Raker

Appliance Repair Professionals, Inc.

Ranges, Cooktops, and Ovens

Manual 11

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WARNING

SAFETY PRECAUTIONS

Safety is very important when working on any appliance .

Disconnect power before servicing any appliance.
Always keep the work area and your shoes dry.
All appliances have sharp edges and should be handled carefully.

Before working on any gas appliance extinguish all open flames and before attempting any gas associated repair, cut off the gas feed.

Always sniff for gas leaks and soap bubble test any parts that may have been disturbed by repair work.

To minimize any potential buildup of gas in case there is a leak, always have the room open to the outside.

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Ranges, Cooktops, and Ovens

Introduction

Cooking equipment has undergone revolutionary changes in the last 40 years. Prior to the 40's, almost all cooking was done by either natural or bottled gas. Out in the country, even a few wood and coal stoves were still in use. Natural gas was available near larger cities. In the country, beyond the natural gas lines, propane or other bottled gases were delivered by truck and stored in tanks behind the house.

Beginning in the 40's, the electric utilities began marketing electric service in rural areas. Eventually virtually every house in the nation had electric service. Many newer houses installed power systems capable of operating air-conditioning systems and electric cooking equipment.

Another factor spurred the growth of electric cooking, there was a nationwide moratorium on gas sales. The supply could not meet the demand and utilities stopped adding more gas lines. They had to discourage the use of natural gas.

Uncle Harry's
Story Time

Not long ago, a customer reminded me of just how ridiculous the moratorium became. He had installed a gas lamp on a pole in his front yard. Gas lamps had been promoted by our local utility, the Baltimore Gas and Electric Co.. In the late 60's, they were advertised as being decorative, good crime preventors, and cheap to operate. The utility only charged about a $1.50 a month for the gas.

Along came the moratorium and customers were asked to turn off their lamps. It probably was a meaningless, but symbolic gesture on the part of the utilities. The overall amount of gas being used was very small. Anyway, he refused to turn his off. The utility increased his monthly fee to $12.00, about ten times his original amount!

He told me that he didn't give a damn, he liked the thing and kept it on anyway.

It's been on for nearly twenty years.

The gas crunch, along with the migration into the suburbs, beyond the gas lines, spurred the popularity of electric cooking.

Today, most new homes are built as “all electric.” Any new development that has gas heating and cooking is special.

In the last twenty years, a great consolidation has taken place and a number of small range manufacturers have closed. Only a few large ones still manufacture gas-cooking equipment.

These trends affect the types of calls that a service company gets. Companies working in older large cities will see a great many gas cooking appliances. Those in newer rural areas will get calls on electric cooking appliances.

Another factor affecting service calls is the longevity of some cooking equipment. Older gas ranges were very simple and highly reliable. Many have lasted for thirty and even forty years. Other then one thermostat and four gas cocks, there is not much to wear out on a gas range. In contrast the heavy currents used in electric cooking result in earlier failure and more service calls.

Understanding Cooking Equipment

To make it easier to understand cooking appliances, we will first separate gas from electric. A second separation will be between ovens and cooktops. A gas oven is completely different from an electric cooktop and needs to be studied separately. Their main common ground is that they both cook food.

To clarify terms, let us define and describe the common cooking appliances.

Ranges:

A range combines an oven and a cooktop in one unit. It is the older traditional cooking appliance. Most ranges are freestanding units. Years ago, they were often 36" and occasionally 48” wide. Today, most are 30” wide and include four burners and one oven.

Nearly all new ranges fit in between two base cabinets and can be slid out for rear service.

The top of the range has four burners for either frying, boiling or grilling. Below, is an oven for baking and roasting. The controls for the burners and the oven can be found nearly anywhere.

Standard Electric and Gas Ranges (Fig 11-1)

Some of the older 40” and 48” ranges included a second smaller oven beside the large one. Back in the 60’s, both GE and Frigidaire made some wonderful, big ranges.

Uncle Harry's
Story Time

*In my old house, I had a **60**" Vulcan Hart oven (a commercial brand). It included six huge gas burners on the left side and a 30" square griddle and broiler on the right. Below were two full sized ovens, side by side. On the grill, we could cook up pancakes for twenty in short order.*

The range was a 1958 model from the Baltimore Art Museum. The museum, a customer of mine, remodeled the restaurant kitchen in the late 70's and I got the old range for nothing.

A Classic Chambers Range (Fig 11-2)

I completely rebuilt it and converted it from natural to propane gas. Without question, it was the centerpiece of the kitchen. Today, we still cook on a Vulcan Hart, but it is a more modern 48" model.

There are other classic ranges in use. In 1996, I checked out a 1945 Chambers range for a Realtor. It was in perfect operating order. (More on that particular range later.)

A Set in or Drop In Ranges

Once in a while, in homes built in the 70's, you will encounter a "drop-in range". A drop in range is designed to fit exactly into a special wooden base cabinet. The range has no legs and sits in the cabinet like a cradle. It is sometimes necessary to lift the entire unit out to repair it.

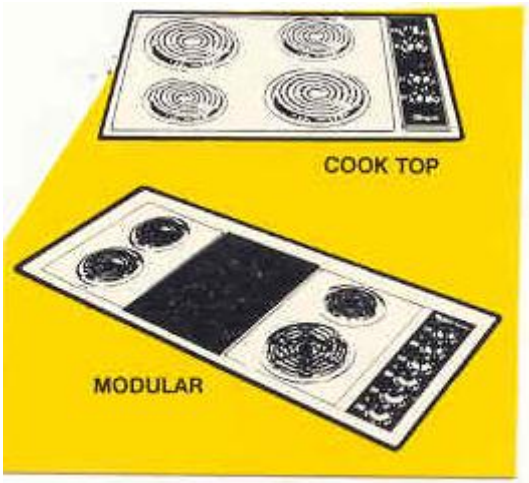
Set-in -Range (Fig 11-3)

Cook tops & Wall Ovens

Modern kitchens have separated the oven from the cooktop. It is now fashionable to have a cooktop in the countertop, and a wall oven in a wall cabinet.

The operation and service of the separated units are still exactly the same as the combination.

Cooktop & Wall Oven (Fig 11-4)



Eye Level Ovens

For a period into the 80's, a second oven was added to the range. A second smaller oven was built above the range and supported by a strong metal shelf system built into the back of the range. In many cases, all of the controls were built into the upper oven and all the wires of gas lines ran down the back wall to the burners and the oven

Eye Level Oven (Fig 11-5)

Double Wall Ovens

In more expensive homes, wall ovens often include two ovens in one unit. The combination maybe built in a variety of ways. It may include:

1. One standard and one smaller oven.

2. Two full sized ovens.

3. Either, one, or both ovens will be self-cleaning.

4. One may be a standard oven and the second may be a microwave (or convection microwave).

Typical Wall Oven, Doors Off and Ready for Repair (Fig 11-6)

With the advent of countrywide housepower, electric ranges began to spread. Most electric ranges require a 2-pole or double 50-amp circuit breaker. Electric range power requirements are similar to those of home air conditioning. Today, most new homes are going up in rural subdivisions that usually are all electric, rather than a combination of natural gas and electric.

Depending on the utility distribution network in your area, service calls will include a mixture of gas and electric ranges, ovens, and cooktops.

Gas Cock (in the off position) and Gas Flex Line(Fig 11-7)

Gas Cooking Appliances

The Theory of Operation

Cooking and heating gas is supplied to the house in piping at a relatively low pressure. The metal piping goes through a gas meter and continues through the house connecting to each appliance. Natural gas lines are made of black iron and are sized to fit the load and the length of the run.

In residential use, gas lines are either 3/4 or 1/2 pipe. (These are nominal pipe sizes and do not measure in inches.) At each appliance, a gas cock or shut-off valve is installed.

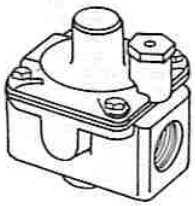
A gas flex line is connected from the gas cock to the appliance. The flexible line allows movement for cleaning and servicing. The flex line in connected to the appliance inlet pipe.

Within all gas appliances, the gas first enters a “regulator.” A simple valve and diaphragm device in the regulator levels out any fluctuations in gas pressure.

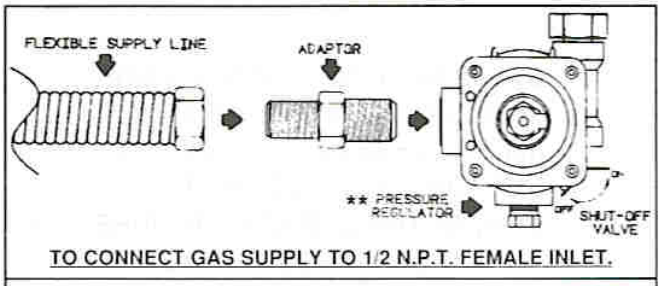
Regulator and Typical Fittings (Fig 11-8)

CONVERTIBLE PRESSURE REGULATORS

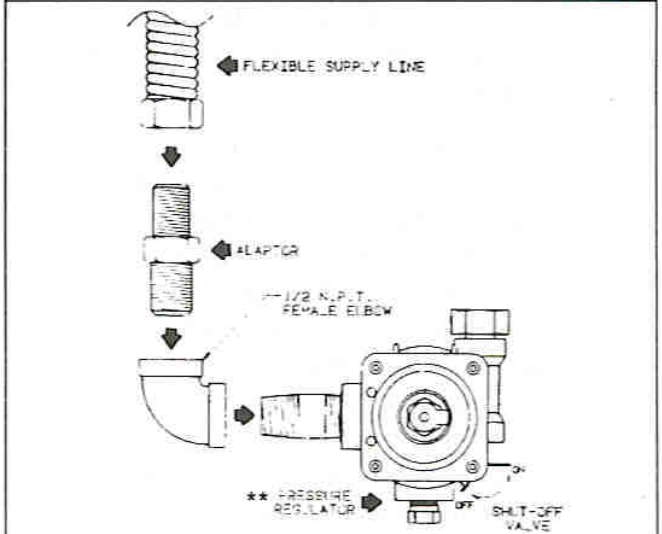
By simply reversing the cap, the regulator converts from LP to Natural gas and vice versa. Capacity to 200,000 B.T.U./hr. (main burner only) or 160,000 B.T.U./hr. (main burner and pilot). Rated at 90,000 B.T.U./hr. at 0.3" W.C.



A150C2	1/2 x 1/2
A150C3	3/4 x 3/4



TO CONNECT GAS SUPPLY TO 1/2 N.P.T. FEMALE INLET.



TO CONNECT GAS SUPPLY TO 1 2 N.P.T. MALE INLET.

FIGURE 4
REGULATOR & ALTERNATE CONNECTORS

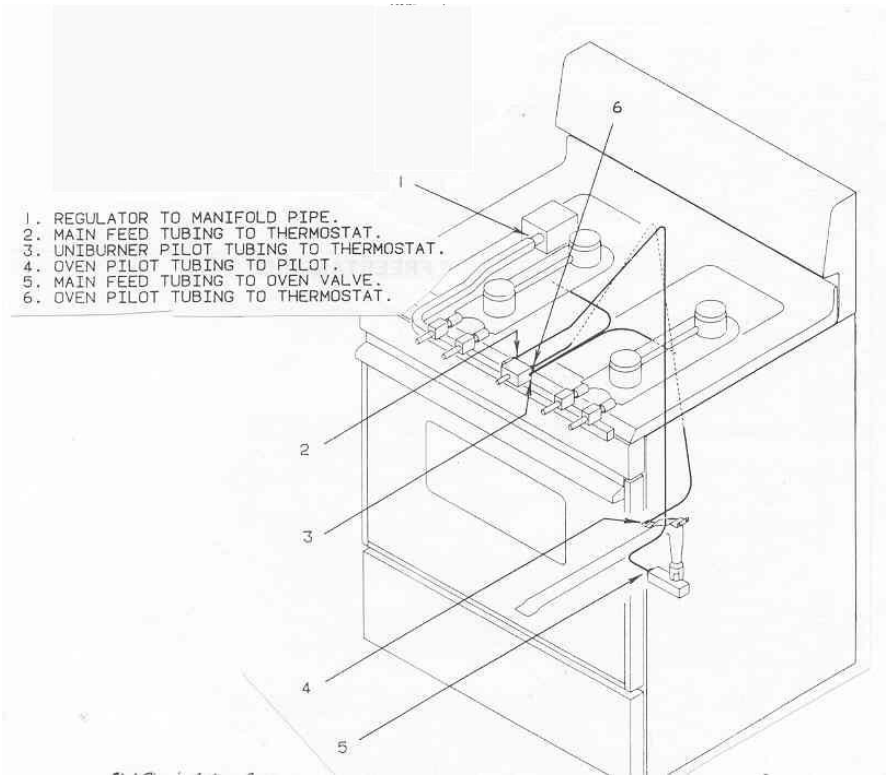
** THE REGULATOR ON YOUR RANGE MAY DIFFER FROM THIS ILLUSTRATION.

Gas Distribution

Down stream from the regulator, the gas passes through various valves that control the gas flow. When the control valves are on the flow is determined by the orifice at the end of the gas pipe.

Remember back in Lesson Three on dryers, we studied the different orifice sizes required for different types of gases. (Go back and reread the sections entitled Gas Conversion Kits and Pilot Orifices.) Cooking appliances operate the same way.

Gas Distribution in a Typical Range (Fig 11-9)



A gas cooktop usually has four adjustable orifices, one for each burner. An oven only has one. It is for the main burner. The orifice is restricted when it is tightened. When the appliance is originally installed, the orifices are adjusted slightly to get the proper amount of gas flowing to each burner.

Adjusting Gas Orifices and the Gas and Air Mixture

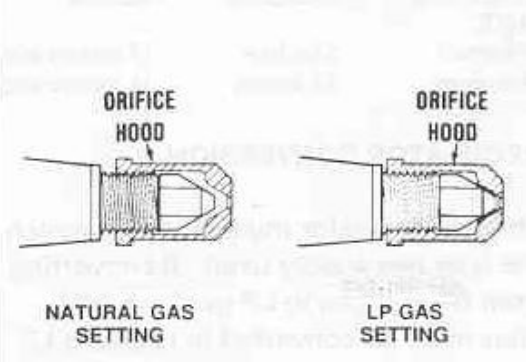
Two gases, natural gas and air, must combine to form a clean burning flame. Unless someone has been playing with the adjustments, they are usually very close to the correct setting.

If the gas orifice is set too tight, the gas flame will be too small for the burner and provide insufficient heat. If it is too high the gas will lift away from the burner surface and pop on and off. It will not burn smoothly. In between these two extremes is the proper setting.

It is even possible to intentionally set one burner a little hotter than another on a cooktop. Some cooks like to have a lower burner (even at full blast) for soups or simmering.

The orifice adjustment on some burners allows for wide gas control. Some brands use this adjustment to regulate the flow rate between natural and propane gas. When operating on propane the orifice is tightened to greatly restrict the flow.

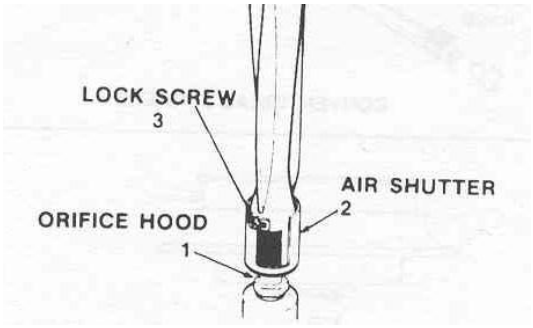
Adjusting an orifice between Natural and Propane (only on some brands and models) (Fig 11-10)



Gas and Air Adjustments

While setting the gas flow, leave the air shutter (# 2 in diagram) adjustment in the middle. The air shutter is much less critical than the gas orifice. It allows air to mix with the gas as it flows down the flame tube to the burner. The air control only causes problems if it is set too close to the off position. Set to close, the gas will not have enough air to burn cleanly. Instead, it will burn with a yellow billowing flame.

Air Damper and Burner Tube (Fig 11-11)



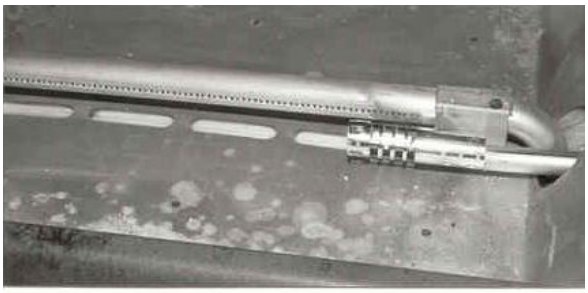
A yellow flame, like that off a candle, will quickly generate carbon and everything will turn black. With the air adjustment set wide open, the flame may get noisy, tend to lift from the burner and flutter around. Setting the damper in the middle usually works just fine.

Air and gas adjustments are the same on ovens, cooktops, gas dryers, gas water heaters and even gas furnaces. When the flame is adjusted correctly it will burn evenly, cleanly, and quietly. Adjusting a gas burner flame is not hard, but it requires a little practice.

Burners and Burner Tubes

Between the pilot light and the burner is a “burner tube”. Air and gas mix inside the burner tube prior to entering the burner itself. On ovens and cooktops the burner is a separate piece designed to evenly distribute the heat. Oven burners are long and narrow and conform to the dimensions of the oven. Cooktop burners are round and fit cookware.

Oven Burner and Tube along with Cooktop Burner and Tube (Fig 11-12)



Pilot systems

Before the 70's all gas appliances used a standing pilot to lit the gas. During the 70's various electric pilot systems were introduced to eliminate standing pilots. Generally, automatic ignition systems create a great many more service calls than the old standard pilot lights. Today, because of their reliability, only commercial appliances use standing pilots. All domestic gas equipment use electric ignition.

Uncle Harry's
Story Time

I remember back in the 70's, when the electric ignition systems first came out. They were designed to save money by saving gas. All the service men laughed. We knew better. Eliminating the pilot would save perhaps $10-15.00 per year. Maintaining the ignition system would cost considerably more. How right we were. Repairing various igniter systems is a real moneymaker, read on.

Because they are so small, pilot lights do create some problems. The slightest draft or smallest amount of dirt can disturb the flame and it will go out. The size of the pilot light is controlled by a tiny petcock mounted where the aluminum pilot supply line leaves the main gas manifold.

Pilot lights should be adjusted so that there is a tiny yellow tip on top of the blue flame. A pilot light that is adjusted too small will blow out easily and a pilot that is adjusted too large and yellow will create carbon buildup. A large pilot will also generate too much heat on the surface of the cooktop or in the oven.

Uncle Harry's
Trick of the Trade # 172

Carbon and ash buildup around the pilot light flame and housing are a common reason for poor ignition. Also, the pilot frequently blows out.

Simply tapping a pilot assembly with a screwdriver will often be sufficient to clean it. The accumulated ash just falls away as dust.

Flash Tubes

Between a pilot light and each burner is a flash tube. It act much like a fuse. Several holes are drilled in the side of the main burner that allow gas to leak toward the pilot light. When the gas control is turned on, gas flows out of the main burner and also flows out of the small pilot light holes into the flash tube.

At the far end of the tube is a burning pilot light. When the gas reaches the pilot it ignites. The burning gas then "flashes back" through the tube and lights the main burner.

Uncle Harry's

Trick of the Trade # 173

A diligent housewife can easily plug up the small orifices in the side of the burner with soap. Partially or full clogged burner holes will cause poor or intermittent ignition. They can be cleaned with any soft sharp object, such as a broom straw.

Another solution is to advise the homeowner to soak or boil the clogged burner in water. They must be thoroughly dry before they are reinstalled and used.

A crooked or damaged flash tube will also cause intermittent ignition. Flash tubes can also get out of position during cleaning and cause problems.

Gas Cocks

On a cooktop, a simple, very reliable valve controls the gas to each burner. All gas valves rotate through 90 degrees. At one extreme the gas is full off, at the other it is on. In between settings allow partial gas flow.

A gas valve has no gaskets, it relies on two carefully machined tapers sliding together. A small amount of grease between the tapers completes the seal.

On rare occasion, a customer may drop a heavy pan and break off a valve stem. Replacing a gas cock is extremely rare.

Uncle Harry's

Story Time

A woman operated a day care center out of her house, for 6 to 8 small children. One day she noticed a gas odor in the kitchen and traced it to one of the burners on the cooktop. With the burner shut off, she could still smell gas leaking around the gas cock.

She called local utility, the Baltimore Gas & Electric Co. BG & E showed up promptly. It happened to be when all the parents were picking up their children.

The technician came in with his sniff tester, checked the cooktop, and cut off the valve to the top. He said that a gas cock was leaking. He then installed a red tag. It said, "Do not use, dangerous, hazardous, and a qualified person must come repair this unit."

He then proceeded, past the parents, to the basement and tagged off the hot water heater and the furnace. Apparently they had a minor problem in the vent system.

You can imagine the anger pent up in the homeowner. Casually a technician goes about the house, hanging bright red tags on 3 different appliances as if the house is ready to blow up. Of course all the parents are watching carefully.

She asked the technician if he could fix the furnace and the water heater and the cooktop instead of just shutting them down.

He replied, "No, I am only involved in safety issues. You need to have another service technicians to come out and diagnose the problem. That technician will, in turn, order the parts. A third technician will come out later and install the necessary repair parts."

He estimated that the fees to fix the cooktop alone would be $150-200.00. She immediately got on the telephone and after considerable effort found a service company that was willing to repair the gas leak in the cooktop. The repair company told her that they knew exactly the part that was needed. They would go ahead and order a gas cock and call her in a few days when the part came in. Then they would come out and install it. The cost was estimated at $120-150.00.

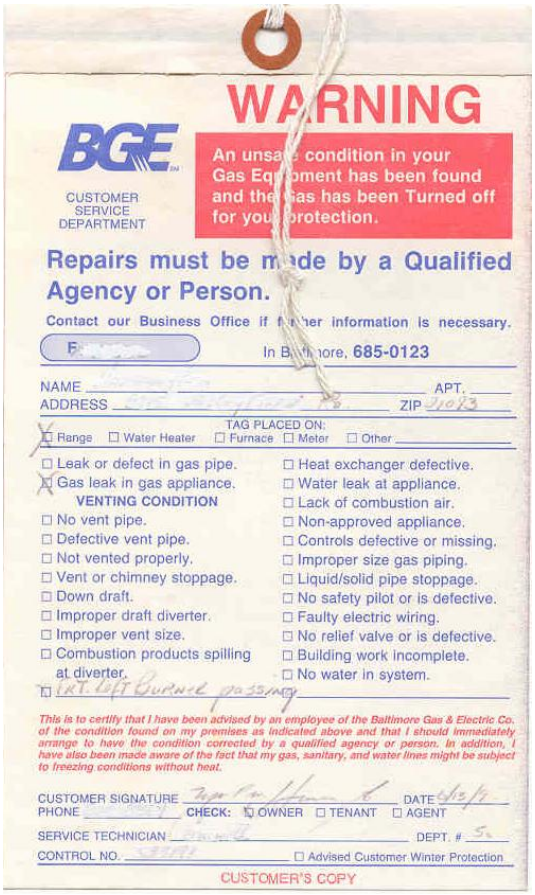
More than 10 days went by without any word from the service company. Of course, cooking was difficult without a cooktop. Getting impatient, she called again only to find they had no record of her order.

*Beside herself with frustration, she got on the phone again. Her plumber recommended me. After hearing her story, I explained to her that in **25 years** of service calls, I had only **once** had to replace a gas cock on a cooktop. I was sure that it needed nothing but a cleaning and regreasing. The only thing that keeps the gas from leaking other than precision machining is heavy-duty grease.*

The next day I went out to her house, cleaned the gas cock, regreased it, put it together. It worked just fine. I tore off the red BGE tag. (see attached)

I was in the house about 1/2 hr. and charged her $75 for the repair. The other two companies looked pretty ridiculous and I established a tight relationship with a new household.

Sample Turn-off Tag (Fig 11-13)



WARNING

BGE

CUSTOMER SERVICE DEPARTMENT

An unsafe condition in your Gas Equipment has been found and the Gas has been Turned off for your protection.

Repairs must be made by a Qualified Agency or Person.

Contact our Business Office if further information is necessary.

In Baltimore, 685-0123

NAME _____ APT. ____

ADDRESS _____ ZIP 21073

TAG PLACED ON:
☒ Range ☐ Water Heater ☐ Furnace ☐ Meter ☐ Other _____

☐ Leak or defect in gas pipe.
☒ Gas leak in gas appliance.

VENTING CONDITION
☐ No vent pipe.
☐ Defective vent pipe.
☐ Not vented properly.
☐ Vent or chimney stoppage.
☐ Down draft.
☐ Improper draft diverter.
☐ Improper vent size.
☐ Combustion products spilling at diverter.

☐ Heat exchanger defective.
☐ Water leak at appliance.
☐ Lack of combustion air.
☐ Non-approved appliance.
☐ Controls defective or missing.
☐ Improper size gas piping.
☐ Liquid/solid pipe stoppage.
☐ No safety pilot or is defective.
☐ Faulty electric wiring.
☐ No relief valve or is defective.
☐ Building work incomplete.
☐ No water in system.

☐ LRT. left burner passing

This is to certify that I have been advised by an employee of the Baltimore Gas & Electric Co. of the condition found on my premises as indicated above and that I should immediately arrange to have the condition corrected by a qualified agency or person. In addition, I have also been made aware of the fact that my gas, sanitary, and water lines might be subject to freezing conditions without heat.

CUSTOMER SIGNATURE _____ DATE 4/13/99
PHONE _____ CHECK: ☒ OWNER ☐ TENANT ☐ AGENT

SERVICE TECHNICIAN _____ DEPT. # 5

CONTROL NO. _____ ☐ Advised Customer Winter Protection

CUSTOMER'S COPY

Gas Cook tops

Gas cooktops are relatively simple and generate few service calls. The components that make up a cooktop are:

1. A regulator.

2. Piping and a manifold to distribute the gas.

3. Four gas cocks.

4. Four flash tubes.

5. Four burners, burner tubes, orifices and air shutters.

6. One, two or even four pilot lights.

Service calls are usually a result of dirt build up or damage. Actual parts' failures are rare.

Gas Cooktops with Electric Ignition

Today few cooktops have pilot lights, most have electric ignition. The gas is ignited by a spark generated in a spark module. The spark module is the modern version of the spark coil used on old cars. The module is operated by 110 VAC and controlled by small switches mounted on the shaft of the gas cocks.

To light the burner, the gas cock must be set in the “light position” as designated on the dial. The light position allows gas to pass through the valve to the burner and it also closes the switch to the spark module.

The module generates a small arc instead of a constant pilot light. As long as the gas cock is left in the light position, the spark module generates an arc every few seconds. The sparking makes an audible ticking sound.

Typically all four-burner switches are wired in parallel. There is only one circuit to the spark module. It may create arcs in one, two or maybe even four places simultaneously. Turning any one-burner valve to the "light" position will cause arcing at all of the burner pilot locations. Of course, only the one, with gas flowing, will light.

Automatic ignition system failures

High voltage arcing systems fail four different ways:

1. Dirt will get between the sparking rod and the surrounding metal. The dirt will short out the spark by grounding it. Careful cleaning will correct the problem.

2. The rotary control switches mounted on the shaft of the gas burner valves fail. If they get wet or dirty, they short and make a permanent connection to the module. It then arcs continuously. The switches also fail to complete the circuit to the module. If three burners work and one doesn't. A new switch is necessary.

3. The module will fail and not generate high voltage when 110 VAC is applied to the input terminals. A new module is needed.

4. The wiring between the module and the arcing points fails and grounds out the spark before it gets to the flash tube. (This is identical to an old car on a wet morning. Moisture can get into the ignition wiring and ground out the spark to the spark plugs.)

Rotary Switches (Fig 11-14)

Identifying Ignition Switches
(Fig 11-15)

HARPCO SPARK IGNITION SWITCHES

1899 TOP BURNER SWITCH IDENTIFICATION CHART

NOTES:
1. Normally closed swtiches were used with the 6530 Series modules. All other switches are normally open.
2. In a few applications where the manifold is very close to the range front panel, the rivet head is covered with tape to prevent current leakage.
3. The degree of rotation at which the switch makes contact is very difficult to determine but is furnished for reference.

Part Number	Make & Break	Stem Flat Position	Terminal Location		Cam Color	Comments
			Side	Back		
1899G0001	163°	6	2	—	Natural	
1899G0002	30°	6	2	—	Gray	Normally closed
1899G0003	82°	6	2	—	Dark blue	
1899G0005	163°	6	1	1	Natural	
1899G0006	30°	6	—	2	Gray	Normally closed
1899G0009	98°	6	2	—	Dark green	
1899G0012	98°	6	1	1	Dark green	
1899G0013	53°/83°	12	1	1	Orange	
1899G0014	75°/105°	6	2	—	Yellow	
1899G0016	163°	12	2	—	Light green	
1899G0021	25°/270°	6	2	—	Light blue	
1899G0022	82°	12	2	—	Light red	
1899G0023	150°	12	2	—	Dark red	
1899G0025	150°	6	2	—	Black	
1899G0031	53°/83°	9	1	1	Gray	
1899G0035	150°	12	—	2	Dark red	

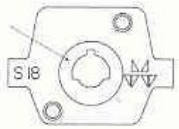
Identification

Step 1. **Determine location of terminals:** at the side(s) of the switch or at the back at a right angle to switch body.

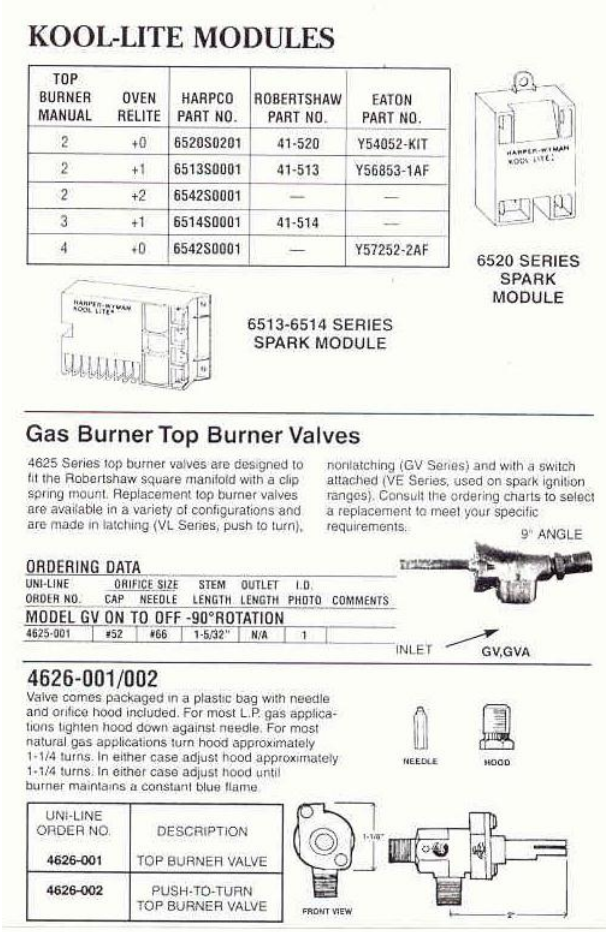
Step 2. **Determine stem flat position of value or switch.**

Step 3. **Check color of switch cam.**

Step 4. **Determine whether switch is used in a normally open** (6513 Series) **or normally closed** (6530 Series) **spark ignition system.**



Spark Modules and Top Burner Valves (Fig 11-16)



KOOL-LITE MODULES

TOP BURNER MANUAL	OVEN RELITE	HARPCO PART NO.	ROBERTSHAW PART NO.	EATON PART NO.
2	+0	6520S0201	41-520	Y54052-KIT
2	+1	6513S0001	41-513	Y56853-1AF
2	+2	6542S0001	—	—
3	+1	6514S0001	41-514	—
4	+0	6542S0001	—	Y57252-2AF

6520 SERIES SPARK MODULE

6513-6514 SERIES SPARK MODULE

Gas Burner Top Burner Valves

4625 Series top burner valves are designed to fit the Robertshaw square manifold with a clip spring mount. Replacement top burner valves are available in a variety of configurations and are made in latching (VL Series, push to turn), nonlatching (GV Series) and with a switch attached (VE Series, used on spark ignition ranges). Consult the ordering charts to select a replacement to meet your specific requirements.

9° ANGLE

ORDERING DATA

UNI-LINE ORDER NO.	ORIFICE SIZE CAP	ORIFICE SIZE NEEDLE	STEM LENGTH	OUTLET LENGTH	I.D. PHOTO	COMMENTS
MODEL GV ON TO OFF -90°ROTATION						
4625-001	#52	#66	1-5/32"	N/A	1	

INLET GV,GVA

4626-001/002

Valve comes packaged in a plastic bag with needle and orifice hood included. For most L.P. gas applications tighten hood down against needle. For most natural gas applications turn hood approximately 1-1/4 turns. In either case adjust hood approximately 1-1/4 turns. In either case adjust hood until burner maintains a constant blue flame.

NEEDLE HOOD

UNI-LINE ORDER NO.	DESCRIPTION
4626-001	TOP BURNER VALVE
4626-002	PUSH-TO-TURN TOP BURNER VALVE

FRONT VIEW

Uncle Harry's

Trick of the Trade # 173

Customers often use spray cleaners like Fantastic to clean a cooktop. The spray can get into the switches and short out. The cooktop will begin to arc and tick continuously.

Advise the customer to unplug the cooktop, and let it sit overnight to dry out. Usually, the cleaner will evaporate and everything will be fine the next day. If not a new switch is needed.

Uncle Harry's

Trick of the Trade # 174

Electric cooktop igniters create more service calls then any other gas cooktop component.

Uncle Harry's

Story Time

I ran a service call one time for a landlord in a fairly crummy section of town. The complaint was the cooktop wouldn't ignite. On arrival I tried one of the top burner valves and sure enough I could hear it ticking. The module was arcing, but the gas wasn't lighting.

I looked further and found that the arcing was not taking place at the flash tube. The insulation on the high voltage wiring had been chewed off by rats in about four different places. The arcing was between the bare wires and the metal frame. I chopped out the bad wiring and installed a fresh piece.

Later the landlord told me that the house had been completely renovated less than nine months before. It was a wreck when I was there. It's amazing how fast a bad tenant can destroy a piece of property.

Gas Ovens

Ovens are considerably more complicated than cooktops. They include many of the same components, but in addition to an gas system, the oven must provide temperature control and a chamber is needed to contain the heat.

Gas Oven Thermostats

Although oven thermostats are made in many ways, they do have a lot in common.

First the thermostat is always mounted on the main gas manifold of the oven. On ranges, it is mounted among the burner gas cocks.

Second they all have a probe into the oven, thereby monitoring the air temperature. This is called a capillary tube (sound familiar?). The capillary tube weaves its way from the thermostat through the oven lining and into the oven cavity. It is enlarged at the end and hangs on the wall of the oven on "capillary clips."

Inside the capillary tube is a gas (not natural gas) that expands with temperature. The expanding gas moves a sensitive diaphragm inside the thermostat. This motion is used to open and close off the flow of gas. Moving the oven control dial changes the amount of movement needed and thereby the temperature setting.

If a capillary tube breaks off, the thermostat will not shut off the gas and the oven will get very hot.

Replacing an oven thermostat involves threading the capillary tube through the oven wall. In many cases, this can be very time consuming. It usually requires pulling out the oven and removing panels

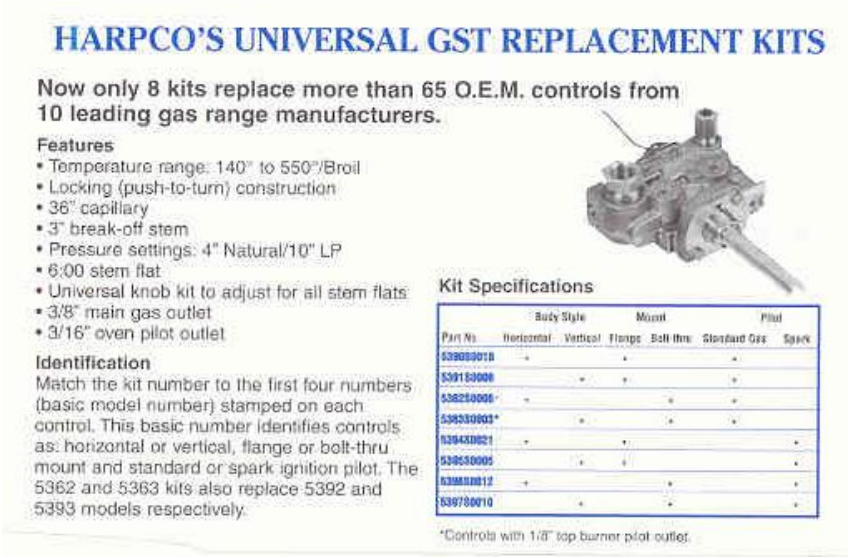
Replacing the Oven Thermostat

Gas oven thermostats are one of the most reliable units in all appliances. It's not unusual to find a thermostat that's over 30 years old that still works fine. Robertshaw makes kits with various adapters and fittings to fit many of the older style oven thermostats. If an oven thermostat goes bad, the oven will no longer control the temperature setting. It will both drift off the set point or go sky-high and not control at all. Care must be exercised in replacing a thermostat to insure that there are no leaks and that the fittings match up perfectly when doing a replacement.

Oven Thermostats (Fig 11-17)

Gas compression fittings are very fine thread and very easy to cross thread during installation. Replacing any gas component requires shutting the gas off to the entire oven.

In older houses, the oven may not have its own cutoff valve. You may be forced to cut off the gas to the entire house and re-light the pilots to the water, the dryer, and the furnace, in addition to the pilots in the oven. Oven thermostats are expensive. Consequently, the replacement cost of an oven thermostat with labor approaches $300.00 in many cases.



Types of Thermostats and Safety Systems

Many types of systems have been used to control oven temperature. Going from the oldest to the newest, they are:

1. Standing pilots and BJ and BJC valves

2. Standing pilots and MSC valves.

3. Standing pilots and flame safety switches.

4. Glow bar electric igniters and electric gas valves.

1. Standing pilots, BJ and BJC valves

BJ Valves

The oldest oven designs, like the one on the Chambers in the photograph, did not have a standing pilot. Each time it was used, the cook needed to light the oven with a match. A hole in the oven bottom was labeled "LITE HERE". Once the oven was lit, a pilot light remained on until the main valve was shut off.

A BJ Valve (Fig 11-18)

Uncle Harry's
Story Time

A young family moved into an old home in Baltimore. The husband called to complain that the oven pilot would not stay on. I went to the house and found an old oven the Chambers mentioned before) with a BJ type valve. I explained that the pilot only remained on when the oven was in use. It needed to be lit each time it was used. It was working exactly as it was designed.

A few weeks later, he called me for advice on a new oven. I asked him why he was replacing a perfectly good oven. His wife had turned on the oven and then retrieved the matches in the next room. When she lit it a minute later, the accumulated gas exploded and scared her half to death. While she had been retrieving the matches the gas had been building up in the oven. Luckily, she was only scared and not hurt. After that, she didn't like the oven and wanted a new one.

BJC Valves

One design improvement over the BJ included a standing pilot. The pilot heated a thermocouple element exactly like the ones studied under dryers. A BJC valve has a hold down button exactly like the old dryers and today waterheaters. The pilot is lit while the button is held down and the thermocouple gets hot. On the BJC valve, the pilot safety magnet and the temperature control bellows were built into the same housing.

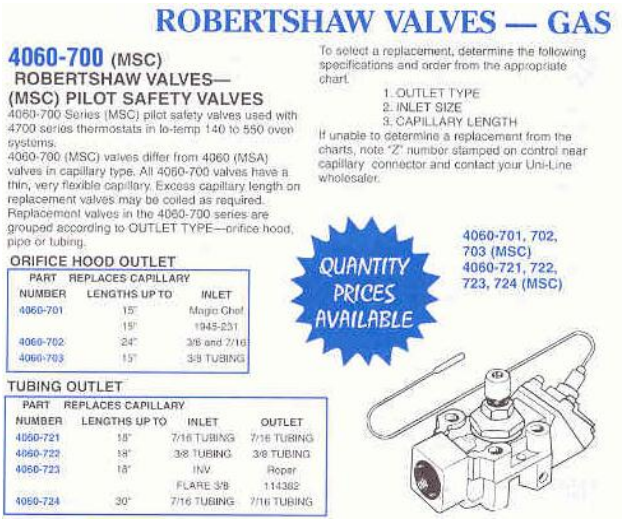
Very few of these ovens are still operating. But it is interesting to understand the evolution of present designs.

2. Standing Pilots and MSC Valves

The design following the BJC type separated the pilot safety from the temperature control. The main gas control remains mounted on the manifold. The MSC pilot safety system is placed next to the pilot itself. The MSC system was, and still is, a popular design.

The MSC is a secondary valve placed the gas line to the burner. By using a second valve independent of the first, a greater level of safety is achieved. Both valves must fail simultaneously for gas to freely flow and cause a hazard.

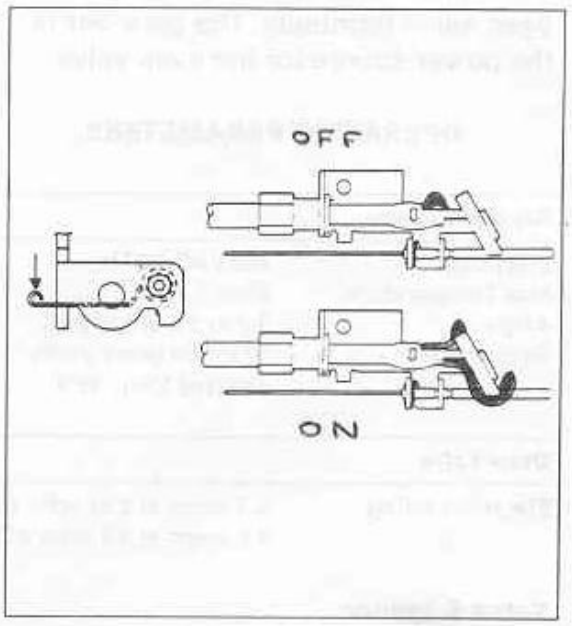
A MSC Valve (Fig 11-19)



Understanding an MSC Valve

The MSC is operated by a pilot capillary tube that senses the heat of the pilot light. The valve is only open when the pilot gets it very hot.

An MSC Pilot Assembly (Fig 11-20)



OVEN SYSTEM OPERATION

In the "off" position gas is always supplied to the constant pilot. When the thermostat knob is turned on to any temperature setting from 140° to 550°, gas glow to the pilot is increased. The heater pilot portion of the pilot flame heats the flame responsive element of the safety valve. When it has been heated for 30 to 60 seconds, the safety valve will open and allow gas to glow to the oven burner, where it will be lighted by the pilot.

When the set temperature is reached, the thermostat reduces the flow of gas to the pilot, the flame responsive element cools, and the safety valve closes shutting off the gas to the oven burner. As the oven temperature cools, the thermostat will increase the flow of gas to the pilot - warming the element, opening the safety valve and re-lighting the oven burner. This cycle will continue until the oven control knob is turned off.

The MSC pilot is more complicated then the old standing pilot design. The pilot has two settings, the small standby pilot and a much larger control flame that heats the MSC capillary tube. The larger flame is controlled by the main control valve.

Understanding the MSC Two-stage Capillary Safety System

Sequence of Operation

A small pilot is on constantly.

Step 1. The thermostat is turned on sending gas down the main supply line to the main burner. It also sends gas down a second pilot line increasing the size of the pilot light.

Step 2. The larger secondary pilot expands to the capillary safety valve probe and heats it up.

Step 3. After 30-40 sec., the safety valve opens and allows gas to go through the main burner orifice.

Step 4. The large pilot lights off the main flame.

Step 5. Up inside the oven, near where the food will be placed, a second capillary is connected to the main thermostat.

Step 6. Once the air temperature reaches the set point, 350°F for instance, the main thermostat cuts off the gas to the secondary pilot

Step 7. After about 20 seconds, the MSC valve shuts down the main gas to the burner.

When the air temperature drops back down, the secondary pilot comes back on and the whole process starts all over again.

Component by Component

The most frequent problem with the two-stage ignition standby system is caused by dirt on the pilot assembly. Anything that interferes with the heating of the capillary tip prevents the opening of the MSC valve.

The capillary is fragile and sometimes it gets knocked aside or bent. Most often it just gets dirty from ashes and needs to be tapped several times with a small tool. Robertshaw manufactures all the MSC valves for all oven manufacturers.

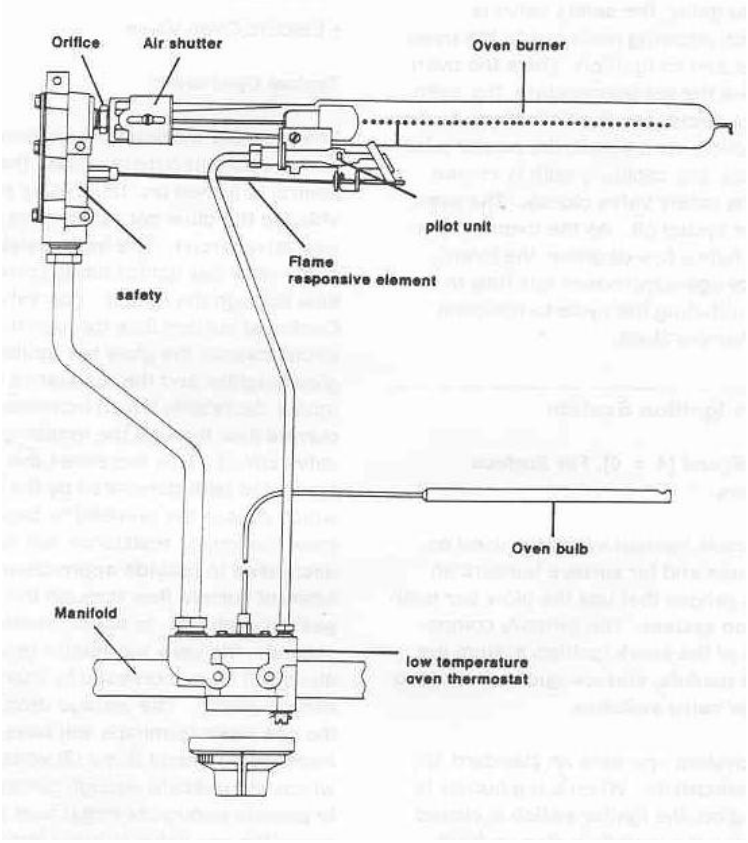
Uncle Harry's

Trick of the Trade # 175

To test a questionable MSC valve, hit the secondary pilot with a propane torch and get the capillary red hot. If the valve still fails to open, it is bad. If you find it necessary to take apart a pilot assembly in order to clean it, never use anything other than a soft cloth or air to clean the pilot orifice.

Many small apartment-sized ovens are still made with a standing pilot operating a MSC safety valve. Larger more expensive ovens are usually electric ignition.

The Complete MSC System | **(Fig 11-21)**



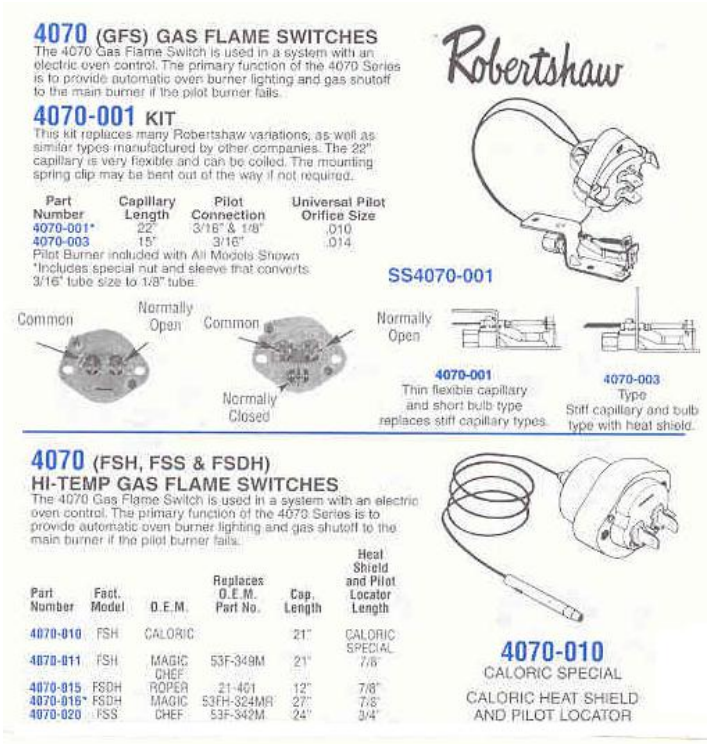
3. Standing Pilots and Flame Safety Switches

A flame safety switch is similar to an MSC valve. It too senses the heat from the pilot light. However, the flame safety does not directly open the gas valve. Instead, it closes an electrical contact.

Flame safety Switches (Fig 11-22)

Flame safeties are used with electrically operated gas valves. They are wired in series with the valve circuit. If the flame safety is not closed the main valve will not get any power. (Electric valves are studied in the next section.)

Flame safety switches are diagnosed exactly like MSC pilot assemblies. The electric valves are diagnosed like the valves found under glow bar igniters.



4. Glow Bar Gas Ignition Systems

During the 1980's, most manufacturers began using pilotless ignition systems in their range ovens and wall ovens. A few ranges' ovens use the spark system similar to that used on most cooktops.

However, by far the most popular system is the glow bar ceramic igniter. The glow bar system is a blend of gas and electric technology. It includes both a gas control and electric ignition.

The ceramic igniter is similar to that used in gas dryers. The glow bar is placed adjacent to the main burner right in the flow of the gas.

The glow bar is wired in series with the main gas valve. The power to the glow bar and the gas valve is controlled by the oven thermostat.

Ceramic Glow Bar (Fig 11-23)

The Sequence of Operation

Step 1. The oven thermostat is rotated and set at 350°F. 110 VAC is applied to the ceramic igniter circuit. The series circuit to the igniter also flows through a bi-metal heating strip within the gas valve.

Step 2. The igniter gradually heats up to an almost white-hot temperature. The current draw to the glow bar of approximately 3 amp slowly bends the bi-metal within the gas valve and opens the valve.

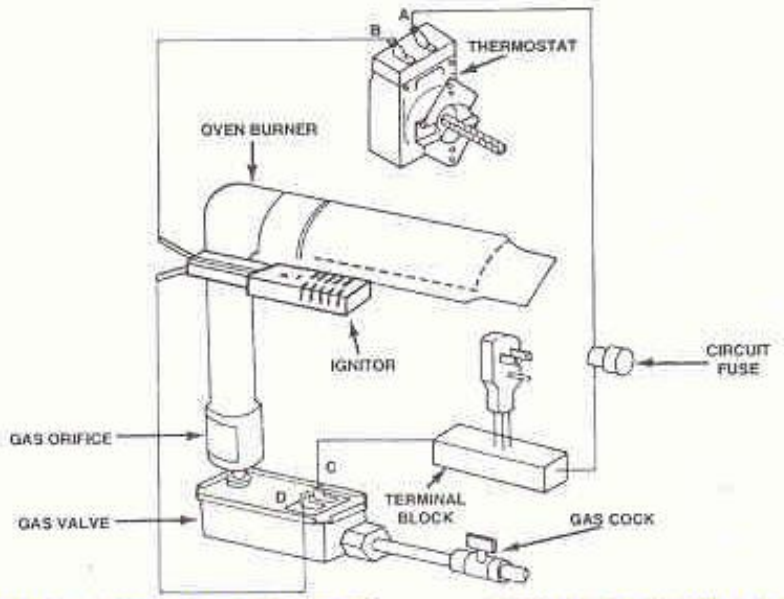
Step 3. The gas flows into the main burner and is ignited by the white-hot ceramic igniter.

When the oven reaches its preset temperature, the capillary probe within the oven chamber sends a pressure signal to the thermostat and turns off the 110 VAC to the igniter. The current drops off and the bi-metal strip cools down. After about 10-15 seconds, it shuts the gas off.

More Detailed Description of Igniter Failures (Fig. 11-24 **)**

HOT SURFACE IGNITORS

TROUBLESHOOTING FOR GAS RANGE HOT SURFACE IGNITORS



IGNITOR GLOWS BUT NO IGNITION

1. Check amp draw at valve.
   A. Using wrap around amp meter test one leg for amp draw at point "D" or "C."
      1. Norton (flat) ignitor should show 3.2–3.6 amps.
      2. Carborundum (round) ignitor should show 2.5–3.0 amps.
      3. If respective amp draw is not present change ignitor.
   B. If correct amp draw is present change gas valve.

NOTE: Norton (flat) ignitor with powder blue ceramic body has carborundum amp value - 2.5–30° amps.

IGNITOR DOESN'T GLOW

1. Check power supply to oven.
   A. Check internal fuses.
2. If power source is working
   A. **Disconnect power to oven** and remove wires at "B" and "C." Check for continuity between wire "B" and terminal "C." If continuity is present see step 3.
   B. If continuity is not present remove wire at "D" and probe terminals "D" and "C" for continuity. If not replace gas valve.
   C. If continuity is present at "D" and "C" probe wire "B" and wire "D." If continuity is not present replace ignitor.
3. If continuity was present in step "A" check oven thermostat.
   A. Make sure oven is not heated and turn oven dial to 350°. Probe terminals at "A" and "B." If continuity is not present replace oven thermostat.

Component by Component

The Ceramic Igniter

The igniter is the weak spot in the system just described. When the igniter ages, it does not get quite as bright as when it's new. An old igniter draws slightly less current.

When the current drops, even 10-15% below the designed value, the bi-metal does not bend enough to open the valve.

Ceramic Oven Igniters (Fig 11-25)

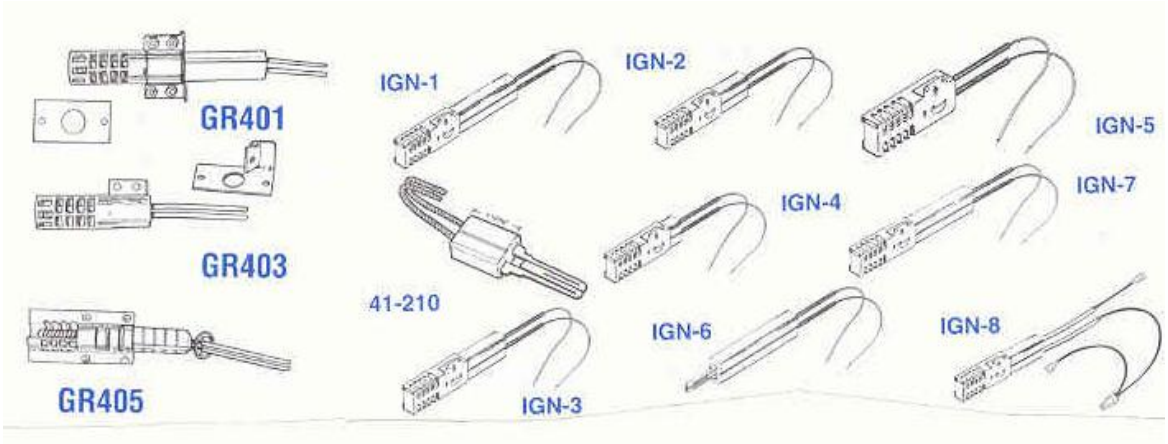
The common complaints are:

"The light comes on in my oven, but the gas won't ignite", or

"The oven won't come on, but I smell gas.", or

"My oven takes forever to light."

A weak igniter eventually opens the gas valve, but if it takes too long, proper temperatures will not be maintained. Igniters come in a great variety of shapes and sizes. Four or five universal igniters will fit 90% of all ranges. Once in a while, the igniter will crack and fail to glow at all. It can be easily checked with an ohmmeter.



The Electric Gas Valve

The gas valve is highly dependable and rarely fails.

Uncle Harry's
Trick of the Trade # 176

Never apply 110 VAC across it to see if it will open. You will destroy the valve, it operates on about **10** VAC. It can be properly tested with an ohmmeter.

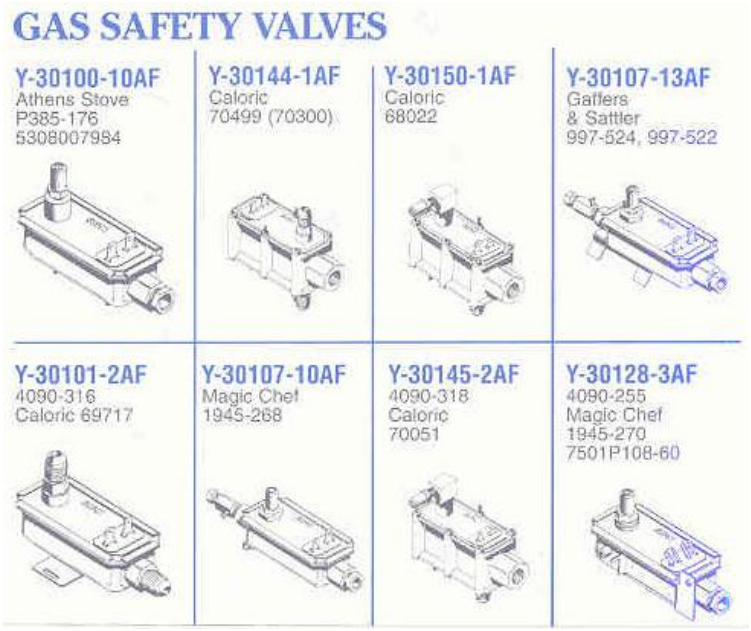
Let Handy Andy, the homeowner blow out his own valve, not you.

On rare occasion, the bi-metal heater will open circuit and the valve will need to be replaced. Usually it is the result of someone fooling around and damaging it.

Uncle Harry's
Trick of the Trade # 177

If an igniter glows, and the valve won't open, always replace the igniter. The igniter is dim with age. Trust your *Uncle Harry.*

A Typical Electric Gas Valves (Fig 11-26)



Oven Thermostats used on Ceramic Igniters

The oven thermostat diagnosis and replacement for the ceramic igniter type are exactly the same as that for the standing pilot design. The operating logic is the same.

In more than nine out of ten cases, replacing the igniter will solve an ignition problem on a gas oven. It is a very quick, profitable repair job.

Oven Door Hinges

You may be surprised to learn that door hinges on ovens wear out and require replacement. Sometimes the tensioning springs snap and the door gets heavy.

More often, the door hinges and hinge pins rust and wear out. On some of the better-designed ovens, the door and the hinges may be replaced without pulling out the oven or the range.

Hinge replacement needs to be priced out as a two-trip job. It can be a time consuming job and will always exceed $150.00.

Various Hinge Set-ups (Fig 11-27)

Damaged Hinges (Fig 11-28)

Oven Door Glass

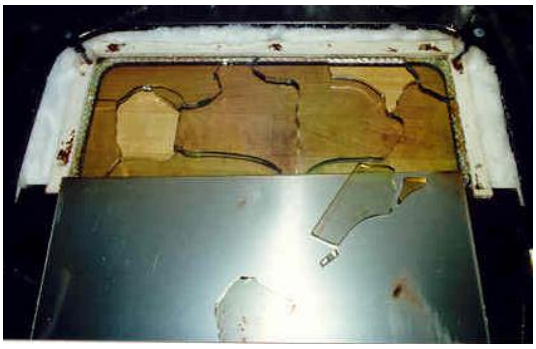
Many oven doors include a glass panel. The panel is made up of three pieces:

1. An inner glass.

2. An outer glass.

3. A frame to hold a pocket of insulating air.

Changing a Door Glass (Fig. 11-29)

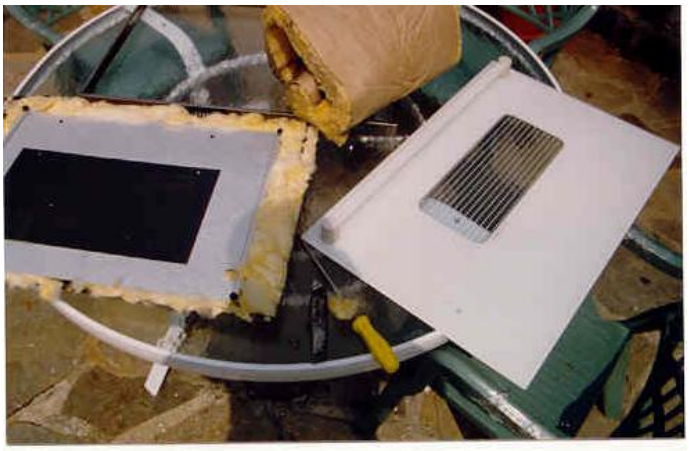


In all doors, the inner glass is tempered high temperature glass. It must be to withstand the oven heat. Some manufacturers supply the glass window as one unit. Others supply pieces for rebuilding the window.

Some oven doors are made up of numerous pieces and can be complicated to rebuild. This is particularly true on self-cleaning models.

In all cases, the glass must be ordered from the manufacturer.

Reinsulating and Replacing a Door Glass (Fig 11-30)



Electric Cooking Appliances

Most modern houses include all-electric kitchens. For close to 20 years, the trend has been away from gas cooking and toward electric. This is in spite of the fact that most serious cooks aware that gas cooking is superior to electric. (today there are few serious cooks.)

Electricity can do an adequate job of heating an oven, but an electric cooktop is inherently slower than gas. Gas can be adjusted up and down very quickly and gas burners provide more total heat. But cooking is not a high priority today, and most housewives have learned to deal with electric cooking equipment. As servicemen, it doesn't matter as long as the calls continue to come in.

Electric Cooktops

The Principle of Operation

A 3-wire, 220 VAC line is connected electric cooking appliances. Cooktops are supplied by a double 30-40 amp breaker. All four burners are operated by 220 VAC. Each burner is controlled by a selector switch. Most selector switches are a push in and turn style.

When the selector is set on "High", 220 VAC is connected directly to the two burner terminals. When the selector is set on "Medium", the switch cycles the 220 VAC on and off to modulate the heat. Naturally, the power is on less at a lower heat setting.

Most burner switches include a bi-metal heater to cycle the internal contact point on and off. Burners come in 6" and 8" diameters. They are connected to the cooktop wiring in two different ways.

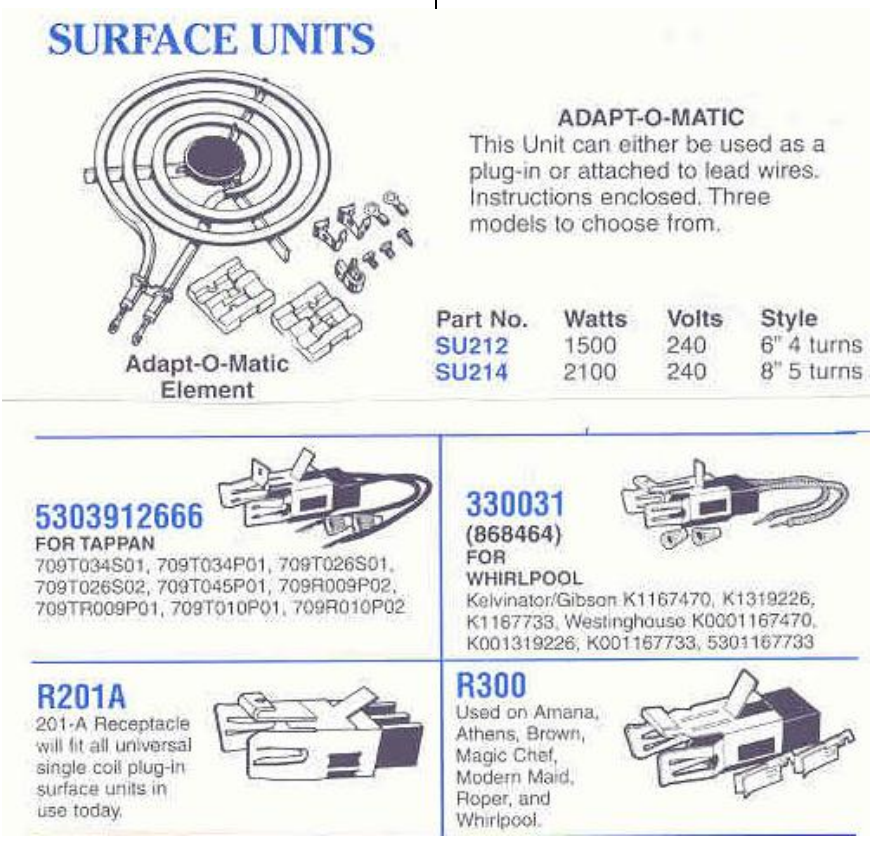
1. The older and less popular method is to connect wires permanently to the burners.

2. The more popular method is a quick-disconnect burner. The quick-disconnect allows the homeowner to easily remove the burners for cleaning.

A great number of 6 and 8" burners are interchangeable. It's only necessary to stock one of each to cover a multitude of brands.

GE is different from the rest. GE burners came in several different styles and must be purchased by model number in order to get the correct unit.

Burners and Sockets (Fig 11-31)



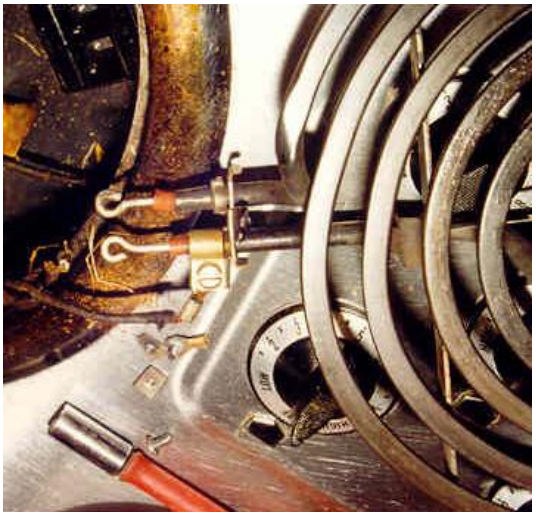
Component by Component

Burners and sockets

The quick-disconnect socket is the weakest part of an electric cooktop. The burner socket contains spring-loaded connections that grasp the prongs of the burner. The socket and prongs carry a heavy current whenever the burner is on. Heat is generated in the socket connection. Gradually the socket and the prongs deteriorate and poor heating results.

Typical Burners and Sockets

(Fig 11-32

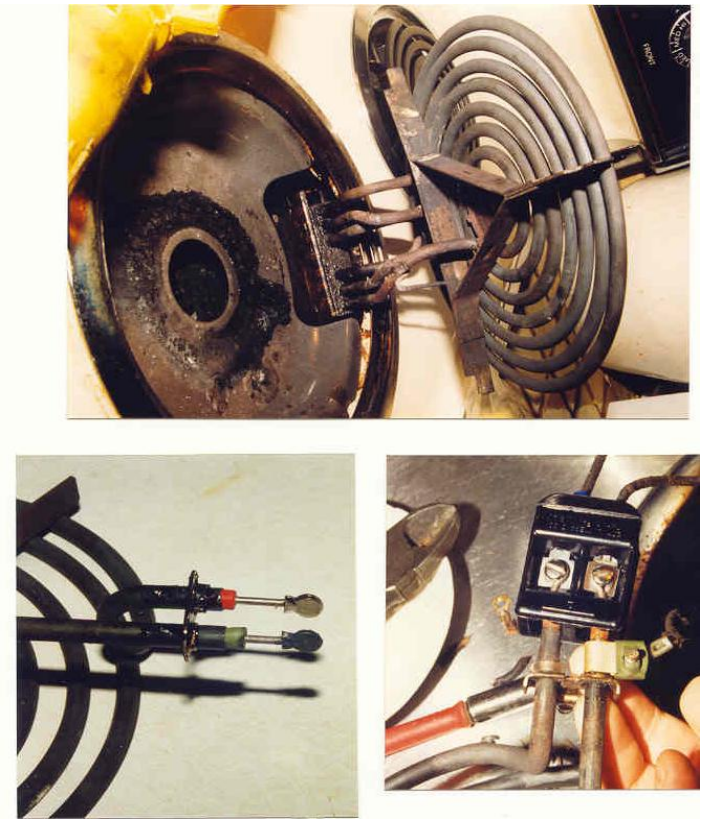


Uncle Harry's
Trick of the Trade # 178

In order to provide reliable heat, always replace the burner and socket as a set. The large front favored burner is almost always the one that fails first. The socket that fits Whirlpool cooktops (Part #33031) will fit many other brands.

Sometimes it's necessary to bend the mounting tab in order to position it. A failing quick-disconnect socket will cause intermittent heating. If it's jiggled in the socket, the burner may heat up for a while.

GE Special Burner and Other Typical Burners (Fig 11-33)



Burner Switches

Burner switches fail five different ways

1. The connections burn off inside the switch and break the circuit to the burner.

2. More often the wires burn off at the burner connection points.

In either of these cases, the burner will not heat.

3. The burner's internal circuitry will fail and it will no longer control the temperature. Instead, it will only heat on high. Either the bi-metal inside the switch has failed or the contacts have melted together, eliminating the cycling feature.

4. Control of the indicator light is a separate contact within the burner switch. Occasionally this contact fails and will not light the indicator when the burner is on.

5. Even more bothersome, sometimes the light stays on, even though the switch is in the "Off" position.

In all of these five cases, replace the control switch.

Uncle Harry's
Trick of the Trade # 178

Whenever a wire burns off a burner switch, **replace the wire end and the switch**. Putting a new spade end on the end of the wire is not sufficient.

The contact points inside the switch are failing and generating a hot connection point.

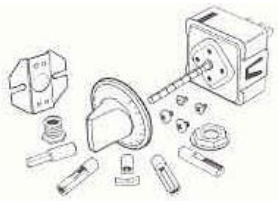
Replacing Burner Switches

Robertshaw makes a universal series of burner switches. Part No. 5500-200 will fit a great many cooktops. This small kit comes with numerous adapters to fit different shaft lengths and shaft cross sections.

The kit is very good except for one thing. The knobs don't always look perfect when you are finished. However, they are usually good enough and a second trip for the exact replacement switch is avoided.

Robert Shaw Kits
(Fig. 11-34)

5500
DOMESTIC UNI-KITS®
5500 Infinite Uni-Kits include adaptors for screw or palnut type mounting. Kits include dial adaptors to allow customer's dial to be used.

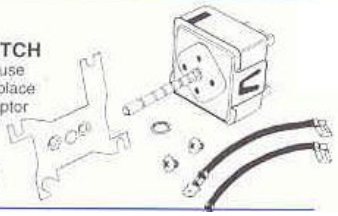


STANDARD UNI-KITS®

Part Number	Reference Number	Voltage	Dial Included
5500-102			NONE
5500-103	INF-120-599	120 VAC	BLACK
5500-104			WHITE
5500-113	INF-120-599B		BLACK
5500-202			NONE
5500-203	INF-240-597	240 VAC	BLACK
5500-204			WHITE
5500-208	INF-208-642	208 VAC	BLACK
5500-213	INF-240-597B	240 VAC	BLACK
5500-225	INF-240-777		NONE
PUSH-TO-TURN UNI-KITS®			
5500-105			NONE
5500-106	INF-120PX-820	120 VAC	WHITE
5500-107			BLACK
5500-200			NONE
5500-206	INF-240PX-803	240 VAC	WHITE
5500-207			BLACK

5500-237 or 6622S0011
WESTINGHOUSE REPLACEMENT SWITCH
This switch has the same dial shaft as a Westinghouse switch, grooved at all the standard lengths. It will replace virtually all Westinghouse infinite switches. This adaptor plate will replace Westinghouse "R," "S," "T" and "W" mounting types.

Will replace Q80583, Q80584, Q163521, Q163522, Q600491, Q600492.



Uncle Harry's
Trick of the Trade # 179

It's very important to copy the wiring exactly when installing a new burner switch. The new and old switches are marked L-1 and L-2 for the incoming line. The burner connections are marked H-1 and H-2. "P" is for the pilot light wire.

Interchanging the L-1 with L-2, or interchanging H-1 with H-2 will result in blowing out the new switch and other switches in the cooktop.

Also there is very little clearance inside many burner control boxes. Be very careful that no connections touch one another, or touch the metal cabinet.

Uncle Harry has been there and learned the hard way.

Ceramic Cooktops

The logic of the ceramic cooktop is exactly the same as the exposed coil cooktop. Homeowners like ceramic cooktops because they are appealing to the eye and very easy to clean. However, they are slower acting than exposed coil type.

Ceramic cooktops provide very few service calls. *Uncle Harry* never been able to figure out whether that is because there are very few in homes or if it's because the people that have them, don't ever cook.

Corning made the original ceramic cooktops and provided cookware with the top. The cookware was manufactured with a perfectly flat bottom. The flat bottom allowed maximum heat transfer from the ceramic top to the pot.

Today manufacturers don't provide cookware with their cooktops, but the flatness of the cookware is still critical to quick heating. An old bent-up frying pan will not work well on a ceramic cooktop.

In order to replace a burner switch or a burner on a ceramic cooktop, it must be removed from the countertop and disassembled. Such a repair can be time consuming.

Uncle Harry's
Story Time

A customer called me to replace a ceramic cooktop. Upon arrival, I found out that what she really meant was she wanted to replace the ceramic glass on her Corning cooktop. Somehow she had managed to find the glass on her own and had it there waiting for me.

Her husband had sized up the task and said, "No, thank you."

The old glass had broken into about a hundred shards. It took me over an hour to figure out how to get the thing apart, clean out the glass, and install the new sheet of glass. I had never replaced one on a Corning before and I was worried about breaking it.

While I was working, I asked the customer how the glass had been broken. She explained that her husband was replacing the fan switch in the hood above the cooktop. While doing so, he sat on the top and it shattered. No wonder he didn't want to repair it himself.

Luckily, he came through unscathed.

Electric Ovens

Gas and electric ovens are similar in many ways. The major difference, of course, is that the heat source is no longer natural or propane gas. Instead, it's an electric heating element. Again, there's no difference between an electric wall oven and an electric range oven.

All electric ovens have a bake element and a broil element. Like on the cooktops, the elements are operated by 220 VAC and get cherry red at full voltage.

There are three basic types of electric ovens:

1. Conventional

2. Continuous Cleaning

3. Self-cleaning.

1. Conventional ovens

On a conventional electric ovens, the cook turns the oven thermostat to a baking temperature (350°F) and sets the oven selector switch to bake. On most ovens, this turns on **both** the bake and broil elements during the **pre-heat** process. The broil element stays on until the oven temperature gets within 100°F of the pre-set point.

Using the broil element in addition to the bake element during the pre-heat shortens the pre-heat time. As the pre-set temperature is approached, the broil element is turned off and the oven depends on the bake element to maintain the setting.

The bake element is cycled on and off by the thermostat. A capillary probe, exactly like that on a gas oven, is connected to the electric oven thermostat.

The contacts within the thermostat must carry a high current for the bake and broil elements. The same current flows through the oven selector switch. Contacts that carry high current wear out much faster than those carrying small amounts. It is fairly common to find a bad thermostat on older electric ovens.

Hot Wire Relays

Some ovens are designed to minimize early failure in expensive thermostats. To lower the current carried by the thermostats, engineers have added another component, a hot wire relay.

Instead of carrying the full current, the thermostat controls the circuit (low current) to an intermediate relay. This relay opens and closes heavy duty contacts when needed. The heavy contacts in the hot wire relay, in turn, turn on and off the bake and broil elements. A hot wire relay costs about 20% of an oven thermostat and is easily replaced as a separate unit. Many hot wire relays and interchangeable.

A Universal Hot-Wire Relay
(Fig 11-35)

Other Hot Wire Relays
(Fig 11-36)

Oven Relay

Part No.	Replacement for O.E.M.	O.E.M. Relay No.
66006-3AF	Amana	27171-01
	Caloric	42040
	Magic Chef	1832303
	Modern Maid	74-03-081
	Roper	4325190
	Thermador	14-19-129
66006-2AF	Frigidaire	5300632171
66006-1AF	Caloric	91669
	Philco	3417-002-001

Component by Component

Bake and Broil Elements

A bake element is used a lot more frequently than a broil element. Subsequently, it fails a lot more often. Bake elements sometimes fail quietly and just cease heating. Usually, however, they go out in high style.

Running through the center of the bake and broil elements is a nichrome wire that is encased in an insulating material. The insulating material is, in turn, inside a metal jacket. Often the heating wire will short through the insulation to the metal jacket and form a brilliant welding rod. It will blow a visible hole through the metal jacket and sometimes continue burning several inches along the element, arcing and sparking as it goes.

Blown Out Bake Element
(Fig. 11-37)

Uncle Harry's
Trick of the Trade # 179

If the homeowner is fairly certain that an element has burned up, ask for a model number. Take a new element with you to the house and eliminate a second trip. Elements come in hundreds of shapes and sizes, making it impossible to stock them on a truck.

The connection on the back of an element is also a frequent source of service calls. The wiring and spade connectors burn off. Unless the connection to the element looks shiny and new, replace the element along with the wiring connectors.

Uncle Harry's
Trick of the Trade # 180

Use only high temperature loops and spade ends when connecting to bake and broil elements. High temperature ones are made of stainless steel instead of plated copper. It's usually possible to replace the bake and broil elements from inside the oven cavity. If the oven wires are broken off inside the wall, use a coat hanger with a hook bent on the end, to fish them out.

Visual inspection will frequently reveal a bad element. Otherwise test a suspect element for continuity.

Oven thermostats

Electric oven thermostats fail the same way that gas oven thermostats do -

1. They won't work at all and there is no heat.

2. The temperature goes sky high.

3. The temperature is off at least 50-100°F from the set point.

Calibrating oven thermostats

Customers often ask to have their oven thermostat calibrated. Many assume that this is a simple process. First, it is not a simple process, and, second, it usually does not work.

Uncle Harry's
Trick of the Trade # 181

Don't calibrate thermostats.

Pay attention to your *Uncle Harry* .

Uncle Harry's
Story Time

Not long ago I was called to a house to check out a very old wall oven. I tested the temperature and found the oven 100°F too low. It was too old to get parts and I explained to the customer that calibrating an old thermostat would not do any good. She asked me to please try anyway.

I spend about 20 min. with a remote reading thermometer and set it as close as I could. While I was waiting for the oven to stabilize, she told me that her garbage disposal had an odor in it. The odor, I explained, was from old food tucked in the crevices of her old disposer. I suggested that she take a bone and let it beat around inside the disposer for a minute and then flush it clean. She found an old dog bone and we completed the process. The odor went away.

By the way, this cleaning method is recommended by some manufacturers. We used to demonstrate the Maytag disposer in our store by grinding up a tenpenny nail!

A few days later I received an irate message on my answering machine. First, the oven had burned up all of her holiday pies; and second, when she went to use her sweet-smelling disposer, it leaked like a sieve. Beating around the bone had ruined it. She had to call an emergency plumber over the holiday weekend to install a new disposer. Naturally the plumber told her I was an idiot for recommending a bone as a cleaning method.

In trying to help out the customer, I had done more harm than good and I wound up refunding her money.

Calibration of an old thermostat just doesn't work. There is only one exception. Some new ovens are off only 30-50°F. Many of the newer ones even have calibration marks built into the back of the indicator knob.

Customers often rely on very cheap thermostats purchased at the grocery store. They get mislead because they don't really understand how an oven works. Ovens often cycle 35°F. above and below the set point as the elements cycle on and off. The food averages out the temperature.

Calibrating an oven requires a remote reading thermometer such as a shown in Fig. 11-37. It takes at least 30 minutes of adjusting and waiting to get it right. Most thermostats have a tiny screw that is accessible when the knobs is removed. On some newer ones the knob itself is adjusted.

Uncle Harry's
Trick of the Trade # 182

Half the time a “calibration service call” turns out to be bogus. Many people just don't know how to cook.

Calibration Meters
(Fig. 11-37)

TEMPERATURE TESTERS

DT012/P1 Digital High Temperature Tester

Range: -40° to 1200°F, ±1° of reading, ±4 digits. For testing ovens, including self-cleaning ovens, grills, fryers, process ovens, dryers, measuring stack temperatures and other industrial and service applications.

- LCD display, 3-1/2 digit, 0.5" numerals • Type J thermocouple
- Low battery indication
- Size: 4.75" x 2.64" x 1"
- Complete with 4' temperature probe, carrying case, battery and instructions.
- Three Year Limited Warranty

ACCESSORIES	PART NO.
4' Temperature probe	ATT19
Handle	ATT39
Surface probe, 8" tip	ATT40
Hot liquid immersion probe	ATT41
Air probe, 8" tip	ATT42
Battery, 9V	AB9
Tilt stand carrying case	AC90

MT012A High Temperature Tester

RANGE: 0° to 1200°F, ±3% of full scale accuracy. For testing ovens, including self-cleaning ovens (probe #ATT27), grills, fryers (probe #ATT26), process ovens, dryers, measuring stack temperatures and other industrial and service applications.

- Five way binding posts • Fast response welded thermocouple
- Size: 6.2" x 4" x 1.9"
- Complete with 4' temperature probe, tilt stand carrying case, and instructions.
- Three Year Limited Warranty

ACCESSORIES	PART NO.
4' Temperature probe	ATT6
4' Disposable temp. probe	ATT7
Surface temperature probe	ATT10
Hot liquid immersion probe	ATT11
Tilt-stand carrying case	AC12

DT3/P1 Digital Differential Thermometer Kit

- RANGES: -50° to 300°F, -45°C to 150°C
- ACCURACY: ±1°F/C, ±1 LSD to 212°F, ±2°F, ±1 LSD over 212°F
- LCD display, 3-1/2 digit
- Single or dual probe operation for differential calculations
- Complete with two standard probes, carrying case, clamp strap adapter, battery and instructions.
- Three Year Limited Warranty

ACCESSORIES	PART NO.
Battery, 9V	AB9
15' sealed probe	ATT20
30' sealed probe	ATT21
15' air probe	ATT22
30' air probe	ATT23
30' probe extension	ATT24
Carrying case	AC85

MT4 Solid State 4 Station Temperature Tester

- RANGES: Dual temperature range -50° to 120°F, 110° to 280°F
- Measures temperature at four separate locations • Ideal for superheat and heat pump temperature measurements
- Electronically regulated power supply eliminates calibration adjustments
- Size: 6.13" x 4" x 1.75"
- Complete with two 15' sealed temperature probes, carrying case, battery, ACS1 clamp strap adapter and instructions
- Three Year Limited Warranty

NOTE: The MT4 accessory probes are not interchangeable with the MTR4A.

ACCESSORIES	PART NO.
15' Sealed temperature probe	ATT20
30' Sealed temperature probe	ATT21
15' Air temperature probe	ATT22
30' Air temperature probe	ATT23
30' Probe extension	ATT24
Battery, 9V	AB9
Clamp strap adaptor (pkg. of 2)	ACS1
Carrying case	AC40
AC adapter	AACA1

Selector Switches and Thermostat Diagnosis

Occasionally, a problem will occur with the oven that is hard to diagnose. If the elements are good and the wiring is intact, the problem will be in the wiring, the selector or the oven thermostat.

The circuit diagram is often missing making it very difficult to separate and diagnosis the problem. First assume that the wiring is not the problem. Wiring only fails at connection points, not in the middle. Visually eliminate that possibility before ordering any parts.

Uncle Harry's

Trick of the Trade # 183

If the problem has been localized to the oven thermostat and the selector switch, replace both components to insure success. The oven thermostat is the likely culprit and four times more expensive than the selector. However, you can never be sure without a good circuit diagram and complicated testing.

Replacing both provides a first-class job for the customer and it will keep you out of trouble. The bulk of the expense is in the labor anyway, not in the parts.

Replacing oven thermostats

Oven thermostat replacement is a difficult and time-consuming job. It usually requires pulling a wall oven at least halfway out of the cabinet and disassembling the control panel. There are two difficult areas

1. Feeding the long capillary tube through the insulation and into the oven cavity is difficult just like on a gas oven

2. Removing the wiring from the old thermostat and connecting it to the new.

Uncle Harry's

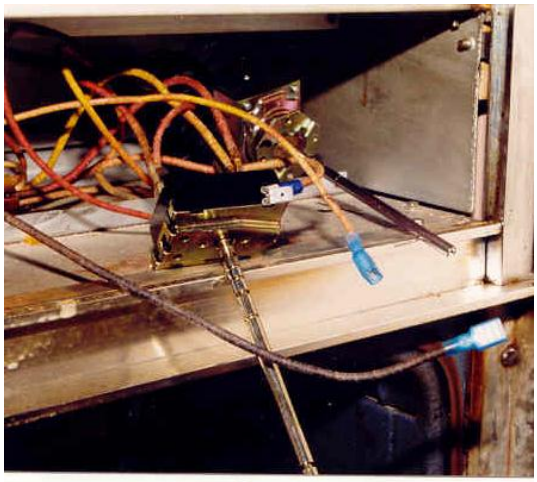
Trick of the Trade # 184

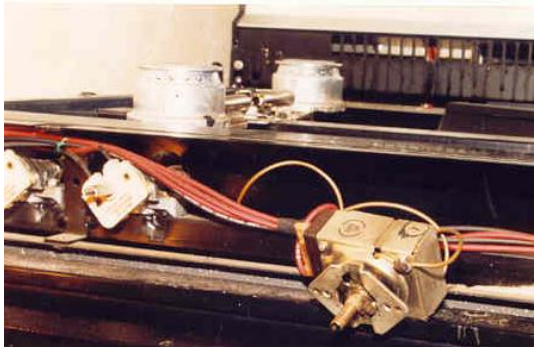
When replacing an oven thermostat, put the new thermostat next to the old. Take one wire off the old and move it to the new.

Never pull off all the wires at the same time. You will surely miss a color code and blow up the new thermostat

Second, remove the oven capillary intact instead of chopping it into pieces. In doing so, you have maintained a fallback position in case the problem turns out to be somewhere other than the thermostat.

Installing a New Thermostat (Fig. 11-38)





Replacing Selector Switches

Replacing a selector switch is very similar to replacing a surface control switch. It is far easier than replacing a thermostat. Follow the same wiring advice as on a thermostat.

Uncle Harry's
Story Time

One year as Thanksgiving was approaching, I received a call to replace a thermostat on an old range with a double oven. All the controls were in the upper eye-level oven. I ordered the thermostat without going because the range temperature was going sky high. It seemed like a clean telephone diagnosis.

The Friday before Thanksgiving, I went to the house and took the range apart to replace the thermostat. It was a difficult repair. A ceramic floor had been installed in front of the range. I had to jack the range up 1/2" on wooden shims in order to pull it out from the wall.

I chopped out the old thermostat and capillary and installed the new one. While the console was still open, I carefully checked the wires to make sure nothing was shorted and turned the range on to test it.

Sparks flew and I knew I was in trouble. My heart sank as I tested to find out what damage I had done

Lo and behold, I had blown out the new thermostat. A wire that I had not seen had touched part of the cabinet. I had to reassemble the entire range to get it back into the hole and order another thermostat.

The second time, the pressure was on. I had to order a replacement air freight in order to beat the Thanksgiving holiday.

Two days before Thanksgiving I returned to the house and installed the second new thermostat. I could really feel the pressure this time when I turned it on to test it. No sparks! - That was an improvement!

Happily, I let the oven run at 250°F. After about 15 minutes, I sadly realized that it was getting hotter and hotter. It was not cycling off. Digging further, in desperation, I found a hidden hot wire relay . I checked it with my ohm meter and it was shorted. The element were on constantly.

Fortunately, I had a relay on the truck and was able to finish the job in time for turkey dinner.

In hindsight, if I had carefully removed the old thermostat, I could have retraced my steps and still been done in one service call. With my cutters I had destroyed what was actually a good thermostat and then blew up the new one.

Of course, my basic mistake was jumping to conclusions and ordering a thermostat before I had investigated and made a proper diagnosis. Hard lessons such as this experience are excellent teachers.

It's hard to forget the terror felt when the sparks fly on a brand new thermostat

In many cases, it is really inconvenient to take all the covers off a range or oven to perform a complete diagnosis. To avoid taking the oven apart twice, it's necessary to buy a selector switch, oven thermostat and a hot-wire relay if there is one. In doing so, you will be prepared for any circumstances.

Continuous Cleaning Ovens

For a few years manufacturers made "continuous cleaning ovens." The inner surfaces of the clean oven was sprayed with a porous surface instead of porcelain. The porous surface was designed to make dirt flake off rather than stick.

The ovens were electrically exactly like a conventional oven. Only the inner surface was different.

Continuous cleaning worked somewhat for a careful housewife but it failed miserably for most households. Once it was stained, nothing could be done to remove the stains. Any cleaning agent remained in the porous surface and made a bigger stain.

Generally, the whole idea was a big flop. Most of the continuous cleaners have now been replaced. Self-cleaning ovens are far superior at dirt clean-up.

Self-Cleaning Electric Ovens

Since the 1970's, many electric ovens have been manufactured with a self-cleaning option.

The cooking procedures and operating procedures on a conventional oven are the same as that on a self-cleaning oven. A self-cleaner merely adds a second layer of complexity.

Operating principles

Self-cleaning ovens utilize the fact that most food spillage will burn into a fine ash at 900°F. The oven design is modified to be able to withstand this high temperature. A locking system is added to prevent the user from opening it, when the temperature gets above 550°F.

Many designs include a shutter to close off the window glass. This is to prevent it from cracking. The cleaning cycle takes between two and three hours depending on the quantity of spillage.

It's recommended that the racks be removed prior to the self-cleaning cycle. The racks, if left inside, will not be harmed, but the chrome will darken.

After the cleaning cycle, the small quantity of ash left can be wiped up with a wet paper towel.

Theory of Operation

Once the operator selects "Clean" on the oven thermostat and on the oven selector, the logic circuitry of the oven is significantly altered.

Switching to self-clean drops the bake and broil element voltage from 220 VAC to 110 VAC. The heating is long and slow. The elements stay on a much greater percentage of time during the self-cleaning cycle instead of cycling on and off as they do on regular cooking.

Most self-cleaners have a locking latch handle that must be thrown prior to the self-cleaning cycle. A few, such as Amana, use a small motor to activate a hook that grabs the door and holds it shut during the cleaning cycle.

There is a safety thermostat built into the latching mechanism. Once that temperature reaches 550°F, it disables the latch mechanism. It is then impossible to open the oven door and get burned.

The oven clock is used to start and stop the timing of the oven cleaning cycle. Setting the clock can be confusing for customers and mechanics. Oven clock knobs often push in and pop out to turn the oven on and off.

Uncle Harry's

Trick of the Trade # 185

When approaching a completely dead electric oven, it is important to check the clock settings before anything else. Customers and visitors frequently move the clock. It is easy to leave the clock in an automatic position instead of the manual position and not be aware of it.

Uncle Harry's

Story Time

Years ago I did a lot of work for a private school, McDonogh School. The campus included a dozen apartments for teachers and administrators. Every year in August when the new batch arrived, I could depend on a minimum of two service calls to repair broken ovens. They were always the same thing. The oven clocks would be improperly set in the "off" position.

Replacing Bad Clocks

Oven clocks cost about $100.00 wholesale. With installation and markup on parts, replacement cost will be between $225-250. Customers seldom wish to spend that amount of money for the luxury of an oven clock. Since the wiring to the oven diverts through the clock, occasionally burned out contacts within the clock itself can cause an oven failure. Fiddling with the clock controls will often cause a flicker on the oven indicator lights, helping with the diagnosis. The oven clock circuit is a simple one and usually exposed if the console cover is taken off. Contact damage is most often evident just by looking.

Uncle Harry's

Trick of the Trade # 186

Many customers don't realize that it's possible to self-clean an oven with a broken clock. Instead of using the clock for timing, simply turn the clock controls manually on and then off three hours later.

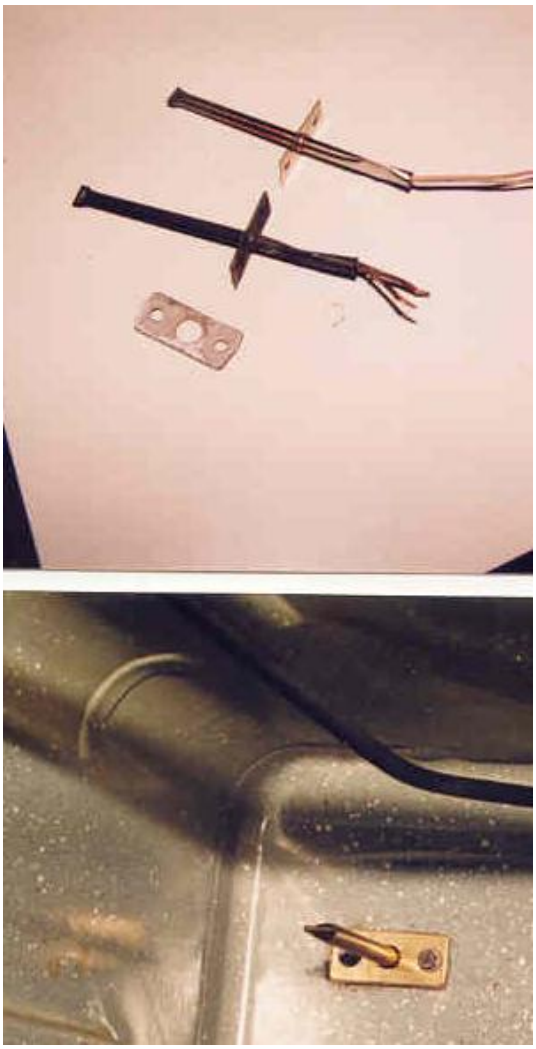
Oven Thermostats for Self-Cleaning Ovens

It is difficult to engineer a thermostat that can effectively and accurately control from 200-900°F. Like the early icemakers, the early self-cleaning ovens were very troublesome and hard to keep in service.

GE had one of the early successful self-cleaning oven designs. Instead of a capillary
thermostat, they used a variable resistor known as the 15 ohm sensor. The 15 ohm sensor was mounted in the oven cavity instead of a capillary. It was connected by two wires to the thermostat. The resistance of the sensor would climb as the temperature of the oven rose. The thermostat was designed to sense the resistance change and open and close a hot wire relay.

A GE 15 Ohm Sensor
(Fig. 11-39)

Sample 15 Ohm Sensors
(Fig. 11-40)



Brand new electronic self-cleaning ovens use the same basic principle. The resistance change is measured by a printed board rather than a complicated thermostat. Failure of the 15 ohm sensor is common and easily corrected. It's simple to test the sensor with an ohmmeter. Normally when it fails, it opens circuits.

Uncle Harry's
Trick of the Trade # 187

Always use porcelain wire nuts when replacing a 15 ohm sensor. Plastic ones will melt and short at self-cleaning temperatures.

If the 15 ohm sensor tests OK, it's necessary to replace the thermostat and selector on a self-cleaning oven. Use the same logic described on a conventional oven. Again, be cautious and test the hot wire relay if one is in the circuit.

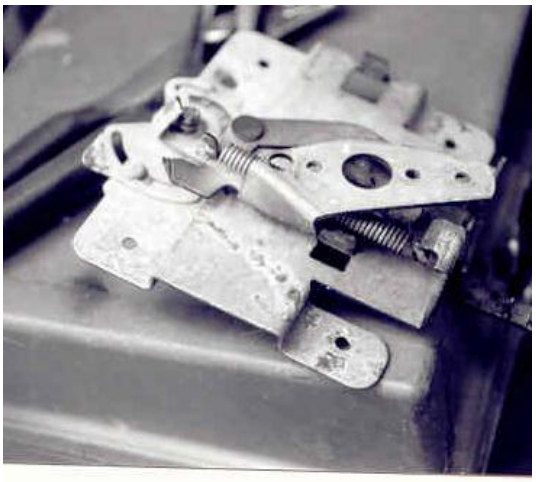
Some brands use complex thermostats instead of sensors to control self cleaning ovens. They are diagnosed just like regular electric thermostats.

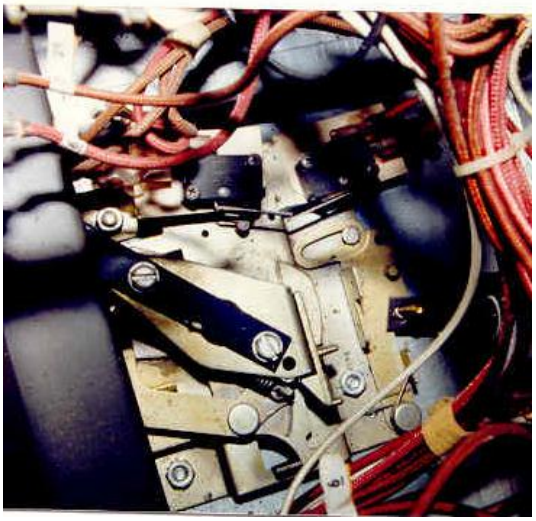
Locking Mechanisms

The latch and lock mechanism is the biggest source of problems on self-cleaning ovens. The linkages are easily bent out of shape by customers trying to unlock the oven. Forcing a jammed lock will bend up linkage and cause an oven failure. Even a slightly bent linkage can cause troubles.

Most linkages include two or even three microswitches to check the position of the lock arms. The switches insure that the door is fully closed before activating the self-cleaning. Self-cleaning latch assemblies are easy to diagnosis. The difficult part is gaining access for a visual inspection. Most of the time the damage is obvious and easily diagnosed.

Various Locking Mechanisms
(Fig. 11-41)





GE has had a long-running latch design. The latch arms reach from the front all the way to the back of the range. The lock and latch mechanism is mounted on the back. It is often necessary to raise the top and pull out the range in order to gain full access to the latching assembly. Almost always, the fault is in a bent or damaged mechanism.

A GE Long Arm Lock System
(Fig. 11-42)

Safety Interlocks

There are literally a dozen different self-cleaning design circuits. It is impractical to dwell on each circuit individually. However, a checklist is helpful. If an oven bakes and broils satisfactorily on the normal cooking cycle, but it fails to self-clean, check the following list:

1. Carefully follow the instructions printed on the range for activating the clean cycle, which will include:

2. Setting the start and stop time on the clock.

3. Raising the window shutter if it has one

4. Closing the door and checking the door switches.

5. Setting the selector switch

6. Setting the clean thermostat

7. Pushing in the latch button before locking the door

8. Latching the door

Some customers rarely use the self-cleaning mechanism and forget the procedure. If you're certain that the correct procedure has been followed, then the following possibilities exist:

1. The most popular failure is of one of the microswitches within the latch mechanism. Attempt to shine a light through the cracks of the latch mechanism to see if there is any visible sign of damage.

2. Pull the oven and the inspection covers and visually inspect the latch mechanism and the wiring between the clock selector and thermostat.

3. Check for any door hinge monitor switches that may be faulty. A careful visual inspection will almost always locate the problem.

4. Operate each interlock and microswitch with a small screwdriver. Make sure that you can hear each one click. Many times universal microswitches will fit self-cleaning ovens and avoid ordering a part.

5. Only as a last resort, trace the circuit with the wiring diagram. This is very difficult on a self-cleaning oven and should be avoided if possible.

Electronic Control Systems

In the late 80's, manufacturers began using solid state printed circuits to control electric ovens. The clock, thermostat, and selector switch are all combined into a single printed circuit. These are known as ERC Systems (Electronic Range Controls).

The theory of operation is very close to that of the GE 15 ohm system. The sensor operation and diagnosis is the same as the GE. Test the oven sensor with an ohm meter.

A safety feature has been added to the newer electronic designs. A thermal fuse is in series with the oven sensor. It is a non-resetable fuse link (just like on newer dryers) that opens circuits if the oven gets too hot. The printed circuit, the sensor, and the non-resetable fuse are the only three components in the circuit.

Repairing the Electronic Control Board

The electronic control boards have two weak spots. The heavy currents to the bake and broil elements flows through the printed circuit board and is controlled by two small relays. The relays are operated by the solid state circuitry. The power to the bake and broil elements must enter the board, go through the relay, and then be delivered to the elements. That circuit of the board is prone to failure.

It's frequently possible to visually find a melted solder joint on the section of the board that carries the heaviest current. It can be quickly repaired with a lightweight soldering iron. (This process is covered fully in Lesson 15, Microwave Repair.)

The temperature control also breaks loose from the board. The twisting motion causes the solder joints to crack and results in intermittent settings. With care, this can also be soldered back in place.

Anything beyond these simple repairs will require a board replacement. Most boards include self-diagnostic circuitry that will light up an "Error" code in the case of failure. The following error codes are typical of many of the boards. Using this simple crib sheet will allow you to diagnose many of the electronic circuit boards.

Error Codes
(Fig. 11-43)

Failure Code Explanations

The ERC is is capable of detecting certain failures within the ERC and oven sensor circuit.

F1 and F5—These codes indicate a failure within the ERC, which usually requires replacing the control.

F2—Oven exceeded 590 degrees

F3—Open sensor or open in sensor circuit.

F4—Shorted sensor or short in sensor circuit

F6—Failure within the ERC time keeping circuits, or caused by fluctuations of the 60 cycle power source.

IMPORTANT: If an F2 failure code is shown, check the sensor circuit completely. The following can also cause this code to be displayed.

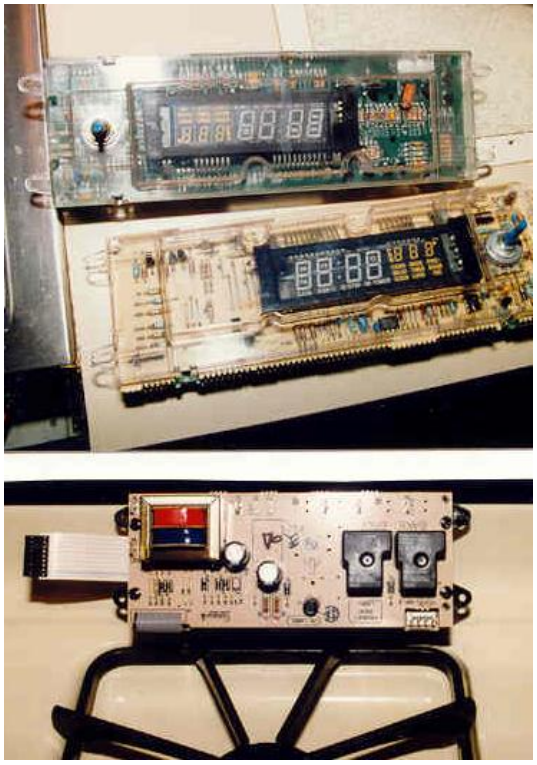
1. High resistance in the sensor circuit. For example, poor contact between sensor harness plug and ERC.
2. An accumulation of moisture or food soils deposited by evaporating moisture can create a low resistance across the terminals of the sensor harness connector terminals.

SELF-CLEANING ERC SYSTEMS

Installing a New Board

Replacing a printed circuit board is a simple operation. The only hard part is getting the board. The boards generally cost $80.00-120.00. Customers fuss about the cost of replacement with good cause, most of the ovens are not very old.

Typical Circuit Boards
(Fig. 11-44)



Removing a Large Wall Oven from the Cabinet

In about one third of the cases, it will be necessary to remove a wall oven from the cabinet in order to service it. A double oven and even a single oven can be to heavy for a one person to manage. It's possible to set the oven on a stool, strong boxes, or even hefty plastic milk crates stolen from a local grocery store. None of those methods are really professional.

Using a Homemade Oven Cart (Fig. 11-45)

Uncle Harry's
Trick of the Trade # 188

Make up your own universal wall oven support table. A well-made table will last you a lifetime, save your back, and make you look very professional. The rig as shown can be made with the ability to support a wall oven from 6" up to 2' high. It is strong enough to handle a big Thermador double self-cleaning oven.

Cart Folded for Transport and in Use (Fig 11-46)

Gas Versus Electric Cooking

It is common for housewives to ask questions or be ignorant of basic cooking and baking techniques. There are significant differences between cooking on gas and electric appliances.

Gas versus Electric Baking

In a gas oven, a flame that burns against a heavy metal plate generates the heat. The burner and plate are always below the oven chamber and separated from the oven by a second metal panel, the bottom of the oven. The gas flame heats the air that circulates through the oven. Nearly all of the heat is transferred by the hot air into the food. This is called convection cooking.

In an electric oven the bake element is exposed in the bottom of the oven. It too heats the air and creates convection currents. However the red-hot element also radiates a great amount of heat. It acts like a huge heat lamp and heats the bottom of the food more than the top.

It is a very common to have customer complain that her new electric oven does not bake as well or as evenly as her old gas oven did. Often the bottom of a cake will cook faster than the top. A large part of the problem comes from the basic design of the oven.

Uncle Harry's
Trick of the Trade # 189

It is possible to improve the evenness of the heating and decrease the radiant effect in an electric oven. Place a cookie sheet on a separate rack between the bake element and the baking pan. A few good electric oven cookbooks even suggest this method.

Many of my customers, and even my wife, have noticed a significant improvement in baking using that simple technique

Gas Versus Electric Cooktops

It is also common to have housewives gripe about the slowness of electric cooktop cooking. All electric burners are slow to heat up and cool off. The difference is even more noticeable on ceramic cooktops. It is impossible to quickly change heating as required by some recipes. An omelet is a prime example. There is nothing that can be done to improve on this situation.

Conclusion

As strange as it seems, all oven and cooktop repairs are a seasonal business. There are far more service calls between Labor Day and Christmas than at any other time during the year. Homeowners come in from summertime play and gear up for the cooking season. Electric and gas cooktops are very easy to properly service. Conventional ranges are the next easiest with an occasional pesky thermostat problem. Self-cleaning electric ovens are the most difficult, but with patience and careful observation, they can also be moneymakers. Take your time and think out the problems carefully. You will stay out of trouble.

Uncle Harry's
Trick of the Trade # 189

Nearly all oven and cooktop repairs are very obvious and easy to repair. Overall they are much simpler than refrigerators or icemakers.

Flat Rates

Following is *Uncle Harry's* suggested pricing for typical cooking appliances. A complete set of flat rates is in the Flat Rate Book.

Ovens

Description of the Job	Price
1) Install new bake or broil element with wire ends	$125.00
2) Replace thermostat (gas or electric)	245.00
3) Install selector switch	160.00
4) Install new clock	230.00
5) Install ceramic igniter	145.00
6) Install MSC valve	185.00
7) Clean pilot assembly	89.00
8) Replace oven sensor or pilot safety	125.00
9) Repair circuit board	115.00
10)Replace hot-wire relay	145.00
11)Replace printed circuit board	240.00
12)Add for removal from wall cabinet	+48.00
13)Repair connection box	98.00
14)Install new door glass	135.00+
15)Replace spark module	135.00
16)Replace lock assembly	185.00
17)Replace hinge set	190.00

Cooktops

1) Replace 6” burner and socket Plus (+$10.00 for GE)	135.00
2) Replace 8” burner and socket (+$10.00 for GE)	145.00
3) Replace infinite switch	128.00
4) Replace burner sparker switch (gas)	125.00

Examination

Manual 11

Ranges, Cooktops, & Ovens

(Note: More than one answer maybe correct.)

1. Gas and electric cooking appliances
A. must be studied separately.
B. are exactly the same.
C. all cook food.
D. differ in how they cook.

2. A set-in range
A. is harder to service.
B. has no feet.
C. pulls out easily.
D. is still popular.

3.A flexible gas line
A. is illegal.
B. allows easier service.
C. frequently breaks.
D. is rarely used.

4. A burner orifice
A. should not be adjusted.
B. sets the proper flame level.
C. controls gas flow.
D. is hard to set.

5. “Flash tubes”
A. take pictures.
B. light the burner.
C. are near the oven burner.
D. get out of position.

6. Standing pilots
A. are being phased out.
B. blow out a lot.
C. are very reliable.
D. are commonly used

7. The top burner spark module
A. creates an arc.
B. operates quietly.
C. operates on gas power.
D. is controlled by burner switches.

8. Cleaning a gas cooktop
A. is no problem whatever.
B. must be done with care.
C. can plug the pilot orifice.
D. can short out the burner switches.

9. All gas thermostats
A. are time consuming to replace.
B. must be replaced carefully.
C. are cheap.
D. operate with a capillary tube.

10. An MSC valve
A. is a double safety.
B. has no standing pilot.
C. tests for pilot heat.
D. none of the above

11. An MSC valve
A. can be tested with a torch.
B. can be cleaned with a tap.
C. is still popular.
D. A, B, & C.

12. Glow bar igniters
A. are rarely found today.
B. get old and dim.
C. light the gas instantly.
D. can be tested with an ohmmeter.

13. An electric gas valve
A. is a big nuisance.
B. seldom goes bad.
C. is a low voltage device.
D. should be tested with a line cord.

14. Oven hinges
A. often require pulling the oven out.
B. usually require two trips.
C. are a common service call.
D. A B & C.

15. Burner sockets
A. should be replaced with the burner.
B. cause poor heating.
C. interchange.
D. are a very common service call.

16. Burner switches
A. fail three ways.
B. always supply full power.
C. fail internally.
D. A, B, & C.

17. A hot-wire relay
A. only carries a light current.
B. is operated by the oven thermostat.
C. is operated by the lock assembly.
D. is designed to carry high element current.

18. Bake and broil elements
A. burn in half.
B. burn off at the connection point.
C. burn out quietly.
D. A, B, & C.

19. Self-Cleaning ovens
A. need to be set to clean carefully.
B. are easy to do operate.
C. are best repaired by a professional.
D. A, B, & C.

20. Electronic range controls
A. are often repairable in the field.
B. are similar to the GE system.
C. use a thermal fuse.
D. are expensive.

Examination Answers

Manual 11

Ranges, Cooktops and Ovens

1. A, C & D. Even through gas and electric appliances all cook food, they must be studied separately for they are totally different in how they operate.

2. A, B. A set-in range, now out of fashion, fits into a wood cabinet and is hard to remove for service.

3. B. Flexible gas line rarely ever leak and make service access much easier.

4. B & C. A burner orifice controls the flow of gas and sets the proper flame level.

5. A, B & D. Flash tubes are used to take pictures with a camera and have nothing to do appliances. Flash tubes carry burning gas from the pilot light to top burners. They can get knocked out of position, bent and fail to operate.

6. A & C. Standing pilot design is being replaced by sparker mechanisms and ceramic igniters even though standing pilots are very reliable.

7. A & D. Spark modules control burner switches and create an arc, which lights the gas.

8. B, C & D Water and soap can damage touchpad parts, can plug the pilot orifice and short out top burner switches.

9. A B & D.

10. A & C. An MSC valve will only function after being heated by an enlarged pilot light. It operates as a double safety.

11. A B & C. A tap with a tool or heat from a propane torch can be used to test an MSC valve. They are still often used in standing pilot designs.

12. B & D. Most often glow bar igniters get dim and fail to operate the bi-metal gas valve. In some cases, they will test positive for continuity with an ohmmeter even though they will not function when in the circuit. A cracked one will show an open circuit with an ohmmeter.

13. B & C. An electric gas valve is in series with the glow bar igniter and seldom goes bad.

14. A & B.

15. A, B, C & D. Bad burners and burner sockets are the most common electric range repair.

16. A & C.

17. A, B, & D. A hot wire relay carries a light current to operate a hot wire heater and a heavy current through the contacts, which supply control the oven heating elements.

18. D. Bake and broil elements burn in half, burn wires off at the connection points, and die quietly with no visible damage.

19. A & C. Self-cleaning ovens are often complex to set on the clean cycle. Repairs are best left to a professional.

20. A, B, C & D. All electronic range controls are expensive. The newer designs are similar to the old GE 15 ohm sensor system. Many of the newer designs use a thermal fuse and are repairable in the field.