

APPLICATION

These gas controls combine a Lite-Rite manual gas cock knob, safety shutoff Pilotstat control assembly, dual automatic valve operators, and optional types of gas pressure regulators. A pilot burner and 30 mV thermocouple, together with accessory controls required for the heating appliance, complete the automatic control system.

The controls differ only in the type of valve operator and capacity. The VR400, VR800, and VR810 provide a maximum capacity of 110 to 250 cfh [3.1 to 7.0 m³/hr] natural gas depending on the size of the inlet and outlet tapplings. The VR401, VR801, and VR811 provide a maximum capacity of 110 cfh [3.1 m³/hr] natural gas. Based on 1000 Btu/ft³, 0.64 sp gr natural gas at 1 in. w.c. pressure drop [37.3 MJ/m³, 0.64 sp gr natural gas at 0.25 kPa pressure drop].

For gases other than natural gas, use the following conversion factors:

GAS CAPACITY CONVERSION TABLE

GAS	sp gr	MULTIPLY LISTED CAPACITY BY
Mfd.	0.60	0.516
Mixed	0.70	0.765
Propane	1.53	1.620

The VR810 and VR811 are equipped with a delayed-opening type bimetal second operator; all other models are the standard magnetic operator. All controls are equipped with pilot gas flow adjustment and outlet pressure tapping.

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.

CAUTION

1. SHUT OFF GAS DURING INSTALLATION at main gas supply.
2. Be sure to conduct Gas Leak Test (page 3) after completion.
3. Disconnect power supply before connecting wiring to prevent electrical shock or equipment damage.
4. On systems with 24 V valve operator, never apply a jumper across (or short) the valve coil terminals, even temporarily. This may burn out heat anticipator in thermostat.
5. Do not bend pilot tubing at control or pilot after compression nut has been tightened, as this may result in gas leakage at the connection.
6. Install sediment trap (drip leg) in gas supply line.

IMPORTANT

1. The appliance manufacturer usually provides wiring diagrams, startup and checkout instructions, and service procedures for the specific controls employed. If not supplied, the information below may be used as a general guide for application by an original equipment manufacturer.
2. The combination gas valves are shipped with seals over inlet and outlet tapplings. Do not remove seals until ready to connect piping.

Fig. 1 shows the top view of "A" models with a standard pressure regulator. The step-opening pressure regulator for "C" models is also shown. "D" and "E" model pressure regulators are shown in Figs. 5 and 6. On "B" models, a blank plate replaces the pressure regulators.

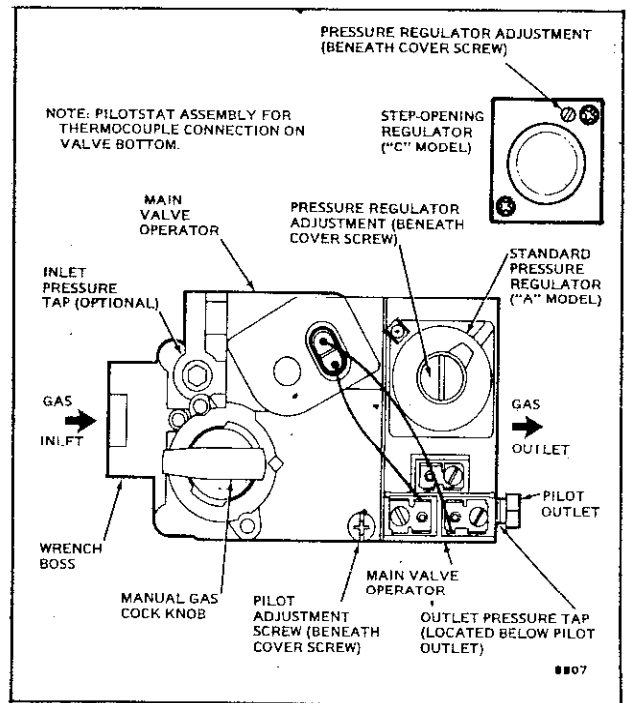


Fig. 1—Top view of VR800 gas control.

PIPING INSTALLATION

All piping must comply with local codes and ordinances or the National Fuel Gas Code (ANSI Z223.1-1974 and NFPA No. 54). If copper tubing is to be used, obtain a tube-to-pipe coupling. A sediment trap or drip leg must be installed in the supply line to the controls in all gas appliance piping (Fig. 2).

Prepare and install tubing following approved tubing standards and practice. When approved tubing is connected to the sediment trap, be sure tubing ends are square, deburred, and clean. All bends must be smooth and without deformation.

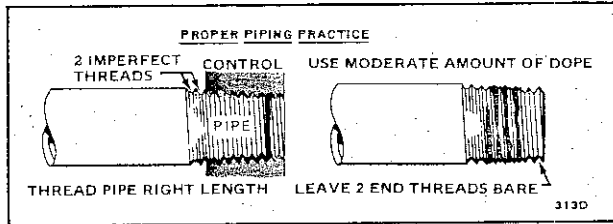
Prepare and install threaded pipe as follows:

1. Use new, properly reamed pipe free from chips.
2. Do not thread pipe too far. Valve distortion or malfunction may result from excess pipe within the control.

3. Apply moderate amount of good quality dope to pipe only, leaving 2 end threads bare. If LP gas installation, use compound resistant to action of liquefied petroleum gases.

LENGTH OF STANDARD PIPE THREADS (in.)

PIPE SIZE	EFFECTIVE LENGTH OF THREAD	OVERALL LENGTH OF THREAD
3/8	3/8	9/16
1/2	1/2	3/4
3/4	1/2-9/16	13/16



4. Install drip leg (sediment trap) in the supply line to the gas control (Fig. 2).

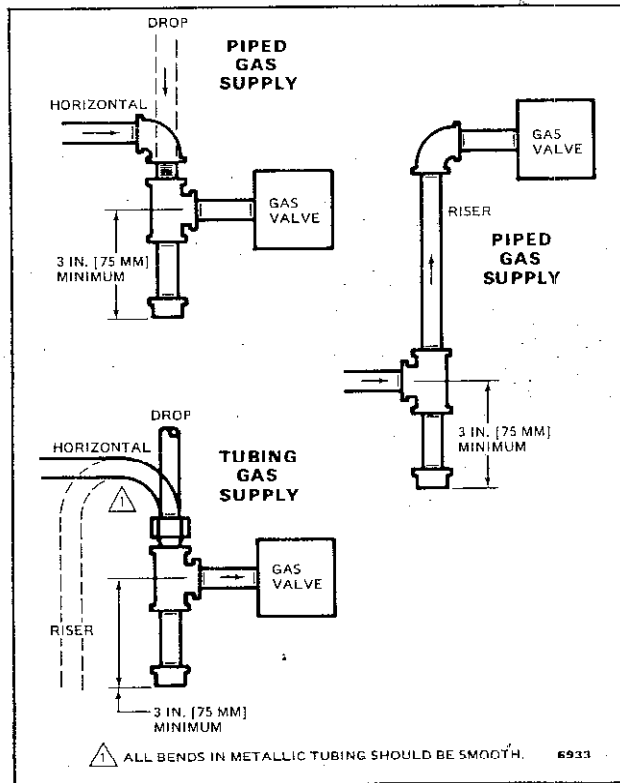


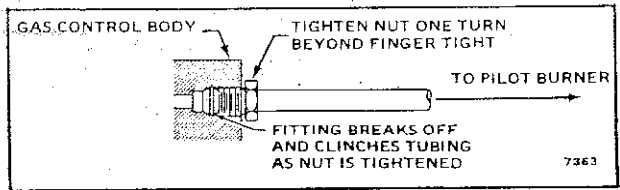
Fig. 2—Sediment trap (drip leg) installation.

INSTALL CONTROL

1. These controls can be mounted 0-90 degrees, in any direction, from the upright position of the gas cock knob.
2. Install the control so that gas supply is connected to the end provided with projecting boss for wrench application. See Fig. 1.

CONNECT PILOT GAS TUBING TO GAS CONTROL

1. Square off and remove burrs from end of tubing. Bend tubing to desired form for routing to pilot burner.
2. Unscrew brass compression fitting from the pilot outlet. Slip the fitting over the tubing and slide out of the way.



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

3. 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 fitting into place and engage threads—turn until finger tight.
4. Then use 7/16 inch wrench and tighten 1 turn beyond finger tight.
5. Connect other end of tubing to pilot burner according to pilot burner manufacturer's instructions.

CONNECT THERMOCOUPLE

The thermocouple connection (to the Pilotstat control power unit—see Fig. 1) is an electrical connection and must be clean and dry. Never use pipe compound. Tighten only 1/4 turn beyond finger tight to give good electrical continuity.

WIRING

Check the wiring diagram furnished by the appliance manufacturer, if available, for circuits differing from the typical systems shown. Carefully follow any special instructions affecting the general procedures outlined below.

All wiring must comply with local codes and ordinances.

WIRING 24 VOLT MODELS (FIG. 3)

NOTE: The V804 valve operator provided on VR800 and VR801 controls has blue terminal block. The V814 operator on VR810 and VR811 controls has black terminal block. (Terminals and markings are identical.)

1. Install transformer, low voltage thermostat, and other controls as required.
2. Connect control circuit to operator terminals. See Fig. 3 for typical wiring diagram.
3. Adjust thermostat heat anticipator to the rating stamped on valve operator.

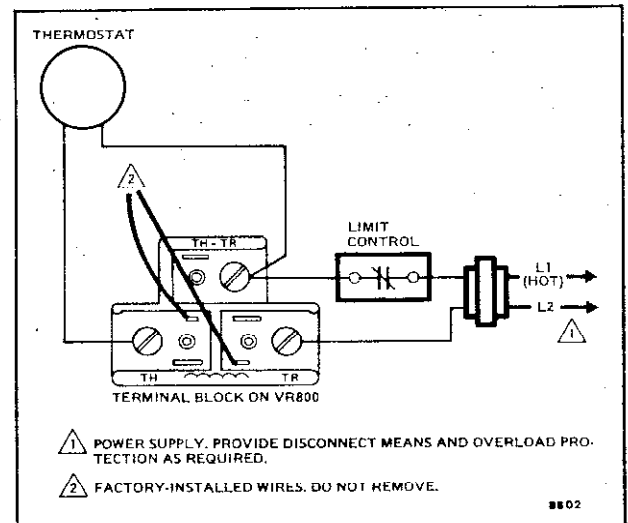


Fig. 3—Typical wiring diagram for 24 V system.

WIRING LINE VOLT MODELS (FIG. 4)

1. Install the line voltage thermostat (or controller) and other controls as required. Refer to Fig. 4 for typical wiring diagram.

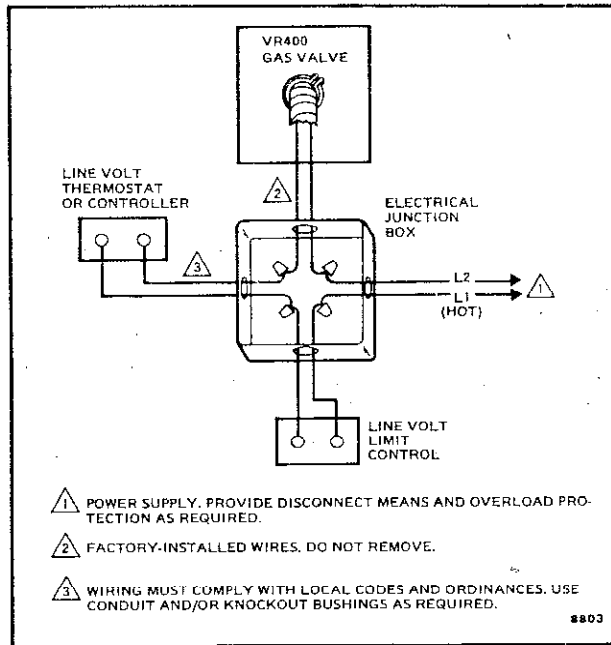


Fig. 4—Typical wiring diagram for line volt system.

2. Be sure to use junction box, as shown, when connecting control circuit to valve operator. Make conduit connection to operator as follows:

- Slip conduit fitting over integral leadwires and screw securely into hole in operator cover.
- Cut flexible conduit to appropriate length. Slip conduit over leadwires and attach to fitting.
- Route and connect flexible conduit to junction box. Connect integral wires to control circuit. Do NOT splice wires except within junction box.

STARTUP AND ADJUSTMENTS

WARNING

"E" MODELS WITH V5309 LP-NAT. GAS CHANGEOVER REGULATOR

The V5309 regulator must be properly set for the type of gas to be used. Follow instructions on page 4.

GAS COCK SETTINGS

The Lite-Rite gas cock knob (Fig. 1) has three settings:

OFF, which prevents any gas from passing through valve to either main or pilot burner;

PILOT, which permits gas to flow to pilot burner only (when gas cock knob is held depressed or when thermocouple is heated sufficiently to hold the Pilotstat pilot safety control valve open);

ON, which permits gas to flow to both main and pilot burners when the system is functioning properly.

PILOT LIGHTING PROCEDURE

1. Slightly depress Lite-Rite gas cock knob if at PILOT position and turn clockwise to OFF. Wait 5 minutes for all unburned gas to vent. **REMEMBER** that

LP gas does not vent upward naturally.

2. Turn the Lite-Rite gas cock knob to PILOT, depress it completely, and light the pilot burner. *The knob must be held down about 1 minute* before the pilot burner will stay lit after releasing the knob.

3. Turn the knob to ON, and set the thermostat above room temperature to turn on main burner.

SPECIAL NOTE ON VR810 AND VR811 MODELS:

At normal on-off cycling rates, valve opens and closes approximately 15 seconds after thermostat action. Exact timings in field usage may vary slightly depending upon voltage, ambient temperature, and length of burner ON and OFF periods. When cycling the thermostat manually, allow 1/2 minute for valve to close before turning burner on again.

GAS LEAK TEST

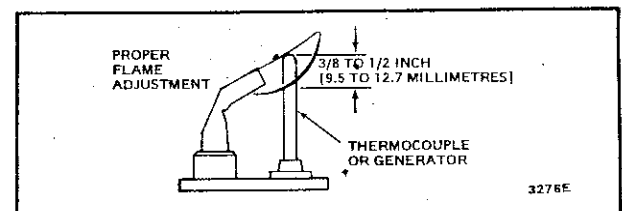
WARNING

DO NOT OMIT THIS TEST

With main burner in operation, paint pipe joints, pilot gas tubing connections, and valve gasket lines with rich soap and water solution. Bubbles indicate gas leakage. To stop leak, tighten joints and screws or replace gasket.

PILOT FLAME ADJUSTMENT

The pilot flame should envelop 3/8 to 1/2 in. [9.5 to 12.7 mm] of the tip of the thermocouple. Remove pilot adjustment cover screw (Fig. 1). Turn inner adjustment screw clockwise to decrease or counterclockwise to increase pilot flame. *Be sure to replace cover screw after adjustment to prevent possible gas leakage.*





CHECK GAS INPUT AND BURNER IGNITION

CAUTION

- Do not exceed input rating stamped on nameplate of appliance, or manufacturer's recommended burner orifice pressure for size orifice(s) used. Make certain primary air supply to main burner is properly adjusted for complete combustion. Follow instructions of appliance manufacturer if provided.
- IF USING METER CLOCKING METHOD:** Make certain there is no gas flow through the meter other than to the appliance being checked. Other appliances must remain off, and the pilot extinguished (or other consumption deducted from the meter reading).
- IF USING MANIFOLD PRESSURE METHOD:** Be sure gas cock is in PILOT position before removing pressure tap plug to connect pressure gauge (manometer). Also turn gas cock back to PILOT when removing gauge and replacing plug. Repeat gas leak test at plug (main burner must be operating).

STANDARD PRESSURE REGULATOR ("A" MODELS)

1. Check input to main burner by clocking gas meter or by using a pressure gauge (manometer) connected to downstream tapping (Fig. 1). The standard natural gas model is factory-set at 3.5 inches wc [0.87 kPa] outlet pressure and the standard LP gas model is set at 11 inches [2.73 kPa]. If adjustment is required, proceed with step 2.

2. Remove cover screw (see Fig. 1). Using screwdriver, turn adjusting screw clockwise  to increase or counterclockwise  to decrease gas pressure to burner. (NOTE: Adjustment fitting is plastic and may require slightly greater turning force than metal thread.) Replace cover screw.

NOTE: On V5306C with 1.0 inch wc [0.25 kPa] limited adjustment, do not force adjustments screw beyond stops.

NO PRESSURE REGULATOR ("B" MODELS)



1. With main burner off, connect pressure gauge (manometer) to downstream pressure tapping (Fig. 1).

2. With main burner operating, check burner manifold pressure.

3. If pressure is not as specified by the appliance manufacturer, readjust regulator on LP gas storage tank.

STEP-OPENING PRESSURE REGULATOR ("C" MODELS)

1. With main burner operating, check input by clocking gas meter, or check burner manifold pressure using pressure gauge (manometer) connected to downstream pressure tapping (Fig. 1).

2. If adjustment is required, remove cover screw (Fig. 1). Using a small screwdriver, turn adjusting screw clockwise  to increase or counterclockwise  to decrease gas pressure to burner. Replace cover screw.

3. Check burner performance at step pressure, observing burner ignition and flame characteristics. Burner should ignite properly and without flashback to orifice, and all ports should remain lit. Cycle burner several times (wait 30 seconds between cycles to allow servo regulator to resume step action). Repeat after allowing appliance to cool.

HI-LO PRESSURE REGULATOR ("D" MODELS)

The HI or LO flame setting is selected by positioning the white knob (Fig. 5) on the regulator. The burner will operate in the low fire position when knob is outward; it will operate in the high fire position when knob is downward.

1. *Adjust to LO setting* by pulling knob upward to its outermost position.

NOTE: Turn on main burner, observing ignition and flame characteristics. Burner should ignite promptly and without flashback to orifice, and all ports should remain lit. Cycle burner several times, and then repeat after allowing appliance to cool.

2. *Adjust to HI setting* by pushing the knob downward towards the regulator body.

3. *Check gas input to appliance:*

a. With burner operating, check gas input by clocking gas meter, or check burner manifold pressure using pressure gauge (manometer) connected to downstream pressure tapping (Fig. 1).

b. If gas input exceeds nameplate rating, check burner orifice diameter against appliance manufacturer's specification for gas being used. (The V5308 is not field adjustable.)

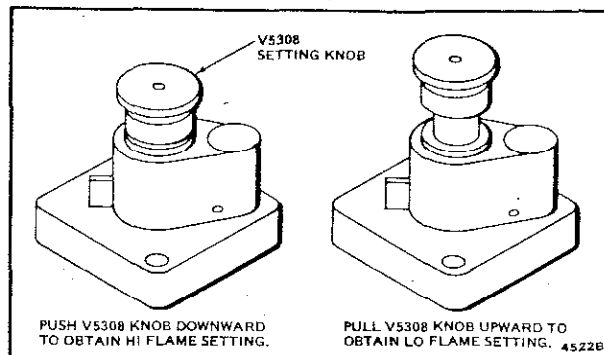


Fig. 5—HI and LO settings for "D" model pressure regulator.

LP-NATURAL CHANGEOVER PRESSURE REGULATOR ("E" MODEL)

WARNING

When a gas system is being converted, the main burner and pilot orifices **MUST** be changed to meet appliance manufacturer's specifications for the particular gas. Refer to appliance manufacturer's instructions for orifice specifications and change-over procedures.

The natural and LP gas settings are selected by positioning the slotted shaft as shown in Fig. 6.

1. *Natural or LP gas setting*

Adjust to LP gas setting as follows:

- Remove cover screw (Fig. 1).
- With a small screwdriver, depress and rotate the shaft so the slot is in line with LP stamped on the bushing (Fig. 6).

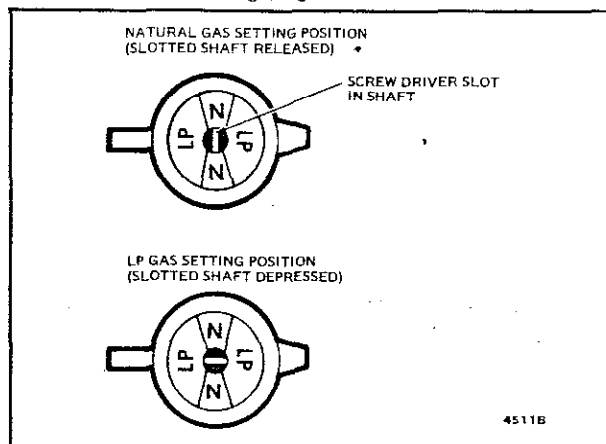


Fig. 6—Natural-LP gas settings, V5309 Changeover Regulator.

NOTE: The shaft will remain depressed for LP gas operation.

c. Replace cover screw.

Adjust to natural gas as follows:

- Remove cover screw (Fig. 1)
- With a small screwdriver, rotate the shaft so the slot is in line with N stamped on the bushing (Fig. 6).
- Replace cover screw.

2. Check gas input to appliance:
 - a. With burner operating, check gas input by closing gas meter (if permissible) or check burner manifold pressure using pressure gauge (manometer) connected to downstream pressure tapping (see Fig. 1).
 - b. If gas input exceeds nameplate rating, check burner orifice diameter against appliance manufacturer's specification for gas being used. (The V5309 is not field adjustable.)

WARNING

At time of changeover to other gas, again check gas input after changing pilot and main burner orifices. Follow procedure above.

CHECKOUT

With Lite-Rite gas cock knob in PILOT position, extinguish pilot flame and make certain Pilotstat unit shuts off gas flow within 2-1/2 minutes. (Safety shutoff of pilot gas proves complete shutdown since Pilotstat pilot safety control valve blocks flow of gas to both main burner and pilot.)

Put the system into operation and observe through complete cycle to be sure all controls function properly.

SERVICE PROCEDURES AND INFORMATION

PILOT WILL NOT LIGHT

1. Main gas supply must be turned on and pilot gas supply line purged of air.
2. With Lite-Rite gas cock knob at PILOT position, depress knob and hold during heatup period of thermocouple or generator. See Pilot Lighting Procedure.
3. Possible obstructions to gas flow:
 - a. Pilot gas adjustment screw closed.
 - b. Clogged pilot filter, tubing or orifice.

PILOT GOES OUT WHEN LITE-RITE KNOB IS RELEASED

1. Check pilot flame adjustment.
2. Check the connection to Pilotstat control power unit (Fig. 1). This is an electrical connection and must be clean and secure.
3. If power unit still does not hold in, use the W720 Systems Tester to obtain the exact open and closed circuit output voltages of the thermocouple. Compare with the Acceptable Range Charts in W720 manual or Gas Controls Service Handbook. Next check resistance of Pilotstat control power unit.

If W720 or other meter is not available, first replace thermocouple. If this does not correct the condition, replace power unit (adjacent to the gas cock knob—see Fig. 1). Turn off gas supply to appliance (at service cock or meter) and remove power unit with wrench. Install and tighten new power unit. Turn on gas supply and check for gas leakage.

**TABLE II—SERVO PRESSURE REGULATOR SPECIFICATIONS
PRESSURES IN INCHES WC [kPa]**

SUFFIX LETTER ^a OF COMPLETE COMBINATION CONTROL	TYPE OF PRESSURE REGULATION	MODEL NO. OF REGULATOR PROVIDED	TYPE OF GAS	OUTLET PRESSURE TO BURNER				RANGE OF ADJUSTMENT	
				STANDARD FACTORY SETTINGS		RANGES OF OPTIONAL FACTORY SETTINGS			
				in. wc	kPa	in. wc	kPa	in. wc	kPa
"A"	Standard	V5306A-Cb,c	Nat.	3.5	0.9	3 to 5	0.7 to 1.2	3 to 5 ^d	0.7 to 1.2
			LP	11.0	2.73	8 to 12	2 to 3	8 to 12 ^d	2 to 3
"B"	None	Blank Plate	LP	Depends on LP gas tank					
"C"	Step-Opening	V5307A	Nat.	0.9 step, (50% of full rate) 3.5 full rate	0.2 step, (50% of full rate) 0.9 full rate	Step—0.7 to 50% of full rate press.; Full rate—3 to 5	Step 0.15 to 50% of full rate. Full rate—0.7 to 1.2	Step—none; Full rate—3 to 5	Step—none; Full rate—0.7 to 1.2
			LP	2.2 step, (45% of full rate) 11.0 full rate	0.5 step, (45% of full rate) 2.7 full rate	Step—1.0 to 50% full rate press.; Full rate—8 to 12	Step—0.25 to 50% of full rate. Full rate—2 to 3	Step—none; Full rate—8 to 12	Step—none; Full rate—2 to 3
"D"	Hi-Lo Flame	V5308A	Nat.	0.9 on Lo, (50% of Hi) 3.5 on Hi	0.2 on Lo (50% of Hi) 0.9 on Hi	Lo—0.7 to 50% of Hi Hi—3 to 5	Lo—0.15 to 50% of Hi Hi—0.7 to 1.2	Non-adjustable	Non-adjustable
			LP	2.75 on Lo, (50% of Hi) 11.0 on Hi	0.7 on Lo (50% of Hi) 2.7 on Hi	Lo—1.0 to 50% of Hi Hi—8 to 12	Lo—0.25 to 50% of Hi Hi—2 to 3		
"E"	LP-Nat. Changeover	V5309A	LP	11.0 at setting	2.7 at setting	—	—	Non-adjustable	Non-adjustable
			Nat.	3.5 at setting	0.9 at setting	—	—		

^aExamples of position of SUFFIX LETTER in model number of complete control: V800A, V800B, and V800C.

^bV5306B Pressure Regulator ("A" models) is low temperature rated for minus 40 to plus 175 F [minus 40 to plus 79 C]. The V5306B may be used to replace a V5306A with 32 to 175 F [0 to 79 C] ambient temperature rating.

^cV5306C ("A" models^a) has a 1.0 inch wc [0.25 kPa] adjustment range.

^dModels available with limited adjustment of 1.0 in. wc [0.25 kPa].

VALVE WILL NOT OPEN

1. Adjust thermostat several degrees above room temperature.
2. Listen for audible "click" as first valve operator opens.
3. Using ac voltmeter, measure voltage across terminals TH and TR.
4. Then if:
 - a. No voltage is present, troubleshoot temperature control circuit. (Refer to appliance manufacturer's wiring diagram.)
 - b. 24 Vac is present, but first operator did not "click" or open, replace the valve.
 - c. 24 Vac is present and first valve operator "clicked" open. Replace the operator-regulator assembly on the valve.

PERFORMANCE DATA AND SPECIFICATIONS

TABLE 1—GENERAL ELECTRICAL DATA

TYPE OF CONTROL	THERMOSTAT HEATER SETTING	ELECTRIC VALVE OPERATOR TIMING ^b	TYPE PILOTSTAT POWER UNIT
24 volt ^a	0.6 amp current	V804—less than 3 sec. V814—30 sec. nominal	30 mV (0.018 ohms)
line volt	Not applicable (0.04 amp current)	V404—less than 3 sec.	

^aRecommended transformers: AT20, AT40 or AT72.

^bApplicable to both opening and closing cycles.

TABLE 2—PILOTSTAT POWER UNIT

HOLD-IN	DROP-OUT	RESISTANCE
300 mA max.	250 to 70 mA	0.018 ohms

COMPONENT AND PARTS REPLACEMENT

The second automatic valve operators and servo regulators may be replaced in service maintenance. (Model numbers are stamped on side of control body.) Complete instructions are furnished with the component.

REPLACEMENT VALVE OPERATORS^a:

Use V804 for VR800, VR801, VR810, and VR811 controls.

Use V404 for VR400 and VR401 controls.

^aThe V404B and V804B are low ambient temperature rated, minus 40 to plus 175 F [minus 40 to plus 79 C] and may be used to replace standard ambient temperature rated "A" model operators.

REPLACEMENT PILOTSTAT POWER UNIT (30 mV):

Part No. 392393.

PRESSURE REGULATOR LP CONVERSION KIT:

Part No. 391937.

OPERATING INSTRUCTIONS FOR HOMEOWNERS

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.


LITE-RITE KNOB SETTINGS


Refer to Gas Cock Settings.

TO LIGHT PILOT AND TURN ON MAIN BURNER

Follow Pilot Lighting Procedure.

TO SHUT OFF

1. For TEMPORARY situations: Main burner can be shut off by turning clockwise  from ON to PILOT. Pilot will remain lit—ready for return to normal service without relighting. (This is the recommended summer shutdown position.)

2. For COMPLETE SHUTDOWN: Slightly depress Lite-Rite knob when at PILOT position and turn clockwise  to OFF. Both pilot and main burner now are shut off.

TO SELECT SETTING ON "D" MODELS WITH HI-LO FEATURE

Follow step 1 or 3 under "D" MODEL PROCEDURE on page 4.

AUTOMATIC SHUTOFF OPERATION

The automatic safety shutoff valve blocks gas flow to the main burner and pilot burner if the pilot flame goes out or becomes too small for adequate ignition.

If safety shutoff occurs, check pilot flame after relighting and adjust if necessary. See Pilot Flame Adjustment. If shutoff reoccurs, contact your local dealer or gas utility to correct condition causing shutdown.

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