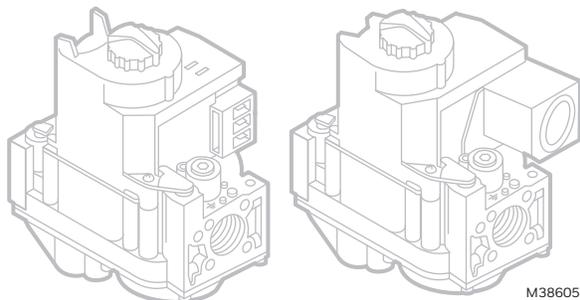


resideo



# VR8205; VR4205 Direct Ignition Dual Automatic Valve Combination Gas Controls

## INSTALLATION INSTRUCTIONS



## APPLICATION

The VR8205 and VR4205 Direct Ignition Dual Automatic Valve Combination Gas Controls are for use with direct ignition systems in gas-fired appliances. The controls include a safety shutoff, a manual valve, two automatic operators and a pressure regulator and conduit cover (VR4205 only).

## FEATURES

- VR8205 used with S89C,E,F and S87 series 5 and later.
- VR4205 used with 120 Vac direct ignition modules.
- VR8205 for use with 24 Vac heating appliances and VR4205 for use with 120 Vac heating appliances that burn natural or manufactured gas, or liquefied petroleum (LP) gas.
- Capacity rated at 150 cfh at 1 in. wc pressure drop [4.2 m<sup>3</sup>/h at 0.25 kPa].
- Solenoid operated first automatic valve opens on thermostat call for heat and closes when call for heat ends.
- Diaphragm-operated second automatic valve opens under control of the regulator and closes if gas or power supply is interrupted.
- Two-position gas control knob has ON and OFF positions.
- All adjustments and wiring connections accessible from top of the control.
- Compact size.

- Straight-through body pattern; right angle adapters available for inlet and outlet.
- 1/2 in. inlet and 1/2 in. outlet; adapters available for 3/8 or 3/4 in.
- Adjustable servo regulator effectively maintains almost constant gas output pressure under wide fluctuations in gas supply pressure.
- Inlet and outlet screens included.
- Wiring terminal block color-coded brown to indicate direct ignition control.
- May be installed at any angle between 0 and 90 degrees from the upright position, including vertically.
- 1/4 in. male quick-connect terminals for electrical connections.
- 0° F to 175° F [-18° C to +79° C] temperature range standard; -40° F to +175° F [-40° C to +79° C] available.
- Inlet and outlet pressure taps included; both taps accessible from top of control.
- Standard-, slow- and step-opening models available.

## SPECIFICATIONS

### IMPORTANT:

*The specifications given in this publication do not include normal manufacturing tolerances. Therefore, this unit may not exactly match the listed specifications. 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:

VR8205 and VR4205 Dual Automatic Valve Combination Gas Controls for use in Direct Ignition Systems. See Table 1 for specifications.

### SUPPLY VOLTAGE:

VR4205: 120 Vac, 60 Hz.  
VR8205: 24 Vac, 60 Hz. (50/60 Hz models available on request.)

### CURRENT DRAW:

VR4205: 0.1A  
VR8205: 0.5A



68-0049-03

**Table 1. Model Specifications.**

Model No. Suffix Letter	Opening Characteristic	Type of Gas	Standard Factory Regulator Settings		Optional Factory Regulator Settings		Range of Field Adjustment	
			in. wc	kPa	in. wc	kPa	in. wc	kPa
VR8205A,M VR4205M	Standard	Natural	3.5	0.9	3 to 5	0.7 to 1.2	3 to 5	0.7 to 1.2
		LP	10.0	2.5	8 to 12	2 to 3	8 to 12	2 to 3
VR8205C,P VR4205P	Step-opening	Natural	Step-0.7, 0.9,1.2 or 1.7, as ordered <sup>a</sup> Full Rate- 3.5	Step-0.17, 0.22, 0.30 or 0.48, as ordered <sup>a</sup> Full Rate- 0.9	Step-0.7, 0.9,1.2 or 1.7, as ordered <sup>a</sup> Full Rate- 3 to 5	Step-0.17, 0.22, 0.30 or 0.48, as ordered <sup>a</sup> Full Rate- 0.7 to 1.2	Step-none; Full Rate- 3-5	Step-none; Full Rate- 0.7 to 1.2
		LP	Step-1.4, 2.5, 4.0 or 5.5, as ordered <sup>a</sup> Full Rate-10	Step-0.35, 0.62, 0.99 or 1.37, as ordered <sup>a</sup> Full Rate- 2.5	Step-1.4, 2.5, 4.0 or 5.5, as ordered <sup>a</sup> Full Rate- 8 to 12	Step-0.35, 0.62, 0.99 or 1.37, as ordered <sup>a</sup> Full Rate- 2-3	Step-none; Full Rate- 8-12	Step-none; Full Rate- 2 to 3
VR8205H,K VR4205H	Slow-opening	Natural	3.5	0.9	3 to 5	0.7 to 1.2	3 to 5	0.7 to 1.2
		LP	10.0	2.5	8 to 12	2 to 3	8 to 12	2 to 3

<sup>a</sup> Step pressure not adjustable.

NOTE: Flange Kits include one flange with attached O-ring and four mounting screws.

**ELECTRICAL CONNECTIONS:** 1/4 in. male quick-connects.  
Two convenience terminals on top of control (optional).  
Terminal block color-coded brown.

**PRESSURE TAPPING:** Inlet and outlet taps standard. Taps accessible from top of control. Tap is 1/8 in. NPT with plug containing recess for 3/16 in. Allen wrench.

**TYPE OF GAS:** Separate models for natural (and manufactured) or LP gas.

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

**CAPACITY:**

At minimum regulation:  
Natural gas: 20,000 Btuh [5860W]<sup>a</sup>.  
LP gas: 40,000 Btuh [11,700W].  
At 1 in. [0.25 kPa] pressure drop: 150,000 Btuh [44,000W]<sup>a</sup>.  
At maximum regulation: 200,000 Btuh [58,600W]<sup>a</sup>.

**PRESSURE REGULATION:** See Table 1. Regulator adjustment accessible from top of control.

<sup>a</sup> 0.64 sp gr natural gas at 1 in. [0.25 kPa] pressure drop; use conversion factors in Table 2 to convert for other gases.

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

**Table 2. Gas Capacity Conversion Factors.**

sp gr	Multiply Listed Capacity By
0.60	0.516
0.70	0.765
1.53	1.62

**TEMPERATURE RATING:**

VR8205A,C,H; VR4205H: 0° F to 175° F [-18° C to +79° C].  
VR8205M,P,K; VR4205M,P: -40° F to +175° F [-40° C to +79° C].

**DIMENSIONS:** See Fig. 1.

**BODY PATTERN:** Straight-through with 1/2 in. inlet and 1/2 in. outlet. Flanges available for 3/8, 1/2 and 3/4 in. straight and 90° angle connection. See Table 3.

**APPROVALS:**

American Gas Association design certificate: L2025006.  
Canadian Gas Association design certificate: L2025006.  
Australian Gas Association design certificate: 4214.  
Approved for Delta C applications.

**Table 3. Flange Part Numbers.**

Inlet/Outlet Pipe Size	Flange Type	Part No.	
		Less 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	393690-3	393690-13
3/4 in. NPT	Straight	393690-4	393690-14
	Elbow	393690-5	393690-15

**ACCESSORIES:**

- Flanges; see Table 3.
- 394349 9/64 in. hex tool for flange assembly screws.
- 393691 Natural to LP Conversion Kit.
- 394588 LP to Natural Conversion Kit.



**FLANGES:**

1. Choose the appropriate flange for your application.
2. Remove seal over control inlet or outlet.
3. Assure the O-ring is fitted in the groove of flange. If the O-ring is not attached or is missing, do not use flange.
4. With O-ring facing control, align the screw 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.

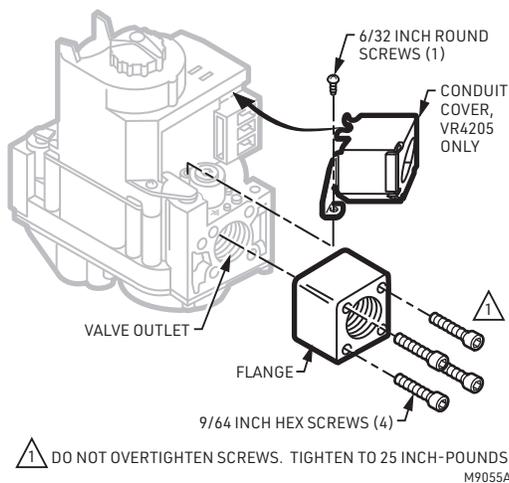
**BUSHINGS:**

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

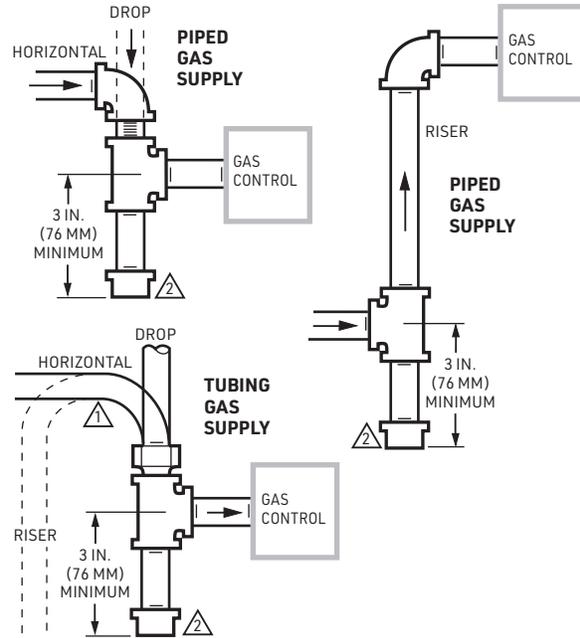
Complete instructions below for piping, installing control, and wiring. Make certain the leak test you perform on the control after completing the installation includes leak testing the adapters and screws. If you use a wrench on the valve after flanges are installed, use the wrench only on the flange, not on the control. See Fig. 6.

**Using Adapters to Solve Swing Radius Problems**

In some field service applications, it is difficult or impossible to thread the control onto the gas supply pipe because of space limitations. Usually this problem can be resolved by using an adapter. The adapter is installed on the end of the supply pipe in place of the gas control, following the same precautions and instructions that are used for installing the gas control. After the adapter is installed, the gas control is attached to the adapter as outlined above. Note that the use of an adapter increases the overall length of the gas control.



**Fig. 2. Fasten flange to control with 25 inch-pounds torque.**



- ⚠ ALL BENDS IN METALLIC TUBING SHOULD BE SMOOTH.
- ⚠ 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. M3077D

**Fig. 3. Sediment trap installation.**

**Location**

The combination gas control is mounted in the appliance vestibule on the gas manifold. If this is a replacement application, mount the gas control in the same location as the old control.

Locate the combination gas control where it cannot be affected by steam cleaning, high humidity, or dripping water, corrosive chemicals, dust or grease accumulation or excessive heat. To assure proper operation, follow these guidelines:

- Locate gas control in a well-ventilated area.
- Mount gas control high enough above the cabinet bottom to avoid exposure to flooding or splashing water.
- Assure the ambient temperature does not exceed the ambient temperature ratings for each component.
- Cover gas control if 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 are likely.

### 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. All tubing bends must be smooth and without deformation.
2. Run pipe or tubing to the control. If tubing is used, obtain a tube-to-pipe coupling to connect the tubing to the control.
3. Install sediment trap in the supply line to the gas control. See Fig. 3.

### Install Control

1. This control can be mounted 0-90 degrees, in any direction, from the upright position of the gas control knob, including vertically.
2. Mount the control so gas flow is in the direction of the arrow on the bottom of the control.
3. Thread pipe into control. Do not thread pipe too far. Valve distortion or malfunction may result if the pipe is inserted too deeply. Refer to Table 4.

Table 4. NPT Pipe Thread Length in in.

Pipe Size	Thread Pipe This Amount	Maximum Depth Pipe Can Be Inserted Into Control
3/8	9/16	3/8
1/2	3/4	1/2
3/4	13/16	3/4

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. See Fig. 4.

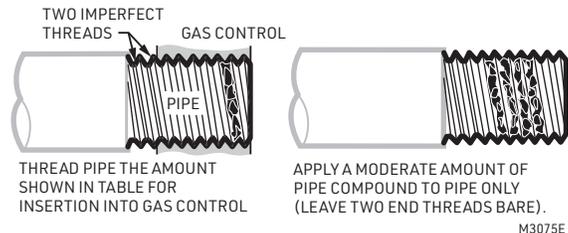


Fig. 4. Use moderate amount of pipe compound.

5. Remove seals over control inlet and outlet if necessary.
6. Connect pipe to control inlet and outlet. Use wrench on the square ends of the control. If an adapter is used, place wrench on adapter rather than on control. Refer to Fig. 5 and 6.

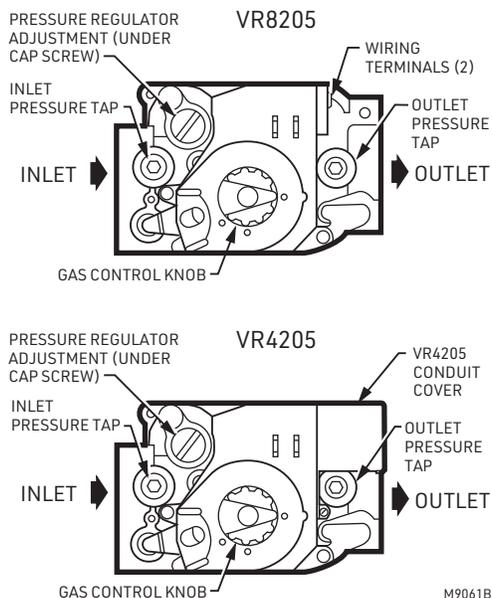


Fig. 5. Top view of gas control.

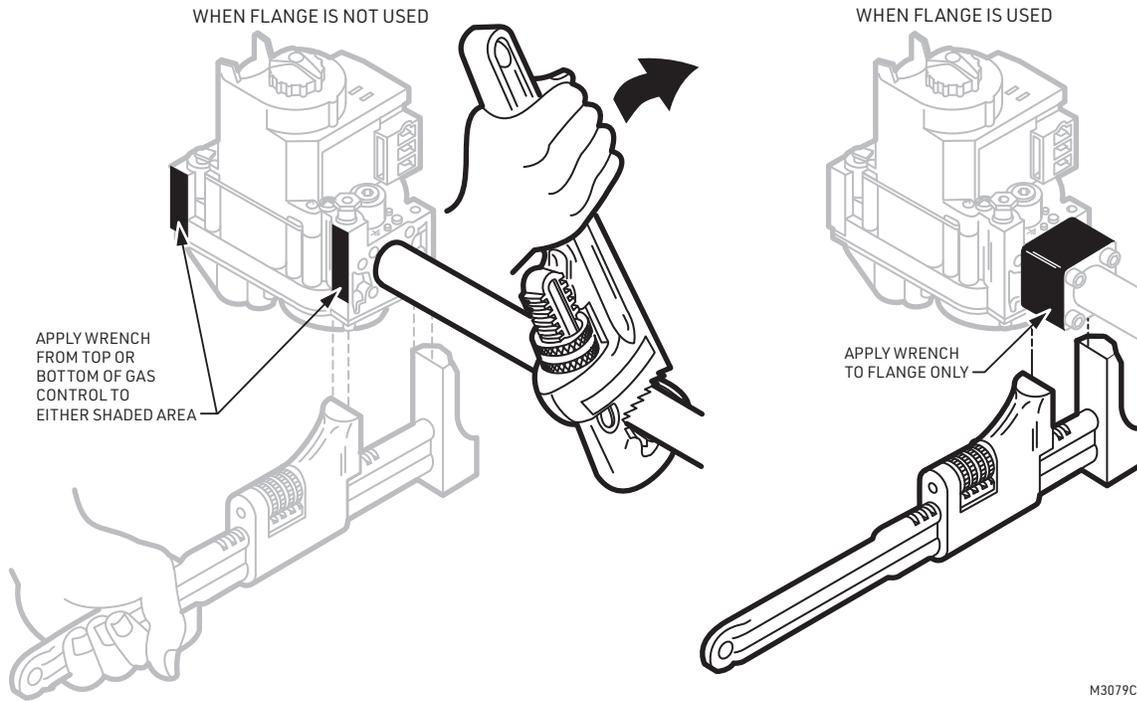


Fig. 6. Proper use of wrench on gas control with and without flanges.

## WIRING

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

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 valve and make sure it matches the available supply. Install transformer, thermostat, and other controls as required.
2. For VR4205, when the gas control is installed external to the appliance, install the conduit cover on the conduit fitting. Do not secure conduit cover at this time.
3. Connect control circuit to gas control terminals. See Fig. 5 and 7-9.

NOTE: Use leadwires with insulated terminals.

4. For VR4205, make sure conduit cover is in position and secured to the gas valve with the screw provided. See Fig. 2.
5. Adjust thermostat heat anticipator as instructed in appliance manual (i.e., usually 0.1A for VR4205 and 0.5A for VR8205).

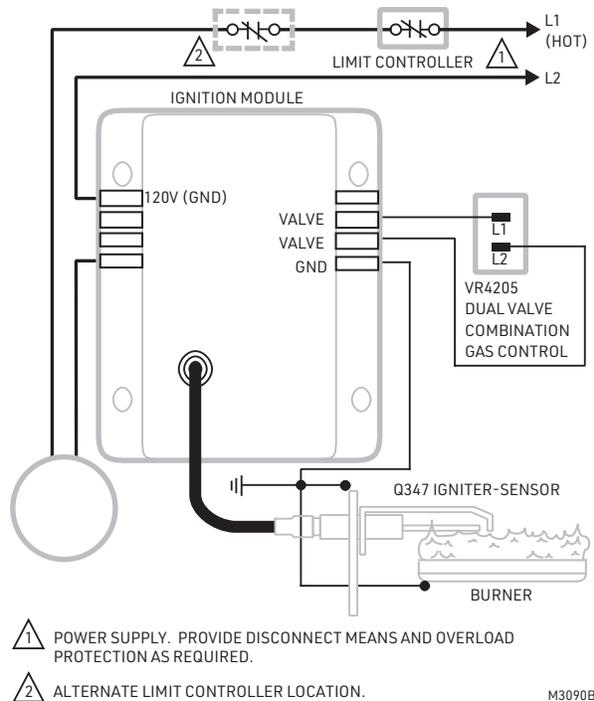


Fig. 7. Wiring connections for 120 volt control in direct ignition system.

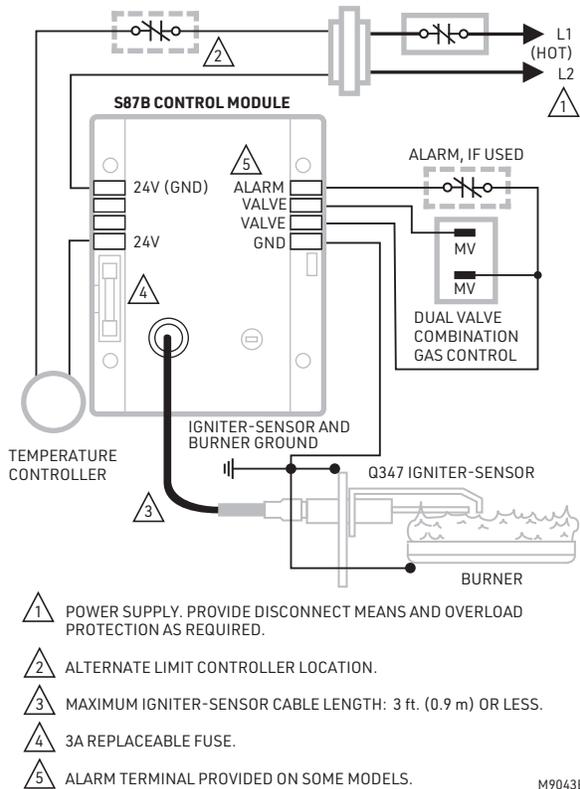


Fig. 8. Wiring connections for 24 volt control in S87 Direct Ignition System.

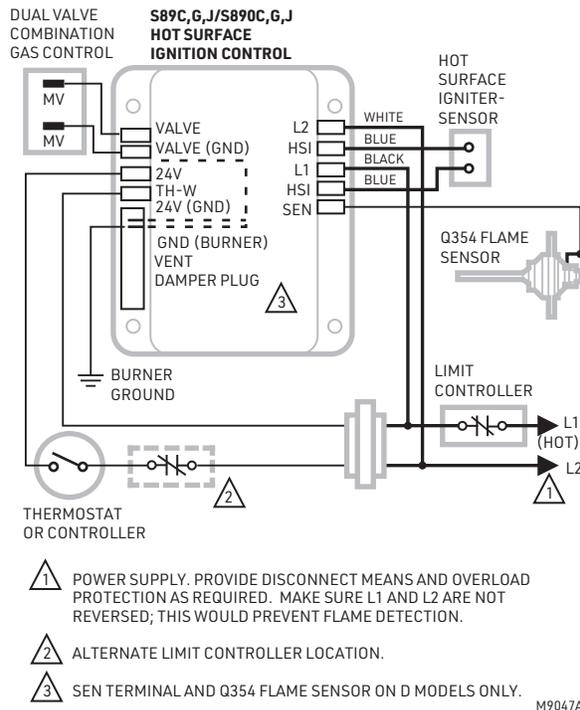


Fig. 9. Wiring connections for 24 volt control in S89C Direct Ignition System.

## STARTUP AND CHECKOUT

### ⚠️ WARNING

Fire or explosion hazard. Can cause property damage, severe injury, or death.

1. Do not force the gas control knob on the appliance. Use only your hand to turn the gas control knob. Never use any tools.
2. If the knob will not operate by hand, the control should be replaced by a qualified service technician.

### Gas Control Knob Settings

Gas control knob settings are as follows:

OFF: Prevents main gas flow through the control.

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

NOTE: Controls are shipped with the gas control knob 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 soap and water solution any time work is done on a gas system.

### Gas Leak Test

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

### Turn On System

Rotate the gas control knob counterclockwise to ON.

### Turn On Main Burner

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

## Check and Adjust Gas Input and Burner Ignition

### CAUTION

1. Do not exceed input rating stamped on appliance nameplate, or manufacturer recommended burner orifice pressure for size orifice(s) used. Make certain primary air supply to main burner is properly adjusted for complete combustion. Follow appliance manufacturer instructions.
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 their pilots extinguished (or their 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: Be sure gas control is in OFF position before removing outlet pressure tap plug to connect manometer (pressure gauge). Also turn gas control knob back to OFF when removing gauge and replacing 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.

#### STANDARD PRESSURE REGULATOR

1. Check the manifold pressure listed on the appliance nameplate. Gas control outlet pressure should match the nameplate.
2. With main burner operating, check gas control flow rate using the meter clocking method or check pressure by using a manometer connected to the outlet pressure tap on the gas control. See Fig. 5.
3. If necessary, adjust pressure regulator to match appliance rating. See Table 5 or 6 for factory set nominal pressure and adjustment setting range.
  - a. Remove pressure regulator adjustment cap screw.
  - b. Using screwdriver, turn inner adjustment screw clockwise to increase or counterclockwise to decrease gas pressure to burner.

- c. Always replace cap screw and tighten firmly to prevent gas leakage.
4. If desired outlet pressure or flow rate cannot be achieved by adjusting the gas control, check gas control inlet pressure using a manometer at the gas control inlet pressure tap. If inlet pressure is in the nominal range (see Table 5 or 6), replace gas control. Otherwise, take the necessary steps to provide proper gas pressure on the control.

#### SLOW-OPENING AND STEP-OPENING PRESSURE REGULATORS

1. Check the full rate manifold pressure listed on the appliance nameplate. Gas control full rate outlet pressure should match this rating.
2. With main burner operating, check gas control flow rate using the meter clocking method or pressure using a manometer connected to the outlet pressure tap on the gas control. See Fig. 5.
3. If necessary, adjust pressure regulator to match appliance rating. See Table 5 or 6 for factory set nominal outlet pressure and adjustment setting range.
  - a. Remove pressure regulator adjustment screw.
  - b. Using screwdriver, turn inner adjustment screw clockwise to increase or counterclockwise to decrease gas pressure to burner.
  - c. Always replace cap screw and tighten firmly to prevent gas leakage.
4. If desired outlet pressure or flow rate cannot be achieved by adjusting the gas control, check gas control inlet pressure using a manometer at the gas control inlet pressure tap. If inlet pressure is in the nominal range (see Table 5 or 6), replace gas control. Otherwise, take the necessary steps to provide proper gas pressure to the control.
5. STEP-OPENING PRESSURE REGULATORS ONLY. Carefully check burner lightoff at step pressure. Make sure burner lights smoothly and without flashback to orifice. Make sure all ports remain lit. Cycle burner several times, allowing at least 30 seconds between cycles for regulator to resume step function. Repeat after allowing burner to cool. Readjust full rate outlet pressure, if necessary, to improve lightoff characteristics.

Table 5. 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-opening	Natural	5.0 - 7.0	—	3.5	—	3.0 - 5.0
	LP	12.0 - 14.0	—	10.0	—	8.0 - 12.0
Step-opening	Natural	5.0 - 7.0	0.9	3.5	—	3.0 - 5.0
	LP	12.0 - 14.0	2.2	10.0	—	8.0 - 12.0

Table 6. 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-opening	Natural	1.2 - 1.7	—	0.9	—	0.7 - 1.2
	LP	2.9 - 3.9	—	2.5	—	2.0 - 3.0
Step-opening	Natural	1.2 - 1.7	0.9	0.9	None	0.7 - 1.2
	LP	2.9 - 3.9	2.2	2.5	None	2.0 - 3.0

## Check Safety Lockout (Slow-opening Controls Only)

1. With the system power off and the thermostat set to call for heat, manually shut off the gas supply.
2. Energize ignitor control and start timing safety lockout time. When spark ignition terminates, stop timing. When using the VR8205H or VR4205H step-opening control, the specified ignitor control safety lockout time must exceed 8.5 seconds for system to function properly.
3. After spark cutoff, manually reopen gas control knob. No gas should flow to the main burner.
4. Reset system by adjusting thermostat below room temperature, waiting 30 seconds, and moving thermostat setting up to call for heat. Normal ignition should occur.

## 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 1-7 below before starting and compare to the safety shutdown or safety lockout tests recommended for the direct ignition (DI) module. Where they differ, use the procedure recommended for the module.

1. Turn off gas supply.
2. Set thermostat or controller above room temperature to call for heat.
3. Watch for ignition spark or for glow at hot surface igniter either immediately or following prepurge. See DI module specifications.
4. Time the length of the igniter operation. See DI module specifications.
5. After the module locks out, open manual gas cock and make sure no gas is flowing to the burner.
6. Set the thermostat below room temperature and wait one minute.
7. Operate system through one complete cycle to make sure all controls operate properly.

## MAINTENANCE

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

- In many such applications, particularly commercial cooking, the equipment operates 100,000-200,000 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 gas control, see 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 gas control to deteriorate more rapidly, the system should be checked more often.

Gas valves exposed to high ammonia conditions; i.e., those used in greenhouses or animal barns, may fail in one or two years. Contact your sales representative to request a gas valve with corrosion resistant construction.

The gas control should be replaced if:

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

## OPERATION

The VR8205;VR4205 gas controls provide ON-OFF manual control of gas flow. In the OFF position, gas flow to the main burner is mechanically blocked. In the ON position, gas flows to the main burner under control of the thermostat, the direct ignition (DI) module, and the two automatic main valves.

### System Operation With Module

When the thermostat calls for heat, the DI module is energized. The module activates the first and second automatic valves of the gas control, which allow gas to flow to the main burner. At the same time, the DI module generates a spark at the igniter-sensor to light the main burner.

The second automatic valve diaphragm, controlled by the servo pressure regulator, opens and adjusts gas flow as long as the system is powered. The servo pressure regulator monitors outlet pressure to provide an even flow of gas to the main burner. Loss of power (thermostat satisfied) deenergizes the DI module and closes the automatic valves. The system is ready to return to normal service when power is restored through the thermostat.

If the igniter-sensor stops detecting a flame at the main burner, the trial for ignition is restarted. On DI modules with lockout timers, the automatic valves are de-energized and ignition stops after the lockout period. On modules without lockout timers, the trial for ignition continues indefinitely.

If main burner flame is restarted successfully, operation continues as described above. Gas control operation is described in more detail below.

## Valve Position During Thermostat Off Cycle

The 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 operator valve diaphragm.

The combination of spring pressure under the second automatic valve diaphragm and lack of outlet pressure holds the diaphragm firmly closed. Gas flow to the main burner is blocked by both valves.

## When Thermostat Calls For Heat

When the thermostat calls for heat, the DI module generates a spark at the main burner and the first automatic valve and second automatic valve operators are energized (Fig. 11). The first automatic valve opens, and the second automatic valve operator valve disc is lifted off its seat.

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 gas to flow to the main burner.

## Standard Regulation

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 valve, 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, flow of gas through the second automatic valve is increased, and outlet pressure rises to the desired level.

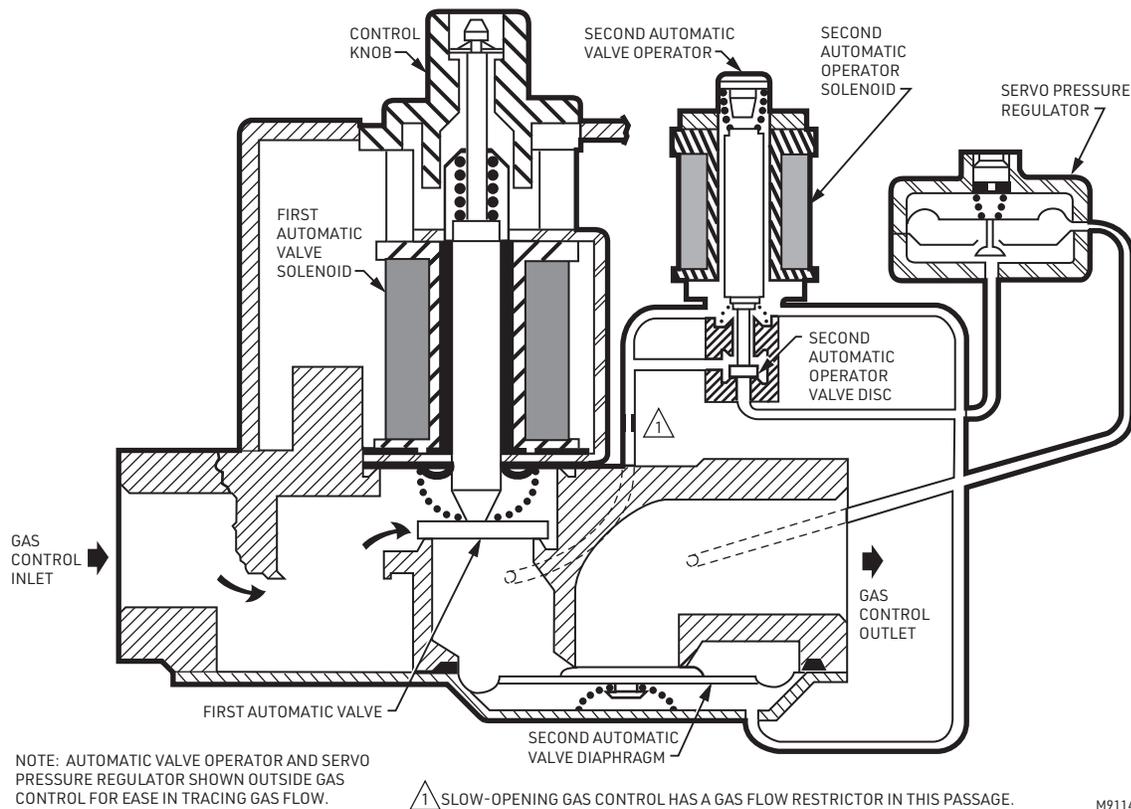


Fig. 10. Position of gas control components during thermostat off cycle.

### Slow-Opening Regulation

Slow-opening gas controls function the same as standard models except that when the thermostat calls for heat, the second automatic valve opens gradually. Opening is slowed because a flow restructure in the passage from the second automatic operator slows 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 in. wc [0 kPa] to rated output pressure within 3-6 seconds (for an 80,000 Btuh furnace at 7 in. wc [1.8 kPa] inlet pressure and 3.5 in. wc [0.9 kPa] outlet pressure).

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 reenergized within 60 seconds, it may bypass or shorten the length of the low pressure step. The burner may relight at the full flow rate.

### Step-Opening Regulation

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 disc opens. The low pressure regulator maintains outlet pressure at the preset step rate for

### When The Call For Heat Ends

When the call for heat ends, the first automatic valve and the second automatic valve operator close, bypassing the regulator(s) and shutting off the main burner and the pilot. As pressure inside the gas control and underneath the automatic valve diaphragm equalizes, spring pressure closes the second automatic valve to provide a second barrier to gas flow.

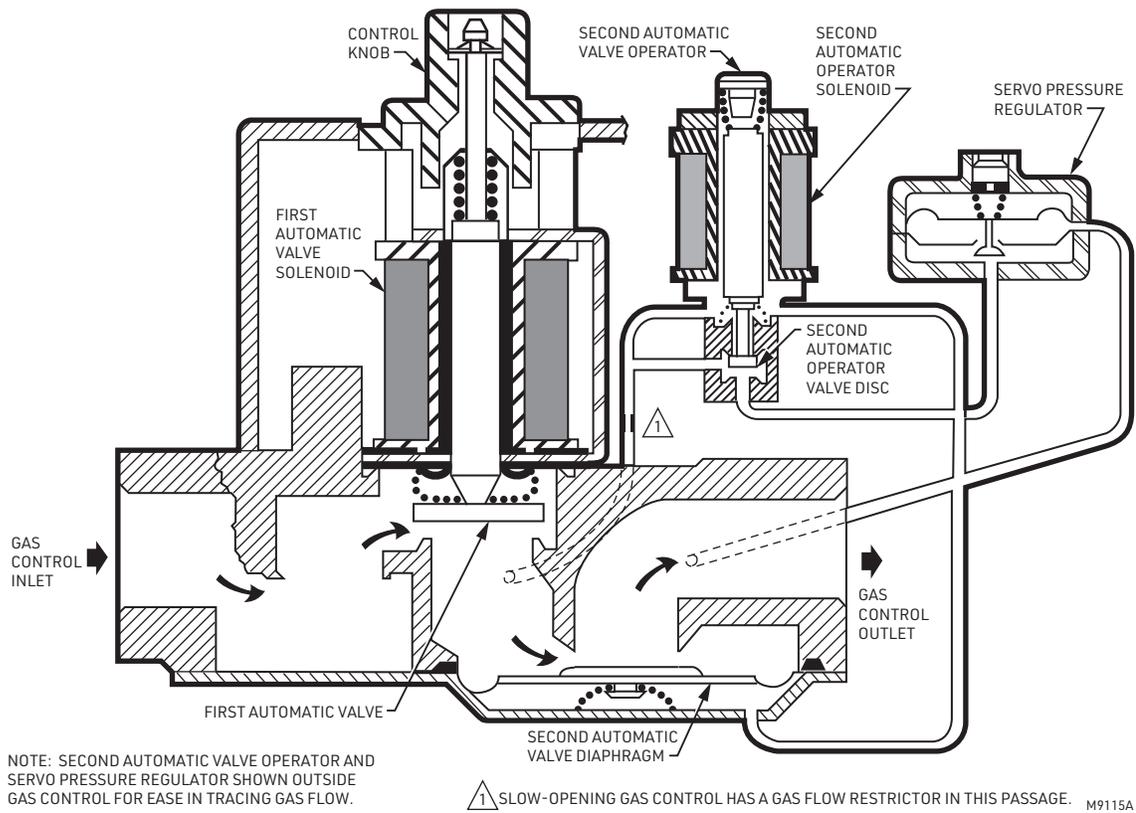


Fig. 11. Position of gas control components during burner on cycle.

## SERVICE

### ⚠️ WARNING

**Fire or explosion hazard. Can cause property damage, severe injury, or death.**  
Do not disassemble the gas control; it contains no replaceable components. Attempted disassembly or repair may damage the control..

### ⚠️ CAUTION

Do not apply a jumper across (or short) the valve coil terminals, even temporarily. Doing so may burn out the heat anticipator in the thermostat or damage the DI 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. Confirm that gas control knob is in the ON position.
2. Adjust thermostat several degrees above room temperature.
3. Using ac voltmeter, measure voltage across MV terminals at gas control.
4. If no voltage is present, check control circuit for proper operation.
5. If proper control system voltage is present, replace gas control.

## Instructions to the Homeowner

### 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.

1. Before lighting, smell around the appliance area for gas. If the appliance uses LP (bottled) gas, be sure to smell next to the floor because LP gas is heavier than air. If you smell gas, immediately shut off the manual valve in the gas piping to the appliance, or on LP, at the tank. Do not try to light any appliance. Do not touch any electrical switch or use the phone. Leave the building and call your gas supplier. If your gas supplier cannot be reached, call the fire department.
2. Do not force the gas control knob on the appliance. Use only your hand to turn the gas control knob. Never use any tools. If the knob will not operate by hand, replace the control using a qualified service technician. Force or attempted repair can result in fire or explosion.
3. The gas control must be replaced if it has been flooded with water. Call a qualified service technician.
4. The gas control is a safety device. It must be replaced in case of any physical damage such as 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, requiring special instructions.

## To Turn On Furnace

STOP: Read the safety information above.

1. The lighting sequence on this appliance is automatic; do not attempt to manually light the main burner.
2. If the furnace does not come on when the thermostat is set several degrees above room temperature, set the thermostat to the bottom of its range to reset safety control.
3. Remove burner access panel if provided on your appliance.
4. Turn the gas control knob (Fig. 5) clockwise to OFF.
5. Wait five minutes to allow any gas in the combustion chamber to vent. If you then smell gas in the appliance area or near the floor in an LP installation, immediately shut off the manual valve in the gas piping to the appliance, or on LP, at the tank. Do not touch any electrical switch or use the phone. Leave the building and call your gas supplier. If your gas supplier cannot be reached, call the fire department. Failure to do so may result in fire or explosion.
6. If you don't smell gas, turn knob on gas control counterclockwise to ON.
7. Replace burner access panel.
8. Reset thermostat to desired temperature.
9. If burner does not come on when room temperature is below thermostat setting, turn gas control knob to OFF and contact a qualified service technician for assistance.

## To Turn Off Appliance

Turn gas control knob clockwise to OFF.



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1985 Douglas Drive North, Golden Valley, MN 55422  
1-800-468-1502  
68-0049-03 M.S. Rev. 04-21 | Printed in United States

www.resideo.com