

YUKON EAGLE

OWNER'S MANUAL

- **Assembly**
- **Installation**
- **Operation**
- **Repair Parts**

Model No.
LWO-112 (Oil Fired)
LWG-112 (Gas Fired)
LWO-168 (Oil Fired)
LWG-168 (Gas Fired)

CAUTION:
Read Rules And
Instructions
Carefully For
Safe Operation

IMPORTANT:

Installation must be made in accordance with state and local ordinances which may differ from this installation manual.



YUKON HUSKY/EAGLE I YUKON POLAR/EAGLE II OIL/GAS SOLID FUEL FIRED CENTRAL FURNACE

FOR YOUR SAFETY:

If you smell gas:

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

FOR YOUR SAFETY:

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



All furnaces in this owner's manual are UL Listed in UL file #MH 11057

DANGER

RISK OF FIRE OR EXPLOSION

Do not burn garbage, gasoline, drain oil, kerosene, thinners, etc.

WARNING

RISK OF FIRE

- Firing door and ash door must be tightly closed during operation.
- Do not operate with flue draft exceeding .03" W.C.
- Do not store flammable materials within marked installation clearances.
- Frequently inspect and clean heat exchanger, smoke pipe, and chimney of soot and/or creosote.
- Do not connect this unit to a chimney flue serving another appliance.

CAUTION

BLACK SURFACES ARE HOT

Keep children away. Do not touch.

FURNACE DIMENSIONS

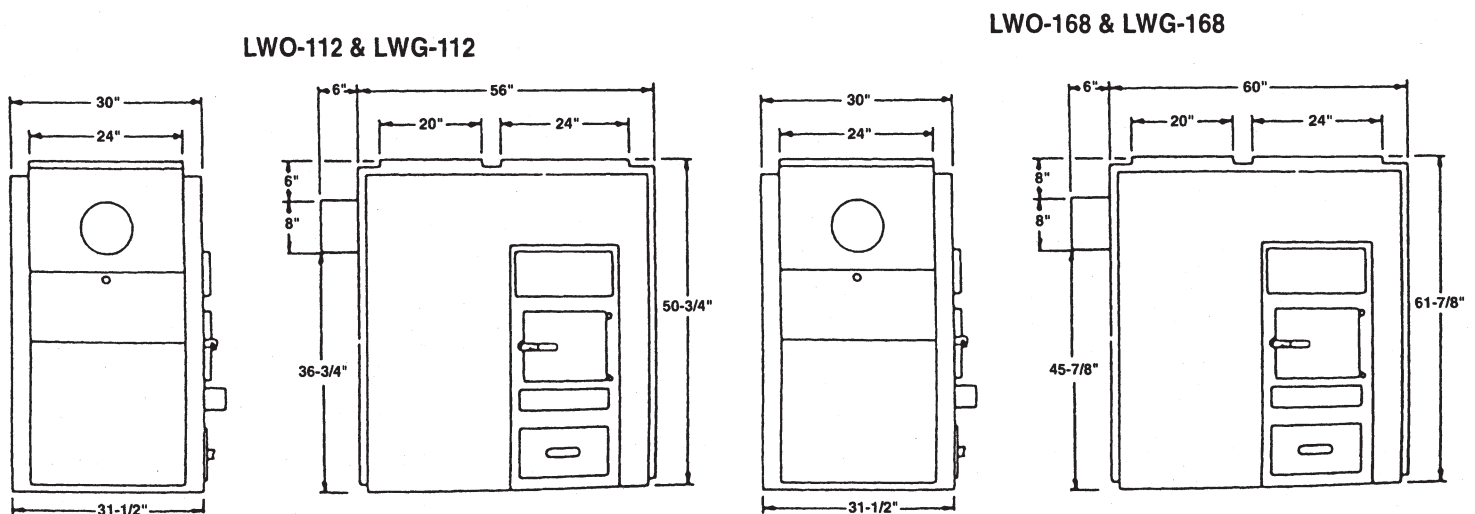


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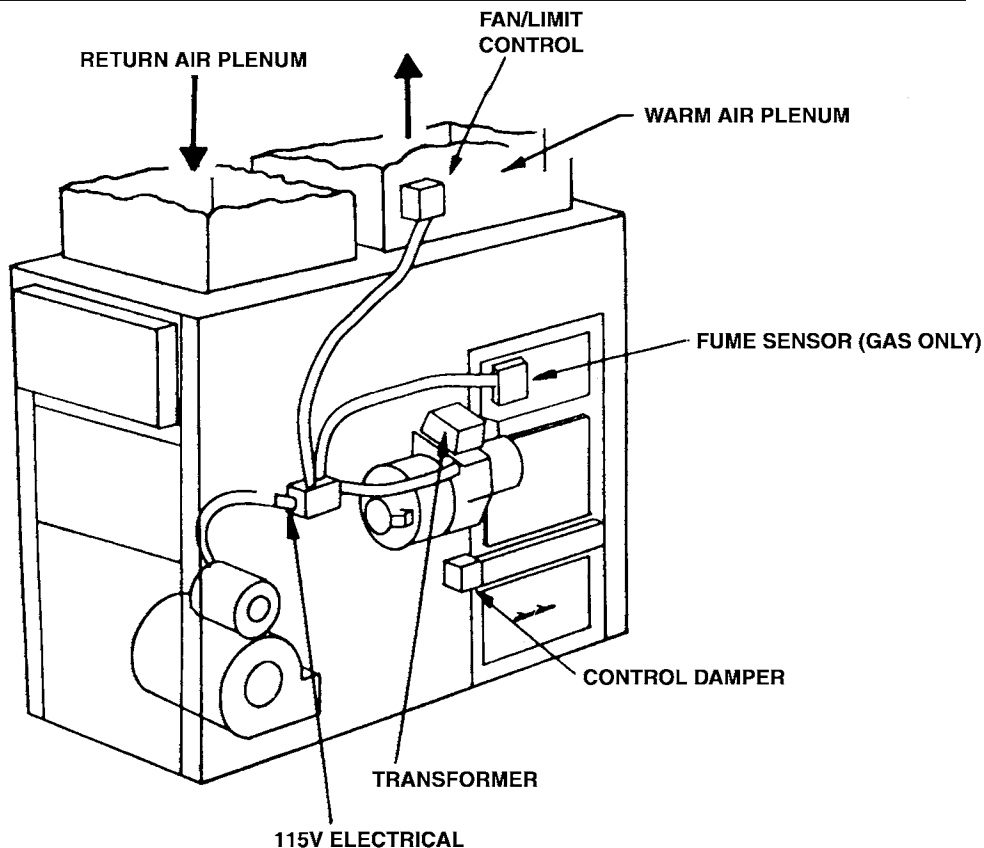
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Areas of this manual refer to Underwriters Laboratories (UL) and the National Fire Protection Association (NFPA).

UL & NFPA are non-profit organizations.

UL is the oldest and largest public safety testing laboratory in the world. All furnaces in this manual are Listed by UL. They have passed all of the safety and efficiency requirements for both gas and oil in the U.S. The UL Listing label is also your assurance that UL employees inspect our furnaces during the manufacturing process several times a year on an unannounced basis.

NFPA Codes, Standards, recommended practices, and guides referred to in this document have been developed through a consensus process approved by the American National Standards Institute. State and local codes are adopted from these standards.



INTRODUCTION

This manual provides installation, operation and maintenance instructions as well as parts ordering information for the combination oil/gas solid fuel furnace models LWO-112 or LWG-112 and the LWO-168 or LWG-168.

IMPORTANT

Please read all instructions carefully before attempting installation of this unit. Installation should only be done by a qualified installer.

UNPACKING AND INSPECTION

Inspect the unit for visible damage. The furnace is shipped in three cartons. Contents of items shipped is as follows:

1. Carton One: The basic furnace comes in the crate. Inside the filter door, below the flue outlet, is the pre-assembled, circulating fan, motor, belt, drives and drip shield. The air filter lies in a frame above the fan. Inside the furnace wood-firing door are three wood grates, secondary air shut-off assembly, smoke pipe draw collar, primary air draft tube and door handle weldment. Remove these items and set aside for later installation.
2. Carton Two: This accessory package contains the secondary air intake cover, thermostats, barometric damper, fan and limit control, damper control unit, transformer, wiring harness, fume sensor (gas only) and owner's manual.
3. Carton Three: The oil or gas burner is in this carton pre-assembled and ready for installation.

RULES FOR SAFE INSTALLATION AND OPERATION

1. Read these rules and the instructions carefully. Failure to follow these rules and instructions could cause a malfunction of the furnace. This could result in death, serious bodily injury and/or property damage.
2. Check your local codes. The installation must comply with them.
3. Use only the type of fuel approved for this furnace. Over-firing will result in failure of heat exchanger and cause dangerous operation.
4. Oil storage tanks, piping and valves should be installed and tested in accordance with NFPA 31.
5. You must have a sufficient supply of combustion air to the area in which the furnace is located. (page 17)
6. Factory Built Chimneys: Connect this furnace to a chimney that complies with NFPA 211 3-1.2. Factory built chimneys for use with wood-burning appliances shall comply with the HT requirements of UL 103 or CAN/ULC-S629-M87. This means you must install what is referred to as type HT all fuel chimney.
Masonry Chimneys: Connect this furnace to a chimney that complies with NFPA 211 3-1.2. A field constructed chimney of solid masonry units, bricks, stones, listed masonry chimney units, or reinforced Portland cement concrete that is lined with suitable chimney flue liners and built in accordance with the provisions of Chapter 4 of this standard.
7. Follow a regular service and maintenance schedule for efficient and safe operation.
8. Before servicing, allow furnace to cool. Always shut off electricity and fuel to furnace when working on it. This will prevent electrical shocks or burns.

FURNACE SPECIFICATIONS

MODEL LWO-112 (Oil)

Input rating	140,000 BTU
Nozzle	1.0 G.P.H. - 80 H
Burner	Wayne Model - MSR

MODEL LWG-112 (Gas)

Input rating	140,000 BTU*/HR
	NAT L/P
Orifice	7/32" (.218 dia.) 29 (.136 dia.)
Manifold Pressure	3.5 W.C.P. 10.0 W.C.P.
Burner	Wayne Model P250-AF-DI-Y

MODEL LWO-112 or LWG-112

Blower Size	10" x 10"
Blower C.F.M.	800 - 1800
Motor Size	1/3 - 1/2 - 3/4 HP
Firebrick Lined	2" THICK
Cast Iron Grates	YES
Wood Fire Door	11" x 10"
Air Filter	20" x 25" x 1"
Wood Combustion Chamber Size	24" x 16"

MODEL LWO-168 (Oil)

Input rating	189,000 BTU
Nozzle	1.35 G.P.H. - 80 H
Burner	Wayne Model - MSR

MODEL LWO-168 (Gas)

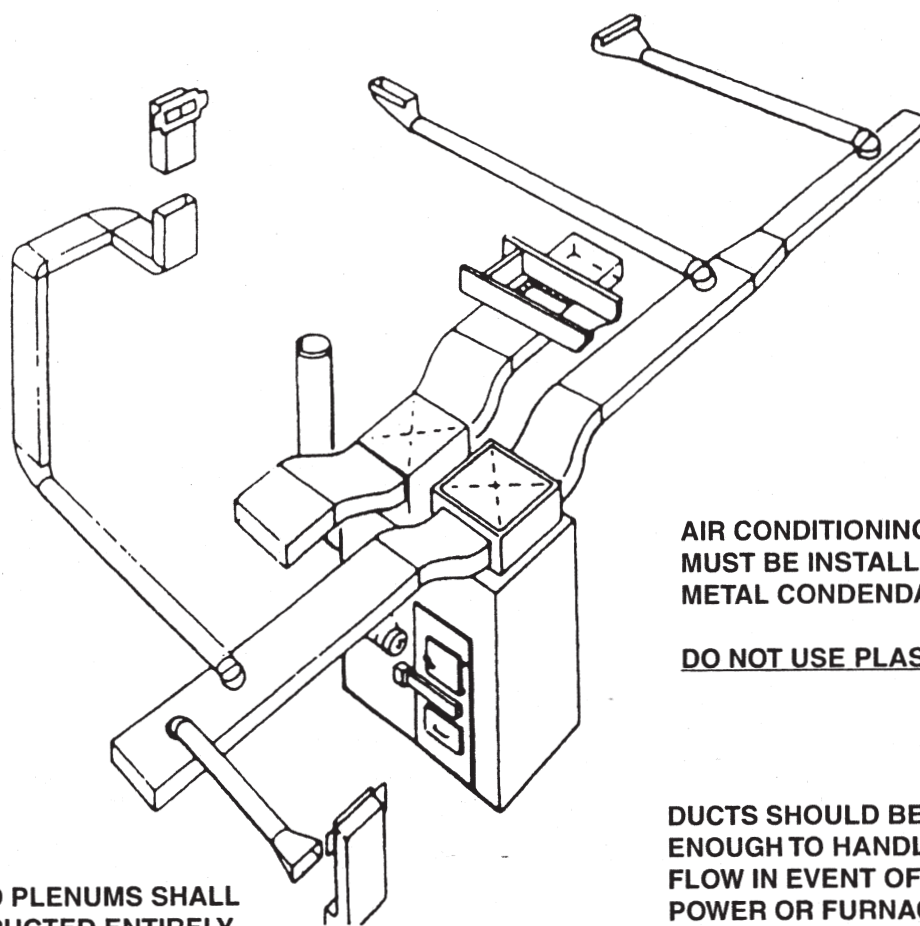
Input rating	189,000 BTU*/HR
	NAT L/P
Orifice	"F" (.257 dia.) "23" (.154 dia.)
Manifold Pressure	3.5 W.C.P. 10.0 W.C.P.
Burner	Wayne Model P250-AF-DI-Y

MODELS LWO-168, LWG-168

Blower Size	11" x 10"
Blower C.F.M.	1200 - 2000
Motor Size	1/3 - 1/2 - 3/4 HP
Firebrick	2" THICK
Cast Iron Grates	YES
Wood Fire Door	13-1/4" x 13-1/4"
Air Filter	20" x 25" x 1"
Wood Combustion Chamber Size	24" x 18"

NOTE

It is recommended that a 2", noncombustible, raised pad be used for the furnace. This will prevent moisture from getting under the furnace and causing corrosion.



**DUCTS AND PLENUMS SHALL
BE CONSTRUCTED ENTIRELY
OF SHEET METAL**

**AIR CONDITIONING COIL
MUST BE INSTALLED WITH
METAL CONDENSATE PAN**

DO NOT USE PLASTIC PAN

**DUCTS SHOULD BE LARGE
ENOUGH TO HANDLE GRAVITY AIR
FLOW IN EVENT OF ELECTRIC
POWER OR FURNACE FAN FAILURE**

TYPICAL INSTALLATION

DANGERS - CAUTION - FIRE HAZARDS (Burn wood logs or coal only)

- Do not install a power humidifier on the warm air plenum.
- Do not load wood above secondary air tube. Doing so will cause over-fire and damage to combustion chamber will result.
- Do not attempt to light a wood or coal fire when oil or gas vapors are present. An explosion or flashback could cause personal injury.
- Do not install on combustible floor.
- Load wood or coal carefully or damage may result to fire brick or refractory pot liner.
- Fire the oil or gas burner at least once each week during the heating season. This will insure clean nozzles and electrodes.
- Inspect air filter regularly. Clean or replace as necessary. Filter size is 20" x 25" x 1".
- If an over-fire situation should occur, be sure ash door and fire door are closed. Turn thermostat down to close primary air damper.
- In the event of an electrical power failure, be sure ash door and fire door remain closed.
- In the event of a soot or creosote fire, call your fire department immediately. Turn thermostat down to close primary air damper and make sure ash door and fire door are closed.

If duct system cannot accommodate gravity air flow in the event of an electrical power or furnace fan failure, a UL Listed spring loaded damper placed in the warm air plenum, equipped with a fusible link that melts at excessive temperatures and then opens the damper, can be used to reduce the heat in the warm air ducts.

SECONDARY AIR SHUT OFF MODELS LWO-112 & LWG-112 ONLY

1. Remove round secondary air shut off disc from plastic bag.
2. Screw disc to the intake cover just installed.

Opening the disc when burning wood provides room air to the round perforated tubes between the top and bottom row of firebrick, thereby causing secondary combustion of the unburned wood gases as they leave the initial flame. This patented feature increases wood burning efficiency up to 40% while reducing smoke and creosote.

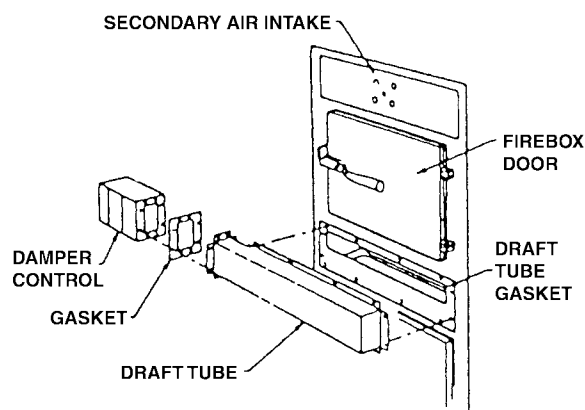
When burning gas or oil for extended periods of time, this disc should be closed.

It is not necessary to provide this disc on models LWG-168 and LWO -168. Maximum efficiency is achieved without this disc.

SECONDARY AIR INTAKE COVER

1. Remove secondary air intake cover from accessory package and align over mounting holes located above fire door assembly on face of furnace.
2. Insert 12 number 10 x 3/4 hex HD drill screws (furnished with cover) through mounting holes and tighten.

Fig. 5



CLEARANCES TO COMBUSTIBLES

Above Top of Warm Air Plenum	From the Front	From Sides and Back	From Chimney Connector	6 Ft. of Plenum	6 Ft. of Plenum
6"	48"	18"*	18"	6"	1"

Service clearance of 24" min. required to service blower.

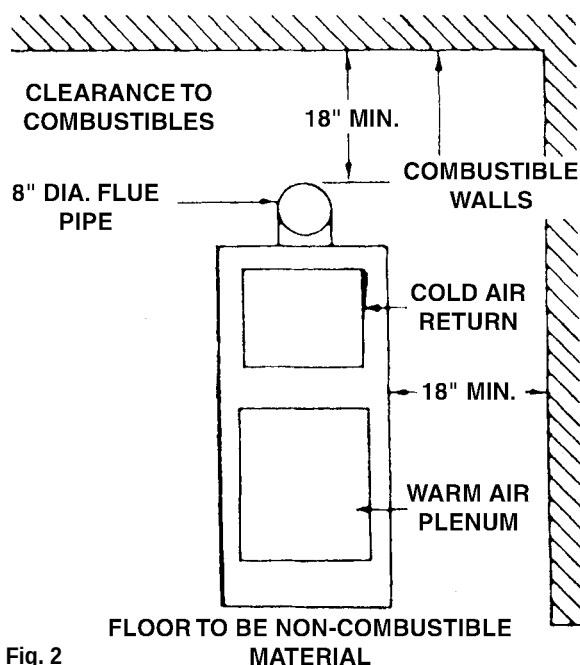
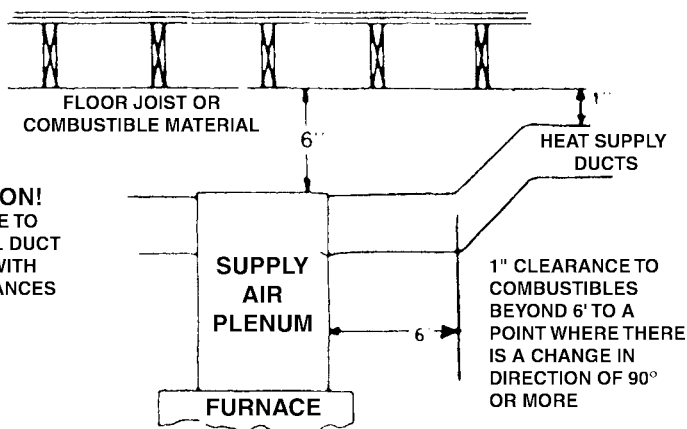


Fig. 2

CAUTION!
BE SURE TO
INSTALL DUCT
WORK WITH
CLEARANCES
SHOWN



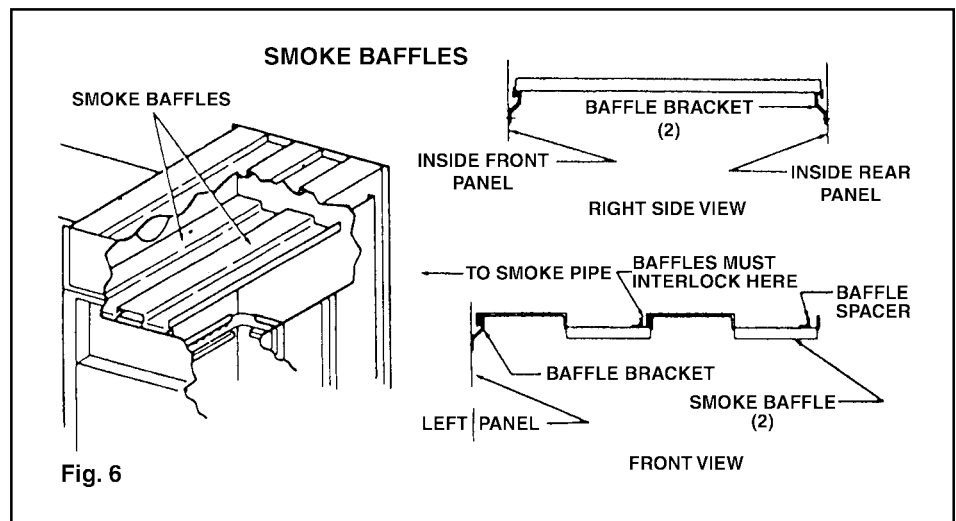
SIDE VIEW

Up to 50% less clearance between combustible walls and chimney connector to furnace and ducts is allowed if insulated according to NFPA Standard 90B or your local building code. This copyrighted book is available from the National Fire Protection Association Inc. P.O. Box 9101, Quincy, MA 02269-9101.

SMOKE BAFFLES

The smoke baffles are factory installed and **must** be checked to see that they have not become dislodged during shipping. Refer to Fig. 6 for proper installation and, if necessary to reposition, proceed as follows:

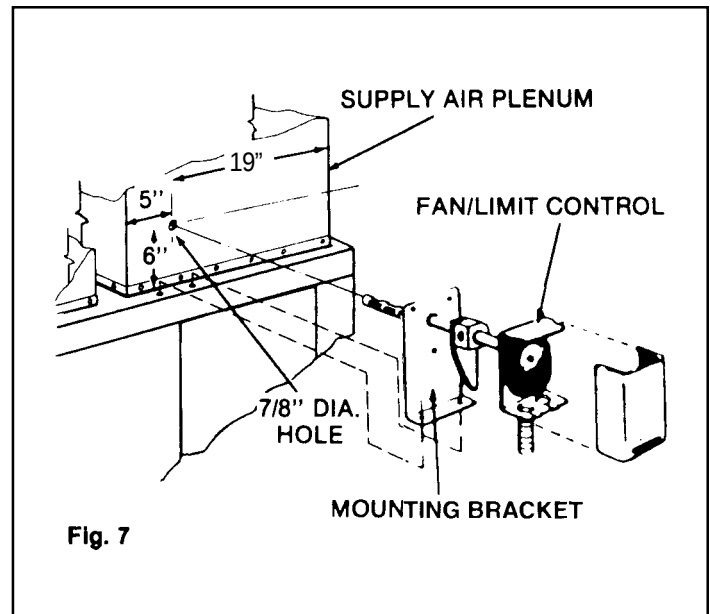
1. Holding baffle in proper position, tilt rear up to clear baffle mounting brackets.
2. Push baffle up to top of combustion chamber above all three brackets, level off, slide left and lower onto mounting brackets.
3. Check to see that all three brackets are engaged.



4. Repeat with second baffle, making sure baffles interlock as shown in Fig. 6. When properly installed, baffles will not move more than 1/4" in any direction. Failure to have baffles properly installed will **severely** affect combustion efficiency.

INSTALLING THE HONEYWELL FAN/LIMIT CONTROL

1. After attaching the warm air sheet metal plenum to the furnace, using the fan/limit control white mounting flange as a template, place it on the top edge of the furnace casing above the fire door so that the holes in the furnace casing and the flange are aligned with each other. Attach the screws to secure the flange. (See Fig. 7)
2. Using the flange as a template, mark the center of the large hole and the two smaller holes, remove the bracket and drill a 7/8" hole and two 1/8" holes in the sheet metal plenum.
3. Replace the flange and reattach it with the mounting screws.
4. Mount the fan/limit control ridged bracket (furnished with the fan/limit control) with two 1/2 x 7 sheet metal screws.
5. Insert the fan/limit control into the bracket. Align so that it is straight. Tighten setscrew to secure control.



MOUNTING THE THERMOSTATS

The thermostats must be mounted on an interior centrally located wall away from direct sunlight and drafts and approximately 5 feet above the floor. It is not required that they be level. Place them right next to each other.

Two Honeywell digital thermostats are furnished with all multi-level furnaces. The larger thermostat controls your gas, oil or electric, whichever back-up fuel you have. It offers one setting for the temperature you want the burner started in the event your wood supply is not adequate to keep your home at its temperature setting. It also has a night setback feature that allows you to keep a lower temperature at desired times. This thermostat also controls the air conditioning, if applicable.

The smaller thermostat controls the wood/coal room temperature. It does not have a night setback feature.

If you have no plans for air conditioning now or in the future, you will need a 3-wire thermostat cable from your furnace to your thermostat. If you intend to install air conditioning either now or in the future, a 5-wire thermostat cable is required.

TYPICAL THERMOSTAT SETTINGS

The wood thermostat (the smaller one) is set on 74 degrees. The larger thermostat is set at 70 degrees. The night setback on the larger thermostat is set at 66 degrees. The wood thermostat calls for heat first by opening the air to the wood fire. It opens and closes automatically to keep the temperature at 74 degrees. If you run low or out of wood, the burner will come on automatically when the temperature in the home reduces to 70 degrees, or if the thermostat were in the setback mode, the burner would not start until it is called on at 66 degrees.

When the expensive fuel is burning, the wood thermostat goes blank.

LOCATING THE FURNACE

Locate the furnace as close to the chimney and as near the center of the heat distribution as possible.

The furnace should be located with respect to building construction and the placement of other equipment. Consideration should be given to sufficient clearance in order to provide adequate access for the cleaning of surfaces; the replacement of air filters, blowers, motors, controls and the chimney connector; and for the lubrication and servicing of moving parts.

Standard installation clearances from combustible surfaces are 48" in the front of this furnace, 18" from the sides, rear and smoke pipe.

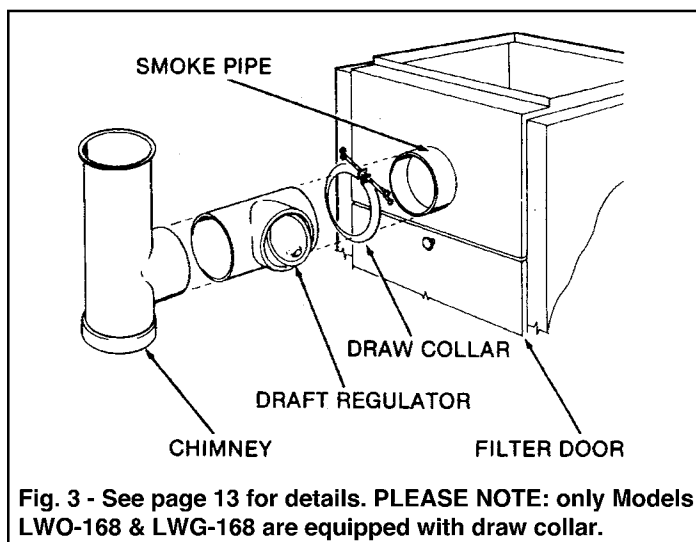
INSTALLATION

Typical furnace installation is shown in Fig. 2 (page 6). Place your furnace in the pre-selected location, making sure it is level. Proceed as follows:

READ ALL INSTRUCTIONS BEFORE INSTALLING

DRAW COLLAR - Models LWO-168 & LWG-168 ONLY

Attach the draw collar around the stainless steel smoke pipe where it leaves the furnace tight against the furnace cabinet. Keep field installed smoke pipe at least 2" away from draw collar to insure that smoke leaving the furnace will not be drawn into the circulating air stream. Refer to Fig. 3.



FIREBRICK PLACEMENT (Fig. 4)
LWO 112 & LWG-112

LOWER ROW

1. Place 3 12x6 brick at rear of firebox
2. Place 4 12x6 brick on side opposite burner
3. Place 4 12x6 brick on burner side

UPPER ROW

1. Place 2 9x6 brick at rear of firebox. The 9-inch side lying down.
2. Place 1 9x6 and 1 12x6 brick on side opposite burner. The 9-inch and 12-inch side lying down.

INSTALL GRATES LAST (wide side up)

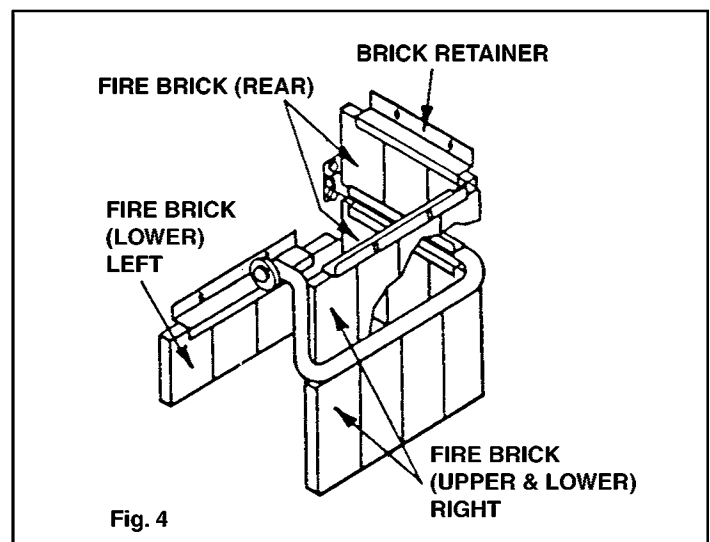
DAMPER CONTROL

Remove control from accessory box and install as follows:

1. Remove the four screws that hold the gasket to the DS-103 panel.
2. Mount the DS-103 to the draft tube using screws removed above. Make sure gasket stays in place. (see Fig. 5, page 6)
3. Loosen the two screws located at slotted end of draft tube, and remove remaining 10 screws. Make sure gasket stays in place.
4. Mount DS-103 control and draft tube assembly to furnace as shown in Fig. 5 (page 6).

NOTE

If barometric damper control is installed horizontally as illustrated, it must be at least 18 inches from furnace smoke outlet.



FIREBRICK PLACEMENT (Fig. 4)
LWO 168 & LWG-168

LOWER ROW

1. Place 3 12x6 brick at rear of firebox
2. Place 4 12x6 brick on side opposite burner
3. Place 4 12x6 brick on burner side

UPPER ROW

1. Place 3 9x6 brick at rear of firebox
2. Place 3 9x6 and 1 4-1/2x9 brick on side opposite burner

INSTALL GRATES LAST (wide side up)

DS-103 DAMPER CONTROL

The T&T terminals are connected to the T&T terminals on the gas or oil burner. The R terminal is not used. The C terminal is connected to the C terminal on the 24-volt transformer. Terminal 1 is connected to the wood thermostat. Terminal 2 is connected to the burner thermostat. When Terminal 1 is energized by the wood thermostat, a relay on the circuit board energizes a solenoid that opens a damper that supplies air to the wood fire. When terminal 2 is energized, it closes this damper and energizes the T&T terminals, which in turn energizes the burner.

OIL BURNER INSTALLATION

NOTICE

- Model LWO-112 burner has a (140,000 BTU input)
1.00 G.P.H. 80 degree H nozzle installed at the factory.
- Model LWO-168 burner has a (189,000 BTU input)
1.35 G.P.H. 80 degree H nozzle installed at the factory.

GUN ASSEMBLY ADJUSTMENT

The gun assembly can be adjusted in the slot of the fan housing by loosening screw holding slot cover in position. Adjust nozzle tip so it is located 7/8" behind the front face of the burner cone.

Install burner as follows:

1. Make sure hole in side of pyrolite chamber lines up with hole in the end of the blast tube.
2. Remove nuts from burner mounting studs on face of the furnace.
3. Place gasket (packed on burner box) over studs and install drip-shield. (Shipped in blower compartment.)
4. Insert burner tube into furnace so that burner mounting flange is tight against the drip-shield and furnace front.
5. Install mounting nuts and tighten.

CAUTION

This furnace is not approved for use with aluminum wire.

FUEL TANKS AND FUEL LINES

Fuel tanks and fuel lines must be installed in accordance with requirements of NFPA 31.

If the fuel lines are under 30 feet in length, it is satisfactory to use 3/8" O.D. copper tube. Never use tube smaller than 3/8" O.D. If the lines are over 30 feet in length, we recommend 1/2" O.D. tube. Use good flare connections on the fuel lines and, whenever possible, avoid splicing the tube. Never make a splice or joint underground. Whenever possible, avoid overhead lines; avoid kinks and traps in the lines. Do not fasten fuel lines directly to floor joists, sills, or girders. Whenever possible, support fuel lines with sound-absorbing devices.

SINGLE LINE SYSTEM

Use a single line hookup only when fuel does not have to be lifted from the tank to the burner. When the outlet on the fuel tank is higher than the inlet on the burner, a single line system can be used.

NOTE

24 volt wires from the transformer to DS-103 control, from burner to DS-103, and from thermostat to DS-103 need not be enclosed in conduit unless required by local codes.

TWO LINE SYSTEM

Use a two-line system when it is necessary to lift the fuel from the tank to the burner. On outside buried tanks, install a supply line from the tank to the burner and return line from the burner back to the tank. The supply line is called the suction line. The suction line should extend down to within a few inches of the bottom of the fuel tank.

OIL FILTER

A fuel filter should be used with either an outside or inside fuel tank. In all cases install the filter in accordance with local codes. The filter should always be installed inside, near the furnace. An inside tank shall be placed not less than 5 feet horizontally away from the furnace or any internal or external fire or flame appliance being served by the tank.

New oil replacement cartridges should be installed annually or as required. Always use the new gasket that is supplied with the replacement cartridge. Tighten the top of the filter carefully and check the gasket for proper fit.

FILL AND VENT PIPES

Fuel tanks must be equipped with a fill pipe and a vent pipe. Fill pipes should be terminated in a convenient place for filling and should be equipped with a watertight cap. It is recommended that 1-1/4" pipe be used for the vent. The vent should extend outdoors and an approved vent hood should be used.

ELECTRIC WIRING

All electrical wiring must be done in accordance with the National Electrical Code and the code legally authorized in the area where the installation is being made. The circuit protector device must be located in a convenient place near the furnace. No lighter than No. 14 wire should be used in the furnace power supply circuit. All furnaces covered by this manual and installed in the United States of America operate on 115 Volts, 60 Cycle, 1-Phase Alternating Current with a 20 amp circuit protector device

WARNING

Turn off electric power at circuit protector device before making any line voltage connections.

WIRING THE FURNACE

The furnace wiring is provided in harness form.

Mount the 4 x 4 junction box on 7/8 inch diameter opening on front of blower compartment and secure with conduit connector and lock-nut for blower motor lead conduit and at least one screw.

Connect components as shown in wiring diagrams on pages 11- 12.

GAS BURNER INSTALLATION

Model LWG-112

A 7/32" dia. orifice has been installed at the factory (140,000 BTU input - nat. gas). To convert to LP gas, see manufacturers instructions packed with the burner.

Model LWG-168

A "F" (.257 dia.) orifice has been installed at the factory (189,000 BTU input - nat. gas). To convert to LP gas, see manufacturers instructions packed with burner.

Install burner as follows:

1. Make sure hole in side of pyrolite chamber lines up with hole in the end of the blast tube.
2. Remove nuts from burner mounting studs on face of the furnace.
3. Install drip shield (shipped in blower compartment) over studs. Place gasket (packed in burner box) over drip shield.
4. Assemble mounting flange over burner blast tube (flat surface away from burner housing). Do not tighten clamping screws.
5. Insert burner tube into furnace. Align holes in mounting flange over studs on furnace. Replace nuts removed in step 2 above and tighten.
6. Insert burner so that burner housing is tight against mounting flange (end of blast tube should be flush with inside of pyrolite chamber). Level burner and tighten clamping screws.

GAS PIPING

All piping must comply with local codes. In the absence of local codes, follow the national fuel gas code ANSI Z233.1. A sediment trap or drip leg must be installed in the supply line to the burner. (See Fig. 9, page 10)

A union shall be installed in the gas line adjacent to and upstream from the control manifold and downstream from the manual main shut-off valve.

A manual shut-off valve shall be installed in the gas supply line with a 1/8" N.P.T. plugged tapping for test gauge connection.

The building structure should not be weakened by the installation of the gas piping. The piping should not be supported by other piping, but should be firmly supported with pipe hooks, straps, bands or hangers. Butt or lap welding pipe should not be bent.

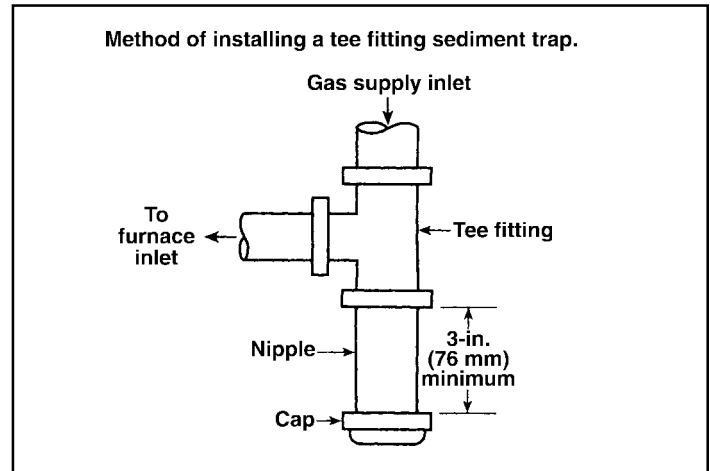
The gas piping should be installed so as to prevent an accumulation of condensation and must be protected against freezing. A horizontal pipe should be pitched so that it grades toward the meter and is free from sags. The pipe should not be run through or in an air duct or clothes chute.

After the piping and meter connections have been checked for leaks, purge the system of air. Be sure to relight all pilots on other appliances.

The gas line should be a separate supply direct from the meter to the burner. It is recommended that new pipe be used and located so that a minimum amount of work will be required in future servicing. The piping should be installed so as to be durable, substantial and gas tight. It should be clear and free from cutting burrs and defects in structure or threading. Cast iron fittings or aluminum tubing should not be used for the main gas circuit. Joint compounds (pipe dope) should be used sparingly on male threads only and be approved for all gases.

GAS PIPE SIZING

Check with your local gas supplier to determine total gas load for all of your gas appliances. Size pipe accordingly.



FUME SENSOR

The FUME SENSOR is a manual reset heat/pressure sensor which will shut down the gas burner in the event of a chimney down draft, plugged chimney, plugged smoke pipe or a plugged secondary heat exchanger. In the event of a shut down, check above and correct before resetting sensor and putting furnace back into operation. Wire per schematic.

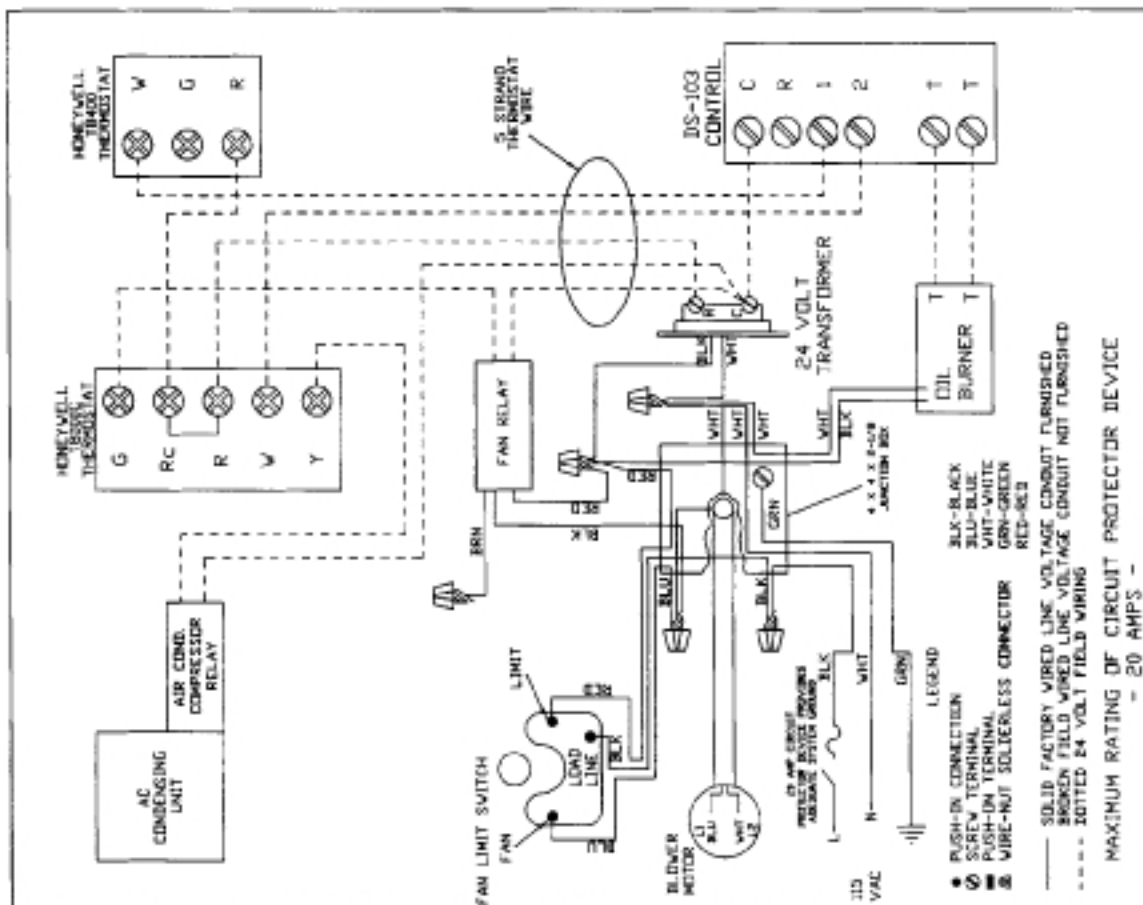
MOUNTING FUME SENSOR (GAS MODELS ONLY)

1. Screw fume sensor into threaded hole located in secondary air intake cover.
2. Align sensor so that the air slot on back of sensor cover is in the vertical position and tighten clamping nut.

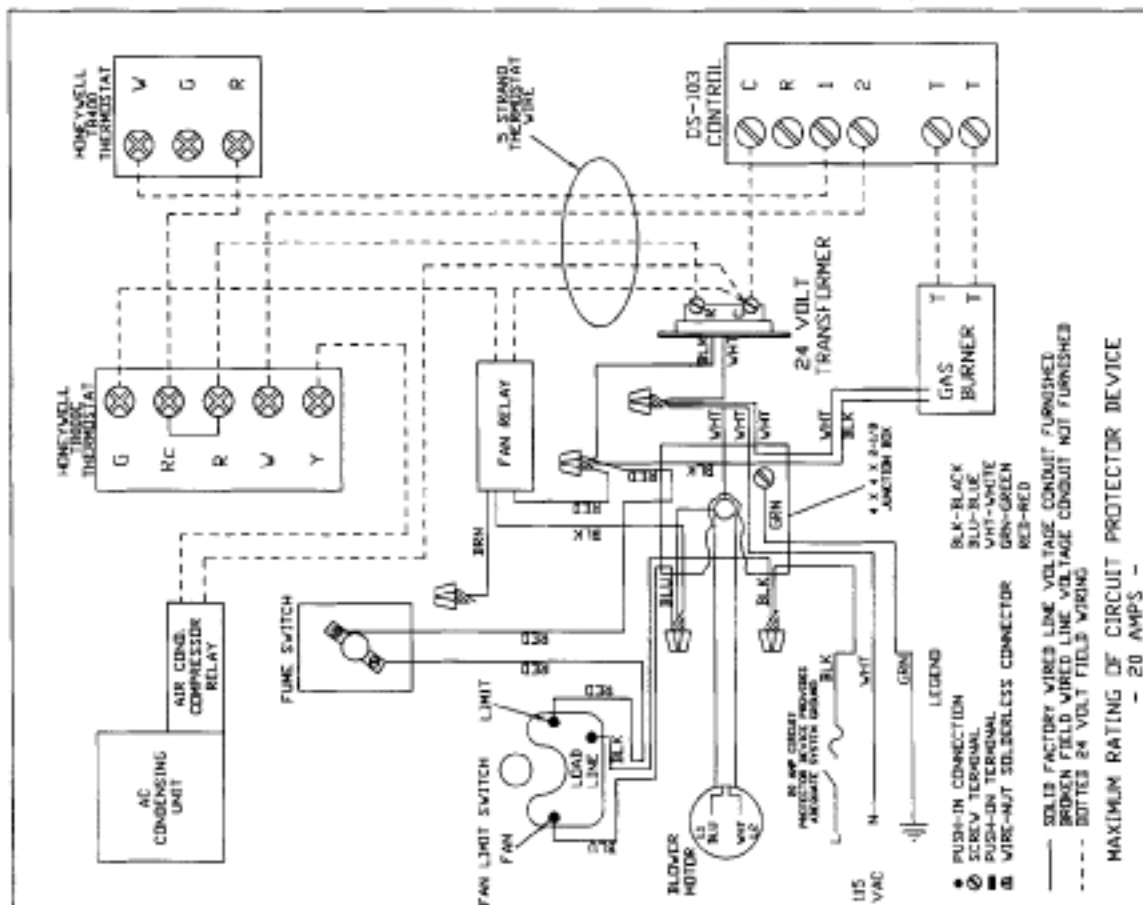
INSTALLING AIR CONDITIONING COIL

The coil should always be installed in the warm air plenum. The metal condensate pan should be at least 2 inches above the fan limit control probe so that the heated air flow direction is not changed. The air flow needed for gravity operation in the event of an electric power or furnace fan failure must not be restricted. It is recommended that you install manual dampers along side of the condensate pan that can be manually removed or opened for winter operation.

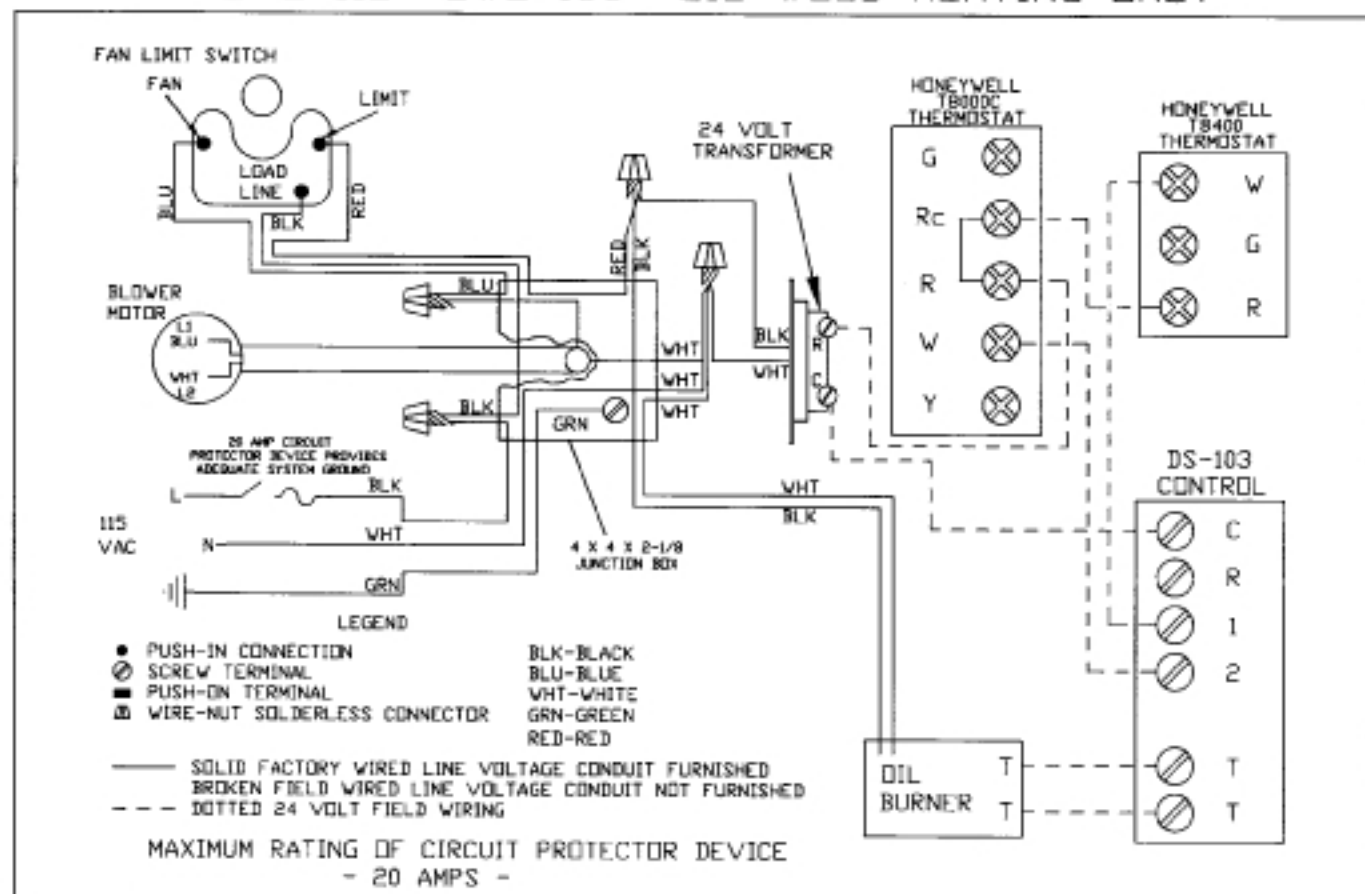
OIL HEATING WITH AIR CONDITIONING



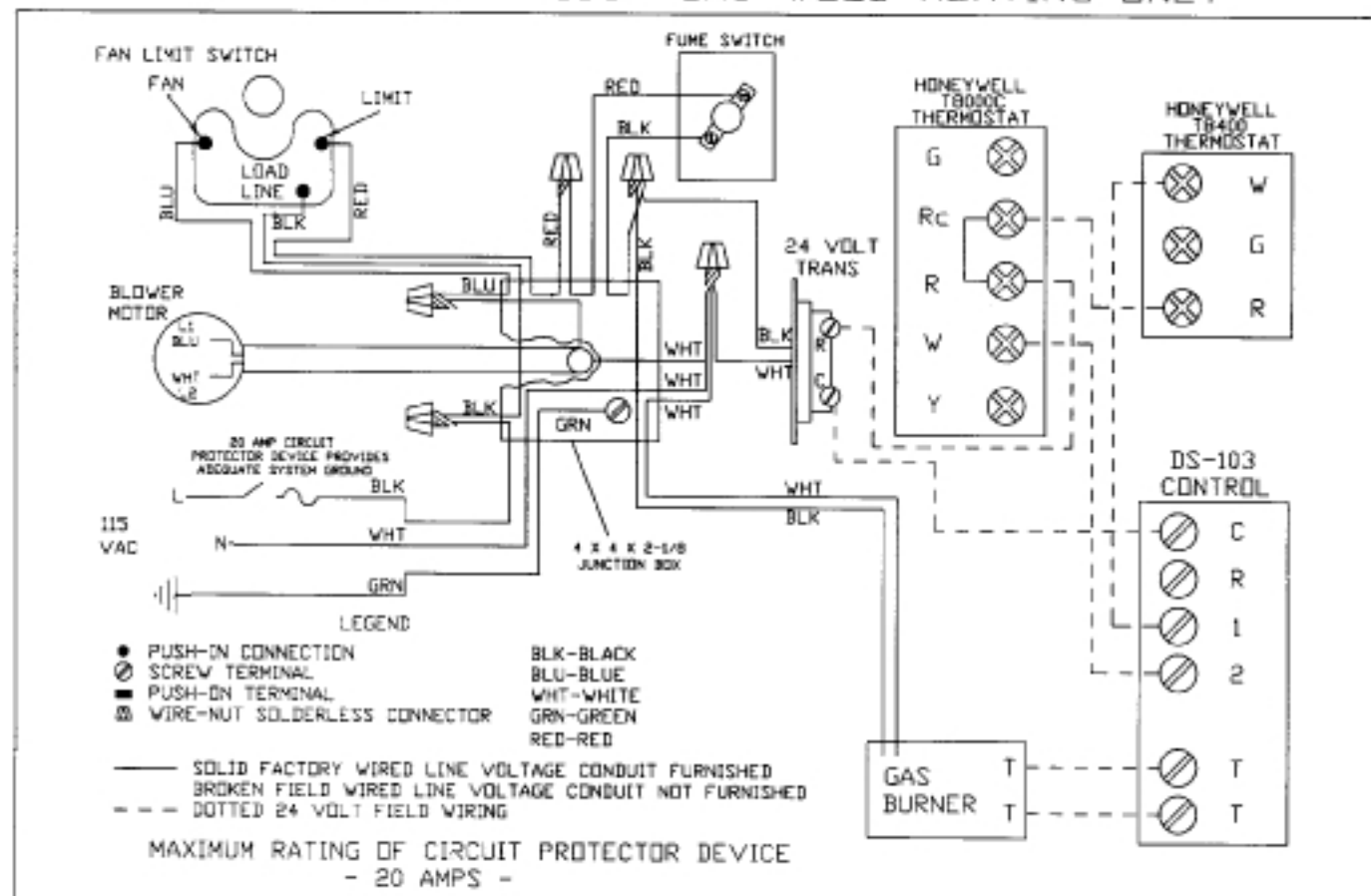
GAS HEATING WITH AIR CONDITIONING



LWO 112 LWO 168 OIL WOOD HEATING ONLY



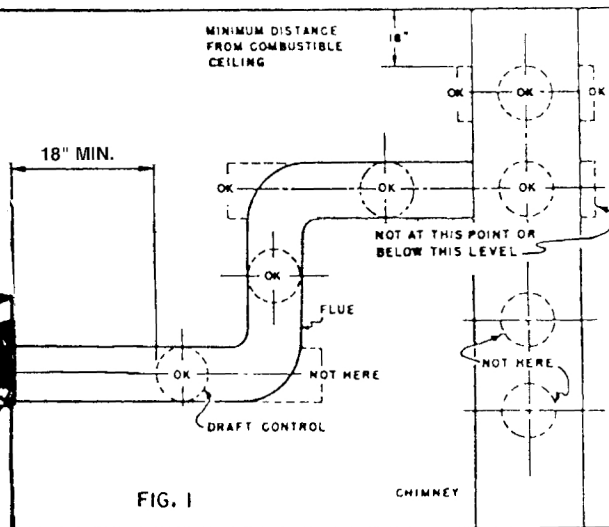
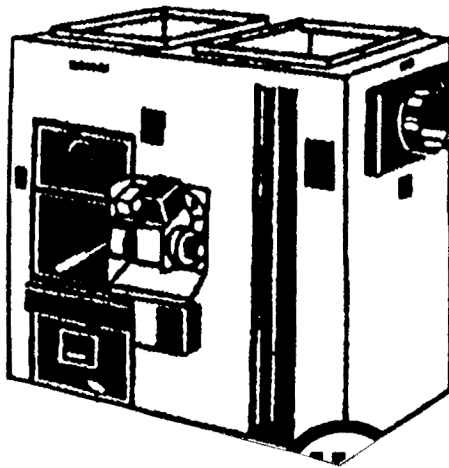
LWG 112 LWG 168 GAS WOOD HEATING ONLY



INSTRUCTIONS FOR INSTALLING FIELD R-C

BAROMETRIC DRAFT CONTROLS CHOOSING THE LOCATION

Do not attach draft control to top or bottom of flue pipe, nor in room separated from appliance. Best location is as close to appliances as possible.



INSTALLATION

Important: Make these adjustments when installing.

VERTICAL FLUE:

1. Adjustment weight must be in RIGHT HAND SLOT (marked "V") in bracket on gate.
2. The arrow on flap at bottom of gate must line up with letter "V" on lower right part of gate. If it does not, remove flap, turn over and snap on to gate again.

Flap can be removed by inserting small screw driver at the back side of the gate between the gate and the flap, then pulling downward on flap.

HORIZONTAL FLUE:

1. Adjustment weight must be in LEFT HAND SLOT (marked "H") in bracket on gate.
2. The arrow on flap at bottom of gate must line up with letter "H" on lower left part of gate. If it does not, remove flap, turn over and snap on to gate again.

Bend outward the two ears at the front corners of collar and insert clamping screw. Bolt the remainder of the collar together. See Figure 2. Hold the collar against the flue in the EXACT position and mark the outline of the collar on the flue. Cut a hole in the flue about half an inch smaller than the marks.

Then cut a series of short slits (about 3/8" or 1/2" deep) around the edges of the opening. After the collar is strapped on the flue the cut edges can be bent outward into the collar and thus make a better joint. WHEN FINISHED, THE OPENING INTO THE FLUE MUST BE EQUAL IN SIZE TO THE COLLAR OF THE DRAFT CONTROL. If flue pipe is made of material too heavy to bend out into the collar,

the opening into the flue must be within 1/4" of the same diameter as the collar.

Strap the collar to the flue pipe and place the draft control into the collar, fastening it there by tightening the clamping screw in the collar.

Use a spirit level to make sure that the control does not lean forward or backward but instead is plumb in both directions, regardless of whether the flue is horizontal, vertical or sloping.

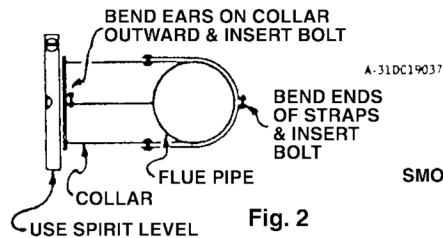


Fig. 2



Fig. 3

INITIAL SETTING OF BAROMETRIC CONTROL

Set the control at a maximum of .03 or as low a draft as will give good combustion and meet the requirements for heat. Turn adjustment weight counter-clockwise to loosen, then slide in slot to proper position and tighten. Bracket is marked 2, 4, 6, and 8, which indicates draft settings of .02, .04, etc. (These are drafts in flue adjacent to control, not over-fire drafts.) A monometer must be used to accurately adjust flue draft.

CAUTION

Do not use any smoke pipes less than 24 gauge between furnace and chimney.

CONNECTING SMOKE PIPE

Set the smoke pipe end of the furnace as close to the chimney as possible. For every foot of lateral pipe, the rise of the smoke pipe toward the chimney must be at least one inch. Do not exceed 10 feet in length. A cleanout tee should be installed for removal of soot and fly ash. (See Fig. 3, page 8)

Do not install the smoke pipe longer than necessary to reach the chimney for purposes of trapping heat. The smoke outlet temperature is designed so that the heat emitted is needed to carry the by-products of combustion out through the chimney.

The smoke pipe must not pass through any combustible material.

WARNING

No damper, heat saver or automatic vent damper device except the barometric draft regulator should be installed in or on the smoke pipe.

The smoke pipe entrance into a masonry chimney should be at least 2 feet above the cleanout. The smoke pipe must not extend into the chimney beyond the inner face of the chimney liner.

LESSER CLEARANCES TO COMBUSTIBLE MATERIALS ALLOWED

This furnace is UL Listed thus requiring 18 inches from the smoke pipe to a combustible surface. A reduction of 9 inches from a combustible ceiling and 12 inches from a combustible wall is allowed if the space is insulated according to NFPA 90B, table 6-5.1.2.

DO NOT CONNECT THIS FURNACE TO A CHIMNEY SERVING ANOTHER APPLIANCE

The chimney should be no less than 8 inches inside diameter or equal.

WARNING

Check your chimney. The chimney is a very important part of your heating system. It must be the right size, properly constructed and in good condition. No furnace can function properly with a bad chimney. The chimney must supply a draft of at least .03 Water Column. If possible, use a 15 foot or higher chimney. Add an additional foot to the chimney for each 1000 feet of elevation above sea level.

PROPER CHIMNEYS

The National Fire Protection Association (NFPA) requires that all factory built chimneys be Listed and installed in accordance with conditions of the Listing in the manufacturers instructions. NFPA also requires that your chimney extend at least three (3) feet above the highest point when it passes through the roof and at least two (2) feet higher than any portion of the building within ten (10) feet of the chimney.

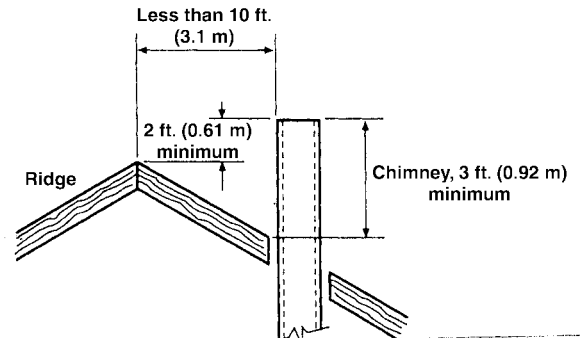
Factory built chimneys must be what NFPA refers to in NFPA 211 1-5.217.4* as Type HT. HT is an abbreviation meaning high temperature.

Masonry Chimneys as referred to in NFPA 211 1-5.2.17.6, a field constructed chimney of solid masonry units, bricks, stones, listed masonry chimney units, or reinforced concrete that is lined with suitable chimney flue liners and built with the provisions of Chapter 4 of this standard.

As described in NFPA 54 (National Fuel Gas Code) section 7.5.5. (c) A Listed combination gas- and solid fuel appliance equipped with a manual reset device to shut off gas to the main burner in the event of flue gas spillage shall be permitted to be connected to a single chimney flue. The chimney flue shall be sized to properly vent the appliance.

All gas-solid fuel and oil-solid fuel combination furnaces in this manual are Underwriters Laboratories (cULus) Listed for one (1) flue.

CHIMNEY TERMINATION (LESS THAN 10 FT.)



CHIMNEY TERMINATION (MORE THAN 10 FT.)

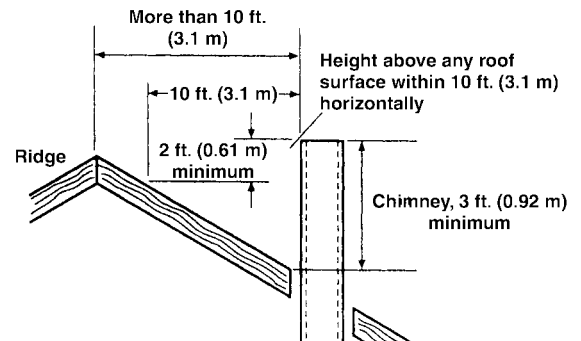


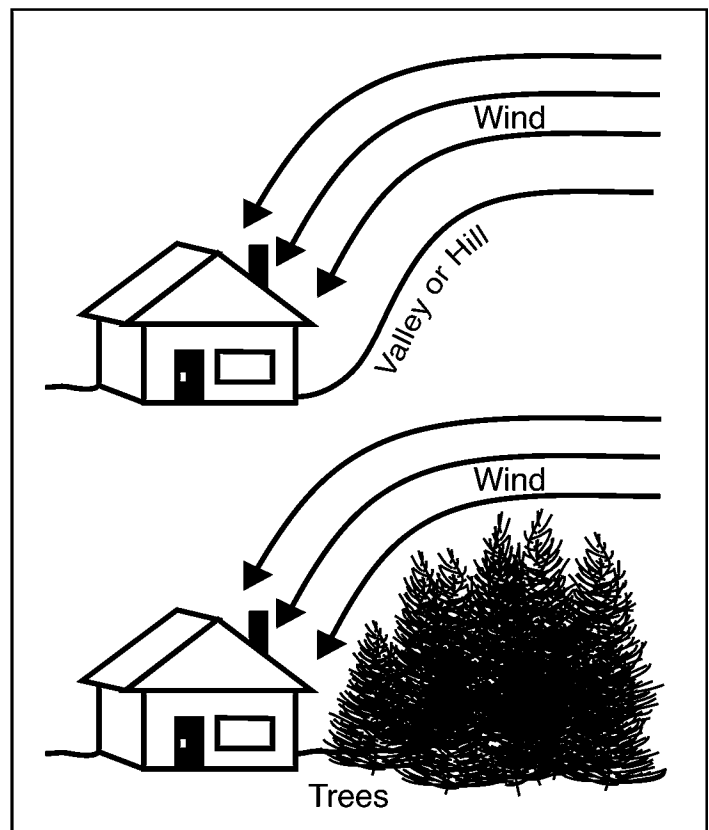
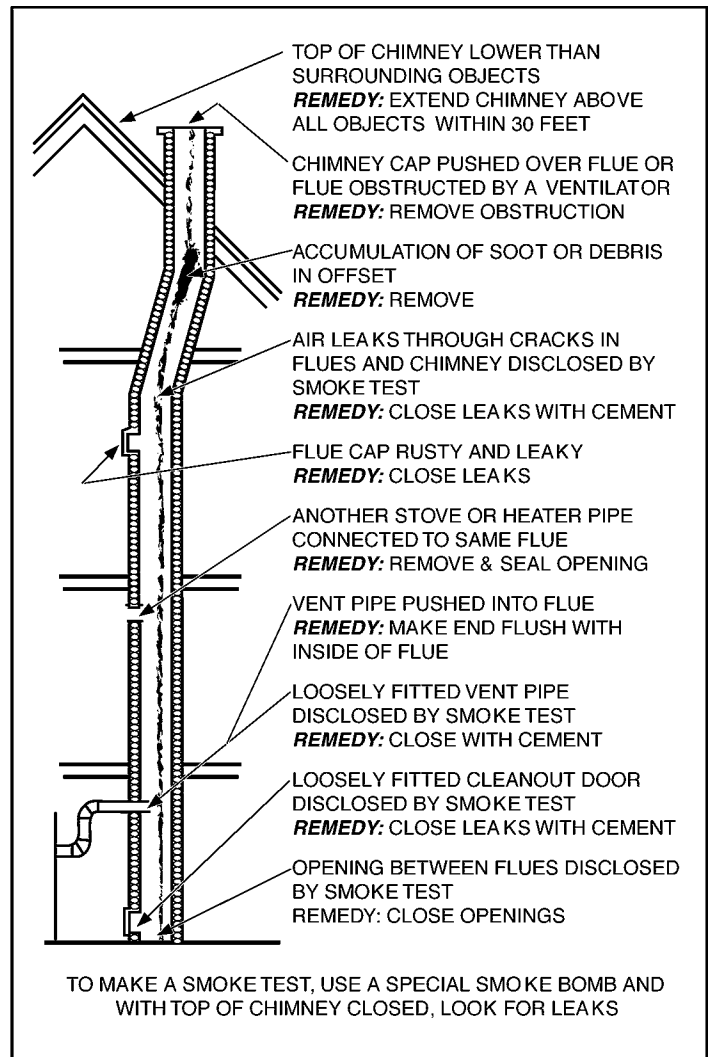
Fig. 12

FAULTY CHIMNEY AND/OR DRAFT PROBLEMS - CAUSES AND CURES

A sound chimney system is imperative, especially when burning wood. Indoor chimneys, either masonry or type "HT" metal chimneys are best. Because warm air rises, a warm chimney allows the smoke and other by-products of combustion a natural exit up and out the chimney. Outdoor chimneys should be your last choice. Cold air naturally falls right down the cold chimney. Until the heat from the furnace warms the chimney, there is no natural draft to allow the smoke and by-products of combustion to rise naturally up the chimney. Outdoor class "A" triple wall is not acceptable because their thermo-siphon design will not allow the chimney to heat up, causing heavy creosote build-up and possible chimney fires.

If you know your chimney is sound and you still have downdraft problems such as smoke or smell in the room in which the furnace is located, your chimney may not be operating properly. One or more of the following suggestions may be necessary.

1. **Barometric draft control** - This control must be set at .03. This is just a guide. It must be set with a draft gauge to prove that the chimney is drawing .03.
2. **Combustion air** - You must have outdoor combustion air introduced into the room where the furnace resides in the manner described on page 17. This method supplies air for combustion as well as replacing air that is drawn out by the chimney. Leaky doors and windows will not provide acceptable results.
3. **Cold outdoor chimney** - Sometimes in the spring or fall, or if you live in a mild climate, your heat demands are small and your chimney just does not heat up enough to induce a natural exit up draft, you may want to consider a power vent to force a draft up the chimney. A Model D-3 or AD-1 power venter is available from Tjernland Manufacturing Co. in White Bear Lake, Minnesota or Model D1-2 is available from Field Controls Co., Kinston, North Carolina.
4. **Chimney not tall enough** - Your chimney must terminate at least 2 feet above the peak of the roof. Adding more chimney height sometimes cures the problem. (See Fig. 12, page 14)
5. **Home located on side of hill** - When the wind blows over a hill toward your home, the wind will fall. This could cause a downdraft into your chimney. Some common solutions to correct downdrafts are to add a chimney cap with a weather vane, add height to the chimney or add a power venter.
6. **Tall trees near your home** - If you have trees that are near and higher than your home, a downdraft can occur when the wind blows. Correct the same way as if you live on the side of a hill or in a valley.
7. **Chimney too large** - Your chimney should not be more than 8 inches in diameter or the equivalent. If too large, the sides of the chimney may not heat up to create a natural draft. When this happens, the smoke and gases cool. They become heavy and other gases from the fire try to penetrate this heavy column of cool air. This results in back puffing, poor combustion or burning and may cause odors in your home. The solution is to improve your chimney or line it with 8-inch type 304 stainless steel flue liner. If your large chimney is outside masonry, insulate between the masonry and 8-inch flue pipe.

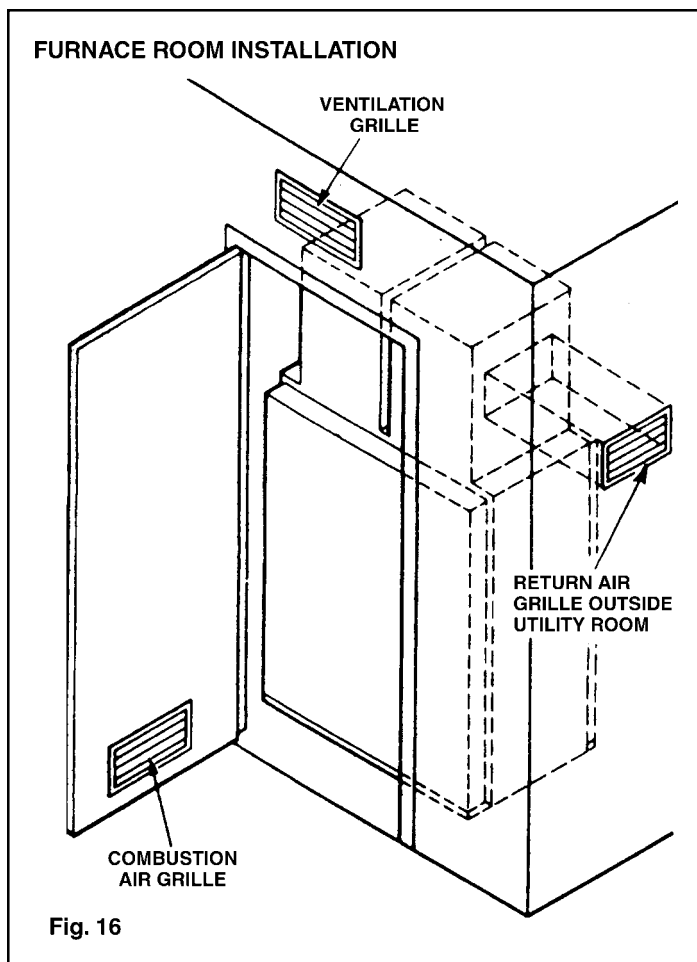


FURNACE LOCATED IN CONFINED SPACE

When the furnace is in a utility room, install two open grilles in a wall or door opening to the rest of the house. One grille will supply combustion air. Locate it near the floor. The other grille is for ventilation. Locate it close to the ceiling. Each grille must have a free area of not less than one square inch for each 1000 BTU/hr. of the total input rating of all the appliances in the confined space. (See Fig. 16 below)

FOR EXAMPLE: Your furnace is rated at 150,000 BTU per hour. The water heater is rated 30,000 BTU per hour. The total is 180,000 BTU per hour.

You need two grilles, each with 180 square inches of free opening. Metal grilles have about 60% free (open) area, so you need two metal grilles with 300 square inches each of louvered area. The height should be about half the width.



FRESH AIR DUCT CAPACITIES

Fresh air duct capacities for duct supplying fresh air

BTU Per Hour Input*

Size	1/4 in. Mesh Screen BTU	Wood Louvers BTU	Metal Louvers BTU
3-1/4 x 12 in.	144,000	36,000	108,000
8 in. round	200,000	50,000	150,000
8 x 12 in.	382,000	96,000	288,000
8 x 16 in.	512,000	128,000	384,000

* Based on opening covered by 1/4 inch mesh screen, wood or metal louvers.

OPERATION — OIL FIRING THE UNIT

To start the oil burner, proceed as follows:

1. Check for oil in storage tank. No. 2 fuel oil may be used if tank is in the basement or if buried below ground. No. 1 fuel must be used if the tank is outside and above ground.
2. Fuses in main switch panel must be good or circuit breakers in on position. 20 amp circuit to be used.
3. Check to see if oil valve at main tank is open.
4. Be sure nozzle of proper size is in and tightly screwed down and that electrodes are properly spaced. See Oil Burner instructions.
5. With combustion chamber door open, set thermostat about 10 degrees higher than room temperature to make sure thermostat contacts are made. (Remember left lever on thermostat is for burner.) If wiring is properly done and all controls properly installed and adjusted, the burner should start. If not, check primary relay first to make sure it is properly set, and if burner does not start, recheck wiring and all controls thoroughly. Don't forget to check the cad cell.
6. If burner is installed with a single oil line, the burner will have to be purged of the entrapped air in the oil line and burner before oil will flow to the nozzle. (See burner instruction sheet for this operation.) If a return line is used, purging will not be necessary, although this will speed the starting of the burner if done. If this is done, the pump should pick up its oil in less than a minute. If ignition does not take place during this time, allow to set for a moment and recycle. If ignition does not take place at this time, recheck wiring and controls. Check pump pressure and adjust to 100 psi. With stack temperature stabilized, check draft between barometric damper and furnace. Adjust to .03 inch water column.

STARTING BURNER AFTER IGNITION FAILURE

Before proceeding, find the cause of ignition failure — plugged nozzle, dirty electric eye, sooted electrodes, plugged oil line, etc. Do not attempt to restart burner when excess oil has accumulated or when combustion chamber is very hot. Press reset button on primary relay control and burner should start. Do not attempt this more than twice. If burner fails to operate, call a service technician.

WARNING

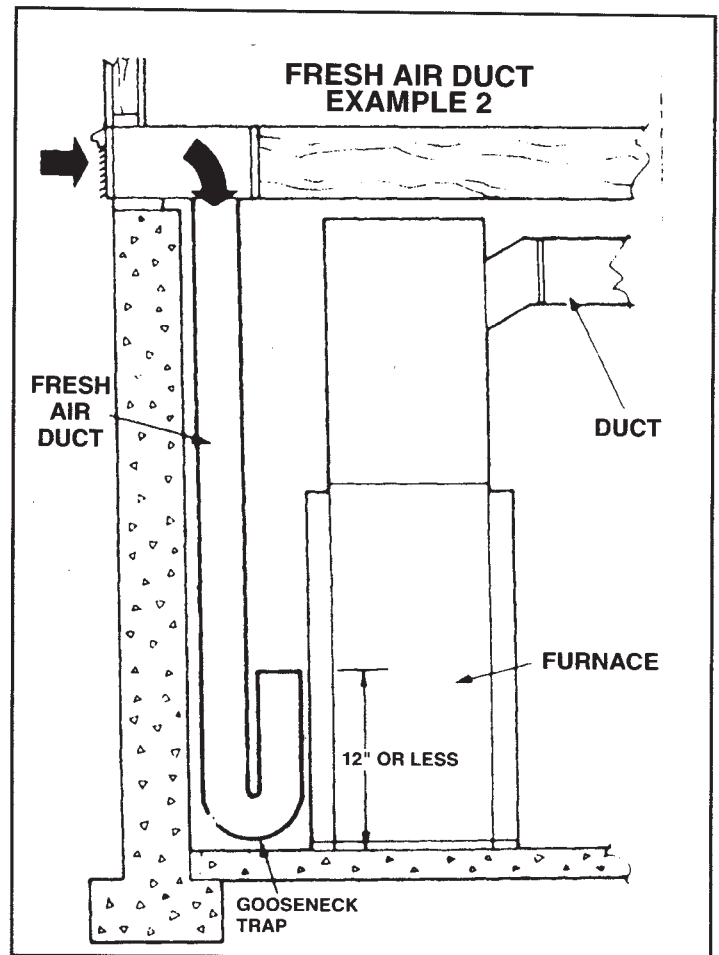
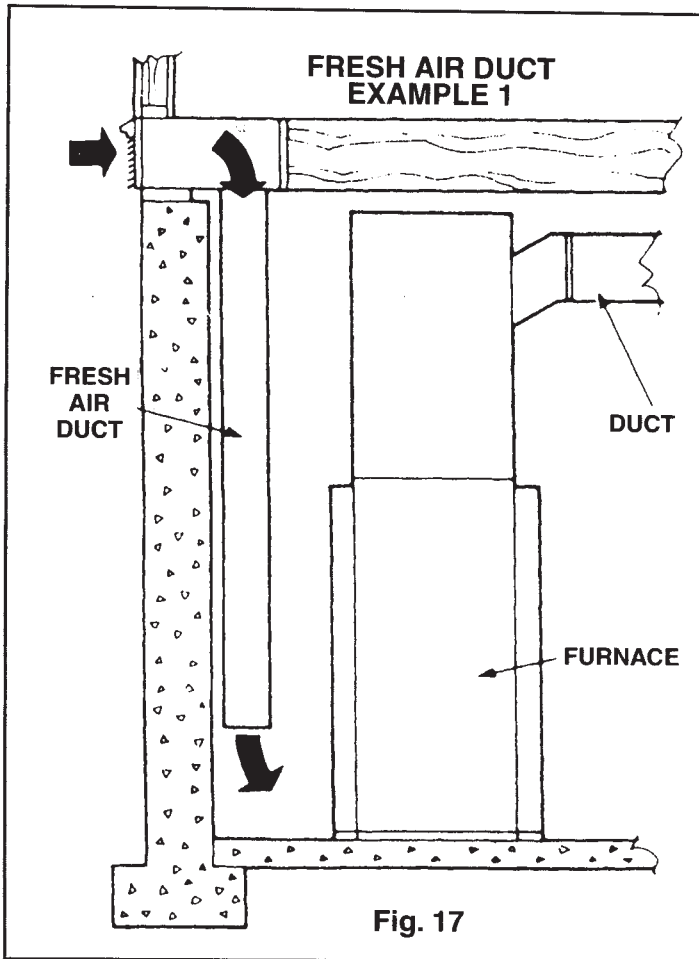
Enough air insures proper combustion and assures that no hazard will develop due to the lack of oxygen.

NOTE

If you have a fireplace, a kitchen, bath fan or water heater that vents to the outside, add enough duct size to your fresh air requirements to accommodate their air needs.

WARNING

Return air **MUST NOT** be drawn from inside the room where the furnace is located.



COMBUSTION AIR

Make-up outside air to the furnace for proper fuel combustion must be provided by openings to the outside of the building. The openings of ducts supplying such make-up air shall have unobstructed areas not less than the area of the flue pipe.

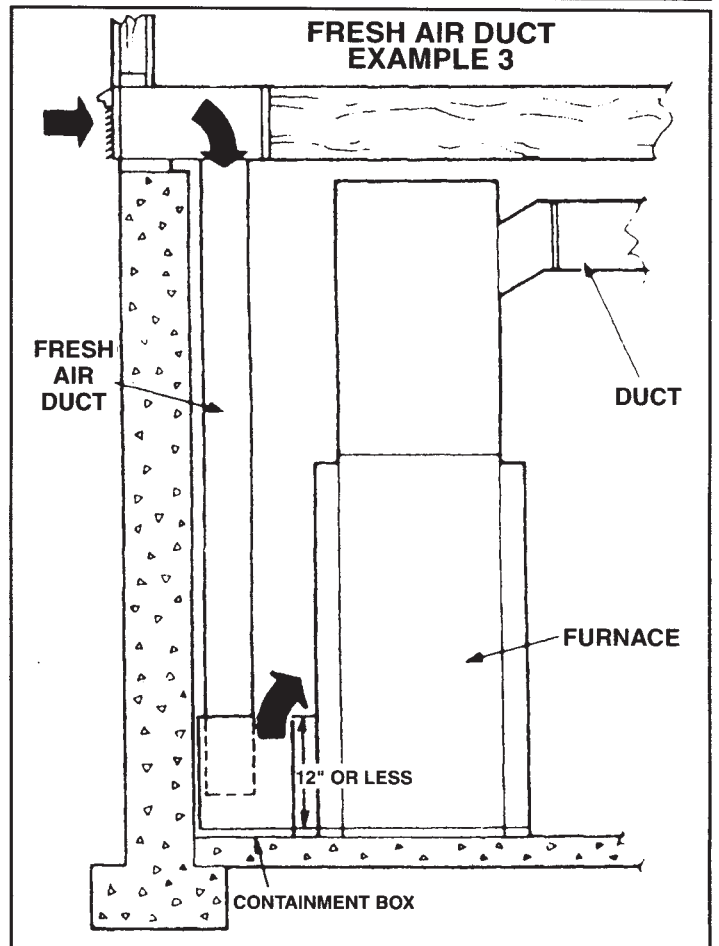
NOTE

Outside air is needed to replace the air used by the burner and wood combustion process. Outside air is also required to replace the air used for taking the by-products of combustion of the gas or oil burner and wood/coal smoke out the chimney. Outside air is also needed to replace any air expelled by kitchen or bathroom fans as well as water heater chimneys or fans.

Failure to provide outside air to the area in which the furnace is located will result in a negative pressure or vacuum in the home. Smoke from the wood fire may not be drawn up the chimney, causing creosote buildup and sometimes causing smoke to enter the furnace room.

WARNING

You must provide for enough fresh air to assure proper combustion. The fire in the furnace uses oxygen and must have a continuous supply. The air in a house contains only enough oxygen to supply the furnace for a short time. Outside air must enter the house to replace that used by the burner.



GAS FIRING UNIT

GAS FIRING THE UNIT.

To start burner, proceed as follows:

1. Make sure the manual shut-off valve is closed and control knob on gas valve is in the "off" position.
2. Set room thermostat above room temperature and allow burner to run for 5 minutes to purge unburned gases from the unit.
3. Set thermostat below room temperature to shut down burner.
4. Wait 1 minute. Turn manual shut-off valve on and turn control knob to "on". (There is no pilot on this burner.)
5. Set room thermostat above room temperature to start burner. Ignition should occur approximately 30 seconds after burner motor starts up.
6. If burner does not ignite, shut off burner and wait 5 minutes, then repeat steps 1 through 5.

STARTING BURNER AFTER IGNITION FAILURE

Before proceeding, find the cause of ignition failure. Refer to manufacturer troubleshooting booklet furnished with the gas burner. After cause has been corrected, repeat steps 1 through 5 above.

STARTING WOOD FIRE WITH GAS OR OIL BURNER

Place three or four 6 to 8 inch diameter logs in the firebox. Set the temperature on the small thermostat to the desired setting. Set the temperature on the larger thermostat above room temperature. The flame from the burner need not touch the wood to ignite.

HAND FIRING WOOD

Set the small thermostat above room temperature. Set the larger thermostat below room temperature. The damper to the firebox should now be open.

Place paper and kindling in the firebox as you would in a fireplace or campfire. Add logs to top of fire once kindling is burning. Reset small thermostat to desired room temperature.

Never leave ash drawer open, either to start fire or to provide more heat. The furnace is designed to provide adequate heat with the ash drawer closed.

WARNING

Never operate furnace with ash drawer open. It could cause the fire to burn at extreme temperatures, causing metal fatigue and firebox failure.

CAUTION RESTRICTED USE DURING ELECTRIC POWER FAILURE OR FURNACE FAN FAILURE

Furnace may be converted to a gravity system. Directions must be followed carefully to avoid an over-fire situation.

Remove access door to blower compartment and remove air filter. Then replace access door. Keep ash drawer tightly closed. Do not tamper with wood primary air control. Load wood to half the recommended normal height, approximately 4 inches above grate.

Do not overload, as no furnace fan is available to rapidly carry away the heat. Load small amounts of wood frequently until power is restored.

Open all air registers and remove all obstructions near them. Keep children away from air registers or burns could result.

Primary air damper and burner will operate automatically when electric power is restored.

IMPORTANT

Keep ash drawer empty. Primary air to the wood chamber travels under the grate. Also, if ashes are permitted to build up above the grates, the grates will warp and eventually burn out.

DANGER

Never burn materials other than coal or wood logs, preferably split and dried. A chimney fire or heat exchanger failure could result. This includes large amounts of corrugated boxes, wood shavings, paper scraps, dried Christmas trees, coke, garbage, tires or other burnable products.

CAUTION OVERLOADING WITH WOOD

Do not overload your furnace with wood. Failure or damage to the firebox could result. Never allow the hot coals to build up above the lower firebricks.

BEST WOOD TO BURN

All solid fuel, whether it is coal, pine, oak or any grain has about 12,000 BTU's per pound if it's moisture content is zero. Wood that has been cut, split and air dried for 2 years has about 8,000 usable BTU's per pound. Hardwood such as oak or hard maple has nearly twice the BTU's per cord as pine or aspen because it is nearly twice as heavy.

Freshly cut wood has about 50% moisture content. Wood that has been cut and split for 2 years has about 20%. Wood must reach at least 435° to ignite. High moisture content wood does not allow the gases in wood to get hot enough to provide complete combustion, thereby creating smoke and creosote, which is usable energy, but wasted because of incomplete combustion.

Yukon/Eagle furnaces are designed to wring the most energy possible from each log. Your furnace is designed to allow the primary air under the grate to create the initial burning. As the wood burns, gases, which contain 40% of the energy in the wood, escape to the top of the flame. The patented secondary air system (the round tubes between the firebrick) draws room air into the tubes and provides oxygen to the firebox to burn these gases. The result is you will use up to 75% less wood than stoves, furnaces or outdoor boilers without these features.

Type	Pound Weight per Cord	BTU's Per Cord Air Dried Wood	Equivalent Value #2 Fuel Oil Gallons
White Pine	1800	17,000,000	120
Aspen	1900	17,500,000	125
Spruce	2100	18,000,000	130
Ash	2900	22,500,000	160
Tamarack	2500	24,000,000	170
Soft Maple	2500	24,000,000	170
Yellow Birch	3000	26,000,000	185
Red Oak	3250	27,000,000	195
Hard Maple	3000	29,000,000	200
Hickory	3600	30,500,000	215

CAUTION

REMOVE AIR CONDITIONING COIL FROM WARM AIR PLENUM IF USING FURNACE DURING FAN FAILURE OR ELECTRIC POWER FAILURE.

If for any reason there should be an electric power failure, either from high limit cutoff or electrical power outage, the damper will automatically close, preventing over-fire with no blower, thus preventing heat exchanger damage.

BURNING COAL ON 1/2-INCH OPENING GRATES

(Optional)

GENERAL INFORMATION

This information contains the instructions for burning various types of coal, storage of coal, and the cleaning of the furnace.

Some coal is oil-treated at the mine and some users have indicated that it tends to make the coal more difficult to start.

Burning coal requires some patience and a regular procedure. With improper tending, a coal fire can go out in a short time. Once the fire starts to go out, it is almost impossible to reverse.

After a coal fire goes out, all the coal must be removed from the furnace before the starting process can be repeated.

Our coal burning instructions are general, as coal comes in various sizes and types. Anthracite coal is most recommended as it burns with little smoke when burning properly.

OPERATING INSTRUCTIONS FOR BURNING COAL

GENERAL INFORMATION

CAUTION

Burn Anthracite — Bituminous — Lignite coals only

DO NOT BURN

Petroleum — Coke — Cannel Coals

IGNITION TEMPERATURE OF COAL AND WOOD

How hot does coal have to get to ignite? Following are examples of the ignition points of various materials:

Paper ignites @ 350°F

Wood ignites @ 435°F

COAL: Western lignite ignites @ 630°F
Low volatile bituminous ignites @ 765°F
High volatile bituminous ignites @ 870°F
Anthracite ignites @ 925°F

WHAT SIZE COAL SHOULD I BURN?

The air space between the furnace grates is 1/2 inch; therefore, coal smaller than 1/2 inch can fall through the grates into the ash pan.

Pea size coal ranges from 9/16 to 11/16 inch.

Nut size coal ranges from 1-3/16 to 1-5/8 inches.

Stove size coal ranges from 1-5/8 to 2-7/16 inches.

Nut size is preferred by most people and is recommended for use in this furnace.

Anthracite coal is hard and burns like the charcoal that is used in your barbecue grill. The coals must touch each other to ignite. Therefore, the smaller the coal, the easier to ignite. Stove coal is not as likely to touch each other because of its size.

Bituminous coal is soft and not as desirable as hard coal. It creates dust when handled and produces large amounts of smoke and soot when burned at a slow rate. Also, soft coal from some areas of the country contains higher sulfur content, but a large portion of it may be removed if the coal is cleaned.

HOW TO START A COAL FIRE

CAUTION

Do not use kerosene, gasoline, thinners, etc. to start a coal fire.

To start a coal fire, place a small amount of crumpled paper and sticks of kindling wood on the ash-covered grates.

Ignite the paper and after the wood is burning briskly, cover with a thin layer of coal. As the first layer of coal becomes ignited, add more coal gradually until the fire bed is built up to approximately 6 inches deep. As fresh coal is added always leave some of the glowing coal uncovered.

Draw the top red coals toward the front of the firebox and pile fresh coals toward the back.

The grates must be protected from direct contact with the fire by a layer of ash, one (1) or two (2) inches thick. The ash left on the grate will help prevent overheating of the cast iron grates and coal from falling through the grate's opening.

MAINTAINING A COAL FIRE

Bituminous coal should be built into a cone shape once the fire has started. When refiring, break up the cone a little using a poker, especially if it has caked over to form a crust. Be careful not to mix the coal as this increases the chance of forming clinkers.

Western lignite coal should be burned the same way you would burn wood. (Refer to wood burning instruction.)

SHAKING THE GRATES

Shaking a fire should only be done if room is needed for fresh coal or if the ash accumulation on the grates is excessive. Generally, the grates need only be shaken once or twice a day.

Shake the grates using a few short strokes and stop when the first

red coals appear in the ash pan. Under-shaking restricts the amount of air that reaches the fire and over-shaking may cause the fire to go out.

A coal fire should never be poked or broken up as this serves to bring ash to the surface of the coal bed where it may fuse into lumps or clinkers which interfere with proper burning.

IMPORTANT

Never smother fire when adding fresh coal.

Anthracite Coal — To bank the fire for the night, pile the coal higher to the back of the firebox and allow it to slope toward the fire box door. Always leave some red or burning coals uncovered in the front of the firebox.

Bituminous Coal — To bank the fire for the night, shake the fire and add coal, forming the center cone. Allow enough time for the volatiles to burn off before closing the fire door.

GRATE CARE — ASH REMOVAL

It is necessary that ashes be removed from the ash pan on a daily basis and should never be allowed to accumulate high enough to come in contact with the grates. Such a condition could cut off necessary air circulation and could also result in a warping or burnout of the grates.

ASH DISPOSAL

Unlike wood ashes, coal ash should not be spread on the garden. The minerals in coal ash contain several chemicals which could be harmful to plant life.

RECOVERING UNBURNED COAL

Screen coal ashes through a piece of 1/4 inch or 3/8 inch mesh hardware cloth to recover any unburned coal that has fallen through the grates

STORAGE OF COAL

Coal may be stored indoors or outdoors, with some precautions:

1. The storage area must be free of materials that are easily burned, such as paper, wood, rags and leaves.
2. Alternate wetting and drying of coal should be avoided. Outside storages should be protected from rain or snow. Wet coal should not be piled on dry coal.
3. Locate the storage area in a cool, 75° F or lower, area.
4. Nut coal weighs approximately 58 lbs. per cu. ft. A storage bin 4-feet square by 4-feet high will hold 2 tons.

CLEANING FURNACE AND CHIMNEY FLUE PIPES

Be sure to check and clean the furnace heat exchange flue pipes and chimney on a frequent basis. Soot and fly ash should not be allowed to build up on any of these surfaces. Chimneys are best cleaned professionally.

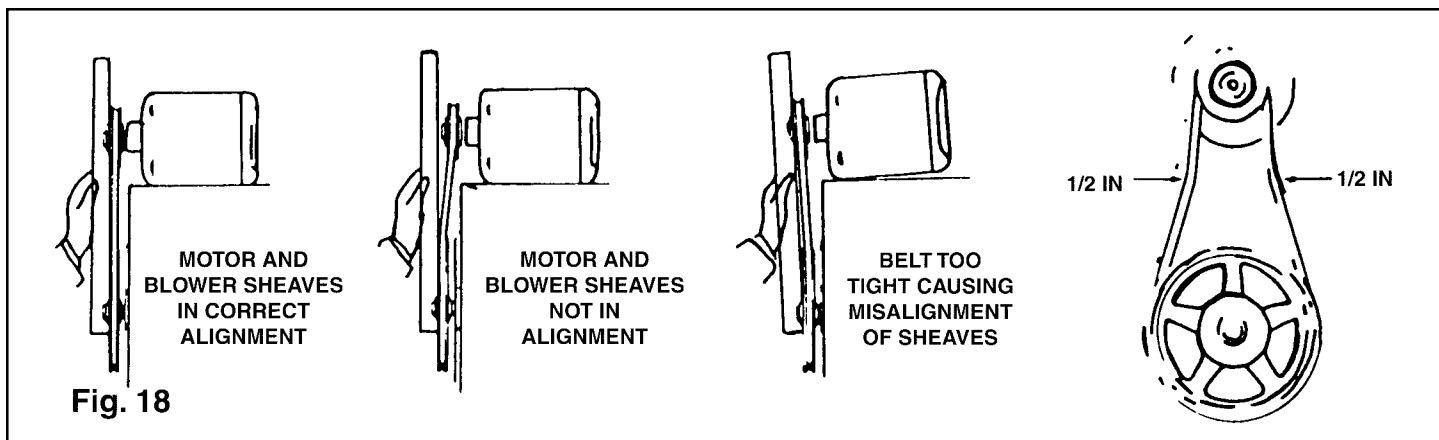


Fig. 18

CHECKS AND ADJUSTMENTS

If you have installed your own furnace, we ask that you call for an inspection by a Service Technician. The peace of mind and assured performance are well worth the cost involved. A technician has the proper instruments to make the necessary check and adjustments.

FURNACE BLOWER ADJUSTMENT

Set adjustable motor pulley so blower will give approximately 90° F temperature rise through furnace. After pulley has been adjusted check bolt as follows: (see Fig. 18)

The belt is drawn tight during shipment; therefore both belt tension and sheave alignment must be rechecked by the installer when the furnace is placed in service.

Improper belt tension and pulley misalignment are the major causes of furnace fan noise and failure of belts and bearings.

Sheave alignment is easily determined with a straight edge held across the outer face of the fan sheave. The face of the motor sheave should also be parallel to the straight edge at all points.

Proper belt tension is more difficult to determine accurately. Too little tension will permit slippage causing belt wear and may cause noise or squealing when the motor starts. Excessive tension increases motor load and may cause the oil film between shaft and bearing to fail. This, in turn, causes the bearing to seize or burn out.

The proper belt tension is the minimum which will drive the blower without slippage. This varies with sheave diameter, fan size, and motor starting torque characteristics. The practical belt tension can best be determined by actual experience, but when in doubt it is better to have the belt too loose rather than too tight. Belt tension can be judged by grasping the belt as shown. The belt should be deflected approximately one inch when moderate pressure is applied.

AIR CONDITIONING

See air circulating fan performance curve charts on page 26 for the LWO-112 model and the LWO-168 model. Service factors for factory furnished motors are 1/3 HP = 1.35, 1/2 HP = 1.25, 3/4 HP = 1.15. All motors are Class A with Class B insulation.

DUCT WORK AND BLOWER SPEED ADJUSTMENT

Supply and return duct system should be sized properly for efficient operation. Normal air temperature rise through the furnace should be adjusted to approximately 90° F. Proper blower speed adjustment, in conjunction with adequate duct work are necessary to achieve this.

A high temperature rise will result in excessive fuel usage, due to the high stack temperature that always accompanies a high air temperature rise. It can also cause premature heat exchanger failure.

To perform temperature rise check, start furnace and let it run a minimum of 10 minutes (be sure all duct work is complete and furnace is in its normal operating condition). Place #1 thermometer in the return near the furnace. Place #2 thermometer in the supply duct near the furnace, but not in the plenum. After 10 minutes or more operation, take thermometer readings. Supply air temperature should be no more than 90° higher than return air temperature.

Air temperature rise can be lowered by:

1. Increasing blower speed.
2. Additional supply or return outlets.
3. Lowering firing rate.

TESTING INSTALLATIONS FOR EFFICIENCY

IMPORTANT

Draft gauge must be used. Draft in smoke pipe must be set at .03 Water Column updraft. Failure to set properly will cause fuel to be wasted, heating will not be satisfactory, fast build-up of creosote in heat exchanger and chimney may occur and cause damage to your heating system.

The draft regulator will afford the user maximum fuel efficiency, however, the finest draft regulator in the world cannot increase the efficiency of a heating system if the system as well as the regulator is not in proper adjustment.

Many common tests are available to establish the efficiency of the system. One such test is outlined on page 22.

Basically, stack temperature and percentage of CO₂ are a measure of stack losses for any fuel. Therefore, many of the basic principles can be and should be applied to oil-fired furnaces as well as for those burning solid fuels.

In preparation for these tests, the following should be checked. The Draft Regulator installed should be:

- plumb and level
- in the same room as the unit
- on the side of a vertical, sloping or horizontal smoke pipe
- located close to the furnace

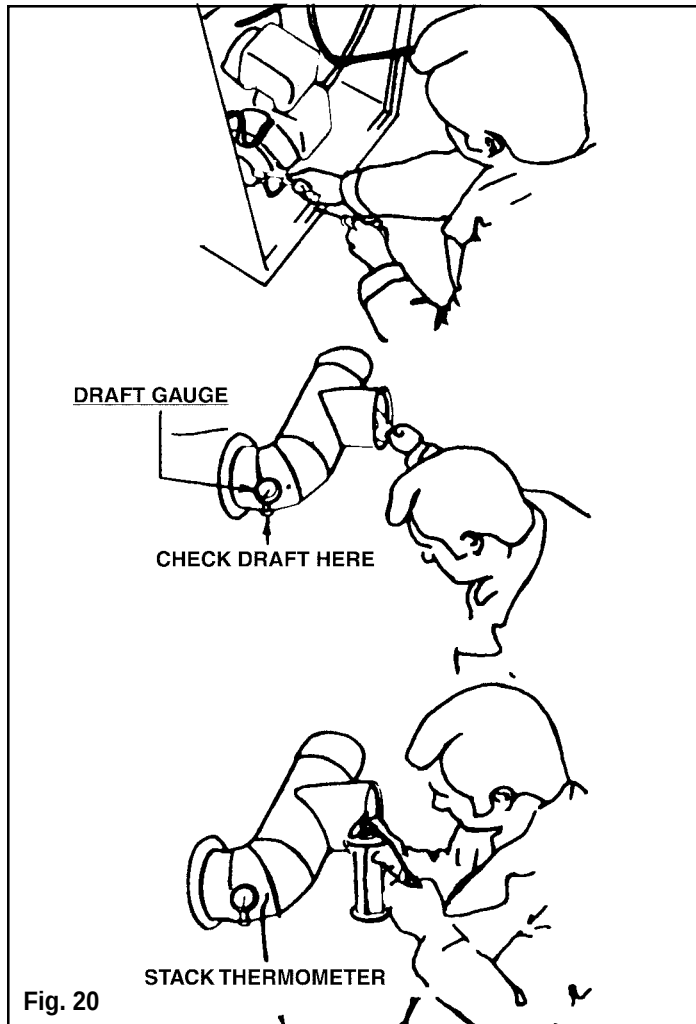


Fig. 20

Drill two holes approximately 1/4 inch in diameter in the flue pipe between the outlet from the furnace and the Draft Control.

Insert a stack thermometer in one of the holes and leave it there continually during the test so that you can refer to it at any time. (See Fig. 20.)

TEST PROCEDURE

Step 1. Set the thermostat high enough so that the unit will run for at least 15 minutes, the maximum time that should be required for the test. Let the unit operate enough for the stack temperature to stabilize.

Step 2. For your initial set of readings, set the Draft Regulator so that there is .03 Water Column Draft in the smoke pipe between the flue outlet and draft regulator. (See Fig. 20.)

Step 3. Insert the sampling tube of the CO₂ tester in the hole that you have drilled adjacent to the stack thermometer and find the percentage of CO₂ in the sample of the products of combustion. Follow the instructions of the manufacturer of the instrument you are using.

Step 4. Use efficiency finder chart or stack loss slide rule to determine efficiency. (See Fig. 21.) Be sure to subtract room temperature from stack thermometer reading and use this net stack temperature for determining the efficiency.

Step 5. Insert end of smoke tester into same hole as was used to test for CO₂ and perform the smoke test.

Step 5. The filter paper from the smoke test, when compared to the standard, must be determined and be found to be satisfactory. It should never be greater than #2, preferably #1 or zero, depending on local requirements or your own service standard. (See Fig. 21.)

Repeat steps 3, 4, and 5 as needed, adjusting the air shutter on the burner and draft regulator until you obtain the highest possible efficiency. It is desirable to have a high CO₂ reading and low stack temperature with a minimum smoke reading.

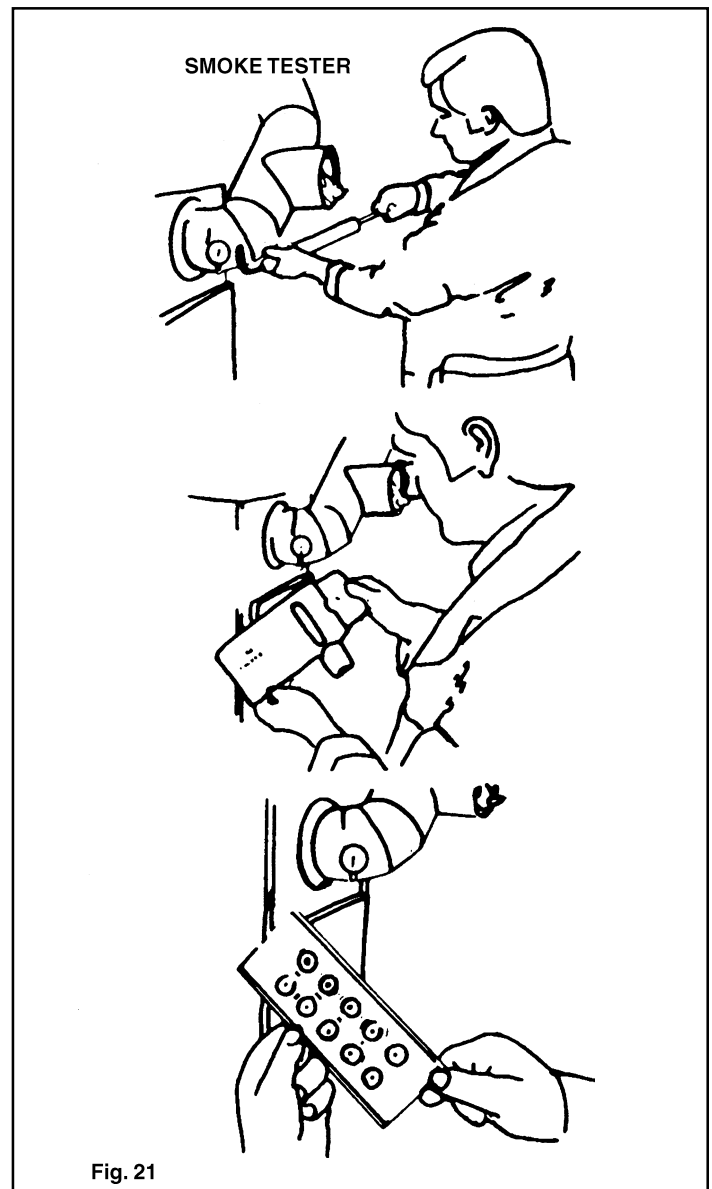


Fig. 21

MAINTENANCE INSTRUCTIONS

CAUTION

The furnace has a high efficiency "fiber-type refractory" combustion chamber. Normal servicing of this unit does not require cleaning of the combustion chamber. If for any reason it becomes necessary to work in the area of the combustion chamber, use EXTREME caution.

OIL BURNER

A. Lubrication:

1. The two oil cups on the oil burner motor should be lubricated every three months with a few drops of good grade light motor oil, No. 10 or 20 S.A.E.

B. At the end of the heating season:

1. Shut off electric current to burner at fuse panel.
2. If oil strainer has not been cleaned recently, it should be removed and cleaned (consult instruction card furnished with fuel unit).
3. Oil storage tank should be kept filled to prevent water vapor from collecting. It is suggested the valve in the suction line be closed. Oil storage tank should be cleaned every 2 or 3 years to remove any sediment or water that has collected in the tank.

C. At the start of the heating season:

1. It is advisable to have a service technician inspect and service your burner for the coming heating season.
2. Heating plant, smoke pipe and chimney should be cleaned and checked for repairs.
3. Lubricate burner as directed above.
4. It is advisable to have the entire electrical system inspected before putting the burner into operation after it has been standing idle for the summer months. This should include primary relay, limit control, thermostat. Check the electrodes for carbon and cracks in insulators, and corrosion on all terminals of the electrodes and transformer.

D. Emergency stops:

1. Cut off all electrical current to the burner by turning off electrical power in main fuse panel.

E. Air filter:

1. Check and clean monthly. Change filter at least twice a year.

F. Blower motor:

1. If motor has oil caps, oil twice yearly.

G. Grates:

1. Keep ash drawer emptied. Failure to do this will cause grates to warp.

H. Smoke Pipe, Chimney and Furnace Heat Exchanger:

1. Do not burn green or freshly felled wood. If you do, creosote and soot may build up in the chimney, smoke pipe and furnace heat exchanger. This should be checked and cleaned several times each heating season, especially if only green wood is being burned.

NOTE

Soot will act as an insulator which will cause less heat to be transferred into your duct system and more heat out your chimney, thus reducing the efficiency of both the wood and fuel being burned.

HOW TO PREVENT RUST AND CORROSION

At the end of each heating season, clean both primary and secondary heat exchanger and ash pan thoroughly. Paint the inside of the heat exchanger with automobile crankcase oil. This will decrease rusting caused by summer moisture.

If black paint on firing door area wears or burns off, it can be repainted with a high temperature, flat black, air-drying paint.

CAUTION

Before cleaning chimney, smoke pipe and furnace, be sure to turn electrical power off to the furnace and any other appliance connected to chimney. Be sure wood fire is out and inside of furnace is cool.

CLEANING THE CHIMNEY, SMOKE PIPE AND HEAT EXCHANGER

Avoid chimney fires. On a regular schedule, check for creosote and soot buildup in the chimney, smoke pipe and heat exchanger. They must be kept clean. Keep a professional chimney sweep in mind if you have access to one.

Steel brushes are the safest for cleaning metal surfaces. Salt solutions and some chemicals may damage metal surfaces. Do not overfire your furnace. Do not burn anything that combusts in seconds. Excessive fuel temperatures may result, thereby igniting creosote.

To clean the chimney, obtain a stiff brush with an extendible handle and insert the brush into the chimney from the top. Continue the brushing and sweeping downward until entire length of chimney is cleaned.

After cleaning the chimney, the debris will be at the bottom of the chimney at the clean-out opening. Open the clean-out door and sweep the debris out into a metal container.

The smoke pipe from the furnace to the chimney can be cleaned with an 8-inch diameter brush. A smaller brush can also be used.

A steel brush 3 x 8 or 4 x 6-inch, with a flexible, steel handle is ideal for cleaning the secondary heat exchanger of furnace. The primary heat exchanger can be cleaned with any steel brush. A furnace vacuum cleaner may be used.

IN CASE OF CHIMNEY FIRE

CALL THE FIRE DEPARTMENT IMMEDIATELY!

EXTINGUISH THE FIRE IN FURNACE BY SETTING THE THERMOSTAT ALL THE WAY TO THE LEFT TO CLOSE PRIMARY AIR DAMPER AND SHUT OFF OIL BURNER. EMPTY FIRE CHAMBER AND ASH PAN INTO SAFE, FIREPROOF CONTAINER.

NOTE

Do not use your furnace until a professional inspection has been made of your furnace, smoke pipe and chimney.

DISPOSAL OF ASHES

Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a noncombustible floor or on the ground, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the container until all cinders have thoroughly cooled.

CREOSOTE—FORMATION AND NEED FOR REMOVAL

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited, this creosote makes an extremely hot fire.

The chimney connector and chimney should be inspected at least twice monthly during the heating season to determine if a creosote buildup has occurred.

If creosote has accumulated it should be removed to reduce the risk of a chimney fire.

SERVICE HINTS - OIL

IF YOUR FURNACE IS NOT HEATING OR GIVING ENOUGH HEAT...
POSSIBLE CAUSE:

Thermostat is not set correctly

Burner is not firing properly

No power to furnace

No oil in tank

Valve in oil line is closed

Oil filter plugged

Cycling on limit control

WHAT TO DO:

- Check to see that thermostat is set on "HEAT" position and the heat anticipator is set properly. Reset thermostat above room temperature.
- Contact your local serviceman.
- Check fuse or circuit breaker. If fuse is blown, replace. If breaker is tripped, reset. Check to be sure shut-off switch is "ON".
- Check oil tank gauge. If empty, have tank filled and start burner.
- Open valve in oil line and start burner.
- Replace filter cartridge.
- Check to see limit control pointer is set against stop at 250° F. Clean or replace air filter if dirty. Check to be sure all registers and grilles are open and not disturbed.

SERVICE HINTS - GAS - (ADDITIONAL SERVICE HINTS ARE PROVIDED BY THE BURNER MANUFACTURER THAT IS INCLUDED WITH THIS FURNACE.)
WHAT'S WRONG:

Lockout occurs 3-10 seconds after ignition

Flame not established

Arcing to ground

No spark

Arcing other than across gap

Weak spark

No flame

Low flame current and/or nuisance lockouts

Nuisance lockouts

WHY:

- Reverse polarity.
- System improperly grounded.
- Gas pressure too high, causing flame to lift off burner.
- Sensor probe incorrectly positioned in flame pattern.
- Spark gap too small.
- Spark too large.
- Corroded connector.
- Cracked or dirty insulator.
- Broken high voltage lead.
- High voltage lead too close to metal surface.
- Valve malfunction.
- Electrode improperly placed.
- Flame current falls below 2.5 μ A.
- Low gas pressure.

IF YOU DON'T SEEM TO BE GETTING ENOUGH AIR CIRCULATION...

POSSIBLE CAUSE:

Air filter is dirty

Registers and grilles are obstructed

WHAT TO DO:

- Clean or replace air filter as necessary
- Check supply or damper positions. Check registers and grilles to make sure they are not closed or are not obstructed by carpet, draperies or furniture. Remove any obstructions.

SMOKE IN THE FURNACE ROOM

This condition is usually caused because the smoke is not being drawn up through the chimney. Other causes could be a failed (fire-box) heat exchanger. Check with your qualified furnace service provider.

Chimney causes:

1. Fresh air for combustion must be supplied to the furnace room by one of the methods described in this installation manual. (See Fig. 17, page 17)
2. Cold chimney. Warm air rises and cool air falls. Outside chimneys are cold, which can cause downdrafts until the chimney heats up. This usually happens in the spring and fall of the year when outdoor temperatures are mild, not producing enough heat to warm the chimney up.
3. Chimney not tall enough. It must terminate at least 2 feet above the peak of the roof.
4. If your home is in a valley or you have high trees near your home or if you live on the east side of a hill or mountain, a downdraft can occur when the wind blows. One solution is to add a chimney cap with a weather vane. This often will turn a downdraft into an updraft. Another solution is to add height to your chimney. Another solution is to add a power ventor to the smoke pipe that operates when the thermostat is calling for wood heat.
5. The barometric draft control must be set at .03. If set less, the chimney may not draw. If set higher, the wood fire may draw too much combustion air, causing the room temperature to exceed the thermostat setting.

SECONDARY AIR DISC

This disc is provided on models LWO-112 and LWG-112.

If you burn mainly solid fuel, this disc should be open to furnish air over the fire. This patented combustion method will increase the efficiency of wood or coal by up to 40%. If you use gas or oil as your primary fuel, close the disc.

OVER HEATING WHEN BURNING SOLID FUEL AS YOUR PRIMARY SOURCE OF HEAT

If the furnace provides heat when the thermostat is satisfied, thereby over heating the home, at least one of these ideas will help.

1. The best answer is to use fewer logs at each filling. This provides the maximum amount of heat while conserving wood.
2. There are 3 pegs in the fan and limit control. One peg is set at 250° F. Never change this setting. The middle peg is set at 150° F. This is the temperature setting that the air circulating fan starts. You may want to set this setting at 160° F or higher. The bottom peg is set at 120° F. Reset this peg to 130° F or higher. These new settings will not allow the fan to run as much, thereby reducing the amount provided to the rooms.
3. If you feel the furnace is oversized for your requirements, you can cover part of the grate with a piece of heavy metal. This will retard the fire but also will not burn as clean, causing some creosote buildup in the firebox and chimney.

If you made any adjustments to the fan and limit control, you will not have continuity of operation, which means that your air circulation blower may not operate continually when burning oil or gas.

GAS OR OIL PART OF FURNACE TOO LARGE FOR THE HOME

If you or your furnace service provider feel the furnace BTU input is too large or too high, either the gas or oil BTU input can be reduced to as little as 75,000 BTU input. If you decide on this option, you will have to adjust the air circulation blower to a lower speed to assure continuity of operation. Slowing the blower down will allow the blower to run continually if the thermostat is calling for heat from the gas or oil burner.

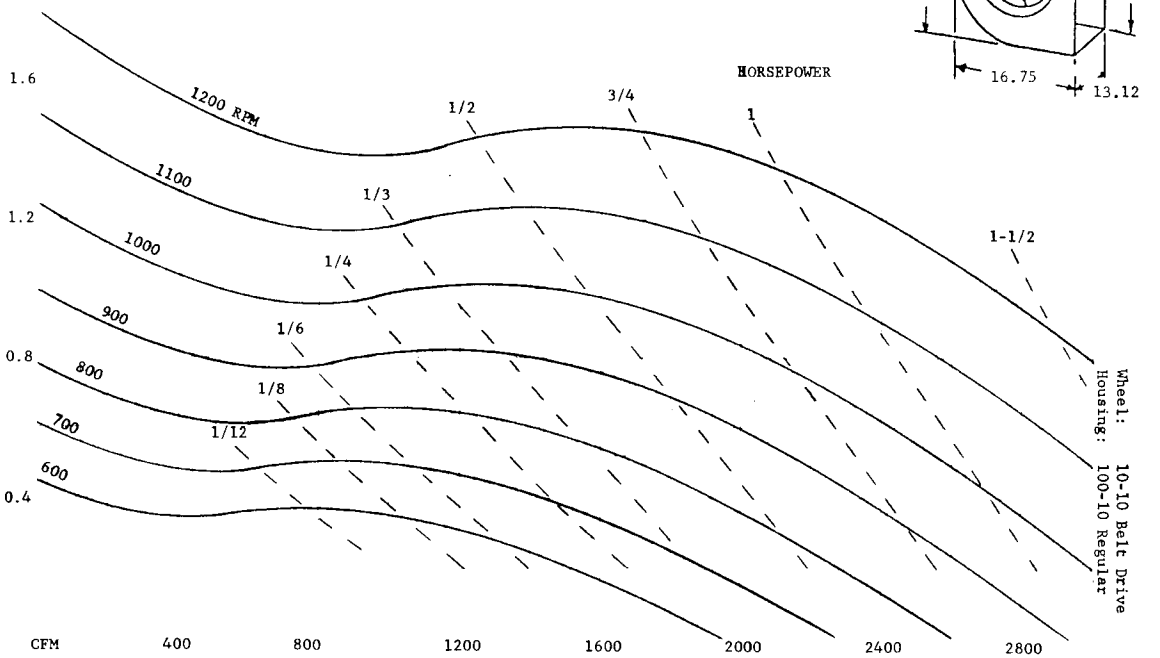
IMPORTANT

During normal operation, firing door and ash drawer must be kept tightly closed. Air leakage will cause loss of efficiency resulting in higher heating costs. If door gaskets become worn, replace with 1/2" fiberglass rope available from local sources.

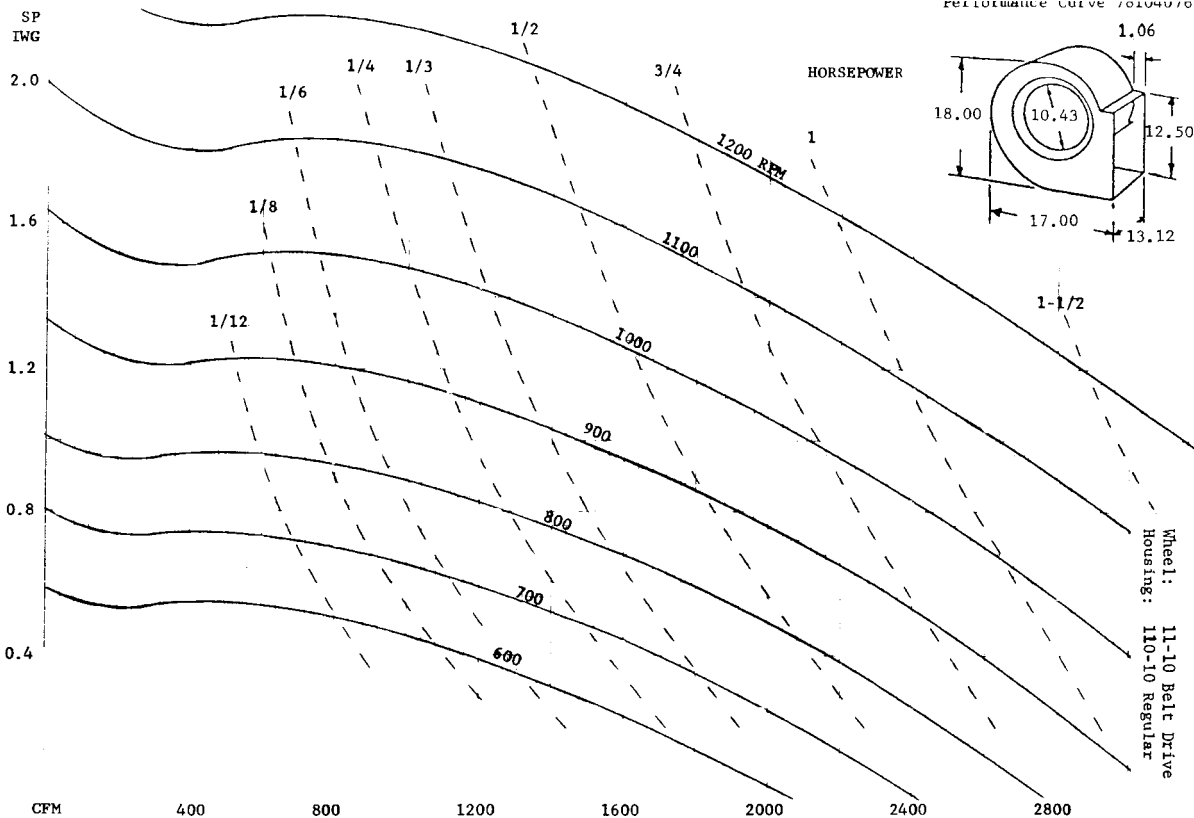
NOTE

If for any reason there should be an electric power failure, either from high limit cut-off or electrical power outage, the damper will automatically close, preventing over-fire with no blower, thus preventing heat exchanger damage.

SP
IWG
2.0
1.6
1.2
0.8
0.4



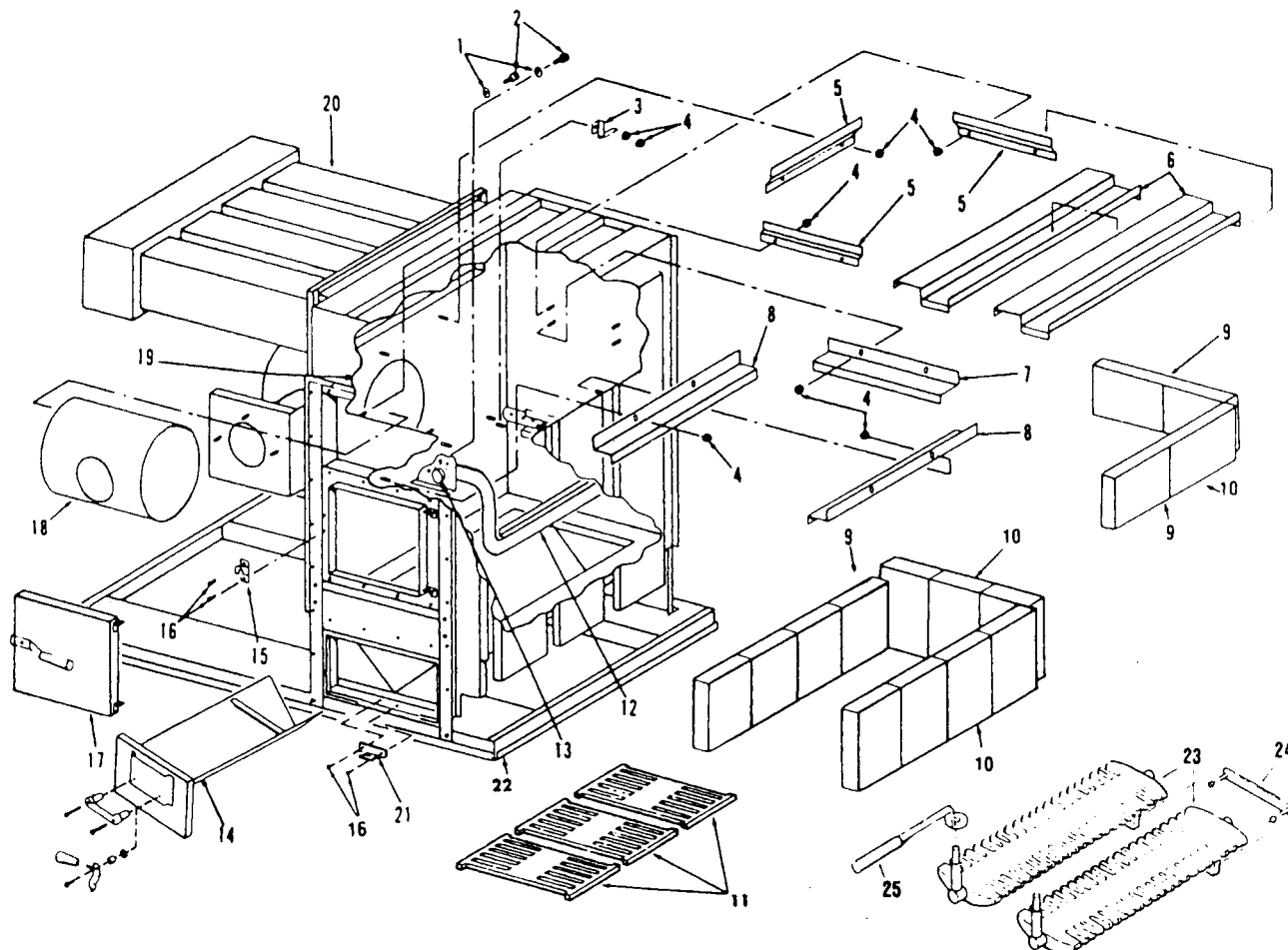
**THIS CIRCULATING FAN PERFORMANCE CURVE CHART IS FOR DETERMINING
MOTOR HORSEPOWER NEEDS FOR THE LWO-112 AND LWG-112**



**THIS CIRCULATING FAN PERFORMANCE CURVE CHART IS FOR DETERMINING
MOTOR HORSEPOWER NEEDS FOR THE LWO-168 AND LWG-168**

Repair Parts — Combustion Chamber Assembly (LEFT HAND SHOWN)

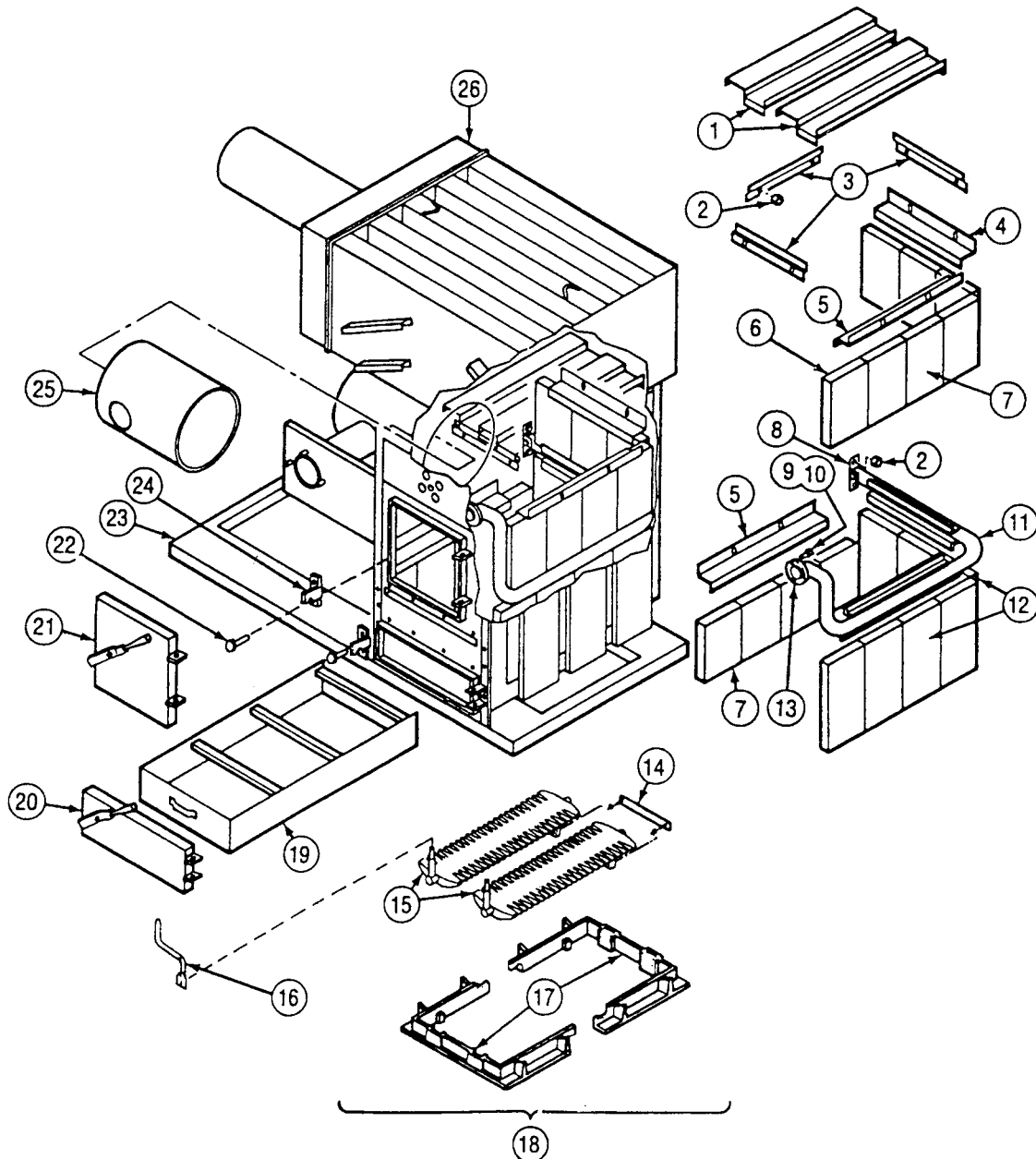
EAGLE-YUKON OIL/GAS — SOLID FUEL COMBINATION FURNACE Models LWO-112 and LWG-112



Key No.	Left Hand	Right Hand	Description
1	10110500	10110500	Fender Washer 5/16 I.D. x 1-inch O.D. (2 Req.)
2	10104900	10104900	Screw Thread Cutting Hex Washed HD 1/4 20 x 3/4 (2 Req.)
3	20106300	20106300	Bracket, Tube Support
4	10105300	10105300	Nut Hex 1/4-20 (14 Req.)
5	20102200	20102200	Bracket, Baffle (3 Req.)
6	20105900	20105900	Baffle, Smoke (2 Req.)
7	20102640	20102640	Top Brick Retainer, Rear
8	20102650	20102650	Top Brick Retainer, Side (2 Req.)
9	10100700	10100700	Fire Brick 9 x 6 x 2-inch (7 Req.)
10	10116200	10116200	Fire Brick 12 x 6 x 2-inch (8 Req.)
11	10100900	10100900	Grate, 3/4-inch Cast Iron 15 3/4 x 7 7/8 (3 Req.)
12	20105100	21105100	Air Tube, Secondary
13	10110700	10110700	Gasket, Secondary Air Tube
14	20107503	20107503	Pan, Ash (See Page For Component Parts)
15	20105703	20105703	Latch, Door
16	10105000	10105000	Screw, Machine Rd HD 1/4-20 x 3/4 (4 Req.)
17	20104903	21104903	Fire Door Assy (See Page 23 for Component Parts)
18	10100601	10100601	Liner, Refractory POT - 10-inch O.D. x 10-inch
19	20105803	21105803	Firebox
20	20200800	20200800	Secondary Heat Exchanger
21	20107003	20107003	Latch, Ash Pan
22	20300603	21300603	Base
•	20200700	20200700	Nut Retainer - Top & Bottom (22 1/2-inch (2 Req.)
•	20200790	20200790	Nut Retainer - Side (7 3/4-inch) (2 Req.)
•	10103800	10103800	Gasket Heat Exchanger 68-inch
•	10106100	10106100	Washer 1/4 x 20 SAE (16 Req.)
•	10104800	10104800	Screw Thread Cutting Hex Washer HD 1/4-20 x 1-inch (16 Req.)
•	10103990	10103990	Gasket, Ash Pan 1/2 Thermocord 42
23		10123200	Grate Ass'y Complete
24		10122400	Coal Grate - 2 REQ'D
•		20108400	Connecting Rod Ass'y (Includes 2 5/16-inch Locknut)
•		10122500	Grate Frame - 2 REQ'D
25		10122900	Coal Grate, Handle

Repair Parts — Combustion Chamber Assembly (LEFT HAND SHOWN)

EAGLE-YUKON OIL/GAS — SOLID FUEL COMBINATION FURNACE Models LWO-168 and LWG-168



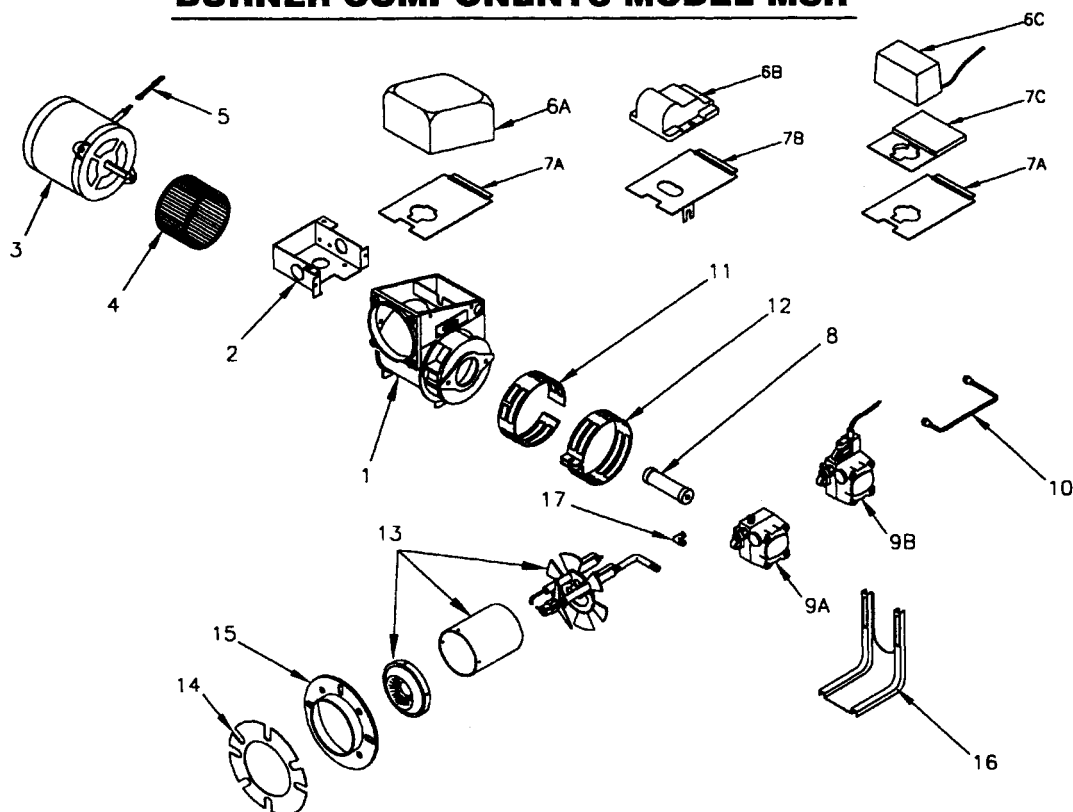
Key No.	Left Hand	Right Hand	Description
1	20105900	20105900	Smoke Baffle (2 Req.)
2	10105300	10105300	Hex Nut, 1/4 - 20 (14 Req.)
3	20102200	20102200	Bracket, Baffle (3 Req.)
4	20102640	20102640	Top Brick Retainer, Rear
5	20102650	20102650	Top Brick Retainer, Side (2 Req.)
6	10100800	10100800	Fire Brick, 9 x 4 1/2 x 2-inch (1 Req.)
7	10100700	10100700	Fire Brick, 9 x 6 x 2-inch (10 Req.)
8	20106300	20106300	Bracket, Tube Support
9	10110500	10110500	Fender Washer, 3/8-inch I.D. x 1-inch O.D. (2 Req.)
10	10104900	10104900	Screw, Thread Cutting, Hex Washer Hd. 1/4-20 x 3/4-inch (2 Req.)
11	50105320	51105320	Secondary Air Tube Weldment
12	10116200	10116200	Fire Brick 12 x 6 x 2-inch (7 Req.)
13	10110700	10110700	Gasket, Secondary Air Tube
14	20108400	20108400	Connecting Rod Assembly** (includes two 3/8-inch Locknuts)

Key No.	Left Hand	Right Hand	Description
15	10122400	10122400	Coal Grate** (2 Req.)
16	10122900	10122900	Coal Grate Handle**
17	10123990	10123990	Coal Grate Frame** (2 Req.)
18	10124500	10124500	Coal Shaker Grate Assembly Complete** (Includes Items 14, 15, 16, 17)
19	50105503	50105503	Ash Pan Weldment
20	50106603	50106603	Ash Door Assembly
21	50104303	50104303	Fire Door Assembly (see page 27 for component parts)
22	10105000	10105000	Screw, Machine, Rd. Hd., 1/4 - 20 x 3/4-in. (4 Req.)
23	50300700	51300700	Base Weldment
24	10139700	10139700	Door Latch (2 Req.)
25	10100602	10100602	Refractory Pot Liner
26	50105403	50105403	Combustion Chamber Weldment
*	10901500	10901500	3 x 8-inch Steel Flue Brush
*	10100950	10100950	Wood Grates, Standard (3 Req.)

* Not Illustrated / ** Optional



BURNER COMPONENTS MODEL MSR



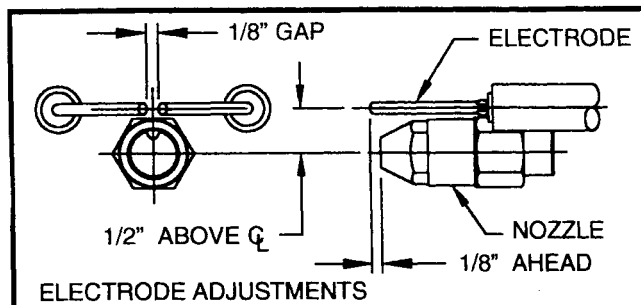
MSR BURNER MODEL, PART DESCRIPTION AND PART NUMBER WHEN ORDERING PARTS

NO.	DESCRIPTION	PART NO.
1	BURNER HOUSING	31841-001
2	JUNCTION BOX ASM	21419
3	MOTOR 1/8 H.P.	20627
4	BLOWER WHEEL 3 1/8 X 4 1/4 BLOWER WHEEL 3 1/2 X 4 1/4	20673 21427
5	MOTOR CORD COVER	13029
6A	TRANSFORMER 115V	20593-002
	230V	100991-001
6B	FRANCE IGNITOR 115V	101051-001
6C	CARLIN IGNITOR 230V	21985-001
7A	COVER	21723-002
7B	COVER	21723-003
7C	COVER	100730-001
8	COUPLING	13424
9A	FUEL UNIT MODEL A	13495
9B	FUEL UNIT MODEL B	13494 (#9)
9B	SUNTEC COMBO UNIT 115V	101123-001
	SUNTEC COMBO UNIT 230V	101123-002
10	6" OIL LINE ASSEMBLY	14451
	8" OIL LINE FOR COMBO	14452
11	INNER AIR BAND	20601-002
12	OUTER AIR BAND	20602-002

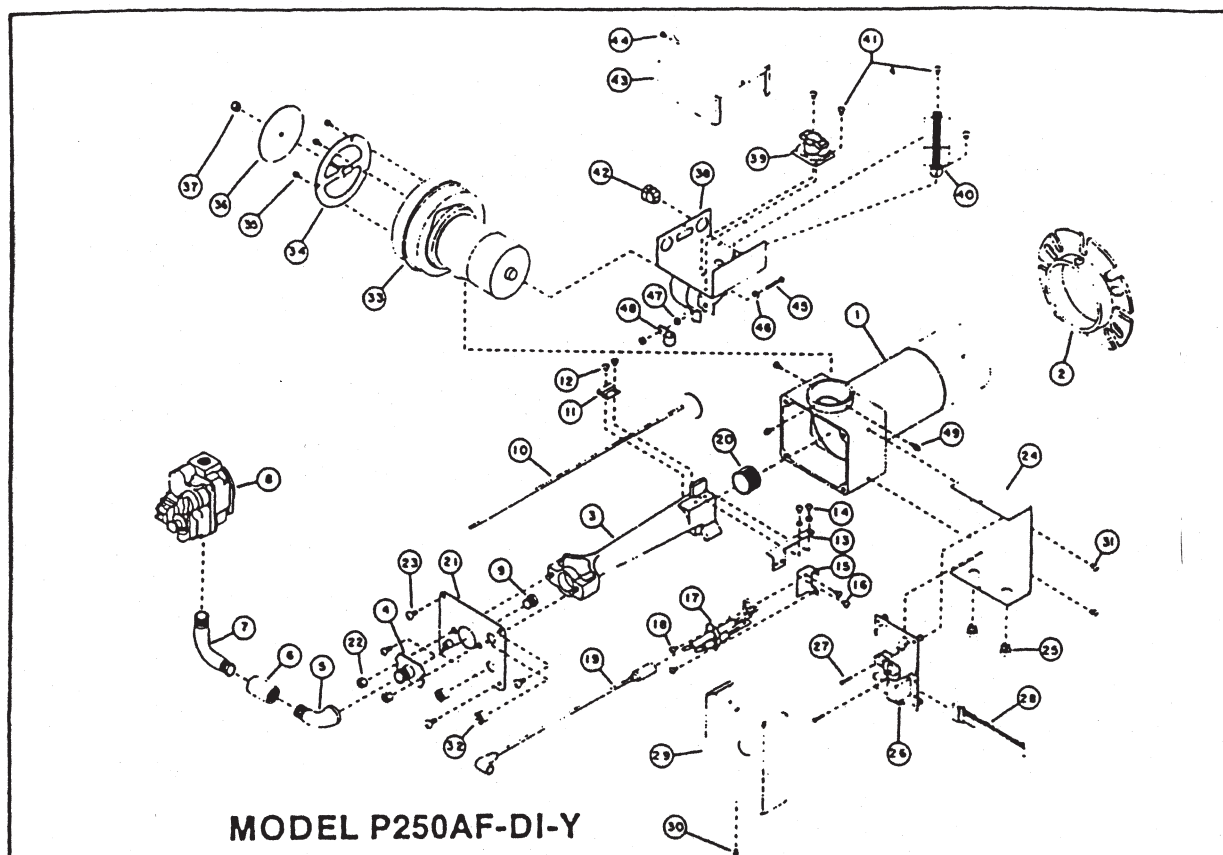
NO.	DESCRIPTION	PART NO.
13	AIR TUBE & GUN ASM.	*
14	GASKET	12484
15	ADJUSTABLE FLANGE	2689-011
16	PEDESTAL MOUNT	21760-011
17	ELBOW	13494

13084 Primary Relay (Honeywell R8184G-1013)
 14289 Cad Cell Assembly (Honeywell C554A)
 10100300 Cad Cell Only (Honeywell 120320)

NOTE: BACKSIDE OF FLAMELOCK TO NOZZLE FACE.



repair parts - GAS BURNER ASSEMBLY



Key No.	Part No.	Description
1	62287	Air Tube/Housing & Extension Assembly
2	60746	Adjustable Flange Assembly
3	61817	Venturi/Stud Assembly
4	60155	Orifice Holder Connector
5	60564	Street Ell
6	60014	Coupling
7	60152	Pipe Ell
8	62289	Gas Valve
9	62371-003	Orifice "F" (.257 dia.) NAT.
9A	62371-004	Orifice "23" (.154 dia.) L/P
10	61818	Flamespreader Assembly
11	61840	Flamespreader Bracket
12	60063	Screw #10-32 x 1/4-inch
13	62007	Electrode Bracket
14	60063	Screw #10-32 x 1/4-inch
15	62008	Mounting Bracket
16	60057	Screw #6-32 x 5/16-inch
17	62261	Electrode Assembly
18	60057	Screw #6-32 x 5/16-inch
19	61987	Ignition Cable
20	60748	Flame Retention Assembly
21	62049	Housing Cover Assembly
22	15872	Hex Nut 5/16 x 18
23	60089	Screw 1/4-20 x 1/2-inch

Key No.	Part No.	Description
24	62197	Ignitor Control Box
25	13026	Strain Relief
26	61990	Ignitor Control
27	60110	Screw #6-32 x 3/4-inch
28	61986	Wire Assembly - Low Voltage
29	62198	Control Box Cover
30	60057	Screw #6-32 x 5/16-inch
31	60057	Screw #6-32 x 5/16-inch
32	60177	Bushing
33	60172	Motor Blower Assembly
34	62284	Air Shutter Assembly
35	60052	Screw #8-15 x 1/2-inch
36	61770	Air Shutter Disc
37	13313	Hex Nut 1/4-20
38	62296	Control Box Assembly
39	61444	Relay Sub Assembly
40	60186	Transformer - 24 Volt
41	60057	Screw #6-32 x 5/16-inch
42	62304	Strain Relief
43	62290	Control Box Cover Assembly
44	60057	Screw #6-32 x 5/16-inch
45	61755	Screw #10-32 x 1 1/4-inch
46	60143	Flat Washer
47	60054	Hex Nut #10-32
48	62047	Cable Clamp
49	60052	Screw #8-15 x 1/2-inch

Model Number: _____ **Serial Number:** _____

Installation Date: _____ Contractor: _____

Service Calls: _____

Notes: _____

YUKON

EAGLE

OWNER'S MANUAL

Model No.

LWO-112 (Oil Fired)

LWG-112 (Gas Fired)

LWO-168 (Oil Fired)

LWG-168 (Gas Fired)

CAUTION:
Read Rules And
Instructions
Carefully For
Safe Operation

IMPORTANT:

Installation must be made in accordance with state and local ordinances which may differ from this installation manual.

YUKON HUSKY/EAGLE I YUKON POLAR/EAGLE II OIL/GAS SOLID FUEL FIRED CENTRAL FURNACE

HOW TO ORDER REPAIR PARTS

WHEN ORDERING REPAIR PARTS,
ALWAYS GIVE THE FOLLOWING INFORMATION:

- PART NUMBER
- PART DESCRIPTION
- MODEL NUMBER
- NAME OF ITEM

**ALL PARTS MAY BE PURCHASED FROM A
YUKON DEALER, ONLINE AT OUR WEBSITE
OR FROM OUR FACTORY.**

PHONE:	1-800-358-0060
FAX:	1-800-440-1994
E-MAIL:	yukon@mlccmn.net
WEBSITE:	www.yukon-eagle.com