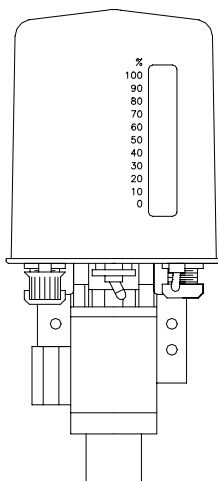


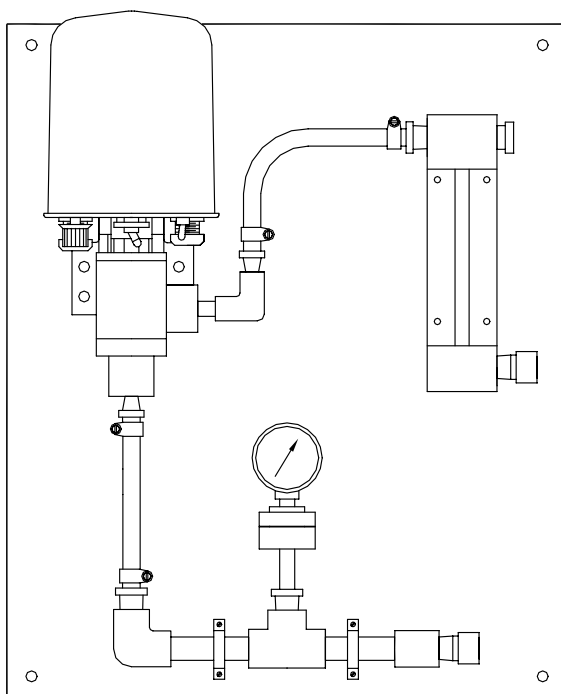
Instruction Manual — Automatic Gas Control Valve, Series 1410



CAPITAL CONTROLS



Wall Mounted Automatic Gas Control Valve



Wall Panel Mounted Automatic Gas Control Valve

These instructions generally describe the installation, operation, and maintenance of subject equipment. Capital Controls Company reserves the right to make engineering refinements that may not be described herein. Should any questions arise that cannot be answered specifically by these instructions, they should be directed to Capital Controls Company or our sales agent for a response.

Capital Controls Company takes all possible precautions in packaging each equipment item to prevent shipping damage. Carefully inspect each item and report damages immediately to the shipping agent for equipment shipped F.O.B. Colmar, or to Capital Controls Company for equipment shipped F.O.B. job site. Do not install any damaged equipment.

Refer to your chemical supplier for information on storage and use of chemical supply containers.

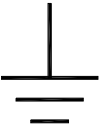
Follow all instructions on any labels or attached tags. Carefully inspect all packing material before discarding to prevent loss of accessories, mounting hardware, spare parts, or instructions.

READ THE ENTIRE MANUAL BEFORE OPERATING

USE ONLY IN ACCORDANCE WITH INSTRUCTION MANUAL



WARNING: HAZARDOUS VOLTAGES



PROTECTIVE GROUND EARCH TERMINAL

WARNING: FAILURE TO INSTALL, SET UP OR OPERATE THE AUTOMATIC GAS CONTROL VALVE IN THE MANNER SPECIFIED BY CAPITAL CONTROLS MAY IMPAIR THE PROTECTION PROVIDED BY THIS EQUIPMENT.

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SAFETY

The recommended operating procedures have been designed with careful attention to safety. Capital Controls has made formal safety reviews of the initial design and any subsequent changes. This procedure is followed for all new products and covers areas in addition to those included in applicable safety standards. Regardless of these efforts, it is not possible to eliminate all hazards from the equipment or to foresee every possible hazard which may occur. Safety is the responsibility of the user.

This equipment has been designed in accordance with safety specification IEC 1010-1 and ANSI/ISA S82.01 and meets the requirements for Class 1, Installation Category III equipment.

Observe the following precautions:

Observe all safety warnings marked on the equipment. These warnings identify areas of immediate hazard which could result in personal injury or loss of life.

Do not use this equipment for any purpose other than described in this instruction manual.

Disconnect power to the equipment prior to removing the cover and making connections to the wiring terminals.

Use all practical safety precautions to prevent contact with energized parts of the equipment and related circuits.

Use the recommended connection procedures described elsewhere in this manual.

This equipment operates from a single phase power source. It requires a three-wire power cord. The voltage to ground from either pole of the power source must not exceed the maximum rated operating voltage, 240 Vac. Before making connection to the power source, determine that the voltage of the power source is correct. The power source must have a high rupture fuse or circuit breaker rated no higher than 15 amps.

Capital Controls recommends that qualified personnel install and connect this equipment. Component replacement and internal adjustments must be made by qualified service personnel.

The following warning and caution notices are used in this manual where applicable and should be strictly observed.

WARNING

Warning, as used in this manual, is defined as a condition or practice which could result in personal injury or loss of life.

CAUTION

Caution, as used in this manual, is defined as a condition or practice which could result in damage to or destruction of this equipment.

1 INTRODUCTION

1.1 General

These instructions apply to the wall and panel mounted Series 1410 Automatic Gas Control Valve. Component instruction manuals and supplemental data are referenced where applicable. Maximum capacity of the valve is related to:

the gas being dispensed.
the capacity of the vacuum regulator.
the capacity of the ejector.

1.2 Specifications

Maximum Capacity (Chlorine)*	Ranges	
	PPD	kg/h
100 PPD (2 kg/h)	100 50 25 10	2 1 0.5 0.2
200 PPD (4 kg/h)	200 100	4 2
500 PPD (10 kg/h)	500 200	10 4

*All capacities are listed for chlorine gas. To determine capacities for sulfur dioxide, multiply each value by 0.95. For carbon dioxide, multiply each value by 0.78. For ammonia, multiply each value by 0.5.

Signal Input:

- a. 0-20 mAdc
- b. 4-20 mAdc
- c. 10-50 mAdc
- d. 1-5 Vdc
- e. 0-5 Vdc

Power Requirements: 120 Vac or 240 Vac, 50/60 Hz, single phase

Power Consumption: 15 VA

Display: LED bar graph, 0-100% of full valve capacity, in 10% increments. Bottom LED indicates power ON.

Alarm Contact: Unpowered TRIAC rated 0.5 amps @ 240 Vac maximum. Selectable N.O. or N.C. at valve closed.

Ambient Temperature: 32° F to 125° F (0° C to 50° C)

Dosage Ratios: Maximum - 2:1, Minimum - 1:5

Meter Panel

Vacuum Gauge - 0-30 inches of mercury
Meter Size - 6"

Vacuum Line Connector Size:

Feed Rate	Length of Vacuum Line		
	100 feet (30 m)	200 feet (60 m)	500 feet (150 m)
To 50 PPD (1 kg/h)	3/8"	3/8"	1/2"
100 PPD (2 kg/h)	3/8"	1/2"	5/8"
200 PPD (4 kg/h)	1/2"	5/8"	3/4"
500 PPD (5 kg/h)	5/8"	3/4"	1"

1.3 Principle of Operation

Install the Automatic Gas Control Valve or panel between the vacuum regulator (or switchover module, if provided) and the ejector or chemical induction unit. (Figure 1) When the valve receives an input signal, typically from a process flow transmitter, it compares its present gas feed to the desired gas feed and repositions the valve until a balance is achieved. The result is a linear gas feed rate adjustment in proportion to the input signal to provide versatile automatic control.

A dosage control knob is provided to manually adjust the gas dosage. Once set, the dosage maintains a fixed ratio between the gas feed rate and the process flow, regardless of flow variations. The dosage control knob permits adjustment to the dosage ratio to 1/5 of the design dosage for any process flow up to the maximum flow rate. It also permits an increase in the gas feed dosage up to twice the design dosage at half the maximum process flow rate. A Manual/Auto switch and a manual rate adjustment switch are provided to manually operate the valve in the event of a loss of input signal or manual override.

A solid-state electronic switch contact or TRIAC is provided to activate a remote device when a fully closed valve condition occurs. The TRIAC, when energized, acts as a switch closure or opening and connects into the hot side of the power line of the remote device.

The valve may be fitted with an optional dual potentiometer (0-500 ohms) where the resistance value is proportional to valve position. When the potentiometer is connected to the R/I (resistance to current) signal conversion module, an inferred gas flow rate output signal is available. A local line power ON/OFF switch is not provided since constant power should be maintained to the electronics boards.

Accuracy of the gas feed rate is dependent upon maintaining a constant differential pressure (vacuum) between the valve inlet and outlet. This may be accomplished by increasing the vacuum level measured at the valve's outlet to 14.6" of mercury minimum when sonic conditions occur or installing an external differential pressure regulator in the downstream vacuum line.

Automatic Gas Control Valves 50 PPD/1 kg/h and over, use the sonic principle without the differential pressure regulator. For capacities of 25 PPD/0.5 kg/h or less, the differential pressure regulator is supplied to provide improved accuracy and adjustability by increasing the resolution.

NOTE: Valves 50 PPD (1 kg/h) and over require a minimum vacuum of 14.6 inches of mercury at the valve outlet to operate at sonic flow. To assure this vacuum level, selection of the next higher capacity ejector is recommended.

Wall panels contain a vacuum gauge and a 6" meter panel to aid in monitoring the feeder operation.

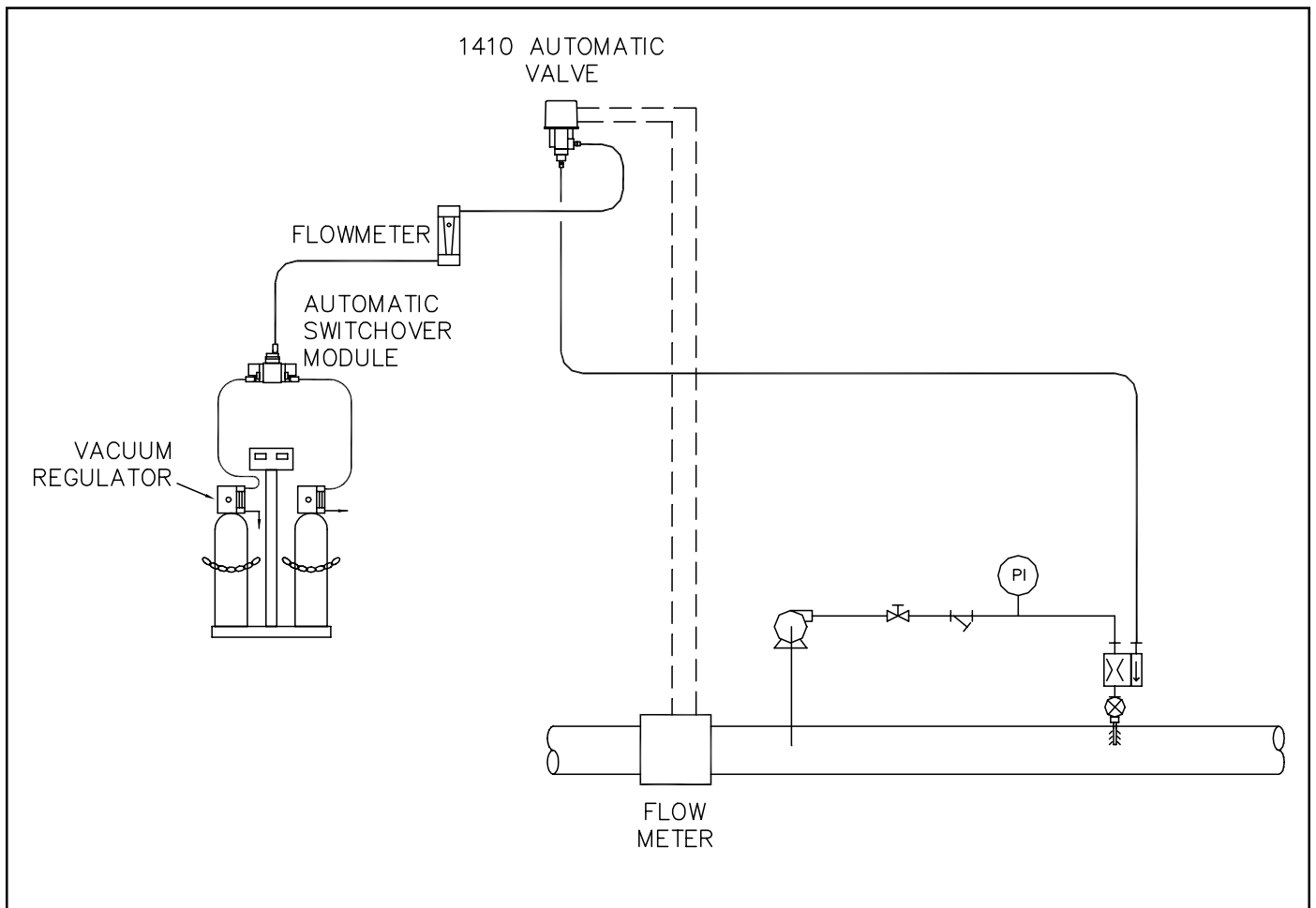


Figure 1 - Automatic Gas Control Valve Flow Diagram

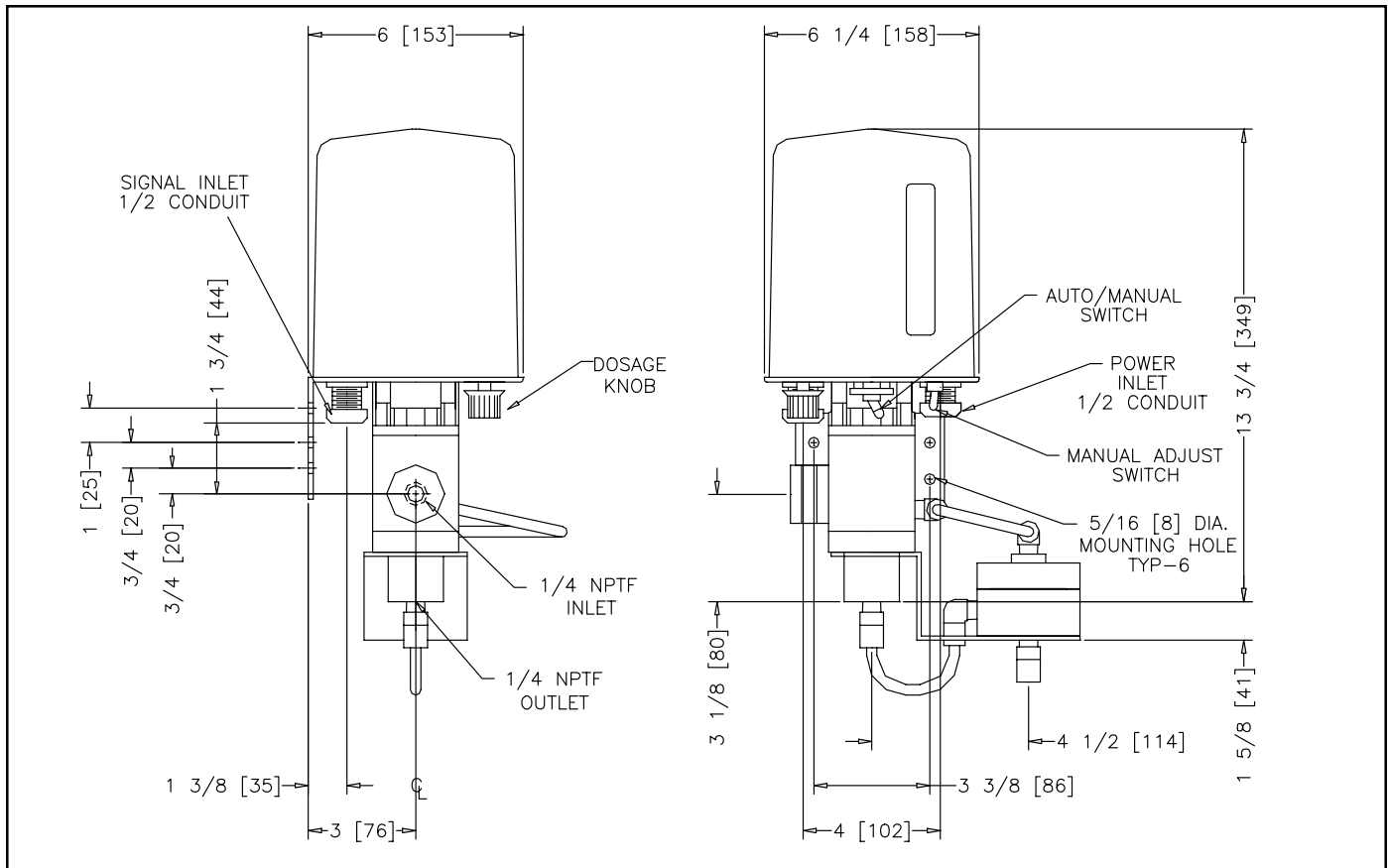


Figure 2 - Dimensions for Wall Mounted Automatic Gas Control Valve with DP Regulator

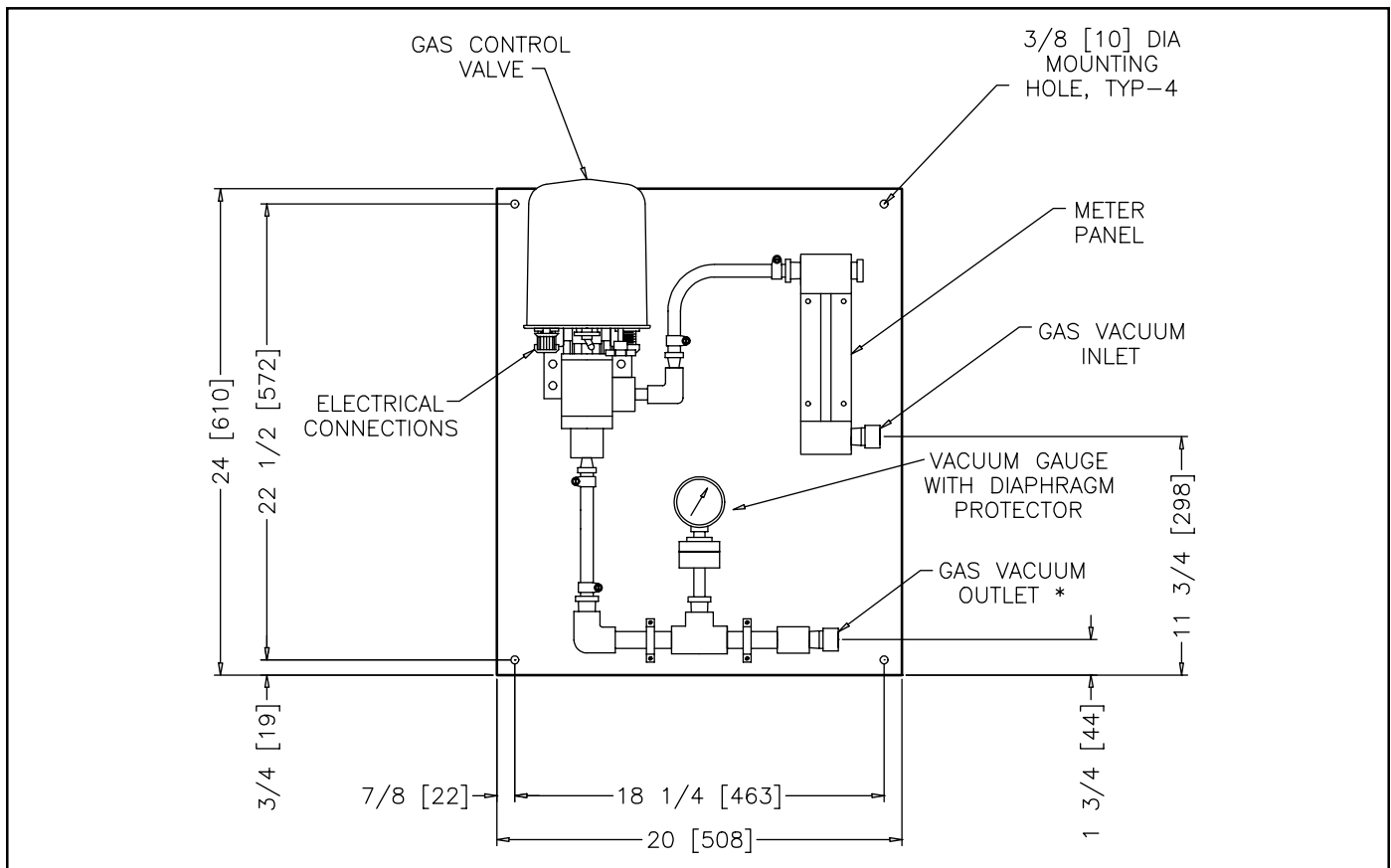


Figure 3 - Dimensions for Panel Mounted Automatic Gas Control Valve

2 INSTALLATION

2.1 Mounting

The valve or panel should be mounted indoors or under a protective cover, on a vertical, vibration-free surface away from splashing liquid and strong magnetic fields, positioned between the vacuum regulator or switchover module and the ejector. (Refer to Parts Lists 100.7081 and 100.7082 and Figures 2 and 3 for dimensional information.)

Mounting holes are provided on each side of the valve bracket or on the four (4) corners of the panel.

Secure with 1/4" bolts. It will be necessary to remove the power and signal conduit connectors to access the top mounting holes on the valve. Replace connector after mounting is complete.

2.2 Electrical Connections

WARNING: FAILURE TO DISCONNECT POWER TO THIS EQUIPMENT PRIOR TO ACCESSING THE INTERIOR OF THE HOUSING MAY RESULT IN SERIOUS PERSONAL HAZARD FROM EXPOSURE TO LETHAL VOLTAGES.

2.2.1 Remove the screw in the top of the electronics cover and remove the cover.

2.2.2 Connect the line voltage, flow signal and alarm contact. Refer to Figure 4.

CAUTION: ALL WIRING MUST CONFORM TO NATIONAL AND LOCAL ELECTRICAL CODES. LINE VOLTAGE AND FLOW SIGNAL LINES SHOULD NOT BE RUN IN THE SAME CONDUIT.

2.2.3 Replace and secure the valve electronics cover.

2.3 Vacuum Connections

2.3.1 Wall Mounted Valve

- a. Connect a vacuum line from the vacuum regulator or switchover module to the valve and from the valve to the ejector. GAS IN on the left side, GAS OUT from the bottom of the valve or differential pressure regulator.
- b. Choose the proper size vacuum tubing for the gas feed rate and the gas in and gas out fittings. See Vacuum Line Connector Size chart in section 1.2
- c. Be sure to allow enough length for removal of the vacuum regulator when changing the gas containers.

2.3.2 Wall Panel Mounted Valve

- a. Connect a vacuum line from the vacuum regulator or switchover module to the inlet GAS IN on the upper right side of the panel. Connect the gas outlet, after the vacuum gauge located on the lower right side of the panel, to the ejector.

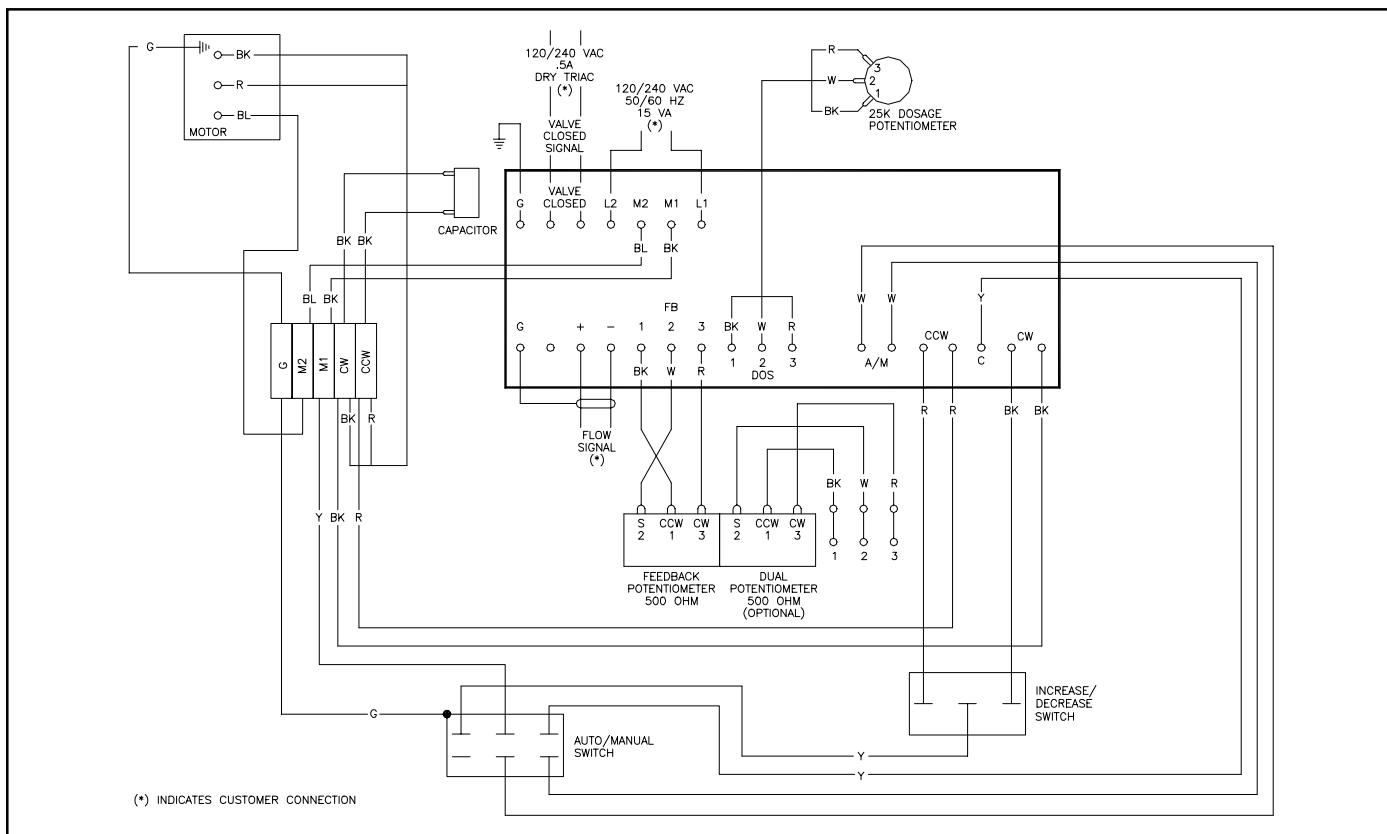


Figure 4 - Automatic Valve Wiring Diagram

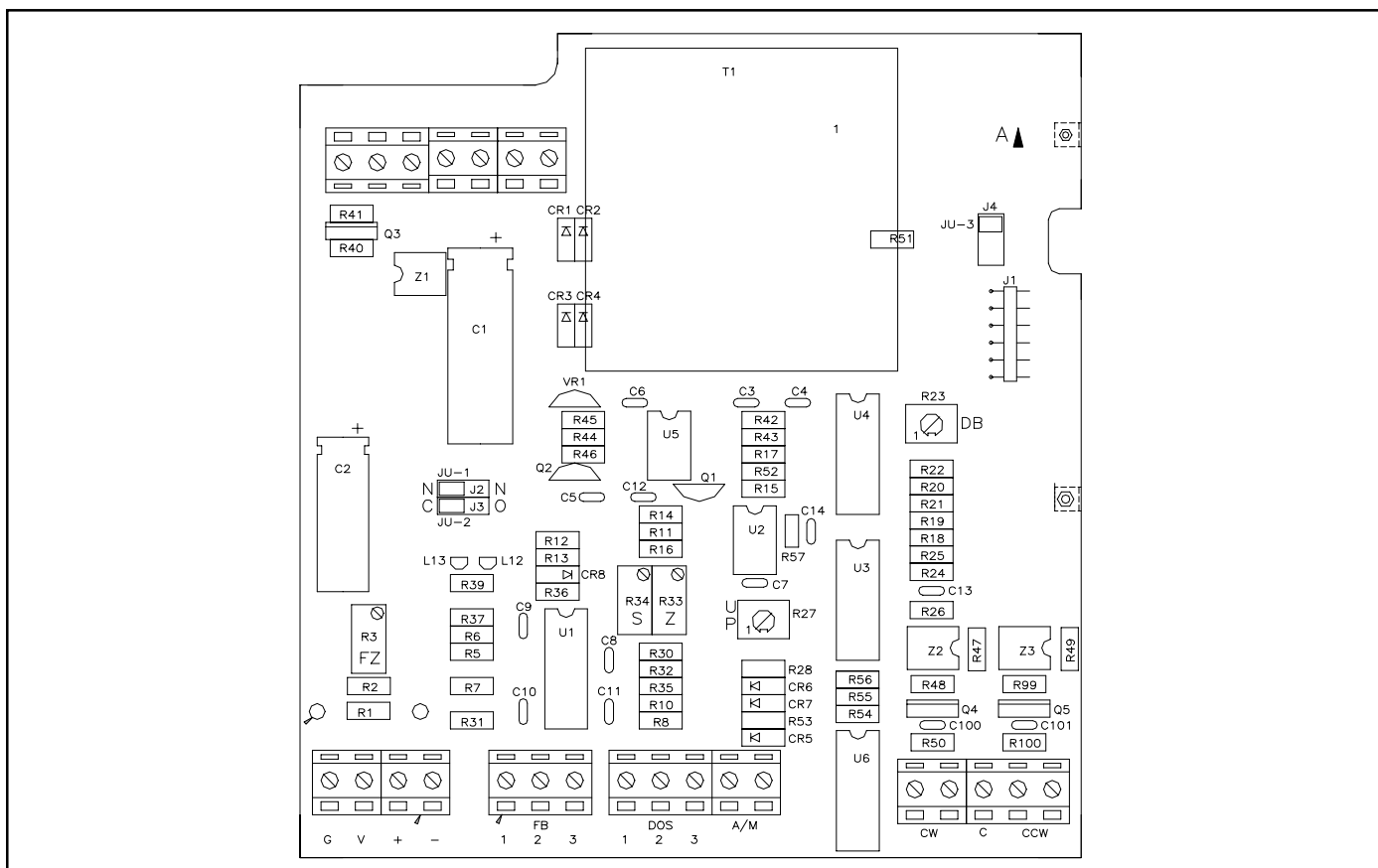


Figure 5 - PC board Component Locations

3 OPERATION

3.1 General

For operation of the vacuum regulator, process water flow transmitter, ejector or chemical induction unit included in the automatic gas feed system, refer to the appropriate instructions.

3.2 Start-Up

- 3.2.1 Use a plastic squeeze bottle 1/4 full of leak test solution to check for gas leaks. Use 26° Baume ammonia solution for chlorine or sulfur dioxide, or household chlorine bleach for ammonia.
- Operate the ejector with the gas supply valve closed.
 - Shut off the ejector water supply valve.
 - Open the gas supply valve 1/4 turn and close immediately.
 - Hold the plastic squeeze bottle of test solution below the valve inlet and outlet connections. Squeeze the plastic bottle to exhaust fumes from the test solutions. If gas is leaking, white smoke will appear. **DO NOT BREATHE THE WHITE SMOKE THAT IS FORMED.** See gas leak section of the Troubleshooting Chart.
- 3.2.2 After eliminating the leaks, turn on the gas supply.
- 3.2.3 With the AUTO/MANUAL switch in the AUTO position, the automatic valve will move to the control point set by the dosage adjustment. The bar graph will indicate approximate valve position. The bottom lamp is always lit to indicate power.
- 3.2.4 Calculate or estimate the required gas feed rate for the chemical reaction desired.
- 3.2.5 Use the dosage adjustment knob on the automatic gas control valve to increase or decrease the gas feed rate. The actual flow of the gas will be indicated on the gas flowmeter of the vacuum regulator. The bar graph indicator will provide a percentage display of the amount the valve is opened in proportion to the full valve capacity. The dosage adjustment knob permits ratio adjustment down to as low as 1/5 of the design dosage for any given process flow up to the maximum flow (Refer to Table I). The dosage adjustment also permits an increase to twice the design dosage at half the maximum flow. Table II illustrates this capability.
- 3.2.6 After the system is in operation, check the chemical residual to determine if the desired residual is being maintained. Increase or decrease the dosage until the correct residual is obtained.
- 3.2.7 The dosage is now set at a fixed ratio with a variation in process flow from minimum to maximum.
- 3.2.8 A fully closed valve will activate the alarm contact to indicate a no flow condition.
- Set jumpers to N.C. position to drive normally energized gas shutoff solenoids.
 - Set jumpers to N.O. position to drive valve closed alarm lamps.

Table I

Water Flow (GPM)	Maximum Flow signal (mA)	Approximate Gas Feed PPD (kg/h)	Approximate Dosage (mg/l)	Approximate Dosage Ratio
1000	20	50 (1)	4.1	1
1000	20	37.5 (0.75)	3.12	3/4
1000	20	25 (0.5)	2.0	1/2
1000	20	12.5 (0.25)	1.04	1/4
1000	20	10 (0.2)	0.83	1/5

Table II

Water Flow (GPM)	Mid-Scale Flow Signal (mA)	Approximate Gas Feed PPD (kg/h)	Approximate Dosage (mg/l)	Approximate Dosage Ratio
500	12	25 (0.5)	4.16	1
500	12	31.2 (0.624)	5.2	1 1/4
500	12	37.4 (0.748)	6.2	1 1/2
500	12	43.7 (0.874)	7.28	1 3/4
500	12	50 (1)	8.32	2

3.3 Manual Operation

Manual operation is used in the event of a loss of input signal or manual override. Refer to Figure 6. For manual operation, proceed as follows:

- 3.3.1 Switch the AUTO/MANUAL switch to the MANUAL position.
- 3.3.2 Move the manual adjustment switch left or right to obtain the desired feed rate (indicated on gas flowmeter).
- 3.3.3 The bar graph will indicate valve position.
- 3.3.4 When the condition is corrected, switch the AUTO/MANUAL switch to the AUTO position and resume automatic gas feed.

3.4 Calibration

Valve calibration is required when components have been changed, or if a change in valve capacity is desired. Equipment Required:

Digital volt meter	3/32 Allen wrench
1/16 Allen wrench	1 thin blade screwdriver
Flow signal source or 1K test potentiometer	

3.4.1 Initial Vacuum Test

Confirm that a strong vacuum is being developed by the ejector as follows:

- a. Disconnect the vacuum tubing at the ejector.
- b. Open the ejector water supply valve. The ejector should be operating and creating a vacuum.

- c. Put your finger on the vacuum connector opening and feel the vacuum. There should be no doubt that a vacuum exists. If there is no vacuum, be certain the supply pressure is sufficient and either the nozzle or water/solution piping is not plugged. Correct the condition and obtain proper vacuum before proceeding.
- d. Test the ejector check valve performance by starting and stopping the ejector water flow several times, confirming that no water leaks out of the vacuum connection. Reconnect the vacuum line.
- e. Panel mounted units are provided with a vacuum gauge. Operate the ejector until a maximum vacuum level is reached and stabilized.
- f. Stop the ejector water supply. If the vacuum level holds for 10 minutes, calibration can begin. If not, refer to Troubleshooting Chart regarding vacuum leaks
- g. Resume ejector operation. Slowly open the gas supply valve 1/4 turn.

3.4.2 Bottom Stop Adjustment (Zero Flow) - Refer to Figures 6 and 7.

If the valve meter plug and/or feedback potentiometer gear have been replaced or if the bottom mechanical stop has been moved, reset as follows:

- a. Remove the feedback potentiometer gear.
- b. Loosen the bottom stop.
- c. Move the AUTO/MANUAL switch to the MANUAL position.
- d. With the ejector operating, operate the manual adjustment switch until the gas flow is zero as indicated by the vacuum regulator gas flowmeter.
- e. Set the bottom stop. Make sure the valve stops below the zero gas flow rate position within 1/2 turn.
- f. Manually increase then decrease the valve plug one rotation to ensure that the stop position does not interfere with the valve movement. Make sure the valve position is returned to the bottom stop.
- g. With follower assembly against bottom motor stop, remove black and white feedback potentiometer wires and connect Multimeter across feedback potentiometer. Adjust potentiometer for 15 ohms. Reconnect feedback potentiometer wires.
- h. Install the correct gear on the potentiometer shaft.

3.4.3 Full Scale (Maximum Flow) Stop Adjustment - Refer to Figure 6.

If the capacity is being changed or if the top stop has been moved, reset as follows:

CAUTION: WHEN ADJUSTING THE TOP STOP BE SURE NOT TO EXCEED A TOTAL OF 15 1/2 TURNS OF THE VALVE PLUG. EXCEEDING THIS RATING MAY CAUSE DAMAGE TO THE FEEDBACK POTENTIOMETER.

- a. Using the manual adjustment switch, manually turn the valve against the bottom stop. Check for zero flow. Refer to Sections 3.4.2 and 3.4.5 if zero adjustment must be made.
- b. Loosen the top stop and, with the ejector running, adjust the valve to the required maximum gas flow rate as indicated on the vacuum regulator flowmeter.
- c. Set the top stop to permit the valve to open past the maximum required setting by no more than 1/2 turn.
- d. Manually decrease and increase the valve one (1) full turn to ensure the stop does not interfere with valve movement.

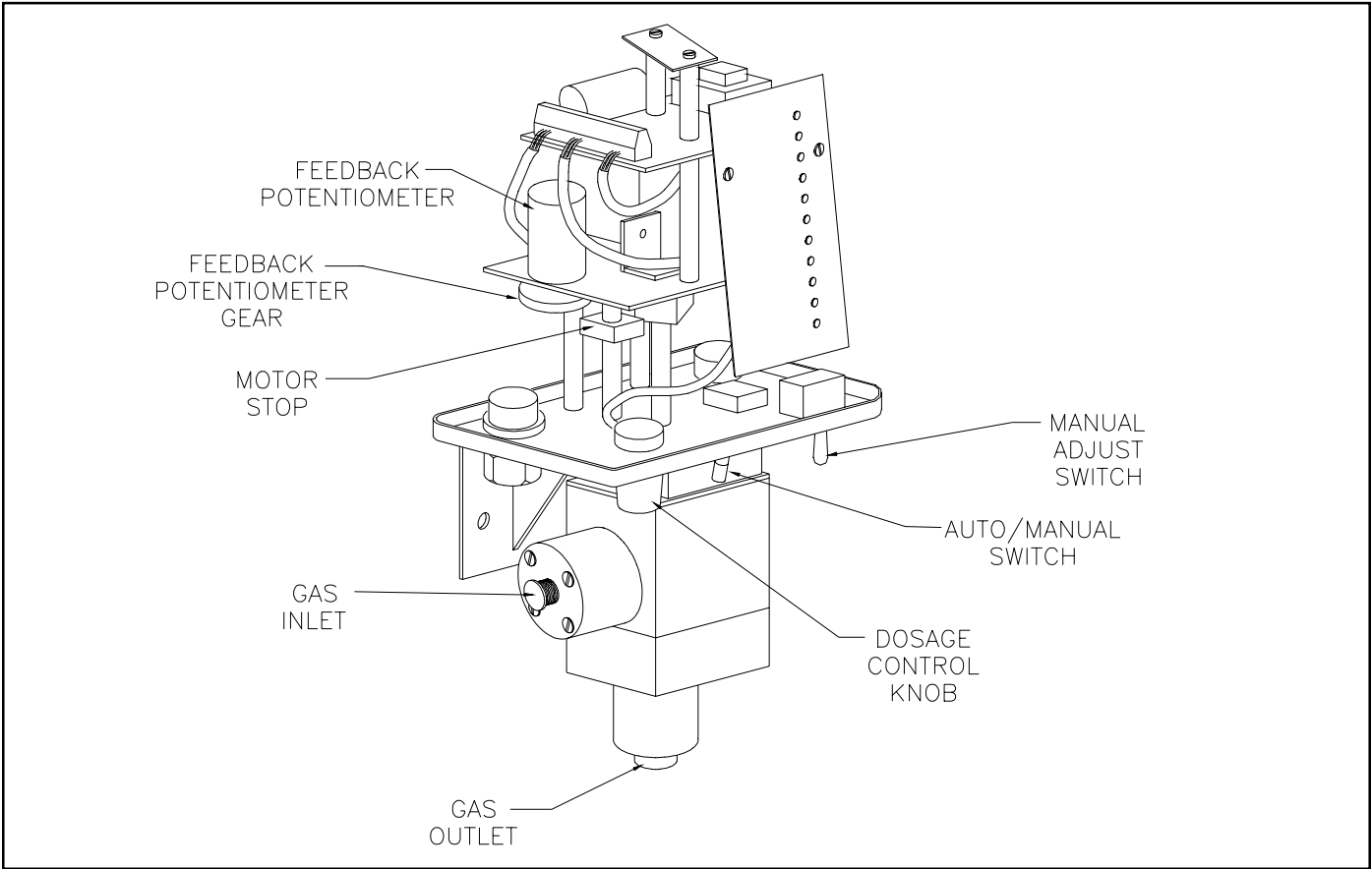


Figure 6 - Automatic Valve Less Cover

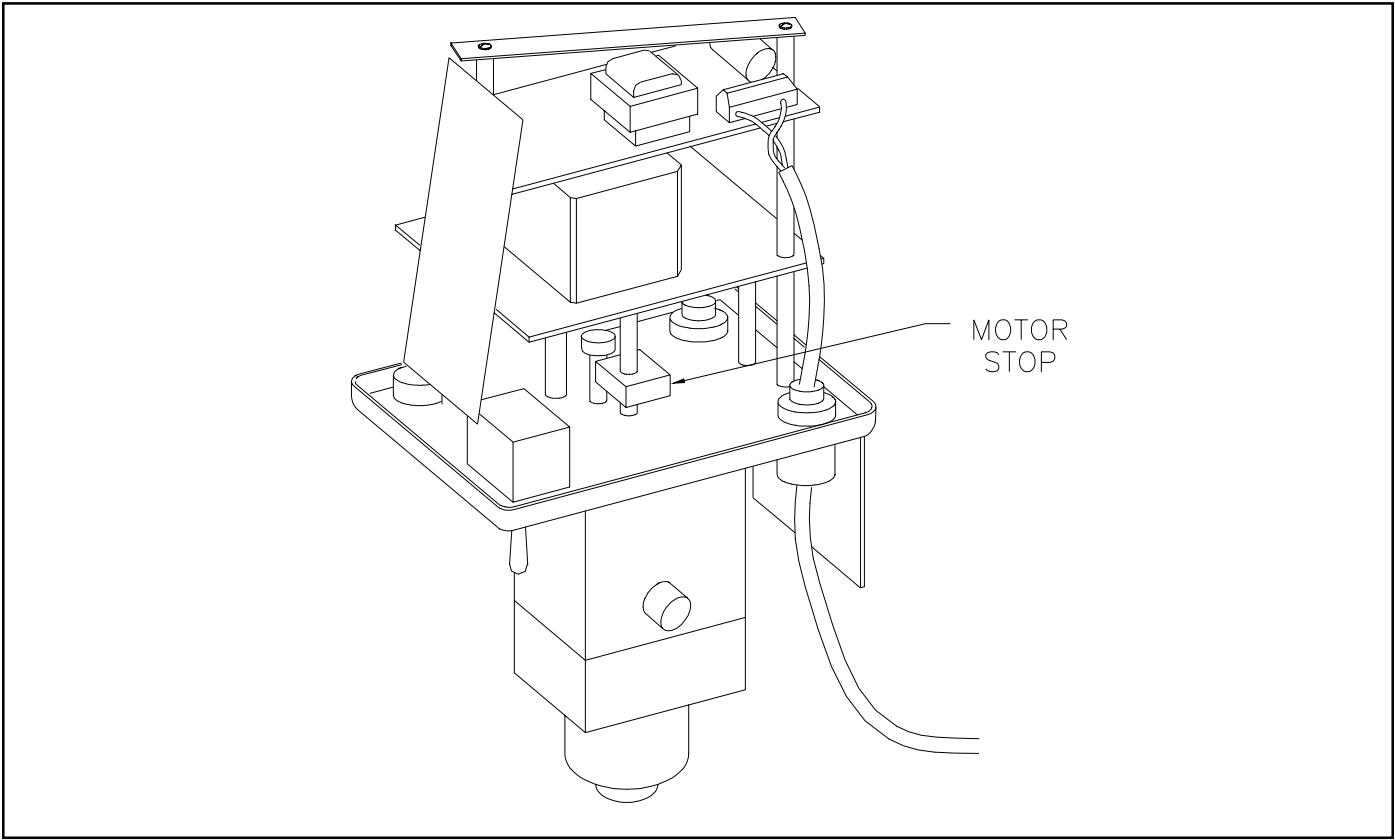


Figure 7 - Valve Bottom Stop

3.4.4 Electrical Calibration - Refer to Figure 5.

NOTE: Check for proper value of RI Resistor Per Table IV.

- a. Select the desired position for the valve closed output signal.
 1. Use N.C. position to drive normally energized gas shutoff solenoids.
 2. Use N.O. position to drive valve closed alarm lamps.
- b. Set H-L jumper to the H position.
- c. Set UP potentiometer according to Table III. 0% is full counterclockwise, 100% is full clockwise.

Table III

Capacity	UP%	Approximate Turns - 100%
10 PPD (200 g/h)	50	3
25 PPD (0.5 kg/h)	30	8
50 PPD (1 kg/h)	40	4
100 PPD (2 kg/h)	30	8
200 PPD (4 kg/h)	30	10
500 PPD (10 kg/h)	30	7.5

- d. For FZ (Flow Zero) adjustment, connect an electrical signal source across FLOW + and - input terminals. If process flow signal is not available, connect 1K potentiometer according to Figure 6.
 1. Set DOSAGE potentiometer full clockwise (Maximum dosage)
 2. Connect digital volt meter across flow input terminals - set digital volt meter for 20 Vdc range.
 3. Adjust the input signal for zero flow per Table IV. Set the AUTO/MANUAL switch to AUTO.
 4. If the valve is fully closed to the mechanical stop, adjust the Z potentiometer, in a clockwise direction, until the valve opens 1/4 to 1/2 turn.
 5. If jumpers are set to N.C. position, adjust FZ potentiometer clockwise until L13 LED is ON, then counterclockwise until LED just turns OFF.
 6. If jumpers are set to N.O. position, adjust FZ potentiometer clockwise until L12 LED is OFF, then adjust counterclockwise until LED just turns ON.

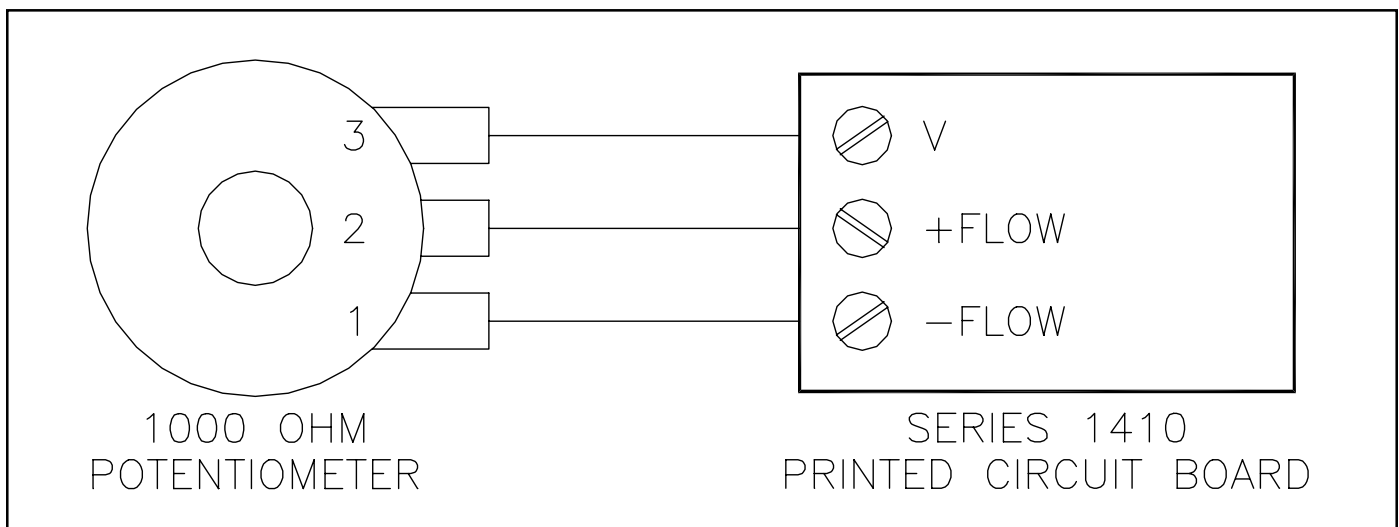


Figure 8 - Test Potentiometer Connections

3.4.5 Dosage and Deadband (DB) Adjustment (Refer to Figure 5)

- Adjust input signal per Table IV for 90% flow.
- Set dosage control knob approximately halfway (midrange).
- Adjust DB potentiometer clockwise until the valve oscillates or “hunts”, then counterclockwise until oscillation stops, then adjust DB counterclockwise approximately 10° further.
- Adjust dosage control knob until the LED indicating 90% of valve opening is ON (second from the top)

3.4.6 Zero (Z) Adjustment

- Adjust input signal for 25% flow from Table IV.
- Adjust Z potentiometer clockwise until more than 25% of gas feed is indicated on the flowmeter, then counterclockwise until 25% of gas feed is indicated.

Table IV

Input Signal	Zero Flow		25% Flow		90% Flow		RI
	Meter Reading	Volts	Meter Reading	Volts	Meter Reading	Volts	
0-5 V	0 V	0	1.25 V	1.25	4.5 V	4.5	None
0-20 mA _{dc}	0 mA	0	5.0 mA	1.25	18.0 V	4.5	249Ω
1-5 V	1 V	1	2.0 V	2.0	4.6 V	4.6	None
4-20 mA _{dc}	4 mA	1	8.0 mA	2.0	18.4 mA	4.6	249Ω
10-50 mA _{dc}	10 mA	1	20 mA	2.0	46.0 mA	4.6	None
*20-4 mA _{dc}	20 mA	5	16 mA	4.0	5.6 mA	1.4	249Ω

*NOTE: This input signal is set for sulfur dioxide feed used in applications such as dechlorination.

3.4.7 Span (S) Adjustment

- Adjust input signal for 90% flow from Table IV.
- Adjust S potentiometer clockwise until more than 90% of gas feed is indicated on the gas flowmeter, then counterclockwise until 90% of the gas feed is indicated.
- Adjust input signal for 25% flow from Table IV, and readjust Z potentiometer for 25% of gas feed, if necessary.
- Adjust input signal for 90% flow from Table IV, and readjust S potentiometer for 90% of gas feed, if necessary.
- Repeat steps c and d until no further adjustments are necessary.

4 SERVICE

NOTE: DUE TO THE NATURE OF THIS EQUIPMENT AND THE USE OF CUSTOM-BUILD ELEMENTS, IT IS RECOMMENDED THAT THIS EQUIPMENT BE RETURNED TO THE FACTORY FOR REPAIR OR REPLACEMENT IF FOUND TO BE DEFECTIVE IN FORM OR FUNCTION.

4.1 Cleaning Slotted Valve Plug (Refer to Figure 9)

- 4.1.1 Evacuate all gas from the system before disassembly.
- 4.1.2 Disconnect power to the valve.
- 4.1.3 Remove all vacuum tubing to the valve.
- 4.1.4 Remove the four (4) screws holding the filter body to the center body. Examine the filter floss and inlet screen for dirt buildup. Replace as necessary.
- 4.1.5 Remove the four (4) screws securing the bottom and center bodies to the top body.
- 4.1.6 Carefully slide first the bottom body, then the center body down off the valve plug. Replace the D-115 diaphragm with a new diaphragm when reassembling the bottom and center bodies.
- 4.1.7 Remove the spring clip at the top of the valve plug while holding the valve plug. The valve plug is easily scratched and should be handled with care. Be sure the spacer between the two shaft sealing o-rings does not drop off when the valve plug is removed.
- 4.1.8 To clean the metering slot, use a soft brush and scrub the slot under hot water. If residue remains, use a solvent, such as acetone or alcohol.

CAUTION: NEVER USE SHARP OBJECT TO CLEAN VALVE PLUG.

- 4.1.9 Reassemble the valve by reversing steps 1 to 7, making certain all parts are clean. The diaphragm fits over the valve plug with the turned up center hole toward the top of the valve. Tighten all body bolts evenly - DO NOT OVER-TIGHTEN.

4.2 Feedback Potentiometer Replacement

- 4.2.1 Manually close the valve until the valve stem touches the bottom stop. DO NOT reposition the bottom stop. The gas flowmeter should now read zero.
- 4.2.2 Disconnect power to the valve.
- 4.2.3 Loosen the socket set screw in the feedback potentiometer gear using 0.05" Allen wrench, and slide the gear off the shaft. Refer to Figure 6.
- 4.2.4 Remove the two (2) clamp screws holding the potentiometer in place.
- 4.2.5 Remove the potentiometer and disconnect the wires from the terminal strip. Note position of the wires. See Figure 4.
- 4.2.6 Position the feedback potentiometer in the mounting bracket hole and clamp in place.
- 4.2.7 Adjust the feedback potentiometer for 15.0 ohms at zero gas flow between the black and white wires.
- 4.2.8 Slide the feedback potentiometer gear onto the shaft engaging the mating gear. DO NOT rotate the gear. Tighten the socket set screw to clamp the gear to the shaft.
- 4.2.9 Reconnect the wires from the potentiometer to the terminal strip. See Figure 4.
- 4.2.10 Reconnect power and replace valve cover.

- 4.2.11 Rotate the motor gears manually and observe the feedback potentiometer gear for proper operation.
- 4.2.12 Confirm calibration or recalibrate as required.
- 4.2.13 Replace valve cover.

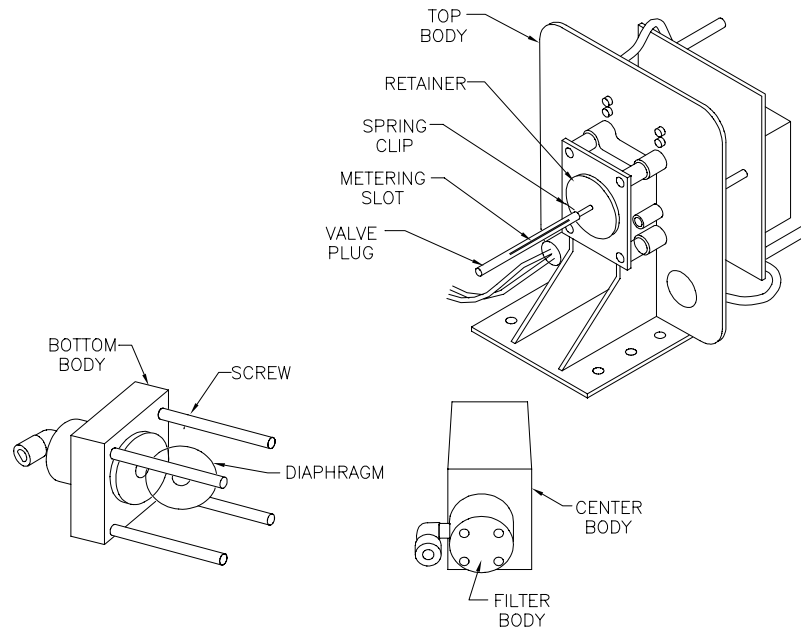


Figure 9 - Disassembled Valve

5 TROUBLESHOOTING CHART

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
1. Required gas flow rate is not achieved at start-up.	a. Insufficient ejector vacuum from insufficient supply pressure for existing back pressure. b. Leakage at vacuum line connection at ejector inlet. c. Vacuum piping exceeds maximum distance.	a. Refer to Condition 8. See Ejector Instruction Manual. b. Inspect connection, remake as necessary. c. Refer to Section 1.2, Specifications.
2. Required gas flow rate is not achieved on start-up following an extended period of shutdown.	a. Insufficient ejector vacuum. b. Leakage at vacuum line connection at inlet to ejector. c. Leakage around flowmeter gaskets.	a. Refer to Condition 8. See Ejector Instruction Manual b. Inspect connection, remake if necessary. c. Inspect and align flowmeter or replace gaskets.
3. Flowmeter float bouncing and/or maximum gas flow rate cannot be achieved during operation.	a. Gas inlet screen at vacuum regulator dirty. b. Flowmeter dirty. c. Gas inlet screen at auto valve dirty.	a. Clean or replace gas inlet screen. Refer to Vacuum regulator Instructions. b. Clean flowmeter. c. Clean or replace screen. See Service Section 4.1.
4. Maximum gas flow fails to provide desired chemical residual.	a. Air leakage some point upstream of flowmeter. b. Chemical demand and/or flow has increased above original capacity requirements. c. Gas supply exhausted.	a. Refer to Conditions 1 and 2. b. Contact supplier and review equipment capacity. c. Replenish gas supply.
5. Minimum gas flow provides too high a chemical residual.	a. Chemical demand and/or flow has decreased below original capacity requirements.	a. Contact supplier and review equipment capacity.
6. Flowmeter fails to indicate gas flow during operation.	a. Flowmeter plugged. b. Loss of vacuum condition downstream of flowmeter.	a. Clean flowmeter. b. Refer to previous Conditions.
7. Float in gas flowmeter drops during normal operation.	a. Gas supply valve(s) closed. b. Gas supply exhausted. c. Screen in vacuum regulator inlet plugged.	a. Open gas supply valves. b. Replenish gas supply. c. Clean screen. See Vacuum Regulator Instruction Manual
8. Insufficient ejector vacuum.	a. Y-strainer in water supply line is dirty reducing supply pressure. b. Back pressure is greater than that listed for the ejector because: 1) solution valve, if present, not fully open; 2) solution line, if present, partially blocked; or 3) back pressure at point of application has increased above its original value. c. Ejector nozzle and/or throat dirty.	a. Clean Y-strainer. If this does not correct the problem, refer to Ejector Instruction Manual. b. Open solution valve; clean solution line; determine cause of abnormally high back pressure and correct condition. c. Clean nozzle and/or throat and confirm nozzle/throat diameter.

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
9. Gas leak	There are a few possible points of gas pressure leaks in addition to the obvious points at gas pressure piping connections. These are not usual, but if detected, should be immediately located and corrected. Even small leaks can create a safety hazard and cause serious corrosion to equipment in the area.	
	a. Gas leak at cylinder valve. b. Leakage at lead gasket, attaching vacuum regulator to cylinder valve caused by over or under tight condition, a used gasket or dirty gasket	a. Tighten cylinder valve packing nut without exerting excessive force. If this does not eliminate the leak, close the valve and call the gas supplier. b. Install a new lead gasket each time the seal has been broken. Make certain the gasket and the gasket surfaces are clean and smooth.
10. Loss of gas feed.	a. Dirty or plugged ejector nozzle. b. Insufficient water pressure. c. No gas supply. d. Plugged gas inlet screen of vacuum regulator. e. Plugged gas inlet screen at valve.	a. Insufficient vacuum can be checked by disconnecting the vacuum line at the ejector and holding the palm of your hand briefly over the end of the inlet fitting to the ejector check valve assembly. Suitable vacuum will exert a strong pull. Refer to Ejector Instruction Manual. b. Check as above. Hydraulic requirements vary with capacity and installation conditions. c. Replenish gas supply. d. Refer to vacuum regulator Instruction Manual. e. Refer to Service Section 4.1.
11. Erratic operation	a. An oversized system, where actual maximum requirement corresponds to 10 or 20% of system capacity, will make chemical residual difficult to control. b. Dirty valve plug.	a. Consult factory or re-sizing. b. Clean valve plug. Refer to Service section 4.1.
12. Unstable chemical residual.	a. Inoperative or faulty flow transmitter	a. Consult flow meter manufacturer.
13. Runaway valve condition at steady flow conditions.	a. Open feedback potentiometer.	a. Replace feedback potentiometer. Refer to Service Section 4.2.
14. Automatic valve neither opens nor closes.	a. No power. (LED not illuminated). b. Main fuse blown or circuit breaker tripped. c. Incorrect or loose wiring. d. Incorrect power.	. Check power is ON and AUTO/MANUAL switch is in AUTO position. b. Replace fuse or reset circuit breaker. c. Visually inspect all wiring. d. Check for proper voltage on terminals. e. Replace printed circuit board.
15. Automatic Valve closed to minimum position.	a. Incorrect wiring. b. Circuit board damaged or loose in mount. c. Feed system oversized. d. Loss of flow signal.	a. Check for wiring errors to valve. b. Tighten or replace printed circuit board. c. Contact supplier and review equipment capacity requirements. d. Service flow transmitter

TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
16. Automatic Valve opens to maximum position.	a. Incorrect wiring. b. Flow transmitter signal changing but controls do not respond. c. Feed system undersized. d. No RI resistor for current inputs	a. Check for wiring errors to valve. b. Inspect flow signal line for open or short. c. Contact supplier and review equipment capacity requirements. d. Add RI resistor.

EC DECLARATION OF CONFORMITY

This is to certify that the

Series 1410 Gas Valve

Manufactured by
Capital Controls Company, Inc.
3000 Advance Lane
Colmar, Pennsylvania 18915
Tel 215-997-4000

Conforms with the protection requirements of European Council Directive 89/336/EEC as amended by 91/263/EEC and 92/31/EEC, relating to Electromagnetic Compatibility and European Low Voltage Directive 93/68 EEC, relating to Electrical Equipment Safety, by the application of:

Test results to the following EMC standards:

**EN50081-1 Emission Standard
(BSEN 55022 Class B)**

EN50082-1 Generic Immunity Standard

Standards applied for LVD:

**BSEN 61010-1 Safety Requirements for
Electrical Equipment for Measurement, Control and Laboratory Use**

Tests carried out by Capital Controls Company, Inc., dated April through July 1996,
Met Laboratories, Baltimore, Maryland, dated July 1996,
Radiation Sciences Inc., Harleysville, Pennsylvania, dated March 1997,
Access Test Services Ltd, Chestnut Hill, Keswick, UK, dated September 1997.

Importer: Capital Controls Company, Inc.

Address: 3000 Advance Lane
Colmar, PA 18915

Signed:



Wayne B. Huebner
General Manager
Capital Controls Co., Inc.

Date: December 12, 2000

Design improvements may be made without notice.

Represented by:

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