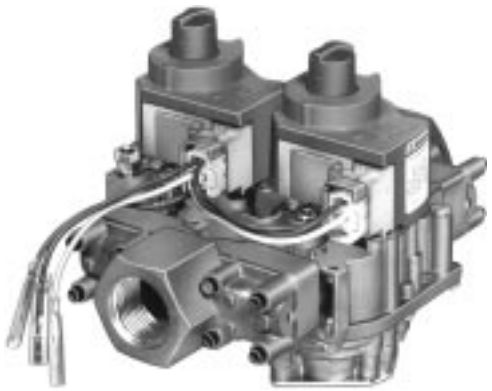
VR8404 High Capacity Intermittent Pilot Dual Automatic Valve Combination Gas Controls

These high capacity intermittent pilot combination gas controls are used in gas-fired appliances. This gas control consists of two valves assembled in parallel on a die-cast manifold to provide high capacity. Each valve includes a manual valve and two automatic operators. One valve has a pilot outlet and the other does not have a pilot outlet. A nonremovable electrical wiring harness connects both valves. DO NOT ALTER OR REMOVE THIS HARNESS. Three pigtail leads (with 1/4-inch quick connects) provide for field connection. Valves have fixed pressure regulation and are not adjustable.



- It is recommended that an appliance shutoff valve be installed upstream of the VR8404.
- Gas controls are available for natural gas and LP; they are not convertible from one gas to another.
- Used with S86F,H; S860D, S8600F,H and S90A,B Control Modules.
- For use with 24 Vac heating appliances that burn natural or manufactured gas, or liquefied petroleum (LP) gas.
- Capacity rated up to 500 feet^3/hour at 1 inch wc pressure drop [14.2 meters^3/hour at 0.25 kPa]. Maximum capacity rated up to 720 feet^3/hour [20.3 meters^3/hour]. Minimum capacity rated at 200 feet^3/hour [5.7 meters^3/hour].
- Solenoid-operated first automatic valves open on thermostat call for heat and close when call for heat ends.
- Diaphragm-operated second automatic valves open under control of the regulator and close if gas or power supply is interrupted.
- Two-position gas control knobs have ON and OFF positions.
- All adjustments and wiring connections are accessible from top of the control.
- Straight-through body pattern.
- Available in 3/4 x 3/4 in., 3/4 x 1 in. and 1 x 1 in. inlet and outlet combinations.
- Non-adjustable servo regulator effectively maintains almost constant gas output pressure under wide fluctuations in gas supply pressure.
- Inlet screen included.
- Pilot filter included.
- May be installed at any angle between 0 and 90 degrees from the upright position, including vertically.
- 3/4 in. x 1 in. bushings are available to reduce the inlet and outlet of the entire gas control.
- -40° F to +175° F [-40° C to +79° C] temperature range standard (VR8404H: 0° F to +175° F [-18° C to 79° C]).
- Inlet and outlet pressure taps provided; both taps accessible from top of control.
- Standard, slow, and step-opening models available.

CONTENTS

Specifications

IMPORTANT: *The specifications given in this publication do not include normal manufacturing tolerances. Therefore, this unit may not match exactly the listed specification. Also, this product is tested and calibrated under closely controlled conditions, and some minor differences in performance can be expected if those conditions are changed.*

MODELS: VR8404 High Capacity Dual Automatic Valve Combination Gas Controls for use in Intermittent Pilot Systems. See Table 1.

ELECTRICAL RATINGS:

Voltage and Frequency: 24 Vac, 60 Hz (50/60 Hz models available on request).

Current Draw: 1.4A.

Thermostat Heat Anticipator Settings: 1.4A.

ELECTRICAL CONNECTIONS: Three pigtail leads with 1/4 in. quick connects.

TYPE OF GAS: Separate models available for natural gas or LP. Valves are not convertible.

BODY PATTERN: Straight-through body pattern.

INLET/OUTLET SIZES: 3/4 x 3/4 in., 3/4 x 1 in. 1 x 1 in.

PRESSURE REGULATION: Not adjustable.

DIMENSIONS: See Fig. 1.

TEMPERATURE RATING:

VR8404H: 0° F to +175° F [-18° C to +79° C];

VR8404M, P: -40° F to 175° F [-40° C to +79° C].

PILOT GAS OUTLET: Compression fitting for 1/4 inch OD tubing.

PRESSURE TAPPING: Inlet and outlet taps standard. Taps accessible from top of gas control. Tap is 1.8 inch NPT with plug containing recess for 3/16 inch Allen wrench.

TABLE 1—MODEL SPECIFICATIONS (PRESSURE REGULATOR PRESSURES IN IN. WC (kPa)).

Model	Type of Gas	Nominal Inlet Pressure	Factory Set Outlet Pressure	
			Step	Full Rate
H (Slow-opening)	Natural	7.0 [1.7]	—	3.0 - 5.0 [0.7 - 1.2]
	LP	14.0 [3.9]	—	8.0 - 12.0 [2.0 - 3.0]
M (Standard)	Natural	7.0 [1.7]	—	3.0 - 5.0 [0.7 - 1.2]
	LP	14.0 [3.9]	—	8.0 - 12.0 [2.0 - 3.0]
P (Step-opening)	Natural	7.0 [1.7]	0.7, 0.9, 1.2, 1.7, [0.17, 0.22, 0.30, 0.42]	3.0 - 5.0 [0.7 - 1.2]
	LP	14.0 [3.9]	1.4, 2.5, 4.0, 5.5 [0.35, 0.62, 1.0, 1.4]	8.0 - 12.0 [2.0 - 3.0]

NOTE: Factory set outlet pressure is not field adjustable.

Ordering Information

When purchasing replacement and modernization products from your TRADELINE® wholesaler or distributor, refer to the Tradeline Catalog or price sheets for complete ordering number, or specify—

1. Order number.
2. Natural or LP gas.
3. Step pressure on VR8404P.
4. Accessories, if desired.
5. Order separately; pilot burner, igniter-sensor, transformer, limit controller, and thermostat or controller as required.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Home and Building Control Sales Office (please check the white pages of your phone directory).
2. Home and Building Control Customer Logistics
   Honeywell, Inc., 1885 Douglas Drive North
   Minneapolis, Minnesota 55422-4386 (612) 951-1000

In Canada—Honeywell Limited/Honeywell Limitee, 740 Ellesmere Road, Scarborough, Ontario M1P2V9. International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

CAPACITY:

Size (in.) (Inlet x Outlet)	Capacity ft^3/ hr [m^3/hr] at 1 in. wc Pressure Drop[a]	Minimum Regulated Capacity ft^3/hr [m^3/hr]	Maximum Regulated Capacity ft^3/hr [m^3/hr]
3/4 x 3/4	400 [11.3]	200 [5.7]	575 [16.3]
3/4 x 1	450 [12.7]	200 [5.7]	625 [17.7]
1 x 1	500 [14.1]	200 [5.7]	720 [20.3]

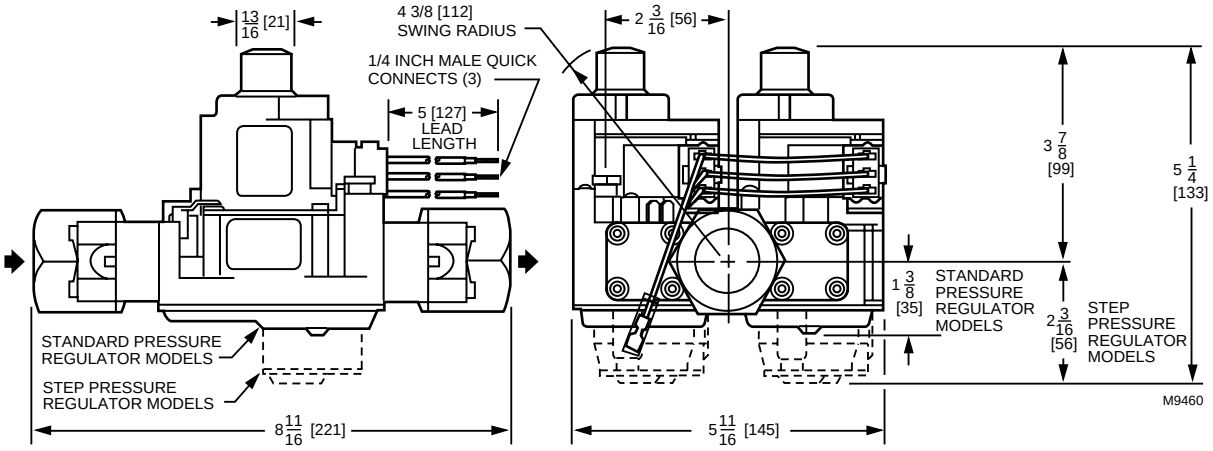
[a] Capacity based on 1000 Btu/ft^3, 0.64 specific gravity natural gas at 1 in. wc pressure drop [37.3 MJ/m^3, 0.64 specific gravity natural gas at 0.25 kPa pressure drop].

Use conversion factors in Table 2 to convert capacities for other gases.

TABLE 2—GAS CAPACITY CONVERSION FACTORS.

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

Fig. 1—VR8404 dimensions in inches [millimeters].



PRESSURE RATING: AGA rating 1/2 psi [3.5 kPa] inlet pressure.

MOUNTING: Can be mounted 0 to 90 degrees in any direction from the upright position of the gas control knob including vertically.

APPROVALS:

American Gas Association design certificate: L2025009.
Canadian Gas Association design certificate: L2025009.
Underwriters Laboratories Inc.: MH8191.

ACCESSORY:

390427H 3/4 in. x 1 in. Bushing.

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. The installer must be a trained, experienced service technician.

4. After installation is complete, use these instructions to check out product operation.

! *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 appliance service valve before starting installation, and perform the Gas Leak Test after completion of installation.
3. Do not bend pilot tubing at gas control or pilot burner after compression fitting has been tightened, because gas leakage at the connection can result.
4. Always install sediment trap in gas supply line to prevent contamination of gas control.
5. Do not force the gas control knobs. Use only your hand to turn the gas control knobs. Never use any tools. If the gas control knobs will not operate by hand, call a qualified service technician to replace the entire gas control. Force or attempted repair can result in fire or explosion.
6. Replace entire VR8404 when doing a product replacement. Do not replace individual valve components.
7. For complete *device* shutoff, both gas control knobs must be in the OFF position. For complete a*ppliance* shutoff, turn off the upstream appliance valve and disconnect the power supply.
8. Use the wiring harness for connecting the entire gas control to the ignition control module. Do not remove the harness or modify the wires in the harness.

! *CAUTION*

Never apply a jumper across or short the valve leadwires. This can burn out the heat anticipator in the thermostat or damage the electronic intermittent pilot (IP) module.

IMPORTANT: *This entire gas control is shipped with protective seals over inlet and outlet tappings. Do not remove seals until ready to connect piping.*

Follow the appliance manufacturer instructions if available; otherwise, use the instructions provided below.

INSTALL BUSHINGS ON ENTIRE GAS CONTROL

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

CHOOSE GAS CONTROL LOCATION

Locate the gas control in the appliance vestibule on the gas manifold. In replacement applications, locate the entire gas control in the same location as the old gas control.

Do not locate the entire gas control where it can be affected by steam cleaning, high humidity, dripping water, corrosive chemicals, dust or grease accumulation, or excessive heat. To safeguard proper operation, follow these guidelines:

- Locate entire gas control in a well-ventilated area.
- Mount entire gas control high enough above the cabinet bottom to avoid exposure to flooding or splashing water.
- Make sure the ambient temperature does not exceed the ambient temperature ratings for the entire gas control.
- Cover entire gas control when appliance is cleaned with water, steam, or chemicals or to avoid dust and grease accumulation.
- Avoid locating gas control where exposure to corrosive chemical fumes or dripping water is possible.

Install Appliance Shutoff Valve

It is recommended that an appliance shutoff valve be installed upstream of the VR8404. Refer to the instructions provided by the valve manufacturer.

Install Piping to Gas Control

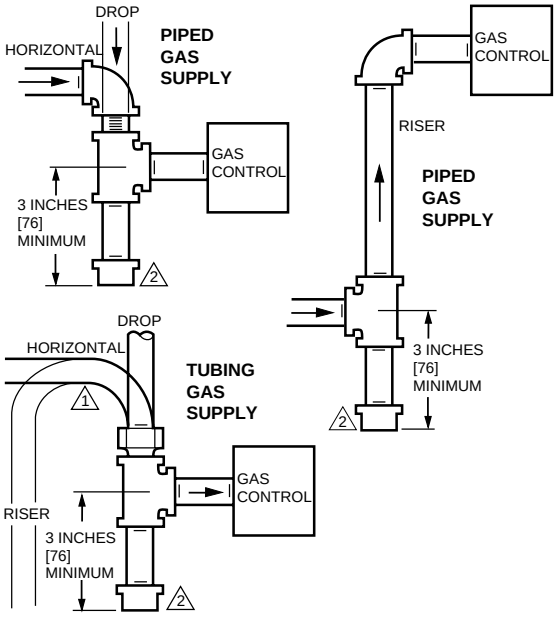
All piping must comply with local codes and ordinances or with the National Fuel Gas Code (ANSI Z223.1 NFPA No. 54), whichever applies. Tubing installation must comply with approved standards and practices.

1. Use new, properly reamed pipe free from chips. If tubing is used, make sure the ends are square, deburred and clean. Make sure all tubing bends are smooth and without deformation.
2. Run pipe or tubing to the gas control. If tubing is used, obtain a tube-to-pipe coupling to connect the tubing to the gas control.
3. Install sediment trap in the supply line to the entire gas control. See Fig. 2.

Install Gas Control

1. This gas control can be mounted from 0 to 90 degrees in any direction from the vertical position of the gas control knobs.
2. Mount the gas control so gas flow is in the direction of the arrows on the bottom of the controls.
3. Thread pipe for insertion into the gas control manifold. *Do not thread pipe too far*. Manifold distortion or malfunction can result if the pipe is inserted too deeply into the gas control. Refer to Table 3.
4. Apply a moderate amount of good quality pipe compound (do *not* use Teflon tape) to pipe only, leaving two end threads bare. On LP installations, use compound resistant to LP gas. Refer to Fig. 3.

Fig. 2—Install sediment trap.



1 ALL BENDS IN METALLIC TUBING SHOULD BE SMOOTH.

2 CAUTION: SHUT OFF THE MAIN GAS SUPPLY BEFORE REMOVING END CAP TO PREVENT GAS FROM FILLING THE WORK AREA. TEST FOR GAS LEAKAGE WHEN INSTALLATION IS COMPLETE.

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TABLE 3—NPT PIPE THREAD LENGTH IN IN.

Pipe Size	Thread Pipe This Amount	Maximum Depth Pipe Can Be Inserted Into Control
3/4	13/16	3/4
1	1-1/16	1

5. Remove seals over gas control inlet and outlet if necessary.

6. Connect pipe to gas control inlet and outlet. Use a wrench on the manifold rather than on the gas control. Refer to Figs. 4 and 5.

Fig. 3—Use moderate amount of pipe compound.

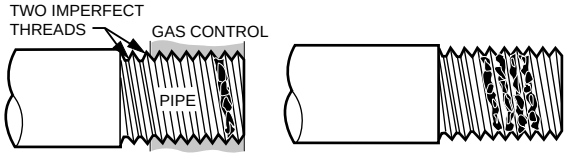

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Fig. 4—Top view of gas control.

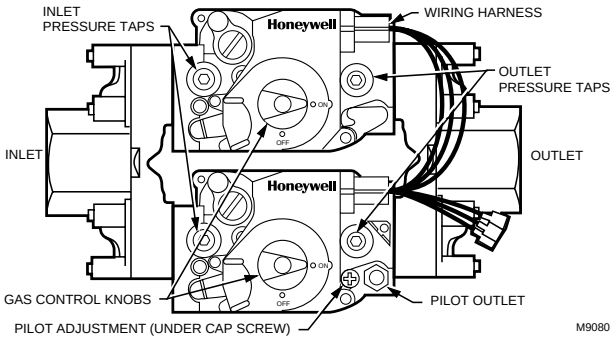

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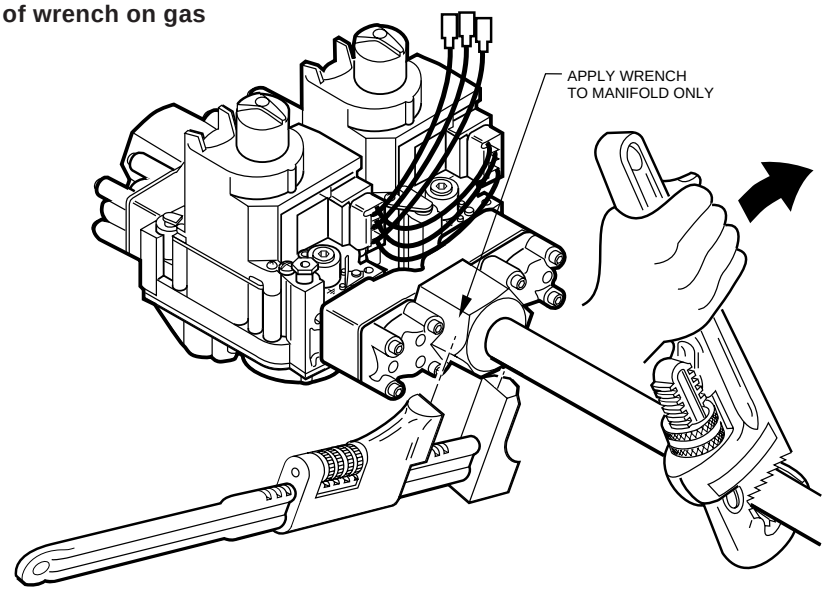
Fig. 5—Proper use of wrench on gas control manifold.



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Connect Pilot Gas Tubing

1. Cut tubing to desired length and bend as necessary for routing to pilot burner. Do not make sharp bends or deform the tubing. Do not bend tubing at gas control or pilot burner after compression fitting has been tightened because this can result in gas leakage at the connection.
2. Square off and remove burrs from end of tubing.
3. Unscrew compression fitting from the pilot outlet (Fig. 4). Slip the compression fitting over the tubing and slide out of the way.

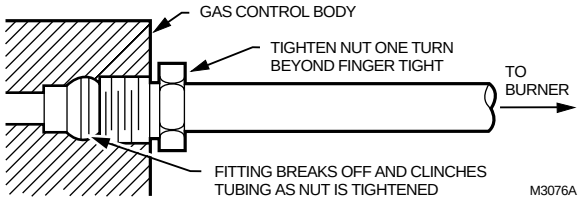
NOTE: When replacing an entire gas control, cut off old compression fitting and replace with the new compression fitting provided on the gas control. Never use the old compression fitting because it may not provide a gas-tight seal.

4. Push tubing into the pilot gas tapping on the outlet end of the control until it bottoms. While holding tubing all the way in, slide compression fitting into place, engage threads and turn until finger tight. Then tighten one more turn with wrench. Do not over tighten. Refer to Fig. 6.
5. Connect other end of tubing to pilot burner according to pilot burner manufacturer instructions.

WIRING

Follow the wiring instructions furnished by the appliance manufacturer, if available, or use the general instructions provided.

Fig. 6—Always use new compression fitting.

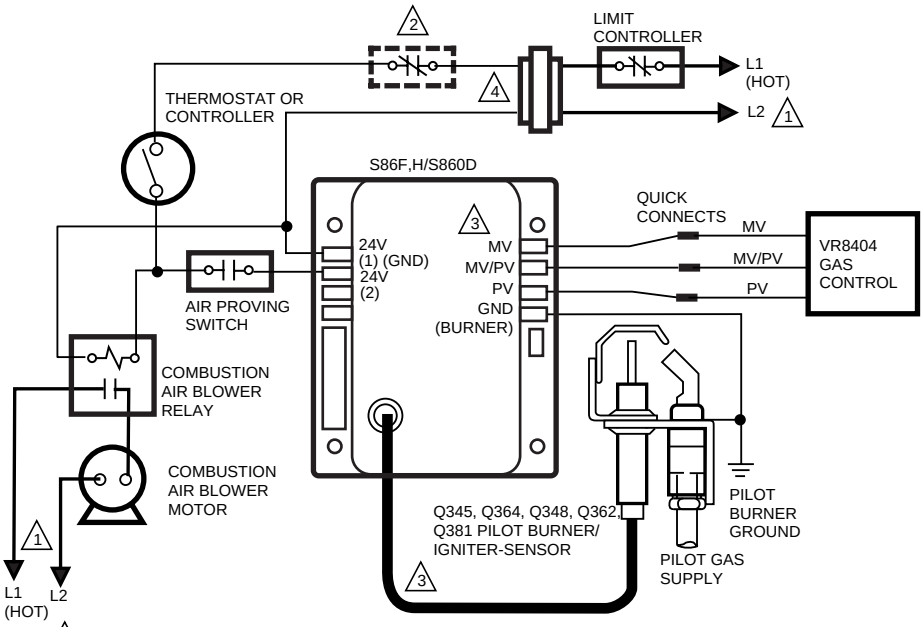


All wiring including insulated quick connect terminals must comply with applicable electrical codes and ordinances.

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

1. Check the power supply rating on the gas control and make sure it matches the available supply. Install transformer, thermostat, and other controls as required.
2. Connect control circuit to gas control terminals. See Figs. 4 and 7 or 8.
3. Adjust thermostat heat anticipator to 1.4A rating stamped on gas control.

Fig. 7—VR8404 wiring connections in intermittent ignition system with S86.



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 ALTERNATE LIMIT CONTROLLER LOCATION.

3 MAXIMUM CABLE LENGTH 3 FEET [0.9 METER].

4 CONTROLS IN 24V CIRCUIT MUST NOT BE IN GROUND LEG TO TRANSFORMER.

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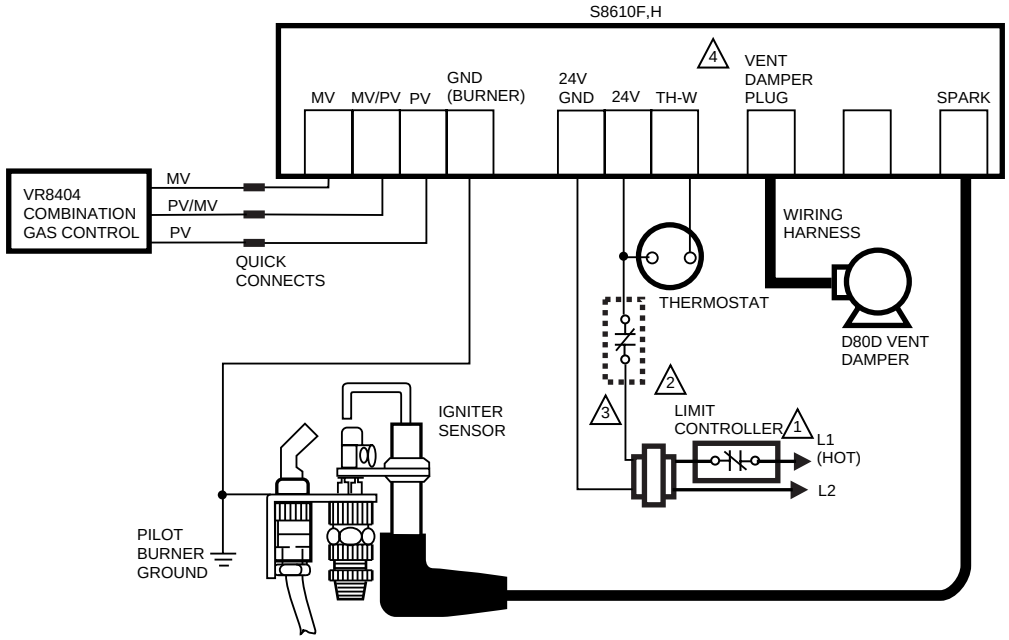
Fig. 8—VR8404 wiring connections in intermittent ignition system with S8600.



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 ALTERNATE LIMIT CONTROLLER LOCATION.

3 CONTROLS IN 24V CIRCUIT MUST NOT BE IN GROUND LEG TO TRANSFORMER.

4 REMOVE PLUG ONLY IF USING VENT DAMPER. FUSE BLOWS ON STARTUP WHEN PLUGIS REMOVED AND VENT DAMPER WIRING HARNESS IS INSTALLED; THEN MODULE WILL OPERATE ONLY WHEN VENT DAMPER IS CONNECTED.

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Startup and Checkout

WARNING

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.

1. Do not force the gas control knobs. Use only your hand to turn the gas control knobs. Never use any tools.
2. If the gas control knobs will not operate by hand, call a qualified service technician to replace the entire gas control.
3. Both knobs must be in the same position for operation or shutoff.

GAS CONTROL KNOBS SETTINGS

The gas control knobs have two settings:

OFF: Prevents pilot and main burner gas flow.

ON: Permits gas to flow into the control body. Under control of the thermostat and intermittent pilot module, gas can flow to the pilot and main burner.

NOTE: Gas controls are shipped with the gas control knobs in the ON position.

PERFORM GAS LEAK TEST

WARNING

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.

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

GAS LEAK TEST

1. Paint all pipe connections upstream of the gas control with a rich soap and water solution. Bubbles indicate a gas leak.
2. If a gas leak is detected, tighten the pipe connection.
3. Stand clear while lighting main burner to prevent injury caused from hidden gas leaks that could cause flashback in the appliance vestibule. Turn on the entire gas control and light the main burner as described below.
4. With the main burner in operation, paint all pipe joints and gas control inlet and outlet with a rich soap and water solution.

5. If another gas leak is detected, tighten pipe connections.
6. Replace the part if gas leak cannot be stopped.

TURN ON GAS CONTROL

Rotate the gas control knobs counterclockwise to ON.

TURN ON MAIN BURNER

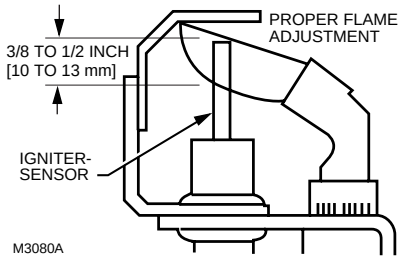
Follow instructions provided by appliance manufacturer or turn up thermostat to call for heat.

ADJUST THE PILOT BURNER FLAME

The pilot flame should envelop 3/8 to 1/2 inch [10 to 13 millimeters] of the igniter-sensor tip. Refer to Fig. 9. To adjust the pilot flame.

1. Remove the pilot adjustment cover screw. Refer to Fig. 4.
2. Turn the inner adjustment screw clockwise to decrease or counterclockwise to increase the pilot flame.
3. To prevent gas leakage replace the cover screw after adjustment.

Fig. 9—Proper flame adjustment.



CHECK GAS INPUT TO MAIN BURNER

CAUTION

1. Do not exceed the input rating stamped on the appliance nameplate, or manufacturer recommended burner orifice pressure for the size orifice(s) used. Make certain the primary air supply to the main burner is properly adjusted for complete combustion (refer to the appliance manufacturer instructions).
2. WHEN CHECKING GAS INPUT BY CLOCKING THE GAS METER:
   - Make sure that the only gas flow through the meter is that of the appliance being checked.
   - Make certain that other appliances are turned off with pilot burners extinguished (or deduct that gas consumption from the meter reading).
   - Convert the flow rate to Btuh as described in the Gas Controls Handbook, form 70-2602, and compare to the Btuh input rating on the appliance nameplate.

Standard-Opening and Slow-Opening Pressure Regulator

1. The gas control outlet pressure should match the manifold pressure listed on the appliance nameplate.
2. With the main burner operating, check the gas control flow rate using the meter clocking method.
3. If the desired gas flow rate is not as stamped on the control, check the gas control inlet pressure using a manometer at the inlet pressure tap. *Regulators are fixed. They are not adjustable*. If the inlet pressure is in the normal range (refer to Table 4), replace the entire gas control. Otherwise, take the necessary steps to provide proper gas pressure to the gas control.

TABLE 4—PRESSURE REGULATOR SPECIFICATION PRESSURES IN IN. WC [kPa].

Model	Type of Gas	Nominal Inlet Pressure	Factory Set Outlet Pressure	
			Step	Full Rate
H (Slow-opening)	Natural	7.0 [1.7]	—	3.0 - 5.0 [0.7 - 1.2]
	LP	14.0 [3.9]	—	8.0 - 12.0 [2.0 - 3.0]
M (Standard)	Natural	7.0 [1.7]	—	3.0 - 5.0 [0.7 - 1.2]
	LP	14.0 [3.9]	—	8.0 - 12.0 [2.0 - 3.0]
P (Step-opening)	Natural	7.0 [1.7]	0.7, 0.9, 1.2, 1.7, [0.17, 0.22, 0.30, 0.42]	3.0 - 5.0 [0.7 - 1.2]
	LP	14.0 [3.9]	1.4, 2.5, 4.0, 5.5 [0.35, 0.62, 1.0, 1.4]	8.0 - 12.0 [2.0 - 3.0]

NOTE: Factory set outlet pressure is not field adjustable.

Step-Opening Pressure Regulator

1. The gas control outlet pressure should match the manifold pressure listed on the appliance nameplate.

2. With the main burner operating, check the gas control flow rate using the meter clocking method.

3. If desired flow rate is not as stamped on the control, check the inlet pressure using a manometer at inlet pressure tap or upstream of the gas control. *Regulators are fixed. They are not adjustable*. If the inlet pressure is in the normal range (refer to Table 4), replace the entire gas control. Otherwise, take the necessary steps to provide proper gas pressure to the gas control.

4. Carefully check main burner lightoff at the step pressure. Make sure the main burner lights smoothly and without flashback to the orifice and that all ports remain lit. Cycle the main burner several times, allowing at least 30 seconds between cycles for the regulator to resume the step function. Repeat after allowing main burner to cool.

CHECK SAFETY SHUTDOWN PERFORMANCE

WARNING

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.

Perform the safety shutdown test any time work is done on a gas system.

NOTE: Read steps 1 through 7 below before starting, and compare to the safety shutdown or safety lockout tests recommended for the intermittent pilot (IP) module. Where they differ, use the procedure recommended for the module.

1. Turn off knobs on entire gas control.

2. Set thermostat or controller above room temperature to call for heat.

3. Watch for spark at pilot burner either immediately or following prepurge. See IP Module specifications.

4. If module has timed ignition, time the length of the spark operation. See IP Module specifications.

5. After the module locks out, open gas control knobs and make sure there is no gas flow to the pilot or main burner. *With modules that continue spark until pilot lights or system is shut down manually, pilot should light when gas control knobs are opened*.

6. Set thermostat below room temperature and wait one minute.

7. Operate system through one complete cycle to make sure all controls operate properly.

Maintenance

WARNING

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.

Do not disassemble the gas control or either valve. They contain no replaceable components. Attempted disassembly or repair can damage the gas control.

Regular preventive maintenance is important in applications such as commercial cooking, agricultural and industrial operations 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 checkout of the entire gas control; see Startup and Checkout section. To check out the control system, see the appliance manufacturer literature. Maintenance frequency must be determined individually for each application. Some considerations are:

- C*ycling frequency*. Appliances that may cycle 100,000 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 gas control to deteriorate more rapidly, the system should be checked more often.

If the gas controls will be exposed to high ammonia conditions; e.g., those used in greenhouses or animal barns, contact your Honeywell sales representative to request a gas control with corrosion resistant construction.

The entire gas control should be replaced if:

- It does not perform properly during checkout or troubleshooting.
- The gas control knobs are hard to turn.
- The gas control is likely to have operated for more than 200,000 cycles.

Operation

The VR8404 gas controls provide ON-OFF manual control gas flow. When both knobs are in the OFF position, pilot and main burner gas flow is prevented. When both knobs are in the ON position, pilot and main burner gas flow is under control of the thermostat, the intermittent pilot module, and the two automatic valve operators of each valve.

The VR8404 gas controls consist of two parallel valves on a die-cast manifold to provide high capacity. The individual valves operate in unison to regulate gas flow. The following information describes how each individual valve operates as well as how they interact.

SYSTEM OPERATION WITH S8600

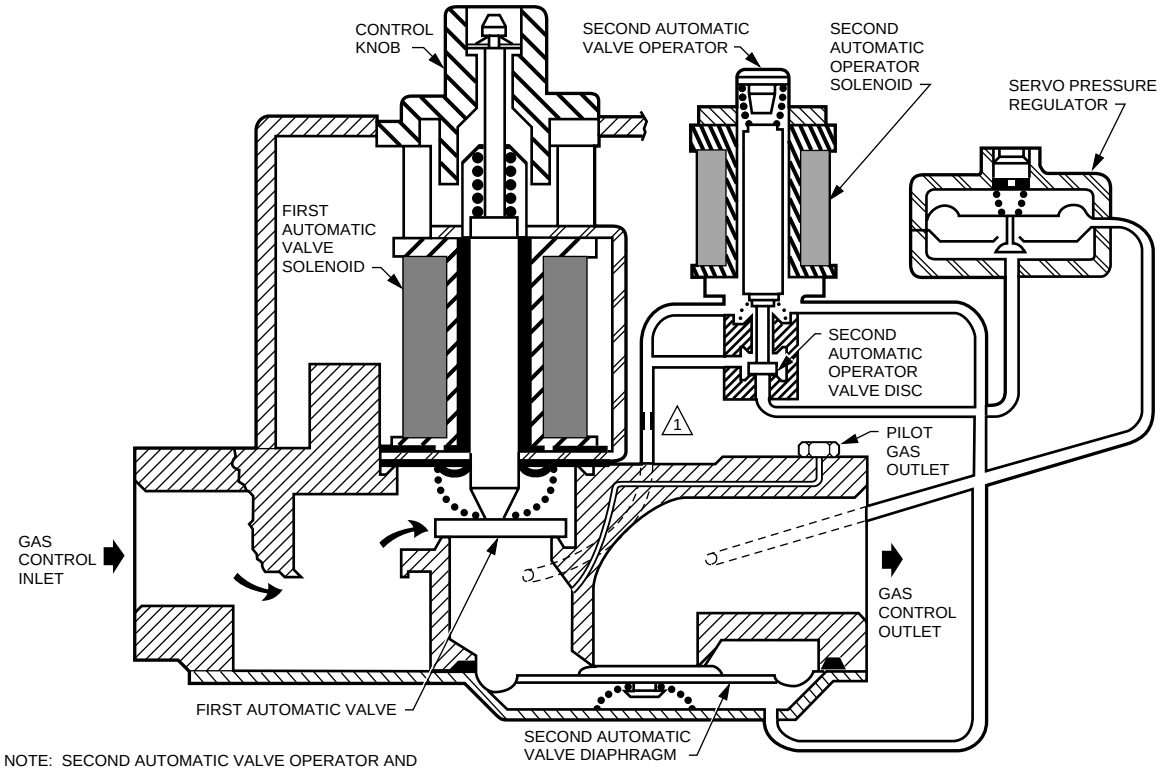
When the thermostat calls for heat, the S8600 Intermittent Pilot Module is energized. The S8600, in turn, activates the first automatic valves of the gas control. Pilot gas flow is allowed. Simultaneously, the S8600 module generates a spark at the igniter-sensor and lights the pilot. The pilot flame is sensed by the igniter-sensor, and spark generation ends.

After the pilot is lit, the S8600 module energizes the solenoid for the second automatic valve operators and gas flows to the main burner (the first automatic valve remains energized). The second automatic valve diaphragms controlled by the servo pressure regulators open and adjust gas flow as long as the system is powered and the pilot is burning. The servo pressure regulators monitor outlet pressure to provide an even main burner gas flow. Loss of power (thermostat satisfied) de-energizes the S8600 module and closes the automatic valves. The system is ready to return to normal service when power is restored through the thermostat.

Loss of pilot flame, or flame too small to reliably light main burner, closes the second automatic valve operators. The S8600 module then attempts to restart pilot. On S8600 modules with lockout timers, the first automatic valves close after the lockout period. On S8600 modules without lockout timers, the trial for ignition continues indefinitely and the first automatic valves remain open.

If pilot flame is restarted successfully, main burner is reopened , and gas flows to main burner as described above. Gas control operation is described in more detail later.

Fig. 10—Position of gas control components during thermostat Off cycle. Both valves positioned the same; one valve shown for simplicity.



NOTE: SECOND AUTOMATIC VALVE OPERATOR AND SERVO PRESSURE REGULATOR SHOWN OUTSIDE GAS CONTROL FOR EASE IN TRACING GAS FLOW.

1 SLOW-OPENING GAS CONTROL HAS A GAS FLOW RESTRICTOR IN THIS PASSAGE.

M9126

VALVE POSITION DURING THERMOSTAT OFF CYCLE

Each valve is positioned as shown in Fig. 10 when the:

- Manual gas control knob is in the ON position.
- Thermostat is not calling for heat.

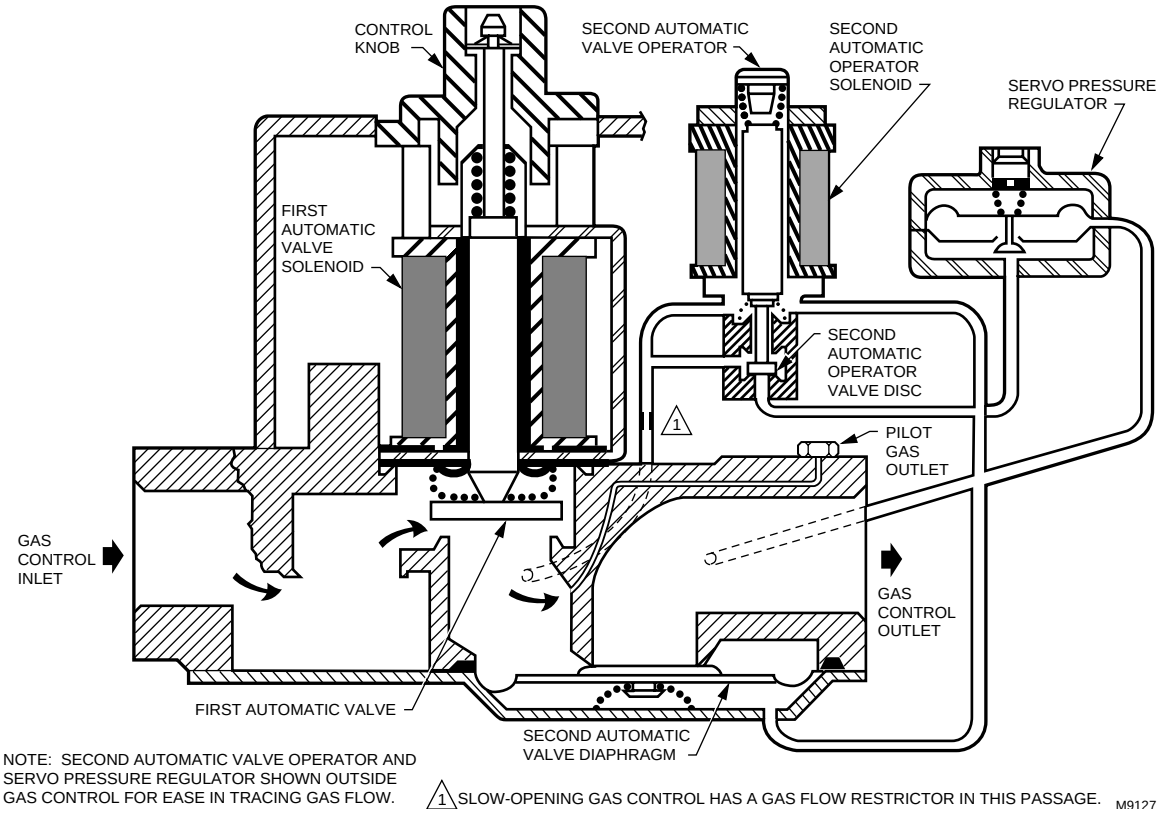
The first automatic valve is closed. The second automatic valve operator is de-energized, closing the channel to the pressure regulator, and opening a channel to the underside of the second automatic valve diaphragm. The combination of spring pressure under the second automatic valve diaphragm and lack of outlet pressure hold the diaphragm firmly closed. Gas pilot burner gas flow is prevented by the first automatic valve and main burner by both valves.

WHEN THERMOSTAT CALLS FOR HEAT

When the thermostat calls for heat, the trial for pilot ignition begins. The first automatic valve solenoid is energized by the module and opens, allowing pilot burner gas flow. Gas also flows to the second automatic valve operator, but is mechanically blocked at the operator. See Fig. 11.

After the pilot lights and the pilot flame is sensed by the igniter-sensor, the second automatic valve solenoid is energized by the module, and the second automatic operator valve disc is lifted off its seat. See Fig. 12. This diverts gas flow from the second automatic valve diaphragm and causes a reduction of pressure on the underside of this diaphragm. The reduced pressure on the bottom of the automatic valve diaphragm repositions the diaphragm downward, away from the valve seat, allowing main burner gas flow.

Fig. 11—Position of gas control components during the trial for pilot ignition. Both valves are positioned the same; one valve shown for simplicity (pilot valve energized).



Standard-Opening Pressure Regulation (VR8404M)

During the ON cycle, the servo pressure regulator provides close control of outlet pressure, even if inlet pressure and flow rate vary widely. Any outlet pressure change is immediately reflected back to the pressure regulator diaphragm, which repositions to change the flow rate through the regulator and, thus, through the automatic valve.

If outlet pressure begins to rise, the pressure regulator diaphragm moves slightly higher, allowing less gas flow to the gas control outlet. This increases gas pressure under the automatic valve diaphragm and repositions the valve disc closer to the seat. Thus, flow of gas through the second automatic valve is reduced, and outlet pressure falls to the desired level.

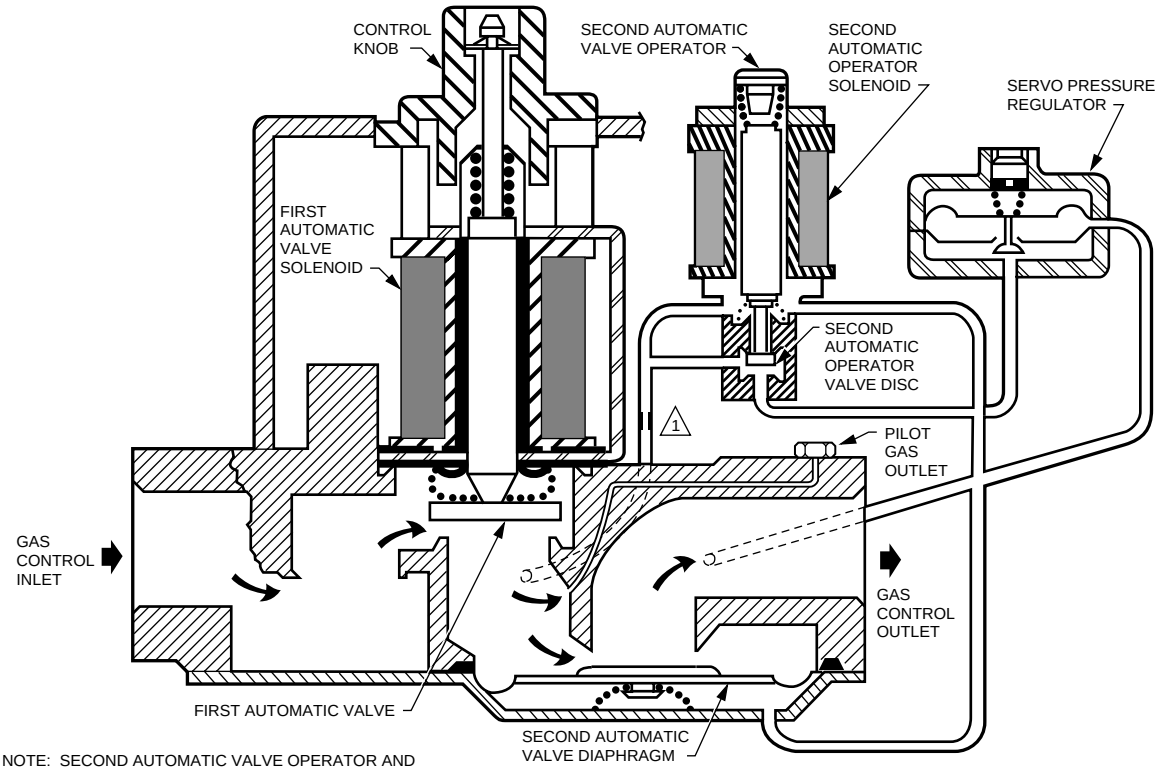
If outlet pressure begins to fall, the pressure regulator diaphragm moves slightly lower, allowing more gas flow to the gas control outlet. This decreases gas pressure under the second automatic valve diaphragm and repositions the valve disc further from the seat. Thus, gas flow through the second automatic valve is increased, and outlet pressure rises to the desired level.

Slow-Opening Pressure Regulation (VR8404H)

Slow-opening gas controls function the same as standard-opening models except that when the thermostat calls for heat, the second automatic valve opens gradually.

Opening is slowed because a gas flow restrictor in the passage from the second automatic operator shows the rate at which gas pressure is reduced under the second automatic valve diaphragm after the second automatic operator opens. Outlet pressure to the main burner increases gradually from 0 inches wc [0 kPa] to rated output pressure within 3 to 6 seconds (for an 80,000 Btuh furnace at 7 inches wc [1.8 kPa] inlet pressure and 3.5 inches wc [0.9 kPa] outlet pressure).

Fig. 12—Position of gas control components during burner cycle. Both valves positioned the same; one valve shown for simplicity (pilot and main valve energized).



Step-Opening Pressure Regulation (VR8404P)

Step-opening gas controls actually combine two pressure regulators, one for the low pressure and one for the full-rate pressure. When the thermostat calls for heat, the automatic operator valve disk opens. The low pressure regulator maintains outlet pressure at the preset step rate for several seconds. Then the regulator valve is forced fully open by the timing diaphragm, which is operated by bleed gas. When the low pressure regulator is fully open, the high pressure regulator maintains the desired full-rate outlet pressure as described for the standard regulator.

The step model requires approximately 60 seconds to reset once the main burner goes off. If it is re-energized with 60 seconds, it may bypass or shorten the length of the low pressure step. The burner may relight at the full flow rate.

When the Call for Heat Ends

When the calls for heat ends, the first automatic valves and the second automatic valve operators close, bypassing the regulator(s) and shutting off the main burner and the pilot gas flow. As pressure inside the gas controls and underneath the automatic valve diaphragms equalize, spring pressure closes the second automatic valve to provide a second barrier to gas flow.

Service

WARNING

FIRE OR EXPLOSION HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY, OR DEATH.

Do not disassemble the gas control or either valve. They contain no replaceable components. Attempted disassembly or repair will damage the gas control.

CAUTION

Do not apply a jumper across or short the valve leadwires. Doing so can burn out the heat anticipator in the thermostat or damage the electronic module.

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

IF MAIN BURNER WILL NOT COME ON WITH CALL FOR HEAT

1. Make sure gas control knobs are in the ON position.
2. Adjust thermostat several degrees above room temperature.
3. Using an ac voltmeter, check for 24V at the gas control.
   - If pilot lights, measure across MV/PV and MV.
   - If pilot does not light, measure across MV/PV and PV before safety lockout occurs.
4. If no voltage is present, check control circuit for proper operation.
5. If 24V is present, replace the entire gas control.

INSTRUCTIONS TO THE USER
FOR YOUR SAFETY, READ BEFORE LIGHTING

WARNING

IF YOU DO NOT FOLLOW THE WARNINGS BELOW AND THE LIGHTING INSTRUCTIONS EXACTLY, A FIRE OR EXPLOSION CAN RESULT WITH PROPERTY DAMAGE, PERSONAL INJURY OR LOSS OF LIFE.

Follow these warnings exactly:

1. Pilot flame is lit automatically. Do not light the pilot flame manually.
2. Before lighting pilot burner flame, smell around the appliance for gas. Be sure to smell next to the floor because LP gas is heavier than air.
3. IF YOU SMELL GAS:
   - Turn off the gas supply at the appliance service valve. On LP gas systems, turn off gas supply at the gas tank.
   - Do not light any appliances.
   - 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 can not reach your gas supplier, call the fire department.
4. Do not force the gas control knobs. Use only your hand to turn the gas control knobs. Never use any tools. If the gas control knob will not operate by hand, call a qualified service technician to replace the entire gas control. Force or attempted repair can result in a fire or explosion.
5. Call a qualified service technician to replace the entire gas control if it has been flooded with water.
6. Replace the entire gas control in the event of any physical damage, tampering, bent terminals, missing or broken parts, stripped threads, or evidence of exposure to heat.

IMPORTANT: *Follow the operating instructions provided by the manufacturer of your heating appliance. The information below will be of assistance in a typical control application, but the specific controls used and the procedures outlined by the manufacturer of your appliance may differ, and require special instructions.*

TO TURN ON THE APPLIANCE
STOP: READ THE WARNING ABOVE

The pilot flame is lit automatically. *Do not attempt to manually light the pilot.* 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 gas control access panel.
4. Turn both of the gas control knobs clockwise  to OFF.
5. Wait five minutes to clear any unburned gas. If you then smell gas, STOP! Follow step 3 in the Warning in the Instructions To The User section. If you do not smell gas, continue with the next step.
6. Turn both of the gas control knobs counterclockwise  to ON.
7. Replace the gas 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, set the gas control knobs to OFF, turn off the upstream appliance valve, and contact a qualified service technician for assistance.

T**URNING OFF THE APPLIANCE**

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

COMPLETE APPLIANCE SHUTDOWN: Turn both gas control knobs clockwise  to OFF. Do not force. Turn off the upstream appliance valve and disconnect power supply. Appliance will be completely shut off.

To resume normal operation, turn on the upstream appliance valve and connect the power supply; then follow the procedure above.

Honeywell

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