

## INSTALLATION DATA

# 700 SERIES

## GAS HEATING CONTROLS

The 700 Series gas controls are designed for a wide variety of heating applications. Models are available for: Manual, Millivolt, Hydraulic, 24 Volt and Line Voltage. Models are available with and without a pressure regulator. A field-addable pressure regulator is also available separately. **(NOTE: The Pressure regulator is "built-in" on hydraulic models and requires replacement of the operator assembly when converting from one gas to another. Controls are multiposition and can be mounted in any position (except upside-down).**

### SPECIFICATIONS

#### ELECTRICAL RATINGS

24 Volt Models

12 VDC - 0.18 amps

24 VDC - 0.2 amps

Millivolt models

250 MV to 750 MV

Line Voltage Models

120 VAC - .034 amps

240 VAC - .017 amps

#### CONTROL VOLTAGE IDENTIFICATION - WIRING BLOCK



#### PRESSURE REGULATOR (Optional by Model)

Natural Gas

Factory set at 3.5" W.C.

L.P. Gas

Factory set at 11.0" W.C.

#### TEMP. RANGE (Hydraulic Models Only)

#### DIAL EQUIVALENTS (Hydraulic Models Only)

Standard Dial Type

Dial Position	1	2	3	4	5	6	7	8	HI
Temperature °F	58°	62°	66°	70°	74°	78°	82°	86°	90°

Remote Dial Type

Dial Position	Low	Med.	High
Temperature °F	50°	70°	90°

#### CAPILLARY LENGTH (Hydraulic Models Only)

Single capillary type

36"

Remote dial type

Combination 18" & 48"

#### PUBLIC BODY & LENGTH (Hydraulic Models Only)

1 1/2" x 8"

#### PILOT OUTLET

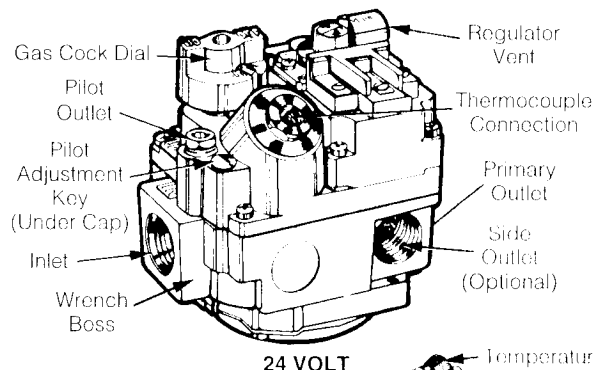
1/4" Tubing

#### AMBIENT TEMPERATURE

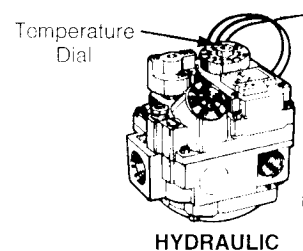
-40° to 175°F

#### MAXIMUM INLET PRESSURE

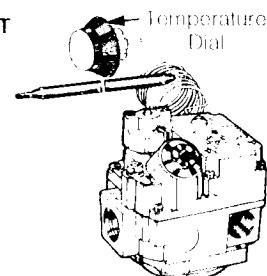
14" W.C. (1/2 PSI)



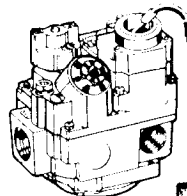
24 VOLT



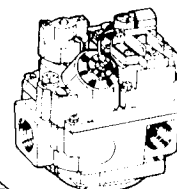
HYDRAULIC



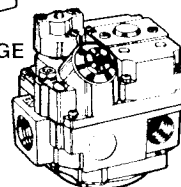
HYDRAULIC  
WITH  
REMOTE  
DIAL



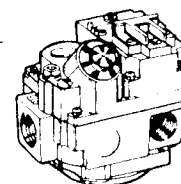
LINE VOLTAGE



MILLIVOLT



MANUAL



DIAPHRAGM  
GAS VALVE

#### CAUTION

THIS DEVICE SHOULD BE INSTALLED BY A QUALIFIED TECHNICIAN WITH DUE REGARD FOR SAFETY AS IMPROPER INSTALLATION COULD RESULT IN A HAZARDOUS CONDITION.

## INSTALLATION INSTRUCTIONS

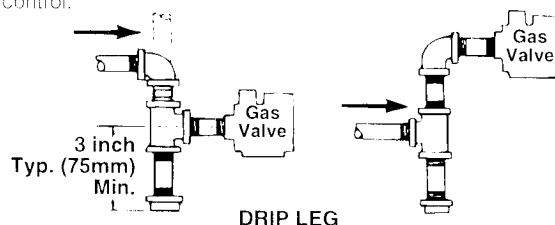
**Turn off gas supply and electrical power to equipment before servicing.**

### PIPING

1. Check replacement valve for multiple outlets (side outlets). If it has them, be sure all unused outlets are plugged using the socket plugs provided.
2. Pipe or tubing must be clean and free of scale and dirt.
3. Make sure gas piping is pressure tested before control is connected. High pressure can damage control causing a hazardous condition. Do not subject control to more than 1/2 PSI, (14" W.C.) inlet pressure.
4. If it is not already installed, a drip leg (sediment trap) must be added to the gas supply line to the control. (See figure to the right.) All piping must comply with local codes and ordinances and with National Fuel Gas Code (ANSI Z223.1 / NFPA, No. 54).
5. Using pipe thread compound suitable for gas being used, apply a small amount on the male pipe threads. (Do not use Teflon tape or Teflon compound.) Leave the first two threads clean. Never use

compound on female threads as it might be pushed into the control body.

6. The gas valve is multiposition and can be mounted in any position (except upside-down) without affecting its operation.
7. Install gas valve so gas flow conforms with the inlet and outlet of the control.



## INSTALLATION INSTRUCTIONS (Cont'd)

8. **DO NOT** insert any object other than suitable pipe or tubing in the inlet or outlet of this control. Internal damage may occur and result in a hazardous condition. A backup wrench should only be used on the inlet wrench boss provided for this purpose, never on body of the control, as this could distort the casting. **NOTE:** Do not overtighten any pipe connections, as this could crack the valve body. A valve with a cracked valve body will not be warrantied.

### PILOT TUBING

1. Make sure tubing is free of burrs and dirt.
2. We strongly recommend that the pilot orifice be checked and cleaned if necessary at this time.
3. Connect pilot tubing into the control using fitting provided, and tighten for a gas tight seal.

### PRESSURE REGULATOR VENT

The 700, when equipped with a pressure regulator, has as standard equipment a built-in Vent Limiter. The regulator vent is tapped 1/8" tubing if vent tubing is required. This fitting is available in a package of 15, order 4590-065. **CAUTION:** If bleed tubing is used, do not allow main burner or pilot flame impingement on the tubing as this will eventually cause clogging of the tubing and improper regulator operation. If bleed tubing is not used, the regulator vent must be properly shielded from moisture.

### THERMOCOUPLE CONNECTION

The thermocouple nut should be started and turned all the way in by hand. An additional quarter turn with a small (4") wrench will then be sufficient to set the lock washer. **CAUTION:** Overtightening may cause damage to the thermocouple or magnet and is unnecessary.

### HYDRAULIC MODELS

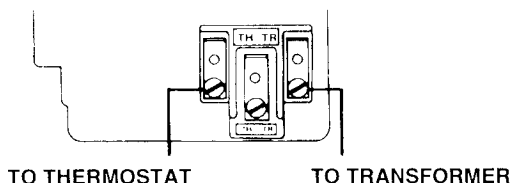
1. **NOTE:** Capillary is liquid-filled and sharp bends are to be avoided.
2. Sensing bulb positioning is important. Attach remote sensing bulb into the existing clips provided by the manufacturer of the equipment.
3. On models with dual capillary or remote dial, install remote dial unit into panel opening provided by the manufacturer.
4. For installations requiring a remote dial drive rod to operate the gas cock dial, order 1751-009 Drive Rod Adaptor Kit.

### WIRING

**DO NOT** short gas valve terminals. This will damage wall thermostat and void warranty.

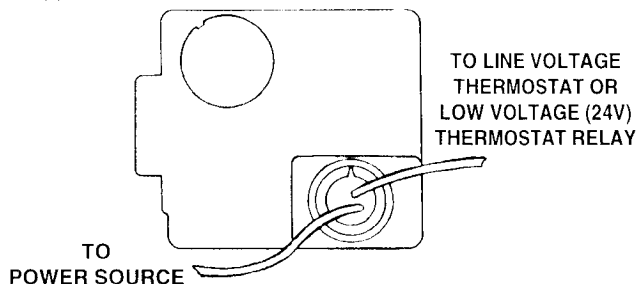
#### 24 Volt Models

1. Check the system for the proper transformer by comparing the VA ratings of the transformer and the system. The system rating is determined by multiplying the voltage draw times the amp draw. Normally 20VA transformers are sufficient for heating only applications and 40VA for heating / cooling applications.
2. Connect lead from transformer to "TR" terminal on gas valve operator - see drawing.
3. Connect lead from wall thermostat to "TH" terminal on gas valve operator - see drawing.



#### Line Voltage Models

1. Check old gas valve or appliance. Determine operating voltage for gas valve 120 VAC or 240 VAC (see front page).
2. Make sure replacement gas valve is the correct voltage to match application.



#### Millivolt Models

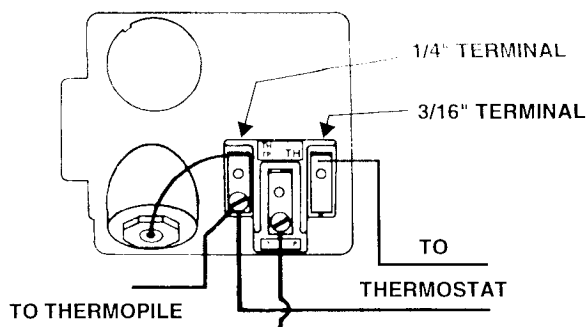
Most appliances manufactured in the USA and Canada are manufactured to meet the standards set forth by the American National Standards Institute (ANSI). A recent revision in the standards "mis-wiring requirements for gas valves" was effective January 1, 1996. The reason for this standard was so that you as a service technician could disconnect the gas valve wires and reconnect them without making a mistake. Therefore all Robertshaw millivolt gas valves now meet the new standard. The 700-500 series millivolt gas valves now have a 1/4" quick connect terminal and a 3/16" quick connect terminal on the terminal block. There is **NO** terminal screw (or threads) on the side that has the 3/16" terminal. If your old application used a terminal screw, you will need to use the 3/16" adaptor terminal that is included with this gas valve.

The 700 Series millivolt valves are designed to operate with 1950 and 1951 Series thermopiles. These valves will also operate with any competitive thermopiles having outputs of 250 MV to 750 MV.

For best operation of a millivolt system, the lead wires from the valve to the wall thermostat should not exceed the recommended maximum lengths shown below:

Wire Size	Max. Length	Wire Size	Max. Length
14 GA.	100 FT.	20 GA.	25 FT.
16 GA.	64 FT.	22 GA.	16 FT.
18 GA.	40 FT.		

#### TWO-LEAD TYPE THERMOPILE WIRING



### LEAK TEST

Leak test with a soap solution after installing with main burner on. Coat pipe and tubing joints, gasket, etc. with soap solution. Bubbles indicate leaks.

## OPERATING INSTRUCTIONS

### WARNING

To avoid possible injury, fire and explosion, please read and follow these precautions and all instruction on appliance before lighting the pilot. L.P. (Propane) gas is heavier than air and will remain at **floor level** if there is a leak. Before lighting, sniff at **floor level**. **If you smell gas**, follow these rules:

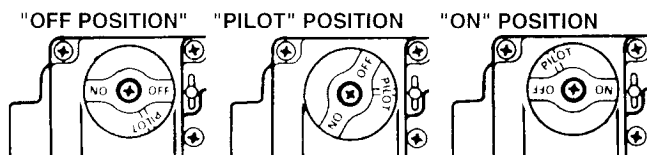
1. Get all people out of the building.
2. **DO NOT** light matches. **DO NOT** turn electric lights or switches on or off in area **DO NOT** use an electric fan to remove gas from area.
3. Shut off gas at main shutoff or L.P. tank outside of building.
4. Telephone gas company and fire department. Ask instructions.

Before hanging up, give your name, address, and phone number. **DO NOT** go back into building. If help is coming wait for them to arrive.

If L.P. tank runs out of fuel, turn off gas at the appliance. After L.P. tank is refilled, appliance must be relit according to manufacturer's instructions. If the gas control has been exposed to **WATER** in any way, **DO NOT** try to use it. It must be replaced. **DO NOT** attempt repair on gas control or appliance.

Tampering is **DANGEROUS** and voids all warranties.

1. Turn temperature dial (hydraulic models) or wall thermostat (electric models) to its lowest setting. Remove burner access panel(s).



Dials must only be operated by hand. **DO NOT** use pliers, wrenches or other tools to turn dials. The Gas Cock Dial cannot be turned to 'OFF' position without first depressing dial in 'PILOT' position and then rotating to 'OFF'.

## SERVICE INSTRUCTIONS

**CAUTION:** If control has been exposed to water in any way, it must be replaced. If gas valve fails to shut off, do not turn off electrical power. Turn off gas supply allowing fan or circulating pump (if so equipped) to continue running until system has cooled. Replace control.

### AUTOMATIC PILOT SYSTEM

To perform the following test, we recommend using our 900-041 test meter.

There are three major causes of pilot outage in the automatic pilot systems.

1. Improper pilot operation.
2. Low output thermocouple or thermopile.
3. Inoperative automatic pilot magnet.

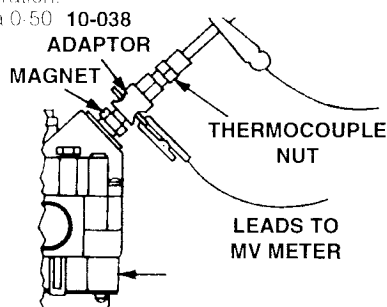
Test procedures and steps to follow in checking each component of the automatic pilot systems are listed below.

#### Thermocouple Check (Except Millivolt)

A closed circuit millivolt check is used to check thermocouple output. This check is performed as follows:

1. Check for proper pilot operation.

2. Use a millivolt meter with a 0-50 millivolt range.
3. Connect Adaptor Part No. 10-038 and millivolt meter leads as shown in figure below. Be sure connections are snug.



2. Turn Gas Cock Dial to 'OFF' position.
  3. **WARNING:** Wait at least 5 minutes to allow any gas in the combustion chamber to vent. If you then smell gas in the appliance area or near the floor, STOP and follow warning instructions to the left. Failure to do so may result in fire or explosion.
  4. If you don't smell gas, turn gas cock dial counterclockwise to the 'PILOT' position.
  5. Hold match at pilot burner. **WARNING:** If pilot lights without depressing gas cock dial, replace control. NOTE: This does not apply to models without a safety magnet. On these models pilot gas will flow all the time when control is in the 'ON' position. Depress and hold gas cock dial while lighting pilot burner. Allow pilot to burn approximately one minute (1-1/2 minutes for millivolt models) before releasing gas cock dial. If pilot does not remain lighted, repeat operation allowing longer period before releasing gas cock dial. (Adjust pilot, if necessary, as noted under 'Pilot Burner Adjustment'.) The thermocouple or thermopile may also be defective and should be checked out (see 'SERVICE INSTRUCTIONS'.)
- WARNING:** If gas cock dial does not pop up when released replace control.
6. Refer to specific model.

#### Manual Models Only

The appliance is now in operation. When heat is desired, turn gas cock dial to 'ON' position. When heat is no longer required, turn gas cock dial back to 'PILOT' position.

#### Hydraulic Models

Turn gas cock dial to 'ON' position and turn temperature dial to desired position. Allow burner to cycle on and off.

#### 24 Volt and Millivolt Models

Turn gas cock dial to 'ON' position and set room thermostat to desired temperature. Allow burner to cycle on and off.

7. Replace burner access panel.

4. Follow standard lighting procedure.
5. Check closed circuit thermocouple output. If less than eight millivolts, replace with 1970 or 1980 thermocouple.
6. Repeat standard lighting procedure after thermocouple replacement.

#### Automatic Pilot Magnet Check (Thermocouple Type)

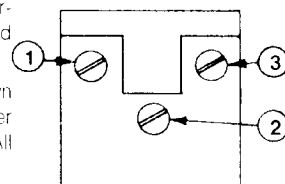
If the closed circuit check shows thermocouple output is greater than eight millivolts and pilot will not remain lit when reset button is released after initial lighting procedure, check operation of pilot magnet as follows:

1. Adaptor Part No. 10-038 should remain connected in system as shown in figure to left.
2. Follow standard lighting procedure and continue holding reset button down.
3. Allow thermocouple output to stabilize and note meter reading.
4. Extinguish pilot by releasing reset button and turning GAS COCK DIAL to 'OFF' position.
5. A good magnet should remain locked up for a drop of five millivolts or more from the original stabilized reading before releasing.
6. If magnet does not operate properly, replace the valve.

#### Millivolt System

The millivolt system and individual components may be checked with a millivolt meter having a 0-1000 MV range. Before checking system, be certain wall thermostat lead wire does not exceed length recommended in Wiring Section under 'Millivolt Models' and all connections are clean and tight.

Conduct each check shown in chart shown on top of next page by connecting meter test leads to terminals as indicated. All readings are closed circuit.



## SERVICE INSTRUCTIONS (Cont'd)

COMPONENT CHECK	CONNECT METER TEST LEADS TO TERMINALS	WALL THERMOSTAT CONTACTS SHOULD BE	METER READING SHOULD BE	SEE CHECK RESULT BELOW
Valve Operator System	2 & 3	Closed	Greater Than 100 MV	A
Wall Thermostat	1 & 3	Closed	Less Than 80 MV	C
Thermopile and Magnet	1 & 2	Open	Greater Than 325 MV	B

### A. TEST RESULTS

If the reading is more than 100 millivolts and the automatic valve does not come on, replace the valve operator. If the closed circuit reading is less than 100 millivolts, determine the cause by proceeding with steps "B" and "C".

### B. TEST RESULTS

If "B" reading is less 325 MV, clean and tighten all electrical connections and adjust pilot if necessary to increase millivolt output. If unable to adjust to at least the specified minimum, change the thermopile. When proper thermopile output is obtained, the magnet may then be checked. With pilot operation, allow meter reading to stabilize. Extinguish pilot burner and note meter reading at dropout point of magnet. If magnet remains locked up to a reading of 120 MV or less, the magnet is good.

### C. TEST RESULTS

If "C" reading is more than that specified for the system being checked, clean and tighten thermostat leads and connections, shorten lead wires if possible or use heavier gauge wire. Rapidly cycle thermostat to clean contacts, or change the thermostat.

### PILOT BURNER ADJUSTMENT

1. Remove pilot adjustment cap.
2. Adjust pilot key to provide properly sized flame on the thermocouple or thermopile. The flame should cover the upper 3/8" of the tip.
3. Replace pilot adjustment cap.

**IMPORTANT: Do not use GAS COCK DIAL to adjust gas output on 7000 models.**

### PRESSURE REGULATOR ADJUSTMENTS

Adjustment of the pressure regulator is not normally necessary since it is preset at the factory. However, field adjustment may be accomplished as follows:

**NOTE:** Manometer attachment may be accomplished at pressure tap plug, below control outlet.

#### Manual and Electric Models

1. Remove regulator adjustment screw cap. (Top of regulator.)
2. With small screwdriver, rotate adjustment screw "clockwise" to increase, or "counterclockwise" to decrease pressure.]
3. Replace regulator adjustment screw cap.

#### Hydraulic Models

Hydraulic models (if regulated) have a built-in pressure regulator and no adjustments can be made.

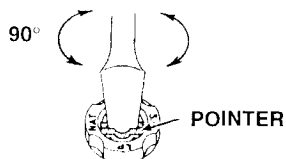
### REGULATOR CONVERSION OR REPLACEMENT

**CAUTION:** Main burner and pilot orifices must be changed when regulator is converted from one type gas to another.

#### Convertible Regulator Models

700 models with convertible regulators may be converted from Natural gas operation to L.P. gas operation or L.P. gas operation to Natural gas operation.

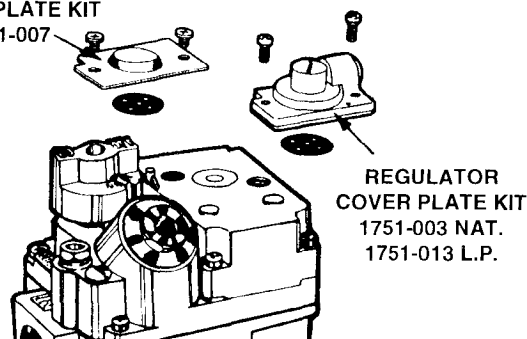
1. Insert a wide screwdriver blade in slot in converter pointer.
2. Rotate pointer 90° to convert regulator from Natural to L.P. gas operation or L.P. to natural gas operation. The pointer indicates the type gas and pressure at which the converter is set.



## REGULATOR REPLACEMENT

Hydraulic models do not have a replaceable pressure regulator. If it is necessary to change to another gas then the valve operator will need to be changed.

### REGULATOR COVER PLATE KIT 1751-007

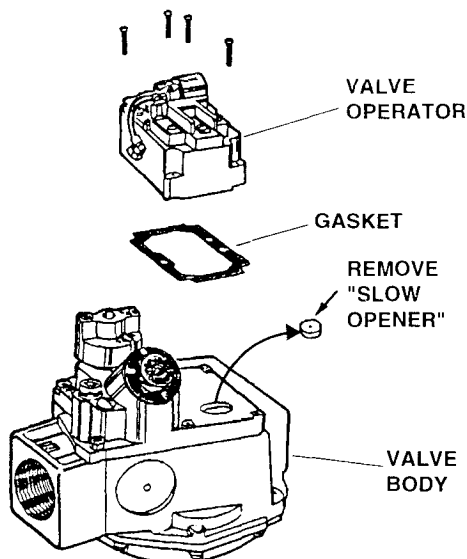


1. Depress and turn gas cock dial to "OFF".
2. Remove two screws, regulator cartridge and gasket.
3. Install new gasket and regulator (this assembly must be positioned properly). Use new screws supplied with regulator.
4. Relight appliance by following steps 4, 5 and 6 of procedure for lighting and relighting.
5. Test for leaks around the regulator using soap solution with main burner "ON".

## SLOW OPENING FEATURE

If the replacement unit has a "slow opener" it will be indicated in the factory model number by -S7A, -S7B or -S7C. Example: 7000BER-S7C. If original control **DID NOT** have a slow opening feature and after installation of replacement control you encounter ignition problems, the "slow opener" can be removed. Proceed as follows:

1. Shut off all gas and electricity to equipment being serviced.
2. Disconnect the wires connected to operator. Move them out of the way. **NOTE:** Mark them so they don't get connected wrong later on.
3. Locate the (4) screws that hold the valve operator to the valve body. Remove all 4 and remove the valve operator and gasket.
4. Locate the "slow opener disc." See drawing below. Using a sharp pointed tool like an ice pick, stick it into the slow opener disc and "pop" it out.
5. Reinstall the valve operator and gasket. Reconnect the wires removed in step 2 above. Restore gas supply and check for gas leaks.



## ROBERTSHAW CONTROLS COMPANY

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