning appliance in the same area, have a qualified service agency check the combustion air supply.

5. Familiarize yourself with the possible air starvation signals outlined in the Combustion Air and Indoor Humidity section and perform the checks to determine if combustion air is adequate.
6. Maintain safety and service clearances from the furnace as listed on Furnace Clearance Label inside the cabinet. Keep the furnace room or area clean and free of combustible materials at all times. Never store gasoline, paint, aerosol cans, waxes, bleaches, dry cleaning fluid or items such as papers, rags, brooms or dust mops near the furnace.
7. If your furnace is installed in an area with loose fill or exposed insulation, the insulating material must be kept free and clear of furnace as some insulation is combustible. If additional insulation is added make sure the furnace area is checked.
8. Familiarize yourself with the controls that shut off the gas and electrical power to the furnace. If the furnace is to be shutdown, for any length of time, turn off both the gas and electrical power. For safety always turn them off before performing service or maintenance on the furnace.
9. Establish a regular service and maintenance schedule to insure efficient and safe operation of the furnace. It is recommended that you have a qualified service agency perform a complete check on the furnace, before each heating season. See Service Technician Checks.

SERVICE TECHNICIAN CHECKS

When the furnace is being inspected for condition and operation have the Service Technician check the following items.

For additional information the Service Technician can consult the installation instructions and applicable service manual for the furnace.

1. Check for adequate combustion air being supplied to the furnace area and all air openings into or from the furnace.
2. Check all flue gas passages including main and pilot burners, heat exchanger, and vent pipe.
3. Check gas pipe and all connections inside and leading to the furnace for leaks.
4. Check electrical wiring and connections.
5. Check supply and return air ducts for leakage, blockage and connections to furnace.
6. Check circulating air blower wheel and motor, clean and lubricate if required.

7. Perform an operational checkout on the furnace to be sure safety controls function and that furnace operates properly.

FREEZING TEMPERATURES AND YOUR HOME

Your furnace is equipped with safety devices that may keep it from operating if there are any abnormal conditions affecting the furnace and L.P. models may not operate if there is even a brief or slight interruption in the electric power or gas supply.

If your furnace remains shut down long enough during freezing temperatures, for water pipes to freeze it could result in serious water damage.

If your home will be unattended during this time you should take these precautions.

1. Shut the water off at the main inlet into your home and drain the water lines if possible.
2. Have someone check your home as often as necessary for temperature conditions that could cause water damage. Suggest they call a qualified service agency if required.

COMBUSTION AIR/INDOOR HUMIDITY

(How They Affect Your Safety and Comfort)

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.

Your home needs to breathe and the different temperatures and humidity ranges in your home during the year makes it necessary to be sensitive to air requirements and potential ventilation problems.

Because of high energy costs for home heating, new materials and methods are being used in construction and remodeling. The improved construction and additional insulation has made these homes much tighter around windows and doors so that air leakage is minimal. This may create a problem in supplying enough combustion and ventilation air for gas-fired or other fuel burning appliances. Fresh air is needed for combustion and ventilation of flue gases.

1. How do I know if my furnace or other appliances are receiving enough air for proper combustion and ventilation of flue gases?

Use the following checkout procedure to determine if the air leakage into your home is adequate to supply the needs of your appliances and fireplace. If you are uncertain about your ability to perform these checks contact your installing dealer or place of purchase.

A. Make the inspection as follows:

1. Close all doors and windows. If you have a fireplace, start a fire and wait until flames are burning vigorously.
2. Turn on all exhausting devices, such as: kitchen and bathroom exhaust fans - dryers (gas or electric)
3. Turn on all vented gas appliances, such as: heating equipment (includes any room heaters) water heaters.
4. Wait ten (10) minutes for drafts to stabilize.

An energy efficient home or a home using exhaust fans, fireplaces, clothes dryers, and gas appliances increases this problem and your appliances could be starving for air, which is unsafe.

This may result in more and more air being drawn from the house until fresh air is sucked in through an appliance flue or fireplace chimney. **Carbon monoxide can be the result.**

Carbon monoxide or "CO" is a colorless and odorless gas produced when fuel is not burned completely or when the flame does not receive sufficient oxygen.

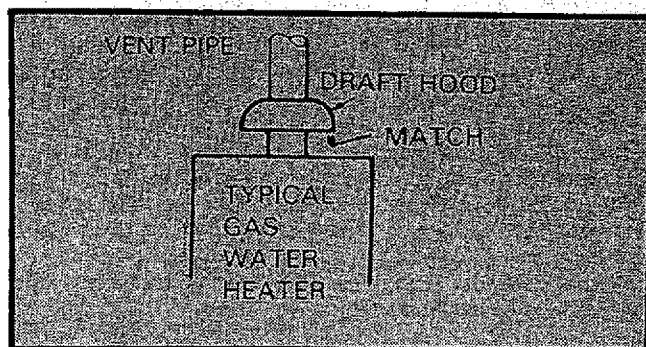
CARBON MONOXIDE CAN RESULT IN ASPHYXIATION.

Be aware of these air starvation signals:

1. Headaches-Nausea-Dizziness
2. Excessive humidity-Heavily frosted windows or a moist "clammy" feeling in the home.
3. Smoke from the fireplace won't draw up the chimney.
4. Flue gases won't draw up the appliance flue pipe.

5. Check for draft hood spillage at each appliance. (Hold a lighted match 2" from draft opening as shown for the typical gas water heater.)

FIG. 1 CHECK FOR DRAFT HOOD SPILLAGE



B. No Spillage -

If match flame pulls toward draft hood, this indicates sufficient infiltration air. Return exhausting devices and appliances to the condition you found them.

Combustion Air and Indoor Humidity (Cont.)

C. Draft Hood Spillage -

If there is spillage at a draft hood - (match goes out or flame wavers away from draft hood):

1. Check for plugged flue connectors and chimneys. Check and repair stoppage and test again.
2. If you have a fireplace, open a window or door near the fireplace and then check for spillage.
 - a. If spillage stops, do not use the fireplace until you can supply fresh air by a permanent duct.
3. If you have kitchen and bathroom exhaust fans turn them off and check for spillage.
 - a. If spillage stops, do not use exhaust fans until you can supply fresh air by a permanent duct. Circuit breakers for fans should be turned off.

WARNING

DRAFT HOOD SPILLAGE CAN CAUSE BODILY INJURY OR DEATH FROM ASPHYXIATION. SPILLAGE INDICATES THAT ADDITIONAL AIR MUST BE BROUGHT INTO THE STRUCTURE FROM THE OUTSIDE. KEEP A WINDOW OPEN (MINIMUM 2" NEAR THE APPLIANCE UNTIL A PERMANENT AIR DUCT IS INSTALLED. CONTACT A QUALIFIED SERVICE AGENCY.

4. Spillage means air starvation and a fresh air duct or air intakes must be installed to provide air directly to the furnace or other gas appliance. These must comply with local and state building codes or in their absence with the National Fuel Gas Code NFPA 54/ANSI Z223.1, current edition.

2. What is Relative Humidity and how do I know if it is too high or low?

Relative humidity is the amount of water vapor in the air relative to the amount the air can hold at the same temperature. Example: At 40% relative humidity, the air can hold 60% more moisture before it is saturated.

The colder the air, the less moisture it can hold. As air is warmed, its ability to hold moisture is increased. Example: A winter day, outdoor temperature 10°F, and relative humidity of 70%. If that air enters a home and is warmed to 72°F the relative humidity will drop to 6% (very dry) if no more moisture is added.

Relative humidity is important to your health and home as proper humidification helps cut down on incidences of respiratory illness and helps keep air cleaner and fresher.

HAS YOUR FURNACE BEEN REPLACED?

This furnace is very efficient and has a much smaller vent (flue) pipe with a blower in the venting system.

The smaller vent and blower increases the efficiency of the furnace but they will also decrease the amount of natural air infiltration into the house. This is because less air will escape up the vent system during the off cycle so less cold dry air will enter the house by infiltration. This in conjunction with other items may cause the humidity to raise to uncomfortable levels. This condition can usually be eliminated by minor changes in everyday routines, see "If Humidity Is Too High".

VISUAL METHODS OF GAUGING INDOOR HUMIDITY:

- Frequent fogging or excessive condensation on inside windows indicates the indoor humidity level is too high for outdoor weather conditions. Damage to the building may result if the condition persists. (Condensation on inside of storm windows indicates loose inside windows. Adding weatherstripping to tighten inside windows usually corrects this problem.)
- Drop three ice cubes into a glass of water and stir. If, within three minutes, moisture does not form on the glass, the air is too dry and a humidifier would be beneficial. (Do not perform this test in the kitchen, as cooking vapors may produce inaccurate results.)

A good relative humidity is one just high enough to barely start condensation along the lower edges or lower corners of the windows. More than that can be damaging.

IF HUMIDITY IS TOO HIGH....

Condensation occurs when warm, moist air contacts a cool surface (window or outside wall, for example), and drops of water or a coating of frost form. The condensation problem increases as the outside temperature decreases.

A high humidity level usually results from bathing or cooking, etc. Suggestions for correcting this problem:

1. Turn down or discontinue use of humidifier.
2. Use range and bathroom exhaust fans while cooking and bathing or open a door or window for a few minutes to bring in cool dryer air.
3. Cook with pans covered.
4. Take shorter baths or showers with cooler water.
5. Install a fresh air intake duct. Cold, dry air brought in from outside to the furnace area lowers the indoor humidity level.
6. If the above measures do not correct the problem, have appliances checked. A malfunctioning appliance can contribute water vapor to the house.
7. If the above items do not correct the problem consult a heating contractor about adding a heat recovery ventilator or air to air heat exchanger.

RECOMMENDED INDOOR HUMIDITY:

Use the following table as a guide. It shows the recommended maximum indoor humidity in relationship to the outdoor temperature.

TEMPERATURE	HUMIDITY
+ 20°F and above	35%
+ 10°F	30%
0°F	25%
-10°F	20%
-20°F	15%

YOUR FURNACE

Condensing furnaces have a higher efficiency rating than conventional gas furnaces, but are basically the same in design and operation. The major difference is the addition of a secondary heat exchanger which captures heat that would normally go out the furnace vent pipe.

By capturing this heat the flue gases are cooled to a point where most of the vapor (mainly water) condenses out and must be drained away. Because the gases are cooled down plastic pipe is used for the vent pipe in place of metal.

The following paragraphs and illustration will help you to understand the main parts of your furnace and how they operate.

DOOR INTERLOCK SWITCH

All of the electrical power for the furnace goes through the Door Interlock Switch and the furnace will not operate if the Blower Door is not properly in place.

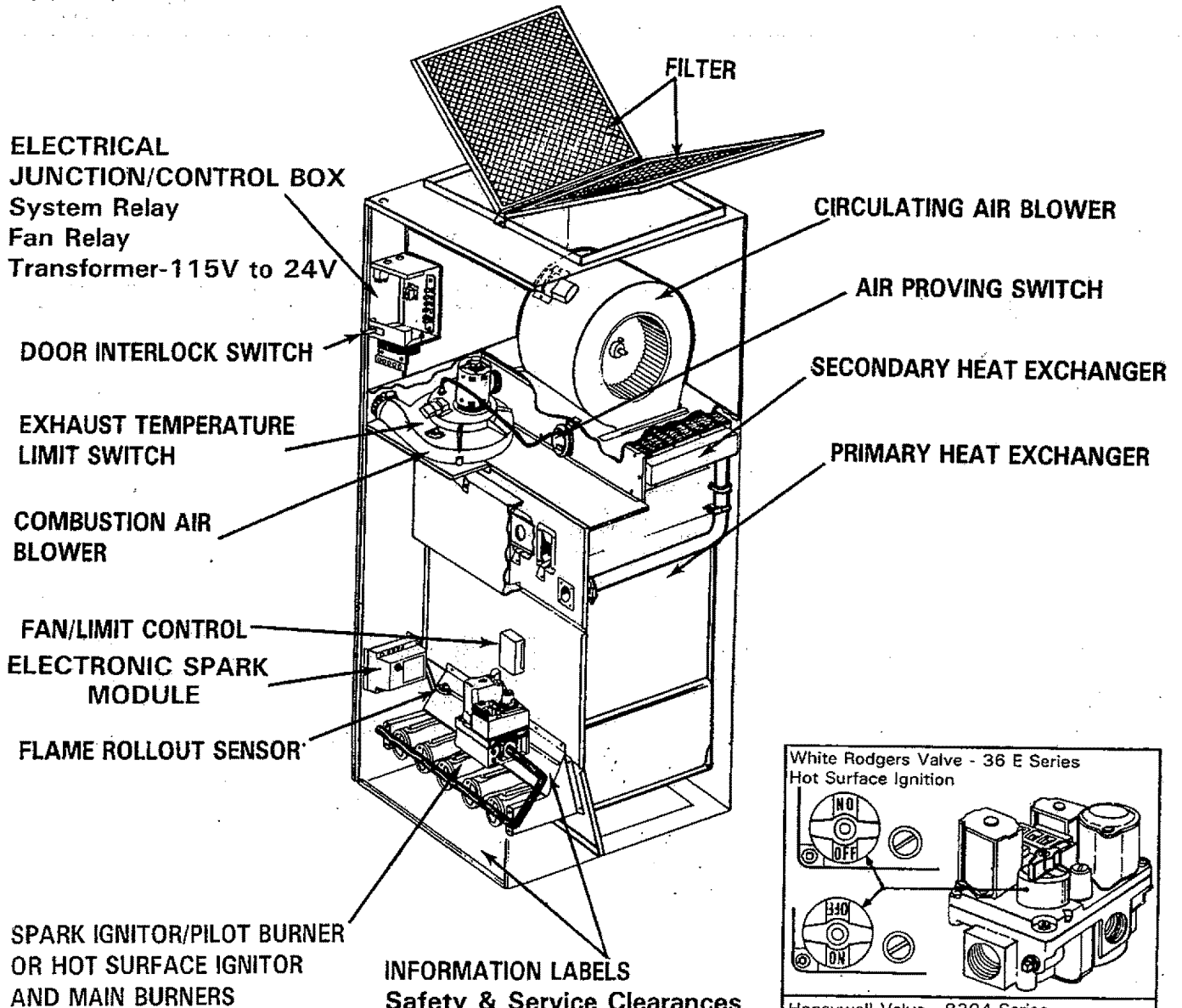
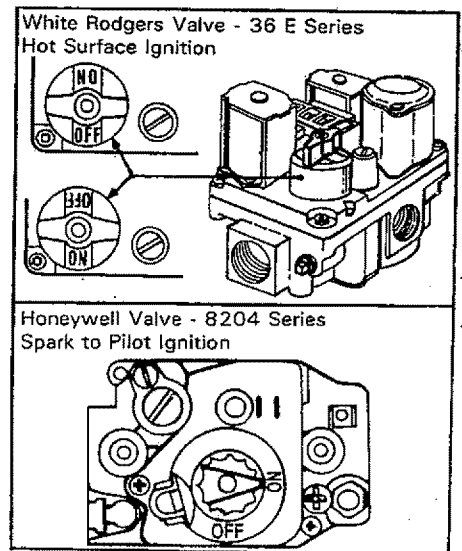


FIG. 2
TYPICAL COUNTERFLOW



Your Furnace (Cont.)

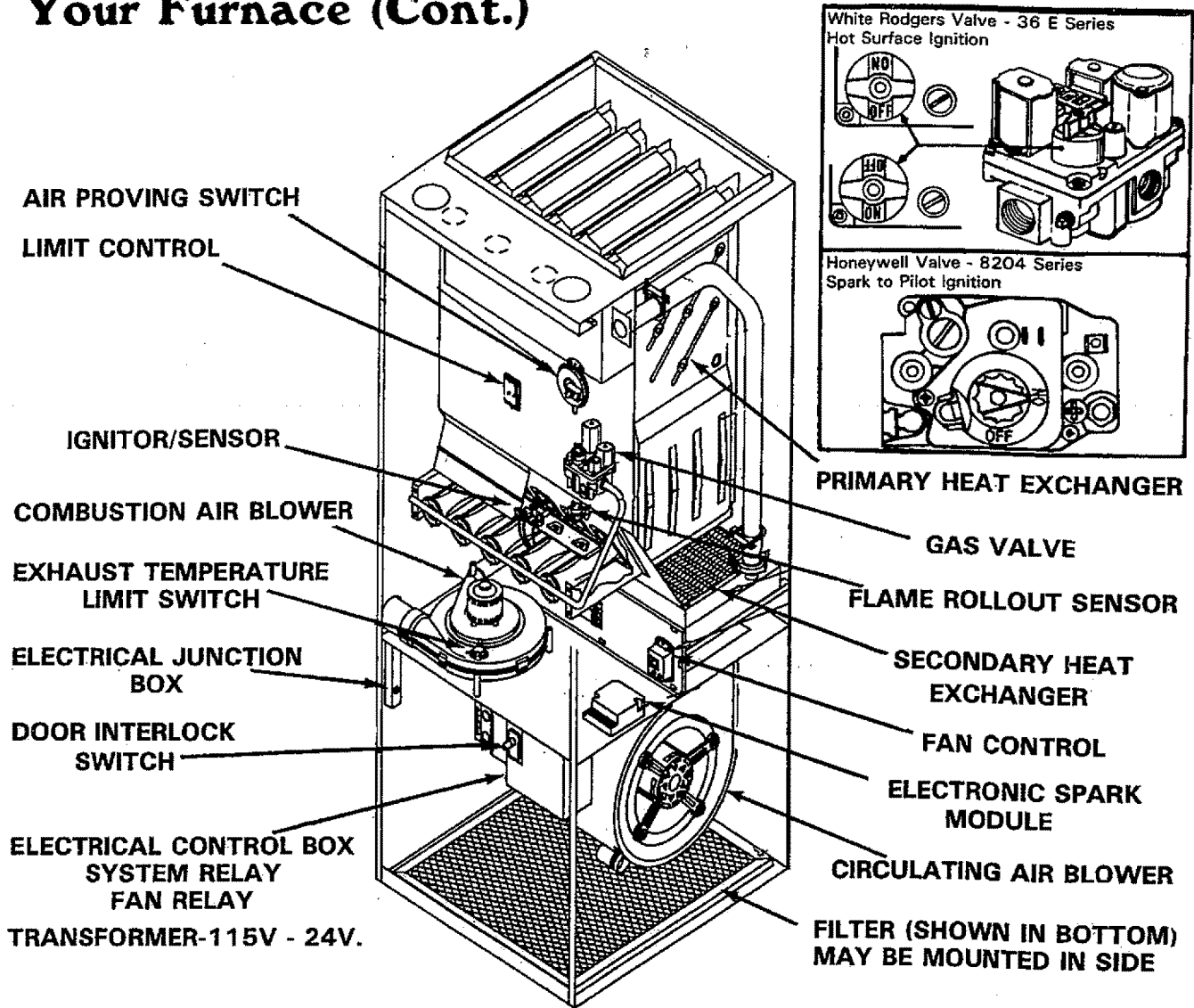


FIG. 3

TYPICAL UPFLOW

THERMOSTAT

See separate description under "Thermostat". As the temperature in your home drops the thermostat closes and completes a low voltage (24V) control circuit to the System Relay inside the control box. This relay closes and provides power to the Electronic Ignition Module, and Combustion Air Blower. The thermostat also completes a circuit to an internal heater inside the Fan/Limit Control. This allows more precise Fan "ON" control to help maintain comfortable temperatures in your home.

ELECTRONIC SPARK MODULE/GAS VALVE

When the thermostat calls for heat it completes a low voltage (24V) circuit to the electronic ignition module. The module either starts an electric spark or activates a hot surface ignitor to ignite the gas as the gas valve opens letting gas through to pilot or main burner. When the flame is firmly established the module will shut off. For safety it will automatically restart if the

flame is interrupted. If there is an abnormal function, the gas valve is designed to automatically shut off the gas.

COMBUSTION AIR BLOWER

The System Relay closes to start the Combustion Air Blower which exhausts the vent gases out through the vent pipe. The blower creates a pressure differential inside the furnace which provides the right amount of induced draft (air) to properly control combustion for maximum efficiency. This part of the system provides several safety features as the electrical circuit for the Electronic Ignition Module/Gas Valve must go through a Flame Roll Out Sensor, Air Proving Switch, Exhaust Temperature Limit Switch and the temperature limit portion of the Fan/Limit Control. If the right amount of air is not going through the furnace or if temperatures are too hot the electrical circuit to the Electronic Ignition Module/Gas Valve will be interrupted.

Your Furnace (Cont.)

CIRCULATING AIR BLOWER

The blower to circulate room air through the furnace starts as soon as the internal heater in the Fan/Limit control causes the fan switch portion to close completing the electrical circuit.

It shuts off when the Fan/Limit Control opens the electrical circuit. This means the blower comes on approximately 30 seconds after the furnace first starts and it continues to run until the furnace cools down. This helps to achieve the maximum comfort and efficiency from your furnace.

FAN RELAY

This relay provides electric power to the Circulating Air Blower for continuous blower operation (Thermostat Fan Switch set to "FAN ON") and for the blower to run if central air conditioning is installed.

FAN/LIMIT CONTROL

The Fan/Limit Control provides power to the Circulating Air Blower to keep it on, until the furnace cools down. The limit portion provides safety because it will open the low voltage control circuit, shutting the furnace down if it gets too hot.

The fan off setting can be adjusted if the fan remains on long enough that cool drafts are felt in the room after the furnace shuts off. Contact a Qualified Service Technician.

DRAIN TRAP ASSEMBLY

The drain trap has a float in it, that will cause the furnace to shut down if the drain lines become obstructed. If this happens the trap and lines must be taken apart and cleaned. See "Condensate Disposal" page 10.

Thermostat

Your furnace will not operate properly without a good quality, correctly installed thermostat. The thermostat location is very important as it must be sensing average room temperatures. It must not be exposed to hot or cold drafts or hot or cold spots on the wall, such as outside walls or a wall with pipes inside or openings into attic.

There are many types and styles of thermostats but the operation is usually similar. **BE SURE TO BECOME FAMILIAR WITH YOUR THERMOSTAT.** The simplest type of thermostat only starts and stops the furnace to maintain the proper room temperature. The most widely used types will control both heating and cooling functions and will have a Fan Switch with Auto and ON settings. On Auto, the Circulating Air Blower will cycle on/off with the furnace but if switched to ON it will run constantly whether or not the furnace is on.

In addition there are thermostats that automatically switch from Heating to Cooling and with night set-backs. The night set-back, or multiple set-back type, will lower the temperature at night or during the day when no one is at home.

HEATING:

Position the Thermostat System Switch on HEAT. Set the Fan Switch to AUTO for the blower to cycle ON/OFF. Select desired temperature setting and furnace will automatically start up and shut off as required to maintain that setting. Fan Switch may be positioned to ON for continuous air circulation only if that position maintains the same or a higher blower speed so you have the same or greater airflow.

CAUTION

Continuous Fan ON at too slow of a blower speed may cause improper furnace operation and possible damage to the heat exchanger.

HEATING ANTICIPATOR:

For more precise comfort control your thermostat may have an adjustable Heat Anticipator. (Some are not adjustable). For most homes the anticipator should be set on the value listed in the Tech Data Sheet which is found in the Furnace Technical Support Manual.

If your furnace cycles ON/OFF with very short ON intervals or if the OFF cycle is so long that room temperatures become uncomfortable the anticipator setting may need to be adjusted.

To Adjust:

Remove thermostat cover and locate anticipator. Check the setting. If not on the setting recommended for your furnace, move the lever to the proper setting and try it for a day or two.

To lengthen burner-on time move the indicator towards "Longer". To decrease burner-on time move in opposite direction.

NOTE

To accurately determine the effect do not adjust more than half a scale marking at a time and allow a day between adjustments.

COOLING:

For cooling simply position the system switch to COOL instead of HEAT and thermostat will function in the same manner to control cooling.

Operating Your Furnace

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

Before starting your furnace be sure you read and understand all of the procedures in this manual. Check to make sure the furnace filter is clean and correctly installed.

STARTING THE FURNACE

WARNING

DO NOT ATTEMPT TO LIGHT THE BURNER WITH A MATCH OR FLAME OF ANY KIND. YOU COULD BE INJURED.

See page 5 or 6 for location and illustration of gas valve.

1. Turn the thermostat to its lowest temperature setting or to OFF if equipped with a System Select Switch.
2. Turn Manual Shutoff Valve, in the gas line, to OFF position, should be a right angle or 90° to gas line.
3. Turn OFF electric power to furnace at disconnect switch or circuit breaker.
4. Remove furnace access panel, exposing gas controls and burner compartment.
5. Locate gas valve and identify settings. The valve is marked with ON — OFF positions.
6. Turn the knob all the way to OFF. Make sure it has been in OFF for at least 5 minutes before proceeding.
7. Turn the control knob to ON (Depress knob to turn on some Honeywell valves).
8. Replace access panels and doors.
9. Turn ON electric power for furnace.
10. Open the Manual Shutoff Valve in the gas-line.
11. Set thermostat to desired temperature and System Select Switch to HEAT if equipped.

The furnace will begin sparking to ignite the pilot flame or the hot surface ignitor will heat up to ignite the gas. When the system verifies a steady flame the ignition system will shut off.

With Spark to Pilot Ignition (System Retries)

The ignition system will spark to light the pilot for 90 seconds. If the pilot does not light within 90 seconds the system will shut off for 5 minutes and then it will try again for 90 seconds. It will continue to cycle until the pilot lights, (90 seconds ON/5 minutes OFF).

If the unit does not start after 3 tries or approximately 20 minutes, shut the unit off at the thermostat and call a qualified Service Agency.

WITH HOT SURFACE IGNITION SYSTEM

Furnace will make several attempts to lite before going into lockout. Each attempt requires a longer time with the total cycle taking approximately 8-10 minutes.

If air remaining in the lines on a new installation prevents the furnace from lighting ONE additional cycle may be tried. If furnace does not light, turn the thermostat to its lowest setting. Wait one minute, then turn it back up above the temperature shown on the thermometer. This starts the ignition cycle over again. **DO NOT REPEAT MORE THAN ONCE.** If furnace will not light, call a qualified Service Agency.

TURNING OFF THE FURNACE

1. Set the thermostat to the lowest setting or set System Select Switch to OFF if equipped.
- Should overheating occur or the gas supply fail to shut off, shut off the manual gas valve to the furnace before shutting off the electrical supply.**

EXTENDED SHUTDOWN

1. Set thermostat to lowest setting or set System Select Switch to OFF if equipped.
2. Turn Manual Shutoff Valve to off position, right angle or 90° to gas line.
3. Turn electric power off. (May be left "ON" for set-back or chronograph type thermostat with batteries, provided thermostat has a system select switch to place in the "OFF" position.)
4. Turn the gas valve control knob to "OFF".

Winter Shutdown

If there is the possibility of freezing temperatures, remove the condensate drain trap and empty to prevent freezing.

L P Model Furnaces

WARNING

If your L.P. (liquefied petroleum) gas furnace is installed in a basement, an excavated area or a confined space, we recommend that you contact your L.P. supplier about installing a warning device that would alert you to a gas leak. We recommend this because L.P. gas is heavier than air and any leaking gas can settle in any low areas or confined spaces. This L.P. gas would create a **DANGER OF EXPLOSION OR FIRE**. If you suspect the presence of gas, follow the instructions on the cover of this manual.

FURNACE MAINTENANCE

It is recommended that you have your furnace inspected and serviced on an annual basis (before the heating season) by a qualified service technician.

You may perform maintenance on the furnace yourself, but remember that certain mechanical and electrical skills and tools are required to properly perform maintenance on the furnace. Personal injury or death may result if you are not properly trained. You should call your installing dealer or place of purchase if you are uncertain about your ability to perform maintenance.

WARNING

TURN OFF ELECTRIC POWER TO FURNACE BEFORE PERFORMING ANY MAINTENANCE OR REMOVING PANELS BECAUSE OF THE DANGER OF ELECTRICAL SHOCK

AIR FILTERS — Monthly

The air filter(s) should be inspected at least monthly and cleaned or replaced as required. There are two types of filters most commonly used. The most widely used is the fiberglass disposable type which should be replaced before it becomes clogged. The other type commonly in use is the washable type constructed of aluminum mesh, foam, or reinforced fibers. Washable filters may be cleaned by soaking in mild detergent and rinsing with water.

NOTE

Some filters are marked with an arrow to indicate the proper direction of air flow through the filter. When installing the arrow must point in the direction of the air flow. Remember that dirty filters are the most common cause of inadequate heating or cooling performance.

The table on page 10 lists recommended sizes and types of filters that may be used with your furnace, based on the input rating and nominal tons of air conditioning that may be used with the furnace.

However, the furnace installer may have used a larger filter for additional air volume or if the furnace was installed for Heating Only with a remote filter cabinet or central return he may have installed a smaller filter. If air conditioning has been added since your furnace was installed, make sure the filter size is adequate.

Replacement filters should be of the same type and size to ensure adequate air flow and filtering, unless a disposable low velocity filter is replaced with a washable high velocity type.

Filter Replacement

The filter will normally be found inside the furnace blower compartment, see pages 5 and 6, but alternate locations may be a remote filter rack attached to the outside of the furnace, a separate return air cabinet attached to furnace or a remote filter grille.

Remote filter grilles and return air cabinets will usually have a hinged door or removable panel to be able to remove filter. Filter racks attached to the furnace will usually be made so the filter simply slides out one side for removal. Use only the same size filter. The type must be the same unless replacing a disposable low velocity type, with a washable high velocity type.

WARNING

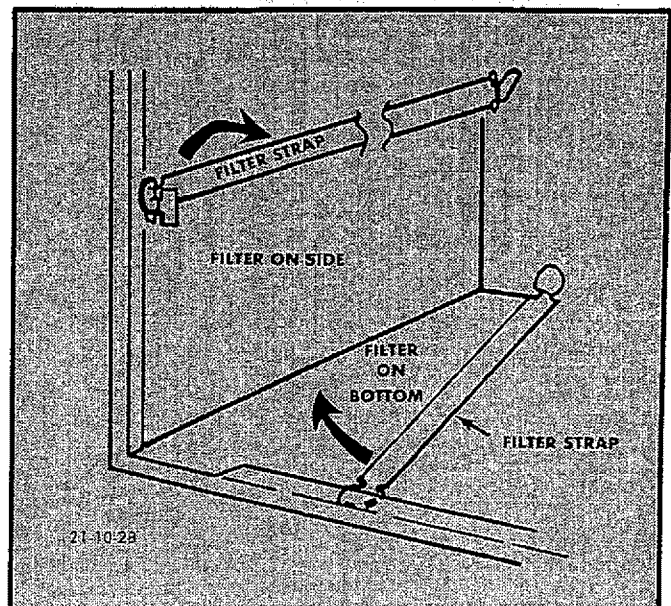
NEVER OPERATE FURNACE WITHOUT A FILTER INSTALLED AS DUST AND LINT WILL BUILD UP ON INTERNAL PARTS RESULTING IN LOSS OF EFFICIENCY, EQUIPMENT DAMAGE AND POSSIBLE FIRE.

Filter Replacement/Upflow (Hi-Boy)

See Figure 4

1. Turn off electric power for furnace at circuit breaker or disconnect switch.
2. Remove blower compartment door.
3. Pull back on filter clip and remove filter being careful not to dislodge dirt and debris from filter.
4. Inspect filter and replace or clean washable type. If filter is aluminum mesh it should be recoated with filter coating spray.
5. Reinstall filter under clips. If filter is marked for air flow direction make sure it's installed correctly.
6. Replace blower compartment door making sure that it's tightly closed.
7. Turn on electric power for the furnace.

FIGURE 4 FILTER REPLACEMENT



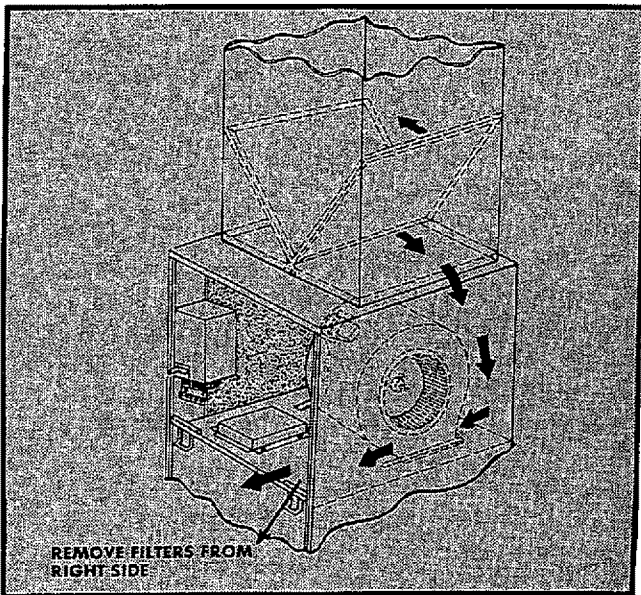
Furnace Maintenance (Cont.)

Filter Replacement/Counterflow

See Figure 5

1. Turn off electric power for furnace at circuit breaker or disconnect switch.
2. Remove blower compartment door.
3. Reach up through right side and lift upward and swing top of filter towards center of furnace then pull filter down and remove being careful not to dislodge dirt and debris from filter.
4. Inspect filter and replace or clean washable type. If filter is aluminum mesh it should be recoated with filter coating spray.

FIG. 5 COUNTERFLOW FILTER REPLACEMENT



5. Reinstall left filter first. If filter is marked for air flow direction make sure it's installed correctly.
6. Replace blower compartment door making sure that it's tightly closed.
7. Turn on electric power for the furnace.

FIG. 6 RECOMMENDED REMOTE FILTER SIZES

Nominal Tons Air Conditioning Nominal Air Flow Cubic Feet per Minute	Recommended Filter Sizes Sq. Inch Surface Area/Nominal Size		Furnace Size 1000 X BTUH
	Disposable Filters	Cleanable Filters	
Up Thru 2 Tons 800-900 CFM	432 20X25	260 15X20	40 50 75 (counterflow) (only)
2½ Tons 900-1100 CFM	480 20X30	288 14X25	40 50 75 100
3 Tons 1100-1300 CFM	576 14X25(2)	346 16X25	40 50 75 100
3½ Tons 1300-1500 CFM	672 16X25(2)	404 20X25	100 125 75 (upflow only)
4 Tons 1500-1700 CFM	768 20X25(2)	461 20X25	125 100 (upflow only)
4½ Tons 1700-1900 CFM	864 20X25(2)	519 24X25	125
5 Tons 1900-2100 CFM	960 20X30 (2)	576 24X25	125

CONDENSATE DISPOSAL Monthly/Annually

Your furnace has a condensate trap as part of the vent system. The moisture in the flue gases will condense and collect in the trap to go to an inside drain or be pumped to a sewer line using a condensate pump.

The Condensate Trap and Condensate Neutralizer Cartridge (if used) in the drain line leading from the trap will require some maintenance. Disassemble and clean trap and cartridge prior to each heating season or if drain line becomes plugged.

Inspect the drain line and overflow line at least monthly. If the Condensate Neutralizer Cartridge becomes plugged the condensate will flow through the overflow line. If this happens clean both cartridge and trap.

TO CLEAN: Disconnect the drain line cartridge and unscrew end cap from cartridge. Pour the neutralizer out and thoroughly flush neutralizer and inside of cartridge with water. Pour neutralizer back into cartridge, adding neutralizer if cartridge is less than ¾ full. Unscrew trap from Vent Connecting Tee and flush thoroughly with water, use soap if necessary to clean, **DO NOT USE** any kind of solvents. Make sure float is reinstalled in trap, Ref. Fig. 7.

Reassemble and seal threaded connections with silicone rubber (bathtub caulk) or pipe dope approved for plastic pipe.

See repair parts section in the Furnace Technical Support Manual, to order replacement neutralizer.

Do not use Condensate for any reason as it is acidic.

FURNACE CONDITION AND FLUE GAS PASSAGES/Monthly

A properly adjusted gas furnace should not require cleaning at frequent intervals, but it should be inspected regularly to ensure safe and efficient operation. A brief monthly inspection is recommended that does not require disassembly. In addition you should have the furnace inspected, and cleaned if required, by a qualified service technician annually.

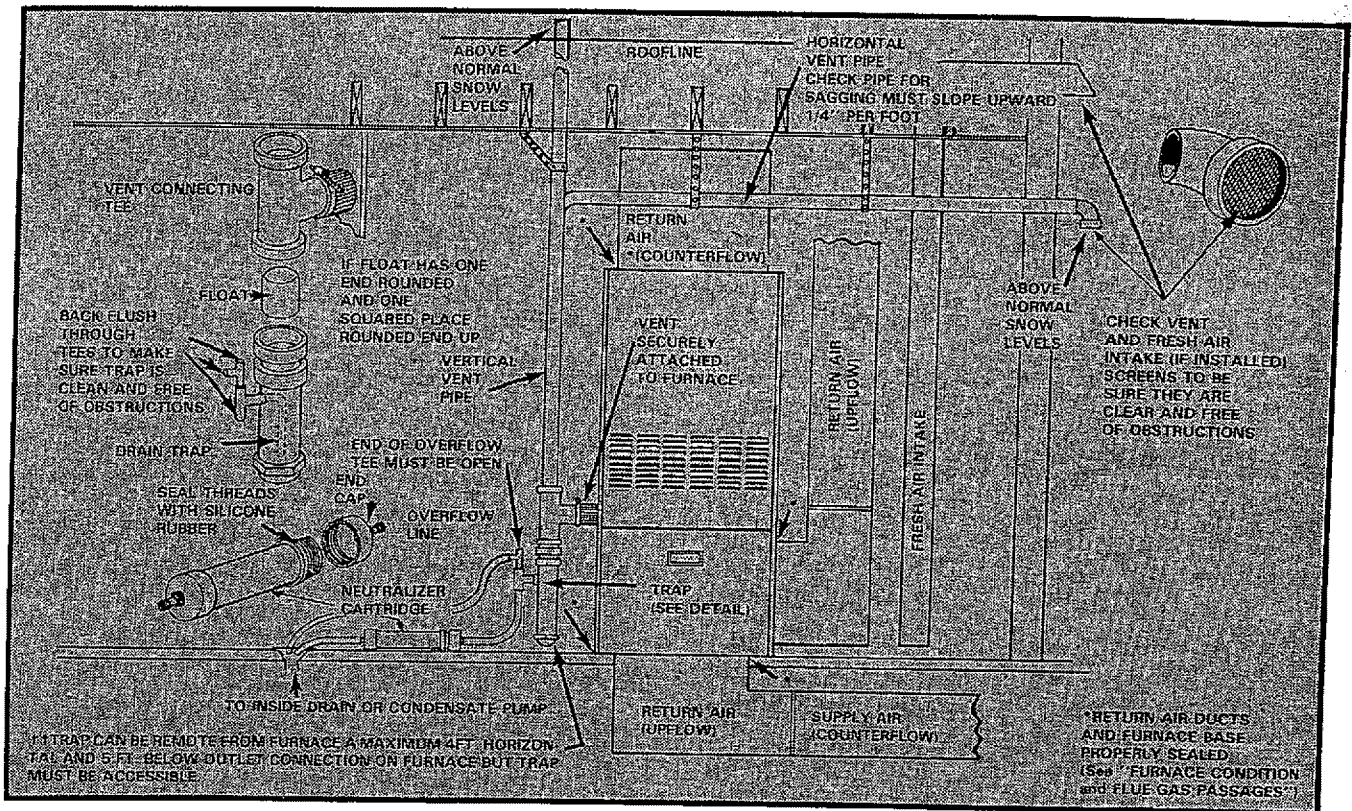
During the monthly inspection check the vent pipe and fresh air intake (if installed), to be sure they are clear and free of obstructions. Check vent pipe for evidence of condensate leakage, tight joints, secure attachment to furnace and sagging pipe.

Horizontal sections of pipe must slope upward 1/4" per foot except sections between furnace and drain trap when trap is not mounted directly on furnace. Any horizontal section (max. 4' long) must slope down a minimum of 1/4" per foot to trap. Vertical sections to trap can be a maximum of 5 feet.

Check return air duct to make sure it is sealed to furnace casing and that it is in good physical condition. It must terminate outside the space containing the furnace with no holes or inlets in furnace space.

Furnace Maintenance (Cont.)

FIG. 7 TYPICAL INSTALLATION



The floor or furnace base must be in good physical condition. For Upflow Furnace with a bottom return the floor or base area around the furnace must form a seal (no sagging, cracks defects etc.) to prevent air from being pulled in from furnace area, or any defect area must be sealed between floor or base and furnace.

Remove the front panel and use a flashlight to inspect the visible part of the heat exchanger, burners and ignitor. Check for loose soot and give particular attention to obvious deterioration from corrosion or other sources. Check for any signs of condensate leakage inside furnace cabinet.

If soot or deterioration is found or if there is evidence of condensate leakage inside furnace **DO NOT OPERATE FURNACE.**

Call a qualified service technician.

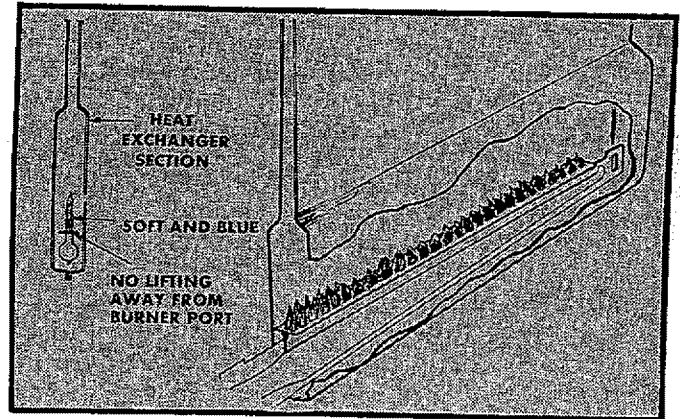
MAIN BURNER & PILOT FLAMES/Monthly

Allow furnace to run approximately 10 minutes then inspect the main burner flames and pilot flame (except furnaces with Hot Surface Ignition).

MAIN BURNER FLAMES should be stable, soft and blue, (dust may cause orange tips or they may have wisps of yellow but they must not have solid yellow tips). They should extend directly upward from burner without curling, floating or lifting off. They must not touch the sides of the heat exchanger.

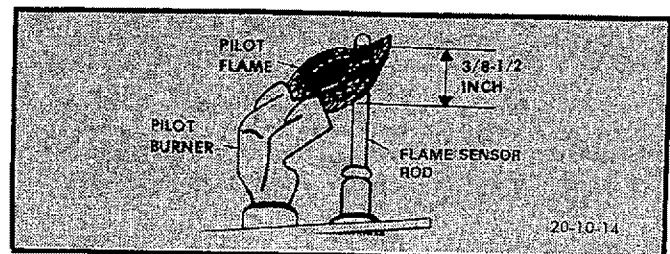
Contact a qualified service agency at once if an abnormal flame appearance should develop.

FIG. 8 MAIN BURNER FLAME



PILOT FLAME should surround 3/8" to 1/2" of the ignitor/sensor tip.

FIG. 9 PILOT FLAME



Furnace Maintenance (Cont.)

BLOWER MOTOR

Motor will require lubrication every five (5) years or normal operation. Add 1/2 teaspoon (2 cc) of SAE #10W30 motor oil to each motor bearing through oil tubes or by removing cap plugs in motor end bells.

CAUTION

DO NOT over oil or use 3 in 1 oil, penetrating oil, WD40 or similar oils on oil motor bearings. Use of these may damage these motors.

SERVICE HINTS

If your furnace fails to operate properly, you may avoid inconvenience and the cost of a service call by checking the following points before you call for service.

NO HEAT OR NOT ENOUGH HEAT...

POSSIBLE CAUSE

Thermostat not set correctly.

No electric power to furnace.

Filter is dirty.

Gas is shut off.

Warm air registers closed or blocked.

Return grilles blocked.

Vent Pipe is obstructed or Drain lines on Condensate Trap are obstructed causing float to rise and block vent pipe.

WHAT TO DO

Set above room temperature. On heating/cooling systems, turn system switch to "Heat"; fan switch to "Auto" or "On" (continuous fan operation).

Check fuse or circuit breaker. Replace blown fuse. Reset breaker. Turn switch on. Be sure blower access door is securely installed. Clean filter.

Turn gas valve on.

Open registers. Move rugs, furniture, other obstructions.

Furnace has a pressure switch in the vent system which interrupts the electrical circuit. If the furnace is vented horizontally check the outlet area to make sure it is not obstructed. Check drain lines and Condensate Trap.

FURNACE RECORD

Model No. _____

Furnace Size (Btuh) _____

Serial No. _____

Where Purchased _____ Date _____

Installer _____ Date _____

Dealer _____ Phone _____

Service History _____

Model No., Size, Serial No. etc. will be found on the Furnace Rating Plate, See Page 5.