

## SV9401/SV9402/SV9403, SV9501/SV9502/ SV9503, SV9601/SV9602 SmartValve™ SYSTEM CONTROLS

### INSTALLATION INSTRUCTIONS

#### APPLICATION

The SV9401/SV9402/SV9403, SV9501/SV9502/SV9503, and SV9601/SV9602 SmartValve™ System Controls combine gas flow control and electronic intermittent pilot sequencing functions into a single unit. This product family offers several different intermittent pilot sequences for a wide range of applications. See Table 1 for specific sequences available. The Q3450 or Q3480 Intermittent Pilot hardware provides the low voltage ignition, flame sensor, and pilot burner. This system is suitable for application in a wide range of gas-fired appliances including furnaces, rooftop furnaces, boilers, unit heaters, infrared heaters, space heaters, water heaters, decorative appliances, and commercial cooking units. The specific application of the SmartValve System is the responsibility of the appliance manufacturer. See Table 2 for gas capacity and thread sizes.

#### SPECIFICATIONS

##### WARNING

**Fire or Explosion Hazard.**

**Can cause property damage, severe injury, or death.**

The SV9401/SV9402/SV9403; SV9501/SV9502/SV9503; SV9601/SV9602 provide direct replacement only. Use the Y8610 to convert standing pilot systems to electronic ignition systems.

##### **Ignition Sequences:**

See Table 1 for available ignition sequences.

##### **Body Pattern:**

Straight through. See Table 2 for inlet and outlet specifications.

##### **Capacity:**

See Table 2 for available gas flow capacities.

Table 3 describes the acceptable ambient temperature range for the SV9X01, SV9X02, and SV9X03 SmartValves.

**Table 1. Ignition Sequence Description.<sup>a</sup>**

Model	Type	Prepurge (sec)	Ignition Trial Time <sup>b</sup>	Auto Reset Time
SV9401/SV9501/SV9601	Continuous Retry	—	90 seconds	5 minutes
SV9402/SV9502/SV9602	Continuous Retry	15 or 30 seconds	90 seconds	5 minutes
SV9403/SV9503	Single Trial with Lockout	—	90 seconds	N/A

<sup>a</sup> All times increase by approximately 20 percent when used at 50 Hz.

<sup>b</sup> Pilot flow stops at end of ignition trial unless pilot lights and proves.



**Table 2. Capacity and Inlet and Outlet Specifications.**

Model	Size Inlet x Outlet (in.)	Capacity (at 1 in. wc pressure drop <sup>a</sup> )	Minimum Regulated Capacity	Maximum Regulated Capacity
SV9401/SV9402/SV9403	1/2 x 1/2 NPT	85 ft <sup>3</sup> /hr (2.3m <sup>3</sup> /hr)	10 ft <sup>3</sup> /hrb (0.4m <sup>3</sup> /hr) <sup>b</sup>	120 ft <sup>3</sup> /hr (3.4m <sup>3</sup> /hr)
SV9501/SV9502/SV9503	1/2 x 1/2 NPT	150 ft <sup>3</sup> /hr (4.2m <sup>3</sup> /hr)	20 ft <sup>3</sup> /hr (0.6m <sup>3</sup> /hr) <sup>c</sup>	200 ft <sup>3</sup> /hr (5.7m <sup>3</sup> /hr)
SV9501	1/2 NPT x 1/2 inverted flare	130 ft <sup>3</sup> /hr (3.7m <sup>3</sup> /hr)	20 ft <sup>3</sup> /hr (0.6m <sup>3</sup> /hr) <sup>c</sup>	180 ft <sup>3</sup> /hr (5.1m <sup>3</sup> /hr)
SV9601/SV9602 <sup>d</sup>	1/2 x 1/2 NPT	240 ft <sup>3</sup> /hr (6.8m <sup>3</sup> /hr) <sup>e</sup>	30 ft <sup>3</sup> /hr (0.8m <sup>3</sup> /hr)	340 ft <sup>3</sup> /hr (9.6m <sup>3</sup> /hr) <sup>e</sup>
	1/2 x 3/4 NPT	270 ft <sup>3</sup> /hr (7.6m <sup>3</sup> /hr) <sup>e</sup>	30 ft <sup>3</sup> /hr (0.8m <sup>3</sup> /hr)	370 ft <sup>3</sup> /hr (10.5m <sup>3</sup> /hr) <sup>e</sup>
	3/4 x 3/4 NPT	300 ft <sup>3</sup> /hr (8.5m <sup>3</sup> /hr) <sup>e</sup>	30 ft <sup>3</sup> /hr (0.8m <sup>3</sup> /hr)	415 ft <sup>3</sup> /hr (11.8m <sup>3</sup> /hr) <sup>e</sup>

<sup>a</sup> Capacity based on 1000 Btu/ft<sup>3</sup>, 0.64 specific gravity at 1 in. wc pressure drop (37.3 MJ/m<sup>3</sup>, 0.64 specific gravity natural gas at 0.25 kPa pressure drop).

<sup>b</sup> Minimum regulation for LP gas is 15,000 Btuh.

<sup>c</sup> Minimum regulation for LP gas is 40,000 Btuh

<sup>d</sup> Capacity is reduced by 5 percent with the use of optional outlet screen.

<sup>e</sup> Valves are guaranteed only at 77 percent of the rating.

**Table 3. Model Number Suffix Letter Description.**

Model No. Suffix Letter	Ambient Temperature Range	Pressure Regulator Type
H	0°F to 175°F (-18°C to +79°C)	Slow opening
M	-40°F to +175°F (-40°C to +79°C)	Standard opening
P	-40°F to +175°F (-40°C to +79°C)	Step opening
R	-40°F to +175°F (-40°C to +79°C)	Standard opening—convertible (Natural/LP) for mobile home application.

**Electrical Ratings:**

System Transformer: 40 VA minimum NEMA-rated transformer. Control systems using SV9601, SV9602, or other large secondary loads may require a larger transformer. Refer to the appliance manufacturer recommendation.

Voltage and Frequency: 24 Vac, 50/60 Hz.

Current draw at 24 Vac: 24V Hot: 1.25A nominal (1.5A maximum) when igniter is powered.

24V Thermostat: See Table 4.

Electronic Fan Timer Output: 0.1A maximum at 24 Vac. Output is 8 Vac less than thermostat input voltage at 0.1A draw.

**Table 4. Thermostat Current (Run Mode).**

Model	24 Vac, 50/60 Hz
SV9401/SV9402/SV9403	0.20A/0.20A
SV9501/SV9502/SV9503	0.20A/0.20A
SV9601/SV9602	0.20A/0.20A

**Ignition Sequence Timing at 60 Hz Input**

Prepurge Time (Factory-set on SV9402, SV9502, and SV9602):

15 or 30 seconds depending on model.

**Trial for Ignition:**

90 seconds.

**Automatic Reset Time:**

5 minutes.

NOTE: The SV9403 and SV9503 are lockout models and do not provide Automatic Reset Time.

**Flame Failure Response Time:**

1.6 seconds maximum at 3 μA.

**IMPORTANT**

*All timings increase by 20 percent with 50 Hz input.*

**Gas Conversion Kits:**

See Table 5 for gas conversion kit information.

NOTE: See appliance manufacturer specifications and instructions and information in these installation instructions before attempting to convert an appliance.

**Pipe Adapters:**

Angle and straight flange adapters available for 3/8-, 1/2- and 3/4-in. NPT pipe. See Table 6.

NOTE: Models with 3/4 in. inlet or outlet do not accommodate the adapter kits.

Table 5. Available Gas Conversion Kits.

Model No. Suffix Letter	Kit to Convert Natural Gas to LP	Kit to Convert LP to Natural Gas
H, M	393691	394588
P	Not field convertible	Not field convertible
R	Not required (convertible regulator)	Not required (convertible regulator)

Table 6. Flange Adapter Part Numbers.

Inlet/Outlet Pipe Size	Flange Type	Flange Kit Part No. <sup>a,b</sup>	
		Without Hex Wrench	With Hex Wrench
3/8 in. NPT	Straight	393690-1	393690-11
	Elbow	393690-2	393690-12
1/2 in. NPT	Straight	393690-6	393690-16
	Elbow	390690-3	390690-13
3/4 in. NPT	Straight	393690-4	393690-14
	Elbow	393690-5	393690-15

<sup>a</sup> Flange kits include one flange, one O-ring, and four mounting screws.

<sup>b</sup> Do not use flanges on control models with 3/4 in. inlet or outlet. On models with 1/2 inlet and 3/4 in. outlet, use flanges only on the 1/2 in. inlet side.

#### Approvals:

International Approval Services (IAS): Design Certified C2030017.

## PLANNING THE INSTALLATION

### WARNING

#### Fire or Explosion Hazard.

Can cause product damage, severe injury, or death.

Follow these warnings exactly:

1. Plan the installation as outlined below.
2. Plan for frequent maintenance as described in the Maintenance section.

When intermittent pilot systems are used on central heating equipment in barns, greenhouses, and commercial properties and on heating appliances such as commercial cookers, agricultural equipment, industrial heating equipment and pool heaters, heavy demands are made on the controls. Special steps may be required to prevent nuisance shutdowns and control failure due to frequent cycling, severe environmental conditions related to moisture, corrosive chemicals, dust or excessive heat. These applications require Honeywell Home and Building Control Engineering review; contact your Honeywell Sales Representative for assistance.

Review the following conditions that can apply to your specific installation and take the precautionary steps suggested.

### Frequent Cycling

This control is designed for use on appliances that typically cycle three to four times an hour only during the heating season. In year-around applications and applications with greater cycling rates, the control can wear out more quickly. Perform a monthly checkout as described in this instruction manual.

### Water or Steam Cleaning

If a control gets wet, replace it. If the appliance is likely to be cleaned with water or steam, protect (cover) the control and wiring from water or steam flow. Mount the control high enough above the bottom of the cabinet so it does not get wet during normal cleaning procedures.

### High Humidity or Dripping Water

Dripping water can cause the control to fail. Never install an appliance where water can drip on the control. In addition, high ambient humidity can cause the control to corrode and fail. If the appliance is in a humid atmosphere, make sure air circulation around the control is adequate to prevent condensation. Also, regularly check out the system as described in this instruction manual.

### Corrosive Chemicals

Corrosive chemicals can attack the control, eventually causing a failure. If chemicals are used for routine cleaning, avoid contact with the control. Where chemicals are suspended in air, as in some industrial or agricultural applications, protect the control in an enclosure.

### Dust or Grease Accumulation

Heavy accumulations of dust or grease can cause the control to malfunction. Where dust or grease can be a problem, provide covers for the control to limit contamination.

### Heat

Excessively high temperatures can damage the control. Make sure the maximum ambient temperature at the control does not exceed the control rating. If the appliance operates at very high temperatures, use insulation, shielding, and air circulation, as necessary, to protect the control. The appliance manufacturer should provide proper insulation or shielding; verify proper air circulation is maintained when the appliance is installed.

## INSTALLATION

### When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

### WARNING

**Fire or Explosion Hazard.**  
**Can cause property damage, severe injury, or death.**

Follow these warnings exactly:

1. Disconnect power supply before wiring to prevent electrical shock or equipment damage.
2. To avoid dangerous accumulation of fuel gas, turn off gas supply at the appliance service valve before starting installation, and perform Gas Leak Test after completion of installation.
3. Do not bend pilot tubing at ignition system control or pilot burner after compression fitting is tightened, or gas leakage at the connection can result.
4. Always install a sediment trap in gas supply line to prevent contamination of ignition system control.

### CAUTION

**Electrical Shock or Equipment Damage.**  
**Can shock individuals or short equipment circuitry.**

1. Never apply a jumper across or short the thermostat, 24V hot or 24V common terminal in the SV9401/SV9402/SV9403, SV9501/SV9502/SV9503, or SV9601/SV9602 wiring harness. This can burn out the heat anticipator in the thermostat or damage the system transformer.
2. Never short the electronic fan timer (EFT) output. This can damage the EFT drive circuitry.

### IMPORTANT

*These ignition system controls are shipped with protective seals over the inlet and outlet tappings. Do not remove the seals until ready to connect the piping.*

Follow the appliance manufacturer instructions if available; otherwise, use these instructions as a guide.

## Converting Ignition System Control from Natural Gas to LP Gas Application (or LP Gas to Natural Gas Application)

### WARNING

**Fire or Explosion Hazard.**  
**Can cause property damage, severe injury, or death.**

1. Do NOT attempt to convert step-opening models (SV9401P/SV9402P/SV9403P, SV9501P/SV9502P/SV9503P, or SV9601P/SV9602P).
2. Always change the main and pilot burner orifices when converting from natural to LP gas or from LP to natural gas. Follow appliance manufacturer specifications and instructions to assure proper appliance conversion.
3. Ignition system controls are factory-set for natural (and manufactured) or LP gas. Do not attempt to use an ignition system control set for natural (manufactured) gas on LP gas, or an ignition system control set for LP gas on natural (manufactured) gas.

## Convertible (Natural/LP) Regulator for Mobile Home Applications

Ignition system controls with suffix letter R are convertible pressure regulator models. They can be converted from natural gas to LP or from LP to natural gas without a conversion kit.

Before converting the ignition control from one gas to another, check the ignition control label and the appliance manufacturer rating plate to determine if the factory-set pressure regulator setting meets the appliance manifold requirements after conversion.

**NOTE:** Convertible pressure regulator models (suffix letter R) do not have field-adjustable regulators.

If the factory pressure regulator setting meets the appliance manifold requirement, convert the ignition control using the following procedure:

1. Remove the pressure regulator cap. See Fig.
2. Turn over the cap so the letters facing up are for the gas type the appliance uses—NAT for natural gas and LP for LP gas.
3. Replace the cap and tighten firmly.

## Install Adapters on Control

### IMPORTANT

*3/4 in. inlets and outlets do not accommodate flange adapters.*

If adapters are being installed on the control, mount them as follows:

### Flanges

1. Choose the appropriate flange for your application as listed in Table 5.
2. Remove the seal over the ignition system control inlet or outlet.

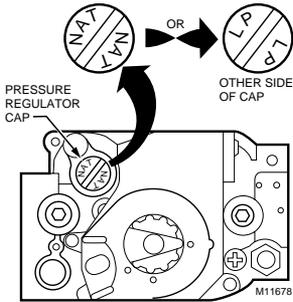


Fig. 1. Convertible Regulator for SmartValves.

3. Make sure that the O-ring fits in the groove of the flange. If the O-ring is not attached or missing, do not use the flange.
4. With the O-ring facing the ignition system control, align the screw holes on the ignition system control with the holes in the flange. Insert and tighten the screws provided with the flange. See Fig. 2. Tighten the screws to 25 inch-pounds of torque to provide a gas-tight seal.

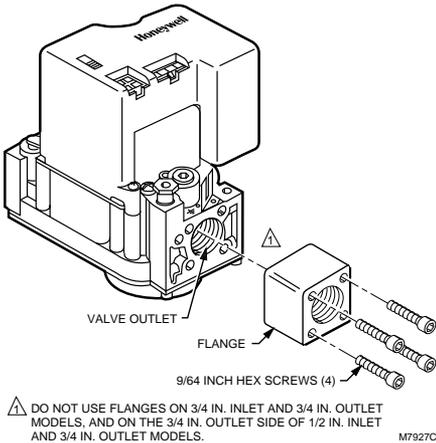


Fig. 2. Firmly fasten flange to valve but do not over-tighten screws.

### Bushings

1. Remove the seal over the ignition system control inlet or outlet.
2. Apply a moderate amount of good quality pipe compound to the bushing, leaving two end threads bare. On an LP installation, use compound resistant to LP gas. Do not use Teflon tape.
3. Insert the bushing in the ignition system control and carefully thread the pipe into the bushing until tight.

Follow the instructions below to installing the piping, and control. Connect the pilot tubing and wiring. Make sure the leak test you perform on the control after completing the installation includes the adapters and screws. If you use a wrench on the valve after the flanges are installed, use the wrench only on the flange, not on the control. See Fig. 6.

### Location

The SV9401/SV9402/SV9403, SV9501/SV9502/SV9503, and SV9601/SV9602 are mounted in the appliance vestibule on the gas manifold.

### IMPORTANT

*Make sure the mounting location protects the control from dripping water and excessive humidity.*

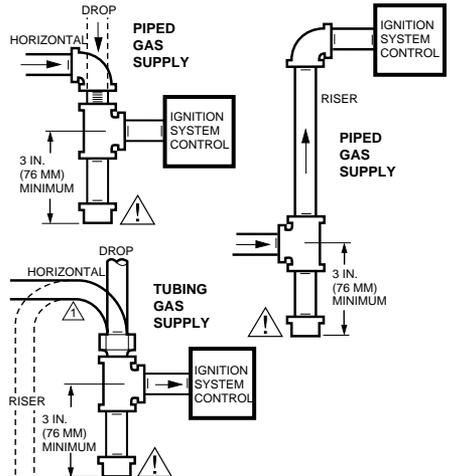
### IMPORTANT

*Make sure the mounting location maximum and minimum ambient temperature are both within the specified acceptable range.*

### Install Piping on Control

All piping must comply with local codes and ordinances or with the National Fuel Gas Code (ANSI Z223.1 NFPA No. 54), as applicable.

1. Use new, properly reamed pipe free from chips. If tubing is used, make sure the ends are square, deburred and clean. All tubing bends must be smooth and without deformation.
2. Run pipe or tubing to the ignition system control. If tubing is used, obtain a tube-to-pipe coupling to connect the tubing to the ignition system control.
3. Install a sediment trap in the supply line to the ignition system control as shown in Fig. 3.



### CAUTION

**GAS LEAKAGE HAZARD**  
FAILURE TO FOLLOW PRECAUTIONS CAN RESULT IN A GAS-FILLED WORK AREA.  
SHUT OFF THE MAIN GAS SUPPLY BEFORE REMOVING END CAP.  
TEST FOR GAS LEAKAGE WHEN INSTALLATION IS COMPLETE.

ALL BENDS IN METALLIC TUBING SHOULD BE SMOOTH. M3343B

Fig. 3. Sediment trap installation.

## Install Control

1. This ignition system control can be mounted 0 to 90 degrees in any direction, including vertically, from the upright position of the ignition system control switch.
2. Mount the control so the gas flow is in the direction of the arrow on the bottom of the ignition system control.
3. Thread the pipe the amount shown in Table 7 for maximum pipe insertion into ignition system control or adapters. Do not thread pipe too far. Valve distortion or malfunction can result if the pipe is inserted too deeply.
4. Apply a moderate amount of good quality pipe compound (do not use Teflon tape) only to the pipe, leaving two end threads bare as shown in Fig. 4. On LP installations, use a compound resistant to LP gas.

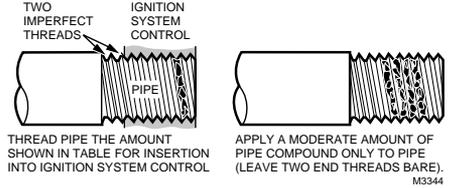


Fig. 4. Use moderate amount of pipe compound.

Table 7. NPT Pipe Thread Length (in.).

Pipe Size (Inches)	Thread Pipe this Amount (Inches)	Maximum Depth Pipe can be Inserted into Control (Inches)
3/8	9/16	3/8
1/2	3/4	1/2
3/4	13/16	3/4

5. Remove the seals over the ignition system control inlet and outlet, if necessary.
6. Connect the pipe to the ignition system control inlet and outlet. Use a wrench on the square ends of the ignition system control. If a flange is used, place the wrench on the flange rather than on the ignition system control as shown in Fig. 5 and 6.

## Connect Pilot Gas Tubing

1. Cut tubing to the desired length and bend as necessary for routing to the pilot burner. Do not make sharp bends or deform the tubing. Do not bend the tubing at the ignition system control after the compression nut is tightened because this can result in gas leakage at the connection.
2. Square off and remove burrs from the end of the tubing.
3. Unscrew the brass compression fitting from the pilot outlet as shown in Fig. 6.
4. Slip the fitting over the tubing and slide out of the way as shown in Fig. 7.
5. Push the tubing into the pilot gas tapping on the outlet end of the control until it bottoms.
6. While holding the tubing all the way in, slide the fitting into place and engage the threads; then turn until finger tight.
7. Then tighten one more turn with a wrench. Do not overtighten.
8. Connect the other end of the tubing to the pilot burner according to the instructions supplied with Q3450/Q3480.

NOTE: The pilot tubing provides the SmartValve System flame sense current path. Make sure the connections are clean and tight for proper appliance operation.

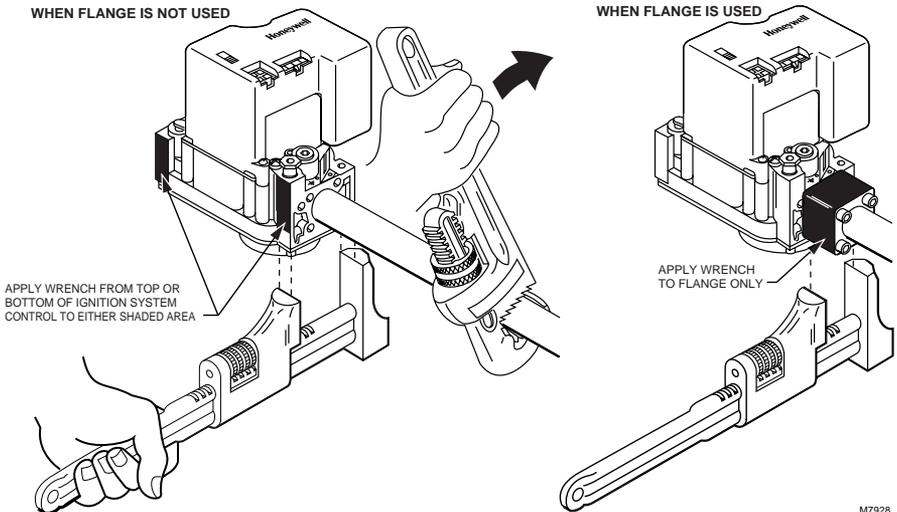


Fig. 5. Proper use of wrench on ignition system control with and without flanges.

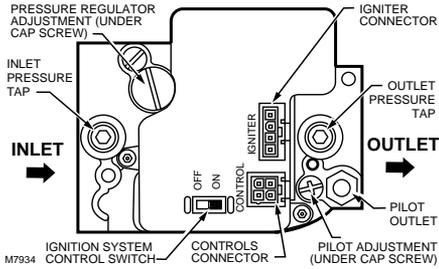


Fig. 6. Top view of ignition system control.

## Wiring

Follow the wiring instructions furnished by the appliance manufacturer if available. Otherwise, use these instructions. Where these instructions differ from the appliance manufacturer, follow the appliance manufacturer's instructions.

### IMPORTANT

All wiring must comply with applicable electrical codes and ordinances.



## CAUTION

### Electrical Shock or Equipment Damage.

Disconnect power supply before making wiring connections.

1. Check the power supply rating on the ignition system control and make sure it matches the available supply. The system transformer should be NEMA rated for 40 VA or higher. An appliance system power review is recommended. Install a transformer, thermostat and other controls, as required.

2. Connect control circuit to the ignition system control using the keyed plug connector. See Fig. 8 through 11.

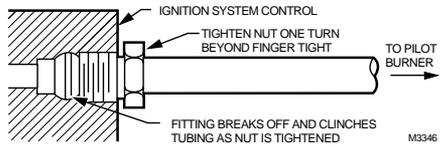


Fig. 7. Always use new compression fitting.

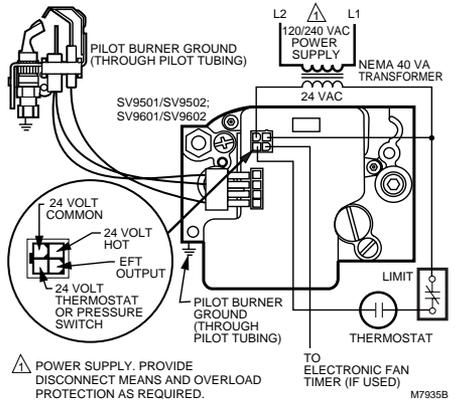


Fig. 8. SV9401/SV9402/SV9403, SV9501/SV9502/SV9503, SV9601/SV9602 basic wiring diagram.

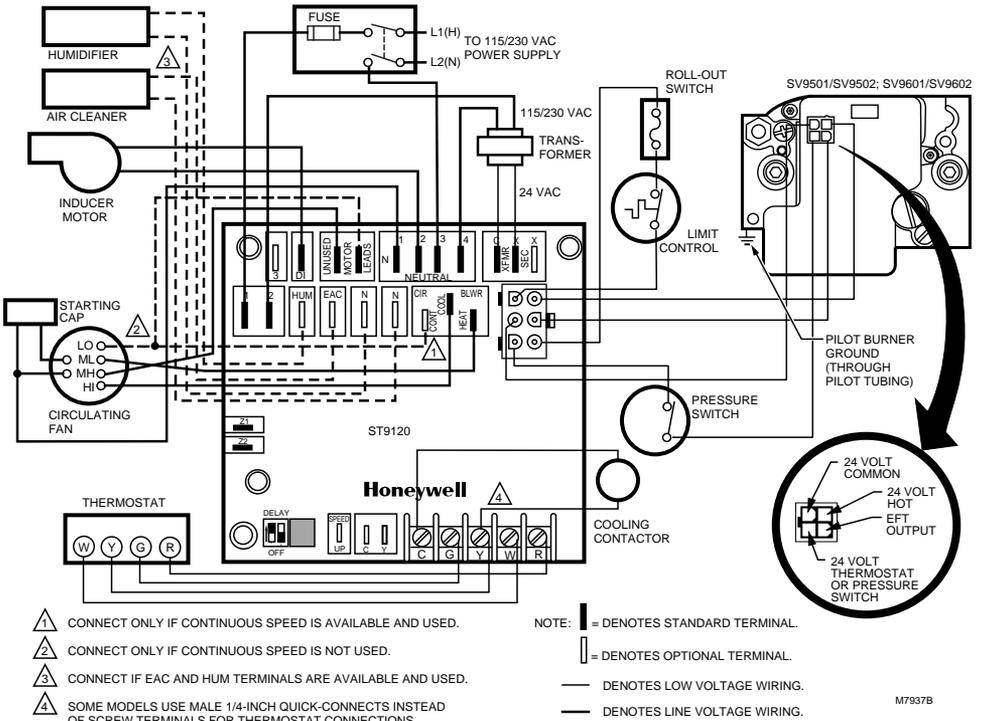


Fig. 9. SV9401/SV9402/SV9403, SV9501/SV9502/SV9503, SV9601/SV9602 typical wiring connections in fan-assisted warm air furnace with electronic fan timer.

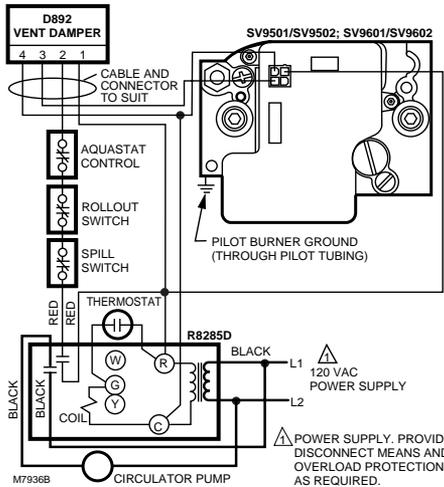


Fig. 10. SV9401/SV9402/SV9403, SV9501/SV9502/SV9503, SV9601/SV9602 typical wiring diagram in atmospheric boiler.

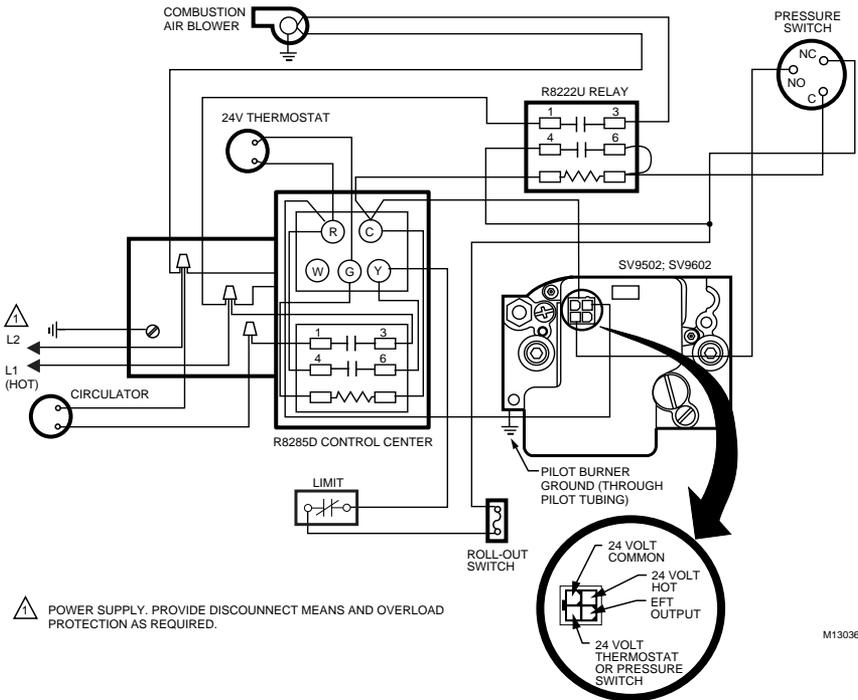


Fig. 11. SV9402, SV9502, SV9602 typical wiring connections in induced draft boiler application.

## STARTUP AND CHECKOUT

### Ignition System Control Switch Settings

Ignition system control switch settings are:

**OFF** Prevents pilot and main gas flow through the ignition system control.

**ON** Permits gas to flow into the control body. Under control of the thermostat, gas can flow to the pilot and main burners.

**NOTE:** Controls are shipped with the ignition system control switch in the ON position.

### Turn on Main Burner

Follow the instructions provided by the appliance manufacturer or turn up the thermostat to call for heat.

### Perform Gas Leak Test

#### **WARNING**

**Fire or Explosion Hazard.**

**Can cause property damage, severe injury, or death.**

Check for gas leaks with soap and water solution any time work is done on a gas system.



## CAUTION

**Equipment Damage Hazard.**

Contact with soap and water can damage the control. Do not spray soap and water solution on the SmartValve housing.

### Gas Leak Test

1. Paint pipe connections upstream of the ignition system control with rich soap and water solution. Bubbles indicate a gas leak.
2. If a leak is detected, tighten the pipe connections.
3. Stand clear of the main burner while lighting to prevent injury caused from hidden leaks that could cause flashback in the appliance vestibule. Light the main burner.
4. With the main burner in operation, paint the pipe joints (including adapters) and the control inlet and outlet with rich soap and water solution.
5. If another leak is detected, tighten the adapter screws, joints, and pipe connections.
6. Replace the part if a leak cannot be stopped.

### Check and Adjust Pilot Flame

The pilot flame should envelop 3/8 to 1/2 in. (10 to 13 mm) of the tip of the flame rod. It should also be in continual contact with the ground electrode. See Fig. 12. If the pilot flame is small or lazy, or does not touch the ground electrode, the inlet gas pressure may be too low, or the pilot

orifice may be partially clogged. Check and repair as necessary. If the pilot flame is hard and noisy, the inlet gas pressure may be too high. The ignition system control has a pilot adjustment mechanism to reduce the pilot flow, if necessary. Use the following procedure:

1. Remove pilot adjustment cover screw. See Fig. 4.

NOTE: Pilot adjustment is shipped at full flow rate.

2. Turn the inner adjustment screw clockwise if the inlet pressure is too high.

NOTE: If the adjustment screw is used to reduce pilot flow rate, the pilot flame can become too small for reliable system operation if the system inlet pressure drops significantly.

3. Replace the cover screw after the adjustment to prevent gas leakage.

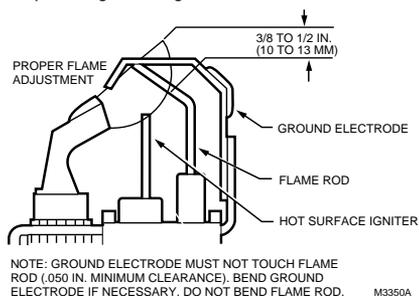


Fig. 12. Proper flame adjustment.

## Check and Adjust Gas Input and Burner Ignition

### IMPORTANT

1. Do not exceed input rating stamped on the appliance nameplate.
2. Do not exceed manufacturer's recommended burner orifice.
3. Make certain primary air supply to main burner is adjusted properly for complete combustion.
4. Follow appliance manufacturer instructions.

## Checking Gas Input by Clocking Gas Meter

### IMPORTANT

1. Make sure there is no gas flow through the meter except to the appliance being checked. Other appliances must remain off with their pilot lights extinguished. Otherwise, subtract that usage from the meter reading.
2. Convert the flow rate to Btuh as described in Gas Controls Handbook, form 70-2602.
3. Compare actual Btuh to the input rate on the appliance nameplate.

## Checking Gas Input with Manometer

### IMPORTANT

1. Make sure the ignition system control is in the OFF position before removing outlet pressure tap plug to connect manometer (pressure gauge).
2. Shut off gas supply at the manual valve in the gas piping to the appliance or, for LP, at the tank.
3. Move the ignition system control switch to the OFF position when removing the gauge and replacing the plug.
4. Remove inlet pressure tap plug.
5. Shut off gas supply.
6. Disconnect manometer and replace plug.
7. Repeat Gas Leak Test at plug with main burner operating.

NOTE: Check the inlet pressure before adjusting the pressure regulator.

## Standard (M) and Slow-Opening (H) Pressure Regulator Models

1. Carefully check the main burner lightoff to make sure the burner lights smoothly and all the ports remain lit.
2. Check the full rate manifold pressure listed on the appliance nameplate. The ignition system control full rate outlet pressure should match this rating.
3. With the main burner operating, check the ignition system control flow using the meter clocking method or check pressure using a manometer connected to the output pressure tap on the ignition system control.
4. Adjust the pressure regulator (if necessary) to match the appliance rating. See Tables 8A and 8B for factory set nominal outlet pressure and adjustment range.
  - a. Remove the pressure regulator adjustment cap screw.
  - b. Using a screwdriver, turn the inner adjustment screw clockwise to increase or counterclockwise to decrease the gas pressure to the burner.
  - c. Replace the cap screw and tighten firmly to prevent gas leakage.
5. If the desired outlet pressure or flow rate cannot be achieved by adjusting the ignition system control, check the ignition system control inlet pressure using a manometer at the inlet pressure tap of the ignition system control. If the inlet pressure is in the nominal range (Tables 8A and 8B), replace the ignition system control. Otherwise, take the necessary steps to provide proper gas pressure to the control.

NOTE: If the burner firing rate is above 85,000 Btuh on SV9401/SV9402/SV9403 or 150,000 Btuh for SV9501/SV9502/SV9503 models (see Table 2 for SV9601/SV9602 capacities), it may not be possible to deliver the desired outlet pressure. This is an application issue, not a control failure. Take whatever steps are required to correct the situation.

### Step-Opening (P) Pressure Regulator Models

Step-opening models require you to check and adjust the full-rate pressure first and then check the step pressure.

The step pressure is not field-adjustable.

1. Carefully check the main burner lightoff to make sure the burner lights smoothly and all the ports remain lit.
2. Check the manifold pressure listed on the appliance nameplate. The ignition system control full rate outlet pressure should match this rating.
3. With the main burner operating, check the ignition system control flow using the meter clamping method or check pressure using a manometer connected to the output pressure tap on the ignition system control.
4. Adjust the pressure regulator (if necessary) to match the appliance rating. See Tables 8A and 8B for factory set nominal outlet pressure and adjustment range.
  - a. Remove the pressure regulator adjustment cap screw.
  - b. Using a screwdriver, turn the inner adjustment screw clockwise to increase or counterclockwise to decrease the gas pressure to the burner.
  - c. Replace the cap screw and tighten firmly to prevent gas leakage.
5. If the desired outlet pressure or flow rate cannot be achieved by adjusting the ignition system control, check the ignition system control inlet pressure using a manometer at the inlet pressure tap of the ignition system control. If the inlet pressure is in the nominal range (Tables 8A and 8B), replace the ignition system control. Otherwise, take the necessary steps to provide proper gas pressure to the control.
6. Carefully check the burner lightoff at step pressure to make sure the burner lights smoothly, without flashback to the orifice. Make sure all ports remain lit.
7. Cycle the burner several times, allowing at least 60 seconds between cycles for the regulator to resume the step function.
8. Repeat steps 6 and 7 after allowing the burner to cool.
9. Readjust the full rate outlet pressure (if necessary) to improve lightoff characteristics.

### Convertible (R) Models

Models with convertible (NAT/LP) regulators, used for mobile home applications, are not field-adjustable. Do not attempt to adjust outlet pressure on these controls. Use the instructions in this manual for changing between LP and natural gas.

**Table 8A. Pressure Regulator Specification Pressures (in. wc).**

Model Type	Type of Gas	Nominal Inlet Pressure Range	Factory Set Nominal Outlet Pressure		Setting Range	
			Step	Full Rate	Step	Full Rate
Standard Slow	NAT	5.0-7.0	—	3.5	—	3-5
	LP	12.0-14.0	—	10.0	—	8-12
Step	NAT	5.0-7.0	0.9	3.5	None	3-5
	LP	12.0-14.0	2.2	10.0	None	8-12
Convertible	NAT	5.0-7.0	—	3.5	None	None
	LP	12.0-14.0	—	10.0	None	None

**Table 8B. Pressure Regulator Specification Pressures (kPa).**

Model Type	Type of Gas	Nominal Inlet Pressure Range	Factory Set Nominal Outlet Pressure		Setting Range	
			Step	Full Rate	Step	Full Rate
Standard, Slow	NAT	1.2-1.7	—	0.9	—	0.7-1.2
	LP	2.9-3.9	—	2.5	—	2.0-3.0
Step	NAT	1.2-1.7	0.2	0.9	None	0.7-1.2
	LP	2.9-3.9	0.5	2.5	None	2.0-3.0
Convertible	NAT	1.2-1.7	—	0.9	None	None
	LP	2.9-3.9	—	2.5	None	None

## MAINTENANCE



### WARNING

**Fire or Explosion Hazard.**  
**Can cause property damage, severe injury, or death.**

Do not attempt to take the control apart or clean it. Improper cleaning or reassembly can cause gas leakage.

Regular preventive maintenance is important in applications such as in the commercial cooking and agricultural and industrial industries that place a heavy load on system controls because:

- In many such applications, particularly commercial cooking, the equipment operates 100,000 to 200,000 cycles per year. Such heavy cycling can wear out the gas control in one to two years.
- Exposure to water, dirt, chemicals and heat can damage the gas control and shut down the control system.

The maintenance program should include regular check-out of the control as outlined in the Startup and Checkout section, and the control system as described in the appliance manufacturer literature.

Maintenance frequency must be determined individually for each application. Some considerations are:

- Cycling frequency. Appliances that may cycle 20,000 times annually should be checked monthly.
- Intermittent use. Appliances that are used seasonally should be checked before shutdown and again before the next use.
- Consequence of unexpected shutdown. Where the cost of an unexpected shutdown would be high, the system should be checked more often.
- Dusty, wet, or corrosive environment. Because these environments can cause the gas control to deteriorate more rapidly, the system should be checked more often.

The system should be replaced if:

- It does not perform properly on checkout or troubleshooting.
- The gas control is likely to have operated for more than 200,000 cycles.
- The control is wet or looks as if it has been wet.

## SERVICE



### CAUTION

**Equipment Damage.**  
**Can cause property damage.**

Do not disassemble the ignition system control; it contains no replaceable components. Attempted disassembly or repair can damage the ignition system control.



### CAUTION

**Electrical Equipment Damage Hazard.**

Do not apply a jumper across or short the thermostat, 24V hot or 24V common terminal in the SV9401/SV9402/SV9403, SV9501/SV9502/SV9503, or SV9601/SV9602 wiring harness. This can burn out the heat anticipator in the thermostat or damage the system transformer.

Carefully read the Sequence of Operation and Troubleshooting information before attempting to service the appliance. After servicing, make sure the system operates properly.

#### IMPORTANT

*Allow 60 seconds after shutdown before re-energizing a step-opening model to assure lightoff at step pressure.*

## SEQUENCE OF OPERATION

Fig. 13 shows the sequence of operation for this family of gas controls. When reviewing sequence of operation:

- Make sure the appliance is powered with the gas supply turned on.
- Make sure the ignition system control switch is in the ON position.

## TROUBLESHOOTING

### If Main Burner Will Not Come On With Call for Heat

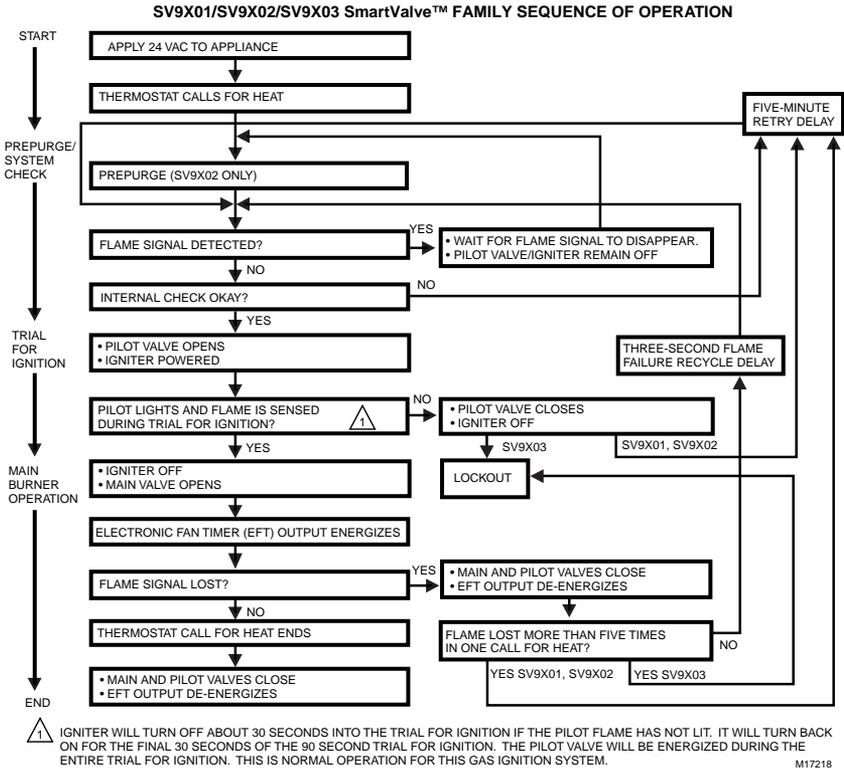
1. Make sure the appliance has power and the gas supply is turned on.
2. Make sure the ignition system control switch is in the ON position.
3. Adjust the thermostat several degrees above room temperature.
4. If the appliance does not light, check for proper ignition control system operation. Use Fig. 13.
5. If it appears the ignition control system is not working properly, use Fig. 14 as a troubleshooting guide.

#### IMPORTANT

1. *Proper troubleshooting requires measurement of voltage and resistance with a volt/ohm meter.*
2. *Use proper size probes and appropriate testing techniques to get good test information without damaging the control terminals, connectors, or wiring harness.*

Use the following basic troubleshooting procedure:

1. Review this information carefully before going to the job site.
2. Identify the specific ignition control model on the appliance.
3. Make sure the Q3450/Q3480 HSI element is good.
4. Make sure the ignition control switch (knob if SV9500) is in the ON position unless directed otherwise in the Troubleshooting flow chart.



**Fig. 13. SV9401/SV9402/SV9403, SV9501/SV9502/SV9503, SV9601/SV9602 SmartValve sequence of operation.**

5. Make sure the appliance call for heat function provides proper inputs to the ignition control through the 2X2 power connector.
6. Follow the Operating Sequence and Troubleshooting flow charts Fig. 13 and Fig. 14 to determine if the ignition control system is defective.

**NOTE:** Most modern gas appliances have more than one component in the control string. Improper operation of any one component in the control string can cause the appliance to fail to operate. Use Fig. 14 to locate and correct the true source of the problem.

**SV9X01/SV9X02/SV9X03 SmartValve™ TROUBLESHOOTING SEQUENCE**

**START**

- TURN OFF GAS SUPPLY
- ASSURE SmartValve SWITCH IS IN ON POSITION
- DISCONNECT SYSTEM CONTROL HARNESS
- SET THERMOSTAT TO CALL FOR HEAT

CHECK FOR PROPER VOLTAGE AT CONTROL HARNESS (SEE INSET A). VOLTAGE SHOULD BE 24V BETWEEN THERMOSTAT OR PRESSURE SWITCH AND 24V COMMON, AND 24V BETWEEN 24V COMMON AND 24V HOT. ⚠️

PLUG HARNESS INTO SmartValve CONTROL. WAIT FOR INTERNAL CHECK DELAY (SV9X01, SV9X03) OR PREPURGE (SV9X02)

IGNITER WARMS UP AND GLOWS RED ⚠️

- TURN ON GAS SUPPLY
- PILOT BURNER LIGHTS

MAIN VALVE OPENS AND MAIN BURNER LIGHTS

SYSTEM IS OKAY

**NOTE: BEFORE TROUBLESHOOTING, BECOME FAMILIAR WITH THE STARTUP AND CHECKOUT PROCEDURE. ALSO CHECK PILOT BURNER ELEMENT FOR RESISTANCE LESS THAN 10 OHMS WITH ELEMENT AT ROOM TEMPERATURE.**

- CHECK:**
- LINE VOLTAGE POWER
  - LOW VOLTAGE TRANSFORMER
  - LIMIT CONTROLLER
  - THERMOSTAT
  - WIRING
  - AIR PROVING SWITCH ON COMBUSTION AIR BLOWER SYSTEM
  - VENT DAMPER (IF USED) IS OPEN AND END SWITCH MAKES

WITH PILOT BURNER CABLE CONNECTED, MEASURE VOLTAGE AT SmartValve HSI ELEMENT OUTPUT (SEE INSET B) 24V NOMINAL. ⚠️ ⚠️

REPLACE IGNITER/FLAME ROD ASSEMBLY

CHECK THAT PILOT GAS IS FLOWING. WAIT TO ASSURE PILOT GAS TUBING IS PURGED. RECYCLE CALL FOR HEAT IF NECESSARY.

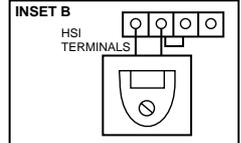
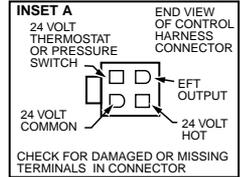
MEASURE VOLTAGE BETWEEN 24V HOT AND 24V COMMON LEADS TO SmartValve CONTROL. MUST MEASURE AT LEAST 19.5 VAC WITH IGNITER POWERED. SEE INSET A TO IDENTIFY PROPER LEAD. THIS CHECK MUST BE DONE WITH THE SmartValve CONTROL CONNECTED AND IGNITER POWERED. ⚠️

REPLACE IGNITER/FLAME ROD ASSEMBLY

- CHECK THAT PILOT FLAME MAKES GOOD CONTACT WITH PILOT BURNER FLAME ROD.
- ASSURE PILOT MOUNTING BRACKETS AND PILOT BURNER ARE NOT BENT OR DAMAGED.
- CHECK GAS SUPPLY PRESSURE.
- CHECK PILOT BURNER ORIFICES FOR CONTAMINATION OR DAMAGE
- CHECK FOR GOOD ELECTRICAL CONNECTION THROUGH THE PILOT TUBING.
- IF ALL OF THE ABOVE ARE GOOD, REPLACE IGNITER/FLAME ROD ASSEMBLY

CYCLE THERMOSTAT OFF AND BACK ON

MAIN BURNER LIGHTS



REPLACE SmartValve CONTROL

REPLACE SmartValve CONTROL

CHECK TRANSFORMER AND LINE VOLT SUPPLY

REPLACE SmartValve CONTROL

⚠️ 1 IGNITER WILL CYCLE OFF AND BACK ON ONCE DURING THE 90 SECOND IGNITION TRIAL. ALL VOLTAGE MEASUREMENTS MUST BE TAKEN WHILE THE IGNITER IS POWERED.

⚠️ 2 WHEN MEASURING VOLTAGE AT CONNECTIONS, USE CARE TO ASSURE TERMINALS ARE NOT DAMAGED.

**Fig. 14. SV9401/SV9402/SV9403, SV9501/SV9502/SV9503, SV9601/SV9602 SmartValve troubleshooting sequence.**

## INSTRUCTIONS TO THE HOMEOWNER

### WARNING

**Fire or Explosion Hazard.**  
**Can cause property damage, severe injury, or death.**

Follow these warnings exactly:

1. Do not light the pilot flame manually.
2. Before lighting the pilot burner flame, smell around the appliance for gas. Be sure to smell next to the floor because LP gas is heavier than air.

### WARNING

**Fire or Explosion Hazard.**  
**Can cause property damage, severe injury, or death.**

If you smell gas:

- Turn off the gas supply at the appliance service valve. On LP gas systems, turn off the gas supply at the gas tank.
- Do not light any appliances in the house.
- Do not touch electrical switches or use the phone.
- Leave the building and use a neighbor's phone to call your gas supplier.
- If you cannot reach your gas supplier, call the fire department.

The ignition system control must be replaced in event of any physical damage, tampering, bent terminals, missing or broken parts, stripped threads, or evidence of exposure to heat, water, or excessive moisture.

### IMPORTANT

*Follow the operating instructions provided by the manufacturer of your heating appliance. These instructions describe a typical ignition system control application, but the specific controls used and the procedures outlined by the manufacturer of your appliance can differ, requiring special instructions.*

### STOP: Read the Warnings Above.

The pilot flame is lit automatically. If the appliance does not turn on when the thermostat is set several degrees above room temperature, follow these instructions:

1. Set the thermostat to its lowest setting to reset the safety control.
2. Disconnect all electric power to the appliance.
3. Remove the ignition system control access panel.
4. Move the ignition system control switch to the OFF position.
5. Wait five minutes to clear out any unburned gas. If you then smell gas, STOP! Follow the Warnings above. If you do not smell gas, continue with the next step.
6. Move the ignition system control switch to the ON position.
7. Replace the ignition system control access panel.
8. Reconnect all electric power to the appliance.
9. Set the thermostat to the desired setting.
10. If the appliance does not turn on, move the ignition system control switch to the OFF position and contact a qualified service technician for assistance.

## TURNING OFF THE APPLIANCE

### Vacation Shutdown—

Set the thermostat to the desired room temperature while you are away.

### Complete Shutdown—

Turn off power to the appliance. Turn off the gas supply to the appliance. Appliance will completely shut off. Follow the procedure in the Instructions to the Homeowner section above to resume normal operation.

**Honeywell**

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