

CONSUMER SERVICES TECHNICAL
EDUCATION GROUP PRESENTS

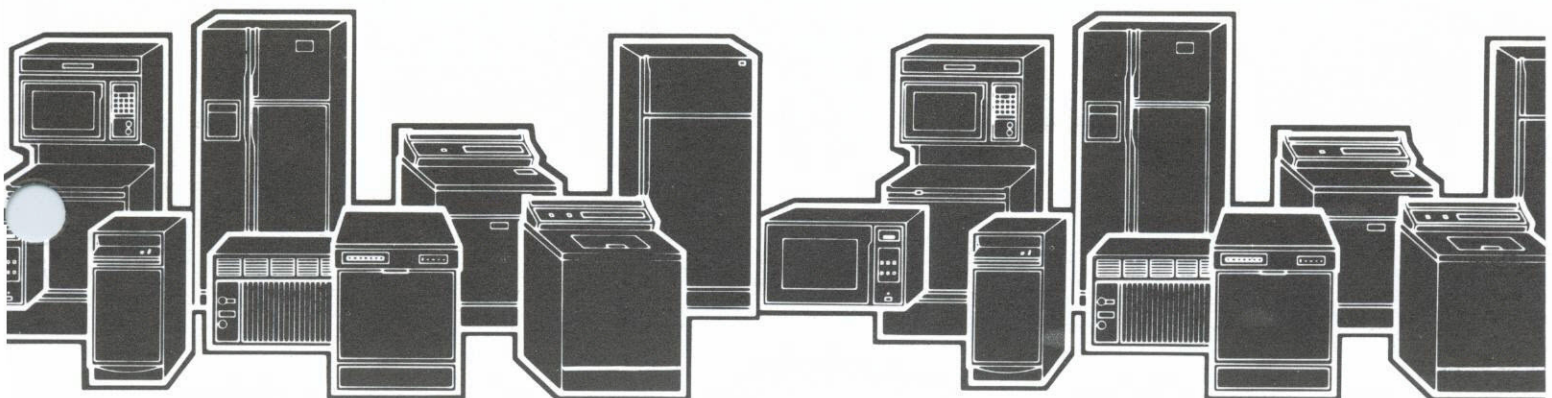
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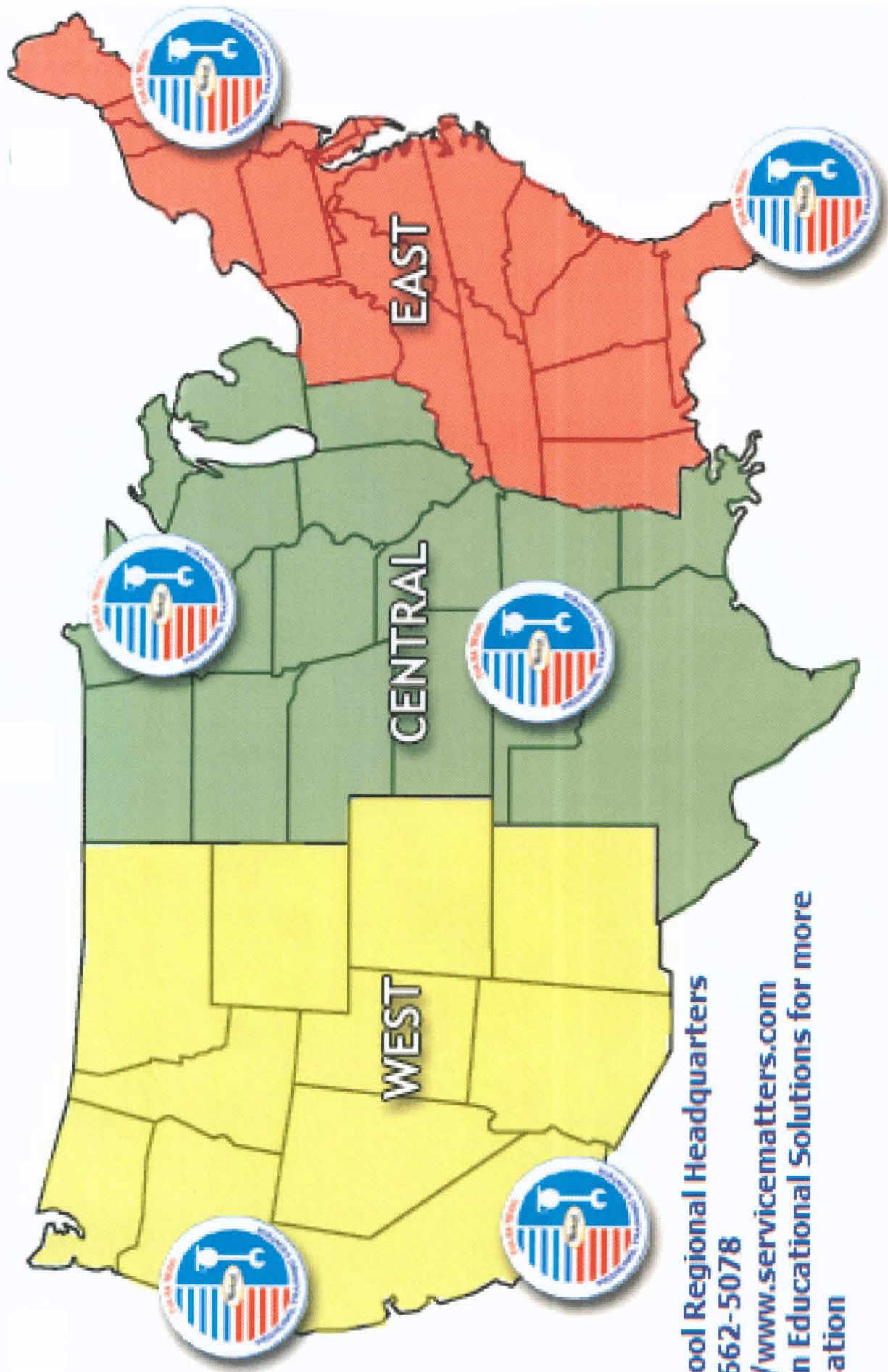


Gas Basics

DRYER AND RANGE BURNERS

Part No. 4314010





Whirlpool Regional Headquarters

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INTRODUCTION

This book is designed to be used as an 'On the Job' reference and a supplement for video tape, part number 4314011, titled Gas Basics. The video tape is divided into the first five sections listed in the Contents above and a letter appears in the lower left corner corner of the screen to identify each section. A set of slides, part number 4314016, is available for use with this book.

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SECTION 'A' - GAS BASICS

HEAT ENERGY

The heat energy produced when burning a gas fuel is commonly expressed in British Thermal Units, or B.T.U.'s.

1 B.T.U. = the amount of heat needed to raise one pound of water 1 degree F.

(A wooden kitchen match produces about 1 B.T.U. of heat.)

FUEL TYPES

There are four types of gas fuels and are referred to by a number.

- No. 1 = natural gas
- No. 2 = mixed gas
- No. 3 = manufactured gas
- No. 4 = liquified petroleum gas

NO. 1 NATURAL GAS: Found under-ground and is called "wet gas" since it contains heavy hydrocarbons such as propane, butane, and other substances.

Gas suppliers remove the heavier hydrocarbons and leave only methane and ethane. In some areas, natural gas contains hydrogen sulfide and is called "sour" gas. Sour gas corrodes copper and brass parts and aluminum orifices must be used in these supply areas.

Natural gas is lighter than air. It has a heat value between 900 and 1200 B.T.U. per cubic foot.

NO. 2 MIXED GAS: Made from a mixture of natural and manufactured gas. Lighter than air, it has a heat value between 700 and 900 B.T.U. per cubic foot.

NO. 3 MANUFACTURED GAS:

Made from coal and petroleum and has a heat value of 500 to 700 B.T.U. per cubic foot. It is also lighter than air.

NO. 4 LIQUEFIED PETROLEUM GAS (L.P.):

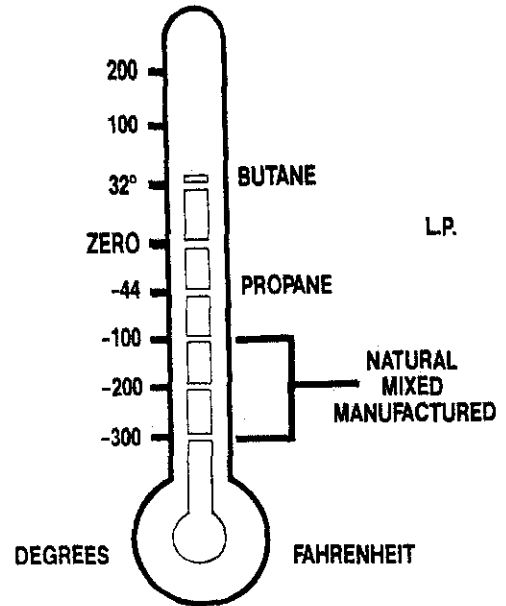
Mainly propane with a heat value of 2500 B.T.U. per cubic foot or butane with a heat value of 3200 B.T.U. per cubic foot. L.P. gas is converted to liquid under moderate pressure and is easily transported in pressurized tanks. When released to normal atmospheric pressure and temperature the liquid returns to its gaseous form. L.P. gas is heavier than air and will lay in the lowest spot it can find if it is released into a room.

GAS FUELS	BTU VALUE/CU. FT.	SPECIFIC GRAVITY
NATURAL	1075 (MAY VARY FROM 900 TO 1200)	.65 TO .70
MIXED	800 (MAY VARY FROM 700 TO 900)	.50
MANUFACTURED	535 (MAY VARY FROM 500 TO 700)	.38 TO .40
PROPANE	2500	1.53
BUTANE	3200	2.0

CHARACTERISTICS OF GAS FUELS

BOILING POINT OF GAS

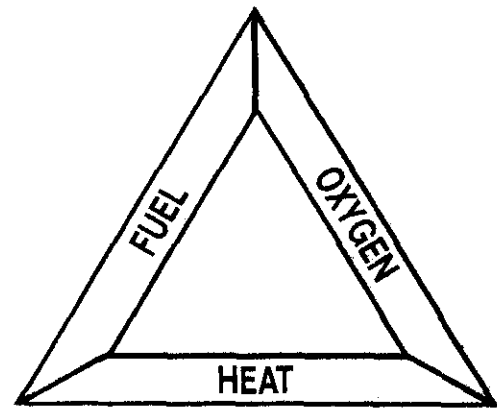
This chart shows the boiling point of the four types of gases. The boiling point is the temperature at which gas will turn from its liquid state to its gaseous state. NOTE: Butane will not turn into gas at temperatures below 32 degrees.



BOILING POINT OF GAS

COMBUSTION TRIANGLE

Fuel, oxygen, and heat are needed for combustion to take place. All must be present for burning to start. Remove any of the three and the burning will stop.



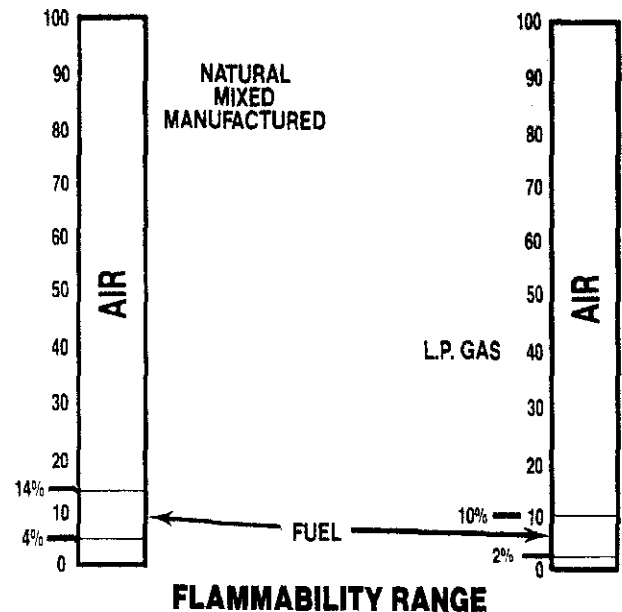
THE COMBUSTION TRIANGLE

IGNITION TEMPERATURE

It takes between 900 to 1200 degrees FAHRENHEIT to ignite the gases used by dryers and ranges.

FLAMMABILITY RANGE

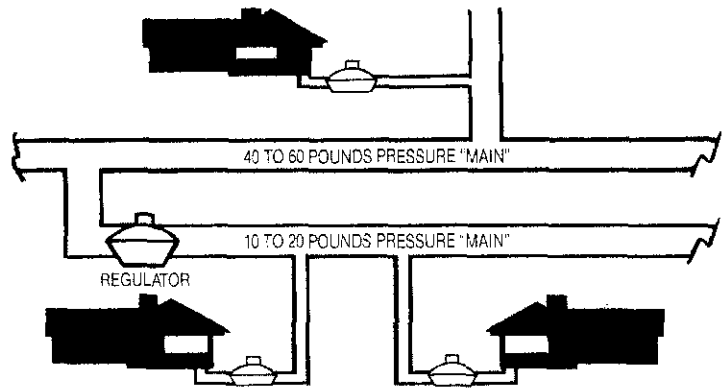
This is the proper mixture, or ratio of gas and air required for burning. Too little or too much gas in the mixture will not allow burning to take place.



FLAMMABILITY RANGE

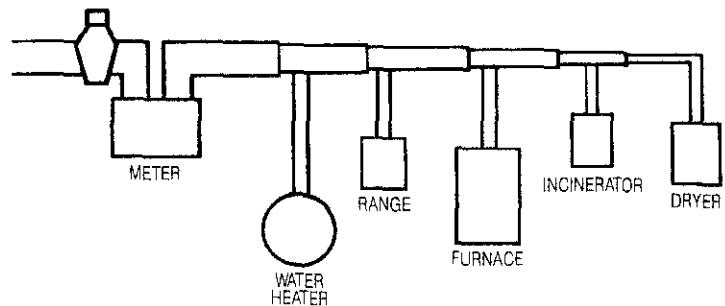
DISTRIBUTION

Utility companies pipe gas through underground gas mains at pressures between 18 to 60 pounds per square inch. Branches from the mains to buildings are connected to gas meters. The gas meters regulate the pressure down to 6 to 8 inches of water column pressure for use in the building.



GAS DISTRIBUTION PRESSURES

Most household appliances operate on 3 to 5 inches water column pressure and have their own pressure regulator. A properly piped system is able to supply all of the appliances at one time.



HOUSEHOLD DISTRIBUTION SYSTEM

PRESSURE REGULATORS

The purpose of the regulator is to reduce and maintain within close limits the pressure needed for the dryer or range to operate. The regulator on a dryer burner is a good example.

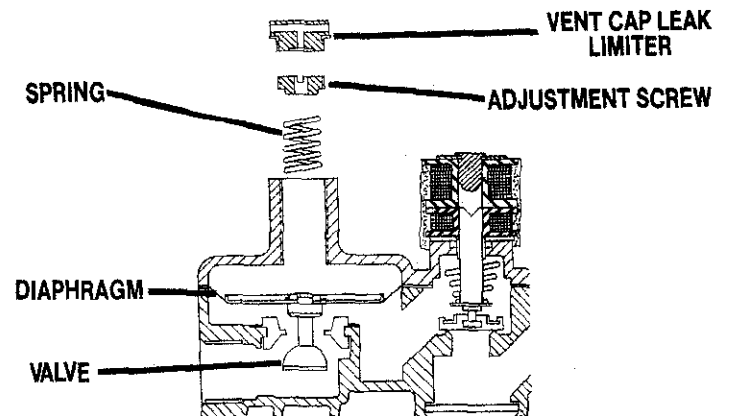
LEAK LIMITER SCREW - in case the diaphragm develops a leak.

ADJUSTMENT SCREW - used to adjust the spring pressure. These two parts have holes in them to vent the area above the diaphragm to the atmosphere to allow it to move up and down.

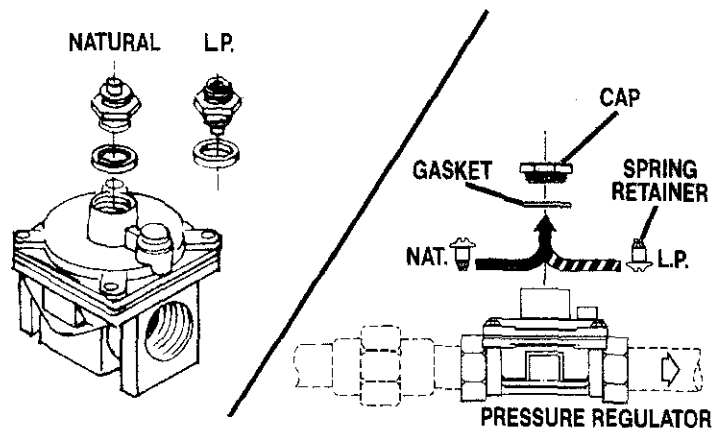
SPRING - applies pressure to top of diaphragm.

DIAPHRAGM - made of a flexible rubber material and has a valve attached to it. As gas enters the valve opening it applies pressure to the underside of the diaphragm, which in turn pulls the valve up and reduces the size of the valve opening. The higher the inlet pressure, the more the size is reduced. This controls the pressure of the gas that enters the burner.

In those rare occasions on dryers where regulator adjustment is needed, remove the leak limiter cap screw and turn the adjustment screw to change the pressure regulated by the regulator. The regulator on newer ranges cannot be adjusted.



DRYER PRESSURE REGULATOR



RANGE PRESSURE REGULATORS

CHECKING GAS PRESSURE

All gas dryers and ranges are shipped from the factory equipped to burn natural gas. The regulators are adjusted to three to five inches of water column pressure and should not require adjustment.

NOTE: MANY RANGES REQUIRE FIVE INCHES OF WATER COLUMN PRESSURE. ALWAYS CHECK THE TOP REGULATOR TO SEE WHAT PRESSURE THE RANGE YOU ARE CHECKING REQUIRES. Pressure is checked by using a manometer.

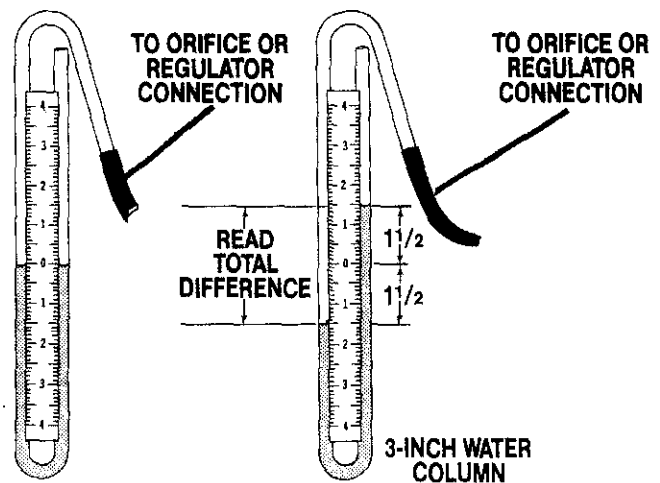
To check gas pressure on a range:

1. Connect manometer hose to a gas valve orifice.
2. Light one of the other burners, turning it to its highest setting.
3. Turn on the valve leading to the manometer.
4. Read the pressure on the manometer by adding the total difference between the two columns.

To check gas pressure on a dryer:

1. Turn off the gas supply to the burner.
2. Remove the manometer plug and attach the manometer hose.
3. Turn on the gas and operate the burner.
4. Read the pressure on the manometer.

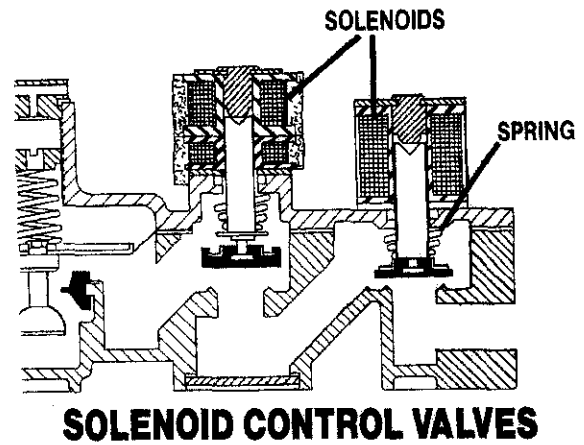
Note: Coloring should not be added to the water used in the manometer unless it is specified by the manometer manufacturer. Using an unspecified coloring could change the specific gravity of the water and cause inaccurate readings.



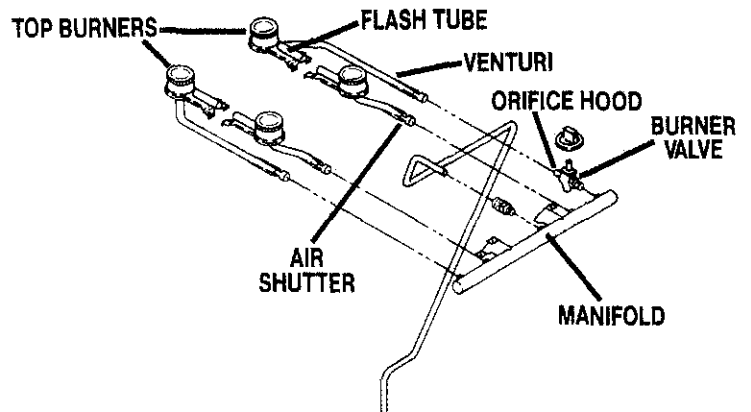
MANOMETER

BURNER ASSEMBLIES

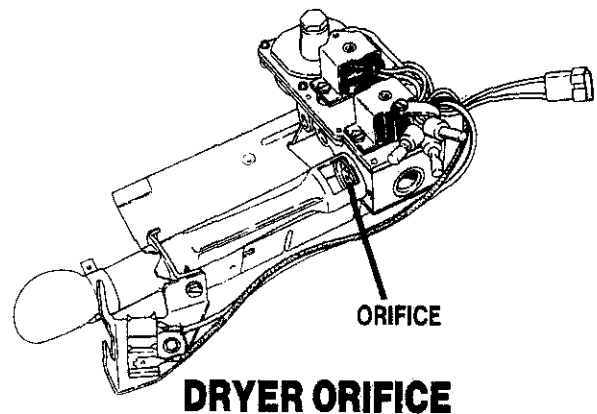
On dryers, after the gas passes through the regulator, it encounters the first of two electrical solenoid control valves. Both valves are spring loaded closed and the solenoids must be energized for them to open. Both valves must be open for the burner to work.



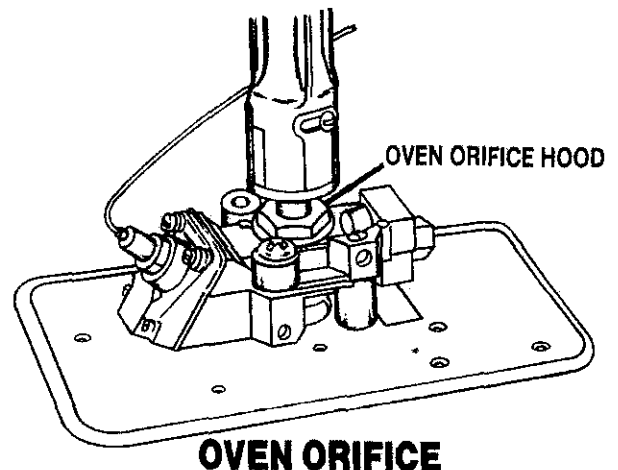
On ranges, after passing through the regulator, the gas enters a manifold which distributes it to the burner valves and most thermostats. This is explained in the range section of this book.



After passing through the valves, the gas comes to the orifice. The main purpose of the orifice is to control the gas output from the valve body at a set level into the burner and shutter assembly.

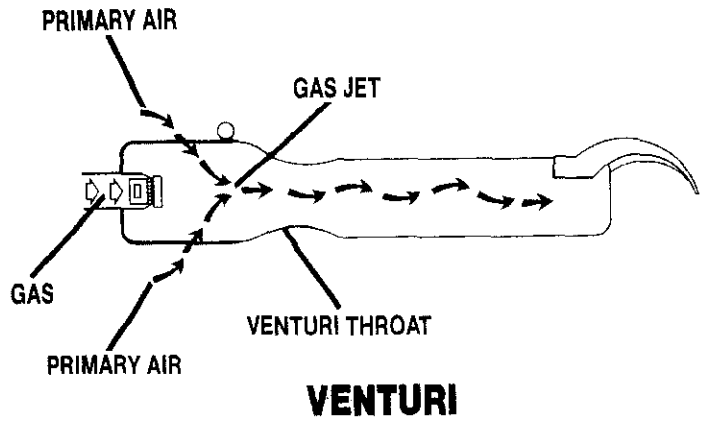


The orifice is a precision part and should never be redrilled in the field. Drilling could leave a burr which changes the flow pattern of the gas creating turbulence inside the venturi and reduce the amount of primary air drawn in through the shutter.

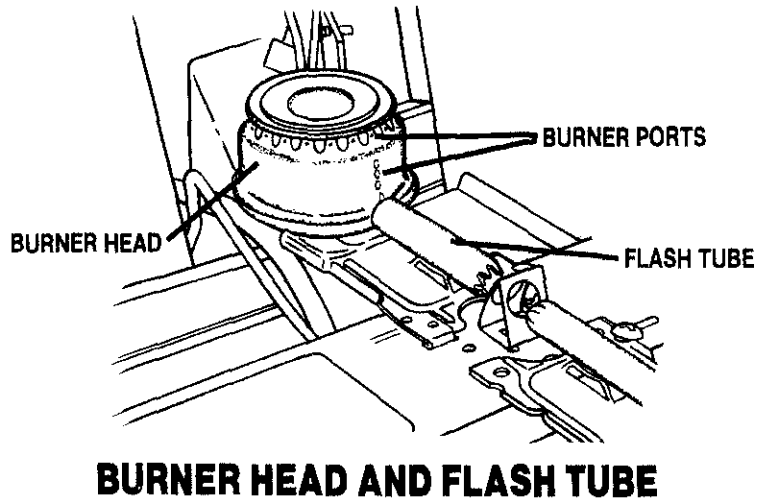


Burner B.T.U. ratings can be changed by varying the orifice size. Orifices have a number stamped on them. The larger the number, the smaller the hole. On dryers, the orifice should be changed if it is supplied with anything other than natural gas. A chart in the service manual will help you determine proper orifice size.

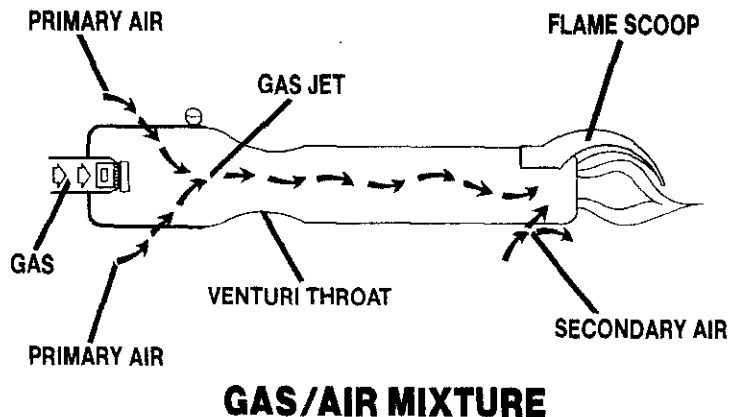
Next is the venturi. With gas flow being properly directed into the venturi throat, a vacuum or suction is created. This suction draws in the primary air through the open shutter ports.



In a range, as gas reaches the burner head, it flows through holes or ports in the burner. At the same time some gas flows through some in the side of the burner head and into the flash tube. Gas flows through the flash tube and is ignited by a standing pilot or an ignitor. This process is also explained in the range section of this book.



In a dryer, the gas and air are mixed in the venturi and leave through the open port under the flame scoop. Secondary air is mixed in at this point and the mixture is ignited by a hot ignitor.



L.P. GAS

L.P. gas differs from natural, mixed and manufactured in the following ways:

1. It burns with a higher B.T.U. value.
2. It is heavier than air.
3. It requires more pressure to move it.
4. It has its own pressure regulator adjusted to 11 inches water column pressure.

On dryers, to compensate for these differences, a smaller orifice must be used and the regulator function on the burner must be bypassed. This allows the regulator on the L.P. tank to provide the 11 inches pressure.




Ranges are equipped with adjustable orifice hoods on all valves except for the blanket of flame broiler.

The specifics of conversion to L.P. gas use is covered in the dryer and range sections of this book.

FLAME ADJUSTMENTS

Flame characteristics can be changed by adjusting the primary air intake at the air shutter. On burners that do not have adjustable shutters, kits are available to make adjustments possible.

This chart illustrates typical flame characteristics.

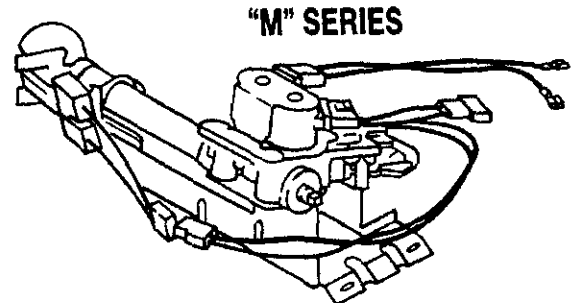
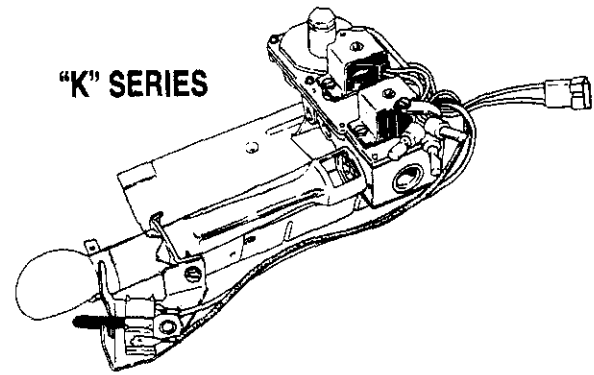
		
IDEAL FLAME	EXCESSIVE GAS	EXCESSIVE AIR
SHARP, BLUE/WHITE INNER CONE ROUNDED, BLUE OUTER FLAME NO YELLOW IN FLAME	SOFT FLAME YELLOW COLOR SOOTY	NARROW FLAME NOISY AIR GAP (LIFTING)
	ADJUST AIR SHUTTER	ADJUST AIR SHUTTER

FLAME CHARACTERISTICS

SECTION 'B' - DRYER BURNERS

GLO-SIL BURNER ASSEMBLY

The Glo-Sil type burner has been used in production for many years. The 'K' series was used until 1984 when the 'M' series was phased into production. Although they are different in appearance, they function the same way.



GLO-SIL BURNERS

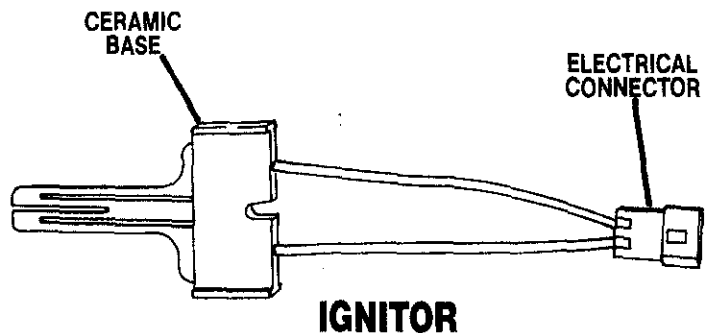
BURNER COMPONENTS

SPLIT COIL SOLENOID

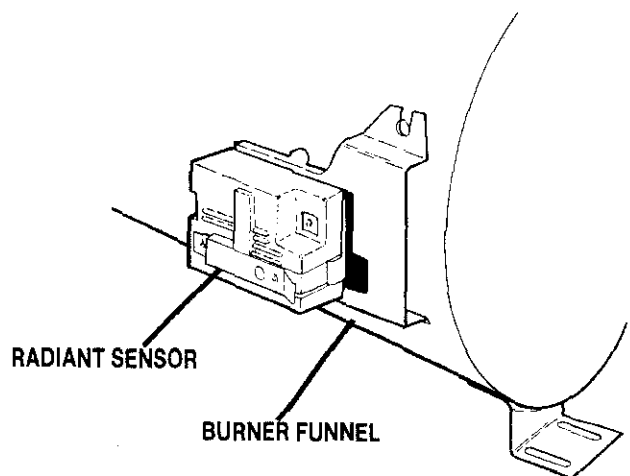
DESIGN - is used to operate the first of the two valves. Both coils must be energized for the valve to be opened.

IGNITOR - heats to a temperature of about 2200 degrees F in about 15 to 30 seconds after line voltage is applied to it. It is made of recrystallized silicon carbide which is very brittle and care must be used when handling it. Several different styles have been used but they all function the same way.

RADIANT SENSOR - is mounted on side of burner funnel assembly. A cut-out in the funnel allows radiant heat from the ignitor and gas flame to contact the sensor. Its contacts are single-pole, single-throw and are calibrated to open when the ignitor reaches 2200 degrees F. Heat from the burner flame holds the contacts open after ignition.



IGNITOR



RADIANT SENSOR

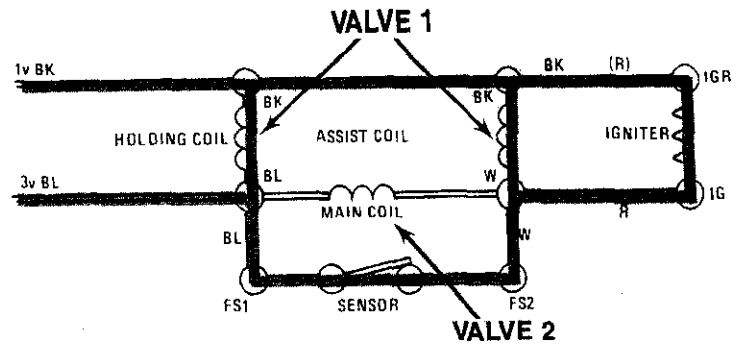
BURNER OPERATION

The following wiring diagrams illustrate burner operation.

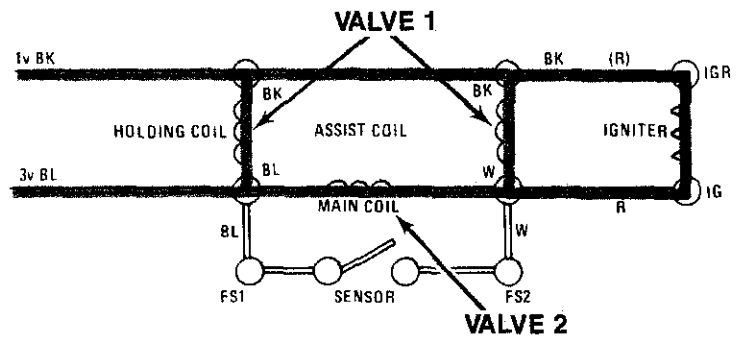
When voltage is applied, a circuit is completed from 1 V to the igniter and sensor back to 3 V. At the same time, the holding coil is energized, and the assist coil is energized, and through the sensor. Both of these coils must have full line voltage applied to lift valve number one off its seat. This action means that the igniter is heating and number one valve is open. No gas flows, however, until valve number two also opens. The number two coil is not energized because current is shunted through the sensor switch, which is a path of least resistance.

When the igniter reaches a temperature hot enough to open the radiant sensor contacts, the only path left is through the number two coil. This causes valve number two to open. Gas now flows through the valve and is ignited instantly by the hot igniter. At this point, magnetism through the assist coil is reduced, but magnetism from the hold coil is enough to hold the number one valve open.

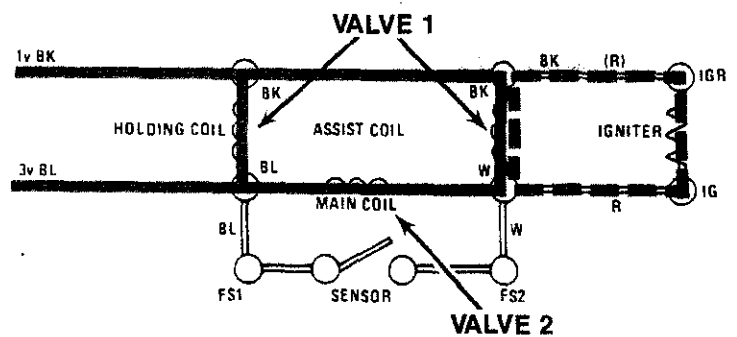
If voltage to the burner is momentarily interrupted and then restored, the number two valve will open. With the reduced current through the assist coil, now in series with the number two coil, the number one valve will not open. When the sensor cools and the contacts reclose, re-ignition will re-occur.



IGNITER HEATING, VALVE #1 OPEN, VALVE #2 CLOSED



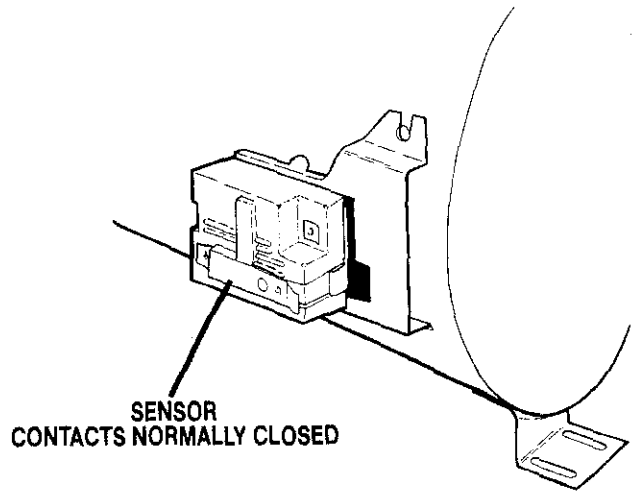
SENSOR OPEN, VALVE #2 OPEN, IGNITION



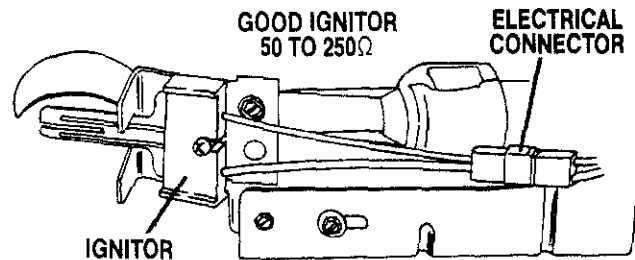
MOMENTARY POWER INTERRUPTION, VALVE #1 CLOSED, VALVE #2 OPEN, SENSOR OPEN

BURNER CHECKOUT

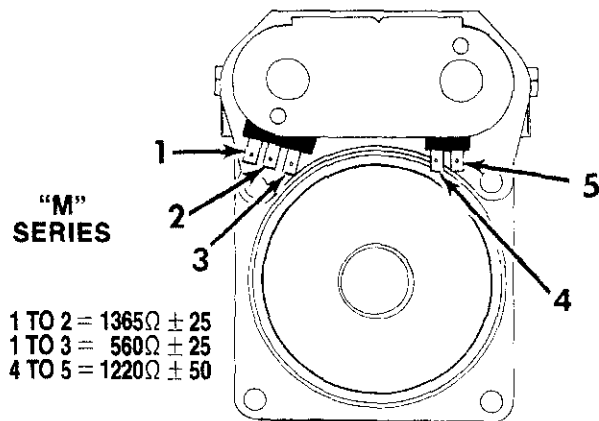
SENSOR - cold, the contacts should be closed and read zero resistance. Replace it if it is open. The sensor must open before the main coil can be energized. Welded contacts will not permit the sensor to open. If the ignitor is good and the sensor does not open, it should be replaced.



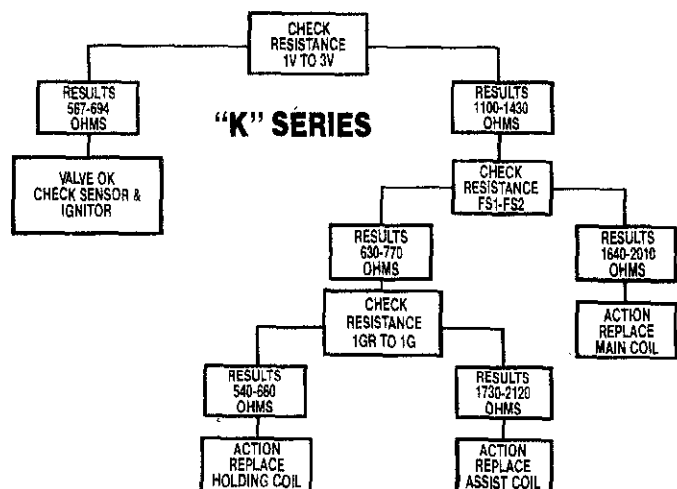
IGNITOR - resistance across the terminals of a good ignitor should be between 50 and 250 ohms. A cracked ignitor will show higher resistance and not radiate enough heat to open the radiant sensor.



'M' SERIES COILS - disconnect the wiring harness plugs and check for the resistances shown in the chart.



'K' SERIES COILS - disconnect the ignitor and radiant sensor leads as well as the main burner disconnect plug. Use the chart to determine the defective component.



L.P. CONVERSION

To burn L.P. gas, the burner must be converted using a kit. The conversion kit number can be found on the burner base or in the parts list.

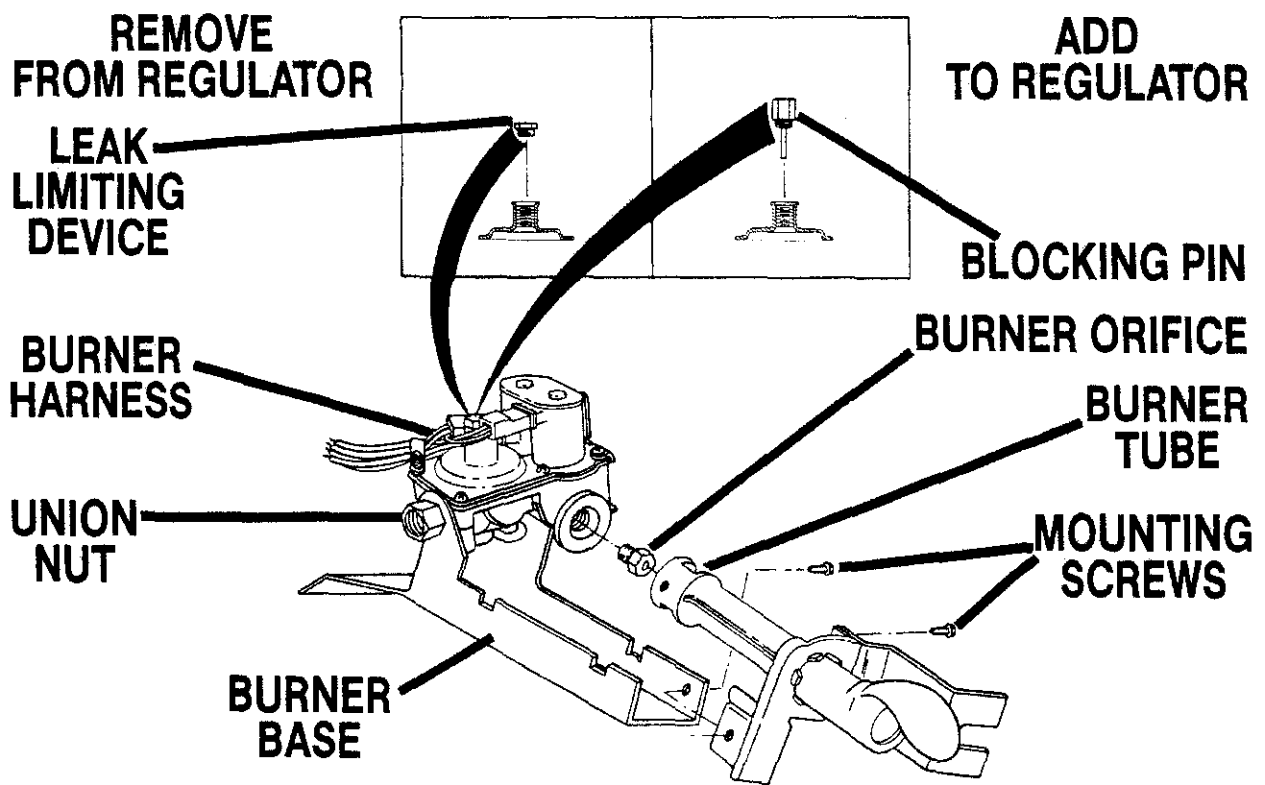
Always follow local codes and ordinances when making L.P. conversions.

To install the kit:

1. Remove the burner from the dryer.
2. Remove the burner tube.
3. Install the orifice provided in the kit.
4. Reinstall the burner tube.

5. Remove the leak limiter cap screw and gasket.
6. Install the regulator plug furnished in the kit.
7. Apply the labels supplied in the kit. One on the burner one in the door well.
8. Reinstall the burner in the dryer.

In cases where a burner is converted from L.P. to natural, mixed, or manufactured gas, refer to the orifice chart in the service manual after obtaining the original burner rating from the label inside the dryer door well.

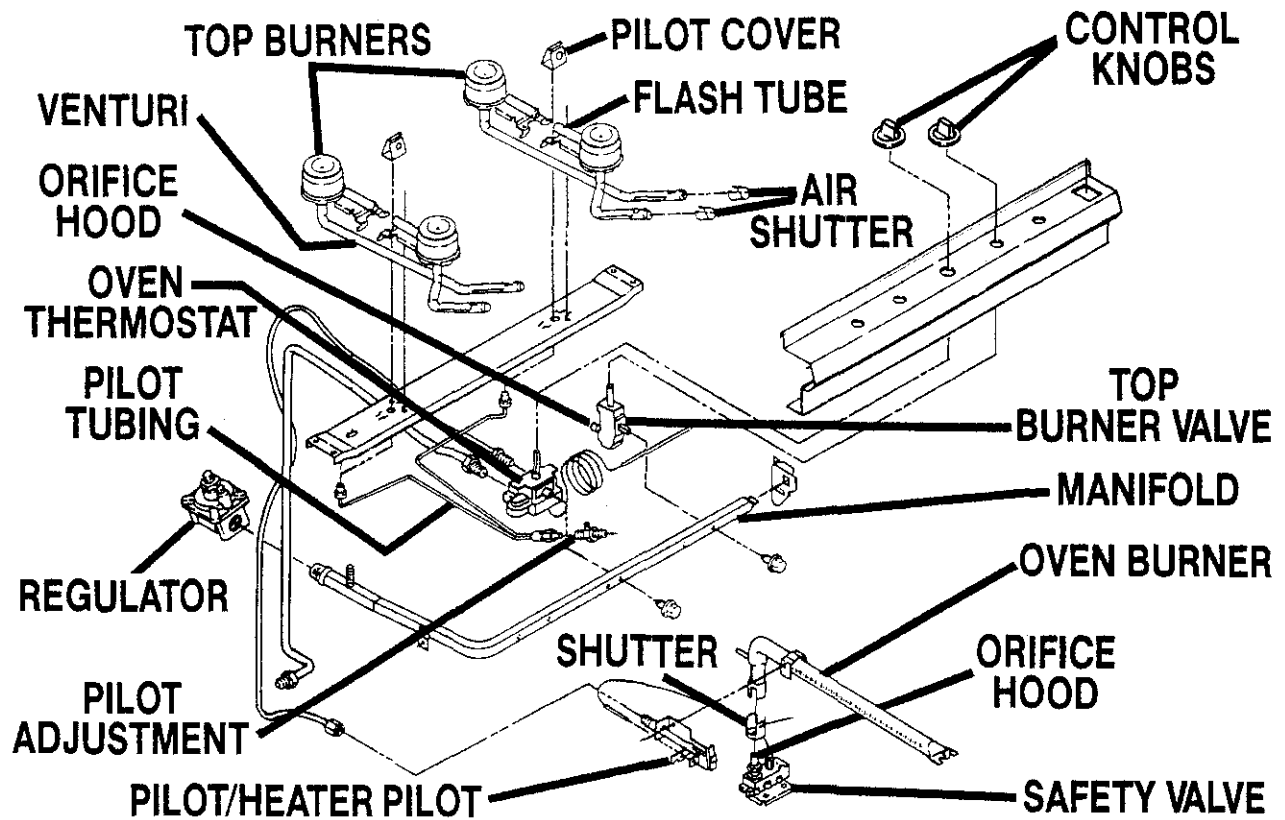


L.P. CONVERSION

SECTION "C"

STANDING PILOT IGNITION SYSTEMS

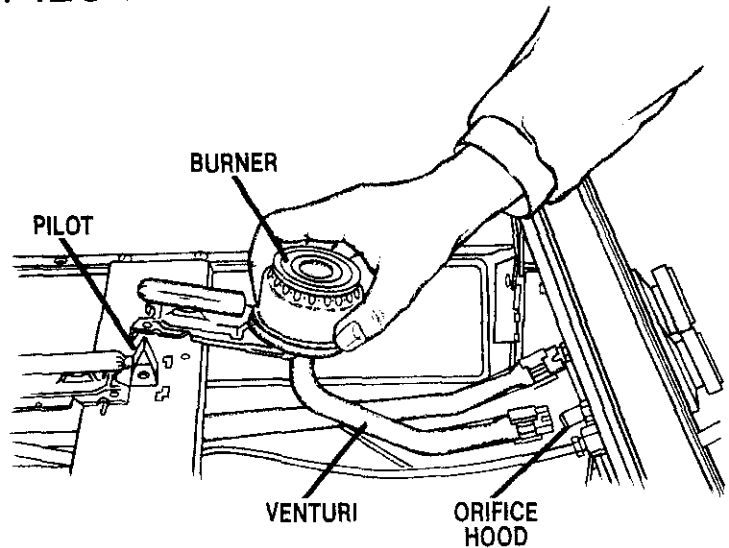
The diagram below shows the components location that were discussed in the video and the basics section of this book. Detailed information on this system can be found on the following pages.



COMPONENT LOCATION

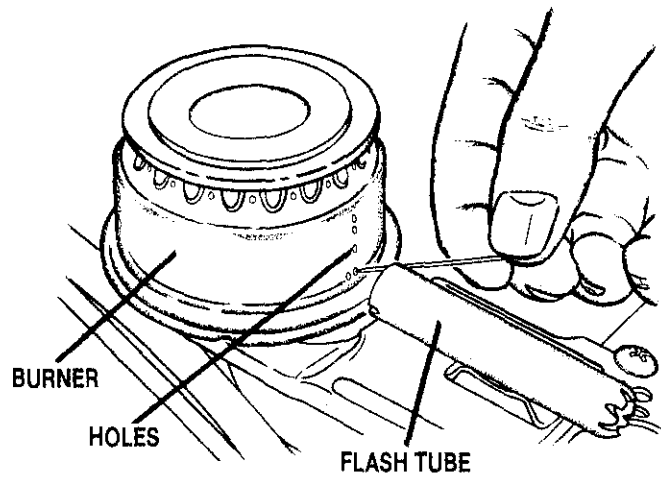
STANDING PILOT RANGES

Burner Assembly: Gas enters the range and is regulated by the pressure regulator. From the regulator the gas enters the manifold. The manifold distributes gas from the regulator to the burner valves. Once a valve is turned on, gas flows through the orifice into the venturi and on to the burner, this assembly simply slides over the orifice hood.



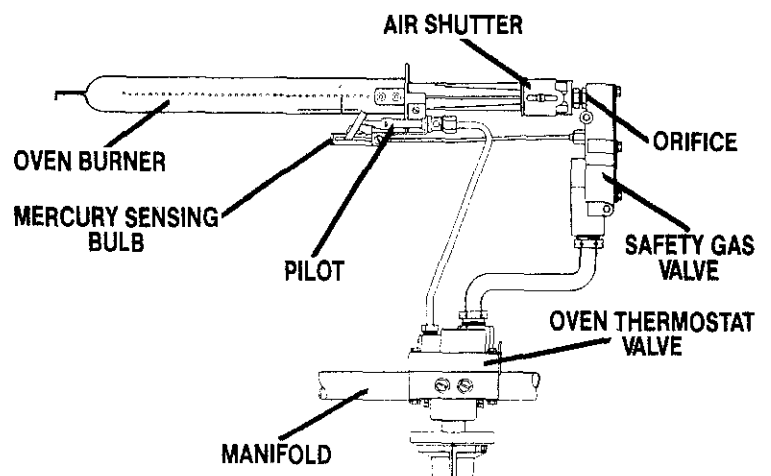
BURNER COMPONENTS

As gas flows into the burner, air is drawn into the shutter to provide primary air for the proper air/gas combustion ratio as explained in basics. As the gas reaches the burner head, it will begin to flow through the holes in the side of the burner head and into the flash tube. Gas flows through the flash tube and is then ignited by the standing pilot or ignitor. As this gas is ignited, it flashes back through the tube and ignites the burner.



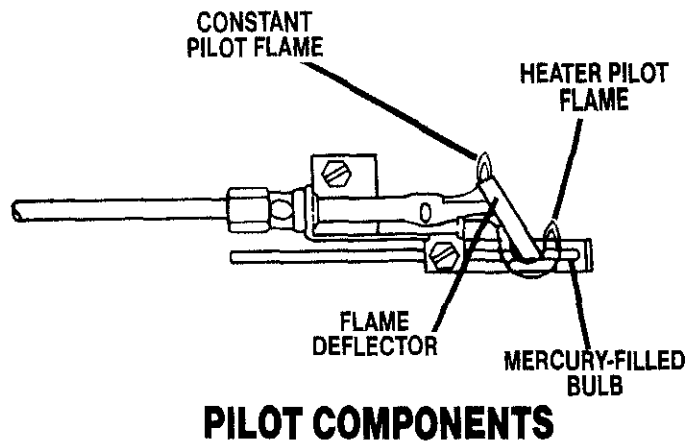
TOP BURNER

Oven System: The oven is controlled by the thermostat valve. The valve is mounted to the manifold. From the valve are gas lines to the oven burner and one line to the pilot. A small amount of gas flows through this valve constantly for the oven standing pilot. When the thermostat is set two things happen. First, gas flows through the thermostat to the safety valve at the burner. Secondly, whenever the thermostat is set and the thermostat bulb is calling for heat, the gas flow will increase to the pilot, causing a heater pilot.

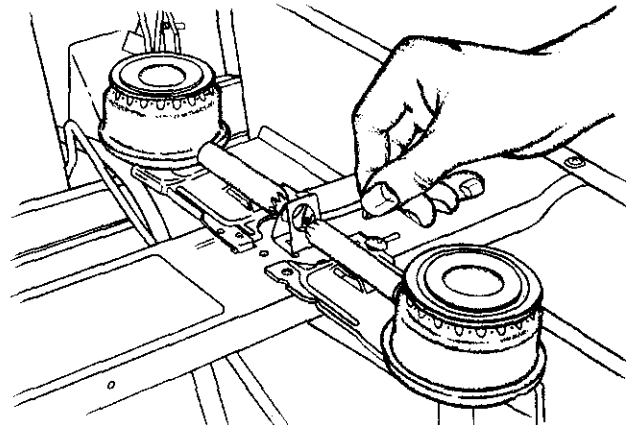


OVEN SYSTEM

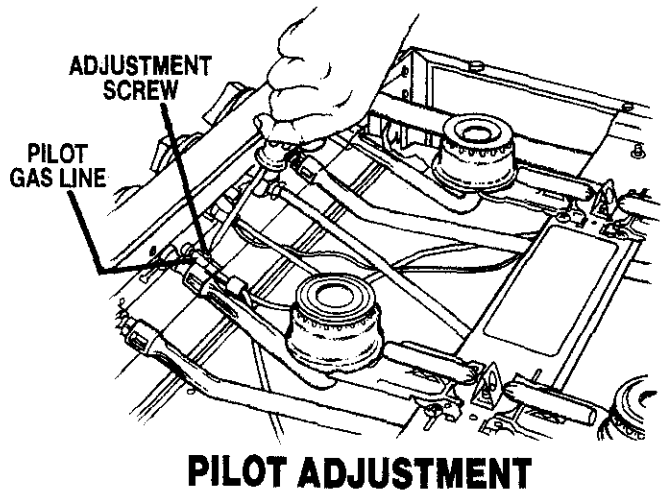
Oven System cont. A flame deflector spreads the heater pilot flame over a mercury-filled bulb. After this bulb is heated, it will cause the safety valve to open. The safety valve will then open and allow gas to flow to the oven burner. The burner is then ignited by the heater pilot.



The burner continues to operate until the preset temperature in the oven is reached. Once temperature is reached the heater pilot is reduced to the regular standing pilot flame until the thermostat again calls for heat.

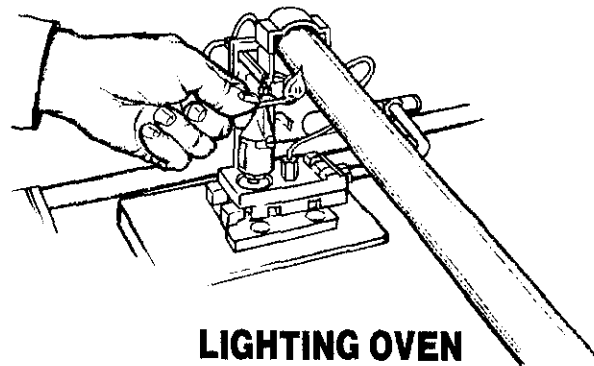


Lighting the Range: To light and adjust standing pilot ranges, follow these simple steps. Be sure all control knobs are in the OFF position. Raise the cooktop. Place a lighted match near the opening of the pilot between the two burners.



Adjust the pilot adjustment screw so the pilot flame tip is 1/4" to 3/8" high and centered in the hole in the pilot housing.

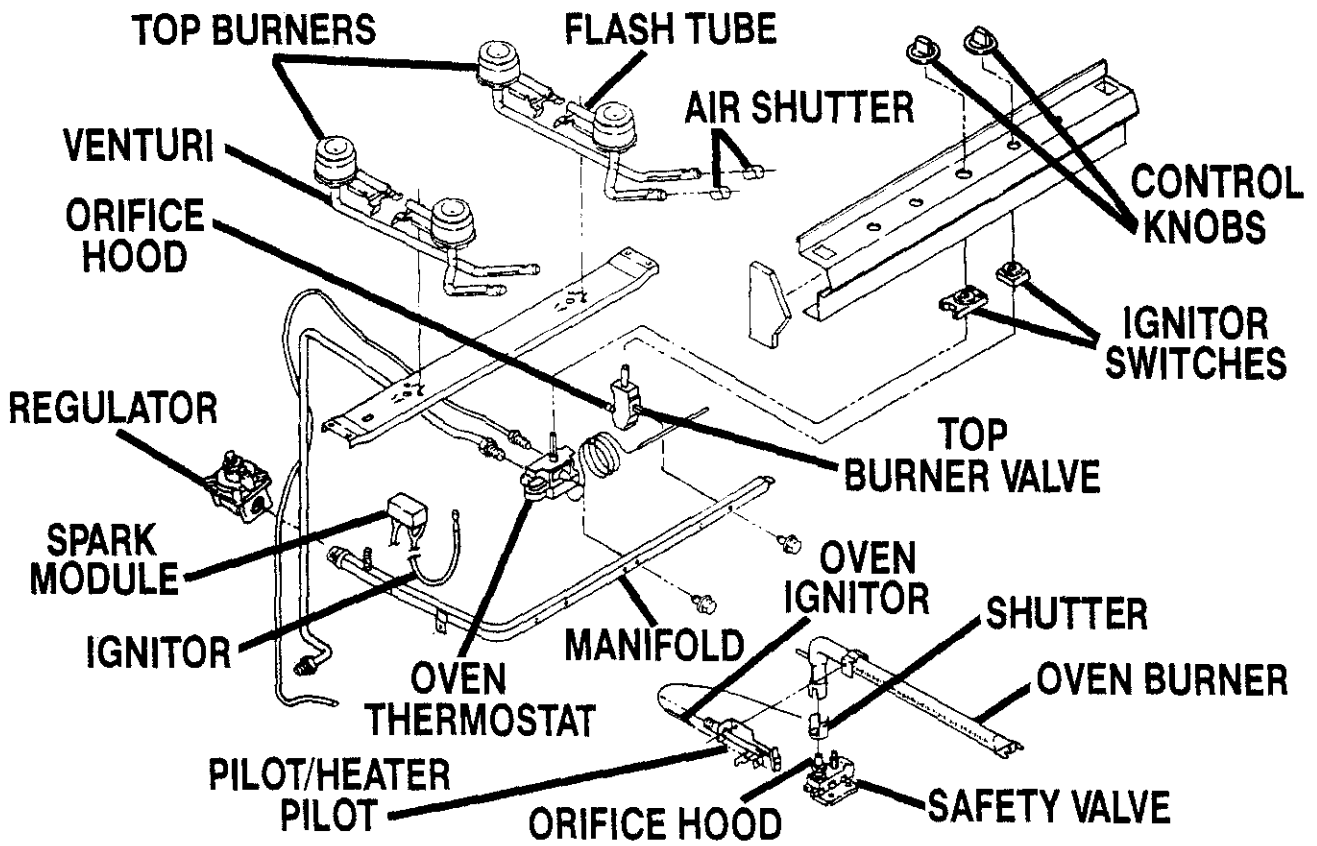
To light the oven burner, make sure the oven is OFF. Remove the oven racks. Hold a lighted match to the opening in the top of the pilot at the rear of the oven burner. No pilot adjustments are required.



SECTION "D"

SPARK IGNITION SYSTEMS

The diagram below shows the components location that were discussed in the video and the basics section of this book. Detailed information on this system can be found on the following pages.



COMPONENT LOCATION

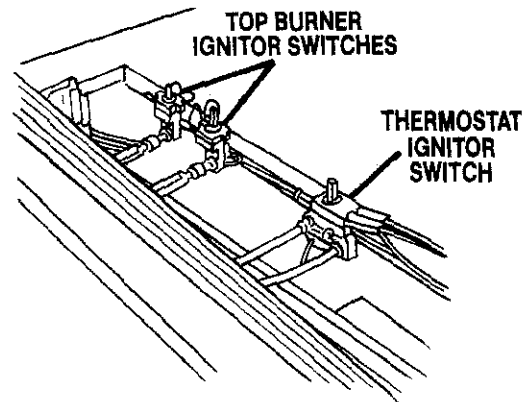
SPARK IGNITION SYSTEMS

The gas burner and oven burner operations were explained in the standing pilot range section of this book. There are very few differences between it and the spark ignition system range.

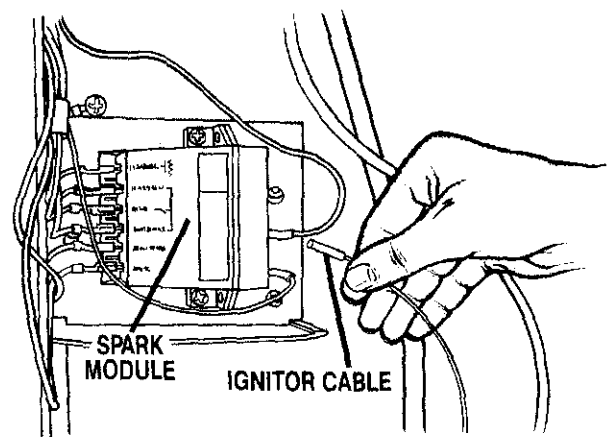
Range Ignitors: Instead of standing pilots to ignite the top and oven burners you have ignitors. These ignitors are controlled by switches that are on each burner valve and the thermostat valve. These switches are rotary actuated and simply slide over the valve stem and snap on the valve. Turning on a burner valve to lite or setting the thermostat closes the switch, making a circuit to the spark module. They are normally open switches and are wired in parallel.

Spark Module: The Spark module is mounted on the rear of the range. Whenever the module is energized by one of the switches, through an ignitor cable, a solid-state circuit and pulse transformer within the the module electronically sends pulses to "ALL" of the ignitor electrodes at the same time. No adjustments can be made to the module and it is serviced only as an assembly.

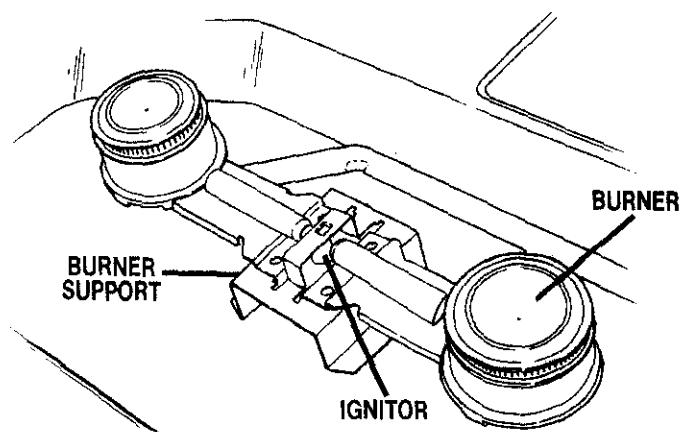
Top Burner Ignitors: The burner ignitors are basically a metal rod with a ceramic insulating body which is wired directly to the spark module. Pulses from the spark module cause the ignitors to arc to the ground strap above the ignitor. These pulses or sparks light the top burners through the flash tube.



RANGE IGNITORS

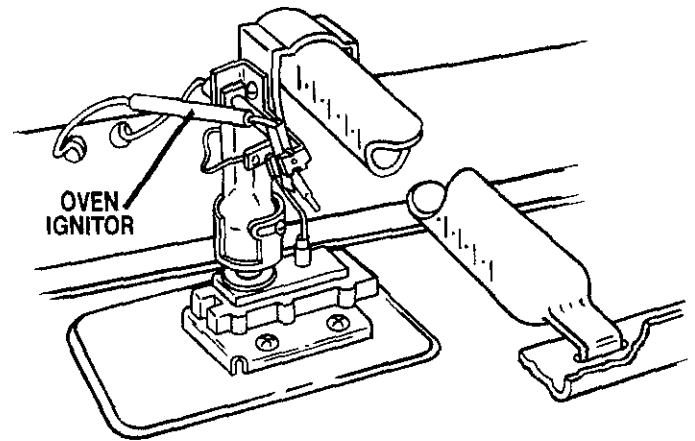


SPARK MODULE



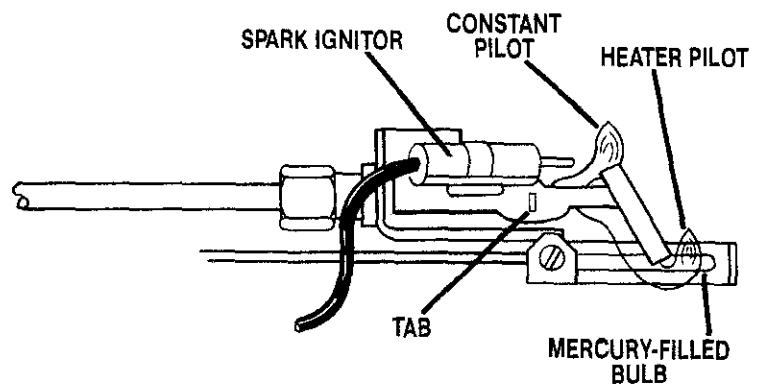
TOP BURNER IGNITORS

Oven Ignitor System: The oven burner ignitor has a larger electrode and sparks to the tab on the pilot. Unlike the surface burners which are manual, the oven ignition system is an automatic or a re-ignition system. When the thermostat knob is set, the ignitor switch activates the spark module and ignitors, and gas flows to the pilot burner. The ignitor will spark until the pilot is ignited and then stop. The pilot will continue to burn until the thermostat is turned off. The ignitor stops sparking because the module is sending a sensing current through the ignitor along with the high-voltage pulses. There is about 1/10" of an inch gap between the ignitor electrode and the tab on the pilot flame. The high-voltage pulses "jump the gap" to ground, creating the spark, but the low voltage current cannot bridge the gap.



OVEN BURNER ASSEMBLY

When the pilot does light, the flame fills the gap between the ignitor electrode and the ground tab on the pilot. The flame is actually a conductor due to its carbon content. Therefore, the sensing current will pass through the pilot flame to ground, completing a circuit back to the spark module. When this sensing circuit is completed, the ignitor module is de-activated and stops sending high-voltage pulses to the ignitors.



OVEN IGNITOR SYSTEM

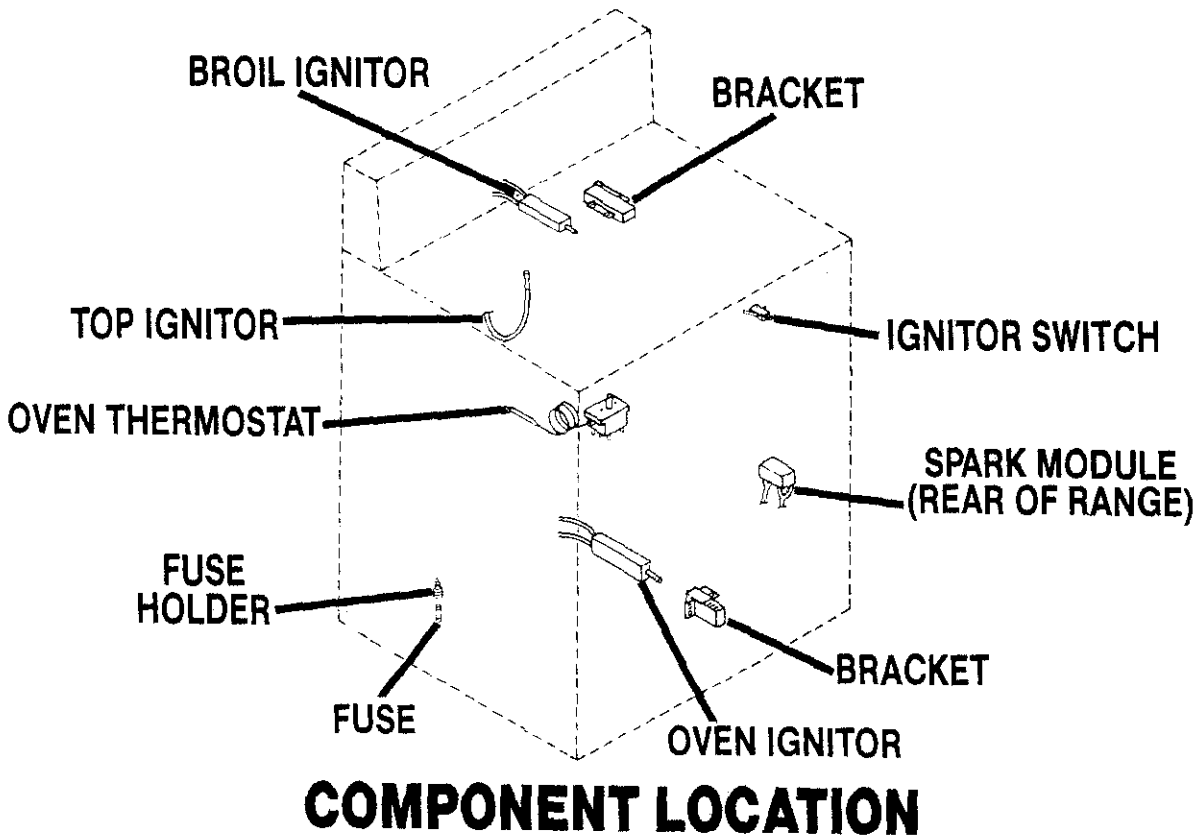
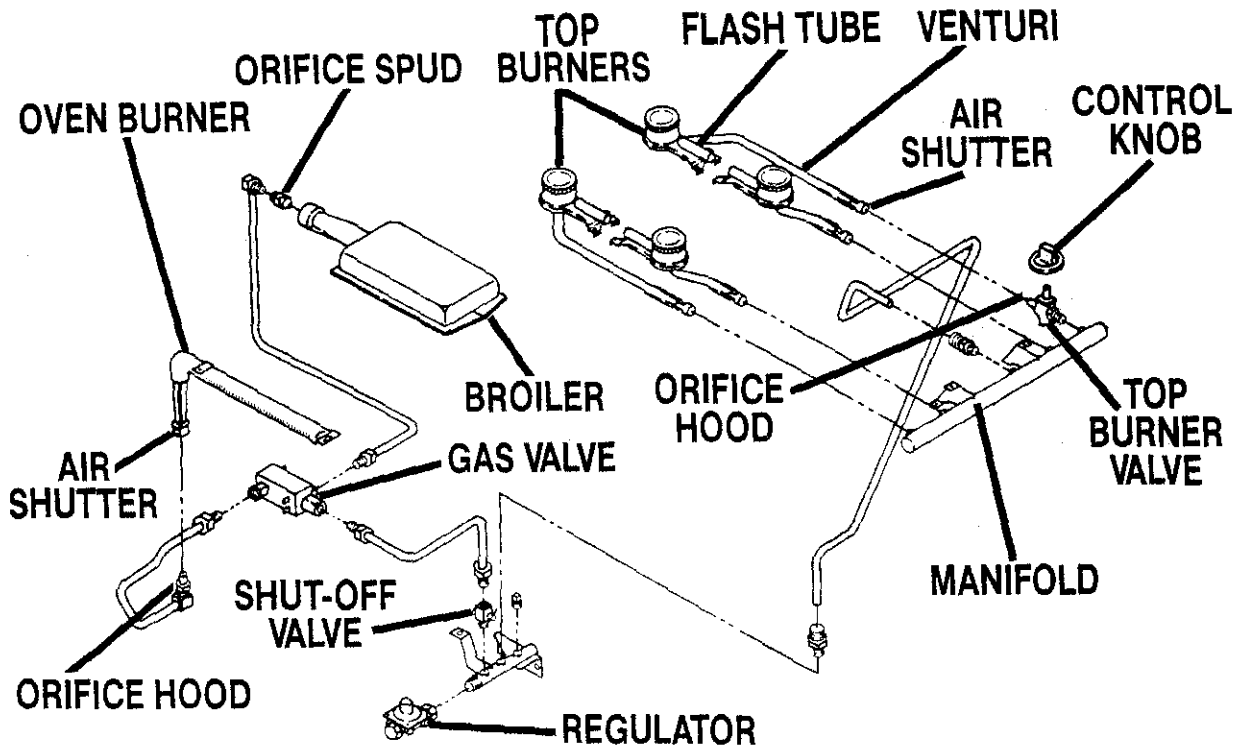
Re-ignition System: If the pilot should go out, the sensing current circuit is interrupted by the loss of the flame, and the spark module will begin sending pulses to the ignitors which will continue sparking until the pilot lights. This is called re-ignition.

The rest of the oven burner system is the same as the standing pilot models. Remember in this system, the pilot will continue to burn until the thermostat is turned off, which shuts off gas to the pilot.

SECTION "E"

GLO IGNITION SYSTEMS & RANGE CONVERSION

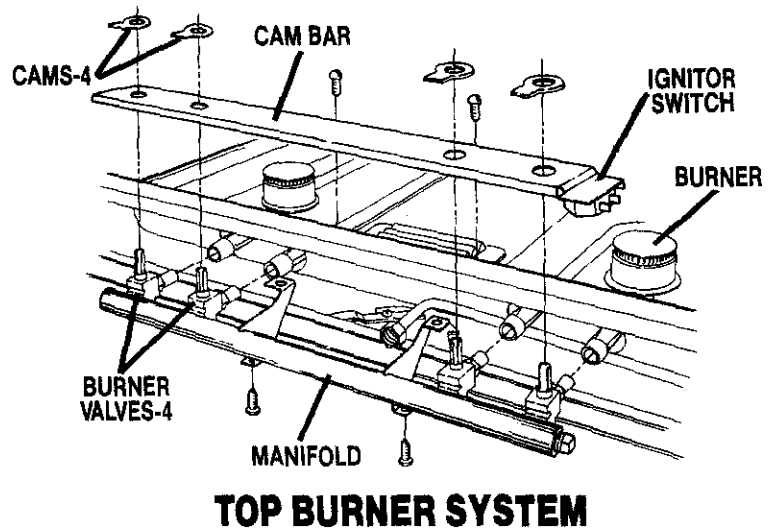
The diagrams below show the components location that were discussed in the video and the basics section of this book. Detailed information on this system can be found on the following pages.



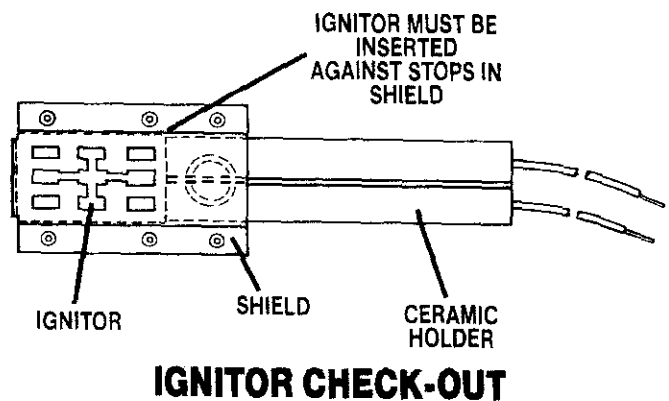
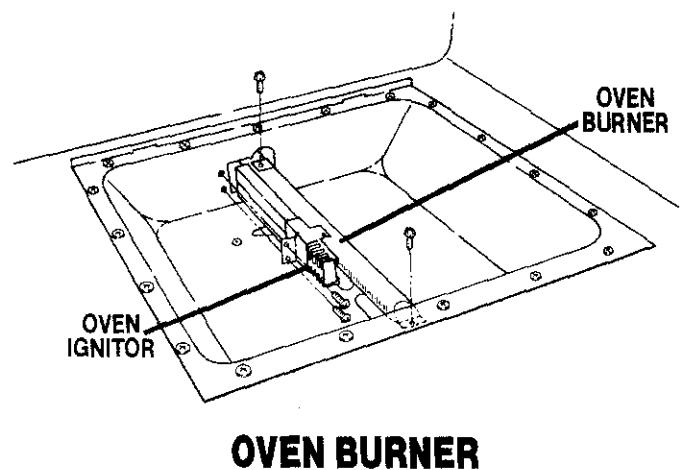
GLO IGNITION SYSTEMS

In the Glo Ignition system, the top burner spark ignition works in the same manner as covered in the Spark Ignition section of this book except for the ignition switch.

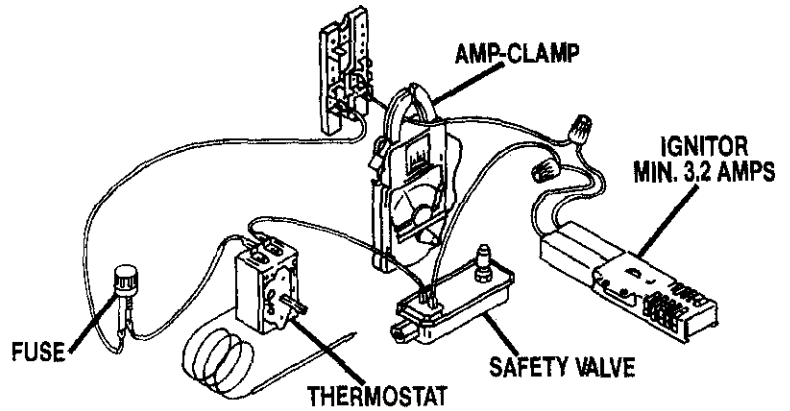
Top Burner Ignition: The ignition switch is connected to a cam bar which sits on top of the burner valves and manifold. On each burner valve shaft, there is a cam. When the control knob is turned the cam rotates with the shaft of the burner valve. Once the control knob is turned to the lite position, the cam will slide the cam bar actuating the ignitor switch and completing the circuit to the ignitor module. This system functions just like most gas ranges with top burner spark ignition, except it only has one ignitor switch instead of four.



Oven Burner Ignition: The oven burner system is slightly different than the previous oven discussed. Instead of a standing pilot or spark ignition system this system uses a carbide glo type ignitor. This glo ignitor, when voltage is applied, heats to a high temperature to ignite the gas in the main burner. The ignitor is quite brittle so care must be used when servicing it.

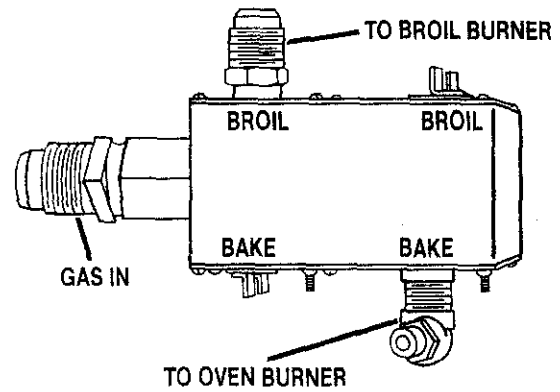


Safety Valve: In series with the ignitor is the safety valve which is located behind the storage drawer. The valve is a bimetal type valve that opens and closes electrically. When the ignitor is energized it will draw 3.2 amps. This 3.2 amperage draw is enough to cause a bimetal, inside the valve, to warp open and allow gas to flow to the burner being operated. The safety valve supplies both the broil and bake burners.

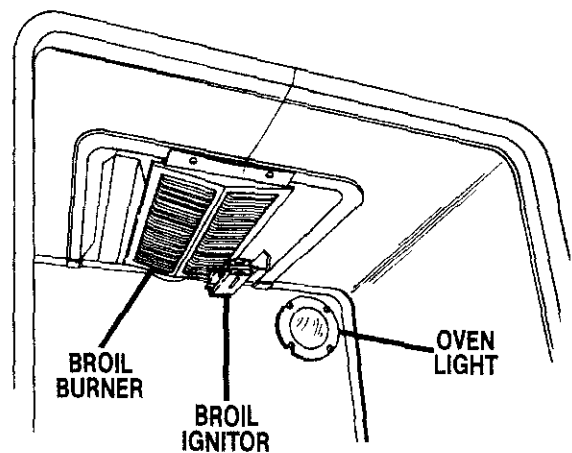


SAFETY VALVE/IGNITOR TEST

Broiler Burner: The broiler burner or blanket-of-flame burner is an infrared burner. This burner has no gas input adjustment since the infrared burner is equipped with a fixed orifice. There is no air shutter to adjust. The burner may have a hazy or fuzzy appearance when in operation. This haze may be 3/8" thick, maximum and is normal for this type burner.



OVEN SAFETY VALVE

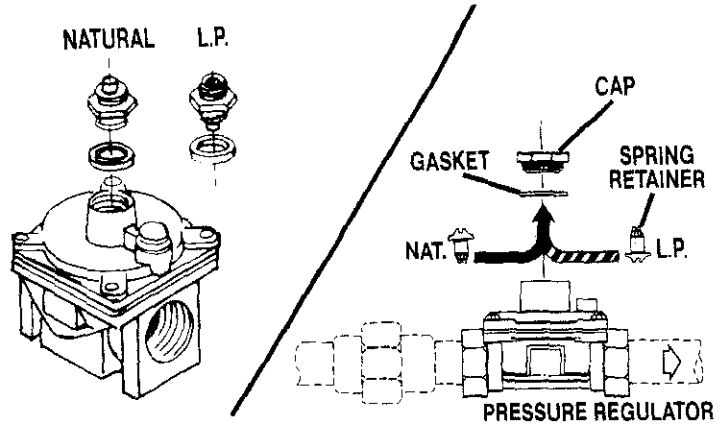


BLANKET-OF-FLAME BROILER

RANGE CONVERSIONS

All ranges are shipped from the factory to burn natural gas. If they are to be used with LP gas they must be converted.

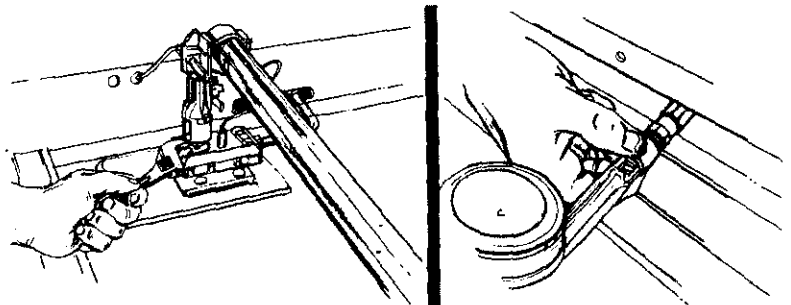
Regulator: First the pressure regulator must be converted. Use a wrench to unscrew the cap from the top by turning it counterclockwise. Turn the cap over so the hole end is up. Replace the cap and gasket on the regulator.



REGULATORS

Top and Oven Burners:

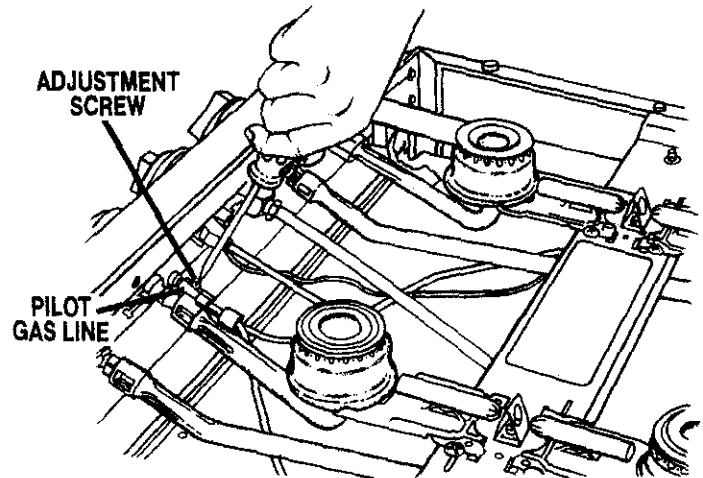
To convert the cooktop and oven burners, screw the burner orifice hoods down 2 to 2½ turns. Do not overtighten them. Adjust the air shutters to achieve the proper flame by sliding the air shutter to close or open. The burner flames cannot be properly adjusted if this conversion is not made.



TURN DOWN ORIFICE HOOD

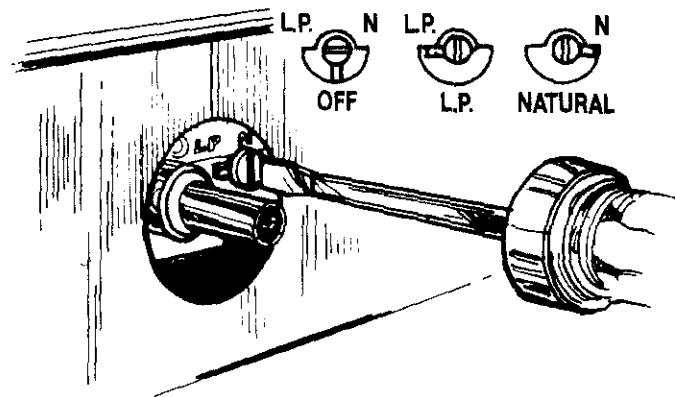
ADJUST SHUTTERS

Cooktop burners with standing pilots require adjustment of a pilot flame 3/8" high. The adjustment control is located on the manifold pipe at the pilot flame base, or as shown, depending on the model.



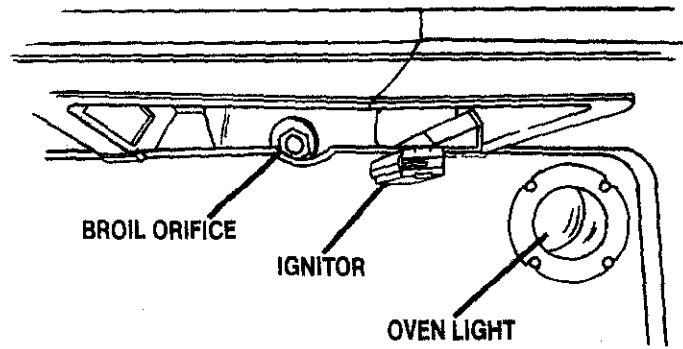
PILOT ADJUSTMENT

Thermostat: To convert the oven thermostat to L.P. gas, remove the thermostat knob, then use a small screwdriver to rotate the key from "N" to L.P.

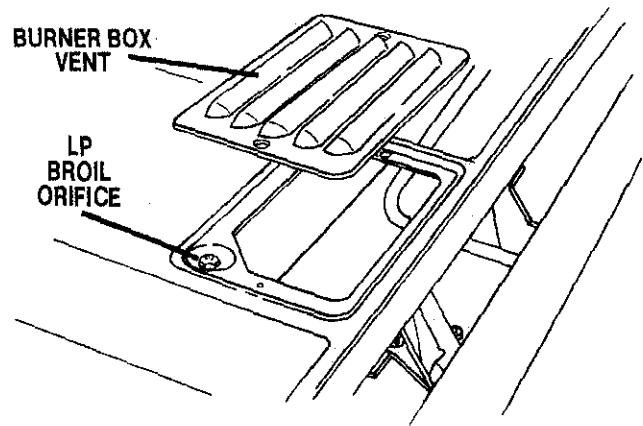


THERMOSTAT ADJUSTMENT

Broiler Burner: The broiler burner orifice spud on self-cleaning ranges must be changed. This spud can be found under the louvered plate in the center of the burner box under the cooktop. Remove the two screws fastening it to the oven. Remove the burner to expose the orifice spud in the rear well. Then replace the spud.



BROILER ORIFICE LOCATION



ORIFICE SPUD LOCATION

SECTION "F" **RANGE DIAGNOSIS**

Baking

- Common baking problems.
- Cakes rise higher on one side.
- Cake burns on bottom.
- Cakes too light in color on top.

General

- Unit continues to spark after it is turned off.
- Intermittent or occasional spark after unit is turned off.
- No spark or only random spark at one ignitor.
- No spark at any time.
- Unit sparks but no ignition.
- Won't clean.

Spark Ignition

- No sparks appear at any electrode gap when any top burner valve is turned on.
- Sparks are present but not at all points, or full strength.
- Sparking occurs at electrodes when all valves are off.
- All burners that are turned on have lighted but electrodes are still sparking.

Top Burners

- Top burner fails to ignite.
- Flames "lift off" ports.
- Clogged ports.
- Top burners-yellow flame.
- Soot formation.
- Burner noisy when extinguished.
- Pilot goes out.

Oven Burners

- Baking takes too long.
- Oven temperature too high.
- Oven burner won't light.
- Burner flames not properly adjusted on preadjusted range.
- Oven burner flame does not cut off.
- Oven burner goes out after ovens to temp. does not re-ignite.
- Oven burner won't come on (controls set properly).
- Oven burner rapid cycles.
- No constant pilot.
- No heater pilot.
- Oven will not maintain proper baking temperatures.
- No main burner flame.
- Broiler Pan.

COMMON BAKING PROBLEMS AND WHY THEY HAPPEN

FOOD NOT DONE AT END OF COOKING TIME. <ul style="list-style-type: none"> ● Temperature too low. ● Incorrect use of aluminum foil. ● Too many pans on a rack. ● Oven door opened frequently. 	PIE BURNS AROUND EDGE OF CRUST. <ul style="list-style-type: none"> ● Temperature too high. ● Pans touching each other or the oven walls. ● Edge of pie crust too tall.
CAKE NOT DONE IN CENTER. <ul style="list-style-type: none"> ● Temperature too high. ● Pan too small. ● Pan not in center of oven. 	PIE HAS SOAKED CRUST. <ul style="list-style-type: none"> ● Temperature too low at start of baking. ● Filling too juicy. ● Used shiny pans not dark or anodized pan.
CAKE UNDERSIZED. <ul style="list-style-type: none"> ● Too little leavening. ● Batter overbeaten. ● Pan too large. ● Temperature too high. 	BROWNING PATTERN IS UNEVEN. <ul style="list-style-type: none"> ● Utensils too large. ● Utensils are of different materials. ● Oven racks too close to oven bottom. ● Incorrect use of aluminum foil. ● Oven vent may be blocked.
CAKE FALLS. <ul style="list-style-type: none"> ● Too much shortening, liquid or sugar. ● Too much leavening. ● Temperature too low. ● Pan too small. ● Stale baking powder. ● Oven door opened frequently. 	CAKE CRACKS ON TOP. <ul style="list-style-type: none"> ● Temperature too high. ● Batter overmixed. ● Too much leavening.
CAKE HAS TUNNELS. <ul style="list-style-type: none"> ● Not enough shortening. ● Overmixing after adding flour. ● Used all-purpose flour. 	BISCUITS, CAKES OR COOKIES ARE DARK ON THE BOTTOM AND/OR ARE PALE ON TOP. <ul style="list-style-type: none"> ● Oven not preheated. ● Too many pans on one rack. ● Used dark or heavy pans rather than shiny pans. ● Pan too deep or too large. ● Used incorrect rack position. ● Pan too close to oven bottom. ● Cookie sheet too large for oven rack. ● Uneven heat distribution in oven—pans blocking air circulation or oven vent blocked. ● Incorrect use of aluminum foil. ● Oven door not closed tightly or opened too frequently. ● Oven temperature too low.
CAKE HIGH IN MIDDLE. <ul style="list-style-type: none"> ● Too much flour. ● Temperature too high. 	
CAKE IS UNEVEN. <ul style="list-style-type: none"> ● Pans not staggered in oven, are touching each other or the oven walls. ● Batter uneven in pans. ● Warped pans. ● Range not level. 	

PROBLEM: Cakes rise higher on one side.

<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
Range not level or pans set too close to side of oven.	Level range. Move cake pans away from side of oven.

PROBLEM: Cakes burn on bottom.

<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. Burner out of adjustment. 2. Oven control out of adjustment. 3. Oven too full for proper heat circulation. 	<ol style="list-style-type: none"> 1. Adjust for correct flame on burner. 2. Calibrate oven control. 3. Space pans to where the heat can circulate around them.

PROBLEM: Cakes too light in color on top.

<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. Oven not hot enough. 2. Sides of pans too deep. 	<ol style="list-style-type: none"> 1. Check oven temperature. 2. Use shallower pans.

GENERAL

PROBLEM: Unit continues to spark after it is turned off.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <ol style="list-style-type: none"> 1. Switch is shorted with spillovers. 2. Cam bar or switch hung up. 3. Cam bar spring broken. 4. Switch out of adjustment. 	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <ol style="list-style-type: none"> 1. Can be blown dry with hair dryer or should dry out overnight at room temperature. 2. Free cam bar and/or switch. 3. Replace cam bar spring. 4. Adjust switch.
PROBLEM: An intermittent or occasional spark after unit is turned off.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <p>This condition is caused by crossed polarity. When polarity is correct, no voltage should be present at neutral to ground. And no voltage to spark module with switches at OFF.</p>	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <p>Check for correct polarity at terminal block. With switch cover removed, check for voltage between terminal block at white terminal and green ground. If voltage is present, unplug unit, reverse power cord connection on terminal block.</p>
PROBLEM: No spark or only random spark at one ignitor.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <ol style="list-style-type: none"> 1. Most common cause is a cracked ignitor, or a pinched ignitor lead wire, permitting current leakage. 2. Bad connection of ground or lack of continuity to ground of ignitor. 3. Cracked or broken ignitor extension. 4. Broken terminal. 5. Bad connection, terminal pushed out or sprung. 	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <ol style="list-style-type: none"> 1. Replace ignitor lead or electrode. NOTE: A check on lead assembly can be made by exchanging terminal positions of electrode leads on spark module. If problem persists on same burner, this is proof that lead assembly needs replacing. If problem moves to other burner with this switch, module is defective and should be replaced. 2. Tighten ground connection and correct any breaks in ground path from ignitor cap to unit ground. 3. Replace ignitor extension. 4. Replace terminal. 5. Replace plug assembly.
PROBLEM: No spark any time.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <ol style="list-style-type: none"> 1. Wire off of switch, terminal block or spark module. 2. Ignitor out of adjustment. 	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <ol style="list-style-type: none"> 1. Check for voltage on module between line and neutral—if no voltage here, check for voltage to spark switch. NOTE: If voltage is present at module with no spark, replace spark module. 2. Adjust gap to thickness of two dimes.

PROBLEM: Unit sparks but no ignition.**POSSIBLE CAUSE**

1. Ignition ports on burner stopped.
2. Flash tube not aligned with ignition ports.
3. Low gas pressure. Always check the top of the pressure regulator to see what pressure the range you are checking requires.
4. A draft in the room.
5. Burner orifice partly blocked.

CHECK & SOLUTION

1. Clean ignition ports.
2. Align flash tube with ignition ports.
3. Have customer call gas company for correcting gas pressure.
4. Customer should eliminate excessive drafts near range.
5. Clean orifice. Can use small drill or paper clip.

PROBLEM: Won't clean.**POSSIBLE CAUSE**

1. Controls not set properly.
2. Faulty latch switch.
3. Oven burners don't come on.
4. Clean timer not set.

CHECK & SOLUTION

1. Check instructions closely.
2. Check latch switch.
3. Check burner operation.
4. Set timer properly.

SPARK IGNITION

PROBLEM: No sparks appear at any electrode gap when any top burner valve is turned on.		
<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>SOLUTION</u>
1. No power to range.	Do accessory lights on the range work?	Check power supply to wall outlet; be sure range cord is securely plugged into outlet.
2. No power to module.	With voltmeter check for line voltage across terminals N & L of module.	Correct faulty wiring, connections, slide bar and/or switch so that voltage is present.
3. High voltage circuit wiring to electrodes faulty.	<p>Using an insulated handle screwdriver, check each pair of high voltage terminals (Outputs not being tested should be connected to electrodes.</p> <p>a. Assemble bare "spade" connectors to first two terminals.</p> <p>b. Place screwdriver from one terminal to about 3/16" from adjacent terminal. Sparks should jump from tip of blade to terminal.</p> <p>c. Repeat with remaining terminal pairs. If any pair of terminals fails to spark</p> <p>If no sparks are noted at any pair of terminals when checked as in C, module is faulty.</p>	<p>If all terminals spark as described, check high voltage wiring. Inspect for open connections, shorts to ground or faulty electrodes. If necessary, replace wire and/or electrodes to eliminate any breaks in circuit.</p> <p>Replace module. Wires must be properly reconnected to correct terminals of new module.</p>
PROBLEM: Sparks are present but not at all points, nor at full strength.		
<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>SOLUTION</u>
1. Arcing to range at undesired place.	One of electrodes may have very strong arc.	An electrode may be faulty or a flaw may be present in the high voltage wire. If possible, observe range in dark to help locate breakdown. Replace faulty wiring or electrode. Presence of grease near electrode tips can also sometimes cause accidental grounding to range.
2. Open or break in high voltage circuit.	Additional symptom: All sparks are very weak.	Connection loose or electrode gap distances too great. All gaps should be approximately 1/10" or the width of two dimes.
3. Insufficient high voltage generated.	Additional symptom: All sparks are very weak.	Line voltage should be at least 94 VAC. If at least this voltage is present, replace module. Wires MUST be reconnected to correct terminals of new module.

PROBLEM: Sparking occurs at electrodes when all valves/thermostat(s) are off.

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>SOLUTION</u>
1. Faulty switch; contacts are closed in "Off" position.	Disconnect power to range and note polarity of plug. Disconnect leads from a switch and insulate with electrical tape. Reconnect power to range. Repeat these steps as needed until sparking stops to isolate the failed switch.	Replace failed switch. Reconnect switches one at a time; if problem recurs when any switch is reconnected, that switch is also failed and must be replaced. If sparking does not stop with all switches disconnected simultaneously, see 2.
2. Short circuit from any switch lead to ground or to ground, neutral or common leads.	Disconnect switch leads from module, one at a time, leaving them disconnected as they are checked. If sparking stops when any lead is disconnected, that lead is probably faulty.	Replace faulty lead(s).
3. Short in trigger circuit of module.	If above checks have not found the problem, the module has probably failed internally.	Replace module. Wires must be properly reconnected to correct terminals on new module.

PROBLEM: All burners that are turned on have lighted but electrodes are still sparking.

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>SOLUTION</u>
<p>For Manual Electrodes ONLY:</p> <p>1. Top burner valve remains in "Light" position.</p>	Check top burner valve handle positions.	Turn valve handle(s) from "Light" position.
<p>For Flame Sensing (automatic reignition) Electrodes:</p> <p>2. Insufficient flame in spark gap.</p>	<p>Check for:</p> <p>a. Incorrect positioning of flame sensing electrode.</p> <p>b. Drafts, which lift or blow out flame in spark gap.</p> <p>c. Unstable flame in spark gap.</p> <p>d. Insufficient or unstable constant (oven) pilot flame.</p> <p>e. Incorrect high-voltage output connections.</p>	<p>a. Position electrode so gap is approximately 1/10" (width of two dimes).</p> <p>b. Eliminate drafts.</p> <p>c. Adjust top burner air shutter to stabilize flame.</p> <p>d. Be sure oven pilot selector cartridge is turned all the way to either the Natural or LP gas setting (depending on the gas on which the range is to be used). Also, check for blockage in pilot orifice and/or tubing and, if necessary, correct.</p> <p>e. Be sure oven high-voltage electrode lead is connected to "RE1G" terminal on spark module.</p>
3. Open sensing circuit in module.	If the above checks have not found the problem, the module has probably failed internally.	Replace module. Wires MUST be properly reconnected to correct terminals of new module.

TOP BURNERS (Standing Pilot Models)

PROBLEM: Top burner fails to ignite.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <ol style="list-style-type: none"> 1. Top burner not adjusted properly. 2. Lighter tube out of position. 3. Pilot is out. 4. Top burner is not properly installed. 5. Pilot flame too low. 6. Pilot out of position with lighter tube. 	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <ol style="list-style-type: none"> 1. Adjust air and/or gas to obtain proper flame. 2. Place lighter tube into proper position. 3. Relight pilot. 4. Place burner in its proper position on valve and bracket. 5. Adjust pilot flame. 6. Reposition pilot to lighter tube.
PROBLEM: Flames "lift off" ports.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <p style="text-align: center;">Too much gas, air, or both.</p>	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <p style="text-align: center;">Reduce the amount of air and/or gas.</p>
PROBLEM: Pilot goes out.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <ol style="list-style-type: none"> 1. Top burners not adjusted properly. 2. Pilot flame too low. 3. Top burner blows out pilot as it ignites. 4. Oil in pilot tubing. 	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <ol style="list-style-type: none"> 1. Adjust air and/or gas. 2. Adjust pilot flames. 3. Reduce air to top burner. 4. Replace pilot tubes.
PROBLEM: Clogged ports.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <p style="text-align: center;">Boil over during cooking operation.</p>	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <p style="text-align: center;">Clean ports with a small piece of wire. After cleaning, make certain the ports are clear of cleaning powder.</p>
PROBLEM: Top burners—yellow flame.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <p style="text-align: center;">Insufficient air/too much gas.</p>	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <p style="text-align: center;">Increase air or decrease gas.</p>
PROBLEM: Soot formation.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <p style="text-align: center;">Too much gas or not enough air.</p>	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <p style="text-align: center;">Decrease gas or increase air.</p>
PROBLEM: Burner noisy when extinguished.	
<p style="text-align: center;"><u>POSSIBLE CAUSE</u></p> <p style="text-align: center;">Improper air adjustment.</p>	<p style="text-align: center;"><u>CHECK & SOLUTION</u></p> <p style="text-align: center;">Readjust air shutter.</p>

OVEN BURNERS

PROBLEM: Baking takes too long.	
<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. Oven thermostat calibrated too low. 2. Oven not up to temperature. 	<ol style="list-style-type: none"> 1. Calibrate thermostat. 2. Preheat to set temperature.
PROBLEM: Oven temperature too high.	
<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
Oven thermostat calibrated too high.	Calibrate thermostat.
PROBLEM: Oven burner won't light.	
<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. Faulty ignitor. 2. Burner set for LP connected to natural gas. 3. Clogged ports opposite ignitor. 	<ol style="list-style-type: none"> 1. Replace ignitor. 2. Open burner orifice and turn "Select-A-Gas" screw to natural position. 3. Clean ports with a toothpick or small piece of wire.
PROBLEM: Burner flames not properly adjusted on preadjusted range.	
<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. Gas pressure too high or low. 2. Wrong size orifice in cap. 	<ol style="list-style-type: none"> 1. Check gas pressure regulator and adjust. 2. Replace with proper orifice size.
PROBLEM: Oven burner flame does not cut off.	
<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. Control not calibrated. 2. Burner overgassed. 	<ol style="list-style-type: none"> 1. Check calibration of control. 2. Adjust orifice.
PROBLEM: Oven burner goes out after temperature setting on dial is reached and does not reignite.	
<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
Main burner not adjusted.	Open air shutter on main burner to harden burner flames.

**PROBLEM: Oven Burner won't come on (controls set correctly).
Always check use & care guide for proper setting.**

<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. No 120V to range. 2. 5-amp fuse blown. 3. Inoperative ignitor. 4. Inoperative gas valve. 5. Inoperative selector switch. 6. Faulty thermostat. 7. Open wiring. 	<ol style="list-style-type: none"> 1. Check power supply. 2. Replace fuse. 3. Check out ignitor. 4. Check out gas valve. 5. Check selector switch operation. 6. Check thermostat and replace. 7. Check wiring.

PROBLEM: Oven burner rapid cycles.

<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. Defective pressure regulator. 2. Split oven pilot. 	<ol style="list-style-type: none"> 1. Take a pressure reading at the top burner valve outlet with all burners off. Turn on two burners at once. If the pressure drops more than 8/10" W.C. for L.P. (Nat. gas is lower pressure) and does not correct itself, the regulator will likely need replacing. 2. Clean pilot orifice.

PROBLEM: No constant pilot.

<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. No gas to range. 2. Tubing supply line blocked. 3. Orifice blocked. 	<ol style="list-style-type: none"> 1. Use top burner or other constant gas supply outlet to check gas supply. Adjust constant pilot adjustment. Single tube pilot—set either to Natural (N) or L.P. Gas (LP) position. 2. Disconnect tubing at source and at pilot end and blow out, to clear passageway. 3. Single tube pilot—Disconnect tubing from pilot and blow out, to clear orifice. NOTE: Do not ream or drill out orifice hole. Clean or replace filter sleeve located at manifold. Disconnect tubing from pilot. Remove orifice from pilot and clean out blockage or replace pilot.

PROBLEM: No heater pilot.

<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none"> 1. Thermostat turned off. 2. Heater pilot adjustment turned off. 3. Tubing supply line blocked. 4. Orifice blocked. 5. Pilot blocked. 	<ol style="list-style-type: none"> 1. Turn thermostat knob to setting above oven temperature. 2. Reset heater pilot adjustment until flame just envelopes temperature responsive element. 3. Refer to "Tubing Supply Line Blocked" on constant pilot. 4. Refer to "Orifice Blocked" on constant pilot. 5. Refer to "Pilot Blocked" on constant pilot.

PROBLEM: Oven will not maintain proper baking temperatures.

POSSIBLE CAUSE

1. Oven bulb not in proper location (on its oven clips).
2. Oven bulb coated with foreign material. (Oven cleaner, etc.)
3. Oven bottom improperly positioned.
4. Oven bottom covered with aluminum foil.
5. Thermostat not properly calibrated.

6. Heater pilot flame not cycling off.

7. Safety valve not closing. Temperature responsive element (Mercury Bulb) is being heated by the oven burner flame due to either improper location or an overrated oven burner. (Main burner flame will modulate or throttle when heater pilot flame is off).

8. Safety valve not closing. (Temperature responsive element not being heated by any source.)

CHECK & SOLUTION

1. Secure oven bulb in clips that hold it in proper location. Oven bulb should not touch any surface.
2. Use fine steel wool or scouring pad and gently clean surface bulb. NOTE: Recheck location of bulb.
3. Reposition according to range manufacturers' instructions.
4. If foil blocks holes or slots in oven bottom, oven heat and heat distribution will be affected. Remove foil.
5. Recalibrate as follows:
 - a. Place reliable mercury thermometer (or other suitable instrument) in center of oven.
 - b. Set knob to 300° setting.
 - c. Allow oven to operate at least 20 minutes.
 - d. Calibration adjustment is in center of knob stem.
 - e. Insert screwdriver into knob stem and engage slotted calibration shaft. Hold screwdriver so it does not turn and rotate knob or knob stem to match temperature recorded in oven.
6. (Single pilot tube) High pressure could cause the constant or standing pilot flame to act as a heater pilot flame. Check pressure and proceed as follows:
Replace thermostat if problem is not due to high gas pressure.
7. Check the following:
 - a. Temperature responsive element must be properly located on pilot burner.
 - b. Pilot burner must be properly located on bracket.
 - c. Bracket must be in proper location. Oven burner rate.
8. Replace safety Gas valve with an exact replacement.

PROBLEM: No main burner flame.

<u>POSSIBLE CAUSE</u>	<u>CHECK & SOLUTION</u>
<ol style="list-style-type: none">1. Thermostat set lower than actual oven temperature.2. Temperature responsive element (Mercury Bulb) not hot enough.	<ol style="list-style-type: none">1. Reset knob to higher temperature.2. Check position of temperature element. It MUST be in the path of the heater pilot flame. Reset heater pilot until flame envelopes temperature responsive element. Check gas pressure—Low pressure may give insufficient heater pilot flame. Check pressure regulator. A faulty pressure regulator may cause pressure to be too low.
<ol style="list-style-type: none">3. Defective thermostat—no heater pilot flame, no main burner flame at any setting.	<ol style="list-style-type: none">3. Replace thermostat. NOTE: No heater pilot flame could also be due to low gas pressure or a faulty pressure regulator. Check pressure first before replacing thermostat.
<ol style="list-style-type: none">4. Defective safety valve.	<ol style="list-style-type: none">4. Replace safety valve. NOTE: There are no field adjustments on this control.

THE BROILER PAN

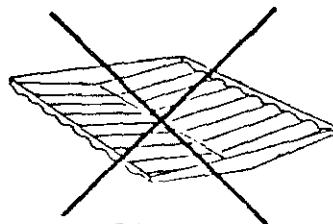
A SPECIALLY DESIGNED BROILER PAN AND GRID HAVE BEEN SUPPLIED WITH THESE MODELS.

IT IS VERY IMPORTANT THAT THE GRID BE PLACED CORRECTLY IN THE PAN FOR PROPER DRAINAGE OF COOKING GREASE INTO THE LOWER PAN. THE FOLLOWING ILLUSTRATIONS SHOW THE CORRECT AND INCORRECT PLACEMENT OF THE GRID. INCORRECT PLACEMENT CAN CAUSE GREASE ACCUMULATION AROUND THE FOOD. IT ALSO MAY RESULT IN OVERHEATED GREASE AND CAUSE A GREASE FIRE.

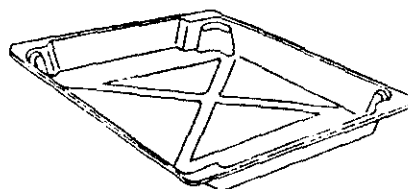
MANY GREASE FIRES ARE CAUSED BY IMPROPER USE OF BROILING PANS AND/OR IMPROPER USE OF ALUMINUM FOIL. IF ALUMINUM FOIL IS USED IN THE BOTTOM OF THE PAN BE ABSOLUTELY SURE IT DOES NOT BLOCK THE DRAIN VENTS ALONG EDGES OF THE PAN.



CORRECT



INCORRECT



TECHNICAL EDUCATION

Making your world a little easier.

