

Model #19 VACUUM SEAL GASKET IS MOUNTED  
ON DOOR

Model #29 VACUUM SEAL GASKET IS MOUNTED  
ON CHAMBER METAL LIP.

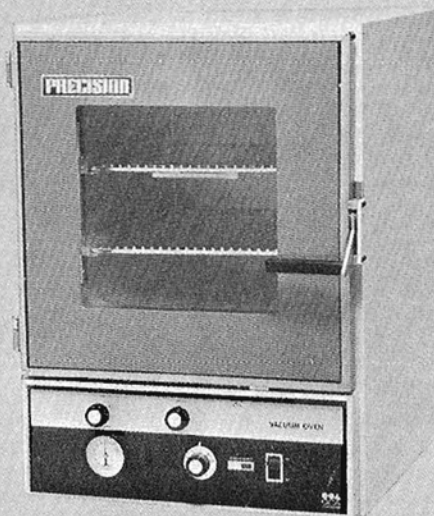
# Precision<sup>®</sup>

## Instruction Manual TS-31468 AU-1

### Precision<sup>®</sup> Laboratory Vacuum Ovens



Model 19



Model 29

## Precision Scientific

## Precision® Laboratory Vacuum Ovens

Catalog Numbers 31468, 31469, 31566, & 31568

### Introduction

Your satisfaction and safety are important to PRECISION SCIENTIFIC and a complete understanding of this unit is necessary to attain these objectives.

As the ultimate user of this apparatus, it is your responsibility to understand its proper function and operational characteristics. This instruction manual should be thoroughly read and all operators given adequate training before attempting to place this unit in service. Awareness of the stated cautions and warnings, and compliance with recommended operating parameters--together with maintenance requirements--are important for safe and satisfactory operation. The unit should be used for its intended application; alterations or modifications will void the Warranty.

**WARNING:** As a routine laboratory precaution, always wear safety glasses when working with this apparatus.

This product is not intended, nor can it be used, as a sterile or patient connected device. In addition, this apparatus is not designed for use in Class I, II, or III locations as defined by the National Electrical Code.

### Unpacking and damage

Save all packing material if apparatus is received damaged. This merchandise was carefully packed and thoroughly inspected before leaving our factory.

Responsibility for its safe delivery was assumed by the carrier upon acceptance of the shipment; therefore, claims for loss or damage sustained in transit must be made upon the carrier by the recipient as follows:

Visible Loss or Damage: Note any external evidence of loss or damage on the freight bill, or express receipt, and have it signed by the carrier's agent. Failure to adequately describe such external evidence of loss or damage may result in the carrier's refusing to honor your damage claim. The form required to file such a claim will be supplied by the carrier.

Concealed Loss or Damage: Concealed loss or damage means loss or damage which does not become apparent until the merchandise has been unpacked and inspected. Should either occur, make a written request for inspection by the carrier's agent within 15 days of the delivery date; then file a claim with the carrier since the damage is the carrier's responsibility.

By following these instructions carefully, we guarantee our full support of your claim to be compensated for loss from concealed damage.

DO NOT -- FOR ANY REASON -- RETURN THIS UNIT WITHOUT FIRST OBTAINING AUTHORIZATION. In any correspondence to PRECISION SCIENTIFIC please supply the nameplate data, including catalog number and serial number.

## General information

This instruction manual encompasses the models listed below, with their specific electrical characteristics.

Catalog Number	Model	Electrical Data			
		Volts	Hz	Watts	Amps
31468	19	120	50/60	600	5.0
31469		230			2.6
31566	29	120	50/60	1600	13.3
31568		230			6.9

Both the Model 19 and the Model 29 contain a welded stainless steel chamber providing a working capacity of one half cubic foot or one and one half cubic foot, respectively. Each oven is supplied with two shelves, one is designed so that an angled thermometer can be secured to it and be read through the glass window in the door.

The ovens have a maximum operating temperature of 200°C and are capable of holding a vacuum of 30 inches of Hg or pressure of 2 psig.

The Model 29 has a door handle with a latch which when engaged with the catch on the cabinet, the door is sealed

against the chamber. The Model 19 uses two knobs with locking screws on either side of the door to engage the lock bars mounted on the cabinet to seal the door against the chamber.

The Model 29 oven contains an additional inlet port in the bottom of the chamber which can be used to introduce another gas into the oven. To gain access to this port it is necessary to lay the oven on its side and remove the base plate from the bottom of the oven. The port is supplied with a 3/8 inch NPT pipe plug that can be removed and replaced with appropriate pipe fittings that contain 3/8 inch NPT threads. In addition, shut "Off" valves and flow gauges may be required depending upon the application. These components are not supplied by GCA/IEG.

Both ovens contain band heaters that are wrapped around the vacuum chamber for fast response, maximum uniformity and safety. Dual thermostats and dual pilot lights are provided. When the red warning light is illuminated, it indicates that the safety thermostat is controlling the oven temperature.

## Technical specifications

Model	Maximum Temperature °C	Guaranteed Temp. Uniformity at 100°C (±°C)	Sensitivity (±°C)	Vacuum		Maximum Pressure psig	Chamber			Exterior Dimensions wxdxh inches (cm)	
				Maximum inches/Hg (mm/Hg)	Loss per day* inches/Hg (mm/Hg)		Dimensions wxdxh inches (cm)	Volume ft³ (liters)	Shelves		
								No. Supplied	Total Area in² (cm²)		
19	200	3.2	0.25 to 1.0	30 (760)	5 (127)	2	8x12x8 (20.3x30.5x20.3)	0.45 (12.7)	2	172 (1110)	14x18x21 (36x46x53)
29	200	3.0	0.3 to 1.3	30 (760)	5 (127)	2	12x17½x12 (30.5x44.5x30.5)	1.5 (42.5)	2	201 (1293)	19x25x27 (48x64x69)

\*Source disconnected.

## Explanation of controls

**"ON - OFF" Switch:** Controls all electrical power to the oven.

**Dual Thermostat Control Knob:** Controls the operating temperature of the chamber and the safety thermostat. The factory set temperature differential

between the dual (control and safety) thermostats is about 8°C.

**"CONTROL/SAFETY" Pilot Lamp:** The left lamp (white) when "On" indicates heater operation. The right lamp (red) when "On" indicates the controlling thermostat has failed and the safety thermostat has taken control.

Vacuum - Pressure Gauge: This gauge has a vacuum range of 0 to 30 inches of mercury and a pressure range of 0 to 2 pounds per square inch.

"VENT" Knob: Clockwise rotation of this knob closes the vent valve and counterclockwise rotation opens the vent valve and allows the chamber to reach atmospheric pressure.

"VACUUM" Knob: Clockwise rotation of this knob closes the vacuum valve and counterclockwise rotation opens the vacuum valve and allows the chamber to be evacuated if connected to a vacuum pump.

## Installation

**WARNING:** Installation should be completed by qualified instrument personnel, ONLY.

Location: The most uniform operating conditions and results will be obtained by placing the unit remote from drafts, ventilating outlets, radiators or any device that would cause a severe change in the ambient conditions surrounding the cabinet. For efficient operation, the cabinet should stand approximately level. If the surface on which it stands is uneven, adjust the leveling legs. Place the plastic feet on the leveling legs to prevent sliding and marring of the work bench.

If the cabinet has been exposed during shipment or storage to temperatures below freezing, it should be allowed to stand in a warm room for 24 to 48 hours before placing into operation.

Insert the shelves in the Model 19 then attach the thermometer to the thermometer bracket on the top shelf. The shelf should be inserted with the cutout in the rear to prevent blockage of the vacuum inlet.

NOTE: The thermometer should be inserted into the holes in the thermometer brackets on the bottom of the shelf and hung horizontally on the hook type bracket.

Insert the shelf supports in the Model 29 followed by the shelves and thermometer. (See note above on thermometer installation.)

The vacuum connection and air inlet are at the rear of the cabinet. Facing the rear of the unit, place 3/4 inch I.D. vacuum tubing (GCA/IEG Cat. No. 167068) on the left-hand connector and clamp the tubing to the connector.

If thin wall tubing is used, it may collapse or leak and thus restrict evacuation of the chamber.

A vacuum pump is preferable for evacuation, although a water aspirator may be used if high vacuum or rapid evacuation is not desired. For the Model 19, a GCA/IEG Model D-25 Vacuum Pump is suggested and for the Model 29 Oven, a Model D-75 Pump.

If it is desirable to bleed "dry" air into the chamber when the vacuum is released, a suitable Drierite® cartridge may be attached to the inlet connector (on the right at the rear). Do not fashion or connect any "drying system" that employs acid-type scrubbers. Rotate the "VENT" knob slightly counterclockwise to bleed the "dry" air into the chamber.

Electrical Connection: Important  
(Please Read Carefully)

**CAUTION:** Be sure that the power supply is of the same voltage as specified on the nameplate.

The Model 19 oven is supplied with a cord and plug.

The power cord of these instruments is equipped with a three-prong (grounding)

plug which mates with a standard three-prong (grounding) wall receptacle to minimize the possibility of electric shock hazard from this apparatus. The user should have the wall receptacle and circuit checked by a qualified electrician to make sure the receptacle is properly grounded.

Where a standard two-prong wall receptacle is encountered, it is the personal responsibility and obligation of the customer to have it replaced with a properly grounded three-prong wall receptacle.

**WARNING:** DO NOT, under any circumstance, cut or remove the third (ground) prong from the power cord. DO NOT use a two-prong adapter plug.

The Model 29 is equipped with a junction box located at the back of the oven. A line cord is not supplied. The service wires should be connected to the three conductors inside the junction box by a qualified electrician.

In accordance with the National Electrical Code, power must be supplied by permanently wired connections. This unit should be wired by a qualified electrician so that proper fusing and service wires are installed. Ground the oven electrically between the mounting screw located inside the conduit box and a water pipe, or well grounded conduit system.

**WARNING:** For personal safety, this apparatus must be properly grounded.

Determine the total amount of current presently being used by other apparatus connected to the circuit that will be used for the Model 19 or Model 29. It is critical that the added current demand and other equipment on the circuit not exceed the rating of the fuse or circuit breaker in use.

## Operation

1. The Model 29 has a door handle with a latch, which when engaged with the catch on the cabinet, the door is sealed against the chamber.

The Model 19 uses two knobs, with locking screws on either side of the door, to engage the lock bars mounted on the cabinet to seal the door against the chamber. When opening or closing the Model 19 door, hold the door upwards so it does not rub against the face of the cabinet. This will also allow proper door locking alignment.

2. Depress the "ON - OFF" switch to the "On" position.
3. Rotate the thermostat control knob clockwise (clockwise rotation increases chamber temperature) to an arbitrary setting.
4. Allow the chamber to heat up until steady readings are observed on the thermometer. The chamber temperature has stabilized when there is uniform cycling on the control pilot light.

This time will vary, depending on whether the unit is at atmospheric pressure, under vacuum, or if air is being continually bled into the chamber.

5. A desired operation chamber temperature as indicated on thermometer, and obtained at a particular thermostat control knob setting, should be recorded for future reference.

The graduations on the knob are reference points only and do not indicate actual temperature.

Before moving from a higher setting to a lower setting, the thermostat control knob should be turned all the way back to the "Zero" position. The new temperature setting should be approached in a clockwise direction.

NOTE 1: When moving from a higher setting to a lower one, the safety pilot light may glow faintly for a short time. This is inconsequential and will disappear as soon as the new lower temperature is stabilized.

NOTE 2: Slight vapor discharge may occur on the initial heat up. This is the dissipation of the protective coatings that have been added to the cabinet. Allow for complete dissipation of the vapors before placing samples in the chamber.

#### LOADING:

##### WARNING: SAFETY PRECAUTIONS

1. DO NOT place any explosive, combustible, or flammable materials in the chamber.
2. DO NOT place sealed containers in the chamber. Sealed containers, filled with materials, do not provide room for expansion and can develop dangerous vapor pressure as the temperature increases.
3. Avoid spillage of liquids.
4. DO NOT evaporate noxious fumes.

Place the samples on the shelves allowing as much space between samples as possible.

Do not place any samples on the bottom of the chamber since they will be exposed to different temperatures than those samples placed on the shelves, because the band heaters are wrapped around the vacuum chamber.

It is also suggested that the front 2 inches, near the window, not be used for loading.

When being used for drying operations, it will be found more efficient to operate with the vent and vacuum valves slightly open and the pump in operation. This will provide some degree of circulation and allow moisture to be withdrawn.

After loading, the time required for the chamber to recover to the original stabilized temperature will be directly related to the mass of the load.

Vacuum Release: To release the vacuum once a test has been completed, it is advisable to continue using the vacuum pump while air is bled into the chamber. While the pump is operating, open the "VENT" knob (turning counterclockwise) just enough to overcome the action of the pump. Continue to rotate the knob slowly until vacuum is released as indicated on the vacuum gauge. This action will protect powdered samples from being scattered within the chamber by a heavy inrush of air. The "VACUUM" valve should be closed, but the pump should be left operating against the "closed system" while the next load is being placed in the chamber.

## Servicing

#### TROUBLESHOOTING:

WARNING: Service should be performed by qualified service personnel. Disconnect the unit from its electrical source. Remove the shelves and thermometer.

Loss of Vacuum: With all parts in normal working order, it should be possible to maintain a vacuum with a leak rate of less than 5 inches of Hg over a 24 hour period with the vacuum source disconnected. If excessive leaking is experienced, the door gasket may need to be replaced. On the Model 19 the gasket is held in place by a gasket retainer on the inside of the door. On the Model 29 the gasket is

cemented to the edge of chamber with RTV silicone rubber cement.

The balance of the vacuum connections and valves are accessible with the removal of the perforated panel from underneath the oven.

The vacuum valve and vent valve in the rear are extended to the control panel with universal couplings and extension shafts.

Should any problems arise concerning the efficiency of vacuum, first check to see that the setscrews have not loosened in the coupling. All threaded fittings are sealed with a sealant.

Temperature Variance or Fluctuation:

1. Test unit when empty; if results are satisfactory, the chamber was improperly loaded. Redistribute the load.
2. Be sure to allow ample time for an empty chamber to stabilize at a temperature setting. It could take over one hour to equilibrate, depending upon the difference between ambient and operating temperatures. The mass of the load can also affect stabilization time.

3. Make certain that severe line voltage fluctuations are not occurring.
4. Make certain that all wire terminal connections are secure.
5. Make certain that an intermittent failure of the switch, thermostat, or wiring has not occurred. Isolate the cause; repair or replace.
6. If the safety thermostat assumes control of the chamber temperature, replace the dual thermostat.

No Heat: If the chamber does not heat, first check the line voltage, circuit breaker and/or fuses, all electrical connections. Check heater continuity.

Heater Resistance Test Procedure:

**WARNING:** Disconnect the oven from its power source.

Refer to the appropriate wiring diagram and the Heater Data Table for resistance values at room temperature. Resistance is measured between terminals 1 and 2 located on the terminal block.

Be sure to disconnect at least one heater lead from the terminal block before taking an ohmmeter reading. If the heater is open (infinite resistance), it should be replaced.

Heater Data Table

<u>Cat. No.</u>	<u>Model</u>	<u>Heater Wattage</u>	<u>Voltage</u>	<u>Resistance Between Heater Leads (ohms)</u>
31468	19	600	120	24
31469			230	88
31566	29	1600	120	9
31568			230	33

## PARTS REPLACEMENT

**WARNING:** Disconnect the oven from its electrical power source. Parts replacement should be completed by qualified service personnel.

**Pilot Light & Switch Replacement:** Lay cabinet on its side and remove bottom panel. The components snap into the control panel and may be pushed out from beneath the cabinet by compressing the mounting clips. The lead wires have slip-on connectors which may be easily removed and placed on the new part.

**NOTE:** Be sure the red portion of a replacement pilot light is on the right side.

**Heater Replacement:** Since wrap-around band heaters are used on the outside of the vacuum chamber, complete disassembly of the cabinet is necessary for their removal. It will be extremely rare that such service is needed, and it is suggested that the cabinet be returned to the factory for such repairs.

**Thermostat Removal:** If thermostat failure occurs, the entire dual thermostat assembly must be replaced.

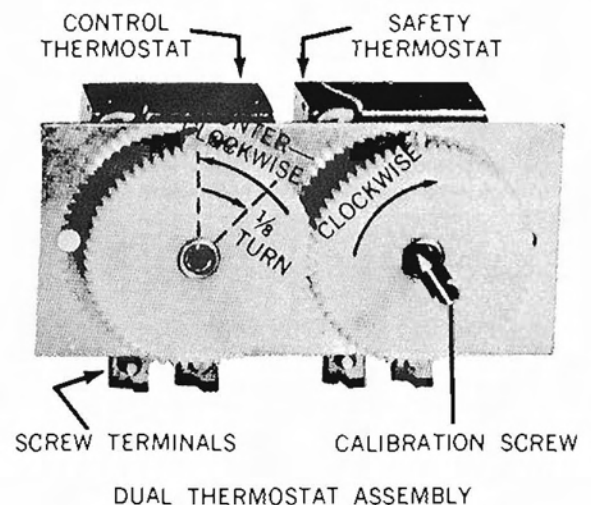
Lay the unit on its right side and remove bottom panel. Loosen the flare connection at the vacuum gauge and the setscrews in the universal joints of the valve extension shafts. Remove the screws on the bottom and top edge of the control panel.

Remove the back outside panel and withdraw the blanket of insulation covering the rear and right (as viewed from the rear) side of the vacuum chamber. The two sensing bulbs of the dual thermostat may be slipped out of the clamp. Using a fine Allen wrench, loosen the two setscrews in the control knob. Remove the assembly mounting bracket from the rear of the control panel.

The replacement of the dual assembly is easily accomplished by reversing the above procedure. When replacing the sensing bulbs, be sure there is good surface contact between the aluminum clamp and each bulb. If necessary, compress the clamp with pliers. Do not put a crimp or sharp bend in the capillary tubes as they are guided into position. Be sure the insulation is properly replaced and the thermostat shaft is full counterclockwise before tightening the knob at the zero index mark. No calibration should be needed.

Calibration of Dual Thermostat Assembly:

Assuming the dual thermostat assembly has been mounted to the control panel and the control panel has not yet been installed on the mounting brackets of the oven, apply power and select an arbitrary operating temperature by turning the long shaft about 1/4 turn clockwise. Do not mount the control knob.



Allow the cabinet to stabilize at this controlling temperature. At this point, it is not known at what temperature the safety thermostat is set to take over control. Locate a piece of wire or clips suitable for shorting the screw terminals on the thermostat.



**WARNING:** Disconnect the line cord from the power supply and immediately connect the two screw terminals of the control thermostat together behind the control panel.

**CAUTION:** Do not change the setting by allowing the shaft to move. (The control thermostat is the left-hand unit in the assembly).

Immediately apply power to the oven. The temperature will rise until the "safety" setpoint is reached, at which time the heaters will shut off and the red safety pilot light will go on. Read the temperature. The difference between this temperature and the original represents the "safety span." Disconnect power and remove the shorting wire.

An extremely fine screwdriver will be needed if an adjustment is to be made of the calibration screw in the center of the long shaft on the safety thermostat.

Reducing the Span: The span should not be so narrow that control and safety thermostat operate alternately as a routine.

If less span is desired, allow the cabinet to stabilize at a pre-selected temperature. While the control light is "On" advance the calibrating screw clockwise until it goes "Out" and the safety pilot light goes "On" -- immediately back off (counterclockwise) about 1/8 of a turn.

The safety will go "Out" and control will go on. This adjustment can only be made while the control light in "On".

Increasing the Span: If the thermostat shafts were not in proper relationship when the replacement was mounted, it is possible to have a temperature span too close, which will cause both the control and safety lights to be on at the same time.

After the unit has stabilized, and when the safety light is "On", turn the fine calibrating screw in the center of the safety thermostat shaft about 1/8 of a turn, counterclockwise.

Open the door and allow the cabinet to cool a moment and the control pilot light will come "On" and a normal operating cycle will begin.

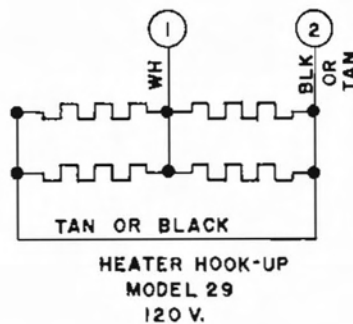
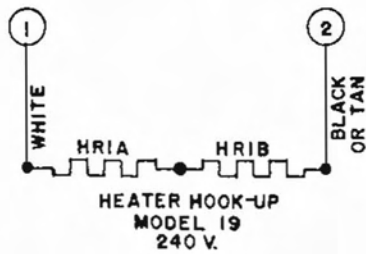
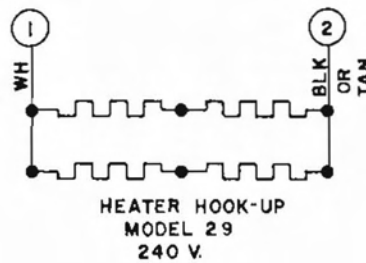
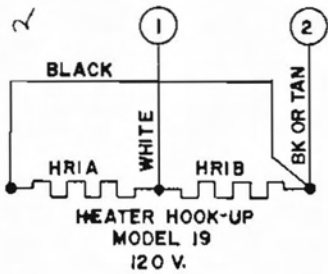
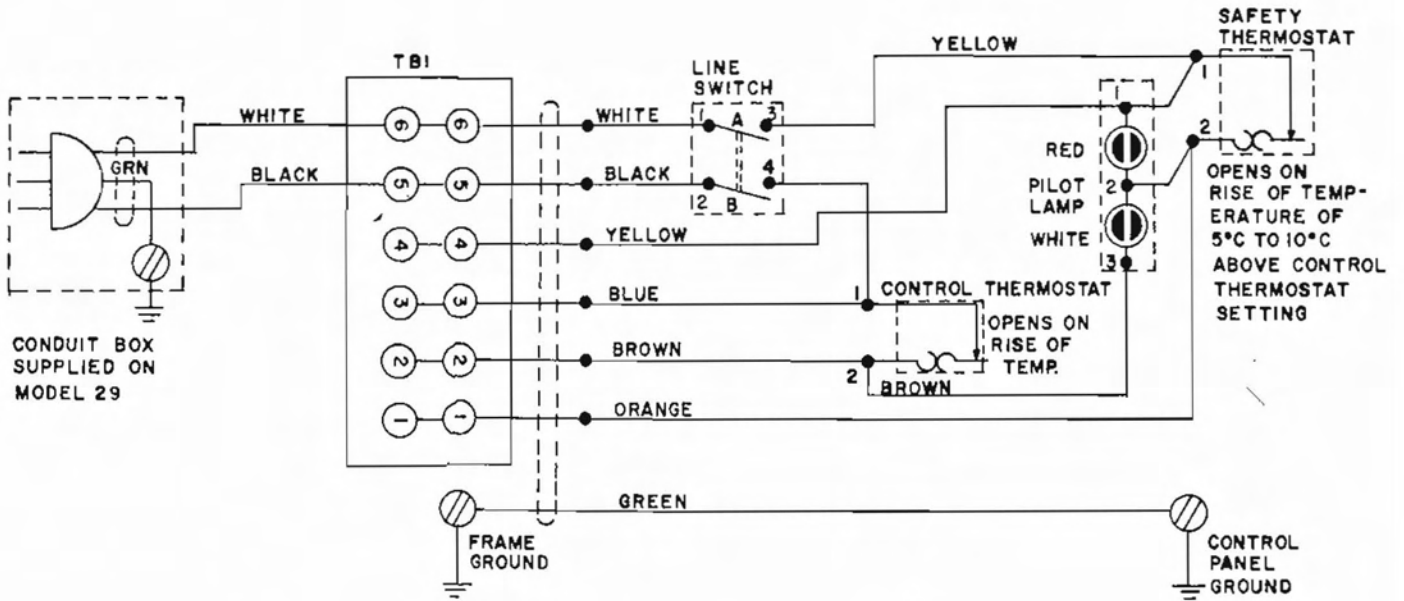
Turn the safety thermostat shaft fully counterclockwise and replace the knob with the "zero" in the "12 o'clock" position. Tighten the setscrew.

## Parts List

ITEM NUMBER	DESCRIPTION	MODEL 19	MODEL 29
1	Heater, 120 V or 230 V, 600 W	539818	--
2	Heater, 120 V or 230 V, 800 W (2 Req.)	--	539707
3	Insulator, Porcelain (Heater)	250086	
4	Thermostat, Dual	239112	
5	Knob, Thermostat	220097	
6	Switch, DPST	240304	
7	Pilot Lamp, 120 V	234147	
8	Pilot Lamp, 230 V	234148	
9	Gauge, 0 to 30 inches of Hg and 2 psi	252114	
10	Thermometer, Angle Type, 40 to 200°C	307060	
11	Shelf	532715	536491
12	Shelf, with Thermometer Brackets	532716	540202
13	Support, Shelf (4 Req.)	N/A	00603802
14	Door Assembly	535756	--
15	Gasket, Silicone (9 inches Sq.)	232103	N/A
16	Glass, Tuflex (1/2 inches X 8 7/8 inches Sq.)	170457	N/A
17	Hinge Pin (2 Req.)	536726	N/A
18	Screw, Door Locking (2 Req.)	536434	N/A
19	Retaining Ring, Screw (2 Req.)	325014	N/A
20	Fibre Washer, 5/16 in. I.D. X 3/4 in. O.D. (2 Req.)	218078	N/A
21	Spacer (2 Req.)	536433	N/A
22	Knob, Door Locking Screw (2 Req.)	220062	N/A
23	Door Assembly	--	540460
24	Latch	N/A	540448
25	Handle, Latch	N/A	540445
26	Spring Washer	N/A	449952
27	Flat Washer 1/32 inch X 3/8 I.D. X 3/4 O.D. (5 Req.)	N/A	449954
28	Glass, Pyrex (3/4 inch X 14 1/4 inches Sq.)	N/A	330252
29	Gasket, Silicone (14 1/4 in. Sq. X 11 in. Sq. Opening)	N/A	232289
30	Hinge, Upper	N/A	540455
31	Hinge, Lower	N/A	540065
32	Pin, Hinge (2 Req.)	N/A	540442
33	Locking Bar, For Lock Screw (2 Req.)	537357	N/A
34	Hinge Leaf, Top	536724	N/A
35	Hinge Leaf, Bottom	536725	N/A
36	Valve, Vacuum/Vent (2 Req.)	251330	542657
37	Knob, Vacuum/Vent (2 Req.)	220061	
38	Coupling, Universal, 1/4 inch (2 Req.)	254048	
39	Hose Connector (2 Req.)	536460	536490
40	Gasket, Chamber, Silicone (50 inches)	N/A	232301
41	Leveler Screw, Foot (4 Req.)	241048	
42	Cap, Plastic, Foot (4 Req.)	241047	
43	Cord and Plug 120 V	353045	N/A
44	Cord and Plug 230 V	353044	N/A

220061

10 7/8" x 11"  
34232098



WIRING DIAGRAM - MODELS 19 & 29 VACUUM OVENS

## Exclusive Precision® Warranty

PRECISION SCIENTIFIC warrants its products against defects in material or in workmanship, when used under appropriate conditions and in accordance with appropriate operating instructions for a period of no less than one (1) year from the date of delivery of the products.

Sole obligation of PRECISION SCIENTIFIC shall be to repair or replace at our option, FOB factory or locally, without charge, any part(s) that prove defective within the warranty period, provided the customer notifies PRECISION SCIENTIFIC promptly and in writing of any such defect. Compensation for labor by other than PRECISION SCIENTIFIC employees will not be our obligation. Part(s) replacement does not constitute an extension of the original warranty period.

PRECISION SCIENTIFIC MAKES NO WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, AS TO THE DESIGN, SALE, INSTALLATION, OR USE OF ITS PRODUCTS, AND SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS.

PRECISION SCIENTIFIC will not assume responsibility for unauthorized repairs or failure as a result of unauthorized product modifications, or for repairs, replacements, or modifications negligently or otherwise improperly made or performed by persons other than PRECISION SCIENTIFIC employees or authorized representatives.

While our personnel are available to advise customers concerning general applications of all manufactured products, oral representations are not warranties with respect to particular applications and should not be relied upon if inconsistent with product specifications or the terms stated herein.

In any event, the terms and conditions contained in PRECISION SCIENTIFIC formal sales contracts shall be controlling; and any changes must be in writing and signed by an authorized executive of PRECISION SCIENTIFIC.

All defective components will be replaced without charge one (1) year from the date of delivery. There will be no charge for labor if the apparatus is returned to the factory prepaid.

Conditions and qualifications of the warranty statement shall prevail at all times.