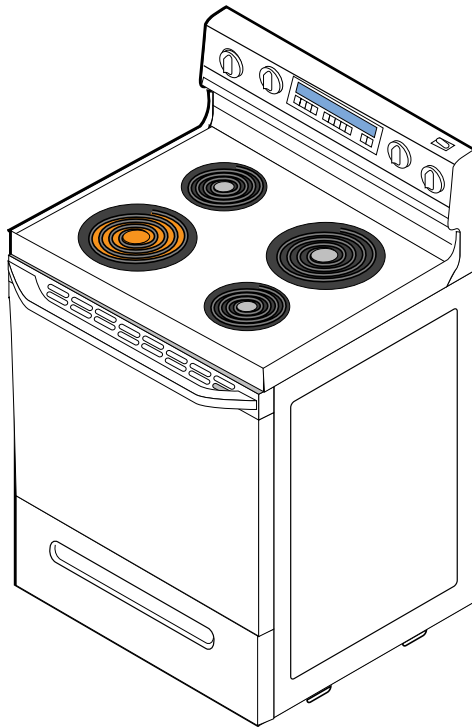




Service Professional Seminar



ELECTRIC RANGES

WARNING

Electrical Shock Hazard

Disconnect the range's line cord plug from the wall receptacle before you service any of the components inside the unit. Failure to do this could result in violent electrical shock.

VOLTAGE CHECKS

When making voltage checks, be sure to observe the following precautions:

1. The floor must be dry. Water and dampness increase the chances of electrical shock.
2. Set the voltmeter correctly for the voltage being measured.
3. Touch only the insulated parts of the meter probes.
4. Touch the component terminals, or wires, with the meter probe tips only.
5. Touch the meter probe tips only on the terminals being checked. Touching other components could damage good parts.

PARTS QUALITY

An important step in the appliance repair procedure is the selection of FSP® (FACTORY SPECIFICATION PARTS) as replacements. Use of "fits-all," or "look alike" parts could result in early parts failure, safety hazard, or substandard performance of a WHIRLPOOL appliance. It could also result in an unnecessary repeat of your repair efforts.

To be sure that the part(s) you purchase meet the exacting quality standards used to build every new WHIRLPOOL appliance, be sure to ask for genuine FSP replacement parts, as specified for your model. "FSP" is a registered trademark of WHIRLPOOL CORPORATION.

You can buy your genuine FSP replacement parts from any authorized WHIRLPOOL Parts Distributor.

WHIRLPOOL CORPORATION assumes no responsibility for any repair made on our products by anyone other than qualified TECH-CARE® Service Technicians.

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INTRODUCTION

This program is designed to teach the servicer basic skills in handling common service procedures for electric ranges. This program does not cover the diagnosis and repair of all range problems and components, (oven liner, wiring harness, etc.).

PROGRAM OBJECTIVE

Upon completion of this program, the participants will be able to identify the location of major range components, as well as diagnose problems, and remove and repair the components causing the problem.

INSTRUCTIONS

This program has the following sections:

- Major Component Locations
- Component Access & Testing
- Theory Of Operation
- Wiring Diagram, Diagnosis Charts, & Error Codes

Complete the “Major Component Locations” section, and have the instructor review the “Performance Check” before continuing. If you have any questions, ask your instructor.

TOOLS YOU WILL NEED

Needle-Nose Pliers

Screwdriver:

- Phillips.

Special Tools:

- Volt-Ohmmeter.

– Section 1 –

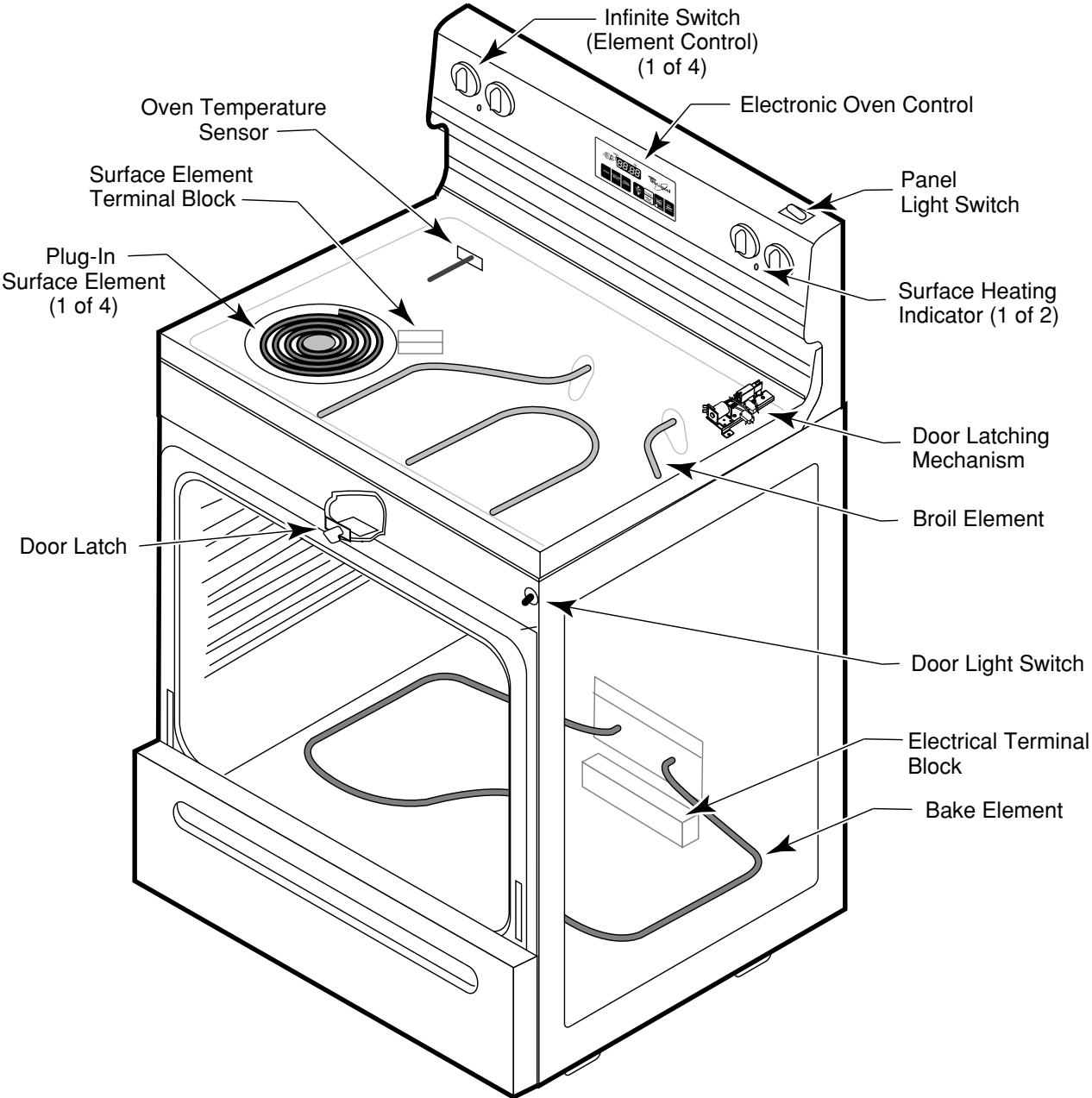
MAJOR COMPONENT LOCATIONS

OBJECTIVE:

To teach the student how to identify the location of each major component in an electric range. These components are the:

- Surface Heating Indicator
- Electronic Oven Control
- Infinite Switch (Element Control)
- Oven Temperature Sensor
- Electrical Terminal Block
- Plug-in Surface Element & Terminal Block
- Broil Element
- Bake Element
- Panel Light Switch
- Door Light Switch
- Door Latch
- Door Latching Mechanism

The illustration below shows the location of the major components in the electric range. Study the illustration until you feel that you can mark the location of these components on a drawing. When you are ready, proceed to the "Performance Check" on the next page.



Performance Check

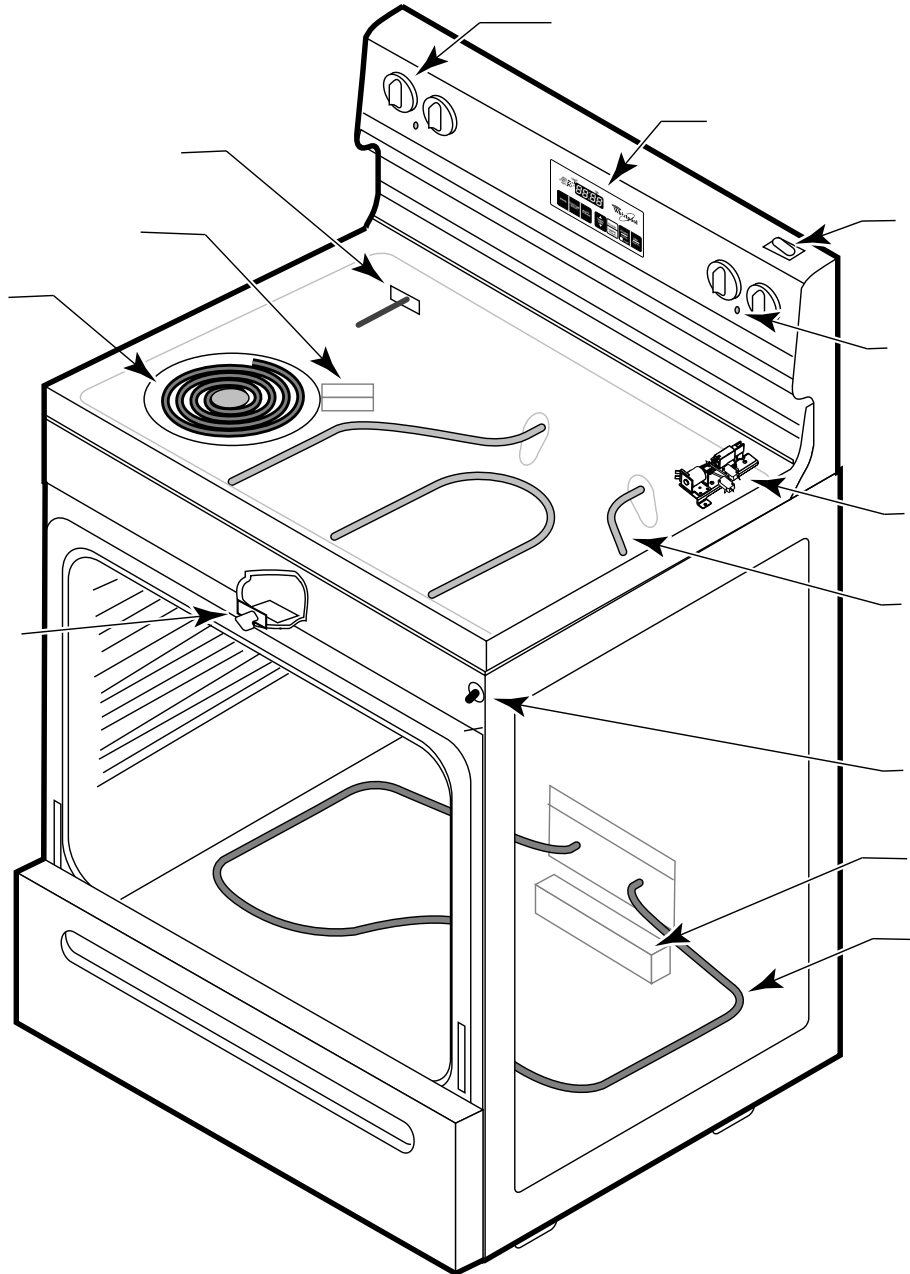
Locate the individual components in the illustration on the next page, and place the letter of each component name next to the arrow. Do not refer back to the example on page 2.

When you are finished, take the book to the instructor, and have the results recorded. After you are signed-off by the instructor, proceed to the next section.

You have four (4) minutes to complete this exercise.

- A. Surface Heating Indicator
- B. Infinite Switch (Element Control)
- C. Electronic Oven Control
- D. Oven Temperature Sensor
- E. Plug-in Surface Element
- F. Surface Element Terminal Block

- G. Broil Element
- H. Bake Element
- K. Electrical Terminal Block
- L. Door Latching Mechanism
- M. Door Latch
- N. Panel Light Switch
- P. Door Light Switch



– Section 2 –

COMPONENT ACCESS & TESTING

OBJECTIVES:

Given the customer complaint about an electric range problem, the student should be able to properly diagnose the problem, and then remove and replace the defective component. The service procedure for each of the following components is discussed in this section:

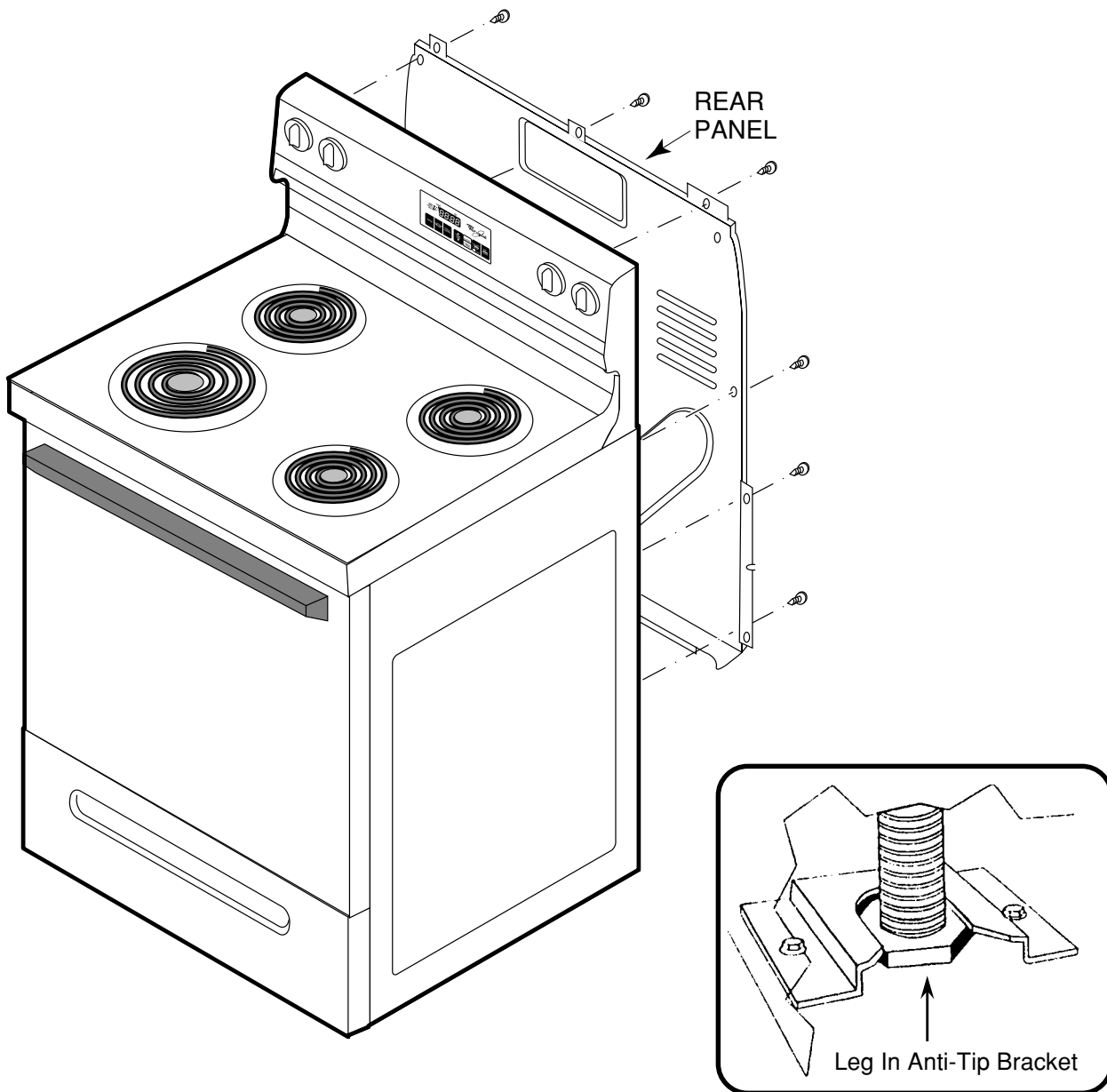
- Surface Heating Indicator
- Electronic Oven Control
- Infinite Switch (Element Control)
- Oven Temperature Sensor
- Electrical Terminal Block
- Plug-in Surface Element & Terminal Block
- Oven Door
- Broil Element
- Bake Element
- Oven Light Switches (door & panel)
- Door Latch
- Door Latching Mechanism
- Oven Vent
- Side Panel

MOVING THE RANGE AND REMOVING THE REAR PANEL

1. Unplug the range.

CAUTION: When you work on the range, be careful when handling the sheet metal parts. Sharp edges may be present, and you can cut yourself if you are not careful.

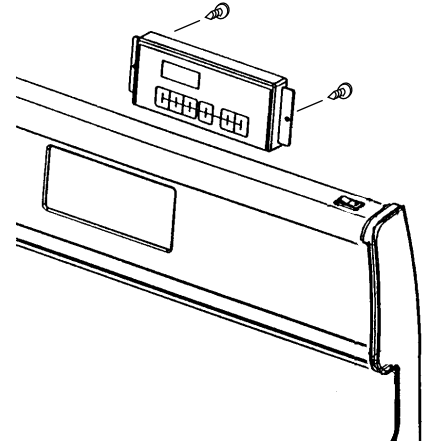
2. To access the rear panel, pull the range forward so that the rear foot disengages from the anti-tip bracket.
3. Remove the rear panel from the range by removing the mounting screws.



IMPORTANT NOTE: When moving the range back into place, make sure that the rear foot engages in the anti-tip bracket. Check to make sure that it is engaged properly by pulling forward on the top of the range. The anti-tip bracket must be installed. If parts are required to install a bracket, call the "Whirlpool Consumer Assistance Center" at: **1-800-253-1301**.

REMOVING THE ELECTRONIC OVEN CONTROL

1. Unplug the range.
2. Remove the rear panel from the range.
3. Disconnect the connectors and wires from the terminals of the oven control. NOTE: The connectors are sized so that they cannot be installed incorrectly or interchanged on the board.
4. From the back of the control panel, remove the two screws from the oven control and remove it from the front panel.



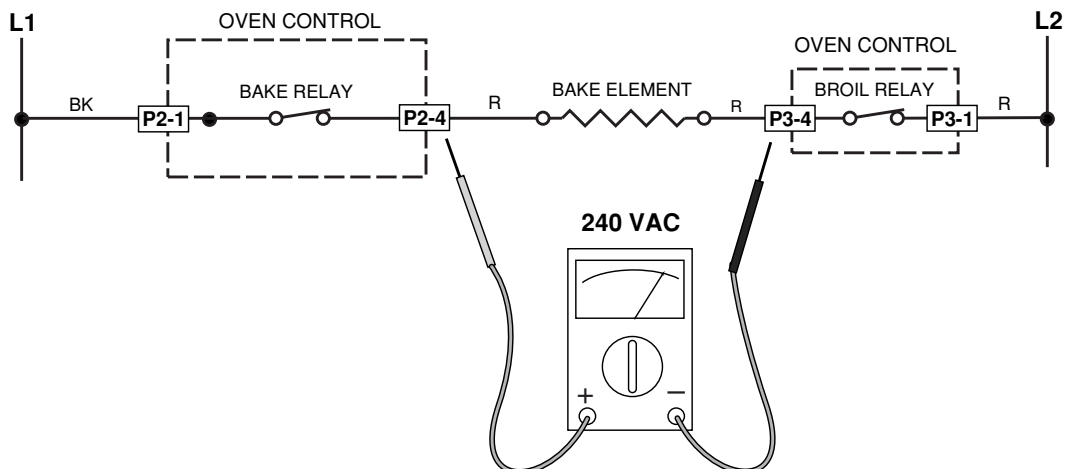
TESTING THE ELECTRONIC OVEN CONTROL

! WARNING

The following tests require 240 volts AC. Use extreme caution when making measurements. Do not touch any component leads with your bare hands. Use only the test probes to make measurements.

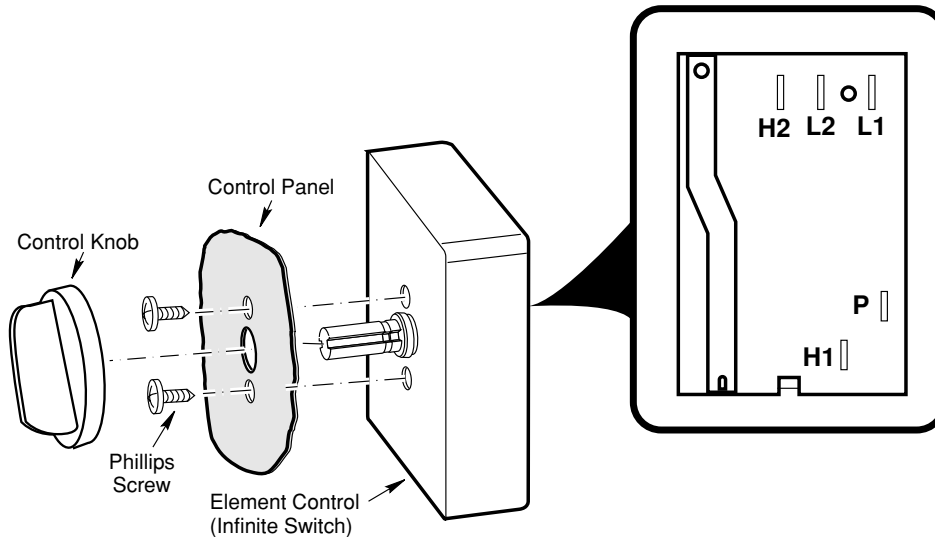
Failure to do so can result in death, or serious injury.

1. Set the voltmeter to the 240 VAC scale.
2. Press the **Bake** keypad and then the **Start** keypad.
3. Touch the meter leads to **P2-4** and **P3-4** on the electronic oven control board. The meter should indicate 240 volts AC.
4. With the oven in the Broil mode, measure points **P2-2** and **P3-2** (Broil element circuit) for 240 volts AC.



REMOVING AN INFINITE SWITCH (ELEMENT CONTROL)

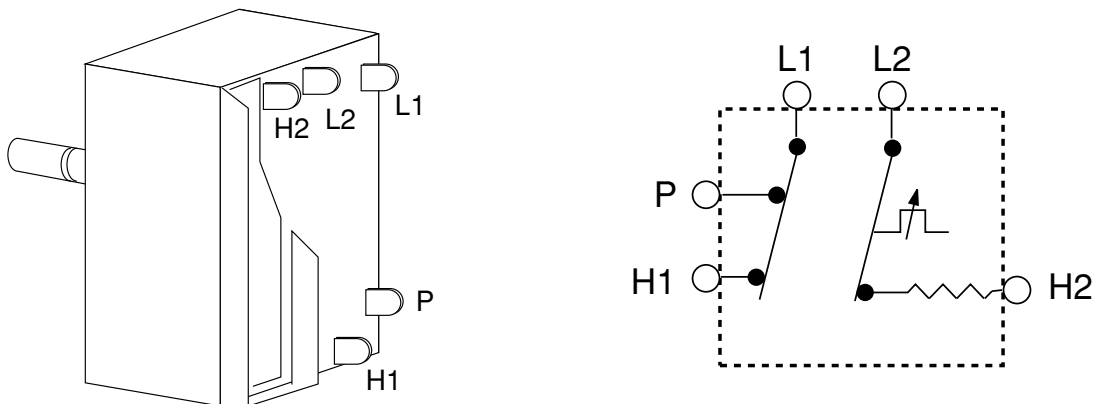
1. Unplug the range.
2. Remove the rear panel from the range.
3. Remove all of the wires from the switch terminals.
4. Remove the control knob and the two phillips screws from the switch.



TESTING AN INFINITE SWITCH (ELEMENT CONTROL)

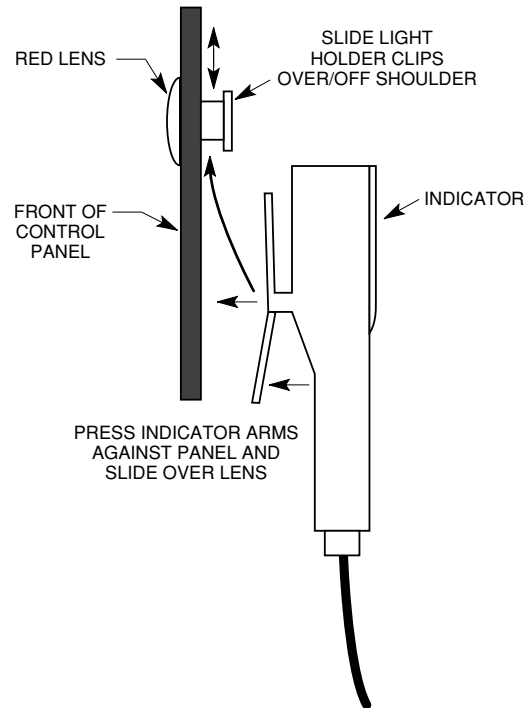
1. Set the ohmmeter to the R x 1 scale.
2. With no power applied, disconnect the wires from the control terminals. Turn the control to the "HI" setting, and you should obtain continuity readings between the following terminals:

L1 and P
L1 and H1
L2 and H2



REMOVING THE SURFACE HEATING INDICATOR

1. Unplug the range.
2. Remove the rear panel from the range.
3. Slide the indicator off the red lens and disconnect the indicator wires.



TESTING THE INDICATOR

1. Set the ohmmeter to the R x 10K scale.
2. If not already done, disconnect the indicator light.
3. Touch the meter leads to the wire connectors of the indicator. The meter should indicate 24 k Ω (24,000 Ω) \pm 5%.

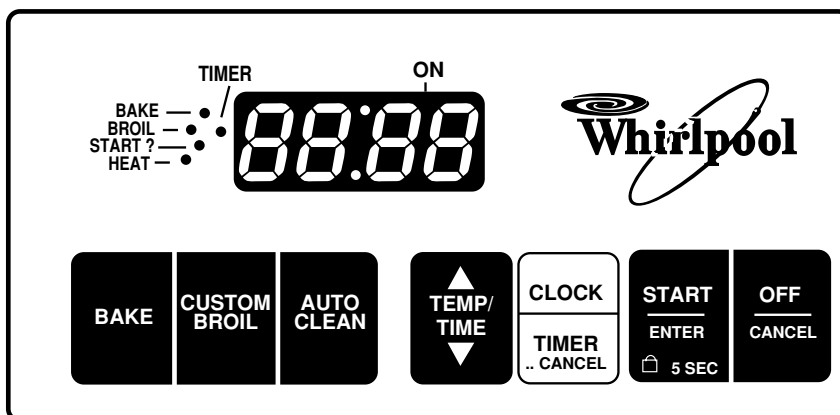
Performance Check

Perform the following steps to familiarize yourself with the various functions of the electronic oven control (see the illustration below).

1. Set the clock for the Time-Of-Day. To set the clock:
 - Press the CLOCK keypad. *12:00* will show on the display.
 - Use the TIME/TEMP Up (▲) and Down (▼) keypads and enter the correct time.
 - Press the START/ENTER keypad.
2. Set the electronic oven control to Bake and listen for the Bake relay to energize. To set the control to Bake:
 - Press the BAKE keypad. The display will indicate *350°*.
 - Use the TIME/TEMP Up (▲) and Down (▼) keypads and change the display to *450°*.
 - Press the START/ENTER keypad.
3. Listen for the Bake relay to energize (click).
4. Press the OFF/CANCEL keypad to turn off the BAKE function.
5. Repeat steps 2 through 4 and check the BROIL and CLEAN functions.

Perform the following steps to calibrate the electronic oven control (see the illustration below).

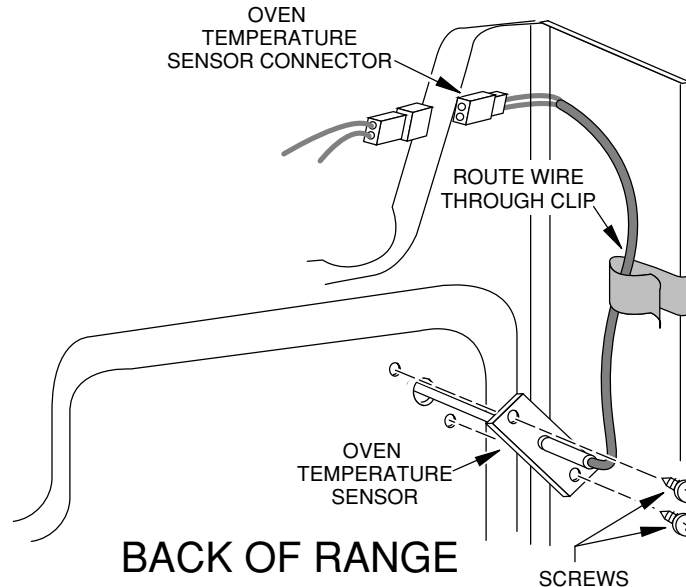
1. Press and hold the BAKE keypad for 5-seconds. *CEL* is shown in the display.
2. Pressing the TEMP/TIME keypad Up (▲) arrow adjusts the temperature in 10°F increments in the following sequence: 0°; 10°; 20°; 30°; -30°; -20°; -10°; 0°.
3. Press the START/ENTER keypad to activate the desired temperature adjustment. If the START/ENTER keypad is not pressed within 5-minutes, the adjustment is ignored.
4. The bake temperature adjustment cannot result in operating temperatures higher than 500°F, or lower than 170°F, as measured at the center of the oven cavity.
5. Once the bake temperature has been adjusted, the broil and clean temperatures are automatically offset by the same degree.



Refer to pages 7, 8, and 9, and remove the components from the control panel.

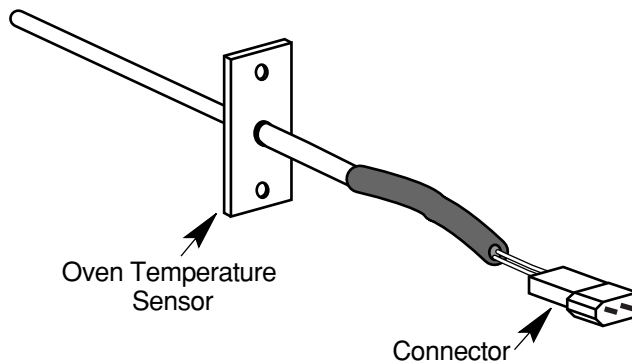
REMOVING THE OVEN TEMPERATURE SENSOR

1. Unplug the range.
2. Remove the rear panel from the range.
3. Unplug the connector from the oven temperature sensor.
4. Remove the two screws from the oven temperature sensor and remove it from the back of the oven.



TESTING AN OVEN TEMPERATURE SENSOR

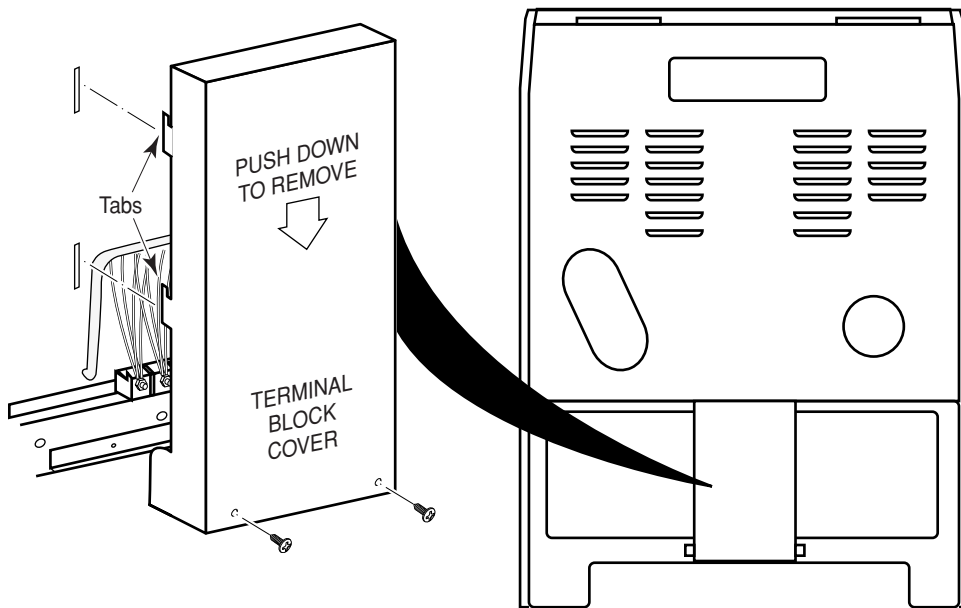
1. Set the ohmmeter to the R x 10 scale.
2. Touch the meter leads to the plug pins (see the illustration). The meter should indicate approximately 1100 Ω at 75 °F. For resistances at other temperatures, refer to the chart below.
NOTE: The readings are approximate.



<u>Temperature (°F)</u>	<u>Resistance (Ω)</u>
32	1000
75	1100
250	1450
350	1650
450	1850
550	2050
650	2230
900	2700

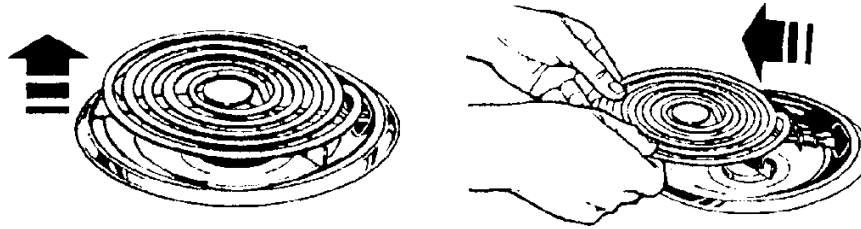
REMOVING THE MAIN ELECTRICAL TERMINAL BLOCK

1. Unplug the range.
2. Remove the terminal block cover screws, push down to unhook the tabs from the chassis, and pull it forward to remove it.
3. Remove the wiring from the terminal block.
4. Remove the mounting screws from the terminal block and remove it from the range.



REMOVING THE PLUG-IN SURFACE ELEMENT

1. Unplug the range.
2. Push and lift the edge of the plug-in surface element opposite the terminal block just enough to clear the reflector bowl, and then pull the element prongs out of the terminal block.

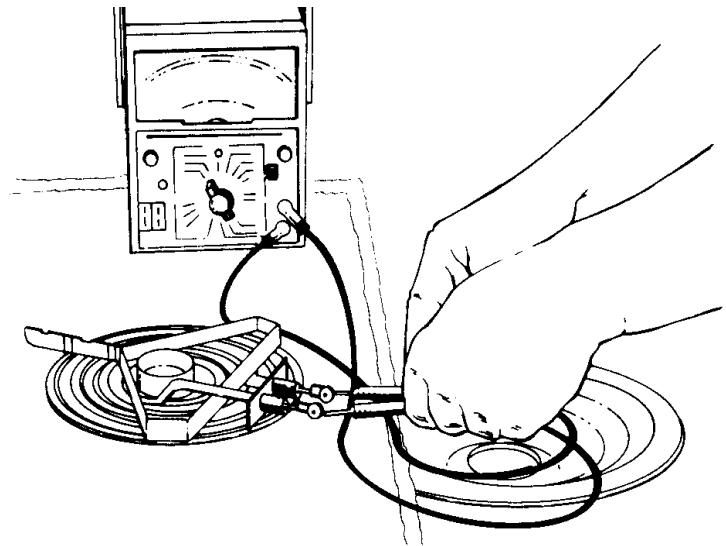
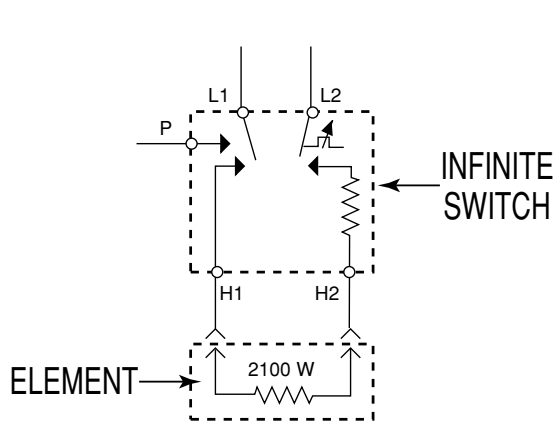


TESTING THE PLUG-IN SURFACE ELEMENT

1. Set the ohmmeter to the R x 1 scale.
2. With the element removed, touch the meter leads to ends of the prongs. The meter should indicate the following (approximate $\pm 20\%$) resistance for the indicated element:

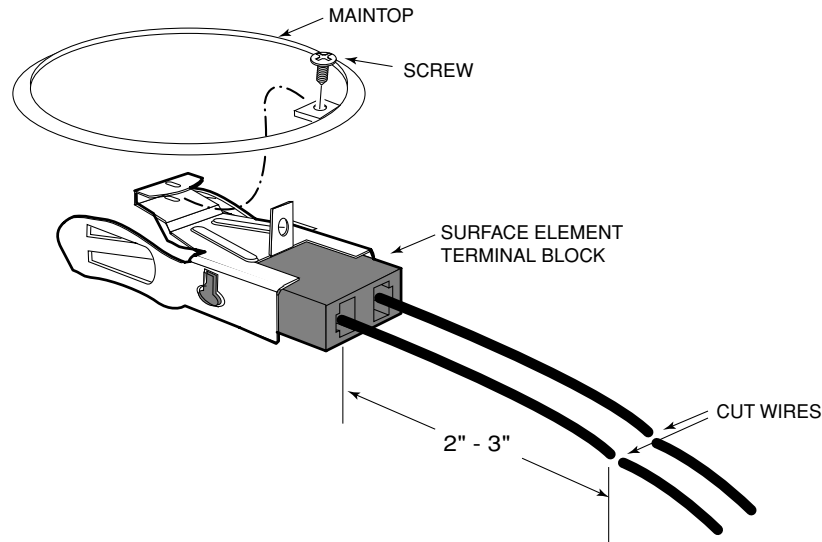
8" Element = 18 - 20 Ω

6" Element = 30 - 33 Ω



REMOVING A SURFACE ELEMENT TERMINAL BLOCK

1. Unplug the range.
2. Remove the surface element from the terminal block.
3. Remove the screw from the terminal block you wish to service, unhook it from the cooktop, and remove it.
4. Cut the two wires approximately 2" - 3" from the edge of the terminal block.



5. Use the "Surface Unit Terminal Block Replacement" (#330031), and follow the instructions contained in the package to install the new terminal block.

TESTING A SURFACE ELEMENT TERMINAL BLOCK

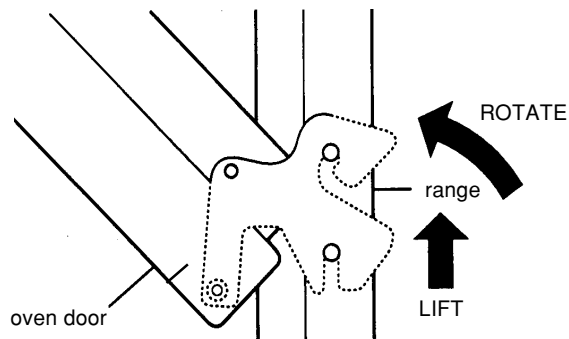
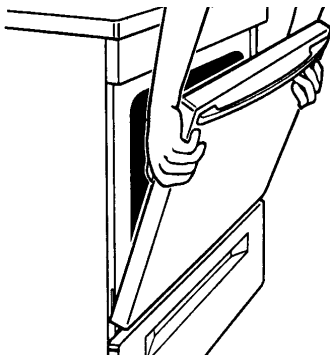
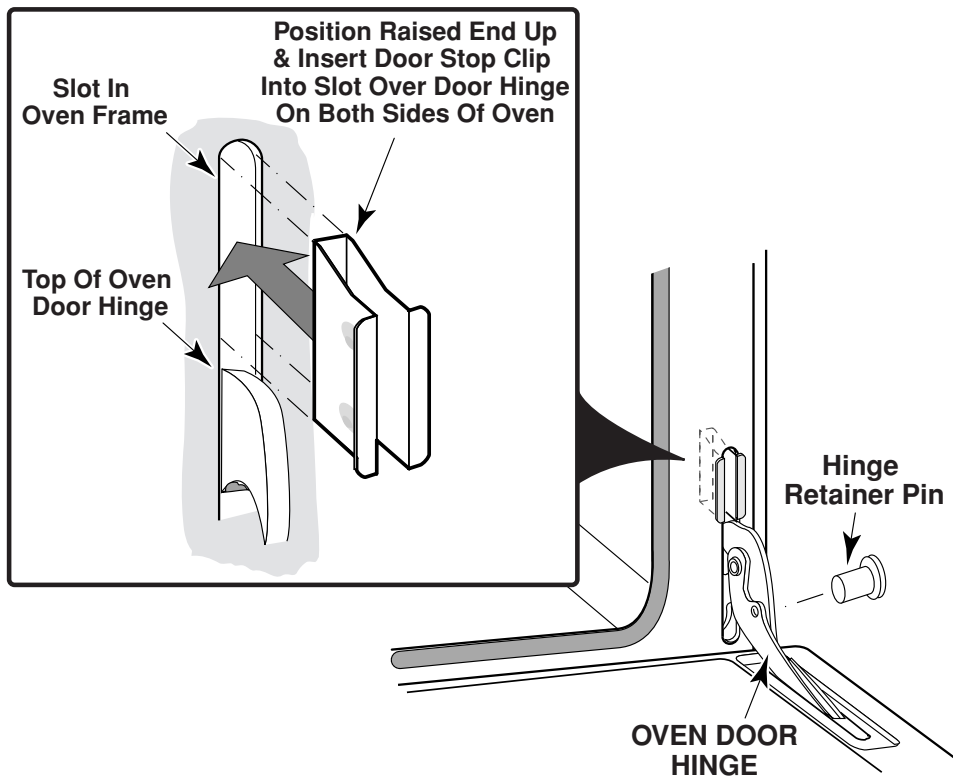
1. Visually inspect the terminal block for the following defects:
 - a) Cracked block.
 - b) Melted block.
 - c) Internal arcing (carbon buildup around terminals).
 - d) Burnt or charred wires.
 - e) Loose connectors.

Performance Check

1. Remove and test the oven temperature sensor.
2. Locate the main electrical terminal block.
3. Remove and test the surface elements.
4. Replace a surface element terminal block.

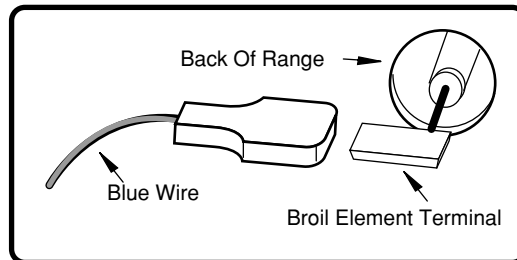
REMOVING THE OVEN DOOR

1. Open the oven door.
2. Remove the door hinge clip.
3. Insert a hinge retainer pin in each door hinge.
4. Close the door to the "broil" position, or until the door contacts the hinge pins.
5. Lift the door up and pull the hinges out of the slots.

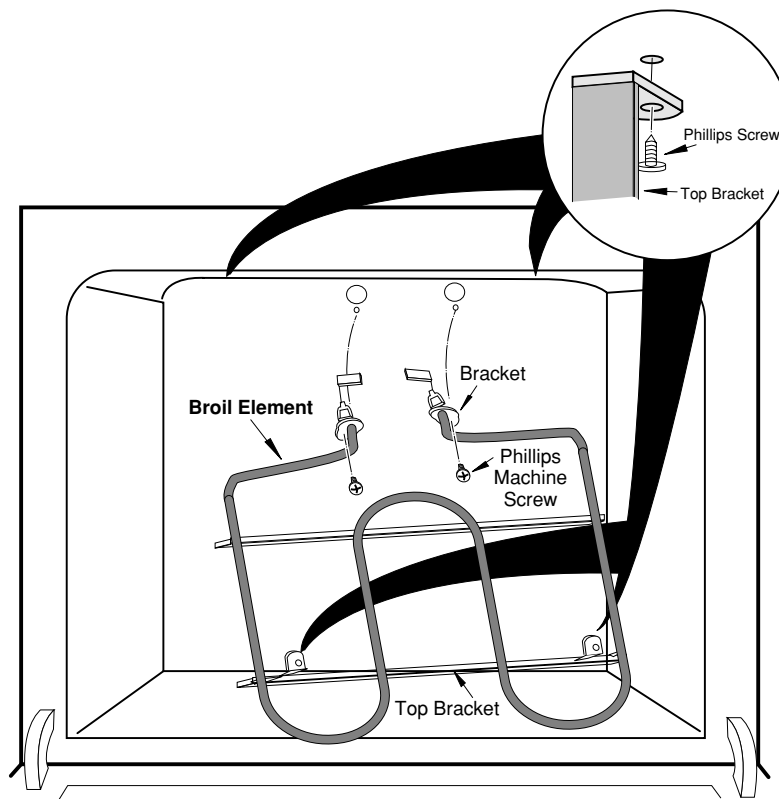


REMOVING THE BROIL ELEMENT

1. Unplug the range.
2. Remove the oven racks.
3. Remove the rear panel from the range.
4. From behind the range, disconnect the wire connectors from the broil element terminals.



5. From inside the oven, remove the screws from the brackets at the top of the broil element and from the mounting brackets, then pull the element forward so that the flag terminals clear the holes, and remove it.

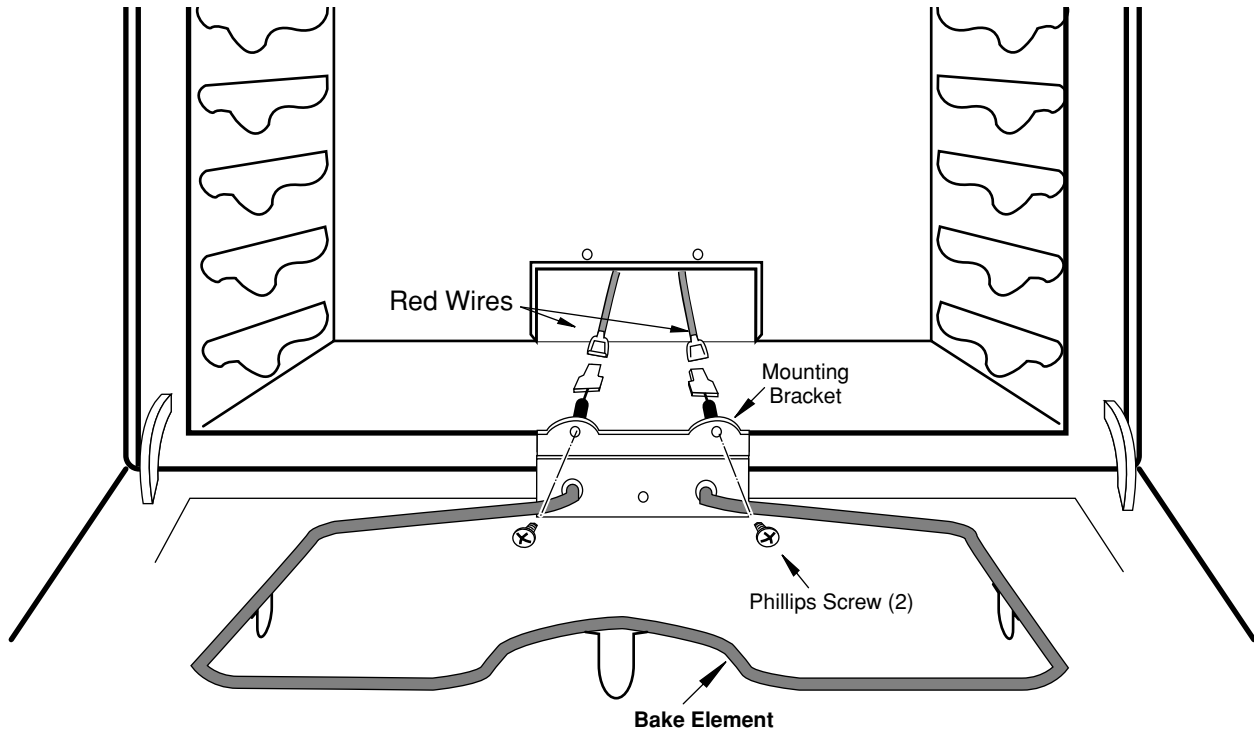


TESTING THE BROIL ELEMENT

1. Set the ohmmeter to the R x 1 scale.
2. Touch the meter leads to the terminal connectors of the broil element. The meter should indicate between 15 - 18 Ω .

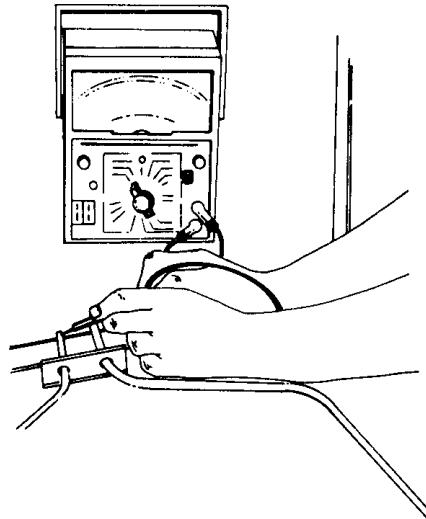
REMOVING THE BAKE ELEMENT

1. Unplug the range.
2. Remove the oven racks.
3. Remove the screws from the bake element bracket, pull the bake element forward, and disconnect the wire connectors from the terminals.



TESTING THE BAKE ELEMENT

1. Set the ohmmeter to the R x 1 scale.
2. Touch the meter leads to the terminal connectors of the bake element. The meter should indicate between 20 - 22 Ω .

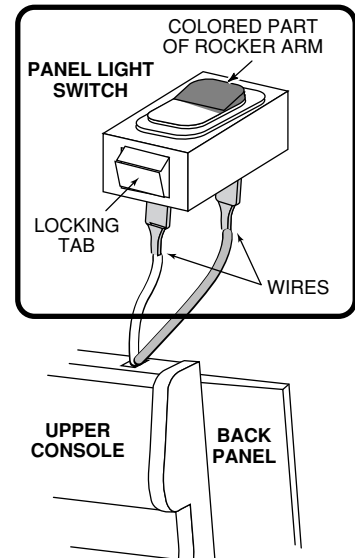


REMOVING THE PANEL LIGHT SWITCH

1. Unplug the range.
2. Remove the rear panel from the range.
3. Remove all wires from the switch terminals.
4. Press the locking arms against the body of the switch and push it out of the upper console.

TESTING THE PANEL LIGHT SWITCH

1. Operate the switch and check it for continuity.

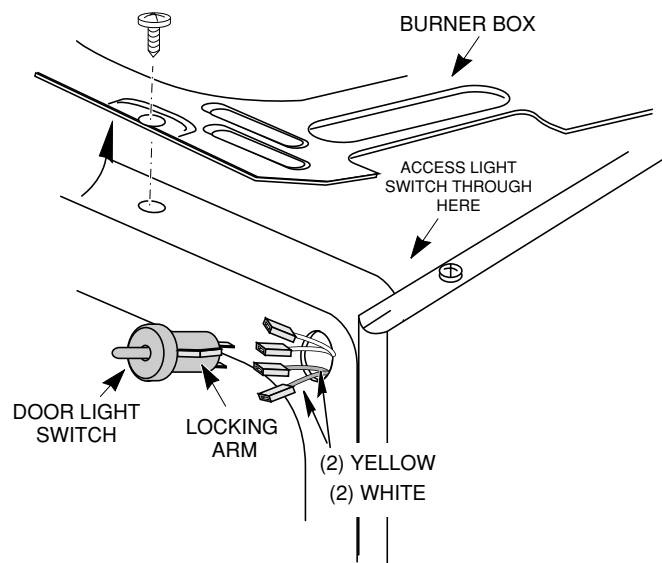


REMOVING THE DOOR LIGHT SWITCH

1. Unplug the range.
2. Lift the cooktop and remove the screws from the burner box that are necessary to lift it and access the door light switch. **IMPORTANT: Do not overbend the burner box at the back or you will crack the enamel finish.**
3. Push the old door light switch out of the cutout and disconnect the wires from the terminals.

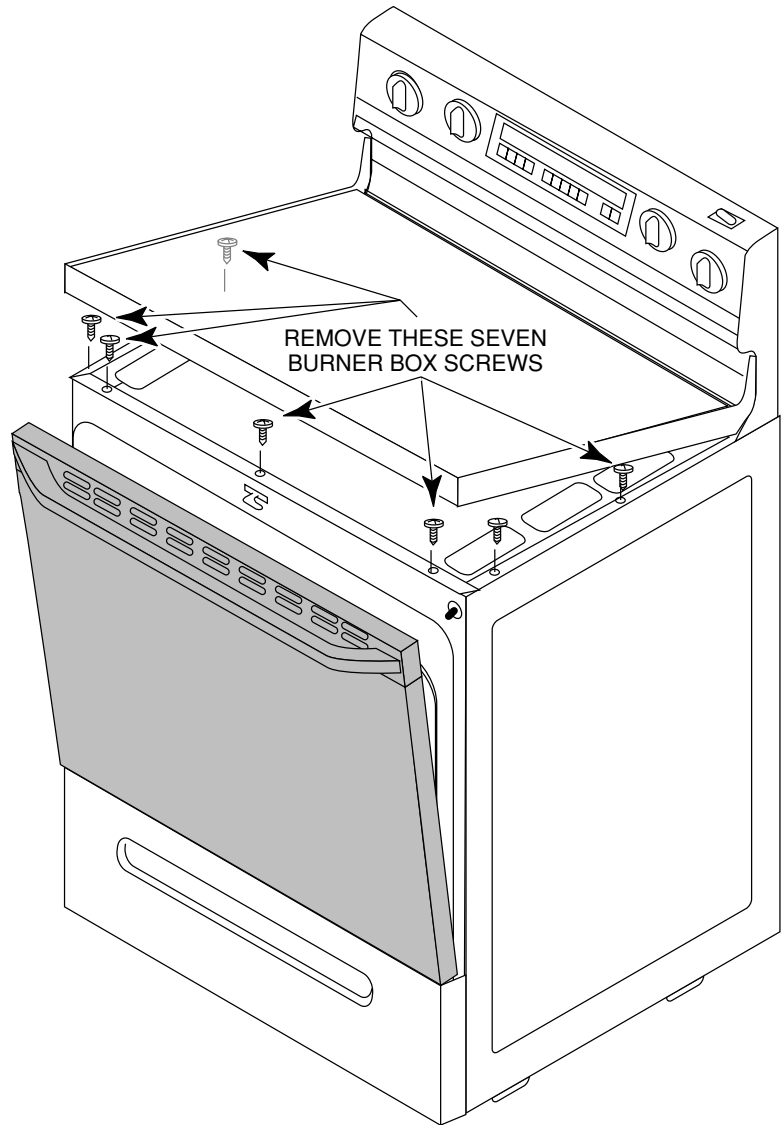
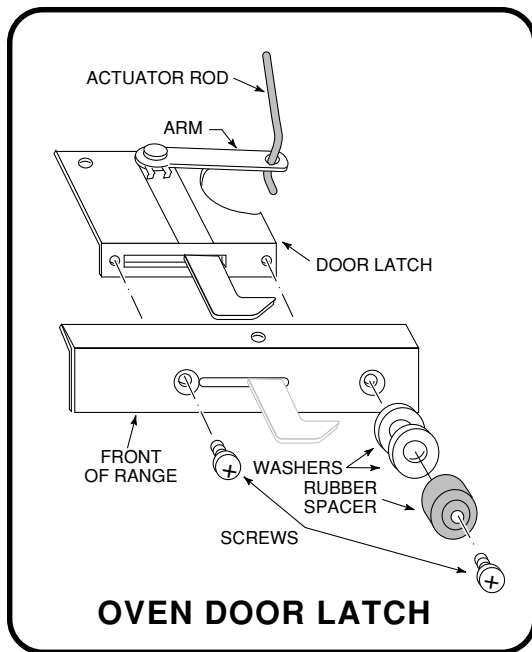
TESTING THE DOOR LIGHT SWITCH

1. Operate the switch and check it for continuity (yellow wires are **normally-open** contacts; white wires are **normally-closed** contacts).

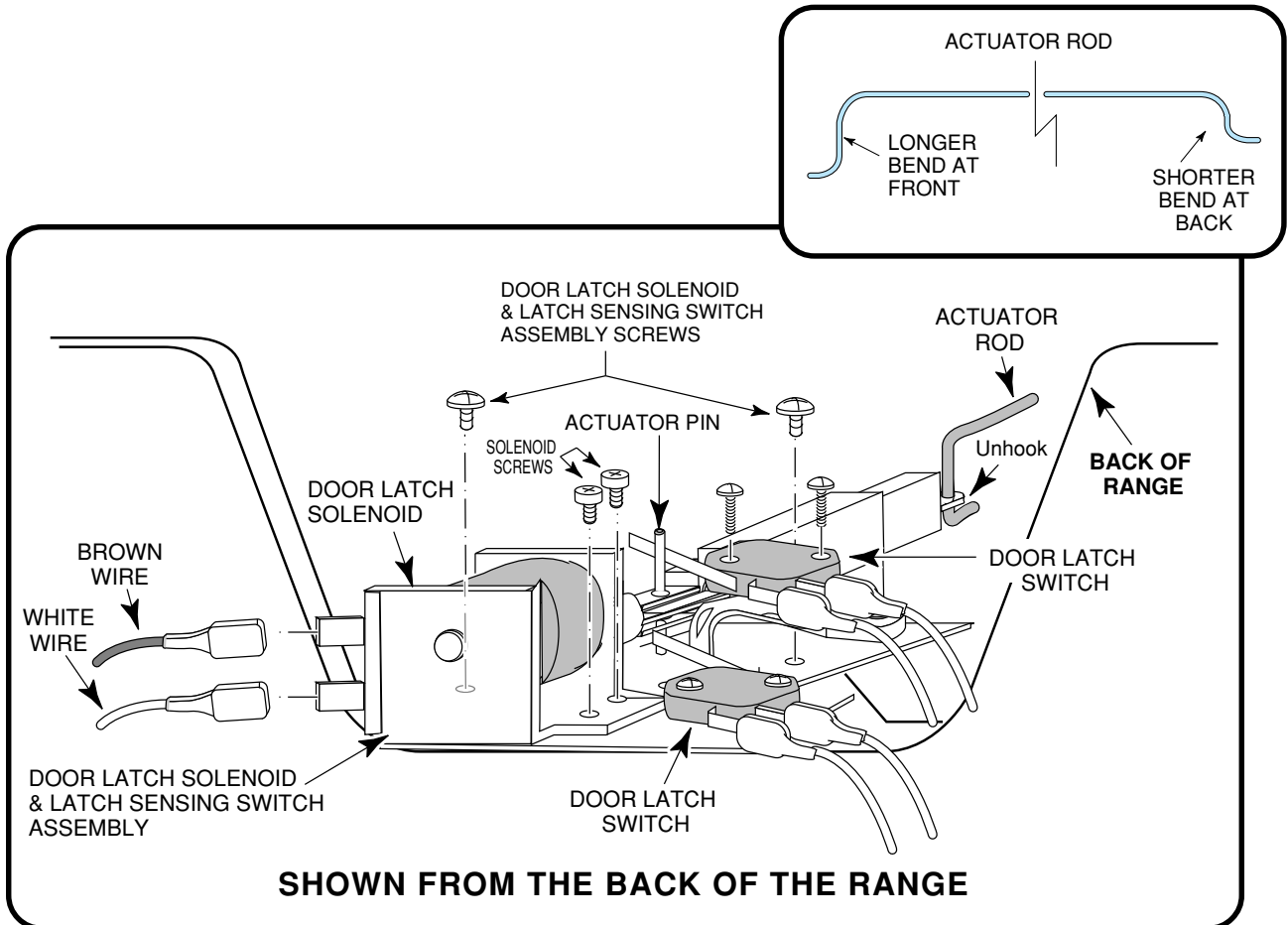


REMOVING THE OVEN DOOR LATCHING MECHANISM

1. Unplug the range.
2. Lift the front of the cooktop so the support arms lock.
3. Remove the screws from the burner box and remove the burner box from the range.
4. Remove the two oven door latch mounting screws from the front of the range.
5. Unhook the actuator rod.
6. Remove the oven door latch.



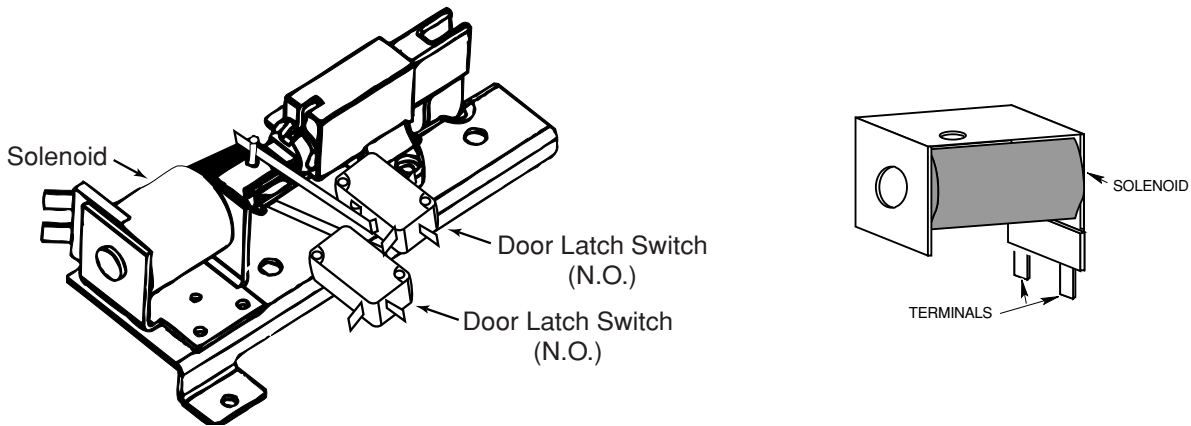
7. From the back of the range, remove the screws from the latch mechanism.
8. Unhook the arm from the actuator rod on the latch mechanism.
9. **To remove the solenoid**, disconnect the two wires from the solenoid terminals and remove the two screws from the bracket.
10. **To remove a switch**, disconnect the wires from the terminals and remove the two screws from the switch body.



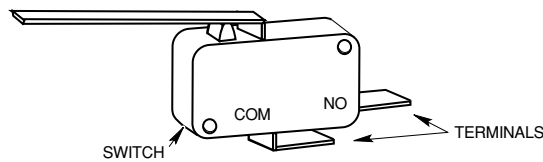
TESTING AN OVEN DOOR LATCH

To test the solenoid windings, perform the following steps:

1. Unplug the range.
2. Set the ohmmeter to the R x 1 scale.
3. Remove the wire from either solenoid terminal.
4. Touch the ohmmeter leads to the terminals of the solenoid. You should obtain a reading of between 50 - 55 Ω .

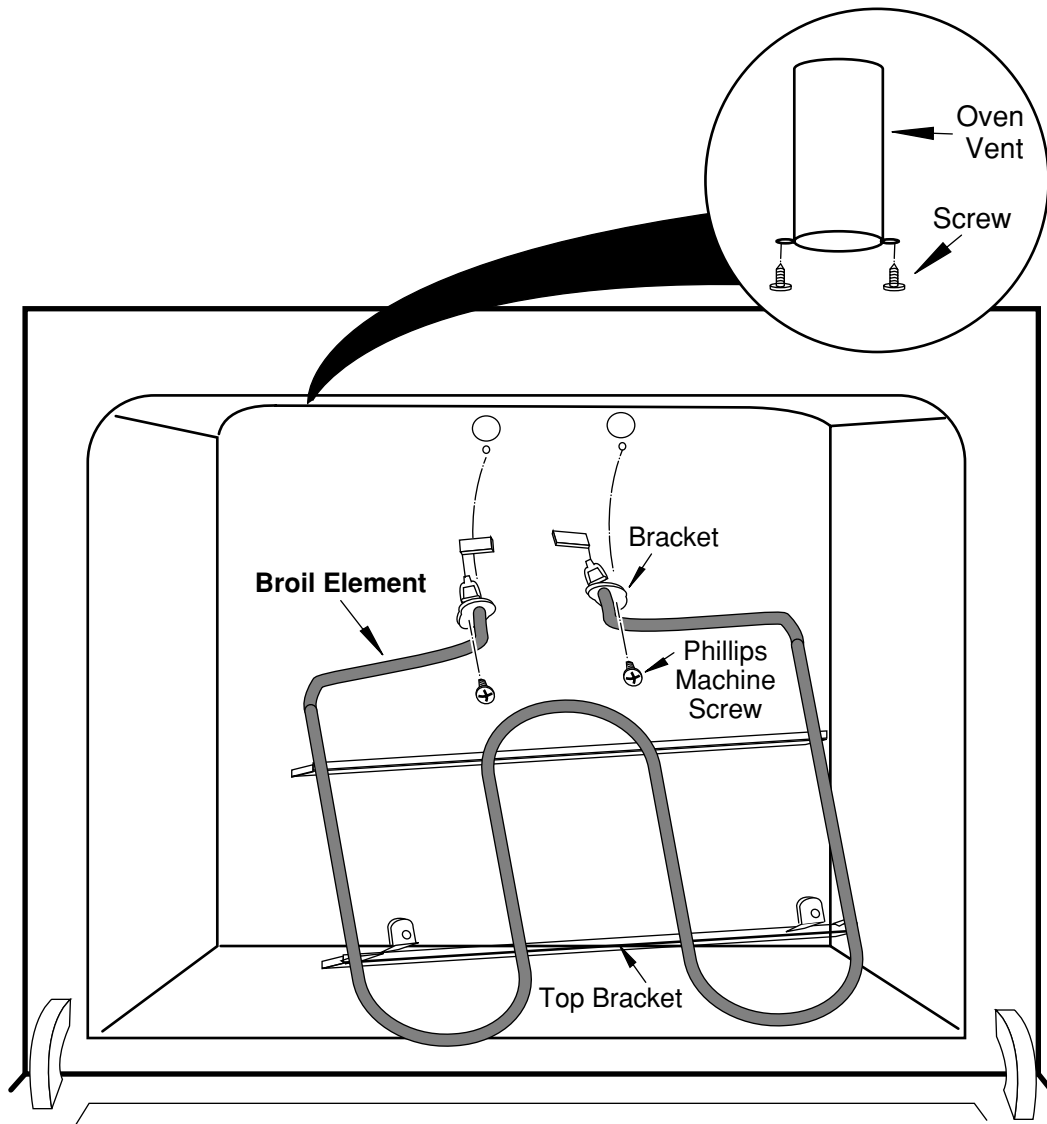


5. Disconnect the wires from the switch terminals.
6. Set the ohmmeter to the R x 1 scale.
7. **For the normally-open switch,** connect the ohmmeter leads to the two terminals and check for an open circuit. The ohmmeter should indicate infinity (∞).
8. Close the switch and the ohmmeter should now indicate continuity (0 Ω).



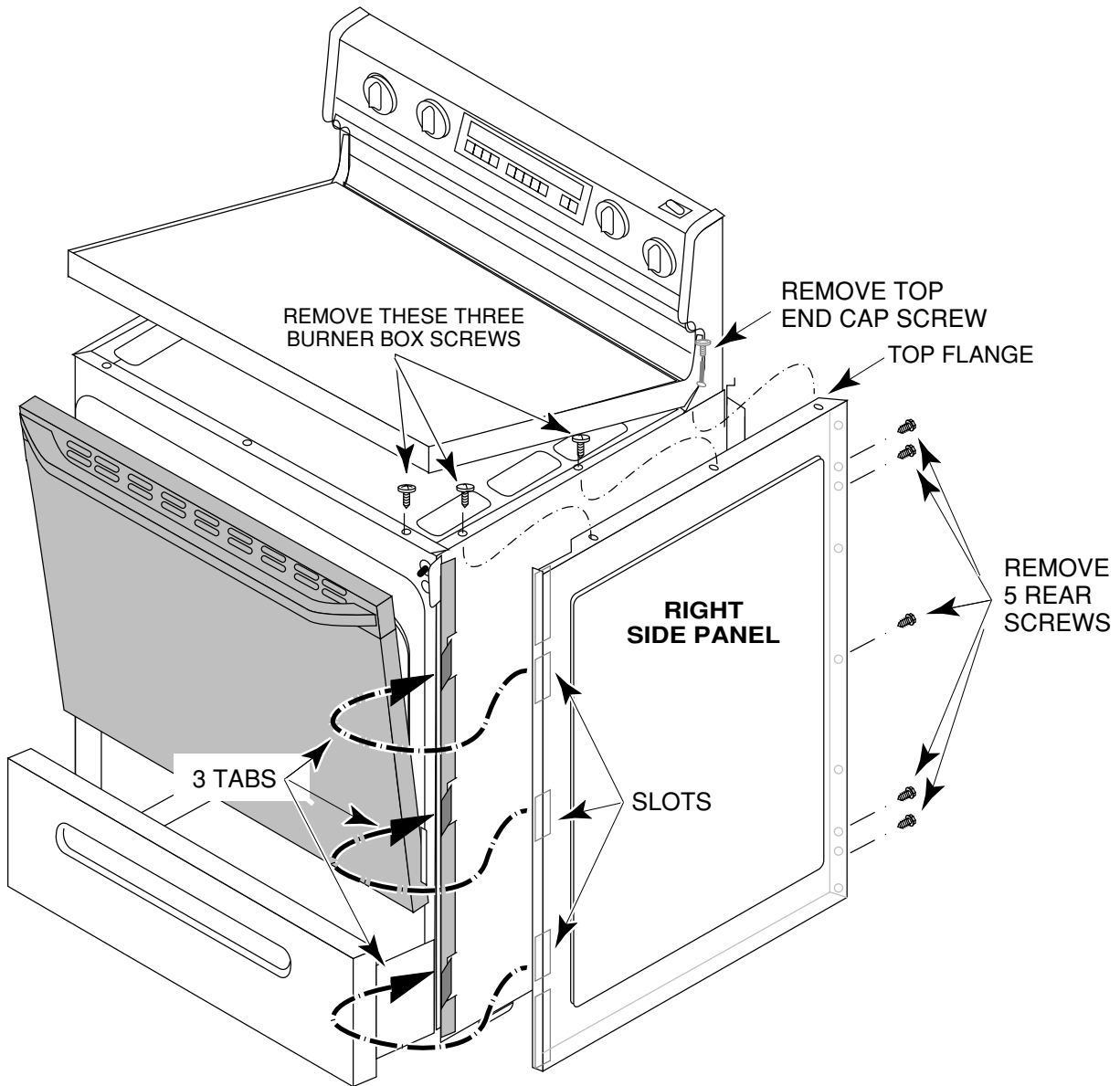
REMOVING THE OVEN VENT

1. Unplug the range.
2. Remove the broil element.
3. From inside the oven, remove the screws from the oven vent and pull it down into the oven to remove it.



REMOVING A SIDE PANEL

1. Unplug the range.
2. Lift the cooktop.
3. Remove the mounting screws from the top and rear of the side panel.
4. Open the oven door and pull the storage drawer out several inches.
5. Pull the rear of the side panel away from the range, push it forward, and unhook the three tabs from the slots at the front of the range.



Performance Check

1. Remove the oven door.
2. Remove and test the broil element.
3. Remove and test the bake element.
4. Remove and test both oven light switches.
5. Remove the door latch.
6. Remove and test the solenoid and switches on the door latching mechanism.
7. Locate the oven vent.
8. Remove a side panel.

– Section 3 –

THEORY OF OPERATION

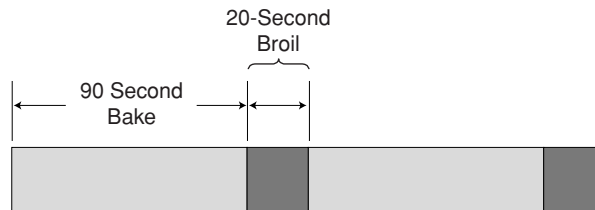
The Bake Function

When the range is plugged in, line voltage from the L1 side of the line is available to the electronic control. To start the Bake function, set the control as follows:

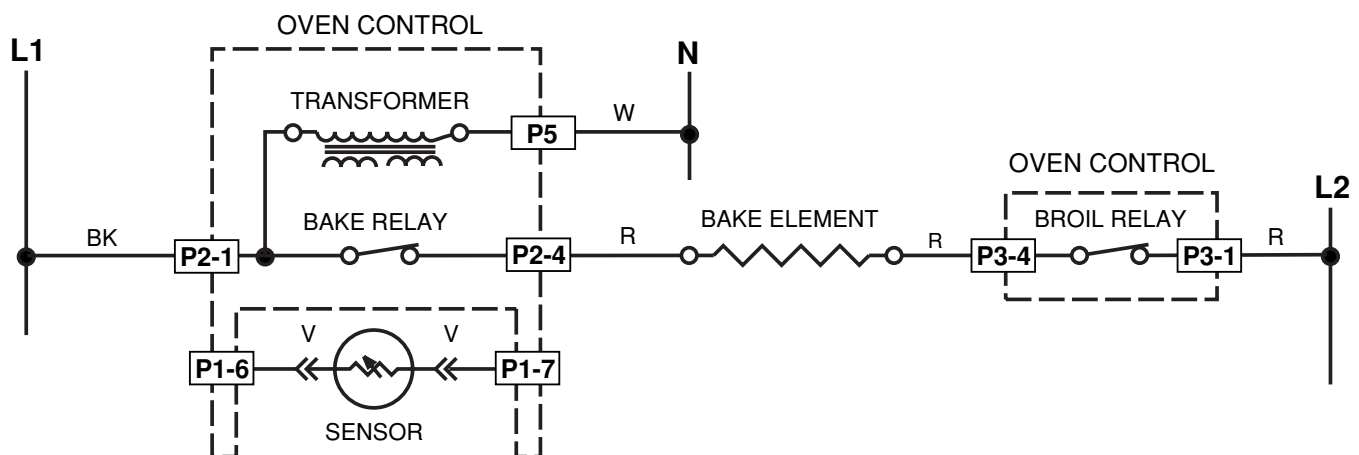
1. Press the BAKE keypad and 350° will be displayed. If you wish to set the oven to a different temperature, press the TEMP Up (▲) and Down (▼) keypads until the desired temperature is displayed.
2. Press the START/ENTER keypad.

As the electronic oven control is set, relays on the microcomputer board are activated to complete a 240 volt alternating current (VAC) circuit from the L1 to L2 side of the line. During that time, the following events occur:

- The Bake relay closes, and current from the L1 side of the line becomes available to the Bake element. The normally closed contact of the broil element is needed to complete this circuit.
- The Bake system cycles on a 110 second cycling mode. For the first 90 seconds of the cycling mode, the Bake element is on. For the last 20 seconds of the cycle, the Broil element is on to provide heat from the top of the oven (top heat).



- This cycling mode will continue throughout the baking cycle. The cycling mode can be interrupted in one of two ways: with the electronic clock at the end of the Cook function, or by the oven temperature sensor when the oven reaches its set temperature.



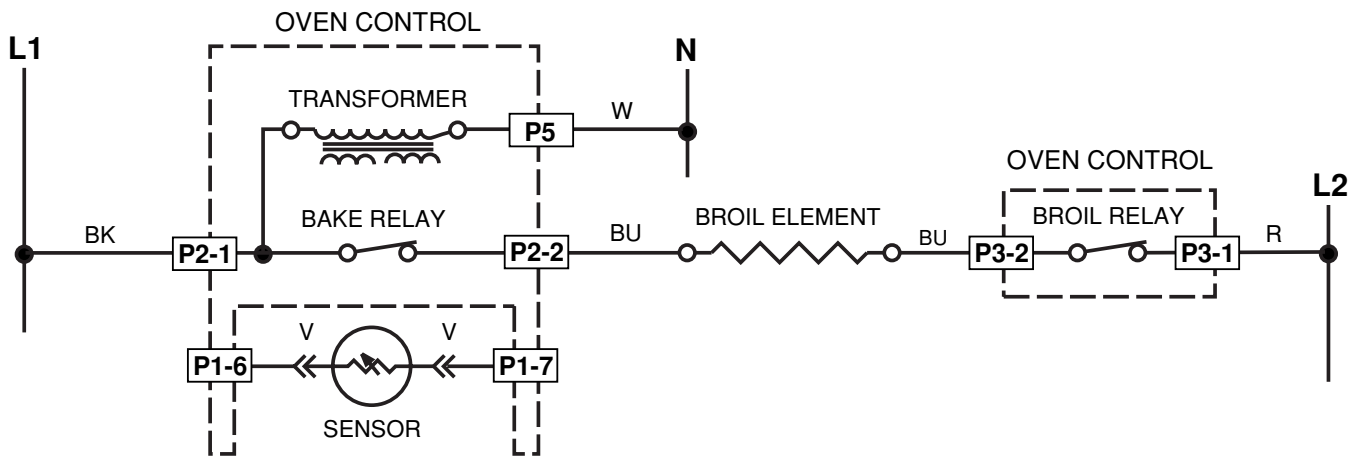
The Broil Function

The Broil function operates just like the Bake function, except that only the Broil element operates during the cycle. The cycle uses the normally-closed contacts of the Bake relay to provide the 240 VAC circuit. The Bake element does not operate during the Broil mode.

Use the following procedure to set the Broil function:

1. Press the Broil keypad and 500° will be displayed. If you wish to "Custom Broil," press the TEMP Up (\blacktriangle) and Down (\blacktriangledown) keypads until the desired temperature is displayed.
2. Press the START/ENTER keypad.

When normal broiling is selected, (oven door open to the "Broil" position and the oven temperature set for 500°), it will take approximately 15 minutes before the oven sensor cycles the oven.

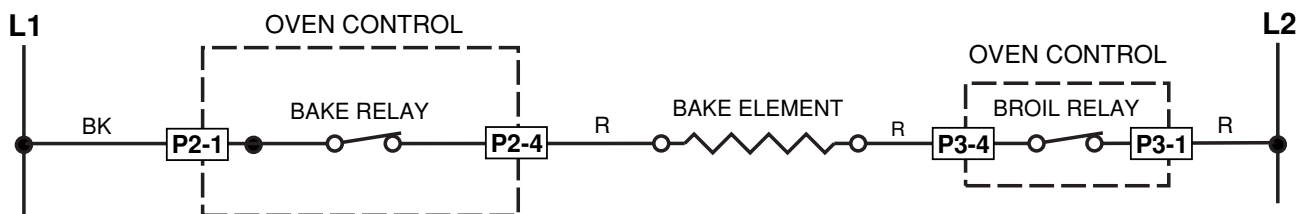


The Clean Function

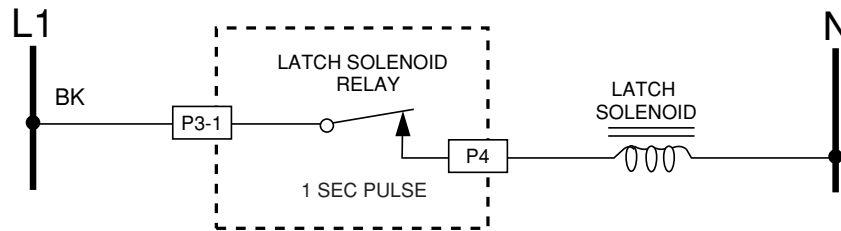
During the oven Clean cycle, the Bake element is used to bring the oven temperature up to approximately 875° (see the following illustration). The Broil element is not used. The oven door must be locked during the time that temperatures are above 600° .

Use the following procedure to set the Clean function:

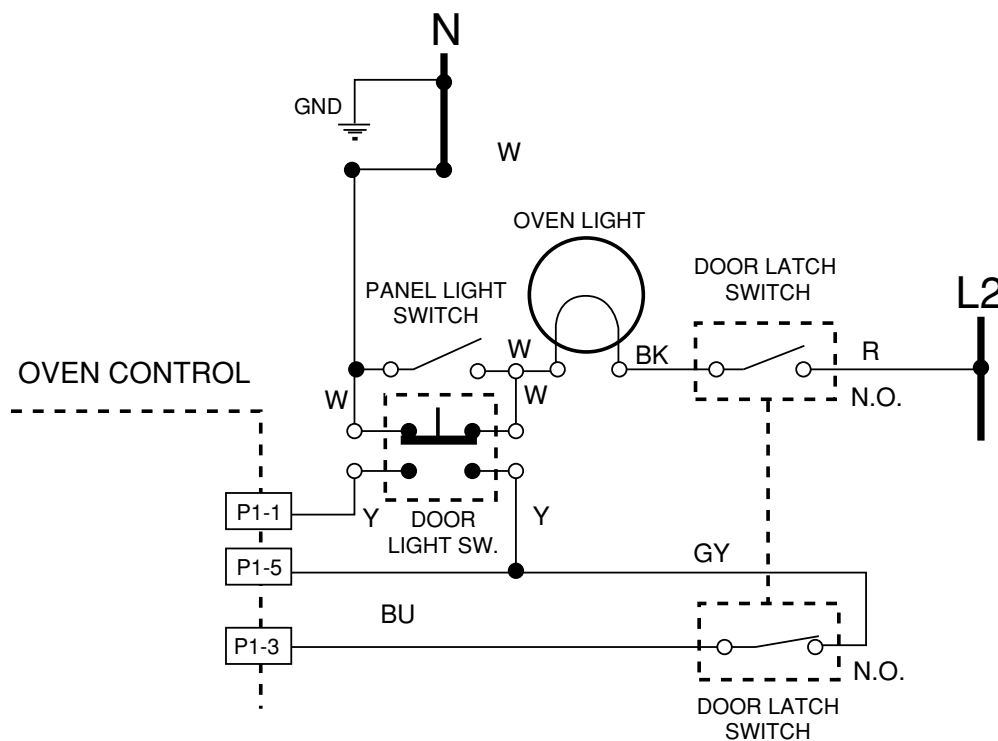
1. Press the CLEAN keypad and $3:00$ will be displayed. The Clean cycle is now set to operate for three hours. If a different time (between 2 and 4 hours) is desired, press the TEMP/TIME Up (\blacktriangle) and Down (\blacktriangledown) keypads until the desired time is displayed.
2. Press the START/ENTER keypad and the following events will occur:
 - The Bake relay will close, and provide 240 volts AC through the Bake element. The Broil element is not used during the Clean cycle so that the oven temperature does not rise too quickly and cause porcelain damage to the oven liner.



- The latch solenoid relay closes for 1 second, and provides a 120 VAC pulse to the latch solenoid, which immediately locks the oven door.



- As the latch solenoid locks the door, it also activates the two door latch switches. Both switches are normally-open switches. The lower switch is closed when the solenoid moves to lock the door, and provides a logic circuit back to the electronic control board to indicate that the Clean cycle can safely continue.
- The upper switch is held closed during normal operation to provide a circuit for the oven light. However, when the Self-Clean cycle is operating and the solenoid closes, it opens the switch, and deactivates the oven light circuit.



- When the oven temperature reaches 600°, the oven door cannot be opened until the oven cools down to below 550°. At that point, the latch solenoid relay will close for just a second, and provide a 120 VAC pulse to the latch solenoid. This unlocks the door and toggles the door latch switches to their normal state.

– Section 4 –

WIRING DIAGRAM, DIAGNOSIS CHARTS, & ERROR CODES

Wiring Diagram

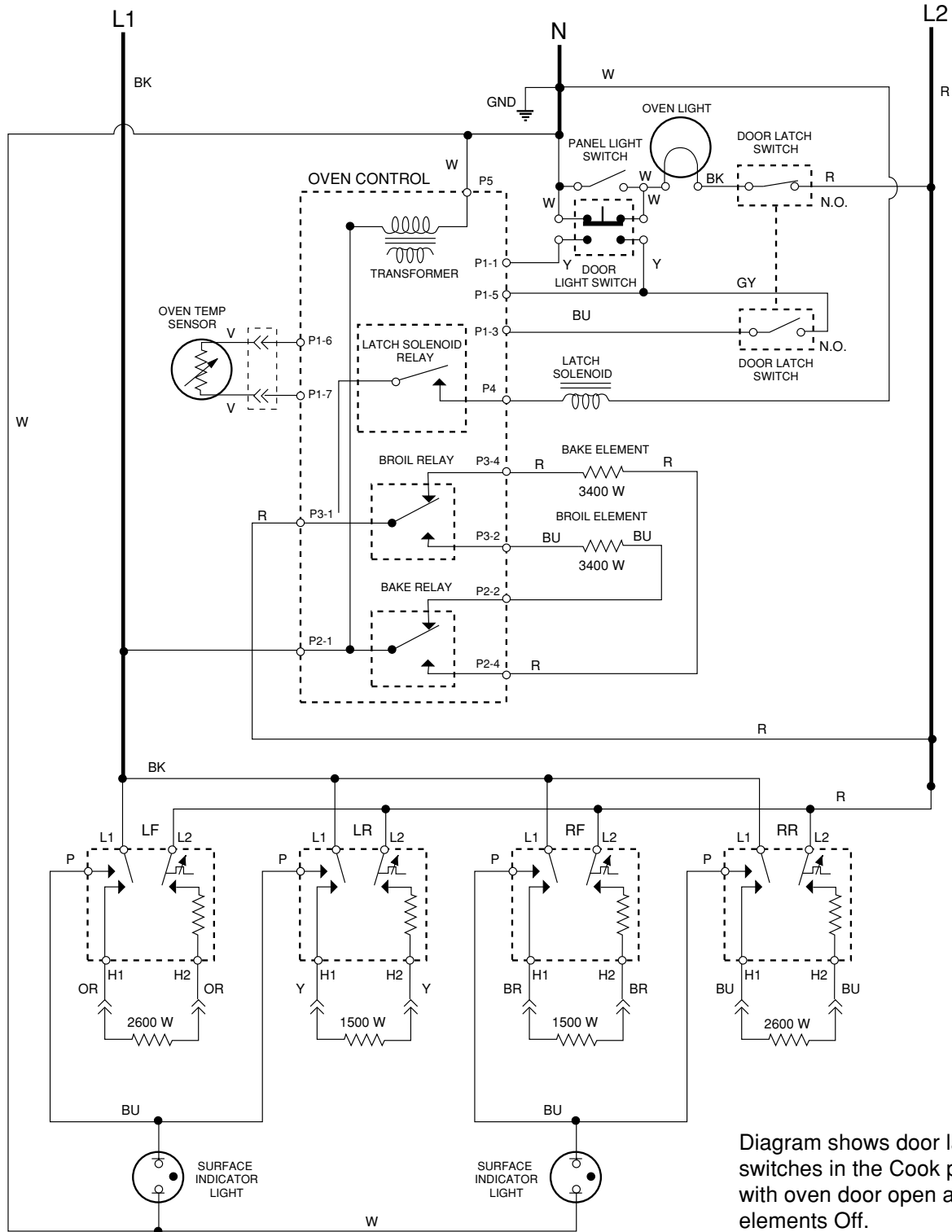


Diagram shows door latch switches in the Cook position with oven door open and elements Off.

Diagnosis Charts

! WARNING

Certain procedures in this section require electrical tests or measurements while power is applied to the range. Exercise extreme caution at all times. If test points are not easily accessible, unplug the range, attach the test equipment, and reapply power for the test.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Oven element smokes when first turned on.	This is normal on a new range. The factory-applied protective coating is burning off. Substance (e.g. food or other material) has spilled onto the element.	Protective coating will burn off in several minutes. Fumes are nontoxic. Let element cool then clean according to Use & Care instructions.
Oven element does not heat.	No line voltage. Loose or bad wiring. Defective element.	Check circuit breaker. Check wiring (see wiring diagram). Check element.
Cooktop element barely heats.	Low line voltage. Loose or bad wiring connection at element or terminal block. Defective cooktop infinite switch.	Line voltage should be minimum 220-volts ± 10 VAC. If necessary, electrician should repair cause for low line voltage. Check wiring (see wiring diagram). Check switch.
Cooktop element will not heat higher than low-medium.	Low line voltage. Defective cooktop element.	Line voltage should be minimum 220-volts ± 10 VAC. Electrician should repair cause for low line voltage. Check element.
Cooktop element heats up normally, but drops to lower setting automatically.	Customer using improper cookware. Defective cooktop infinite switch.	Evaluate suitability of cookware. Check switch.

PROBLEM	POSSIBLE CAUSE	SOLUTION
Surface indicator light does not operate.	Loose or bad wiring to indicator light. Defective indicator light. Defective cooktop infinite switch.	Check wiring (see wiring diagram). Check indicator light. Check switch.
Oven will not bake.	Bake element is defective. Defective electronic control. Loose or bad wiring.	Check bake element. Check control. Check wiring (see wiring diagram).
Oven does not broil.	Broil element is defective. Defective electronic control. Loose or bad wiring.	Check broil element. Check control. Check wiring (see wiring diagram).
Overheating or "runaway" oven.	Defective oven sensor. Defective electronic control.	Check sensor. Check control.
Premature burnout of bake element.	Improper use of oven (e.g. being used to heat the home).	Use oven for baking only.
Damaged oven door gasket.	Improper cleaning.	Do not use harsh abrasives or scouring pads. See Use & Care instructions.
Food is burnt on bottom but not cooked on top.	Defective broil element. Defective electronic oven control. Loose or bad wiring.	Check broil element. Check control. Check wiring (see wiring diagram).

Error Codes

The microcomputer contains self-diagnostic codes that will be displayed on the control panel whenever a failure occurs when using the range. Each code can be cancelled by pressing the OFF/CANCEL keypad. The code will return if the user attempts to use the range before the failure has been corrected. All error code data is shown on the next page.

Display		Likely Cause	Corrective Action
F1	E0 E1 E2	EEPROM communications. EEPROM checksum failure. UL A/D error(s).	<ol style="list-style-type: none"> 1. Use the CANCEL/OFF keypad and verify the failure (if not displayed). 2. Disconnect the power for at least 30-seconds and re-check.
F2	E0 E1	Shorted keypad. Keypad cable unplugged.	<ol style="list-style-type: none"> 1. Use the CANCEL/OFF keypad and verify the failure (if not displayed). 2. Disconnect the power for at least 30-seconds and re-check. 3. Make sure that keypad cable is plugged in and seated in connector on back of control. 4. Reapply power and observe for a minimum of 1-minute. 5. If failure remains, replace the control.
F3	E0 E1 E2 E3	Oven sensor opened. Oven sensor shorted. Bake range overtemp. Clean range overtemp.	<ol style="list-style-type: none"> 1. Measure the sensor value between the connector pins. You should measure $1100\Omega @ 75^{\circ}\text{F}$. If the measurement is not correct, replace the sensor, and refer to steps 3 through 5. Also measure from the sensor connector to the sensor casing for a possible short. 2. Trace the wires and connectors to the sensor from the control, then from the sensor back to the control. If all connections are okay, and there is no wire damage, reference step 3 through 5. 3. Disconnect the power for at least 30-seconds. 4. Reapply power and observe for a minimum of 1-minute. 5. If failure remains, replace the control, and then repeat step 4.
F5	E0 E1 E1	Door & latch switches do not agree. Solenoid not operating or latch switch failure. Latch during clean error.	<ol style="list-style-type: none"> 1. If the door is latched: <ol style="list-style-type: none"> a) Disconnect power and check wires and connectors from the control to the door switch, then from the door switch to the control. If okay, proceed to step b). b) Replace the door switch. c) Reapply power and observe for a minimum of 1-minute. 2. If the door is not latched: <ol style="list-style-type: none"> a) Disconnect power and check wires and connectors from the control to the latch switch, then from the latch switch to the control. If okay, proceed to step b). b) Repeat step a) for the door switch. 3. Measure the door switch. The door open = switch open small low voltage terminals. 4. Measure the latch switch. Unlatch = switch open. CAUTION: The oven light contacts are closed. 5. If corrections are made, reconnect the control and verify the operation. 6. If the failure remains, replace the control.