

Harper Generation Six Oven System

Nos. 5390-5397

Harper Generation Six (GST) thermostats are diecast aluminum, with outlets for main and oven pilot gas. Controls are available in either horizontal (outlet parallel with stem) or vertical (outlet at right angle to stem) configurations. They are available for flange mounting to conventional pipe manifolds or for Harper bolt-through manifolds.

Components

A basic knowledge of system components and their function is essential for understanding how the system works. Figure 1 is a schematic drawing of all elements of a typical Generation Six system. The three basic components need some further explanation.

1. **GSP (5414/15) Pilot Unit.** This is a single tube, dual (constant and heater) pilot. The constant or standing pilot* should be a small stable flame. as shown in Figure 2. When heat is called for, the valve within the thermostat increases gas flow to the Pilot Unit.

**This pilot will be on at all times on ranges with conventional ignition systems; if the oven has a Harper KOOL-LITE ignition system, an electronic module will spark to light the constant and heater pilots when the oven control is turned on.*

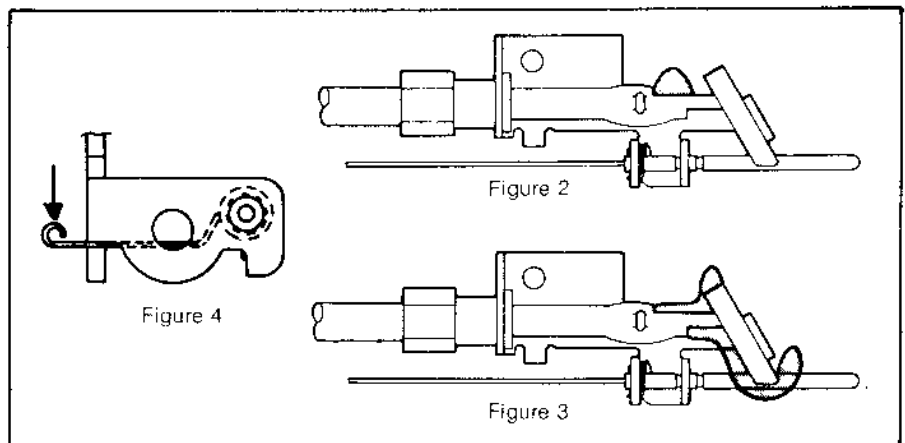
This increased rate (heater) pilot heats the flame responsive element of the GSS safety device, as shown in Figure 3.

The pilot used in Generation Six systems will be of a new, slip-lock design which simplifies safety device installation and replacement. Instead of using a mounting screw to secure the ferrule of the safety device element in the pilot bracket, GSP (5414/15) pilots use a spring clip. To release the safety device element, just push down on the spring clip loop (Figure 4) and pull out the element. To replace, insert element in pilot bracket and push until the element is locked into place.

2. **GSS (5817) Safety Device.** The GSS safety is controlled by its mercury-filled flame responsive element. When this element is heated by the heater (increased rate) pilot flame, the mercury

vaporizes and opens the valve within the GSS control, permitting gas to flow to the oven burner.

3. **GST (5390 Series) Low Temperature Oven Thermostat.** This is an hydraulic control which responds to expansion and contraction of a liquid in the oven bulb. This operates a valve within the thermostat which opens to increase the gas supply to the Pilot Unit when heat is required and closes to shut off this increased rate to the pilot when the oven reaches the set temperature. In addition to controlling heater pilot gas, the thermostat also provides positive shutoff to main burner gas. The gas supply to the oven burner is routed through the shutoff valve portion of the thermostat, to insure that no gas can flow to the oven burner when the oven control knob is in the "Off" position.



System Operation

In the "Off" position gas is always supplied to the constant pilot of ranges with conventional (standing pilot) ignition systems; if the oven has a Harper KOOL-LITE ignition system, an electronic module will spark to light the constant and heater pilots when the oven control is turned on.

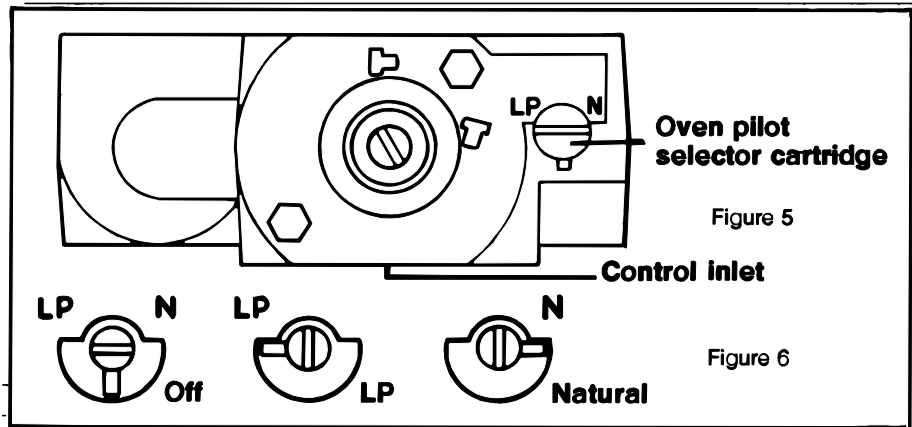
When the thermostat knob is turned on to any temperature setting from 140° to 550°, gas flow to the Pilot Unit is increased. The heater pilot portion of the pilot flame heats the flame responsive element of the Safety Device. When the flame responsive element has been heated for 30 to 60 seconds, the GSS Safety Device will open and allow gas to flow to the oven burner, where it will be lighted by the Pilot.

When the set oven temperature is reached, the valve within the Generation Six thermostat - responding to temperature changes sensed by the oven temperature bulb - will close, shutting off the gas supply to the heater pilot. The flame responsive element will cool and the GSS Safety Device will close, shutting off gas to the oven burner. The oven will cool until the oven bulb temperature drops enough to reopen the valve within the thermostat and bring the heater pilot flame back on, repeating the cycle. This cycle will continue until the oven control knob is turned to the "Off" position. At all temperature settings, when the oven burner is on, it will be at full rate and will *not* modulate.

When the thermostat control knob is turned to the "Broil" position, the heater pilot remains on at all times, keeping the oven burner on and assuring smokeless broiling. At the Broil position, the oven burner will modulate to a lower flame after a period of time but will not cycle off.

Spark Ignition Models

Generation Six thermostats (Models 5394 thru 5397) used on ranges with spark ignition are virtually identical to gas pilot models. However, spark models have a minor internal machining variation so that constant pilot gas will be supplied to the thermostat only when



the thermostat is turned on. For this reason one control may not be substituted for the other. Spark thermostats will also have an actuating switch, which snaps onto the basic thermostat. Service of the gas portion of either system is the same.

Since only the ignition portion of the system is electric, in the event of a power failure a Harper oven thermostat may still be used manually. Turn the oven control knob to the desired temperature. Carefully light the pilot manually with a long match; the oven will then function normally.

If the thermostat is turned rapidly from a cooking to a "keep warm" temperature, sparking may occur for a few seconds. This is due to a drop in pressure and there is no need for the user to be concerned.

Adjustments

Because GST controls cycle on and off at all temperature settings (except Broil), no bypass adjustment is required. Pilot adjustments which were formerly necessary have also been eliminated since pressure regulators are now required for all A.G.A. certified ranges, assuring a consistent gas supply. This permits more standardization in range controls and simplifies range installation and adjustment.

Oven Pilots

One selector cartridge orifices *both* constant and heater pilot gas. Converting the control for use on LP gas from Natural gas or vice versa is a simple matter of turning this selector cartridge to the LP or Natural position. No pilot rate adjustment is required.

In over-manifold mountings, the oven pilot selector cartridge is at the top right of the control (see Figure 5). The cartridge will be located at the bottom left of thermostats mounted under the manifold. When the range is installed, be sure that this selector cartridge (Figure 6) is turned *all the way* to the proper setting. Turn clockwise to the stop for LP Gas; counterclockwise to the stop for Natural Gas. IT IS EXTREMELY IMPORTANT THAT THIS PILOT SELECTOR CARTRIDGE IS SET FOR THE GAS ON WHICH THE RANGE IS TO BE USED.

For ranges where the pilot selector cartridge is not readily accessible, a remote adjustment means will be provided. Check the range manufacturer's installation instructions for specific directions.

Safety Device

When the range is to be used on LP gas, the safety device hood must be adjusted. Turn clockwise no more than two turns so that all gas flow is metered through the orifice in the pin. CAUTION: DO NOT OVER-TORQUE (no more than 35 in. lb.).

Top Burner Pilots

Top burner pilots are not routed through Generation Six thermostats. Top pilot gas will generally be supplied from the manifold. Consult the range manufacturer's instructions for specific directions for adjusting top pilots.

Field Leak Testing

For continuous pilot models, the "Off" position of the selector cartridge (with the slot horizontal) can be very helpful for field leak testing. It provides 100% shutoff to gas to the oven pilots.

Calibration

In the event of oven calibration complaints, *before* recalibrating the control be sure that utensil problems and/or user misunderstanding of oven operation are not the real cause of the service complaint. Check these factors FIRST:

1. **Setting the dial.** Oven temperature will be most accurate when the dial is set by turning just TO the temperature - NOT to a higher temperature and then back.
2. **Aluminum foil.** Aluminum foil should never be used to cover oven racks or so that it blocks any of the oven openings provided for air circulation. If foil is used to catch spillovers, it should be a piece just a little larger than the utensil, placed 3 to 4 inches below the pan.
3. **Oven cleaners.** Oven cleaners

(particularly the aerosol type) can coat the thermostat sensing bulb so that it does not sense oven temperatures accurately. If oven cleaners have been used, carefully clean off any residue left on the sensing bulb before checking oven temperature.

4. **Utensils.** Pans which are too large for the oven are a common offender - particularly cookie sheets. There should be at least 1 to 2 inches between utensils and between the edge of a utensil and any oven surface. Inadequate clearances will result in uneven baking results - and possibly scorching.

5. **User misunderstanding.** Homemakers should expect a new range to perform somewhat differently than the range it replaced. Older ranges are often out of calibration and the oven

may have been a different size and design. Cycling of the oven burner may also be strange to the new user and is another factor which should be explained.

6. **Testing equipment.** Use a *reliable* mercury thermometer or other test equipment which has been periodically checked for accuracy to measure oven temperature. A homemaker's inexpensive thermometer is rarely accurate and valid pyrometer readings are possible only when the instrument leads are in good condition.

If none of these factors seem to apply and your check of oven temperature verifies that oven temperatures are more than 20° above or below the dial setting, then the thermostat may need to be readjusted.

Instructions for Recalibration

NOTE: If a thermostat is more than 20° out of calibration, replacing it will generally be faster and far more accurate than attempting field recalibration. To discourage field recalibration, some GST calibration shafts will be secured with an RTV silicone sealant. The control calibration can be adjusted by removing this material.

1. Place a *reliable* mercury oven thermometer in center of oven.
2. Substitute control knob with center hole for the range control knob.

3. Turn the control knob counterclockwise just to the 300° setting and allow oven to heat until the oven burner has cycled on and off several times. Then, as the oven burner re-ignites, take a temperature reading.

NOTE: If the oven has no window, open door and take thermometer readings as rapidly as possible.

4. When the oven burner flame goes out, take a second thermometer reading immediately.
5. Average the high and low

temperature; this average temperature should be 280° to 320°.

6. If average temperature does not fall within this range, adjust as follows:

- A. Insert screwdriver into hole in center of control knob and engage slotted calibration shaft in center of control stem (Fig. 7.)

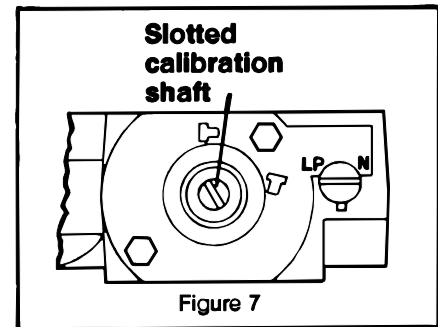


Figure 7

B. *Holding screwdriver so it does not move*, turn control knob to average temperature calculated in Step 5. Turning the calibration shaft just 10° changes the temperature 25°F. Trying to recalibrate without a drilled knob will therefore be difficult.

7. Remove screwdriver. Turn control knob to "Off" and then turn counterclockwise *just* to the 300° setting. Repeat Steps 3, 4, and 5 to recheck the calibration.

8. Replace range control knob; turn clockwise to "Off" position.

BASIC MODEL NUMBERS

Model	Outlet		Mount		Pilot	
	Horizontal	Vertical	Flange	Harper Bolt-thru	Continuous (Standing)	Spark
5390	X		X		X	
5391		X	X		X	
5392	X			X	X	
5393		X		X	X	
5394	X		X			X
5395		X	X			X
5396	X			X		X
5397		X		X		X

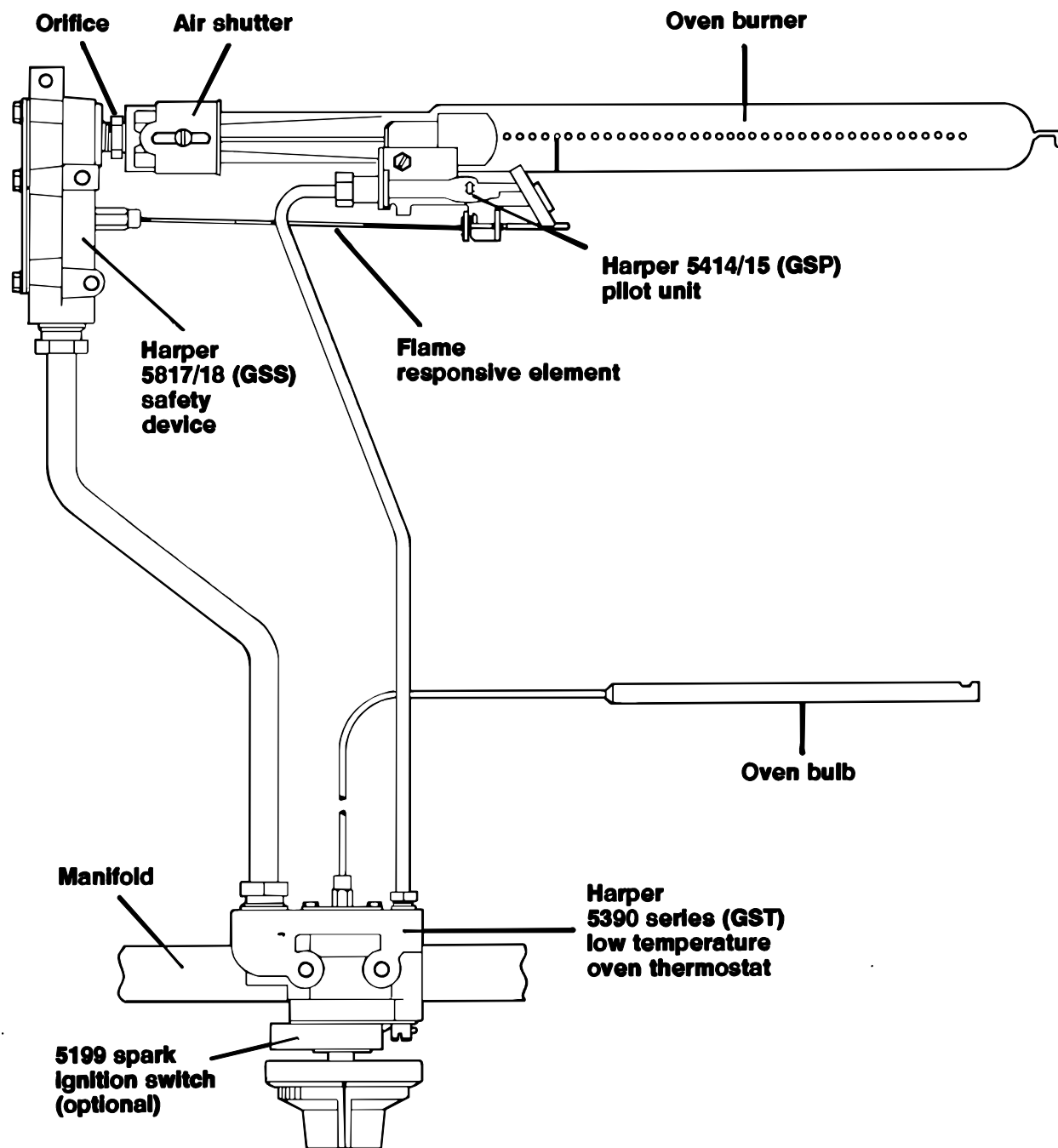


Figure 1

Trouble-Shooting Guide

Before any component is replaced, follow this four-step check list.

1. Be sure that user misunderstanding or utensil problems are not the real source of the complaint.

2. Check basic adjustments: the oven pilot selector cartridge setting, rate and air shutter adjustment of the oven burner, oven thermostat bulb location and condition, location of the flame responsive element in the pilot bracket, etc.

3. Pressure regulators are an important part of the range control system and can be the cause of every problem listed in this Trouble Shooting Guide.

The manufacturer can furnish more detailed service instructions but this is a general guide for checking regulator operation.

A. If the regulator is the convertible type (adjustable for use on either Natural or LP gas), check the setting to be sure it is correct for the gas on which the range is to be used.

B. Check pressure with a water manometer (U-gauge). Remove a top burner and slip the flexible tubing of the manometer over the valve orifice hood. Turn on that burner and any other top burner. The pressure

reading should be within $\pm 10\%$ of the pressure setting marked on the regulator cap.

C. Check for "bounce" by watching the top burner pilots as you turn on two top burner valves simultaneously and rapidly. If the pilot flame decreases substantially or goes out, the regulator should be replaced.

4. If gas pressure and all adjustments seem to be correct, use the chart which follows to help identify the problem and/or the malfunctioning component.

Problem	Cause	Remedy
No constant and/or no heater pilot.	<ul style="list-style-type: none"> 1. No gas to range. 2. Oven pilot selector cartridge turned off. 3. Defective pressure regulator 4. Pilot tubing supply line blocked. 5. Pilot or pilot orifice blocked. 	<ul style="list-style-type: none"> 1. Use top burner or other constant gas supply outlet to check gas supply. 2. Turn oven pilot selector cartridge all the way to the stop for either Natural (N) or LP gas (LP). (See Figure 6.) 3. Replace regulator. 4. Disconnect tubing at source and at pilot end and blow out, to clear passageway. 5. Disconnect tubing and blowout pilot, to clear orifice. If necessary, remove orifice cup from pilot to clean out blockage. <i>DO NOT</i> ream or drill out orifice hole.
	<p><i>Note:</i> 1. For ovens with Harper KOOL-LITE electronic ignition systems, if pilots do not light when oven thermostat is turned on, consult KOOL-LITE Trouble Shooting Guide.</p> <p>2. Heater pilot will not come on until oven temperature drops below the thermostat knob setting. To check heater pilot operation when oven is warm, turn thermostat knob to a setting higher than the oven temperature.</p>	
Frequent constant pilot outage.	<ul style="list-style-type: none"> 1. Unstable constant pilot. 2. Strong drafts which blowout pilot. 3. Defective pressure regulator. 4. Defective thermostat. 	<ul style="list-style-type: none"> 1. See instructions 4 and 5 above. 2. Determine and eliminate source of strong drafts (e.g. opening in the wall behind the range). 3. Replace regulator. 4. If remedies suggested above will not correct pilot outage. replace thermostat.
No main burner flame.	<ul style="list-style-type: none"> 1. Thermostat knob setting is lower than actual oven temperature. 2. Defective safety. 	<ul style="list-style-type: none"> 1. Reset knob to higher temperature. 2. Replace safety. <i>NOTE:</i> There are no field adjustments for this control.

Problem	Cause	Remedy
No main burner flame (cont'd)	<p>3. Flame responsive element (Mercury Bulb) not hot enough.</p> <p>4. Defective thermostat - no heater pilot flame, no main burner flame at any setting.</p>	<p>3. Check the following possibilities:</p> <p>A. Check position of flame responsive element in Pilot Unit. The tip <i>must</i> be enveloped by the heater pilot flame as shown in Figure 3.</p> <p>B. Check setting of oven pilot selector cartridge. It <i>must</i> be set for the gas on which the range is to be used.</p> <p>C. Check gas pressure to the range - low gas main pressure may result in insufficient heater pilot flame.</p> <p>D. Check pressure regulator (if applicable). Convertible regulators must be set for the gas on which the range is to be used. An erratic or malfunctioning pressure regulator may cause pressure to be too low, causing insufficient pilot flame.</p> <p>4. Replace thermostat. <i>NOTE:</i> No heater pilot flame could also be due to 3C or 3D above. Always check gas pressure <i>before</i> replacing thermostat.</p>
<p>Oven will not maintain proper baking temperature</p> <p>NOTE: See "Calibration" for other possible factors.</p>	<p>1. Oven bulb not in proper location.</p> <p>2. Oven bulb coated with foreign material (oven cleaner, etc.).</p> <p>3. Oven bottom improperly positioned.</p> <p>4. Oven bottom covered with aluminum foil.</p> <p>5. Utensils too large for the oven, cutting off free circulation of air.</p> <p>6. Thermostat not properly calibrated.</p> <p>7. Heater pilot flame not cycling off.</p> <p>8. Safety device not closing because flame responsive element (Mercury Bulb) is being heated by the oven burner flame. (Main burner flame may modulate or throttle when heater pilot flame is off.)</p> <p>9. Safety device not closing. (Flame responsive element not being heated by any source.)</p>	<p>1. Secure oven bulb in clips that hold it in proper location. Oven bulb should not touch any surface.</p> <p>2. Use fine steel wool or scouring pad and gently clean surface of bulb. <i>NOTE:</i> Replace carefully in locating clips.</p> <p>3. Reposition according to range manufacturer's instructions.</p> <p>4. If foil blocks holes or slots in oven bottom, oven heat and heat distribution will be affected. Remove foil.</p> <p>5. Allow at least 1½ to 2" clearance for air circulation between utensils and between utensils and any oven surface. (In most eye-level ovens, this means that a 14"x10" cookie sheet is the largest one which should be used.)</p> <p>6. See "Instructions for Recalibration".</p> <p>7. Check the following possibilities:</p> <p>A. Check oven pilot selector cartridge setting.</p> <p>B. High pressure could cause the constant (standing) pilot flame to act as a heater pilot flame. Check pressure regulator and replace if necessary.</p> <p>C. Replace thermostat if problem is not due to either A or B above.</p> <p>8. Check the following possibilities:</p> <p>A. Flame responsive element must be properly located in Pilot Unit. (See Figure 3.)</p> <p>B. Pilot Unit must be properly located on the oven burner bracket.</p> <p>C. Oven burner is overrated. Adjust to rating specified by range manufacturer.</p> <p>9. Replace safety device with an exact replacement.</p>



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