

SV9560/SV9570 SmartValve™ Water Heater Controls

INSTALLATION INSTRUCTIONS

APPLICATION

The SV9560/SV9570; SmartValve™ Water Heater Control System is a single unit which combines direct ignition sequencing, gas flow control, temperature sensing and setpoint adjustment features. These controls were designed specifically for gas fired, forced-draft hot water tank heating applications. The ignition source is a 120V hot surface igniter lighting the main burner flame. Two types of 120V igniters may be used; see Table 1.

SV9560/SV9570 Controls provide high temperature thermal cut-out and all gas ignition safety functions, controlling gas flow, ignition source, water temperature and a 120 Vac combustion air blower. The control also monitors the appliance airflow proving switch and limit string to assure proper appliance operation.

The SmartValve Water Heater Control provides prepurge, postpurge and timed trial for ignition with multiple ignition trials and auto reset from lockout. Diagnostic LED indicates system status.

The specific application of the SmartValve System, is the responsibility of the appliance manufacturer. See Table 2 for temperature ranges and regulator types.

SPECIFICATIONS

IMPORTANT

SV9560/SV9570 Controls provide direct replacement only.

Body Pattern:

SV9560/SV9570: Straight through with 1/2 in. inlet and 1/2 in. inverted flare outlet.

Mounting:

Multipoise capability allows mounting in any position 0 to 90° from upright, including vertically.

Electrical Ratings:

Voltage and Frequency: 115 Vac, 60/50 Hz models are available.

Output Ratings:

Igniter Load: 5A maximum at 120 Vac.
Induced Draft Motor Load: 2.5A Full Load,
10A Locked Rotor at 120 Vac.

Current: 0.100A at 115 Vac.

Table 1. SmartValve Hot Surface Igniter Type.

Model No.	Hot Surface Igniter Type	HSI Warmup (seconds)		
		First Try	Subsequent Tries	Flame Recognition Period
SV9560	Norton 271	17	27	3
SV9570	Norton 601	7	12	1

NOTE: See Table 3 for gas capacities.

Table 2. Model Number Suffix Letter Designation.

Model No. Suffix Letter		Ambient Temperature Range	Pressure Regulator Type
A	Control	0° to 150°F (-18°C to +79°C)	Standard
	Sensor	34° to 212°F (1°C to 100°C)	
H	Control	0° to 150°F (-18°C to +79°C)	Slow-opening
	Sensor	34° to 212°F (1°C to 100°C)	

Prepurge Time:

5 seconds.

Ignition Activation Period (IAP, Factory-Set, Trial for Ignition—FRP):

3 or 5 seconds, depending on model.

Interpurge:

30 seconds

Trial for Ignition (IAP+FRP):

4 or 8 seconds, see device label.

Automatic Restart Delay:

60 minutes, minimum.

Postpurge Time (Factory-set):

5 seconds or 50, depending on the model, see device label.

Ignition Retries:

3 retries; 4 trials total before lockout.

Ignition Recycles:

3; 4 losses of flame before lockout.



Flame Failure Response Time:

2 seconds max. at 2 µA.

Capacity:

See Table 3.

Conversion:

Use conversion factors in Table 4 to convert capacities for other gases.

Regulation Range (Btuh);

SV9560/SV9570 with 1/2 in. NPT inlet and 1/2 in. Inverted

Flare Outlet:

Natural Gas:

Minimum: 20,000
Maximum: 180,000.

LP Gas:

Minimum: 40,000.
Maximum: 180,000.

Approvals:

International Approval Services (IAS): Design Certified.
Report no. C2030027.

Planning the Installation



WARNING

Fire or Explosion Hazard.
Can cause property 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.

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 times a day. In year-around applications with greater cycling rates, the control can wear out more quickly. Perform a monthly checkout.

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

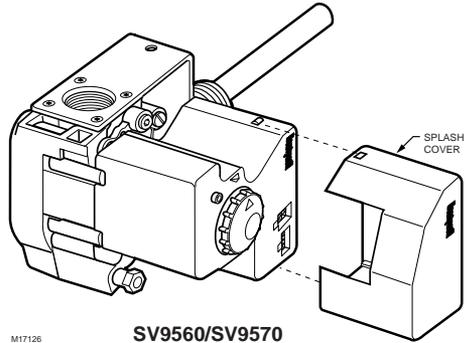
and wiring from water or steam flow. Mount the control high enough above the bottom of the cabinet so it does not get wet during normal cleaning procedures.

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.

IMPORTANT

Always install the splash cover to protect the control from water damage. Refer to Fig. 1.



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SV9560/SV9570

Fig. 1. SV9560/SV9570 Water Heater Control with splash cover.

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 with 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.

Table 3. Capacity of SV9560/SV9570.

Model	Size (Inlet x Outlet) (in.)	Capacity (at 1 in. wc pressure drop ^{a,b})	Minimum Regulated Capacity	Maximum Regulated Capacity
SV9560/SV9570	1/2 NPT x 1/2 inverted flare	130 ft ³ /hr (3.7 m ³ /hr)	20 ft ³ /hr (0.6 m ³ /hr)	180 ft ³ /hr (5.1 m ³ /hr)

^aCapacity based on 1000 Btu/feet³, 0.64 specific gravity natural gas at 1 in. wc pressure drop (37.3 MJ/meter³, 0.64 specific gravity natural gas at 0.25 kPa pressure drop).

^bValves are guaranteed at only 77 percent of the rating.

Table 4. Gas Capacity Conversion Factor.

Gas	Specific Gravity	Multiply Listed Capacity By
Manufactured	0.60	0.516
Mixed	0.70	0.765
Propane	1.53	1.62

Heat

Excessively high temperatures can damage the control. Make sure the maximum ambient temperature at the control does not exceed the rating of the control. If the appliance operates at very high temperatures, use insulation, shielding, and air circulation, as necessary, to protect the control. Proper insulation or shielding should be provided by the appliance manufacturer; 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. Always install a sediment trap in gas supply line to prevent contamination of ignition system control.

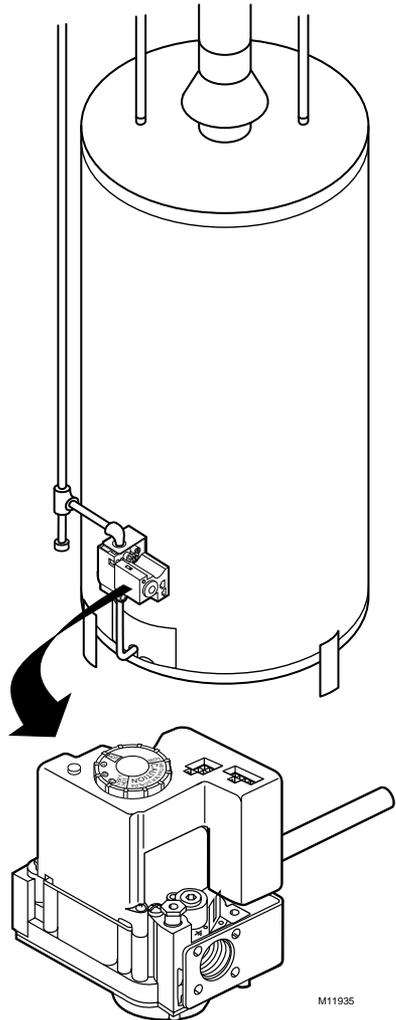
Follow the appliance manufacturer instructions if available; otherwise, use these instructions as a guide.

Location

The SV9560/SV9570 are mounted on the outside of the water heater tank. See Fig. 2.

Install Control to Water Tank

1. If tank is full, drain to point below the tapping.
2. To install the water heater control, screw the water temperature sensing spud into the 3/4 in. NPT water tank immersion well.
3. The control can be mounted 0 to 90° from the upright position.
4. Be certain to mount the SV9560/SV9570 so that gas flow is in the direction of the arrow on the bottom of the control.
5. Use an ANSI approved compound to seal the control to the tank.
6. Follow steps in Connect Gas Supply section (next).



**Fig. 2. Firmly fasten water heater control to tank.
Do not overtighten.**

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Table 6. NPT Pipe Thread Length (in.).

Pipe Size	Thread Pipe this Amount	Maximum Depth Pipe can be Inserted into Control
1/2	3/4	1/2

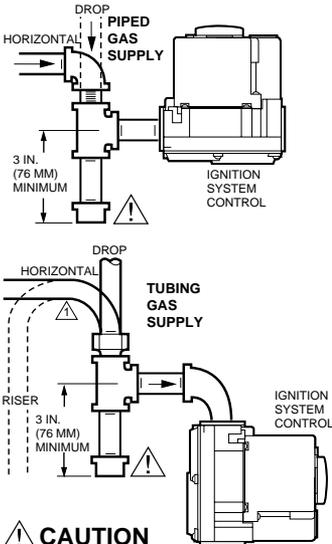
IMPORTANT

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

Connect Gas Supply

All piping must comply with local codes and ordinances or with the National Fuel Gas Code (ANSI Z223.1 NFPA No. 54), whichever applies. Tubing installation must comply with approved standards and practices.

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 water heater control. If tubing is used, obtain a tube-to-pipe coupling to connect the tubing to the control.
3. Install a sediment trap in the supply line to the water heater control. See 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. M11964

Fig. 3. Sediment trap installation.

4. Apply a moderate amount of good quality pipe compound, leaving two end threads bare. On LP installations, use a compound resistant to LP gas. See Fig. 4.

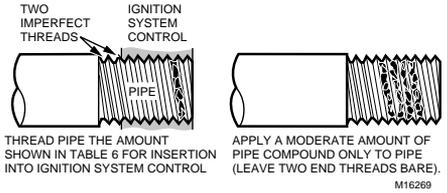


Fig. 4. Use moderate amount of pipe compound.

5. Remove the seals over the water heater control inlet and outlet, if necessary.
6. Connect the pipe to the water heater control inlet and outlet. Use a wrench on the square end of the water heater control. Refer to Fig. 6.

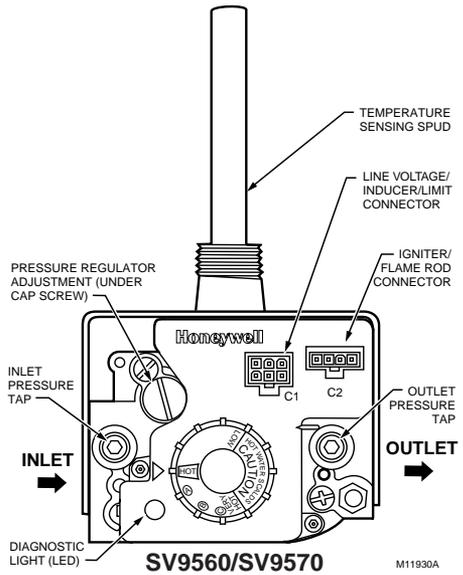


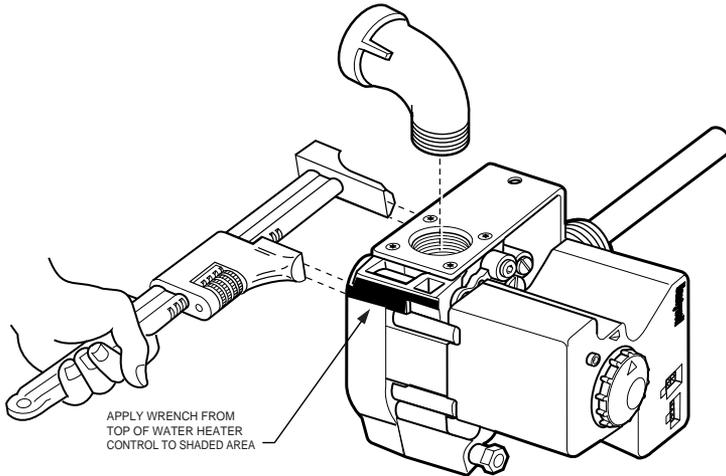
Fig. 5. Top view of water heater control.

CAUTION
Contamination Hazard.
Can cause the device to malfunction.
 Do not use thread tape sealants to seal the gas supply to the control.
 Use a pipe dope compound to seal the connection.
 • Use only ANSI approved compounds.

Wiring

Follow the wiring instructions furnished by the appliance manufacturer, if available, or use the general instructions provided below. When these instructions differ from the appliance manufacturer, follow the appliance manufacturer instructions.

NOTE: All wiring must comply with applicable electrical codes and ordinances.



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SV9560/SV9570

Fig. 6. Proper use of wrench on water heater control.

Disconnect power supply before making wiring connections to prevent electrical shock or equipment damage.

1. Check the power supply rating on the water heater control and make sure it matches the available supply. An appliance system power review is recommended.
2. Connect the 120 Vac power supply HOT lead to L1.
3. Connect neutral to L2.
4. Appliance chassis must have reliable connection to earth ground.
5. Connect control circuit to the water heater control using the keyed connector. See Fig. 7.

Fill Tank

1. Refer to the appliance manufacturer's instructions to fill the tank with water.

Turn on Main Burner

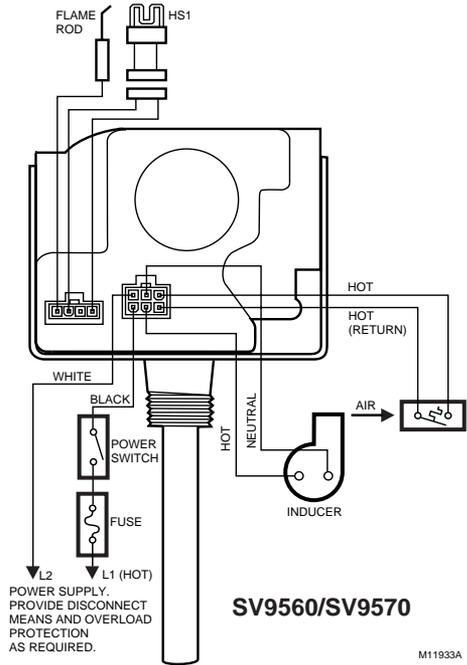
Follow the instructions provided by the appliance manufacturer or turn up the temperature at the setpoint knob.

⚠ WARNING

Scalding Hazard.

Can cause burns, severe injury or death.

Never move setpoint knob past the B setting unless extremely hot water is desired. Always check water temperature at the faucet and readjust until comfortably warm to the touch. Consider the ages and health of all who will come into contact with heated water.



SV9560/SV9570

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Fig. 7. SV9560/SV9570 typical wiring connections.

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

Water Damage Hazard.
Can damage electrical components in the
SV9560/9570.

Do not spray soap and water solution on the SmartValve housing. Do not use an excessive amount of soap and water to perform the gas leak test.

Gas Leak Test

1. Paint pipe connections upstream of the water heater 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 burner while lighting to prevent injury caused from hidden leaks that could cause flashback in the appliance vestibule.
4. With the 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 GAS INPUT AND BURNER IGNITION

WARNING

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

Follow these warnings exactly:

1. Do not exceed input rating stamped on appliance nameplate, or manufacturer's recommended burner orifice pressure for size orifice(s) used. Make certain primary air supply to burner is properly adjusted for complete combustion. Follow instructions of appliance manufacturer.
2. IF CHECKING GAS INPUT BY CLOCKING GAS METER: Make certain there is no gas flow through the meter other than to the appliance being checked. Other appliances must remain off with the pilots extinguished (or that consumption must be deducted from the meter reading). Convert flow rate to Btuh as described in form 70-2602, Gas Controls Handbook, and compare to Btuh input rating on appliance nameplate.
3. IF CHECKING GAS INPUT WITH MANOMETER: Make sure the manual gas shutoff switch is in the OFF position before removing outlet pressure tap plug to connect manometer (pressure gauge). Also move the manual gas shutoff switch to the OFF position when removing the gauge and replacing the plug. Before removing inlet pressure tap plug, shut off gas supply at the manual valve in the gas piping to the appliance or, for LP, at the tank. Also shut off gas supply before disconnecting manometer and replacing plug. Repeat Gas Leak Test at plug with main burner operating.

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

1. Check the full rate manifold pressure listed on the appliance nameplate. Water heater control full rate outlet pressure should match this rating.
2. With burner operating, check the water heater control flow rate using the meter clocking method or check pressure using a manometer connected to the outlet pressure tap on the water heater control. See Fig. 5.

3. If necessary, adjust the pressure regulator to match the appliance rating. See Tables 7A and 7B 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. Always replace the cap screw and tighten firmly to prevent gas leakage.
4. If the desired outlet pressure or flow rate cannot be achieved by adjusting the water heater control, check the water heater control inlet pressure using a manometer at the water heater control inlet pressure tap. If the inlet pressure is in the nominal range (see Tables 7A and 7B), replace the water heater control. Otherwise, take the necessary steps to provide proper gas pressure to the control.

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. Since these environments can cause the 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 control is likely to have operated for more than 150,000 cycles.
 - The control is wet or looks as if it has been wet.

NOTE: If the burner firing rate is above 150,000 Btuh on SV9560/SV9570 models, 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.

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.

Table 7A. 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	—	3.0-5.0
	LP	12.0-14.0	—	10.0	—	8.0-12.0

Table 7B. 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

SERVICE



WARNING

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

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

Sequence of Operations

1. Make sure the appliance control switch is in the ON position.
2. Follow the sequence of operation as shown in Fig. 9.

TROUBLESHOOTING



WARNING

Line Voltage Power.
Can cause property damage,
severe injury or death.

Only a trained, experienced service technician should perform this troubleshooting.

Troubleshooting with LED Indicator Assistance (No cycling of appliance power or request for heat since appliance failure has occurred)

1. Check the system to make sure it is in an active request for heat mode. Turn temperature setpoint knob to low for 10 seconds; turn the temperature setpoint knob to a higher temperature to initiate a request for heat.
2. Remove the appliance burner compartment door. Do not interrupt the power to the SV9560/SV9570 by opening any electrically interlocked panels.
3. Observe LED indicator on SV9560/SV9570 check and repair the system as noted in Table 8. Flash codes are displayed with a 2 second delay between cycles.

4. After LED flash code analysis and appliance repair are complete, turn Temperature setpoint knob to a low temperature for 10 seconds; turn the setpoint knob to a higher temperature to initiate a new request for heat.
5. Observe the ignition sequence; comparing it to the Sequence of Operations shown in Fig. 9. Allow the new ignition sequence to proceed until appliance lights or an abnormal or unexpected event is observed.
6. If an unexpected event is observed, use the Troubleshooting Guide, Fig. 8.
7. After appliance repair is complete, turn temperature spoint knob to low for 10 seconds; turn the setpoint knob to a higher temperature to initiate a new request for heat.

INSTRUCTIONS TO THE HOMEOWNER



WARNING

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

Follow these warnings exactly:

1. 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.
2. The water heater 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.

Table 8. Troubleshooting with the LED.

LED Status	Indicates	Check/Repair
OFF	No power to system control	<ol style="list-style-type: none"> 1. Appliance On/Off switch in the Off position. 2. Line voltage input power at L1 and L2 connectors. 3. System wiring harness in good condition and securely connected at both ends.
Bright - Dim	<p>Normal Operation</p> <p>This indication shows whenever the system is powered, unless some abnormal event has occurred.</p>	Not Applicable
1 Flash	Setpoint error, internal failure detected.	<ol style="list-style-type: none"> 1. Replace control.
2 Flashes	<p>Airflow proving switch remains closed longer than 30 second after a call for heat begins.</p> <p>Combustion air blower is not energized until airflow proving switch opens.</p>	<ol style="list-style-type: none"> 1. Airflow proving switch stuck closed. 2. Airflow proving switch miswired or jumpered. <p>⚠ WARNING Line Voltage Hazard. Can cause property damage, severe injury or death. Turn off appliance before coming in contact with pressure switch and/or electrical connections.</p>
3 Flashes	<p>Airflow proving switch remains open longer than 30 seconds after combustion air blower energized.</p> <p>System goes into 5 minute delay period, with combustion air blower off. At the end of the 5 minute delay, another ignition cycle will begin.</p>	<ol style="list-style-type: none"> 1. Airflow proving switch operation, tubing, and wiring. 2. Obstructions or restrictions in appliance air intake or exhaust flue system that prevent proper combustion air flow. <p>⚠ WARNING Line Voltage Hazard. Can cause property damage, severe injury or death. Turn off appliance before coming in contact with pressure switch and/or electrical connections.</p>
4 Flashes	<p>Thermal Cutoff open.</p> <p>Combustion air blower is energized.</p> <p>Internal hardware failure.</p>	<ol style="list-style-type: none"> 1. Replace Control.
5 Flashes	<p>Flame signal sensed out of proper sequence.</p> <p>Combustion air blower is energized.</p>	<ol style="list-style-type: none"> 1. Flame at main burner 2. Replace control.
6 Flashes	<p>System Lockout</p> <p>After 1 hour lockout reset delay, control will reset and initiate a new ignition sequence if the call for heat is still present.</p>	<ol style="list-style-type: none"> 1. Gas supply off or at too low pressure to operate. 2. Damaged or broken HSI element. 3. Appliance not properly earth grounded. 4. Flame sense rod contaminated or in incorrect location. 5. HSI element located in incorrect position 6. HSI element or flame sense rod wiring in good condition and properly connected. 7. Less than 100 Vac between flame rod and burner pan with 120 Vac input to control. 8. Cycle external power or remove request for heat for 2 seconds and reapply.

SV9560/SV9570 SmartValve™ WATER HEATER CONTROL TROUBLESHOOTING GUIDE

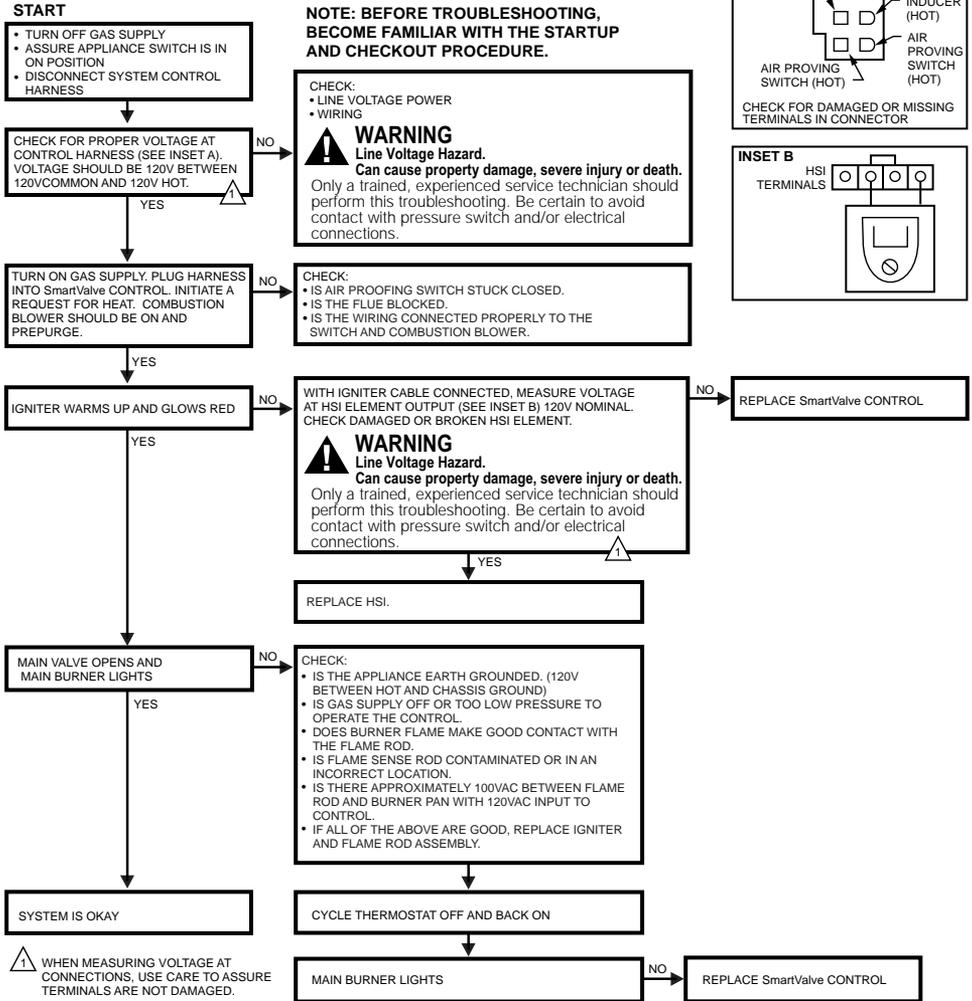


Fig. 8. SV9560/SV9570 Troubleshooting Guide.

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SV9560/SV9570 DIRECT HOT SURFACE IGNITION SmartValve™
SYSTEM CONTROL SEQUENCE OF OPERATION

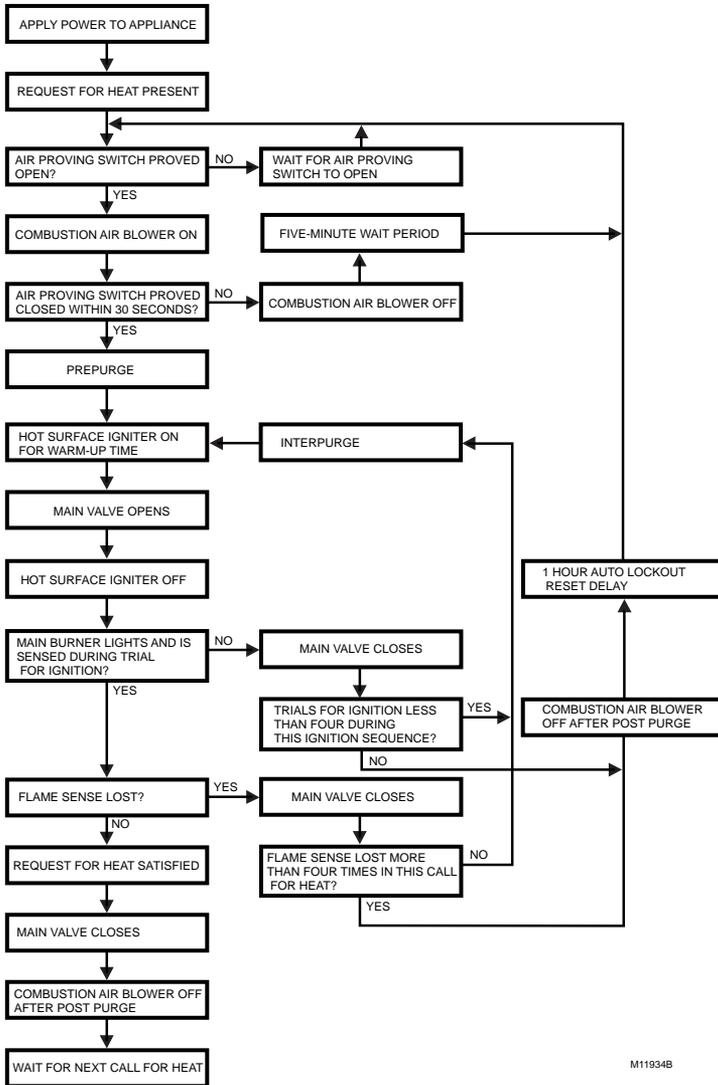


Fig. 9. SV9560/SV9570 Sequence of Operations.

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WARNING

Scalding Hazard.

Can cause burns, severe injury, or death.

Never move temperature setpoint knob past the B setting without checking water temperature at the faucet, and re-adjusting until comfortably warm to the touch. Consider the ages and health of all who will come into contact with heated water.

IMPORTANT

Follow the operating instructions provided by the manufacturer of your water tank appliance. The information in this form describes a typical water heater 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.

If the appliance does not turn on when the setpoint knob is set several degrees above the previous temperature, follow these instructions:

1. Set the temperature setpoint knob to its lowest setting to reset the safety control.
2. Disconnect all electric power to the appliance.

3. Turn off the main gas valve to the appliance.
4. Wait five minutes to clear out any unburned gas. If you then smell gas, STOP! Follow Step 1 in the Warning above. If you DO NOT smell gas, continue with the next step.
5. Turn on the main gas valve to the appliance.
6. Replace the water heater control access panel if provided.
7. Reconnect all electric power to the appliance.
8. Set the setpoint knob to the desired setting.
9. If the appliance does not turn on, turn off the main gas valve to the appliance and contact a qualified service technician for assistance.

TURNING OFF THE APPLIANCE

Vacation Shutdown—

Set the temperature setpoint knob to the desired 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

Home and Building Control

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