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## VS8510, VS8520 Millivolt Gas Valve

### INSTALLATION INSTRUCTIONS

#### APPLICATION

The VS8510, VS8520 Millivolt Gas Valve is compact and has a 60,000 Btuh capacity (1 in. pressure drop for straight through configuration). Its design makes it ideal for fireplace and space heating applications.

#### SPECIFICATIONS

**Main Gas Connection:** Valve: 3/8 in. NPT thread.

**Pilot Gas Connection and Flow:**

Connection Size: 7/16-24 UNS.

Flow: 1700 Btuh at 4.0 in. wc pressure drop.

**Thermocouple and Pilot Threads:** Metric and UNS.

**Ambient Temperature Range:**

0°F to 175°F (-18°C to 79°C).

Option for 225°F (107°C).

**Pressure Regulation:**

Servo regulator with adjustable outlet pressure.

Natural Gas: Typically 3 in. wc.

LP: Typically 11 in. wc.

**Regulator Adjustments:**

Natural Gas: 1/2 in. field adjustable.

LP: 8 in. to 12 in. field adjustable.

**Voltage:**

VS8510: 24 mV operator.

VS8520: 75 mV operator, 30 mV thermocouple.

**Approvals:**

International Approval Services (IAS) Certificate:

C203000

European Community (CE) Certificate: Applied for.

#### 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

**Oxygen depletion hazard.**

**Can cause injury or death due to asphyxiation.**

1. Use only vented gas valve models on vented appliances.
2. Use only unvented gas valve models on unvented appliances.

#### 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 a Gas Leak Test after the installation is complete.
3. Always install the sediment trap in the gas supply line to prevent contamination of the gas control.
4. Do not force the gas control knob. Use only your hand to turn the gas control knob. Never use any tools. If the gas control knob does not operate by hand, the gas control should be replaced by a qualified service technician. Force or attempted repair can result in fire or explosion.



## CAUTION

### Equipment damage.

### Can burn out heat anticipator in thermostat.

Never apply a jumper across or short the valve coil terminals.

## IMPORTANT

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

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

## Converting Between Natural and LP Gas

## WARNING

### Fire or explosion hazard.

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

1. Do not use a gas control set for natural gas on an LP gas system or a gas control set for LP gas on a natural gas system.
2. When making a conversion, the main pilot burner orifices must be changed to meet the appliance manufacturer specifications.

When making a conversion, change main pilot burner orifices to meet the appliance manufacturer specifications. Refer to the appliance manufacturer instructions for orifice specifications and changeover procedure. Gas controls are factory-set for natural (and manufactured) or LP gas. Do not attempt to use a control set for natural (manufactured) gas on LP gas or a control set for LP on natural (manufactured) gas.

VS8510A and VS8520A gas controls with a standard regulator can be converted from one gas to the other with a conversion kit (ordered separately). Order part no. 395991 to convert from natural (manufactured) to LP gas. Order part no. 395992 to convert from LP to natural (manufactured) gas.

VS8510D and VS8520D gas controls with a Convertible High/LP regulator can be converted from one gas to the other with a conversion kit (ordered separately). Order part no. 396087-1 to convert from LP to natural (manufactured) gas. Order part no. 396087-2 to convert from natural (manufactured) to LP gas.

High/Low regulator models VS8510D and VS8520D cannot be converted.

## VS8510R and VS8520R

### Convertible Pressure Regulators

Gas valves with suffix letter R are convertible pressure regulator models. They can be converted from natural gas to LP or from LP to natural gas without a converter kit.

Before converting the gas valve from one gas to another, check the gas valve label and the appliance manufacturer rating plate to make sure the pressure regulator setting (factory set) meets the appliance manifold requirements after conversion.

**NOTE:** Convertible pressure regulator models (suffix R) do not have field-adjustable regulators. The natural gas and LP settings are factory-manufactured.

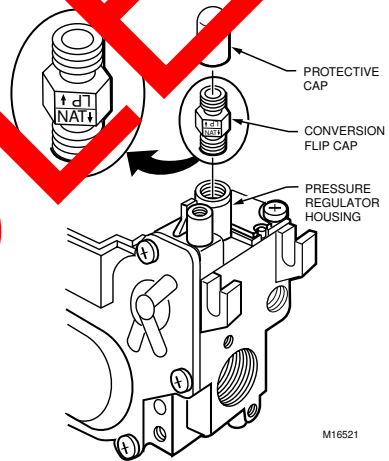
## IMPORTANT

*Follow these instructions carefully.*

## CONVERTING THE GAS VALVE

If the factory pressure regulator setting meets the appliance manifold requirement, convert the gas valve as follows (see Fig. 1):

1. Remove the black thread protective cap. Remove the conversion flip cap by turning it counterclockwise.
  2. Invert the conversion flip cap so the bottom of the letters and associated markings for the gas type appropriate for the appliance application are facing down toward the valve. NAT is for natural gas and LP is for liquid petroleum gas.
- Tighten the conversion flip cap by turning it clockwise, using 10 in. lbs. of force.  
Replace the black thread protective cap.



**Fig. 1. Converting the gas valve (shown assembled for natural gas).**

## Location

Locate the combination gas control where it cannot be affected by steam cleaning, high humidity, 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 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 is 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. When tubing is used, assure 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. 1.

## Install Control

1. Mount control 0 to 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 side of the control.
3. Thread pipe 9/16 in. into the control. Do not insert deeper than 3/8 in. Valve distortion or malfunction can result if the pipe is inserted too deeply.
4. Apply a moderate amount of good quality pipe compound (do not use Teflon tape) to pipe only, leaving two end threads bare. On LP installations, use compound resistant to LP gas. See Fig. 2.
5. Remove seals over control inlet and outlet, if necessary.
6. Connect pipe to control inlet and outlet. Use wrench on either side of the pipe outlet. Refer to Fig. 3 through 5.

## Wiring

Follow the wiring instructions furnished by the appliance manufacturer, if available, or the general instructions provided below. Where the instructions differ from the appliance manufacturer, follow the appliance manufacturer instruction. For typical wiring diagrams, see Fig. 6 and 7.

All wiring must comply with applicable electrical codes and ordinances.

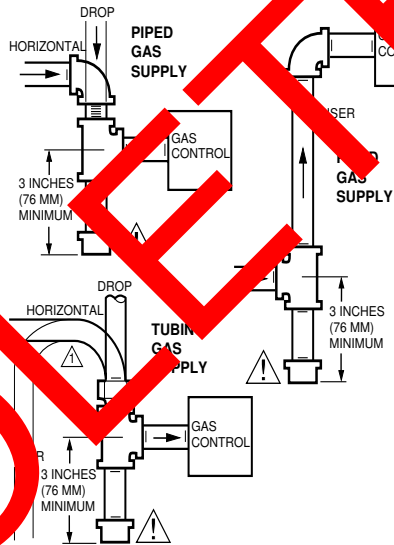
Disconnect power supply before making wiring connections to prevent electrical shock or equipment damage.

Check the power supply rating on the gas control to make sure it matches the available supply. Install the transformer, thermostat, and other controls as required.

2. This valve can only be used in a self-generating system.
3. Adjust the thermostat heat anticipator to the 0.1A at 70 mV rating stamped on the valve operator.

## OPERATION

The Millivolt Gas Valve System has two different configurations. The first configuration includes a gas valve, quick drop-out thermocouple, thermopile, millivolt thermostat and a pilot burner. In this configuration, the thermopile drives the operator and the quick dropout thermocouple operates the power unit. See Fig. 7. The second configuration includes a gas valve, thermopile, millivolt thermostat, and a pilot burner. The thermopile drives the operator and the power unit. See Fig. 8.



### CAUTION

**GAS LEAKAGE HAZARD.**

**FAILURE TO FOLLOW PRECAUTIONS CAN**

**RESULT IN A GAS-FILLED WORK AREA.**

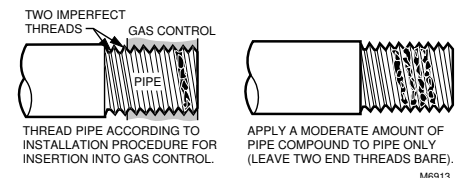
SHUT OFF THE MAIN GAS SUPPLY BEFORE REMOVING END CAP.  
TEST FOR GAS LEAKAGE WHEN INSTALLATION IS COMPLETE.



ALL BENDS IN METALLIC TUBING SHOULD BE SMOOTH.

M4603A

**Fig. 2. Sediment trap installation.**



**Fig. 3. Use moderate amount of pipe compound.**

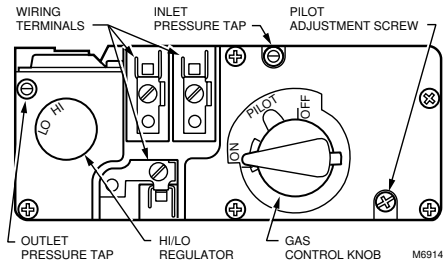


Fig. 4. Top view of gas control with HI/LO regulator.

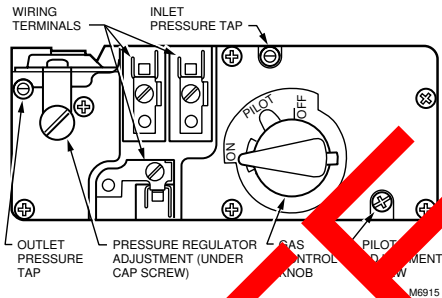


Fig. 5. Top view of gas control with standard regulator.

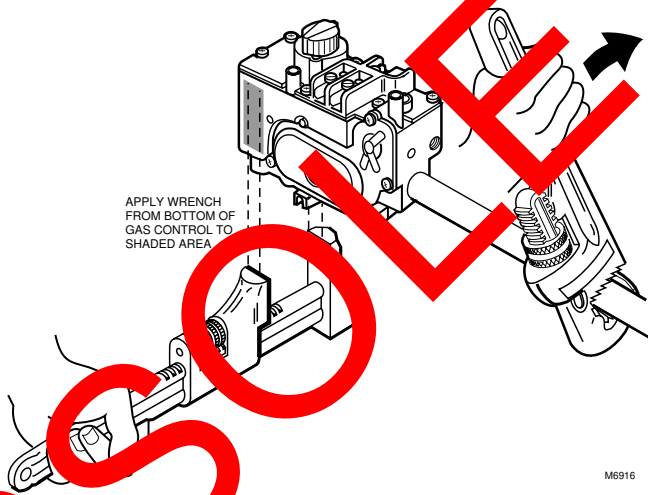


Fig. 6. Proper use of wrench on gas control.

### Pilot Gas and Lighting Procedure

1. Turn the knob counterclockwise  to PILOT position. Push the knob down, and hold in position. The pilot valve opens and allows gas to flow to the pilot burner.
  2. Light the pilot burner while holding the knob down until a strong flame is present (approximately 60 seconds).
  3. Release the knob. The shaft will move upward and engage the safety valve lever that opens the safety valve.
- Turn the knob counterclockwise  to the ON position. On a call-for-heat, the main valve opens and the main burner ignites.

### Shut off Procedure

1. To shut off the system, turn the knob clockwise  to the OFF position. This action closes the main gas and safety valves. However,

the power unit must drop out before the lighting sequence can begin again. The VS8510 drops out within three minutes. The VS8520 drops out within 30 seconds.

2. To relight the pilot light, follow the steps in the Pilot Gas and Lighting Procedure section.

### HI/LO Regulator

As you turn the HI/LO knob, the gas pressure changes.

1. Turn the knob clockwise  towards the HI setting to increase gas pressure. Turn the knob counterclockwise  towards the LO setting to decrease gas pressure. Minimum and maximum regulator settings vary for each individual gas valve. See gas valve label for actual minimum and maximum ranges. Table 1 lists possible minimums and maximums for gas valves.

Table 1. HI/LO and Standard Regulator Specification Pressures in in. wc (kPa).

| Type of Gas | HI/LO Regulator Setting Ranges       | Standard Regulator Setting Ranges    |
|-------------|--------------------------------------|--------------------------------------|
| Natural     | 1.2 in. minimum to 3.5 in. maximum.  | 3.0 minimum to 5.0 maximum.          |
| LP          | 3.7 in. minimum to 11.0 in. maximum. | 8.0 in. minimum to 12.0 in. maximum. |

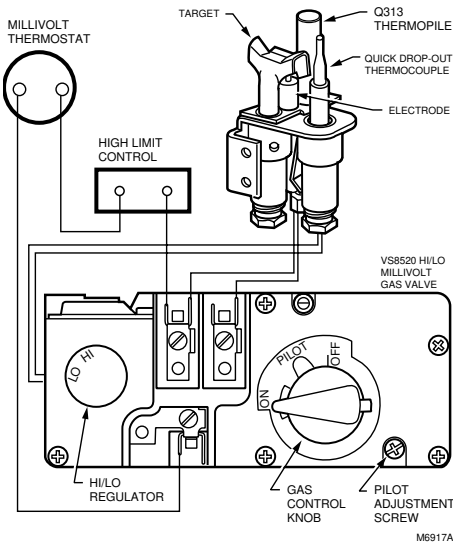


Fig. 7. Millivolt system wiring diagram with quick drop-out thermocouple.

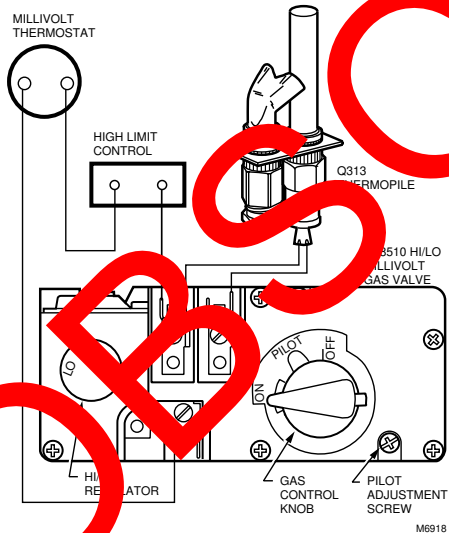


Fig. 8. Millivolt system wiring diagram without quick drop-out thermocouple.

## Standard Pressure Regulator

1. Check the manifold pressure listed on the appliance nameplate. Gas control outlet pressure should match the nameplate.
2. With the main burner operating, check the gas control flow rate using the meter clocking method or measure the pressure by attaching a plastic tube with a 1/4 in. shell I.D. to the manometer and connecting the manometer to the outlet pressure tap on the gas control. See Fig. 9.
3. If necessary, adjust the pressure regulator to match the appliance rating. See Table 1 for factory-set nominal outlet pressure and adjustment ranges.
  - a. Remove pressure regulator adjustment cap screw.
  - b. Using a 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 gas control outlet pressure or flow rate cannot be adjusted 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 normal range (see Table 1), replace gas control. Otherwise, take the necessary steps to provide proper gas pressure on the control.

## 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 does 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 main burner and pilot gas flow. Gas control and thermostat control main burner gas flow.
- PILOT: Opens pilot valve and allows gas flow to pilot burner.
- HI/LO: Manually adjusts outlet pressure.

**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.**

1. Stand away from the main burner while lighting. Hidden gas leaks can cause flashbacks in the appliance vestibule.
2. Check for gas leaks with rich soap and water solution any time work is done on a gas system.

### Gas Leak Test

1. Paint the pipe connections upstream of the gas control with rich soap and water solution. Bubbles indicate a gas leak.
2. If a leak is detected, tighten the pipe connections.
3. Light the main burner.
4. With the main burner in operation, paint the pipe joints (including adapters) and control inlet and outlet with a rich soap and water solution.
5. If another leak is detected, tighten the 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 the instructions provided by the appliance manufacturer or turn up the thermostat to call for heat.

### Check and Adjust Gas Input and Burner Ignition

### CAUTION

**Equipment Damage Hazard.**

**Improper adjustment of gas input and burner can cause carboning and unnecessary shutdown of the system.**

Do not exceed the input rating stamped on the appliance nameplate or manufacturer recommended burner orifice pressure for size orifice used. Ensure primary air supply to the main burner is properly adjusted for complete combustion. Follow the instructions of the appliance manufacturer.

2. IF CHECKING GAS INPUT BY CLOCKING GAS METER: Be sure 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 the consumption must be deducted 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.

3. IF CHECKING GAS INPUT WITH MANOMETER: Both the inlet and outlet pressure taps have a captive screw. To measure the pressure of the tap, loosen, but do not remove the captive screw, attach a plastic tube with a 1/4 in. shell I.D. and connect the manometer. After checking the pressure, turn the control knob to the OFF position. Before opening the outlet pressure tap, ensure the gas control is in the OFF position. Before opening the inlet pressure tap, shut off the gas supply at the manual valve in the gas piping to the appliance or, for LPB, the tank. Repeat the Gas Leak Test at the pressure tap with the main burner operating.

### 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 the gas system.

1. Place gas control knob in PILOT position. Main burner should go off and pilot should remain lit. Extinguish main flame. The VS8510 pilot gas flow should stop within three minutes; the VS8520 pilot gas flow stops within thirty seconds. Safety shutoff on VS gas proves complete shutdown because safety shutoff valve prohibits main burner and pilot gas flow. Relight pilot burner and operate the system through one complete cycle to ensure all controls operate properly.

## MAINTENANCE

### WARNING

**Fire or explosion hazard.**

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

Do not attempt to take apart the gas control or to clean it. Improper assembly and cleaning can cause unreliable operation.

Regular preventive maintenance is important in applications that place a heavy load on system controls such as those used in the commercial cooking and agricultural and industrial industries 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 system as outlined in the Checkout section, and checkout of the control system as described in the appliance manufacturer literature.

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

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

Any control should be replaced if it does not perform properly on checkout or service. In addition, replace any module if it is wet or looks like it has ever been wet.

## 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 can damage the control.

### CAUTION

**Equipment damage.**

**Can burn out heat anticipator in thermostat.**

Do not apply a jumper across (or short) the valve coil terminals even temporarily.

### WARNING

**Fire or explosion hazard.**

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

Exactly follow the warnings and the lighting instructions.

1. Before lighting, smell around the appliance area for gas. If the appliance uses bottled gas, be sure to smell next to the door because LP gas is heavier than air. If you smell gas, immediately shut off the main valve in the gas piping to the appliance or, if not 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 tool to turn the knob. If the control does not operate by hand, have a qualified service technician replace the control. Force or attempted repair can result in fire or explosion.
3. The gas control must be replaced if it has been flooded with water. Only a qualified service technician should replace the control.
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

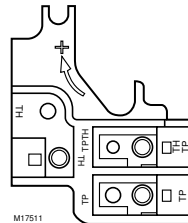
Follow the operating instructions provided by the manufacturer of your heating appliance.

## TROUBLESHOOTING

### IMPORTANT

Troubleshooting procedures should only be performed by an experienced, qualified service technician.

Use Fig. 9 and Table 2 or 3 to assist in troubleshooting the VS8510 or VS8520.



**Fig. 9. Test points for troubleshooting the VS8510/VS8520 Millivolt Gas Valves.**

Table 2. VS8510 Troubleshooting Tests.

| Test Letter | Test              | Connect Meter to | Set Thermostat to | Meter Reading     |
|-------------|-------------------|------------------|-------------------|-------------------|
| A           | Coil Resistance   | TP and TH        | Open              | 3.6 ohms maximum. |
| B           | Thermopile        | TP and TPTH      | Open              | 460 mV minimum.   |
| C           | Operator Pull-In  | TH and TP        | Open              | 155 mV minimum.   |
| D           | Resistance System | —                | Closed            | 1.7 ohms maximum. |

- A—Have thermostat contacts open and pilotstat knob turned to OFF. Coil resistance should be maximum of 3.6 ohms. If not, replace the valve.
- B—Have thermostat contacts open and pilot burning with pilotstat knob turned to PILOT. There should be a minimum of 460 mV. If not, replace thermopile.
- C—Have thermostat contacts open and pilot burning with pilotstat knob in the PILOT position. Close the thermostat contacts. The thermopile should provide 155 mV. If not, replace the thermopile. If output is 155 mV or greater, the valve operator will make an audible sound or click when it pulls in. If the valve does not make a sound, replace the valve.
- D—The system resistance from the remote switch or thermostat and leadwires should not exceed 1.7 ohms. If it does, reduce the resistance.

Table 3. VS8520 Troubleshooting Tests.

| Test Letter | Test              | Connect Meter to | Set Thermostat to | Meter should read |
|-------------|-------------------|------------------|-------------------|-------------------|
| A           | Coil Resistance   | TP and TH        | Open              | 3.6 ohms maximum. |
| B           | Thermopile        | TP and TPTH      | Open              | 460 mV minimum.   |
| C           | Thermocouple      | Tip              | Open              | 18 mV minimum.    |
| D           | Operator Pull-in  | TH and TP        | Open              | 155 mV minimum.   |
| E           | Resistance system | —                | Closed            | 1.7 ohms maximum. |

- A—Have thermostat contacts open and pilotstat knob turned to OFF. Coil resistance should be maximum of 3.6 ohms. If not, replace the valve.
- B—Have thermostat contacts open and pilotstat knob turned to PILOT. There should be a minimum of 460 mV. If not, replace thermopile.
- C—Have thermostat contacts open and pilot burning with the pilotstat knob turned to PILOT. The voltage should be 18 mV for a new thermocouple. You must press pilotstat knob to maintain the gas flow. If the output does not meet the minimum voltage, replace the thermocouple. The power unit should hold in down to 3 mV. If the output of the thermocouple is below 3 mV, replace the thermocouple.
- D—Have thermostat contacts open and pilotstat knob in the PILOT position. Close the thermostat contacts. The thermopile should provide 155 mV. If not, replace the thermopile. If output is 155 mV or greater, the valve operator will make an audible sound or click when it pulls in. If the valve does not make a sound, replace the valve.
- E—The system resistance from the remote switch or thermostat and leadwires should not exceed 1.7 ohms. If it does, reduce the resistance.

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