9-056-694-00 (5053)

OPERATION MANUAL

COLE-PARMER

VACUUM OVENS

MODELS 5053-10 5053-12
5053-20 5053-22
-20

Cole-Parmer Instrument Company
7425 North Oak Park Avenue, Chicago, Illinois 60648
312/647-7600

SPECIFICATIONS

TEMPERATURE RANGE

Slightly above ambient to 220°C, all models.

THERMOMETER

Bimetallic, dial type; range is 0°C to 300°C in 5°C increments.

ELECTRICAL REQUIREMENTS

5053-10 . . . . . 120 VAC, 50/60 Hz, 600 Watts

5053-12 . . . . . 240 VAC, 50/60 Hz, 600 Watts

5053-20 . . . . . 120 VAC, 50/60 Hz, 1600 Watts

* 5053-22 . . . . . 240 VAC, 50/60 Hz, 1600 Watts

WORKING CHAMBER DIMENSIONS

5053-10, 5053-12	12"L x 10"H x 10"W 30.5 x 25.4 x 25.4 cm	0.7 Cubic Feet
* 5053-20, 5053-22	20"L x 14"H x 14"W 50.8 x 35.6 x 35.6 cm	2.26 Cubic Feet

OVERALL DIMENSIONS

5053-10, 5053-12	16-1/4"L x 15-1/2"H x 20"W 41.3 x 39.4 x 50.8 cm
5053-20, 5053-22	25"L x 21-1/4"H x 25-1/8"W 63.5 x 53.9 x 63.8 cm

FEATURES

FRONT VIEW

1. Power Switch.

   Lighted switch turns power on and off to the unit. Switch has a built-in circuit breaker.

2. Control Thermostat with Pilot Light.

   Hydraulic thermostat controls oven temperature from just above ambient up to 220°C. The pilot light is on when the oven is heating; off when power to heaters is off. A fixed setpoint bimetallic thermostat limits maximum temperature to approximately 250°C, if the control thermostat should fail.

3. Vacuum Gauge.

   Gauge displays chamber vacuum level from 0 to 30 inches of mercury.

4. Vacuum/Vent Valve.

   Three-position valve allows vacuum to be drawn, held and released.

5. Hose Connectors.

   Two nickel-plated brass hose connectors accept 1/4" ID flexible tubing. Ports are marked "evacuate" and "vent".

6. Protective Grid.

   Steel grid protects glass from stray blows which could cause the glass window to implode under vacuum.

7. Glass Door.

   Tempered glass door allows clear view of oven contents and dial thermometer.

INSTALLATION

1. LOCATION

Place the oven in a location away from drafts and free of wide temperature shifts. Leave enough space around the oven for the free circulation of air. Heat escaping through the oven walls must be carried off by normal convection. Avoid placing the oven near open windows, radiators and ventilators. The oven must not be placed on a combustible surface.

2. VACUUM PUMP CONNECTIONS

Connect 1/4-inch ID vacuum hose to the left hose connector marked "evacuate". Connect the other end of the hose to a vacuum pump.

3. SHELVES

The shelf assembly is already installed in the oven.

4. ELECTRICAL POWER

Turn the power switch to the "off" position. Plug the power cord into a receptacle that provides the power characteristics specified on the unit's nameplate.

5. LOADING THE OVEN

Distribute the load evenly around the chamber to obtain the most efficient evacuation. There should be at least a one-inch clearance between the walls and the load. Avoid spilling acids in the chamber. Do not place flammable solvents or vapors in the oven. Take precautions against heating substances above auto-ignition temperature. While the oven door is open, apply a high-quality vacuum grease to the door gasket.

6. THERMOMETER

Place the dial thermometer (supplied with the oven) on the top shelf. The dial will be visible through the oven window.

OPERATION

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* DANGER: Do not use in the presence of flammable or combustible *
* materials or explosive gases. Do not use in the presence of *
* pressurized or sealed containers. Fire or explosion may result, *
* causing death or severe injury. *
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* WARNING: Do not heat any substance above a temperature which will *
* cause it to emit toxic fumes. Death or severe injury may result. *
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1. EVACUATE THE CHAMBER

Turn the Vacuum/Vent Valve so the handle points to "evacuate". Turn on the vacuum pump.

Observe the Vacuum Gauge. As the level of vacuum in the chamber increases, the gauge needle will indicate level of vacuum drawn.

When the desired level is reached, turn the Vacuum/Vent Valve to the "closed" position. Turn off the vacuum pump.

2. SET THE THERMOSTAT

Turn the Power Switch on.

Turn the Thermostat knob clockwise to raise the oven temperature. The proper temperature setting will have to be estimated.

Allow time for the oven temperature to rise and stabilize.

Observe the dial Thermometer. If the temperature is too low, turn the Thermostat knob clockwise to raise the temperature. If the temperature is too high, turn the Thermostat knob counterclockwise to lower the temperature.

Allow time for the oven temperature to stabilize.

Continue making fine temperature adjustments until the desired setpoint is reached.

3. MAINTAINING PROPER VACUUM LEVEL

Over time, the vacuum level may decrease slightly. To bring the vacuum level back up, turn the Vacuum/Vent Valve to "evacuate" and start up the vacuum pump.

DESCRIPTION

Cole-Parmer's Vacuum Ovens are designed for drying under carefully controlled conditions -- normal atmosphere, vacuum up to 30" Hg or inert gas atmosphere. The oven facilitates desiccating, vacuum embedding, plating and electronic component processing. Noncorrosive, nonflammable gases such as nitrogen and carbon dioxide may be used in the oven.

All controls and connections (except electrical power) are located on the front in a vertical panel. The lighted power switch, vacuum gauge, temperature control, vacuum control valve, and nickel-plated brass hose connectors are located on the front panel for convenient operation.

The radiant warm-wall heat, with no internal exposed heaters, provides uniform heat while maximizing chamber space. Temperature is controlled by a hydraulic thermostat.

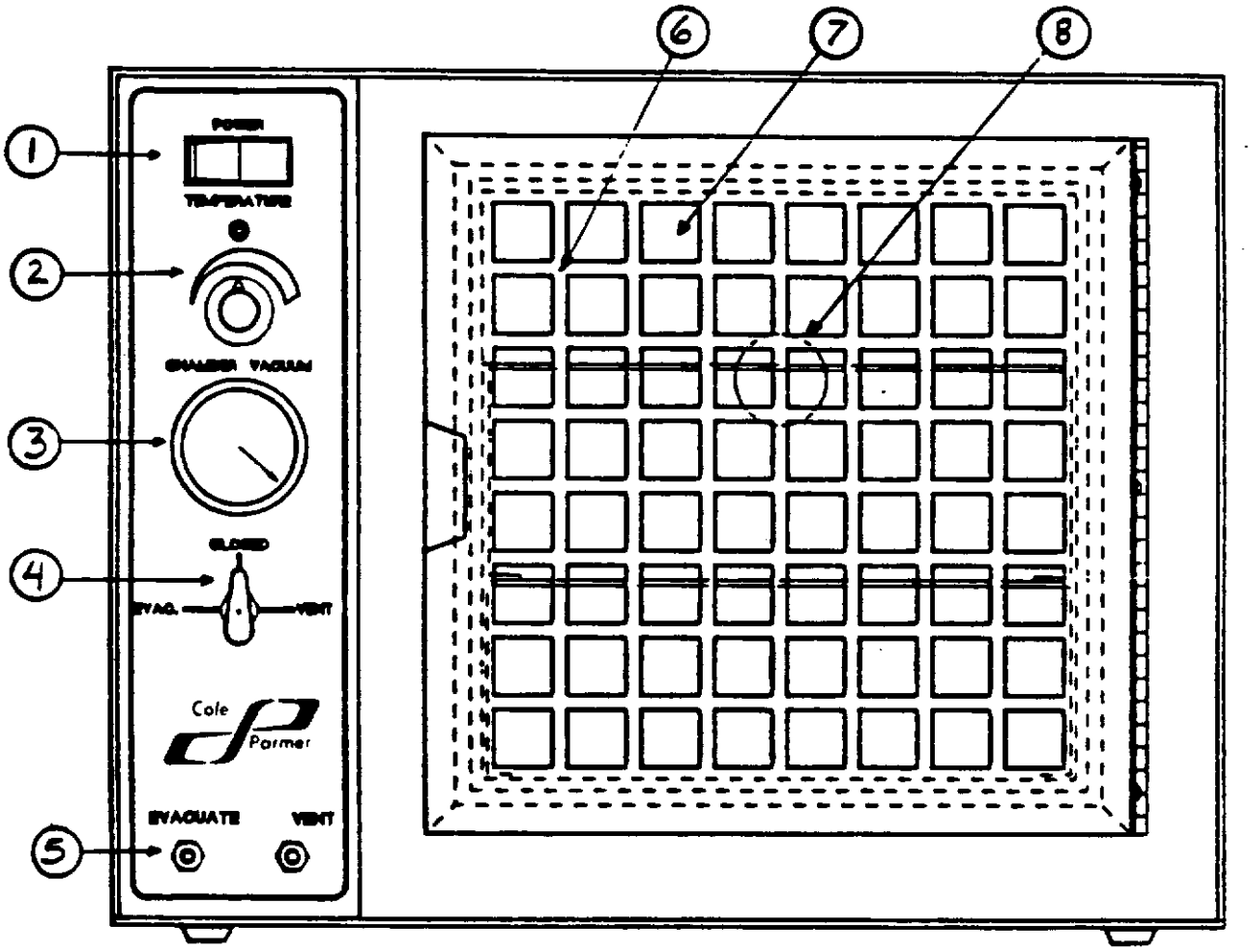
Vacuum levels are precisely controlled between 0 and 30 inches Hg. The silicone door gasket assures a tight seal at all vacuum levels. A high-strength tempered glass window, fully protected by a safety grid, allows full view of oven contents. The two aluminum shelves provide good heat conduction to samples. Shelf assembly removes for easy cleaning. Three inches of glass wool insulation throughout provides good temperature uniformity.

8. Dial Thermometer.

   Bimetallic thermometer provides quick visual temperature readings.

Figure 1

OVEN FRONT VIEW

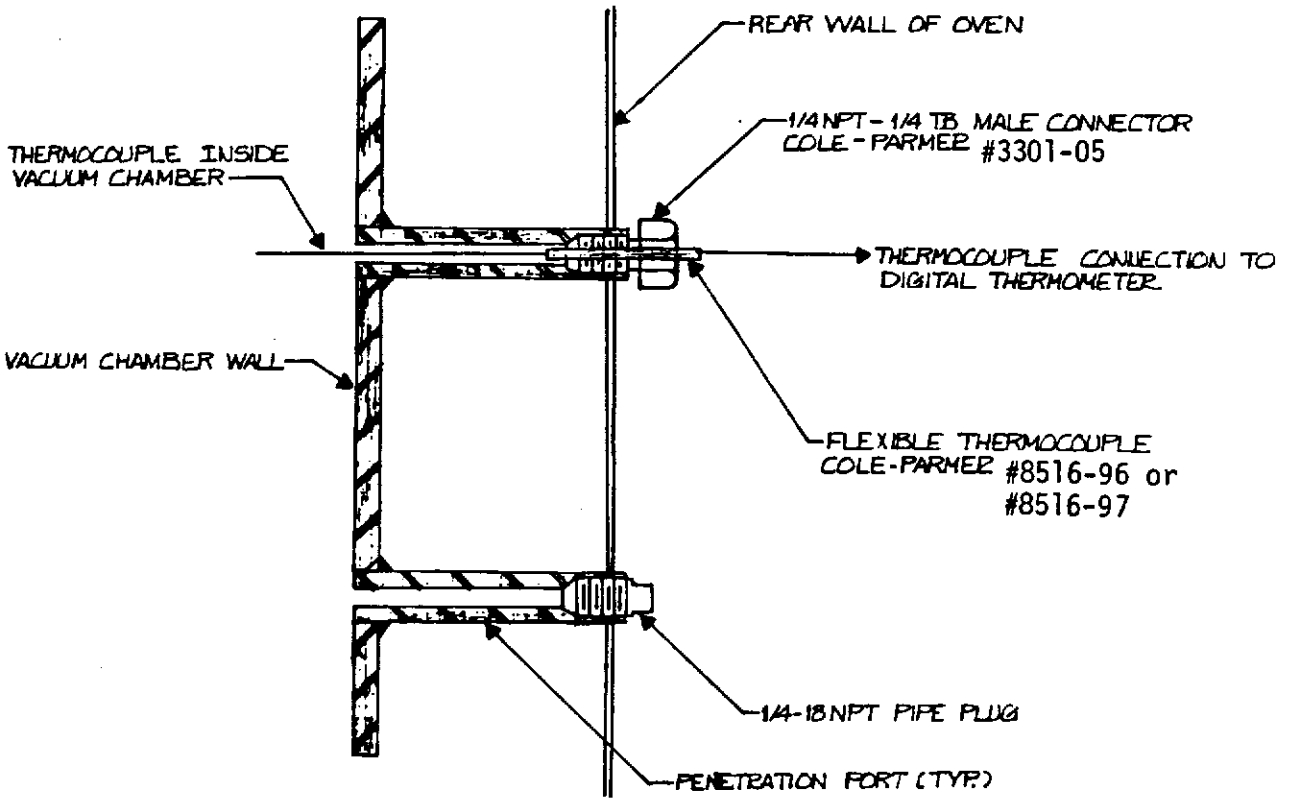


1. Lighted Power Switch
2. Control Thermostat with Pilot Light
3. Vacuum Gauge
4. Vacuum/Vent Valve
5. Hose Connectors
6. Protective Grid
7. Glass Door
8. Dial Thermometer

Cole-Parmer has an extremely flexible probe (#8516-97, ordered separately) which can reach to almost every corner of these ovens. Its unlimited flexibility allows it to be bent to any position, so that it may contact the material in the oven. If you wish only to monitor the atmospheric temperature in the oven, we recommend that you coil the probe so that it is out of the way in the rear of the oven. A diagram below shows a port with fitting and probe installed.

Figure 2

PORT AND FLEXIBLE THERMOCOUPLE



We recommend using Cole-Parmer #8527-30 Digital Thermometer as a readout for the probe temperature.

WIRING

Figure 4: Wiring Diagram 5053-10

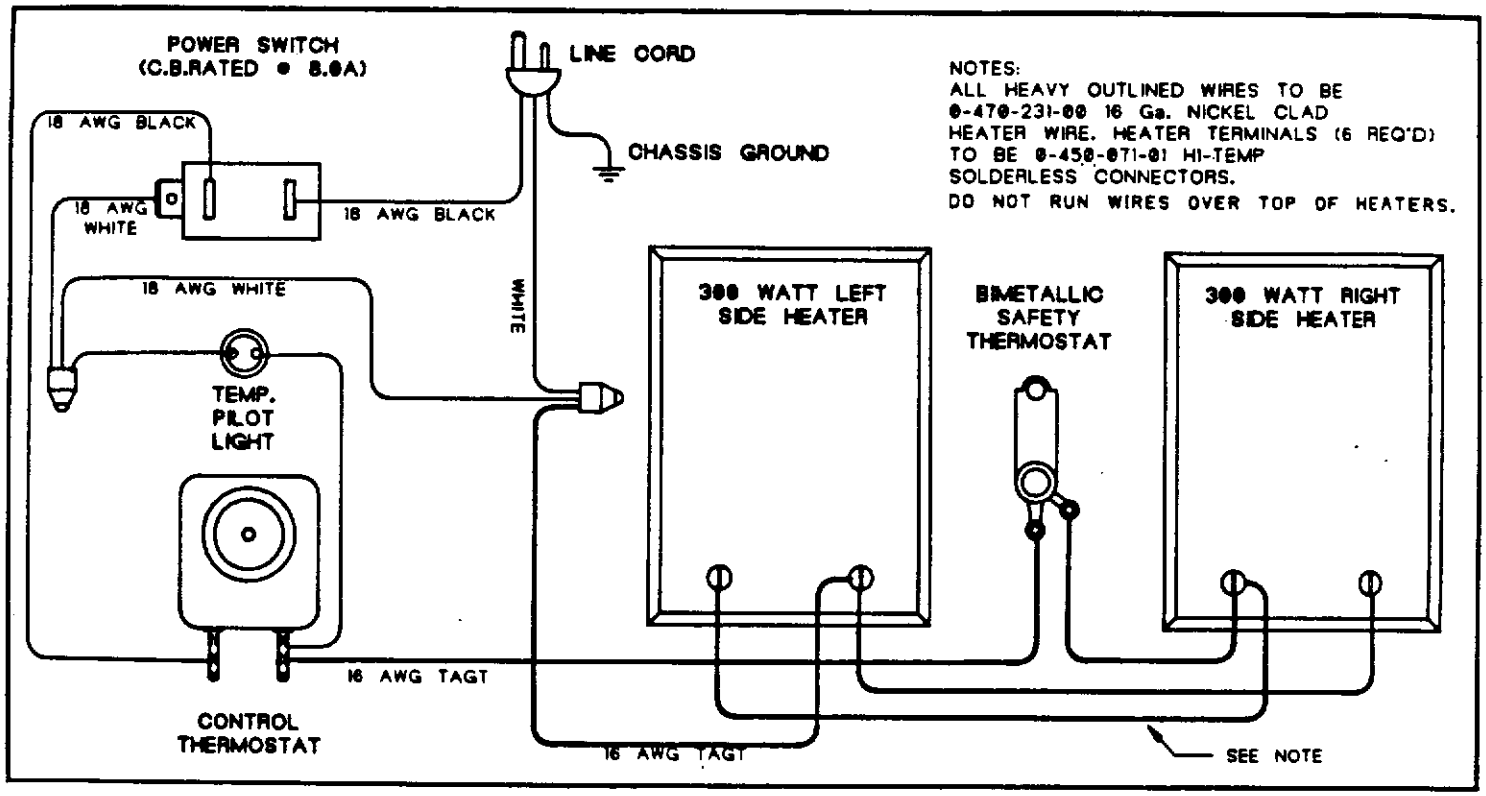


Figure 5: Wiring Diagram 5053-12

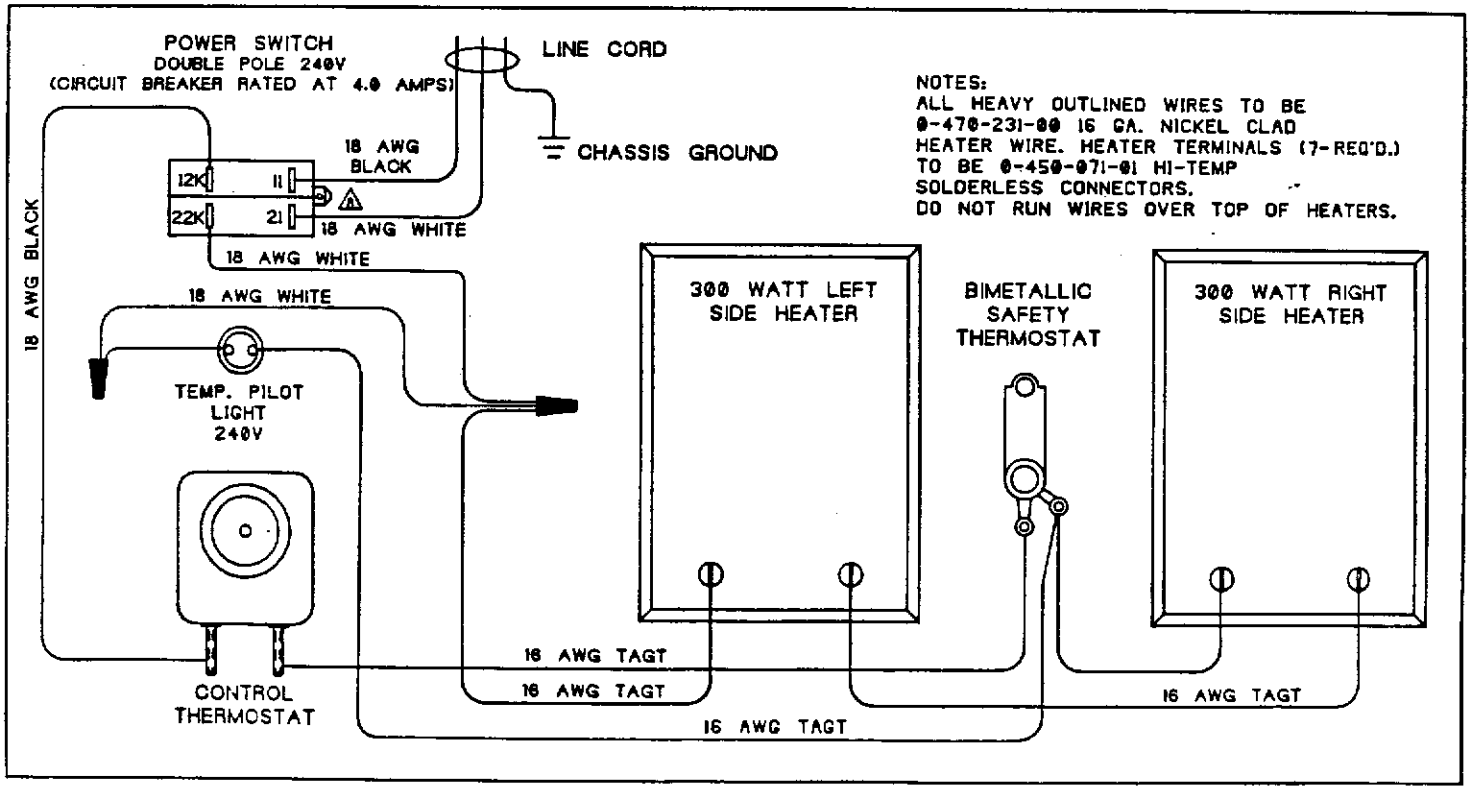


Figure 6: Wiring Diagram 5053-20

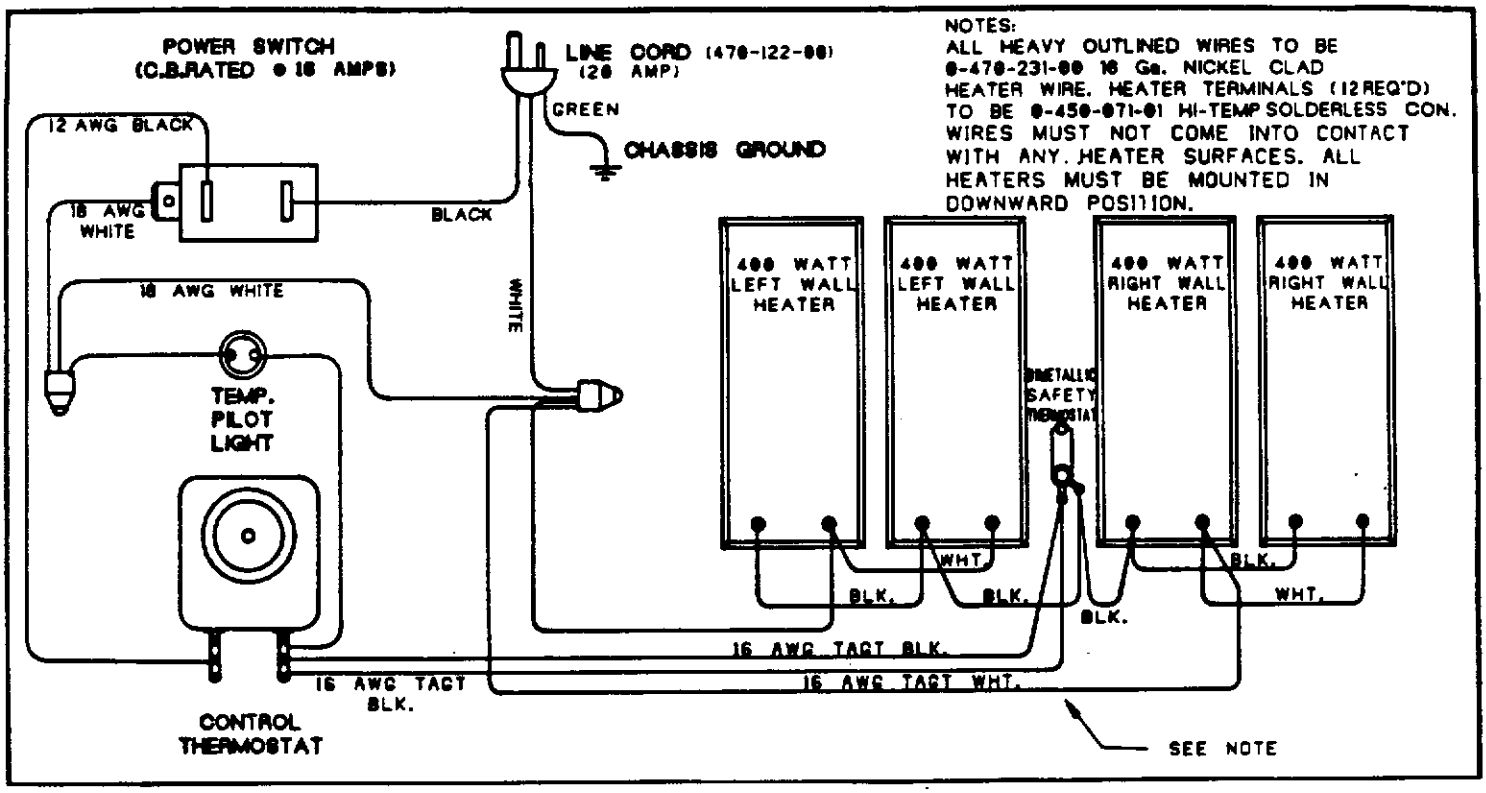
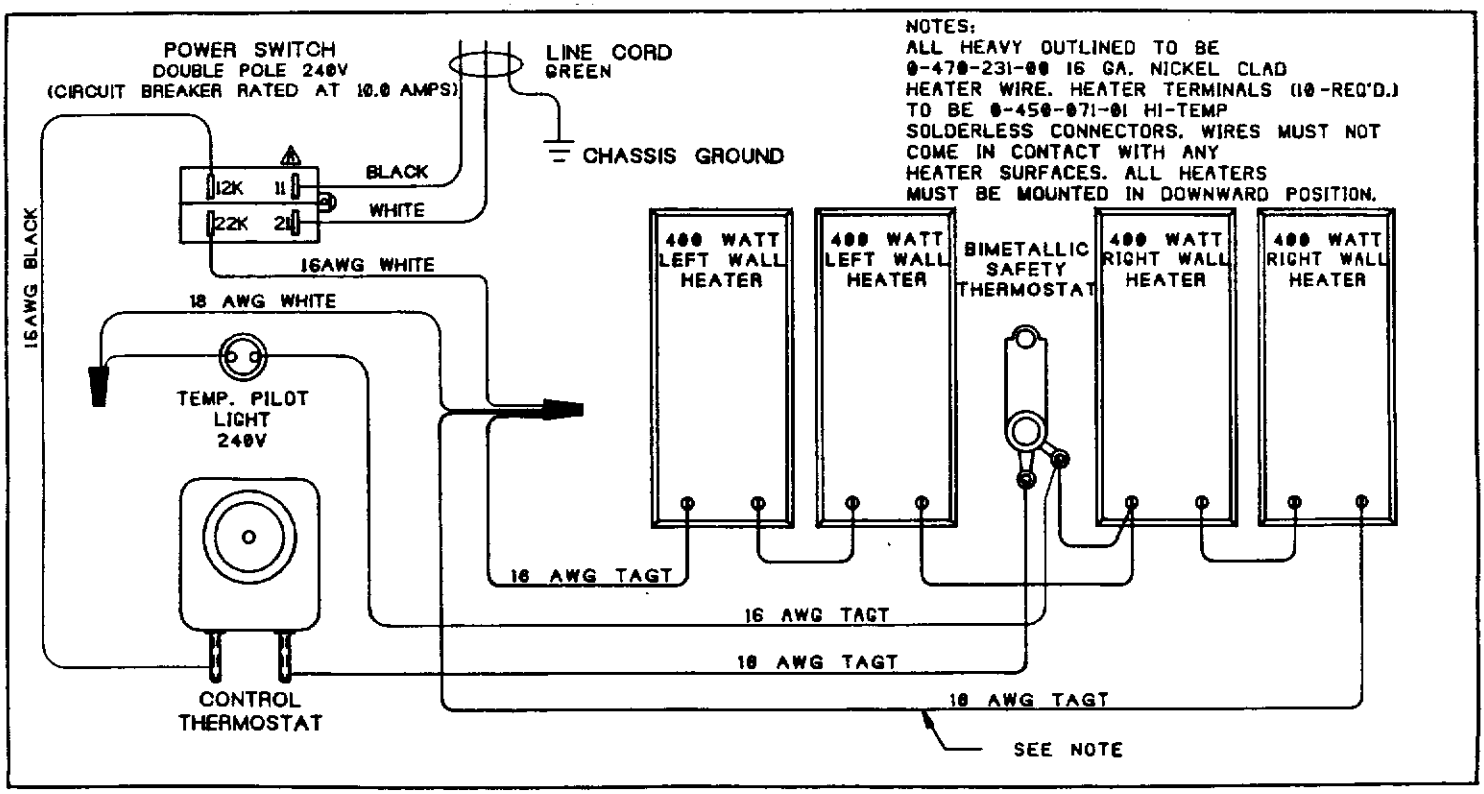


Figure 7: Wiring Diagram 5053-22



MAINTENANCE

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* Make no attempt to service or repair a Cole-Parmer product *
* under warranty before consulting Cole-Parmer. After the *
* warranty period, such consultation is still advised, *
* especially when the repair may be technically sophisticated *
* or difficult. Call Cole-Parmer if assistance is required. *
*
* No merchandise, however, should be returned directly to *
* Cole-Parmer without approval. *
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1. ROUTINE CLEANING

Keep the vents along the left side, back and bottom of the oven free of dust to assure proper air circulation. Doing so will prolong the service life of components.

Wash the baked enamel exterior with mild soapy water to remove fingerprints and smudges.

Clean up spills inside the oven chamber as soon as possible. Do not allow them to bake on. When oven is cool, use hot soapy water and a soft cloth to clean the #304 stainless steel chamber. Do not use scouring pads with metallic content, chlorine bleach or halogen-based cleaners.

The aluminum shelf assembly should be washed with a mild soap and water. Do not use abrasives or halogen-based cleaners -- they will damage the finish. Rinse thoroughly and dry completely.

Interior glass may be cleaned with an ammonia-based glass cleaner and soft, lint-free cloth.

2. TROUBLESHOOTING

There are few components which require repair on the Duo-Vac oven. These include the control thermostat and pilot light, high limit thermostat, heaters, power switch/circuit breaker, vacuum/vent valve and vacuum gauge.

Instructions for replacing these components are in the following Service Guides section. Symptoms and possible causes are described below.

SYMPTOM	POSSIBLE CAUSES
1. Excessive vacuum leaks.	A. Check door gasket and oven door alignment. B. Check vacuum/vent valve; replace if faulty. C. Check for loose fittings.
2. Power switch will not light.	A. Oven is not plugged in or outlet is not receiving power. B. Circuit breaker in power switch has blown; push to "ON" position to reset. If breaker continues to blow, check incoming line.
3. Control thermostat is set for maximum heat, oven does not heat.	A. Check control thermostat; replace if necessary. B. Check high limit thermostat; replace if necessary. C. Check resistance of heaters with ohmmeter; replace faulty heaters.
4. Control thermostat is set for maximum heat, oven heats partially.	A. Check resistance of heaters with ohmmeter; replace faulty heaters. B. Check control and high limit thermostats.
5. Oven will not evacuate or vent.	A. Check vacuum/vent valve; replace if faulty. B. Check for obstruction in vacuum/vent lines and for loose fittings.
6. Vacuum gauge registers a vacuum when chamber is at normal atmosphere.	A. Replace vacuum gauge.
7. Oven heats properly but pilot light does not indicate heater cycling.	A. Replace neon pilot light over the control thermostat.

Note: All male pipe threads are wrapped with Teflon* thread sealing tape to assure a tight fit. Replace the sealing tape each time a male pipe connection is loosened. This will eliminate a potential source of vacuum leaks.

*Teflon--Reg. TM E.I. du Pont de Nemours & Co.

SERVICE GUIDES

1. GASKET REPLACEMENT

Remove all dirt and foreign matter from inside the gasket groove and from all mounting surfaces on the oven.

NOTE: Do not allow any silicone oils or greases to come in contact with the gasket mounting surfaces.

Press the new gasket onto the mounting surface in the center of one of the straight sections. Press the adjacent corners into place, then the side straight sections. Fit the bottom corners, then the bottom straight section. Massage out any bows in the gasket.

Close the oven door to seat the gasket. Open the door and apply a high-quality vacuum grease to the gasket. Evacuate the oven. Press on the door to help seat the gasket as the chamber is evacuated.

2. DOOR ALIGNMENT ADJUSTMENTS

Inspect the two sets of bolts on the door hinge. Bolts holding the hinge on the oven (inside the hinge) can be loosened to adjust the vertical door positioning. Bolts holding the door on the hinge (outside the hinge) can be loosened to adjust the compression tolerance against the gasket.

Ascertain where the door-to-gasket seal is loose and adjust the door and hinge positions accordingly.

Test the seal by evacuating the oven to see if further adjustments are necessary.

3. POWER SWITCH/CIRCUIT BREAKER REPLACEMENT

Unplug oven from outlet before servicing. Remove control panel from oven body. Tilt oven back and remove two Phillips screws under control panel at the front edge. Gently pull the control panel forward from the bottom until the top clears the two positioning studs. The panel can be pulled out about 3 inches. Loosen the bottom compression fitting on the vacuum gauge holding the copper tubing to allow access to the control panel.

Compress the four tabs on the sides of the switch, then push the switch out the front side.

Remove the three leads. Leads have slip-on terminals.

Push switch into place on control panel.

Install leads on new switch (see Wiring Diagram).

Reinstall copper tubing on the vacuum gauge.

Position the panel on two top studs. Replace two bottom retaining screws.

4. HYDRAULIC CONTROL THERMOSTAT REPLACEMENT

Unplug oven from outlet before servicing.

Remove front control panel, back panel and insulation.

a. Remove control panel by removing the two Phillips screws under front edge of oven. Gently pull panel forward until panel clears positioning studs. Remove copper tubing from bottom compression fitting on vacuum gauge to allow access to the control panel.

b. Remove back panel by removing Phillips screws around the back edges of the oven.

c. Pull out rear insulation to expose components.

Remove thermostat bulb from bracket on the right side wall of the vacuum chamber, attached to the heater.

Remove thermostat knob with a 1/16" Allen key.

Remove two Phillips screws holding thermostat on the control panel.

Remove three leads from thermostat.

Install leads on new thermostat (see Wiring Diagram).

Install thermostat on front panel with two Phillips screws.

Replace thermostat knob and tighten with Allen key.

Uncurl enough sensor tubing to place thermostat bulb in its bracket. Allow several inches of slack, so that control panel can be installed and removed easily. Make sure the sensor tubing does not short out any components.

Install copper tubing on bottom compression fitting of vacuum gauge.

Install control panel on oven. Place top of panel on positioning studs and slide bottom of panel into place. Replace two Phillips screws.

Replace insulation on back of oven.

Replace back cover and retaining screws.

5. HEATER PILOT LIGHT REPLACEMENT

Unplug oven from outlet before servicing.

Remove control panel by removing the two Phillips screws under front edge of oven. Gently pull panel forward until panel clears positioning studs. Remove copper tubing from bottom compression fitting on vacuum gauge to allow access to free the control panel.

Remove lead from thermostat. Cut the other lead from wire bundle.

Carefully pry off the retaining clip from back of pilot light. Save it for installation on the new pilot light. Pull light out from the front of the control panel.

Push the new light through the front of the control panel. Install ring lug on lead to the thermostat. Replace retaining clip. Complete wiring installation (see Wiring Diagram).

Install copper tubing on bottom compression fitting of vacuum gauge.

Install control panel on oven. Place top of panel on positioning studs and slide bottom of panel into place. Replace two Phillips screws.

6. BIMETALLIC HIGH LIMIT THERMOSTAT REPLACEMENT

Unplug oven from outlet before servicing.

Remove back panel and insulation.

Remove two leads from thermostat.

Remove nut holding thermostat to back of oven chamber.

Install leads on new thermostat (see Wiring Diagram).

Bolt new thermostat onto back of oven chamber. It is factory preset for approximately 250°C.

Replace insulation and back panel.

7. VACUUM/VENT VALVE REPLACEMENT

Unplug oven from outlet before servicing.

Remove control panel by removing the two Phillips screws under front edge of oven. Gently pull panel forward until panel clears positioning studs. Remove copper tubing from bottom compression fitting on vacuum gauge to allow access to the control panel.

Remove copper tubing from three compression fittings on the vacuum/vent valve. Then take off two elbows and male straight connector from valve body.

Remove valve knob by loosening the set screw with an Allen key.

Loosen retaining nut on front of panel and pull valve out from the back of panel.

Install elbows and straight connector on valve body. Strip off old thread tape from male pipe threads and replace with new tape.

Install new valve in panel and tighten retaining nut.

Replace valve knob and install set screw.

Reconnect copper tubing to compression fittings on valve (see Piping Diagram, figure 2).

Reconnect copper tubing to compression fitting on vacuum gauge.

Install control panel on oven. Place top of panel on positioning studs and slide bottom of panel into place. Replace two Phillips screws.

8. VACUUM GAUGE REPLACEMENT

Unplug oven from outlet before servicing.

Remove control panel by removing the two Phillips screws under front edge of oven. Gently pull panel forward until panel clears positioning studs.

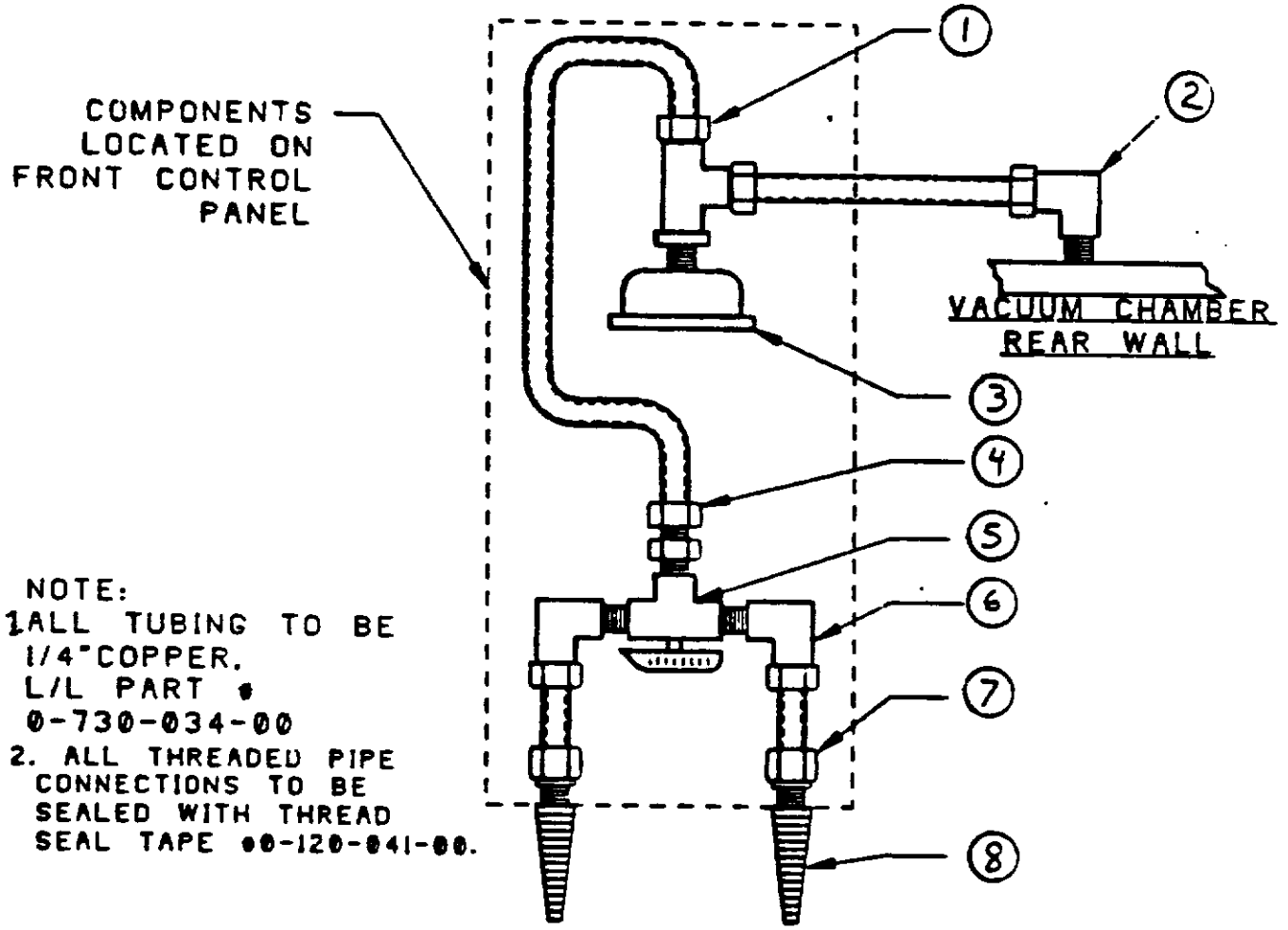
Remove copper tubing from both compression fittings on vacuum gauge.

Remove T-fitting from back of gauge.

Remove gauge retaining bracket by loosening and removing the two thumb-nuts.

Pull gauge out from front of panel.

Figure 2
PIPING DIAGRAM



1. Female Run Tee
2. ¼" NPT S.S. Male Elbow
3. Vacuum Gauge
4. ¼" NPT Male Connector
5. 3-Way Hand Valve
6. ¼" NPT Brass Male Elbows
7. ¼" NPT Female Connector
8. ¼" Hose Barbs

Install new gauge through front of the panel.

Replace gauge retaining bracket and fix in place with two thumb-nuts.

Replace T-fitting on the back of gauge. Apply thread sealing tape to male thread on vacuum gauge fitting.

Strip off old thread tape from male pipe threads. Applu new thread tape.

Install copper tubing in compression fittings. Connect vacuum/vent valve tubing to straight portion of T-fitting. Connect vacuum line tubing to bottom of T-fitting (see Piping Diagram, figure 2).

Install control panel on oven. Place top of panel on positioning studs and slide bottom of panel into place. Replace two Phillips screws.

9. HEATER REPLACEMENT

a. Models 5053-10 and 5053-12.

Unplug oven from outlet before servicing.

Remove back panel by removing screws around back edges of oven. Remove insulation from back and sides.

Oven has two 300-watt heaters, located on the left and right side of the chamber. Remove 3/8" hex head bolts and their washers to remove heater brace. Remove leads from heaters. Check heater resistance with an ohmmeter. Test for a short or low resistance at the sheath encasing the heating element.

Test both heaters to identify the faulty one. Resistance should be 48 ohms. Any reading radically different from this figure indicates a faulty heater.

Install the new heater, lead connections down. Install leads on new heater, so that wires do not come into contact with any heater surfaces (see Wiring Diagram). Install a new heater brace whenever a new heater is installed. Replace bolts and washers and tighten.

Replace side and back insulation. Replace back panel and install screws along back edges of the oven.

b. Models 5053-20 and 5053-22.

Unplug oven from outlet before servicing.

Remove back panel by removing screws around edges of oven. Remove insulation on back side.

Remove control panel by removing the two Phillips screws under front edge of oven. Gently pull panel forward until panel clears positioning studs. Remove copper tubing from bottom compression fitting on vacuum gauge to allow access to the control panel.

Remove oven housing by removing screws around bottom edges of oven. Lift housing up and lay it aside. Remove insulation from top and sides.

Oven has four 400-watt heaters, two on the left side and two on the right side of the chamber. Remove 7/16" hex head bolts and their washers to remove heater brace. Remove leads from heaters. Check heater resistance with an ohmmeter. Test for a short or low resistance at the sheath encasing the heating element.

Test heaters to identify the faulty ones. Resistance should be 36 ohms. Any reading radically different from this figure indicates a faulty heater.

Install the new heater, lead connections down. Install leads on new heater, so that wires do not come into contact with any heater surfaces (see Wiring Diagram). Install a new heater brace whenever a new heater is installed. Replace bolts and washers and tighten.

Replace top and side insulation.

Replace oven housing and install screws along bottom edges of oven.

Reinstall copper tubing on the vacuum gauge.

Install control panel on oven. Place top of panel on positioning studs and slide bottom of panel into place. Replace two Phillips screws.

Replace insulation on back side of oven.

Replace back panel and install screws on back edges of oven.

REPLACEMENT PARTS

DESCRIPTION	PART NUMBER	QTY. USED
Models 5053-10 and 5053-12		
Cordset	470-105-00	1
Door, Glass	540-181-00	1
Gasket, Door	530-158-00	1
Gauge, Vacuum	660-088-00	1
Heater, 300 watts	340-237-00	2
Heater Brace	014-247-00	2
Knob, Thermostat	560-223-00	1
Lamp, Neon (120V)	360-179-00	1
Lamp, Neon (240V)	360-183-00	1
Resistor, carbon, 100 ohm, 1/2 watt for 240V pilot light	411-001-51	1
Shelf Assembly	014-255-00	1
Switch, w/circuit breaker (120V)	330-233-00	1
Switch, w/circuit breaker (240V)	440-293-01	1
Thermometer, Dial	910-017-00	1
Thermostat, Bimetallic	920-283-00	1
Thermostat, Hydraulic	920-223-00	1
Valve, Vacuum/Vent	950-125-00	1
Wiring Diagram for 5053-10	227-659-00	1
Wiring Diagram for 5053-12	223-663-00	1
Models 5053-20 and 5053-22		
Cordset	470-122-00	1
Door, Glass	540-182-00	1
Gasket, Door	530-159-00	1
Gauge, Vacuum	660-088-00	1
Heater, 400 watts	340-171-00	4
Heater Brace	583-657-00	4
Knob, Thermostat	560-223-00	1
Lamp, Neon (120V)	360-179-00	1
Lamp, Neon (240V)	360-183-00	1
Resistor, carbon, 100 ohm 1/2 watt for 240V pilot light	411-001-51	1
Shelf Assembly	014-314-00	1
Switch, w/circuit breaker (120V)	440-301-00	1
Switch, w/circuit breaker (240V)	440-294-00	1
Thermometer, Dial	910-017-00	1
Thermostat, Bimetallic	920-283-00	1
Thermostat, Hydraulic	920-223-00	1
Valve, Vacuum/Vent	950-125-00	1
Wiring Diagram for 5053-20	227-667-00	1
Wiring Diagram for 5053-22	227-668-00	1